Final
Volume 2

# Programmatic Environmental Impact Statement For Northern Border Activities, Appendices

Department of Homeland Security
U.S. Customs and Border Protection


July 2012

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# APPENDIX A

# NORTHERN BORDER PEIS
# PUBLIC INVOLVEMENT

# Appendix A-1
# Northern Border
# Programmatic Environmental Impact Statement

# Public Scoping Report

for

## Scoping Activities Performed May-July 2010

## Scoping Meetings:

July 12, 2010 – Rochester, NY; Augusta, ME

July 13, 2010 – Erie, PA; Swanton/St. Albans, VT

July 14, 2010 – Massena, NY

July 19, 2010 – Bellingham, WA; Duluth, MN

July 21, 2010 – Bonners Ferry/Naples, ID; Minot, ND;
Detroit/Southfield, MI

July 22, 2010 – Havre, MT

## U.S. Customs and Border Protection
## Department of Homeland Security

## Overview of the Scoping Process

U. S. Customs and Border Protection (CBP) developed and executed a public scoping process for its four regional Programmatic Environmental Impact Statements (PEISs) for Northern Border operations. "Scoping" of an environmental impact statement is a process of informing diverse stakeholders about an action that an agency is planning and seeking those stakeholders' feedback on the environmental concerns that that action could generate. The intent of the scoping effort is to adapt the scope of the planned programmatic National Environmental Policy Act (NEPA) document to ensure that it addresses relevant concerns identified by interested members of the public as well as organizations, Native American tribes, and other government agencies and officials.

CBP's public scoping efforts consisted of a Notice of Intent (NOI) to prepare PEISs, scoping letters sent to potentially interested stakeholders, a project Web site, a series of public scoping meetings, and display advertisements and public service announcements making the public aware of the meetings and the public scoping program. CBP Public Affairs posted a press release about scoping on the CBP Web site.

A series of 11 public scoping meetings were arranged for the 4 PEIS regions, 6 during the week of July 12-16, 2010 and 5 during the week of July 19-23, 2010. The meetings were held in the evenings. At each public meeting, attendees were given handouts and invited to view a series of informational posters about CBP and northern border security. At each meeting, CBP and contractor personnel made a brief overview presentation of the PEIS effort. CBP representatives presented information on the suite of potential CBP activities. Mangi Environmental provided contract support and presented information on the NEPA process and environmental considerations. Following the presentation, the presenters invited attendees to view the posters again and to dictate their comments to a court recorder set aside to hear them individually.

Any attendee wishing to make a comment could also do so by filling out a comment form and leaving it at the meeting or mailing it in later. CBP and Mangi Environmental also informed scoping meeting attendees, both by meeting handout and in the visual presentation, how they could make comments through the website or e-mail. Approximately an hour after the initial presentation was given, a second presentation with the ensuing opportunities was given if new attendees had arrived at the meeting.

Scoping letters were sent to a mailing list of approximately 1,200 agencies, organizations, and individuals. The letters described the proposed project and invited comments in response. The meetings and letters established a response date of August 5, 2010.

Appendix A presents a list of the newspapers in which display ads were placed. Appendix B presents the text of the display ads, along with the materials, such as handouts, that were made available at the scoping meetings. Appendix C is a compendium of news articles published after the scoping meetings.

## Scoping Results

### Public Comments

Scoping comments were received at public meetings, as well as through e-mail, faxes, phone calls, and posted letters. Comments received during the scoping process have been organized and annotated using document management software. A total of 223 communications were received during the public scoping process. Mangi Environmental reviewed all the communications and extracted multiple specific comments from each, identifying a total of 500 discrete public scoping comments and organizing them into "comment themes." Each comment theme was assigned a code that indicated the overall category of comment (alpha code) and the specific issue (numeric code). The 51 resulting comment codes are below as well as attached in Appendix D to this report. These themes and comments were then analyzed to help shape the PEIS scope and issue coverage. Appendix D also identifies how each comment will be handled by CBP in developing the PEIS.

| Directory of codes |
|---|
| |
| **I = impact or issue of concern** |
| ***Biological*** |
| **BI-1 – threatened and endangered species** |
| **BI-2 – wildlife** |
| **BI-3 – vegetation** |
| **BI-4 – avian and land migratory species** |
| ***Physical*** |
| **PI-1 – geology & sediment conditions** |
| **PI-2 – physical surface and groundwater conditions** |
| **PI-3 –wetland resources** |
| **PI-4 – water quality** |
| **PI-5 – air & climate (including light)** |
| **PI-6 – sustainability** |
| **PI-7 – prime and unique farmland** |
| ***Socioeconomic*** |
| **SI-1 – recreational fishing and hunting** |
| **SI-2 – cultural recreation, visual studies, and national parks** |
| **SI-3 – noise** |
| **SI-4 – transportation and navigation** |
| **SI-5 – tribal issues** |
| **SI-6 – socioeconomics (anything to do with cost and quality of life)** |
| **SI-6a – commerce concerns** |
| **SI-6b – human health and services (HHS)** |
| **SI-6c – environmental justice** |

| |
|---|
| **SI-6d – family concerns** |
| **SI-6e – green card concerns** |
| **SI-7 – historical issues** |
| **SI-8 – conservation easements** |
| **SI-9 – privacy/invasive actions concerns** |
| ***Operations*** |
| **OI-1 – suggested security actions** |
| **OI-2 – port of entry (POE) concerns and border crossing issues** |
| **OI-2a – Messina specific** |
| **OI-2b – ND International Peace Garden (IPG) specific** |
| **OI-2c – St. Albans specific** |
| |
| **A = alternatives** |
| **A-1 – all suggested alternatives** |
| |
| **R = requests** |
| **R-1 – request PEIS** |
| **R-2 – request comment period extension** |
| **R-3 – request general data** |
| **R-4 – request scoping period reinitiation** |
| **R-5 – request substantial PEIS review period** |
| |
| **M = possible mitigation** |
| |
| **G = general and/or data on resources** |
| **Gm – comments about scoping process** |
| **Gf – general CBP-focused comments** |
| **Gl – comments about legislators, general Government** |
| |
| **C = conceptual** |
| **CS – support project** |
| **CSa – support for national security reasons** |
| **CSb – support for other political reasons** |
| **CSc – support for economic reasons** |
| **CO – oppose project** |
| **COa – oppose for environmental reasons (e.g., too many impacts, too many unknowns)** |
| **COb – oppose for political reasons** |
| **COc – oppose for economic reasons** |
| **CN-1 – support a full, fair evaluation** |

| |
|---|
| **CN-2 – support if the project is evaluated and outlook is good (i.e., if no significant cumulative effects)** |

**Summary of Comments**

Throughout the following summary of results, comment theme codes are given in parentheses. The reader can use the accompanying summary spreadsheet (Appendix D-Scoping Comments Summary Table) to identify the commenters for specific themes.

Comments were received from the following entities:

- Federal agencies: General Services Administration (GSA), National Park Service (NPS), United States Fish and Wildlife Service (USFWS), United States Department of Agriculture/Forest Service (USDA/FS), United States Environmental Protection Agency (USEPA), United States Army Corps of Engineers (USACE), and USDA/Natural Resources Conservation Service (USDA/NRCS)
- States: Montana Fish, Wildlife, and Parks Commission; Washington Department of Transportation; Michigan Department of Natural Resources and the Environment; and Minnesota Department of Natural Resources
- Local government: Macomb County, Michigan
- Independent bodies: Skagit Environmental Endowment Commission (Established by treaty between the United States and Canada. It consists of members appointed by the Governor of British Columbia and Mayor of Seattle. It administers a fund created by the treaty to conserve and protect wilderness and wildlife habitat and to enhance recreation opportunities)
- Tribal governments: Mohawk Council of Akwasasne and Houlton Band of Maliseet Indians
- Nongovernmental Organizations (NGOs): Wildlife Society, National Parks Conservation Association, Conservation Northwest, Lake Champlain Basin Program, Skagit Audubon Society, plus 16 NGOs represented by Dinah Bear, as follows:
    - Sierra Club
    - Border Ambassadors
    - Center for Biological Diversity
    - Center for Large Landscape Conservation
    - Defenders of Wildlife
    - International League of Conservation Photographers
    - National Immigration Forum
    - No Border Wall
    - Natural Resources Defense Council
    - Pacific Rivers Council
    - Sierra Club, Vermont Chapter
    - Texas Border Coalition
    - United Church of Christ
    - Western Land Exchange
    - Wilderness Watch
    - Yellowstone to Yukon Conservation Initiative

**Most Frequent Comments**

A frequency analysis of the comment themes revealed the following ranking of comment frequency:

- Delays in picking up kids at International Peace Garden at Dunseth (98 total mentions, OI-2b)
- Keep Morses line open, other improvements (39 mentions, OI-2c)
- Various security suggestions (e.g., new technology, standardized frequencies, intelligence, and interagency cooperation) (28 mentions, OI-1)
- Concerns about preserving national parks for conservation and recreational values (24 mentions, SI-2)
- Scoping process complaints (21 mentions, Gm)
- Various CBP policy suggestions (e.g., focus nationally and prevent illegal immigrants and drugs) (19 mentions, Gf)
- Mohawk and Seneca tribes do not recognize U.S.- Canada border (16 mentions, SI-5)
- Slow POEs discourage commerce (16 mentions, SI-6a)

The scoping comments can be grouped into the following categories, each discussed separately below:

1. Comments about the scoping process itself
2. Concerns about impacts on specific natural or human environmental resources
3. Operations- or policy-related comments
4. Location-specific comments
5. Requests

1. Comments about the scoping process itself

Many commenters voiced dissatisfaction with the scoping process conducted by CBP. The concerns included:

- Lack of specificity in the description of the proposed action and alternatives in the NOI. Commenters were frustrated because the lack of clarity and detail in defining what CBP is proposing made commenting difficult;
- Lack of cooperators identified among agencies, tribes, and Canadian government; and,
- Inadequate public notification of the scoping meeting logistics:
    - Notifications provided very short lead times (the first meeting was 6 days after NOI publication);
    - Web site information on meeting times was inadequate for the first seven meetings; and,
    - "Calls to the CBP representative listed in the NOI went unanswered for the first week."

2. Concerns about impacts on specific natural or human environmental resources

The single most important issue voiced in comments about the natural environment was the concern that CBP's future actions would threaten ecological, recreational, and wilderness values in public lands along the border.

Sensitive ecological resources specifically mentioned include:

- Species that are state or Federally listed as threatened or endangered (T&E), including grizzly bear, Canada lynx, bull trout, and gray wolf (BI-1);
- Wetlands in the Great Lakes (PI-3);
- Migration corridors for many species that routinely cross the Northern Border (BI-4);
- Aquatic and avian species that could be affected by vehicles or boats (BI-3);
- Invasive species that could be introduced through vehicle or boat patrols (BI-3); and
- Wilderness areas such as Stephen Mather Wilderness in North Cascades National Park, Pasayten Wilderness, and Boundary Waters Canoe Area. Impacts to wilderness values in these areas should be avoided or mitigated, and recreational access should be maintained wherever possible (SI-2). Comments on specific resources and public lands were made by USDA/FS, NPS, and USFWS.

In addition, several commenters expressed concern about the noise (SI-3) as well as light and air pollution (PI-5) created by terrestrial, aerial, and marine patrols and surveillance activities along the border regions. Further, some commenters expressed concern about the visual impacts of new infrastructure (SI-2). Several suggested that mitigation measures must be adopted.

The USDA/NRCS commented that there are many private lands with conservation easements within the 200-mile border swath and that land use changes that CBP may propose as part of a given action should be mindful of easement restrictions.

Many commenters raised concerns about land port of entry (POE) issues. While site-specific concerns are discussed below, it is clear from the overall comments that LPOE issues are the most personal and of greatest direct impact on the lives of people who live near the border. CBP's methods and technologies for processing people and trade as they traverse the border are critical socioeconomic impact-producing factors and, as such, should be included in the scope of this PEIS, assuming that CBP's entire mission of securing the border and facilitating trade and tourism is within the purview of the PEIS. The most frequently expressed concerns were fear of potential LPOE closures (SI-4) and the impact of wait times on daily family and community life (OI-2, 2a, 2b, and 2c).

3. Operations and policy-related comments

Many commenters had specific suggestions, recommendations, or opinions about current and future CBP activities (OI-1 and Gf). Among these were:

- The need for technologies for increased surveillance;
- The need for more cooperation among agencies;
- The use of standardized radio frequencies;
- A focus on smaller checkpoints for intelligence purposes;
- No "Big Brother";
- The need for CBP to stop wasting money and to focus on national, not local, picture;
- The need to focus on preventing illegal immigrants and drugs;
- The importance of not militarizing the border; and,
- That the border is unconstitutional and should be abolished,

4. Location-Specific Comments

Table 1 details the location-specific issues contained in the scoping comments:

**Table 1. Location-specific Comments**

| Location | Comment summary | Number of comments |
|---|---|---|
| Lake of Woods, Boundary Waters | Special preservation necessary, ample wetlands to consider | 6 |
| North Cascades National Park and Pasayten Wilderness | Should not bear any negative impacts from CBP actions | 4 |
| Lake Erie | Easy access for illegal activities | 7 |
| State of Montana Parks | Specific concerns for T&E species, recreational economy | 4 |
| Massena POE | Delays crossing border, lost habitat, and tribal relations issues | 39 |
| Dunseth POE | Irritant to International Peace Garden traffic because of slow movement at and around POE, even if no border crossing | 93 |
| Glacier National Park | Protect resources | 8 |
| Braddock Bay | Migratory bird species concerns | 1 |
| Niagara Watershed | Niagara Power Project concerns of pollution, commerce affected, and waits at the falls | 4 |
| Morses Line POE | Keep it open | 53 |
| White Mountain National Forest (NF) | No impacts from CBP tolerated | 1 |
| Lake Roosevelt | Special attention to impacts here | 1 |
| Colville and Kaniksu NFs | Special attention to impacts here | 2 |
| Ross Lake area | What impacts here? | 9 |
| St. Croix Island | Avoid all impacts and any actions here | 3 |

5. Requests

The following requests were included among the scoping comments:

- Reinitiate scoping (two requests);
- Extend scoping (R-2, three requests);
- Official request for cooperating agency status-NPS only;
- Notification of availability of PEIS (R-1, 11 requests); and,
- Provide substantial PEIS review and comment period (R-5, one request).

A summary spreadsheet of all comments and a key to comment codes are shown in Appendix D.

## Outcomes of Scoping

A major goal of scoping is to help the agency refine its plans as appropriate to ensure that the study responds to relevant concerns. In this instance, CBP determined that several refinements in its plans would enhance the effectiveness of its planned study. These refinements include:

- Preparation of a single nationwide PEIS instead of the earlier preliminary plan to prepare four regional ones. While this makes for a somewhat larger single document, it offers the advantage of less duplication and greater usefulness as a CBP planning tool.
- Publication of an updated Notice, along with letters and other public announcements to inform agencies, the public, and other interested parties about this refinement.
- An affirmation that CBP will welcome comments on the scope of the PEIS at any time, but that the earlier the comments are received, the more useful they will be.
- Coordination between CBP and other major Federal agencies with jurisdiction or expertise to enlist their assistance in the preparation of the PEIS.

# Appendix A-2

## Public Report on Responses to Comments on the Draft Programmatic Environmental Impact Statement (PEIS) for Northern Border Activities

**Duluth, MN: 3-Oct 2011**

**Massena, NY: 4-Oct 2011**

**Caribou, ME: 4-Oct 2011**

**Augusta, ME: 5-Oct 2011**

**Bottineau, ND: 5-Oct 2011**

**St. Albans, VT: 6-Oct 2011**

**St. Albans, VT: 6-Oct 2011**

**Detroit, MI: 6-Oct 2011**

**Havre, MT: 6-Oct 2011**

**Bellingham, WA: 11-Oct 2011**

**Rochester, NY: 11-Oct 2011**

**Naples, ID: 13-Oct 2011**

**National Capital Area (Arlington, VA): 17 Oct 2011**

**Department of Homeland Security**

**U.S. Customs and Border Protection**

## 1) How were comments addressed?

Comments were addressed according to Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA. CEQ Regulations 40 CFR Part 1500.4 outlines the five ways that an agency is to respond to comments received on an Environmental Impact Statement. They are:

**A.** Modify alternatives including the proposed action.

**B.** Develop and evaluate alternatives not previously given serious consideration by the agency.

**C.** Supplement, improve, or modify its analyses.

**D.** Make factual corrections.

**E.** Explain why the comments do not warrant further agency response.

## 2) How many comments were received on the Draft PEIS for Northern Border Activities?

Roughly 120 individual letters were received, of which we extracted around 700 comments. Of these comments, approximately 2/3 were determined to be out of scope for incorporation within the PEIS or repetitive of other comments responded to directly within the PEIS.

## 3) Where can I find responses to the comments I submitted?

Explanations for why comments were determined non-substantive or out of the scope of the PEIS are provided and summarized in Table (A-2.1) of this Appendix. All substantive comments are included in Table (A-2.2) of this Appendix. The are sorted according to the order in which they were received.

## 4) What key themes emerged from the comments?

There were several themes that emerged repeatedly from the comments received. Major themes and CBP responses are summarized below:

**A.** Concerns with impacts to transboundary areas and species.

**i.** CBP is aware of transboundary pacts and treaties between the United States and Canada associated with the project area. Transboundary

Protected Areas have been identified in their associated regional area in PEIS.

ii. Similarly, CBP is aware of the importance of wildlife corridors and the transborder migration of wildlife. Any proposed action that would have an adverse effect on the transboundary migration of sensitive species (including those listed under the Endangered Species Act), habitats, and wildlife movement, would require consultation with U.S. Fish and Wildlife Service (USFWS) and will be addressed as part of site specific environmental reviews for individual actions. Coordination with Canadian agencies on transboundary species concerns would necessarily be done through our Federal natural resource management partners and the Department of State.

**B.** Concerns of potential to build fence.

i. CBP has no intention of installing 4,000 miles or, any significant fraction thereof, of fencing along the United States and Canadian International Border. It is not a part of any Northern Border strategy under consideration. Fencing for traffic management and deterrence at specific crossing points would be extremely limited relative to the amount of infrastructure north of the border. Fencing, used as a force multiplier, may be installed in selected discrete areas where intrusion control is necessary. Prior to installation of any tactical security infrastructure items, a CBP NEPA planning document would be prepared on the environmental impacts of that specific fence project.

**C.** Concerns with impacts to cultural resources.

i. This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications, but would permit CBP to tier off repetitive background information so project specific analysis could focus upon environmental impacts of most concern for planners and the general public. Project specific environmental assessments would be prepared prior to initiation of an actual project proposal at a specific location and be subject to additional NEPA and other appropriate environmental reviews and consultation with potentially affected tribes, land-owners, Federal, State and local agencies with jurisdiction over resources, and the general public. As part of the NEPA process, CBP will comply with the National Historic Preservation Act. CBP retains qualified Archeologists and Architectural Historians to identify cultural resources and historical properties. We have consulted with tribes on the Northern Border PEIS and will consult with the State Historic Preservation Officer (SHPO) and affected tribes for any site specific action with the potential to affect cultural and historical resources.

**D.** Tribal and cultural data and protection concerns.

- **i.** CBP will assess and, when appropriate, consult on all construction, maintenance and repair activities that could impact tribes. CBP has invited participation from all individuals, groups, and governments within the study area. Several tribes provided comments during scoping and during the public comment period for the draft PEIS. Approximately 75 tribes are within 100 miles of the border.

- **ii.** The U.S. Border Patrol (USBP) has created Public Lands Liaisons and tribal liaisons within their sectors to reach out to various governmental agencies and affected tribes which may be affected by their actions. CBP also has a broader State, :Local and Tribal Liaison program to facilitate communication and cooperation with tribes and other governments. CBP and its law enforcement components are attempting to be more responsive to the concerns of local communities in which they interact. Enhanced tribal identification card programs as well as preclearance efforts may reduce issues with transport of important traditional items.

**E.** Concerns with the cumulative impact analysis.

- **i.** CBP's approach to cumulative analysis is reasonable given CBP's small footprint for the area covered. However, CBP will provide additional information on recent historical growth in its activities along the Northern Border to provide meaningful perspective on resource impact trends.

**F.** Issues with how public outreach was conducted.

- **i.** CBP conducted a round of 11 scoping meetings and 13 draft PEIS public meetings across the Northern Border. CBP made efforts to cover as much representative Northern Border territory as it could, given the extent of the area covered in the analysis. CBP could not accommodate meetings in every area that wanted one.

- **ii.** CBP conducted two sets of mass mailings to over 1600 libraries and 900 other addressees and placed notifications in local newspapers. Since there are no specific proposed projects at specific sites, CBP sought not to bias its meeting locations based on existing activities. Any comments based on existing knowledge of environmental concerns with CBP activities have been well received in this process. CBP made attempts to mail out to everyone who made a request and all change requests made.

- **iii.** Extending the comment period would not further public awareness of CBP activities that could affect their local environment. Despite the size of the document, the 45-day period is sufficient for interested parties to comment on concerns about potential future impacts within a given regional environment. The PEIS provides broad-based analysis of impacts from proposed alternative approaches to respond potential threat changes within the next five to seven years. CBP is not proposing an action or management plan in the PEIS. It would not and could not take any specific action based upon the analysis in the PEIS or decisions in the ROD. CBP would provide sufficient notice and review times to the public to comment upon future NEPA documents when it does propose actual projects with the potential for significant impacts to the environment.

**G.** Issues with the selected alternatives.

**i.** The alternatives used in the PEIS were developed to provide CBP decision-makers with a basis for understanding the relative environmental impacts associated with implementing different sets of tools/activities used to facilitate border security along the Northern Border. These alternatives provide a reasonable range of approaches to choose from to meet yet unidentified future threats. The relative environmental impacts that would likely occur from implementing each the alternatives are presented in the PEIS in narrative and tabular form throughout the document. They evidence the different environmental considerations inherent to any strategic approach.

**ii.** The purpose of this PEIS is to provide broad based analysis of CBP activities that could become required within the next five to seven years in response to yet unknown changes in threat conditions. Project specific environmental assessments would be prepared prior to initiation of an actual project proposal. The PEIS would permit CBP to tier off repetitive background information so project specific analysis could focus upon environmental impacts of most concern for planners and the public.

**iii.** No projects will be initiated without additional NEPA documentation being prepared. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed.

**iv.** All activities depicted within the PEIS would require some additional environmental review. Any item meeting the definition of a major Federal action that is not currently categorically excluded, or otherwise disclosed as not requiring additional environmental review would require at least initiation of an environmental assessment.

**H.** Issues with the analysis.

**i.** This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications. Any proposal for actual projects or activity at a specific location would occur in the future and be subject to additional NEPA and other appropriate environmental reviews and consultation with potentially affected tribes, land-owners, Federal, State and local agencies with jurisdiction over resources, and the general public. Project specific environmental assessments would be prepared prior to initiation of an actual project proposal. The PEIS would permit CBP to tier off repetitive background information so project specific analysis could focus upon environmental impacts of most concern for planners and the public.

**ii.** No alternative was selected at the time of publication of the Draft PEIS.

**iii.** Specific contract language for specific actions is not a part of a PEIS. CBP BMPs would address such specific language when required.

**iv.** No projects will be initiated without additional NEPA documentation being prepared. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed.

**I.** Misconception that the PEIS is related to H.R. 1505 National Security and Federal Lands Protection Act.

**i.** It should be understood that CBP Protection is not proposing or planning to request any change in legal responsibilities or to further increase its physical presence along the Northern Border. The PEIS is providing a prudent broad look and potential impacts if activity levels needed to change in the future due to a change in the threat environment along the border.

**Table A-2.1 Comments Received but Not Incorporated into PEIS**

| # | Comment | CBP's Response |
|---|---|---|
| **CULTURAL AWARENESS** | | |
| **8** | The village of St. Regis, or Kanatakon, and the district of Skye must pass through US portion of reservation. The border was drawn through the territory in 1754 by ppl who could not envision the modern scenario with high population, cars, trucks, boats… It is an intrinsic part of the community's philosophy that the US/Canada boundary was never meant to apply to us, and that according to aboriginal laws, we are a singular community, a nation unto ourselves. Outside authorities have dismissed our views; exercised jurisdiction over the divided community; supplanting our traditional gov system with elective gov on both sides of border. Some are believers of Mohawk sovereignty and reject intrusion. Some believe gov has violated the Two Row Wampum, a treaty which assures non-interference in our political, cultural, and economic systems. Even though some (not all) are engaged in the black market, not everyone who believes in the intrusion is, our elected gov helped assist the Integrated Border Enforcement Teams (IBETs) in their crackdown on contraband smuggling. | The issue raised is beyond the scope of analyzing the environmental and related socioeconomic impacts of current and potential/foreseeable future CBP activities along the Northern Border. The PEIS makes no judgment upon the validity of your concerns, but is not the appropriate mechanism for addressing them. Enhanced tribal identification card programs as well as preclearance efforts may reduce issues with transport of important traditional items. |
| **77** | Ceremonial gifts-blankets, medicine bundles, horses, moose meat, caribou, seal walrus. | |
| **81** | Providing ground penetrating radar devices to tribes or their contractors to assist in location of small pox, t.b., Spanish flu, etc. to tribes | |

| | | |
|---|---|---|
| **13** | If fencing and ports of entry for the international road are contemplated, it would greatly affect the day-to-day life of Akwesasne residents, especially those who have to travel from one district of the reserve to another for their jobs and regular act. The existing scenario already adds up to an hour of travel time for normal commuting. | The purpose of this PEIS is to provide broad based analysis of CBP activities that could become required within the next five to seven years in response to yet unknown changes in threat conditions. This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. Upon completion of this PEIS, CBP would still have to complete NEPA analysis for any proposed projects that currently would require environmental assessments and environmental impact statements. Any CBP proposals for projects or activities at specific locations would be made in the future and would comply with all applicable statutory and regulatory environmental requirements. At such time, CBP would also conduct other appropriate required environmental reviews and consult with potentially affected tribes and land-owners as well as Federal, State and local agencies with jurisdiction over resources. The PEIS would permit CBP to tier off repetitive background information so project specific NEPA analysis could focus upon environmental impacts of most concern for planners and the general public. |
| **1150** | When viewing the Mohawk Territory, Federal, State and Provincial governments often parcel the land within the confines of each respective agency. This fragmentation needs to be fully considered under NEPA with respect to EJ. | CBP appreciates your concern. However, parceling of land is outside the scope of CBP's jurisdiction and, therefore, also outside the scope of this PEIS. |
| EXTENT OF TRIBAL CONTACT AND CONSULTATION | | |
| **37** | To listen to Native American issues as well as other people of the area to realize that this area is different that other parts of the (4000 miles of) Northern Border. (Public meeting should have had a public comment period, so people could hear what others had to say.) | CBP made efforts to cover as much representative Northern Border territory as it could, given the extent of the area covered in the analysis. CBP could not accommodate meetings in every area that wanted one. CBP has invited participation from all individuals, groups, and governments within the study area. Several tribes provided comments during scoping and during the public comment period for the draft PEIS. Approximately 75 tribes are within 100 miles of the border. CBP consults on all construction, maintenance and repair activities that could impact tribal possessions or populations. |
| **76** | What involvement has tribes been involved with since the inception of the Homeland Security meeting. | |
| **78** | How many tribes are affected by the on-or near border areas and what dialogue has occurred. | |
| **79** | What CBP's position on tribal consultation. | |

| | | |
|---|---|---|
| **628** | It is imperative that we be an integral part of the CBP's effort to fulfill its mission while maintaining a balance with its responsibility to facilitate legitimate trade and travel. | The purpose of this PEIS is to provide broad based analysis of CBP activities that could become required within the next five to seven years in response to yet unknown changes in threat conditions. This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. Upon completion of this PEIS, CBP would still have to complete NEPA analysis for any proposed projects that currently would require environmental assessments and environmental impact statements. Any CBP proposals for projects or activities at specific locations would be made in the future and would comply with all applicable statutory and regulatory environmental requirements. At such time, CBP would also conduct other appropriate required environmental reviews and consult with potentially affected tribes and land-owners as well as Federal, State and local agencies with jurisdiction over resources. The PEIS would permit CBP to tier off repetitive background information so project specific NEPA analysis could focus upon environmental impacts of most concern for planners and the general public. |
| TREATMENT OF TRIBES AND MEMBERS OF TRIBES | | |
| **445** | The EIS contains no info on contacts with or treatment of Native Americans at the border crossings. Treated as less than citizens, and are harassed when there are not real bad guys to chase. | The issue raised is beyond the scope of analyzing the environmental and related socioeconomic impacts of current and potential/foreseeable future CBP activities along the Northern Border. The PEIS makes no judgment upon the validity of your concerns, but is not the appropriate mechanism for addressing them. |
| **614** | Mistreatment towards native Americans | CBP seeks to treat all people with respect as it discharges its border security mission. |
| **1161** | Both sides of the border can get rude. They take things like medicinal herbs, which we have used since the beginning of time. It is rude because we have a treaty. | Officers are obligated to confiscate undocumented plant and animal materials to safe guard both Canadian and American from potential agricultural infestations. Confiscation of materials by CBP officers is beyond the scope of this PEIS. |

| **CULTURAL RESOURCES** | | |
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| **18** | At Akwesasne the border passes through residential areas, gov facility parking lots, a radio station, and sensitive environmental features such as forests, wetlands, and rivers. The border area is rich with archaeological features dating back thousands of years and all must be considered in any enhancements to the existing border enforcement program. Akwesasne would be the most complicated part of the 4,000 mile border between the US and Canada and may very well need its own socio-economic study, cultural resources survey, and environmental impact study. Urge to consult extensively with Mohawk leaders and community members. | The purpose of this PEIS is to provide broad based analysis of CBP activities that could become required within the next five to seven years in response to yet unknown changes in threat conditions. This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications. Upon completion of this PEIS, CBP would still have to complete NEPA analysis for any proposed projects that would require environmental assessments and environmental impact statements. Any CBP proposals for projects or activities at specific locations would be made in the future and would comply with all applicable statutory and regulatory environmental requirements. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. At such time, CBP would also conduct other appropriate required environmental reviews and consult with potentially affected tribes and land-owners as well as Federal, State and local agencies with jurisdiction over resources. The PEIS would permit CBP to tier off repetitive background information so project specific NEPA analysis could focus upon environmental impacts of most concern for planners and the general public. |
| **115** | Without details, it is impossible to know if the plan at Niagara Falls/Buffalo NY will benefit or compromise the historic areas, aggravate the health and env., kill thriving communities, resolve or exacerbate existing bi-national transportation problems | |
| **518** | In order to appropriately comment, residents need more detailed information on CBP's plans specifically for the Peace Bridge crossing in Buffalo NY, which operates on national protected land and is adjacent to the Prospect Hill-Columbus Park historic district | |
| **626** | As the CBP continues to expand its facilities and services, we believe there is great potential for socioeconomic and cultural impacts on our people. | |

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| **794** | Anticipate that border infrastructure and enforcement actions that fall under the non-specific umbrella categories provided in the DPEIS may have deleterious impacts on sensitive plants and animals and cultural resources because of: anticipated trampling of vegetation and other direct damage to aquatic wildlife, wildlife habitat; fragmentation of habitat/wildlife corridors from roads/barriers, introduction of invasive species; anticipated trampling of cultural resources, disturbance of sites sacred to Native Americans; impacts to endangered species recovery efforts; wildlife mortality/displacement; modification of wildlife behavior; Concerned about the potential for significant impacts to the wilderness character across the National Wilderness Preservation System | |
| **863** | It is unclear how areas of high significance for cultural resources will be considered and analyzed in site specific actions proposed. | |
| **82** | Potential mitigation, "Cree Crossing." | CBP will assess and, when appropriate, consult on all construction, maintenance and repair activities that could impact tribes. |
| **367** | Any development in all listed alternatives of this draft requires a complete site survey and full documentation for cultural resources. | As part of the NEPA process, CBP will comply with the National Historic Preservation Act. CBP retains qualified Archeologists and Historical Architects to identify historical properties and cultural resources. CBP consults with the State Historic Preservation Officer (SHPO) and affected tribes. |
| **369** | The potential for great damage to occur to cultural and paleontological resources through each of the alternatives listed in the draft Northern Border PEIS is very disturbing. | No further response required within the PEIS. CBP thanks you for your comment. |
| **399** | From our quick review of your analysis of the various impacts your alternatives would have on cultural resources, including historic resources, we disagree with your decision to classify most of these as minor to moderate. From our perspective, most of the activities your report describes have the potential to cause real and irreversible harm to cultural resources. | CBP disagrees with this comment. Because this analysis is broad and aimed at strategic understanding, each specific project would have to be evaluated on its own merits and potential impacts consulted upon at the time it is proposed. |

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| **401** | To say that impacts of individual projects will be reviewed under the NHPA at a future date does not provide our resources with adequate protection, because acceptance of your PEIS in its current form already prejudices future reviews. | CBP will continue to analyze impacts under NEPA, NHPA, and a host of other applicable laws and regulations including those directing government to government consultation with Federally-recognized tribes. |
| **BIOLOGICAL RESOURCES** | | |
| **98** | We see no reason to obviate ANY environmental regulations in pursuit of Homeland Security on these very significant public lands. Most of our very important rivers have their headwaters within the 100-mile zone, thereby increasing the likelihood of damage to much of the rest of the State of Maine should CBP succeed in avoiding CWA regulations, for instance. | This PEIS is not tied to any legislation currently under consideration in congress. No projects would be proposed or initiated without additional NEPA documentation, public involvement, tribal consultation (when appropriate), and coordination/consultation with Federal, State, and local resource management agencies. |

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| **115** | Without details, it is impossible to know if the plan at Niagara Falls/Buffalo NY will benefit or compromise the historic areas, aggravate the health and env., kill thriving communities, resolve or exacerbate existing bi-national transportation problems | The purpose of this PEIS is to provide broad based analysis of CBP activities that could become required within the next five to seven years in response to yet unknown changes in threat conditions. This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications. Upon completion of this PEIS, CBP would still have to complete NEPA analysis for any proposed projects that would require environmental assessments and environmental impact statements. Any CBP proposals for projects or activities at specific locations would be made in the future and would comply with all applicable statutory and regulatory environmental requirements. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. At such time, CBP would also conduct other appropriate required environmental reviews and consult with potentially affected tribes and land-owners as well as Federal, State and local agencies with jurisdiction over resources. The PEIS would permit CBP to tier off repetitive background information so project specific NEPA analysis could focus upon environmental impacts of most concern for planners and the general public. |
| **328** | Concerned with the power this will give to border control to circumvent the rules of N Cascades NP. Does not want agencies to have the right to build roads, buildings, trails, and other structures in pristine back country. Where is the evidence for need | |
| **794** | Anticipate that border infrastructure and enforcement actions that fall under the non-specific umbrella categories provided in the DPEIS may have deleterious impacts on sensitive plants and animals and cultural resources because of: anticipated trampling of vegetation and other direct damage to aquatic wildlife, wildlife habitat; fragmentation of. habitat/wildlife corridors from roads/barriers, introduction of | |

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| | invasive species; anticipated trampling of cultural resources, disturbance of sites sacred to Native Americans; impacts to endangered species recovery efforts; wildlife mortality/displacement; modification of wildlife behavior; Concerned about the potential for significant impacts to the wilderness character across the National Wilderness Preservation System | |
| **809** | A revised draft PEIS and the final PEIS should include assessments of these and all other wildlife species/populations potentially affected by this project, and to analyze the potential impacts to wildlife from a full spectrum of potential actions | |
| **818** | PEIS does not adequately assess impacts to a number of wide-ranging species that cross the international border including wolverine, grey wolf, Canadian lynx, fisher, and grizzly bear | |
| **819** | Wolverines, esp in WA, are highly sensitive to human disturbance. Any barriers, new roads or further intrusion (ATVs) into their habitat in the North Cascades would retard and perhaps halt their recovery in WA | |
| **821** | The Final PEIS must do a more thorough job of analyzing impacts of CBP developments and ongoing activities to drive more of the wide-ranging carnivores to extinction. It must provide for full mitigation of habitat impacts | |
| **822** | Strengthen language "In WOR Region, for example woodland caribou…intact habitat where these species occur should be avoided to the greatest extent practicable" DEIS pp. 8.3-22 and -23. Ensure long-term recovery of T&E, full mitigation of impacts | |
| **841** | We are keenly interested in the trans-boundary management of the Skagit ecosystem and any policies and actions that may influence that management | |
| **144** | Increased vehicular access and human activity along the border would impede efforts to recover listed populations of grizzly bear, lynx, and mountain caribou, or other species. It would be more beneficial to construct helistops for border | CBP is aware of this issue and will continue to coordinate its efforts with other agencies to evaluate its actions in this regard. |

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| | patrols than to build new roads. Although this would impact wildlife the impacts would be less. | |
| **155** | Increased motorized vehicular access within wildlife habitats along the border would also hinder efforts to recover caribou, grizzly bear, lynx, and other wildlife. | |
| **156** | Caribou will flee if motorized vehicles make their way into winter habitats causing them to spend crucial energy reserves. | |
| **159** | Activities or projects that reduce the quality or quantity of snowshoe hare habitat (especially multi-storied lodgepole pine and spruce/fir forests) would negatively impact the recovery of lynx. Lynx require high elevation habitats that are capable of supporting populations of snowshoe hare (prey) - multi-storied lodgepole pine and spruce/fir forests are important. | |
| **173** | Any new roads, motorized routes, or increased motorized vehicular access proposed could hinder efforts to recover these species: caribou, [g]rizzly bear, lynx, and other wildlife. | |
| **311** | Do not plan projects with potential impacts on biological resources in protected areas such as North Cascades National Park, Glacier National Park, and the adjacent larger protected landscapes surrounding both that could otherwise have cumulative impacts on grizzly bears and other wildlife habitat and behavior. Also concerned about minor projects that might have these impacts. We hope important biological resources will be avoided when planning any projects in all areas along the border, not just National Parks. | |
| **460** | Particularly concerned about any disturbance or permanent human presence on the Selkirk crest in north Idaho and Purcells in NW MT or anywhere in the mt. caribou recovery zone. Any human disturbance to mt. caribou may result in increased vulnerability to predation and avalanche events and reduced repro success and calf survival | |
| **462** | Urge CBP to exercise restraint in any border related projects/activities that have the potential to undermine/compromise the ecological integrity of our near | |

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| | border/shared US/Canadian border | |
| **537** | Any physical changes CBP might consider need to include Buffalo waterfront, the Niagara River from Lake Erie to Lake Ontario critical habitats. Any physical changes CBP might consider in the Niagara River Greenway should be carefully betted through the Niagara River Greenway Commission and the local public | |
| **556** | If pursued along the MN border, many of the potential activities described in the PEIS could result in adverse impacts to biological and ecological features given the high incidence of rare species; areas free of terrestrial and aquatic non-native invasive species; rare native plant communities, unfragmented or minimally fragmented habitat; public lands designated or managed for protection/conservation of recreational values. | |
| **181** | No mention of the Canada Lynx or Wolverine in the Draft PEIS. | Selected examples of wildlife across the study area are provided in Chapters 4 – 8, Appendix L, and Appendix M. Specific references to the Canada lynx and wolverine were provided in Chapters 7 and 8 and Appendix L and M. Specific ref include: Wolverine: 8.3.1.2/32/35. Lynx: 7.3.2.3/10 /23. 8.3.1.2 /32 of 35. 8.18.3 Line 15 of page 276. Appx L line 40 page 422. Appendix M.Selected examples of wildlife across the study area are provided in Chap 4 – 8, Appx L, and Appx M. Specific references to the Canada lynx and wolverine were provided in Chapters 7 and 8 and Appendix L and M. Specific references include: Wolverine: 8.3.1.2 Line 32 of page 35. Lynx: 7.3.2.3 Line 10 of page 23. 8.3.1.2 Line 32 of page 35. 8.18.3 Line 15 of page 276. Appendix L line 40 page 422. Appendix M. |
| **350** | Oppose any cutting of trees or ground cover near the border that is not recommended by a VT state or County forester for the health of the forest - Vermont | Specific CBP actions will be addressed in specific EA/EISs |
| **352** | The PEIS must take an extremely cautious approach to manipulation of standing forest communities and the creation of obstacles to species migration given the climatic shifts and stresses already on them | |
| **375** | This PEIS disregards impacts to wildlife, fish, birds, amphibians, and reptiles. It disregards impacts from invasive | These issues are addressed in the body of the PEIS. |

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| | species take over cleared out areas | |
| **701** | Fence in the area [St. Lawrence river] will choke it to death. | Fencing, used as a force multiplier, may be installed in selected discrete areas where intrusion control is necessary. Prior to installation of any tactical security infrastructure items, a CBP NEPA planning document would be prepared on the environmental impacts of that specific fence project. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. |
| **805** | Some major impacts to wildlife from construction of physical border barriers and roads incldue: altered wildlife behavior/range from infrastructure construction/operational noise/night lighting/low altitude overflights/increased road mortality/isolation of veg strands/habitat patches/loss of cover/connectivity/rem veg/inter of genetic exchange | CBP has discussed all of those impacts in the PEIS, in appropriate sections, such as air quality and aesthetics. |
| **806** | From construction of barriers and roads: Flora and fauna are vulnerable to significant loss/deterioration of their habitus, and/or increase in risk of human-caused mortality in borderlands | |
| **826** | 8.18.3 page 8-18.2 Biological Resources - does not describe or explain any projected effects of CBP activities, or what those activities might be; merely states that impacts will be less than major but does not justify this statement and gives no examples to support statement | No further response required in the PEIS. |
| **831** | The PEIS must take an extremely cautious approach to manipulation of standing forest communities and the creation of obstacles to species migration given the climatic shifts and stresses already on them | CBP seeks to improve partnerships across and along the Northern Border. No "border fence" is contemplated as a part of this PEIS. |
| **TRANSBOUNDARY IMPACTS** | | |
| **96** | While between Maine and Canada there may be some wildlife that does cross the border due to climate change as well as habitat that is shared across border, that wildlife is not a serious threat to homeland security. | CBP is aware of this issue and will continue to coordinate its efforts with other agencies to evaluate its actions in this regard. |
| **673** | The effect of such a border on migratory patterns of wildlife will be devastated | |
| **674** | Already the impacts of climate change is altering the habitat | |

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| | of all forms of life form the smallest fungi to the largest trees, from the smallest mammals to the megafauna that inhabit this part of the U.S. | |
| **675** | Such a border will devastate the patterns of migration and the ability of such life to move northward during the future major shift in our climate which is already occurring | |
| **129** | Where fencing is constructed along the border to ensure that border crossing can legally regulated at points of entry, the impacts to wildlife or other environmental resources could vary. There primary concern would be the barriers posed to wildlife migration across the border. | Fencing for traffic management and deterrence at specific crossing points would be extremely limited relative to the amount of infrastructure north of the border. However, CBP would not initiate projects without appropriate consideration of impacts to wildlife, consultation with wildlife management agencies, and additional NEPA documentation. |
| **139** | Fencing within wildlife habitats would impeded wildlife mitigation and detract from efforts to sustain or recover populations of wildlife. Environmental impacts would be greater in remote locations that are presently inaccessible to motorized vehicles where the greatest wildlife habitats exist. Transboundary wildlife populations rely on the connectivity of habitat north and south of the border fencing could impact this. | |
| **151** | The recovery area for the mountain caribou is the only established recovery area for an endangered species that extends north of the Canadian border. Caribou are regularly documented in the northwest corner of the state, in the basin north of Snowy Top Mountain, and south along the crest of the Selkirk Mountains. The ability of wildlife managers to recover the "international Herd" to a viable pop depends on the connectivity of habitat. If fences were to be constructed along the Northern Border it would pose a migrational issue to mountain caribou. | The fact that eco-regions extend beyond the border with Canada is recognized and this infers that those species that prefer such habitat may have ranges that include such habitat on both sides of the border. |
| **154** | Grizzly bears recovery depends on free movement across border. The genetic exchange between bears in the greater ecosystem on both sides of the border is critical to ensuring a viable population. Grizzly bears also need secure habitats from the time they 59<br>emerge from hibernation until they retreat to their dens. The density of open motorized routes must be below minimum | CBP is aware of the importance of wildlife corridors and the transborder migration of wildlife. That concern will be part of specific reviews.<br>CBP is aware of these issues and will continue to evaluate its actions in this regard. Specific CBP actions will be addressed in specific EA/EISs |

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| | levels established in the motorized access plan for the Selkirk and Cabinet Yak recovery zone for areas outside of "core" grizzly bear habitat. | |
| **456** | Seriously concerned about any new infrastructure projects that will increase impacts to trans-boundary wildlife species, especially endangered, threatened, or sensitive (species of concern) | |
| **760** | Wildlife analysis insufficient to support site level activity. Activities to secure the border that preclude or reduce the ability animals to safely travel across boundary that are transboundary in distribution and rely on safe/unobstructive travel/connectivity will threatened the survival of these US populations | |
| **SOCIOECONOMIC RESOURCES** | | |
| **110** | Plans in the DPEIS might compromise or risk the multi-billion dollars of trades at Niagara Falls/Buffalo. | The purpose of this PEIS is to provide broad based analysis of CBP activities that could become required within the next five to seven years in response to yet unknown changes in threat conditions. This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications. Upon completion of this PEIS, CBP would still have to complete NEPA analysis for any proposed projects that would require environmental assessments and environmental impact statements. Any CBP proposals for projects or activities at specific locations would be made in the future and would comply with all applicable statutory and regulatory environmental requirements. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. At such time, CBP would also conduct other appropriate required environmental reviews and consult with potentially affected tribes and land-owners as well as Federal, State and local agencies with jurisdiction over resources. The PEIS would permit CBP to tier off repetitive background information so project specific NEPA analysis could focus upon environmental impacts of most concern for planners and the general public. |
| **115** | Without details, it is impossible to know if the plan at Niagara Falls/Buffalo NY will benefit or compromise the historic areas, aggravate the health and env., kill thriving communities, resolve or exacerbate existing bi-national transportation problems | |
| **633** | Border should not divide towns because it causes issues with | The issue raised is beyond the scope of analyzing the environmental |

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| | crossing the border. | and related socioeconomic impacts of current and potential/foreseeable future CBP activities along the Northern Border. The PEIS makes no judgment upon the validity of your concerns, but is not the appropriate mechanism for addressing them. |
| **682** | The BP make at least 80,000 a year while they live areas where the average family income is below poverty | |
| **676** | The impact on life in general and major ethnic communities will be equally devastating | CBP seeks to improve partnerships across and along the Northern Border. No "border fence" is contemplated as a part of this PEIS. |
| **678** | This PEIS will have vast effects on the psyches of the individuals who inhabit the PEIS area | |
| **ALTERNATIVES** | | |
| **24** | CBP does not actually evaluate any of its alternatives. | The alternatives used in the PEIS were developed to provide CBP decisionmakers with a basis for understanding the relative environmental impacts associated with implementing different sets of tools/activities used to facilitate border security along the Northern Border. These alternatives provide a reasonable range of approaches to choose from to meet yet unidentified future threats. The relative environmental impacts that would likely occur from implementing each the alternatives are presented in the PEIS in narrative and tabular form throughout the document. They evidence the different environmental considerations inherent to any strategic approach. |
| **282** | NPCA is concerned that the range of alternatives is not sufficient to fully evaluate the different actions and prescriptions the CBP may implement under the final PEIS. | |
| **283** | The importance of flexibility seems to point to only one alternative meeting the purpose and need - Flexible Direction Alternative. Since only one of the current alternatives seems to full meet the P&N, there is a lack of a full range of alternatives. | |
| **284** | NCPA believes several versions of the Flexible Direction Alternative with different levels of implementation should have been "rigorously explored." | |
| **285** | Overall, the PEIS does not provide a framework to determine where specific components of the Flexible Direction Alternative are appropriate. We request that the Flexible Direction Alternative be supplemented to provide programmatic guidance, as per the document's intent, regarding the most effective and environmentally appropriate tactics within the context of existing land management and environmental policies. Supplemental guidance is required to actually meet the stated purpose of the PEIS, which calls for "A well-integrated, reasonable framework" for sustaining and enhancing security." | |
| **288** | Consider implementing the Flexible Direction Alternative at different levels. Ex: while the current alternative calls for 640 | |

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| | small constructive projects, and alternative that looks at the impact of 300 may be beneficial. | |
| **324** | The final PEIS could be improved by extending the range of alternatives by providing variations of the Flexible Direction Alternative. | |
| **342** | PEIS does not evaluate a full range of alternatives (Muckleshoot Indian Tribe v. USFS). Looking at two similar alternatives in Muckleshoot was not reasonable. | |
| **453** | Concerned about the failure of the PEIS to identify specific proposed action(s). The document states on p. 2-2 that "it does not analyze specific DHS…." This is unsupportable. How can an EIS that does not analyze a proposed strategy provide the necessary analysis for its implementation? | |
| **590** | We are concerned that the range of alternatives as currently stated is insufficient to full evaluate the different actions and prescriptions described under the PEIS. Currently, only the Flexible Direction Alternative meets the purpose and need of the PEIS. This does not meet the intent of NEPA to provide a full range of alternatives for consideration. | |
| **844** | The DPEIS and the range of alternatives presented are too vague and inadequate in detail, discussion, and analysis. | |
| **845** | The DEIS really only presents one action alternative for analysis, rather than a range from heavy to lighter impacts on the land | |
| **25** | CBP chose the Flexible Alternative because the PEIS weak evaluation showed no significant impact. | No alternative was selected at the time of publication of the Draft PEIS. |
| **289** | NCPA would have also appreciated disclosure of the CBP's preferred alternative. In CEQ FAQ's "Section 1502.14(e) requires the section of the EIS on alternatives to identify the agency's preferred alternative if one or more exists." | |
| **290** | NCPA also would have appreciated disclosure of the environmental preferred alternative. The CEQ 40 FAQs "Section 1505.2(b) requires that, in cases where an EIS has been prepared, the ROD must identify all alternatives that were considered, specifying the the alternatives which were | |

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| | considered environmentally preferable" | |
| **424** | The Flexible Alternative is the preferred alternative. Work on a revised PEIS that actually looks into a real range of alternatives and their impact on the different Northern Border lands, wildlife, and communities | |
| **455** | The PEIS does not evaluate any other proposed actions outside of the preferred alternative which is an amalgamation of the other four alternatives | |
| **46** | Is in favor of alternative 1 "No Action". | CBP thanks you for your comment. It will be considered as we finalize determination of impacts from the alternatives. |
| **367** | Any development in all listed alternatives of this draft requires a complete site survey and full documentation for cultural resources. | As part of the NEPA process, CBP will comply with the National Historic Preservation Act. CBP retains qualified Archeologists and Historical Architects to identify historical properties and cultural resources. CBP consults with the State Historic Preservation Officer (SHPO) and affected tribes. With regard to the PEIS, CBP has consulted with tribes. |
| **370** | The Koochiching County Historical Society encourages that all alternatives in this draft PEIS be significantly scaled back and that any future development initiated by the US CBP is undertaken with great caution. | All future site specific proposed actions will require a NEPA document and appropriate SHPO / Tribal consultation. |
| **379** | This PEIS requires a "No Action" alternative | It should be understood that Customs and Border Protection is not proposing or planning to request any change in legal responsibilities or to further increase its physical presence along the Northern Border. The PEIS is providing a prudent broad look and potential impacts if activity levels needed to change in the future due to a change in the threat environment along the border. |
| **423** | The document is vague regarding the proposed alternatives and the impact each would have along the Northern Border. | The purpose of this PEIS is to provide broad based analysis of CBP activities that could become required within the next five to seven years in response to yet unknown changes in threat conditions. This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. Upon |

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| | | completion of this PEIS, CBP would still have to complete NEPA analysis for any proposed projects that currently would require environmental assessments and environmental impact statements. Any CBP proposals for projects or activities at specific locations would be made in the future and would comply with all applicable statutory and regulatory environmental requirements. At such time, CBP would also conduct other appropriate required environmental reviews and consult with potentially affected tribes and land-owners as well as Federal, State and local agencies with jurisdiction over resources. The PEIS would permit CBP to tier off repetitive background information so project specific NEPA analysis could focus upon environmental impacts of most concern for planners and the general public. |
| **436** | The no action makes the most sense because the northern USA citizens are good at catching sneaks trying to cross the border illegally | The issue raised is beyond the scope of analyzing the environmental and related socioeconomic impacts of current and potential/foreseeable future CBP activities along the Northern Border. The PEIS makes no judgment upon the validity of your concerns, but is not the appropriate mechanism for addressing them. |
| **488** | Page 4.10-4 Lines 11 and 12 shows WA State population centers since the 2000 census, "Idaho has…"is this referring to the entire state of Idaho, with the rapid growth in the Boise area or is it restricted to the WOR section? | Information is just on the portion of the state within the WOR region. |
| **489** | Page 4.10-4 Table 4.10-2 Population Centers Chart it should be noted, that while the 87.8% of WA population is in the population centers, only 8.6% of that is within the Spokane sector? | Information is on the Spokane population area, not the sector. |
| **490** | Pg 4.10-6, 12 thru 15 and 18 -19: these statements as well as the charts 4.10-7 tables 4.10-5 and 4.10-6 are erroneous for the Spokane sector. A separate study should have been made for the Blaine and Spokane sector to truly reflect pop/income/poverty/unempl/property | The analysis is not divided upon sector lines because resources are not divided by CBP's operational boundaries. |
| **492** | Statistics are given on these pages and charts for the visitor and economic information for the WOR and WA state. This should be sector specific as the majority of trade and visitors cross in the Blaine Sector | NEPA encourages the use of existing available information appropriate to inform decisions about the agencies proposal. CBP does not have a regional economic growth mission. It facilitates trade and travel which may aid or deter regional economics, but it is a non- |

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| **491** | Chart 4.10.2.4 pg 4.10-10 to 13 sections 4.10.2.5 to 4.10.2.6 a separate study should have been done to assess regional economics | negotiable mission and not a result of CBP's discretionary actions. |
| **582** | Use the principles of the Beyond the Border Work Group to study actions and alternatives. Therefore PNWER opposes the Tactical Security Infrastructure Deployment Alternative and any subsequent program to build barriers, fences, or similar infrastructure on the northern border | Fencing, used as a force multiplier, may be installed in selected discrete areas where intrusion control is necessary. Prior to installation of any tactical security infrastructure items, a CBP NEPA planning document would be prepared on the environmental impacts of that specific fence project. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. |
| **ANALYSIS/CONTENT/TIERING ANALYSIS** | | |
| **23** | Difficult to comment since the information is vague, or CBP does not appear to actually use the PEIS content to actually weigh alternatives. | The purpose of this PEIS is to provide broad based analysis of CBP activities that could become required within the next five to seven years in response to yet unknown changes in threat conditions. This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. Upon completion of this PEIS, CBP would still have to complete NEPA analysis for any proposed projects that currently would require environmental assessments and environmental impact statements. Any CBP proposals for projects or activities at specific locations would be made in the future and would comply with all applicable statutory and regulatory environmental requirements. At such time, CBP would also conduct other appropriate required environmental reviews and consult with potentially affected tribes and land-owners as well as Federal, State and local agencies with jurisdiction over resources. The PEIS would permit CBP to tier off repetitive background information so project specific NEPA analysis could focus upon environmental impacts of most concern for planners and the general public. |
| **51** | Nonnative invasive species should be included in the Wetland and Waterways (3.3.1.6); and Aquatic Resources sections. Potential impacts to alien invasive species are for more severe than just to list species of concern (3.3.3). | |
| **114** | There is an apparent lack of details and information contained in the document | |

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| **323** | Given that there needs to be ground preparation to receive FOBs, any given FOB could have multiple impacts in access, construction, and operations. It isn't clear to NCPA that the estimates of impacts reflect this potential multiplier effect. Further discussion of this issue would be helpful. | |
| **336** | Withdraw and rewrite so specific actions in specific places are proposed for comment not open-ended laundry list. | |
| **372** | makes no sense to consider the northern border as one unit | |
| **423** | The document is vague regarding the proposed alternatives and the impact each would have along the Northern Border. | |
| **448** | Concerned about the scope, vagueness, broad latitude and lack of specificity in the PEIS regarding proposed plans to enhance security on our northern border with Canada esp in wilderness, parks, and national forest lands and critical habitats | |
| **480** | CBP activities likely to have sig neg impacts on the public's use and enjoyment of these public critical areas include mechanized & off-road transport/construction/mgt, power provisions/water/sanitation/commun./over-flights, motorized/night lights/etc | |
| **518** | In order to appropriately comment, residents need more detailed information on CBP's plans specifically for the Peace Bridge crossing in Buffalo NY, which operates on national protected land and is adjacent to the Prospect Hill-Columbus Park historic dist | |
| **520** | Without knowing how CBP plans will impact, alter, or affect our historic community, residents cannot adequately participate in the public comment process. | |

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| **543** | Substance of PEIS is too broad to allow informed comments or be of value in any future project analysis. Its over breadth renders it insufficient under any law requiring env. review. Descriptions of conditions, alternative are too vague. | |
| **544** | Document jumps to sweeping, incorrect conclusions without any basis. Ex: System upgrades having only minor/minimum impacts to air quality, visual, cultural.... Another incorrect analysis is the Peace Bridge Crossing facilitating trade by preclearance or bigger customs plaza would increase truck traffic; increase already unacceptable pollution at that site; encroach on historic neighborhood, threaten neighborhoods viability due to increased commercialization of the area; impair current viewsheds towards the waterfront, historic, neighborhood, Olmsted park; negatively impact use of the homestead park for recreation; overburden the surrounding highways to an unsafe level; unfairly impose on a large poor, minority pop that already has high rate of asthma, burden of increased pollution, noise, and decrease in home values. Large number of children would be impacted | |
| **553** | MNDNR submitted comments on the scope of the PEIS. From reviewing the PEIS, it appears that some of MNDNR scoping comments were not explicitly addressed in the DPEIS. | |
| **560** | It is unclear how CPB will determine which future projects warrant additional environmental review of site specific and cumulative impacts. A description of the "triggers" should be more fully described. | |
| **588** | There is uncertainty about the true and full impact Forward Operating Bases may have on the environment. Their possible reuse and the ground preparation needs have a potential multiplier effect not analyzed in the PEIS | |
| **616** | Does not agree with the project bc the activities being evaluated have already taken place where he lives. | |

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| **620** | Request for clarification on purpose and need. It is unclear what that there is any kind of verification that the current protection actions are failing. Asks what improvements are needed base on current activities. | |
| **626** | As the CBP continues to expand its facilities and services, we believe there is great potential for socioeconomic and cultural impacts on our people. | |
| **833** | Following are lands in VT that would be negatively impacted by any intrusive border structure or activity and should be protected: Missiquoi NWR, Highgate State Park Natural Area, Missisquoi River crossings at East Richford/Lake Memphremagog, Canada View property, Proposed Eagle Point SP, State Wildlife Mgt areas, Nulhegan Basin Division NWR, and Public lands in VT | |
| **852** | The North Cascades, in WA and BC, are of high value both biologically and socially. The habitat provides a travel-way and home for a wide range of species while the landscape provides unparalleled recreational opportunities. It is unclear that the DPEIS considered the real potential environmental impacts that could occur to these habitats through CBP activities | |
| **855** | The balance between access and habitat quality is of high concern for SEEC, and is not clearly laid out in any of the alternatives within the DPEIS nor how any changes to the access system will be analyzed before implementing. | |
| **863** | It is unclear how CBP activities will consider and analyze site scale impacts to sensitive habitats and species that are discuss only broadly in this DPEIS | |
| **221** | Page 3-11, line 3: sentence about 'major cities' is irrelevant and confusing in this location | This merely provides a context for understanding where there may be actual elevated levels of ozone and carbon monoxide near the Northern Border and why. |

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| **52** | Look at standardized contract language for ensuring clean equipment and vehicles, and for clean fill and erosion mitigating materials for construction projects as prevention measures to avoid spreading species. Policies for field personnel are available for ensuring clean equipment and vehicle usage and weed free forage for hose back deployment. Also look at decontamination protocols when crossing continental divide. | Specific contract language for specific actions is not part of a PEIS CBP Best Management Practices would address such specific language when required. |
| **55** | It would be helpful to identify the specific avoidance contractual language, policies and protocols for preventing alien invasive species in Section 9.3 instead of just saying vague statements. Should also acknowledge and deal with Washington and Idaho alien invasive species prevention and control laws. | Specific contract language for specific actions is not part of a PEIS CBP Best Management Practices would address such specific language when required. |
| **53** | Under operations section, enforcement for I-68 Canada Program for recreational boaters listed; Idaho has mandatory boat inspection programs that need to be supported. Based on traffic surveys there is a need for a boat inspection station at the Bonners Ferry crossing. This should be supported and included as a future construction and operation project. | This comment is directed at a site-specific and state mandated program and is outside the scope of consideration for this programmatic review of CBP Northern Border security activities. |
| **56** | In Section 9.5 Water Resources BMPs should include: reseeding and reestablishment of vegetation should be with native or non-invasive vegetation; mulching, straw berms, and temporary cover crops should be certified weed-free mulch or straw; appropriate erosion and sediment control planting needs to be with native or non-invasive vegetation; areas around buildings and parking lots would vegetated to minimize soil erosion should be with native or non-invasive vegetation; design elements such as grass swales and landscape features should be with native or non-invasive vegetation; vehicles that regularly use low-water crossings should be washed frequently and made free of fluid and should also be cleared of weed fragments, seeds, and invasive aquatic organisms; provide training to watercraft operators in the safe operation of boats should also include "clean, drain, dry" procedures for alien invasive plant and animal species; a | Specific seeding used for any specific application would be handled on a case-by-case basis. |

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| | mandatory two-week ATV rider safety course should also include the cleaning of equipment and vehicle protocol. | |
| **104** | The current PEIS as written does not meet either the spirit or the letter of the NEPA. The current PEIS does not study or examine the environmental impacts of the alternatives to the proposed action because all of the alternatives are the proposed action. The current PEIS is nonsensical and arbitrary and capricious in that it does not do the analysis required by law, it creates a carte blanche approval for all actions. | CBP disagrees with the comment. In particular, it does not create a carte blanche approval for all actions as it clearly states any specific project proposals would be subject to additional NEPA analysis. |
| **120** | Given the nature of PEIS can only give general comments on how the Department should proceed with planning and approving future, site specific activities and general conservation issues the Dep. Should be aware of along Idaho's shared border with British Columbia. | CBP thanks you for this comment. |
| **122** | Encourage the Department to give serious consideration to any future site-specific activities and how these projects might affect our communities and our environment. | |
| **123** | The PEIS is written in a general sense both in terms of the action alternatives as well as the analysis of the alternatives. Site specific NEPA is critical to ensuring that decisions that may affect these values are appropriately informed by responsible, science based decision making./Again, site-specific projects and activities should be carefully considered as required by the National Environmental Policy Act. | |
| **128** | Do not see any specific environmental concerns associated with the construction or improvement of existing Ports of Entry or other buildings. | |
| **163** | The cumulative analysis falls short. Central to the analysis of cumulative effects is the disclosure of historical, present, and projected future resource conditions when taken with the action alternatives. The final PEIS should provide a more thorough discussion of the cumulative effects of the action alternatives, when taken with past, present, and reasonably foreseeable future federal actions. | CBP's approach to cumulative analysis is reasonable given CBP's small footprint for the area covered. However, CBP has provided additional information on recent growth in its activities along the Northern Border. |
| **192** | Need clarification on page 1-10, Lines 39-41; Page 1-12, | CBP does not see how these statements can be clarified further. |

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| | Lines 15-17 | |
| **195** | Page 1-16, Lines 19-26: in order to effectively evaluate env impacts, esp biological, some idea of the max length, depth and height of fences in each segment is required | Fencing for traffic management and deterrence at specific crossing points would be extremely limited relative to the amount of infrastructure north of the border. However, CBP would not initiate projects without appropriate consideration of impacts to wildlife, consultation with wildlife management agencies, and additional NEPA documentation. |
| **198** | Page 1-19, lines 15-16: kindly provide an idea of what would trigger the env analysis of a specific project. Would an 'in-kind' replacement trigger an env review. Review for capital cost be a trigger? | All activities depicted within the PEIS would require some additional environmental review. Any item meeting the definition of a major Federal action that is not currently categorically excluded, or otherwise disclosed as not requiring additional environmental review would require at least initiation of an environmental assessment. |
| **199** | Page 1-19, lines 31-33. this being the case, kindly describe the types of situations that would regularly extend beyond the 100-mile zone, their frequency of occurrence, and which would require/trigger additional env review | The issue raised is beyond the scope of analyzing the environmental and related socioeconomic impacts of current and potential/foreseeable future CBP activities along the Northern Border. |
| **201** | Page 1-20, lines 12-15 comment for example, the use of scanning technologies by OFO or USBP at POEs or varies | CBP stands by this statement as the technologies have been repeatedly assessed and their use does not vary significantly in type of location or effect. |
| **202** | Page 1-11 , 21 radiation exposure is determined by duration of, distance from source, amount of shielding. EPA specifically calls out gamma radiation for all three of these factors (http://www.epa.gov/radiation/uunderstand/protection_bsics.htm) can't summarily write off as having little impact on human health and safety | This merely provides a context for understanding where there may be actual elevated levels of ozone and carbon monoxide near the Northern Border and why. |
| **221** | Page 3-11, line 3: sentence about 'major cities' is irrelevant and confusing in this location | |
| **225** | Page 3-12, lines 15-17: you have introduced permitting 225of 'major sources' and tell us it is not subject to GCR…but are there any expected 'major sources' in this This section does not presuppose whether CBP has major sources. It was important to lay out ther regulatory relationships for air quality.peis? If not why raise the issue w/out stating so | This section does not presuppose whether CBP has major sources. It was important to lay out their regulatory relationships for air quality. |
| **226** | Page 3-13, lines 11-14 & 18: presumably fossil-fuel boilers will be of interest in this PEIS…otherwise why call this | The point was to explain the energy/heat component to regulating fossil-fuel boilers. |

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| | source out specifically. Suggest you add a statement to that effect | |
| **230** | Page 3-14, line 36 & Page 3-15 line3: stay consistent: is it rates or thresholds | Terminology is used consistently. |
| **240** | Page 3-29, lines 9-10: Generates noise in a national park that exceeds significant effects thresholds as outlined by the NPS…what of State Parks? | State Parks do not have a general noise threshold level to refer to at a programmatic level. |
| **241** | Page 3-30, line 5-6: should review noise levels created by operation of backup generators at larger facilities | CBP did consider the operation of standby generators in its list of considered noise sources. |
| **242** | Page 3-33, lines 16 to 17: first time anything has been mentioned within Canada. Is the Canadian area also being evaluated for the other resource impacts. Why isn't it in the Exec Summary. Do the sectors in the U.S. control the activities 2 miles directly north of them, or is there a special Canadian-BP? Is the Canadian government aware that the US is building on Canadian soil? by your discussion on page 3-34 lines 6-10, it would seem that the impact of all CBP activities should be evaluated on those 2 miles of Canadian soil. It is mentioned in Land Use, a decision should be made to either consistently evaluate the impact on Can. | CBP's projects and operations would occur in the United States. Some resource areas included Canada when useful for comparison purposes or it helped form the operational picture for the alternatives and impacts in the United States. |
| **247** | Page 3-33, lines 23-24: activates included within CBP's proposals…should also consider increase in total square footage that will be blacktopped rather than rural field or wilderness | This is covered in the expansion of facilities and associated infrastructure. |
| **253** | Page 3-35, lines 29-31:if you are trying to evaluate impacts conservatively, as you have stated, you would want to over-estimate the rec-type land since this type of land is considered more pristine rural/urban LU and would have greater impact than these | Over-estimating areas used for recreation would arbitrarily exaggerate the range of recreation impacts without changing the impact intensity determination. |
| **256** | Page 6.1-2, lines 16-17: concern- oversight of this very similar area split between two different offices resulting in potentially inconsistent analyses and inefficient decisions. Having the entire river w/in one office will ensure effect analyzes. | CBP's offices/sectors are structured for border security and trade and travel facilitation, not environmental resource management. CBP is not the owner or manager of river resources, but is a steward of its own actions. |
| **277** | The document also equally looks at possible mitigation strategies to address and/or avoid these impacts to the highest | CBP made earnest attempts to incorporate concerns expressed during Scoping that were relevant to the proposal and analysis of impacts |

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| | extent practicable by using BMPs | into the Draft PEIS. |
| **477** | many of our scoping comments remain unaddressed. | |
| **281** | We are also disappointed that the Draft PEIS continues to place the entire state of Minnesota in the EOR region. We agree with the NPS that a better approach is to split the estate, placing eastern MN in the GL and the western portion in the EOR. | CBP made earnest attempts to divide the four regions logically, however, different resources have different boundaries for consideration. From a CBP decision-making perspective, it was better to use boundaries familiar to CBP operational components. |
| **339** | Current draft should be withdrawn and rewritten, should look at state by state, potential specific actions in specific places. Using "negligible, minor, moderate, or major" is not helpful. We should not be expected to evaluate vague open-ended laundry list. | Extending the comment period would not further public awareness of CBP activities that could affect their local environment. Despite the size of the document, the 45-day period is sufficient for interested parties to comment on concerns about potential future impacts within a given regional environment. The PEIS provides broad-based analysis of impacts from proposed alternative approaches to respond potential threat changes within the next five to seven years. CBP is not proposing an action or management plan in the PEIS. It would not and could not take any specific action based upon the analysis in the PEIS or decisions in the ROD. CBP would provide sufficient notice and review times to the public to comment upon future NEPA documents when it does propose actual projects with the potential for significant impacts to the environment. |
| **510** | Steep slopes, erosive thin soils, a short construction season, rain on snow events, and an abundance of streams both perennial and intermittent, create a difficult physical env for development of roads and other infrastructure. Specialized BMP's are sometimes required to protect water resources and achieve stable sites during and after construction. Our office can help you by reviewing stormwater pollution prevention plans and providing other information you might find useful. | See 8.5.6.2. |
| **514** | Construction projects in this state that are one or more acres in sized require an EPA NPDES construction general permit to reduce water pollution from eroding construction sites on privately owned land. We encourage you to adhere to this | CBP has clarified text to the document committing to adhere to EPA NPDES construction permit requirements for each state. |

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| **402** | Clearly there needs to be a more inclusive review of the impacts/effects of potential actions before this PEIS is finalized - one that balances the public's right to have its built and natural environment protected with your agency's desire to build or enlarge your facilities. | It should be understood that Customs and Border Protection is not proposing or planning to request any change in legal responsibilities or to further increase its physical presence along the Northern Border. The PEIS is providing a prudent broad look and potential impacts if activity levels needed to change in the future due to a change in the threat environment along the border. |
| **570** | Ch. 8 Environmental Consequences Line 40-41 - This section should acknowledge that European earthworm propagates can also be introduced with placement of fill soils. | CBP is aware of the potential for harm through the intro of invasive species and will continue to monitor this issue |
| **801** | Due to border infrastructure and enforcement actions, impacts on air include: impacts from potential construction and changes to traffic patterns and impacts to viewsheds | CBP has discussed all of those impacts in the PEIS, in appropriate sections, such as air quality and aesthetics. |
| **810** | The proposed action is fundamentally unsatisfactory, it is a list of the types of activities that CBP undertakes in the context of border security | The alternatives used in the PEIS were developed to provide CBP decisionmakers with a basis for understanding the relative environmental impacts associated with implementing different sets of tools/activities used to facilitate border security along the Northern Border. These alternatives provide a reasonable range of approaches to choose from to meet yet unidentified future threats. The relative environmental impacts that would likely occur from implementing each the alternatives are presented in the PEIS in narrative and tabular form throughout the document. They evidence the different environmental considerations inherent to any strategic approach. |
| **835** | Bring PEIS up to the standards set forth by the NEPA and act upon Sierra Club et al.'s comments | |
| **836** | Given breadth and depth of proposed action we recommend that CBP issue a revised draft PEIS and engage the public in a more constructive dialogue about the nature and impacts of the proposed action and, as required, reasonable alternatives to it | |
| **812** | Lack of sufficient info regarding the ecosystems that fall within the project area makes the current form of this document inadequate to allow decision makers or the public to evaluate the actual impacts of the actions it covers (examples of issues incldue ecosystems in Washington and Vermont) | No further response required within the PEIS. |
| **884** | The analysis and decisions by CBP reported in the final PEIS must minimize environmental impacts to such irreplaceable ecosystems as those found within the Skagit watershed. | The Final PEIS includes BMPs and other mitigations that may be called upon at the sie-specific level to minimize impacts to critical, sensitive, and threatened resources. |
| **885** | CBP activities that are likely to have significant negative impacts on the public's use and enjoyment of these public and private landscapes include off-road transport, construction, | The potential for significant impacts is based upon frequency and intensity of action and the sensitivty and capacity of the resource. CBP does not occur with the blanket assessment that impacts are |

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| | provision, water, sanitation, over-flights, watercraft, nighttime light | likely to be significant from these activities at the programmatic level. |
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| **PROCEDURAL** | | |
| **N/A** | *A number of comments were received requesting copies of the document, changes to address, and mailing list additions/removals.* | Made attempts to mail out to everyone who made a request and all change request made. |
| **30** | Should have a public meeting in western Montana. | CBP made efforts to cover as much representative Northern Border territory as it could, given the extent of the area covered in the analysis. CBP could not accommodate meetings in every area that wanted one. |
| **31** | People in western MT would appreciate a field hearing. It is a long way to Bellingham or Havre. This is important. You have plenty of funding, why not include people? | |
| **37** | To listen to Native American issues as well as other people of the area to realize that this area is different that other parts of the (4000 miles of) Northern Border. (Public meeting should have had a public comment period, so people could hear what others had to say.) | |
| **482** | For such a far-reaching document this was poorly advertised. Only 11 meetings on the draft across over 4,000 miles of border is insufficient for the number of citizens it will impact. | |
| **483** | No advertisement was placed in the Republic News Miner - the county paper in Ferry County WA. The meeting in Idaho was at a remote location and was hard to find. Advertising was inadequate and not noticeable regarding the scoping and draft processes | |
| **522** | The senator asked CBP to hold more public meetings in Buffalo. I am deeply concerned that CBP chose to hold public meetings in Rochester, NY and Erie PA while no meetings where scheduled for the Buffalo-Niagara region which hosts 4 major crossings | |
| **840** | I participated in scoping but was not notified of the availability of the DEIS so I missed the Michigan meeting in October | |

<table>
<tr><td>40</td><td>Two weeks ago library did not have a copy of the PEIS. Don't need more agents, as the ones we have do not have enough work to keep them busy.</td><td>Made attempts to mail out to everyone who made a request and all libraries identified within the study area. CBP's agents and officers are very engaged in border security, trade and travel processing, and emergency relief assistance when needed.</td></tr>
<tr><td>109</td><td>No public meetings held in Niagara falls or buffalo, NY even though there are four car or car/truck bridges and two train bridges at the border along the Niagara river</td><td rowspan="2">This PEIS is not tied to any legislation currently under consideration in congress. No projects would be proposed or initiated without additional NEPA documentation, public involvement, tribal consultation (when appropriate), and coordination/consultation with Federal, State, and local resource management agencies.</td></tr>
<tr><td>125</td><td>To clearly outline in the Final PEIS how site specific projects and activities will be planned, approved, and more importantly how the Department will solicit and respond to public concerns, comments, and input.</td></tr>
<tr><td>126</td><td>The Department should consult with the USFWS and the National Marine Fisheries Service both on the PEIS and any future site specific projects. The Idaho Department of Fish and Game should also be consulted.</td><td rowspan="2">The purpose of this PEIS is to provide broad based analysis of CBP activities that could become required within the next five to seven years in response to yet unknown changes in threat conditions. This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. Upon completion of this PEIS, CBP would still have to complete NEPA analysis for any proposed projects that currently would require environmental assessments and environmental impact statements. Any CBP proposals for projects or activities at specific locations would be made in the future and would comply with all applicable statutory and regulatory environmental requirements. At such time, CBP would also conduct other appropriate required environmental reviews and consult with potentially affected tribes and land-owners as well as Federal, State and local agencies with jurisdiction over resources. The PEIS would permit CBP to tier off repetitive background information so project specific NEPA analysis could focus upon environmental impacts of most concern for planners and the general public.</td></tr>
<tr><td>542</td><td>CBP should have provided information in Spanish, including advertising the PEIS in a Hispanic newspaper or radio station in the Buffalo area. Pop surrounding the peace bridge is largely Hispanic, but they have been denied an equal op. to take part</td></tr>
<tr><td>432</td><td>Because illegal immigrants can impact the entire nation, you should take comment from all over the nation, not just along the northern border.</td><td>The issue raised is beyond the scope of analyzing the environmental and related socioeconomic impacts of current and potential/foreseeable future CBP activities along the Northern Border. The PEIS makes no judgment upon the validity of your concerns, but</td></tr>
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| | | is not the appropriate mechanism for addressing them. |
| **523** | According to the PEIS website, the CBP process has been ongoing since July 2010 including activity involving Section 106 of the NHPA. The Prospect-Hill Columbus Park historic district had no knowledge that yet another EIS process that could ultimately impact the crossing | It should be understood that Customs and Border Protection is not proposing or planning to request any change in legal responsibilities or to further increase its physical presence along the Northern Border. The PEIS is providing a prudent broad look and potential impacts if activity levels needed to change in the future due to a change in the threat environment along the border. |
| **842** | We do not believe that a single environmental analysis document can cover the full northern border of the United State while providing adequate attention to the diverse natural resources impacts associated with varying ecosystems across that range. | |
| **525** | We respectfully request inclusion as consulting parties in CBP's section 106 process and be notified of the scheduled meetings and who we should contact as soon as possible. | At the time that CBP makes any specific proposals for changes to border crossings in and around Buffalo, stakeholders can make requests to participate in the section 106 process. |
| **551** | Objects to PEIS' cursory review of historic resources, particularly as it relates to the Buffalo-Niagara crossings. Requests to be listed as a Section 106 consulting party, and be informed of all meetings, and provided necessary materials | |
| **540** | Communicating with state DOTs early and often regarding infrastructure or operational changes on, or near, state highways is critical. All our goals and objectives can be accomplished effectively and safely, but they require coordination up front. | Extending the comment period would not further public awareness of CBP activities that could affect their local environment. Despite the size of the document, the 45-day period is sufficient for interested parties to comment on concerns about potential future impacts within a given regional environment. The PEIS provides broad-based analysis of impacts from proposed alternative approaches to respond potential threat changes within the next five to seven years. CBP is not proposing an action or management plan in the PEIS. It would not and could not take any specific action based upon the analysis in the PEIS or decisions in the ROD. CBP would provide sufficient notice and review times to the public to comment upon future NEPA documents when it does propose actual projects with the potential for significant impacts to the environment. |
| **COMMENT PERIOD** | | |
| **37** | To listen to Native American issues as well as other people of the area to realize that this area is different that other parts of the (4000 miles of) Northern Border. (Public meeting should have had a public comment period, so people could hear what | CBP made efforts to cover as much representative Northern Border territory as it could, given the extent of the area covered in the analysis. CBP could not accommodate meetings in every area that wanted one. |

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| | others had to say.) | |
| **43** | Why don't you want the public to know what you are planning? Why such a short comment period? | The purpose of this PEIS is to provide broad based analysis of CBP activities that could become required within the next five to seven years in response to yet unknown changes in threat conditions. This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. Upon completion of this PEIS, CBP would still have to complete NEPA analysis for any proposed projects that currently would require environmental assessments and environmental impact statements. Any CBP proposals for projects or activities at specific locations would be made in the future and would comply with all applicable statutory and regulatory environmental requirements. At such time, CBP would also conduct other appropriate required environmental reviews and consult with potentially affected tribes and land-owners as well as Federal, State and local agencies with jurisdiction over resources. The PEIS would permit CBP to tier off repetitive background information so project specific NEPA analysis could focus upon environmental impacts of most concern for planners and the general public. |
| **86** | Extend the comment period; because of the short notice and short meetings I was hoping that there would be another opportunity for comments in Maine | |
| **91** | Given that the DHS and CBP issued the PEIS in September with opportunities for public comment restricted to early in October, Sierra Club ME would like to request that DHS and CBP extend the comment period at least 45 days… Allowing such short notice is neither conducive to public awareness nor commentary and appears to be in fact an effort to avoid public input | Extending the comment period would not further public awareness of CBP activities that could affect their local environment. Despite the size of the document, the 45-day period is sufficient for interested parties to comment on concerns about potential future impacts within a given regional environment. The PEIS provides broad-based analysis of impacts from proposed alternative approaches to respond potential threat changes within the next five to seven years. CBP is not proposing an action or management plan in the PEIS. It would not and could not take any specific action based upon the analysis in the PEIS or decisions in the ROD. CBP would provide sufficient notice and review times to the public to comment upon future NEPA documents when it does propose actual projects with the potential for significant impacts to the environment. |
| **108** | Requesting an extension of the deadline for public comments | |
| **330** | I request that the time for public comment be extended to December 31, 2011 | |
| **335** | 45-60 day extension on comment period. | |
| **388** | Our primary objections involve the timeframe for review and | |

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| | comment, the venue of public hearings, and level of effect 4 of 5 alternatives would have on cultural resources. | |
| **391** | We strongly urge you to extend the period for public comment and hold a hearing in Buffalo/Niagara. The choice of Rochester for the only Western New York public meeting on a plan that will have far greater impact on the Buffalo/Niagara region was a poor one indeed. ..actions contemplated under Alternatives two through 5 would have a much more significant effect on this region than they would in Rochester, and public participation and feedback at a public meeting in Rochester would not be representative. We request that you provide the residents and property owners in the Buffalo/Niagara region with an opportunity to hear your presentation, question you, and provide comment on your proposed PEIS by holding an additional public meeting in our region. | |
| **393** | While the comment period of 45 days complies with the federal requirements, this period was wholly inadequate for the public in the Buffalo/Niagara region to review, discuss, comprehend, and provide comments to your agency. We request adequate time to respond to the PEIS. | |
| **394** | While we were holding a conference to protect our built environment...another branch of the federal government appeared to be undermine our efforts by quietly pursuing a plan that could produce disastrous results for our historic neighborhoods, structures, buildings, and cultural landscapes. | |
| **422** | Extended the comment period to December 2011. | |
| **450** | Given the geographic scope and implications of the proposed actions we believe that the comment period is inadequate and that a 60 day extension is warranted to allow stakeholders enough time to analyze the details and implications of the document. A project of this magnitude and over such extensive geography requires much more thorough public outreach. It affects everyone in US and cities like Seattle should not be ignored. Notices of meetings must be more widely posted. Many groups and individuals who are | |

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| | interested in these issues did not even know about this initiative and process, including leading public interest law firms. | |
| **495** | I believe this document should be sent out for another public comment period | |
| **497** | Public meetings did not serve Eastern Washington. I think you should have a meeting either in Colleville or Republic or somewhere near northeastern Washington | |
| **517** | The Columbus Park Association supports U.S. Senator Charles Schumer (NY) along with other organizations across the nation calling upon CBP to extend the PEIS public comment period because the current information is too vague. | |
| **846** | In addition, public outreach in this EIS process does not reflect the magnitude of the analysis zone and potential impact. We suggest extending the public comment period on the DPEIS and conducting thorough outreach to affected communities along the border. | |
| **671** | The comment period for the DPEIS must be extended | |
| **683** | Please allow more time for public comment | |
| **846** | In addition, public outreach in this EIS process does not reflect the magnitude of the analysis zone and potential impact. We suggest extending the public comment period on the DPEIS and conducting thorough outreach to affected communities along the border | |
| **360** | Document was put together without adequate public input and effort was made to get this through bypassing many important state and local agencies. | CBP respectfully disagrees. CBP conducted a round of 11 scoping meetings and 13 draft PEIS public meetings across the Northern Border. CBP conducted two sets of mass mailings to over 1600 libraries and 900 other addressees and placed notifications in local newspapers. Since there are no specific proposed projects at specific sites, CBP sought not to bias its meeting locations based on existing activities. Any comments based on existing knowledge of environmental concerns with CBP activities have been well received in this process. |
| **665** | The general public is not aware that the document is over 1000 pages has been open for public scrutiny and comment for 45 days and that the public comment period ends on October 31, 2011. | |
| **672** | Sufficient work was not done to notify the public of the 45 day comment period nor for the planned meetings. Notices were not put in public papers nor were other media resources in regional localities employed | |
| **434** | Comment period needs to be extended so that comments can | The issue raised is beyond the scope of analyzing the environmental |

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| | be taken from all over the nation. | and related socioeconomic impacts of current and potential/foreseeable future CBP activities along the Northern Border. The PEIS makes no judgment upon the validity of your concerns, but is not the appropriate mechanism for addressing them. |
| **484** | This draft should go out for another public comment period with greater effort to truly notify the public and accumulate a more varied base of comments to assess for the final plan | CBP made efforts to cover as much representative Northern Border territory as it could, given the extent of the area covered in the analysis. CBP could not accommodate meetings in every area that wanted one. |
| **INTER-BORDER RELATIONS** | | |
| **88** | The best defense is to make friends, educate the public, be alert. When you fence in, you only drive the uniformed deeper into what you have not thought of or where you are not looking. | CBP seeks to improve partnerships across and along the Northern Border. No "border fence" is contemplated as a part of this PEIS. |
| **111** | US and Canada have not yet announced their agreement on border security and this could impact the Draft PEIS | This PEIS is meant to provide a strategic perspective to respond to any border security threats or priority changes. Though not directly tied to agreements on border security and trade and travel between the United States and Canada it will be cited as one among several sources that inform possible directions in the next five to seven years. |
| **577** | In Obama and PM Harper's Feb 4 meeting and subsequent announcement of Work Group, certain themes were highlighted: Develop an integrated treaty that would meet the threats and hazards that both our countries face; work on trade facilitation and economic growth and jobs to pursue creative and effective solutions to manage flow of traffic b/w Canada and US; integrate cross-border law enforcement to build existing bilateral law enforcement program; cultural infrastructure and cyber security to implement comprehensive cross-border approach. | |
| **383** | We don't need any more walls, fences, barriers, or divisions between us and our Canadian neighbors. More in common with t than federal authorities that want to divide us like Berlin used to be. Since 9/11 the country has been paralyzed with fear. | It should be understood that Customs and Border Protection is not proposing or planning to request any change in legal responsibilities or to further increase its physical presence along the Northern Border. The PEIS is providing a prudent broad look and potential impacts if activity levels needed to change in the future due to a change in the threat environment along the border. |
| **469** | Question the foundations of the proposed actions in light of our long, close, multi-tiered relationships with our Canadian neighbors who share our security concerns, respect our law, maintain stable institutions | |
| **494** | Canada is not a hostile neighbor which should be considered | CBP seeks to improve partnerships across and along the Northern |

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| | | Border. No "border fence" is contemplated as a part of this PEIS. |
| **472** | more productive/prudent in the long term for the DHS and CBP to put more emphasis on enhancing national security through North American context in close collaboration with our Canadian friends | The PEIS states that CBP would heavily rely on partnerships, including transboundary partnerships, regardless of any alternative approach it takes. However, CBP has the mandate to protect the borders regardless of the level of cooperation. |
| **481** | Trust that CBP will make an effort to clearly communicate/outreach to the American people/agencies of the US federal and state and Canadian govs about specific plans and their rationales before moving forward with these activities | The purpose of this PEIS is to provide broad based analysis of CBP activities that could become required within the next five to seven years in response to yet unknown changes in threat conditions. This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications. There will be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. Upon completion of this PEIS, CBP would still have to complete NEPA analysis for any proposed projects that currently would require environmental assessments and environmental impact statements. Any CBP proposals for projects or activities at specific locations would be made in the future and would comply with all applicable statutory and regulatory environmental requirements. At such time, CBP would also conduct other appropriate required environmental reviews and consult with potentially affected tribes and land-owners as well as Federal, State and local agencies with jurisdiction over resources. The PEIS would permit CBP to tier off repetitive background information so project specific NEPA analysis could focus upon environmental impacts of most concern for planners and the general public. |
| **704** | Should work with Canada toward more partnership in developing and implementing joint endeavors in securing our borders. | CBP thanks you for your comment and agrees that it should continue to expand its partnership with agencies in Canada. |
| **RELATIONSHIP TO PROPOSED LEGISLATION AND CONCERNS ABOUT WAIVERS OF ENVIRONMENTAL LAWS** | | |
| **94** | The PEIS is the result of proposed legislation (HR 1505, 1922, and S 803) which proposed to exclude all border areas within a 100-mile exclusion zone along the entire US borders areas with Canada and Mexico. What possible relationship | This PEIS is not tied to any legislation currently under consideration in congress. No projects would be proposed or initiated without additional NEPA documentation, public involvement, tribal consultation (when appropriate), and coordination/consultation with |

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| | exists between endangered species and border crossing of illegal aliens? | Federal, State, and local resource management agencies. |
| **98** | We see no reason to obviate ANY environmental regulations in pursuit of Homeland Security on these very significant public lands. Most of our very important rivers have their headwaters within the 100-mile zone, thereby increasing the likelihood of damage to much of the rest of the State of Maine should CBP succeed in avoiding CWA regulations, for instance. | |
| **100** | We do not believe that DHS has the expertise to manage actions in a way that minimizes adverse impacts endangering communities, public land, and wildlife. Eliminating mandatory consultations with expert agencies will likely exacerbate problems already documented as the result of border construction activities undertaken without the benefit of normally applicable law. | |
| **106** | It is possible for DHS to seek waivers of certain laws and regulations on federal lands on a case-by-case basis. Absent a compelling and specific basis, a blanket exemption threatens our common heritage and the very things that we value as Americans. Sierra Club Maine supports the Sierra Club request that DHS adopt the no action alternative specified in the PEIS. | |
| **178** | The bill that waves compliance with 36 environmental laws and extends the agencies jurisdiction to within a 100-mile buffer along the borders and coastline is wrong. | |
| **574** | This project and the legislation need to go together (as in be considered together) | |
| **661** | Opposed to allowing the BP unprecedented authority to ignore 36 env laws on federal land in a 100-mile zone. If this legislation is approved, the BP would not have to comply with the ESA, CAA, Safe Drinking Water Act, the Solid Waste Disposal Act and 32 other federal laws in such places as the Olympic National Park and other federal lands. The | |

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| | legislation would give the BP unrestricted freedom to build roads, offices, put up fences, set up surveillance equipment and sensors, and use aircraft and/or vehicles to patrol in all national parks, forests and federal lands within the 100 mile zone. Public is not aware of environmental, social, ecological, and health/safety effects of inacting such legislation. | |
| **664** | Washington's Democratic Gov, Christine Gregoire questions why such a law is needed since the DHS, which oversees BP has not requested the change in legislation. | |
| **666** | Passage of legislation would restrict access to federal lands, create a militarized zone in the wilderness, and unnecessarily waste tax dollars to employ the BP to provide wilderness surveillance when BP are paid outrageous overtime as it is. Most citizens would oppose such legislation if they only knew the inevitable effects. | |
| **111** | U.S. and Canada have not yet announced their agreement on border security and this could impact the Draft PEIS | This PEIS is meant to provide a strategic perspective to respond to any border security threats or priority changes. Though not directly tied to agreements on border security and trade and travel between the United States and Canada it will be cited as one among several sources that inform possible directions in the next five to seven years. |
| **577** | In Obama and PM Harper's Feb 4 meeting and subsequent announcement of Work Group, certain themes were highlighted: Develop an integrated treaty that would meet the threats and hazards that both our countries face; work on trade facilitation and economic growth and jobs to pursue creative and effective solutions to manage flow of traffic b/w Canada and US; integrate cross-border law enforcement to build existing bilateral law enforcement program; cultural infrastructure and cyber security to implement comprehensive cross-border approach. | |
| **MISCELLANEOUS/OPINIONS** | | |
| **14** | Our Canadian residents would be impacted much more than their American counterparts due to geographical divisions. | The purpose of this PEIS is to provide broad based analysis of CBP activities that could become required within the next five to seven years in response to yet unknown changes in threat conditions. This PEIS does not contemplate specific locations for infrastructure, facility, or technology additions or modifications. There will be additional opportunities for public involvement, tribal consultation |
| **26** | CBP's suggestion that it can and should impose whatever action it deems appropriate regardless of existing legal constraint should be the subject of the PEIS. | |
| **137** | Site-specific projects and activities should be carefully | |

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| | considered as required NEPA. | (when appropriate), and coordination/consultation with resource management agencies if any actual projects are proposed. Upon completion of this PEIS, CBP would still have to complete NEPA analysis for any proposed projects that currently would require environmental assessments and environmental impact statements. Any CBP proposals for projects or activities at specific locations would be made in the future and would comply with all applicable statutory and regulatory environmental requirements. At such time, CBP would also conduct other appropriate required environmental reviews and consult with potentially affected tribes and land-owners as well as Federal, State and local agencies with jurisdiction over resources. The PEIS would permit CBP to tier off repetitive background information so project specific NEPA analysis could focus upon environmental impacts of most concern for planners and the general public. |
| **146** | Any proposals for increased motorized access along the border should include consultation with the USFWS, National Marine Fisheries Service, and the public. | |
| **294** | NCPA supports efforts to adhere to all existing law sand specific regulations in protected areas such as national parks when operating ATV's due to the impacts caused by ATVs. Soil impacts such as compaction, rutting, and erosion can occur from high volume use of ATVs. | |
| **320** | The most important aspect of any and all future activities on the Northern Border is the need for site specific NEPA analysis | |
| **328** | Concerned with the power this will give to border control to circumvent the rules of N Cascades NP. Does not want agencies to have the right to build roads, buildings, trails, and other structures in pristine back country. Where is the evidence for need | |
| **373** | This PEIS makes a sham of environmental review. Preferred alternative gives he CBP authority to do basically anything it wants to do, without public knowledge or consent | |
| **374** | This PEIS will overturn a century of environmental law establishing wilderness and protected areas | |
| **376** | This PEIS is actually a terrorist act. Instead of strategic tactics to protects us, it would open up border areas and create passage ways for entry into this country | |
| **387** | We have concluded that the process you have undertaken and the conclusions you have reached in your PEIS are deeply flawed, and we object to the acceptance of this document by those agencies for whom it was prepared. | |
| **443** | Public Bridge Authority operates the Peace Bridge has announced its intention to expand its plaza and initiate a system of preclearance of commercial vehicles on the Canadian side of the border, both of which would be included under this PEIS umbrella | |
| **458** | We support alternatives to infrastructure projects and activities that will undermine the well-being of species, their | |

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| | movement corridors and seasonal habitats and compromise their ability to reproduce/adapt to climate related habitat changes. This includes activities that undermine travel corridors/seasonal habitats of grizzlies, wolverines, Canada lynx, grey wolves, and mt. caribou, etc. including linear disturbances/motorized use/fencing/ | |
| **481** | Trust that CBP will make an effort to clearly communicate/outreach to the American people/agencies of the US federal and state and Canadian govs about specific plans and their rationales before moving forward with these activities | |
| **532** | The lack of space also makes future build-out unsuitable for expanding the footprint of the Peace Bridge plaza, increasing the inspection capacity, facilitating a higher volume of commercial traffic or building a super-sized Duty Free store off of the plaza. | |
| **572** | Please continue to solicit our input on future site and project specific NEPA documentation | |
| **593** | There is a great need for site-specific analysis at the start of each future project or activity that tiers from the PEIS… the specifics of each project will require an additional analysis in either an EA or EIS | |
| **594** | Furthermore, tiering off from this PEIS for projects impacting beyond the 100 mile range should not be done. | |
| **621** | There was no PI process for the upgrades being done at the Massena POE to evaluate socioeconomic impacts to the community and cost to community. No one requested public input or comments on the types of improvements and there has not been transparent, public documentation on costs of improvements or environmental impacts, or potential mitigation, including socioeconomic impacts to the community. | |
| **813** | The analysis and decisions by CBP in the PEIS must min env impacts to pristine landscapes in the Pacific NW - Olympic NP/NF, Mt. Baker-Snoqualmie NF, Okanogan-Wenatchee NF, North Cascades NP, Colville NF, Kaniksu NF, State | |

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| | lands for wildlife-lynx/grizzly, focusing on impacts from mechanized and off-road transport, construction of facilities, resupply of remote facilities, provision of power/water/sanitation, communications, overflights, watercraft, nighttime light, noise on public's use/enjoyment of lands | |
| **870** | There is significant research and new science being produced on both carbon storage and adaptation values of habitats in the northwest that should be referenced and considered in the final PEIS. Old growth forests store carbon and help wildlife as they adapt to changing habitats and climates. | |
| **28** | The actions of the CBP and DHS have the greatest risk to our laws and constitution. | The issue raised is beyond the scope of analyzing the environmental and related socioeconomic impacts of current and potential/foreseeable future CBP activities along the Northern Border. The PEIS makes no judgment upon the validity of your concerns, but is not the appropriate mechanism for addressing them. |
| **45** | Concerned with where the money is coming from for this Border control extension. | |
| **433** | Wants the border secure to make sure no immigrants get through our border illegally. | |
| **435** | Environmental quality regs for PEIS. The project is waste of tax dollars the real threat is Mexico not Canada. | |
| **436** | The no action makes the most sense because the northern USA citizens are good at catching sneaks trying to cross the border illegally | |
| **605** | Locally there is a treaty saying the border extends eight feet about our heads. | |
| **606** | Votes for a redirection in activities | |
| **607** | Brought a letter addressed to Secretary Janet Napolitano about jurisdiction, land and this area | |
| **608** | Brought a letter addressing jurisdiction and land. Stated that we are here illegally and that our own law has been violated. | |
| **610** | Not our nation to guard. | |
| **618** | Millions of dollars are being spent on border protection but little is gained. | |
| **680** | It is unconstitutional and un-American. Being subjected to check points on any basis, especially on a daily basis is | |

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| | completely against the right to privacy and pursuit of happiness enjoyed by the Americans who live in these regions. | |
| **707** | Develop an integrated treaty that would met the threats an hazards that both our countries face- address the threats early | |
| **708** | Trade facilitation economic growth and jobs to pursue creative and effective solutions to manage the flow of traffic between Canada and the United States. | |
| **33** | No to the draft. I am more confused after attending the meeting. | The Draft PEIS itself is the source for understanding the proposal and impacts. |
| **39** | Proposed project is outside of their aboriginal territory and does not need to be a part of the PEIS. | Thank you for informing us that you are not concerned about actions within the study area. |
| **84** | Is interested in the Northern Border of Vermont and Maine. | CBP thanks you for your comment. |
| **143** | While roadways and trails impede efficient and effective patrols, the lack of vehicular access can also be said to decrease opportunities for illegal border crossings and violations. | |
| **334** | Supplied document on environmental study conducted in Vermont | |
| **345** | "Islands" of wild natural areas gradually lose species of animals over time; two such islands in VT | |
| **346** | Museum in Vermont presented several exhibits illustrating the probable effects of global warming; could force VT wildlife to migrate north | |
| **365** | With a document of this magnitude, it is imperative that the entities writing it have an exact understanding of the lands, resources, and assets covered by this draft PEIS. | |
| **366** | Approximately 95% of the lands along the south side of the border between the US and Canada have not been inventoried for cultural of paleontological resources. | |
| **368** | The effects of a single proposed development may be minor, but the cumulative effects of many of the planned and proposed developments become major | |
| **369** | The potential for great damage to occur to cultural and paleontological resources through each of the alternatives listed in the draft Northern Border PEIS is very disturbing. | |

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| **583** | Look forward to working with CBP on this issue | |
| **584** | We are pleased with the thorough evaluation of impacts on the natural and social environment associated with each of the alternatives. | |
| **585** | The PEIS includes a realistic characterization of the activates that could occur under each alternative, the effects of the impacts, and potential mitigation strategies | |
| **625** | We recognize the mission of the CBP to keep terrorists and their weapons out the United States. We share that objective and are committed to ensuring that our lands are not used for nefarious purposes. At the same time we also recognize CBP has a responsibility to facilitate legitimate trade and travel | |
| **695** | In the Olympic Peninsula BP has expended without need and are overpaid with little to do here. Waste of taxes, please recall your guys to elsewhere and leave us alone | |
| **871** | There is a long history of indigenous peoples and activities in the Upper Skagit River system that we have made investments to better understand and recognize, we refer you to two videos that we produced on this topic on our website: skagiteec.org… | |
| **886** | Friends of Acadia is not recommending any one of the alternatives presented. Just commenting generally. | |
| **88** | The best defense is to make friends, educate the public, be alert. When you fence in, you only drive the uniformed deeper into what you have not thought of or where you are not looking. | CBP seeks to improve partnerships across and along the Northern Border. No "border fence" is contemplated as a part of this PEIS. |
| **257** | Does not want to see fencing on the Northern Border. | |
| **431** | A fence is no fix for the threat from Canada [lists lots of reasons] list includes: comparisons of engineering, life expectancy, obesity, deficit, and bank ratings of US and Canada. Excessive security spending represents misallocation of resources | |
| **615** | It is important to emphasize partnerships with state and local governments when CBP builds out infrastructure | |
| **656** | No Fence!!! We have enough officers and defense where it shouldn't be needed, or to ruin the env and to make such an | |

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| | awful site | |
| **677** | Why is the government agents only consider the most harmful ways to cope with problems rather than looking at more reliable and less damaging projects | |
| **687** | Yes please build a fence at the border along NY and the Reservation. Not Canada, just the reservation | |
| **703** | Contraction of any physical barrier such as fence, no matter how short sends a negative message to our neighbors and friends to the north and the rest of the world. Building a fence is not the answer to both our countries security interests, but should instead pursue our mutual interest. | |
| **93** | CBP has pursued this PEIS even though the Department has not requested waivers on protected land in order to perform its duties. | This statement is true. No projects will be initiated without additional NEPA documentation being prepared. There will be additional opportunities for public involvement if any actual projects are proposed. |
| **112** | All plans should respect the 'open border' created by NAFTA | This PEIS is meant to provide a strategic perspective to respond to any border security threats or priority changes. Though not directly tied to agreements on border security and trade and travel between the United States and Canada it will be cited as one among several sources that inform possible directions in the next five to seven years. |
| **138** | The TSIDA poses more potential environmental impacts than FDAIA and DISCETA. | CBP thanks you for your comment. It will be considered as we finalize determination of impacts from the alternatives. |
| **147** | The FDA presents the greatest threat to human health and the environment. All environmental concerns outlined in our comments to other alternatives relate to this one. We encourage CBP to select alternative with more clarity than FDA. With the other alt, the public can have at least some level of expectations about the types of projects and the activities that will take place along the border. | The Flexible Direction Alternative would have the greatest level of impacts among the alternatives if carried through. However, there is no current program of projects planned beyond the levels indicated in the No Action Alternative. Any new specific proposed projects would be subject to additional NEPA analysis and there would be additional opportunities for public involvement, tribal consultation (when appropriate), and coordination/consultation with resource management agencies. |
| **177** | Additional powers of Homeland Security are unnecessary there are no problems with providing sufficient law enforcement services (with current BP and Park Rangers). | CBP, including USBP, is required to protect all of our borders and adhere to the Constitution of the United States of America in conduct of its border security mandate. CBP does not propose any extension of homeland security powers in this PEIS and would conduct additional NEPA analysis for any projects with potential to impact the |
| **573** | There is too much Border Patrol now | |

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| **601** | Fear along the border of being harassed by the Border Patrol | environment proposed in the future. |
| **603** | Doesn't see an option for a reduction in security. Doesn't think all the security is necessary or that it even works. | |
| **606** | Votes for a redirection in activities | |
| **609** | Concern about expanding the border. Read an article about it in the newspaper (something about allowing Canada to do something at/around port) | |
| **684** | Please do not accept any of these proposals except the No action alternative | |
| **685** | In hard times like we Americans are facing, I feel like you could use money to help folks, not waist the money on frivolous projects like this. Problem is Southern Border. | |
| **691** | We like camping, hiking, and walking in a natural env not overrun by BP | |
| **692** | It was very disconcerting to see surveillance cameras everywhere on tall polls, ugly wall, aerostat etc in the south. The BP hassle ppl everywhere. I would hate to see that happen here. | |
| **693** | The BP has been pushing up checkpoints on this Olympic Peninsula (not wanted by ppl), hassling Hispanics everywhere they go, prowling neighborhoods and bushes, arresting and imprisoning legal residents…BP are a menacing presence | |
| **700** | Further restrictions of movements and other obstacles to the area will ensure that the only people left will be the police force in charge of protecting it. Law enforcement presence outnumbers local population. | |
| **183** | The border patrol does not need to be here. It's unneeded and invasive. I wish they would go away. | |
| **179** | Is interested in becoming a Border Patrol agent. | Information on the application process to become a Border Patrol agent is outside the scope of this PEIS. Here is the site for further information: http://www.cbp.gov/xp/cgov/careers/customs_careers/border_careers/application_process/bpa_hire_proces.xml |

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| **258** | Believes that environmental impacts from the proposed construction will be minor and can be controlled by proper construction methods. | CBP will continue to use proper construction methods and best management practices for minimizing/ controlling construction emissions, runoff, and waste. |
| **259** | With respect to construction: All necessary measures must be taken to minimize fugitive dust emissions created during construction activities. | |
| **260** | With respect to construction: Care during construction activities near any state water to min adverse effects on a water body. This includes minimal disturb of stream beds and banks to prevent excess siltation, and the replacements and reveg of an area. Prevent spills of oil/grease that may reach water | |
| **261** | With respect to construction: Projects disturbing one or more acres are required to have a permit to discharge stormwater runoff until the site is stabilized by the reestablishment of vegetation. Additional regulations by cities possible | |
| **262** | With respect to construction: Noise from construction activates may have adverse effects on persons who live near the construction area. Use muffler and timing to minimize issues. | |
| **263** | Believe the proposed activities are consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota. | |
| **264** | Minimum requirements of ND Dep. Of Health to ensure minimal environmental degradation occurs as result of construction or related work with potential to affect waters of ND: Prevent the erosion of exposed soil surfaces and trapping sediments being transported. Fragile and sensitive areas such as wetlands, riparian zones, delicate flora, or land resources will be protected against compaction, vegetation loss, and unnecessary damage | |

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| **265** | Minimum requirements of ND Dep. Of Health to ensure minimal environmental degradation occurs as result of construction or related work with potential to affect waters of ND: All construction which directly or indirectly impacts aquatic systems will be managed to minimize impacts. | |
| **266** | Minimum requirements of ND Dep. Of Health to ensure minimal environmental degradation occurs as result of construction or related work with potential to affect waters of ND: Any fill material placed below the high water mark must be free of top soils, decomposable materials, and persistent synthetic organic compounds. Including asphalt, tires, treated lumber, and construction debris. May require testing of fill materials. Debris and 267solid wastes will be removed from the site and the impacted areas restored as nearly as possible to the original condition | |
| **297** | Any new road construction needs to be kept to an absolute minimum and only go forward with the cooperation and consent of the appropriate land management agency. | CBP would execute or request road construction, maintenance, or closures for the purpose of border security measures. Responsibility for management of forests, parks, wilderness, roadless areas, etc., falls with Department of Interior agencies, US Forest Service, and state, local and private land managers. |
| **301** | While NPCA feels CBP should avoid fencing altogether, we appreciate the PEIS generally seeking to avoid fencing in designated recreation areas. Especially concerned about impact on wildlife movement and wilderness values. | The U.S. Department of Homeland Security, Customs and Border Protection, Office of Border Patrol has no intention of installing 4,000 miles or, any significant fraction thereof, of fencing along the United States and Canadian International Border. It is not feasible, necessary, nor a part of Northern Border strategy. Fencing, used as a force multiplier, may be installed in selected discrete areas where intrusion control is necessary. Prior to installation of any tactical security infrastructure items, a CBP NEPA planning document would be prepared on the environmental impacts of that specific fence project. |
| **303** | Frankly, fencing is not effective in securing the border over the long term, while being very costly to the taxpayer. | |
| **306** | Minimizing the amount of development , traffic, and disruption in previously undisturbed areas are key for minimizing wildlife disruption and recreation impacts. | CBP is aware of this issue and will continue to coordinate its efforts with other agencies to evaluate its actions in this regard |
| **473** | Urge CBP to become a partner in the interests of wildlife and wild lands in a climate changing world as the challenges to maintain the env national security will become all the more | |

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| | serious in the coming decades | |
| **475** | Urge CBP to tour potentially affected areas with gov and independent wildlife biologists and species experts to better understand the breadth of habitat and conservation challenges | |
| **339** | Current draft should be withdrawn and rewritten, should look at state by state, potential specific actions in specific places. Using "negligible, minor, moderate, or major" is not helpful. We should not be expected to evaluate vague open-ended laundry list. | Extending the comment period would not further public awareness of CBP activities that could affect their local environment. Despite the size of the document, the 45-day period is sufficient for interested parties to comment on concerns about potential future impacts within a given regional environment. The PEIS provides broad-based analysis of impacts from proposed alternative approaches to respond potential threat changes within the next five to seven years. CBP is not proposing an action or management plan in the PEIS. It would not and could not take any specific action based upon the analysis in the PEIS or decisions in the ROD. CBP would provide sufficient notice and review times to the public to comment upon future NEPA documents when it does propose actual projects with the potential for significant impacts to the environment. |
| **688** | I am appalled by the possibility of your BP expanding it's presence all over our public lands here on the Olympic peninsula of WA state | |
| **343** | If you are not building a fence, CBP should retract the PEIS and issue a revision so readers can evaluate potential impacts of measures that are actually being measured | CBP stands by the clarity in the document about what is and what is not proposed. CBP cannot be responsible for inaccurate media stories depicting what is said in the PEIS nor can it be responsible for other individuals or organizations that inaccurately read or depict what is said in the PEIS. |
| **348** | Connect the "islands" by natural migration corridors between them - solves migration and climate change issues | CBP is aware of the importance of wildlife corridors and the transborder migration of wildlife. That concern will be specifically addressed as part of specific reviews of specific actions. |
| **361** | It is obvious that the individuals who assembled this document lacked the understanding and expertise for such a task. | No further response required within the PEIS. This is a non-substantive comment. |
| **362** | The City of Ranier rejects the Northern Border PEIS and recommends that it be abolished or sent back to the consultation stage and begun anew. | CBP has incorporated comment responses from all or most comments received from the public in the final PEIS and the PEIS meets CBPs planning needs. |
| **371** | Makes no sense to turn the MN/ border into semi-militarized zone. Little chance of terrorist plot will come my canoe and dog sled across the wilderness to attack--who or what? | It should be understood that Customs and Border Protection is not proposing or planning to request any change in legal responsibilities or to further increase its physical presence along the Northern Border. The PEIS is providing a prudent broad look and potential impacts if activity levels needed to change in the future due to a change in the |
| **377** | This PEIS would allow the govt to set up military drone bases in a secretive manner on public lands that are isolated. | |

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| | Anyone within the 100 mile zone becomes part of a police state | threat environment along the border. |
| **378** | Strategies described will be extremely costly to US taxpayer. We don't need costly and unnecessary patrolling of our border | |
| **384** | Everyone focuses on the Southern Border regions and forgets about our Northern Border regions, thanks for staying on top of the situation. | |
| **402** | Clearly there needs to be a more inclusive review of the impacts/effects of potential actions before this PEIS is finalized - one that balances the public's right to have its built and natural environment protected with your agency's desire to build or enlarge your facilities. | |
| **611** | Border patrol is spending a lot of money on this when there are other issues to address. | |
| **612** | Can't use terrorism as an excuse to take away civil liberties. | |
| **613** | This is just being done as an exercise but you don't really change. | |
| **658** | a waste of money and something I don't want to see | |
| **667** | The expenditure of tax payers' dollars after the const. of an 8 million dollar detention center in Port Angeles is another instance of waste and abuse. Many citizens are outraged at the massive build up of the BP acting as a massive militarized zone in NW | |
| **669** | Your web site makes it difficult to state that one is against the proposal. Sees no reason to take away rights of people within 100 miles of border. | |
| **679** | because it is required that humans are to be considered in the EIS, this plan should not be adopted under these policies and constitutional rights expect as the No Action Alternative. Any other choice would create an unacceptable disruption in the area | |
| **681** | More surveillance, presences, and technologies are not needed. Already there are more BP than needed. | |

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| **686** | not to worry, big brother will look after you, Russia is getting their freedom, here in northern NY the great police state of NY, we are losing ours | |
| **689** | Flush with out tax dollars, I hope your dreams of building walls and whatever obstacles to our freedom of views and movement will not materialize | |
| **690** | The people of the Northern border, contrary to south border, will not tolerate the militarization of their region. We like camping, hiking, and walking in a natural env not overrun by BP | |
| **702** | Stop wasting time and money when you already have a system in place. | |
| **380** | Thinks the EIS is total nonsense. Need to protect our borders but we have to jump thru hoops like this to get the job done. | CBP complies with its Constitutional responsibilities including upholding or complying with all laws of the United States. NEPA is a prudent and valuable planning tool that helps CBP do its part to be a steward of a healthy productive environment as it carries out its mission. |
| **385** | Needs a call back to determine who to address the comment letter to | No further response required within the PEIS. CBP provided. |
| **500** | Includes the northern border of Idaho between Washington and Montana state lines. Administers state programs that include air quality, surface and ground water quality, wastewater, waste and remediation, and drinking water. | CBP will consider these comments in its final determinations regarding mitigations in the PEIS and the ROD. |
| **501** | The tactical security and infrastructure and flexible direction alternative have the greatest potential to affect water quality. | |
| **504** | There is effort both private and public being focused on the recovery of impaired waters throughout the Coeur d' Alene Region on a variety of water quality projects ranging from road closures to remediation of abandon mine sites. Some of this work has been accomplished in the vicinity of the border such as the Boundary Creek watershed which is impaired due to excess temp which results from lack of canopy cover along streams. | |
| **506** | Idaho water become impaired because of cumulative effects of various human activities within a watershed. For example, | |

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| | the clearing of riparian vegetation for fencing, motorized patrol, plugged culverts, loose sand or gravel, use of pesticides, and low water crossing are all minor impacts but if poorly planned can be cumulative impact. | |
| **709** | Integrated cross-border law enforcement to build on existing bilateral law enforcement programs | |
| **710** | Critical infrastructure and cyber security to implement a comprehensive cross-border approach | |
| **502** | A tool to learn about the streams, rivers, and lakes near or crossing the U.S. border is an interactive map www.global.deq.idaho.gov/Website/wq2010/viewer.htm. DEQ also has list of sub basin assessments, TMDLs, and TMDL implementation plans on their website. | CBP has placed this in a list of available resources. |
| **509** | We welcome projects that restore Idaho's impaired waters like the Boundary creek, which calls for an increase of shade | See 8.5.6.2 of the final for details on water BMPs and mitigation measures.. |
| **515** | Idaho is unique in that many individuals use surface water ad their source of drinking water as do several public systems. Care is necessary when planning projects near streams, rivers, and lakes so these are not impacted. | |
| **514** | Idaho is unique in that many individuals use surface water ad their source of drinking water as do several public systems. Care is necessary when planning projects near streams, rivers, and lakes so these are not impacted. | CBP has clarified text to the document committing to adhere to EPA NPDES construction permit requirements for each state. |
| **552** | More technology needs to be in place for areas where the entire border is located in water | CBP agrees that water border areas present a unique challenge for surveillance, deterrence, or interdiction of illegitimate cross border activity. |
| **617** | Worries if X-ray machines are causing cancer in this area due to high levels of exposure and if a study has been done. Death rise after x-ray machines came in. Concerned that different studies aren't being done that maybe should be done | Studies were conducted on exposure when scanning devices were acquired and NEPA documents included analysis of potential radiation exposures for operators and travelers. No adverse effect was found from the levels of exposure encountered at and around the ports. |
| **887** | We request that CBP always do site-specific analysis in coordination with the National Park Service before taking action at Acadia and in the surrounding communities | CBP will necessarily coordinate with NPS, generally. regarding ongoing operations and, specifically, regarding any new projects or major changes in operations. |
| **889** | We feel there is too much unique to Acadia and too much potential for harm by lumping the park in with the general | CBP thanks you for your comment. The are a variety of unique resource areas along the northern border. CBP is committed to |

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| | landscape of Northern New England through this programmatic EIS. | coordinating at the most immediate level to best manage activities in parks, forests, and other areas with sesnitive resources or missions supporting public enjoyment of natural/cultural spaces. |

Table A-2.2

Comments with Responses Incorporated into the PEIS or Otherwise of Special Interest for Response

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 4 | Darren Bonaparte | Akwesasne | Tribal Data Concern & Tech Edits | The territory of Akwesasne - St. Regis Mohawk Reserv. is not mentioned in the list of Native American Lands listed on page 12. This oversight is glaring in that the Massena station is located about 3,000 feet from the western boundary of the reservation. Half of the Akwesasne territory lies in Canada, Visitors from Canada to the Massena station must pass through the Canadian reserve via the international bridge system from Canada which passes through Cornwall island, kawehnoke, a high pop area of reserv. Millions of dollars of contraband pass through the area, according to reports published on a regular bias by Canadian/American law enforcements. It is inexplicable that the PEIS fails to mention even the existence of the Akwesasne territory. Johnson Road, St. Regis Road, River Road, Phillips Road, and McDonald Road all pass across the US/Canada border at various points along the territory but do not have any kind od POE. In most cases, there is no signage or even a border marker | The final PEIS corrected the place in 6.8.2.3 where it just refered to the St.Regis Indian Reservation to refer to the St. Regis Mowhawk Tribe Indian Reservation. In the final as it was in the draft, The St. Regis Mowhawk Tribe reservation is listed in "Table 6.11.-5. Native American Tribes that Have a Reservation, Judicially Established Interest, or Established Traditional Ties to Land within the 100-mile PEIS Corridor," "Figure 6.11-1. Native American Lands Within the 100-mile PEIS Corridor Crossing Wisconsin, Michigan, Ohio, Pennsylvania, and New York," "6.8.2.3 Land Ownership in the Great Lakes Region in the United States," and incorporated into "Table 6.8-7. Land Ownership in the Great Lakes Region." |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 21 | Darren Bonaparte | Akwesasne | Tribal Data Concern & Tech Edits | Error in App H: Historical... pg H-25, 41-44: Iroquois were allies of the British during the French and Indian War, some were allied with the French in beg., but switched sides before summer 1760. Entered into Silver Covenant Chain of Peace & Friendship with Great Brittan and enjoyed free and open trade. | Correction made as follows: "During this same time, the Tuscarora, an Iroquoian-speaking group that migrated from North Carolina, joined the Five Nations. After the French and Indian war (1754-1762), the Iroquois, who had sided with the British, benefited from the subsequent Royal Proclamation of 1763, by which the British Crown prohibited settlement west of the Appalachian Mountains. However, this reprieve was brief, since after the American Revolution, Iroquois lands were increasingly encroached on by American settlers and the Iroquois were forced to relocate to ever-dwindling reservations." |
| 24 | David Hadden | | Action/Alternative/Activities | CBP does not actually evaluate any of its alternatives. | The alternatives used in the PEIS were developed to provide CBP decisionmakers with a basis for understanding the relative environmental impacts associated with implementing different sets of tools/activities used to facilitate border security along the Northern Border. These alternatives provide a reasonable range of approaches to choose from to meet yet unidentified future threats. The relative environmental impacts that would likely occur from implementing each the alternatives are presented in the PEIS in narrative and tabular form throughout the document. They evidence the different environmental considerations inherent to any strategic approach. Chapter 1 of the final further clarifies this approach. |

Appendix A-2
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| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 29 | David Hadden | | Action/Alternative/Activities | Infrastructure upgrades and improvements should include upgrades to roadways and trails or the construction of new roadways . | Under the Tactical Security Infrastructure Deployment Alternative road and trail upgrades and new road construction were already included but the following statement was added to make it more apparent: "This alternative would also include upgrades to roadways and trails proximate to the border or construction of new roadways to access CBP facilities and infrastructure." |
| 34 | Darlene Pearson | | Action/Alternative/Activities | PEIS does not state why we need 100 miles south of the border as opposed to 25. miles. | Under 1.2 CBP NORTHERN BORDER ACTIVITIES, the following was added starting at line 29: [Section 387(a)(3) of the Immigration and Nationality Act provides for CBP agents and officers "to board and search for aliens any vessel within the territorial waters of the United States and any railway car, aircraft, conveyance, or vehicle" within a "reasonable distance from an external boundary of the United States." Part 287 of Chapter 8 of the Code of Federal Regulations clarifies that 100-miles is a reasonable distance from an external boundary. Within the first 25 miles, CBP personnel have the right to access to private lands but not dwellings) to patrol the border to prevent the illegal entry of undocumented CBVs into the United States. ] |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 41 | Margo Locke | | Impact Data/Analysis Determination | Expanding the jurisdiction 100 miles south is total unnecessary. | Under 1.2 CBP NORTHERN BORDER ACTIVITIES, the following was added starting at line 29: [Section 387(a)(3) of the Immigration and Nationality Act provides for CBP agents and officers "to board and search for aliens any vessel within the territorial waters of the United States and any railway car, aircraft, conveyance, or vehicle" within a "reasonable distance from an external boundary of the United States." Part 287 of Chapter 8 of the Code of Federal Regulations clarifies that 100-miles is a reasonable distance from an external boundary. Within the first 25 miles, CBP personnel have the right to access to private lands but not dwellings) to patrol the border to prevent the illegal entry of undocumented CBVs into the United States. ] |
| 42 | Margo Locke | | Action/Alternative/Activities | What are check points for. | This was clarified in 1.2.3.2 USBP Mission and Operations as follows: "Traffic checkpoints, conducted on major roads leading away from the border, are aimed at detecting persons and narcotics entering the country illegally." |
| 49 | Sharon L. Sorby | Pend Oreille County Weed Board | Impact Data/Analysis Determination | Concerns with the lack of redress to alien invasive species, especially noxious weeds. | The final says at 8.3.6 .1: "Depending on project needs and requirements, CBP would implement other protective measures to prevent or limit the spread of invasive plants or animals into native habitats." Within best management practices for reducing impacts to biological resources listed in chapters 8 and 9, CBP included routinely washing and inspecting vehicles used for construction as well as for patrols to remove vegetation, seeds, and insects and animals to reduce the risk of transporting non-native/invasive species into off-road environments. |

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| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 54 | Sharon L. Sorby | Pend Oreille County Weed Board | Impact Data/Analysis Determination | In Chapter 4: West of the Rockies there is no discussion of alien invasive species in the Affected Environment. | In the last paragraph of section 4.3.2.5 Vegetative Habitate Typically Found in the Region, the draft did mention scotch broom as an example of invasives species posing a serious threat to native species in the region. The final clarifies that scotch broom (Cytisus scoparius) is (alien) native to Europe and North Africa.. |
| 80 | Alvin Windy Boy Sr. | | Tribal Data Concern & Tech Edits | Cultural sensitivity training to immigration/CBP. | The final added more explanation about its Environmental and Cultural Stewardship Training for agents: "1.2.2.3 Environmental Awareness .... line 37 on: Environmental and Cultural Stewardship Training, prepared jointly by CBP, the Department of Interior, and the U.S. Department of Agriculture-Forest Service, is mandatory for all USBP agents and available to all CBP personnel. This training provides practical guidelines to practice awareness of:<br>• Natural and cultural resources in the operational environment;<br>• Lands and places set aside for preservation, conservation, or appreciation of unique natural or cultural values; and<br>• People and departments that use or manage that land, including sensitivity to Government-to-Government relations with Tribes.<br>All CBP components otherwise provide environmental and cultural resources training appropriate to their personnel's daily responsibilities." |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 118 | Boundary County Commissioners | Boundary County, ID | Admin Process | Please consider us as equal to any other Government Agency you deal with and we wish to be considered by you in future actions as a co-coordinating agency. | The final PEIS says, in Chap 2 (pg 2-3, that): "When individual projects or program elements with the potential to significantly impact the environment are ripe for proposal and assessment, CBP will continue to conduct appropriate project-specific National Environmental Policy Act (NEPA) analysis. CBP will make determination of the appropriate level of review in accordance with 40 CFR 1501.2 thru 1501.4, as well as DHS Directive 032-01 sections V.H, VI, and Appendix A." |
| 132 | Brad Smith | Idaho Conservation League | Impact Data/Analysis Determination | There are more potential impacts to wildlife and other environmental resources under the DISCTEA when compared to the FDAIA. Increased vehicular access along the Northern Border could negatively affect efforts to recover listed and viable populations of wildlife. Infrastructure such as towers will need access roads or trails for maintenance reducing the quality and availability of wildlife habitats. The Department should carefully evaluate the effects of any such activities to wildlife before proceeding with construction. | The final says at 8.3.6.1 (first sentence): "Site-specific NEPA review would be required if impact to wildlife is a concern at a particular construction site. Planning activities will take the species into consideration within site-specific NEPA review. " |
| 144 | Brad Smith | Idaho Conservation League | Impact Data/Analysis Determination | Increased vehicular access and human activity along the border would impede efforts to recover listed populations of grizzly bear, lynx, and mountain caribou, or other species. It would be more beneficial to construct helistops for border patrols than to build new roads. Although this would impact wildlife the impacts would be less. | The final commits CBP to develop and use more of an ecological site model approach to coordinate with Federal land and natural resource management agencies to evaluate potential impacts of future activities on critical biological resources. |
| 149 | Brad Smith | Idaho Conservation League | Impact Data/Analysis Determination | Primary concern with the PEIS and future activities relates to potential impacts to wildlife. There are a number of T&E species in Idaho whose survival relies on the ability to move across the border. | The final says at 8.3.6.1 (first sentence): "Site-specific NEPA review would be required if impact to wildlife is a concern at a particular construction site. Planning activities will take the species into consideration within site-specific NEPA review. " |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 151 | Brad Smith | Idaho Conservation League | Impact Data/Analysis Determination | The recovery area for the mountain caribou is the only established recovery area for an endangered species that extends north of the Canadian border. Caribou are regularly documented in the northwest corner of the state, in the basin north of Snowy Top Mountain, and south along the crest of the Selkirk Mountains. The ability of wildlife managers to recover the "international Herd" to a viable pop depends on the connectivity of habitat. If fences were to be constructed along the Northern Border it would pose a migrational issue to mountain caribou. | The final says at 8.3.6.1 (first sentence): "Site-specific NEPA review would be required if impact to wildlife is a concern at a particular construction site. Planning activities will take the species into consideration within site-specific NEPA review. " |
| 155 | Brad Smith | Idaho Conservation League | Impact Data/Analysis Determination | Increased motorized vehicular access within wildlife habitats along the border would also hinder efforts to recover caribou, grizzly bear, lynx, and other wildlife. [NOTED LATER: mountain caribou require secure habitat, uninterrupted by human disturbance. Grizzly bears also need secure habitats from the time they emerge from hibernation until they retreat to their dens the following winter. ] | The final commits CBP to use more ecological site models to coordinate with Federal land and natural resource management agencies to evaluate potential impacts of future activities on critical biological resources. |
| 156 | Brad Smith | Idaho Conservation League | Impact Data/Analysis Determination | Caribou will flee if motorized vehicles make their way into winter habitats causing them to spend crucial energy reserves. | The final commits CBP to use more ecological site models to coordinate with Federal land and natural resource management agencies to evaluate potential impacts of future activities on critical biological resources. |
| 159 | Brad Smith | Idaho Conservation League | Impact Data/Analysis Determination | Activities or projects that reduce the quality or quantity of snowshoe hare habitat (especially multi-storied lodegpole pine and spruce/fir forests) would negatively impact the recovery of lynx. Lynx require high elevation habitats that are capable of supporting populations of snowshoe hare (prey) - multi-storied ladgepole pine and spruce/fir forests are important. | The final says at 8.3.6.1 (first sentence): "Site-specific NEPA review would be required if impact to wildlife is a concern at a particular construction site. Planning activities will take the species into consideration within site-specific NEPA review. " |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 160 | Brad Smith | Idaho Conservation League | Impact Data/Analysis Determination | The analysis of cumulative effects in the PEIS falls short. Central to that analysis is disclsoure of historical, present, and projected future resource conditions. | CBP's approach to cumulative analysis is reasonable given CBP's small footprint for the area covered. However, the final provides additional informartion on recent historical growth in its activities along the Northern Border to provide meaningful perspective on resource impact trends. |
| 163 | Brad Smith | Idaho Conservation League | Impact Data/Analysis Determination | The cumulative analysis falls short. Central to the analysis of cumulative effects is the disclosure of historical, present, and projected future resource conditions when taken with the action alternatives. The final PEIS should provide a more thorough discussion of the cumulative effects of the action alternatives, when taken with past, present, and reasonably foreseeable future federal actions. | CBP's approach to cumulative analysis is reasonable given CBP's small footprint for the area covered. However, the final provides additional informartion on recent historical growth in its activities along the Northern Border to provide meaningful perspective on resource impact trends. |
| 185 | Daniele Turcotte | | Tech Edits | Exec Summary: Page ES-1 lines 34-28 duplicated sentence | CBP made appropriate corrections in the final PEIS. |
| 186 | Daniele Turcotte | | Tech Edits | Check grammar, punctuation and capitalization on Page ES-2 Line 33; Page ES-3 Line 9; ES-3 line 26; Page ES-3, Line 40; Page ES-4, lines 13-15; Table ES-1 15; Page ES-4; Page ES-5, Table ES-1 | CBP made appropriate corrections in the final PEIS. |

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| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 187 | Daniele Turcotte | | Action/Alternative/Activities & Tech Edits | Introduction I. Page 1-3, Line 26 Comment: These statements give the impression that the area is a barren wilderness mostly owned by the government and a few Native Americans. However, the PEIS addresses the contiguous land encompassing NB and 100 m south | The terrain south of the border —which ranges from densely forested lands on the west and east coasts, to open plains in the central portion of the country, to the maritime environment of the Great Lakes. — largely comprisesThere are several sparsely populated Federal, state, and tribal lands along the immediate border area and sparsely distributed towns and smaller cities lands along the immediate border area. Around the Great Lakes and in the Pacific Northwest there are . More densely populated urban areas. occur mostly around the Great Lakes.. This operating environment differs appreciably from the other borders and requires its ownto CBP employ a particular mixture of facilities, operations, infrastructure, and technology for itsas an appropriate law enforcement approach. In |
| 188 | Daniele Turcotte | | Action/Alternative/Activities & Tech Edits | What are the actual percentages of public, privately-owned, and tribal lands within the entire area of analysis, ie 40,000 square miles | CBP corrected information on the Federal and tribal lands within the NB study area. Percentage breakdown of private lands is not pertinent to the analys. |
| 189 | Daniele Turcotte | | Tech Edits | Page 1-5, Lines 8-13 (inserts/deletes); Page 1-6, Lines 14-17 & Page 1-7 line 6 (clarification needed); Page 1-7, Lines 20-21: Who is the "interested organization"? It has not been previously referred to. | Replaced "intersted organization" with "documented shipper (or recipient)." Clarified definition of "situational awareness" and denial of CBV awareness of law enforcement routines. |
| 190 | Daniele Turcotte | | Tech Edits | Grammar Page 1-7 Lines, 21-22; | Changed from "They also use canine teams for detecting a variety of substances (such as narcotics and explosives)," to "CBP Officers also use canine teams for detecting a variety of substances (such as narcotics and explosives)." |
| 191 | Daniele Turcotte | | Action/Alternative/Activities | VII Page 1-8, Lines 14-16: untrue, I was stopped at a BP checkpoint on the US 37/12 intersection in northern NY. The checkpt had elevated lights, a USBP van and signage. Neither of these roads meet the border | Changed from "Traffic checkpoints are conducted on roads that meet the border; " to "Traffic checkpoints, conducted on major roads leading away from the border, are aimed at detecting persons and narcotics entering the country illegally." |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 193 | Daniele Turcotte | | Impact Data/Analysis Determination & Action/Alternative/Activities | Page 1-12, lines 18-19: in some sections, CBP operates a Predator-B unmanned aircraft system (UAS) carrying live missiles would result in a different env impact than a crash of an un-armed predator-B | As is stated in the Draft PEIS, CBP's UASs do not carry explosive devices or any other types of munitions or armaments. We clarified the language in the PEIS to make clear that CBP's UASs are never armed and are used strictly for reconnaissance, surveillance, targeting, and acquisition for ground, air and maritime operating environments. |
| 194 | Daniele Turcotte | | Impact Data/Analysis Determination & Action/Alternative/Activities | Page 1-12, Lines 23-24: are lasers the type used as armaments? Concern is again a crash of an aircraft and subsequent accidental deployment of the laser | As is stated in the Draft PEIS, CBP's UASs do not carry explosive devices or any other types of munitions or armaments. We clarified the language in the PEIS to make clear that CBP's UASs are never armed and are used strictly for reconnaissance, surveillance, targeting, and acquisition for ground, air and maritime operating environments. |
| 196 | Daniele Turcotte | | Action/Alternative/Activities | Page 1-18, Lines 18-20 clarification maintain and continually seeking to enhance, security on a long and varied border, that faces facing multiple evolving threats, while using a changing set of resources and techniques, is therefore a highly dynamic enterprise. | Removed the "dynamic enterprises" sentence in the final and refocused paragraph on budgetary and technological considerations for border security maintenance. |
| 197 | Daniele Turcotte | | Tech Edits | Page 1-18, lines 31-31: clarification. Which effort - the PEIS or the newly signed agreement with Canada | Clarified the relationship between the PEIS and the Canada agreement and DHS's NB strategy. |
| 200 | Daniele Turcotte | | Tech Edits | Check grammar on page 1-21 (need to remove both has and the after activity) | Made corrections to discussion of procedural and substantive requirements. |
| 204 | Daniele Turcotte | | Impact Data/Analysis Determination | Page 2-2, Lines 25-28 kindly specify trigger level for conducting and environmental analysis on a specific project | Included the following statement: "When individual projects or program elements with the potential to significantly impact the environment are ripe for proposal and assessment, CBP will continue to conduct appropriate project-specific National Environmental Policy Act (NEPA) analysis. CBP will make determination of the appropriate level of review in accordance with 40 CFR 1501.2 thru 1501.4, as well as DHS Directive 032-01 sections V.H, VI, and Appendix A." |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 205 | Daniele Turcotte | | Tech Edits | Page 2-3, lines 34-35 is confusing | Rephrased as 2-2, line 38 as: "NEPA requires that Federal agencies rigorously explore and objectively evaluate all reasonable alternatives for a proposed action with the potential to significantly impact the human environment. NEPA analysis must also address other alternatives for meeting the agencies purpose for action that were eliminated from detailed study and briefly explain why they were not further analyzed. ( Section 1502.14.)" 2-3, line 36-40: " Increases or fluctuations in the number of personnel securing the Northern Border would likely occur over the next five to seven years as a function of normal CBP-wide growth. Also, if the pace of operations were to increase due to changes in legal or illegitimate movement across the border for extended periods, additional personnel might be required in specific areas or facilities along the border. " |
| 206 | Daniele Turcotte | | Tech Edits | Page 2-3, lines 39-40 grammar | CBP corrected the grammar in the final PEIS by breaking up the sentence into smaller complete thoughts. |
| 207 | Daniele Turcotte | | Action/Alternative/Activities &Tech Edits | Page 2-4, lines 28-30 needs clarification…USBP agents in some locations are currently operating out of leased space… | Clarified as "In some cases, USBP agents are currently operating out of space not optimized for their operational responsibilities. This includes space leased in buildings primarily occupied by other Federal, State, or local governments/law enforcement agencies that may not meet space, location, or accomodation requirements for USBP Stations and the area of operations." |
| 208 | Daniele Turcotte | | Action/Alternative/Activities &Tech Edits | Page 2-4, lines 42-44 needs clarification…It would also divert traffic from or increase the capacity of the more heavily used POEs, which would decrease waiting times…Waiting times for the cross-border violator of the previous sentence? | Clarified by adding "for vehicles enganged in legal trade and travel" to the end of the sentence. |

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|---|---|---|---|---|---|
| 209 | Daniele Turcotte | | Tech Edits | Page 3-8, lines 13-15: those definitions which are essentially the same for both natural env. And societal env. Should be stated in the same manner to avoid confusion to reader | Consolidated the definitions of impact level determintaions so it is easier to read. |
| 210 | Daniele Turcotte | | Tech Edits | page 3-8, lines 18-19: grammar: The viability of the affected resource is not threatened although some impacts may prove irreversible | Corrected the grammar. |
| 211 | Daniele Turcotte | | Tech Edits | Page 3-8, lines 33-34: definitions which are essentially the same for both natural env and societal env should be stated in the same manner to avoid confusing the reader (see comment as 209) | Consolidated the definitions of impact level determintaions so it is easier to read. |
| 212 | Daniele Turcotte | | Tech Edits | Page 3-9, lines 3-5:definitions which are essentially the same for both natural env and societal env should be stated in the same manner to avoid confusing the reader (see comment as 209) | Consolidated the definitions of impact level determintaions so it is easier to read. |
| 213 | Daniele Turcotte | | Tech Edits | Page 3-9, line 8: delete, this item may be true, however it is not a deciding factor as to whether an impact is minor or moderate (proper mitigation) | Concur. Deleted statement on proper mitigation. |
| 214 | Daniele Turcotte | | Tech Edits | Page 3-9, lines 9-10 grammar | Description changed and grammar corrected. |
| 215 | Daniele Turcotte | | Tech Edits | Page 3-9, lines 11-13 definitions which are essentially the same for both natural env and societal env should be stated in the same manner to avoid confusing the reader (see comment as 209) | See response to comment 139. |
| 216 | Daniele Turcotte | | Tech Edits | Page 3-9, line 16 delete, this item may be true, however it is not a deciding factor as to whether an impact is minor or moderate (proper mitigation) (see comment 213) | Concur. Deleted statement on proper mitigation. |
| 217 | Daniele Turcotte | | Tech Edits | Page 3-9, lines 19-21 definitions which are essentially the same for both natural env and societal env should be stated in the same manner to avoid confusing the reader (see comment 209) | Consolidated the definitions of impact level determintaions so it is easier to read. |
| 218 | Daniele Turcotte | | Tech Edits | Page 3-9, line 18: grammar | Description changed and grammar corrected. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 219 | Daniele Turcotte | | Tech Edits | Page 3-9, line 36: grammar | Added "of the" between "descriptions" and "regionally affected." |
| 222 | Daniele Turcotte | | Tech Edits | page 3-11, line 23 & page 3-12 line 4: grammar | Removed comma from between "required" and "interim emission reduction." |
| 223 | Daniele Turcotte | | Impact Data/Analysis Determination | Page 3-11, lines 29-33: comment 93/153(b). These preset threshold levels, or de minimis rates, vary depending on the severity of the nonattainment, the and geographic location and De minimis emissions are total direct and indirect emissions… | Changed to read as: "Total direct and indirect emissions of a criteria pollutant caused by a Federal action in a nonattainment or maintenance area are de minimis if they are at rates less than the specified applicability thresholds. These de minimis rates vary depending on the type of pollutant and the geographic location for the level of nonattainment (Table 3.2-2)." |
| 224 | Daniele Turcotte | | Tech Edits | Page 3-12, line 7: paragraph is confusing. Does 'these' refer to the permitting scenarios or the equipment, timing, etc | Added the word " scenarios" between "These" and "may" to clarify the reference. |
| 227 | Daniele Turcotte | | Tech Edits | Page 3-13, line 26: grammar | Clarified that combination of fossil fuel boilers emitting 100-tpy of regulated pollutants would need to seek PSD permits. |
| 229 | Daniele Turcotte | | Tech Edits | Page 3-13, line 22: grammar | Changed wording to "and to make minor modifications…." |
| 230 | Daniele Turcotte | | Tech Edits | Page 3-14, line 36 & Page 3-15 line3: stay consistent: is it rates or thresholds | Threshold is used consistently for the limit. |
| 231 | Daniele Turcotte | | Tech Edits | Page 3-15, Line 24: Sentence makes no sense | Changed to read as: "Several activities do not generate any direct or indirect emissions that would require CBP to maintain an ongoing program to control them. " |
| 232 | Daniele Turcotte | | Tech Edits | Page 3-15, line 28: grammar | Changed to read as: "The PEIS does not carry these activities forward into the analysis of potential impacts to air quality." |
| 233 | Daniele Turcotte | | Tech Edits | Page 3-22, line 2: grammar | Changed to read as: "Soils with low permeability have more potential for erosion by both wind and water due to the ability of water or air to move through its strata." |
| 234 | Daniele Turcotte | | Tech Edits | Page 3-25, lines 19-20: use same terminology for impacts as in earlier section…ie. Negligible | Changed "insignificant" to "negligible." |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 235 | Daniele Turcotte | | Action/Alternative/Activities | Page 3-25, line 21: I don't believe you have considered enough scenarios for this item. It is not just during construction that there are potential affects to surface/groundwater. Also includes: construction and operating new dikes/culverts can redirect surface water which would affect waters; Runoff from operating new parking lots/airport runways can contain petroleum products and high sediment loads which affect surface/groundwater; leaks of aboveground fuel storage tanks could affect waters. Airplane accidents, predator accidents, marine vessel accidents…. | Now reads as: • Fuel spills and leaks from vehicles, equipment, and storage tanks that runoff impervious surfaces or otherwise transport to make a groundwater aquifer unsuitable for withdrawing drinking water or impair surface waters;<br>• High sediment loads in runoff from construction sites or that harm impair surface waters and aquatic organisms;<br>• Construction projects that redirect surface waters during or after completion of the facilities and infrastructure; and<br>• Substantial withdrawals from an aquifer that change the local water table and cause some existing wells to dry up. |
| 239 | Daniele Turcotte | | Tech Edits | Page 3-29, lines 4: use same terminology as in earlier section: impacts not affects | The final PEIS uses impacts as the dominant terminology except where it wou+K192ld be repetitive or where "affect" is quoted from a reference. |
| 240 | Daniele Turcotte | | Impact Data/Analysis Determination | Page 3-29, lines 9-10: Generates noise in a national park that exceeds significant effects thresholds as outlined by the NPS…what of State Parks? | State parks noise issues are covered by the previous bullet on noise regulations and land management (compatibility with land use planning). In this cae, we are refering to uniform guidance in a Federal law that applies to units of the NPS exclusively. |
| 241 | Daniele Turcotte | | Impact Data/Analysis Determination | Page 3-30, line 5-6: should review noise levels created by operation of backup generators at larger facilities | At 8.6.2 standby generators are considered see "Standby generators at modified POEs would be completely enclosed by buildings or other enclosures. Standby generators would operate for limited periods for maintenance and testing and during power outages. Due to their limited use, effects to the noise environment from standby generators would be minor." |
| 248 | Daniele Turcotte | | Tech Edits | Page 3-34, line 6: some categories of land use…grammar | Corrected to read as: "Some impacts to land use discussed in chapter 8…." |

Appendix A-2
Table A-2.2
Comments with Responses Incorporated into the PEIS or Otherwise of Special Interest for Response

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 249 | Daniele Turcotte | | Impact Data/Analysis Determination | Page 3-34, lines 24-26: to identify the lands most likely…:unclear…combining the list of land uses into a general 'recreation' land use? Or only combining the land uses that have the gov. as a landowner  Also, why not also add campgrounds as you have for the Canadian side? Inconsistency of evaluating Canada | Revised to read as: "CBP's law enforcement jurisdiction frequently places its operational activities within areas designated or otherwise used for recreation and conservation purposes. This PEIS's analysis of areas most likely used for recreation in the United States includes lands within the designations listed beneath:" |
| 251 | Daniele Turcotte | | Impact Data/Analysis Determination | Page 3-35, lines 23-25: the category of recreational land includes more land than that referenced in section 3.17 (recreation). Which focuses specifically on major Federal Recreation Sites.  Shouldn't section 3.17 include discussion of all land now considered 'recreation' in the PEIS, or change the title of 3.17 to "Federal Recreational Areas" | Based on input from National Park Service, the section was rewritten to simplify the land use categorization.  Canadian resources are included when they offer a useful comparison or the connectedness between the resources is relevant to border security and resource protection in the United States. |
| 253 | Daniele Turcotte | | Impact Data/Analysis Determination | Page 3-35, lines 29-31:if you are trying to evaluate impacts conservatively, as you have stated, you would want to over-estimate the rec-type land since this type of land is considered more pristine rural/urban LU and would have greater impact than these | Over-estimating areas used for recreation would arbitrarily exaggerate the range of recreation impacts without changing the impact intensity determination |
| 254 | Daniele Turcotte | | Tech Edits | Page 3-39, line 31: grammar | Corrected to read as: "There is the potential for a land use impact to occur when an activity…." |
| 278 | David Graves | National Parks Conservation Association | Tech Edits | Appendix I fails to mention the existence of Akimina-Kishenina Provincial Park and the British Columbia Flathead Watershed Protection Area. The entirety of this area is low impact use and can be categorically recognized as remote and pristine. | Appendix I now mentions the Akimina-Kishenina Provincial Park.  The British Columbia Flathead Watershed Protection Area has not yet reached status, therefore it is not included in the final. |
| 279 | David Graves | National Parks Conservation Association | Tech Edits | Appendix I in the Glacier National Park portion fails to mention the North Fork of the Flathead River's designation as a Wild and Scenic River. NPCA believes the entirety - not most - of the area is low impact use. | The entirety of the Flathead River's designation is mentioned in the Flathead National Forest portion below. The final removes the word most implying that the whole area low impact use. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 280 | David Graves | National Parks Conservation Association | Tech Edits | In Appendix I the Flathead National Forest part incorrectly states that the northern most extent of the Flathead National Forest is 50 miles south of the border. Instead, it is contiguous. | Changed to read as: Flathead NF starts just south of the northern border extending over 100 miles into Montana. |
| 291 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination & Action/Alternative/Activities | One of the most important activities the CBP should pursue is cooperation with the NPS and other state and federal land management agencies that currently supervise thousands of acres within the 100 mile wide border corridor in which CBP actions will take place. Taking advantage of these resources and identifyign other opportunities to emply existing assets in increasing border security should be a primte objetive of this proposed action. | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |
| 292 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination & Action/Alternative/Activities | NCPA supports efforts to coordinate with relevant federal land managers (including NPS) when needing access to lookout sites, in order to ensure consistency with the land manager's mission and specific land management requirements. | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |
| 299 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | NCPA supports efforts to redesign lighting on communications and radar towers to limit avian and bat mortality from collisions, which frequently occur on nights with bad weather. Use strobe or white lights and remove non-flashing and steady-burning red lights to substantially reduce mortality. | The final incorporates consideration of avian and bat hazard friendly technologies into mitigations for tower designs. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 300 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | NCPA supports efforts to eliminate the potential for significant major adverse visual impacts, by situating proposed towers and associated facilities at least 1.5 miles from Ares designated for their visual sensitivity (such as national monuments and park ...). NPCA believes 1.5 mile buffer zone is not appropirate in all situations, should take into consideration site-specific viewshet. | CBP concurs that site-specific considerations dictate tower placement and design. However, this may mean that towers need to be much closer than 1.5-miles which is proposed as a mitigation stratgy and not a design and placment requirement. |
| 304 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination & Action/Alternative/Activities | NCPA supports efforts to continue strengthening partnerships, communication, and discussion with knowledgeable personnel in recreation areas, such as NPS personnel, and ensure that the placement of new infrastructure, patrol routes, and other actions would have a low impact. | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |
| 305 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination & Action/Alternative/Activities | We strongly urge that this partnership cooperation be extended to include personnel knowledgeable about the movement and habitat needs of wildlife. | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 306 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | Minimizing the amount of development , traffic, and disruption in previously undisturbed areas are key for minimizing wildlife disruption and recreation impacts. | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program.  CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |
| 308 | David Graves | National Parks Conservation Association | Action/Alternative/Activities & Impact Data/Analysis Determination | NCPA supports efforts to work with national park and forest service personnel to alert visitors to new traffic checkpoints if they are located in areas that could affect recreational users. | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program.  CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |
| 311 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | Do not plan projects with potential impacts on biological resources in protected areas such as North Cascades National Park, Glacier National Park, and the adjacent larger protected landscapes surrounding both that could otherwise have cumulative impacts on grizzly bears and other wlidlife habitat and behavior.  Also concerned about minor projects that might have these impacts.  We hope important biological resources will be avoided when planning any projects in all areas along the border, not just National Parks. | The final commits CBP to develop and use more of an ecological site model approach to coordinate with Federal land and natural resource management agencies to evaluate potential impacts of future  activities on critical biological resources. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 314 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | NCPA supports efforts to substantially involve other Federal agencies that manage border area in mitigation when the CBP periodically determines if adaptations would be feasible to further enhance beneficial effects of lessen adverse effects identified through the impact monitoring porgram and adaptive management effort. | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |
| 315 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | Through this project, CBP will periodically measure the conditions of various environmental resources being affected by CBP's activities. NPCA recommends that these periodic measurements be published and easily available to the public. | CBP's commitment to responding to public inquiries regarding monitoring mitigations is found ar DHS Directive 023-01, Appendix A, 1.C(5). CBP will report summary monitoring information as appropriate and meaningful given the projects and environmental concerns and any additional reporting requirements from DHS. |
| 316 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | Regarding the periodic measurements of environmental resources, CBP should ask for assitance from park service and forest service scientists who may have knowledge of landscape conditions over the long-term ND can more easily identify changes or impacts. | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |
| 317 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | The draft PEIS does not mention that the U.S. government has subst. treaty obligations (World Heritage Convention) to protect the natural values of Waterton-Glacer International Peace Park. NCPA requests that this issue be specifically addressed in PEIS | CBP added a list of all World Heritage sites within the study area and clarified their unique value and protections. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 318 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | In the past, regardless of MOU's between CBP and NPS, CBP has occasionally pursued border related activities within national parks that should have resulted in prior consultation, but did not. NCPA hopes that the guidance and actions described in the PEIS that relate to coordination and consultation with the NPS will be followed and that future cooperation between these agencies will result in a safer border and healthier environment along that border. | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |
| 320 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | The most important aspect of any and all future activities on the Northern Border is the need for site specific NEPA analysis | Added to the end of 1.1 Purpose of the PEIS: "CBP would not implement any alternative or any element of any alternative in this PEIS based solely on the analysis presented in this document. Material proposed changes to CBP activities meeting the definition of "major Federal action" (40 CFR 1508.18) would be subjected to further NEPA review at the appropriate level of analysis and documentation. This FPEIS would provide background information for incorporation into those more project-specific plans. However, site-specific NEPA will continue to be completed for all projects that would have required it prior to the PEIS. Subsequent environmental analysis documents for specific projects within the area studied in this PEIS will "tier off" or draw upon the general information in this area-wide programmatic analysis document. " |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 321 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | NCPA is concerned that the impacts of projects may extend beyond the analysis area, as stated in the draft PEIS: "The region of impacts varies, however, depending on the activity and the resource being assessed. For that reason, the region of impact can extend beyond the current lines. NCPA believes tiering off of PEIS for projects that extend beyond the project area is incorrect and inappropriate. | Added to the end of 1.1 Purpose of the PEIS: "CBP would not implement any alternative or any element of any alternative in this PEIS based solely on the analysis presented in this document. Material proposed changes to CBP activities meeting the definition of "major Federal action" (40 CFR 1508.18) would be subjected to further NEPA review at the appropriate level of analysis and documentation. This FPEIS would provide background information for incorporation into those more project-specific plans. However, site-specific NEPA will continue to be completed for all projects that would have required it prior to the PEIS. Subsequent environmental analysis documents for specific projects within the area studied in this PEIS will "tier off" or draw upon the general information in this area-wide programmatic analysis document. " |
| 322 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | NPCA believes it is important to have a separate environmental resource category about RF/EM radiation because it is not just a HHS issue and can harm animals, and there is ample precedent for RF radiation exposure associated with radar systems to be included in the PEIS. | CBP does not believe that it should further segment resource areas in the PEIS because it dilutes presentation of synergistic/combined impacts to the affected environment by cutting it into ever smaller resources areas regardless of actual relative level of impacts. Instead CBP added more reference to potential for FR/EM radiation exposure to other natural resources in the biologial resources consideration area. For example, "The presence and operation of communication towers can cause long-term impacts to avian habitat, mortality, and behavior from tower collisions and/or tower avoidance. Lights on towers and other infrastructure may, under intermittent circumstances, attract avian species near electromagnetic or radio frequency emitting sources." |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 324 | David Graves | National Parks Conservation Association | Action/Alternative/Activities | The final PEIS could be improved by extending the range of alternatives by providing variations of the Flexible Direction Alternative. | The alternatives used in the PEIS were developed to provide CBP decisionmakers with a basis for understanding the relative environmental impacts associated with implementing different sets of tools/activities used to facilitate border security along the Northern Border. These alternatives provide a reasonable range of approaches to choose from to meet yet unidentified future threats. The relative environmental impacts that would likely occur from implementing each the alternatives are presented in the PEIS in narrative and tabular form throughout the document. They evidence the different environmental considerations inherent to any strategic approach. Chapter 1 of the final further clarifies this approach. |
| 325 | David Graves | National Parks Conservation Association | Impact Data/Analysis Determination | Importantly, continued and improved consultation and coordination with federal land managers, especially the NPS will help this project meet its goals while avoiding unnecessary impacts to the natural environment. | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 326 | David Graves | National Parks Conservation Association | Admin Process | Finally, the CBP needs to make a dedicated effort to engage in a thorough analysis of site-specific impacts for future projects tiered off of the PEIs and not rely solely on the analysis from the PEIS | Added to the end of 1.1 Purpose of the PEIS: "CBP would not implement any alternative or any element of any alternative in this PEIS based solely on the analysis presented in this document. Material proposed changes to CBP activities meeting the definition of "major Federal action" (40 CFR 1508.18) would be subjected to further NEPA review at the appropriate level of analysis and documentation. This FPEIS would provide background information for incorporation into those more project-specific plans. However, site-specific NEPA will continue to be completed for all projects that would have required it prior to the PEIS. Subsequent environmental analysis documents for specific projects within the area studied in this PEIS will "tier off" or draw upon the general information in this area-wide programmatic analysis document. " |
| 331 | Dee Miller | | No Comment/Beyond Scope | Where can we read the public comments that have been submitted? | See Appendix A-2: Public Comments on the Draft PEIS. |
| 340 | Don Dickson | Vermont Sierra Club | Impact Data/Analysis Determination & Action/Alternative/Activities | In chapter 7 regarding the NE region (7.17.2.1) it does not mention VT or the Green Mountains; contains voluminous factual info but no mention of impacts of proposed actions | CBP included reference to Vermont and the Green Mountains. Impacts analysis information is contained within chapter 8. |
| 341 | Don Dickson | Vermont Sierra Club | Impact Data/Analysis Determination | 8.18.3 page 8-18.2 Biological Resources - does not describe or explain any projected effects of CBP activities, or what those activities might be; merely states that impacts will be less than major but does not justify this statement and gives no examples to support statement | The purpose of this PEIS is to generalize potential impacts and provide info for decision-making. Specific actions would require specific review for potential env impacts through the NEPA required EA/EIS process |

Table A-2.2

Comments with Responses Incorporated into the PEIS or Otherwise of Special Interest for Response

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 351 | Don Dickson | Vermont Sierra Club | Impact Data/Analysis Determination | Assess Carbon Dioxide emissions and other CC impacts in project analysis…it is a requirement. Climate Change has already, and will increasingly, involve substantial climatic disturbances such as rising temps, extreme weather events, seasonal changes affecting flora and fauna, increased invasive species, species migration, ground level ozone, and AQ | Added a reference in the text of the final to identify that "Data on CO2 emissions from construction of various tactical security infrastructure projects can be found at Appendix J1-9 and J1-10." |
| 356 | Don Dickson | Vermont Sierra Club | Impact Data/Analysis Determination | Following will be negatively impacted by any intrusive border structure or activity and should be protected: Missiquoi NWR, Highgate State Park Natural Area, Missisquoi River crossings at East Richford/Lake Memphremagog, Canada View property, Proposed Eagle Point SP, State Wildlife Mgt areas, Nulhegan Basin Division NWR, and Public lands in VT | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |
| 359 | Edgar Oerichbauer | City of Ranier | Action/Alternative/Activities | The Northern Border PEIS lacked any conclusive evidence that this undertaking was needed. | The PEIS clarifies in Chapter 1 INTRODUCTION that CBP prepared this PEIS for Northern Border Activities is to inform decision-makers about potential environmental and socioeconomic impacts that could occur if CBP were were required to implement major program enhancements to the improve security along the United States Northern Border with Canada. |
| 363 | Edgar Oerichbauer | Koochiching County Historical Society | Tech Edits & Impact Data/Analysis Determination | After an initial reading of the draft Northern Border PEIs, it is apparent that there is much confusion on the different types of land management and about the missions and responsibilities of different agencies. | Thank you for your comment. CBP has made the appropriate corrections |
| 364 | Edgar Oerichbauer | Koochiching County Historical Society | Tech Edits | Stating that the USFS manages national parks (page 5.8-11) is confusing | Thank you for your comment. CBP has made the appropriate corrections |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 404 | George Eskridge | House of Representatives State of Idaho | Impact Data/Analysis Determination | Addressing threats and hazards early including natural disasters and man-made threats, including terrorism | The purpose and need for the proposed action now clarifies that CBP needs to take a a risk-based apporach to identify and resolve threats efficiently. |
| 405 | George Eskridge | House of Representatives State of Idaho | Impact Data/Analysis Determination | Trade facilitation economic growth and jobs to purse creative and effective solutions to manage the flow of traffic between Canada and the United States. | Thank you for your comment. CBP must execute its mission with regard to the considerations of the Beyond the Border Action Plan which address trade and travel promotion and economic growth. |
| 406 | George Eskridge | House of Representatives State of Idaho | Action/Alternative/Activities | Integrated cross-border law enforcement to build an existing bilateral law enforcement program | The PEIS addresses the variety of domestic and cross-border partnerships which facilitate a risk-based approach to border security. |
| 407 | George Eskridge | House of Representatives State of Idaho | Action/Alternative/Activities | Critical infrastructure and cyber security to implement a comprehensive cross-border approach | The PEIS addresses the physical infrastructure with the potential to imapct the phsical environment. |
| 413 | Johnna Exner | | Impact Data/Analysis Determination | document should address private property rights and construction related to property rights. ACTUAL COMMENT …So this should address private property rights and constitution, and my comments are that land use and road construction and whaterever decisions they decied to make, how it affects our private property. | See response to comment 34. Thank you for your comment. Programmitic documents are intended to addess issues in a broad sense. As such, it cannot address privarte property rights. This document cannot address constitutional issues in that it deals with impacts to proposed actions. |
| 414 | Johnna Exner | | Impact Data/Analysis Determination | What are the impacts to the people who live in these areas that are within the scope or within the stuff that's going to be done. | Thank you for your comment. The PEIS talks to the issue in a different manner than what you have requested. The document disucsses impacts to such items as traffic, land use, air quality, etc. All of these are related to people but in a broader manner than this specific comment. |
| 427 | James Devine | USDOI, USGS | Impact Data/Analysis Determination | The DEIS describes in general terms a number of sensitive habitat types; however, it does discuss whether any of these sensitive habitats would be affected the proposed action. We suggest that the Final EIS identify and discuss the potential impacts. | The final says at 8.3.6.1 (first sentence): "Site-specific NEPA review would be required if impact to wildlife is a concern at a particular construction site. Planning activities will take the species into consideration within site-specific NEPA review. " |

Appendix A-2
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| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 428 | James Devine | USDOI, USGS | Impact Data/Analysis Determination | The DEIS does not include a list of birds found in the border area. Final EIS should include a list of birds in the border area and address possible impacts. | Various information on species of all types are incorporated through the references used to prepare this PEIS. Since no specific areas are identified for future activities, it would be impossible to asses impacts to all birds or any other species types in detail. |
| 444 | Joe McKay | Native Americans | Tech Edits & Impact Data/Analysis Determination | The EIS lists Indian lands in the same category as publics. They are not public lands, they are owned by the government in trust from Indian tribes. | Corrected to read as: "Public and other non-private land ownership (by Federal agency, Canadian National Parks and Indian Reservations, and state); and" |
| 463 | Joe Scott | Internation Programs Director - Conservation Northwest | Impact Data/Analysis Determination | Urge CBP to consult closely with USFWS, USFS, NPS, NMFS, USGS, and state wildlife agencies/entities such as the Interagency Grizzly Bear Committee/subcommittees/tech teams and International Mt. Caribou Tech team to protect ecological integrity of land | CBP added reference to mechanisms for consulting and coordinating with DOI agencies and Forest Service on sensitive species, habitats, and wildlife movement. Coordination with Canadian agencies on transboundary species concerns would necessarily be done through our Federal natural resource management partners and the Department of State. |
| 464 | Joe Scott | Internation Programs Director - Conservation Northwest | No Comment/Beyond Scopes & Impact Data/Analysis Determination | Also request that CBP consult with Canadian federal and provincial wildlife ministries about potential impacts to at-risk and sensitive trans-boundary species | CBP added reference to mechanisms for consulting and coordinating with DOI agencies and Forest Service on sensitive species, habitats, and wildlife movement. Coordination with Canadian agencies on transboundary species concerns would necessarily be done through our Federal natural resource management partners and the Department of State. |
| 465 | Joe Scott | Internation Programs Director - Conservation Northwest | Impact Data/Analysis Determination | Concerned about projects/activities/infrastructure that have practical effects of increasing human interactions with grizzlies, wolverines, wolves, and lynx and other species that have "peninsular" ranges and very vulnerable pops on WA, ID, MT, BC | The final says at 8.3.6.1 (first sentence): "Site-specific NEPA review would be required if impact to wildlife is a concern at a particular construction site. Planning activities will take the species into consideration within site-specific NEPA review. " |
| 466 | Joe Scott | Internation Programs Director - Conservation Northwest | Impact Data/Analysis Determination | Movement across the border for wildlife (grizzlies and mt. caribou) is very important and barriers like roads, backcountry motorized use and major energy developed projects already exists | The final says at 8.3.6.1 (first sentence): "Site-specific NEPA review would be required if impact to wildlife is a concern at a particular construction site. Planning activities will take the species into consideration within site-specific NEPA review. " |

Appendix A-2
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| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 467 | Joe Scott | Internation Programs Director - Conservation Northwest | Impact Data/Analysis Determination | Paramount that CBP projects are consistent with wildlife mgt habitat standards and recovery planning and objectives of wildlife agencies. Wildlife agencies have worked for decades to secure/recover sensitive species in shared US/Canadian ecosystems and they seek to adapt to what will certainly be profound climate related habitat changes and uncertainties. | CBP added reference to mechanisms for consulting and coordinating with DOI agencies and Forest Service on sensitive species, habitats, and wildlife movement. Coordination with Canadian agencies on transboundary species concerns would necessarily be done through our Federal natural resource management partners and the Department of State. |
| 476 | Joe Scott | Internation Programs Director - Conservation Northwest | Impact Data/Analysis Determination | Consult with biologists and GIS experts who are working to identify core and linkage zone habitats for species in order to avoid further impacts and maintain habitat effectiveness | CBP added reference to mechanisms for consulting and coordinating with DOI agencies and Forest Service on sensitive species, habitats, and wildlife movement. Coordination with Canadian agencies on transboundary species concerns would necessarily be done through our Federal natural resource management partners and the Department of State. |
| 485 | Johnna Exner | | Tech Edits & Impact Data/Analysis Determination | Page 4.8-12 Map of land ownership in WOR, this map is woefully lacking on any designation of private land ownership. In Ferry County, 1999 there were 233,845 acres of private land yet this is not represented | The final does a better job clarifying that the private land dscussed in the document is private land held in trust or otherwise for conservation purposes. |
| 486 | Johnna Exner | | Impact Data/Analysis Determination & Tech Edits | 4.9-3 lines 13 and 14 "Certain recreational users…" please identify who is referred to here in order to ascertain why these "certain" people have a clearer view of CBP infrastructure and activities | CBP clarified that recreational users who accessed areas where CBP infrasturcture was present would have a clearer view of structures. |
| 487 | Johnna Exner | | Tech Edits & Impact Data/Analysis Determination | Page 4.10-1 Lines 22, 23, and 24 this is an overall definition and should be regionally specific. The West side or "Blain Sector" of WA State is entirely different than the "Spokane Sector" both economically and culturally | CBP stands by this definition as sufficient for the PEIS. |
| 493 | Johnna Exner | | Impact Data/Analysis Determination | I submit that the change and delays at the POEs in the Spokane sector have been detrimental to the small communities trade, recreation, and economy along both sides of the border. This should be an economic concern in this economic period | CBP stands by its discussion of impacts from wait times at POEs in various parts of the document. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 509 | June Bergquist | Idaho Department of Environmental Quality | Impact Data/Analysis Determination | We welcome projects that restore Idaho's impaired waters like the Boundary creek, which calls for an increase of shade | CBP has added text to the document commiting to better coordination with state and local agencies with expertise in BMPs and planning to avoid water impacts. |
| 510 | June Bergquist | Idaho Department of Environmental Quality | Impact Data/Analysis Determination | Steep slopes, erosive thin soils, a short construction season, rain on snow events, and an abundance of streams both perennial and intermittent, create a difficult physical env for development of roads and other infrastructure. Specialized BMP's are sometimes required to protect water resources and achieve stable sites during and after construction. Our office can help you by reviewing stormwater pollution prevention plans and providing other information you might find useful. | The final PEIS states at 8.5 that it is common practice in the civil construction industry (and is often specified in the issuance of construction permits) to implement best management practices (BMPs) such as silt fences, silt dams, and mulching for sediment and erosion control. These BMPs substantially reduce the amount of sediment leaving construction sites and entering receiving waters." |
| 514 | June Bergquist | Idaho Department of Environmental Quality | Impact Data/Analysis Determination | Construction projects in this state that are one or more acres in sized require an EPA NPDES construction general permit to reduce water pollution from eroding construction sites on privately owned land. We encourage you to adhere to this | In the final 8.4.2 does say "A soil erosion plan would help to control the impact of impermeable surfaces; NPDES permitting may apply." Could expand if desired. |
| 515 | June Bergquist | Idaho Department of Environmental Quality | Impact Data/Analysis Determination | Idaho is unique in that many individuals use surface water ad their source of drinking water as do several public systems. Care is necessary when planning projects near streams, rivers, and lakes so these are not impacted. | CBP has added text to the document commiting to better coordination with state and local agencies with expertise in BMPs and planning to avoid water impacts. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 527 | Kathleen Mecca | Niagara Gateway Columbus Park Association | Impact Data/Analysis Determination | Over the past town years medical research has determined that commercial traffic at the peace bridge contributes to high rates of asthma on Buffalo's West Side which are 4 times above the national average.. The CDC, American Cancer Association, American Heart Association, and the American Lung Association report cancer, heart attack, stroke, DVT, diabetes, and birth defects might also be linked to carcinogens found in diesel exhaust and diesel soot. the Clean Air coalition of Western New York recently reported the same cancer causing agents found at the Tonawanda Coke Plant in Tonawanda NY are found in diesel emission. Residents who live along the Peace Bridge corridor can no longer be expected to endure this threat [air quality] to their health any longer. A stronger, healthier community requires a cross border infrastructure that undoes the serious damages which have been inflicted upon the communit and its health. | CBP thanks you for your comment. We incorporated some consideration of health aspects from vehicle emissions at border crossings into the PEIS. We have done this at the programmtic level while trying to indicate where more traffic occurs. The purpose of this PEIS is to generalize potential impacts and provide info for decision-making. Specific actions would require specific review for potential env impacts through the NEPA required EA/EIS process. |
| 532 | Kathleen Mecca | Niagara Gateway Columbus Park Association | Impact Data/Analysis Determination | the lack of space also makes future build-out unsuitable for expanding the footprint of the Peace Bridge plaza, increasing the inspection capacity, facilitating a higher volume of commercial traffic or building a super-sized Duty Free store off of the plaza | CBP thanks you for your comment. This PEIS attempted to indicate where more cross-border traffic occurs. The purpose of this PEIS is to generalize potential impacts and provide info for decision-making. Specific actions would require specific review for potential env impacts through the NEPA required EA/EIS process. |
| 537 | Laurance Beahan | Sierra Club | Impact Data/Analysis Determination | Any physical changes CBP might consider need to include Buffalo waterfront, the Niagara River from Lake Erie to Lake Ontario critical habitats. Any physical changes CBP might consider in the Niagara River Greenway should be carefully vetted through the Niagara River Greenway Commission and the local public | The purpose of a PEIS is to generalize potential impacts and provide info for decision-making. Specific actions would require specific review for potential env impacts through the NEPA required EA/EIS process. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 562 | Lori Dowling | Minnesota Department of Natural Resources | Impact Data/Analysis Determination | In the framework for analysis -Recreation and Conservation resource areas the lists (p 3-34 - 3-37) provided do not include National Forest lands without a special designation or tribal lands. These lands meet the definition of "most likely used for recreation in the US" | Tribal lands have their own soverignty and their use will be primarily defined by the associated tribes. National Forest lands likewise have multiple rereation and conservation uses as well as other responsibilities. |
| 564 | Lori Dowling | Minnesota Department of Natural Resources | Impact Data/Analysis Determination | In chapter 5, page 5.5-3 this section should include mention of candidate Wild and Scenic rivers. | The number of river segments eligible for study in the Nationwide Rivers Invenory (NRI) is considerable. CBP will consult with Federal land managers on any NRI listed segments within their jurisdiction. |
| 566 | Lori Dowling | Minnesota Department of Natural Resources | Impact Data/Analysis Determination | On pages 5.5-4 to 5.5.-5 there is no mention that the Pigeon River forms a portion of the Border at the east end of this segment and empties into Lake Superior - the Lake Superior Basin Watershed; also Rainy River Baisin is incorrectly mapped | In the final, the description of the Rainy River Basin is correct and the Pigeon River's relationship to the border is mentioned in the Floodplains subsection of section 5.5. |
| 567 | Lori Dowling | Minnesota Department of Natural Resources | Impact Data/Analysis Determination | On page 5.6-5 there is no mention of legal protection of natural soundscapes in the Wilderness Areas via the Wilderness Act | Natural landscapes protectionin Wilderness Areas derives from Federal land management agency policies beyond the Wilderness Act. CBP will consult with Federal land management agencies regarding all land use policies for specially designated areas. |
| 568 | Lori Dowling | Minnesota Department of Natural Resources | Impact Data/Analysis Determination | Page 5.8-6 Tables 5.8-4, 5.8-5, 5.8-6: the province of Ontario is adjacent to a signifcant portion of this Border segment which includes Provincial Parks is not included in these tables | Additional information on provincial parks is included in the appendix referenced in the subsection on Candian land ownership. |
| 569 | Lori Dowling | Minnesota Department of Natural Resources | Impact Data/Analysis Determination | Page 5.9-5 statement: "The states within the study area with the greatest share of federal land ownership are ID, WA, and MT…" The size of the public land base is not necessarily an accurate metric of recreation use since use levels vary. | The statement is not a metric, but a statement that there is a great potential for recreational use in these large states with large areas for recreational use. |
| 570 | Lori Dowling | Minnesota Department of Natural Resources | Impact Data/Analysis Determination | Ch. 8 Environmental Consequences Line 40-41 - This section should acknowledge that European earthworm propagates can also be introduced with placement of fill soils. | CBP is aware of the potential for harm through the intro of invasive species and will continue to monitor this issue |

Table A-2.2

Comments with Responses Incorporated into the PEIS or Otherwise of Special Interest for Response

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| 582 | Matt Morrison | Pacific Northwest Economic Region | Action/Alternative/Activities | Use the principles of the Beyond the Border Work Group to study actions and alternatives. Therefore PNWER opposes the Tactical Security Infrastructure Deployment Alternative and any subsequent program to build barriers, fences, or similar infrastructure on the northern border | This PEIS was initiated before the Beyond the Border Work Group produced its action plan. The final acknowledges its influence on CBP planning. As is further clarified in the final, CBP would only use barriers at specific points of concern where other methods of border monitring could not be maintained easily. No "border fence" is contemplated within this PEIS. |
| 592 | Matt Rudolf | National Parks Conservation Association | Action/Alternative/Activities | While the document contains a positive intent and some approaches for collaboration with federal land management agencies regarding CBP activities, more consultation is needed and planned for collaboration actually has to occur un the future | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |
| 596 | Merlan Paaverud | North Dakota State Historical Society Officer | Tech Edits | Page 5.11-8: Ambrose Border Inspection Station and two residences are recommended eligible for the National Register of Historic Places. The eligibility recommendations are in "Evaluation of Buildings and Structures at the Land Ports of Entry in North Dakota prepared by Michael Baker. | CBP thanks you for your comments and has ensured that these eligibility recommendations are incorporated into the PEIS (by reference). |
| 597 | Merlan Paaverud | North Dakota State Historical Society Officer | Tech Edits | Page 5.11-9: St. John Border Inspection Station, two residences (since removed), and two fuel storage sheds are recommended eligible for the National Register of Historic Places. The eligibility recommendations are in "Evaluation of Buildings and Structures at the Land Ports of Entry in North Dakota prepared by Michael Baker. | CBP thanks you for your comments and has ensured that these eligibility recommendations are incorporated into the PEIS (by reference). |

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| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 598 | Merlan Paaverud | North Dakota State Historical Society Officer | Tech Edits | Page 5.11-9: Portal Border Inspection Station and Commercial Inspection Station are recommended eligible for the National Register of Historic Places. The eligibility recommendations are in "Evaluation of Buildings and Structures at the Land Ports of Entry in North Dakota prepared by Michael Baker. | CBP thanks you for your comments and has ensured that these eligibility recommendations are incorporated into the PEIS (by reference). |
| 600 | Anenhaienton | | Impact Data/Analysis Determination & No Comment/Beyond Scope | Air units fly very low with lights off several times a day and almost hit my house | CBP aircraft fly at higher altitudes during the daytime due to greater visibility and always have lights on during nightime patrol. We believe that these are not CBP's aircraft, but are reviewing our flight operations. |
| 603 | Anenhaienton | | Action/Alternative/Activities | Doesn't see an option for a reduction in security. Doesn't think all the security is necessary or that it even works. | Reduction in security does not mee the purpose and need. |
| 623 | Ms. Jock | | Impact Data/Analysis Determination | It is not clear what the cumulative impact assessments are. | The cumulative impact assessments provide a perspective on other impact causing activities within the region of study that CBP's activities' impacts could interact with to increase the overall impact determination. |
| 624 | Michael Mitchell | Mohawk Council of Akwesasne | Tribal Concern & Action/Alternative/Activities | the Mohawk Council of Akwesasne represents the Northern territory of Akwesasne with Mohawk lands that lie along the St. Lawrence River. We are located in the Great Lakes region, and we noted that Mohawk lands are not listed amongst the Native American lands. | The final (as did the draft) has Mohawk lands included in 6.8.2.3 Land Ownership..., Table 6.8-7 Land Ownership in the Great Lakes Region, and Figure 6.11-1 Native American Lands within the 100-mile PEIS Corridor…. CBP clarified the points where it said St. Regis Indian Reservation to say St. Regis Mowhawk Tribe Indian Reservation. |
| 626 | Michael Mitchell | Mohawk Council of Akwesasne | Impact Data/Analysis Determination | As the CBP continues to expand its facilities and services, we believe there is great potential for socioeconomic and cultural impacts on our people. | CBP is commited to addressing specific socioeconomic and cultural imapcts in site-specific document for any proposals in the future if/when they ofccur. The final PEIS makes it more clear that CBP is not planning a great expansion of activities based on the PEIS determinations. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 629 | Michael Mitchell | Mohawk Council of Akwesasne | Tribal Data Concern & Impact Data/Analysis Determination | Relationship building, cultural awareness training, and effective communication are keys to minimizing socioeconomic and cultural impacts on our people. It will take our collective effort if the CBP is to be the most effective at fulfilling its mission. | The final added more explanation about its Environmental and Cultural Stewardship Training for agents: "1.2.2.3 Environmental Awareness .... line 37 on: Environmental and Cultural Stewardship Training, prepared jointly by CBP, the Department of Interior, and the U.S. Department of Agriculture-Forest Service, is mandatory for all USBP agents and available to all CBP personnel. This training provides practical guidelines to practice awareness of:<br>• Natural and cultural resources in the operational environment;<br>• Lands and places set aside for preservation, conservation, or appreciation of unique natural or cultural values; and<br>• People and departments that use or manage that land, including sensitivity to Government-to-Government relations with Tribes.<br>All CBP components otherwise provide environmental and cultural resources training appropriate to their personnel's daily responsibilities." |
| 630 | Mel Heinrich | | Impact Data/Analysis Determination | Concerned that about the cost and time it takes to do numerous inspections of ships is slowing down the commerce | Ship inspection is beyond the scope of the NB PEIS. Inspections are conducted as a result of each nation's responsibilities to protect its citizens from agricultural pests, to collect custom's duties, search for cross border stowaways, and other issues. It should be noted that the Free Trade Act does allow for better trade between the US and Canada. |

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| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 631 | Mel Heinrich | | Impact Data/Analysis Determination | Speed up border crossing process by only showing Drivers License for ID | After the terrorist attack on September 11, 2011 programs were put into effect to better identify visitors entering the United States. U.S. and Canadian residents can apply to make their exit and re-entry easier under the Trusted Traveler programs. The Fast Drive program, Nexus Program, SENTRI Program and or the Global Entry program are all WHTI compliant programs that may speed up travel. Keep in mind that depending upon which port of entry or airport that is located in your specific area, one or all of these programs may or may not be available at time of the completion of this PEIS. |
| 632 | Mel Heinrich | | Impact Data/Analysis Determination | Speed up border crossing by using HAZMAT background check instead of running another background check (to get certain other licenses). | After the terrorist attack on September 11, 2011 programs were put into effect to better identify visitors entering the United States. U.S. and Canadian residents can apply to make their exit and re-entry easier under the Trusted Traveler programs. The Fast Drive program, Nexus Program, SENTRI Program and or the Global Entry program are all WHTI compliant programs that may speed up travel. Keep in mind that depending upon which port of entry or airport that is located in your specific area, one or all of these programs may or may not be available at time of the completion of this PEIS. |
| 635 | Mohammad Arif | Selfridge ANG Base | Tech Edits | Page ES-1: Lines 31-38 contain repeated sentences | Thank you for your comment. CBP corrected the sentence. |
| 636 | Mohammad Arif | Selfridge ANG Base | Tech Edits | Page ES-1: Line 39, change evolution to evaluation | Factual correction. Thank you for your comment. Although the word "evolution" was intended there, CBP has further clarified the idea of doing an evaluation to account for changes (or evolutions) in environmental conditions surrounding our activities. |

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| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 657 | No Name 1 | | Action/Alternative/Activities | Concentrate the effort at the actual border, status quo is preferred. Too many agencies there stumbling over each other. | The majority of effort is concentrated at the border, however, 4.000 miles is a very large area and looking both beyond the border northward with Canadian partners and southward with other Federal, State, local, and tribal partners provides efficiencies in detecting CBVs. |
| 659 | No Name 12 | | Tech Edits | pg. 7.11-7 map does not include any lands owned by the Aroostook Band of Micmacs | The description associated with the map does mention the lands of the Aroostook Band of Micmacs. |
| 660 | No Name 12 | | Tribal Data Concern | pg. 7.11-16 table 7.11-4 Native American Tribes that have Reservation, Judicially established interest, or established traditional ties or land within the 100-mile PEIS Corridor who makes up the Wabanaki Nation? | CBP included all Federally-recognized tribes with land within the area of study in the PEIS. |
| 673 | No Name 5 | | Impact Data/Analysis Determination | The effect of such a border on migratory patterns of wildlife will be devastated | The PEIS clarifies in Chapter 1 INTRODUCTION that CBP prepared this PEIS for Northern Border Activities is to inform decision-makers about potential environmental and socioeconomic impacts that could occur if CBP were were required to implement major program enhancements to the improve security along the United States Northern Border with Canada. |
| 674 | No Name 5 | | Impact Data/Analysis Determination | Already the impacts of climate change is altering the habitat of all forms of life form the mallest fungi to the largest trees, from the smallest mammals to the megafauna that inhabit this part of the U.S. | The PEIS clarifies in Chapter 1 INTRODUCTION that CBP prepared this PEIS for Northern Border Activities is to inform decision-makers about potential environmental and socioeconomic impacts that could occur if CBP were were required to implement major program enhancements to the improve security along the United States Northern Border with Canada. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 675 | No Name 5 | | Impact Data/Analysis Determination | Such a border will devastate the patterns of migration and the ability of such life to move northward during the future major shift in our climate which is already occurring | The PEIS clarifies in Chapter 1 INTRODUCTION that CBP prepared this PEIS for Northern Border Activities is to inform decision-makers about potential environmental and socioeconomic impacts that could occur if CBP were were required to implement major program enhancements to the improve security along the United States Northern Border with Canada. |
| 676 | No Name 5 | | Impact Data/Analysis Determination | the impact on life in general and major ethnic communities will be equally devastating | The PEIS clarifies in Chapter 1 INTRODUCTION that CBP prepared this PEIS for Northern Border Activities is to inform decision-makers about potential environmental and socioeconomic impacts that could occur if CBP were were required to implement major program enhancements to the improve security along the United States Northern Border with Canada. |
| 677 | No Name 5 | | Action/Alternative/Activities | Why is the government agents only consider the most harmful ways to cope with problems rather than looking at more reliable and less damaging projects | The PEIS clarifies in Chapter 1 INTRODUCTION that CBP prepared this PEIS for Northern Border Activities is to inform decision-makers about assessing potential environmental and socioeconomic impacts that could occur if CBP were were required to implement major program enhancements to the improve security along the United States Northern Bborder with Canada. |
| 678 | No Name 6 | | Impact Data/Analysis Determination | This PEIS will have vast effects on the psyches of the individuals who inhabit the PEIS area | The PEIS clarifies in Chapter 1 INTRODUCTION that CBP prepared this PEIS for Northern Border Activities is to inform decision-makers about potential environmental and socioeconomic impacts that could occur if CBP were were required to implement major program enhancements to the improve security along the United States Northern Border with Canada. |

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| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 688 | Pat Carneal | | Action/Alternative/Activities | I am appalled by the possibility of your BP expanding it's presence all over our public lands here on the Olympic peninsula of WA state | The PEIS clarifies in Chapter 1 INTRODUCTION that CBP prepared this PEIS for Northern Border Activities is to inform decision-makers about potential environmental and socioeconomic impacts that could occur if CBP were were required to implement major program enhancements to the improve security along the United States Northern Border with Canada. |
| 696 | Paul Danicic | Friends of the Boundary Waters Wilderness | Beyond Scope | Webster-Ashburton treaty of 1842 is still in effect, Article II states [portages near Lake Superior] shall be free and open to both countries | We thank you for this comment. It is beyond the scope of this PEIS. |
| 697 | Paul Danicic | Friends of the Boundary Waters Wilderness | Action/Alternative/Activities | "Trans Boundary Protected Area" are generally "managed in parallel" and includes Boundary Waters Canoe Area Wilderness and other lands in this area. This area should be treated differently than the better defined border areas. Should be treated as "leave well enough alone" "unless and until there is any indiciation that these might present any special border enforcement issues". | CBP identified Transboundary Protected Areas in the appropriate regional environment sections in the final and discussed their treament in Land Use environmental consequences. |
| 699 | Paul Danicic | Friends of the Boundary Waters Wilderness | Action/Alternative/Activities | If enforcement is needed in Boundary Waters Canoe Area Wilderness , all measures should be taken to first work with the governing land agencies like UFS and NPS to minimize ecological, visual, and auditory impacts. | CBP is commited to working with all Federal and state land managers to determine ways to mitigate adverse impacts while maintaining CBP's security mission. |
| 712 | Mark Mitskovski | | Admin Process | Requests a meeting in Buffalo | CBP had a limited budget and we were informed by our counterparts that Rochester was a good location by which to split the travel distance between major areas. During our first set of public meetings, CBP did not receieve strong requests to hold the public meeting in Buffalo so CBP returned to Rochester. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 713 | Mark Mitskovski | | Admin Process | Why we chose to have a meeting in Rochester and not Buffalo. | CBP had a limited budget and we were informed by our counterparts that Rochester was a good location by which to split the travel distance between major areas. During our first set of public meetings, CBP did not receieve strong requests to hold the public meeting in Buffalo so CBP returned to Rochester. |
| 715 | Mark Mitskovski | | Impact Data/Analysis Determination | 25,000 document cases of asthma in children around the Peace Bridge due to commercial truck driving. | CBP thanks you for your comment. We incorporated some consideration of health aspects from vehicle emissions at border crossings into the PEIS. We have done this at the programmtic level while trying to indicate where more traffic occurs. The purpose of this PEIS is to generalize potential impacts and provide info for decision-making. Specific actions would require specific review for potential env impacts through the NEPA required EA/EIS process. |
| 716 | Mark Mitskovski | | Impact Data/Analysis Determination | Consideration of environmental issues that surround the Peace Bridge and direct impact the bridge and traffic have on the community. | Thank you for your comment. These impacts are addressed generally within the PEIS. Site specific analysis would cover issues related to the Peace Bridge itself. |
| 718 | Mark Mitskovski | | Impact Data/Analysis Determination | Not considering the impact to the community from activities on the Peace Bridge (lost wages, children being out of school) and enabling the bridge operator to do these activities . | Thank you for your comment. These impacts are addressed generally within the PEIS. Site specific analysis would cover issues related to the Peace Bridge itself. |
| 720 | Mark Mitskovski | | Action/Alternative/Activities | Expand scope of EIS. | Thank you for your comment. These impacts are addressed generally within the PEIS. Site specific analysis would cover issues related to the Peace Bridge itself. |
| 722 | Mark Mitskovski | | Impact Data/Analysis Determination | PEIS is too short on the environmental impacts. Spend to much time talking about flora and fauna and less about people. | Thank you for your comment. These impacts are addressed generally within the PEIS. Site specific analysis would cover issues related to the Peace Bridge itself. |

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| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 737 | Scott Nicol | Sierra Club | Action/Alternative/Activities | There are no actual alternatives to the preferred action in the draft PEIS. A revised draft PEIS should be developed that actually looks at a range of alternatives. Issues with the Flexible Direction Alternative beign the preferred alternative so no other alternatives being considered. | The alternatives used in the PEIS were developed to provide CBP decisionmakers with a basis for understanding the relative environmental impacts associated with implementing different sets of tools/activities used to facilitate border security along the Northern Border. These alternatives provide a reasonable range of approaches to choose from to meet yet unidentified future threats. The relative environmental impacts that would likely occur from implementing each the alternatives are presented in the PEIS in narrative and tabular form throughout the document. They evidence the different environmental considerations inherent to any strategic approach. |
| 738 | Scott Nicol | Sierra Club | Action/Alternative/Activities | If no fence is being considered as part of this project, a revised draft PEIS should be issued with references to fencing excised so the stakeholders can focus their comments on the potential impacts under consideration. Fencing is listed under Tactical Security Alternative but in Canadian press comment said a border fence along the northern border is not being considered. Or clarification on apparent conflict is necessary. | The alternatives used in the PEIS were developed to provide CBP decisionmakers with a basis for understanding the relative environmental impacts associated with implementing different sets of tools/activities used to facilitate border security along the Northern Border. These alternatives provide a reasonable range of approaches to choose from to meet yet unidentified future threats. The relative environmental impacts that would likely occur from implementing each the alternatives are presented in the PEIS in narrative and tabular form throughout the document. They evidence the different environmental considerations inherent to any strategic approach. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 747 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Action/Alternative/Activities | Most fundamental flaw: failure to identify a true proposed action. An EIS that does not analyze a proposed strategy does not provide the analysis necessary for implementation of a strategy | The alternatives used in the PEIS were developed to provide CBP decisionmakers with a basis for understanding the relative environmental impacts associated with implementing different sets of tools/activities used to facilitate border security along the Northern Border. These alternatives provide a reasonable range of approaches to choose from to meet yet unidentified future threats. The relative environmental impacts that would likely occur from implementing each the alternatives are presented in the PEIS in narrative and tabular form throughout the document. They evidence the different environmental considerations inherent to any strategic approach. |
| 748 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Action/Alternative/Activities | PEISs typically have well-defined proposed actions - for example, a management plan, guidelines, or a strategy - and alternatives to the proposed action | The alternatives used in the PEIS were developed to provide CBP decisionmakers with a basis for understanding the relative environmental impacts associated with implementing different sets of tools/activities used to facilitate border security along the Northern Border. These alternatives provide a reasonable range of approaches to choose from to meet yet unidentified future threats. The relative environmental impacts that would likely occur from implementing each the alternatives are presented in the PEIS in narrative and tabular form throughout the document. They evidence the different environmental considerations inherent to any strategic approach. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 749 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Action/Alternative/Activities | Contrary to the NEPA regulations promulgated by the CEQ and binding all federal agencies, the draft PEIS fails to identify any alternatives other than the proposed action. The Flexible Direction Alternative (aka all alternatives), is the preferred alternative, there is nothing outside of the preferred alternative that was studied in the DPEIS | The alternatives used in the PEIS were developed to provide CBP decisionmakers with a basis for understanding the relative environmental impacts associated with implementing different sets of tools/activities used to facilitate border security along the Northern Border. These alternatives provide a reasonable range of approaches to choose from to meet yet unidentified future threats. The relative environmental impacts that would likely occur from implementing each the alternatives are presented in the PEIS in narrative and tabular form throughout the document. They evidence the different environmental considerations inherent to any strategic approach. |
| 751 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Action/Alternative/Activities | NEPA requires an agency to consider a full range of reasonable alternatives to the proposed action *(Bob Marshall Alliance v. Hodel).* Only looking at two very similar alternatives violates the mandate to review a full range of reasonable alternatives (*Muckleshoot* ). The alternatives, are only a single proposed action that has been artificially, and likely temporarily, separated, are insufficient to satisfy NEPA | See response to comment 24. CBP's need is to have the ability to respond to any threat or priority wherever and however it might emerge along the border. Scenario based alternatives would be limited to the scenario they were composed to counter. The alternatives in the PEIS are tools based and responsive to a wider range of threats at any points along the border. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 753 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Action/Alternative/Activities | A revised draft PEIS should be developed that actually looks at a range of alternatives, rather than disingenuously breaking the preferred alternative into pieces that are easily reassembled. Alternatives might include a choice of strategy, such as placing an emphasis on increased security at the POEs as opposed to areas between the Ports | The alternatives used in the PEIS were developed to provide CBP decisionmakers with a basis for understanding the relative environmental impacts associated with implementing different sets of tools/activities used to facilitate border security along the Northern Border. These alternatives provide a reasonable range of approaches to choose from to meet yet unidentified future threats. The relative environmental impacts that would likely occur from implementing each the alternatives are presented in the PEIS in narrative and tabular form throughout the document. They evidence the different environmental considerations inherent to any strategic approach. |
| 756 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Action/Alternative/Activities | It would be wise to consider the desirable balance and policy direction at the strategic level for the northern border now, realizing that it might need to be adjusted to meet changing conditions in the future | This is CBP's point in proposing alternatives that are not rooted in a specific response scenario or specific points along the border. |
| 757 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Action/Alternative/Activities | An articulated strategy for the border security along the northern border could address implementation of a policy and protocol regarding CBP activities on public lands, recognizing the wide variety of both terrain and statutory uses of those lands. | CBP is not the land manager for the areas it patrols and protects. It is CBP's responsibility to adhere to the 1996 MOU and any site-specific agreements. We adhere to protocols set by the individual public land manager for patrols. However, pursuit policies necessarily protect agent safety first. |
| 758 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Action/Alternative/Activities | While the PEIS has much factual info about the history of native Americans and treaties and applicable laws, regulations and EO dealing with tribes, it appears devoid of any discussion regarding CBP's proposed actions to tribes and security/effects | There is no proposal to increase activities on native American lands. However, if any projects or activity increases were proposed in the future, CBP would consult with the specifically affected tribes/nations in accordance with Section 106 NHPA, any other applicable laws, and any specific programmatic agrreements that applied. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 760 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | Wildlife analysis insufficient to support site level activity. Activities to secure the border that preclude or reduce the ability animals to safely travel across boundary that are transboundary in distribution and rely on safe/unobstructive travel/connectivity will threatened the survival of these US populations | Concur that the PEIS is not sufficient to support any new site-level activty or specific new projects. CBP is aware of the importance of wildlife cooridors and the transborder migration of wildlie. That conern will be specifically addressed as part of specific reviews of specific actions |
| 773 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | PEIS provides general examples of types of impacts that result from certain activities and generally rates those impacts as "minor" to "moderate" but fails to estimate the level of development that could occur under this program over the next 5-7 years. Broad conclusions that have no basis in the info provided in the PEIS. The discussion of impacts resulting from the construction and maintenance of linear facilities makes it clear that severe consequences are likely from this action alternative. The descrition of the severity of impacts and the conlusion that impacts woudl be "minor" do not add up for linear construction (ch 8.3 p16-18). The only explanation given is mitigation will bring the level down but the PEIS admits potential depends on location and footprint (hence concern of not adding up). | CBP has considered the concerns regarding impacts from linear facilities and has clarified the conditions under which impacts would be greater than "minor." However, since mitigating BMPs, including siting decisions and the anticipated minimal footprint for infrastructure, are a part of all construction activities CBP maintains that the overall impact determination should be "minor." |
| 778 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | The Best Mgt, Minimization, and Mitigation section begins to flesh out the types of mitigation that should be used in site level development but fails to provide a comprehensive mitigation program and future CBP mitigation activities should not be limited to the content of this chapter. Some specific mitigation direction is given, but other recommendations are vague, and doesn't address what BMP's are and which are sufficient. | CBP has clarified that mitigations will necessarily be selected based on site-specific considerations and state and local requirements. |

Appendix A-2
Table A-2.2
Comments with Responses Incorporated into the PEIS or Otherwise of Special Interest for Response

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 780 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | BMPS that state "CBP will strive.." leaves much to be desired by members of the public seeking assurances that these irreplaceable resources will not be damaged by CBP activities (sensitive biological resources) | NEPA does not require assurances that there will be no disturbance at all to sensitive resources. Members of the public also want assurances that CBP will not compromise effective border protection while it complies with all applicable laws and regulations. CBP has clarified its commitment to enhance coordination and consultation with natural resource managers to limit impacts and assure compliance with mandated protections when it proposes specific projects. |
| 781 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | Activities affecting water resources lacks adequate measure for sedimentation from roads by restricting it to only "high" loads at construction sites...there is no quantitative definition for substantial. Identified construction activities affecting water resources do not include construction of new roads and trails, improving or modifying existing transportation networks; however, these appear to be included in the construction categories from chapter 2 | New roads are dealt with in 8.5.4 of the PEIS. Due to the variability of soil properties and proximity/sensitivity of water bodies, CBP agrees that it should not restrict consideration of controls to "high" loads of sedimentation from construction sites. |
| 787 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | Land Use analysis in the PEIS fails to consider implications of future CBP activities on public land | CBP maintains that publc land impacts were addressed adequately for a programmatic document of this nature. |
| 788 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | PEIS fails to discuss what impact to the ownership type (lands) has on CBP activities. Leases/zoning laws/Memorandum of Understanding with public land managers must be considered. | Any specific impacts to CBP activities on specific parcels would be addressed in specific convenents and agreement documents. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 789 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | CBP should take advantage of land mgt agencies that already laid out pathway for minimizing and mitigating impacts to natural resources. FPEIS should acknowledge that public lands were established by Congress for the use and enjoyment of all Americans and that the responsibility to protect natural resources increases whenever public lands are used for CBP activities. Coordinate with the land mgt agencies and observance of their laws, regs, and plans as a primary avenue for meeting the obligation to the public and to future generations to preserve our public lands. | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |
| 800 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | Due to border infrastructure and enforcement actions, impacts on aquatic enviornment include: effects on hydrological flows, toxic discharges and disturbance of aquatic habitat. | CBP concurs that these were addressed adequately for a programmatic document of this nature. |
| 801 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | Due to border infrastructure and enforcement actions, impacts on air include: impacts from potential construction and changes to traffic patterns and impacts to viewsheds | In the final this is generally covered in 8.2.1. "These effects would be primarily due to emissions from planned construction projects, and motorized ground, aircraft, and vessel patrols." Viewshed impacts are addressed in aesthetics. |
| 805 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | Some major impacts to wildlife from construction of physical border barriers and roads incldue: altered wildlife behavior/range from infrastructure construction/operational noise/night lighting/low altitude overflights/increased road mortality/isolation of veg strands/habitat patches/loss of cover/connectivity/rem veg/inter of genetic exchange | 8.3.6.1 first sentence "Site-specific NEPA review would be required if impact to wildlife is a concern at a particular construction site. Planning activities will take the species into consideration within site-specific NEPA review. " |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 806 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | From construction of barriers and roads: Flora and fauna are vulnerable to significant loss/deterioration of their habitus, and/or increase in risk of human-caused mortality in borderlands | 8.3.6.1 first sentence "Site-specific NEPA review would be required if impact to wildlife is a concern at a particular construction site. Planning activities will take the species into consideration within site-specific NEPA review. " |
| 808 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | More intensive actions (then barriers and roads) such as fencing, light, noise devices, surveillance equipment, are likely to have more detrimental effects on species sensitive to human activity and developments | The final attempts to make it more clear that the impacts will vary based on the sensitivity of the resource and the location of the activity. |
| 811 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Action/Alternative/Activities | Nothing in Draft PEIS adequately informs the public as to what decisions will be made as a result of this process | CBP has stated the decisions it will make more explicitly in the Final PEIS. The decision will inform the public of what strategic approach CBP has determined meets its border security and trade and travel facilitation needs for the foreseeable future. It will not however, direct any specific future increase in activity. |
| 815 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | The Final PEIS and final decisions must ensure that activities of CBP are in concert with MOU (to minimize new road/trail construction) between fed agencies for recovery of grizzly bear…include MOU in PEIS. Grizzly bear analysis simplistic (8-3.9) and needs to be strengthened. Many ways to patrol without harming Grizzlies. Also need free access across border to protect population of grizzlies. | CBP is not the land manager for the areas it patrols and protects. It is CBP's responsibility to adhere to the 1996 MOU and any site-specific agreements. We adhere to protocols set by the individual public land manager for patrols. However, pursuit policies necessarily protect agent safety first. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 816 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Action/Alternative/Activities & Impact Data/Analysis Determination | Some low-impact types of border patrol operations, such as using horses or pack strings, could be made compatible with wilderness and "backcountry" designations. Using Atvs and four wheel-drive vehicles would not be compatible. | CBP would cooperate/coordinate with the applicable Federal land managers and adhere to their management plans for proposed, recommended, and designated wilderness areas. If construction was identified as an absolute security need in a specific case, CBP would go through the proper environmental reviews and administrative procedures with the jurisdictional agencies and Congress for clearance to construct. |
| 817 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Action/Alternative/Activities | Oppose construction of facilities, including towers, fences, barriers, and buildings within Roadless areas, FS proposed wilderness areas, and existing designated wilderness areas prior to Congressional final decision. Any construction should take place within already developed areas. | CBP will cooperate/coordinate with the applicable Federal land managers and adhere to their management plans for proposed, recommended, and designated wilderness areas. If construction was identified as an absolute security need in a specific case, CBP would go through the proper environmental reviews and administrative procedures with the jurisdictional agencies and Congress for clearance to construct. |
| 823 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Action/Alternative/Activities | The final PEIS should include provisions that all existing inventoried Roadless areas, as well as univentoried areas are still unroaded, remain free of new roads built for CBP purposes | CBP would cooperate/coordinate with the applicable Federal land managers and adhere to their management plans for uninventoried unroaded and inventoried roadless areas. CBP cannot commit to never seeking to alter the road structure in roadless areas. However,CBP would go through proper administrative procedures through the Forest Service, and in coorperation with the Department of Interior as appropriate, if a change affecting road addition was required to fulfill a border security mandate. |
| 824 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | Ch. 7 about New England (7.17.2.1) does not mention Vermont or the Green Mountain National Forest. Whole PEIS contains voluminous factual info about the NE region but no mention of any env impacts of proposed CBP actions. | The final PEIS discusses the Green Mountain Forest in 7.17.2.1. Environmental impacts are addressed in Chapter 8. |

Appendix A-2
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|---|---|---|---|---|---|
| 826 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | 8.18.3 page 8-18.2 Biological Resources - does not describe or explain any projected effects of CBP activities, or what those activities might be; merely states that impacts will be less than major but does not justify this statement and gives no examples to support statement | The purpose of a PEIS is to generalize potential impacts and provide info for decision-making. Specific actions would require specific review for potential env impacts through the NEPA required EA/EIS process |
| 830 | Scott Nicol, Sierra Club, Wilderness Watch Wildlands CPR, Wildlands Network, Yellowstone to Yukon Conservation Initiative | 11 organizations | Impact Data/Analysis Determination | Assess Carbon Dioxide emissions and other CC impacts in project analysis…it is a requirement. Climate Change has already, and will increasingly, involve substantial climatic disturbances such as rising temps, extreme weather events, seasonal changes affecting flora and fauna, increased invasive species, species migration, ground level ozone, and AQ | Added a reference in the text of the final to identify that "Data on CO2 emissions from construction of various tactical security infrastructure projects can be found at Appendix J1-9 and J1-10." |
| 848 | Scott Powell | Skagit Environmental Endowment Commission | Tech Edits & Impact Data/Analysis Determination | The DPEIS incorrectly summarizes the primary purpose of the High Ross Treaty, which resolved a longstanding international environmental dispute by stating that, at least until 2065, the Ross damn would not be raised | Additional text was added regarding the 1984 Treaty and the international ecological, recreational, and cultural protection goals it outlined including that the High Ross Treaty also created the Skagit Environmental Endowment Commission (SEEC) to manage an endowment fund to preserve the area, pristine wilderness and fish and wildlife habitat in the Upper Skagit Watershed until 2065. |
| 849 | Scott Powell | Skagit Environmental Endowment Commission | Tech Edits & Impact Data/Analysis Determination | The DPEIS summary of the High Ross Treaty leaves out a critical part outlining the need for protecting the international ecological, recreational, and cultural significance of the Skagit Valley | Additional text was added regarding the 1984 Treaty and the international ecological, recreational, and cultural protection goals it outlined including that the High Ross Treaty also created the Skagit Environmental Endowment Commission (SEEC) to manage an endowment fund to preserve the area, pristine wilderness and fish and wildlife habitat in the Upper Skagit Watershed until 2065. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 862 | Scott Powell | Skagit Environmental Endowment Commission | Impact Data/Analysis Determination | The Skagit within the North Cascades is home to both federally and state listed species, many of which depend on free movement across the border with secure habitat on either side. | Concerns regarding movement of wildlife across the broder and potential impacts to that movement by CBP are generally addresed throughout the final. |
| 863 | Scott Powell | Skagit Environmental Endowment Commission | Impact Data/Analysis Determination | It is unclear how CBP activities will consider and analyze site scale impacts to sensitive habitats and species that are discuss only broadly in this DPEIS | 8.3.6.1 first sentence "Site-specific NEPA review would be required if impact to wildlife is a concern at a particular construction site. Planning activities will take the species into consideration within site-specific NEPA review. " |
| 864 | Scott Powell | Skagit Environmental Endowment Commission | Tech Edits | The description of the Okanogan and Wenatchee National forests and Pasayten Wilderness should be correctly identified in Washington State rather than Idaho. Portions of the Okanogan/Pasayten are in our interest area. | CBP added to and corrected and the discussion of the area. |
| 865 | Scott Powell | Skagit Environmental Endowment Commission | Tech Edits | The description of the North Cascades Complex should include: 3 units that are collectively managed by the NPS as a single administrative entity | CBP added to and corrected and the discussion of the area. |
| 866 | Scott Powell | Skagit Environmental Endowment Commission | Tech Edits | The description of the North Cascades Complex should include: information about the Stephen Mather Wilderness | CBP added to and corrected and the discussion of the area. |
| 867 | Scott Powell | Skagit Environmental Endowment Commission | Tech Edits | The description of the North Cascades Complex should include: Wilderness is a fundamental resource and value for the greater North Cascades ecosystem, in general, and for the North Cascades Complex in particular | CBP added to and corrected and the discussion of the area. |
| 868 | Scott Powell | Skagit Environmental Endowment Commission | Tech Edits | The description of the North Cascades Complex should include: The national park portion of the complex is almost entirely within wilderness… | CBP added to and corrected and the discussion of the area. |
| 869 | Scott Powell | Skagit Environmental Endowment Commission | Impact Data/Analysis Determination | We believe this scope of discussion on climate change is too narrow. Should also include impact to state, regional, and national climate mitigation and adaptation strategies. | CBP is commited to working within state plans for air quality and sustainable land management to the extent feasible or otherwise required by law. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 874 | Scott Powell | Skagit Environmental Endowment Commission | Impact Data/Analysis Determination | The Land Use analysis in the DPEIS fails to consider implications for future CBP activities on public lands. Land use section also fails to discuss what impact ownership type has on CBP activities. | Under 1.2 CBP NORTHERN BORDER ACTIVITIES, the following was added starting at line 29: [Section 387(a)(3) of the Immigration and Nationality Act provides for CBP agents and officers "to board and search for aliens any vessel within the territorial waters of the United States and any railway car, aircraft, conveyance, or vehicle" within a "reasonable distance from an external boundary of the United States." Part 287 of Chapter 8 of the Code of Federal Regulations clarifies that 100-miles is a reasonable distance from an external boundary. Within the first 25 miles, CBP personnel have the right to access to private lands but not dwellings) to patrol the border to prevent the illegal entry of undocumented CBVs into the United States. ] |
| 876 | Scott Powell | Skagit Environmental Endowment Commission | Impact Data/Analysis Determination & Action/Alternative/Activities | The DPEIS refers to MOE's that exist with public agencies, but the final decision must clearly outline the unique requirements of analysis and public engagement prior to any actions on public lands. How unique requirements are addressed are not addressed in PEIS. | Added to the end of 1.1 Purpose of the PEIS: "CBP would not implement any alternative or any element of any alternative in this PEIS based solely on the analysis presented in this document. Material proposed changes to CBP activities meeting the definition of "major Federal action" (40 CFR 1508.18) would be subjected to further NEPA review at the appropriate level of analysis and documentation. This FPEIS would provide background information for incorporation into those more project-specific plans. However, site-specific NEPA will continue to be completed for all projects that would have required it prior to the PEIS. Subsequent environmental analysis documents for specific projects within the area studied in this PEIS will "tier off" or draw upon the general information in this area-wide programmatic analysis document. " |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 878 | Scott Powell | Skagit Environmental Endowment Commission | Impact Data/Analysis Determination | Specific to the trans-boundary Skagit ecosystem, land management plans would all need to be consulted to guide decision making about whether a CBP development is an appropriate use for certain areas of our public lands | Consult ingwith other governmental and private partners and land managers to resolve issues of potential conflicts with current land use planning; |
| 879 | Scott Powell | Skagit Environmental Endowment Commission | Admin Process | USFWS and Washington department of Fish and Wildlife would need to be consulted regarding impacts to any fish and wildlife species | 8.3.6.3 states "Once a species list is obtained or verified as accurate, Federal agencies must determine whether their actions may affect any listed species or their critical habitat. If no species or their critical habitats are affected, no further consultation is required. If species may be affected, the agency must consult with the FWS (USDOI, 2010d)." |
| 880 | Scott Powell | Skagit Environmental Endowment Commission | Impact Data/Analysis Determination | the final PEIS should acknowledge that public lands are unique and that the responsibility to protect natural resources increases whenever public lands are used for CBP activities | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |
| 881 | Scott Powell | Skagit Environmental Endowment Commission | Action/Alternative/Activities | the final PEIs should identify coordination with the land management agencies and observance of their laws, regulations, and plans as a primary avenue for meeting the obligation to the public and to future generations to preserve our public lands | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 882 | Scott Powell | Skagit Environmental Endowment Commission | Tech Edits | Correction: On page 3-34 you omit "wilderness" from the list of land use designations that support recreational activities on the U.S. side of the border | Although the Wilderness Act specifically states that wilderness areas are set aside for recreation as well as other uses. The list on the following page includes wilderness areas among places used for recreation that are also specifically recognized for conservation purposes . |
| 883 | Scott Powell | Skagit Environmental Endowment Commission | Tech Edits | Correction: On page 3-43, national parks are excluded from the list of areas having "High visual sensitivity" | Added "units of the National Park System and removed the following: " Threatened and endangered species designated critical habitat; Wildlife movement corridors; Areas for which an agency or organization is committed to take certain actions with respect to sensitive species habitat. |
| 890 | Stephanie Clement | Friends of Acadia | Impact Data/Analysis Determination | We would encourage the CBP to broaden the scope of environmental effects in the programmatic EIS to include the night sky as a resource. We encourage CBP to address the impacts on night skies on an equal basis with air quality, noise, etc. | CBP has added discsussion of night sky as a resource area characteristic based on NPS comments. |
| 894 | Stephanie Clement | Friends of Acadia | Impact Data/Analysis Determination | In the mitigation of glare, we encourage the CBP to use full cut-off light fixtures for all facilities, even on the approach to border crossings. | CBP has added more discussion of full cut-off lamps to potential mitigations for light pollution in 8.9.7 as discussion of the "night sky" as a resource area and "light pollution" as an impact are increased in corresponding chapters and sections. |
| 895 | Stephanie Clement | Friends of Acadia | Impact Data/Analysis Determination | Acadia is a significant economic generator for Maine, such economic contribution based on a wealth of natural beautiful deserves special consideration. We hope that CBP will delve deeply at Acadia in a cooperative planning process. | Added at 2-3, 36-41: "CBP is continuing to pursue and expand its cooperation with Federal and State land management agencies through several mechanisms including the Borderland Management Task Force and the Public Lands Liaison Agent program. CBP would expand its cooperation to cover more planning for specific construction, repair, and maintenance projects and generally for law enforcement activity operations." |

Table A-2.2

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| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 906 | Thomas Herrera-Mishler | Buffalo Olmsted Parks | Admin Process | Group requests: 1) Request a list of meeting attendees as well as all minutes and resolutions from previous meeting relating to the PEIS 2) A copy of the PEIS in its current draft form 3) A clear timeline on the study process highlighting benchmarks and opportunities for consulting party and public comments in the future | CBP added an appendix (A-2) on public meetings and comments on the Draft PEIS to the final PEIS. Additional information on study process was added to the website. |
| 1001 | Carol Groom | Vermont Chapter of the Sierra Club | Action/Alternative/Activities | Questioned if they would build a road parallel to the entire border. | Typically, CBP law enforcement officers use existing roads. New roads were constructed along the southern border as patrol roads and to construct and repair the fence. |
| 1013 | Mike | | Action/Alternative/Activities | Concerned that regulating immigration is not a core purpose of USBP …up on the screen here they are only concerned about terrorists. There's no mention of their core purpose in life of regulating immigration any more. | The comment ispartially correct in that CBP deals with cross border violator-terrorist threats mare than with immigration. Immigration is now part of Immigration and Customs Enforcement (ICE) and Customs and Immigration Services (CIS). USBP mission is to protect the borders of the United States, including stopping cross border violations of all types. |
| 1145 | Mark H. Garrow | St. Regis Mohawk Tribal council | Impact Data/Analysis Determination | With respect to the summary of environmental impacts that were considered in the conclusion section of the PEIS for each alternative, this list does not fully interpret the true impacts as they would relate to a border community such as ours | CBP has improved the summary comparison of alternatvies at the programmatic level. Specific impacts would be visited in site and project specific documentation. |
| 1146 | Mark H. Garrow | St. Regis Mohawk Tribal council | Action/Alternative/Activities | Heightened security and new facilities have made conditions and delays worse (in respect to their specific area of concern). To further affect our community by considering any alternatives besides No Action would be a grave carriage of injustice. | CBP appreciates your concern and has sought to improve discussion of the impacts of current delays and potential delays should an alternative be selected. |

Appendix A-2
Table A-2.2
Comments with Responses Incorporated into the PEIS or Otherwise of Special Interest for Response

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 1150 | Mark H. Garrow | St. Regis Mohawk Tribal council | Impact Data/Analysis Determination | When viewing the Mohawk Territory, Federal, State and Provincial governments often parcel the land within the confines of each respective agency. This fragmentation needs to be fully considered under NEPA with respect to EJ. | CBP appreciates your concern and has sought to improve discussion of how analysis of communities should not be fragmented in site specific documentation. |
| 1153 | Lou Hagener | | Action/Alternative/Activities | Hope that any aspect of this project involves a lot of cooperation with local law enforcement agents. It has been disappointing so far - hard to work between the Federal agencies. And that is part of your alternative, I think, and that is soemthing I really wan to see. | See resopnse to comment 1153. Thank you for your comment. As previously indicated, the Office of Border Patrol and U.S. Border Patrol has created Public Lands Liasons and tribal laisons within their sectors to reach out to various governmental agencies and affected tribes which may be affected by their actions. CBP and its law enforcment components are attempting to be more responsive to the concerns of local communities in which they interact. |
| 1159 | Duncan Standing Rock | Ojibwa Tribe | Tribal Data Concern | Ojibwa people have the 1777 treaty which gives them the right to pass and repass the border. (International Treaty). Law enforcement on both sides needs a better understanding of this. | Thanks you for your comment. Congress established under the commerce act, immigration act, and other acts to regulate entrance and exit from the United States. Review of congressional acts and international treaties are beyond the scope of this PEIS. |
| 1168 | Alvin Windy Boy Sr. | | Admin Process & Tribal Data Concern | You have 556 federally recognized tribes that all do things differently. You need to have some type of cultural sensitivity | See resopnse to comment 1153. Thank you for your comment. As previously indicated, the Office of Border Patrol and U.S. Border Patrol has created Public Lands Liasons and tribal laisons within their sectors to reach out to various governmental agencies and affected tribes which may be affected by their actions. CBP and its law enforcment components are attempting to be more responsive to the concerns of local communities in which they interact. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 1176 | Alvin Windy Boy Sr. | | Admin Process | It concerns me the way consultation with tribal governments have been handled. We are concerned with what's happening with a lot of these projects, and I hope someone takes that serious. | Thank you for your comment. CBP is working to improve tribal consultation for undertakings. Typically for new construction projects, CBP will first send out consultation letters to affected tribes and the the State Historic Preservation Officer (SHPO) indicating the nature and scope of the project and request if there is any information either group wishes to provide CBP for evaluation or inclusion. CBP will then typically have an Archeological and Historic Property Survey conducted. The results of the survey and CBP's determination is then submitted to the SHPO and any tribe that requests a copy of the survey. CBP strives to be in compliance with the National Historic Preservation Act of 1966. It should be noted that our correspondence is sent to either the Tribal executive officer (e.g., Chief, Chairperson, President) or to the Tribal Historic Preservation Officer (THPO) or to any other person so directed by tribal leadership. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
|---|---|---|---|---|---|
| 1181 | Alvin Windy Boy Sr. | | Tribal Ddata Concern & Impact Data/Analysis Determination | [Comment has to do with use of trails and acquiring Caribou.] Is CBP going to assure my tribe, the Ojibwa tribe that ability to carry those out at the border crossing | The U.S. Government and Canadian Government have established legal port of entries between the two countries. Canandian citizens, American citizens and other international visitors to both countries are required to use the legal ports of entry. The John Jay Treaty does not prohibit governments from establishing legal access points between countries.<br>Food products from Canada, including pet food and fresh (frozen or chilled), cooked, canned or otherwise processed products containing beef, veal, bison, and cervid (e.g. deer, elk, moose, caribou etc.) are now permitted from Canada in passenger baggage. Products containing sheep, lamb, or goat will not be allowed entry.<br>The passenger must provide proof of the origin of beef, pork, poultry, cervid meat, and pet food in order to bring them into the United States. Examples of proof of origin include the grocery store receipt where the product was purchased or the label on the product indicating the province in which it was packaged.<br>Hunter harvested game birds (pheasant, quail, goose, etc.) or cervid carcasses (e.g. deer, moose |
| 1184 | Candi Schaedle | USEPA, NEPA Compliance Division | Tech Edits | Table 3.2-1 Chapter 3 incorrectly lists the states Indiana and Illinois, and it should be corrected to include WI and MI | Changes made as requested. |
| 1185 | Candi Schaedle | USEPA, NEPA Compliance Division | Tech Edits | Corrections and additions to add to table 3.2-1 1. Replace MdDNR with Minnesota Pollution Control Agency 2. Michigan - Department of Env Quality (DEQ) and 3. WI - Dept of Natural Resources (DNR) | Changes made as requested. |
| 1186 | Candi Schaedle | USEPA, NEPA Compliance Division | Tech Edits | Regional 5 offic noted that the population data for Lake County, Minnesota may be inccorrect and the accuracy of these numbers used for the noise supporting document may need to be revised | Changes made as requested. |

| ID | Name | Agency/ Organization [If Identified] | Type of Comment | Comment | Incorporation/Response |
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| 1187 | Candi Schaedle | USEPA, NEPA Compliance Division | Impact Data/Analysis Determination | Provides adequate discussion of the potential env impacts and we have not ID any potential env impacts requiring substantive changes. | 1503.4(a)(5). No further change required within the PEIS. |
| 1188 | Candi Schaedle | USEPA, NEPA Compliance Division | Impact Data/Analysis Determination | Recommend that during the construction phase of future project-specific actions along the NB that CBP consider adopting additional measures, such as diesel retrofits, the use of clean fuels, and anti-idling provisions to reduce vehicle emissions | Added this consideration under contract actions BMP for the Climate Change and Suatinability environmental resource area. |
| 202-1202 | Daniele Turcotte | | Tech Edits | Page 1-22 Lines 19-28 tense | Corrected for the Final PEIS. |

# APPENDIX B

# ABOUT U.S. CUSTOMS AND BORDER PROTECTION: MISSION AND CORE VALUES

## CBP MISSION

"We are the guardians of our Nation's borders. We are America's frontline. We safeguard the American homeland at and beyond our borders. We protect the American public against terrorists and the instruments of terror. We steadfastly enforce the laws of the United States while fostering our Nation's economic security through lawful international trade and travel. We serve the American public with vigilance, integrity, and professionalism." (USDHS, 2009)

## CBP CORE VALUES

Vigilance is how U.S. Customs and Border Protection (CBP) ensures the safety of all Americans. CBP is continuously watchful and alert to deter, detect, and prevent threats to our Nation. CBP demonstrates courage and valor in the protection of our Nation.

Service to Country is embodied in the work CBP does. CBP is dedicated to defending and upholding the Constitution of the United States. The American people have entrusted CBP to protect the homeland and defend liberty.

Integrity is CBP's cornerstone. CBP is guided by the highest ethical and moral principles.

## CBP PURPOSES AND GOALS

### EFFECTIVE TARGETING

Each year, more than 11 million maritime containers arrive at U.S. seaports. At land borders, another 11 million arrive by truck and 2.7 million by rail. CBP is responsible for knowing what is inside and whether it poses a risk to the American people, as well as for ensuring that all proper revenues are collected.

CBP assesses all people and cargo entering the United States from abroad for terrorist risk. People who may pose a risk can now be better identified through initiatives such as the Advance Passenger Information System, United States Visitor and Immigrant Status Indication Technology (known as US-VISIT), and the Student and Exchange Visitor System. CBP regularly refuses entry to people who may pose a threat to U.S. security.

In addition, CBP uses advance information from the Automated Targeting System, the Automated Export System, and the Trade Act of 2002 Advance Electronic Information Regulations to identify cargo that may pose a threat. The National Targeting Centers of CBP's Office of Intelligence and Operations Coordination enhance these initiatives by synthesizing information to provide tactical targeting. Using risk management techniques, the centers identify suspicious individuals and containers before arrival.

The Automated Commercial Environment has made electronic risk management far more effective. The ACE Secure Data Portal provides a single, centralized online access point to connect CBP and the trade community. CBP's modernization efforts enhance border security while optimizing the ever-increasing flow of legitimate trade.

CBP also screens high-risk imported food shipments in order to prevent bioterrorism/agro-terrorism. U. S. Food and Drug Administration and CBP personnel are working side by side at the National Targeting Center (NTC) to protect the U.S. food supply by taking action and implementing provisions of the Bioterrorism Act of 2002. CBP and FDA are able to react quickly to threats of bioterrorist attacks on the U.S. food supply and to other food-related emergencies (USDHS, 2010).

## FOSTERING LEGITIMATE AND SAFE TRAVEL

Fostering legitimate and safe travel is a key goal of CBP, which increases passenger security through effective risk assessment. The Secure Electronic Network for Travelers Rapid Inspection (SENTRI) and NEXUS U.S–Canada are trusted traveler programs that expedite entry into the United States. Advance Passenger Information System and the Rice–Chertoff Initiative have aided in accomplishing CBP's travel goals. The Electronic System for Travel Authorization is an automated system to pre-approve visitors from Visa Waiver Program countries. Global Entry is a trusted traveler program for U.S. citizens, U.S. nationals, U.S. lawful permanent residents and citizens of other participating countries (USDHS, 2010).

## PARTNERING WITH OTHER COUNTRIES

CBP has created smarter borders by extending our zone of security beyond our physical borders. The Container Security Initiative (CSI) was announced in January 2002 as a strategy to secure and protect the United States against terrorism and acts of terror involving the international maritime supply chain. CBP stations teams of U.S. officers in 58 operational foreign seaports to work together with host country counterparts to identify and inspect potentially high-risk shipments before they reach the United States. More than 80 percent of maritime containerized cargo destined to the United States originates in or transits through a CSI port and is screened prior to being laden aboard a U.S.-bound vessel.

CBP has implemented joint initiatives with our bordering countries, Canada and Mexico: the Smart Border Declaration and associated 30-Point Action Plan with Canada and the Smart Border Accord with Mexico. The Secure Electronic Network for Travelers Rapid Inspection allows prescreened, low-risk travelers from Mexico to be expeditiously processed through dedicated lanes. Similarly, on the northern border with Canada, CBP is using NEXUS to identify and facilitate low-risk travelers. Along both borders, CBP has implemented the Free and Secure Trade (FAST) program. The FAST program utilizes transponder technology and pre-arrival shipment information to process participating trucks as they arrive at the border, expediting trade while better securing our borders.

An agreement with Canada allows CBP to target, screen, and examine rail shipments headed to the United States. CBP agents in Mexico and Canada coordinate border security issues. CBP Border Patrol agents, the Royal Canadian Mounted Police, and the Drug Enforcement Administration, as well as state and local law enforcement agencies from Canada and the United States, have joined together to form 14 Integrated Border Enforcement Teams. Covering the entire northern border, these teams focus on criminal activity such as cross-border smuggling of drugs, humans, and contraband as well as cross-border terrorist movements (USDHS, 2010).

## PARTNERING WITH THE PRIVATE SECTOR

Processing the sheer volume of trade entering the United States each year requires help from the private sector. The Customs–Trade Partnership Against Terrorism (C-TPAT) is a joint government-business initiative designed to strengthen overall supply chain and border security while facilitating legitimate, compliant trade. To date, more than 9,800 companies are partnering with CBP. C-TPAT is the largest, most successful government-private sector partnership to arise in response to the attacks of September 11, 2001.

In addition, CBP is piloting the Advanced Trade Data Initiative, which works with the trade community to obtain information on U.S.-bound goods at the earliest possible point in the supply chain. Partnering with carriers, importers, shippers, and terminal operators, CBP is gathering supply chain data and feeding it into its systems to validate container shipments during the supply process. This information increases CBP's existing ability to zero in on suspect movements and perform any necessary security inspections at the earliest point possible in the supply chain (USDHS, 2010).

## INSPECTION TECHNOLOGY AND EQUIPMENT

Given the magnitude of CBP's responsibility, the development and deployment of sophisticated detection technology is essential. Deployment of nonintrusive inspection technology is increasing and is viewed as "force multipliers" that enable CBP officers to screen or examine a larger portion of the stream of commercial traffic.

CBP does not rely on any single technology or inspection process. Instead, officers and agents use various technologies in different combinations to substantially increase the likelihood that terrorist weapons, including a nuclear or radiological weapon, will be detected and interdicted.

Technologies deployed to our Nation's land, sea, and air ports of entry include large-scale x-ray and gamma-imaging systems. CBP has deployed radiation-detection technology, including personal radiation detectors, radiation isotope identifiers, and radiation portal monitors. CBP uses trained explosive detector dogs. CBP's Laboratories and Scientific Services Fast Response Team reacts to calls on suspicious containers. Laboratories and Scientific Services also operate a 24 hour a day, 7 –day a week, 365 day a year hotline at its Chemical, Biological, Radiation, and Nuclear Technical Data Assessment and Teleforensic Center (USDHS, 2010).

## OUTBOUND INSPECTIONS: KEEPING WEAPONS AND MONEY OUT OF TERRORIST HANDS

CBP has the authority to search outbound as well as inbound shipments and uses targeting to carry out its mission in this area. Targeting of outbound shipments and people is a multi-dimensional effort that is enhanced by interagency cooperation.

CBP in union with the U.S. Department of State and the U.S. Census Bureau has put in place regulations that require electronic export information to be submitted to the U.S. Munitions List and technology information to be submitted to the Commerce Control List. This information flows via the Automated Export System. CBP is also working with the U.S. Departments of State and Defense to improve procedures on exported shipments of foreign military sales commodities. CBP also works with U.S. Immigration and Customs Enforcement and the Bureau of Alcohol, Tobacco, Firearms and Explosives to seize outbound illicit cash/monetary instruments and illegal exports of firearms and ammunition (USDHS, 2010).

## PROTECTING BORDER AREAS BETWEEN OFFICIAL PORTS OF ENTRY

Border Patrol agents and Office of Air and Marine personnel are better securing areas between the ports of entry by implementing a comprehensive border enforcement strategy, expanding, integrating, and coordinating the use of technology and communications through the following.

- The Integrated Surveillance Intelligence System uses remotely monitored a night-day camera and sensing systems to better detect, monitor, and respond to illegal crossings.
- Unmanned Aircraft Systems (UAS)—CBP's remotely piloted surveillance aircraft—are equipped with sophisticated on-board sensors. UASs provide long-range surveillance and are useful for monitoring remote land border areas where patrols cannot easily travel and infrastructure is difficult or impossible to build.
- Remote Video Surveillance Systems provide coverage 24 hours a day, 7 days a week to detect illegal crossings on both the northern and southern borders.
- Geographic Information System, a CBP Border Patrol southwest border initiative, tracks illegal migration patterns.

## REFERENCES:

(USDHS, 2009). U.S. Department of Homeland Security, U.S. Customs and Border Protection. 2009. *CBP Mission Statement and Core Values*. Accessed December 2010 at http://www.cbp.gov/xp/cgov/about/mission/guardians.xml.

(USDHS, 2010). U.S. Department of Homeland Security, U.S. Customs and Border Protection. 2010. *Protecting Our Borders – This is CBP*. Accessed December 2010 at http://www.cbp.gov/xp/cgov/about/mission/cbp.xml.

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# APPENDIX C

# POTENTIALLY RELEVANT FEDERAL STATUTES AND EXECUTIVE ORDERS

## FEDERAL STATUTES

**American Indian Religious Freedom Act, 42 USC §1996—**Protects the spiritual beliefs and practices of Native Americans and Native Hawaiians, as guaranteed by the First Amendment of the U.S. Constitution. Although not specifically prohibiting any physical alteration of sacred sites or guarantee unlimited access to such sites, directs Federal agencies to consult with traditional religious leaders to ensure that agency policies and procedures protect and preserve traditional cultural practices through careful consultation with designated tribal representatives to make certain that the sites are not physically harmed and access and use of the sites are not impeded.

**Archaeological Resources Protection Act (ARPA), 16 USC §470aa *et seq.***—Requires a permit for excavation or removal of archaeological resources from publicly held or Native American lands. Could work in tandem with the American Indian Religious Freedom Act with added requirements to protect Native American cultural and religious sites.

**Architectural Barriers Act, 42 USC §4151 *et seq.*—**Requires access to facilities designed, built, altered, or leased with Federal funds to comply with standards that ensure access to the built environment.

**Clean Air Act (CAA), 42 USC §7401 *et seq.*—**Establishes a nationwide Federal-state air pollution control program, generally administered by the states with U.S. Environmental Protection Agency (USEPA) oversight. Would require CBP actions with air emissions to perform conformity analysis in National Environmental Policy Act (NEPA) documents for actions that occur in air quality “nonattainment” areas along the northern border (there are a small number of such counties and cities in New York, Montana, and Wisconsin). In addition, USEPA is in the process of regulating greenhouse gases (GHGs) as air pollutants, which will require the Programmatic Environmental Impact Statement (PEIS) to consider the GHG-emitting potential of CBP facilities and activities collectively and cumulatively with other such local and regional GHG emissions.

**Clean Water Act (CWA), 33 USC §1251 *et seq.*—**Establishes a nationwide Federal-state water pollution control program, generally administered by the states with EPA oversight. Could require some CBP actions to obtain Federal/state storm water national pollutant discharge elimination system (NPDES) permits and Federal and/or state wetlands permits.

**Coastal Zone Management Act (CZMA), 16 USC §1451 *et seq.*—**Provides for management of the nation’s coastal resources, including the Great Lakes, and balances economic development with environmental conservation. Federal programs, such as those run by CBP, must comply with “Federal consistency” requirements under the Act. The following states along the northern border have approved Coastal Zone Management (CZM) Plans: Maine, Michigan, Minnesota, New York, Ohio, Pennsylvania, Washington, and Wisconsin (New Hampshire also has an approved CZM Plan, but it does not apply to its portion of the northern border).

**Community Environmental Response Facilitation Act, 42 USC §9620(h)—**Amends the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to require the Federal Government, before termination of Federal activities on any real property owned by the Government, to identify real property where no hazardous substance was disposed of, stored, or released. Would require CBP to perform environmental site assessments to identify land free of hazardous substances during land transfers when it terminates operations at a location and transfers the property to a third party and be responsible for any cleanup costs required after the transfer.

**CERCLA, 42 USC §9601 *et seq*.—**Provides Federal authority over releases or threatened releases of hazardous substances that may endanger public health or the environment, establishes requirements for closed and abandoned hazardous waste sites, and provides for the liability of persons responsible for the release of hazardous substances. Site contamination at CBP facilities could trigger these requirements but would more likely have to comply with Brownfield requirements designed to allow redevelopment of contaminated sites with provisions to protect the public and the environment.

**Department of Transportation (DOT) Act, 49 USC §303 (Section 4(f)).—**Prohibits DOT agencies from approving the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites for highways unless there is no feasible and prudent alternative to the use of land and the action includes all possible planning to minimize harm to the property resulting from such use.

**Emergency Planning and Community Right-to-Know Act (EPCRA), 42 USC §1001 *et seq.*—**Requires Federal agencies to provide information on hazardous and toxic chemicals to state emergency response commissions, local emergency planning committees, and the EPA. Some chemicals used at CBP facilities may require submission of relevant information to these state and local authorities and to EPA.

**Endangered Species Act (ESA), 16 USC 1531 *et seq.*—**Establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants, as well as the preservation of the ecosystems on which they depend. May require CBP to consult with U.S. Fish and Wildlife Services (USFWS) for terrestrial or non-anadromous aquatic species and the National Marine Fisheries Service for anadromous and marine species to ensure that its actions will not jeopardize endangered or threatened species or their critical habitat.

**Farmland Protection Policy Act (FPPA), 7 USC §4201 *et seq.*—**Directs Federal agencies to identify and quantify adverse impacts of Federal programs on farmlands in order to minimize the unnecessary and irreversible conversion of agricultural land to non-agricultural uses. Some CBP activities in rural areas might require analysis under this statute.

**Federal Aviation Act, 49 USC §§106(f) and (g)—**Give the Administrator of the Federal Aviation Administration (FAA) the authority to regulate objects affecting navigable airspace. CBP would be required to notify the FAA if any structure of more than 200 feet high would be constructed or for structures that would be within glide paths of airports, so that the FAA could then determine if the structure would or would not be an obstruction to air navigation.

**Federal Insecticide, Fungicide, and Rodenticide Act, 7 USC §135 *et seq***.—Sets up the basic Federal system of pesticide regulation to protect applicators, consumers, and the environment, administered by EPA and the appropriate state environmental agencies. CBP activities dealing with pesticides would have to comply with these requirements.

**Federal Records Act, 44 USC §2101 *et seq.*—**Requires the proper maintenance and disposition of agency records to ensure adequate and proper documentation of the policies and transactions of the Federal Government.

**Fish and Wildlife Conservation Act, 16 USC §2901 *et seq.* and Fish and Wildlife Coordination Act, 16 USC §661 *et seq.*—**Encourage Federal agencies to conserve and promote conservation of non-game fish and wildlife species and their habitats, and require Federal agencies undertaking projects affecting water resources to consult with USFWS and the state agency responsible for fish and wildlife resources. Compliance with these statutes is carried out procedurally as part of the NEPA EIS process.

**Migratory Bird Treaty Act (MBTA), 16 USC §703 *et seq.*—**Implements treaties designed to protect migratory birds and makes the taking, killing, or possessing migratory birds unlawful. CBP enforces this statute along with a number of other conservation statutes (see "Summary of Laws and Regulations Enforced by CBP").

**National Historic Preservation Act (NHPA), 16 USC §470 *et seq.*—**Promotes historic preservation by ensuring that Federal agencies consider historic properties when planning and making decisions and before the issuance of any license or expenditure of Federal funds on a project. Section 106 of NHPA establishes a four-step process by which Federal agencies take into account the effects of their actions on historic properties; consult with state and tribal historic preservation offices, and other appropriate consulting parties; and provide the Advisory Council on Historic Preservation to comment when applicable. Although the regulations do not mandate preservation in all cases, they integrate preservation values into planning and decision-making.

**Native American Graves Protection and Repatriation Act (NAGPRA), 25 USC §3001.—** Establishes the ownership and requires repatriation of archaeological and cultural items excavated or discovered on Federal land. CBP would follow the provisions of this Act if any excavations associated with proposed construction led to unexpected discoveries of Native American graves or grave artifacts.

**Noise Control Act of 1972, 42 USC §4901 *et seq.*—**Directs Federal agencies to carry out programs in their jurisdictions to the fullest extent within their authority in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health and welfare. This would involve CBP complying with applicable municipal noise ordinances to the maximum extent practicable.

**Occupational Safety and Health Act (OSHA), 29 USC §651 *et seq.*—**Does not apply to Federal agencies' activities but does require them to develop their own equivalent rules that result in the same safe work conditions that private employers must provide under the Act. DHS Directive Number 066-01 (July 25, 2008) is the relevant CBP OSHA rule.

**Pollution Prevention Act, 42 USC §13101 *et seq.*—**Establishes a national policy for waste management and pollution control that focuses first on source reduction and then on environmentally safe waste recycling, treatment, and disposal. Guidance for complying with the Act is provided by Executive Orders 12873 and 13423 (see below). These requirements could affect those functions of CBP operations that involve waste generation, management, and disposal at its facilities.

**Resource Conservation and Recovery Act (RCRA), 42 USC §6901 *et seq.*—**Establishes a nationwide “cradle-to-grave” Federal–state solid and hazardous waste management program, generally administered by the states with EPA oversight. CBP activities would not be likely to trigger any of the major Federal or state permit or corrective action requirements under RCRA, but many CBP activities are likely to be small quantity generators of hazardous wastes and may have underground storage tank requirements.

**Safe Drinking Water Act, 41 USC §201 et seq.—**Authorizes EPA to establish minimum standards to protect tap water and requires all owners or operators of public water systems to comply with these primary (health-related) standards. Under the Act, EPA also establishes minimum standards for state programs to protect underground sources of drinking water from endangerment by underground injection of fluids. CBP actions involving providing drinking water sources could have requirements under this law.

**Toxic Substances Control Act (TSCA), 7 USC §136 *et seq*.**—Authorizes the EPA to obtain data from industry on health and environmental effects of chemical substances and mixtures, and, if found that unreasonable risk or injury may occur, EPA may regulate, limit, or prohibit the manufacture, processing, commercial distribution, use, and disposal of such chemicals and mixtures. CBP uses the material data safety sheets produced under this law to handle such materials safely.

**Wild and Scenic Rivers Act, 16 USC §1271 *et seq.*—**Preserves certain rivers with outstanding natural, cultural, and recreational value in a free-flowing condition for the enjoyment of present and future generations. The Act encourages river management that crosses political boundaries and promotes public participation in developing goals for river protection. CBP would comply with management measures applicable to designated wild and scenic rivers along the Northern Border.

## FEDERAL EXECUTIVE ORDERS

Federal Executive Orders are declarations issued by the president that have the force of law. They are usually based on existing statutory authority and require no action by Congress to become effective. The following Executive Orders relate to issues considered in this PEIS.

**Executive Order 11514—**“Protection and Enhancement of Environmental Quality,” March 5, 1979, amended by Executive Order 11541, July 1, 1970 and Executive Order 11991, May 24, 1977.

**Executive Order 11593—**“Protection and Enhancement of the Cultural Environment,” May 13, 1971.

**Executive Order 11988—**“Floodplain Management and Protection,” May 24, 1977, amended by Executive Order 12148, July 20, 1979.

**Executive Order 11990—**“Protection of Wetlands,” May 24, 1977, amended by Executive Order 12608, September 9, 1987.

**Executive Order 12088—**“Federal Compliance with Pollution Control Standards,” October 13, 1978 (amended by Executive Order 12580, January 23 1987).

**Executive Order 12114—**“Environmental Effects Abroad of Major Federal Actions,” January 9, 1979.

**Executive Order 12372—**“Intergovernmental Review of Federal Programs,” July 14, 1982, amended by Executive Order 12416, April 8, 1983, supplemented by Executive Order 13132, August 4, 1999.

**Executive Order 12856—**“Right to Know Laws and Pollution Prevention Requirements,” August 3, 1993.

**Executive Order 12873—**“Federal Acquisition, Recycling, and Waste Prevention,” October 20, 1993.

**Executive Order 12898—**“Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” February 11, 1994.

**Executive Order 12938—**“Proliferation of Weapons of Mass Destruction,” November 14, 1994.

**Executive Order 12969—**“Federal Acquisition and Community Right-to-Know,” August 8, 1995.

**Executive Order 13007—**“Indian Sacred Sites,” May 24, 1996.

**Executive Order 13031—**“Federal Alternative Fuel Vehicle Leadership,” December 13, 1996.

**Executive Order 13045—**“Protection of Children from Environmental Health and Safety Risks,” April 21, 1997, amended by Executive Order 13229, October 9, 2001 and Executive Order 13296, April 18, 2003.

**Executive Order 13112—**“Invasive Species,” February 3, 1999, as amended by Executive Order 13286, February 23, 2008.

**Executive Order 13132—**“Federalism,” August 4, 1999.

**Executive Order 13134—**“Development and Promotion of Biobased Products and Bioenergy,” August 12, 1999.

**Executive Order 13150—**“Federal Workforce Transport.” April 21, 2000.

**Executive Order 13158—**“Marine Protection Areas,” May 26, 2000.

**Executive Order 13175—**“Consultation and Coordination with Indian Tribal Governments,” November 6, 2000.

**Executive Order 13186—**"Responsibilities of Federal Agencies to Protect Migratory Birds," January 10, 2001.

**Executive Order 13211—**"Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," May 18, 2001.

**Executive Order 13212—**"Actions to Expedite Energy-Related Projects," May 18, 2001.

**Executive Order 13228—**"Establishment of the Office of Homeland Security and the Homeland Security Council," October 8, 2001.

**Executive Order 13284—**"Amendments of Executive Orders, and Other Actions, in Connection with the Establishment of the Department of Homeland Security," January 23, 2003.

**Executive Order 13286—**"Amendment of Executive Orders, and Other Actions, in Connection With the Transfer of Certain Functions to the Secretary of Homeland Security," February 28, 2003.

**Executive Order 13296—**"Amendments to Executive Order 13045, Protection of Children from Environmental Health and Safety Risks," April 18, 2003.

**Executive Order 13302—**"Actions Amending Executive Order 13212, Actions to Expedite Energy-Related Projects," May 15, 2003.

**Executive Order 13352—**"Executive Order Facilitation of Cooperative Conservation," August 26, 2004.

**Executive Order 13423—**"Strengthening Federal Environmental, Energy, and Transportation Management," January 26, 2007.

**Executive Order 13514—**"Federal Leadership in Environmental, Energy, and Economic Performance," October 5, 2009.

**Executive Order 13526—**"Classified National Security Information," December 29, 2009.

**Executive Order 13546—**"Optimizing the Security of Biological Select Agents and Toxins in the United States," July 2, 2010.

**Executive Order 13547—**"Stewardship of the Oceans, Our Coasts, and the Great Lakes," July 19, 2010.

**Executive Order 13549—**"Classified National Security Information Programs for State, Local, Tribal, and Private Sector Entities," August 18, 2010.

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# APPENDIX D

# POTENTIALLY APPLICABLE CATEGORICAL EXCLUSIONS FROM DHS MANAGEMENT DIRECTIVE 023-01

The following categorical exclusions (CATEXs) from the Department of Homeland Security (DHS) Management Directive 023-01 are those most likely to be applicable to U.S. Customs and Border Protection (CBP) actions that are covered by this Programmatic Environmental Impact Statement (PEIS). (For a complete list of DHS CATEXs see Table 1 in DHS Management Directive 023-01.)

The actions marked by asterisks (*) have a higher possibility of involving extraordinary circumstances. A "Record of Environmental Consideration" (REC) will be prepared whenever a CATEX thus identified is used.

## ADMINISTRATIVE CATEXS

**A2—Reductions, realignments, or relocation of personnel** that do not result in exceeding the infrastructure capacity or changing the use of space

**A4—Information gathering, data analysis and processing, information dissemination, review, interpretation, and development of documents.**

**A6—Procurement of non-hazardous goods and services, and storage, recycling, and disposal of non-hazardous materials and wastes**, that complies with applicable requirements and is in support of routine administrative, operational, or maintenance activities.

## OPERATIONAL CATEXS

**B1—Research, development, testing, and evaluation activities, or laboratory operations conducted within existing enclosed facilities** consistent with previously established safety levels and in compliance with applicable Federal, tribal, state, and local requirements to protect the environment when it will result in no, or de minimus change in the use of the facility.

**B2—Transportation of personnel, detainees, equipment, and evidentiary materials** in wheeled vehicles over existing roads or jeep trails established by federal, tribal, state, or local governments, including access to permanent and temporary observation posts.

**B3—Proposed activities and operations to be conducted in an existing structure** that would be compatible with and similar in scope to its ongoing functional uses and would be consistent with previously established safety levels and in compliance with applicable Federal, tribal, state, or local requirements to protect the environment.

**B7—Initial assignment or realignment of mobile assets, including vehicles, vessels and aircraft**, to existing operational facilities that have the capacity to accommodate such assets or where supporting infrastructure changes will be minor in nature to perform as new homeports or for repair and overhaul.

**B8*—Acquisition, installation, maintenance, operation, or evaluation of security equipment** to screen for or detect dangerous or illegal individuals or materials at existing facilities and the eventual removal and disposal of that equipment in compliance with Applicable Federal, tribal, state, and local requirements to protect the environment. Examples of the equipment include, but are not limited to: (a) low-level X-ray devices, (b) cameras and biometric devices, (c) passive inspection devices, (d) detection or security systems for explosive, biological, or chemical substances, and, (e) access controls, screening devices, and traffic management systems.

**B9*—Acquisition, installation, operation, or evaluation of physical security devices, or controls** to enhance the physical security of existing critical assets and the eventual removal and disposal of that equipment in compliance with applicable requirements to protect the environment. Examples include, but are not limited to: (a) motion detection systems, (b) use of temporary barriers, fences, and jersey walls on or adjacent to existing facilities or on land that has already been disturbed or built upon, (c) impact resistant doors and gates, (d) X-ray units, (e) remote video surveillance systems, (f) diver/swimmer detection systems, except sonar, (g) blast/shock impact-resistant systems for land based and waterfront facilities, (i) column and surface wraps, and (j) breakage/shatter-resistant glass.

**B10—Identifications, inspections, surveys, or sampling, testing, seizures, quarantines, removals, sanitization, and monitoring of imported products** that cause little or no physical alteration of the environment.

**B11—Routine monitoring and surveillance activities** that support law enforcement or homeland security and defense operations, such as patrols, investigations, and intelligence gathering, but not including any construction activities (construction activities are addressed in section E of these CATEXs).

## REAL ESTATE ACTIVITIES

**C1—Acquisition of an interest in real property that is not within or adjacent to environmentally sensitive areas**, including interests less than a fee simple, by purchase, lease, assignment, easement, condemnation, or donation, which does not result in a change in the functional use of the property.

**C2—Lease extensions, renewals, or succeeding leases** where there is no change in the facility's use and all environmental operating permits have been acquired and are current.

## REPAIR AND MAINTENANCE ACTIVITIES

**D1—Minor renovations and additions to buildings, roads, airfields, grounds, equipment, and other facilities** that do not result in a change in the functional use of the real property (e.g. realigning interior spaces of an existing building, adding a small storage shed to an existing building, retrofitting for energy conservation, or installing a small antenna on an already existing antenna tower that does not cause the total height to exceed 200 feet and where the FCC would not require an environmental assessment or environmental impact statement for the installation).

**D2—Routine upgrade, repair, maintenance, or replacement of equipment and vehicles,** such as aircraft, vessels, or airfield equipment, that does not result in a change in the functional use of the property.

**D3—Repair and maintenance of Department-managed buildings, roads, airfields, grounds, equipment, and other facilities** which do not result in a change in functional use or an impact on a historically significant element or setting (e.g., replacing a roof, painting a building, resurfacing a road or runway, pest control activities, restoration of trails and firebreaks, culvert maintenance, grounds maintenance, existing security systems, and maintenance of waterfront facilities that does not require individual regulatory permits).

**D4*—Reconstruction and/or repair by replacement of existing utilities or surveillance systems** in an existing right-of-way or easement, upon agreement with the owner of the relevant property interest.

**D5*—Maintenance dredging activities within waterways, floodplains, and wetlands** where no new depths are required, applicable permits are secured, and associated debris disposal is done at an approved disposal site.

## CONSTRUCTION, INSTALLATION, AND DEMOLITION ACTIVITIES

**E1—Construction, installation, operation, maintenance, and removal of utility and communication systems** (such as mobile antennas, data processing cable, and similar electronic equipment) that use existing rights-of-way, easements, utility distribution systems, and/or facilities. This is limited to activities with towers where the resulting total height does not exceed 200 feet and where the FCC would not require an environmental assessment or environmental impact statement for the acquisition, installation, operation or maintenance.

**E2*—New construction upon or improvement of land where all of the following conditions are met:** (a) The structure and proposed use are compatible with applicable Federal, tribal, state, and local planning and zoning standards and consistent with federally approved state coastal management programs, (b) The site is in a developed area and/or a previously disturbed site, (c) The proposed use will not substantially increase the number of motor vehicles at the facility or in the area, (d) The site and scale of construction or improvement are consistent with those of existing, adjacent, or nearby buildings, and, (e) The construction or improvement will not result in uses that exceed existing support infrastructure capacities (roads, sewer, water, parking, etc.).

**E3*—Acquisition, installation, operation, and maintenance of equipment, devices, and/or controls necessary** to mitigate effects of the Department's missions on health and the environment, including the execution of appropriate real estate agreements. Examples include but are not limited to: (a) pollution prevention and pollution control equipment required to meet applicable Federal, tribal, state, or local requirements, (b) noise abatement measures, including construction of noise barriers, installation of noise control materials, or planting native trees and/or native vegetation for use as a noise abatement measure, and, (c) devices to protect human or animal life, such as raptor electrocution prevention devices, fencing to restrict wildlife movement on to airfields, fencing and grating to prevent accidental entry to hazardous or restricted areas, and rescue beacons to protect human life.

**E4*—Removal or demolition, along with subsequent disposal of debris to permitted or authorized off-site locations, of non-historic buildings, structures, other improvement**s, and/or equipment in compliance with applicable environmental and safety requirements.

**E6—Reconstruction of roads on Departmental facilities,** where runoff, erosion, and sedimentation issues are mitigated through implementation of best management practices.

## HAZARDOUS/RADIOACTIVE MATERIALS MANAGEMENT AND OPERATIONS

**F1—Routine procurement, transportation, distribution, use, and storage of hazardous materials** that comply with all applicable requirements, such as Occupational Safety and Health Act (OSHA) and National Fire Protection Association (NFPA).

**F2—Reuse, recycling, and disposal of solid, medical, radiological, and hazardous waste** generated incidental to Department activities that comply with applicable requirements such as Resource Conservation and Recovery Act (RCRA), Occupational Safety and Health Act (OSHA), and state hazardous waste management practices. Examples include but are not limited to: (a) appropriate treatment and disposal of medical waste conducted in accordance with all federal, state, local and tribal laws and regulations, (b) temporary storage and disposal solid waste, conducted in accordance with all federal, state, local and tribal laws and regulations, (c) disposal of radiological waste through manufacturer return and recycling programs, and, (c) hazardous waste minimization activities.

**F3—Use (that may include the processes of installation, maintenance, non-destructive testing, and calibration), transport, and storage of hand-held, mobile or stationary instruments, containing sealed radiological and radioactive materials,** to screen for or detect dangerous or illegal individuals or materials in compliance with commercial manufacturers' specifications, as well as applicable Federal requirements to protect the human environment. Examples of such instruments include but are not limited to: (a) gauging devices, tracers, and other analytical instruments, (b) instruments used in industrial radiography, (c) systems used in medical and veterinary practices and, (d) Nuclear Regulatory Commission (NRC) approved, sealed, small source radiation devices for scanning vehicles and packages where radiation exposure to employees or the public does not exceed 0.1 rem per year and where systems are maintained within the NRC license parameters at existing facilities.

## TRAINING AND EXERCISES

**G1—Training of homeland security personnel, including international, tribal, state, and local agency representatives** using existing facilities where the training occurs in accordance with applicable permits and other requirements for the protection of the environment. This exclusion does not apply to training that involves the use of live chemical, biological, or radiological agents except when conducted at a location designed and constructed to contain the materials used for that training. Examples include but are not limited to: (a) administrative or classroom training, (b) tactical training, including but not limited to training in explosives and incendiary devices, arson investigation and firefighting, and emergency preparedness and response, (c) vehicle and small boat operation training, (d) small arms and less-than-lethal weapons training, (e) security specialties and terrorist response training, (f) crowd control training, including gas range training, (g) enforcement response, self-defense, and interdiction techniques training, and, (h) techniques for use in fingerprinting and drug analysis.

**G2—Projects, grants, cooperative agreements, contracts, or activities to design, develop, and conduct national, state, local, or international exercises** to test the readiness of the Nation to prevent or respond to a terrorist attack or a natural or manmade disaster and where conducted in accordance with existing facility or land use designations. This exclusion does not apply to exercises that involve the use of chemical, biological, radiological, nuclear, or explosive agents/devices (other than small devices such as practice grenades/flash bang devices used to simulate an attack during exercise play).

## UNIQUE FOR CBP

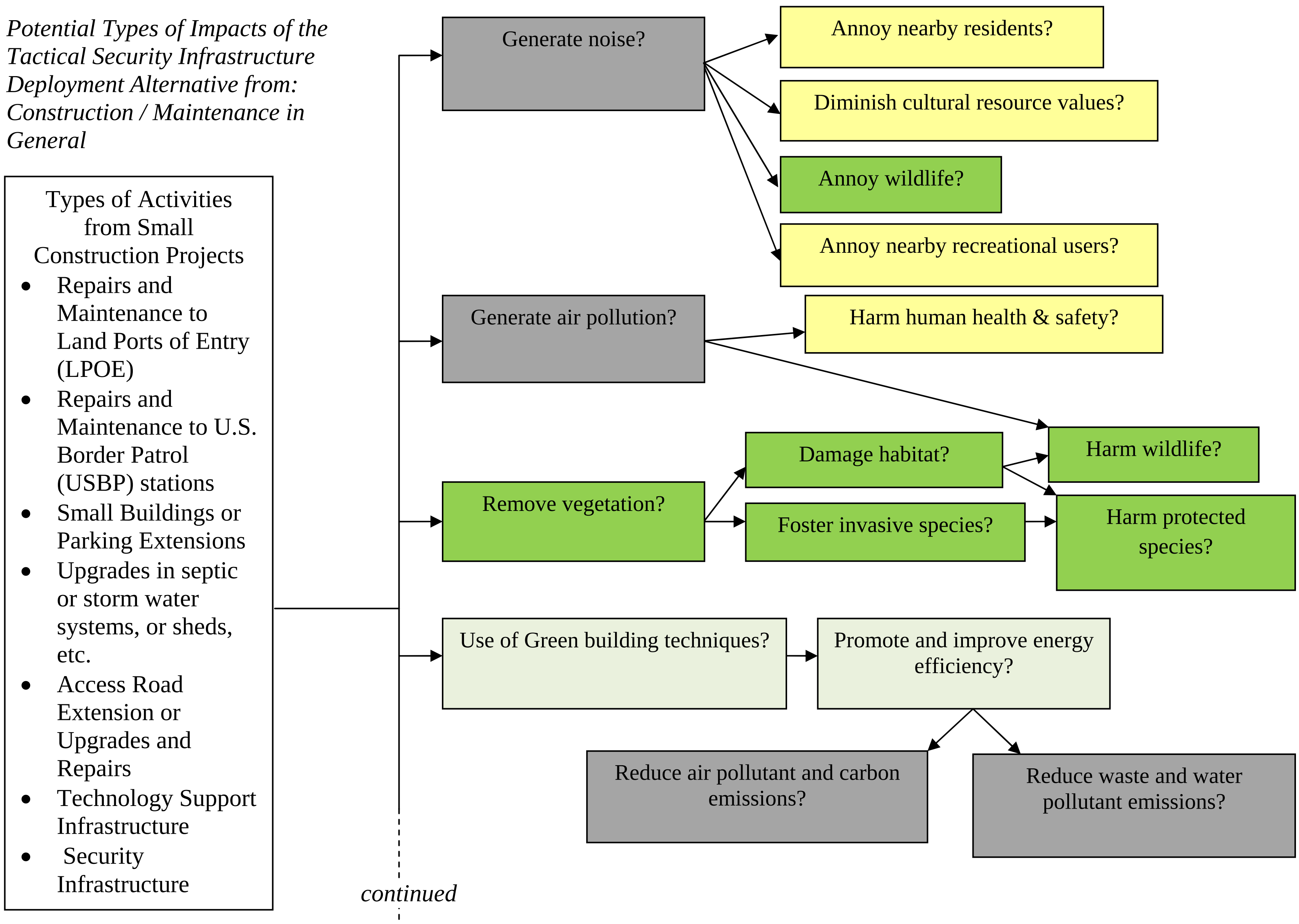
**K1—Road dragging of existing roads and trails established** by Federal, tribal, state, or local governments to maintain a clearly delineated right-of-way, to provide evidence of foot traffic and that will not expand the width, length, or footprint of the road or trail.

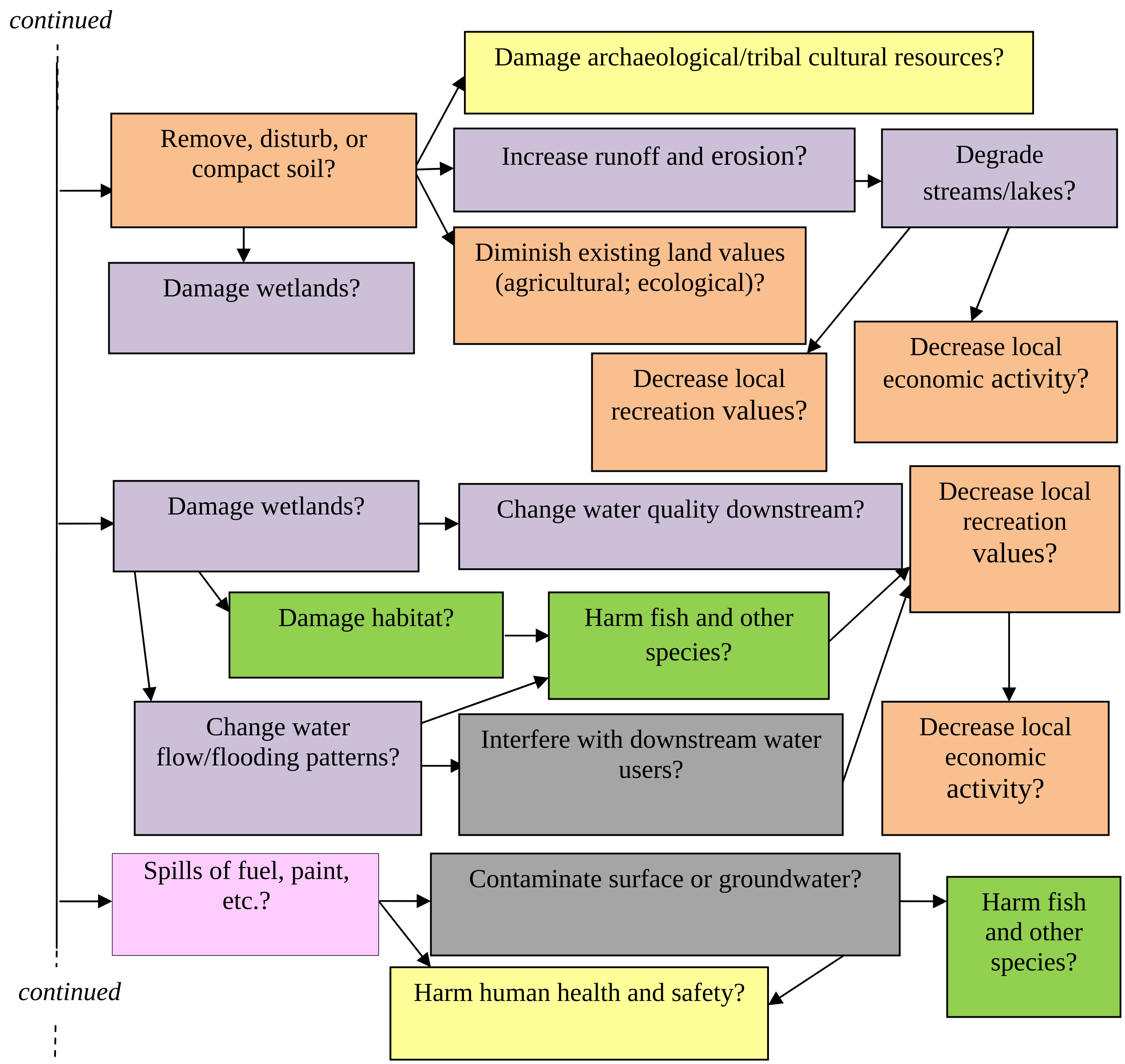
**K2—Repair and maintenance of existing border fences** that do not involve expansion in width or length of the project, and will not encroach on adjacent habitat.

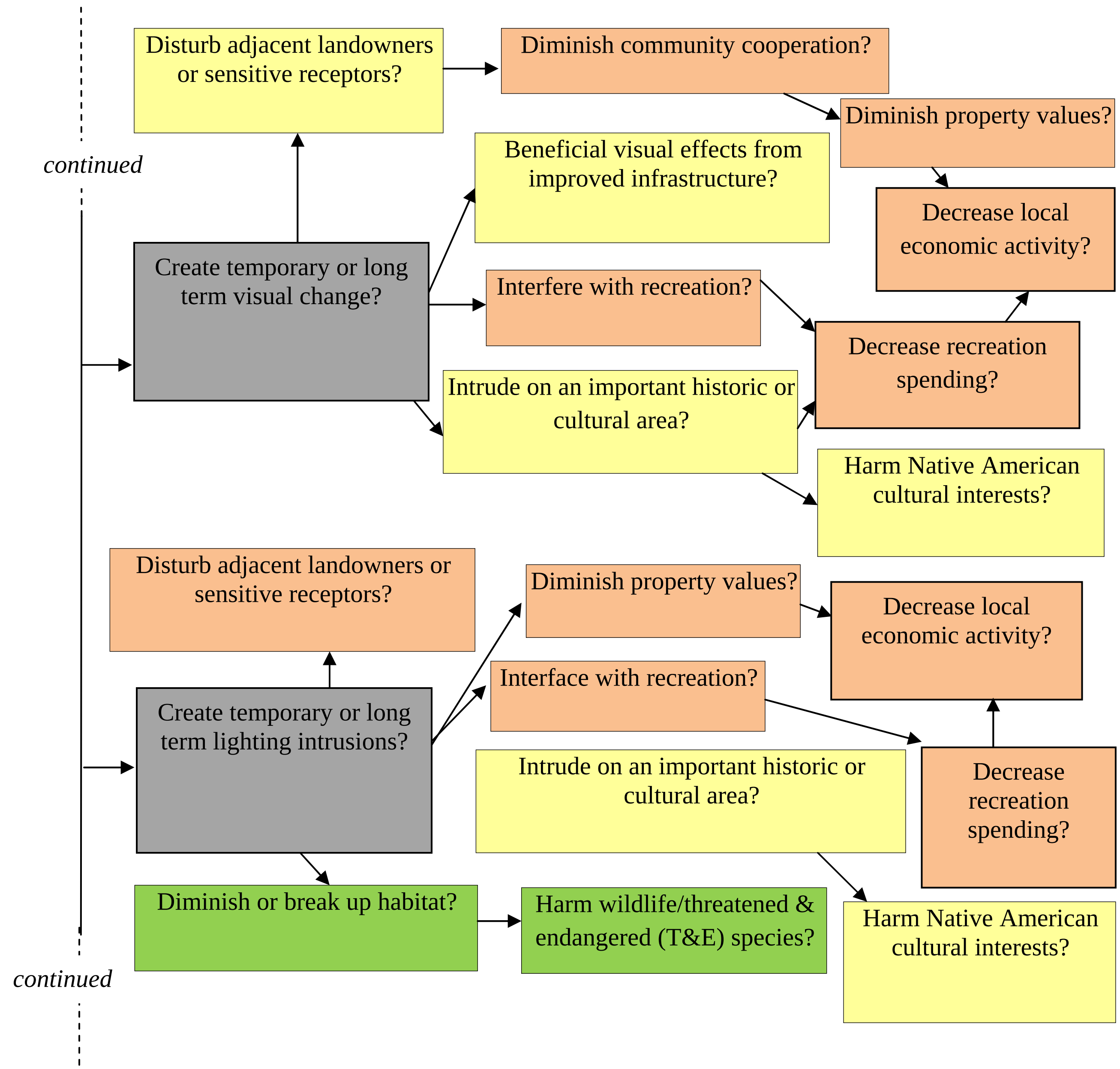
# APPENDIX E

# CAUSE-EFFECT QUESTIONS NETWORK

*Potential Types of Impacts of the Tactical Security Infrastructure Deployment Alternative from: Construction / Maintenance in General*




continued
Damage archaeological/tribal cultural resources?
Remove, disturb, or compact soil?
Increase runoff and erosion?
Degrade streams/lakes?
Diminish existing land values (agricultural; ecological)?
Damage wetlands?
Decrease local economic activity?
Decrease local recreation values?
Damage wetlands?
Change water quality downstream?
Decrease local recreation values?
Damage habitat?
Harm fish and other species?
Change water flow/flooding patterns?
Interfere with downstream water users?
Decrease local economic activity?
Spills of fuel, paint, etc.?
Contaminate surface or groundwater?
Harm fish and other species?
Harm human health and safety?
continued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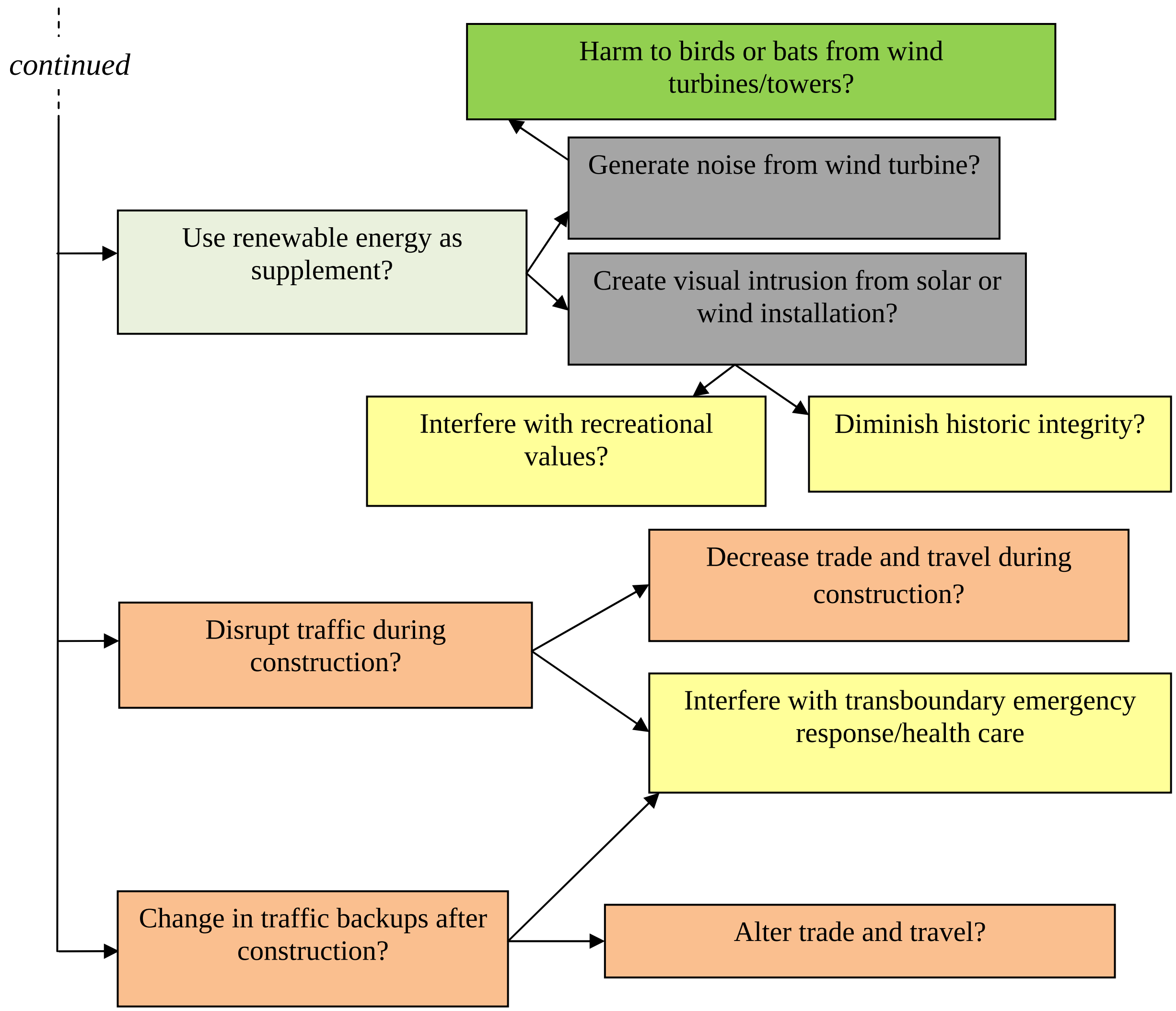
Disturb adjacent landowners or sensitive receptors?
Diminish community cooperation?
Diminish property values?
Beneficial visual effects from improved infrastructure?
Decrease local economic activity?
Create temporary or long term visual change?
Interfere with recreation?
Decrease recreation spending?
Intrude on an important historic or cultural area?
Harm Native American cultural interests?
Disturb adjacent landowners or sensitive receptors?
Diminish property values?
Decrease local economic activity?
Interface with recreation?
Create temporary or long term lighting intrusions?
Intrude on an important historic or cultural area?
Decrease recreation spending?
Diminish or break up habitat?
Harm wildlife/threatened & endangered (T&E) species?
Harm Native American cultural interests?
continued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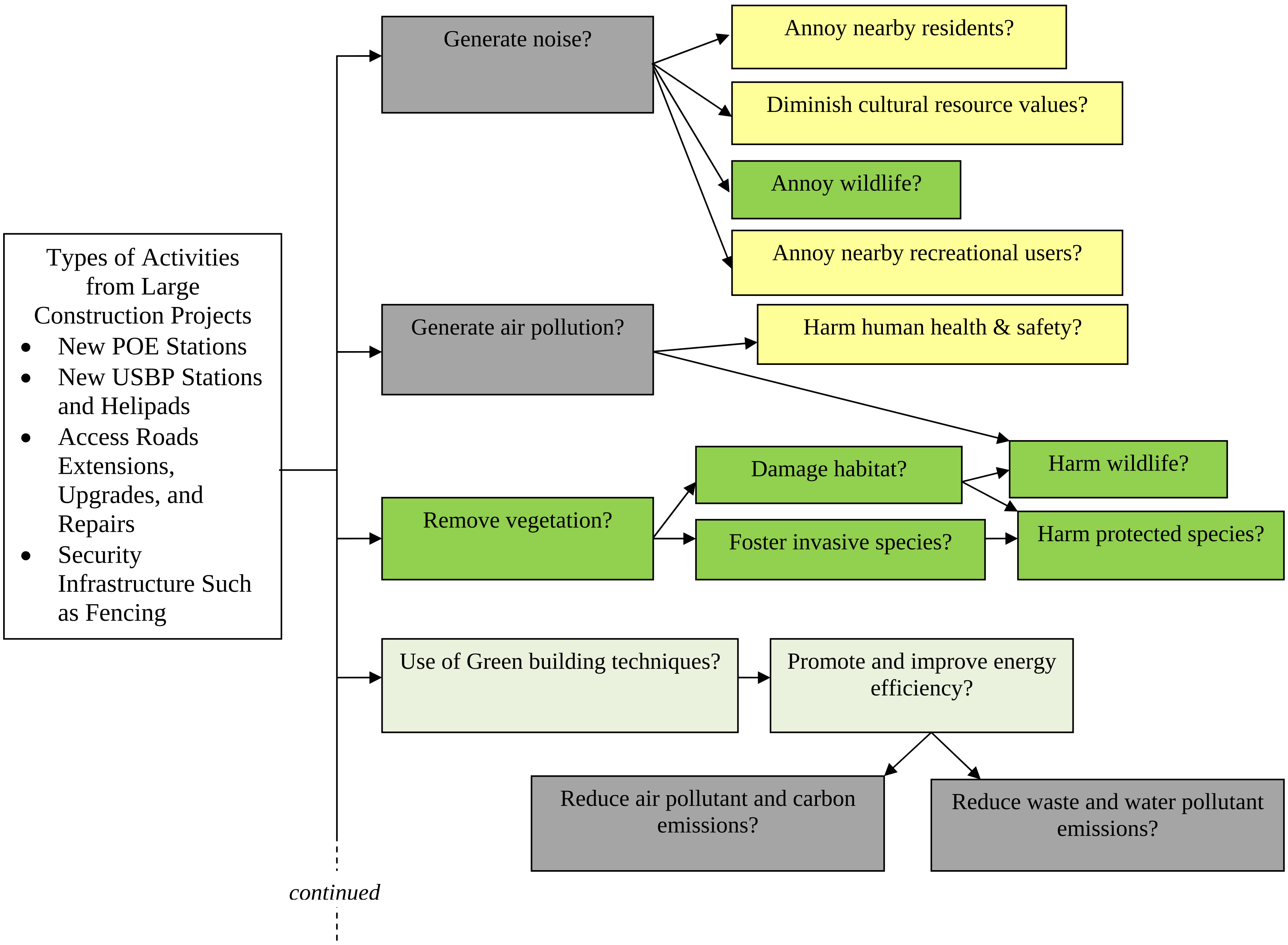
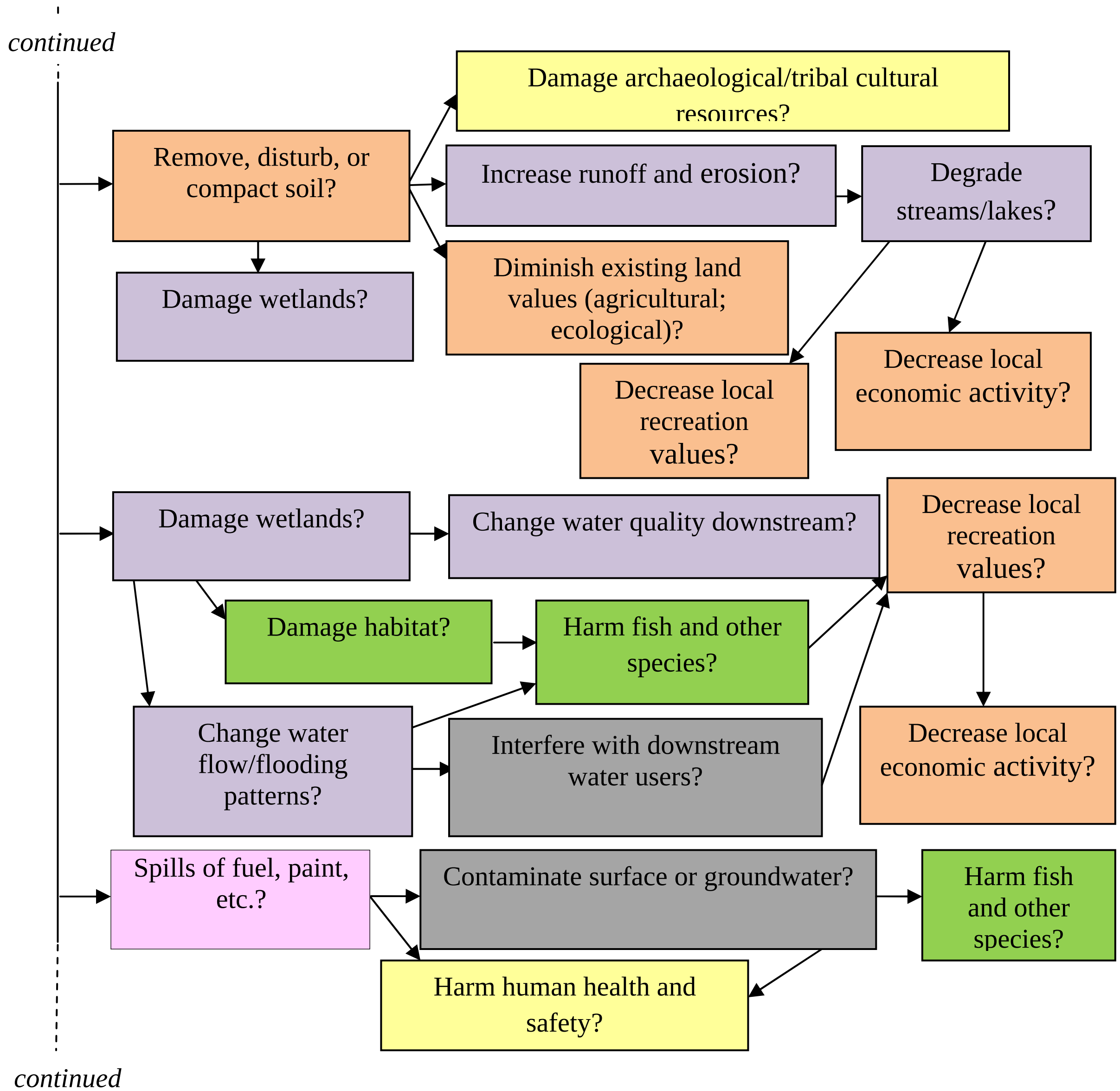
Harm to birds or bats from wind turbines/towers?
Generate noise from wind turbine?
Use renewable energy as supplement?
Create visual intrusion from solar or wind installation?
Interfere with recreational values?
Diminish historic integrity?
Decrease trade and travel during construction?
Disrupt traffic during construction?
Interfere with transboundary emergency response/health care
Change in traffic backups after construction?
Alter trade and travel?


Types of Activities from Large Construction Projects
• New POE Stations
• New USBP Stations and Helipads
• Access Roads Extensions, Upgrades, and Repairs
• Security Infrastructure Such as Fencing
Generate noise?
Annoy nearby residents?
Diminish cultural resource values?
Annoy wildlife?
Annoy nearby recreational users?
Generate air pollution?
Harm human health & safety?
Harm wildlife?
Damage habitat?
Remove vegetation?
Foster invasive species?
Harm protected species?
Use of Green building techniques?
Promote and improve energy efficiency?
Reduce air pollutant and carbon emissions?
Reduce waste and water pollutant emissions?
continued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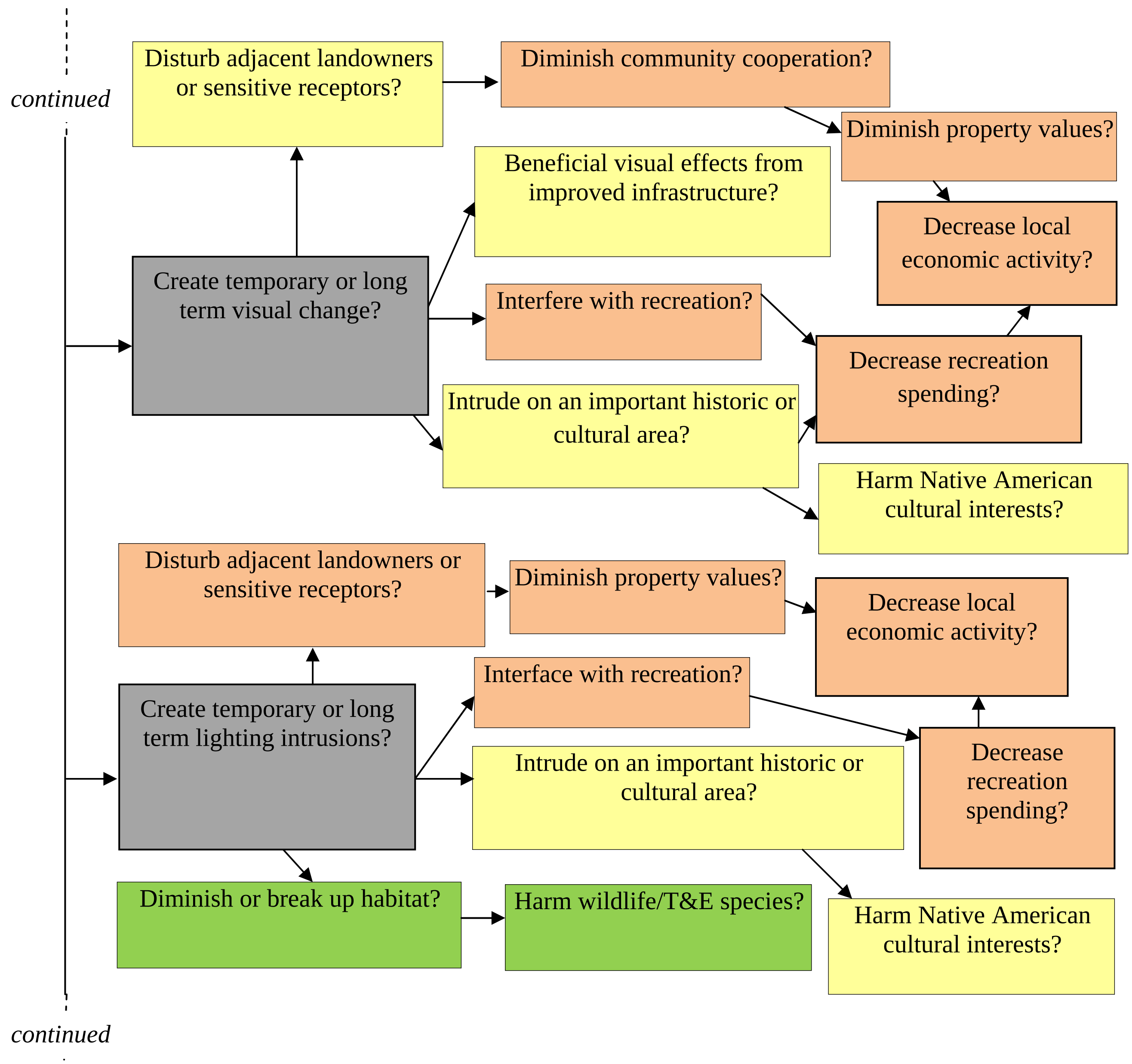
Damage archaeological/tribal cultural resources?
Remove, disturb, or compact soil?
Increase runoff and erosion?
Degrade streams/lakes?
Damage wetlands?
Diminish existing land values (agricultural; ecological)?
Decrease local economic activity?
Decrease local recreation values?
Damage wetlands?
Change water quality downstream?
Decrease local recreation values?
Damage habitat?
Harm fish and other species?
Change water flow/flooding patterns?
Interfere with downstream water users?
Decrease local economic activity?
Spills of fuel, paint, etc.?
Contaminate surface or groundwater?
Harm fish and other species?
Harm human health and safety?
continued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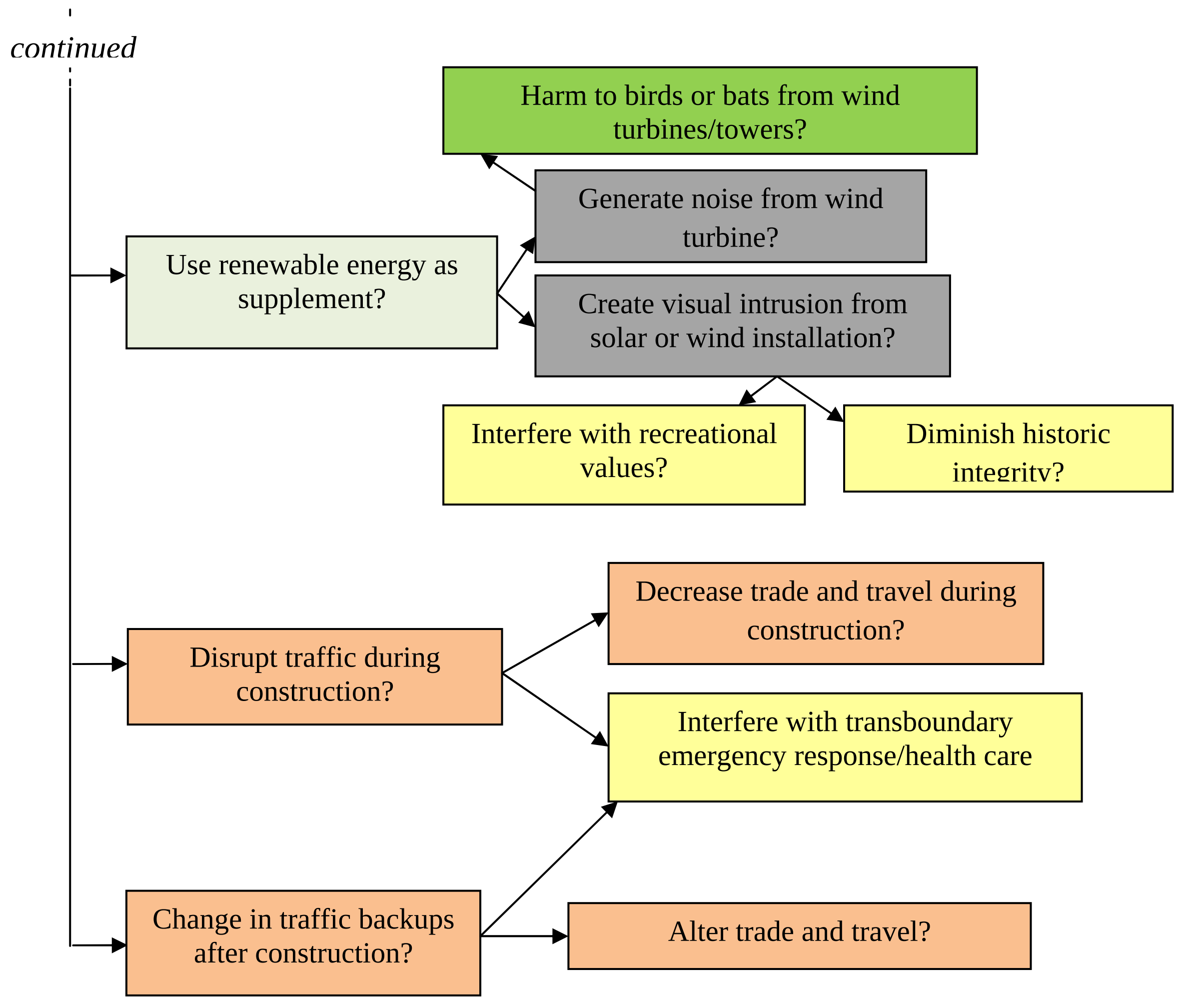
Disturb adjacent landowners or sensitive receptors?
Diminish community cooperation?
Diminish property values?
Beneficial visual effects from improved infrastructure?
Decrease local economic activity?
Create temporary or long term visual change?
Interfere with recreation?
Decrease recreation spending?
Intrude on an important historic or cultural area?
Harm Native American cultural interests?
Disturb adjacent landowners or sensitive receptors?
Diminish property values?
Decrease local economic activity?
Interface with recreation?
Create temporary or long term lighting intrusions?
Intrude on an important historic or cultural area?
Decrease recreation spending?
Diminish or break up habitat?
Harm wildlife/T&E species?
Harm Native American cultural interests?
continued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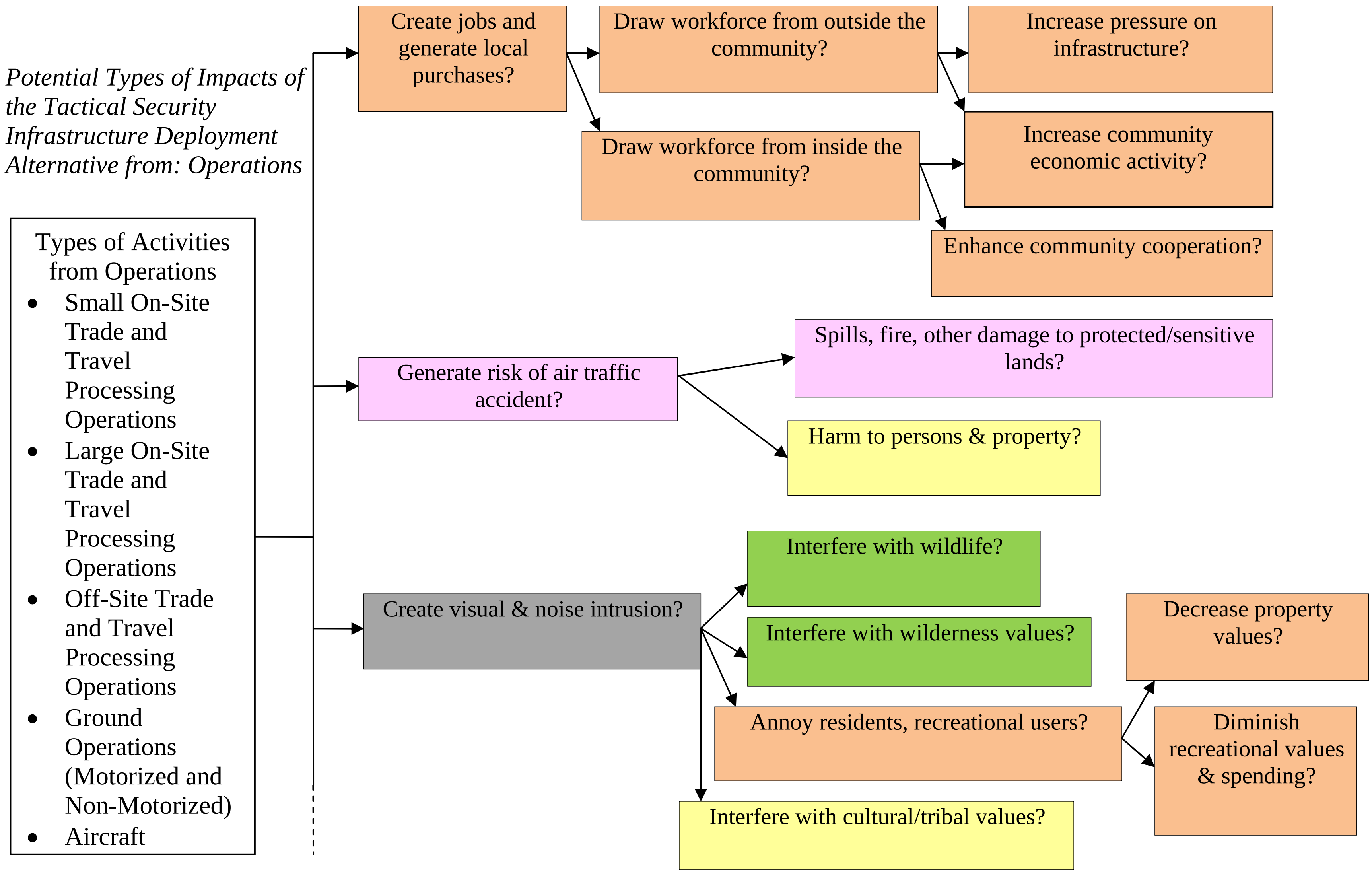
Harm to birds or bats from wind turbines/towers?
Generate noise from wind turbine?
Use renewable energy as supplement?
Create visual intrusion from solar or wind installation?
Interfere with recreational values?
Diminish historic integrity?
Decrease trade and travel during construction?
Disrupt traffic during construction?
Interfere with transboundary emergency response/health care
Change in traffic backups after construction?
Alter trade and travel?


Potential Types of Impacts of the Tactical Security Infrastructure Deployment Alternative from: Operations
Types of Activities from Operations
• Small On-Site Trade and Travel Processing Operations
• Large On-Site Trade and Travel Processing Operations
• Off-Site Trade and Travel Processing Operations
• Ground Operations (Motorized and Non-Motorized)
• Aircraft
Create jobs and generate local purchases?
Draw workforce from outside the community?
Increase pressure on infrastructure?
Draw workforce from inside the community?
Increase community economic activity?
Enhance community cooperation?
Generate risk of air traffic accident?
Spills, fire, other damage to protected/sensitive lands?
Harm to persons & property?
Create visual & noise intrusion?
Interfere with wildlife?
Interfere with wilderness values?
Decrease property values?
Annoy residents, recreational users?
Diminish recreational values & spending?
Interfere with cultural/tribal values?

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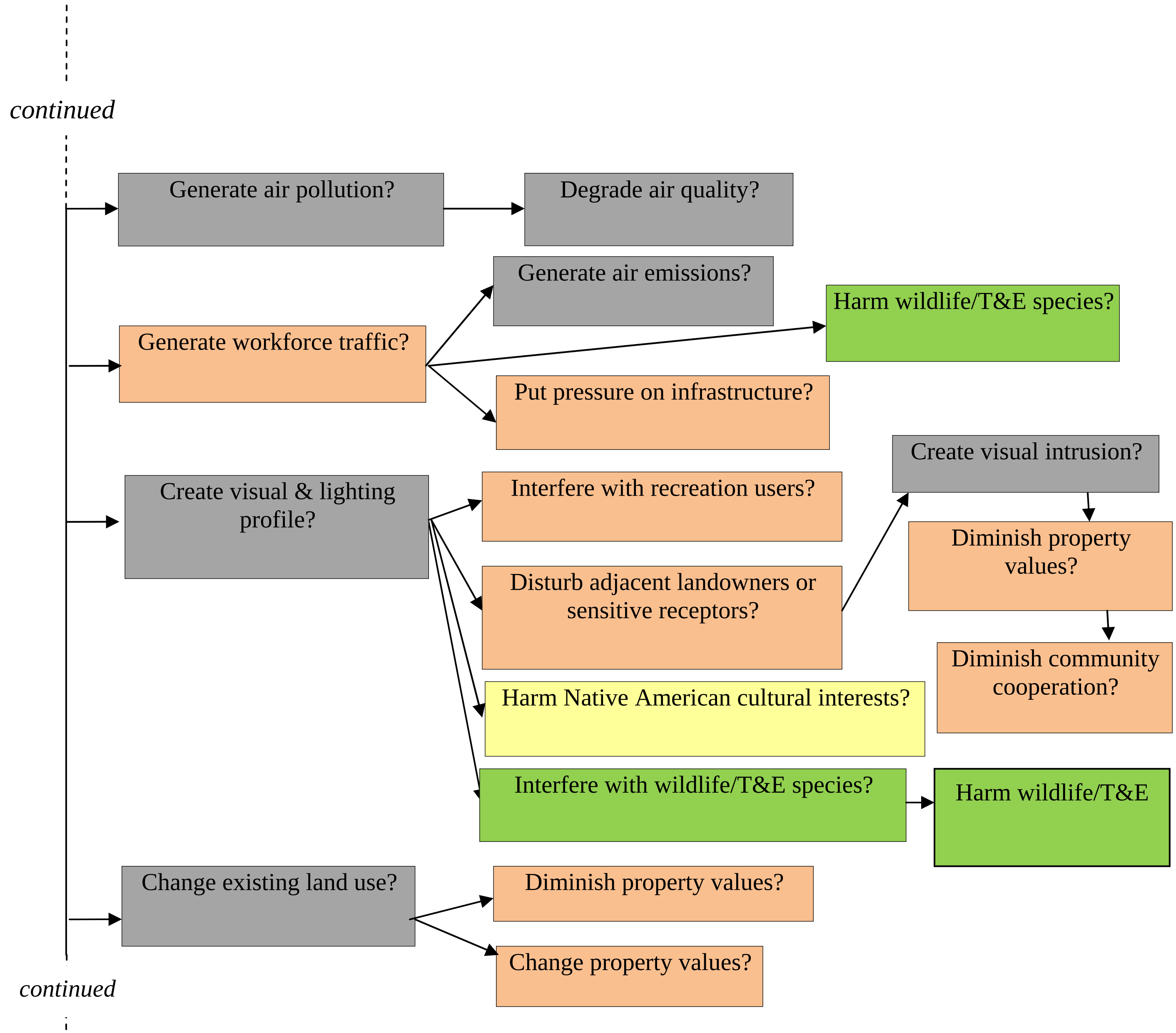
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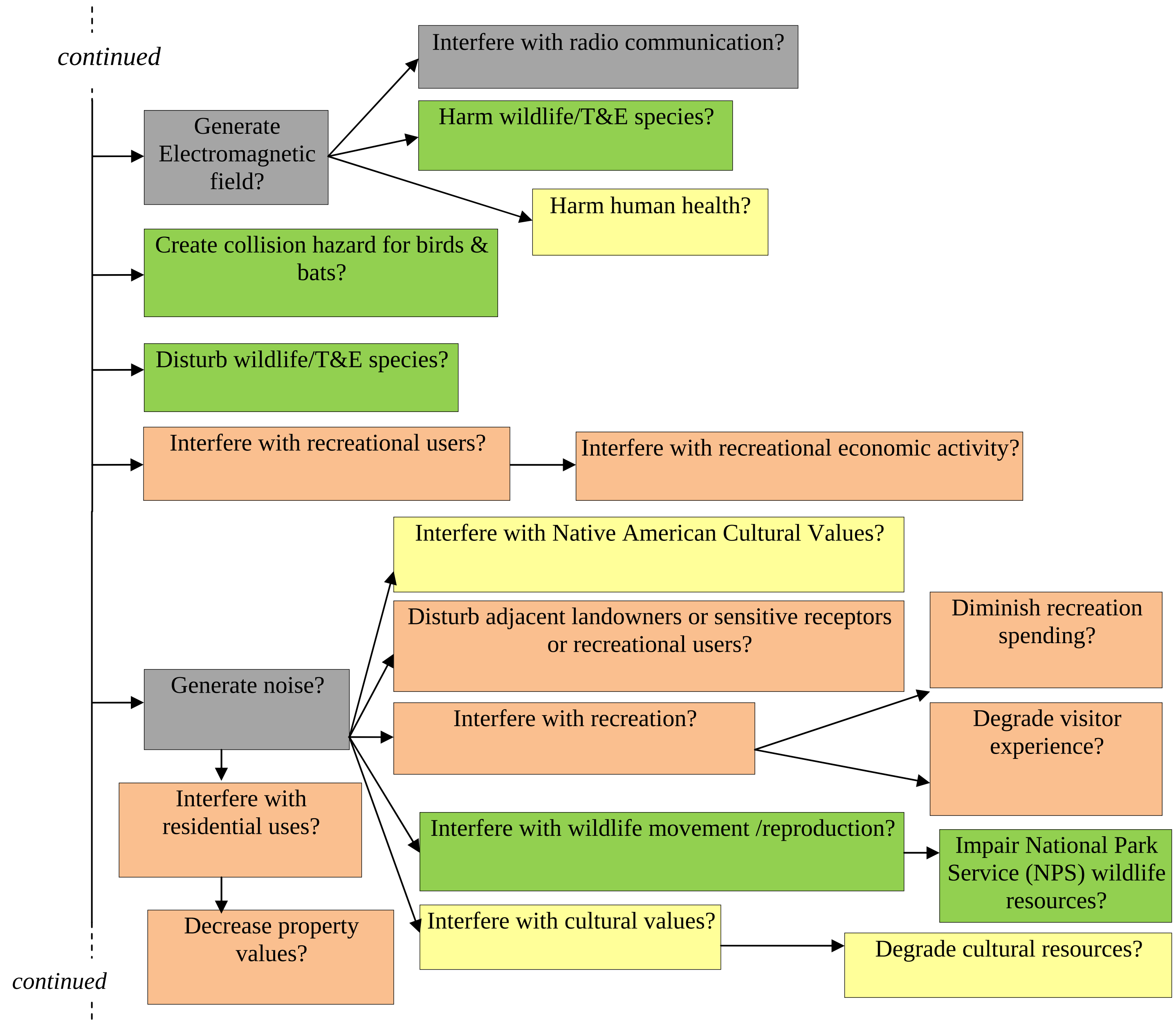
Generate air pollution?
Degrade air quality?
Generate air emissions?
Harm wildlife/T&E species?
Generate workforce traffic?
Put pressure on infrastructure?
Create visual intrusion?
Create visual & lighting profile?
Interfere with recreation users?
Diminish property values?
Disturb adjacent landowners or sensitive receptors?
Diminish community cooperation?
Harm Native American cultural interests?
Interfere with wildlife/T&E species?
Harm wildlife/T&E
Change existing land use?
Diminish property values?
Change property values?
continued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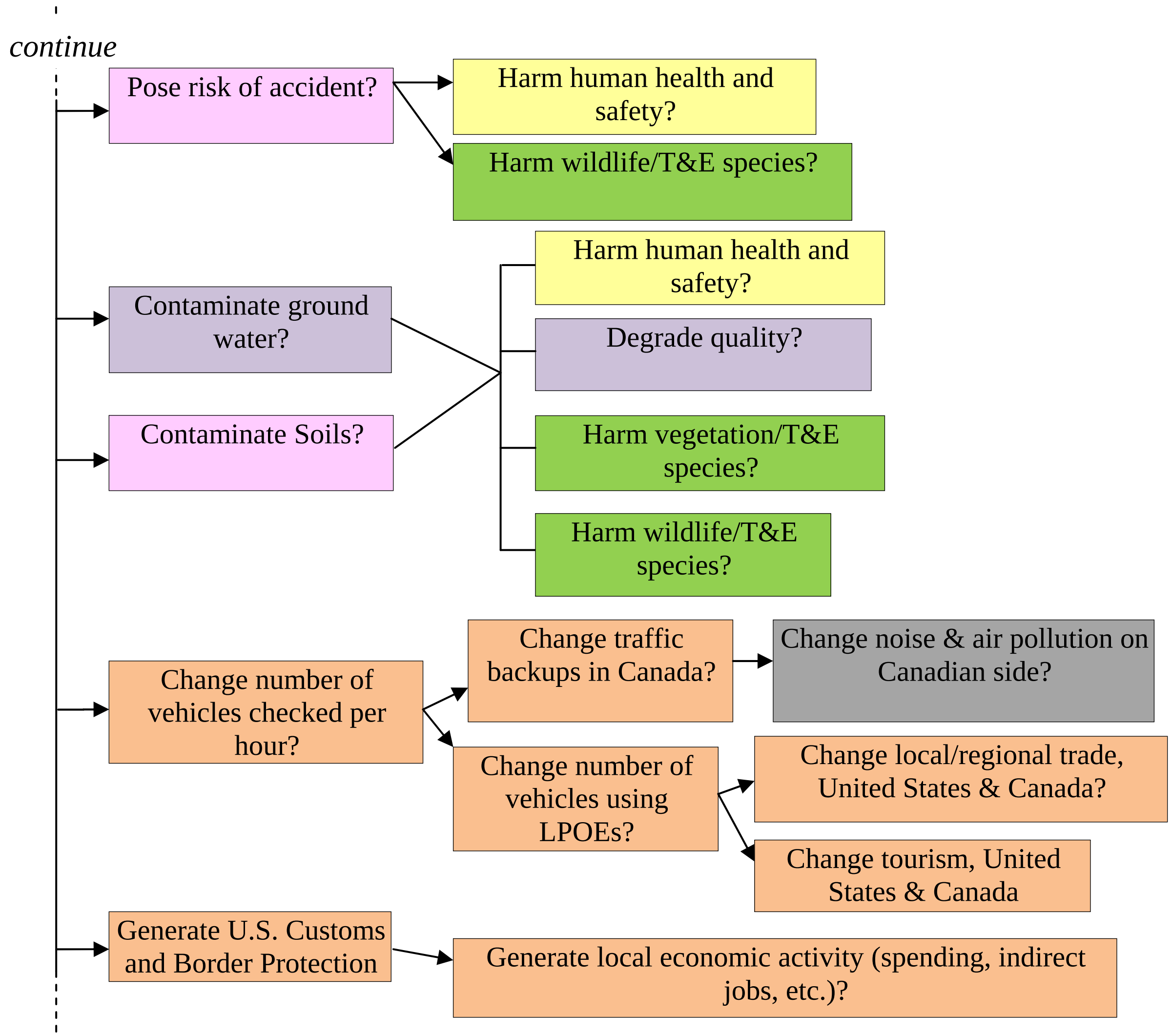
Generate Electromagnetic field?
Interfere with radio communication?
Harm wildlife/T&E species?
Harm human health?
Create collision hazard for birds & bats?
Disturb wildlife/T&E species?
Interfere with recreational users?
Interfere with recreational economic activity?
Generate noise?
Interfere with Native American Cultural Values?
Disturb adjacent landowners or sensitive receptors or recreational users?
Diminish recreation spending?
Interfere with recreation?
Degrade visitor experience?
Interfere with wildlife movement /reproduction?
Impair National Park Service (NPS) wildlife resources?
Interfere with cultural values?
Degrade cultural resources?
Interfere with residential uses?
Decrease property values?
continued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Pose risk of accident?
Harm human health and safety?
Harm wildlife/T&E species?
Contaminate ground water?
Contaminate Soils?
Harm human health and safety?
Degrade quality?
Harm vegetation/T&E species?
Harm wildlife/T&E species?
Change number of vehicles checked per hour?
Change traffic backups in Canada?
Change noise & air pollution on Canadian side?
Change number of vehicles using LPOEs?
Change local/regional trade, United States & Canada?
Change tourism, United States & Canada
Generate U.S. Customs and Border Protection
Generate local economic activity (spending, indirect jobs, etc.)?

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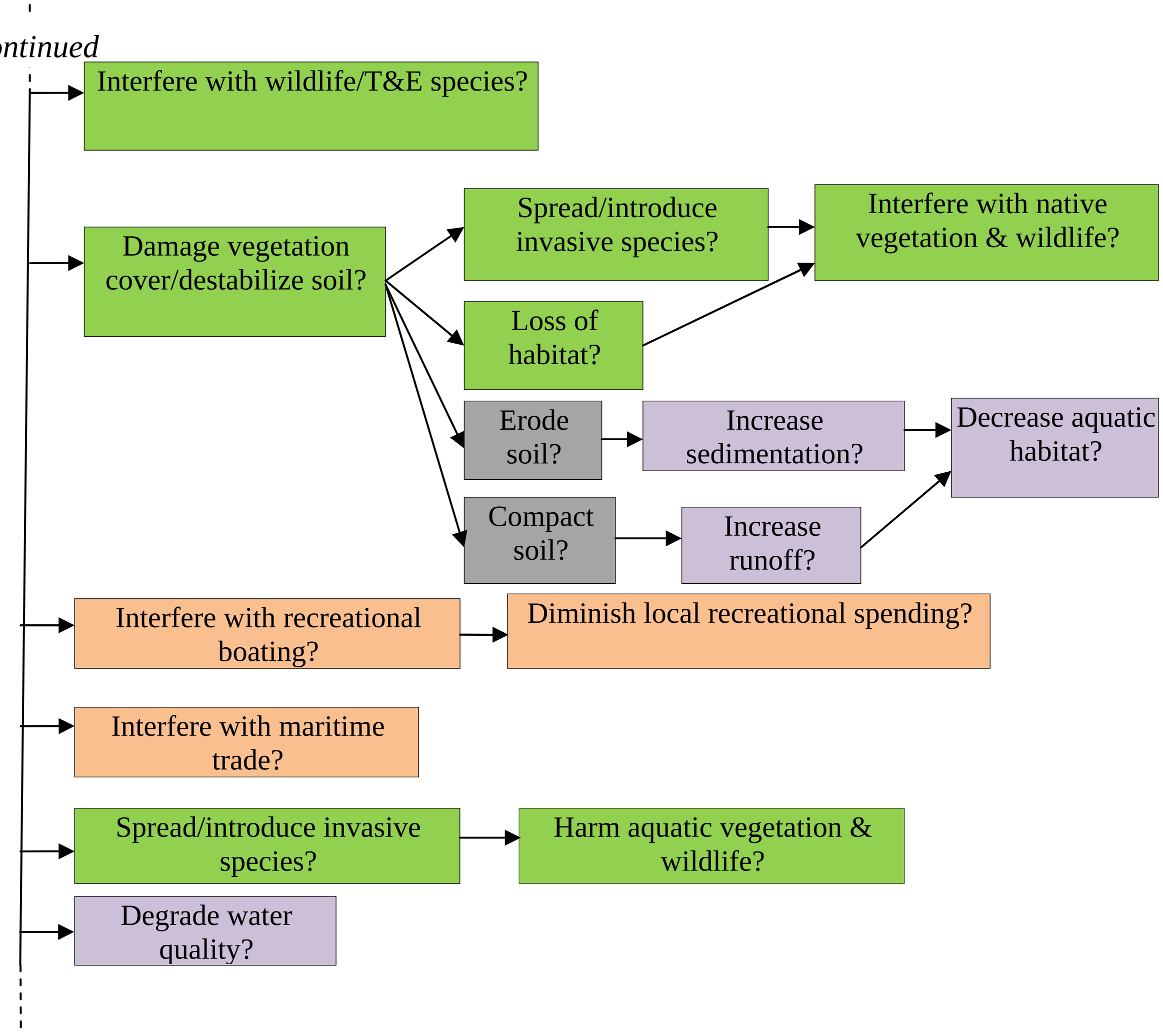


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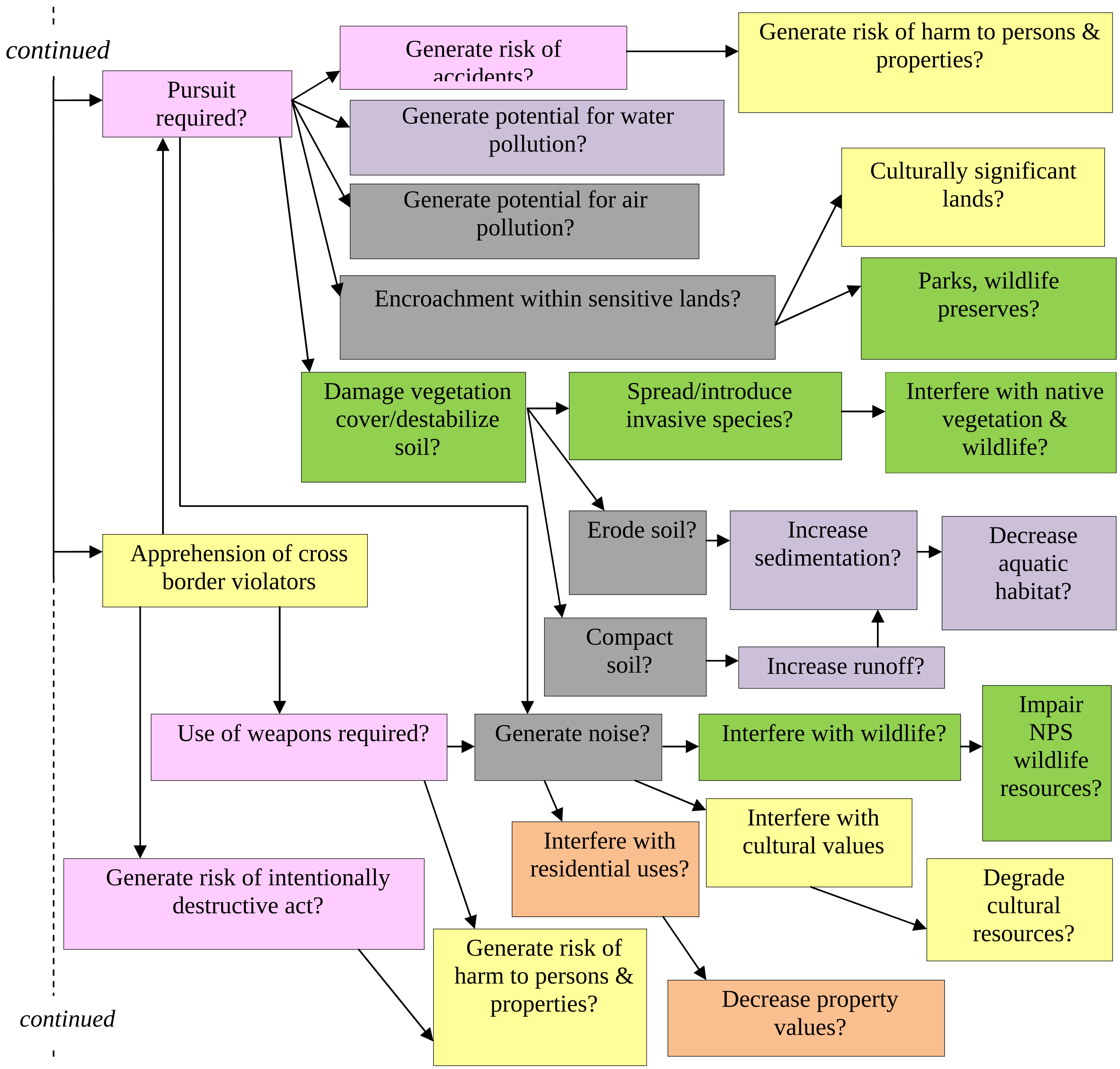
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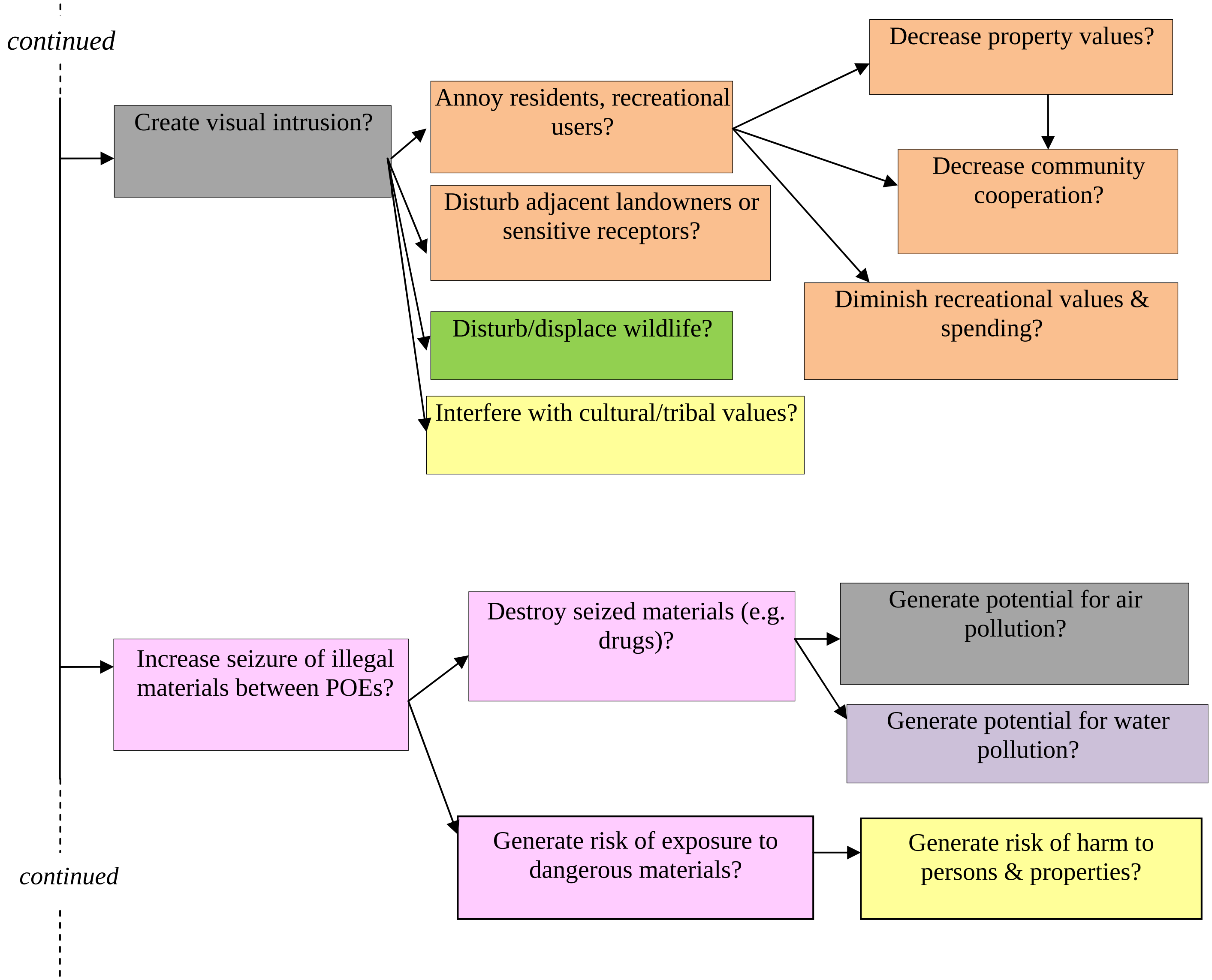
Pursuit required?
Generate risk of accidents?
Generate risk of harm to persons & properties?
Generate potential for water pollution?
Generate potential for air pollution?
Culturally significant lands?
Encroachment within sensitive lands?
Parks, wildlife preserves?
Damage vegetation cover/destabilize soil?
Spread/introduce invasive species?
Interfere with native vegetation & wildlife?
Erode soil?
Increase sedimentation?
Decrease aquatic habitat?
Apprehension of cross border violators
Compact soil?
Increase runoff?
Use of weapons required?
Generate noise?
Interfere with wildlife?
Impair NPS wildlife resources?
Interfere with cultural values
Interfere with residential uses?
Generate risk of intentionally destructive act?
Degrade cultural resources?
Generate risk of harm to persons & properties?
Decrease property values?
continued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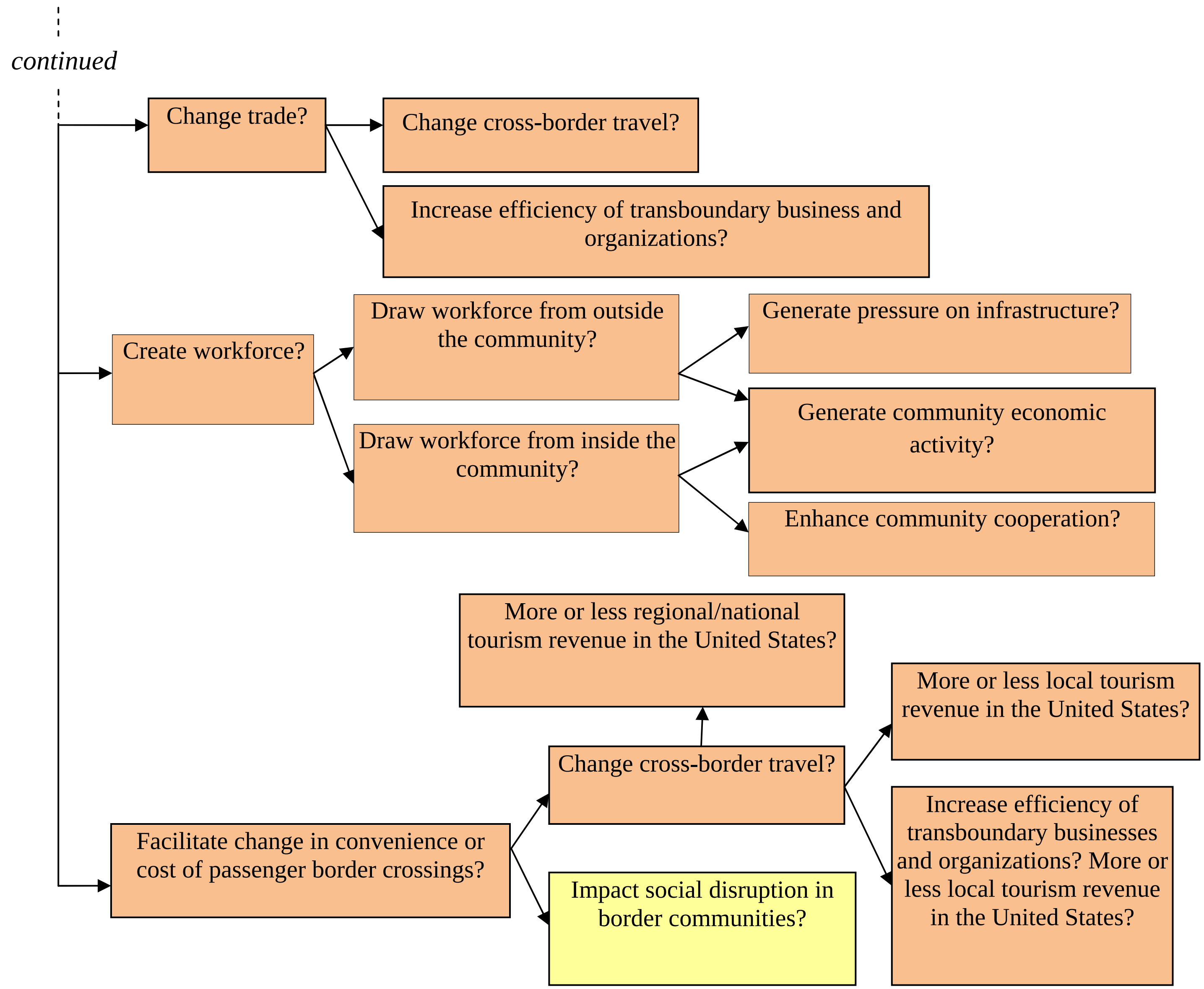
Create visual intrusion?
Annoy residents, recreational users?
Disturb adjacent landowners or sensitive receptors?
Disturb/displace wildlife?
Interfere with cultural/tribal values?
Decrease property values?
Decrease community cooperation?
Diminish recreational values & spending?
Increase seizure of illegal materials between POEs?
Destroy seized materials (e.g. drugs)?
Generate potential for air pollution?
Generate potential for water pollution?
Generate risk of exposure to dangerous materials?
Generate risk of harm to persons & properties?
continued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Change trade?
Change cross-border travel?
Increase efficiency of transboundary business and organizations?
Create workforce?
Draw workforce from outside the community?
Draw workforce from inside the community?
Generate pressure on infrastructure?
Generate community economic activity?
Enhance community cooperation?
More or less regional/national tourism revenue in the United States?
More or less local tourism revenue in the United States?
Change cross-border travel?
Facilitate change in convenience or cost of passenger border crossings?
Impact social disruption in border communities?
Increase efficiency of transboundary businesses and organizations? More or less local tourism revenue in the United States?

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# APPENDIX F

# NORTHERN BORDER PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT (PEIS) CUMULATIVE SCENARIO

## 1.1 NON-U.S. CUSTOMS AND BORDER PROTECTION PROJECTS AND ACTIVITIES CONTRIBUTING TO CUMULATIVE IMPACTS

Cumulative impacts are the result of adding the incremental impacts of the proposed action to other past, present, and reasonably foreseeable future actions. The Customs and Border Protection (CBP) northern border program includes multiple projects and activities. Therefore, the cumulative analysis in the PEIS first discusses the added and synergistic effects of all the individual actions that make up the CBP northern border program. Then the range of actions considered in the cumulative analysis is expanded to address the incremental effects of adding the CBP program to other, non-CBP program past, present, and reasonably foreseeable future projects and activities. Table F-1 lists significant non-CBP projects and activities that could affect the resources potentially affected by the proposed action.

The cumulative analysis assumes the implementation of all mitigation measures required by statute and regulation as well as mitigation measures that are part of the CBP program along the northern border. These mitigation measures are considered to be in place for purposes of analysis.

**Table F-1. Non-CBP Projects that Contribute to Cumulative Impacts**

| Project Or Activity | Time Frame | Spatial Extent | Impact-Causing Factors | Affected Resource or Issue1 |
|---|---|---|---|---|
| **ENTIRE BORDER** | | | | |
| Vehicular traffic | Ongoing | Metropolitan areas | • Air emissions<br>• Congestion | • Air quality<br>• Mobility |
| Recreational use of Off-road vehicles and snowmobiles | Ongoing | Parks, natural areas | • Air emissions<br>• Compaction<br>• Noise | • Air quality<br>• Soils<br>• Vegetation<br>• Wildlife |
| Hunting and fishing | Ongoing | All states | • Disturbance to wildlife<br>• Habitat disruption<br>• Depletion of wildlife | • Wildlife<br>• Habitat<br>• Tourism<br>• Economic resources |
| Forestry and logging | Ongoing | Portions of the entire border<br><br>Canadian side of border, especially British Columbia | • Tree removal<br>• Trucks<br>• Heavy equipment<br>• Access road construction<br>• Site grading<br>• Air emissions<br>• Noise<br>• Controlled burns<br>• Erosion and runoff<br>• Jobs | • Soils<br>• Vegetation and wildlife<br>• Surface and ground water<br>• Viewshed<br>• Air quality<br>• Socioeconomic resources |
| Hiking, biking, horseback riding, cross-country skiing. | Ongoing | Trails, parks, other natural areas | • Compaction<br>• Erosion<br>• Disturbance<br>• Noise | • Soils<br>• Water quality<br>• Vegetation and wildlife<br>• Human health and safety<br>• Land use |

| Project Or Activity | Time Frame | Spatial Extent | Impact-Causing Factors | Affected Resource or Issue1 |
|---|---|---|---|---|
| Road repair and construction | Ongoing | All states along the border | • Construction equipment<br>• Soil compaction<br>• Erosion<br>• Air emissions<br>• Grading<br>• Noise<br>• Jobs | • Soils<br>• Air quality<br>• Vegetation and wildlife<br>• Water quality<br>• Residential areas<br>• Aesthetic quality<br>• Human health and safety<br>• Traffic<br>• Socioeconomic resources |
| Communication towers | Ongoing | All states along the border | • Interference with CBP towers<br>• Visual impacts | • Radio communications<br>• Viewshed |
| Patrolling and reconnaissance by other agencies | Ongoing | All states along the border | • Air traffic<br>• Ground patrols<br>• Vessel traffic<br>• Noise | • Vegetation<br>• Air quality<br>• Cultural resources<br>• Wildlife<br>• Noise disturbance<br>• Human health and safety |
| **NEW ENGLAND REGION: MAINE, NEW HAMPSHIRE, AND VERMONT** | | | | |
| Mining – sand, gravel, cement, peat, stone, and clay | Ongoing | Maine | • Land clearing and grading<br>• Excavation and extraction<br>• Erosion and runoff<br>• Chemical releases<br>• Hazardous waste<br>• Milling and crushing<br>• Site reclamation<br>• Jobs | • Wildlife habitat<br>• Surface and ground water<br>• Human health and safety<br>• Air quality<br>• Land use<br>• Socioeconomic resources |

| Project Or Activity | Time Frame | Spatial Extent | Impact-Causing Factors | Affected Resource or Issue1 |
|---|---|---|---|---|
| Kibby Mountain Wind Farm – 44 wind turbines | 22 wind turbines are operational; another 22 to be operational Nov., 2010 | Maine – Kibby and Skinner Township (Franklin County) | • Construction<br>• Facility operations<br>• Visual impacts<br>• Noise<br>• Reduced air emissions<br>• Jobs | • Wildlife habitat<br>• Viewshed<br>• Air quality<br>• Socioeconomic resources |
| Kibby Mountain Extension Project – 11 to 15 wind turbines | Project is currently in the planning stage; construction has not begun. | Maine – Sisk Mt, Kibby, and Chain of Ponds Townships (Franklin County) | • Construction<br>• Facility operations<br>• Visual impacts<br>• Noise<br>• Reduced air emissions<br>• Jobs | • Wildlife habitat<br>• Viewshed<br>• Air quality<br>• Socioeconomic resources |
| The Granite Reliable Wind Park – 33 wind turbines | In development – construction starting in 2011 | New Hampshire - Sanguinary Ridge | • Construction<br>• Facility operations<br>• Visual impacts<br>• Noise<br>• Reduced air emissions<br>• Jobs | • Wildlife habitat<br>• Viewshed<br>• Air quality<br>• Socioeconomic resources |
| Six wind parks of varying size; up to 24 wind turbines | In development | Vermont – Orleans County, South Hero, Milton, East Haven, Coventry, Burlington | • Construction<br>• Facility operations<br>• Visual impacts<br>• Noise<br>• Reduced air emissions<br>• Jobs | • Wildlife habitat<br>• Viewshed<br>• Air quality<br>• Socioeconomic resources |
| Glen Ellis Site Improvement Project – possible improvements to parking, drainage, toilet facilities, hiking trails, and picnic areas | Beginning Oct. 2011 | New Hampshire – White Mountain National Forest | • Paving<br>• Clearing and grading<br>• Erosion and runoff<br>• Construction<br>• Trail maintenance | • Soils<br>• Vegetation and wildlife<br>• Surface water |

| Project Or Activity | Time Frame | Spatial Extent | Impact-Causing Factors | Affected Resource or Issue1 |
|---|---|---|---|---|
| Crawford Stewardship Project – maintenance and improvement of existing recreation facilities | Planning and analysis stage | New Hampshire – White Mountain National Forest, Coos County and Grafton County | • Paving<br>• Clearing and grading<br>• Erosion and runoff<br>• Construction<br>• Trail maintenance | • Soils<br>• Vegetation and wildlife<br>• Surface water |
| Farming – potatoes | Ongoing | Maine | • Pesticides and fertilizer<br>• Soil cultivation<br>• Vegetation removal<br>• Erosion and runoff | • Soils<br>• Water quality<br>• Wildlife<br>• Land use |
| Farming – dairy cows | Ongoing | New Hampshire – Coos County | • Grazing<br>• Waste<br>• Water contamination from runoff | • Soils<br>• Water quality<br>• Socioeconomic resources<br>• Hazardous waste |
| Forestry and logging | Ongoing | Maine, New Hampshire, Vermont | • Tree removal<br>• Trucks<br>• Heavy equipment<br>• Air emissions<br>• Site grading<br>• Erosion and runoff<br>• Noise<br>• Jobs | • Soils<br>• Vegetation and wildlife<br>• Surface and ground water<br>• Air quality<br>• Viewshed<br>• Human health and safety<br>• Socioeconomic resources<br>• Land use |

| Project Or Activity | Time Frame | Spatial Extent | Impact-Causing Factors | Affected Resource or Issue1 |
|---|---|---|---|---|
| Tree farms | Ongoing | Maine | • Pesticides and fertilizer<br>• Reduce biodiversity<br>• Reduce runoff<br>• Soil stabilization<br>• Oxygen production<br>• Carbon dioxide absorption | • Soils<br>• Vegetation<br>• Wildlife habitat<br>• Water quality<br>• Air quality<br>• Land use |
| Canada's Economic Action Plan – Infrastructure at ports of entry - modernization and expansion of Canada Border Services Agency facilities | 2010 - 2011 | Prescott, Ontario and<br>Huntingdon, Kingsgate<br><br>New York | • Clearing and grading<br>• Construction<br>• Visual impacts<br>• Construction traffic<br>• Improved cross-border traffic | • Vegetation and wildlife<br>• Viewshed<br>• Mobility<br>• Socioeconomic resources |
| **GREAT LAKES REGION: NEW YORK, PENNSYLVANIA, OHIO, MICHIGAN, AND WISCONSIN** | | | | |
| Vessel traffic | Ongoing | Great Lakes, including Canadian waters | • Noise<br>• Air emissions<br>• Discharges to water<br>• Vessel traffic | • Human health and safety<br>• Air quality<br>• Water quality |
| Bruce to Milton Transmission Reinforcement – 500-kV electricity transmission line | 2008 - 2011 | Kincardine, Ontario in a southeast direction to Milton, Ontario<br><br>New York | • Visual impacts (towers)<br>• Clearing and grading<br>• Erosion and runoff<br>• Construction | • Wildlife<br>• Viewshed<br>• Water quality<br>• Air quality |
| Darlington New Nuclear Power Plant – four new nuclear reactors | 2007 - 2012 | Darlington, Ontario<br><br>New York | • Runoff<br>• Air emissions<br>• Water discharges<br>• Hazardous materials and waste | • Wildlife<br>• Air quality<br>• Human health and safety<br>• Water resources |
| Hammond Reef Gold Mine – 50,000 ton/day gold mine project | Ongoing | 170 km west of Thunder Bay, Ontario<br><br>Minnesota and Wisconsin | • Runoff<br>• Air emissions<br>• Chemical releases<br>• Hazardous materials and waste | • Wildlife<br>• Air quality<br>• Water resources<br>• Human health and safety |

| Project Or Activity | Time Frame | Spatial Extent | Impact-Causing Factors | Affected Resource or Issue1 |
|---|---|---|---|---|
| Marathon Copper Mine – an open-pit mine with ore being processed at a nearby processing facility | 2010 - ongoing | 10 km north of the Town of Marathon, Ontario<br><br>Wisconsin | • Runoff<br>• Air emissions<br>• Chemical releases<br>• Hazardous materials and waste | • Wildlife<br>• Air quality<br>• Water resources<br>• Human health and safety |
| Port Granby Long-Term Low-Level Radioactive Waste Management - Port Granby waste management facility | Began in 2010 | North shore of Lake Ontario<br><br>New York | • Clean up radio-active waste and contaminated soil<br>• Air emissions<br>• Erosion and runoff<br>• Hazardous waste | • Wildlife<br>• Air quality<br>• Human health and safety<br>• Water resources |
| **EAST OF THE ROCKIES REGION: MINNESOTA, NORTH DAKOTA, AND EASTERN MONTANA** | | | | |
| Mineral mining | Ongoing | Minnesota, North Dakota, Montana | • Land clearing and grading<br>• Excavation and extraction<br>• Erosion and runoff<br>• Milling and crushing<br>• Hazardous waste<br>• Chemical releases | • Vegetation<br>• Wildlife habitat<br>• Water resources<br>• Human health and safety<br>• Air quality<br>• Land use |
| Wind farm and energy park | Ongoing | Montana – Toole County | • Construction<br>• Facility operations<br>• Visual impacts<br>• Noise<br>• Reduced air emissions | • Vegetation<br>• Wildlife habitat<br>• Viewshed<br>• Air quality<br>• Socioeconomic resources |
| Farming- wheat, barley | Ongoing | Montana, North Dakota | • Cultivation<br>• Habitat conversion<br>• Soil cover during winter<br>• Field expansion<br>• Pesticides and fertilizer | • Soils<br>• Water resources<br>• Vegetation and wildlife<br>• Socioeconomic resources<br>• Land use |

| Project Or Activity | Time Frame | Spatial Extent | Impact-Causing Factors | Affected Resource or Issue1 |
|---|---|---|---|---|
| Farming – sugar beets | Ongoing | North Dakota, Minnesota | • Cultivation<br>• Habitat conversion<br>• Harvesting equipment<br>• Runoff<br>• Pesticides and fertilizer | • Soils<br>• Water resources<br>• Vegetation and wildlife<br>• Socioeconomic resources<br>• Land use |
| Farming – soy beans | Ongoing | North Dakota, Minnesota | • Cultivation<br>• Habitat conversion<br>• Harvesting equipment<br>• Runoff<br>• Pesticides and fertilizer | • Soils<br>• Water resources<br>• Vegetation and wildlife<br>• Socioeconomic resources<br>• Land use |
| Farming – cattle and hog | Ongoing | Montana, North Dakota, Minnesota | • Air emissions<br>• Over-grazing<br>• Runoff<br>• Waste generation | • Water resources<br>• Air quality<br>• Socioeconomic resources<br>• Land use |
| Hartland wind farm – 333 wind turbines | Construction to begin in 2012 | North Dakota – Burke, Mountrail, and Ward counties | • Construction<br>• Facility operations<br>• Visual impacts<br>• Noise<br>• Reduced air emissions<br>• Jobs | • Wildlife habitat<br>• Viewshed<br>• Air quality<br>• Socioeconomic resources |
| Highwood Generating Station – coal-fired power plant and four wind turbines | In development | Montana – Great Falls | • Land clearing and grading<br>• Construction<br>• Erosion and runoff<br>• Air emissions<br>• Water discharges<br>• Job creation<br>• Noise<br>• Visual impacts<br>• Hazardous waste | • Air quality<br>• Water resources<br>• Vegetation<br>• Wildlife<br>• Cultural resources<br>• Viewshed<br>• Socioeconomic resources |

| Project Or Activity | Time Frame | Spatial Extent | Impact-Causing Factors | Affected Resource or Issue1 |
|---|---|---|---|---|
| Mon Dak Power Facility – coal, petroleum, wind, corn - ethanol | In development | Between Williston, North Dakota and Sidney, Montana | • Land clearing and grading<br>• Construction<br>• Erosion and runoff<br>• Air emissions<br>• Water discharges<br>• Job creation<br>• Noise<br>• Visual impacts<br>• Hazardous waste | • Air quality<br>• Water quality<br>• Vegetation<br>• Wildlife<br>• Cultural resources<br>• Viewshed<br>• Socioeconomic resources |
| Bakken Pipeline – 123.4-kilometers oil pipeline | 2010 - 2011 | Steelman, Saskatchewan to Cromer, Manitoba<br><br>North Dakota | • Clearing<br>• Erosion and runoff<br>• Air emissions | • Wildlife<br>• Water resources<br>• Air quality |
| Keystone XL Pipeline – 527-kilometer oil pipeline | Began in 2009 | Hardisty, Alberta to Monchy, Saskatchewan<br><br>Eastern Montana | • Clearing<br>• Erosion and runoff<br>• Air emissions | • Wildlife<br>• Water resources<br>• Air quality |
| Vantage Pipeline – 705-kilometer liquid ethane pipeline from Tioga, North Dakota to Empress, Alberta | Began in 2010 | North Dakota<br><br>Alberta | • Clearing and grading<br>• Erosion and runoff<br>• Construction<br>• Access roads<br>• Visual impacts | • Vegetation and wildlife<br>• Water resources<br>• Viewshed<br>• Air quality |
| **WEST OF THE ROCKIES REGION: WESTERN MONTANA, IDAHO, AND WASHINGTON** | | | | |
| West Pine Zone Pre-commercial thinning and prescribed fire | The next 10 - 15 years | Washington<br>5,100 acres of tree removal and<br>4,500 acres of prescribed fire | • Chain-saw pre-commercial tree thinning<br>• Prescribed burns<br>• Erosion and runoff | • Noise<br>• Air quality<br>• Water quality<br>• Runoff<br>• Vegetation and wildlife<br>• Human health and safety |

| Project Or Activity | Time Frame | Spatial Extent | Impact-Causing Factors | Affected Resource or Issue1 |
|---|---|---|---|---|
| Forestry and logging | Ongoing | Washington, Idaho, Montana | • Tree removal<br>• Trucks<br>• Heavy equipment<br>• Site grading<br>• Erosion and runoff | • Soil compaction<br>• Vegetation and wildlife<br>• Surface and ground water<br>• Viewshed<br>• Air quality<br>• Human health and safety<br>• Economics<br>• Land use |
| Farming – dairy | Ongoing | Washington | • Grazing<br>• Waste<br>• Water contamination from runoff | • Soils<br>• Water quality<br>• Socioeconomic resources<br>• Land use<br>• Hazardous waste |
| Farming – crops | Ongoing | Washington | • Pesticides and fertilizer<br>• Soil cultivation<br>• Vegetation removal<br>• Erosion | • Soils<br>• Water resources<br>• Vegetation and wildlife<br>• Socioeconomic resources<br>• Land use |

| Project Or Activity | Time Frame | Spatial Extent | Impact-Causing Factors | Affected Resource or Issue1 |
|---|---|---|---|---|
| Line Creek Coal Mine Expansion - coal mine expansion to maintain a production capacity of 10,700 tons per day | Began in 2009 | East Kootenay region of British Columbia<br><br>Idaho and Montana | • Air emissions<br>• Runoff<br>• Chemical releases<br>• Hazardous materials | • Air quality<br>• Water resources<br>• Human health |
| McNab Aggregate Mine – sand and gravel pit, processing plant, marine loading facility, upgrades to a small craft dock, an electrical substation, a maintenance facility, and an office. | Began in 2010 | On the western shore of Howe Sound in British Columbia<br><br>Washington | • Air emissions<br>• Runoff<br>• Chemical releases<br>• Hazardous materials | • Air quality<br>• Water resources<br>• Human health |
| Canada's Economic Action Plan – Infrastructure at ports of entry – modernization and expansion of Canada Border Services Agency facilities | 2010 – 2011 | Pacific Highway in British Columbia<br><br>Washington | • Clearing and grading<br>• Construction<br>• Visual impacts<br>• Construction traffic<br>• Improved cross-border traffic | • Vegetation and wildlife<br>• Viewshed<br>• Traffic<br>• Socioeconomic resources |

1 Only resources and issues affected by CBP projects and activities are considered in the cumulative analysis.

## 2.1 ADDITIONAL NON-CBP NORTHERN BORDER PROJECTS

Additional existing and planned non-CBP projects along the northern border that could contribute to cumulative impacts are described below.

### MAINE

**Port of Eastport Automated Bulk Materials Handling System:** The Port of Eastport, Maine is located along the northern border. Expansion of the Port of Eastport Automated Bulk Materials Handling System will allow the port to have both import and export capabilities in the bulk materials market. Expansion will include a new mainline 900-foot bi-directional conveyor system, related ship-loading equipment, and bulk yard receiving and storage facilities on the port's existing property. This will increase the amount of imports coming into the United States. About 30 new jobs will be created. The total project cost is $8,000,000.

**Aroostook County Transportation Plan:** The County Transportation Plan proposes a new, 2-lane, controlled-access highway extending east and north from the Route 1/Route 89 intersections, crossing Route 1 north of the Cary Medical Center, and connecting to Route 161 at a point approximately 1.25 miles south of Ogren Road. The project is located just north of Interstate 95 and extends to the northern border. Although benefiting the economy of Maine, the project will have some adverse environmental effects on wildlife, wetlands, water, vegetation, and land use. Impact-causing factors include runoff, land clearing, and visual impacts.

**Northern Forest Canoe Trail**: This multi-state initiative includes building recreational infrastructure along a 740-mile canoe trail in New York, Vermont, New Hampshire, Maine, and Canada. The project consists of constructing nine kiosks, placing 28 register boxes in key locations along the trail, completing the GIS mapping of the canoe trail route, and upgrading the organization's website planner. The trail starts in Fort Kent, Maine and extends to Old Forge, New York. Besides beneficial impacts on recreation, there will be some adverse environmental effects on water, soil, and vegetation. Impact-causing factors include land clearing, soil compaction, and vegetation removal.

**Kibby Mountain Extension Project**: The Kibby Mountain wind project is the largest wind power project in New England, currently consisting of 44 turbines. In January 2011 TransCanada was awarded a permit for an additional 11 turbines for Sisk Mountain located in Kibby and Chain of Ponds Townships in Franklin County, Maine. The turbines will generate 92 million kilowatt hours of electric generation per year, the equivalent of supplying 13,000 average Maine households. Environmental effects on wildlife habitat, viewshed, air quality, and socioeconomic resources are expected. Impact-causing factors include construction, facility operations, noise, reduced air emissions, and creation of jobs.

### NEW HAMPSHIRE

**Groveton LINC Cell Phone Tower**: A new cell phone tower is proposed to increase access to wireless in Groveton, Coos County, New Hampshire. The proposed cell phone tower site is located 13 miles north of the town on municipal reservoir property. The proposed cell phone tower site provides the best coverage area and provides simple access for construction. Total project costs are $220,000.  Some environmental effects on wildlife habitat, viewshed, air quality, and socioeconomic resources are expected.  Impact-causing factors include construction and facility operations.

**The Granite Reliable Wind Park**:  Located in Coos County, New Hampshire, the Granite Reliable Wind Park is currently in development and when operating will be a 99-megawatt (MW) windpark.  The windpark will create new jobs and will invest in the local economy; however, adverse effects on wildlife habitat, viewsheds, and air quality are expected.  Impact-causing factors include reduction in air emissions, construction, and facility operations.

**VERMONT**

**Northern Vermont Fiber Optic Connection Project:**  A fiber-optic cable connection from Stanhope, Quebec to Norton, Vermont will be built to ensure that technological infrastructure is available in this rural area.  This will help create jobs in the area.  Besides beneficial socioeconomic impacts, the project may cause adverse environmental effects to water, soil, and vegetation.  Impact-causing factors include land clearing, soil compaction, and vegetation removal.

**NEW YORK**

**St. Lawrence County IDA Water Line**:  A second water main will be constructed in the Village of Gouverneur, St. Lawrence County, New York.  The project is expected to create 300 jobs.  Impact-causing factors include runoff, land clearing, and visual impacts.

**Bruce to Milton Transmission Reinforcement Project**: Hydro One is proposing to build a new 180-kilometer double-circuit 500-kV transmission line from the Bruce Power facility in Kincardine, Ontario to Hydro One’s Milton Switching Station in the Town of Milton, New York. The Bruce to Milton Project supports the Province’s climate change and clean air initiatives by providing transmission capability to reliably and safely deliver an additional 3,000 MW of energy from clean and renewable sources.  Construction is projected to last from 2008 through 2011.  This project could cause visual impacts and would require clearing and grading.  This would lead to erosion and runoff.  There could be impacts on vegetation, wildlife, air quality, human health and safety, land use, scenic quality, and water resources.  Construction would also create jobs in the surrounding area.

**Lewis County Water/Wastewater Implementation Project**:  Located in Lewis County, New York, the project is designed to facilitate improved efficiencies for water and wastewater infrastructure in the Villages of Lyons Falls and Port Leyden, and the Town of Martinsburg. This project will enable local businesses to continue or expand operations, thereby creating new jobs and maintaining existing ones.  The business impact also includes improving water/wastewater services to Otis Technology, Inc., a world leader in gun cleaning systems and one of the largest private employers in Lewis County.  Construction is projected to begin in 2011.  This project will help retain over 250 jobs.  On top of impacts to the job force and economy, there could be effects on human health and safety, water, vegetation, wildlife, and land use.  Impact-causing factors include runoff, land clearing, construction, and noise.

**Midtown Rising**: Midtown Rising is a redevelopment partnership that will significantly shape the rebirth of the downtown Rochester, New York core through major public and private investment, job creation and infrastructure development. At the heart of the project is the rehabilitation of the nearly 9-acre former Midtown Plaza into a mixed-use area designed to attract a critical mass of residents and 24-hour amenities. Midtown Rising is an 8- to 10-year development plan, which began in 2008. Once completed, the site will accommodate about one million square feet of office, residential, hotel and retail space and will create approximately 2,000 new jobs for downtown Rochester. On top of impacts to the job force and economy there could be effects on human health and safety, water, wildlife, vegetation, scenic quality, and air quality. Impact-causing factors include runoff, land clearing, construction, and noise.

## OHIO

**Northwest Ohio Intermodal Facility**: Located in Wood County, Ohio, the facility is the cornerstone of the National Gateway, an $840-million, multi-state infrastructure initiative aimed at creating an efficient and environmentally-friendly freight link between the mid-Atlantic ports and the Midwest. The new facility will employ more than 200 people when fully operational with an additional 400 jobs being created during the construction phase. Over the next 10 years, creation of more than 2,600 direct and indirect jobs is expected as a result of the project. The Northwest Ohio Intermodal Facility offers the potential for significant new business investment and job growth in the region. Thousands of containers will move goods by rail into the terminal, and there would be an opportunity to return the containers overseas with American products or commodities. This project is directly related to several other key investments in the region, such as a Route 18 transformation and a regional collaboration with Lucas County to expand I-75. The facility could put Wood County at the center of a very significant transportation and distribution system that would benefit all sectors of the economy, especially agriculture. The project is scheduled for completion in the second quarter of 2011. On top of impacts to the job force and economy, there could be environmental effects on human health and safety, water, wildlife, vegetation, and land use. Impact-causing factors include runoff, land clearing, construction and noise.

**OneCommunity**: Located throughout northeastern Ohio, OneCommunity was awarded a $44.8-million stimulus grant in August 2010 to add nearly 1,000 miles of fiber to the existing community broadband network. Part of a $70-million fiber-construction initiative, the Comprehensive Community Infrastructure project will: Create 500 jobs; deliver high-speed affordable connectivity to an estimated 800 anchor institutions such as schools, hospitals, government offices, public safety facilities, and other non profits; provide service to the region's carriers, cable operators, and private networks, enabling them to offer individuals and businesses a broader range of affordable broadband services; and combine with two other fiber construction projects to create a seamless open network across the entire state of Ohio. Construction on the project is scheduled to begin at the end of 2010 and last through 2012. On top of impacts to the job force and economy, there could be effects on human health and safety, water, wildlife, vegetation, scenic quality, and land use. Impact-causing factors include runoff, land clearing, and construction.

**Com Net, Inc.**: Located throughout western Ohio, the project will add almost 700 new miles of fiber to its high-capacity network to expand existing broadband services to rural and underserved communities in 28 western Ohio counties. The project proposes to provide connectivity to a high-capacity fiber network to as many as 880 community anchor institutions including K-12, state and local government, public safety, libraries, and community support organization facilities; spur affordable broadband access for local consumers and businesses by enabling local service providers to connect to the project's open network; and encourage investment in economically distressed counties served by the project, 20 of which have unemployment rates higher than the state average. On top of impacts to the job force and economy, there could be effects on human health and safety, water, wildlife, vegetation, and land use. Impact-causing factors include runoff, land clearing, and construction.

**LEEDCo**: This wind project will be located in Lake Erie off the coast of Ohio and is projected to eventually generate 1,000 MW of electricity. The first turbines will be located 6 miles north of Cleveland Browns stadium. This initial phase will cost between $80 million and $100 million. The direct-drive turbines will each provide 4 MW of electricity and should be operational by the end of 2012, generating enough electricity to power 6,000 homes. This phase will be followed by subsequent projects with a long-term goal of 1,000 MW in the Ohio waters of Lake Erie by 2020.

## MICHIGAN

**Thumb Loop Transmission Line Project**: Approved in August 2010, this project calls for the construction of approximately 140 miles of double-circuit 345,000-volt (345-kV) lines and 4 new substations that will serve as the backbone of the system to provide power to the "Thumb" region. The Huron POE is 86.2 miles away from the loop in Tuscola County, 63 miles from the same loop within Huron County, and 20 miles from the U.S.-Canada border. The western side of the loop from Tuscola County to Huron County is tentatively planned to enter service in late 2013; the remainder would be targeted for completion by 2015. Impact-producing activities include clearing, grading, and construction. Impacts could occur to human health and safety, land use, visual resources, water, and biological resources.

## WISCONSIN

**Curt Manufacturing**: A 150,000-square-foot warehouse and logistics facility will be built adjacent to an existing 165,000-square-foot manufacturing plant, enabling Curt to expand their fabrication, welding, and two-coat finishing process areas for towing systems, goods, trailer products, and specialty equipment. Construction of this $12.8-million facility expansion has begun in Altoona, Wisconsin, which is 275 miles from the northern border and 195 miles from the Green Bay POE. The project is expected to be completed by June 2011, and will create up to 125 jobs. Impact-causing factors include construction, facility operations, noise, air emissions, and job creation, and water discharges.

**The Alberta Clipper**: Enbridge Energy, LP, completed the installation of a 1,000-mile, 36-inch pipeline from northern Canada, to Superior, Wisconsin in March 2010, 326 miles of which was in the United States. The pipeline was being built along an existing Enbridge pipeline right-of-way that enters the United States near Neche, North Dakota, running through northwestern Minnesota, past Thief River Falls and Clearbrook, Minnesota**.** The Green Bay POE is the CBP facility closest to Superior, Wisconsin, which is approximately 320 miles away and 100 miles from the northern border. The Enbridge expansion will pump another 19 million gallons of oil into the Midwest each day. Impact-causing factors include erosion and runoff, construction, air emissions, and the use of access roads.

**Weston-Arrowhead Transmission Line**: The Wisconsin Public Service Corporation and Minnesota Power propose to construct a new 220-mile, 345-kV electric transmission line from the Weston Power Plant near Wausau, Wisconsin to the Arrowhead substation near Duluth, Minnesota**.** The Green Bay POE is approximately 94.4 miles from the Weston Power Plant near Wausau, Wisconsin and 189 miles from the northern border. The Arrowhead substation near Duluth, Minnesota is closest to the Roseau POE, approximately 66 miles away. The project also includes the proposed construction of a new 345/115-kV substation to be located near Tripoli, Wisconsin and the construction of a new 115-kV transmission line from the Tripoli substation to the existing Highway 8 substation in Rhinelander, Wisconsin. Project activities include clearing, grading, and construction, which could cause impacts to human health and safety, land use, visual resources, water, and biological resources.

**MINNESOTA**

**St. Louis County Union Depot and Northern Lights Express**: These projects are part of a planned high-speed passenger rail line between Twin Ports and Twin Cities. It is a part of the larger Midwest Regional Rail Initiative. The Minnesota portion includes about 150 miles of rail and would cut travel time by 30 to 50 percent. Since most infrastructure is in place and impacts would be limited to socioeconomic affects, jobs, noise, and air quality.

**Willmar Municipal Utility, Corncob Co-combustion Plant Modification**: This $3 million project will be the first full-scale corncob co-combustion power generation system in the United States and will utilize an agricultural by-product to create fuel.

**Goodhue County Wind Project**: The project will spread over 32,000 acres of Goodhue County and will include up to fifty 400-foot turbines. Negotiations with homeowners should address noise impacts. Construction should be completed in spring 2011 with operations beginning soon after.

**Polymet Land Exchange**: Forest Service lands would be used for sulfide mining in the Superior National Forest, resulting in the acquisition of 6,650 acres of publicly owned lands and the loss of over 1,000 acres of wetlands in the Lake Superior Watershed. The Iron Range Resources and Rehabilitation Board approved a $4-million loan to Polymet; it is currently being challenged in court. The facility could provide up to 400 permanent jobs. Superior National Forest is about 12 miles from the Canadian border.

**NORTH DAKOTA**

**Langdon Wind Project**: This project is located in Langdon, Cavalier County, North Dakota. Total energy production is expected to be 159 MW at peak output using 106 wind turbines. Thirty-five miles of transmission line will be upgraded from 41.6 kV to 115 kV. Operations began in 2008. Langdon is just over 80 miles from the Canadian border. Impact-causing factors include construction, facility operations, noise, air emissions, and disturbance to wildlife. Affected resources include jobs, human health and safety, and aesthetic resources.

**Renewable Energy Plant**: Construction started on this $60-million project in Cavalier County in January 2010. It is expected to be operational in December 2014. Energy sources include biofuel and wind. The supply of the raw products is readily available for plant operations and growers of the products will have shorter distances to drive to sell their product. The development of a biomass energy plant would complement a planned canola crushing plant.

**Midwest Independent Transmission System Operator Smart Grid Project**: This $34.5-million project covers parts of Iowa, Illinois, Michigan, Minnesota, Missouri, Montana, North Dakota, Ohio, Pennsylvania, South Dakota, and Wisconsin. This project will install, test, integrate, and monitor phasor measurement units in strategic locations across the Midwest in independent transmission system operations, which will improve energy dispatching, system reliability, and planning capabilities. Impacts could occur from construction and changes to utilities and infrastructure.

**Southern Lights Project**: This pipeline system will transport light hydrocarbons from the Chicago area to Alberta's oil sands. The pipeline will connect Canada's vast oil sands with key refinery markets in the U.S. Midwest, and it will require construction of some new pipelines and use of some segments of existing Enbridge pipeline that will be reversed for south-to-north use. A separate pipeline is proposed from Edmonton, Alberta to the heavy oil-sands region in northern Alberta. The project also includes a 313-mile, 20-inch crude oil pipeline from Cromer, Manitoba to Clearbrook, Minnesota that was brought into operation in February 2009. Project activities would create jobs and could cause impacts to wildlife, vegetation, soils, air and water quality, and human health and safety.

**Quintana Capital Group Pipeline:** This $250-million, 300-mile-long pipeline system will extend from Watford City in western North Dakota to Fallon County in eastern Montana and will connect the Williston Basin producing regions with the TransCanada Keystone XL pipeline. Completion is scheduled for 2013. Watford City, North Dakota is just over 80 miles from the Canadian border. Construction activities could affect vegetation, wildlife, soils, air and water quality, visual resources, and socioeconomic resources. Spills and leaks could occur during operations.

### MONTANA

**Keystone Gulf Coast Expansion**: The proposed project is a 1,661-mile, 36-inch crude oil pipeline that would begin at Hardisty, Alberta and extend southeast through Saskatchewan, Montana, South Dakota, and Nebraska. The pipeline is 440 miles from the closest CBP facility—the Roseau POE—and 200 miles from Great Falls, Montana. The Keystone XL pipeline would enter the United States at Port Morgan, Montana and then extend through South Dakota, Nebraska, Oklahoma, and Texas. Construction began in 2009, and the Montana segment of the 327.5-mile (total) oil pipeline is scheduled for construction in 2011 and 2012. The Keystone XL Pipeline will have the nominal capacity to deliver up to 900,000 barrels per day of crude oil. Impact-producing factors include clearing, erosion and runoff, job creation, and air emissions.

**Existing Wind Facilities:** (1) The **Horseshoe Bend Wind Park**, is a 9-MW capacity wind farm about 5 miles west of the City of Great Falls and about 7 miles northwest of Great Falls POE; (2) the **Valley County Wind Farm** is a 10-MW capacity facility about 26 miles north of Glasgow, 20 miles south from the Opheim POE, and 30 miles from the northern border; and (3) the **Glacier Wind Farm** is a 210-MW capacity wind farm near Ethridge, Montana, which is around 15 miles west of the Shelby Border Patrol station and 30 miles from the northern border. Impact-producing factors include construction, facility operations, visual impacts, noise, and reduced air emissions.

**Westmoreland Savage Corporation's Savage Mine**: This 874-acre strategically placed single-pit surface mine is located in Sidney, 100 miles from the northern border and 90 miles from the Raymond POE. The Savage Mine produces approximately 350,000 tons of lignite annually and also has a full-requirements contract with the 69-MW Lewis & Clark Station, which utilizes emission control technologies and has a long-standing annual supply relationship with a sugar beet refinery near Sidney, Montana. Impact-causing factors include land clearing and grading, excavation and extraction, erosion and runoff, milling and crushing, hazardous waste, and chemical releases.

**Montanore Silver-Copper Project:** This project would be located in the Coeur d'Alene Mining District, roughly 50 miles from the Canadian border and the Eureka POE. The proposed Montanore project is targeting an initial production capacity of approximately 12,500 tons per day, to yield an annual production rate of 8 million ounces of silver and 60 million pounds of copper. The mine is estimated to contain more than 230 million ounces of silver and nearly 2 billion pounds of copper. Based on long-term silver and copper prices, the mine has a $ 485.6 million net present value. Major infrastructure for the project will include construction of a 230-kV electrical transmission line approximately 17 miles in length, access road and bridge improvements, and water treatment facilities. The project is currently undergoing NEPA analysis. Impact-causing factors include erosion and runoff, clearing and grading, excavation and extraction, air emissions, chemical releases, hazardous materials and waste, visual impacts (towers), water discharges, and job creation.

## WASHINGTON

**The Kittitas Valley Wind Power Project**: This project is located in Kittitas County, Washington, approximately 12 miles west of Ellensburg. Construction began in mid-March 2010. Forty-eight of 52 wind turbines have been installed, and the project is scheduled for completion in 2011. The project site consists of approximately 5,400 acres of forest and rangeland; the project connects to the Bonneville Power Administration transmission system. Resources that could be affected by this project include, but are not limited to, visual resources, jobs, habitat, vegetation, recreation, local residences, human health and safety, land use, bird and bat migration, and traffic.

**The Teanaway Solar Reserve (TSR) project**: The TSR project received final approval in August 2010. The 75-MW project, when completed, will likely be the largest photovoltaic (PV) installation in the northwest and one of the largest in the world. When operational, the reserve will supply enough electricity to power about 45,000 homes. It will be built about 90 miles east of Seattle just outside of Cle Elum, Washington on previously logged land. Resources that could be affected by this project include, but are not limited to, visual resources, jobs, recreation, local residences, human health and safety, noise, habitat, introduction of invasive species, and land use.

**The Satsop Combustion Turbine Project**: This project consists of 2 combustion turbine generators in a "two on one" configuration with a single steam turbine generator; it is located on a 20-acre site within the Satsop Redevelopment Park in Grays Harbor County. The project will produce a nominal output of approximately 530-MW per year, with a maximum annual output of approximately 650-MW. The entire 20-acre site was previously developed, including grading and surfacing with gravel and asphalt. Resources that could be affected by this project include, but are not limited to, jobs, recreation, local residences, human health and safety, land use, noise, habitat, traffic, and introduction of invasive species.

**The Desert Claim Wind Power Project:** This wind project will be a 190-MW wind power project located on approximately 5,200 contiguous acres in Kittitas County, 8 miles northwest of Ellensburg, Washington. The project will include a maximum of 95 turbines and associated electrical collection system that would connect to the regional high-voltage transmission grid. The project area includes purchased land and land leased from private and public land owners. These MM92 model turbines have a tower height of 258 feet, a rotor diameter of 304 feet, a total height of 410 feet, and a generating capacity of 2.0 MW. Resources that could be affected include, but are not limited to visual resources, jobs, habitat, vegetation, recreation, local residences, human health and safety, land use, and bird and bat migration.

**The BP Cherry Point Cogeneration Project:** The proposed project is to construct and operate a 720-MW, natural-gas-fired, combined-cycle cogeneration facility in Whatcom County, Washington, approximately 7 miles south of Blaine. The project would provide stable and reliable electricity and steam to meet the needs of the refinery and provide electricity to the Bonneville Federal Columbia River Transmission System. Approximately 195 acres of undeveloped land would be converted for the cogeneration facility, which would consist of gas, water, wastewater, and steam pipelines; construction laydown areas; access roads; and wetland mitigation areas. There are no immediate plans to begin construction. Resources that could be affected by this project include jobs, noise, spills, air quality, vegetation habitat, water quality, introduction of invasive species, land use, human health and safety, recreation, local residences, and traffic.

**The Sumas Generating Station:** The Sumas Generating Station is located in Sumas, Washington, just south of the Canadian border. The facility can produce 125 MW of electricity when operating at maximum capacity. That is enough power to meet the peak electricity needs of about 94,000 households. Built in 1993, the power plant employs modern, combined-cycle combustion-turbine technology that allows it to generate electricity using both a natural gas cycle and, from the exhaust heat of its power-generating turbines, a steam cycle. Combined-cycle plants like Sumas operate more efficiently than single-cycle gas-fired plants.

## CANADA

### *Adjacent to New England Region*

**St. Stephen Border Crossing:** This project is part of the Federal government's initiative to improve the accessibility of its buildings. An accessibility audit will be conducted by the Public Works and Government Services Canada followed by any needed repairs or upgrades. This border crossing is directly opposite of the Calais POE, north of the U.S.-Canada border.

**Contaminated Sites Action Plan:** This project involves conducting assessments to help determine the nature and level of contamination, as well as the next steps in the environmental remediation of the contaminated sites. The following locations along the border are designated as site locations:

- St. Croix border crossing, across the border from the Vanceboro POE in Maine; and
- St. Leonard border crossing, across the border from the Van Buren POE in Maine.

**Infrastructure at Ports of Entry:** Through Canada's Economic Action Plan, the Federal government is providing funding to accelerate the modernization and expansion of Canada Border Services Agency facilities at Prescott, Ontario and at Huntingdon, Kingsgate, and the Pacific Highway in British Columbia. The initiative costs an estimated $70 million, and construction at all sites is scheduled for completion in March 2012. This project involves the following border crossings and project specifics:

- Investigating water issues and septic fields as well as repairing the flooring at the St. Croix border crossing, customs, and immigration complex, across from the Vanceboro POE in Maine.
- Across from the Van Buren POE, the St. Leonard customs and immigration building will be remodeled with new paint and flooring.

### *Adjacent to the Great Lakes Region*

**Bruce to Milton Transmission Reinforcement:** Hydro One's Bruce to Milton Transmission Reinforcement Project is a 500-kV electricity transmission line proposal that will connect the proposed new nuclear power sources at the Bruce site in Kincardine, Ontario to the switching station just west of Toronto, Ontario. The proposal requires the construction of temporary access roads. This project is still awaiting approval but has a proposed timeline that calls for operations beginning in 2012.

**Darlington New Nuclear Power Plant:** Ontario Power Generation's Darlington New Nuclear Power Plant Project is a proposal to construct and operate up to four new nuclear reactors at the Darlington, Ontario nuclear site for the production of approximately 4,800 MW of electricity. The site is located in the regional municipality of Durham, 70 kilometers (43.5 miles) east of Toronto and across Lake Ontario from Orcutt, New York.

**Trillium Offshore Wind Farm:** Trillium Power Wind Corp., Toronto is proposing Trillium Power Wind 1, a 414-MW project consisting of 138 wind turbines. The project would cover about 16,000 acres in the shoals south and west of Main Duck Island, 27 kilometers (16.8 miles) from Cape Vincent in Lake Ontario. The project will sit 17 kilometers (10.6 miles) from the nearest shoreline in Prince Edward County, Ontario and 28 kilometers (17.4 miles) from the shoreline in the town of Greater Napanee, where the transmission line will make landfall. Trillium Power plans to begin construction in July 2012 and complete the project in November 2014.

**Wolfe Island Wind Plant Rehabilitation:** This project involves rehabilitating the Wolfe Island Wind Plant. This is expected to generate increased traffic volumes on the Township Road system. The project is located on Wolfe Island, which is on the northwest edge of Lake Ontario just north of the Canada-U.S. boundary and about 64.4 kilometers (40 miles) south of the

Ogdensburg, New York POE. The facility currently includes 86 wind turbines and can generate up to 594,000 MW per year.

### *Adjacent to the East of the Rockies Region*

**Southern Manitoba Railway Operation:** Boundary Trail Railway Company will establish a short-line railway operation in the communities of Morden, Manitou, Darlingford, La Rivière, and the rural municipalities of Stanley and Pembina that will provide rail transport service for the region's agricultural producers and other businesses on the section of track between Morden and Binney Siding just west of Manitou. This project occurs just north of Grand Forks, North Dakota and will run close to the Pembina POE.

**Vantage Pipeline:** The proposed Vantage Pipeline is a high vapor pressure pipeline carrying ethane from a source near Tioga, North Dakota, extending northwest, through Saskatchewan, Canada, and terminating near Empress, Alberta. The pipeline will link a growing supply of ethane from North Dakota to markets in Alberta. The proposed pipeline will be steel, approximately 700-km long (430 miles), with an outside diameter of 273 millimeters (11 inches).

### *Adjacent to the West of the Rockies Region*

**Infrastructure at Ports of Entry:** Through Canada's Economic Action Plan, the Federal government is providing funding to accelerate the modernization and expansion of Canada Border Services Agency facilities at Prescott, Ontario and at Huntingdon, Kingsgate and the Pacific Highway in British Columbia. The initiative costs an estimated $70 million, and construction at all sites is scheduled for completion in March 2012. Work will take place at the following sites:

- Huntingdon, British Columbia / Sumas, Washington – Modernization;
- Kingsgate, British Columbia / Eastport, Idaho – Replacement; and
- Pacific Highway in British Columbia / Blaine, Washington – Modernization.

**Marten Ridge Wind Energy:** Premier Renewable Energy's Marten Ridge Wind Energy project is an 80-MW wind-power proposal located near Fernie, British Columbia. The proposal consists of approximately forty 2-MW wind turbines, an interconnecting collector system, a substation, access roads, and an overhead transmission line to connect the wind turbine area to an interconnection point on the existing power grid. This project is located about 32.2 kilometers (20 miles) north of the Roosville POE in Montana.

**Bakken Pipeline:** Enbridge Bakken Pipeline Company Inc. has proposed the construction of a 123.4-kilometer (76.7 mile) oil pipeline from Steelman, Saskatchewan to Cromer, Manitoba. The pipeline will be designed to transport up to 145,800 barrels-per-day of oil and will connect to a pipeline in North Dakota. As the existing pipeline originates in the United States, the overall Bakken Expansion Program will include regulatory applications on both sides of the border. The project is still in the environmental assessment stage. Construction may begin in 2012.

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# APPENDIX G

# BUREAU OF LAND MANAGEMENT VISUAL RESOURCES MANAGEMENT GUIDE

## PART I: GENERAL INFORMATION

General Guidance.

A. Overview. The visual resource inventory process provides Bureau of Land Management (BLM) managers with a means for determining visual values. The inventory consists of a scenic quality evaluation, sensitivity level analysis, and a delineation of distance zones. Based on these three factors, BLM-administered lands are placed into one of four visual resource inventory classes. These inventory classes represent the relative value of the visual resources. Classes I and II being the most valued, Class III representing a moderate value, and Class IV being of least value. The inventory classes provide the basis for considering visual values in the resource management planning (RMP) process. Visual Resource Management classes are established through the RMP process for all BLM-administered lands (see also Manual 1625.3). During the RMP process, the class boundaries are adjusted as necessary to reflect the resource allocation decisions made in RMP's. Visual management objectives are established for each class. (See Section VB.)

B. Implementation Options. The detail of the inventory will vary with the visual character of the landscapes being inventoried. For example, the flat, colorless, and barren mancos shale area in southeastern Utah should not be given the same treatment as the rugged and colorful formations of the Colorado River area. Sensitive areas such as those near major highways or communities or adjacent to national parks should be given special treatment. It may be necessary to modify or make adaptations to the inventory system in such places as Alaska where the resource characteristics and the land-use patterns are significantly different from those in the Western States. These adaptations must (1) provide a more cost-effective way to complete a quality inventory, and (2) keep the conceptual framework of the Visual Resource Management (VRM) system intact.

C. Material Storage. All visual resource inventory rating forms, overlays, slides, and written material should be filed in the Resource Area Office.

**II. Scenic Quality Evaluation**. Scenic quality is a measure of the visual appeal of a tract of land. In the visual resource inventory process, public lands are give an A, B, or C rating based on the apparent scenic quality which is determined using seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications (see Illustrations 1, 2, 3, and 4). During the rating process, each of these factors are ranked on a comparative basis with similar features within the physiographic province. Use the physiographic provinces as delineated by Fenneman (see Illustrations 5 and 6) to the extent possible. The boundaries of these provinces may be refined to fit local situations. The "Ecoregions of the United States" by R.C. Bailey may be helpful in making these refinements. An important premise of the evaluation is that all public lands have scenic value, but areas with the most variety and most harmonious composition have the greatest scenic value. Another important concept is that the evaluation of scenic quality is done in relationship to the natural landscape. This does not mean that man-made features within a landscape necessarily detract from the scenic value. Man-made features that compliment the natural landscape may enhance the scenic value. Evaluations should avoid any bias against man-made modification to natural landscape.

A. Delineating Scenic Quality Rating Units (SQRU's). The planning area is subdivided into scenic quality rating units for rating purposes. Rating areas are delineated on a basis of: like physiographic characteristics; similar visual patterns, texture, color, variety, etc.; and areas which have similar impacts from man-made modifications. The size of SQRU's may vary from several thousand acres to 100 or less acres, depending on the homogeneity of the landscape features and the detail desired in the inventory. Normally, more detailed attention will be given to highly scenic areas or areas of known high sensitivity. Map and number each SQRU on an overlay as shown in Illustration 7.

B. Evaluating Scenic Quality. It is recommended that an interdisciplinary team do the evaluations. Ideally, one team member should have an environmental design arts background. All participants should have an understanding of the visual resource inventory system and be familiar with the areas to be evaluated. Evaluate each SQRU by observing the area from several important viewpoints. Scores should reflect the evaluator's overall impression of the area. After evaluating all the SQRU's, show the scenic ratings on the scenic quality overlay (see Illustration 7). Record the rating on the Scenic Quality Rating Summary - Bureau Form 8400-5 (see Illustration 4). Bureau Form 8400-1 (see Illustration 3) may be used as a worksheet for completing each scenic quality evaluation. A photographic record should be maintained for the area. Photographs and completed evaluation forms should be filed for future reference.

**III. Sensitivity Level Analysis.** Sensitivity levels are a measure of public concern for scenic quality. Public lands are assigned high, medium, or low sensitivity levels by analyzing the various indicators of public concern.

<u>A. Factors to Consider.</u>

1. Type of Users. Visual sensitivity will vary with the type of users. Recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change.

2. Amount of Use. Areas seen and used by large numbers of people are potentially more sensitive. Protection of visual values usually becomes more important as the number of viewers increase.

3. Public Interest. The visual quality of an area may be of concern to local, state, or National groups. Indicators of this concern are usually expressed in public meetings, letters, newspaper or magazine articles, newsletters, land-use plans, etc. Public controversy created in response to proposed activities that would change the landscape character should also be considered.

4. Adjacent Land Uses. The interrelationship with land uses in adjacent lands can affect the visual sensitivity of an area. For example, an area within the viewshed of a residential area may be very sensitive, whereas an area surrounded by commercially developed lands may not be visually sensitive.

5. Special Areas. Management objectives for special areas, such as Natural Areas, Wilderness Areas or Wilderness Study Areas, Wild and Scenic Rivers, Scenic Areas, Scenic Roads or Trails, and Areas of Critical Environmental Concern (ACEC), frequently require special consideration for the protection of the visual values. This does not necessarily mean that these areas are

scenic, but rather that one of the management objectives may be to preserve the natural landscape setting. The management objectives for these areas may be used as a basis for assigning sensitivity levels.

6. Other Factors. Consider any other information such as research or studies that includes indicators of visual sensitivity.

B. Delineation of Sensitivity Level Rating Units (SLRU's).

There is no standard procedure for delineating SLRU's. The boundaries will depend on the factor that is driving the sensitivity consideration. Consequently, a thorough review of the factors referred to in IIIA should be completed before any attempt is made to delineate SLRU's. Distance zone may also play an important role in identifying the SLRU boundaries.

C. Documentation Requirements.

1. Narrative. Prepare a summary statement with the essential facts and rationale to support the conclusions reached on sensitivity levels. The format for presenting this information is optional. As a minimum, the summary data must be entered on Form 8400-6 (see Illustration 8). Backup information used to evaluate each of the factors should be maintained with the inventory record.

D. Completion of Sensitivity Rating.

The instructions for completing the sensitivity ratings are shown in Illustration 8. Ideally, the rating should be done as a team effort involving the Area or District VRM Coordinator, Area Manager, and at least one other staff person. If timing or funding will allow this approach, the rating may be done by the VRM coordinator and reviewed by the Area Manager. Management should be in agreement on the summary rating for each SLRU.

**IV. Distance Zones**. Landscapes are subdivided into three distanced zones based on relative visibility from travel routes or observation points. The three zones are: foreground-middleground, background, and seldom seen. The foreground-middleground (fm) zone includes areas seen from highways, rivers, or other viewing locations that are less than 3 to 5 miles away. Seen areas beyond the foreground-middleground zone but usually less than 15 miles away are in the background (bg) zone. Areas not seen as foreground-middleground or background (i.e., hidden from view) are in the seldom-seen (ss) zone.

A. Mapping Distance Zones.

Prepare a distance zone overlay (see Illustration 10) using a base map common to the scenic quality base map. Distance zones are determined in the field by actually traveling along each route and observing the area that can be viewed. If the route is a highway or trail, it should be traveled in both directions, unless it is a one-way route. River use usually is one way; however, if there is up-river travel, it too should be evaluated from both directions. If a vehicle or boat is used for this field survey, it is best to have both a driver and an observer. Distance zones should be mapped for all areas. While they are not necessary to determine classes in Class A scenic areas or for areas with low sensitivity levels, distance zones can provide valuable data during the RMP process when adjustments to VRM classes are made to resolve resource allocation conflicts.

1. Foreground-Middleground Zone. This is the area that can be seen from each travel route for a distance of 3 to 5 miles where management activities might be viewed in detail. The outer boundary of this distance zone is defined as the point where the texture and form of individual plants are no longer apparent in the landscape. In some areas, atmospheric conditions can reduce visibility and shorten the distance normally covered by each zone. Also, where the foreground-middleground zone from one travel route overlaps the background from another route, use only the foreground-middleground designation.

2. Background Zone. This is the remaining area which can be seen from each travel route to approximately 15 miles. Do not include areas in the background that are so far distant that the only thing discernible is the form or outline. In order to be included within this distance zone, vegetation should be visible at least as patterns of light and dark.

3. Seldom-Seen Zone. These are areas that are not visible within the foreground-middleground and background zones and areas beyond the background zones.

<u>B. Coordinating Distance Zones Delineation and Sensitivity Level Analyses.</u>

It is recommended that distance zones be delineated before the sensitivity analysis is done. The distance zone delineations provide valuable information that can be very useful in the sensitivity analysis. For example, the foreground-middleground zones are more visible to the public and changes are more noticeable and are more likely to trigger public concern. Also, the boundaries of the distance zones are very useful in helping to establish sensitivity rating units.

## V. Visual Resource Classes and Objectives.

A. Purposes of Visual Resource Classes. Visual resource classes are categories assigned to public lands, which serves two purposes: (1) an inventory tool that portrays the relative value of the visual resources, and (2) a management tool that portrays the visual management objectives. There are four classes (I, II, III, and IV).

1. Visual Resource Inventory Classes. Visual resource inventory classes are assigned through the inventory process. Class I is assigned to those areas where a management decision has been made previously to maintain a natural landscape. This includes areas such as national wilderness areas, the wild section of national wild and scenic rivers, and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Classes II, III, and IV are assigned based on a combination of scenic quality, sensitivity level, and distance zones. This is accomplished by combining the three overlays for scenic quality, sensitivity levels, and distance zones and using the guidelines shown in Illustration 11 to assign the proper class. The end product is a visual resource inventory class overlay as shown in Illustration 12. Inventory classes are informational in nature and provide the basis for considering visual values in the RMP process. They do not establish management direction and should not be used as a basis for constraining or limiting surface disturbing activities.

2. Visual Resource Management Classes. Visual resource management classes are assigned through RMP's. The assignment of visual management classes is ultimately based on the management decisions made in RMP's. However, visual values must be considered throughout

the RMP process. All actions proposed during the RMP process that would result in surface disturbances must consider the importance of the visual values and the impacts the project may have on these values. Management decisions in the RMP must reflect the value of visual resources. In fact, the value of the visual resource may be the driving force for some management decisions. For example, highly scenic areas which need special management attention may be designated as scenic Areas of Critical Environmental Concern and classified as VRM Class I based on the importance of the visual values. A map is developed in each RMP showing the approved visual resource management classes.

B. Objectives for Visual Resource Classes.

1. Class I Objective. The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

2. Class II Objective. The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

3. Class III Objective. The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

4. Class IV Objectives. The objective of this class is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

C. Rehabilitation Areas.

Areas in need of rehabilitation from a visual standpoint should be flagged during the inventory process. The level of rehabilitation will be determined through the RMP process by assigning the VRM class approved for that particular area.

D. Interim VRM Classes and Objectives.

Interim visual management classes are established where a project is proposed and there are no RMP-approved VRM objectives. These classes are developed using the guidelines in Section I to V and must conform to the land-use allocations set forth in the RMP, which covers the project area. The establishment of interim VRM classes will not require a RMP amendment, unless the project that is driving the evaluation requires one.

## PART II: RATING SCENIC QUALITY

**Purpose**: To rate the visual quality of the scenic resource on all BLM managed lands.
**How to Identify Scenic Value:** All BLM lands have scenic value.
**How to Determine Minimum Suitability:** All BLM lands are rated for scenic values. Also rate adjacent or intermingling non-BLM lands within the planning unit.
**When to Evaluate Scenic Quality:** Rate for scenery under the most critical conditions (e.g., highest user period or season of use, sidelight, proper atmospheric conditions, etc.).
**How to Delineate Rating Areas:** Consider the following factors when delineating rating areas:

1. Like physiographic characteristics (e.g., land form, vegetation, etc.).
2. Similar visual patterns, texture, color, variety, etc.
3. Areas which have a similar impact from cultural modifications (e.g., roads, historical and other structures, mining operations, or other surface disturbances).

**Explanation of Criteria:** (See Illustration 1)
NOTE: Values for each rating criteria are maximum and minimum scores only. It is also possible to assign scores within these ranges.

**SCENIC QUALITY**
A = 19 or more
B = 12-18
C = 11 or less

**Illustration 1 - Scenic Quality - Explanation of Rating Criteria**

| Scenic Quality - Explanation of Rating Criteria |
|---|
| Landform |
| Topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured. Outstanding landforms may be monumental, as the Grand Canyon, the Sawtooth Mountain Range in Idaho, the Wrangell Mountain Range in Alaska, or they may be exceedingly artistic and subtle as certain badlands, pinnacles, arches, and other extraordinary formations. |
| Vegetation |
| Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular. Consider also smaller- scale vegetational features which add striking and intriguing detail elements to the landscape (e.g., gnarled or windbeaten trees, and joshua trees). |

| |
|---|
| Water |
| That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration in selecting the rating score. |
| Color |
| Consider the overall color(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) as they appear during seasons or periods of high use. Key factors to use when rating "color" are variety, contrast, and harmony. |
| Adjacent Scenery |
| Degree to which scenery outside the scenery unit being rated enhances the overall impression of the scenery within the rating unit. The distance which adjacent scenery will influence scenery within the rating unit will normally range from 0-5 miles, depending upon the characteristics of the topography, the vegetative cover, and other such factors. This factor is generally applied to units which would normally rate very low in score, but the influence of the adjacent unit would enhance the visual quality and raise the score. |
| Scarcity |
| This factor provides an opportunity to give added importance to one or all of the scenic features that appear to be relatively unique or rare within one physiographic region. There may also be cases where a separate evaluation of each of the key factors does not give a true picture of the overall scenic quality of an area. Often it is a number of not so spectacular elements in the proper combination that produces the most pleasing and memorable scenery - the scarcity factor can be used to recognize this type of area and give it the added emphasis it needs. |
| Cultural Modifications |
| Cultural modifications in the landform/water, vegetation, and addition of structures should be considered and may detract from the scenery in the form of a negative intrusion or complement or improve the scenic quality of a unit. Rate accordingly. |

**Illustration 2 - Scenic Quality Inventory and Evaluation Chart**

| Key factors | Rating Criteria and Score | | |
|---|---|---|---|
| Landform | High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops, or severe surface variation or highly eroded formations including major badlands or dune systems; or detail features dominant and exceptionally striking and intriguing, such as glaciers. **5** | Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting erosional patterns or variety in size and shape of landforms; or detail features which are interesting though not dominant or exceptional. **3** | Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features. **1** |
| Vegetation | A variety of vegetative types as expressed in interesting forms, textures, and patterns. **5** | Some variety of vegetation, but only one or two major types. **3** | Little or no variety or contrast in vegetation. **1** |
| Water | Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. **5** | Flowing, or still, but not dominant in the landscape. **3** | Absent, or present, but not noticeable. **0** |
| Color | Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. **5** | Some intensity or variety in colors and contrast of the soil, rock and vegetation, but not a dominant scenic element. **3** | Subtle color variations, contrast, or interest; generally mute tones. **1** |

| | | | |
|---|---|---|---|
| Influence of adjacent scenery | Adjacent scenery greatly enhances visual quality. **5** | Adjacent scenery moderately enhances overall visual quality. **3** | Adjacent scenery has little or no influence on overall visual quality. **0** |
| Scarcity | One of a kind; or unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. *** 5+** | Distinctive, though somewhat similar to others within the region. **3** | Interesting within its setting, but fairly common within the region. **1** |
| Cultural modifications | Modifications add favorably to visual variety while promoting visual harmony. **2** | Modifications add little or no visual variety to the area, and introduce no discordant elements. **0** | Modifications add variety, but are very discordant and promote strong disharmony. **-4** |

* A rating of greater than 5 can be given but must be supported by written justification.

## Part III: Determining the Visual Resource Inventory Classes

1. **Class I**. Class I is assigned to all special areas where the current management situations requires maintaining a natural environment essentially unaltered by man.

2. **Classes II, III, and IV**. These classes are assigned based on combinations of scenic quality, sensitivity levels, and distance zones as shown in the following matrix:

| | | **High** | | | **Medium** | | | **Low** |
|---|---|---|---|---|---|---|---|---|
| **Special Areas** | | **I** | **I** | **I** | **I** | **I** | **I** | **I** |
| **Scenic Quality** | **A** | **II** | **II** | **II** | **II** | **II** | **II** | **II** |
| | **B** | **II** | **III** | **III***<br>**IV*** | **III** | **IV** | **IV** | **IV** |
| | **C** | **III** | **IV** | **IV** | **IV** | **IV** | **IV** | **IV** |
| | | **f/m** | **b** | **s/s** | **f/m** | **B** | **s/s** | **s/s** |
| | | **DISTANCE ZONES** | | | | | | |

* If adjacent areas is Class III or lower assign Class III, if higher assign Class IV

## PART IV: MITIGATION

A. LANDFORM/WATER BODY.

1. Reduce Size of Cut and Fill Slopes. Consider:
    a. Relocating to an area with less slope;
    b. Changing road width, grade, etc;
    c. Changing alignment to follow existing grades; and,
    d. Prohibiting dumping of excess material on downhill slopes.
2. Reduce Earthwork Contrasts. Consider:
    a. Rounding and/or warping slopes;
    b. Retaining rocks, trees, drainage, etc;
    c. Toning down freshly broken rock faces with asphalt emulsion spray or with gray point;
    d. Adding mulch, hydromulch, or topsoil;
    e. Shaping cuts and fills to appear as natural forms;
    f. Cutting rock areas so forms are irregular;
    g. Designing to take advantage of natural screens (i.e., vegetation, land forms); and,
    h. Grass seeding of cuts and fills.
3. Maintain the Integrity of Topographic Units. Consider:
    a. Locating projects away from prominent topographic features; and,
    b. Designing projects to blend with topographic forms in shape and placement.

B. VEGETATION.

1. Retain Existing Vegetation. Consider:
    a. Using retaining walls on fill slopes;
    b. Reducing surface disturbance; and,
    c. Protecting roots from damage during excavations.
2. Enhance Revegetation. Consider:
    a. Mulching cleared areas;
    b. Controlling planting times;
    c. Furrowing slopes;
    d. Planting holes on cut/fill slopes;
    e. Choosing native plant species;
    f. Stockpiling and reusing topsoil; and,
    g. Fertilizing, mulching, and watering vegetation.
3. Minimize Impact on Existing Vegetation. Consider:
    a. Partial cut instead of clear cut;
    b. Using irregular clearing shapes;
    c. Feathering/thinning edges;
    d. Disposing of all slash;
    e. Controlling construction access;
    f. Utilizing existing roads;
    g. Limiting work within construction area;
    h. Selecting type of equipment to be used;
    i. Minimizing clearing size (i.e., strip only where necessary); and,
    j. Grass seeding of cleared areas.
4. Maintain the Integrity of Vegetative Units. Consider utilizing the edge effect for structure placement along natural vegetative breaks.

C. STRUCTURES.
1. Minimize the Number of Visible Structures.
2. Minimize Structure Contrast. Consider:
   a. Using earth-tone paints and stains;
   b. Using cor-ten steel (self-weathering);
   c. Treating wood for self-weathering;
   d. Using natural stone surfaces;
   e. Burying all or part of the structure; and,
   f. Selecting paint finishes with low levels of reflectivity (i.e., flat or semi-gloss).
3. Redesign Structures that do not Blend/Fit. Consider:
   a. Using rustic designs and native building materials;
   b. Using natural appearing forms to complement landscape character (use special designs only as a last resort); and,
   c. Relocating structure.
4. Minimize Impact of Utility Crossings. Consider:
   a. Making crossings at right angles;
   b. Setting back structures at a maximum distance from the crossing;
   c. Leaving vegetation along the roadside;
   d. Minimizing viewing time; and,
   e. Utilizing natural screening.
5. Recognize the Value and Limitations of Color. Consider:
   a. That color (hue) is most effective within 1,000 feet. Beyond that point color becomes more difficult to distinguish and tone or value determines visibility and resulting visual contrast;
   b. That using color has limited effectiveness (in the background distance zone) in reducing visual impacts on structures that are silhouetted against the sky;
   c. Painting structures somewhat darker than the adjacent landscape to compensate for the effects of shade and shadow; and,
   d. Selecting color to blend with the land and not the sky.

***Source: BLM Manual H-8410-1 - Visual Resource Inventory***

## PART V--VISUAL AESTHETIC IMPACT CHECKLIST

The analysis of Visual Aesthetic impacts should begin with the following project-specific questions:

1. What is the visual/aesthetic character of the project site/study area?
2. What sensitive receptors might have views of the existing and proposed facilities?
3. From what locations could the existing and proposed facilities potentially be seen?
4. What will the proposed facilities look like, as compared to the existing facilities?
5. What is the potential visual impact of the project?

To characterize the potential impact, consider the extent to which the project would:

1. Have a substantial adverse effect on a scenic vista?
2. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

3. Substantially degrade the existing visual character or quality of the site and its surroundings?
4. Create a new source of substantial light or glare?

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# APPENDIX H

# HISTORIC, ARCHAEOLOGICAL, AND PALEONTOLOGICAL CONTEXTS

# 1 CULTURAL HISTORY

This section includes succinct reviews of the cultural histories of the four geographic regions (encompassing 13 states) that are within the 100-mile corridor of the northern border project area.

## 1.1 PREHISTORIC CONTEXT

Since the Paleo-Indian period is very similar across the entire northern border, a single discussion of that period is presented below. All other prehistoric/pre-contact traditions are discussed on a regional and state-by-state basis.

### 1.1.1 PALEO-INDIAN PERIOD

Large portions of the study area were covered by the Laurentide and Cordilleran ice sheets at the time of the Late Wisconsin Glacial Maximum (ca. 21,000 B.P.) (Dreimanis, 1977:71; Hill, 2006:83, 85; Ogden, 1977:18). The exceptions include a small portion of northwestern Pennsylvania and parts of northern Montana, Idaho, and Washington. Besides rendering large portions of North America uninhabitable, the ice sheets also trapped a significant portion of the earth's water, resulting in lower sea levels in parts of the study area along the Atlantic and Pacific coastlines. The ice sheets receded from their maximum extent after 21,000 B.P. and were north of the study area by ca. 14,000 B.P. to 12,500 B.P. (Hill, 2006). As they melted, a series of proglacial water bodies formed along their margins, such as the Champlain Sea, Lake Iroquois, and Glacial Lakes Albany and Vermont in the Northeast, Glacial Lakes Chicago and Whittlesey in the Great Lakes region, and Glacial Lakes Columbia, Brewster, and Missoula in the Northwest. The northern Great Lakes area, including much of the northern peninsula of Michigan, was the last region to be ice free. The landscape south of the melting glaciers was primarily covered with "tundra-like vegetation," although more productive microhabitats were likely distributed along the edges of proglacial water bodies (Sirkin, 1977:210; see also Wright, 2006:107). Numerous types of fauna were present, such as mastodon, caribou, horse, bison, musk-ox, giant ground sloth, white-tailed deer, elk-moose, and wapiti, along with species of smaller mammals, birds, fish, reptiles, and shellfish, many of which were hunted by the area's earliest human occupants (Lepper and Funk, 2006:188; see also Funk, 1993:258).

No archaeological sites are known within the area of glaciation that pre-date the melting of overlying glacial ice. However, the Meadowcroft Rockshelter site, located in an unglaciated part of southwestern Pennsylvania just south of the study area, has yielded definitive dates associated with cultural materials from as early as 15,950 B.P. (Lepper and Funk, 2006:174). Similarly early sites may exist under water along coastal areas that were dry during periods of advanced glaciation. Early Paleo-Indian sites, which date to soon after the glacial retreat (generally between 12,000 B.P. and 10,000 B.P.), have been found throughout the study area. Typically, these sites include Clovis-like projectile points, which have characteristic channels/flutes that were probably used for hafting (Justice, 1995:17-29; Ritchie, 1971:10, 21-22, 74-75). Although the points are broadly similar across much of the continent, some display differences suggesting variation among social groups (Funk, 1983:309; Griffin, 1983:243; Ritchie, 1980:1; Stothers, 1996).

Relatively few early Paleo-Indian sites have yielded radiocarbon dates; the ages of most have been inferred from the presence of fluted points (Funk, 1983:309; Ritchie and Funk, 1973:334). Finds are frequently limited to single projectile points with no accompanying items. Although there is some variation across the study area, typical Paleo-Indian tool kits included unifacially-flaked end- and side-scrapers (some of which are 'limace' (slug-shaped), bifacial preforms, distinct debitage created during point fluting (i.e., 'channel' flakes), burins, wedges, gravers, biface knives, large chopping and cutting biface, drills, and denticulates (Funk, 1983:309; Snow, 1980). Tools are generally made with high-quality stone, sometimes procured from exotic (long-distance) sources.

Late Paleo-Indian (ca. 10,900 B.P.-10,000 B.P.) sites are associated with diagnostic, parallel-flaked, lanceolate Plano tradition projectile points. Plano points are most frequently found in the Plains, where some are associated with bison kills/processing sites (Justice, 1995:30-35). They are extremely scarce in Pennsylvania, New York, and New England, but occur more frequently further to the north, where peri-glacial environments endured until after 10,000 B.P. (Funk, 1983:315-316; see also Lepper and Funk, 2006:193).

Paleo-Indian sites can be grouped into any number of several functional classes, among which are: workshops/quarries; small camps; major, recurrently occupied camps; kill sites; rockshelter/ cave camps; and possible cremation sites (Buckmaster and Paquette, 1989; Frison, 1996; Mason and Irwin, 1960; Meinholz and Kuehn, 1996; Ritchie and Funk, 1973:333-334). Workshops/ quarries are defined by the presence of numerous pieces of debitage and stone tool fragments, a low quantity or absence of evidence for longer-term visits such as hearths, and proximity to a lithic source. Examples include: Munsungun in Maine; West Athens Hill and Divers Lake in New York; and several Knife River quarry sites in North Dakota (Funk, 1983:314; Lepper and Funk, 2006:181). Attributes of small camps include a limited areal extent and relatively few artifacts, which might include items associated with hunting, butchering, woodworking, or knapping. Example sites include: Beacon Hill, Lamontagne, and Keogh in Maine; and Potts, Davis, and Kings Road in New York. Major recurrently occupied camps typically cover larger areas than small camps, have more artifacts representing a greater range of activities, and include several 'hotspots,' probably indicative of multiple occupations or areas used during a single occupation my multiple social groups. Examples include: the Michaud and Taxiway sites in Maine; Reagan in Vermont; Arc in New York; Shoop in Pennsylvania; Paleo Crossing in Ohio; and Samels Field in Michigan (Cleland and Ruggles, 1996; Holliday and Mandel, 2006:36; Ritchie and Funk, 1973:333-334; Shott and Wright, 1999; Witthoft, 1952). Kill sites are represented by disarticulated faunal (skeletal) remains in association with Paleo-Indian artifacts. Example sites include the Vail site in Maine (Lepper and Funk, 2006:182). Rockshelter and cave sites are largely defined by the presence of Paleo-Indian artifacts in proximity to those geographic features; visits to these sites would have been brief and probably by relatively few people (Ritchie and Funk, 1973:334). Examples include the Aurora Run Rockshelter, the Squaw Rockshelter, and Sheriden Cave in Ohio, and Dutchess Quarry Cave in New York (Holliday and Mandel, 2006:36; Lepper and Funk, 2006:175; Ritchie and Funk 1973:334). There is also some evidence for large-scale bison kills in Montana and possible cremation burials have been found on the Upper Peninsula of Michigan (Buckmaster and Paquette, 1989; Frison, 1996; Justice, 1995:33; Mason and Irwin, 1960; Meinholz and Kuehn, 1996).

Paleo-Indian quarries/workshops predictably occur near sources of lithic material with qualities favorable for knapping. By definition rockshelter sites are limited to their geographic settings. Camps were typically on "high, well-drained ground… on such topographic features as hills, drumlins, knolls, or terraces" and probably near animal migration routes (Ritchie and Funk, 1973:334-335; also see Lepper and Funk, 2006:189). Proximity to water was an additional – and perhaps primary – determinative factor in site location (Holliday and Mandel, 2006:35-36). Many sites, such as Arc and Hiscock in New York, Paleo Crossing in Ohio, and several Saginaw River valley sites in Michigan are located along the peripheries of paleolakes, ponds and wetlands (Cleland et al., 1998; Holliday and Mandel, 2006:36; Laub et al., 1996:1; Lepper and Funk, 2006:190; Loring, 1980). Conversely, few Paleo-Indian sites have been found along younger drainages along the Great Lakes - features that developed after the immediate post-glacial period (Holliday and Mandel, 2006:36; Lantz, 1984:219). Paleo-Indians in Maine, New Hampshire, Vermont, and Washington also appear to have been exploiting upland environments not necessarily in proximity to water (Lacy, 1994; 1999; Loring, 1980). In general, fewer Paleo-Indian sites are known for the parts of the study area in Washington, Idaho, Montana, and North Dakota than for states further to the east.

### 1.1.2 NEW ENGLAND REGION

#### 1.1.2.1 State of Maine

**Early and Middle Archaic Periods**

Once thought to be rare in Maine, sites of the Early Archaic and Middle Archaic periods (ca. 10,000 B.P.-8,000 B.P. and 8,000 B.P.-6,000 B.P., respectively) have become much more understood in the last 25 years. Early and Middle Archaic period components have been identified at multi-component stratified sites along the Penobscot, Piscataquis, Kennebec, and Androscoggin rivers and are known from private collections from many Maine lake inlet and outlet sites, including some along the Saint Croix and Saint John Rivers.

These sites exhibit tool assemblages typical of the Gulf of Maine Archaic tradition and include quartz core and flake tools such as thick core/uniface scrapers, fully channeled gouges, celts and stone rods of several forms with few, if any, flaked stone projectile points, although biface manufacture is evident among debitage assemblages. Early Archaic period bifurcate-based points and Middle Archaic period Neville and Stark stemmed points are rarely recovered but are more common in southwestern Maine private collections. Their apparent rarity contributed to early assessments of regional low populations during these periods. Broadly flaring, flat-bottomed, fully channeled gouges are likely earlier than narrower or parallel-sided forms and the later two forms persist well into (or through) the Middle Archaic period. Various forms of slate projectile points and the semi-lunar knife or "ulu" may have appeared by the end of the Early Archaic period and certainly are present in some Middle Archaic period site assemblages.

Subsistence and seasonality evidence from Native American sites in Maine begins to accrue in the Early Archaic period. Early and Middle Archaic period components at sites such as the stratified sites on the Piscataquis River in Milo and N'tolonapemk at the outlet of Meddybemps Lake, among others, contain calcined bones of anadromous fish such as alewife and shad and catadromous eels among other fish, as well as turtle, beaver, muskrat, woodchuck, otter and fox. N'tolonapemk also contained the remains of two semi-subterranean house pits radiocarbon dated to 8,690±50 B.P. and 8,670±60 B.P. No definitive evidence of Early or Middle Archaic period mortuary sites has been identified within the overall study area but it is expected that people practiced the mortuary ceremonialism identified at other Gulf of Maine Archaic period mortuary sites in the broad region.

**Late (and Transitional) Archaic Periods**

Sites of the Late Archaic period (ca. 6,000 B.P.-3,900 B.P.) are numerous in Maine and are associated with the Moorehead Burial tradition, apparent elaborations of the Gulf of Maine mortuary ceremonialism that include cemeteries with pit features containing abundant red ocher, suites of typical lithic artifacts that were consistently associated with certain portions of the Late Archaic period, and occasional evidence of cremations. These cemeteries are generally located on elevated well-drained landforms overlooking suitable places to harvest anadromous fish and support band-sized gatherings, and may have served as territorial boundary indicators.

The earliest Late Archaic period occupations have been found in Maine's interior and appear related to the Laurentian tradition Vergennes phase as defined in New York. Artifact assemblages from these sites vary little from earlier Middle Archaic period assemblages apart from the inclusion of broadly side-notched "Otter Creek" projectile points. Also included are ulus, short channeled gouges, celts, slate points, and stone rods. Pecked stone plummets are fairly common at this time but may have initially appeared at the end of the Middle Archaic period. A feature at the Sharrow site in Milo (F.17), with two radiocarbon dates of 5,900 B.P. and 6,000 B.P., contained a plummet and conjoining fragments of a bone or antler point with multiple barbs. A similar barbed point of swordfish rostrum was recovered from a feature associated with the Vergennes phase at Site 96.02 at the outlet of Lewey Lake in Princeton. Interior sites of the Late Archaic period continue to be located along rivers at good fishing spots and at lake inlets and outlets and also include turtle, beaver, and occasional bird and large mammal subsistence remains. The Sebasticook Fish Weir in Newport was initially constructed at this time.

It is also during the Late Archaic period that sites of the small stemmed point tradition (ca. 5,000 B.P.-4,500 B.P.) appear along the coast of Maine. Earlier Archaic occupations undoubtedly occurred on the coast, but were later submerged by rising sea levels due to coastal subsidence. The small stemmed point tradition may have arrived in Maine somewhat later than the Vergennes phase, but is at least partly contemporary with the Vergennes phase and may have persisted longer. Artifact assemblages of the small stemmed point tradition are similar to contemporary assemblages in the interior with the exception of the diagnostic projectile point styles and the apparent absence of ulus in small stemmed point tradition assemblages. As already mentioned, sites of the small stemmed point tradition occur along the coast but also occur on some major islands and to the head of tide on major river estuaries.

Subsistence evidence is more common in small stemmed point tradition faunal assemblages as the presence clam shells neutralizes soil acidity. The small stemmed point component (Occupation 1) at the Turner Farm site demonstrates a clear focus on procuring fish (including swordfish) from the ocean, with a secondary reliance on deer, with clam as a supplementary resource.

Succeeding or developing from the small stemmed point tradition, the Late Archaic period Moorehead phase people (ca. 4,500 B.P.-3,800 B.P.) often occupied the same sites, focused on the same coastal resources, and continued the Moorehead burial tradition. Projectile points of the Moorehead phase are generally longer with proportionately narrower blades than those of the small stemmed point tradition and resemble roughly contemporary Sylvan Stemmed projectile points associated with the Mast Forest Archaic tradition of New York. Short channeled gouges, plummets, celts, and slate points continued in use and were variously included as burial goods, although slate points of the Moorehead phase burials are often long, narrow faceted “bayonets,” sometimes decorated with incised designs on one face and possibly intended as strictly ritual items. Some otherwise utilitarian items such as plummets exhibit effigy-like characteristics. Evidence of long distance cultural connections during Maine’s Late Archaic period Moorehead phase includes Ramah quartzite bifaces from northern Labrador and side-notched bifaces resembling Normanskill projectile points from New York and Vermont, some made of Vermont Cheshire quartzite, in some cemeteries.

The Transitional Archaic period (ca. 3,800 B.P.-2,800 B.P.) of much of Maine is mostly associated with the Susquehanna tradition, often considered to be an example of the migration of people from the Mid-Atlantic states into New England. The initial regional manifestation of the Susquehanna tradition is similar to the Atlantic phase of Massachusetts and includes large broad stemmed projectile points referred to as Snook Kill or Atlantic points, distinctive drills, celts, occasional fully grooved axes, and short-channeled gouges and cremation burials with little or no red ocher included. Susquehanna sites (and cemeteries) are often located on the same landforms as Moorehead sites but are sometimes very large and possibly more numerous and widely distributed through much of Maine. As seen from Turner Farm, Susquehanna subsistence on the coast, even at this island site, is more focused on terrestrial resources such as deer than is the Moorhead phase occupation, with some use of inshore fish and no swordfish exploitation. This may be, at least in part, due to cooling of the Gulf of Maine waters.

The next Susquehanna tradition manifestation in Maine apparently differs little from the earlier Atlantic other than that projectile points resemble the “Wayland Notched” points of Massachusetts and the number of sites and site size appears to have decreased. This decrease may be a result of sampling as much of the forested parts of Maine have received relatively little professional attention while the many lakes that are seasonally lowered in the fall are well known to attract the attention of collectors. The later manifestations of the Susquehanna tradition to the west of Maine are poorly represented in Maine collections. Projectile points of the Orient phase are occasionally recovered, particularly in central and western Maine, and a few possibly associated steatite bowls are known.

Although some early Susquehanna sites are known, notably the Mud Lake Stream site, very little evidence of the Susquehanna tradition is known from the Canadian Maritime provinces or from eastern Maine. Instead, a regional Transitional Archaic presence has been suggested for the areas adjacent to the Saint John and Saint Croix Rivers and Passamaquoddy Bay.

### Ceramic (Woodland) Period

The Ceramic period (ca. 2,800 B.P.-2,100 B.P.) in Maine begins with the arrival of Native American pottery into the region about as early as any other place in the Northeast, as demonstrated by a 2,720±90 B.P. associated with a semi-subterranean house pit within the shell midden at the Knox site. The first ceramics to appear in Maine consisted of conical pots with cordage or fabric-impressed interiors and exteriors. Early Ceramic period sites often demonstrate evidence of cultural contact with cultures to the west in the form of "Meadowood" side-notched projectile points and lobate-stemmed points similar to those associated with the Early Woodland Middlesex Adena culture, although made of local materials. Occasionally, blocked-end tubular tobacco pipes of Ohio pipe clay have been found in Maine. Early Ceramic sites often contain numerous small end scrapers and occasional diagnostic tear drop-shaped bifacial scrapers. The Early Ceramic people of Maine continued the hunter/gatherer subsistence economy of their Archaic period predecessors. Seasonality assessments of clam shells from a variety of Ceramic period shell midden sites suggest that coastal people exploited the resources of the exposed coast and islands during the warmer months and moved to sheltered coves in the winter. There are also many sites spanning the entire Ceramic period throughout the interior of Maine but, likely due to preservation conditions and sampling biases, no evidence of the location of winter occupations has been recovered.

Most of Maine's shell middens appear to have begun accumulating during the Middle Ceramic period (ca. 2,100 B.P.-1,000 B.P.) and suggests an expanding population. Early Middle Ceramic period pottery is well-fired and thin with pseudo scallop shell and/or rocker dentate decoration over much of the exterior. Subsequent Middle Ceramic period pottery became thicker and less well fired with cord-wrapped stick and punctate decoration confined to the shoulder, neck, and rim of pots. Projectile points during this time exhibit a variety of stemmed and notched styles and the recovery of numerous small end scrapers of high quality materials from distant source areas demonstrate expanding Middle Ceramic period social connections with people to the east, west, and north.

Late Ceramic period (ca. 1,000 B.P.-400 B.P.) sites are well represented in both the interior and on the coast of Maine. Late Ceramic pottery becomes globular, thinner, and well fired once again, with zoned incised exterior decoration of the collar and rim most common, following ceramic patterns elsewhere in the Northeast. Projectile points are of side-notched and corner-notched forms, with corner-notched points most common in eastern Maine and side-notched points dominant in central Maine, although both forms are found at many sites. In western Maine triangular "Levanna" projectile points become dominant and likely indicate cultural influences from the west. Agriculture with maize, beans, and squash also appears in western Maine in the Late Ceramic period associated with larger, more permanent settlements. The adoption of maize agriculture never spread further east than the Kennebec River during the pre-Contact era. In central and eastern Maine Native Americans never abandoned the mobile hunter/gatherer lifestyle of their ancestors, likely an indication of the abundance of resources available to them and the shorter growing season west of the Kennebec River.

### Native Americans in the Historic Period - Contact Period

The ancestors of the Micmac people of Nova Scotia began regular contact with European fishermen in the early sixteenth century. Almost certainly European material culture items such as kettles, iron tools, weapons and cloth were available to the people of Maine well before they ever saw a European. By the early seventeenth century, the fur trade was well established and competition between the English, Dutch and French created a complex trading sphere with Native Americans at the nexus. Maine's Native American populations were drawn into warfare due to conflicts between these European countries over trading connections as well as pressure from English colonists spreading eastward along the coast.

Depopulation as a result of epidemics of European diseases, warfare, and the conversion of many Maine people to the Catholic faith caused many Native Americans to abandon their traditional homelands, sometimes temporarily, to seek refuge in Canada where many of their descendants still live. Others returned or never left their homelands and became the ancestors of today's Maine's Passamaquoddy, Maliseet, Penobscot, and Micmac people. Contact period archaeological sites containing a combination of both European and Native American artifacts are distributed along the coast and at several historically recorded villages on the Androscoggin, Kennebec, Penobscot, and Saint Croix Rivers, as well as a recently discovered site on the U.S.-Canada border at East Grand Lake.

#### 1.1.2.2 State of New Hampshire

Archaeologists generally group Native American sites in New Hampshire into the Paleo-Indian, (ca. 11,500 B.P.-9,000 B.P.), Archaic, (ca. 9,000 B.P.-2,700 B.P.), and Woodland or Ceramic (ca. 2,700 B.P.-400 B.P.) periods (Haviland and Power, 1994; Thomas 1994; Bunker 1994). In addition, there is a time-transgressive period of early European exploration and settlement referred to as the Contact period, ca. 1400-1660 A.D. for New Hampshire's seacoast and 1623-1770 A.D. for New Hampshire's interior. These major periods are subdivided further into narrower temporal units with every period and subdivision represented in the 100-mile corridor of the northern border project area.

In general, early archaeological sites are assigned time periods based on seriation of projectile point or ceramic styles, and radiocarbon dating. Due to the impacts of long-term and extensive agricultural plowing during the historic period, a majority of archaeological sites not only in New Hampshire, but in the Northeast in general, are shallow, often lack intact features, and are typically dated using temporally diagnostic projectile points, tools, or pottery alone. Radiocarbon dating of sites in this region is therefore relatively rare. Cultural affiliation is easier to document from the Woodland period forward because greater numbers of artifacts have survived for archaeologists to examine.

**Archaic Period**

The Archaic period is the longest and perhaps the best-represented period in the archaeological record of New Hampshire because of the attention it has received from archaeologists (Starbuck, 2006). The Paleo-Indian period appears to have ended when the focal adaptation the Paleo-Indians relied on collapsed, forcing a rapid readjustment of their culture (Spiess and Wilson, 1987). This is evidenced by a "clear archaeological discontinuity, for the artifact styles and overall adjustments of Indians during the Early Archaic are indisputably different from those of the preceding Paleo-Indian period" (Snow, 1980:157).

Study of the Archaic period can provide an understanding of the social, cultural, and technological changes that occurred when the climate transitioned from the end of the Ice Age and to milder environmental conditions. The beginning of the Archaic period corresponds with the establishment of a closed forest environment across the Northeast sometime between 10,000 B.P. and 9,000 B.P., depending on the particular region (Spiess and Wilson, 1987; Robinson et al., 1992). With the transition to a closed forest environment, reliance on big-game terrestrial fauna diminished (as did the species themselves). Thus, strong evidence for hilltop lookout campsites is not present in the Early Archaic period (Thomas et al., 1981).

Well-known sites in New Hampshire associated with the Early Archaic period are Weirs Beach on Lake Winnepesaukee and the Neville site at Amoskeag Falls. Evidence of surface hearths and deep pits, along with a wide range of tool types, nutshell remains, and faunal remains representing mammals and fish, were also recovered (Thomas, 1994:51, 53). Preservation of faunal and floral remains associated with Early Archaic sites is rare, but a mixed diet of different resources is suggested. At one time, continuity of human occupation in the Northeast after the Paleo-Indian period remained a subject of considerable doubt (Sanger, 1979). Site preservation factors related to environmental change have provided keys for interpretation of the Early Archaic archaeological record in the northeast and elsewhere. Thomas (1994) and other archaeologists working in the Northeast believed that Early Archaic sites would continue to be very difficult to locate, because in addition to shallow contexts, they were believed to have survived in deep alluvial deposits along major rivers, in areas currently submerged by lakes such as Lake Champlain, or in environments that were not usually surveyed.

In the southeast, early Archaic sites had been primarily identified in stratified alluvial contexts; often sites had been deeply buried through active floodplain sedimentation (Jennings, 1989). As early as 1994, Thomas (1994:50) concluded that archaeological projects in New England had also begun to show the existence of deeply buried Early and Middle Archaic period sites on riverine terraces. Manifestations of the early Archaic period on upland ridges and deflated hill tops are now deemed as peripheral to the main occupations on riverine terraces (Chapman, 1980). Thomas (1994:53) also argued that we have a “poor understanding of the factors which may affect [Early Archaic] site discovery . . . and the complex natural environment to which people had adapted.” Because of this, Early Archaic cultural adaptations are difficult to reconstruct. However, evidence from sites outside the Northeast suggests a broadening of the subsistence base to a more diffuse subsistence adaptation (Thomas, 1994). This coincides with the collapse of the focal subsistence adaptation of the Paleo-Indians. It also appears that seasonal movements were more complex with the broader range of resources utilized during the Early Archaic period. Little is known about Early Archaic cultural preferences for site locations and the association of those sites with past local and regional environments.

In contrast to Paleo-Indian sites, most of the lithic materials recovered from Early Archaic contexts appear to derive from local sources of chert, quartzite, or quartz. Flaked stone tools seem less common in New Hampshire during the Early Archaic as seen at the Weirs Beach site which contained an unusual assemblage of quartz debitage, cores, steep-bitted quartz scrapers, and elongated stone rods made of schist (Bolian, 1980; Maymon and Bolian, 1992). Expedient tools, however, are a frequent component of Early, Middle, and even Late Archaic sites in both states. Extensive manufacture and use of expedient tools using local materials during the Archic period cautions that archaeologists need to take more care not to prematurely discard materials, such as phyllite, typically not associated with flaked or ground tools (c.f., Klink, 1992; Stone, 1994; Brigham et al., 2001). Lithic projectile points made during the early Archaic period often have characteristic bifurcate bases and occasionally serrated edges (Snow, 1980). Preservation of faunal and floral remains associated with Early Archaic archaeological sites is rare, but a mixed diet of different resources is suggested (Thomas, 1994).

Archaeological data from New Hampshire, particularly from sites in Manchester and Concord, shows that by the Middle Archaic period fairly sizeable settlements had developed on waterways and lakes that exhibited a greater reliance on fish (Starbuck, 2006). Dincauze's work at the Neville site, a deeply stratified site on the Merrimack River, was a great contribution in understanding temporal subdivisions of the Archaic period for southern and coastal New England. Middle Archaic peoples continued to heavily rely on quartz, but volcanic materials were also increasingly used (Bunker, 1994).

Archaeologists believe that by the Late Archaic Period, the Northeast had a substantial resident population. Regionally, archaeologists define four major archaeological traditions for the Late Archaic period (i.e., Laurentian, Narrow Point, Susquehanna, and Maritime Archaic), and these are subdivided into phases. All traditions but the Maritime Archaic appear to occur in New Hampshire and may exhibit a blending of the four traditions that created a culture unique to the region (Starbuck, 2006). Late Archaic sites have been found in association with major drainages and bordering wetlands, in minor streams and tributaries, in once marginal upland areas, and on upland ridges. While Late Archaic sites are by no means rare in New Hampshire (Starbuck, 2006), well-documented assemblages with absolute dating of associated features are uncommon. While Late Archaic sites are represented on the Vermont side of the Connecticut River, little is reported for the New Hampshire side of the river. The use of diverse lithic raw material for the Late Archaic has also been documented in New Hampshire (Starbuck, 2006). New Hampshire Late Archaic sites also exhibit intensive settlement with many location reoccupied on the basis of seasonal hunting and gathering patterns. In New Hampshire's Lakes Region, the Davison Brook Site (17-GR-201) provided a significant contribution to our understanding of Late Archaic settlement, technology, resource acquisition, consumption, and possibly mortuary practices (Goodby, 2001).

During the Late Archaic, differential temporal and spatial environmental exploitation for habitation and burial sites is typical. By the Late Archaic period, habitation and resource exploitation sites appear to have been associated with present-day upland ridges, lake shorelines, wetland borders, and along streams and rivers. Therefore, Late Archaic site locations are expected to contrast with older Paleo-Indian through Middle Archaic sites that have been closely associated with late Pleistocene-aged "*fossil*" shorelines and landforms or stratified alluvial contexts.

At the close of the Late Archaic period, a transitional period from the preceramic Late Archaic to the ceramic Early Woodland followed. This period is termed the Terminal Archaic or Transitional period (ca. 3,700 B.P.-2,700 B.P.). The Terminal Archaic period is defined as "essentially preceramic and marked by carved soapstone (steatite) vessels, together with new varieties of projectile points" (Ritchie, 1980:150), including the broad points of the Susquehanna tradition and the later Orient "fishtail" points. The presence of various types of Archaic archaeological sites in the northern border project area of New Hampshire suggests that there is a high probability of encountering additional archaeological sites of this age. T he most sensitive areas for these sites appear to be beside larger rivers, and especially near falls or rapids, beside modern lakes, ponds or wetlands or submerged under their waters, on prominent knolls and terraces along major drainages and valley edges, and upon sandy deltas.

## Woodland Period

The first use of ceramics marks the Woodland period in northern New England. Many northern New England archaeologists prefer the term Ceramic Period, rather than Woodland Period. Although ceramics were present, other typical "Woodland" characteristics such as domesticated crops (e.g., corn and tobacco) did not play a large part in annual subsistence patterns in this area. The Woodland period is subdivided into three sub-periods: the Early Woodland period (ca. 2,800 B.P.-1,850 B.P.); the Middle Woodland period (ca. 2,050 B.P.-900 B.P.); and the Late Woodland period (ca. 900 B.P.-350 B.P.; Thomas, 1994; Bunker, 1994). The transformation into the Woodland period is distinguished by the development and use of ceramics. The use of ceramic containers may have influenced settlement patterns due to their capacity for use as food storage containers in addition to their use for cooking.

The ability to store food made possible more sedentary, long-term settlements and partially offset the seasonal fluctuation of resources (Petersen and Power, 1985). Ironically, recovery of pottery from nearly all but the best archaeological contexts in New Hampshire is rare. Much of New Hampshire's Woodland period is known from excavation of several deeply stratified sites on the Merrimack River, such as the Neville site at Amoskeag Falls (Dincauze, 1976), the nearby Smyth Site (Kenyon, 1981; 1983; 1985), the Eddy Site (Bunker, 1992) Garvin's Falls (Starbuck, 1983; 1985b), and Seawall's Falls (Starbuck, 1982; 1983; 1985a). However, on occasion, even fairly shallow deposits such as those at the Lodge Site in Tilton, New Hampshire (NH-31-6-6) have yielded significant information (Gengras and Bunker, 1998).

Early Woodland habitation sites often suggest a pond, lake, or riverine orientation. Upland locations may have been virtually abandoned in favor of more productive alluvial environments (Thomas, 1994). Large habitation sites appear to be rare during this period. Evidence from other sites in the Northeast suggests that the absence of these sites might be attributed to a regional climatic cooling trend that began in about 3,000 B.P. As the climate cooled, forest composition changed, which may have resulted in lowering the distribution and diversity of game species. This shift in the resource base may have caused a change in settlement patterns. If this is correct, "during this period of climatic pressure, families may have remained in small groups which exploited a diversity of resources throughout the year, so that only small sites were ever occupied" (Thomas et al., 1981:73). Evidence from these small sites would be scant, thereby making it difficult to locate habitation sites.

Annual subsistence patterns still included hunting, fishing, and gathering, although environmental characteristics, and therefore manner of exploitation of the resources, had changed from that evidenced in the Archaic Period. Faunal remains recovered from the Boucher site in Vermont suggest that moose, deer, bear, raccoon, beaver, and turkey were exploited (Thomas, 1994:72). Thomas (1994:72) writes "the season of site occupation and the environmental characteristics of the territory surrounding any specific [Early Woodland] site undoubtedly had a great deal to do with types of foods which were available." Much more remains to be determined about Early Woodland Period interactions with the local environments. The presence of Early Woodland sites within the northern border project area however, suggests that there is potential to encounter additional sites of this age.

Early Woodland archaeology of the Northeast may be better known from burial sites than habitation sites. Many Early Woodland mortuary sites were accidentally discovered near Lake

Champlain and on the Lower Missisquoi River in Vermont as surface finds by collectors or during modern industrial quarrying for sand and gravel.

Middle Woodland sites are quite common and well dated. Well-documented stratified sites exist and “some aspects of the Middle Woodland cultural system are better documented than they are for all other periods of prehistory” (Thomas, 1994:74). Middle Woodland period sites are large in size and contain extensive archaeological materials. This seems to indicate that large numbers of people regularly gathered at these sites to exploit local food resources. Evidence from stratified levels at Middle Woodland period sites reveals that the use of non-local cherts predominated in the manufacture of stone tools. In addition, ceramic assemblages from sites of this period are related to styles from the Great Lakes and St. Lawrence River drainage (Petersen and Power, 1983).

The Late Woodland is characterized by a pattern of population growth and territorial expansion across the Northeast (Calloway 1990). As noted for the Archaic period, well-documented archaeological sites on the New Hampshire side of the Connecticut River for the Late Woodland period are rare. The Late Woodland is also marked by the confirmed cultivation of non-indigenous plants. Recently, Chilton (2006, 2008) reassessed the introduction of corn in New England. Heckenberger and Petersen (1988; Heckenberger et al., 1992) hypothesize that cultigens quickly became an important dietary focus soon after their adoption and local populations became increasingly tethered to floodplain sites, minimally from April through September (Haviland and Power, 1994). Archaeological investigations at Shelburne Pond in Vermont suggest that aboriginal utilization of the rich wetland and marsh environments increased as waters became more eutrophic.

After 500 B.P there appears to be a decline in evidence of Native American occupation. Data from Late Woodland sites located on the Missisquoi River in Vermont suggests a heavy reliance on hunting and horticulture. The Woodland Period Abenaki probably did not grow corn along the Missisquoi until after 1100 A.D. Thomas (1994:86) suggests that further study is “clearly needed to determine whether the poor visibility [of these Late Woodland Period sites] today resulted from a substantial shift in settlement focus to areas which are not commonly surveyed, from major demographic changes [perhaps resulting from Iroquoian movement into the St. Lawrence Valley], from site loss due to historic plowing and pilfering, or from other causes.” Although few Late Woodland period archaeological sites are known within the northern border project area of New Hampshire, their presence and recent discoveries suggest that the possibility for encountering additional sites of this age is high.

#### 1.1.2.3 State of Vermont

Archaeologists generally group Native American sites in Vermont into the Paleo-Indian, (ca. 11,500 B.P.-9,000 B.P.), Archaic, (ca. 9,000 B.P.-2700 B.P.), and Woodland or Ceramic (ca. 2700 B.P.-400 B.P.) periods (Haviland and Power, 1994; Thomas 1994; Bunker 1994). In addition, there is a time-transgressive period of early European exploration and settlement referred to as the Contact period, ca. 1609 A.D.-1790 A.D. for Vermont. These major periods are subdivided further into narrower temporal units with every period and subdivision represented in the 100-mile corridor of the northern border project area.

In general, early archaeological sites are assigned time periods based on seriation of projectile point or ceramic styles, and radiocarbon dating. Due to the impacts of long-term and extensive agricultural plowing during the historic period, a majority of archaeological sites in not only Vermont and New Hampshire, but the Northeast in general, are shallow, often lack intact features, and are typically dated using temporally diagnostic projectile points, tools, or pottery alone. Radiocarbon dating of sites in this region is therefore relatively rare. Cultural affiliation is easier to document from the Woodland period forward because greater numbers of artifacts have survived for archaeologists to examine.

**Archaic Period**

In Vermont, later Woodland sites appear to be more common than Middle Archaic sites, which are poorly represented (Thomas, 1994). The Paleo-Indian period appears to have ended when the focal adaptation the Paleo-Indians relied on collapsed, forcing a rapid readjustment of their culture (Spiess and Wilson, 1987). This is evidenced by a "clear archaeological discontinuity, for the artifact styles and overall adjustments of Indians during the Early Archaic are indisputably different from those of the preceding Paleo-Indian period" (Snow, 1980:157).

Study of the Archaic period can provide an understanding of the social, cultural, and technological changes that occurred when the climate transitioned from the end of the Ice Age and to milder environmental conditions. The beginning of the Archaic period corresponds with the establishment of a closed forest environment across the Northeast sometime between 10,000 B.P. and 9,000 B.P., depending on the particular region (Spiess and Wilson, 1987; Robinson et al., 1992). With the transition to a closed forest environment, reliance on big-game terrestrial fauna diminished (as did the species themselves), with the result that strong evidence for hilltop lookout campsites is not present in the Early Archaic period (Thomas et al., 1981).

Well-known sites in Vermont associated with the Early Archaic period are the John's Bridge site in Swanton, Vermont, the Ewing and Auclair sites on Shelburne Pond, and Weirs Beach on Lake Winnepesaukee. The John's Bridge site (VT-FR-69) contains the best known and dated assemblage of Early Archaic tools in Vermont. The John's Bridge site is a small single-component site situated on a bedrock-defended terrace overlooking the Missisquoi River. The triangular to ovate, corner-notched projectile points recovered from John's Bridge were named Swanton Corner-Notched, after several similar projectile points were recovered from the Champlain Basin (identified at 13 other sites in Vermont), and as far northeast as Maine (Thomas, 1994:50). Evidence of surface hearths and deep pits, along with a wide range of tool types, nutshell remains, and faunal remains representing mammals and fish, were also recovered (Thomas, 1994:51, 53). Preservation of faunal and floral remains associated with Early Archaic sites is rare, but a mixed diet of different resources is suggested. At one time, continuity of human occupation in the Northeast after the Paleo-Indian period remained a subject of considerable doubt (Sanger, 1979). Site preservation factors related to environmental change have provided keys for interpretation of the Early Archaic archaeological record in the northeast and elsewhere. Thomas (1994) and other archaeologists working in the Northeast believed that Early Archaic sites would continue to be difficult to locate, because in addition to shallow contexts, they were believed to have survived in deep alluvial deposits along major rivers, in areas currently submerged by lakes such as Lake Champlain, or in environments that were not usually surveyed.

In the southeast, early Archaic sites had been primarily identified in stratified alluvial contexts; often sites had been deeply buried through active floodplain sedimentation (Jennings, 1989). As early as 1994, Thomas (1994:50) concluded that archaeological projects in New England had also begun to show the existence of deeply buried Early and Middle Archaic period sites on riverine terraces. Manifestations of the early Archaic period on upland ridges and deflated hill tops are now deemed as peripheral to the main occupations on riverine terraces (Chapman, 1980). Thomas (1994:53) also argued that we have a "poor understanding of the factors which may affect [Early Archaic] site discovery . . . and the complex natural environment to which people had adapted." Because of this, Early Archaic cultural adaptations are difficult to reconstruct. However, evidence from sites outside the Northeast suggests a broadening of the subsistence base to a more diffuse subsistence adaptation (Thomas, 1994). This coincides with the collapse of the focal subsistence adaptation of the Paleo-Indians. It also appears that seasonal movements were more complex with the broader range of resources utilized during the Early Archaic period. Little is known about Early Archaic cultural preferences for site locations and the association of those sites with past local and regional environments.

In contrast to Paleo-Indian sites, most of the lithic materials recovered from Early Archaic contexts appear to derive from local sources of chert, quartzite, or quartz. Thomas (1994:52) infers that this predominance of local raw materials implies that "people had settled into Vermont by this time and knew where to easily find workable stone" and other resources. Flaked stone tools seem less common in New Hampshire during the Early Archaic as seen at the Weirs Beach site, which contained an unusual assemblage of quartz debitage, cores, steep-bitted quartz scrapers, and elongated stone rods made of schist (Bolian, 1980; Maymon and Bolian, 1992). Expedient tools, however, are a frequent component of Early, Middle, and even late Archaic sites in both states. Extensive manufacture and use of expedient tools using local materials during the Archaic period cautions that archaeologists need to take more care not to prematurely discard materials, such as phyllite, typically not associated with flaked or ground tools (c.f., Klink, 1992; Stone, 1994; Brigham et al., 2001). Lithic projectile points made during the early Archaic period often have characteristic bifurcate bases and occasionally serrated edges (Snow, 1980). Preservation of faunal and floral remains associated with Early Archaic archaeological sites is rare, but a mixed diet of different resources is suggested (Thomas, 1994).

Middle Archaic peoples continued to heavily rely on quartz, but volcanic materials were also increasingly used (Bunker, 1994). Two sites on Indian Brook in Essex, Vermont (VT-CH-229 and VT-CH-230) produced numerous large, blocky quartz scrapers similar to ones found in New Hampshire and Maine tentatively attributed to the Middle Archaic, despite a few Early and Late Archaic projectile points found at or near these sites (Thomas, 1992; Dillon et al., 1985).

The archaeological picture by Middle Archaic times was somewhat different in Vermont, in contrast to New Hampshire's growing data on Middle Archaic sites. "Recognition of Middle Archaic period sites in Vermont is so limited at this time that little can be said about settlement patterns. Furthermore, no subsistence data have been recovered from any Middle Archaic period site in Vermont" (Thomas, 1994:55). This pattern sharply contrasts with other northern New England manifestations of the Middle Archaic where an increasing number of projectile points diagnostic of the time period and a higher number of excavated sites point to a mid-Holocene population expansion. Thomas (1992, 1994) argues that the artifact technology in the Champlain Lowlands of Vermont may remain unrecognized, and that this region may have been influenced more during the Archaic period by cultures to the north and west. Another hypothesis is related to early terrace preservation from ongoing lateral fluvial erosion during the Holocene. However, preservation biases would seem as likely to have affected Early Archaic sites as Middle Archaic sites.

Yet another hypothesis offered is that sites of the period that were oriented toward wetland and anadromous resources may now be eroded (e.g., by a rise in freshwater Lake Champlain levels) or impacted by development during the historic and modern time periods. For example, if sites were located near Missisquoi Bay in northwestern Vermont in order to exploit wetland resources in the Archaic, those sites would now lie well below the present-day surface of Lake Champlain. Drowned sites off Lake Champlain's present shoreline remain a possibility, although shoreline erosion would probably have affected the integrity of such sites. While the upper reaches of the Missisquoi River might not have supported significant anadromous fishing sites, archaeologists could expect to find some evidence of human exploitation of aquatic resources in the northern border project area. Refinement of Vermont's Middle Archaic awaits more exploration of well-dated archaeological contexts.

Archaeologists believe that by the Late Archaic Period, the Northeast had a substantial resident population. Regionally, archaeologists define four major archaeological traditions for the Late Archaic period (i.e., Laurentian, Narrow Point, Susquehanna, and Maritime Archaic), and these are subdivided into phases. All traditions but the Maritime Archaic appear to occur in Vermont and New Hampshire, where a blending of the four traditions appear that created a culture unique to the region (Starbuck, 2006). Late Archaic sites have been found in association with major drainages and bordering wetlands, in minor streams and tributaries, in once marginal upland areas, and on upland ridges. While Late Archaic sites are by no means rare in Vermont (Bailey, 1939; Thomas, 1992; Haviland and Power, 1994; Thomas, 2002), well-documented assemblages with absolute dating of associated features are uncommon. Late Archaic occupations at the Grand Isle Fish Hatchery are consistent with settlement patterns anticipated for this period. The radiocarbon dated Late Archaic Saxe Brook North Site in Highgate, Vermont was positioned at an important river confluence. Its artifacts and faunal remains point to strong use of wetland resources along the fringes of the Rock River, and are consistent with what we know of the Late Archaic period (Sloma and Callum 2001). Late Archaic sites are also represented on the Vermont side of the Connecticut River at Sumner's Falls and Skitchewaug. Occasionally, unusual finds have been discovered associated with the Late Archic, such as the unearthing of a rare cache of sixteen Late Archaic projectile points in Rutland, Vermont in 2010 (Minichiello, 2010).

Although rare in the Northeast, one example of a Glacial Kame burial site dated to the Late Archaic was identified in western Vermont in a gravel pit on Isle LaMotte (Haviland and Power, 1994; Thomas et al., 1992). Ceremonial burials of this kind are found in gravel ridges or glacial kames. The Isle La Motte Cemetery site yielded two burials consisting of burned and unburned bone stained with red ochre. Sandal sole gorgets made of marine shell and other exotic items suggest an affiliation with the Glacial Kame burial complex that is focused in the south-central Great Lakes (Thomas, 1994:65). During the Late Archaic, differential temporal and spatial environmental exploitation for habitation and burial sites is typical. Distribution of sites across Vermont's landscape is extensive and "sites in a number of environments will be difficult to locate" (Thomas, 1994:66). By the Late Archaic period, habitation and resource exploitation sites appear to have been associated with present-day upland ridges, lake shorelines, wetland borders, and along streams and rivers. Therefore, Late Archaic site locations are expected to contrast with older Paleo-Indian through Middle Archaic sites that have been closely associated with late Pleistocene-aged "*fossil*" shorelines and landforms or stratified alluvial contexts. Late Archaic period sites are expected farther from the modern Missisquoi River channel on former knolls, old point bars, and near abandoned river channels and tributaries that might likely supported a marshy habitat.

At the close of the Late Archaic period, a transitional period from the preceramic Late Archaic to the ceramic Early Woodland followed. This period is termed the Terminal Archaic or Transitional period (ca. 3,700 B.P.-2,700 B.P.). The Terminal Archaic period is defined as "essentially preceramic and marked by carved soapstone (steatite) vessels, together with new varieties of projectile points" (Ritchie, 1980:150), including the broad points of the Susquehanna tradition and the later Orient "fishtail" points. The presence of various types of Archaic archaeological sites in the northern border project area of Vermont suggests that there is a high probability of encountering additional archaeological sites of this age. The most sensitive areas for these sites appear to be beside larger rivers, and especially near falls or rapids, modern lakes, ponds, or wetlands or submerged under their waters, on prominent knolls and terraces along major drainages and valley edges, and upon sandy deltas.

**Woodland Period**

The first use of ceramics marks the Woodland period in northern New England. Many northern New England archaeologists prefer the term Ceramic Period, rather than Woodland Period. Although ceramics were present, other typical "Woodland" characteristics such as domesticated crops (e.g., corn and tobacco) did not play a large part in annual subsistence patterns here. The Woodland period is subdivided into three subperiods. These are the Early Woodland period (ca. 2,800 B.P.-1,850 B.P.); the Middle Woodland period (ca. 2,050 B.P.-900 B.P.); and the Late Woodland period (ca. 900 B.P.-350 B.P.; Thomas, 1994; Bunker, 1994). The transformation into the Woodland period is distinguished by the development and use of ceramics. The use of ceramic containers may have influenced settlement patterns due to their capacity for use as food storage containers in addition to their use for cooking.

The ability to store food made possible more sedentary, long-term settlements and partially offset the seasonal fluctuation of resources (Petersen and Power, 1985). Ironically, recovery of pottery from nearly all but the best archaeological contexts in Vermont and New Hampshire is rare. Relatively intact sherds are more likely to be found in stratified deposits like Vermont's Winooski site (VT-CH-46; Petersen and Power, 1983).

Early Woodland habitation sites often suggest a pond, lake, or riverine orientation. Upland locations may have been virtually abandoned in favor of more productive alluvial environments (Thomas, 1994). Large habitation sites appear to be rare during this period. Evidence from other sites in the Northeast suggests that the absence of these sites might be attributed to a regional climatic cooling trend that began about 3,000 B.P. As the climate cooled, forest composition changed, which may have resulted in lowering the distribution and diversity of game species. This shift in the resource base may have caused a change in settlement patterns. If this is correct, "during this period of climatic pressure, families may have remained in small groups which exploited a diversity of resources throughout the year, so that only small sites were ever occupied" (Thomas et al., 1981:73). Evidence from these small sites would be scant, thereby making it difficult to locate habitation sites. Annual subsistence patterns still included hunting, fishing, and gathering, although environmental characteristics, and therefore manner of exploitation of the resources, had changed from that evidenced in the Archaic Period. Early Woodland occupations in the Connecticut River valley include certain components found in lower terraces of the Skitchewaug site (Heckenberger and Petersen, 1988) and Canaan's Bridge Site. Cassedy (1991) documents many other scattered occurrences of Early Woodland projectile points or pottery in the Connecticut River valley. A site located in Highgate (VT-FR-161) shows evidence of Early Woodland subsistence activities, including hunting of deer, beaver, and bear (Thomas and Dillon, 1985). A small site in Vergennes, Vermont yielded big information on an Early Woodland hunting camp (Donta and Medina, 2008). Faunal remains recovered from the Boucher site suggest that moose, deer, bear, raccoon, beaver, and turkey were exploited (Thomas, 1994:72). Thomas (1994:72) writes "the season of site occupation and the environmental characteristics of the territory surrounding any specific [Early Woodland] site undoubtedly had a great deal to do with types of foods which were available." Much more remains to be determined about Early Woodland Period interactions with the local environments. The presence of Early Woodland sites within the northern border project area however, suggests that there is potential to encounter additional sites of this age.

Early Woodland archaeology of the Northeast may be better known from burial sites than habitation sites. Many Early Woodland mortuary sites were accidentally discovered near Lake Champlain and on the Lower Missisquoi River as surface finds by collectors or during modern industrial quarrying for sand and gravel. Some of these cemetery/burial sites include the Frink Farm site (VT-FR-1) in Highgate (Robinson et al., 1993; Perry, 1868; Perkins, 1873), the Boucher site in Swanton (VT-FR-26; Heckenberger et al., 1990a; 1990b), and the East (VT-AD-26), and Bennett (VT-AD-298) sites in Orwell. Two additional sites in the Champlain Lowland, VT-FR-16 and VT-FR-48, contained blocked-end tubular pipes and birdstones; artifacts commonly found in association with human burials. These rare artifacts suggest that burials could have been present, and that excavation failed to recover fragile osteological remains, or simply these less durable materials did not survive. The Ewing and Auclair sites on Shelburne Pond both produced evidence of Early Woodland burial plots.

Middle Woodland sites are quite common and well dated. Well-documented stratified sites exist and "some aspects of the Middle Woodland cultural system are better documented than they are for all other periods of prehistory" (Thomas, 1994:74). The Winooski site in northwestern Vermont serves as a type-site for Middle Woodland archaeological sequences in western Vermont (Thomas, 1994). Archaeological remains were recovered from stratified alluvial deposits along the lower reaches of the Winooski River about "a half-mile downstream from the first falls and rapids" (Thomas, 1994:74). Middle Woodland period sites are large in size and contain extensive archaeological materials. This seems to indicate that large numbers of people regularly gathered at these sites to exploit local food resources. In particular, the large Winooski site contained evidence of fishing, hunting, and nut harvesting (Petersen and Power, 1983). Evidence from stratified levels at Middle Woodland period sites reveals that the use of nonlocal cherts predominated in the manufacture of stone tools. In addition, ceramic assemblages from sites of this period are related to styles from the Great Lakes and St. Lawrence River drainage (Petersen and Power, 1983). These characteristics suggest that long-distance trade or exchange networks existed during the Middle Woodland period in Vermont (Petersen and Power, 1983).

The Late Woodland is characterized by a pattern of population growth and territorial expansion across the Northeast (Calloway, 1990). Thomas (1994:83) also notes that "sites dating to the Late Woodland Period occur throughout Vermont, but the actual time of their occupation has been very difficult to determine" as radiocarbon dates only exist for six Late Woodland sites. Half of these, Sumner's Falls (800 ±80 B.P.), Skitchewaug (850 ±50 to 580 ±60 B.P.), and Dewey's Mills (490 ±120 B.P.) lie in the Connecticut River valley or along one of its major tributaries (Thomas, 1994). Haviland and Power (1994) note that house features have been identified at a site in Fairlee, Vermont. Further toward southern Vermont in the Connecticut River Valley are VT-WD-14 on Dummerston Island, a single sherd recovered from Fort Dummer in Brattleboro, Vermont, and a number of sites in the Great Bend area at Vernon, Vermont. The Late Woodland is marked by the confirmed cultivation of non-indigenous plants. For example, carbonized corn, beans, and squash were recovered from storage pit and associated shallow pit house features at Skitchewaug (Heckenberger and Petersen, 1988; Thomas, 1994). Recently, Chilton (2006, 2008) reassessed the introduction of corn in New England. Heckenberger and Petersen (1988; Heckenberger et al., 1992) hypothesize that cultigens quickly became an important dietary focus soon after their adoption and local populations became increasingly tethered to floodplain sites, minimally from April through September (Haviland and Power, 1994). Archaeological investigations at Shelburne Pond suggest aboriginal utilization of the rich wetland and marsh environments increased as waters became more eutrophic. Similarly, hydrological changes affecting Lake Champlain and associated riverine water levels may have influenced the size and location of marshlands where Native Americans sought resources during the Late Woodland period.

After 500 B.P there appears to be a decline in evidence of Native American occupation. Abenaki oral traditions and ceramic vessels in older artifact traditions indicate local continuity of occupation in northwestern Vermont between 500 B.P. and 350 B.P. Data from Late Woodland sites located on the Missisquoi River suggests a heavy reliance on hunting and horticulture and that the Woodland Period Abenaki probably didn't grow corn along the Missisquoi until after 1100 A.D. Perhaps the most important Late Woodland archaeological discovery occurred just a few years ago when the Vermont Agency of Transportation was preparing to reconstruct the Missisquoi Bridge at the north end of Lake Champlain. Initial sampling and subsequent evaluation discovered a late pre Contact or early Contact period village site with impressive features, faunal and flora remains, and ceramics. The Bohannon site (VT-GI-26/32) was occupied sometime between 1400 A.D. and 1600 A.D. (Crock and Mandel, 2001). Thomas (1994:86) suggests that further study is "clearly needed to determine whether the poor visibility [of these Late Woodland Period sites] today resulted from a substantial shift in settlement focus to areas which are not commonly surveyed, from major demographic changes [perhaps resulting from Iroquoian movement into the St. Lawrence Valley], from site loss due to historic plowing and pilfering, or from other causes." Although few Late Woodland period archaeological sites are known within the northern border project area of Vermont, their presence and recent discoveries suggest that the possibility for encountering additional sites of this age is high.

### 1.1.3 GREAT LAKES REGION

#### 1.1.3.1 State of New York

**Early and Middle Archaic**

In the Northeast, the Early and Middle Archaic (ca. 10,000 B.P. to 8,000 B.P. and ca. 8,000 B.P. to 6,000 B.P., respectively) have come to be primarily defined in terms of climatic/environmental transition. During these times, the ecological setting transformed from immediate post-glacial tundra and spruce-park forests through denser spruce-fir, pine-oak, and deciduous oak-hemlock forests to an essentially modern oak-hickory forest system (Funk, 1983:304-305; Lepper and Funk, 2006:171-172). As is the case for the Paleo-Indian period, archaeological sites from the Early and Middle Archaic have mostly been identified by the presence of diagnostic projectile points, including Hi-Lo, Kanawha Stemmed, Kirk, LeCroy Bifurcated Stem, MacCorkle, Palmer, Raddatz Side-Notched, and St. Albans Side-Notched points (Abel and Fuerst 1999:12-13; Calkin and Miller 1977:309; Justice 1995:44-46, 54-58, 67-69, 71-79, 81-85, 86-96). Many of these point types have characteristic bifurcated bases.

Relatively few Early and Middle Archaic sites have been found in New York (Funk, 1978:20). The low frequency of sites probably correlates with small populations, even relative to earlier Paleo-Indian levels (Fitting, 1978a:14; Funk, 1983:316-319; Griffin, 1983:248; Lepper and Funk 2006:193). These low population levels may be related to a minimally-productive environment; for example "coniferous forests with their low carrying capacity for deer and other game constituted an unfavorable environment for hunters and gatherers" (Funk, 1978:23; Calkin and Miller, 1977:309; cf. Nicholas, 1987:100-105). However, many sites probably remain to be found in less-studied areas, since the post-glacial environment in the Northeast was not uniformly desolate and included highly productive diverse environments like "lakes, ponds, extensive wetlands, and emergent riverine systems" that formed in the basins of former glacial lakes (Lepper and Funk, 2006:193; Nicholas, 1987:105-106).

Many Early and Middle Archaic sites in the Northeast cluster on former glacial lakes (Nicholas, 1987:106). In the Susquehanna Valley in New York (just outside the study area), Early Archaic projectile point forms have been found in both uplands and valley floors (Funk, 1993:317). The Zawatski Site, an Early Archaic site in western New York, was situated on the floodplain of the Allegheny River in Cattaraugus County (Calkin and Miller, 1977:310-312), suggesting that an Early Archaic preference towards occupation on valley floors was not confined to the Susquehanna (cf. Lepper and Funk, 2006:193).

In general, there is meager direct evidence concerning Early and Middle Archaic subsistence, site types, and tool assemblages (with the exception of projectile points) in New York (Abel and Fuerst, 1999:13; Funk, 1993:258-265). The Haviland site, located in a relic meander of Cobleskill Creek in Schoharie County, New York is a rare example of an excavated Early Archaic lithic workshop (Ferguson, 1995). Artifacts from the site include Kanawha bifurcate-base projectile points, thin bifacial ovate knives, thin unifacial tools, cores, hammerstones, debitage, abraders, anvils, choppers, and pitted stones. Middle Archaic tool kits are more extensive than those from the Early Archaic and include pecked and ground stone items (axes, adzes, gouges, celts, mortars, pestles, plummets, and netsinkers), polished tools such as bannerstones, and bone artifacts (awls, barbed harpoon tips, gorges, and fishhooks) (Stothers et al., 2001:237-238).

### Late Archaic

The Late Archaic Period in New York is most typically defined as the time between the stabilization of post-glacial forest systems to roughly modern states (deciduous forests across the Lake Plain portions of the state and Hemlock-Pine-Hardwoods forests elsewhere in the study area (Tuck, 1978:29; Wright, 2006:103-104) and the appearance of ceramic vessels. Conventional dates for the period are ca. 6,000 B.P. to 3,000 B.P. The Late Archaic contrasts sharply with the Early and Middle Archaic in terms of volume of data; far more Late Archaic sites are known than for the other parts of the Archaic (Funk, 1983:320; Prufer, 2001:188).

As is the case for earlier times, the majority of temporally diagnostic/representative Late Archaic artifacts are projectile points, although more is known about their accompanying tool kits (Funk, 1983:320). Projectile points from the first millennium of the Late Archaic include large broad side-notched styles that have square tangs and indented or straight bases, known throughout the Northeast as Otter Creek (Funk, 1983:320; Justice, 1995:61-62; Stothers et al., 2001:237). These points have been found with bifacial knives, unifacial side and end scrapers, anvilstones, and hammerstones (Funk, 1983:321; cf. Ritchie, 1979).

For the part of the Late Archaic beginning ca. 5,200 B.P., Ritchie and others have defined several large-scale archaeological ‘traditions’ that extend across the Northeast, including the Laurentian/Lake Forest, and Narrow-Stemmed/Piedmont Traditions (Funk 1983:321-329; Ritchie 1944:234-253; 1980:79-125; Ritchie and Funk 1973:338-341; Stothers et al. 2001:238; Tuck 1978:29-32). The Laurentian/Lake Forest Tradition includes northwestern Pennsylvania and much of New York State and extends across southeastern Ontario into eastern Michigan and extreme northwestern Ohio (Dragoo 1971; Prufer 2001:188-189; Stothers et al. 2001:238; Tuck 1978:29). Sites generally date between 5,200 B.P. and 4,000 B.P. Associated projectile point types include: Vergennes (which are early [ca. 5,200 B.P.] and primarily confined to central and northern New York State); the Brewerton point series (Brewerton Corner-Notched, Brewerton Eared-Notched, Brewerton Eared Triangle, and Brewerton Side-Notched); Vosburg; Genesee; and Snook Kill (all of which are found throughout the state with the exception of the extreme north) (Funk 1983:321; Justice 1995:115-118, 120-124; Ritchie 1971).

In addition to the chipped stone projectile points, Laurentian Tradition assemblages typically include: end and side scrapers; knives; drills; bannerstones; ground stone points, axes, knives, ‘ulu’-like tools, adzes, celts, and gouges (the groundstone points, knives, and ‘ulus’ are mostly limited to Vergennes contexts); plummets; hammerstones; anvilstones; and bone awls, gorges, and leister points (Funk, 1983:323; Prufer, 2001:190-193). There are numerous Laurentian Tradition sites in the state, among which are: Candee, FDP1002 and FDP1025 (in Fort Drum), Frontenac Island, O’Neil 1, Oberlander No. 1, Robinson, and Smoky Hollow (Abel and Fuerst 1999:14-15; Ritchie 1940; 1944:234; 1945; 1980:40-41, 79-125; Ritchie and Funk, 1973:4, 74-95).

Narrow Stemmed/Piedmont Tradition assemblages date to ca. 4,500 to 3,500 B.P. (Funk, 1983:324; Stothers et al., 2001:238). Although they tend to be found south of Laurentian sites, there is a great deal of overlap between the traditions, and they are occasionally found in the same contexts, such as at the Frontenac Island Site in Cayuga County (Funk, 1983:329; Ritchie, 1944:260-273, 292-310; 1945; 1980:36-79; Tuck, 1978:29). The defining characteristic of the Narrow Point is a series of narrow-stemmed and narrow side-notched projectile points, including types such as Lamoka (known from throughout New York). The only other common element of Narrow Point Tradition assemblages appears to be a "general scarcity of uniface tools" (Funk, 1983:324). Sites in the Lamoka phase of the tradition also sometimes yield distinct ground stone 'beveled adzes,' along with ornaments and tools made from antler and bone. The Lamoka Lake site in western New York is the largest, most productive, and perhaps best-known of the Narrow Stemmed Tradition sites in the study area (Funk, 1983:327).

Late Archaic sites in New York can be divided into four general classes: small open camps, large camp sites, quarries/workshops, and rockshelters/caves (Ritchie and Funk, 1973:337-338; Stothers and Abel, 1993; Stothers et al., 2001:242-246). Small open camps are typically located "inland from large waterways, frequently on small streams, on marshes, or near copious springs" while the larger camps are "on major bodies of water, near good fishing grounds" (Ritchie and Funk, 1973:337-338; also see Funk, 1983:327). Quarries and workshops are located near raw material sources. The oldest known burial/mortuary sites in the state date to the Late Archaic and include Frontenac Island (Ritchie 1945).

### Transitional/Terminal Archaic

In the Northeast, the Transitional/Terminal Archaic is defined as the time before the adoption of clay vessel technology during which people were making stone containers, which were primarily made from soft soapstone/steatite (Ritchie 1980:150; Ritchie and Funk, 1973:71; Tuck, 1978:37). Obviously the timing of these developments varied from one part of New York State to another, but typically-used dates fall in the range of ca. 3,700 B.P. to 2,700 B.P. The definitional basis for this time period is highly problematic since recent research has demonstrated that contexts with early ceramic vessels temporally overlap with those that have steatite containers entirely (Hoffman, 1998; see Ritchie, 1980:157). In central New York, the Transitional Archaic is represented by the Frost Island phase (Ritchie, 1980:156-164).

Besides the soapstone containers, the Transitional Archaic in New York is associated with a series of Susquehanna tradition broad-headed stone spear points that were initially developed in the Southeast (Funk, 1983:331; Trubowitz and Snethkamp, 1975:19; Witthoft, 1971; some researchers associate Genesee and Snook Kill points with the broad point tradition (Funk, 1983:331; 1993:224; Stothers et al., 2001:238). Examples of these projectile points in New York include: Susquehanna Broad, Perkiomen Broad (found throughout the state, outside its most northerly areas), and 'Turkey-tail' blades/points (found in the western part of the state) (Justice, 1995:167-170; Ritchie, 1971; Stothers et al., 2001:238). In addition to steatite vessels and projectile points, other typical Transitional Archaic artifacts include: chipped stone scrapers, drills, and gravers (many of which have bases similar to Susquehanna tradition projectile points, suggesting expedient reuse); possible 'strike-a-lights'; netsinkers manufactured from pebbles; hammerstones; rectangular shale gorgets; 'cupstones'; adzes; and anvils (Ritchie, 1980:151, 159).

Transitional Archaic sites in New York tend to "occupy a riverine setting, never far from the main stream" and are typically small or "occur as superimposed components marking a succession of temporary sojourning places by the same group" (Ritchie, 1980:157; see also

Tuck, 1978:37). The presence of netsinkers on some sites suggests that fishing was a prominent element of subsistence (Ritchie, 1980:151, 157-159; Ritchie and Funk, 1973:72). Transitional Archaic sites in the western part of the state have been found in a variety of ecological settings including glacial uplands, terraces, and river floodplains (Trubowitz and Snethkamp, 1975:20). Example sites in the study area include O'Neil and Hickory Hill Marsh in New York (Ritchie 1980:156-164; Ritchie and Funk 1973:71-95).

In general, very little is known about Transitional Archaic burials in central New York (Ritchie, 1980:163). However, people inhabiting the northern part of the state in the final years of the Archaic were participating in the earliest known of a series of practices relating to elaborate burial treatment of the deceased that included interments in mounds and the presence of exotic grave goods, the so-called "Glacial Kame culture" (Abel and Fuerst, 1999:16; Tuck, 1978:39). As the name suggests these burials were placed in natural gravel knolls. They include items such as distinctive "sandal sole shell gorgets," rectangular shell gorgets, rolled copper beads, shell beads, copper adzes, projectile points, leather fragments, and pieces of galena (Funk, 1983:334; Griffin, 1983:253; Ritchie, 1980:133-134). Some of these items imply the existence of long-distance trade routes, including copper, which came from the upper Great Lakes and the shell, which originated along the eastern North American coast. Burials were also occasionally accompanied by red ocher (Ritchie, 1980:133). Example sites in the study area include Muskalonge Lake in northern New York and Isle La Motte in Vermont (Abel and Fuerst, 1999:16-17; Ritchie, 1980:132-134).

**Woodland**

The Woodland Period is defined as the time during which people adopted and used ceramic vessel technology (Feder, 1984:101-102; Sears, 1948; see also Willey, 1966:267-268; discussion in Snow 1980:262). Although the timing of the adoption of clay container technology varied across the New York, 3,000 B.P. is generally used as a convention for the beginning of the Woodland (Funk 1983:306-307; 1993:; Kent et al., 1971:195-196; Ritchie, 1980:179; see also Snow 1980:262; Stoltman 1978). The period extended to historic times (ca. 1600 A.D.-350 B.P.). General developments during the Woodland include increases in population, the adoption of horticulture and domestication of plants such as maize, beans, and squash, nucleation of settlement patterns in some areas, and an elaboration and intensification of the burial practices and long-distance interaction presaged by the Glacial Kame phenomenon.

**Early Woodland**

Besides the initial appearance of pottery, the Early Woodland period in New York is associated with an elaborate suite of mortuary practices collectively known as Adena (Stothers and Abel, 2008:79). Just outside the study area in southern Ohio and southwestern Pennsylvania, Adena burials are in man-made mounds (Coe et al., 1986:51; Dragoo, 1963:134). While such tumuli are rare in the state (one exception is the Long Sault Island site in northern New York [Ritchie and Funk, 1973:97]), Adena grave goods have been found with burials across New York (Dragoo, 1963:177). Items associated with Adena-like burials in the state include: stone (sometimes clay) block-end tubes; lanceolate and leaf-shaped bifaces; trianguloid and ovoid cache blades; stemmed or side-notched projectile points, frequently falling in the range of the 'Adena' type (Justice, 1995:191-192, 196; Ritchie, 1971:12-13); bar amulets; copper awls and celts; gorgets; birdstones; cylindrical copper beads; and shell beads (Dragoo, 1963:176-188;

Ritchie and Funk, 1973:97). Graves were frequently accompanied by red ocher (Ritchie and Funk, 1973:97). Also, as with Glacial Kame burial practices, some Early Woodland graves and cemeteries in New York are on natural knolls and many items are made from exotic raw materials. Examples of Early Woodland Adena-like cemeteries and burial sites include Vine Valley, Morrow, and Palatine Bridge in New York (Funk, 1983:312-313, 335; Granger, 1978a:100). Most of these burial sites tend to be on "terraces of major streams or near large deep water lakes in the Erie-Ontario Lowland Zone" (Granger, 1978a:100; see also Ritchie and Funk, 1973:348).

Less is known about Early Woodland settlement and subsistence patterns in New York than burial practices (Funk, 1973:336; Granger, 1978a:96). However, at least two archaeological cultures, typically designated as the Meadowood and Middlesex phases (Ritchie, 1980; Meyer-Oakes, 1955:58), were closely associated with elements of Adena in the state (Granger 1978a). Middlesex refers to sites with Adena-like burials, as well as assemblages from non-burial contexts that include Adena artifacts (Funk, 1983:335). Meadowood phase sites have yielded more data concerning settlement and subsistence than those from the Middlesex. These sites are primarily clustered in central and western New York and are generally found adjacent to major streams and lakes, although some are known from areas near wetlands and smaller water bodies. Typical artifact assemblages include: early pottery (primarily the Vinette I type - conoidal-based, "unornamented," straight-sided pots, cord-roughened on the entirety of their interiors and exteriors (Ritchie and MacNeish, 1949:100); diagnostic Meadowood-style projectile points (Justice, 1995:170-172; Ritchie, 1971:35-36); other tools such as drills and scrapers with bases suggesting they are re-worked projectile points; anvilstones; abrading stones; hammerstones; cigar/tube-shaped smoking pipes; birdstones; and gorgets (Funk, 1983:335; Ritchie, 1980:191-196). Some sites have produced data suggesting oblong house forms measuring about 4 m by 5 m (12 ft by 16 ft) (Ritchie and Funk, 1973:107; Stothers and Abel, 1993:33, 62-63). Fragments of basketry and fish nets have also been found (Ritchie, 1980:194-195). Burials with Adena-like qualities are also sometimes present. Example sites include: Riverhaven No. 2, Vinette, Scaccia, and Sinking Ponds (Funk, 1983:335; Granger, 1978b; Ritchie, 1980:190-191; Ritchie and Funk, 1973:96).

**Middle Woodland**

In New York, the appearance of several types of decorated 'post-Vinette I' ceramic vessels around 2,000 B.P. marks the beginning of the Middle Woodland (Kostiw, 1995). In areas to the southwest, the period is associated with the appearance of the 'Hopewell Interaction Sphere,' a phenomenon largely defined by the presence of earthworks and burial mounds sometimes including lavish quantities of exotic grave goods. Hopewell-like mounds and artifacts are found in western and central New York, but they did not appear there until several centuries after their beginnings in Ohio. In New York, the Middle Woodland extends to 1,000 B.P.

Hopewell-like burial mounds in western and central New York are up to 50 ft in diameter and 9 ft in height. Burials were inside stone slab cists and were typically extended; cremated remains of other individuals are occasionally found in the mounds outside the cists (Ritchie, 1980:227). Among the elaborate grave goods found in the mounds are: platform pipes (made from both 'Ohio fireclay' and local materials), some with animal effigies; slate pendants; red and yellow ocher; two-holed gorgets; copper beads, ear spools, breast ornaments, celts, and awls; copper or silver panpipe covers; stone celts and adzes; prismatic flake knives; and projectile points (some of which are large examples of the Snyders type manufactured from high-quality stone from Ohio) (Coe at al., 1986:50-55; Funk, 1983:340; Justice, 1995:201-204; Ritchie, 1938; 1980:227). Examples of Middle Woodland burial mounds in New York include Squawkie Hill, Geneseo, Cain, Bluff Point, and Wheatland (Carpenter, 1950; Ritchie, 1938; 1980:217-228). Mounds tend to be near major rivers or large bodies of water, such as the Genesee, Finger Lakes, and Lake Ontario. They also are frequently not near habitation sites (Kostiw, 1995:41).

Relative to burial practices, little is known about Middle Woodland subsistence, settlement, and other aspects of culture throughout the Northeast (Bowen, 1992:63; Funk, 1983:339; 1993:200; Ritchie, 1980:226). However, the period is known to have witnessed numerous cultural innovations, including the adoption of the bow-and-arrow (Kostiw, 1995:38) and maize agriculture (Hart and Brumbach, 2003; Hart et al., 2007). New York habitation sites are typically grouped into the Point Peninsula Tradition (Brose, 2000:99; Funk, 1983:338; Ritchie and Funk, 1973:118-119; Stothers and Abel, 1993:31; 2008:96). Typical ceramic vessels from the early parts of the Middle Woodland were small (one to four quart capacities) and conoidal-based, while later pottery was larger and had increasingly globular bodies (Hart and Brumbach, 2009; Ritchie and Funk, 1973:117; Ritchie and MacNeish, 1949). Other artifacts include small projectile points (such as the Levanna, Jack's Reef and Raccoon Notched types), larger points (such as the Fox Creek type, which is limited to eastern New York), bone awls and barbed points, bifacial knives, scrapers, drills, netsinkers, celts, adzes, copper fishhooks and gorges, antler points, bone daggers, and compound bone fishhooks (Funk, 1983:337-343; Justice, 1995:215-220, 228).

Later Middle Woodland sites in New York have post mold patterns suggesting round houses (Funk 1983:340). Several types of sites are known, including large semi-permanent recurrently-occupied camps, small seasonal recurrently occupied camps, workshops, and small temporary camps (Brose, 2000:99; Ritchie and Funk, 1973:349-354). Sites typically occur on rivers, lakes, and in areas near marshes, bogs, and springs (Ritchie and Funk, 1973:349-354). Examples include: Felix, Kipp Island, Canoe Point, and Davenport Creamery (Funk and Hoagland, 1972; Ritchie and Funk, 1973).

**Late Woodland**

In New York, the Late Woodland spans the years between 1,000 B.P. and the Protohistoric period – the time when European goods were reaching Native American groups, but before the point when there was direct contact between Indians and Europeans (generally around 1525-1550 A.D./425 B.P.-400 B.P. in New York (Bradley, 2005; Engelbrecht, 2003:133-137; Snow, 2000:77-78; Stothers, 2000:52-53). Developments during the Late Woodland include the adoption of horticulture based on maize, squash, and beans, increasingly sedentary settlement patterns, the nucleation of groups into historically-known population centers, and the appearance of pallisaded villages with longhouses. In the New York part of the study area, the Late Woodland is largely synonymous with the Iroquoian tradition. People throughout the Northeast were manufacturing diagnostic small triangular (Madison-type) projectile points (Justice, 1995:224-227). Late Woodland inhabitants of New York State were probably mostly speakers of Iroquoian languages.

For the first half of the Late Woodland (ca. 1,000 B.P. to 700 B.P.), settlements/occupation sites in New York remained relatively small and some, such as the Bates site, had low numbers of rectangular-shaped houses (Engelbrecht, 2003:89). Settlements gradually shifted from river floodplains and areas near wetlands to more elevated settings away from canoe-navigable waterways – a movement indicating “an increasing focus on features favorable to maize horticulture” (Hasenstab, 2007:169) and possibly a preference for easily-defensible locations. By 450 B.P. to 350 B.P., Iroquoian speaking people throughout central and western New York were living in villages up to eight to ten acres in extent that had longhouses and palisades (Engelbrecht, 2003:89). These village sites cluster in the historical homelands of the Five Nations Iroquois (the Seneca, Cayuga, Onondaga, Oneida, and Mohawk (Niemczycki, 1984; Pratt, 1976; Tuck, 1971), as well as nearby groups, such as the Erie who occupied the east end of Lake Erie (Engelbrecht, 2003:143; White, 1961; 1978). Outside these permanent villages, people occasionally visited other areas, such as zones along large rivers and water bodies, for resource procurement activities (such as fishing and hunting), during which they occupied smaller camps, such as that represented by the Street site (Rieth, 2002). There were gradual changes in ceramic vessel morphology throughout the Late Woodland in New York (Hart and Brumbach, 2009; MacNeish, 1952; Ritchie and MacNeish, 1949). Early pots have conoidal bodies with cord-roughened exteriors, lack collars, and were typically decorated with cord-wrapped stick impressions, while later (post ca. 650 B.P.) vessels had globular bodies with smooth exteriors, collars, and incised decorations, sometimes with castellations and anthropomorphic designs.

### Protohistoric and Historic Periods

Items of European manufacture appear on Native American archaeological sites throughout the study area in New York beginning in the first half of the sixteenth century A.D. (ca. 450 B.P.-400 B.P.). Such artifacts were quickly integrated into the material culture inventories of native groups and included: sheet brass, copper and iron kettles; items derived from sheet metal kettles, including tinkling cones, projectile points, and other tools and ornamental items; colorful glass trade beads; and iron axe blades (Bradley, 2005:69-80). 'True' Wampum - small white and purple beads made from marine shells drilled with metal tools - also dates to the Protohistoric (Ceci, 1989:72-73; Tooker, 1978:422). Site locations were generally similar to those during the Late Woodland; examples include the Onondaga sites at Temperence House, Quirk, and Chase, and the Seneca site at Richmond Mills (Bradley, 2005:49-50; Engelbrecht, 2003:133). The five Iroquois nations likely began the process of forming the League of the Iroquois during the Protohistoric (Engelbrecht, 2003:130).

Early historical events involving Indian groups living in New York, Pennsylvania, and Ohio were heavily influenced by the European fur trade and the roles the Five Nations Iroquois played in it. The French established a trading outpost at Tadoussac on the St. Lawrence River about 1600 A.D. and the Dutch settled around Albany by ca. 1620 A.D. The Dutch were later forced out of their land holdings in the Northeast by the British in the 1660s. The Five Nations benefited from trade with the French, Dutch, and British which, among other items brought them European weapons. The European hunger for beaver pelts also drove Five Nations expansion to areas to the west, and by the middle of the 1600s, they had largely dispersed/destroyed many of their neighbors, including the Neutral and Erie in western New York (and probably northwestern Pennsylvania) and the Algonquian groups living in northern Ohio (Engelbrecht, 2003:142-144; Trigger, 1978; White, 1991). Meanwhile, the Iroquois suffered as a result of European epidemic diseases; in some cases mortality rates were as high as 90 percent (Engelbrecht, 2003:158). In the early eighteenth century, Iroquois relations with the French and British stabilized for a time, during which settlements became increasingly dispersed and varied, consisting of small numbers of large villages and larger numbers of small settlements, some of which were located on major bodies of water (Engelbrecht, 2003:166).

During this same time, the Tuscarora, an Iroquoian-speaking group that migrated from North Carolina, joined the Five Nations. After the French and Indian war (1754-1762), the Iroquois, who had sided with the British, benefited from the subsequent Royal Proclamation of 1763, by which the British Crown prohibited settlement west of the Appalachian Mountains. However, this reprieve was brief, since after the American Revolution, Iroquois lands were increasingly encroached on by American settlers and the Iroquois were forced to relocate to ever-dwindling reservations.

#### 1.1.3.2 Commonwealth of Pennsylvania

**Early and Middle Archaic**

In northwestern Pennsylvania the Early and Middle Archaic (ca. 10,000 B.P.-8,000 B.P. and ca. 8,000 B.P.-6,000 B.P., respectively) have come to be primarily defined in terms of climatic / environmental transition. During these times, the ecological setting in the Northeast transformed from immediate post-glacial tundra and spruce-park forests through denser spruce-fir, pine-oak, and deciduous oak-hemlock forests to an essentially modern oak-hickory forest system (Funk, 1983:304-305; Lepper and Funk, 2006:171-172). As is the case for the Paleo-Indian period, archaeological sites from the Early and Middle Archaic have been mostly identified by the presence of diagnostic projectile points, including Hi-Lo, Kanawha Stemmed, Kirk, LeCroy Bifurcated Stem, MacCorkle, Palmer, Raddatz Side-Notched, and St. Albans Side-Notched points, all of which have been found throughout the Northeast; and Thebes and St Charles points, which are known in western Pennsylvania (Abel and Fuerst, 1999:12-13; Calkin and Miller, 1977:309; Justice, 1995:44-46, 54-58, 67-69, 71-79, 81-85, 86-96; Stothers, 1996:179-181; Stothers et al., 2001:235). Many of these point types have characteristic bifurcated bases.

Relatively few Early and Middle Archaic sites have been found in northwestern Pennsylvania (Funk, 1978:20; Prufer, 2001:187-188). The low frequency of sites probably correlates with small populations, even relative to earlier Paleo-Indian levels (Fitting, 1978a:14; Funk, 1983: 316-319; Griffin, 1983:248; Lepper and Funk, 2006:193). These low population levels may be related to a minimally-productive environment; for example “coniferous forests with their low carrying capacity for deer and other game constituted an unfavorable environment for hunters and gatherers” (Funk, 1978:23; Calkin and Miller, 1977:309; cf. Nicholas, 1987:100-105). However, many sites probably remain to be found in less-studied areas, since the post-glacial environment in the Northeast was not uniformly desolate and included highly productive diverse environments like “lakes, ponds, extensive wetlands, and emergent riverine systems” that formed in the basins of former glacial lakes (Lepper and Funk, 2006:193; Nicholas, 1987:105-106).

Many Early and Middle Archaic sites in the Northeast cluster on former glacial lakes (Nicholas, 1987:106). In the Susquehanna Valley in New York (just outside the study area), Early Archaic projectile point forms have been found in both uplands and valley floors (Funk, 1993:317). The Zawatski Site, an Early Archaic site in western New York, was situated on the flood plain of the Allegheny River in Cattaraugus County (Calkin and Miller, 1977:310-312), suggesting that an

Early Archaic preference towards occupation on valley floors was not confined to the Susquehanna (cf. Lepper and Funk, 2006:193).

In general, there is meager direct evidence concerning Early and Middle Archaic subsistence, site types, and tool assemblages (with the exception of projectile points) in northwestern Pennsylvania (Abel and Fuerst, 1999:13; Funk, 1993:258-265; Stothers et al., 2001:236). The Haviland site, located in a relic meander of Cobleskill Creek in Schoharie County, New York is a rare example of an excavated Early Archaic lithic workshop in the Northeast (Ferguson, 1995). Artifacts from the site include Kanawha bifurcate-base projectile points, thin bifacial ovate knives, thin unifacial tools, cores, hammerstones, debitage, abraders, anvils, choppers, and pitted stones. Middle Archaic tool kits are more extensive than those from the Early Archaic and include pecked and ground stone items (axes, adzes, gouges, celts, mortars, pestles, plummets, and netsinkers), polished tools, such as bannerstones, and bone artifacts (awls, barbed harpoon tips, gorges, and fishhooks) (Stothers et al., 2001:237-238).

**Late Archaic**

The Late Archaic Period in Ohio is most typically defined as the time between the stabilization of post-glacial forest systems to roughly modern states (deciduous forests in the Lake Plain region of northwestern Pennsylvania and Hemlock-Pine-Hardwoods forests to the south (Tuck, 1978:29; Wright, 2006:103-104) and the appearance of ceramic vessels. Conventional dates for the period are 6,000 B.P. to 3,000 B.P. The Late Archaic contrasts sharply with the Early and Middle Archaic in terms of volume of data; far more Late Archaic sites are known than for the other parts of the Archaic (Funk, 1983:320; Prufer, 2001:188).

As is the case for earlier times, the majority of temporally diagnostic/representative Late Archaic artifacts are projectile points, but more is known about their accompanying tool kits (Funk, 1983:320). Projectile points from the first millennium of the Late Archaic include large broad side-notched styles that have square tangs and indented or straight bases, designated Otter Creek throughout the Northeast (Funk, 1983:320; Justice, 1995:61-62; Stothers et al., 2001:237). Otter Creek points have been found with bifacial knives, unifacial side and end scrapers, anvilstones, and hammerstones (Funk, 1983:321; cf. Ritchie 1979).

For the part of the Late Archaic beginning ca. 5,200 B.P., Ritchie and others have defined several large-scale archaeological ‘traditions’ that extend across parts of the Northeast, including the Laurentian/Lake Forest, and Narrow-Stemmed/Piedmont Traditions (Funk, 1983:321-329; Ritchie, 1944:234-253; 1980:79-125; Ritchie and Funk, 1973:338-341; Stothers et al., 2001:238; Tuck 1978:29-32). Northwestern Pennsylvania is near the southern edge of The Laurentian/Lake Forest Tradition, which also includes much of New York State and extends across southeastern Ontario into eastern Michigan and extreme northwestern Ohio (Dragoo, 1971; Prufer 2001:188-189; Stothers et al. 2001:238; Tuck 1978:29). Sites generally date between 5,200 B.P. and 4,000 B.P. Associated projectile point types include: examples of the Brewerton point series (Brewerton Corner-Notched, Brewerton Eared-Notched, Brewerton Eared Triangle, and Brewerton Side-Notched); Vosburg; Genesee; and Snook Kill (Funk, 1983:321; Justice, 1995:115-118, 120-124; Ritchie, 1971; Stothers and Abel, 1993:31; Stothers et al., 2001:238).

In addition to the chipped stone projectiles points, Laurentian Tradition assemblages typically include: end and side scrapers; knives; drills; bannerstones; ground stone axes, adzes, celts, and gouges; plummets; hammerstones; anvilstones; and bone awls, gorges, and leister points (Funk, 1983:323; Prufer, 2001:190-193). In parts of Ohio just west of northwestern Pennsylvania, cores are rare and tool-making debitage tends to be scarce and small-sized; sources for lithic materials there are primarily local (Prufer, 2001:193-195). Example Laurentian Tradition sites include: Ringler and Lukens Hill in northeastern Ohio (Prufer, 2001:190-195; Stothers and Abel, 1993:29).

Narrow Stemmed/Piedmont Tradition assemblages date to ca. 4,500 to 3,500 B.P. (Funk, 1983:324; Stothers et al., 2001:238). Although they tend to be found south of Laurentian sites, there is a great deal of overlap between the traditions, and they are occasionally found in the same contexts (Funk, 1983:329; Ritchie, 1944:260-273, 292-310; 1945; 1980:36-79; Tuck, 1978:29). The defining characteristic of the Narrow Point is a series of narrow-stemmed and narrow side-notched projectile points, including types such as Lamoka (Justice, 1995:124-130; Ritchie, 1971:29; Stothers et al., 2001:238). The only other common element of Narrow Point Tradition assemblages appears to be a “general scarcity of uniface tools” (Funk, 1983:324). Sites in the Lamoka phase of the tradition also sometimes yield distinct ground stone ‘beveled adzes,’ along with ornaments and tools made from antler and bone. The Lamoka Lake site in western New York is the largest, most productive, and perhaps best-known of the Narrow Stemmed Tradition sites in the study area (Funk, 1983:327).

**Transitional/Terminal Archaic**

In the Northeast, the Transitional/Terminal Archaic is defined as the time before the adoption of clay vessel technology during which people were making stone containers, which were primarily made from soft soapstone/steatite (Ritchie, 1980:150; Ritchie and Funk, 1973:71; Tuck, 1978:37). Obviously the timing of these developments varied from one part of the study area to another, but typically-used dates fall in the range of ca. 3,700 B.P. to 2,700 B.P. The definitional basis for this time period is highly problematic since recent research has demonstrated that contexts with early ceramic vessels temporally overlap with those that have steatite containers entirely (Hoffman, 1998; see Ritchie, 1980:157).

Besides the soapstone containers, the Transitional Archaic in northwestern Pennsylvania is associated with a series of Susquehanna tradition broad-headed stone spear points (Funk, 1983:331; Trubowitz and Snethkamp, 1975:19; Witthoft, 1971); some researchers associate Genesee and Snook Kill points with the broad point tradition (Funk, 1983:331; 1993:224; Stothers et al., 2001:238). Examples of these projectile points in the study area include: Susquehanna Broad, Perkiomen Broad, and ‘Turkey-tail’ blades/points (Justice, 1995:167-170; Ritchie, 1971; Stothers et al., 2001:238). Besides projectile points and steatite vessels, other typical Transitional Archaic artifacts include: chipped stone scrapers, drills, and gravers (many of which have bases similar to Susquehanna tradition projectile points, suggesting expedient reuse); possible ‘strike-a-lights’; netsinkers manufactured from pebbles; hammerstones; rectangular shale gorgets; ‘cupstones’; adzes; and anvils (Ritchie, 1980:151, 159).

Transitional Archaic sites tend to “occupy a riverine setting, never far from the main stream” and are typically small or “occur as superimposed components marking a succession of temporary sojourning places by the same group” (Ritchie, 1980:157; see also Tuck, 1978:37). The presence of netsinkers on some sites suggests that fishing was a prominent element of subsistence (Ritchie, 1980:151, 157-159; Ritchie and Funk, 1973:72). Transitional Archaic sites in New

York just north of the Pennsylvania portion of the study area have been found in a variety of ecological settings, including glacial uplands, terraces, and river floodplains (Trubowitz and Snethkamp, 1975:20). Example sites in the study area include O'Neil and Hickory Hill Marsh in New York (Ritchie, 1980:156-164; Ritchie and Funk, 1973:71-95).

**Woodland**

The Woodland Period is defined as the time during which people adopted and used ceramic vessel technology (Feder, 1984:101-102; Sears, 1948; see also Willey, 1966:267-268; discussion in Snow, 1980:262). Although the timing of the adoption of clay container technology varied across the region, 3,000 B.P. is generally used as a convention for the beginning of the Woodland (Funk, 1983:306-307; 1993:Figure 40; Kent et al., 1971:195-196; Ritchie, 1980:179; see also Snow, 1980:262; Stoltman, 1978). The period extended to historic times (ca. 1600 A.D./350 B.P.). General developments during the Woodland in the Northeast include increases in population, the adoption of horticulture and domestication of plants such as maize, beans, and squash, nucleation of settlement patterns in some areas, and an elaboration, intensification, and expansion of the burial practices and long distance interaction presaged by the Glacial Kame phenomenon (a set of burial practices from areas north of Pennsylvania that included burials in glacial kames that were accompanied by exotic grave goods).

**Early Woodland**

Besides the initial appearance of pottery, the Early Woodland period in northwestern Pennsylvania is associated with an elaborate suite of mortuary practices collectively known as Adena (Stothers and Abel, 2008:79). Just outside the study area in southern Ohio and southwestern Pennsylvania, Adena burials are in man-made mounds (Coe et al., 1986:51; Dragoo, 1963:134). While such tumuli are rare in the study area, Adena grave goods have been found with burials across northwestern Pennsylvania (Dragoo, 1963:177). Items associated with Adena-like burials include: stone (sometimes clay) block-end tubes; lanceolate and leaf-shaped bifaces; trianguloid and ovoid cache blades; stemmed or side-notched projectile points, frequently falling in the range of the 'Adena' type (Justice, 1995:191-192, 196; Ritchie, 1971:12-13); bar amulets; copper awls and celts; gorgets; birdstones; cylindrical copper beads; and shell beads (Dragoo, 1963:176-188; Ritchie and Funk, 1973:97). Graves were frequently accompanied by red ocher (Ritchie and Funk, 1973:97). Some Adena burials and cemeteries are on natural knolls and many items are made from exotic raw materials. Examples of nearby Early Woodland Adena-like cemeteries and burial sites include Green Creek, Marblehead, and Hickory Island No. 2 in northern Ohio (Stothers and Abel, 2008:81, 98-99) and Vine Valley, Morrow, and Palatine Bridge in New York (Funk, 1983:312-313, 335; Granger, 1978a:100). Burial sites tend to be on "terraces of major streams or near large deep water lakes in the Erie-Ontario Lowland Zone" (Granger, 1978a:100; see also Ritchie and Funk, 1973:348).

Less is known about Early Woodland settlement and subsistence patterns in the northwestern Pennsylvania area than burial practices (Funk, 1973:336; Granger, 1978a:96). At least two archaeological cultures, typically designated as the Meadowood and Middlesex phases (Ritchie, 1980; Meyer-Oakes, 1955:58), were closely associated with elements of Adena in New York and Pennsylvania (Granger, 1978a). Middlesex refers to contexts with Adena-like burials and assemblages from non-burial contexts that include Adena artifacts (Funk, 1983:335). Meadowood phase sites have yielded more data concerning settlement and subsistence than those from the Middlesex. Meadowood sites are primarily clustered in central and western New York and are generally found adjacent to major streams and lakes, although some are known from areas near wetlands and smaller water bodies. Typical artifact assemblages include: early pottery (examples of which have thick walls, are conoidal-based, straight-sided, "unornamented," and are cord-roughened on the entirety of their interiors and exteriors (Ritchie and MacNeish, 1949:100; Stothers and Abel, 1993:44); diagnostic Meadowood-style projectile points (Justice, 1995:170-172; Ritchie, 1971:35-36); other tools such as drills and scrapers with bases suggesting they are re-worked projectile points; anvilstones; abrading stones; hammerstones; cigar/tube-shaped smoking pipes; birdstones; and gorgets (Funk, 1983:335; Ritchie, 1980:191-196). Some New York and Ohio sites have produced data suggesting oblong house forms measuring about 4 m by 5 m (12 ft by 16 ft) (Ritchie and Funk, 1973:107; Stothers and Abel, 1993:33, 62-63). Fragments of basketry and fish nets have also been found (Ritchie, 1980:194-195). Burials with Adena-like qualities are also sometimes present. Nearby example sites include: Riverhaven No. 2, Vinette, Scaccia, and Sinking Ponds in New York (Funk, 1983:335; Granger, 1978b; Ritchie, 1980:190-191; Ritchie and Funk, 1973:96); and Weilnau and Seeman's Fort in north-central Ohio (Stothers and Abel, 1993:194-195).

**Middle Woodland**

In northwestern Pennsylvania, the appearance of several types of decorated 'post-Vinette I' ceramic vessels around 2,000 B.P. marks the beginning of the Middle Woodland (Kostiw, 1995). In areas to the west and southwest, the period is associated with the appearance of the 'Hopewell Interaction Sphere,' a phenomenon largely defined by the presence of earthworks and burial mounds sometimes including lavish quantities of exotic grave goods. Hopewell-like mounds and artifacts are found in northwestern Pennsylvania, but they did not appear there until several centuries after their beginnings in Ohio. In northwestern Pennsylvania the Middle Woodland extends to 1,000 B.P.

Hopewell-like burial mounds in northern Ohio, northwestern Pennsylvania, and western and central New York are up to 50 ft in diameter and 9 ft in height. Burials were inside stone slab cists and were typically extended; cremated remains of other individuals are occasionally found in the mounds outside the cists (Ritchie, 1980:227). Among the elaborate grave goods found in the mounds are: platform pipes (made from both 'Ohio fireclay' and local materials), some with animal effigies; slate pendants; red and yellow ocher; two-holed gorgets; copper beads, ear spools, breast ornaments, celts, and awls; copper or silver panpipe covers; stone celts and adzes; prismatic flake knives; and projectile points (some of which are large examples of the Snyders type manufactured from high-quality stone from Ohio) (Coe at al., 1986:50-55; Funk, 1983:340; Justice, 1995:201-204; Ritchie, 1938; 1980:227). One example of Middle Woodland burial mounds in northwest Pennsylvania is the Irvine Mound (Carpenter, 1956). Mounds tend to be near major rivers or large bodies of water, such as the Genesee, Finger Lakes, and Lake Ontario. They also are frequently not near habitation sites (Kostiw, 1995:41).

Relative to burial practices, little is known about Middle Woodland subsistence, settlement, and other aspects of culture throughout the Northeast (Bowen, 1992:63; Funk, 1983:339; 1993:200; Ritchie, 1980:226). However, the period is known to have witnessed numerous cultural innovations, including the adoption of the bow-and-arrow (Kostiw, 1995:38) and maize agriculture (Hart and Brumbach, 2003; Hart et al., 2007). Northwest Pennsylvania Middle Woodland habitation sites are typically grouped into the Scioto/Watson Tradition (Brose, 2000:99). Typical ceramic vessels from nearby northeastern Ohio were “unimaginative plain or cordmarked…ceramics with slightly curved rims” (Brose, 2000:99). Other Middle Woodland artifacts include small projectile points (such as the Levanna, Jack’s Reef and Raccoon Notched types), bone awls and barbed points, bifacial knives, scrapers, drills, netsinkers, celts, adzes, copper fishhooks and gorges, antler points, bone daggers, and compound bone fishhooks (Funk, 1983:337-343; Justice, 1995:215-220, 228). Later Middle Woodland sites in New York and Ohio have post mold patterns suggesting round houses (Brose, 2000:99; Funk, 1983:340). Several types of sites are known, including large semi-permanent recurrently-occupied camps, small seasonal recurrently occupied camps, workshops, and small temporary camps (Brose, 2000:99; Ritchie and Funk, 1973:349-354). In New York, sites typically occur on rivers, lakes, and in areas near marshes, bogs, and springs; in northern Ohio they are on bluffs overlooking major rivers (Bowen, 1992:63; Brose, 2000:99; Ritchie and Funk, 1973:349-354).

### Late Woodland

In northwestern Pennsylvania, the Late Woodland spans the years between 1,000 B.P. and the Protohistoric period – the time when European goods were reaching Native American groups, but before the point when there was direct contact between Indians and Europeans (generally around 1525 A.D.-1550 A.D./425 B.P.-400 B.P. in New York, Pennsylvania, and Ohio (Bradley, 2005; Engelbrecht, 2003:133-137; Snow, 2000:77-78; Stothers, 2000:52-53]). Developments during the Late Woodland include the adoption of horticulture based on maize, squash, and beans, increasingly sedentary settlement patterns, the nucleation of groups into historically-known population centers, and the appearance of pallisaded villages with longhouses. In northwestern Pennsylvania, the time period is primarily represented by the Eastwall/McFate Tradition, which is distinguished from surrounding traditions largely on the basis of pottery attributes (Johnson, 1976). People throughout the area were manufactured diagnostic small triangular (Madison-type) projectile points (Justice, 1995:224-227). Late Woodland inhabitants of northwestern Pennsylvania were probably Iroquoian speakers (Johnson, 1976).

Early Late Woodland (pre-700 B.P.) settlements in northwestern Pennsylvania had oval houses, while later ones had rectanguloid structures and were concentrated on high river bluffs. After ca. 500 B.P., villages were “on high dissected plateaus, overlooking sheltered arable flood plains” (Brose, 2000:106-107). Their occupants also employed smaller camps along upland rivers, in rockshelters, and along lakeshores for hunting and fishing (Brose, 2000:107). McFate is an important site in northwestern Pennsylvania (Johnson, 1976).

### Protohistoric and Historic Periods

Items of European manufacture appear on Native American archaeological sites throughout the study area in New York, Ohio and Pennsylvania beginning in the first half of the sixteenth century A.D. (ca. 450 B.P.-400 B.P.). Such artifacts were quickly integrated into the material culture inventories of native groups and included: sheet brass, copper and iron kettles; items derived from sheet metal kettles, including tinkling cones, projectile points, and other tools and ornamental items; colorful glass trade beads; and iron axe blades (Bradley, 2005:69-80). 'True' Wampum - small white and purple beads made from marine shells drilled with metal tools - also dates to the Protohistoric (Ceci, 1989:72-73; Tooker, 1978:422). Site locations were generally similar to those during the Late Woodland. There is some evidence that Iroquoian-speaking people in northwestern Pennsylvania and extreme northeastern (possibly Neutral) Ohio (represented by the Eastwall Complex) expanded their territory further to the west after about 1550 A.D.

Early historical events involving Indian groups living in New York, Pennsylvania, and Ohio were heavily influenced by the European fur trade and the roles the Five Nations Iroquois played in it. The French established a trading outpost at Tadoussac on the St. Lawrence River about 1600 A.D. and the Dutch settled around Albany by ca. 1620 A.D. The Dutch were later forced out of their land holdings in the Northeast by the British in the 1660s. The Five Nations benefited from trade with the French, Dutch, and British which, among other items brought them European weapons. The European hunger for beaver pelts also drove Five Nations expansion to areas to the west, and by the middle of the 1600s, they had largely dispersed/destroyed many of their neighbors, including the Neutral and Erie in western New York (and probably northwestern Pennsylvania) and the Algonquian groups living in northern Ohio (Engelbrecht, 2003:142-144; Trigger, 1978; White, 1991). Thereafter, northwestern Pennsylvania, along with much of northern Ohio, was essentially devoid of Native American habitation.

#### 1.1.3.3 State of Ohio

**Early and Middle Archaic**

In Ohio, the Early and Middle Archaic (ca. 10,000 B.P.-8,000 B.P. and ca. 8,000 B.P.-6,000 B.P., respectively) have come to be primarily defined in terms of climatic/environmental transition. During these times, the ecological setting in the Northeast transformed from immediate post-glacial tundra and spruce-park forests through denser spruce-fir, pine-oak, and deciduous oak-hemlock forests to an essentially modern oak-hickory forest system (Funk, 1983:304-305; Lepper and Funk, 2006:171-172). As is the case for the Paleo-Indian period, archaeological sites from the Early and Middle Archaic in Ohio have been mostly identified by the presence of diagnostic projectile points, including Hi-Lo, Kanawha Stemmed, Kirk, LeCroy Bifurcated Stem, MacCorkle, Palmer, Raddatz Side-Notched, St. Albans Side-Notched, Thebes, St. Charles, Decatur, and Lake Erie Bifurcated Base points (Abel and Fuerst, 1999:12-13; Calkin and Miller, 1977:309; Justice, 1995:44-46, 54-58, 67-69, 71-79, 81-85, 86-96; Stothers, 1996:179-181; Stothers et al., 2001:235). Many of these point types have characteristic bifurcated bases.

Relatively few Early and Middle Archaic sites have been found in northern Ohio (Funk, 1978:20; Prufer, 2001:187-188). The low frequency of sites probably correlates with small populations, even relative to earlier Paleo-Indian levels (Fitting, 1978a:14; Funk, 1983:316-319; Griffin, 1983:248; Lepper and Funk, 2006:193). These low population levels may be related to a minimally-productive environment; for example "coniferous forests with their low carrying capacity for deer and other game constituted an unfavorable environment for hunters and gatherers" (Funk, 1978:23; Calkin and Miller, 1977:309; cf. Nicholas, 1987:100-105). However, many sites probably remain to be found in less-studied areas, since the post-glacial environment in the Northeast was not uniformly desolate and included highly productive diverse environments like "lakes, ponds, extensive wetlands, and emergent riverine systems" that formed in the basins of former glacial lakes (Lepper and Funk, 2006:193; Nicholas, 1987:105-106).

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In general, there is meager direct evidence concerning Early and Middle Archaic subsistence, site types, and tool assemblages (with the exception of projectile points) in Ohio (Abel and Fuerst, 1999:13; Funk 1993:258-265; Stothers et al., 2001:236). The Haviland site, located in a relic meander of Cobleskill Creek in Schoharie County, New York is a rare example of an excavated Early Archaic lithic workshop (Ferguson, 1995). Artifacts from the site include Kanawha bifurcate-base projectile points, thin bifacial ovate knives, thin unifacial tools, cores, hammerstones, debitage, abraders, anvils, choppers, and pitted stones. Middle Archaic tool kits are more extensive than those from the Early Archaic and include pecked and ground stone items (axes, adzes, gouges, celts, mortars, pestles, plummets, and netsinkers), polished tools, such as bannerstones, and bone artifacts (awls, barbed harpoon tips, gorges, and fishhooks) (Stothers et al., 2001:237-238). Most Archaic sites in Ohio have been disturbed by deep plowing and very little is known about their internal structures; the Erskine site in Mahoning County, which has not been plowed, represents an Early Archaic exception to this pattern (Prufer, 2001:189-190). Another unusual occupation site is the Early Archaic Weilnau site in north-central Ohio, which yielded possible evidence of a structure (Stothers et al., 2001:241). Besides open air sites, there are indications that Early and Middle Archaic individuals visited rockshelters; The Krill Cave site in the northeastern part of the state, which includes an Early Archaic component, is one example in the study area (Prufer, 2001:189).

### Late Archaic

The Late Archaic Period in Ohio is most typically defined as the time between the stabilization of post-glacial forest systems to roughly modern states (i.e., the deciduous forests that cover much of Ohio) and the appearance of ceramic vessels. Conventional dates for the period are ca. 6,000 B.P. to 3,000 B.P. The Late Archaic contrasts sharply with the Early and Middle Archaic in terms of volume of data; far more Late Archaic sites are known than for the other parts of the Archaic (Funk, 1983:320; Prufer, 2001:188).

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In addition to the chipped stone projectiles points, Laurentian Tradition assemblages from Ohio typically include: end and side scrapers; knives; drills; bannerstones; ground stone axes, adzes, celts, and gouges; plummets; hammerstones; anvilstones; and bone awls, gorges, and leister points (Funk, 1983:323; Prufer, 2001:190-193). In the northeastern part of the state, cores are rare and tool-making debitage tends to be scarce and small-sized; sources for lithic materials there are primarily local (Prufer, 2001:193-195). Example Laurentian Tradition sites include: Kirian-Treglia in the northwestern Ohio (Stothers and Abel, 1993:29); and Ringler and Lukens Hill in the northeastern part of the state (Prufer, 2001:190-195; Stothers and Abel, 1993:29).

Narrow Stemmed/Piedmont Tradition assemblages date to ca. 4,500 B.P. to 3,500 B.P. (Funk, 1983:324; Stothers et al., 2001:238). Although they tend to be found south of Laurentian sites, including in northern Ohio, there is a great deal of overlap between the traditions, and they are occasionally found in the same contexts (Funk, 1983:329; Ritchie, 1944:260-273, 292-310; 1945; 1980:36-79; Tuck, 1978:29). The defining characteristic of the Narrow Point is a series of narrow-stemmed and narrow side-notched projectile points, including types from Ohio such as Lamoka, highly similar Durst Stemmed and Dustin points, and Bottleneck Stemmed points (Justice, 1995:124-130; Ritchie, 1971:29; Stothers et al., 2001:238). The only other common element of Narrow Point Tradition assemblages appears to be a "general scarcity of uniface tools" (Funk, 1983:324). Sites in the Lamoka phase of the tradition also sometimes yield distinct ground stone 'beveled adzes,' along with ornaments and tools made from antler and bone. The Lamoka Lake site in western New York is the largest, most productive, and perhaps best-known of the Narrow Stemmed Tradition sites in the study area (Funk, 1983:327).

In northwestern Ohio, Late Archaic sites can be divided into four general classes: small open camps, large camp sites, quarries/workshops, and rockshelters/caves (Ritchie and Funk, 1973: 337-338; Stothers and Abel, 1993; Stothers et al., 2001:242-246). Small open camps are typically located "inland from large waterways, frequently on small streams, on marshes, or near copious springs" while the larger camps are "on major bodies of water, near good fishing grounds" (Ritchie and Funk, 1973:337-338; also see Funk, 1983:327). Quarries and workshops are located near raw material sources. In northeastern Ohio, open (i.e., non-cave) Archaic-period sites are primarily camps, some of which were occupied on numerous occasions. They are typically located on high terrain near major rivers and streams and on knolls near ponds, wetlands, and lakes (Prufer, 2001:188-189). The oldest known burial/mortuary sites in Ohio date to the Late Archaic and include Missionary Island in the northwest part of the state (Stothers et al., 2001:244, 264-265).

### Transitional / Terminal Archaic

In the Northeast, the Transitional/Terminal Archaic is defined as the time before the adoption of clay vessel technology during which people were making stone containers, which were primarily made from soft soapstone/steatite (Ritchie, 1980:150; Ritchie and Funk, 1973:71; Tuck, 1978:37). Obviously the timing of these developments varied from one part of the study area to another, but typically-used dates fall in the range of ca. 3,700 B.P. to 2,700 B.P. The definitional basis for this time period is highly problematic since recent research has demonstrated that contexts with early ceramic vessels temporally overlap with those that have steatite containers entirely (Hoffman, 1998; see Ritchie, 1980:157). In much of northern Ohio, the time period is usually integrated into the Late Archaic (Prufer, 2001; Stothers et al., 2001).

Besides the soapstone containers, the Transitional Archaic in Ohio is associated with a series of Susquehanna tradition broad-headed stone spear points (Funk, 1983:331; Trubowitz and Snethkamp, 1975:19; Witthoft, 1971; some researchers associate Genesee and Snook Kill points with the broad point tradition (Funk, 1983:331; 1993:224; Stothers et al., 2001:238). Examples of these projectile points in northern Ohio include: Susquehanna Broad, Perkiomen Broad; Ashtabula; ‘Turkey-tail’; and Adder Orchard points (Justice, 1995:167-170; Ritchie, 1971; Stothers et al., 2001:238). In the northwestern part of the state, broad-headed points were succeeded by a series of small projectile points (the Late Archaic Small Point Horizon) in the latter years of the Late (Terminal) Archaic that include types such as Innes, Crawford Knoll, Trimble Side-Notched, and Merom Expanding-Stem (Stothers et al., 2001:238; Justice, 1995:130-132). Besides projectile points, other typical Transitional Archaic artifacts include: chipped stone scrapers, drills, and gravers (many of which have bases similar to Susquehanna tradition projectile points, suggesting expedient reuse); possible ‘strike-a-lights’; netsinkers manufactured from pebbles; hammerstones; rectangular shale gorgets; ‘cupstones’; adzes; and anvils (Ritchie, 1980:151, 159).

In parts of the Northeast, Transitional Archaic sites typically “occupy a riverine setting, never far from the main stream” and are typically small or “occur as superimposed components marking a succession of temporary sojourning places by the same group” (Ritchie, 1980:157; see also Tuck, 1978:37). The presence of netsinkers on some sites suggests that fishing was a prominent element of subsistence (Ritchie, 1980:151, 157-159; Ritchie and Funk, 1973:72). Transitional Archaic sites in western New York have been found in a variety of ecological settings, including glacial uplands, terraces, and river floodplains (Trubowitz and Snethkamp, 1975:20).

People inhabiting Ohio in the final years of the Archaic were participating in the earliest known of a series of practices relating to elaborate burial treatment of the deceased that included interments in mounds and the presence of exotic grave goods, the “Glacial Kame culture” (Abel and Fuerst, 1999:16; Tuck, 1978:39). As the name suggests these burials were placed in natural gravel knolls. They include items such as distinctive “sandal sole shell gorgets,” rectangular shell gorgets, rolled copper beads, shell beads, copper adzes, projectile points, leather fragments, and pieces of galena (Funk, 1983:334; Griffin, 1983:253; Ritchie, 1980:133-134). Some of these items imply the existence of long-distance trade routes, including copper which came from the upper Great Lakes and the shell, which originated along the eastern North American coast. Burials were also occasionally accompanied by red ocher (Ritchie, 1980:133). A pair of closely related Terminal Archaic Period burial sites in northwestern Ohio (the Williams cemetery and Sidecut crematory/cache site) are representative of another type of burial in which individuals were interred in non-mound contexts, but still with exotic grave goods that included marine shell beads and lithic artifacts made from cherts from eastern Ohio and the Niagara Peninsula (Abel et al., 2001). Both sites are on the floodplain of the Maumee River.

**Woodland**

The Woodland Period is defined as the time during which people adopted and used ceramic vessel technology (Feder, 1984:101-102; Sears, 1948; see also Willey, 1966:267-268; discussion in Snow, 1980:262). Although the timing of the adoption of clay container technology varied across the region, 3,000 B.P. is generally used as a convention for the beginning of the Woodland (Funk, 1983:306-307; 1993:Figure 40; Kent et al., 1971:195-196; Ritchie, 1980:179; see also Snow, 1980:262; Stoltman, 1978). The period extended to historic times (ca. A.D. 1600/350 B.P). General developments during the Woodland include increases in population, the adoption of horticulture and domestication of plants such as maize, beans, and squash, nucleation of settlement patterns in some areas, and an elaboration and intensification of the burial practices and long distance interaction presaged by the Glacial Kame phenomenon.

**Early Woodland**

Besides the initial appearance of pottery, the Early Woodland period in Ohio is associated with an elaborate suite of mortuary practices collectively known as Adena (Stothers and Abel, 2008:79). Just outside the study area in southern Ohio and southwestern Pennsylvania, Adena burials are in man-made mounds (Coe et al., 1986:51; Dragoo, 1963:134). While such tumuli are relatively rare in the northern part of the state, Adena grave goods have been found with burials across New York, northwestern Pennsylvania, and northern Ohio (Dragoo, 1963:177). Items associated with Adena-like burials include: stone (sometimes clay) block-end tubes; lanceolate and leaf-shaped bifaces; trianguloid and ovoid cache blades; stemmed or side-notched projectile points, frequently falling in the range of the 'Adena' type (Justice, 1995:191-192, 196; Ritchie, 1971:12-13); bar amulets; copper awls and celts; gorgets; birdstones; cylindrical copper beads; and shell beads (Dragoo, 1963:176-188; Ritchie and Funk, 1973:97). Graves were frequently accompanied by red ocher (Ritchie and Funk, 1973:97). Examples of Early Woodland Adena-like cemeteries and burial sites include Green Creek, Marblehead, and Hickory Island No. 2 in northern Ohio (Stothers and Abel, 2008:81, 98-99). Most of these burial sites tend to be on "terraces of major streams or near large deep water lakes in the Erie-Ontario Lowland Zone" (Granger, 1978a:100; see also Ritchie and Funk, 1973:348).

Less is known about Early Woodland settlement and subsistence patterns in Ohio than burial practices (Funk, 1973:336; Granger, 1978a:96). Habitation sites are generally found adjacent to major streams and lakes, although some are known from areas near wetlands and smaller water bodies. Typical artifact assemblages include: early pottery (generally thick-walled forms with conoidal, straight-walled forms such as the Leimbach Thick and Fayette Thick types (Stothers and Abel, 1993:44); diagnostic Meadowood-style projectile points (Justice, 1995:170-172; Ritchie, 1971:35-36); other tools such as drills and scrapers with bases suggesting they are re-worked projectile points; anvilstones; abrading stones; hammerstones; cigar/tube-shaped smoking pipes; birdstones; and gorgets (Funk, 1983:335; Ritchie, 1980:191-196). Some New York and Ohio sites have produced data suggesting oblong house forms measuring about 4 m by 5 m (12 ft by 16 ft) (Ritchie and Funk, 1973:107; Stothers and Abel, 1993:33, 62-63). Burials with Adena-like qualities are also sometimes present. Example sites include Weilnau and Seeman's Fort in north-central Ohio (Stothers and Abel, 1993:194-195). In the northwestern part of the state, sites around the Maumee River (including the later components of the Williams and Sidecut cemeteries) suggest a subsistence strategy heavily oriented towards fishing. This area was possibly also a center for regional interaction (Stothers and Abel, 2008:113-114). In other parts of northern Ohio, subsistence strategies were apparently less focused on fishing.

**Middle Woodland**

In Ohio, the Middle Woodland Period is associated with the appearance of the so-called 'Hopewell Interaction Sphere,' a phenomenon largely defined by the presence of earthworks and burial mounds sometimes including lavish quantities of exotic grave goods (ca. 2,300 B.P. to 1,600 B.P.) (Funk, 1983:337-338; Griffin, 1983:260-267). In the northeastern part of the state, the Middle Woodland extends to 1,000 B.P., while it ends earlier in the remainder of the northern portion of Ohio, at about the time of the disappearance of Hopewell around 1,600 B.P. to 1,500 B.P. (Abel et al., 2000; Brose, 2000; Stothers and Betchel, 2000).

Hopewell-like burial mounds in northern Ohio are up to 50 ft in diameter and 9 ft in height. Burials were inside stone slab cists and were typically extended; cremated remains of other individuals are occasionally found in the mounds outside the cists (Ritchie, 1980:227). Among the elaborate grave goods found in the mounds are: platform pipes (made from both 'Ohio fireclay' and local materials), some with animal effigies; slate pendants; red and yellow ocher; two-holed gorgets; copper beads, ear spools, breast ornaments, celts, and awls; copper or silver panpipe covers; stone celts and adzes; prismatic flake knives; and projectile points (some of which are large examples of the Snyders type manufactured from high-quality stone from Ohio) (Coe at al., 1986:50-55; Funk, 1983:340; Justice, 1995:201-204; Ritchie, 1938; 1980:227). The Esch site is one example of a Middle Woodland burial mound site in northern Ohio (Stothers et al., 1979). Mounds tend to be near major rivers or large bodies of water, including Lake Erie. They also are frequently not near habitation sites (Kostiw, 1995:41).

Relative to burial practices, little is known about Middle Woodland subsistence, settlement, and other aspects of culture throughout the Northeast (Bowen, 1992:63; Funk, 1983:339; 1993:200; Ritchie, 1980:226). However, the period is known to have witnessed numerous cultural innovations, including the adoption of the bow-and-arrow (Kostiw, 1995:38) and maize agriculture (Hart and Brumbach, 2003; Hart et al., 2007). Northwest Ohio Middle Woodland habitation sites are typically grouped into the Point Peninsula Tradition, while those in the northeastern part of the state are part of the Scioto/Watson Tradition and those along the north-central Lake Erie shore are elements of the Esch Phase (Brose, 2000:99; Funk, 1983:338; Ritchie and Funk, 1973:118-119; Stothers and Abel, 1993:31; 2008:96). Typical ceramic vessels in and northwestern Ohio from the early parts of the Middle Woodland were small (one to four quart capacities) and conoidal-based, while later pottery was larger and had increasingly globular bodies (Hart and Brumbach, 2009; Ritchie and Funk, 1973:117; Ritchie and MacNeish, 1949). Vessels from northeastern Ohio were "unimaginative plain or cordmarked…ceramics with slightly curved rims" (Brose, 2000:99). Other artifacts include small projectile points (such as the Levanna, Jack's Reef and Raccoon Notched types), bone awls and barbed points, bifacial knives, scrapers, drills, netsinkers, celts, adzes, copper fishhooks and gorges, antler points, bone daggers, and compound bone fishhooks (Funk, 1983:337-343; Justice, 1995:215-220, 228). Later Middle Woodland sites in Ohio have post mold patterns suggesting round houses (Brose, 2000:99; Funk, 1983:340). Several types of sites are known, including large semi-permanent recurrently-occupied camps, small seasonal recurrently occupied camps, workshops, and small temporary camps (Brose, 2000:99; Ritchie and Funk, 1973:349-354). Sites are usually on bluffs overlooking major rivers (Bowen, 1992:63; Brose, 2000:99; Ritchie and Funk, 1973:349-354). Examples include: and Esch, Heckelman, and 33Wo89 (Bowen, 1992; Ritchie and Funk, 1973).

**Late Woodland**

In northeastern Ohio, the Late Woodland spans the years between ca. 1,000 B.P. and the Protohistoric period – the time when European goods were reaching Native American groups, but before the point when there was direct contact between Indians and Europeans (generally around 525 A.D.-1550 A.D./425 B.P.-400 B.P. in New York, Pennsylvania, and Ohio (Bradley, 2005; Engelbrecht, 2003:133-137; Snow, 2000:77-78; Stothers, 2000:52-53). In the northwestern part of the state, the time period extends from the end of Hopewell (ca. 1,600 B.P.-1,500 B.P.) to the Protohistoric. Developments during the Late Woodland include the adoption of horticulture based on maize, squash, and beans, increasingly sedentary settlement patterns, and the appearance of pallisaded villages, some with longhouses. Late Woodland archaeological traditions in the northern part of the state, distinguishable by differences in artifact assemblages (primarily ceramics and smoking pipes) and settlement patterns, include the Western Basin, Sandusky, and Whittlesey and Eastwall Complexes. People throughout the area were manufactured diagnostic small triangular (Madison-type) projectile points (Justice, 1995:224-227). Late Woodland inhabitants of northwestern and north-central Ohio were probably Algonquian speakers, while those living in the extreme northeastern part of the state were likely Iroquoian.

In northwestern and north-central Ohio early Late Woodland (pre-1,000 B.P.) habitation sites typically had circular houses built on river bluffs, islands, sand spits, and inland relic beach ridges (Brose, 2000:99). Later settlement systems in the area were increasingly focused in river valleys, each of which was apparently dominated by single villages. There were fewer settlements in upper portions of river drainages (Bowen, 1992; Brose, 1999:100, 103-405). After ca. 500 B.P. villages were pallisaded and at least some houses were plastered (Brose, 1999:104). In far northeastern Ohio early Late Woodland (pre-700 B.P.) settlements had oval houses, while later ones had rectanguloid structures and were concentrated on high river bluffs. After ca. 500 B.P., villages were "on high dissected plateaus, overlooking sheltered arable flood plains" (Brose, 2000:106-107). Their occupants also employed smaller camps along upland rivers, in rockshelters, and along lakeshores for hunting and fishing (Brose, 2000:107). Attributes of Late Woodland northern Ohio ceramics were highly variable; at the most general level, pots had conoidal to globular bodies (sometimes elongated) with moderately restricted necks and some had collars. Occasionally, pots had appliqué decoration (such as the elaborate Parker Festooned type) or stirrup handles (Brose, 2000; Stothers and Betchel, 2000). Sites with early Late Woodland components include Libben and Baker II in the northwestern part of the state; among later sites are Eiden and South Park in north-central Ohio (Brose 2000; Stothers and Betchel, 2000). In general, little is known of the ethnicity of the Late Woodland inhabitants of northern Ohio, although it is likely that those living in the north-central part of the state (archaeologically represented as the late prehistoric Indian Hills Phase of the Sandusky Tradition) were ancestors of the Mascouten (Abel et al., 2000:385; Brose, 2000:110; Stothers, 2000).

### Protohistoric and Historic Periods

Items of European manufacture appear on Native American archaeological sites throughout northern Ohio beginning in the first half of the sixteenth century A.D. (ca. 450 B.P.-400 B.P.). Such artifacts were quickly integrated into the material culture inventories of native groups and included: sheet brass, copper and iron kettles; items derived from sheet metal kettles, including tinkling cones, projectile points, and other tools and ornamental items; colorful glass trade beads; and iron axe blades (Bradley, 2005:69-80). 'True' Wampum - small white and purple beads made from marine shells drilled with metal tools - also dates to the Protohistoric (Ceci, 1989:72-73; Tooker, 1978:422). Site locations were generally similar to those during the Late Woodland (Bradley, 2005:49-50; Engelbrecht, 2003:133). There is some evidence that Iroquoian-speaking people in extreme northeastern (possibly Neutral) Ohio (represented by the Eastwall Complex) expanded their territory further to the west after about 1550 A.D., displacing groups represented by the Whittlesey Complex (Brose, 2000; Redmond, 2000). Ohio example sites include Muddy Creek, Petersen, and Indian Hills.

Early historical events involving Indian groups living in New York, Pennsylvania, and Ohio were heavily influenced by the European fur trade and the roles the Five Nations Iroquois played in it. The French established a trading outpost at Tadoussac on the St. Lawrence River about 1600 A.D. and the Dutch settled around Albany by ca. 1620 A.D. The Dutch were later forced out of their land holdings in the Northeast by the British in the 1660s. The Five Nations benefited from trade with the French, Dutch, and British which, among other items brought them European weapons. The European hunger for beaver pelts also drove Five Nations expansion to areas to the west, and by the middle of the 1600s, they had largely dispersed/destroyed many of their neighbors, including the Neutral and Erie in western New York (and probably northwestern Pennsylvania) and the Algonquian groups living in northern Ohio (Engelbrecht, 2003:142-144; Trigger, 1978; White, 1991). After this time, northern Ohio was largely devoid of Native American habitation.

## 1.1.3.4 State of Michigan (Lower Peninsula)

### Early and Middle Archaic Periods

The Early and Middle Archaic periods take place during a time of rapid environmental change and fluctuations in the levels of the Great Lakes. Pine forest replaced the spruce parkland by about 10,000 B.P., followed by a mixed coniferous-deciduous forest by about 8,000 B.C., and finally essentially modern forest distributions between about 7,500 B.P. and 7,000 B.P. (Kapp, 1999). These periods corresponded to significantly lower levels in the Great Lakes basins that began around 10,000 B.P. (Monaghan and Lovis, 2005). Beginning around 7,500 B.P. lake levels slowly began to recover, culminating in much higher than modern lake levels known as the Nipissing and Algoma levels between about 5,500 B.P. and 3,500 B.P. when essentially modern levels were achieved (Larsen, 1985a; Larsen, 1985b; Larsen, 1999; Monaghan and Lovis, 2005).

Evidence for the Early Archaic (ca. 9,500 B.P. to 8,000 B.P.) is limited but is marked by an increase in projectile point styles. A variety of large notched and stemmed forms, some with bifurcated bases, come into use, along with a variety of groundstone implements (axes, adzes, gouges, and grinding equipment), choppers, knives, and scrapers.  This diversity is thought to reflect an increasingly regionally based population and changes in the subsistence economy (Cleland, 1992; Fitting, 1975; Lovis, 2009; Mason, 1981).  In the southern part of the Lower Peninsula, it has been suggested that Early Archaic foragers organized into small, seasonally mobile bands that exploited a wide area and used a variety of resources (Arnold, 1977). Evidence for the Early Archaic in the northeastern Lower Peninsula is virtually absent, although it is believed that despite low population densities these people followed a pattern similar to those farther to the south.

The Middle Archaic period (ca. 8,000 B.P.-5,000 B.P.) is similarly poorly documented and understood across Michigan's Lower Peninsula, although it does appear that there is a decrease in the population density during this period.  Large side-notched projectile points are characteristic of this period; other point styles, while present, are only poorly known (Lovis and Robertson, 1989).  Among the few excavated Middle Archaic sites are the Weber I (Lovis, 1989) and Bear Creek (Branstner and Hambacher, 1994) sites in the Saginaw River valley.  The former, which was occupied during the late summer or fall, is indicative of continued high residential mobility (Lovis, 1999; Robertson, 1987).  Food remains indicate exploitation of a variety of large and small mammals, fish, birds, reptiles, and a range of nuts, berries, and wild seeds (Egan, 1988; Smith and Egan, 1990).  In contrast, the Bear Creek site appears to represent a short-term cold season camp where hunting was one of the primary activities.  These sites suggest that people focused on a range of seasonally available resources and moved from one resource patch to another over the course of the year.  Evidence for Middle Archaic occupation in the area north of the Saginaw River valley is extremely limited, consisting of only a small number of poorly documented isolated projectile point finds.

**Late Archaic Period**

The Late Archaic period is relatively well known.  Most of this research has taken place in the Saginaw River valley (Fitting, 1975; Robertson et al., 1999); although much of what is known can be extended across the southeastern Lower Peninsula.  Very little Archaic period research has been conducted in the northeastern Lower Peninsula, so this period is only rudimentarily understood in that portion of the state.

The Late Archaic is marked by continued development of a seasonally based diffuse subsistence and settlement lifestyle evinced by an increase in the number of sites and the development of larger, more varied toolkits.  A proliferation of medium- and small-sized notched and stemmed projectile points differentiate this period from earlier periods.  Larger corner-notched points are replaced by a small point phase consisting of highly variable small notched, expanding stemmed, and narrow point styles that are superseded by broad-bladed projectile points at the end of the Late Archaic.

A pattern of seasonal mobility appears to persist during the Late Archaic; however, repeated use of sites in economically important areas suggests that populations followed more regularized scheduled movement within geographically constrained regions, such as the Saginaw River valley (Robertson, 1987).  Many of these larger multicomponent sites are located in the lower reaches of rivers draining the Saginaw basin and surrounding the Shiawassee Embayment (an extensive swamp and marsh system).  Smaller special purpose camps and cold season encampments occurred in the morainal highlands surrounding the valley. Ceremonial burial complexes (Glacial Kame, Red Ocher, and Old Copper) developed during this time and are characterized by the use of cemeteries and exotic graves goods (Turkey-tail points, red ocher, copper and shell artifacts, and elaborate groundstone tools).

Cleland (1974) suggests that Late Archaic peoples in the northern Lower Peninsula focused on the exploitation of inland resources along major rivers and streams. The settlement system comprised a series of small, seasonally occupied residential camps that would have allowed groups to easily move from one area to another as resources became available. Evidence in support of this model has been recovered from the Screaming Loon site, located in the Inland Waterway area of eastern Emmitt County (Lovis, 1990). A wide range of activities were carried out at the site. Remains at the site indicate that a range of terrestrial animal and plant resources were used, including riverine resources such as fish.

**Woodland Period**

The onset of the Woodland period in Michigan's Lower Peninsula is distinguished by the appearance of pottery, the use of burial mounds, new artifact types, and stylistic changes (Fitting, 1975; Mason, 1981). During the Early Woodland period (ca. 600 B.C.-200 B.C.) south of the Saginaw River valley, pottery appeared around 600 B.C. and consists of thick, crudely made interior and exterior cord-marked vessels (Fischer, 1972; Garland, 1986; Garland and Beld, 1999). This period also saw shifts in the lithic technology. Projectile points are mostly stemmed forms characterized by straight stems and weak shoulders. Pottery did not occur in the northeastern Lower Peninsula during this time, but the distinctive stemmed points are present. A style of side-notched points known as Meadowood, present across the southern Lower Peninsula, indicates cultural ties with southern Ontario and western New York.

Interpretation of Early Woodland settlement and subsistence patterns is limited by the small number of well-documented sites. In general, however, the diffuse Late Archaic hunting and gathering adaptation persisted, and small amounts of cultigens (squash and sunflower) appear to have been added to the diet in some southern areas (Garland, 1986; Ozker, 1982). Elaborate burial ceremonialism continued. The period is also marked by evidence for widespread inter-regional trade that would have organized what was becoming an efficient procurement system within the broader context of the diffuse subsistence economy (Fitting, 1975; Garland and Beld, 1999; Mason, 1981; Prahl et al., 1981).

The broad-scale cultural differentiation between areas north of the Saginaw River valley and those from the Saginaw River valley southward also becomes more evident during the Middle Woodland period (ca. 200 B.C.-600 A.D.). In the southern parts, this period is often marked by discernable influences of Hopewell cultural groups. Interestingly, although no clear Hopewellian sites have been identified in the southeastern Lower Peninsula (Halsey, 2010), Middle Woodland sites in the Saginaw River valley show such influences, particularly in regards to pottery decoration and projectile point styles. Middle Woodland pottery features dentate and rocker stamping, incising, trailing, punctating, and zonation (Fischer, 1972; Fitting, 1975; Kingsley, 1999; Mason, 1981). Also associated with this period are a variety of expanding stemmed and corner-notched point types, exotic grave goods, copper tools, marine shell artifacts, and specialized tools made from non-local cherts. Subsistence information from the Saginaw River valley suggests an increasing reliance on wetland and aquatic resources and continued use of native cultigens (Egan, 1993; Kingsley, 1999; Lovis et al., 2001).

Middle Woodland cultures in the northeastern Lower Peninsula appear to be more closely aligned with Lake Forest (Fitting, 1975) or Northern Tier (Mason, 1981) Middle Woodland cultures that predominate across the Upper Peninsula, although influences from the Saginaw River valley northward are also seen (Brose and Hambacher, 1999). This is most clearly evident in the ceramic decoration, which is similar to that on Laurel and other related northern Middle Woodland ceramics. The economy of these groups may have emphasized the importance of fishing, particularly shallow-water spring spawning species. Larger warm season villages where multiple family groups congregated were supplemented by smaller, special purpose satellite camps and small, cold season camps located away from the coast where hunting was the key economic activity.

The Late Woodland period (ca. 600 A.D.-1600 A.D.) is characterized by continued increases in population, an increase in the size and number of sites, a trend toward greater regional diversity, and changes in technology and subsistence patterns (Cleland, 1992; Holman and Brashler, 1999; Martin, 1999; Krakker, 1999). Generally, both the north and south subsistence economies appear to be keyed to seasonally dense plant and animal resources and an increased reliance on agriculture, especially in the southeastern Lower Peninsula. Although maize horticulture appears to be a feature of northern Late Woodland groups, its exact role and importance is less clear. Technological changes include use of the bow and arrow, as evidenced by the small triangular, notched, and flake points, and the use of deep-water gill nets in the northeastern Lower Peninsula (Cleland, 1982; Fitting, 1975; Martin, 1989; Mason, 1981).

In the Saginaw River valley and southeastern Michigan, the early Late Woodland period is represented by the Wayne Tradition (Fitting, 1965; Fitting, 1975; Halsey, 1976), characterized by globular vessels with cord-marked exteriors and simple decoration made with impressions by corded wrapped objects and tool punctates. Close similarity between Wayne wares and other regional wares from across the southern part of the state are thought to reflect a high degree of interaction among the regional populations (Brashler, 1981). This period also sees the end of the Wayne Mortuary tradition, which features both open cemeteries and mounds and exotic grave goods (Halsey, 1976).

After ca. 1000 A.D., Younge tradition ceramics begin to replace the Wayne tradition. Younge pottery consists of large globular to elongated vessels that are usually collared—often castellated—and exhibit complex rim and shoulder decoration made with plain tools (Fitting, 1965; Murphy and Ferris, 1990; Stothers 1999). These ceramics are related to those from the Western Basin tradition from southwestern Ontario and northwestern Ohio. Even with an increased reliance on maize horticulture as a foundation of the economy, scheduled movements to take advantage of seasonally available resources were still taking place. Thus, while villages were located along floodplains and the Great Lakes shorelines for access to easily tillable soils, riverine resources, and transportations, smaller seasonal camps also occurred in upland and headwater settings (Krakker, 1999; Stamps and Zurel, 1980)

In the northeastern Lower Peninsula, Late Woodland groups appear to have the closest cultural ties with groups in the Straits of Mackinac regions; however, the co-occurrence of more northerly ceramics with ceramics more typical of the Saginaw River valley region suggests that there was close interaction between these populations, as well as periodic use of some of the same environments (Holman and Kingsley, 1996). During the early Late Woodland period, Mackinac wares, with their globular bodies and everted rims, cord-marked exteriors, and typically simple geometric decorations made with a variety of corded tools predominated across this area. After about 1100 A.D., Mackinac wares were replaced by Juntunen wares, which are generally larger with less sharply everted collared—frequently castellated—rims, have smoothed exteriors, and are decorated with a variety of linear motifs made with plain tool punctations, incising, and the stab-drag technique (McPherron, 1967).

The settlement and subsistence economy of the Late Woodland groups in the northeastern Lower Peninsula were keyed around the development of the Inland Shore Fishery and deep-water fall spawning fish (Cleland, 1982; Martin, 1989). The Inland Shore Fishery allowed the formation of larger villages situated along the Great Lakes coast and higher population densities; however, the seasonal nature of the resource base still required groups to follow a pattern of seasonal mobility with warm season villages dividing into smaller family-based groups that appear to have moved into the interior for cold season hunting.

### Native Americans in the Historic Period

The patterns of Native American settlement and subsistence across the eastern Lower Peninsula at the time of historic contact with the Europeans largely mirror the patterns seen toward the end of the Late Woodland period. The location and distribution of the traditional territories associated with the various Native American groups is not as clear, however, as it is in other parts of the Great Lakes region. This is in part a result of the fact that the earliest contact took place in the more eastern and northern parts of the Great Lakes region and a significant European presence was not established in the Lower Peninsula until after some of the major disruptions in Native American societies (Iroquois wars and European diseases) (Cleland, 1992; Cleland, 1999; Tanner, 1987). Historically, the Ojibwa appear to have been the predominant group in the northern Lower Peninsula, while members of the Fire Nation, including groups such as the Sauk and Fox, most likely predominated in the more southern parts of the region (Cleland, 1992; Cleland, 1999).

Following the seventeenth-century diaspora of indigenous tribes, the Ottawa and Ojibwa began to fill the geographic void across the eastern Lower Peninsula and had become well established in these areas by the middle of the eighteenth century (Cleland, 1992; Tanner, 1987). Following the American Revolution, a series of treaties beginning with the Treaty of Greenville in 1795 and culminating with the 1836 Treaty of Washington, passed control of the Lower Peninsula from Native American hands (Cleland, 1992).

## 1.1.3.5 States of Michigan (Upper Peninsula) and Wisconsin

### Early and Middle Archaic Periods

The Early Archaic period begins about 10,000 B.P. and takes place during a time of continued environmental change as the landscape recovered from the after-effects of glaciation. The pine forests that dominated the region earlier were replaced by a mixed deciduous-coniferous forest by about 8,000 B.P. and then by essentially modern forests by about 7,500 B.P. (Davis, 1983; Webb et al., 1983). Fluctuations in the levels of the Great Lakes also continued. During this period the historic low lake levels in the Lake Huron and Michigan basins were replaced by a gradual rising of the lakes until they reached a higher than modern level around 5,500 B.P. known as the Nipissing stage (Anderton, 1993; Larsen, 1985a; Larsen, 1985b). The large migratory game that the earlier Paleo-Indians had relied on and organized their economy around disappeared and were replaced with a wider array of large-, medium-, and small-sized game and a broad variety of plant resources.

As part of the response to these changing conditions, the tool kit used by Early and Middle Archaic populations in the region expanded to include a number of new tool forms designed for efficient exploitation of the new suite of resources that were emerging. Lanceolate points were replaced by a variety of notched and barbed projectile points, a wider variety of scrapers, bifaces and other tools, the beginning of the use of copper, and a variety of groundstone tools such as axes, adzes, and gouges were added to the repertoire. Early and Middle Archaic sites are virtually unknown in Michigan's Upper Peninsula and northern Wisconsin. A number of factors have been invoked to explain this lack of sites including a decline in population due to unfavorable environmental conditions (Fitting, 1975), inundation of many of the sites as lake levels recovered from the historic lows, and/or the inability to adequately identify and differentiate the sites due to the lack of diagnostic artifacts and associated radiocarbon dates (Stoltman, 1986:213). Based on information from more southern parts of the Great Lakes, however, it is believed that Early Archaic peoples continued a highly mobile lifestyle and possessed an economy that emphasized hunting and also incorporated a broader array of wild plant resources.

The Middle Archaic period (ca. 5,000 B.P.-3,200 B.P.) is distinguished by the manufacture of large side-notched projectile points, a marked increase in the use of copper for making tools and ornaments, and continued use of groundstone tools. The Old Copper culture (primarily a burial complex) developed during this period (Mason, 1981; Ritzenthaler, 1957; Stoltman, 1986; Stoltman, 1997). Some of the Middle Archaic sites excavated in the region are associated with the Old Copper culture and have produced a wide variety of tools and ornaments and possible evidence for the use of cemeteries. If sites like Riverside, Reigh, and Oconto did serve as burial grounds, it suggests that the people were beginning to better define territories and were less mobile than previous periods. While a mobile lifestyle following seasonally available resources probably typified this period, we know from the manufacture of copper fishing gear that fish were added to the economy and became an important part of it. The occurrence of the few major sites that are known in major river valleys also points to an increase in the importance of riverine and wetland resources.

### Late Archaic Period

Across the northern Great Lakes, the Late Archaic period (ca. 3,200 B.P./1200 B.C.-1 A.D.) is better represented and understood than the preceding periods, although the number of excavated sites remains small (Fitting, 1975; Lovis, 2009; Mason, 1981; Robertson et al., 1999). Late Archaic cultures are differentiated from the earlier Archaic cultures primarily by changes in projectile point styles in which there is a proliferation of small and medium-sized notched, expanding stemmed, and stemmed types (Robertson et al., 1999). There is little evidence for the importation of goods from other areas aside from small quantities of high quality cherts and orthoquartzites; however, native copper continued in use and was probably traded outside the region. Late Archaic sites have been identified at a number of locales both across Michigan's Upper Peninsula (Anderton, 1993; Benchley et al., 1988; Conway, 1980; Dunham and Anderton, 1999; Fitting, 1974; Franzen, 1987; Wright, 1972) and in northern Wisconsin (Bruhy et al., 1999; Salzer, 1969; 1974; Stoltman, 1986; Stoltman, 1997).

In general, Late Archaic lifeways have been characterized as a diffuse adaptation based on scheduled use of a variety of plant and animal resources; fish were an abundant, highly productive and reliable resource (Cleland, 1976; Cleland, 1982). Available information indicates that the annual economic round focused on hunting with population movement to the coastal areas during the spring and summer where spearing shallow-water spawning fish, hunting waterfowl and mammals in adjacent wetlands, and collecting wild plant foods took place. In the winter, groups probably split into smaller family-sized units and moved into interior lake and other near-wetland settings where hunting was a primary activity (Dunham and Anderton, 1999). Evidence for a small oval or round house floor defined by a wall trench was identified at the Butternut Lake Inlet site in northeastern Wisconsin (Bruhy et al., 1999). The occurrence of acorns indicate these nuts were being processed at the site and recovered bone shows evidence of large game hunting and suggests that the site was occupied in the fall and possibly the winter. It has also been suggested that many of the small lithic scatters that lack pottery found on relict shorelines associated with earlier stages of the Great Lakes date to the Late Archaic period (Anderton, 1993; Conway, 1980; Franzen, 1987).

**Woodland Period**

The Woodland period is distinguished from the Archaic by more numerous sites that become larger through time and a number of technological innovations, such as the introduction of ceramics and new tools for fishing. Like the Archaic period, the Woodland period has been subdivided into Early, Middle, and Late subperiods (Halsey, 1999; Stevenson et al., 1997). Knowledge about the nature of the lifestyles practiced during each of these periods is uneven, at best.

Early Woodland occupations are poorly known in both the Upper Peninsula and northern Wisconsin. Aside from the possible introduction of pottery from the south, what little is known suggests that it represents a continuation of Late Archaic lifestyles; Early Woodland populations appear to have pursued a broad spectrum economy with aquatic resources playing an increasingly important role in the subsistence economy (Cleland, 1982). Pottery decorated with incised designs over cordmarked surfaces, known as Dane Incised, is associated with the later portions of the Early Woodland in southern and western Wisconsin (Howell, 2001). It also co-occurs with later Middle Woodland ceramics, suggesting that it may be a later arrival in the northern woods and is not associated with Early Woodland occupations.

The Middle Woodland or Initial Woodland (ca. A.D. 1-500 A.D.) period represents the first widespread introduction of pottery in the region. In general, these groups represent a Lake Forest (Fitting, 1975) or Northern Tier (Mason, 1966; Mason, 1981) adaptation that shares cultural traits with Laurel tradition sites to the north and west (Brose and Hambacher, 1999; Janzen, 1968). Pottery consists of vessels with wide mouths and conoidal (pointed) bases decorated with large plats of vertical and oblique stamped and impressed designs. Large corner-notched projectile points, small “thumbnail” end scrapers, and fishing equipment made from bone, antler, and copper are also elements of the Initial Woodland artifact assemblage. This is also the first period when regional differentiation of groups across the broader region becomes evident in the material culture (Brose and Hambacher, 1999).

Settlement and subsistence patterns indicate a reliance on seasonal fishing, collecting, and hunting with a continued increase in the emphasis on exploitation of aquatic resources. Sites like Summer Island (Brose, 1970), Winter (Richner, 1973), and Naomikong Point (Janzen, 1968) represent large warm season, coastal or near-coastal villages where people congregated to exploit spring spawning fish. Some dispersal into smaller summer fishing camps is also indicated. By the end of the Initial Woodland period there is also evidence that sites were more consistently located to take advantage of deep water-spawning fall fish. During the winter, groups appear to have dispersed into interior wetland and lake settings for hunting and fishing. Small aceramic lithic scatters located on relict beach ridges and interior wetland settings suggest that these resources were exploited year-round. In northern Wisconsin there is also an adaptation focused around the interior lake system known as the Nokomis phase (Salzer, 1969; Salzer, 1974; Salzer, 1986; Stevenson et al. 1996).

The Late Woodland period (ca. A.D. 500-1600 A.D.) is the best documented prehistoric cultural period in the northern Great Lakes. During this period a number of regionally distinct Late Woodland groups are evident across the region along with sites that are more closely affiliated with the Oneota tradition. Broad-scale changes in the technology and subsistence economies are present in the region beginning as early as 600 A.D. (Buckmaster, 1979; Clark, 1991; Cleland, 1982; Martin, 1989; Stevenson et al., 1997). The subsistence economies appear to be organized around the use of seasonally dense, abundant plant and animal resources such as spring and fall spawning fish, seasonal fruits and berries, acorns, and wild rice (Cleland, 1976; Dunham, 2010; Stevenson et al., 1997). Technological changes include the widespread adoption of the bow and arrow, the use of small triangular, notched, and flake projectile points, and the use of deep-water gill nets (Clark, 1991; Cleland, 1976; Cleland, 1982; Martin, 1989).

Pottery made in the eastern Upper Peninsula, the Straits of Mackinac, and northern Lower Michigan during the Late Woodland period, as epitomized by the sequence from the stratified Juntunen site (McPherron, 1967) documents a shift from a more western Blackduck affiliation during the early part of the period to an eastern Iroquoian influence after about 100 A.D. The early pottery is characterized by cordmarked surfaces, moderately to sharply out-flaring rims, and both simple and complex geometric decoration made with corded tools. In the late Late Woodland these ceramics are replaced by larger vessels with smooth surfaces, collars and castellations, and less everted rims decorated with a variety of linear designs made by stab-drag techniques and punctations. Serving as a fall fishing village, the Juntunen site also produced evidence for the use of corn, although it is unclear whether it was grown or traded into the area.

Similar, but regionally distinctive cordmarked early Late Woodland ceramics are seen in the Keweenaw Bay area (Sand Point ware), the Door Peninsula (Heins Creek ware), and the interior of northern Wisconsin (Lakes Phase). The economy of the makers of Heins Creek pottery appears to be oriented around the use of coastal resources, while the Lakes Phase people are focused on the interior lake systems. In addition to larger warm season coastal or lakeside villages and smaller interior winter hunting camps, Lakes Phase peoples are known to use both open cemeteries and burial mounds, which are often situated in headwater locations (Salzer, 1969; Salzer, 1974). The nature of the relationships between these different regional expressions of Late Woodland culture, however, remains poorly understood.

Beginning as early as the tenth century A.D., Oneota peoples related to the Mero Complex on the Door Peninsula begin appearing in northern Wisconsin (Bruhy, 2002; Mason, 1990; Overstreet, 2000) and spread across parts of the Upper Peninsula, most likely sometime around 1200 A.D. (Halsey, 1999). Oneota pottery consists of infrequently decorated grit- and/or shell-tempered globular vessels with sharply everted rims. Some exhibit occasional lip modifications and simple trailed designs. The presence of garden beds bespeak the use of maize horticulture by these peoples (Buckmaster, 2004), although they also appear to have incorporated locally available starchy-seeded annuals, like chenopodium, knotweed, little barley, and wild rice along with fruits and berries into their diet (Bruhy, 2002; Bruhy et al., 1999). Mounds and clusters of storage pits have been identified in proximity to a number of Oneota village sites in northern Wisconsin.

### Native Americans in the Historic Period

It is clear that the historic Native American groups encountered across the region by the early French explorers had cultural ties with the preceding late Late Woodland period. Much of the Upper Peninsula was historically used by the Ojibwa and Ottawa; the Ojibwa also lived across northern Wisconsin. Other groups had traditional territories in the region, such as the Menominee in the Menominee River valley area, the Winnebago (Ho Chunk) in the Door Peninsula area, and Siouian speakers, primarily the Dakota and Assiniboine, farther to the west along the western shores of Lake Superior (Tanner, 1987; Trigger, 1976). Native American cultures were dramatically affected by European influences, land use, and political control by the mid-seventeenth century. French explorers, traders, and Jesuit missionaries begin making contact with Native American groups in the upper Great Lakes by this time (Cleland, 1992; Stone and Chaput, 1976; Tanner, 1987). It was also during this period that a number of groups were pushed west by the outbreak of hostilities with the Iroquois, setting off a series of movements that disrupted traditional distribution of Native peoples. Refugee Huron and Ottawa groups arrived in the Chequamegon Bay region around 1650, although they eventually relocated to the Straits of Mackinac region around 1670. As political control of this region passed from French (pre-1760), to British (post-1760), and finally American jurisdiction (1796-present), Native American societies changed in many respects as they became increasingly dependent on Euroamerican technologies and became intermeshed with the now-dominant society. Many aspects of the traditional cultures and beliefs have survived and area enjoying a resurgence in modern times.

## 1.1.4 EAST OF THE ROCKIES (EOR) REGION

### 1.1.4.1 State of Minnesota

Northern Minnesota extends across parts of the Central Lowlands and the Superior Upland physiographic provinces (Fenneman and Johnson, 1946). The Central Lowlands region of the state includes the Eastern Lake, Western Lake, and Dissected Till Plains sub-provinces.

Minnesota is mostly in the Northeastern Plains cultural region of the Great Plains, with a small portion of the northeast part of the state extending into the Northeast cultural region (DeMallie, 2001a; DeMallie, 2001b; Trigger, 1978). The prehistory of the state is outlined in a number of monographs and edited volumes (e.g., DeMallie, 2001a; DeMallie, 2001b; Frison, 2001; Harrison, 1985; Fitting, 1978a; Fitting, 1978b; Tuck, 1978).

A Cultural context for the prehistoric period in Minnesota and the larger area of the plains was developed in the early and mid-twentieth century by Kroeber (1936), and was elaborated by others in later years (Wilford, 1955; Quimby, 1960; Wedel, 1961; Bamforth, 1988; Johnson, 2004; Fitting, 1978a; Fitting, 1978b; Tuck, 1978; Gibbon et al, 2000). However, detailed cultural chronologies for the portion of Minnesota within 100 miles of the Canadian border are largely nonexistent, although chronologies have been developed for other parts of the state (Harrison, 1985).

The Minnesota State Historic Preservation Office (SHPO) has developed a historic preservation plan titled *Gaining Ground: A Preservation Plan for Minnesota's Historic Properties 2006-2010* (2006) that includes cultural contexts for both the prehistoric and historic periods. The foundation for the current plan was created in 1995, in a document titled *Preserving Minnesota: a Plan for Historic Properties in the New Century* (MN SHPO, 1995). The prehistoric cultural chronology for Minnesota divides the approximately 11,500-year continuum into five main phases or cultural traditions (MN SHPO, 2010). From earliest to latest, the defined traditions are:

- Paleo-Indian Period (see Section 1.1.1)
- Archaic Period
- Woodland Period
- Plains Village Tradition
- Mississippian Tradition

The prehistoric context is available at
http://www.mnhs.org/shpo/survey/docs_pdfs/HistoryArchitectureSurveyManualOctober2010.pdf

**Archaic Period**

During the Archaic Period (ca. 8,000 B.P. –2,500 B.P.), the subsistence practices focused on hunting and gathering as suggested by the presence of flaked stone spear and dart points, bifaces, scrapers, and knives. Groundstone and copper tools also appear during this time period. Typical sites include stone quarries and resource procurement areas, tool production sites, hunting and game processing sites, and camps.

**Woodland Period**

The Woodland Period (ca. 500 B.C. (2,500 B.P.) – 900 A.D., and 1650 A.D. in some areas) witnessed a transition from a somewhat mobile settlement system to a more sedentary lifeway with semi-permanent villages. The development and use of pottery and more elaborate human burials are key elements of the period. Artifact assemblages typically include bone artifacts, bone and shell beads and ornaments, ground stone implements, and small projectile points. Sites include resource procurement sites, villages, camps, hunting and processing sites, and burial mounds.

**Plains Village Tradition**

The Plains Village Tradition (ca. A.D. 900–1300 A.D.) is characterized by the development of villages focused on cultivation of crops along river banks and major drainages. Structures include lodges and stockaded village compounds. The range of artifact types produced during the Plains Village Tradition far exceeded the variability in earlier assemblages. Among the items they comprised were copper implements, bone and stone tools, small stone arrow points, and elaborately decorated ceramics. Typical sites include those related to resource procurement, villages, camps, hunting and processing sites, and burials.

**Mississippian Tradition**

The Mississippian Tradition (ca. 900 A.D.–1650 A.D.) in Minnesota was primarily confined to the southern parts of the state, but some of its elements (particularly those related to ideology) probably extended further to the north. The Mississippian had its origins in the southern United States and is partially characterized by cultural influences from Mexico. Its defining qualities include an intensification of agriculture, along with increases in the size and complexity of communities and cultural systems. While unquestionably influenced by Mississippian Tradition developments to the south, sites in Minnesota display a variation of those lifeways to life in forest and prairie environments. Cultivation relied heavily on corn, beans, squash, sunflowers, and tobacco. Hunting and fishing were also important. Small side-notched arrow points are typical of this period, as are groundstone tools (e.g., axes, hammerstones, mauls, and grinding stones), bone and antler tools, shell, bone and copper beads and ornaments, and incised pottery. Typical sites of the Mississippian Tradition period include large villages, agricultural fields, tool production loci, hunting and processing sites, and burials.

#### 1.1.4.2 State of North Dakota

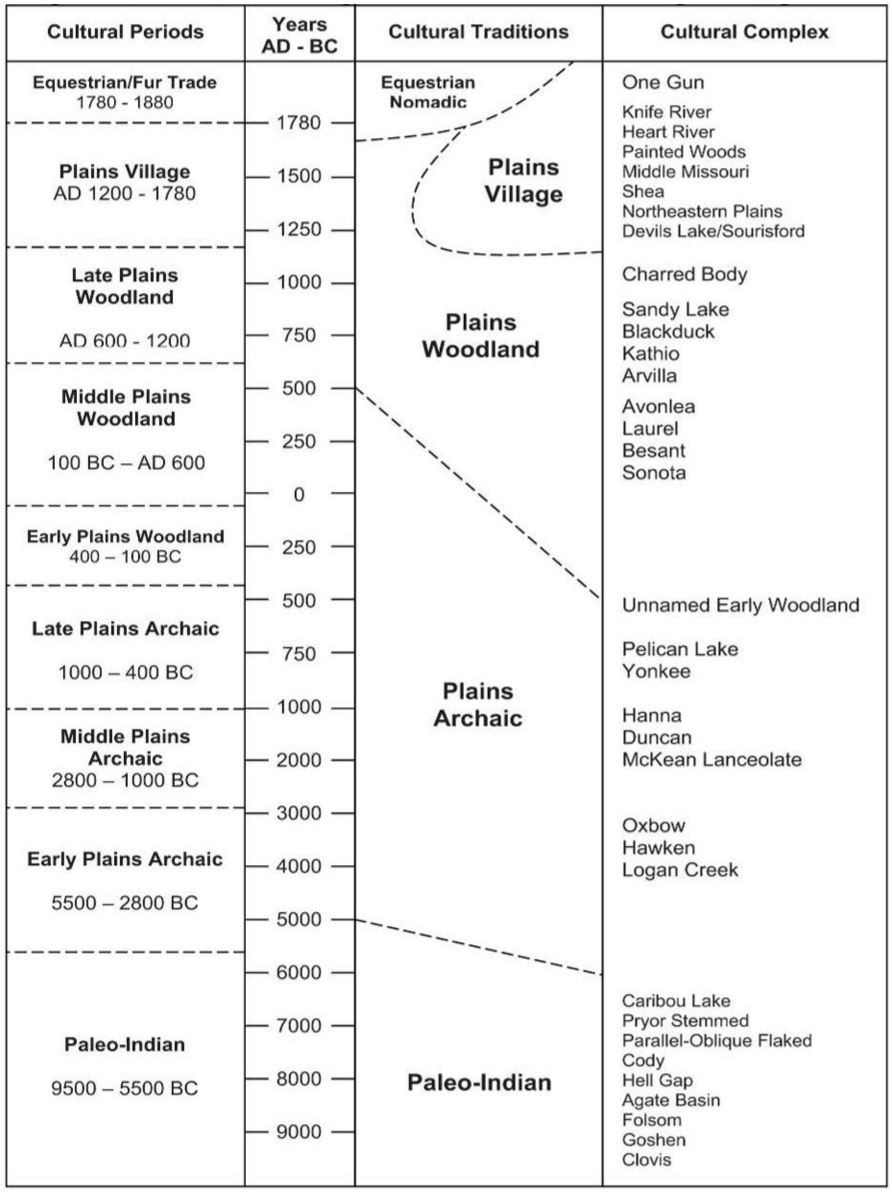
Northern North Dakota extends across parts of the Great Plains and Central Lowlands physiographic provinces (Fenneman and Johnson, 1946). The area in the Great Plains province includes both the glaciated and unglaciated Missouri Plateau sub-provinces. The Central Lowlands province includes the Western Lake sub-province.

Northern North Dakota is in the Northern Plains cultural area (Wood, 1998:11). The prehistory of the state has been summarized in several monographs and edited volumes, including Wood (1998:1-15; 2001:186-195); Kay(1998:16-49); DeMallie (2001b); Frison (1998:140-172; 2001: 131-145); and Johnson (1998:159-172). The Great Plains cultural area extends from central Canada to southern Texas.

A Cultural context for the prehistoric period in North Dakota and the larger area of the Great Plains was developed in the early and mid-twentieth century by Kroeber (1939), and was elaborated by others in later years (Wedel, 1961; Bamforth, 1988; Frison 1991, Gregg, et al., 2008; Kornfeld et al 2010). Detailed cultural chronologies for the northern portion of North Dakota are largely nonexistent, although chronologies have been developed for other parts of the state (Gregg, 1984; see ND SHPO, 2009; Gregg et al, 2008). The North Dakota State Historic Preservation Office (ND SHPO) has developed a historic preservation plan titled *Historic Preservation in North Dakota, 2010-2015: A Statewide Comprehensive Plan* (2009) that includes cultural contexts for both the prehistoric and historic periods. Its prehistoric cultural chronology is illustrated in Figure H-1.

In common usage, the prehistoric cultural chronology for North Dakota includes five archaeological traditions: Paleo-Indian, Plains Archaic, Plains Woodland, Plains Village, and Equestrian Nomadic. The time periods for each vary across space.

**Figure H-1. Prehistoric/Precontact Cultural Chronology for North Dakota**




Source: (Gregg et al., 2008).

## Plains Archaic Tradition

The Plains Archaic (ca. 7,500 B.P.–2,400 B.P.) is divided into Early (ca. 7,500 B.P.-4,800 B.P.), Middle (ca. 4,800 B.P.-3,000 B.P.), and Late (ca. 3,000 B.P –2,400 B.P.) periods (e.g. Dyck and Morlan 2001; Wedel 1983). Plains Archaic complexes are primarily represented in the North Dakota archaeological record by distinct types of projectile points, including: Logan Creek, Hawken, Oxbow, McKean Lanceolate, Duncan, Hanna, Pelican Lake, and Yonkee. Throughout the Plains Archaic, people were inhabiting and continually adapting to environments that were changing from a periglacial habitat to those with essentially modern characteristics. Much of this climatic and environmental change occurred during the first few millennia of the time period, ca. 7,500 B.P. to 4,000 B.P., a time represented archaeologically by the ‘Mummy Cave’ series of sites. In general, the evidence from these sites indicates people were surviving as “mobile bands using large territories within a thinly populated region” (Dyck and Morlan, 2001:115). Mummy Cave artifacts primarily comprise stone tools, among which are notched projectile points such as the Blackwater and Hawkins types, as well as a geographically-widespread series of simple implements manufactured from chert pebbles that were used as scrapers and wedges. Although far fewer in number, sites also have yielded bone implements, such as needles, knives, hooks, flaking tools, and awls. The atl-atl (or ‘spearthrower’ is probably also developed during the first few millennia of the Plains Archaic). The evidence indicates people were primarily relying on bison for food, although remains from other animal species are also found at archaeological sites, such as those of ground squirrels, canines, and small mammals. Although there is very little direct evidence for plant use, it is highly likely that people were gathering floral material for use as food and for implement manufacture (e.g., baskets). Sites are typically found along large rivers and include camps and animal kill sites.

The part of the Plains Archaic that extends after ca. 4,000 B.P. includes archaeological assemblages from the Pelican Lake and Besant series of sites, which are distinguished primarily on the basis of their distinct projectile points. Both relied heavily on the Bison and lived in tepee-like structures. Their sites tend to be along rivers and include habitations and burial and kill sites; some burials are covered with rock cairns (Dyck and Morlan 2001:121-125).

**Plains Woodland Tradition**

The Plains Woodland tradition (ca. 2,400 B.P.–1200 A.D.) is divided into Early (ca. 400 B.C.-100 B.C.), Middle (ca. 100 B.C.- 600 A.D.), and Late (ca. 600 A.D.-1200 A.D.) periods. In general, Plains Woodland people continued a strategy of subsistence based on hunting and gathering, but also began to inter their dead in mounds with increasingly elaborate grave goods. The also developed ceramic vessel technology and intensified their use of indigenous seedy plants and grasses for food. The bow and arrow technology and point types generally replaced the atlatl around 600 A.D. Plains Woodland complexes are identified in the archaeological record in North Dakota through the presence of distinct types of projectile points, such as the Sonota/Besant, Laurel, Avonlea, Arvilla, Kathio, Blackduck, Charred Body, and Sandy Lake types. Sites tend to be clustered along rivers and include burial mounds and other burial sites, occupations, , quarries, lithic procurement areas, and bison kill loci.

**Plains Village Tradition**

People of the Plains Village tradition (ca. 1200 A.D.–1780 A.D.) were horticulturists, hunters, and gatherers. They lived in the North Dakota area from as early as ca. 1200 A.D. until ca. 1780 A.D., after which their populations were decimated by plagues of European diseases and the migration of Euro-American settlers into their territory. It is generally believed that the key element in Plains Village adaptive strategies was the production of a dependable, storable, surplus food supply, primarily in the form of dried corn. Stored surpluses of food facilitated the formation of larger, more permanent settlements based around earth lodges.

Typical Plains Village sites types include semi-permanent occupations (among which are fortified and unfortified earth lodge villages, and winter villages and some of which included conical timber lodges), hunting camps, flint quarries, eagle trapping sites, burial sites, lithic workshops, bison kill sites, and rock art sites.

### Equestrian Nomadic Tradition

The Equestrian Nomadic tradition (ca. A.D. 1780–1880 A.D.) describes lifeways that were dependent upon horses and that developed during protohistoric and early historic times in the Northern Plains. The use of horses resulted in significant changes in subsistence economies, demographics, social organization, and settlement patterns. Known site types include camps, battle sites, and animal kill sites.

#### 1.1.4.3 State of Montana

The project area that encompasses northern Montana spans two major physiographic provinces, as defined by Nevin Fenneman and D.W. Johnson (1946). The eastern portion of the northern border is situated in the glaciated area of the Missouri Plateau section, within the Great Plains province, in the Interior Plains division. The smaller, western most portion of the northern border falls within the Northern Rocky Mountains province of the Rocky Mountain System division.

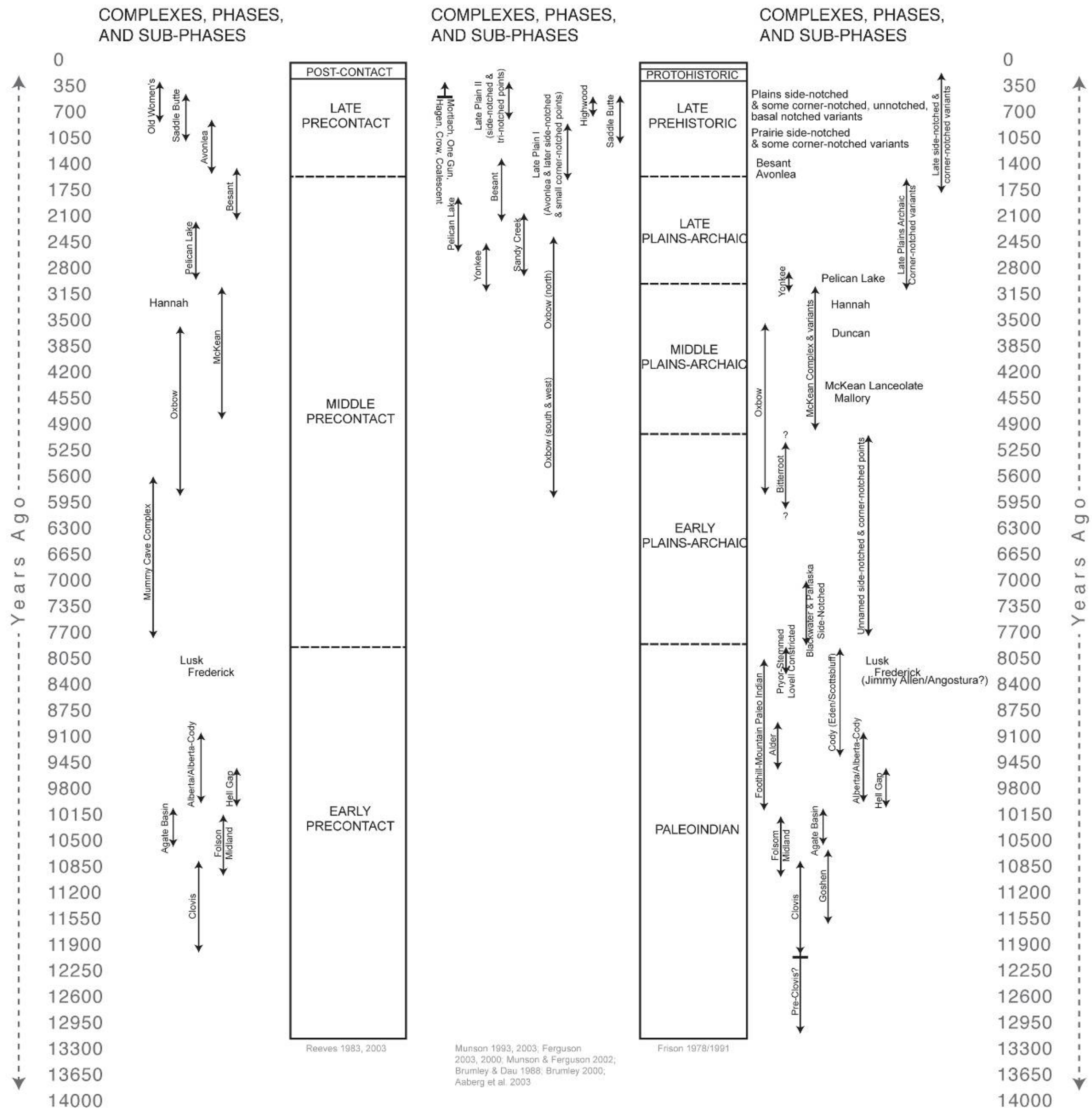
Various attempts have been made to link precontact (prehistoric) culture areas with natural physiographic areas of the region, and the western United States (Mulloy, 1958; Wedel, 1961; Frison, 1991).

Cultural contexts for the precontact period in Montana were first developed in the 1950s (Mulloy 1958), and were revised by others in later years (Reeves, 1970, 1983; Frison, 1991; DeMallie, 2001b; Kornfeld et al, 2010). Regional chronologies and precontact contexts have been developed for specific areas within the state. Although some revisions continue, the basic cultural chronologies remain unchanged. Aaberg (2006) synthesizes a regional context for precontact archaeological sites in eastern Montana. Similar contexts have been devised from data originating from specific areas of the northwestern plains and northern Rocky Mountains, but have resulted in chronologies that are generally applicable throughout northern Montana (Greiser, 1984; Frison, 1991, 2001; Davis et al, 1995). These chronologies, describing the precontact context of the project area, are summarized below.

Due to the lack of a single cultural context for the precontact period in Montana, this brief summary utilizes the synthesized cultural context developed by Aaberg (2006), which is a compilation of several sources (Figure H-2).

The precontact cultural chronology for Montana separates the approximately 13,000-year continuum into four main phases, descending through time from the Post-Contact or Protohistoric, at the recent end of the timeline, to the Late Precontact or Late Prehistoric, to the Middle Precontact or Plains-Archaic, and beginning with Early Precontact or Paleo-Indian.

**Figure H-2. Prehistoric/Precontact Cultural Chronologies for Montana and Surrounding Areas of the Northern Great Plains**




Source: (Adapted from Aaberg et al., 2006.)

Notes: Frison's (1991) chronology further separates the Plains-Archaic period into three sub-periods of Late, Middle, and Early.

## Middle Precontact (early portion)/Early Plains Archaic Period

Frison (1991) separates the Archaic Period (ca. 7,800 B.P.–5,000 B.P.) into three subdivisions, the Early-, Middle-, and Late-Archaic. Reeves (1970, 1983) does not indicate separate subdivisions for his defined Middle Precontact Period, which is conterminous with the Archaic. The archaeological record shows a reliance on bison hunting, with some locations of mass killing. Frison (1991) notes an increase in the frequency of ground stone tools throughout the archaeological record for this period, possibly related to a corresponding increase in the procurement and processing of plant food products.

The major change observed in the material culture of the Middle Precontact Period is evidenced by the disappearance of lanceolate and large stemmed projectile points, typical of the Early Precontact/Paleo-Indian Period. The tool collection is exemplified by side-notched and corner-notched point types. Throughout the area, the characteristic site types include lithic scatters and tool production sites, camp sites, game drives and processing sites, and related occupation and use areas.

### Middle Precontact (middle portion)/Middle Plains Archaic Period

**The middle portion of the Middle Precontact Period** (ca. 5,000 B.P.–3,000 B.P.), discussed by Reeves (1970, 1983), corresponds to Frison's (1991) definition of the Middle Plains Archaic Period. This differentiated period appears to be one of transition in climatic conditions, availability of natural resources, and corresponding changes in human cultural attributes and artifact assemblages.

Although there are possibly older examples within the area of Montana, stone tipi rings are represented in the archaeological record by 4,000 years B.P. (Brumley and Dickerson, 2000).

Diagnostic stone tools, in the form of projectile points and other biface tools, identified in the archaeological record during this time interval, show a continuation of the side-notched and corner-notched forms of the previous sub-period.

Other stone tools include oval bifaces, lanceolate-shaped bifaces, knives, small end scrapers, unifacial knives and side-scrapers, small pebble hammerstones, chopping tools, irregular polyhedral cores, perforators, and flake tools (Melton, 1988; Aaberg et al, 2003). Site types range the full spectrum, from lithic scatters and tool production sites, quarry sites, and habitation sites with tipi rings, to camp sites, game drives and processing sites, and related occupation and use areas.

### Middle Precontact (late portion)/Late Plains Archaic Period

This sub-period (ca. 3,000 B.P.–1,500 B.P.) is characterized by a continuation of big game hunting, with emphasis on bison in the plains and lower mountain valley regions of Montana. Strong evidence for large-scale, communal bison kills date to this time (Aaberg et al, 2006:177). Acquisition of bison during this period is documented from drives, cliff jumps, traps, and impoundments.

Increased use of the tipi as a habitation structure is noted during this period. Ceramics first appear at cultural sites on the plains of eastern Montana at the end of this time period (Kornfeld et al, 2010:432-440). Continued use of ground stone implements is also seen in the archaeological record, along with use of the atlatl for throwing hafted projectile points.

The dominant tool kit of the late portion of the Middle Precontact/Late Plains Archaic Period includes predominantly corner-notch projectile points and lithic tools, flake tools, drills, scrapers, bifacial cores, beveled edge bifacial knives, and ground stone tools (Ferguson, 2003; Frison, 1991; Kornfeld et al, 2010).

Site types range across the full spectrum, from lithic scatters and tool production sites, quarry sites, and habitation sites with tipi rings, to field-camp sites, game drives, kill sites and processing areas, rock cairns, and related occupation and use areas.

**Late Precontact/Late Prehistoric Period**

The major shift in technology that occurred at the beginning of the Late Precontact/Late Prehistoric Period (ca. 1,500 B.P.–200 B.P.) throughout Montana is the introduction of the bow and arrow (Frison, 1991; Kornfeld et al., 2010). Large game hunting, with a focus on bison procurement, including communal kills and hunting, is seen as the primary subsistence adaptation of the time (Aaberg, 2006:185). Many other species of game and smaller animals were also acquired, often throughout a broader seasonal schedule.

Other cultural attributes of the period within Montana include relatively large quantities of projectile points and point preforms, large numbers and types of bone and sandstone tools, as well as faunal remains from rodents and large ungulates (Fredlund 1988). Ceramics also have been identified at sites in the northern extent of the Plains (Johnson, 1988; Quigg, 1988). As is the case with the earlier period, site types during this time range across the full spectrum, from lithic scatters and tool production sites, quarry sites, and habitation sites with tipi rings, to field-camp sites, game drives, kill sites and processing areas, rock cairns, trails, and related occupation, ceremonial sites, and use areas.

**Postcontact/Protohistoric Period**

The beginning of the Postcontact/Protohistoric Period (ca. 250 B.P.–100 B.P.) is generally defined as the time during which the horse and European trade goods were introduced to native cultures. The acquisition of the horse, guns, metal knives, and other goods from the eastern United States caused a dramatic change in the established but dynamic cultures of the Native American's residing in the Northern Rocky Mountains and Northwestern Plains. As a result, hunting and subsistence strategies began to change at this time as well.

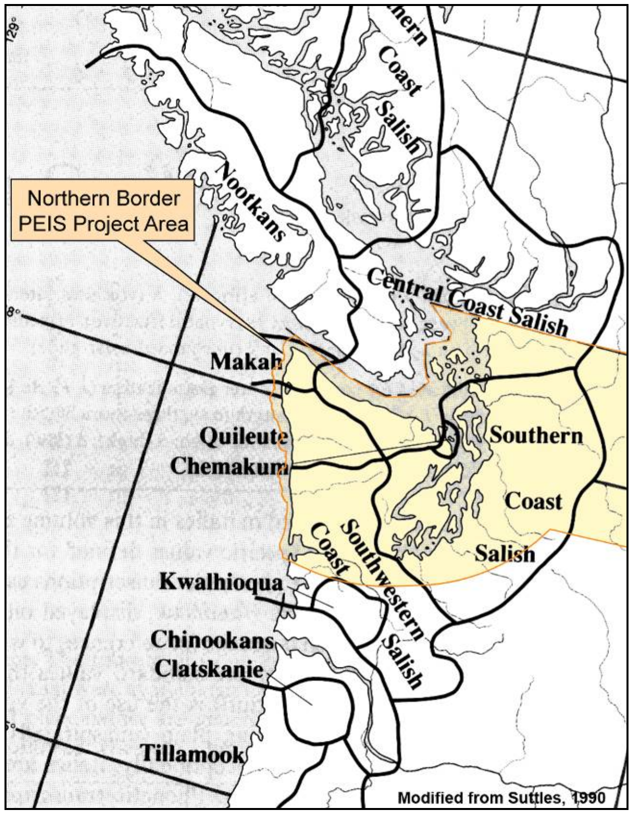
The Post contact Period resulted in a blending of cultural artifacts, tools, and cultural activities – a combining of traditional technologies and items with newly acquired trade items. The traditional tool kit was supplemented by factory made fabrics, European-style clothing and ornaments, trade beads, guns, and ammunition, as well as metal objects, including tools, cookware, knives, arrow points, axes, and lances.

### 1.1.5 WEST OF THE ROCKIES (WOR) REGION

#### 1.1.5.1 States of Washington and Idaho

Two Native American Culture Areas, defined over the past century by anthropologists and archaeologists, provide a useful characterization of the pre-contact archaeology and ethnography of Washington and Idaho within the Northern Border Programmatic Environmental Impact Statement (PEIS) project area. The Northwest Coast Culture Area (Figure H-3) is comprised of linguistic groups that inhabited the Pacific Coast of the United States and Canada, from northern California to the Alaskan Panhandle and extending inland one hundred miles or more into the Cascade and Coastal mountain ranges. The Plateau and Northern Rocky Mountain Culture Area (Figure H-4) is comprised of linguistic groups inhabiting intermontane western North America between the Coast and Cascade Mountains and the northern Rocky Mountains. Only a narrow portion within each Culture Area may be affected by the actions considered in this PEIS.

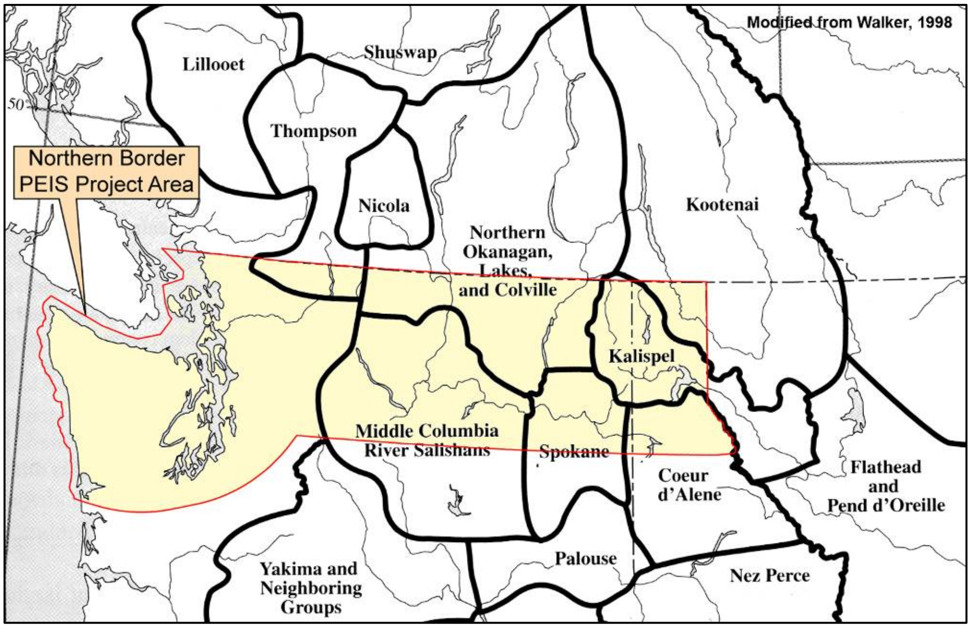
**Figure H-3. Northwest Coast Culture Area**




## 1.1.6 Northwest Coast Culture Area

The traditional territory of Southern and Central Coast Salish groups corresponds with the Puget Sound and Strait of Juan de Fuca region. In addition to these groups, the Makah, Quileute, and Southwestern Coast Salish traditionally inhabited the outer Pacific Coast and Olympic Peninsula (Suttles, 1990). Several broad environments within this Northwest Coast Culture Area are bisected by the PEIS zone and are relevant when considering Native American settlement patterns and the potential for impact to archaeological resources. The Olympic Peninsula is characterized by high-energy coastlines on its western and northern shores, a deep but protected fjord on its eastern shore, and inland topography dominated by steep-walled river valleys radiating outward from the Olympic Mountains. The remainder of the PEIS zone within the Northwest Coast Culture Area corresponds with the Puget Lowlands and the western flanks of the Cascade Mountains. The lowlands are characterized by a broad glacial drift plain and relatively low-energy marine embayments and islands in the Puget Sound and Strait of Georgia, all of which were created by advance and retreat of the Puget Lobe of the Cordilleran ice sheet at the end of the Pleistocene. The drift plain is dissected by river systems originating in the Cascade Mountains, which attain elevations exceeding 10,000 feet (3,048 meters) above sea level at the summits of several stratovolcanoes.

**Figure H-4. Plateau and Northern Rocky Mountain Culture Area**




## *Land Use*

Native American subsistence and settlement in this portion of the Northwest Coast Culture Area witnessed a continuity of economic focus that included hunting, fishing, and gathering since the end of the Pleistocene epoch (Ames and Maschner, 1999). The allocation of these pursuits changed, however, as the environment of Western Washington was altered by geological and climatic processes. With these changes, the human population grew and suitable locations for hunting, fishing, gathering, and settlement shifted as well. The archaeological record suggests the earliest human occupants of Western Washington lived in small, highly mobile groups that pursued a variety of game, including now-extinct large terrestrial mammals, across a landscape that was quickly changing in terms of post-Pleistocene marine shoreline configuration and plant and animal communities. Relative sea level was in the process of stabilizing during the early Holocene epoch, and the archaeological record reflects a terrestrial economic focus ranging from the crest of the Cascade Mountains down to what was during that period a marine shoreline gradually being inundated. Archaeological evidence of fishing along major river systems during the early Holocene exists, but the importance of salmon fishing during this time relative to other subsistence pursuits is much more equivocal than later in the Holocene. The past 5,000 years is a period when sea level and river valley systems stabilized, allowing salmon and shellfish habitats to establish themselves and growing Native American communities to adjust to their location and abundance for subsistence. Vegetation throughout the lowlands and uplands also approximated its modern character by the mid-Holocene. Seasonal berry-picking in the uplands became another cornerstone of Native American land use, which archaeologists hypothesize has intensified over the past several thousand years. Native American land use shifted dramatically as a result of initial Euroamerican contact at the end of the eighteenth century, when disease epidemics decimated communities (Boyd, 1999).

### *Site Types*

Broad-scale changes in Native American land use from the end of the Pleistocene to first encounters with Euroamerican explorers in the late 1700s are manifested in the archaeological record by a variety of artifacts and features. Archaeologists have classified this material into assemblages to infer chronological sequences and past lifeways. This brief overview describes the kinds of pre-contact Native American archaeological deposits found in Western Washington and the patterns in their distribution that have been formally studied since the mid-twentieth century. Artifacts and assemblages characteristic of particular chronological periods are further described in the subsequent section.

Archaeological sites clearly associated with any kind of residence are quite rare in Western Washington. These sites contain hearths, cooking and food processing features, post-molds and other structural remnants indicative of both domestic and economic activities. The ethnographically derived categories of *village* and *camp* are often used to differentiate particular residential sites in the prehistoric archaeological record of the Northwest Coast. In the logistically-organized settlement patterns that characterized much of the Northwest Coast around the time of contact, villages were the central residential unit of a particular community for at least a portion of its seasonal economic round. Archaeological remains consist of either multiple residential structures or a single very large house, a diverse artifact assemblage reflecting a wide variety of economic and social activities, and the remains of subsistence resources harvested across several seasons. In the same kind of settlement pattern, camps are more seasonally limited residences of families and task groups and are situated at or near important resources. They are usually manifested by features of a single dwelling, artifacts reflecting only a single or a few economic pursuits, and deposits that are less extensive and lack the stratigraphic complexity of village sites. Overall mobility of Native American communities was greater prior to the village-oriented settlement pattern hypothesized for most of the central Northwest Coast over the past few thousand years. Instead of a single village, community residences were centered on several base camps throughout the annual economic cycle, and smaller camps were used for specific tasks. Most residential sites that have been identified in this region are situated in places that allow easy access to subsistence resources, fresh water, and transportation corridors such as marine shorelines, river valleys, and mountain ridge lines and passes.

Much more common than residential sites along the central Northwest Coast are the archaeological remains of harvesting and processing activities and lithic tool manufacture and maintenance. Such deposits are also found as part of residential sites, but are more frequently identified without additional evidence of dwellings. Examples of these kinds of sites include most *shell middens*, comprised of shellfish and other faunal remains discarded during their processing and consumption. Their size, thickness, extent of stratigraphic complexity, and contents vary widely. All provide at least some information regarding past subsistence, and often datable organic material as well. The soil chemistry of shell middens allows preservation of bone, including human remains. Shell middens are usually situated along the shoreline at the time of deposition, but subsequent tectonic activity and sea level change have resulted in the discovery of middens today in both intertidal environments and inland along former beach landforms. Other *resource processing features* such as camas ovens and storage and roasting pits are found in a wider variety of settings, from huckleberry grounds in montane environments to wetlands and prairies in both the coastal and interior lowlands. They are manifested by concentrations of fire-modified rock, charcoal, and burned sediment, and sometimes the remains of processed resources such as charred plant material, seeds, or calcined bone and shell. Where the landscape has undergone the most intensive historic and modern development, most notably in urban and suburban areas and tilled agricultural land, all that may be left of these sites are dispersed loci of fire-modified rock and little else to indicate their age or function.

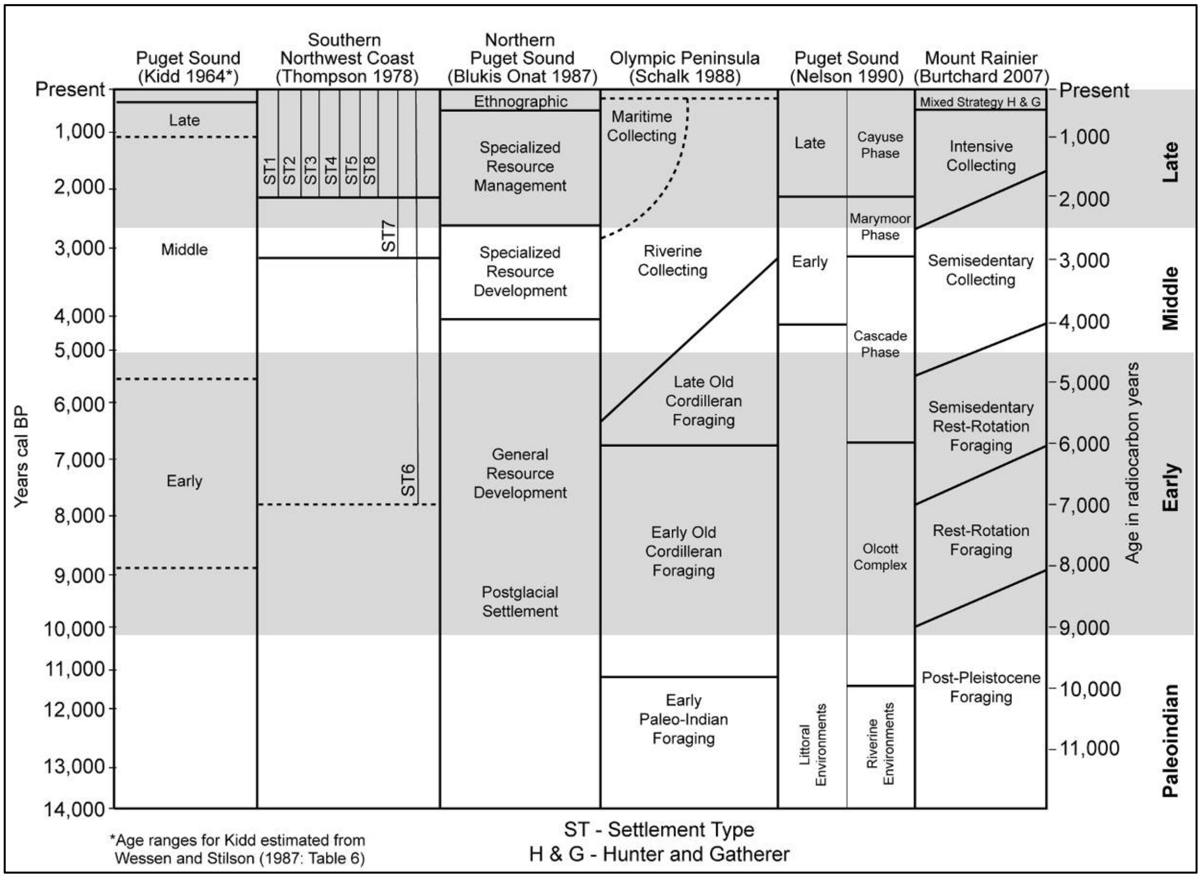
Lithic tools and tool-making debris are often found unassociated with features or cultural stratigraphy that would otherwise provide ages or contexts to interpret their functions or places in a particular land use pattern. Such sites are usually referred to as *lithic scatters* or *lithic material* sites. *Quarry sites* are distinctive lithic material sites in that they have been identified at natural outcrops of toolstone and consist of dense concentrations of cores and debitage with few if any finished stone tools. Estimating the age of lithic material sites is also difficult if they lack temporally diagnostic artifacts such as projectile points. These sites are found on almost every part of the landscape of Western Washington, from high elevation toolstone outcrops and ideal vantage points for hunting to the broad lowlands and coast.

#### *Prehistoric Chronological Sequence*

Several published culture-historical sequences are important to the identification and interpretation of the Western Washington archaeological record. All focus on sub-areas within this portion of the PEIS zone or neighboring regions of British Columbia. The more recently derived sequences often build on the work of early researchers and share similar age divisions and characteristics of periods, phases, and other culture-historical units. The designations of chronological periods, their characteristics, and their implications for the archaeological record in the PEIS zone are summarized in a very general fashion in this section. The periods used here include the *Paleo-Indian, Early, Middle*, and *Late* Periods. This terminology is similar to some of the specific sequences cited below; however the divisions between them as conceptualized in this document follow major environmental changes as well as patterns of human land use: the end of the Pleistocene epoch and the early Holocene (ca. 10,000 B.P.-5,000 B.P.), middle-late Holocene (ca. 5,000 B.P.-2,500 B.P.) and late Holocene before Euroamerican contact (ca. 2,500 B.P.-200 B.P.).

The summary below is derived from sequences developed for the Strait of Georgia and San Juan Islands area (King, 1950); the Fraser Delta area (Borden, 1970); the Skagit River delta (Thompson, 1978); central and northern Puget Sound (Blukis Onat, 1987; Kidd, 1964; Nelson, 1990); the Cascade Mountains (Burtchard, 2007); and the Olympic Peninsula (Schalk, 1988; Wessen, 1990). The northern lowlands portion of the PEIS zone centered on the San Juan Islands and Strait of Georgia has a more fully developed culture historical sequence and formalized phase system, which is a product of the earliest intensive excavation in the central Northwest Coast occurring here (Borden, 1950; Carlson, 1960; King, 1950; Stein, 2000). A comparative schematic of some of these sequences is shown in Figure H-5, which demonstrates the variability of temporal divisions between culture historical sequences of particular sub-regions environmental zones. More general overviews of Northwest Coast prehistory contain useful summaries of the prehistoric cultural sequences in other areas, broader patterns across the region, and persistent research questions that have guided research in this region (Ames and Maschner, 1999; Matson and Coupland, 1995).

**Figure H-5. Western Washington Chronological Sequence**




## Early Period

During the early Holocene (ca. 10,000 B.P.-5,000 B.P.), the region experienced a relatively stable environment compared with the dynamic changes that occurred at the end of the Pleistocene, albeit one warmer and drier than today's climate. Relative sea level fluctuation was the most significant long-term environmental perturbation; rising global sea level during this time submerged the marine shorelines that may have been occupied during earlier times. Brush fires and forest fires were common during periods of summer drought and caused short-term, localized environmental changes in the forest parkland habitats. By the end of this period, the post-glacial parkland/forest mosaic across much of Western Washington evolved into a closed canopy forest. The distribution of important subsistence resources such as deer and elk changed, and human land use patterns changed as well. Prior to the mid-Holocene closing of the forest canopy, terrestrial mammals were a subsistence resource widely available throughout the glacial drift plains. The first well-dated evidence of generalized, marine littoral subsistence first appears in the archaeological record of the Gulf of Georgia region during this period as well.

Humans accommodated environmental changes during the Early Period by utilizing a wider range of subsistence resources. Increasingly complex patterns of land use resulted in additional archaeological site types, more elaborate toolkits, and more intensive use of the marine shoreline and anadromous fish runs that grew more productive as the pace of rising sea level slowed. The archaeological record of residential camps is still very sparse during this period, probably due in large part to poor preservation of landforms of suitable age that would host such sites. Specific activity sites that first appear during this period include high-elevation lithic quarries in the North Cascade Mountains, stone tool manufacturing sites on older river terraces in the foothills and glacial drift plain lowlands, and isolated finds of large lanceolate projectile points often made of volcanic rock that are usually attributed to early Holocene-aged manufacture.

**Middle Period**

The period between 5,000 (B.P.) and 2,500 (B.P.) years ago was pivotal for changing human land use in Western Washington. This period encompasses the shift from relatively high residential mobility to a pattern of logistical mobility. The archaeological record shows this change as an increasingly diverse range of site types and a greater proportion of non-residential sites associated with resource procurement and processing in a variety of settings. Development of a closed canopy forest and coeval reduction in the density and distribution of ungulates was probably an important factor in this diversification. A relatively stabilized sea level by the mid-Holocene promoted development of shellfish beds along the marine littoral, and the growing human population utilized this labor-intensive but seasonally profitable resource; the majority of shell middens in Western Washington postdate ca. 5,000 B.P.

The archaeological record of Western Washington grows substantially during this period in terms of dated site components. Artifact assemblages from the period demonstrate more elaborate technologies to access an increasingly diverse range of new resources and to better utilize old ones. Along with widespread distribution of shell middens along the marine shoreline, artifacts and features associated with fish processing and hunting along the lower and middle reaches of rivers have been found. The period is characterized by a growing human population, increasing diversity of utilized habitats facilitated by changing technology, and a much greater proportion of landforms that survive today than from previous time periods. The broad corridor of the PEIS zone contains landforms that are archaeologically sensitive for this period and that transect the Olympic Peninsula, the Puget Sound lowlands, the San Juan Islands, and the foothills and mountains of the Cascade Range.

**Late Period**

The diversity of site types, physical characteristics of deposits, and distribution of archaeological sites across multiple microenvironments over the past 2,500 years (Late Period, ca. 2,500 B.P.-200 B.P.) reflect a well-established seasonal round in Western Washington largely analogous to ethnographically described land use patterns. The seasonal round of land use that centered on winter villages was established in the region by this time. Many landforms in Western Washington have the potential to retain intact archaeological material dating to the period between 2,500 and 200 years ago; areas with the highest probabilities include the marine littoral, intact levees and terraces on alluvial floodplains, the shores of mountain lakes, mountain ridge complexes, and prairies.

Along with a greater diversity of site types, feature classes, and artifact forms, there is increasing evidence in the archaeological record of social stratification, long-distance trade, and intensified use of subsistence resources such as shellfish, salmon, and plants that are most useful when a sufficient labor pool and appropriate technology are brought to bear. Most of these characteristics make their first appearances in the archaeological record prior to this time, including the presence of exotic lithic raw material such as obsidian as early as the Paleo-Indian Period, limited use of fish, shellfish, and plants from the Early Period, and material culture indicative of warfare and social stratification from the Middle Period. It is the abundance of these archaeological correlates dating to the Late Period coupled with similar patterns seen across much of the Northwest Coast culture area at the same time, however, that distinguish this time period from earlier ones.

### Plateau and Northern Rocky Mountain Culture Area

The traditional territory of Salish-speaking groups and the Kootenai in the PEIS zone corresponds with the Columbia Plateau and northern Rocky Mountains of eastern Washington and Idaho (Walker, 1998). Similar to Western Washington, the PEIS zone bisects several distinct environmental zones that are relevant when considering prehistoric land use and potential to impact archaeological resources. This portion of the PEIS zone is mountainous with the exception of the northern edge of the central Columbia River basin, which comprises the only extensive level landform within the area of consideration. The headwaters of all the major river systems that drain this area (including, from west to east, the Okanogan, Sanpoil, Columbia, Pend Oreille, and Kootenay Rivers) reside to the north in British Columbia and their north-south trending valleys were carved by continental glaciation during the Pleistocene. The mountain-valley systems and Columbia Basin that comprise this portion of the Northern Border PEIS project area today represent a more arid environment with greater seasonal temperature extremes than that of Western Washington. The extent and magnitude of this seasonality, however, have fluctuated since the end of the Pleistocene and shaped changes in human land use over time.

#### *Land Use*

Settlement and subsistence in the region over the past several millennia centered around several seasonally restricted but often abundant resources (Chatters and Pokotylo, 1998; Pokotylo and Mitchell, 1998; Ames et al., 1998). Salmon, edible roots, and ungulates were staple subsistence resources for much of the Holocene. The distribution of subsistence resources and basic environmental constraints such as availability of water throughout this landscape helped shape seasonal land use patterns, and broad-scale changes in their availability over time coincide with changes in the archaeological record of northeastern Washington and northern Idaho. Runs of spawning salmon are impeded past Kettle Falls and Metaline Falls, and were therefore not a directly accessible resource to Native American communities living in the Pend Oreille and Kootenay River basins. Ethnographically, these groups relied more heavily on edible roots, most notably camas in the Calispell Valley. They led a much more mobile lifestyle than the salmon-dependent communities of the Plateau to the west, and their patterns involved trade for salmon with those Plateau groups and seasonal pursuit of bison in the Great Plains to the east (cf. Anastasio, 1985).

Similar to many other parts of North America at the end of the Pleistocene, the earliest human populations in this region were small, highly mobile groups that frequently moved hunting camps across a landscape that was recently deglaciated and, across the Columbia Basin, repeatedly scoured by massive floods as glacial lakes to the southeast periodically released meltwater. There is limited archaeological evidence of salmon fishing and plant processing elsewhere in the Plateau dating back to the beginning of the Holocene. The focus of these early groups however, especially within the PEIS zone, appears to have been on large ungulates. The climate, which was at a peak of warmth and aridity in the millennia following retreat of continental glaciations, continued to be warmer than today.

By about 8,000 years ago, however, a trend towards cooler and wetter conditions in the northern Plateau allowed an expansion of mountain forests into lower elevations and shrub-steppe vegetation to replace the grasslands that covered the Columbia Basin. The relatively cooler and wetter seasonal conditions that intensified into the mid-Holocene expanded ungulate habitat and promoted growth of root plants that soon became economically important. Salmon habitat improved as well once the water temperature of the Columbia and Fraser River systems cooled and sediment load from channel down-cutting decreased. Campsites situated near these resources and the tools for efficient harvest and processing appear in the archaeological record during this time.

The late Holocene saw further changes in land use patterns and greater dependence upon particular subsistence resources and food storage strategies. In general, the climate shifted towards the same cooler, wetter Neoglacial regime seen across much of northwestern North America; brief periods within the latter half of the Holocene, however, brought occasions of drought, flooding, and warming. Parallel to these changes were shifts from settlements with fewer but larger semi-subterranean houses to village sites with numerous but smaller pithouses in some regions, and an opposite pattern in others. One broad-scale trend during this period was a growing dependence upon storage as a mechanism to offset fluctuations in seasonal resource availability and inter-annual productivity. Increasingly intensified use of salmon occurred along the Columbia River and its tributaries below Kettle Falls as ungulate habitat shrank during the late Holocene. Labor-intensive resources such as freshwater mussels and edible roots increase in importance as well, especially in places within this region that did not provide access to salmon. Similar to the rest of North America, land use patterns dramatically shifted as a result of initial Euroamerican contact and disease epidemics at the end of the eighteenth century. Like those epidemics, the adoption of horses as a means of transport and trade in the interior Northwest preceded actual contact with Euroamericans by several years and had profound implications on Native American land use.

### *Site Types*

The archaeological record of the Plateau region along the U.S.-Canada border is characterized by a variety of artifacts and features that reflect broad-scale changes in Native American land use from the end of the Pleistocene to first encounters with Euroamerican explorers in the late 1700s. These materials and deposits are classified into assemblages to infer chronological sequences and past lifeways. This brief overview describes the kinds of pre-contact Native American archaeological deposits found in Eastern Washington and Idaho within the PEIS zone. Artifacts and assemblages characteristic of particular chronological periods are further described in the subsequent section.

Residential sites, often in the form of one or more semi-subterranean house pits, are more common in the archaeological record of the Eastern Washington Plateau than that of Western Washington. Sites pre-dating the mid-Holocene are inferred to be habitations based on the composition of their lithic and faunal assemblages and presence of fire-modified and occasional features (Chatters and Pokotylo, 1998). The first house pit sites to appear across the region by about 5,000 years ago were near the ecotones between steppe and forests and contained house pits in small numbers, usually one to three of various sizes and shapes containing diverse tool assemblages. Occasionally houses contain storage pit features and abundant hopper-mortar bases, suggesting a level of sedentism where resources were abundant yet entailed substantial processing. During the later Holocene pit houses often increased in diameter and depth, and the complexity of housefloor and associated midden stratigraphy grew. Large villages of numerous house pits along the lower reaches of larger rivers characterize the archaeological record of the past 2,000 years, although the numbers of pits within villages (and inferred human population) decrease during the roughly 1,200 years prior to Euroamerican contact. Post-depostional processes are the most critical factor in preservation and visibility of archaeological pithouse remains. Housepit sites may be visible on the ground surface of stable landforms that have been relatively unaffected by erosion or deposition over the past several millennia, such as older river terraces. Infilling of house pits after abandonment, especially of those along rivers depositing large volumes of sediment along their banks, in areas exposed to sustained aeolian sedimentation, and places within volcanic ashfall zones that accumulate tephra deposits, may deeply bury the remains of housepits.

Other kinds of prehistoric archaeological sites that occur within the PEIS zone in this region include a variety of resource processing features and lithic reduction sites. Artifacts and features associated with plant and fish processing are often found within and around the remains of houses; however, such materials are also identified unassociated with the remains of dwellings in places of high resource abundance. Pit features containing calcined salmon bones found along rivers are often associated with fishing gear such as netweights and processing tools such as ground stone knives. Freshwater mussel shell middens are often exposed along eroding riverbanks. Camas ovens are a notable archaeological feature of the Calispell Valley, comprised of dense buried deposits of fire-modified cobbles, charcoal-rich sediments, and often the charred remains of camas bulbs (Thoms, 1989). Other archaeological features indicative of Native American activity that may be found in isolation include rock cairns along ridgelines and talus slope burials on the flanks of hills and mountains.

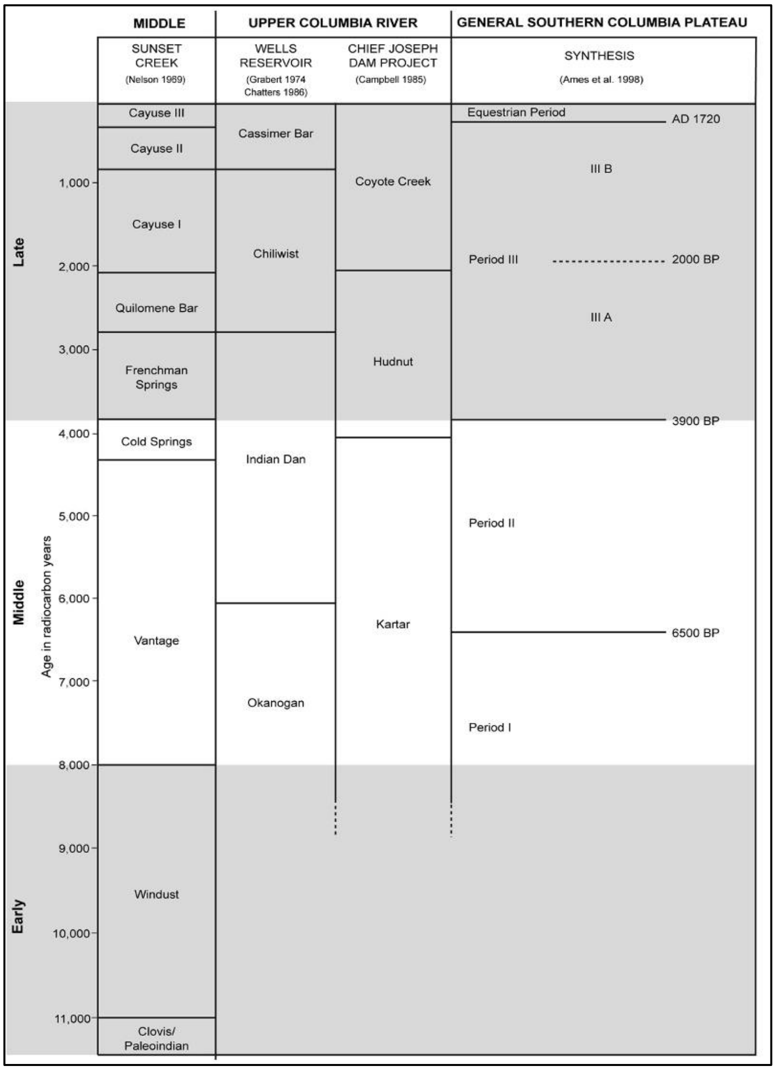
Several archaeological complexes have been identified that are defined by nearly continuous distributions of features, lithic artifacts, and house remains that, when interpreted as a whole, present a picture of long-term occupation of the landscape and abundant data on changing land use patterns. An Archaeological District on the Upper Pend Oreille River (Miss, 2004) in Idaho typifies this kind of site complex, as do districts in Washington that have undergone intensive archaeological investigation: Lake Roosevelt above the Grand Coulee Dam (Chatters, 1984), the Lake Pateros reservoir (Chatters, 1986), the Spokane River, the Kettle River in the vicinity of Kettle Falls (Chance and Chance, 1985), in the Calispell Valley (Thoms and Burtchard, 1986), and sites near Chief Joseph Dam and Rufus Woods Lake reservoir (Campbell, 1985).

### *Prehistoric Chronological Sequence*

Several published culture-historical sequences aid in the identification and interpretation of the archaeological record of the Plateau Culture Area within the PEIS zone. The designations of chronological periods, their characteristics, and their implications for the archaeological record in the PEIS zone are summarized in a very general fashion in this section. The periods used here include the Early, Middle, and Late Periods as generalized by Chatters and Pokotylo (1998). The divisions between the broad periods follow environmental changes as well as patterns of human land use: the end of the Pleistocene epoch and the early Holocene (ca. 12,000 B.P.-8,000 B.P.), the early to middle Holocene (ca. 8,000 B.P.-4,000 B.P.) and late Holocene before Euroamerican contact (ca. 4,000 B.P.-300 B.P.). Subdivisions within their broad periods are not discussed in detail here.

The general sequence is derived from those developed for the Okanogan River Valley (Grabert, 1968; Grabert, 1974); the Kettle Falls vicinity (Chance, 1986; Chance and Chance, 1982); the Wells Reservoir and Lake Pateros (Chatters, 1986); the Lake Rufus Woods and Chief Joseph Dam region (Campbell, 1985); and the vicinity of the Pend Oreille and Kootenay Rivers (Thoms and Burtchard 1987). The work of Nelson (1969) and Leonhardy and Rice (1970) in the central Columbia and Lower Snake Basins to the south of the PEIS zone laid the foundation for much of these later syntheses. Several of the major sequences shown in Figure H-6 attest to the variability in temporal divisions of specific sequences. More general overviews of Plateau prehistory contain useful summaries of the prehistoric cultural sequences in other areas, broader patterns across the region, and persistent research questions that have guided research in this region (Walker, 1998 and references therein).

**Figure H-6. Plateau Culture Area Chronology**




## Early Period

The Early Period (12,000 – 8,000 B.P.) spans the Late Pleistocene and Early Holocene, a time of initial human settlement when continental glaciers retreated north and climate remained warmer and drier than today. The Paleo-Indian archaeological components that date to this age are rare throughout the Plateau. The East Wenatchee Clovis Cache was discovered in Grant County just south of the PEIS zone and represents a notable, if atypical, assemblage of Clovis projectile points and other lithic and bone artifacts that date to this period. More widespread are components dated to the Early Period based on the presence of projectile points of the Western Stemmed Tradition, which may represent a separate influx of humans into the region around the time of the Pleistocene-Holocene transition (Beck and Jones, 2010).

Humans adapted to environmental changes during the Early Period by utilizing a wide range of subsistence resources and establishing short-term camps near those resources. The archaeological record of residential camps is extremely sparse during this period, probably due to a combination of very low population densities and poor preservation of landforms of suitable age that would host such sites. Most sites consist of concentrations of lithic material on geologically older landforms. A variety of projectile points used to arm spears and darts are stylistically diagnostic to the Early Period and are frequently used to assign otherwise undated lithic assemblages to this time, including fluted and concave-based points of the Clovis and Folsom tradition and lanceolate stemmed points of the Windust tradition.

**Middle Period**

The Middle Period (ca. 8,000 B.P.–4,000 B.P.) spans the middle of the Holocene epoch, a time of shifting climatic regimes and concomitant changes in vegetation patterns and subsistence resource distribution. Human adaptations to these changes resulted in an archaeological record that highlights variability in residential site structure, subsistence economies, and other aspects of social structure such as mortuary practices between different regions within the Plateau Culture Area. Housepits make their first appearance in the archaeological record during this time, along with widespread direct evidence of root utilization.

Change in land use towards a greater reliance on riverine and plant resources is manifested in the archaeological record by sites located along salmon-bearing streams, near freshwater mussel habitat, and in areas where important edible roots thrived during mid-Holocene climatic amelioration. Faunal assemblages from riverine sites attest to the importance of fish and freshwater mussels, as do ground bone and stone fishing gear. Milling stones and hopper mortar bases at some sites reflect plant processing. The persistence of hunting as an important activity is, however, apparent in the record from campsites with hunting gear in a variety of environmental zones. Along with certain kinds of plant processing artifacts, projectile points diagnostic of this time period include willow leaf-shaped points of the Cascade/Old Cordilleran tradition and large side-notched points.

**Late Period**

The Late Period (ca. 4,000 B.P.–300 B.P.) encompasses a time in which the regional climate first cooled and then warmed, resulting in changes in human population, pithouse construction, resource availability and economic orientation, and social structure. The small numbers of house pits along major salmon-bearing rivers that characterize the initial Late Period become clustered in larger numbers and highly variable in size by the middle of the Late Period. Towards the end of the Late Period prior to Euro-American contact, many of the larger village sites were apparently abandoned as land use favored more upland areas for much of the annual round and pithouses were established upstream in protected valleys of smaller tributaries. Although there is some debate regarding human population levels in the Plateau towards the end of the Late Period, artifacts assemblages exhibit a growing diversity of tool types, raw materials suggesting long-distance trade networks stretching from the Great Plains to the Pacific Coast, and plant and animal remains indicative of expanding diet breadth. Projectile point styles are at their most complex during this time and include a variety of small arrowheads as well as points to arm larger projectiles.

## 1.2 HISTORIC CONTEXT

### 1.2.1 NEW ENGLAND REGION

#### 1.2.1.1 State of Maine

The U.S. Customs and Border Protection (CBP) northern border project area – 100-mile jurisdiction – encompasses nearly the entire State of Maine except York County and the southern portion of Cumberland County in southern Maine. This area is referred to as the *study area* in this subsection.

- Contact Period/Exploration/Colonial Period

The history of European contact, exploration, and settlement in northern New England and the greater maritime peninsula (Quebec, New Brunswick, and Nova Scotia) of which Maine is a part, commences in the mid-sixteenth and early seventeenth centuries. The early colonial period in Maine is divided into three periods (Early Settlement, 1604-1675; Indian Wars, 1675-early eighteenth century; and the Resettlement Period, early-mid-eighteenth century) and is best represented in southern-most coastal Maine. The 1604 French colony at St. Croix in the northeast corner of the state signaled the arrival of a European power which was to compete with the English colonies to the south. Intermittent warfare characterized much of the period, 1604-1759. Territorial conflict arose initially with the displacement and widespread disruption of Native American culture and competition among European interests to control the fur trade. Specifically, the boundary of New France extended well into Maine and was marked by a series of seventeenth-century and early eighteenth-century French missions (Castine, Norridgewock, Canton, Fryeburg), which in effect curtailed English settlement throughout the northern border area of Maine until the end of the French and Indian Wars, ca. 1759.

With the British conquest of French Canada, ca. 1760, there emerged a period of rapid development in southern sections of the state accompanied by an increase in diversity of industry, transportation, commerce and trade, and agriculture. Variability among site types likewise increases throughout the later historic period with the introduction of technological innovations, division of labor, ethnic diversity, availability of a greater range of natural resources, and other factors.

- Frontier

Primarily, the early settlement period in Maine's interior occurred after the American Revolution, and constitutes a period of approximately 50 years from the first settlement of a given township/plantation. Priority resources, or those which were built within 50 years of the township/plantation's first settlement include, dwelling sites, farmsteads, and village centers/rural neighborhoods (containing, for example, water-powered saw and gristmills, tanneries, carding factories, blacksmith and carriage shops, stores, hotels, churches, schools, cemeteries) are site types that supply data regarding the adaptation of new populations to wilderness landscapes. There are numerous examples of these and related resources in all settled townships.

In northern Maine, the Madawaska settlements represent the oldest permanent settlement, and date to the ca. late 1780s. The St. John River, which now delineates the international border in this region, was part of a long distance water/overland route between Halifax/Saint John and Quebec, an important Native American travel corridor and prior to the Acadian settlements, a route utilized by French-speaking missionaries, couriers, traders, and the military. This extensive tract of land was populated largely by Acadians displaced by the formation of the British province of New Brunswick. Their source of livelihood was farming and settled among them were people from Quebec, Native Americans both local and from the lower St. John Valley and a number of Irish immigrants. Settlers from Maine's upper Kennebec Valley arrived in northern-most Maine in the early nineteenth century.

- War

As a border territory, Maine was a center of contention between the British and Americans during both the American Revolution and the War of 1812. During the Revolution, Portland was bombarded by a British fleet, and the British occupied a significant portion of the southern part of the state. In the War of 1812, the British again occupied parts of Maine.

After the wars with Great Britain, the upper St. John River area was claimed by both New Brunswick and the State of Maine. The dispute intensified principally within the context of logging and lumbering. The Houlton Barracks, Fort Kent, Fort Fairfield, the military road(s) and border outposts are historic resources associated with the Aroostook War, ca. 1839. The conflict was settled without armed warfare, by treaty in 1842.

Along the Atlantic Coast, excellent representations of early colonial period coastal sites in the study area include the fortified settlements of the Popham Colony (mouth of the Kennebec River), Fort Pemaquid (Muscongus Bay), and Fort Pentagoet (Penobscot Bay). Also, sunken vessels and earthworks of the Revolutionary War era have been identified in the archaeological record.

- Government

Maine became part of the Massachusetts Bay Colony in 1652, although the two were not physically attached. Maine seceded from Massachusetts in 1820 and became a state as part of the Missouri compromise. The northern U.S. border between Maine and New Brunswick remained disputed until the 1842 Webster-Ashburton Treaty, by which the boundary largely assumed its current configuration.

- Agriculture

Since many areas of Maine are distant from markets and the state typically has rocky soils and short growing seasons, agriculture as an industry there was generally not as successful as in other states. However, agriculture at the local level has remained important throughout Maine's history, largely due to the remoteness of many of its smaller settlements. Also, despite the limitations imposed by the state's geography, the growing of potatoes as a cash crop has been successful in some areas in the years following the installation of rail lines, most notably in Aroostook County.

- Commerce and Trade

Along the Atlantic Coast, seventeenth-century and early eighteenth-century French farmsteads and settlements are alluded to in the archival record. Extensive salt marsh diking is suggestive of Acadian farming practice. However, in the nineteenth century, the economy of the coastal region came to be dominated by shipbuilding and fishing; granite and slate quarrying and cotton textile production were also practiced. Nineteenth-century archaeological sites are represented by numerous site types, including farms, dwellings, tidal, water- and horse-powered mills, quarries, and many others.

Distant markets and poor roads discouraged rapid town development until the extension of rail transportation into the St. John Valley and other interior parts of the state. This resulted in the commercialization of potato growing which produced rail-side potato houses, starch factories, and increasingly larger farms. Outside the Aroostook County farming district, logging and lumbering retained prominence as northern Maine's most important industry.

Beginning in the 1820s, the logging industry grew to become a vital part of the economy across much of Maine. It is has gone through three distinct phases, each phase representing more extensive harvest areas and more intensive means of mechanical production. Resources representing the earliest phase of logging and lumbering, the white pine-era, generally have greater historical significance than those representing the subsequent periods of spruce-logging and pulp and paper manufacturing. Nevertheless, logging camps, driving dams, company farms, and other resources from these latter phases also possess historical significance. Other inland rural industries in the state included maple syrup production along Maine's western border with Quebec, and quarrying, hide-tanning, and lime and charcoal production. Also, beginning in the early twentieth century, paper and wood pulp production supplemented the lumber industry.

In the remote townships of the interior parts of the state, where settlement was virtually non-existent, logging and lumbering, hemlock bark extraction and other forest-based industries provide site types of potential historical significance. Archaeological resources, such as logging camps, driving dams, company farms, supply depots, logging railroads, and sporting camps form a significant portion of the infrastructure of Maine's nineteenth century forested interior.

- Transportation

In Maine's Interior, the network of roads and waterways utilized for local and long distance transport make up a set of resources related to the patterns of early settlement and town development. Notable among the long distance overland routes are the Coos Trail/Magog Road leading from the head of navigation on the Kennebec River (Hallowell) to Montreal, and the Canada Road, linking the upper Kennebec River region with Quebec.

The first railroads were built in Maine in the 1830s. By 1853, the Grand Trunk Railroad connected Portland with Montreal and Portland became the *de facto* winter port for much of Canada. A large portion of Maine's historical railroads use an atypically narrow gauge of 2 feet.

A number of historic resources and contexts apply specifically to the Maine-Canadian border. These range from historic, cross-border familial and economic ties to smuggling, customs and law enforcement.

#### 1.2.1.2 State of New Hampshire

- Contact Period/Exploration/Colonial Period

Northeastern New England of the seventeenth century presents a complex portrait of dispersed and shifting Native American settlement in response to contact with European traders. Intertribal warfare, catastrophic epidemics and chronic illnesses probably reduced Native American populations in New Hampshire by as much as 90 percent. Archaeological components and sites of the Early Contact period are underrepresented in New Hampshire, and notable New Hampshire Contact Period archaeological sites include Fort Hill site in Hinsdale, New Hampshire (Thomas, 1979), and the Connor Site in Shelburne, New Hampshire (Potter, 1998).

During this early period, Lake Champlain, the Connecticut River, and other major waterways functioned as transportation highways through heavily wooded, mountainous terrain, connecting many disparate settlements (Haviland and Power, 1994). Overland trails were also important Native American travel routes. Samuel de Champlain was the first European to visit Amoskeag Falls in June 1605. In 1609, Champlain journeyed south from Canada, by canoe, to the lake that bears his name.

Actual contact with Europeans occurred relatively late in the interior of New Hampshire because of the remote mountainous position of Western Abenaki country in an area heavily contested by the colonial powers. William Pynchon of Springfield, Massachusetts, first documented trade with a Sokoki in 1648. English trade was largely a commercial venture while French traders cooperated with Catholic missionaries. The English ban on weapon trade, and their alliance with the Haudenosaunee (Iroquois), traditional enemy of the Abenakis, aggravated relations between the Sokokis and the English (Haviland and Power, 1994).

Rivalry between the English and French saw the western Abenaki primarily as French allies during King William's War (1690-1700), and Queen Anne's War (1702-1713). These conflicts ultimately gave rise to military traffic and conflict along Lake Champlain waterways. New Hampshire became a separate province in 1680. The English established forts and garrisons along the northern frontier of Massachusetts and the Province of New Hampshire from which they maintained defenses, as well as sent scouting and raiding parties. By 1736, Massachusetts had established four towns along the New Hampshire side of the Connecticut River, numbered one through four (Bruce, 1990).

During the French and Indian War (1754-1763), increased pressure on the Indians led to revenge killings across northern New England (Corbett, 2002). Abenaki fought with the French at the battles of Monongahela, Oswego, Lake George, William Henry, Québec, and elsewhere, as well as conducted their own raids (Foster and Cowan, 1998:208). The British retaliated by developing strategically placed forts and a group of rangers, experienced in guerilla-style forest warfare. British control of the forts at Ticonderoga and Crown Point essentially pushed the frontier between the British and French north.

During the American Revolution, many Abenaki opted to remain neutral, others took sides with either the colonists or the British, and still others played both sides. Colonial militia manned forts in the Champlain Valley, New Hampshire's seacoast, and frontier borders to defend from

British incursion (Charlton, 1931; Churchill, 1967; Wheeler and Wheeler, 1968; Hance, 1991:384; Kingsley, 1997).

- Frontier

Most settlers in New Hampshire faced the problem of accessing their property via the network of footpaths, Indian trails, and military roads. Early settlement during times of peace spurred improvement to existing overland and waterborne transportation networks. Once settlers reached their lot, their first priority was to remove the forest, build a shelter, and clear an area to plant food (Garvin and Garvin, 1988).

Early Euro-American settlers in New Hampshire probably applied the Native American technique of burning forested land as a primary land-clearance tool (Day, 1953; Krech, 1999). Many found agricultural fields and old campsites already cleared and “abandoned” by Native Americans. Settlers also likely cleared land by axe. Early residential farmstead sites may include, but are not limited to, the following components: improved parcels of land, woodlot, temporary and permanent residential structures, outbuildings, water source, refuse area(s), animal pens, specialized activity areas, and occasionally a cemetery. General improvements include field clearings resulting in stone piles, stone walls, stone or wooden property boundary markers, landscaping through cut and fill areas, stone quarrying, orchards, pasture, cultivated and fallow fields, and gardens.

- Transportation

During the nineteenth century most primitive overland and waterborne transport came to an end (Wilgus, 1945). The next phase of transportation improvements, toll roads, shunpikes, stage roads, and post roads enhanced travel and provided new links to waterways and canals. At the same time, settlement declined across the narrow valleys of New Hampshire with rough terrain unadapted to labor-saving machinery and the availability of land in the West.

Commercialization of agriculture and development of small industries was aided by advances in transportation – such as toll roads and canals. Several turnpikes were established early in the nineteenth century to provide a straight and direct route for teamsters, travelers, and stagecoaches to connect from Massachusetts and the Connecticut River valley towns of southern New Hampshire and Vermont (Wood, 1997). With the success of the Erie Canal after 1825 drawing commerce to New York City, Boston merchants sought to access the commerce of the Great Lakes through a steam-powered railroad across New Hampshire and Vermont. Between 1840 and 1870 railroads had the single most important effect on New Hampshire (Goldthwait, 1927). With the introduction of the railroad, it was easy to import feed grains and other products from the Midwest. Establishment of railroads in the region provided better shipping facilities and expanded markets for the town’s farm produce and mineral resources, and simultaneously hastened westward migration. Granite was hauled to larger southern New England markets via railroads (Blaisdell, 1982), with tracks also following the rivers.

Improved automotive technology, coupled with State and Federal support of road construction and maintenance, made highway travel a viable alternative to railroads. Railroads continued to be consolidated and suffered from the introduction of fossil fuels.

- Agriculture

Mid-nineteenth- to early twentieth-century farmsteads featured structures and activity areas nearly identical to those of preceding generations and included a domestic structure or structures (tenant houses), numerous barns and other outbuildings, discrete dump areas, water systems, and special resource areas. However, mid-nineteenth- to early twentieth-century farmstead buildings were more permanent, larger and occasionally highly specialized (Milot, 1994).

Settlers essentially grew most of what they ate and made most of what they needed, if not by themselves, almost certainly within their community. The earliest crops grown by Euro-American settlers in this region included "Indian corn," wheat, and potatoes (*cf.*, Stewart, 1817; Thompson, 1842; Dutcher, 1871:297). Wild game, fish, and fruits and nuts supplemented most diets (cf., Dutcher, 1871:291). Farmsteads gradually diversified and became more economically viable. Technological innovations allowed farmers to till more land and harvest more effectively, with less help. More and more people followed other professions, such as shopkeepers, carpenters, foundry workers, etc., but maintained some land that they farmed. The need for greater purchasing power also required farmers to raise a greater quantity of cash crops (Donath, 1992:214). For example, raising hops began to assume commercial importance in New England during the last quarter of the eighteenth century and was focused in northern Middlesex County (Kelsey, 1980). By 1880, hop culture was introduced to nearby Bedford, New Hampshire and soon stretched across Hillsborough County. Other major cash crops were potash and pearl ash made by distilling wood ash accumulated after burning the trees cut while clearing the fields. Ash was also a valuable commodity locally and for international export (Miller, 1980; Meeks, 1986b).

Small farms disappeared in New Hampshire as the West opened up for settlement and industrialization took over. Farm towns became increasingly concentrated in one or more village centers, usually marked by a few stores, a district school, a church, an inn or hotel, and perhaps surrounded by a small number of dairy farms. Farmers in northern New England had to change and adapt their mode of agriculture to stay competitive (Donath, 1992:215). This included increasing the numbers of livestock, especially sheep that could graze steep, rocky, and hilly terrain. Patterns of early agriculture gave way to Spanish Merino and other sheep farming. Some of these changes began to obscure late eighteenth-century field patterns (McHenry, 1986) with later nineteenth-century developments, such as the addition, removal, or burial of stone walls to accommodate plows pulled by oxen, horses, and eventually tractors of growing size that could no longer negotiate the field corners in the manner that draught animals could.

In general, sheep and wool production era peaked in the late 1830s, and many farmers had turned to stock breeding for the western market (Donath, 1992:215-216). As the nineteenth century evolved, the cash crops changed to wheat, and then wool, and finally dairy products (Wilson, 1967:15-26; Sherman, 1999 [1872]).

By 1920 fluid milk was the major income source of most Northern New England farmers (Meeks, 1986b). However, population was generally in decline until 1920 and 1930, respectively. Old textile mills were proving to be as uncompetitive as the old hill farms. Farm abandonment climaxed by the mid-twentieth century (Donath, 1992:216).

- Industry and Manufacturing

The region's waterways and excellent mill privileges stimulated a strong industrial base in the region. Waterpower was first harnessed to run saw and gristmills. Later, waterpower supported the growth of the textile industry in early-nineteenth century. Industrial activity provided for other village, town, and national community needs. Early industries generally spanned in scope from small, self-sufficient operations to larger commercial enterprises. Local industry relied heavily on readily available natural resources such as timber, bedrock, minerals, surficial deposits, and water.

Primitive roads were built into once-inaccessible forests followed by logging railroads. Major rivers, smaller tributaries and the outlets of lakes and ponds across New Hampshire and Vermont provided waterpower for the vast majority of energy necessary to produce and/or refine these products. Logging camps predated construction of the Rutland & Burlington Railroad in the late 1840s. Industry was, and remains, a vital force of northern New England's economy. Many residential sites are closely associated with nearby industries, whether cottage enterprise or large commercial businesses. Location of former industrial complexes may, or may not, be evident on today's modern landscape.

Many of the remaining industries in nearby hamlets still relied heavily upon agricultural pursuits that were part of a diversified economy that was gradually becoming more specialized: cider mills, sawmills, gristmills, and cheese factories. Initially, any surplus milk was turned into cheese; however, as rail transportation to urban markets improved, butter and then cream became the premium products. The wood-products industry remained active in northern New England because the forests of New Hampshire had not yet been completely cleared as they had in other parts of New England.

- Commerce and Trade

Settlers made most of what they needed, if not by themselves, almost certainly within their community. Whatever skills were not locally available, like shoemaking, were generally provided by barter or purchase from neighbors or itinerant craftsmen. Many farmers undertook some type of specialized activity when not engaged in agricultural pursuits. These skills ranged from working as a homebuilder or mason, cooper, wheelwright, blacksmithing, ferrier, basket maker, potter, and so on. Clay was fashioned and fired into bricks and pottery. Settlers also prospected for stone to build foundations for homes, to mark lot boundaries, and to support early industries. Local bog iron or hematite ore was smelted into iron, supplying early blacksmiths and later industrial purposes.

Towns gradually became responsible for the maintenance of other local roads as soon as they were surveyed, laid out, and officially entered onto town records (Garvin and Garvin, 1988; Hance, 1991). Later, bridges were constructed to access other routes where perhaps only fords existed. Economic and regional growth patterns ultimately dictated the evolution of a growing road framework.

Near the end of the nineteenth century investors were building grand hotels along coastal areas, in the mountains and surrounding the lakes of New Hampshire to serve tourists from all over the

United States and Europe. Rustic camps and summer homes grew in popularity as well, and in no time, “summer people” began buying up old hill farms for summer homes.

- Government

New Hampshire was one of the original thirteen states that formed the United States of America and rebelled against Great Britain in 1776. New Hampshire was the ninth state to ratify the Constitution in June 1788.

- Domestic, Social, and Cultural

Family cemeteries often provided the nucleus of what would ultimately become a hamlet, village, town, or municipal cemetery. The progress toward establishing characteristic town features of a town plot or village common, meeting house and school varied, often they were not in place until the community was actually settled (Woodard, 1936).

A general downward population trend is attributed to the natural and social upheaval described and the attractiveness of less expensive and fertile land in western New York and Ohio. Large waves of people emigrated from Vermont and New Hampshire as land became less available and opened elsewhere. This process started early, but accelerated as better routes opened up to the west. Those who stayed behind continued to consolidate small farms, eventually developing into the rural agriculture familiar through town histories. Farmers in northern New England had to change and adapt their mode of agriculture to stay competitive (Donath, 1992:215).

After the Civil War, temporary jobs in New England’s textile mills, logging and mining camps, railroad construction, and agriculture offered economic opportunity to new groups of immigrants.

Manufacturing centers began to attract new industries such as clothing and electronics. Only in the last decades of the twentieth century has the population curve of New Hampshire rebounded. The prominence of the dairy industry in the early to mid-twentieth century and improved farming methods led to increased yields and decreased dairy product prices hastening the demise of the family farm. Presently, small family farms persist in New Hampshire and there is hope that specialty products will maintain agriculture and the wood products industry in this area for future generations.

#### 1.2.1.3 State of Vermont

- Contact Period/Exploration/Colonial Period

Intertribal warfare, catastrophic epidemics and chronic illnesses probably reduced Native American populations in Vermont and New Hampshire by as much as 90 percent. Archaeological components and sites of the Early Contact period are underrepresented in Vermont. During this early period, Lake Champlain, the Connecticut River and other major waterways functioned as transportation highways through heavily wooded, mountainous terrain, connecting many disparate settlements (Haviland and Power, 1994). Overland trails were also important Native American travel routes. Samuel de Champlain was the first European to explore what is now Lake Champlain in July 1609 (Grant, 1907:161).

Actual contact with Europeans occurred relatively late in Vermont because of the remote mountainous location of Western Abenaki country. English trade was largely a commercial venture while French traders cooperated with Catholic missionaries. The English ban on weapon trade, and their alliance with the Iroquois, traditional enemy of the Abenakis, aggravated relations between the Sokokis and the English (Haviland and Power, 1994).

Rivalry between the English and French saw the western Abenaki primarily as French allies during King William's War (1690-1700), and Queen Anne's War (1702-1713). These conflicts ultimately gave rise to military traffic and conflict along Lake Champlain waterways. The British established forts and garrisons along the northern frontier of Massachusetts and the Province of New Hampshire from which they maintained defenses, as well as sent scouting and raiding parties. For example, the British soon built a short-lived fort and trading center at Chimney Point in 1690 during King William's War.

The first permanent British outposts in what is now Vermont were in the Connecticut River valley. By 1736, Massachusetts established four towns along the New Hampshire side of the Connecticut River, numbered one through four. Fort Dummer (Fort Number One) was erected in 1724, where Brattleboro, Vermont later grew up. In 1739, Josiah Sartwell built a fortified house in present day Vernon, Vermont (Bruce, 1990).

In about 1730, a few French-Canadians traveled south, up Lake Champlain and established a settlement at Chimney Point. This community consisted of a blockhouse enclosed by a wooden stockade on the east side of Lake Champlain north of what is now Crown Point, New York (Hall, 1868:2; Coolidge, 1938:233). Reconstruction of the bridge connecting Vermont and New York in 2010 uncovered evidence of this French fort at Chimney Point (Crock, 2010). In 1731, the French army built another wooden stockade, but this time, on Lake Champlain's western shore. This latter structure was enlarged over the next few years and eventually surpassed by a stone fortification at the same location called Fort St. Frédéric (Palmer, 1866; Lonergan, 1950). Fort St. Frédéric would protect French interests in the region and later favor the development of French seigniories along Lake Champlain (Coolidge, 1938:224). From this location, the French and their Indian allies would launch attacks on British settlements (Steele, 1990).

During the French and Indian War (1754-1763), increased pressure on the Indians led to revenge killings across northern New England (Corbett, 2002). Abenaki fought with the French at the battles of Monongahela, Oswego, Lake George, William Henry, Québec, and elsewhere, as well as conducted their own raids (Foster and Cowan, 1998:208). The English retaliated by developing strategically placed forts and a group of rangers, experienced in guerilla-style forest warfare. British control of the forts at Ticonderoga and Crown Point essentially pushed the frontier between the British and French north.

British governors of both New York and New Hampshire now claimed territory between Lake Champlain and the Connecticut River. Anglo-Americans, looking to move into Vermont, considered settling the land in the north. With British victory over the French and lessening in the fear of Indian reprisals, waves of settlers started to pour into Vermont.

During the American Revolution, many Abenaki opted to remain neutral, others took sides with either the colonists or the British, and still others played both sides. Colonial militia manned forts in the Champlain Valley, New Hampshire's seacoast, and frontier borders to defend from British incursion (Charlton, 1931; Churchill, 1967; Wheeler and Wheeler, 1968; Hance, 1991:384; Kingsley, 1997).

- Frontier

From the conclusion of the French and Indian War to about the 1780s, Vermont provided one of the only frontier outlets to southern New England's sons and daughters. French and Indian War service, particularly among those who helped build the Crown Point Road, introduced many soldiers to the Vermont's advantageous land and resources. Two separate streams of emigrants, one from eastern Connecticut or Massachusetts and the other from western parts of those states, helped shaped the distinctive ethnic character of Yankee Vermont (Meeks, 1986b; Hubka, 1984). Those settling along the Crown Point Road brought with them characteristic patterns of community development, architecture, types of government, and religion. At the beginning of the Revolution, Vermont declared itself an independent nation. The formation of this republic led to the issuance of new land grants and the reallocation of residual lands. The intervening disputed land years led to numerous hostilities between the territorial rights of New York and New Hampshire proprietors. Jurisdictional dispute between French, English and Vermont land grants was not formally settled until 1791 when the Republic of Vermont became a state (Nye, 1947:272-275).

Most settlers in Vermont faced the problem of accessing their property via the network of footpaths, Indian trails, and military roads. Early settlement during times of peace spurred improvement to existing overland and waterborne transportation networks. Once settlers reached their lot, their first priority was to remove the forest, build a shelter, and clear an area to plant food (Garvin and Garvin, 1988).

Early American settlers in Vermont probably applied the Native American technique of burning forested land as a primary land-clearance tool (Day, 1953; Krech, 1999). Many found agricultural fields and old campsites already cleared and "abandoned" by Native Americans. Early residential farmstead sites may include, but are not limited to, the following components: improved parcels of land, woodlot, temporary and permanent residential structures, outbuildings, water source, refuse area(s), animal pens, specialized activity areas, and occasionally a cemetery. General improvements include field clearings resulting in stone piles, stone walls, stone or wooden property boundary markers, landscaping through cut and fill areas, stone quarrying, orchards, pasture, cultivated and fallow fields, and gardens.

- Transportation

During the nineteenth century most primitive overland and waterborne transport came to an end (Wilgus, 1945). The next phase of transportation improvements, toll roads, shunpikes, stage roads, and post roads enhanced travel and provided new links to waterways and canals. At the same time, settlement declined across the narrow valleys of New Hampshire with rough terrain unadapted to labor-saving machinery and the availability of land in the West.

Commercialization of agriculture and development of small industries was aided by advances in transportation – such as toll roads and canals. Several turnpikes were established early in the nineteenth century to provide a straight and direct route for teamsters, travelers, and stagecoaches to connect from Massachusetts and the Connecticut River valley towns of southern New Hampshire and Vermont (Wood, 1997). With the success of the Erie Canal after 1825 drawing commerce to New York City, Boston merchants sought to access the commerce of the Great Lakes through a steam-powered railroad across New Hampshire and Vermont. Between 1840 and 1870 railroads had the single most important effect on New Hampshire (Goldthwait, 1927). With the introduction of the railroad, it was easy to import feed grains and other products from the Midwest. Establishment of railroads in the region provided better shipping facilities and expanded markets for the town's farm produce and mineral resources, and simultaneously hastened westward migration. Granite was hauled to larger southern New England markets via railroads (Blaisdell, 1982), with tracks also following the rivers.

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Mid-nineteenth- to early twentieth-century farmsteads featured structures and activity areas nearly identical to those of preceding generations and included a domestic structure or structures (tenant houses), numerous barns and other outbuildings, discrete dump areas, water systems, and special resource areas. However, mid-nineteenth- to early twentieth-century farmstead buildings were more permanent, larger and occasionally highly specialized (Milot, 1994).

Settlers essentially grew most of what they ate and made most of what they needed, if not by themselves, almost certainly within their community. The earliest crops grown by Euro-American settlers in this region included "Indian corn," wheat, and potatoes (*cf.*, Stewart, 1817; Thompson, 1842; Dutcher, 1871:297). Wild game, fish, and fruits and nuts supplemented most diets (*cf.*, Dutcher, 1871:291). Farmsteads gradually diversified and became more economically viable. Technological innovations allowed farmers to till more land and harvest more effectively with less help. More and more people followed other professions, such as shopkeepers, carpenters, foundry workers, etc., but maintained some land that they farmed. The need for greater purchasing power also required farmers to raise a greater quantity of cash crops (Donath, 1992:214). For example, raising hops began to assume commercial importance in New England during the last quarter of the eighteenth century and was focused in northern Middlesex County (Kelsey, 1980). By 1880, hop culture was introduced in Vermont. Other major cash crops were potash and pearl ash made by distilling wood ash accumulated after burning the trees cut while clearing the fields. Ash was also a valuable commodity locally and for international export (Miller, 1980; Meeks, 1986b).

Small farms disappeared in Vermont as the West opened up for settlement and industrialization took over. Farm towns became increasingly concentrated in one or more village centers, usually marked by a few stores, a district school, a church, an inn or hotel, and perhaps surrounded by a small number of dairy farms. Farmers in northern New England had to change and adapt their mode of agriculture to stay competitive (Donath, 1992:215). This included increasing the numbers of livestock, especially sheep that could graze steep, rocky, and hilly terrain. Patterns of early agriculture gave way to Spanish Merino and other sheep farming. Some of these changes began to obscure late eighteenth-century field patterns (McHenry, 1986) with later nineteenth-century developments, such as the addition, removal, or burial of stone walls to accommodate plows pulled by oxen, horses, and eventually tractors of growing size that could no longer negotiate the field corners in the manner that draught animals could.

In general, sheep and wool production era peaked in the late 1830s, and many farmers had turned to stock breeding for the western market (Donath, 1992:215-216). As the nineteenth century evolved, the cash crops changed to wheat, and then wool, and finally dairy products (Wilson, 1967:15-26; Sherman, 1999 [1872]).

By 1920 fluid milk was the major income source of most Northern New England farmers (Meeks, 1986b). However, population was generally in decline until 1920 and 1930, respectively. Old textile mills were proving to be as uncompetitive as the old hill farms. Farm abandonment climaxed by the mid-twentieth century (Donath, 1992:216).

- Industry and Manufacturing

The region's waterways and excellent mill privileges stimulated a strong industrial base in the region. Waterpower was first harnessed to run saw and gristmills. Later, waterpower supported the growth of the textile industry in early-nineteenth century. Industrial activity provided for other village, town, and national community needs. Early industries generally spanned in scope from small, self-sufficient operations to larger commercial enterprises. Local industry relied heavily on readily available natural resources such as timber, bedrock, minerals, surficial deposits, and water.

Primitive roads were built into once-inaccessible forests followed by logging railroads. Major rivers, smaller tributaries and the outlets of lakes and ponds across Vermont provided waterpower for the vast majority of energy necessary to produce and/or refine these products. Logging camps predated construction of the Rutland & Burlington Railroad in the late 1840s. Industry was, and remains, a vital force of northern New England's economy. Many residential sites are closely associated with nearby industries, whether cottage enterprise or large commercial businesses. Location of former industrial complexes may, or may not, be evident on today's modern landscape.

Many of the remaining industries in nearby hamlets still relied heavily upon agricultural pursuits that were part of a diversified economy that was gradually becoming more specialized: cider mills, sawmills, gristmills, and cheese factories. Initially, any surplus milk was turned into cheese; however, as rail transportation to urban markets improved, butter and then cream became the premium products. The wood-products industry remained active in northern New England because the forests of Vermont had not yet been completely cleared as they had in other parts of New England.

- Commerce and Trade

Settlers made most of what they needed, if not by themselves, almost certainly within their community. Whatever skills were not locally available, like shoemaking, were generally provided by barter or purchase from neighbors or itinerant craftsmen. Many farmers undertook some type of specialized activity when not engaged in agricultural pursuits. These skills ranged from working as a homebuilder or mason, cooper, wheelwright, blacksmithing, ferrier, basket maker, potter, and so on. Clay was fashioned and fired into bricks and pottery. Settlers also prospected for stone to build foundations for homes, to mark lot boundaries, and to support early industries. Local bog iron or hematite ore was smelted into iron, supplying early blacksmiths and later industrial purposes.

Towns gradually became responsible for the maintenance of other local roads as soon as they were surveyed, laid out, and officially entered onto town records (Garvin and Garvin, 1988; Hance, 1991). Later, bridges were constructed to access other routes where perhaps only fords existed. Economic and regional growth patterns ultimately dictated the evolution of a growing road framework.

Near the end of the nineteenth century investors were building grand hotels along coastal areas, in the mountains and surrounding the lakes of Vermont to serve tourists from all over the United States and Europe. Rustic camps and summer homes grew in popularity as well, and in no time, "summer people" began buying up old hill farms for summer homes.

- Government

Administratively part of New York after 1766, Vermont became an independent republic in 1777 during the Revolutionary War. In 1791, Vermont ratified the U.S. Constitution, becoming the fourteenth state of the union. Vermont has 14 counties.

- Domestic, Social, and Cultural

Family cemeteries often provided the nucleus of what would ultimately become a hamlet, village, town, or municipal cemetery. The progress toward establishing characteristic town features of a town plot or village common, meeting house and school varied, often they were not in place until the community was actually settled (Woodard, 1936).

A general downward population trend is attributed to the natural and social upheaval described and the attractiveness of less expensive and fertile land in western New York and Ohio. Large waves of people emigrated from Vermont and New Hampshire as land became less available and opened elsewhere. This process started early, but accelerated as better routes opened up to the west. Those who stayed behind continued to consolidate small farms, eventually developing into the rural agriculture familiar through town histories. Farmers in northern New England had to change and adapt their mode of agriculture to stay competitive (Donath, 1992:215).

After the Civil War, temporary jobs in New England's textile mills, logging and mining camps, railroad construction, and agriculture offered economic opportunity to new groups of immigrants.

Manufacturing centers began to attract new industries such as clothing and electronics. Only in the last decades of the twentieth century has the population curve of New Hampshire rebounded. The prominence of the dairy industry in the early to mid-twentieth century and improved farming methods led to increased yields and decreased dairy product prices hastening the demise of the family farm. Presently, small family farms persist in Vermont and there is hope that specialty products will maintain agriculture and the wood products industry in this area for future generations.

### 1.2.2 GREAT LAKES REGION

#### 1.2.2.1 State of New York

- Contact Period/Exploration/Colonial Period

The French and Dutch initiated exploration of New York in 1609. The French in the north identified Lake Champlain and explored areas along Lake Ontario and Lake Erie. The Dutch settled Manhattan and areas along Atlantic Ocean, exploring the Hudson Valley. Jesuit missionaries under French authority periodically visited the northern and western New York (into western Pennsylvania and the western Great Lakes). Despite a troublesome relationship with the Haudenosaunee (Iroquois) nations, the French established trading posts at Youngstown (New York) and near Rochester by early eighteenth century. By the middle of the eighteenth century, the French had established fortifications in the Champlain Valley, Lake George, northern New York (Ogdensburg), and western New York (Brasser, 1978; Ellis et al., 1967).

In 1664, the English supplanted the Dutch in southern New York and became patrons of the Haudenosaunee. Gradually filtering west along Mohawk River and over the Catskills and Helderbergs into central New York, the British erected fortifications in the Mohawk Valley and established their primary western outpost at Oswego by the middle of the eighteenth century. The ancient rivalry between these two European monarchies intensified during the period, reaching a crescendo in the 1750s, when warfare flared anew. Despite gaining total control over Lake Ontario during the early stages of the conflict, the French ultimately lost the French and Indian War and all of their North American colonies to the British with the Treaty of Paris in 1763 (Aldenderfer et al., 1982:III-30; Hale, 1972). Central New York, the Champlain Valley, and the Lake George area were predominant theaters in the conflict as dramatized by the book *Last of the Mohicans.*

During the American Revolution, New York was again major theater during the early stages of the conflict, as Great Britain launched attacks on the colony from Canada and their outpost at Oswego. Lake Champlain is reputed to be the scene of the first naval battle fought by the United States Navy. On October 11, 1776, the engagement occurred in a strait between the mainland near Plattsburgh and Valcour Island. Patriot ships under the direction of Brigadier General Benedict Arnold were largely destroyed by a superior British force, but the battle postponed the British campaign to separate New England from the rest of the rebelling colonies. A second British attempt at splitting the colonies occurred the following year under the command of General John Burgoyne. Settlers in the Champlain Valley were driven out when the British invaded (Ellis et al., 1967; Hurd, 1880).

Burgoyne implemented his second attempt to conquer New York in 1777. While he replicated his advance down the Champlain valley, forces from New York City and Oswego would join him at Albany, thus splitting New England from the rest of the colonies. However, the important Battle of Oriskany, just east of Rome, New York, stopped the advance of British forces from Oswego, and left the undermanned British vulnerable to defeat at the significant Battle of Saratoga. Aside from pitched battles, both the British and Americans enlisted the aid of individual Haudenosaunee nations in their skirmishes in the frontier, as several of the nations allied with Great Britain and several with the Americans. British and Haudenosaunee conducted devastating raids on isolated farming communities in the Mohawk and Cherry valleys. As a result, in 1779 Major General John Sullivan led a punitive assault into the heart of Haudenosaunee country in an effort to halt these incursions against the settlers. Sullivan's Continentals engaged in "scorched earth" tactics, destroying settlements, cornfields, and orchards throughout the Finger Lakes region. Seeking refuge in the Niagara River valley, many Haudenosaunee suffered through a difficult winter of hardship and hunger. Fort Niagara remained a British outpost during the war (Aldrich, 1893:199; Abler and Tooker, 1978:507-508; Ellis et al., 1967:115-117; Tooker, 1978:435; Peirce, 1879:13-19).

The British and their Loyalist allies were expelled from the new United States after the Treaty of Paris (1783) ended the Revolutionary War, although the British did not vacate forts along Lake Ontario or farther west until 1796 (Jay's Treaty). The Haudenosaunee, abandoned in the United States by the British, were forced to make peace as separate nations with the Americans. In 1794, the United States and the Six Nations signed a treaty at Canandaigua which defined the boundaries of the Haudenosaunee nations in New York State (Abler and Tooker, 1978:508). Several treaties between speculators and the Haudenosaunee extinguished their title to most of the land in New York by the early nineteenth century, except for small reservations (Abler and Tooker, 1978:509, 512).

- Frontier

The International Border did not exist until 1783 when the United States won its independence. Even during the nineteenth century it remained a light presence on border communities in Northern New York, which was an unbroken wilderness in 1783 except for a few settlements fringing Lake Champlain. In fact, most of the region lying between Lake Champlain on the east, Lake Ontario on the west, the St. Lawrence River on the north, and the southern slopes of the Adirondacks remained wilderness until late in the nineteenth century (Ellis et al., 1967:156).

With the return of peace after the Revolution, settlers and land speculators again began to trickle westward and northward, exerting pressure to open up land formerly occupied by the Haudenosaunee. After machinations over the settlement of Canadian refugees, the extent of colonial charters, back pay owed to soldiers, and squatters occupying unsettled lands, most of the newly opened frontier areas in the state were patented in large tracts of land to speculators, who had their parcels surveyed and sold off to settlers, or tried to. Areas in northern and central New York were surveyed by the state and reserved for former Continental soldiers, however most of this land reverted to the speculators (Ellis et al., 1967:152-156; Schein, 1993:5-8; Abler and Tooker, 1978:507-509).

By 1812, areas in northern and western New York had been settled and rural industries and local commerce were in development. As a result of their location along the International Border, western New York and Lake Erie, and northern New York and Lake Ontario were theaters in the War of 1812 between the United States and Great Britain. Shore areas along Lakes Erie and Ontario were marauded by British soldiers and the United States launched invasions of Canada from Northern New York and from Buffalo and Lewiston. These areas were also invaded by British forces from Canada. Buffalo, Youngstown, Lewiston, and what is now Niagara Falls were all burned to the ground by the British at the end of 1813 (Hurd, 1880; Smith, 1884; Hickey, 1989). Governor Daniel Tompkins remarked, "The whole frontier from Lake Ontario to Lake Erie is depopulated & the buildings & improvements, with a few exceptions, destroyed" (Hurd, 1880; Smith, 1884; Hickey, 1989:143).

- Transportation

Overland roads were generally poor; however, rivers provided essential inland transportation as well as power for early saw and gristmills. Because of their proximity and lack of inland roads, early settlements in northern New York were more closely tied to British settlements in Canada through the navigable Champlain Valley than to American settlements in the Mohawk Valley. As a result of this proximity, violation of the embargo of British goods was an open secret and smuggling was rampant during the run up to the War of 1812 (Ellis et al., 1967:156; Meinig, 1966:144-145, 153).

Despite the improvements in roads and development of mills and other processing facilities during the early nineteenth century, economic growth still lagged. A problem facing many rural farming communities was ensuring that their products could reach markets. Logging, lumbering, and timber-related products were the initial commodities of many counties during the early years of settlement. Once the initial round of tree clearing had been completed, the pioneers worked the land sowing crops and grazing animals (Seaver, 1918; Hough, 1853; Hurd, 1880; Sullivan and Martin, 1979).

To combat the general lack of transportation, improvements of the state's natural waterways began as early as 1791, but the events of the War of 1812 suspended these undertakings. Begun at Rome in 1817, the Erie Canal linked Buffalo on Lake Erie with the Hudson River and New York City upon its completion in 1825. The nearly simultaneous construction of the Champlain Canal extended transportation capabilities from the Hudson River to Lake Champlain. The success of the Erie Canal inspired numerous other efforts of canal construction in the state. Localities near the canals prospered, and those at some distance from them saw their economic livelihood undermined by the cheap transportation (Shaw, 1990).

The arrival of the railroads during the mid-nineteenth century fostered the continued economic diversification the state and the emergence of more densely populated, more heavily industrialized areas. As railroad crossed the state, the New York Central Railroad was formed in 1853, merging in 1869 with Cornelius Vanderbilt's Hudson River Railroad, as a result of the consolidation of numerous smaller local lines. Other major railroad routes included the Lehigh Valley, the Erie, the Northern, and the Delaware, Lackawannna & Western, among many other smaller local lines. During the twentieth century, the number of lines has consolidated (Dunn, 2000).

By the middle of the nineteenth century, efforts were made to construct bridges over the Niagara River to connect Canada and the United States. What is now the City of Niagara Falls was the site of the first international railway suspension bridge over the river in 1848 (Anonymous, 1878:319-320; Pool, 1897:192; Williams, 1921:407-408, 520-521). John A. Roebling directed the construction of a second suspension bridge between 1852 and 1855, when the first locomotive made the crossing. Other bridges followed in the twentieth century and included the Lewiston-Queenston Bridge, the Whirlpool Bridge, the Rainbow Bridge, and the Peace Bridge. An International Railroad Bridge was constructed from Buffalo to Canada in 1873.

- Agriculture

Once the pioneers cleared the abundant forest cover, they planted subsistence crops, the surplus of which was sold or traded. Agriculture formed the predominant economic activity outside the larger urban areas of the state until well into the twentieth century (Aldrich, 1893; McIntosh, 1876). During the nineteenth century, wheat was the great staple, but after the Civil War and the opening of the wheat fields of the Midwest, barley, corn, and oats became important crops. Farms also produced geographically specialized fruit crops, notably grapes, cherries, apples, peaches, pears, and raspberries. From the late nineteenth century into the twentieth century, dairying and stock-raising were predominant farm specialties, and expanded into more market-oriented enterprises with the aid of improved canal, railroad, and steamboat transportation.

By the mid-nineteenth century, tobacco was grown several southern counties, which supported local cigar manufacturers. In the years after the Civil War, grapes and winemaking became successfully cultivated products in the Finger Lakes region as well as along Lake Erie in Chautauqua County, although homemade wine could utilize grapes, strawberries, raspberries or other fruit. Today, many peach, cherry, apricot, and apple orchards remain.

- Industry and Manufacturing

The earliest industries focused on forest products and utilized the abundant water resources for power, and included asheries that burned timber into a white powder called pearl ash or potash, sawmills, gristmills, and tanneries. Industrial activity intensified in the years before the Civil War, and expanded greatly after the conflict. Urban areas attracted businesses, industrial organizations, transportation networks and people.

In 1877, the Niagara Falls Hydraulic Power and Manufacturing Company initiated the first large-scale attempt to provide hydroelectric power. Its success provided electricity for the lights of the Village of Niagara Falls by 1882. During the last quarter of the nineteenth century, the use of electricity began to replace steam as the source of power for all types of industrial operations (Pool, 1897:226-230; Williams, 1921:180, 190). In 1896, the Niagara Falls Power Company implemented a system for long-distance electricity distribution using alternating current (AC), transmitting power from Niagara Falls to the City of Buffalo. Major cities, Buffalo, Niagara Falls, Rochester, Oswego, Watertown, and Plattsburgh enhanced the economic role by using newly developed electric power to enhance their manufacturing and industrial bases. Niagara Falls, for example, became a center of electrochemistry, electrometallurgy, as well as the chemical industry (Dumych, 1996:7; Churchill, 1895).

In Northern New York, bark skinners harvesting for the tanning industry and charcoal makers for the iron industry had, by the time of the Civil War, reduced the primeval forest cover of the Adirondacks. In the late nineteenth century, lumbering operations entered the higher Adirondacks cutting trees for pulp and lumber. These companies purchased and cut large tracts of timber land, later forfeiting denuded acres to the State in lieu of taxes. During this time, the destruction of such large swaths of forest raised an outcry and resulted in the creation of the Adirondack Forest Preserve in 1885. The Adirondack Park was created in 1892 and contains six million acres of both State-owned and private land (Adirondack Park Agency, 2003; Haynes, 2001).

The commercial lumbering and pulp industry began a long decline in the early twentieth century before essentially dying out in the 1920s. During the early years of the twenty-first century, several wind-energy projects and wind farms have been constructed or are in the process of being constructed in northern New York. Today, the area remains a rural mix of small farms, towns and forests. Tourism, timbering, dairying, and some farming are the dominant economic activities in the area, as has generally been the case for well over a century.

- Commerce and Trade

Commerce and trade were initially locally focused. As transportation improved with the advent of better roads, canals, and railroads, trade became more extended. Municipalities on Lake Ontario and Lake Erie, such as Buffalo, Oswego, and Rochester developed extensive port operations. Municipalities along the Erie Canal and the other canals also developed port facilities (Churchill, 1985; Smith, 1884).

The invention and proliferation of the grain elevator reinforces Buffalo's strategic location at the nexus of the Great Lakes/inland trade and the ocean trade associated with the Atlantic ports. Beginning in 1842, construction of numerous grain elevators would turn Buffalo into one of the leading grain shipping centers in North America (Goldman, 1983:58; Smith, 1884). By 1863, numerous grain elevators enshadowed Buffalo's harbor and were part of an extensive transportation network and developing industrial economy. From the mid-nineteenth century to the mid-twentieth century, Buffalo's lake port was a center for an extensive inland trade in grain, lumber, livestock, iron, and limestone, which utilized canal boats and freight trains to transport goods east (Kowsky et al., 1981:248).

- Government

New York was one of the original thirteen states that formed the United States of America and rebelled against Great Britain in 1776. New York was the tenth state to ratify the Constitution on July 26, 1788. At present, New York State has 62 counties, 932 towns, and 62 cities. It also has nine Indian reservations. In total, the state has over 4,200 local governments (New York State Department of State, 2009).

- Domestic, Social, and Cultural

Settlement of New York began in the early seventeenth century, focused along the Atlantic Coast and Hudson River Valley. Gradually, settlers spread throughout the state. Early settlers erected log cabins and cleared fields of trees in order to farm their land. As houses became more elaborate, they were made of frame construction, and later from a variety of building materials, such as stone and brick. In larger urban environments, residences rose to multi-story dimensions in a variety of styles.

The economic prosperity resulting from the Erie Canal swelled the population in centers along its route. Hundreds of thousands of settlers arrived at Buffalo as they journeyed west as "more immigrants passed through these streets [surrounding the Erie Canal] during the height of the canal era (1830-1865) than passed through Ellis Island" (Rapp, 1993). Population also clustered at railroad nodes.

In July 1885, the New York State Niagara Reservation Park was officially opened by New York State. The lengthy campaign to build support from political and business leaders for a park to preserve the falls was underpinned by the persistence and organizational skills of Frederick Law

Olmsted. In addition to building the consensus for the park, he and his associate Calvert Vaux were commissioned to prepare the layout and planting plan for the reservation (Hall, 1995:179-185; Williams, 1972:16-17).

The Adirondack Forest Preserve was created in 1885, and the Adirondack Park was established in 1892 and contains six million acres of both State-owned and private land. The Forest Preserve was made "forever wild" in 1895. In the twenty-first century, the Forest Preserve covers approximately 2.5 million acres (Adirondack Park Agency, 2003; Haynes, 2001).

#### 1.2.2.2 Commonwealth of Pennsylvania

- Contact Period/Exploration/Colonial Period

While Dutch and Swedish traders explored and settled portions of eastern Pennsylvania as early as the 1620s, Catholic missionaries and French explorers would not enter the valleys and waterways of western Pennsylvania until the 1660s. As the fur trade became more established during the seventeenth and eighteenth centuries, the European powers erected fortified trading posts in the frontier. However, it would not be until the eighteenth century that the inland areas of western Pennsylvania saw fortifications. By the 1700s, Haudenosaunee (Iroquois) incursions into the area pushed local Delaware and Shawnee populations as far west as what is now Illinois. As a result, northwestern Pennsylvania and northeastern Ohio became a sparsely settled hinterland of the Seneca, subject to hunting and resource procurement (Hunter, 1978:590).

By 1669, the French portaged from Lake Erie to Chautauqua Lake (in western New York) and then via waterways through western Pennsylvania to the Mississippi River. This route was traversed in 1739 by forces under the command of Charles Le Moyne de Longueuil as part of an indecisive effort to reinforce French forces in what is now northern Mississippi (Stevens and Kent, 2000 [1941]; Figure H-7). A similar route was followed by a French expedition under the direction of Captain Pierre-Joseph Céloron de Blainville in 1749 in the run-up to the French and Indian War. By the middle of the eighteenth century, the French had created a string of military and trading installations extending from Fort Niagara at Lake Ontario along the southern shore of Lake Erie to Presqu'isle (present-day Erie, Pennsylvania) into the Ohio valley (see Figure H-7). In the late 1740s, both French traders and British settlers had expanded their activities west of the Appalachian Mountains to engage native nations in the Ohio Country. As a result, each kingdom intensified their efforts to deny the other access to the area (Abler and Tooker, 1978:506-507; Tooker, 1978:431-432; Smith 2008).

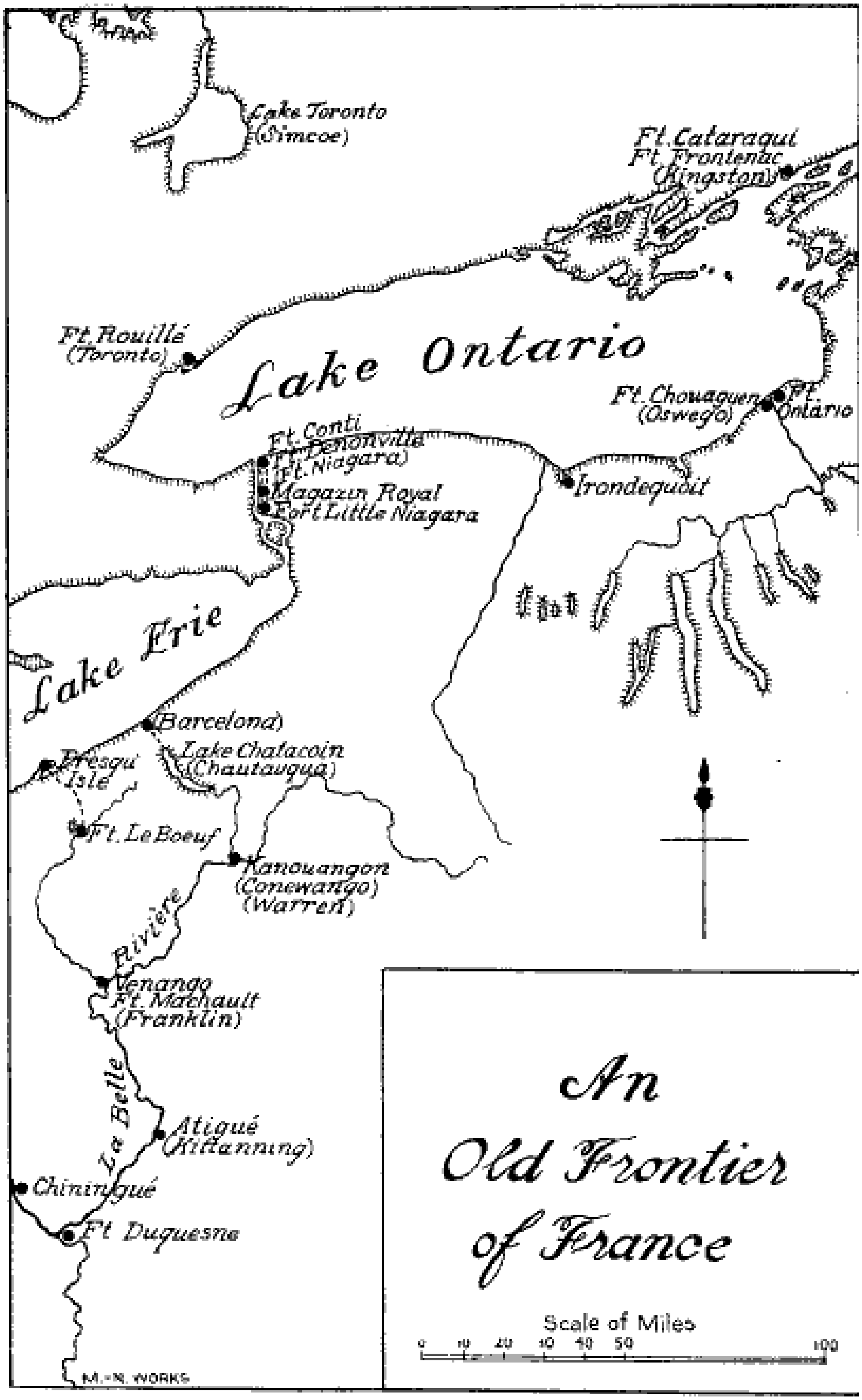
Great Britain and France engaged in another round of their incessant colonial war in the 1750s. While much of the action of the conflict occurred elsewhere, what is now western Pennsylvania saw the erection of several French fortifications, including Fort de la Presqu'isle (1753); Fort de la Riviere au Boeuf (Fort Le Boeuf) on French Creek (1753, near Waterford); and Fort Machault at the confluence of French Creek and the Allegheny River (1753-1757, present-day Franklin) (see Figure H-7). An important supply route extended from Presqu'isle to the junction of the Allegheny and Monongahela rivers which forms the Ohio River, where the French erected Fort Duquesne (present-day Pittsburgh). The British would make extensive use of this route after the construction of Fort Pitt. Later, the British would construct Fort Venago (1760) in proximity to the former location of Fort Machault, which the French burned upon their evacuation of the area in 1759 (Waddell and Bomberger, 1996:1-9; Smith, 2008; Tooker, 1978:432-434; Davis, 1986:206).

- Frontier

The focus of attention of the French and Indian War was the Ohio Valley. While British land speculators were promoting the Ohio Valley, settlers in western Pennsylvania were subject to attacks from native allies of the French. In 1754, Major George Washington was sent to meet the French at Fort Le Boeuf to inform them of Virginia's interest in this land, and was rebuffed, resulting in an exchange of gunfire, and the erection of the short-lived Fort Necessity (Tindall, 1988:167-168). After a long march from Philadelphia, British troops under the command of General John Forbes frightened the French into deserting and burning Fort Duquesne. After a siege, British troops captured Fort Niagara in July 1759 and the French abandoned their outposts in western Pennsylvania. The British erected Fort Pitt on the ruins of Fort Duquesne (Tindall, 1988:172; Tooker, 1978:433; Department of General Services, 2009:1-13).

After the French defeat and their loss of North American colonies, some of the western Seneca, remaining loyal to the French, joined Pontiac's Rebellion (1763-1764), harrying English-American settlers in the upper Great Lakes and the Ohio Valley. Pontiac's forces attacked and took British-occupied Fort Venago, Fort Le Boeuf, and Fort Presqu'isle. In an attempt to quell the rebellion, King George III issued the Royal Proclamation of 1763 which created a line along the crest of the Appalachian Mountains beyond which settlement was forbidden (Waddell and Bomberger, 1996:57-60; Tindall, 1988:182-184). In the first Treaty of Stanwix in 1768, the Haudenosaunee relinquished their land in central Pennsylvania to the British.

**Figure H-7. French Outposts in Western New York and Northwestern Pennsylvania During the Mid-Eighteenth Century**




Source: (Severance 1917).

During the Revolutionary War, Major General John Sullivan campaign into New York's Haudenosaunee country had a Pennsylvania component. Colonel Daniel Broadhead, 8th Pennsylvania Regiment, led a complementary maneuver to drive British-allied nations from the Allegheny valley in western Pennsylvania. The Americans destroyed ten native villages during their march up the Allegheny River between Fort Pitt and Olean Point (New York). Provisioned and armed by the British, groups of Native Americans periodically harassed colonial settlements until the end of the war (Abler and Tooker, 1978:508; Department of General Services, 2009:1-16).

After the conclusion of the Revolution, the Haudenosaunee were forced to make peace as separate nations with the Americans. As a result, they relinquished all their land west of the Niagara River in the subsequent Second Fort Stanwix Treaty (1784). During these negotiations, the Haudenosaunee also sold the title to their land in Pennsylvania in a series of deeds. During the Fort McIntosh treaty negotiations (1785), the Delaware and Wyandot also released their claims to land in Pennsylvania to the Commonwealth ((Abler and Tooker, 1978:507-508; Ellis et al., 1967:115-117). Hunter, 1978:593; Davis, 1986:199; Pennsylvania Historical Museum Commission [PHMC], 2008).

European-American settlement of northwestern Pennsylvania dates from the end of the American Revolution as traders and settlers entered the upper Ohio Valley through the major river systems and Lake Erie. These water routes were interconnected within a complex system of inland Indian and military paths and served as channels of both commerce and communication. Pennsylvania purchased the Erie Triangle from the Federal Government in 1792 in hopes that the port located at Erie would attract the developing Great Lakes commercial traffic, where it would be conveyed through Pennsylvania to the busy Atlantic Ocean ports at Philadelphia. However, the construction of the Erie Canal in New York turned this dream to smoke (Tindall, 1988:266-268; Fletcher, 1971:6; Davis, 1986:199, 206).

During the closing years of the Revolutionary War, numerous states and the Federal Government attempted to compensate soldiers who fought against the British with grants of land. In 1780, the Pennsylvania General Assembly reserved land north and west of the Ohio and Allegheny rivers as "Donation Lands," to be distributed through a lottery to Pennsylvania veterans. Three years later, additional territory in this region was designated as "Depreciation Lands" to replace "certificates of depreciation" that had been given to Pennsylvania's veterans in compensation for the great depreciation in Continental currency. Settlement had to wait, however, until Native American title to these lands had been extinguished. As noted, title was secured by 1785 (Fletcher, 1971:10; Davis, 1986:199; Wallace, 1978:443-444).

After machinations over the extent of colonial charters, restitution to Revolutionary soldiers, attempted settlement of expatriate French nobility, and squatters occupying unsettled lands, most of the newly opened frontier areas in the state were patented in large tracts of land to speculators. The rugged western Pennsylvania countryside saw little actual settlement as the land was considered practically worthless (Fletcher, 1971:26, 30; Currin, 2001; Frederick, ca. 2000; Schadenberger and Wilson 2001 [1947]).

The rugged, heavily forested terrain and the distance from established settlements retarded the area's initial growth away from the lake shore. Migration from eastern New York and New

England into the northwestern counties became a torrent after 1810. These settlers erected log or frame homes and established a variety of rural industries, including taverns, small hotels, grist and sawmills, blacksmith shops, and distilleries (McKnight 1905:569; Frederick ca. 2000; Payne 1999-2009; Bates, 1884:855; Fletcher 1971:46).

During the late 1780s, the Commonwealth of Pennsylvania surveyed and explored the northwestern parts of the state in an effort to develop it. A group of speculators, the Pennsylvania Population Company (formed in 1792), purchased a large portion of the Erie Triangle to sell it off at a profit. A village at Presque Isle was formed by legislative act in 1792, and the Commonwealth established a military presence there in 1794. General Anthony Wayne's troops landed at Presque Isle in 1795 after the Battle of Fallen Timbers, and erected fortifications and a sawmill in the village. Surveyors arrived later that year, and settlement began in earnest.

- Transportation

The French had constructed a portage road from what is now Waterford to Presque Isle prior to the French and Indian War. In 1803, an Erie to Waterford turnpike was chartered to facilitate the transfer of the Great Lakes trade inland. With the excellent port at Erie, commerce from the lakes could be enhanced by a linkage from the port through Waterford on French Creek to Pittsburgh and beyond via the network of rivers that stretched all the way to the Mississippi and the Gulf of Mexico. The creation of additional turnpikes promoted the movement of both goods and people. The National Road was an important route for western migration prior to 1850 (Fletcher, 1971; Sanford, 1862, 1894; Department of General Services, 2009:1-19). In the mid-1840s, the Erie extension of the Pennsylvania Main Line Canal connected New Castle to Erie (Davis, 1986:207; Sanford, 1862:117-119) and augmented the commercial development of Erie, although the Erie Canal in New York State attracted a significant amount of Great Lakes shipping to Buffalo.

The railroad was the major infrastructure advance during the middle decades of the nineteenth century. Early railroad construction centered on the creation of short feeder routes that connected coal mines to the main Pennsylvania canal. Railroad building after 1850 marked the profitable end of canals and cattle driving. The Pennsylvania Railroad built a line between Harrisburg and Pittsburgh, as branches extended from the main line to Erie, Blairsville, and Uniontown. The route was completed to Pittsburgh in December 1852 (Department of General Services, 2009:1:20; Fletcher, 1955:318-320). The Philadelphia & Erie Railroad opened as far as Warren in 1859, and was extended to Sunbury in 1864 (Bates, 1884:855).

- Agriculture

In order to grow any type of crop in this heavily forested area, most of the settlers had to clear their lots of trees. As a result, lumbering and timber by-products—potash, pearl ash, and charcoal—were the region's first important industry. The sale of wood ashes was the only cash-producing crop for many early settlers during their first years in northwestern Pennsylvania. Other forest products included tanbark and lumber (Fletcher, 1971:329).

During the nineteenth century, wheat was the great staple, but after the Civil War and the opening of the wheat fields of the Midwest, barley, corn, and oats became important crops. In the years after the Civil War, grapes and winemaking became successfully cultivated products along Lake Erie. Today, many peach, cherry, apricot, and apple orchards remain.

In addition to forest and agricultural products, cattle driving was a part of the pioneer economy until the railroads were built. Every year cattle were collected and driven over the Alleghenies in droves of 100 to counties in the vicinity of Philadelphia. Stock driving ceased about 1850 when railroads began to provide through transportation (Fletcher, 1971:180). Railroads arrived in the late 1860s to revive the lumber industry, coal mining, and tanning and wood chemical industries (e.g., turpentine, creosote) flourished while the forests lasted. From the mid-nineteenth century into the twentieth century, dairying and stock-raising were predominant farm specialties, and expanded into more market-oriented enterprises with the aid of improved transportation.

- Industry and Manufacturing

As lumbering operations increased, settlement expanded with each new cutting operation. For example, the City of Bradford developed from a lumbering camp (Fletcher, 1971:78-79). As railroads expanded into the rural parts of the state to transport timber, coal, and other products, the population of the region increased. Despite a negative prognosis regarding coal and a general lack of transportation, drilling in northwestern Pennsylvania initiated an oil boom beginning in 1871, which lasted to about the end of the 1880s. The industry was revived in the 1930s and 1940s by a water-injection method to recover the oil. In addition to oil, natural gas production remains an important component in the economy, especially since the emergence hydro-fracturing in the twenty-first century (Ross and Caplinger, 1994).

By the 1920s, through extensive clearing for the wood-chemical industry and technological developments such as the advent of steam power, the band saw, and the Shay locomotive, the forests of northwestern Pennsylvania were quite barren. Much like in New York's Adirondack Mountains, once the forests of Pennsylvania were cleared, timber companies vacated the deforested land in tax delinquency. As a result, Congress passed the Weeks Act in 1911 that allowed the Federal Government to purchase land in the east to establish national forests. The Allegheny National Forest was founded in 1923. The Civilian Conservation Corps erected recreational areas within the forest during the 1930s (USDA Forest Service, 2004).

The major industries of northwestern Pennsylvania during the twentieth century included coal, oil, and natural-gas production, and timbering. The lumber industry revived after World War II through managed forest systems in the National Forest. Other products include Zippo lighters, cutlery, motor oil, corrugated boxes, furniture, glass containers and construction blocks, and oil and gas pipes and equipment. The Allegheny National Forest encompasses portions of northwestern Pennsylvania (USDA Forest Service, 2007; PHMC, 2008).

- Commerce and Trade

Commerce and trade were initially locally focused. As transportation improved with the advent of better roads, canals, and railroads, trade became more extended. The City of Erie, on Lake Erie developed extensive port operations.

- Government

Pennsylvania was one of the original thirteen states that formed the United States of America and rebelled against Great Britain in 1776. Pennsylvania was the second state to ratify the Constitution on December 12, 1787. At present, Pennsylvania has 67 counties, 958 boroughs, 1,547 townships, and 56 cities (Department of General Services, 2009).

- Domestic, Social and Cultural

Settlement of Pennsylvania began in the mid-seventeenth century, focused along the Atlantic coast. Gradually, settlers spread throughout the state. Early settlers erected log cabins and cleared fields of trees in order to farm their land. As houses became more elaborate, they were made of frame construction, and later from a variety of building materials, such as stone and brick. In larger urban environments, residences rose to multi-story dimensions in a variety of styles. Migration from eastern New York, eastern Pennsylvania, and New England into the northwestern counties of the state became a torrent after 1820. These settlers erected log or frame homes and established a variety of rural industries, including taverns, small hotels, grist and sawmills, blacksmith shops, and distilleries (Frederick, ca. 2000; Payne, 1999-2009; Fletcher, 1971:46).

The Allegheny National Forest was founded in 1923. In 1965, the Allegheny Reservoir was created as a result of the construction of the Kinzua Dam (USDA Forest Service, 2004).

#### 1.2.2.3 State of Ohio

- Contact Period/Exploration/Colonial Period

The French were the first Europeans to penetrate the interior of what is now the State of Ohio during the second half of the seventeenth century. During the late 1660s, René-Robert Cavelier, Sieur de La Salle and a small party explored Lake Erie and what would become the Ohio Country, the area between Lake Erie and the Ohio River on the north and south, and the Allegheny and Maumee rivers on the east and west. La Salle's foray were part of general reconnoitering and trade expeditions as the French sought to establish contacts with native groups and trading posts in the New World wilderness (Howe, 1852; Hurt, 1995; OHC, 2010; OHO, 2010).

The next prominent European visit occurred in 1739, when Charles Le Moyne de Longeuil led an expedition from Lake Erie through western New York and Pennsylvania down the Ohio River to the Mississippi River, exploring the interior of the Ohio Country. His expedition provided the earliest firsthand information about the area. A similar route was followed by a French expedition under the direction of Captain Pierre-Joseph Céloron de Blainville in 1749 in the run-up to the French and Indian War (Scott, 1877; Graham, 1883; Smith, 2008; OHC, 2010).

During the first half of the eighteenth century, the French created a string of military and trading installations that stretched from Lake Ontario south to Presqu'isle (present-day Erie, Pennsylvania) into the Ohio Valley. During this time, forts on the Maumee River in northwest Ohio, as well as the Illinois and the Mississippi rivers were established. By 1750, a fort at the mouth of the Wabash River (in southwestern Indiana) opened a transportation route between that river and a fort on the Maumee River (Howe, 1852; Hurt, 1995; OHC, 2010; OHO, 2010).

Disagreements over this area erupted into violence as both Great Britain and France claimed the lands in the Ohio Country. While French efforts were focused on areas along Lake Erie, the British infiltrated the area from the south during the 1740s by building a trading post on the Great Miami and forming the Ohio Company to develop the Indian trade. By the 1750s, British trading posts began to emerge among several Indian nations in the Ohio valley, notably at Logs Town, a Seneca village west of Fort Duquesne, along the Miami River, near what is now Piqua, Ohio, and within a settlement of Miami Indians known as Pickawillanees (Howe, 1852; Hurt, 1995; OHC, 2010; OHO, 2010; Hunter, 1978:590). During this period, George Washington represented Virginia's interests in expanding into this area, and his efforts to survey the area sparked the French and Indian War.

The rivalry between the British and the French reached crescendo in 1754, when the two countries went to war. British losses early in the conflict allowed the Indians to reclaim some of their territory in the Ohio Country. Late in the war, however, Britain's fortunes reversed and the French were driven from the area. Skirmishing between Native Americans and the English continued throughout the remainder of the French and Indian War and extended into the early post-war period as British forces in the frontier confronted Indian attempts to drive them back over the mountains. Great Britain issued the Proclamation of 1763 in an attempt to slow immigration over the Alleghenies as an olive branch to the native nations. However, Pontiac marshaled the disparate tribes into a loose, short-lived confederation to attack British positions, and achieved some success in the Ohio Country (1763-1765) (Hunter, 1978).

- Frontier

The Ohio Country was an active war zone during the American Revolution, and during the post-war period. Various Ohio Indian nations allied themselves with the British during the American Revolution, and participated in raids on American settlements in western Virginia and Pennsylvania. From 1777 to 1794, numerous battles and strikes were fought by American and Indian forces in the Ohio Country. Sometimes the Americans claimed the field and sometimes the Indians did. Treaties at Fort Stanwix (1784) and Fort McIntosh (1785) marked the end of formal occupation of the Ohio Country by Native Americans. These treaties were reaffirmed by the Treaty of Fort Harmar (1789). With Indian title largely extinguished, large was parceled off in large tracts to speculators and land companies in the 1780s and 1790s. Despite these agreements, Native nations remained in the area and tensions between settlers and Indians escalated. American and Indian raids and reprisals plagued the Ohio Country for the next 20 years (Howe, 1852; Hurt, 1995; Mahon, 1988; Horsman, 1988).

After the Revolution, eastern states with claims on unappropriated western lands ceded those claims to the Federal Government, except Connecticut (Western Reserve) and Virginia (Military Tract). This resulted in the designation of these unappropriated areas as the Northwest Territory, where the U.S. Congress implemented a mechanism for the creation of new states from the area and appointed General Arthur St. Clair as territorial governor in 1787. Land companies were formed to serve as land agents to populate the area in the late 1780s. Settlement schemes were implemented by New England Company, the Scioto Land Company, the Miami Company, the Connecticut Land Company John Cleves Symmes, and Congress's French Grant (Howe, 1852; Hurt, 1995; Horsman, 1988:31; OHC, 2010; OHO, 2010). Settlers came from various points east, especially Connecticut, establishing farms along the rivers and creating a developed and prosperous land. Many of the settlers were Revolutionary War soldiers, who received land for their services.

Confrontations between the settlers and the Indians resulted, as Indian resistance to American settlement was being fueled by an alliance with the British. A fierce battle occurred in August 1794 at Fallen Timbers in northwestern Ohio, west of Lake Erie. Despite the American victory under the command of General Anthony Wayne and the subsequent Treaty of Greenville (1795), hostilities continued in the face of increased American settlement. Moses Cleaveland landed at the mouth of the Cuyahoga in the Western Reserve in 1796, and Ebenezer Zane completed a rudimentary road across Ohio, and established three ferries in 1797 (Horsman, 1988:32-33; Scott, 1877; Howe, 1852; OHC, 2010; OHO, 2010). In 1798, the Harrison Land Act divided the Northwest Territory into the Ohio Country and the Indiana Territory (Petro, 1994; Knepper, 2002; Randall and Ryan, 1912).

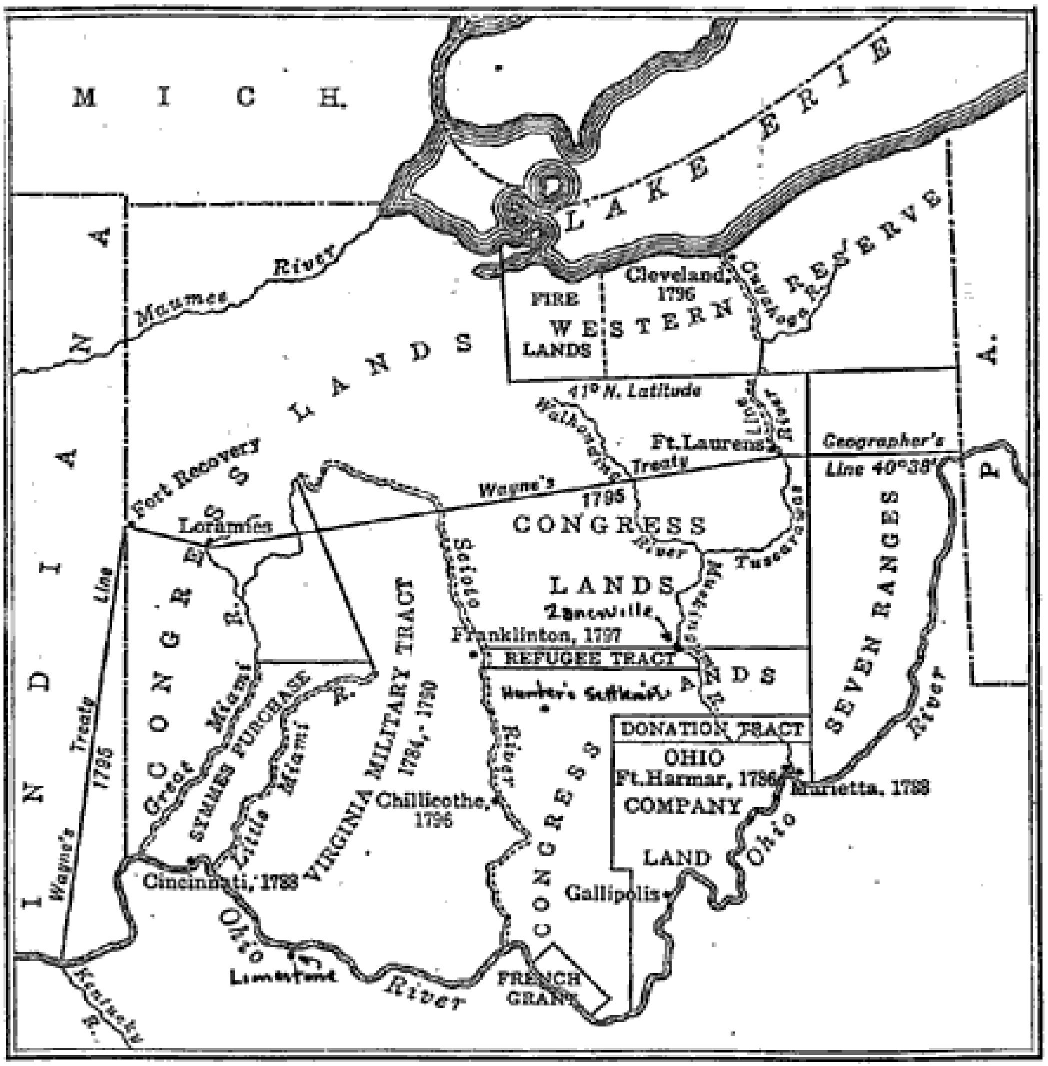
Jay's Treaty with Great Britain resolved several issues smoldering since the conclusion of the Revolution. As a result of the treaty, the British withdrew their soldiers from posts along the northern border between the United States and Canada, and a commission was established to settle outstanding border issues between the United States and Canada (Mahon, 1988:152).

During the early nineteenth century, Tecumseh and his brother Tenskwatawa led a Shawnee revival in western Ohio and Indiana. Supported by British intervention, the revival evolved into an intertribal movement that rekindled Native American resistance to American expansion. In November 1811, Gen. William Henry Harrison, Indiana Territorial Governor, led American troops against a group of Indians at the Battle of Tippecanoe in northern Indiana. The movement dissolved as a result of the battle. This conflict merged into the battles against the British during the War of 1812 (Callender, 1978:632). The American victory over and combined British-Indian force at the Battle of Thames (in Ontario, Canada) in October 1813 "marked the end of effective Indian resistance between the Ohio and Mississippi rivers" (Horsman, 1988:39).

- Transportation

Overland roads were generally poor, however, Lake Erie and inland rivers provided essential transportation as well as power for early sawmills and gristmills. Despite the improvements in roads and development of mills and other processing facilities during the early nineteenth century, economic growth still lagged. A problem facing many rural farming communities was ensuring that their products could reach markets. While the state's population rose in tandem with improved infrastructure, this infrastructure was still inadequate for farmers to get their products to market. Beginning in the 1820s, Ohio developed two main canal lines—the Ohio-Erie Canal between Cleveland on Lake Erie and Cincinnati on the Ohio River; and the Ohio-Miami Canal between Toledo and the junction of the Great Miami and Ohio rivers (Howe, 1852; McGill, 1969; OHC, 2010). A number of other feeder canals were also constructed in the following decades to support both systems.

**Figure H-8. Ohio Land Grants and Surveys**




Source: (Randall and Ryan, 1912).

The impact of the canals on the Ohio economy and settlement was tremendous. Farmers could get their products to market for reasonable profit, and waves of new immigrants, often coming from Lake Erie via New York's Erie Canal, settled in the state. Between 1820 and 1850, the population of the state rose to 1.98 million (McGill, 1969).

Soon after the canals had been completed, the railroad construction began, soon making the canals obsolete. The Erie & Kalamazoo Railroad was first railroad in Ohio, connecting Toledo and Adrian, Michigan in 1836. Other routes quickly followed, as the State supported both canal and railroad construction. The Baltimore & Ohio crossed the Appalachians in the 1850s assuring a connection to east coast markets (Graham, 1883). The businesses that had flourished along the canals slumped as the railroad towns prospered.

- Agriculture

Once the pioneers cleared the abundant forest cover, they planted subsistence crops, the surplus of which was sold or traded. Agriculture formed the predominant economic activity outside the larger urban areas of the state until well into the twentieth century. During the nineteenth century, wheat was the great staple, supplemented by barley, corn, and oats. From the late nineteenth century into the twentieth century, dairying and stock-raising were predominant farm specialties, and expanded into more market-oriented enterprises with the aid of improved canal, railroad, and lake transportation.

- Industry and Manufacturing

Industry developed to complement agricultural endeavors, and included saw and grist mills, iron mines and furnaces, by midcentury coal mining and steel manufacturing. Cleveland became an iron and industrial center in the 1850s, later Youngstown and Toledo emerged as centers for a variety of factories and industries. Industries and businesses blossomed along canal and railroad routes, including hotels, mills, foundries, and distilleries (Graham, 1883). Other manufacturing enterprises included pork products, farm machinery, carriages, cash registers, and oil refineries.

During the late nineteenth century into the twentieth century Cleveland was a leading industrial center as the home to Standard Oil as well as 86 oil refineries, Cleveland also supported facilities related to Dow chemical, Sherwin Williams, Goodyear Tire & Rubber Co., Firestone Tire & Rubber Co., Goodrich Corporation (Akron) and Proctor & Gamble. Other industrial locations included Akron, Toledo, Sandusky, and Ashtabula. With industrialization came increased immigration and urbanization. Like other Great Lakes industrial powers, Ohio's industrial base was undermined by changing economic circumstances in the 1960 and 1970s, notably in steel and heavy industry (Cayton, 2002).

- Commerce and Trade

Waterborne commerce along the lake was one of the earliest components of the area's prosperity, linking the State into broad national and international economies. Economic development advanced from agricultural production to early industry (saw and gristmills) progressing to heavy industrial operations during the 1850s through the twentieth century. From these developments emerged large urban areas like Cleveland, Youngstown, Cincinnati, and Sandusky, which served as commercial nodes to facilitate trade. In the years after the Civil War, Ohio developed into one of major industrial states of the union with essential commercial and shipping connection along the Great Lakes. Raw materials arrived in Ohio's ports and were exchanged for agricultural products and manufacturing goods. Later, railroads provided greater inland links to markets throughout the nation (Cayton, 2002).

- Government

Ohio was the first state created from the Northwest Territories in March 1803. At present, Ohio has 88 counties, 251 cities and 681 villages.

- Domestic, Social, and Cultural

Settlement of Ohio began in the late eighteenth century, focusing along the Lake Erie and the Ohio valley. Gradually, settlers spread throughout the state. Early settlers erected log cabins and cleared fields of trees in order to farm their land. As houses became more elaborate, they were made of frame construction, and later from a variety of building materials, such as stone and brick. In larger urban environments, residences rose to multi-story dimensions in a variety of styles. Migration from eastern states into the state became a torrent after the War of 1812. Settlers erected log or frame homes and established a variety of rural industries including taverns, small hotels, grist and sawmills, blacksmith shops, and distilleries (Howe, 1852).

After the Civil War into the twentieth century, increasing industrial development and manufacturing attracted hundreds of thousands of new immigrants, both European immigrants and blacks from the South (Cayton, 2002).

#### 1.2.2.4 State of Michigan (Lower Peninsula)

- Contact Period/Exploration/Colonial Period

The first Europeans made their way to what is now Michigan around 1620. Among the earliest recorded visitors were French priests and their party of fellow explorers. The French government, claiming the lands for their own, gave large sections to new settlers, who established trading posts dealing in furs and other commodities. Today, in historically French areas such as Detroit and Monroe, civil land divisions carry reminders of the earliest land claims, known as ribbon farms. These narrow and deep lots front on a river or lake and extend into the interior as much as a mile or more. This arrangement provided each settler direct access to the waterway, which was at the time the easiest means of transportation.

A number of forts were established during early settlement, including Fort Michilimackinac in Mackinaw City, Forts Detroit (later Fort Shelby), and Wayne in Detroit, and Fort Gratiot in Port Huron. Ironically, both Forts Michilimackinac and Gratiot were constructed by the French to protect the area from the British but were lost to the other side. Michigan’s forts provided both a sense of security to those living in the region and a center for commerce and trade, thus encouraging settlement. As a result, the State’s population grew.

- Transportation

Overland travel was initially difficult in the state, due largely to the heavy forestation. Early routes followed long-established animal and Native American pathways. North of Detroit, explorers met with swampy conditions forcing slow, difficult movement that often resulted in a general condemnation of the entire state as a wasteland.

Three key events improved the movement of both goods and people into Michigan. The completion of the Erie Canal provided a water route for immigrants from New York to the shores of lower Michigan beginning in 1825. The completion of the first locks in Sault Ste. Marie in 1855 opened a path to the west end of Lake Superior from New York and effectively connected Lakes Erie, Huron, Michigan, and Superior. Finally, the 1959 completion of the St. Lawrence Seaway provided a water route from the east coast to Chicago by water (Dunbar and May, 1995).

Forging new roads was challenging, so the existing network of paths provided a logical place to construct new roadways. Corduroy roads were among the earliest roads constructed. These were, particularly in urban environments, followed by brick roads. While most of the brick roads are gone, it is still possible to find remnants in communities such as Detroit, Mount Clemens, and Bay City. As transportation methods shifted from horseback to horse-drawn carriage and to the horseless carriage, road surfaces became smoother. In 1909, the first one-mile stretch of concrete roadway was paved in the City of Highland Park (Dunbar and May, 1995).

By the late nineteenth century, a network of major railroad lines provided connections to the east and west, and the major industrial centers of the state were connected by interurban railroads. These rail lines connected one side of the Detroit metropolis with the other and from Detroit to Saginaw and Lansing. Railroads facilitated the growth of major industries. In communities like Jackson and Durand, railroad repair shops became dominant employers, drawing additional industries, workers, and residents.

During the twentieth century, four of the most notable bridges in the state were erected, three of which connect Michigan to Canada. In the 1920s, the Ambassador Bridge was completed connecting Detroit with Windsor. The Blue Water Bridge, opened in 1938, connects Port Huron and Sarnia across the St. Clair River. In 1962, the International Bridge was opened between Sault Ste. Marie, Michigan, and Sault Ste. Marie, Ontario, Canada. Michigan's most famous bridge, the five-mile-long Mackinac Bridge, or "Mighty Mac," opened for traffic in 1957 and connects the Lower Peninsula with the Upper Peninsula (Michigan Department of Transportation, 2009).

- Agriculture

Wheat was an early favorite crop, with other grains following soon after. In areas where heavy logging had occurred, one of the first crops to flourish after the trees were removed was the potato. Early in the twentieth century, the Petoskey area was recognized for its production of the Chief Petoskey seed potato. Corn and soy beans are common crops grown in the Lower Peninsula; sugar beets are prevalent in the Saginaw River valley.

Pomiculture was established by the late nineteenth century and early twentieth century. Microclimates in Michigan make it possible to produce apples in the Washington area of Macomb County, peaches in nearby Romeo, and both cherries and grapes on the Leelanau (an area known for its wine industry). Viticulture was practiced in the Monroe region as early as the mid-nineteenth century (Hathaway and Kegerreis, 2010).

- Industry/Manufacturing

Settlement in the northern portion of Michigan's Lower Peninsula was facilitated by logging the white pine forests. Lumber companies purchased large tracts of land, where they established camps to facilitate clear cutting. Logging company owners earned millions of dollars, and the titles of Lumber Barons, in the process.

Logging, railroads, and waterborne shipping formed a symbiotic relationship, and communities such as Bay City, Detroit, and other lakeside settlements often included at least a small shipbuilding enterprise. Although shipbuilding has largely ended, the lakeside ports remain connected to the interior by railroad and highways and continue to ship goods.

Although exactly where the automobile was first invented is often disputed, there is no argument that the automobile industry gained its power and reputation in Michigan. Small automobile manufacturers and their suppliers were located across the state, with most cities in the Lower Peninsula claiming one (or more) automotive-related industry. Michigan also claims credit for transfiguring industry in general with the establishment of the assembly line (Catlin, 1926). Detroit-based Albert Kahn and his brother Louis revolutionized the appearance and functionality of the modern factory.

By the early twentieth century, the automobile manufacturing firms of Ford and General Motors (GM) were headquartered in or near Detroit. Ford maintains its world headquarters in Dearborn. GM was headquartered in downtown Detroit and its GM Tech Center was in nearby Warren. In 1940, much of the military's tank construction took place at the Chrysler-operated Warren Tank Factory, which operated in this capacity for over 50 years before closing in the 1990s.

- Commerce and Trade

Like most of the country, Michigan developed trade centers to serve the rural hinterlands; however, unlike most of the country, Michigan also has port cities that facilitated both intra- and interstate shipping and trade. Among the more remarkable products from Michigan manufacturers are catalog homes designed, prepared, and shipped from Bay City to points around the state and country. Tourism has also been an important aspect of Michigan's commerce, with cultural heritage tourism sites across the Lower Peninsula. Entire communities, such as Marshall, Alpena, and Mackinac Island, claim heritage tourism as a major part of their local economies. Lighthouses, a favorite tourist attraction, dot the shores of Lakes Erie, Huron, and Michigan.

- Government

The Michigan Territory was carved out of the Northwest Territories in 1829, with boundaries closely resembling those of today. In 1837, Michigan reached sufficient numbers to gain entry into the United States as the 26th state in the Union (Dunbar and May, 1995). By the time statehood was granted to Michigan, the land was divided into 37 counties. Today, the State contains 83 counties. Within each county, cities, villages, towns, and townships may also have local jurisdiction, depending on their local population and level of incorporation. A number of Michigan's counties continue to boast courthouse squares, a centrally placed courthouse building surrounded by commercial enterprises that often include attorney offices and other court-related businesses. One of the best examples of this is found in Howell, Livingston County.

- Social and Cultural

The first waves of immigration into Michigan consisted largely of people of western European ancestry who were later joined by Germans and Irish. Michigan's status as a "free" state (i.e., without legalized slavery) offered African Americans a permanent home or a refuge during their journey on the Underground Railroad. Later, the automotive industry attracted African American workers from the South. Eastern European communities developed in communities such as Delray in Detroit (Hungarian) and Hamtramck (Polish). In the early twentieth century, Hispanics found employment as migrant workers in Michigan's fields and orchards. The most recent major influx of a single ethnic group has been that from the Middle East. Dearborn, just west of Detroit, represents one of the largest Arabic populations outside the Middle East.

### 1.2.2.5 States of Michigan (Upper Peninsula) and Wisconsin

- Contact Period/Exploration/Colonial Period

The first Europeans made their way to what would be later known as Michigan around 1620. Among the earliest recorded visitors were French priests and their parties of fellow explorers. The French government, claiming the lands for their own, gave large sections to new settlers, who established trading posts dealing in furs and other commodities. Today, in historically French areas such as Sault Ste. Marie, civil land divisions carry reminders of the earliest land claims, known as ribbon farms. These narrow and deep lots front on a river or lake and extend into the interior as much as a mile or more. This arrangement provided each settler direct access to the waterway, which was at the time the easiest means of transportation.

A number of forts were established during early settlement, including Fort Michilimackinac in Mackinaw City. Ironically, Fort Michilimackinac was constructed by the French to protect the area from the British but was lost to the other side. Michigan's forts provided both a sense of security to those living in the region and a center for commerce and trade, thus encouraging settlement. As a result, the State's population grew.

In the northern portions of both Michigan and Wisconsin, settlers followed the logging and mining industries. By the mid- to late nineteenth century, one of major immigrant groups comprised people from Finland, who came to the United States fleeing mandatory military service for Russia, religious bigotry, and other factors (Legreid, 1986). Many of these immigrants made their way to the northern counties of Michigan and Wisconsin.

- Transportation

Water travel facilitated the earliest settlers of Michigan's Upper Peninsula, yet settlement lagged due to difficulty in traversing the region and long, harsh winters. The hazards associated with early efforts to navigate through the St. Marys Rapids (now largely the site of the Soo Locks) also meant settlement in northern Wisconsin trailed far behind the southern portion of the state.

Overland travel was initially difficult, due largely to heavy forestation. As a result, as in other areas across the country, early routes followed long-established animal and Native American pathways. Corduroy roads were among the earliest roads constructed when permanent roadways were desired. These were, particularly in urban environments, followed by brick roads and eventually concrete and asphalt paving.

Although the railroads abounded in Michigan's Lower Peninsula, they came later to the northern regions. Most of the railroads there were used to facilitate the movement of mine workers and goods, rather than the long-distance rails associated with southern portions of the state. One exception was the Duluth, South Shore & Atlantic, which was incorporated in 1886 and extended from St. Ignace to Duluth by the mid-twentieth century. In Wisconsin, a similar lack of railroads existed until the second half of the nineteenth century. The Chicago, St. Paul, Minneapolis & Omaha, part of the Omaha Road, reached the northern portion of Bayfield County, Wisconsin, in the early 1880s.

The International Bridge, completed in the early 1960s and connecting Sault Ste. Marie, Michigan, with Sault Ste. Marie, Ontario, is one of Michigan's three international bridge crossings. The bridge follows a similar route across the Sault Ste. Marie Canals and Locks as the nearby ca. 1880 railroad bridge. Two large-scale bridges are located in Superior, Douglas County, Wisconsin. These include the 1885 Northern Pacific Drawbridge spanning the St. Louis Bay and the 1910 State Highway 105/Minnesota State Highway 23 Bridge over the St. Louis River.

- Agriculture

In most of Michigan's Upper Peninsula and Wisconsin's Lake Superior shore, once the forests were removed, farming was difficult at best. In spite of being promoted as excellent lands to encourage people to settle the regions, the sandy soils made an agricultural lifestyle difficult. In recognition of this, in the State and Federal governments began buying back the lands, and established publically owned forests. Private property is still found in and around the forests but for the most part, widespread agriculture practices are limited.

By the late nineteenth century and into the early twentieth century, fruit production began, fueled by the recognition of microclimates well-suited to pomiculture. These microclimates made it possible to produce fruit orchards in Bayfield, Wisconsin.

- Industry/Manufacturing

Settlement in the Michigan's Upper Peninsula and in the northern tip of Wisconsin was facilitated by logging the extensive white pine forests. Lumber companies purchased large tracks of land, where they established camps to facilitate clear cutting. Logging company owners earned millions of dollars, and the title of Lumber Baron, in the process.

Raw materials form the basis for some of the major industrial activities of the Upper Peninsula and northern Wisconsin. Although Native Americans had long been aware of its existence, the Euroamerican "discovery" of copper in Michigan's Keweenaw Peninsula drove early settlers to the region to pursue its extraction. The copper mining industry was active across much of the northern section of the Upper Peninsula, and lasted well into the twentieth century. At about the same time that copper mining began, iron ore was discovered in the Marquette range (Dunbar and May, 1995). Although copper played out its predominance early, iron ore had an important role on the world stage for considerably longer. In Ashland, Bayfield, and Superior counties, Wisconsin, the extractive industry focused on sandstone. Known as Bayfield or Lake Superior Sandstone, it was widely sought after as a nineteenth-century construction material (Lusignan, 1986).

Many of the extracted raw materials were transported across Lake Superior and down to ports in Indiana, southern Michigan, Ohio, and Pennsylvania for processing. The need for efficient shipping facilities resulted in improvements of harbors, canals, and locks needed to move massive amount of raw goods to the processing plants.

- Government

Michigan and Wisconsin were both part of the Northwest Territories established in the late 1780s. The Michigan Territory was carved out of the Northwest Territories in 1829, with boundaries closely resembling those of today. In 1837, Michigan reached sufficient numbers to gain entry into the United States as the 26th state in the Union (Dunbar and May, 1995). By the time statehood was granted to Michigan, the land was divided into 37 counties. Today, the State contains 83 counties. Wisconsin followed a similar path to statehood, first becoming part of the Michigan Territory, then in 1836 forming the majority of the Wisconsin Territory, before finally entering the union in 1838 as the 30th state (Garfield, 1986a; Garfield, 1986b). Originally consisting of one large county, by the time statehood was granted, Wisconsin had 29 counties. There are currently 72 counties across the State. In both Michigan and Wisconsin, the cities, villages, towns, and townships may have local jurisdiction, depending on population and level of incorporation.

- Social and Cultural

The first waves of immigration into northern Michigan and Wisconsin brought individuals with largely western European ancestry and were later joined by Germans and Irish. Mining jobs in the Upper Peninsula and Wisconsin's Lake Superior shore attracted a number of people from areas with a tradition of mining, such as Cornwall and Wales in the United Kingdom, as well as immigrants from Finland and other Scandinavian countries.

### 1.2.3 EOR REGION

#### 1.2.3.1 State of Minnesota

- Contact Period/Exploration/Colonial Period

Beginning in the mid-seventeenth century the French were the first Europeans to explore what is now Minnesota. These visitors included Claude Allouez and Daniel Greysolon, Sieur du Lhut. As the fur trade became more established during the late seventeenth century and eighteenth century, French voyageurs established trading posts amid the frontier. The first settlement in Minnesota was an outpost called Grand Portage near Lake Superior, where the French fur traders had to make a portage around the rapids of the Pigeon River. Grand Portage became the frontier headquarters of the North West Company, a dominate fur trading operation. In 1721, the French erected Fort Beauharnois on Lake Pepin. The Dakota (Sioux) and the Ojibwa (also called Chippewa) were the two prominent Native American nations in Minnesota from the colonial period until the middle of the nineteenth century (Eccles, 1997; Heidenreich, 1997; Minnesota Historical Society, 2011a).

- Frontier

The northeastern portion of the state (northeast of the Mississippi River) was included as part of the original Northwest Territory, under which the jurisdiction of the Ordinance of 1787 applied. The part of the state south of the Mississippi River was acquired by the United States from France in 1803 as part of the Louisiana Purchase. The northwestern portion of the state became U.S. territory in 1818 as part of a treaty with Britain that established the U.S.-Canadian Border at the 49th parallel, but border disputes would not be resolved until the Webster-Ashburton Treaty in 1842.

Fort Snelling (Minneapolis-St. Paul) was the first permanent U.S. settlement in the area in 1819, and was completed in 1825. The fort overlooked the junction of the Mississippi and Minnesota rivers. Immigration into the region was slow during the first half of the nineteenth century, but, once the value of the vast forestlands of northern and central Minnesota was recognized, lumbermen from the eastern states initiated a wave of settlement. This wave was followed by an influx of German and Scandinavian immigrants who established farmsteads (Minnesota Historical Society, 2011a).

After 1860, Minnesota was the scene of bloody Indian uprisings, including the Sioux Uprising of 1862. The Dakota (Sioux), who had not remained in the state during the influx of American and European settlers, were confined to reservations, some the victims of forced land sales as the Federal Government reneged on earlier treaties. Starvation generated by drought and crop failures, the Dakota attacked local settlements, resulting more than 500 deaths, Indian and non-Indian. The Federal Government brutally extinguished the uprising.

- Transportation

The earliest passages through the wilderness were rivers and Native American trails, including the grand portage around the falls west of Lake Superior. Steamboats on the Mississippi brought settlers to St. Paul in increasing numbers during the early 1800s, and inland roads between settlements became more formalized. Railroads were the major infrastructure advance during the middle decades of the nineteenth century.

The Northern Pacific Railway and St. Paul & Pacific Railroad were early railroads in the state and they helped draw settlers to the state. James J. Hill played a major role in developing Minnesota's rail network, including connections into Canada. He also was the driving force behind extending rail routes west into North Dakota, Montana, and Idaho in the 1880s, which became the Great Northern Railway in the 1890s. Other railroads included the Milwaukee Road, the Lake Superior & Mississippi Railroad, the Soo Line, and the Minneapolis & St. Louis Railway (Hofsommer, 2005).

Ports along Lake Superior benefitted from robust trade on the Great Lakes. The port of Duluth shipped iron ore, coal, and grain from Minnesota to other Great Lakes ports as well as Canada. In 1959, the St. Lawrence Seaway opened, greatly curtailing the Lakes trade as ships leaving Duluth could access the Atlantic Ocean through the lakes and the St. Lawrence River.

- Agriculture

After the Civil War, European immigrants, notably Scandinavians and Germans flocked to Minnesota to settle the state's rich farmland, encouraged by the 1862 Homestead Act. Agricultural products include wheat, corn, oats, and flax. The volume of grain produced enabled Minnesota to become a leading maker of flour, counting Pillsbury and the Washburn-Crosby Company (later, General Mills) as leading millers by the beginning of the twentieth century.

- Industry and Manufacturing

The copious pine, balsam, and spruce forests of the territory spurred the development of the lumber industry as sawmills were built along its major rivers, notably the St. Croix in eastern Minnesota. These forests were opened to lumbering by the end of the 1830s and mostly gone by 1900. The lumbering industry shifted to the north after 1900 and declined thereafter (Minnesota Historical Society, 2011b).

Iron ore was mined commercially beginning in 1884 on the Vermilion Range. In 1890, extensive iron ore deposits were discovered at the Mesabi Range. Large-scale production at this deposit resulted in a population boom for northeastern Minnesota, especially at Duluth. Rigorous exploitation of the deposits depleted the state's reserves of high-grade ore by the late 1950s (Encyclopaedia Britannica 2009a).

- Commerce and Trade

Commerce and trade were initially locally focused. As transportation improved with the advent of better roads, steamers, and railroads, trade with southern Canada and nearby territories became more extended. Areas along Lake Superior developed as a result of a robust lake trade with such ports as Cleveland, Erie, and Buffalo. The first railroad in the state connected Minneapolis and St. Paul in 1862.

- Government

The Minnesota Territory was established on March 3, 1849, and included areas within what are now North Dakota and South Dakota. Minnesota became the $32^{nd}$ state of the Union on May 11, 1858.

- Domestic, Social and Cultural

Settlement of Minnesota began during the eighteenth century, focused on areas along Lake Superior and the Mississippi. As a frontier area, commercial ties with Canada provided an important economic lifeline that was facilitated by the lack of enforcement of border crossing. Areas of central Canada were supplied from settlements in the Red River valley (Gilman, 1991; Wingerd, 2010).

Gradually, settlers spread throughout the state along the state's waterways. Early settlers erected log cabins and cleared fields of trees in order to farm their land. As houses became more elaborate, they were made of frame construction, and later from a variety of building materials, such as stone and brick. In larger urban environments, residences rose to multi-story dimensions in a variety of styles. Scandinavia immigration into the state increased rapidly after the 1862 Homestead Act and with improvements in transportation networks.

#### 1.2.3.2 State of North Dakota

- Contact Period/Exploration/Frontier

Contact between Indigenous people and Europeans began in mid-eighteenth century as French fur traders ventured through the Northern Plains to explore the Rocky Mountains. The first recorded explorer to visit what is now North Dakota was Pierre Gaultier de Varennes, sieur (lord) de La Vérendrye. Fur traders from Canada began to arrive in the 1790s. Alexander Henry established the first trading post in the state at Pembina in 1801. Subsequent trading posts were founded at Fort Union and Fort Clark. Visits to the region by Europeans or Americans were infrequent until after 1804, when Lewis and Clark passed through the area. Men under the direction of Lewis and Clark erected Fort Mandan, where the explorers spent the winter (ND Tourism 2011; Eccles, 1997).

After the War of 1812, expansion west of the Mississippi River increased. American explorers and traders brought manufactured goods and liquor for trade with the Indians, as well as unfamiliar diseases. The populations of many native nations were decimated by contact with the American traders. As explorers and settlers moved westward, the U.S. Army erected numerous forts along the area's rivers beginning in 1857. Settlement of the Northern Plains began in earnest in 1861 with the creation of the Dakota Territory.

- Transportation

The first routes through the wilderness were Native American trails, then U.S military supply routes. Railroads were the major infrastructure advance after 1870. James J. Hill played a major role in developing North Dakota as he was the driving force behind extending rail routes west into North Dakota, Montana, and Idaho in the 1880s. Hill's Great Northern Railroad, the Soo Line Railroad, and the Northern Pacific Railroad linked the region to manufacturers in Minnesota and served to bring North Dakota's wheat crop to markets in the East (Controneo, 1970; Hedges, 1926; Murray, 1957).

- Agriculture

After the railroads reached the Red River, a period of rapid in-migration occurred as 100,000 settlers arrived into the territory between 1879 and 1886. Many of these settlers would establish farmsteads under the 1862 Homestead Act. "Some settled on 160-acre homesteads, while some created bonanza farms that were highly mechanized, well-funded and usually focused on large-scale wheat production" (ND Tourism, 2011). Many of these farms produced wheat, which was shipped to Minnesota to be processed into flour (NPS Parknet, 2011). As Bonanza farms prospered in the eastern part of the state, cattle ranches developed to the west after 1880, centered in the Badlands area.

In the twentieth century, farms diversified their production from wheat to other crops like sugar beets, sunflowers, and oats. Around the same time, farms consolidated, grew larger, and became increasingly mechanized. North Dakota has 77,690 farms in 1920 and less than 30,000 in the first decade of the twenty-first century. The average farm size at present is 1,280 acres (ND Tourism, 2011).

- Industry and Manufacturing

Local industries and light manufacturing are concentrated in the urban areas of the state, such as Fargo and Bismarck. In the twentieth century, oil and natural gas exploration became important industries. "North Dakota is a leading producer of coal, oil, gas, and wind energy" (ND Tourism 2011).

- Commerce and Trade

Commerce and trade focused on agricultural products, notably wheat. As transportation improved with the advent of better roads and railroads, trade with nearby territories became more extended.

- Government

Northeastern North Dakota was acquired by the United States through the Rush-Bagot Agreement of 1817, while most of what is now North Dakota was purchased from France in 1803 as part of the Louisiana Purchase in 1803. The Dakota Territory was established in 1861 and included what is now North and South Dakota. The territory was divided in 1889, and both North and South Dakota became states on November 2, 1889.

- Domestic, Social and Cultural

The U.S. Army established numerous forts in this region beginning in the late 1850s. Settlers and frontiersmen engaged in a great slaughter of northern bison after 1870, which undermined the nomadic culture of the local native nations. During the 1870s and 1880, the U.S. Army engaged in numerous battles with the native nations of the Northern Plains. By the end of the Indian wars in the 1890s, mining, open and fee-simple ranching, and Bonanza and dairy-farm operations had been established throughout the region. Scandinavia and German immigration into the state increased rapidly after the 1862 Homestead Act and with improvements in transportation networks. In the 1950s, North Dakota became the home of two large Air Force bases: Minot and Grand Forks.

### 1.2.3.3 State of Montana

- Contact Period/Exploration/Frontier

The first recorded Euro-American exploration of what is now Montana was the Lewis and Clark Expedition on 1804-1806. François Antoine Laroque representing the North West Company of Canada, a fur-trading operation, explored the Yellowstone River after 1805. Prior to that time the state was occupied by numerous Native American nations, including the Crow, the Cheyenne, the Blackfeet, the Assiniboine (Ojibwe), the Gros Ventre, the Kootenai, the Chippewa, the Cree, the Lakota Sioux, the Arapaho, and the Shoshone.

As subsequent explorations west of the Red River increased, American fur trappers and traders brought manufactured goods and liquor for trade with the Indians, as well as unfamiliar diseases. The populations of many native nations were decimated by contact with the American traders. The period of active fur trading ended during 1840s. In addition to the mountain men, Catholic missionaries also entered the region, establishing Saint Mary's Mission in the Bitterroot Valley. This settlement is presumed to be the first permanent settlement in the state. The priests promoted agriculture and erected a sawmill (State of Montana, 2011).

Fort Benton, established as a fur trading post on the Missouri River in 1847, was the first permanent fort in Montana in 1865. In the 1860s, gold was discovered in Montana. As a result, prospectors and other settlers flocked to the region. “The rapid influx of people led to boomtowns that grew rapidly and declined just as quickly when the gold ran out” (State of Montana, 2011).

- Transportation

The first routes through the wilderness were Native American trails, then U.S. military supply routes. Fort Benton was the western-most navigable point for steamboats on the Missouri River, and became an important trade center as a result. Railroads were the major infrastructure advance after 1880. The Northern Pacific reached Billings in 1882. James J. Hill played a major role in developing the rail network along the northern border, extending a line from Minnesota across North Dakota, Montana, and Idaho into Washington during the 1880s. The line became the Great Northern Railway in the 1890s (Controneo, 1970; Hickcox, 1983; Yenne, 2005).

- Agriculture

Beginning in the 1860s, cattle ranches were established in the western valleys of the territory, spurred by the demand for meat by newly founded mining communities. The availability of free public-domain land in eastern Montana attracted open-range cattle ranches in the 1870s. The railroads also encouraged the development of agriculture along their routes. In 1909, the U.S. Congress passed the Enlarged Homestead Act as an encouragement to settle more marginal lands that could not be irrigated, which resulted in an influx of settlers. Many farmers grew oats and then switched to wheat. Wheat was a successful crop until drought and poor prices destroyed the market after World War I (State of Montana, 2011).

- Industry and Manufacturing

Montana is rich in mineral resources.  Beginning in the 1860s, mining for gold, silver and copper led to the emergence of mining communities.  Butte developed from nearby silver and copper deposits.  The Anaconda Copper Company, one of the world's largest copper mining companies, was based in Butte (State of Montana, 2011). The demand for Montana's mineral wealth drew immigrants from Scandinavia, Central and Eastern Europe, and the United Kingdom.

- Commerce and Trade

Commerce and trade focused on agricultural products, notably oats and later wheat, beef, and mineral products.  As transportation improved with the advent of better roads and railroads, trade with nearby territories became more extended.

- Government

Prior to 1863, what is now Montana was included as part of the Dakota and Washington territories.  In 1863, Montana, Idaho, and most of Wyoming were subsumed as the Idaho territory.  In 1864, the Montana Territory was created with the same boundaries it has now as a state.  Montana was admitted to the union on November 8, 1889.

- Domestic, Social and Cultural

The increasing influx of settlers after 1860 engendered conflicts with the native nations, which could not access their traditional hunting areas.  During the same time, the U.S. Army began establishing numerous forts in this region to provide protection and assert Federal authority.  As a result, Montana became the scene of numerous battles between the army and various native nations over control of the land. These battles included the Battle of Little Big Horn with the Lakota and battles with the Nez Perce.  By the end of the Indian wars in the 1890s, mining, open and fee-simple ranching, and farming operations had been established throughout the region.

The demand for Montana's mineral wealth drew immigrants from Scandinavia, Central and Eastern Europe, and the United Kingdom.  The mixture of immigrant cultures as well as the manual nature of the work led to the emergence of union movements in the mines of Montana.

Beginning in the late nineteenth century, the Federal Government began purchasing large swaths of territory to serve as national parks, with Yellowstone being the first.  Other parks include Glacier and Badlands national parks, and more than 20 national wildlife refuges in the region. Montana contains seven Indian reservations:  Fort Peck Indian Reservation; Fort Belknap Indian Reservation; Northern Cheyenne Indian Reservation; Crow Indian Reservation; Rocky Boy's Indian Reservation; Blackfeet Indian Reservation; and Flathead Indian Reservation.

### 1.2.4 WOR REGION

#### 1.2.4.1 State of Montana

A portion of the State of Montana is considered part of the EOR Region and a portion is considered part of the WOR Region. The historic context developed for the State is presented in its entirety in EOR Region section present above (see Section 1.2.4.2).

### 1.2.4.2 State of Idaho

- Exploration and Frontier

American exploration in the Northwest expanded after the Lewis and Clark expedition had crossed the continent in 1805. John Jacob Astor's Pacific Fur Company tried to compete in the fur trade by establishing an overland system of posts combined with a maritime trading network. The company sold out to the Northwest Company as a result of the War of 1812, but other independent traders known as mountain men continued to maintain an American presence in the region.

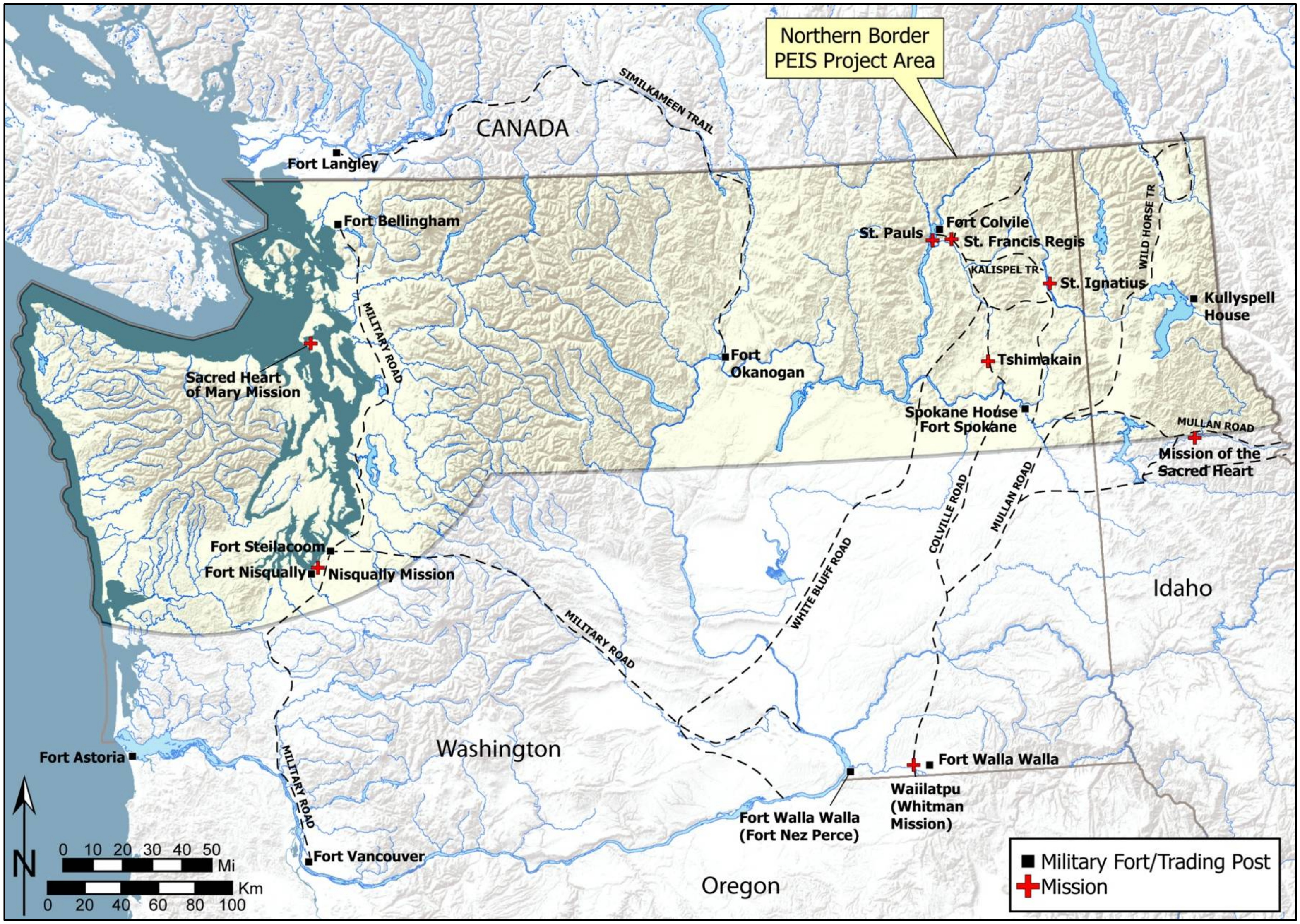
Rivalry between the two largest trading companies, the British Hudson's Bay Company (HBC) and Montreal-based Northwest Company, ended in a merger in 1821, and under the Hudson's Bay name. The new company not only controlled much of the Northwest fur trade but also advanced British dominance in the region. HBC established forts at strategic locations and set up far-reaching networks of exchange throughout the Northwest. None of these forts, however, was located in what is now Idaho (Figure H-9; Carpenter, 1986:25, 26, 30).

As expected, Christian missionaries followed closely behind the commercial ventures, hoping to convert the region's Native peoples. Missionaries conducted religious services at previously established fur-trading operations, as well as at newly created missions along important trade routes or near Native villages.

The American government had long contested British claims in the Northwest, and both sides signed a joint occupation agreement in 1818, which was renewed indefinitely in 1826. The United States pushed for a boundary between British and American interests running from the Rocky Mountains along the 49$^{th}$ parallel to the Pacific. England stood firm against this proposal, calling for the Columbia River as its suggested boundary. The British finally accepted the 49$^{th}$ parallel as the dividing line between the territories of the two countries in 1946. Each nation selected its own boundary commission, and together they spent a total of six years from 1857 to 1862 surveying, clearing and then marking the final boundary (Galbraith, 1957:196-199; Hayes, 2000:150, 171-174).

American settlement in the vast region north of the Columbia expanded quickly once the boundary treaty was signed. Oregon Territory was established in 1848 and included all of the land currently encompassed by Oregon, Washington, Idaho, northwestern Montana and western portions of Wyoming. As the territorial population grew, more would-be settlers headed north to the Puget Sound region and a few into the interior. These residents soon felt isolated from the Oregon territorial government based in Salem and petitioned Congress to create a separate northern territory. In March 1853 the Federal Government established Washington Territory, which continued to include large portions of present-day Idaho and Montana. A huge mining rush that increased the population of the inland counties ultimately led to the formation of a separate Idaho Territory in 1863 (Ficken, 2002:17-19; ISHS, 1976:36-38).

**Figure H-9. Early Trails, Trading Posts, Forts, and Missions in Idaho and Washington**



- Transportation

Improvements in transportation became the major determinant of growth throughout the region. Most Native peoples as well as outsiders who came into the region initially relied on water travel. The earliest explorers and traders along the coast arrived on sailing vessels but canoes were the preferred method of transportation on Puget Sound as well as most of the navigable rivers and streams throughout the interior.

The earliest trade routes in the region were established by Native peoples and were frequently linked to waterways. Incoming traders, miners and settlers readily utilized these established pathways to the interior. As early as 1807, Northwest Company traders crossed the Great Road of the Flatheads, a long-standing Native trail that extended from the Spokane River northeastward through Idaho to the Canadian border. This route became known as the Wild Horse Trail by the 1850s and was used by miners to reach the gold fields of British Columbia (Cork, 1991:3-6).

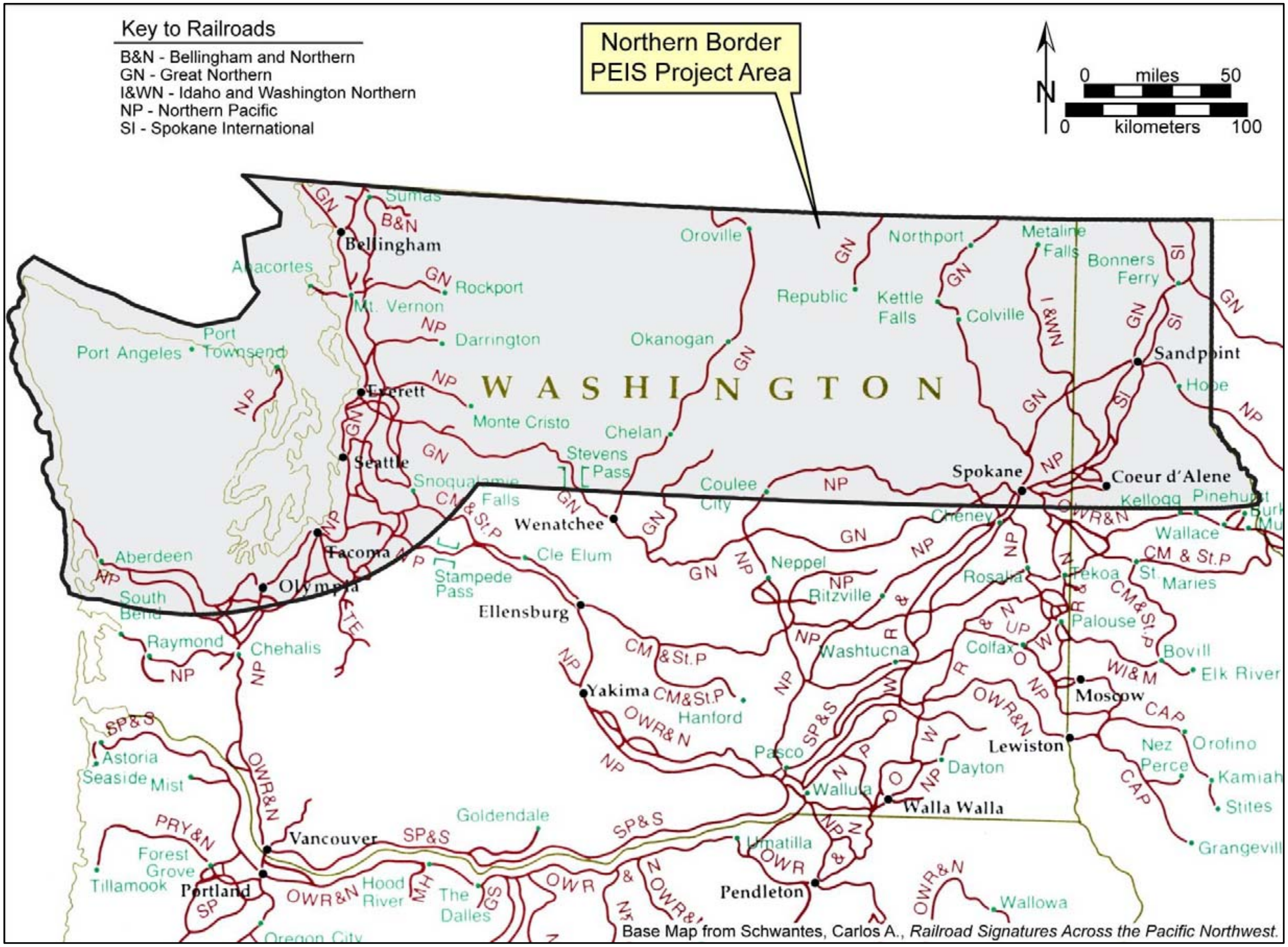
American settlers who wanted to claim their own land in the West came in greater numbers with the opening of the Oregon Trail. Construction of more permanent roads began once the region attained territorial status and the government needed to provide protection and other services for residents. Military roads connected newly built forts across the region and eventually helped to encourage new settlement. The government-built Mullan Road, which extended west from Fort Benton on the Missouri River through Idaho to Fort Walla Walla, opened in 1861 (Schwantes, 1989:149).

Despite the improvements in overland transportation, residents had to wait for the arrival of the railroads for reliable connections to outside markets (Figure H-10). As expected, politics led to the siting of the first transcontinental line through the center of the country, but a second transcontinental line—the Northern Pacific—was chartered in 1864 (Goetzmann, 1959: 274; Schwantes, 1989:142-144).

In 1870, construction of the Northern Pacific began simultaneously at Duluth, Minnesota, in the east and Kalama, Washington (near Tacoma), in the west. Construction was halted periodically as a result of financial difficulties but by 1880 work started on the Pend Oreille Division, which ran more than 200 miles from Ainsworth, near the confluence of the Snake and Columbia rivers, to Lake Pend Oreille. Tracks reached Spokane Falls in June 1881 and the south shore of Lake Pend Oreille on January 9, 1882 (Lewty, 1987:50-64, 90-92).

The first railroad to challenge the Northern Pacific was the Great Northern Railroad. The route of James J. Hill's Great Northern through Idaho ran south from Bonners Ferry to Sandpoint and then followed the northern shore of the Pend Oreille River, heading to Spokane (Armbruster 1999:163-173).

**Figure H-10. Railroad System in Idaho and Washington, ca. 1916**



Other regional railroads that crossed through eastern Washington and North Idaho included the Spokane International in 1906 and the Idaho & Washington Northern Railroad. Branch lines from the main railroads also spread across the region, joining towns and stimulating industrial growth (Fahey, 1986:195-196; Fahey, 1965:209-218).

Rail transport remained important from the World War I through the end of World War II, when improvements to the highway systems undermined the profitability of the lines. As automobile travel increased throughout the 1900s, Federal, State, and local governments worked to improve the network of roads nationwide. Significant Federal funding first became available with passage of the Federal Road Act of 1916 and both State and Federal legislation over the next few decades provided further support for new highway construction (Dilger, 2003:12-13).

- Agriculture

Congress passed the Donation Land Claim Act of 1850, which made very generous land grants to established residents of the territory. In most of the Northern Border PEIS project area these claims were limited in number and were often made by former HBC employees. The Donation law expired in 1855. In parts of North Idaho, two other land laws, the Timber and Stone Act and the Forest Homestead Act, were also widely used to make claims in heavily timbered areas. Settlers also purchased property from the railroads, which advertised and sold portions of their land grants, or in later years from lumber companies that offered cheap, cut-over lands (McLaughlin, 1994:64).

The range of crops grown varied with the environment, which was extremely diverse throughout the PEIS project area. One historian has likened the agricultural regions of the Northwest to "islands separated from one another by forests, mountains and vast prairies of sagebrush and native grasses" (Schwantes1989:167). One of these islands of agriculture was in forested areas of eastern Washington and North Idaho, where stump ranch pioneers tried to convert cut-over lands into fields and pastures. In semi-arid parts of the interior, much of the land was initially used for grazing of cattle and sheep, while dryland farming techniques enabled some successful grain production (Schwantes, 1989:167-168).

The emergence of irrigation transformed other parts of the semi-arid interior. Apples, cherries and other fruit trees thrived on irrigated lands in the Okanogan and Wenatchee Valleys. Later, the construction of the Grand Coulee Dam led to the development of the Columbia Basin Project, an ambitious effort to irrigate more than half a million arid acres for alfalfa, sugar beets, potatoes and a variety of other crops. Near the Idaho border, the Rathdrum Prairie was also irrigated for agricultural production, although financed by several private ventures (Schwantes, 1989:167-171, 349; Meinig, 1969:479-480; Schwantes et al., 1988:90, 157, 160; Renk, 2002).

- Industry and Manufacturing

Timber was often the first "cash crop" for early settlers who cut railroad ties, shingle bolts and fence posts on their own claims. Like many other Northwest industries, the first sawmill in the region was operated by the HBC, but as more Americans arrived, small water-powered mills sprang up in virtually every settlement to mill lumber for buildings. The timber industry experienced a severe downturn during the 1893 depression but rebounded after 1900 when several giant lumber companies moved into the region, looking for new opportunities as

Midwestern reserves of white pine began to dwindle. The largest was the Weyerhaeuser syndicate, which purchased existing mills or started new ones in a number of North Idaho and Washington towns. Competing companies also located in the project area, all supported by lumber camps in the woods that used logging railroads, chutes and flumes and even river drives to remove the timber from often steep and rugged terrain. A unique timber culture also emerged, peopled by itinerant woodsmen and steam donkey engineers, crews of Japanese millworkers and ultimately union organizers trying to protect the interests of many of these laborers. Lumber production peaked in the mid-1920s but experienced a sharp decline with the onset of the Depression, only to recover once more following World War II when the nationwide housing boom led to a renewed demand for lumber products (Hutchison, 1938).

The mining industry in the region also experienced similar boom and bust cycles. Once the 1849 gold excitement in California began to wane, prospectors fanned out across the west looking for new opportunities. The first rush to the northern Rocky Mountain region came in 1855 with the discovery of gold near Colville, Washington. Similar discoveries followed in British Columbia, central and southern Idaho and Montana, generating considerable traffic across the Idaho panhandle. Eager miners and pack trains carrying supplies often used the Mullan Road or the Wildhorse Trail to reach the latest finds (Cork, 1991:3-6).

Another period of mining excitement began in 1882 with the discovery of gold near Murray, Idaho, followed by a major rush to the North Fork of the Coeur d'Alene River in the winter of 1883-1884. Regional mining soon shifted from gold to silver and lead and from placer to lode, as capitalists developed the mineral wealth of Shoshone County, Idaho, in particular. While these mines were by far the most important in northern Idaho, other areas attracted interest as well. An overflow of prospectors poked around the southern end of Lake Pend Oreille with little success, although a nearby silver-lead discovery sparked a rush to the new camp of Chloride in 1888. The community of Lakeview developed into a more permanent town to serve the surrounding mining region, where some lode mining and exploration continued intermittently until the 1960s (Fahey, 1986:175-176; Dahlgren and Kincaid, 1991:173; Hackbarth, 2003:57; Savage, 1967:90-95).

Lime and concrete manufacturing also developed along Lake Pend Oreille and was the basis of important industrial expansion in other parts of the Northwest, including the Baker River drainage and the San Juan Islands in the Western Washington. Energy production also became an important industry in the Northwest, as rivers were harnessed to provide power for growing communities. Private companies built many of the early dams and hydroelectric facilities, but public projects like Seattle's Ross Lake Dam development or the huge, Federally-sponsored Grand Coulee Dam on the Columbia River, added significantly to the region's industrial base.

- Commerce and Trade

In northern Idaho, the availability of transportation also frequently dictated the growth of towns and the development of commercial enterprises. Communities usually first evolved around significant industrial or agricultural activities, but location on major road or rail systems helped to ensure longevity. Depending on their size, smaller towns in northern Idaho, eastern Washington, the Columbia Basin and the interior of northwestern Washington often developed their own commercial districts that included basic banking, retail and supply functions, but also warehousing and storage facilities for the products that were grown, mined or manufactured nearby.  Transportation-related activities, including gas stations, auto repair as well as restaurants, taverns and tourist facilities also became established commercial ventures, especially as highway systems improved.

- Domestic

Initially, relatively large pieces of "free" property were offered in exchange for the construction of a dwelling and evidence of working the land.  As a result, less desirable locations on steep mountainsides or arid bluffs were settled quickly once the more fertile options were no longer available.  As a result, small single-family dwellings as well as a variety of outbuildings are found throughout the region where such lands were homesteaded.  In many of these areas log construction was most prevalent in the early years of development.  Frame houses predominated in communities where sawmills provided a ready supply of lumber, and often in more rural areas homeowners progressed from log cabins to larger frame homes as their economic situation or transportation access improved.

Towns developed in very different patterns than many areas of the eastern United States.  Instead of commercial centers arising naturally out of well-established farming regions or industrial centers, many towns in the Northwest essentially arrived in the wilderness with the railroad.  The major lines established stations at regular intervals and these stops became the centers of new communities.  In other cases entrepreneurs claimed land at the junction of major roads on potential trade networks and hoped to profit by platting their holdings into town sites.

In both Washington and Idaho where extractive industries flourished, many companies built not only mills and manufacturing plants but also employee housing and other standard amenities.  In some remote areas, there were no alternatives.  In some industry-dominated communities, the settings were less picturesque, and often utilitarian company-built housing was merely an addition to an already-established town (Schwantes et al., 1988:113).

By the beginning of the twentieth century the leading cities within the PEIS project area—Seattle, Tacoma and Spokane—initiated most of the economic activity in the region, serving as labor pools, trade and transportation centers and the principal markets for the production of the rest of Washington and northern Idaho.  Multi-family dwellings, residential hotels and tenements marked the city centers until the World War II era, when an influx of war workers led to the construction of defense housing as well as new urban and suburban neighborhoods (Schwantes, 1989:192; Woodbridge and Montgomery, 1980:12-18).

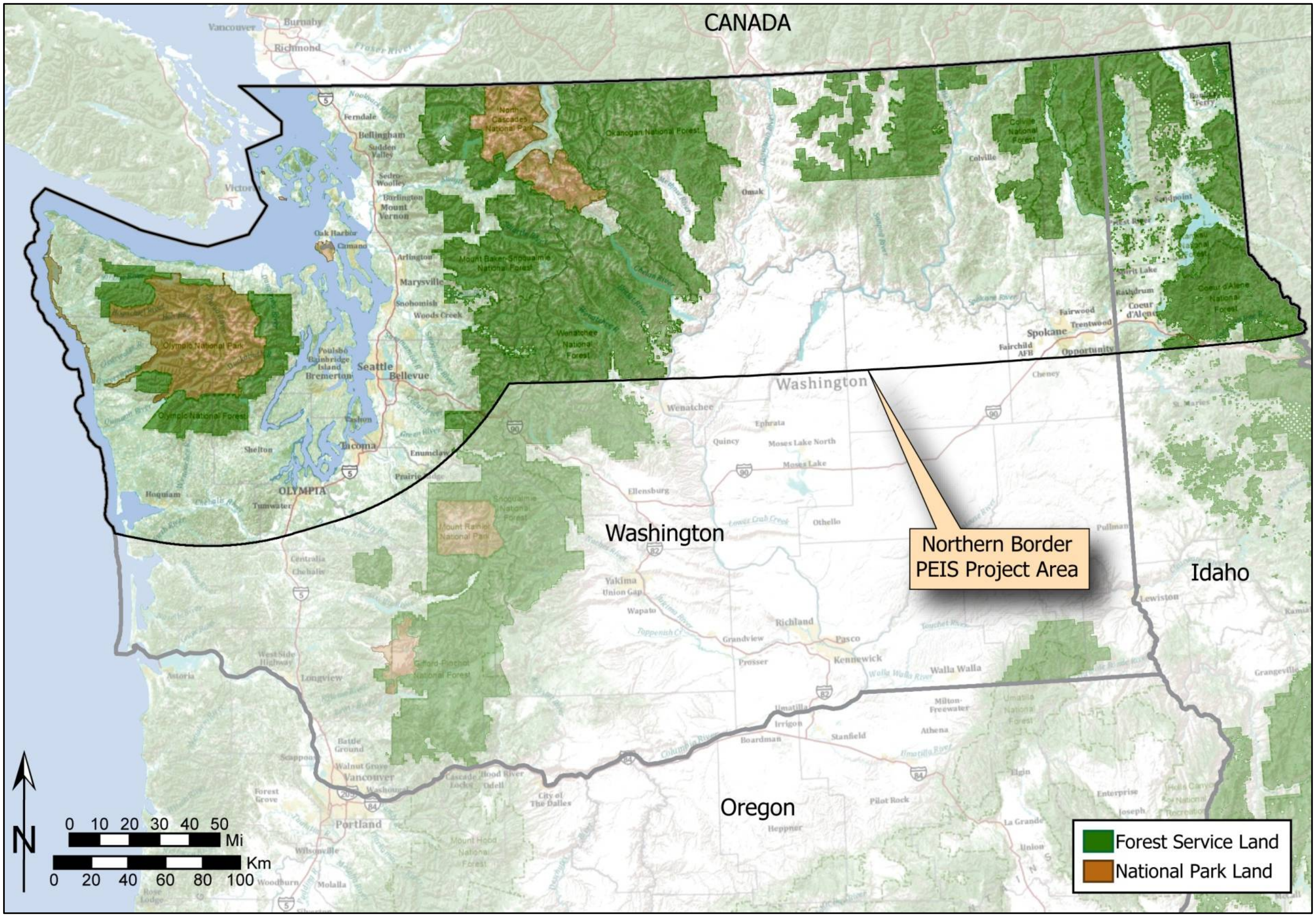
- Government

Idaho was included in the Territory of Washington beginning in 1853.  Later North Idaho residents periodically threatened secession because of the huge distance to the State capital in Boise.  An early role of the Federal Government was to disburse land to settlers, but gradually the value of preserving some of these lands for National Forests and other public uses changed the government's focus to stewardship of remaining resources.  Forests reserves established in the 1890s were precursors to the North Cascades National Park and the Mt. Baker-Snoqualmie National Forest.  Similarly the first reserves in northeastern Washington and Idaho evolved into today's Wenatchee, Colville, and Idaho Panhandle national forests.  Today national park and national forest lands in the PEIS project area encompass more than 9.9 million acres in addition to wildlife preserves, parks and protected areas administered by other government and private agencies (Figure H-11) (Steen, 1991:74-75; Holstine, 1978:44, 50; GIS data from Washington Department of Ecology and Idaho Department of Water Resources, 2009).

Early provisions that prohibited timber harvests, mining, or grazing on Federal lands eventually led to multiple-use management plans that sought to balance resource protection with public access. Government responsibilities in the national forests, for example, included the development of trails and roads for fire protection and logging but also for recreational use.

Government programs, and especially those connected with New Deal measures during the Depression era of the 1930s, also had an important impact on the improvement of public facilities. The Civilian Conservation Corps (CCC), for example, used young, jobless enrollees to work in forest protection and improvement, recreation development, range and wildlife enhancement as well as in emergency work to combat floods, fires, and other disasters. The Works Progress Administration (WPA), among other State and Federal programs, improved additional types of public lands by hiring the unemployed to construct new roadways, bridges and government buildings (Steen, 1991:34-36; Hollenbeck, 1987:284; CCC, 1939:73; Otis et al., 1986:9-10).

**Figure H-11. Modern National Forests and Parks in Idaho and Washington**



- Social and Cultural

Single men predominated in early migrations, and in some areas Masonic Lodges and other fraternal organizations, in addition to saloons, were among the first social establishments. As women and children followed, a primary emphasis was placed on schools. Parochial and private education remained common in growing communities. Territorial legislation in Idaho initiated tax-supported public education (Schwantes, 1989:222-223).

Many of the social institutions that developed also reflected the Northwest's multi-ethnic population base. The wide range of environments within the Northwest contributed to cultural diversity among the region's Native populations, and that diversity continued as newcomers from throughout the world made their way to Idaho. The railroads, in particular, fostered this diversity by hiring huge crews of Chinese, and later Japanese, construction workers and then by promotional efforts in many European countries to encourage immigration on their lines. Hispanic immigration also occurred throughout these periods although most notable are large groups who were drawn to the field of eastern Washington by labor shortages during World War II (Schwantes et al., 1988:70).

By 1900, 15 percent of Idaho's population was foreign born, and those numbers continued to grow over the next few decades. Ethnic groups brought with them social and cultural institutions that were often re-established in their new communities. As was the pattern throughout the West, immigrants frequently settled together around their places of work. Whether they included Italian railroad workers in Priest River, Idaho, German-Russian farmers in Ritzville, Washington, or Chinese business owners in Seattle, these ethnic communities developed their own social fabric that was a unique mix of age-old traditions and new practices. Like the rest of the country, racism and nativism were present in the Northwest, resulting in events like the expulsion of Chinese workers from coastal cities in the 1880s, segregated housing for Blacks in many cities, and the internment of Japanese citizens during World War II, but generally the region has recognized and tried to preserve the unique values of diversity (Schwantes, 1989:186).

#### 1.2.4.3 State of Washington

- Exploration and Frontier

The earliest known explorers to interact with the Native peoples of the Pacific Northwest arrived by sea. Spanish seamen sailed up the Northwest coast as early as 1774, although it was not until 1790 that one of their expeditions first entered Puget Sound. The British joined northwest maritime exploration in 1792 when Captain George Vancouver led an expedition that further surveyed what became coastal Washington, mapping and naming a number of its land and water features.

Sea traders soon followed these explorers. Initially, the valuable pelts of the sea otter were the most sought-after commodity provided by native hunters. In the early nineteenth century, the high prices paid for beaver and other fur-bearing animals drew representatives of large trading companies in Britain, Canada, and the United States overland. They primarily traveled on rivers and streams and followed Indian trails or blazed their own way through mountains or other terrain where there was no navigable water (Scott and DeLorme, 1988:15; Whitebrook, 1959:65-67; 76-78).

American exploration in the Northwest also expanded after the Lewis and Clark expedition had crossed the continent in1805. John Jacob Astor's Pacific Fur Company tried to compete in the fur trade by establishing an overland system of posts combined with a maritime trading network. The company sold out to the Northwest Company as a result of the War of 1812, but other independent traders known as mountain men continued to maintain an American presence in the region.

Rivalry between the two largest trading companies, the British Hudson's Bay Company (HBC) and Montreal-based Northwest Company, ended in a merger in 1821, and under the Hudson's Bay name. The new company not only controlled much of the Northwest fur trade but also advanced British dominance in the region. HBC established forts at strategic locations and set up far-reaching networks of exchange throughout the Northwest (see Figure H-9). Fort Vancouver, built near the confluence of the Columbia River and the Willamette River in 1824, became the centerpiece of company operations in the Northwest. Three years later HBC constructed Fort Langley at the mouth of the Fraser River in Canada to anchor the coastal trade on the north and eventually developed a coastal land route between the two outposts (Carpenter, 1986:25, 26, 30).

American exploration of the region also continued after Congress authorized the President to send naval vessels to survey the Pacific. The United States Exploring Expedition, under the command of Lieutenant Charles Wilkes, set out in 1838 on a four-year expedition, which further established American interest in the settlement of the Northwest Coast. Wilkes and his men made detailed surveys throughout Puget Sound and portions of the Columbia River, while other members of the party also traveled inland across the Cascade Mountains (Viola and Margolis, 1985: 9-11; Haskett, 1974:1-3; Tyler, 1968:244-245).

Both Catholic and Protestant missionaries soon followed the commercial ventures, hoping to minister to the Native peoples of the region, but often having more success with the expanding non-Native populations. Some conducted religious services at the fur trade forts, while others established their own missions along important travel routes or near major Indian villages.

The American government had long contested British claims in the Northwest, and both sides signed a joint occupation agreement in 1818, which was renewed indefinitely in 1826. The United States pushed for a boundary between British and American interests running from the Rocky Mountains along the 49th parallel to the Pacific. England stood firm against this proposal, calling for the Columbia River as its suggested boundary. The British finally accepted the 49th parallel as the dividing line between the territories of the two countries in 1946. Each nation selected its own boundary commission, and together they spent a total of six years from 1857 to 1862 surveying, clearing and then marking the final boundary. No agreement could be reached on the location of the offshore line between the mainland and Vancouver Island, and eventually this final portion of the boundary was settled by arbitration in 1872 (Galbraith, 1957:196-199; Hayes, 2000:150, 171-174).

American settlement in the vast region north of the Columbia expanded quickly once the boundary treaty was signed. Oregon Territory was established in 1848 and included all of the land currently encompassed by Oregon, Washington, Idaho, northwestern Montana and western portions of Wyoming. As the territorial population grew, more would-be settlers headed north to the Puget Sound region and a few into the interior. These residents soon felt isolated from the Oregon territorial government based in Salem and petitioned Congress to create a separate northern territory. In March 1853 the Federal Government established Washington Territory, which continued to include large portions of present-day Idaho and Montana. A huge mining rush that increased the population of the inland counties ultimately led to the formation of a separate Idaho Territory in 1863 (Ficken, 2002:17-19; ISHS, 1976:36-38).

- Transportation

Improvements in transportation became the major determinant of growth throughout the region. Most Native peoples as well as outsiders who came into the region initially relied on water travel. The earliest explorers and traders along the coast arrived on sailing vessels but canoes were the preferred method of transportation on Puget Sound as well as most of the navigable rivers and streams throughout the interior. As the fur trade grew, the HBC first introduced steam vessels to carry larger loads on Puget Sound in 1836, but it was a few more decades before steamer traffic became common on inland lakes and rivers.

A system of trails established by Native peoples of the region often linked these waterways and became important travel routes for traders and the miners and settlers who followed them into the interior. As early as 1807, Northwest Company traders crossed a centuries-old trail called the Great Road of the Flatheads, which extended from the Spokane River northeastward through Idaho to the Canadian border. By the 1850s the same route became known as the Wild Horse Trail and was used by miners to reach the gold fields of British Columbia. Other important overland routes within the Northern Border PEIS project area included the Kalispel Trail in eastern Washington and trails that linked the Hudson’s Bay posts in the interior and along the Pacific coast (Cork, 1991:3-6).

American settlers who wanted to claim their own land in the West came in greater numbers with the opening of the Oregon Trail. Most settlers reached Puget Sound by boat, although gradually trails along the coast were expanded into wagon roads. Construction of more permanent roads began once the region attained territorial status and the government needed to provide protection and other services for residents. Military roads connected newly built forts across the region and eventually helped to encourage new settlement. By 1854 one major route connected Fort Steilacoom on Puget Sound to Fort Walla Walla in south-central Washington, while the government-built Mullan Road, which extended west from Fort Benton on the Missouri River through Idaho to Fort Walla Walla, opened in 1861 (Schwantes, 1989:149).

Water transport also remained important on inland lakes and rivers, especially when it helped to shorten the journey to remote regions. In the 1860s steamers carried passengers up the Columbia River from Kettle Falls to the British Columbia mines and also on the Pend Oreille River north to the Metaline mining district. A system of small ferries, often cable-driven, also provided passage at deep-water crossings of rivers and streams until bridges were built (Harvey, 1989:6; Holstine, 1978:27-28).

Despite improvements in transportation access, Northwest residents also hoped for rail service to connect them to a much broader network of markets across the country (see Figure H-10). In 1853 railroad proponents persuaded Congress to appropriate funds for surveys of potential transcontinental routes. The timing of the surveys coincided with the approval of Washington’s territorial status, and the newly appointed governor, Isaac Ingalls Stevens, headed the exploring party that surveyed a potential northern route to the Pacific. Politics determined the location of the first transcontinental line through the center of the country, but a second cross-country railroad, the Northern Pacific, was chartered in 1864 (Goetzmann, 1959: 274; Schwantes, 1989:142-144; White [Richard], 1991:125; Moody, 1911:141-142).

In 1870 the Northern Pacific began construction at Duluth, Minnesota in the east and Kalama, Washington (near Tacoma), in the west. Financial difficulties halted progress but by 1880 work started on the Pend Oreille Division, which ran more than 200 miles from Ainsworth, near the confluence of the Snake and Columbia rivers, to Lake Pend Oreille. Tracks reached Spokane Falls in June 1881 and the south shore of Lake Pend Oreille on January 9, 1882 (Lewty, 1987:50-64, 90-92).

On the Puget Sound side, railroad officials had chosen Tacoma as the terminus. Disappointed rivals like Seattle responded by raising funds to build their own regional lines that would provide rail connections north to Canada or east to important mining and agricultural areas. The Seattle and Walla Walla and the Seattle, Lakeshore and Eastern as well as the Fairhaven and Southern in Bellingham were just a few of the local railroads that were ultimately absorbed by major lines as competition heated up for access to the Northwest.

The first of the transcontinental railroads to challenge the Northern Pacific was the Great Northern Railroad pushed west from the Great Lakes to the Pacific by James J. Hill. The Great Northern route ran through Idaho to the northern shore of the Pend Oreille River, heading to Spokane. The line then proceeded west through Stevens Pass, arriving in Seattle by 1893 (Armbruster1999:163-173).

Other regional railroads that crossed through Eastern Washington and North Idaho included the Spokane International, which joined Spokane with the Canadian Pacific Railroad at Eastport, Idaho, in 1906, and the Idaho & Washington Northern Railroad running north from McGuire through Spirit Lake and eventually on to Metaline Falls. Branch lines from the main railroads also spread across the region, joining towns and stimulating industrial growth (Fahey, 1986:195-196; Fahey, 1965:209-218).

Rail transport remained important through the World War I era and then experienced decline until World War II. At the same time, improved highway systems provided were increasingly used for both freight and public transportation. As automobile travel increased throughout the early 1900s, Federal, State, and local governments worked to improve the network of roads nationwide. Significant Federal funding first became available with passage of the Federal Road Act of 1916 and both State and Federal legislation over the next few decades provided further support for new highway construction (Dilger, 2003:12-13).

Airplanes also offered an alternative to ground, water and rail transportation. During the World War I era, military aircraft were manufactured in the Northwest and the first of a number of airbases were built. In the post-World War I era additional construction of landing strips, airfields and airports was undertaken for military, commercial and fire-prevention purposes. Some Federal funds were made available during the Depression era to build large numbers of community airfields.  By this time, the Forest Service had also begun to use airplanes for spotting fires and later flew smokejumpers into dangerous areas as a rapid response measure.

- Agriculture

Much of the early impetus for settlement in the Northwest was to claim land for agriculture, but it was not until transportation systems were in place by the 1890s that the amount of farm acreage began to rise dramatically and major crops were established.  The HBC first introduced European agricultural practices at its posts throughout the Northwest to reduce high food costs and increase self-sufficiency.  In addition, the company set up a subsidiary venture, the Puget Sound Agricultural Company, which established agriculture and grazing on company lands along south Puget Sound and on Whidbey Island to produce commodities for sale to Russia, Alaska, and Hawaii.  Missionaries also introduced agricultural practices to local Indian populations and developed some of the first small irrigation systems in the region (Gibson, 1968:18).

Congress passed the Donation Land Claim Act of 1850, which made very generous land grants to established residents of the territory.  In most of the Northern Border PEIS project area these claims were limited in number and were often made by former HBC employees.  The Donation law expired in 1855 and subsequently the majority of Washington settlers filed for land under the Preemption Act, which allowed land purchases for a nominal fee, and the Homestead Act of 1862.  Settlers also purchased property from the railroads, which advertised and sold portions of their land grants, or in later years from lumber companies that offered cheap, cut-over lands.  In the Colville area large parcels of former Indian lands were also sold in the early twentieth century once allotments had been made under the provisions of the Dawes Act of 1887 (McLaughlin, 1994:64).

The range of crops grown varied with the environment, which was extremely diverse throughout the PEIS project area.  One historian has likened the agricultural regions of the Northwest to “islands separated from one another by forests, mountains and vast prairies of sagebrush and native grasses” (Schwantes 1989:167).  One of these islands of agriculture was immediately east of Puget Sound where plentiful rainfall and adequate soils encouraged dairying and truck farming.  Another was in forested areas of Eastern Washington and North Idaho, where stump ranch pioneers tried to convert cut-over lands into fields and pastures.  In semi-arid parts of the interior, much of the land was initially used for grazing of cattle and sheep, while dryland farming techniques enabled some successful grain production.  Wheat became Washington’s most important crop by 1910, but its growing area extended only to the southern edges of the PEIS project area (Schwantes, 1989:167-168).

The emergence of irrigation transformed other parts of the semi-arid interior. Apples, cherries and other fruit trees thrived on irrigated lands in the Okanogan and Wenatchee Valleys.  In 1908 Washington State planted over a million apple trees in a period known as “apple fever,” and within a decade Washington became the country’s leading producer, although subject to huge market swings.  Later, the construction of the Grand Coulee Dam led to the development of the Columbia Basin Project, an ambitious effort to irrigate more than half a million arid acres for alfalfa, sugar beets, potatoes and a variety of other crops.  Near the Idaho border, the Rathdrum Prairie was also irrigated for agricultural production, although financed by several private ventures (Schwantes, 1989:167-171, 349; Meinig, 1969:479-480; Schwantes et al., 1988:90, 157, 160; Renk, 2002).

- Industry and Manufacturing

The northern Puget Sound region and the inland Northwest offered an array of natural resources that could be exploited once transportation systems were in place. After the immediate needs of nearby communities were met, most industrial production and food processing was focused on the export market since the region's initial population was relatively small. The timber industry dominated during the early decades of growth on the Pacific coast, although mining brought the earliest population into the interior. Fish canning, grain milling, lime and concrete manufacture have been other important industries in the project area as has energy production (Chasen, 1981:6).

Timber was often the first "cash crop" for early settlers who cut railroad ties, shingle bolts and fence posts on their own claims. Like many other Northwest industries, the first sawmill in the region was operated by the HBC, but as more Americans arrived, small water-powered mills sprang up in virtually every settlement to mill lumber for buildings. The region's first steam mill was operating in Seattle by 1853, but it was the Olympic Peninsula that for a time became one of the world's leading lumber-producing regions. Much of the production was sent to California for use in its thriving Gold Rush settlements. Also prevalent in western Washington and parts of northern Idaho were shake and shingle mills that utilized locally available Western Red Cedar for their products. By 1890 Washington provided more than one third of the nation's supply (Hutchison, 1938; Ficken, 1967:60).

The timber industry experienced a severe downturn during the 1893 depression but rebounded after 1900 when several giant lumber companies moved into the region, looking for new opportunities as Midwestern reserves of white pine began to dwindle. The largest was the Weyerhaeuser syndicate, which purchased existing mills or started new ones in a number of North Idaho and Washington towns. Competing companies also located in the project area, all supported by lumber camps in the woods that used logging railroads, chutes and flumes and even river drives to remove the timber from often steep and rugged terrain. A unique timber culture also emerged, peopled by itinerant woodsmen and steam donkey engineers, crews of Japanese millworkers and ultimately union organizers trying to protect the interests of many of these laborers. Lumber production peaked in the mid-1920s but experienced a sharp decline with the onset of the Depression, only to recover once more following World War II when the nationwide housing boom led to a renewed demand for lumber products (Hutchison, 1938).

The mining industry in the region also experienced similar boom and bust cycles. Once the 1849 gold excitement in California began to wane, prospectors fanned out across the west looking for new opportunities. The first rush to the northern Rocky Mountain region came in 1855 with the discovery of gold near Colville, Washington. Similar discoveries followed in British Columbia, central and southern Idaho and Montana, generating considerable traffic across the Idaho panhandle. Eager miners and pack trains carrying supplies often used the Mullan Road or the Wildhorse Trail to reach the latest finds (Cork, 1991:3-6).

An overflow of prospectors poked around the southern end of Lake Pend Oreille with little success, although a nearby silver-lead discovery sparked a rush to the new camp of Chloride in 1888. The community of Lakeview developed into a more permanent town to serve the surrounding mining region, where some lode mining and exploration continued intermittently until the 1960s (Fahey, 1986:175-176; Dahlgren and Kincaid, 1991:173; Hackbarth, 2003:57; Savage, 1967:90-95).

Lime and concrete manufacturing also developed along Lake Pend Oreille and was the basis of important industrial expansion in other parts of the Northwest, including the Baker River drainage and the San Juan Islands in the Western Washington. Coal mining conducted in the Cascade Mountains and in areas south of Seattle contributed to that city's early export base. Food processing began as early as the 1870s as salmon canneries were built in coastal towns like Mukilteo and Anacortes, while the milling of wheat and other grains became an early mainstay of Spokane and other inland communities. The advent of the railroad allowed grain to be shipped to coastal ports like Seattle and Tacoma where it could also be processed and shipped to markets abroad. Energy production also became an important industry in the Northwest, as rivers were harnessed to provide power for growing communities. Private companies built many of the early dams and hydroelectric facilities, but public projects like Seattle's Ross Lake Dam development or the huge, Federally sponsored Grand Coulee Dam on the Columbia River, added significantly to the region's industrial base.

- Commerce and Trade

Beginning with the shipment of furs, salted salmon and a few agricultural products during the early decades of the nineteenth century, the Northwest coast developed a thriving Pacific trade. For many years California was the region's major commercial partner, and a number of new ports, including Bellingham, Anacortes and Port Gamble, grew up around north Puget Sound to ship out lumber and other wood products. The advent of regional and then transcontinental rail lines not only opened up interior markets by the 1880s and 1890s, but also fostered an expanded trans-Pacific trade with Hawaii, China and other parts of Southeast Asia as well as Central and South America. Seattle became a supply point for the Klondike Gold Rush of 1897, forging stronger trade ties with Alaska and British Columbia (Berner, 1991:22-23).

Elsewhere in Washington and northern Idaho, the availability of transportation also frequently dictated the growth of towns and the development of commercial enterprises. Communities usually first evolved around significant industrial or agricultural activities, but location on major road or rail systems helped to ensure longevity. Most of the major Washington cities—Bellingham, Everett, Seattle, Tacoma and Olympia on Puget Sound and Spokane in the interior—are within the Northern Border PEIS project area, and these urban centers generally grew as transportation hubs and commercial entrepots for resource-rich hinterlands.

Depending on their size, smaller towns in northern Idaho, eastern Washington, the Columbia Basin and the interior of northwestern Washington often developed their own commercial districts that included basic banking, retail and supply functions, but also warehousing and storage facilities for the products that were grown, mined or manufactured nearby. Transportation-related activities, including gas stations, auto repair as well as restaurants, taverns and tourist facilities also became established commercial ventures, especially as highway systems improved.

- Domestic

Population distribution throughout the Northwest has generally been very uneven, with the preponderance of settlement in lowlands along the coastline or on major river drainages. Since early land laws offered relatively large pieces of “free” property in exchange for construction of a dwelling and evidence of working the land, less desirable locations on steep mountainsides or arid bluffs were also settled quickly once the choice options were no longer available. As a result, small single-family dwellings as well as a variety of outbuildings are found throughout the region where such lands were homesteaded. In many of these areas log construction was most prevalent in the early years of development. Frame houses predominated in communities where sawmills provided a ready supply of lumber, and often in more rural areas homeowners progressed from log cabins to larger frame homes as their economic situation or transportation access improved.

Towns developed in very different patterns than many areas of the eastern United States. Instead of commercial centers arising naturally out of well-established farming regions or industrial centers, many towns in the Northwest essentially arrived in the wilderness with the railroad. The major lines established stations at regular intervals and these stops became the centers of new communities. In other cases entrepreneurs claimed land at the junction of major roads on potential trade networks and hoped to profit by platting their holdings into town sites.

In both Washington and Idaho where extractive industries flourished, many companies built not only mills and manufacturing plants but also employee housing and other standard amenities. In some remote areas, there were no alternatives. In situations like the Puget Sound sawmill town of Port Gamble, built by the Pope and Talbot Lumber Company, small worker houses that reflected the firm’s New England roots were set on tree-lined streets with a community hall, school and hospital nearby. In other industry-dominated communities, the settings were much less picturesque, and often utilitarian company-built housing was merely an addition to an already-established town (Schwantes et al., 1988:113).

By the beginning of the twentieth century the leading cities within the PEIS project area—Seattle, Tacoma, and Spokane—initiated most of the economic activity in the region, serving as labor pools, trade and transportation centers, and the principal markets for the production of the rest of Washington and northern Idaho. The rate of growth in these urban centers was dramatic. Spokane, in particular, developed from a backwater of only 350 people in 1880 to a metropolis of over 100,000 in 1920, while during the same period, Seattle’s population increased ten-fold. All these people needed homes and within the growing cities, single-family residences increasingly were built outside the urban core, with neighborhoods defined by socio-economic criteria, ranging from pattern book to architect-designed styles that generally reflected prestige and perceived popular taste rather than a local identity. Multi-family dwellings, residential hotels and tenements marked the city centers until the World War II era, when an influx of war workers led to the construction of defense housing as well as new urban and suburban neighborhoods (Schwantes, 1989:192; Woodbridge and Montgomery, 1980:12-18).

- Government

The Territory of Washington was first established in 1853 because its far-flung settlers felt that they were being ignored by the Oregon territorial government. Later North Idaho residents periodically threatened secession because of the huge distance to the State capital in Boise. Yet over time, despite some citizen mistrust, Federal, State and local governments played a major role in many aspects of Northwest life, from military operations, resource management and infrastructure development to political organization and protection of citizens.

Among the first actions of Washington territorial government were treaty negotiations with Indian tribes and the establishment of a justice system. During what became known as the Treaty War period, small communities feared attack from local tribes after the treaties were negotiated, and the government responded by calling out volunteer militia units and also building a few strategic forts and blockhouses. Naval ships patrolled the Washington coast while in the interior Army troops battled with Indian groups in several interior areas, including Spokane Plains and Four Lakes. In later years, problems with Native peoples no longer threatened, but new military and strategic considerations also prompted the government to locate a number of Army, Navy and Coast Guard facilities around Puget Sound, including several within the PEIS project area. Additional military bases were established near Spokane, including the World War II-era Farragut Naval Station on Lake Pend Oreille in Idaho (Ruby and Brown, 1970:128-133).

Another early role of the Federal Government was to disburse land to settlers, but gradually the value of preserving some of these lands for National Forests and other public uses changed the government's focus to stewardship of remaining resources. Forests reserves established in the 1890s were precursors to the North Cascades National Park and the Mt. Baker-Snoqualmie National Forest. Similarly the first reserves in northeastern Washington and Idaho evolved into today's Wenatchee, Colville, and Idaho Panhandle national forests. Today national park and national forest lands in the PEIS project area encompass more than 9.9 million acres in addition to wildlife preserves, parks and protected areas administered by other government and private agencies (see Figure H-11) (Steen, 1991:74-75; Holstine, 1978:44, 50; GIS data from Washington Department of Ecology and Idaho Department of Water Resources, 2009).

Early provisions that prohibited timber harvests, mining, or grazing on Federal lands eventually led to multiple-use management plans that sought to balance resource protection with public access. Government responsibilities in the national forests, for example, included the development of trails and roads for fire protection and logging but also for recreational use. Government programs, and especially those connected with New Deal measures during the Depression era of the 1930s, also had an important impact on the improvement of public facilities. The CCC, for example, used young, jobless enrollees to work in forest protection and improvement, recreation development, range and wildlife enhancement as well as in emergency work to combat floods, fires, and other disasters. The WPA, among other state and Federal programs, improved additional types of public lands by hiring the unemployed to construct new roadways, bridges and government buildings (Steen, 1991:34-36; Hollenbeck, 1987:284; CCC, 1939:73; Otis et al., 1986:9-10).

- Social and Cultural

Communities of all sizes needed to address issues related to quality of life and social interactions among its citizens. In this context social and cultural components are broadly defined to include a wide array of activities related to entertainment, health, religious, educational and funerary practices as well as the unique contributions made by the region's widely diverse populations.

In communities across the Northwest, social institutions quickly followed settlement. Single men predominated in early migrations, and in some areas Masonic Lodges and other fraternal organizations, in addition to saloons, were among the first social establishments. As women and children followed, a primary emphasis was placed on schools. The early missionaries had integrated education into their religious programs, and parochial and private education remained common in growing communities. Territorial legislation in both Washington and Idaho initiated tax-supported public education and Washington's Organic Law of 1853 reserved two sections of land in each township to support schools (Schwantes, 1989:222-223).

Other social institutions evolved with the growth of communities. With limited entertainment options, civic groups provided an opportunity for residents to come together outside of their homes or places of work. Churches often became community centers, while public meeting halls were often privately built or incorporated into the same space as organizations like the Grange or local unions. Entertainment options varied from traveling chautauquas and circuses to vaudeville shows in larger cities, while civic organizations, and particularly women's clubs, sponsored musical and cultural events and raised money to support of libraries, gardens, parks and other civic improvements. Generally it was not until the 1880s that towns or other government entities began to play a role in establishing public amenities like parks, playgrounds and other recreational and social facilities. This mix of private and public responsibility for social needs also extended to health care, where physicians developed practices and even small infirmaries in their homes until public facilities, including hospitals, sanitariums, and orphanages, were established.

Many of the social institutions that developed also reflected the Northwest's multi-ethnic population base. The wide range of environments within the Northwest contributed to cultural diversity among the region's Native populations, and that diversity continued as newcomers from throughout the world made their way to Washington and Idaho. The mixed racial fur trade communities introduced by the HBC gave way to new ethnic groups who came for labor or agricultural opportunities. The railroads, in particular, fostered this diversity by hiring huge crews of Chinese, and later Japanese, construction workers and then by promotional efforts in many European countries to encourage immigration on their lines. Scandinavians formed the largest incoming ethnic group, but Great Britain, Italy, and Russia also contributed significant numbers who populated factories and farms between 1880 and 1920. Hispanic immigration also occurred throughout these periods although most notable are large groups who were drawn to the field of eastern Washington by labor shortages during World War II (Schwantes et al., 1988:70).

By 1900, 22 percent of Washington's population was foreign born, and those numbers continued to grow over the next few decades. Ethnic groups brought with them social and cultural institutions that were often re-established in their new communities. As was the pattern throughout the West, immigrants frequently settled together around their places of work. Whether they included Italian railroad workers in Priest River, Idaho, German-Russian farmers in Ritzville, Washington, or Chinese business owners in Seattle, these ethnic communities developed their own social fabric that was a unique mix of age-old traditions and new practices. Like the rest of the country, racism and nativism were present in the Northwest, resulting in events like the expulsion of Chinese workers from coastal cities in the 1880s, segregated housing for Blacks in many cities, and the internment of Japanese citizens during World War II, but generally the region has recognized and tried to preserve the unique values of diversity (Schwantes, 1989:186).

# 2 NATIVE AMERICAN SACRED SITES AND TRADITIONAL CULTURAL PROPERTIES

## 2.1 INTRODUCTION

This section includes brief descriptions of Native American sacred sites and Traditional Cultural Properties (TCP) in the four geographic regions (encompassing 13 states) that are within the 100-mile corridor of the northern border project area. Much of this information is highly protected and is difficult, and often impossible, to obtain. Additional information about these properties may be obtained during the Section 106 consultation process.

Cultural resources may include Traditional Cultural Places or sacred sites as outlined in National Register Bulletin 38 (cf., Parker and King, 1991, 1992; Hadley, 1993; Staap and Burney, 2002). Additional relevant legislation includes the National Historic Preservation Act (NHPA), the National Environmental Policy Act (NEPA) Native American Graves Protection and Repatriation Act (NAGPRA), and the American Indian Religious Freedom Act. Native American sacred sites and TCPs certainly exist within the northern border project area. However, these property types present specific challenges in regard to identification, because no single database exists for this purpose. There are also several challenges to ascribing cultural affiliation to a specific sacred site or TCPs for the purposes of consultation.

Examples of some categories of Native American sacred sites and TCPs that occur within the northern border project area include:

- Burials sites
- Notable Places and/or Landmarks

Places of religious significance

Several forms of data can typically be used to ascribe cultural affiliation to a specific sacred site or TCPs for the purposes of consultation. However, in some instances insufficient data may preclude an objective valid conclusion concerning cultural affiliation. Several groups may claim cultural ties to or ownership of a specific sacred site or TCP. The absence of a sacred sites and TCP database might require the collection of some basic information as to the range of resources that are likely to provide information in regard to sacred sites and TCPs within the northern border project area. Some likely archives or organizations to contact to learn of the scope of their holdings for primary, secondary, and ethnographic data include various Native and ethnic cultural groups, local and state libraries, historical societies, and preservation organizations, folklore societies, and universities and colleges. Oral interviews with individuals who may possess firsthand knowledge of or have researched Native American sacred sites and TCPs might also be productive. Information can be tabulated manually or digitized in a geographic information system (GIS) format for more powerful use.

### 2.1.1 NEW ENGLAND REGION

#### 2.1.1.1 State of Maine

Although Maine's Tribes certainly have locations considered sacred and locations considered to represent TCPs, none are officially designated with the National Park Service. For instance, the Penobscot Nation considers locations such as Mt. Katahdin, Cadillac Mountain and the historic village of Norridgewock, as sacred sites, but these locations are not formally designated as such and this is not an exhaustive listing of all locations considered sacred to the Penobscot.

#### 2.1.1.2 State of New Hampshire

Native American sacred sites and TCPs in the New Hampshire portion of the northern border project area include, but are not limited to, burials, notable places and/or landmarks, and places of religious significance. In general, human burial sites should be afforded some specific recognition or degree of respect. The manner and degree of treatment ultimately falls upon individual customs and beliefs. Ancient to modern Native American, Euro-American, and other ethnic burials exist across the northern border project area of New Hampshire. Burial contexts range widely from isolated unmarked burials to large cemeteries.

It is not unusual for natural landmarks to traditionally mark Native American or Euro-American travel corridors, burials, boundaries, or the places of significant events. Additionally, the places where events occurred may themselves be considered significant. Notable places and landmarks could represent a category of Native American sacred sites and TCPs within the northern border project area of New Hampshire. For example, the Old Man of the Mountain, in Franconia, New Hampshire was a series of five granite cliff ledges on Cannon Mountain in the White Mountains and when viewed from the north, appeared to be the jagged profile of a face. In 2003, the formation collapsed to the ground. The profile has long been a recognizable place and symbol for New Hampshire that could be considered a sacred or Traditional Cultural Place. Special significance might be attributed to places that witnessed important, tragic, or ceremonial events, such as battles, trading spots, or peace ceremonies (Price 1956). Some groups might also consider natural resource areas, where food or medicinal plants were gathered, sacred sites or TCPs.

Americans generally agree that individuals should be free to worship in any manner that they choose as long as their activities do not infringe upon others. For many cultures throughout time, worship is tied to a specific location. Native peoples of New Hampshire ascribe sacred and traditional significance to places associated with Abenaki mythology and creation stories. Ethnohistorical accounts of Native Americans in New Hampshire specifically identify Mount Washington as a sacred location and attribute spiritual significance to other mountainous areas in general (Bayly 1997). "Today Mt. Washington is nicknamed 'The Rockpile' but to the Native Americans it was Agiocochook, an Abenaki name meaning 'Home of the Great Spirit'" (www.nhmagazine.com 2009).

#### 2.1.1.3 State of Vermont

The United States, Vermont, and local communities within the state encourage preservation of a range of Historic Properties through a variety of means. In addition to Federal legislation noted in Section 2.1, state legislation concerning Native American sacred sites and TCPs in Vermont includes the Vermont Historic Preservation Act and the state's land use law ACT 250, as well as local ordinances. Together with the Federal legislation, these state ordinances led to the establishment of state agencies who safeguard archeological sites and historical properties, such as the Vermont Division for Historic Preservation. Other organizations such as Partners for Sacred Places, the only national, non-sectarian, non-profit organization devoted to helping congregations and their communities sustain and actively use older and historic sacred places (http://www.sacredplaces.org/) may be interested in issues concerning sacred sites. Non-profit organizations such as the Archaeological Conservancy, the Vermont Archaeological Society, the Vermont Historical Society, and the Land Trust of Vermont are key partners toward effective historic preservation. During the last decade, states across the nation have made significant progress toward cultural resource stewardship through programs like Archaeology Week or Month and other public outreach. These exemplary programs discourage unnecessary collecting and excavation of archeological sites, Native American sacred sites, and TCPs.

Native American sacred sites and TCPs in the New Hampshire portion of the northern border project area include, but are not limited to, burials, notable places and/or landmarks, and places of religious significance. In general, human burial sites should be afforded some specific recognition or degree of respect. The manner and degree of treatment ultimately falls upon individual customs and beliefs. Ancient to modern Native American, Euro-American, and other ethnic burials exist across the northern border project area of New Hampshire. Burial contexts range widely from isolated unmarked burials to large cemeteries.

It is not unusual for natural landmarks to traditionally mark Native American or Euro-American travel corridors, burials, boundaries, or the places of significant events. Additionally, the places where events occurred may themselves be considered significant. Notable places and landmarks could represent a category of Native American sacred sites and TCPs within the northern border project area of Vermont. For example, a Traditional Cultural Place could be the Socialist Labor Party Hall in Barre, Vermont that had special significance to the city's Italian community. This 1900 Labor Hall provided a meeting place for the Italian community. Special significance might be attributed to places that witnessed important, tragic, or ceremonial events, such as battles, trading spots, or peace ceremonies (Price 1956). Some groups might also consider natural resource areas, where food or medicinal plants were gathered, sacred sites or TCPs.

Americans generally agree that individuals should be free to worship in any manner that they choose as long as their activities do not infringe upon others. For many cultures throughout time, worship is tied to a specific location. Native peoples of Vermont ascribe sacred and traditional significance to places associated with Abenaki mythology and creation stories such as those of Odzihózo on Lake Champlain and Bedgwadzo "Round Mountain" (Haviland and Power 1994), perhaps in a manner similar to Roman Catholics of French-Canadian descents who travel to St. Anne's Shrine. Meeks (1986b:241) wrote that in 1976, St. Anne's Shrine ranked seventh of Vermont's summer stopping spots with 56,000 visitors. Modern Abenaki peoples have also regarded petroglyph sites, such as those at Bellows Falls and Brattleboro, Vermont as powerful sacred places.

## 2.1.2 GREAT LAKES REGION

### 2.1.2.1 State of New York

This sensitive information is presently unavailable for this area. However, it is hoped that consultation with interested tribal parties, as part of the ongoing Section 106 process, will develop the appropriate information.

### 2.1.2.2 Commonwealth of Pennsylvania

This sensitive information is presently unavailable for this area. However, it is hoped that consultation with interested tribal parties, as part of the ongoing Section 106 process, will develop the appropriate information.

### 2.1.2.3 State of Ohio

This sensitive information is presently unavailable for this area. However, it is hoped that consultation with interested tribal parties, as part of the ongoing Section 106 process, will develop the appropriate information.

### 2.1.2.4 State of Michigan (Lower Peninsula)

There are no Native American sacred sites known although they undoubtedly exist in Michigan's Lower Peninsula. Additional consultation on a project-specific basis will be required.

### 2.1.2.5 States of Michigan (Upper Peninsula) and Wisconsin

There are no Native American sacred sites known although they undoubtedly do exist in Michigan's Upper Peninsula and northern Wisconsin. Additional consultation on a project-specific basis will be required.

## 2.1.3 EOR REGION

### 2.1.3.1 State of Minnesota

This sensitive information is presently unavailable for this area. However, it is hoped that consultation with interested tribal parties, as part of the ongoing Section 106 process, will develop the appropriate information.

### 2.1.3.2 State of North Dakota

This sensitive information is presently unavailable for this area. However, it is hoped that consultation with interested tribal parties, as part of the ongoing Section 106 process, will develop the appropriate information.

### 2.1.3.3 State of Montana

This sensitive information is presently unavailable for this area. However, it is hoped that consultation with interested tribal parties, as part of the ongoing Section 106 process, will develop the appropriate information.

### 2.1.4 WOR REGION

#### 2.1.4.1 States of Washington and Idaho

This sensitive information is presently unavailable for the states of Washington and Idaho. However, it is hoped that consultation with interested tribal parties, as part of the ongoing Section 106 process, will develop the appropriate information.

# 3 ABOVE-GROUND HISTORIC PROPERTY TYPES

The National Historic Preservation Act defines a historic property as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (36 Code of Federal Regulations (CFR) 800.16(l)). For Section 106 review purposes, properties eligible for listing in the National Register are treated the same as properties listed in the National Register.

In order for a property to be eligible for listing in the National Register, and be considered a historic property, it must be:

- A building, site, structure, object, or historic district.
- At least 50 years old. In rare exceptions, a property less than 50 years old may be considered a historic property. These exceptions are for more recent properties of outstanding historical significance (as an example, the Allen Park Veterans Affairs Medical Center in Michigan, built in 1939, was determined eligible for its exceptional architecture in 1981).
- Significant within its historic context.
- Possessing integrity, meaning maintaining enough of the original qualities that make it significant.

Section 101 of the NHPA and the National Register regulations (36 CFR 60.3) classify historic properties in the following broad types:

- Building. A building is a structure that shelters people where they live and work. Historic buildings may be public or private, grand or humble, and reflect the diversity of human activity. Examples include houses, offices, schools, mills, prisons, libraries, and train stations. In addition to buildings with notable architectural features, so-called vernacular buildings may have historic significance because of their association with people’s everyday lives. Examples include buildings such as barns, row or tract houses, rural cottages, and diners.
- Site. A site is the location of an event or events. It may be historically important regardless of the historic value of any existing building or structure it encompasses. Examples include archaeological sites, whether ancient or relatively recent (historic), battlefields, designed landscapes such as cemeteries or parks, vernacular landscapes, ruins, and places of religious significance. Archaeological sites might include above-ground components such an intaglios or petroglyphs (rock carvings), pictographs (rock paintings), or standing ruins; however the majority are buried in the ground, and require subsurface field testing to locate, identify, and evaluate. Historic landscapes and traditional religious sites may be difficult to identify. Traditional cultural properties such as sites of religious significance may be identified by the Tribal Historic Preservation Officer (THPO), Native Hawaiian organization, or other tribal representative.
- Structure. A structure is a functional construction, built for some purpose other than sheltering human activity. Often structures are large-scale engineering projects. Examples include bridges, dams, canals, roads, windmills, signal towers, and air or watercraft.

- Object.  An object is defined as a small-scale construction, often of artistic intent, that exists in a setting appropriate to its historic significance.  Objects may be small and moveable, but are intended for a specific location.  Examples include monuments, statues, boundary markers, and mileposts.
- District.  A district may be composed of a variety of property types, unified by their relationships to a historic period or periods.  They often contain both "contributing" and "non-contributing" components.  That is to say, not all the buildings, sites, structures, etc. within the district contribute to its historical significance.  Examples include college campuses, rural estates, rural villages, industrial complexes, commercial centers, concentrations of archaeological sites, areas of traditional cultural significance to Native American tribes, irrigation systems, and transportation systems.

This section includes overviews of the above-ground historic property types found within the four geographic regions (encompassing 13 states) covered by the 100-mile corridor of the northern border project area.

## 3.1 NEW ENGLAND REGION

### 3.1.1 STATE OF MAINE

**Buildings**

As a primarily rural, agricultural state, historic buildings in Maine tend overwhelmingly to be residential and small-scale commercial (i.e., smaller downtown business districts).  While the earliest houses in the state, from the late seventeenth and early eighteenth centuries, tend to be along the coast, several eighteenth century houses exist in the southern portions of the study area. The highest concentration of eighteenth century houses outside of the coastal counties can be found in Oxford County, where 12 are listed on the National Register of Historic Places (NRHP). Most of the counties in the central and northern parts of the state, however, show few if any eighteenth century buildings.  Houses from the early eighteenth century generally are one or one and one-half story buildings, often constructed of logs, while houses from the middle and later parts of the eighteenth century are one, one and one-half, or two stories in height, constructed around a timber frame, and generally with a central brick chimney and unadorned wood siding.

The northern portion of Maine, principally Aroostook County, was in flux through the early nineteenth century as a result of the uncertainty over the border with Canada. The border tensions led to the creation of a blockhouse fort (now located in Fort Kent) along the St. John River.  The early architectural traditions in northern Aroostook County along the border remained influenced by the Acadian settlers, whose building technology differed from that of their English counterparts in the lower part of the state.  The Acadian vernacular architectural traditions in the eighteenth century included log houses that used tenons at the corners rather than notches.

The rivers that drained from the uplands to the coast provided both a source of power and an easy access route to the markets of Boston; this combination provided great opportunities for entrepreneurs in the early nineteenth century.  Railroads first arrived in Maine in the late 1840s, and expanded quickly through the 1850s and 1860s; these provided additional incentives for growth by making the development of factories and larger lumber mills feasible.  As a result, the state of Maine saw a period of impressive economic growth in the decades leading up to the Civil War. Much of this development took place in the central portions of the state, where the rivers proved easier to control. New towns emerged to take advantage of this growth, including Auburn, Lewiston Rumford, Farmington, Madison, Skowhegan, Houlton, and were filled with houses reflecting the then-popular residential styles, particularly Greek Revival, Gothic Revival, and, later, variations of the Italianate styles.

Further from the new and establishing towns of the central and southern portions of the state, in the St. John River Valley along Maine's northern border with Canada, residential architecture tended to be more conservative in style, and continued to reflect the Acadian origins. Greek Revival influences remained longer in these rural areas, and can be seen the variations of vernacular Acadian house types including the one and one-half story front-gable, half-cape house that is scattered throughout the central and northern portions of the state. By the early and mid-twentieth century, however, examples of high-style residential architecture including variations on the Colonial Revival and Mediterranean styles can be found throughout the State.

One of Maine's principal agricultural crops led to the establishment of a particular form of agricultural building: the potato barn. Set partially below grade with only the roof extending above the ground, examples of nineteenth century potato barns can be seen throughout the northern parts of the state, especially in northeastern Aroostook County. Between 1996 and 2004, the SHPO conducted surveys of agricultural buildings in Aroostook County, with particular emphasis on potato barns.

In the late nineteenth century, as the rail lines extended into the state's northern regions, Maine's lakes and forests drew increasingly large numbers of visitors, or "sports," who sought hunting and fishing vacations. This resulted in one of the important new architectural elements in the state, the "sporting camps." These camps range in scale from simple front-gable frame buildings to elaborate estates designed according to formal national architectural styles. These are found most often in the northwestern parts of the state, in the Moosehead/Rangeley Lakes and the Richardson/Mooselookmeguntic Lakes areas. In reviewing projects in these lake and wilderness areas of northern Maine, the SHPO has paid particular attention to sporting camps. The most common theme among the sporting camps is their orientation to water, either rivers or lakes.

In addition to residences, Maine's industrial heritage continues to be represented in historic architecture. Some small-scale industrial buildings remain in the southern portion of the study area: small mill buildings that made use of the limited fall of the rivers and their tidal movement as they approached the coast. More common, though, are the large-scale factory buildings relating to the State's industries, principally paper and textiles. By the late nineteenth and early twentieth centuries, these buildings tended overwhelmingly to be built of brick, two to four stories high, with rows of multi-paned metal-framed windows. Like the sporting camps, many of these older factory buildings tended to be located along the State's rivers, to take advantage of the available hydropower. These buildings are found most often in the smaller and mid-sized piedmont cities such as Waterville, Auburn, Madison, and Skowhegan. Maine also has a long history of the use of hydroelectric power. Many of these hydroelectric powerhouses, dating from the 1890s into the mid-twentieth century, remain, and generally are considered historically significant.

**Structures**

The most imposing historic structures are the various dams on the state's rivers, especially in the southern half of the state. Maine has a long history of hydropower, both in support of small- and large-scale manufacturing and in the generation of electricity. Many of the dams that allowed for the use of that hydropower remain, from small-scale masonry dams, often under 15 feet high, to larger concrete dams that support hydroelectric generation. In addition to dams, the SHPO has in recent years paid attention to the state's bridges. The SHPO, working with the Maine DOT, has completed surveys of the historic bridges in the state in recent years.

Districts

In the central and southern portions of the state, historic districts are located primarily in cities and villages. In addition, however, several farmsteads have been identified as historic districts, particularly in Aroostook County where five of the seven NRHP historic districts are farms. While there are some historic districts that relate primarily to the eighteenth century, particularly in the coastal cities, most urban historic districts in Maine have as a period of significance the late nineteenth and early twentieth centuries. These districts tend to revolve around some combination of residential, commercial, and industrial buildings. Important historic districts can be found in Farmington, Auburn, Lewiston, and Livermore, though many of the smaller cities and villages in the central and northern parts of Maine have not been surveyed and thus may contain significant historic districts.

**Objects**

Objects that are eligible for the NRHP frequently include public monuments. Like historic districts, NRHP eligible or listed objects are found most frequently in towns and cities, where they commemorate veterans or military endeavors. One type of monument, however, is likely to be found in the extreme northern parts of the state: border monuments. These monuments are small obelisks, approximately three feet high, and are made of either concrete or metal. One border monument identified in a 2009 survey of the Hamlin LPOE at the northeastern corner of Maine was recommended eligible for the NRHP. It is not known how many border monuments are in Maine. However, given the importance of the border dispute with Canada in the history of the state, it is likely that other border monuments may be found eligible for the NRHP as well.

**Sites**

Sites that are eligible for the NRHP tend overwhelmingly to be archaeological in nature. However, the Maine SHPO takes linear features into account in assessing effects to above-ground resources. Most frequently, these linear features tend to be former railroad rights of way, though historic roads may also be significant. Perhaps the most significant historic linear feature is the Arnold Trail to Quebec, which has been listed on the NRHP. This linear feature represents the route that Benedict Arnold took during the Revolutionary War, leading a force of 1,100 Continental Army troops in a planned assault on the British stronghold at Quebec. Arnold's route passed through the western portions of Maine and crossed into Canada at what is now Coburn Gore.

### 3.1.2 STATES OF NEW HAMPSHIRE AND VERMONT

The listing of historic properties in Vermont and New Hampshire is an ongoing process and the number of actual inventoried properties and those nominated to the federal register changes. A current listing of historic properties on the National Register by state is maintained by the National Park Service and best accessed online. Information on inventoried properties can be obtained by contacting the state historic preservation office of each state directly.

One of the duties of a State Historic Preservation Officer is to prepare a state historic preservation plan and review and revise that plan. In Vermont, the Division for Historic Preservation highlights significant types of sites in *Keeping Vermont A Special World: The Vermont Historic Preservation Plan.* This ten-year plan summarizes historic contexts that describe what we know about our past according to important themes types of cultural resources, quantity, and quality. Archaeologists further define significance, as a site's potential to yield important information about the past, despite site size, artifact number, or site notoriety. The National Park service maintains a summary of state plans including the ones for Vermont, http://www.nps.gov/history/hps/pad/stateplans/vermont.htm and the New Hampshire 2006-2-10 plan is at the state web site http://www.nh.gov/nhdhr/programs/plan.htm. Both plans are currently under revision.

A state preservation plan is supposed to identify historic preservation contexts and themes. A context is an organizational tool for grouping properties related through their histories by theme, place and time. New Hampshire's list of does not represent all of the historical research topics that could be pursued in New Hampshire. Instead, it reflects the historic contexts illustrated by the properties in the Division of Historical Resources' survey files. Vermont has fewer themes, but they are more developed. The themes of both states are reflected in the context for Vermont and New Hampshire in this document.

## 3.2 GREAT LAKES REGION

### 3.2.1 STATE OF NEW YORK

#### National Historic Landmarks

New York State leads the nation in the number of National Historic Landmarks (NHL) with 263 designated properties representing more than 10 percent of nearly 2,500 NHLs nationwide. New York State's NHLs include: more than half of the state-owned historic sites; eight National Register listed historic districts; natural and scenic areas such as the Adirondack Forest Preserve, Central Park, and Governors Island; numerous historic vessels; the Erie Canal; several Adirondack camps; prehistoric and historic archeological sites; forts and battlefields associated with the French & Indian War, War of 1812, and Revolutionary War; mansions of New York State's landed gentry; numerous buildings designed by internationally- and nationally-significant architects; and places associated with African American history, women's rights, and gay and lesbian civil rights (NYSHPO 2009). The project area includes the NHL Fort Niagara on Lake Ontario, which contains six of the oldest buildings in the entire Great Lakes region.

#### Historical Areas of the National Park System in New York State

Approximately 26 units of the National Park System are also located within New York State. These national monuments, national scenic trails, national heritage areas and corridors, and national historic sites depict the diverse history and culture of America through stories of immigrants arriving in America, the nation's only site dedicated to a first lady, life in the eighteenth and nineteenth centuries, memorials to those who led and fought in battles, historical figures, and the women's rights movement (NYSHPO 2009). Five National Park Service (NPS) historical areas in the project area include the following:

- Erie Canalway National Heritage Corridor (Upstate New York)
- Fort Stanwix National Monument (Rome)
- Hudson River Valley National Heritage Area
- Theodore Roosevelt Inaugural National Historic Site (Buffalo)
- Women's Rights National Historical Park (Seneca Falls)

The project area includes historic resources located in the boundaries of two National Heritage Areas, The Erie Canalway National Heritage Corridor (NHC) and the Champlain Valley National Heritage Partnership (NHP). New York State Heritage Areas in the project area include the following:

- Buffalo
- Concord Grape Belt
- Rochester
- Sackets Harbor
- Schenectady
- Seneca Falls
- Syracuse
- Mohawk Valley Heritage Corridor (only Oneida and Herkimer counties)
- Western Erie Canal Heritage Corridor (Erie, Niagara, Orleans, Monroe and Wayne counties) New York

New York Heritage Trails in the project area include the following:

- French and Indian War Heritage Trail
- Abraham Lincoln Heritage Trail
- Underground Railroad Heritage Trail
- Revolutionary War Heritage Trail
- Women's Heritage Trail

Theodore Roosevelt Heritage Trail

*Underground Railroad Heritage Trail* honors freedom-seekers (escaped slaves) who journeyed north to New York State and those New Yorkers who helped them achieve their dream. It consists of a network of designated historic sites, and regional and local interpretive centers associated with the Underground Railroad, the anti-slavery movement and slavery. Some of these sites are Listed or Eligible for listing in the NRHP (e.g. NRL properties: Harriet Tubman Home for the Aged, Residence and Thomason AME Zion Church[Auburn]; St. James AME Zion

Church [Ithaca; Gerrit Smith Estate and Land Office [Peterboro]; and John Brown Estate and Grave Site [Lake Placid]).

*Revolutionary War Heritage Trail* links together 82 significant historic sites to reveal New York's decisive role in America's fight for independence (e.g. Fort Niagara, Sackets Harbor Fort Stanwix, Oriskiny, Herkimer Home State Historic Site, Fort Klock, Crown Point, Fort Ticonderoga).

*Women's Heritage Trail*- celebrates the achievements and history of women in New York State. These sites enhance our understanding of the daily life and culture of women, as well as their contributions in the struggle for equal rights, and the success they attained in social reform, business, politics and the arts.

The project area includes all of New York State's Seaway Trail a state and national Scenic Byway, which follows 454 miles of the state's northern coastal region along the shores of Lake Erie, Lake Ontario, and the St. Lawrence River. The Great Lakes Seaway Trail is one of America's Byways and is recognized for its unique landscape, scenic freshwater coastline, and historical significance. The Seaway Trail has some 25 historic lighthouses, sites associated with the French and Indian War and Revolutionary War, and 42 War of 1812 sites. The Great Lake Seaway Trail region was the vital transportation and communication link between France and her colonies. In addition, other New York State Scenic Byways cross the North Country region of the state.

### 3.2.2 COMMONWEALTH OF PENNSYLVANIA

#### Representative Architectural Styles

Architectural styles of historic structures and districts vary widely across the large area encompassed by this study (Table H-1). This section briefly outlines the typical architectural styles to be found in Pennsylvania. The PHMC's *Pennsylvania Architectural Field Guide* categorizes architectural styles by key periods of the Commonwealth's development (PHMC, 2011). Available online, the guide provides a brief introduction for each period of development with more detailed information about specific styles on separate Web pages. The PHMC emphasizes the importance of understanding and recognizing the state's traditional and vernacular building traditions and, as such, vernacular designs transcend an era-based classification and are identified in their own category (PHMC, 2010).

## Table H-1. Representative Architectural Styles in Pennsylvania

| **TRADITIONAL/VERNACULAR** | **1638 - 1950** |
|---|---|
| Log Buildings | 1638 - 1880 |
| Postmedieval English | 1682 - 1730 |
| Pennsylvania German Traditional | 1700 - 1870 |
| Barns and Outbuildings | 1700 - 1930 |
| Meetinghouses | 1695 - 1950 |
| **TRADITIONAL/VERNACULAR** | **1638 - 1950** |
| Log Buildings | 1638 - 1880 |
| Postmedieval English | 1682 - 1730 |
| Pennsylvania German Traditional | 1700 - 1870 |
| Barns and Outbuildings | 1700 - 1930 |
| Meetinghouses | 1695 - 1950 |
| **COLONIAL PERIOD** | 1640 - 1800 |
| Georgian Style | 1700 - 1800 |
| **EARLY REPUBLIC PERIOD** | **1780 - 1830** |
| Federal Style | 1780 - 1820 |
| Early Classical Revival Style | |
| Roman Classical Revival Style | 1790 - 1830 |
| Greek Revival Style | 1820 - 1860 |
| **MID 19TH CENTURY PERIOD** | **1830 - 1860** |
| Gothic Revival Style | 1830 - 1860 |
| Exotic Revival/Egyptian Revival Style | 1830-1850, 1920-1930 |
| Italianate Villa/Italianate Style | 1840 - 1885 |
| Octagon Style | 1850 - 1870 |
| **LATE VICTORIAN PERIOD** | **1850 - 1910** |
| Romanesque Revival Style | 1840 - 1900 |
| Second Empire/Mansard Style | 1860 - 1900 |
| High Victorian Gothic Style | 1860 - 1890 |
| Chateauesque Style | 1860 - 1910 |
| Stick Style | 1860 - 1890 |
| Queen Anne Style | 1880 - 1900 |

| LATE 19TH & EARLY 20TH CENTURY REVIVAL PERIOD | 1880 - 1940 |
|---|---|
| Colonial Revival Style | 1880 - 1960 |
| Tudor Revival Style | 1890 - 1940 |
| Collegiate Gothic Style | 1890 - 1940 |
| Italianate Renaissance Revival Style | 1890 - 1935 |
| Classical Revival Style | 1895 - 1950 |
| Beaux Arts Classicism Style | 1885 - 1930 |
| Spanish Colonial Revival Style | 1915 - 1940 |

| MODERN MOVEMENT PERIOD | 1925 - 1950 |
|---|---|
| Art Deco Style | 1925 - 1940 |
| Moderne Style | 1930 - 1950 |
| International Style | 1930 - 1950 |

### Above Ground Historic Property Types

The PHMC's Web page offers a detailed discussion of the most commonly recognized traditional house forms found in Pennsylvania (PHMC, 2010). Common historic building types in Pennsylvania include mills, agricultural or industrial complexes, railroad related structures, schools, churches, novelty buildings, Lake transport/shipping, forest and extraction industries, state parks, and a wide variety of vernacular domestic forms. These buildings may include details of established historic architectural styles, but their appearance is more dictated by necessity and the function they serve (PHMC, 2010). Other historic resources include burial grounds and cemeteries.

Pennsylvania is widely-recognized for possessing one of the most interesting collections of historic bridges of any state. Its ever-expanding population and consequent transportation requirements made the Keystone State a pioneer in transportation innovation, particularly in the design of bridges. Pennsylvania claims numerous engineering milestones in American bridge-building technology. The isolation of its western counties prompted a Fayette County judge, James Finley (1756–1828) to invent America's first suspension bridge in 1796. As the historic center of the iron and steel industry, Pennsylvania once had several iron-bridge manufacturing companies in the state. In 1996, Pennsylvania DOT and the Pennsylvania Division, Federal Highway Administration, in cooperation with PHMC, launched an evaluation of all pre-1957 bridges, which includes county and municipality-owned structures, to identify and record even more historic bridges.

### Multiple and thematic resource property documentation

PHMC maintains a working list of multiple and thematic resource property documentation through 2010 accepted by or listed in the National Register of Historic Places (NRHP). One-third of National Register listed properties in the Commonwealth have been submitted under a multiple or thematic context. The developed historic contexts relevant to the project area include the following themes:

Allegheny County Owned River Bridges Thematic Resource (Thematic Resource Documentation Property [TR])

Allegheny Portage Railroad Multiple Property Submission (Multiple Property Submission [MPS])Allegheny River Navigation System MPS Aluminum Industry Resources of Southwestern Pennsylvania MPS Bituminous Coal and Coke Resources of Pennsylvania MPS Covered Bridges of Erie County TR Emergency Conservation Work (ECW) Architecture in Pennsylvania State Parks: 1933--1942, TR Highway Bridges Owned by the Commonwealth of Pennsylvania, Department of Transportation TR Historic Agricultural Resources of Pennsylvania (available on the PHMC's website) Historic Educational Resources of Pennsylvania (available on the PHMC's website) Iron and Steel Resources of Pennsylvania MPS Oil Industry Resources in Western Pennsylvania MPS Pennsylvania National Guard Armories MPS Pennsylvania Railroad Rolling Stock TRUS. Coast Guard Lighthouses and Light Stations on the Great Lakes TR Whiskey Rebellion Resources in Southwestern Pennsylvania MPS

The project area includes the 64-mile long Pennsylvania Great Lakes Seaway Trail, which is one of America's Byways recognized for its unique landscape, scenic freshwater coastline, and historical significance. The Pennsylvania section of the Great Lakes Seaway Trail offers rural agricultural landscape, historic downtowns, and historic sites related to events of the French and Indian War (Fort de la Presque Isle and Fort Sur La Rivere aux Boeufs) and the War of 1812. The City of Erie section includes Presque Island State Park and three mid-to-late nineteenth century historic lighthouses.

Pennsylvania further recognizes historic resources and sites in its Trails of History program. The project area includes portions of the following Trails: Military History Trail; Industrial Heritage Trail; and Rural Farm and Village History Trail. These trails represent some of Pennsylvania’s most historic sites.

### 3.2.3 STATE OF OHIO

**Representative Architectural Styles**

Architectural styles of historic buildings and districts vary widely across the large area encompassed by this study (Table H-2). This section briefly outlines the architectural styles identified in Ohio. Architectural styles in Ohio range from roughly 1790 to the present. The dates provided for each style represent a frequency range in Ohio based on surveys, observation, and archival research (Gordon, 1992). The list of representative styles is not definitive. For further information on how to indentify Ohio’s architectural styles and historic building types (i.e. the structure’s function, floor plan, configuration, etc.) consult *How to Complete the Ohio Historic Inventory* (Gordon, 1992).

**Table H-2. Representative Architectural Styles in Ohio**

| | |
|---|---|
| Federal (1790-1840)Greek Revival (1835-1860)Gothic Revival (1835-1870)Romanesque Revival (1850-1880)<br>Exotic Revivals (1830-1855; 1920-30)<br>Italianate (1850-1880)<br>Second Empire/Mansard (1855-1885)<br>High Victorian Gothic (1870-1885)<br>Stick (1870-1890)<br>Eastlake (1880-1890<br>Queen Anne (1880-1905)<br>Chateauesque (1885-1905)<br>Shingle Style (1885-1890)<br>Richardsonian Romanesque (1885-1895)Sullivanesque (1890-1920)<br>Commercial Chicago Style (1890-1910)<br>Beaux Arts (1890-1910)<br>Second Renaissance Revival (1890-1925)<br>Neo-classical Revival (1895-1950)<br>Colonial Revival (1895-present)<br>Georgian Revival (1895-present) | Craftsman/Arts and Crafts (1900-1925)<br>Mission (1900-1930)<br>Dutch colonial Revival (1900-1925)<br>Late Gothic Revival (1900-1930)<br>Jacobethan (1900-1935)<br>Prairie (1905-1930)<br>Bungalow (1910-1935)<br>Tudor/English Revival (ca. 1910-1940)<br>French Colinal/Norman Revival (1910-1940)<br>Mediterranean (1915-1940)<br>Art Deco (1927-1940)<br>International (1932-1960)<br>Art Moderne (1935-1950)<br>Modern Movement (1945-1990)<br>Miesian (1945-1970)<br>New Formalism (1955-1970)<br>Postmodernism (1970-present)<br>Neo-expressionism (1950-1970)<br>Brutalism (1960-1970)<br>Deconstructivism (1988-present |

### 3.2.4 STATE OF MICHIGAN (LOWER PENINSULA)

**Property Types by Theme**

Perhaps because of the wealth brought to Michigan's citizens by the automobile industry, the most common building type across the state is the single-family home. Blocks of houses occupy most of southeast Michigan; apartments and condominiums are present primarily in Michigan's urban areas. In more rural areas, houses are surrounded by agricultural buildings, forming farmstead complexes. Scientific farming has resulted in the decline of family-owned farms, but many complexes still survive in areas where scientific farming is impractical. Because of the large number of recreational opportunities associated with lakes, waterways, and hundreds of miles of lakeshore, Michigan boasts a large number of cottages and retreats. These same shorelines also contain lighthouses, docks, piers, and harbors. Early industrial buildings line many of the waterways in the state, particularly near harbors and shipping ports. This trend has changed over the last half-century, moving parklands to these areas and creating "parks" of industrial buildings in less desirable locations.

Commercial centers are situated in most downtown areas, from the tiniest community with a single gas station to the largest cities. Historically, these commercial centers consisted of multi-story buildings packed side-by-side. In the mid-twentieth century, the nationwide trend of indoor shopping centers made its way to the state. More recently, ready vehicular transportation has contributed to the success of strip malls.

**Architectural Styles/Forms**

Buildings of most styles and forms established across the country exist in Michigan. Perhaps the earliest building style constructed in Michigan was Greek Revival. Cobblestone houses or commercial buildings (often in Greek Revival style) are also present in the lower part of the peninsula. In Michigan, some variations on building forms, such as the Hen-and-Chicks, are present, particularly in the southern part of the state where settlement occurred earlier. The I-House is also present in the state. Mid-Century Modern homes are present across the state, although more are present in urban areas than in rural areas. Rustic-style homes and commercial buildings are often associated with the resort areas of northern Michigan, as are large-scale Victorian era hotels and lodges.

Building materials include everything from stone and wood to metal and porcelain enameled panels. Cobblestone construction tends to be found in southern Michigan, while fieldstone sheathing is common in northern parts of the state. A local manufacturer has developed concrete "logs" featured on some rustic buildings, and three well-known catalog house companies were located in Bay City, shipping their products across the state and nation.

### 3.2.5 STATES OF MICHIGAN (UPPER PENINSULA) AND WISCONSIN

**Property Types by Theme**

The most prevalent above-ground resource in the northern portions of Michigan and Wisconsin is the single-family house. These buildings are found in both urban areas and in rural portions of the region, with a greater trend toward higher style buildings in urban areas. Houses tend to be smaller than in the southern portions of Michigan or Wisconsin. Apartments and condominiums may be present but tend to be found in urban areas rather than small towns and rural areas. In rural areas, buildings may be part of a farmstead complex or a camp associated with logging or mining. Because of the large number of recreational opportunities associated with lakes, waterways, and hundreds of miles of lakeshore, the area boasts a large number of cottages and retreats, including housekeeping cabins in motel-like settings, first popularized in the 1930s, with the advent of motor travel. Lighthouses, docks, piers, and harbors are situated along lakeshores.

Early industrial buildings line waterways, particularly near harbors and shipping ports. This trend has changed over the last half-century, moving parklands to these areas and creating "parks" of industrial buildings in less desirable locations. Other extant industrial buildings include modern and historic mining facilities.

Commercial centers are situated in most downtown areas, from the tiniest communities with a single gas station, to the larger cities with many storefronts. Historically, these commercial centers consisted of multi-story buildings packed side-by-side. In the mid-twentieth century, the nationwide trend of indoor shopping centers made its way to the larger cities within the region. Even in the smallest community, commercial development tends to mean the construction of strip malls, where automobile access drives the success.

**Architectural styles/forms**

Perhaps the earliest building style constructed in Michigan was Greek Revival; however, because settlement came much later to the northern portion of Michigan's Lower Peninsula and to the Upper Peninsula, there are few buildings of this style present. Although distinctly more rural than the southern part of the Lower Peninsula, this area does include historic wealth and communities of sufficient size to permit construction of high-style buildings; Second Empire, Italianate, Gothic Revival, Beaux Arts, and Tudor Revival styles all exist there. Richardson Romanesque buildings constructed from local red sandstone are scattered across the Upper Peninsula and along Wisconsin's southern Lake Superior shore.

While examples of the Art Deco and Art Moderne styles are less frequent in the northern region, the Craftsman style Bungalow is found in virtually every community. Rustic style homes and commercial buildings are often associated with the resort areas of northern Michigan. Large-scale Victorian era hotels and lodges constructed to serve those seeking the pleasant summers away from allergens and city heat dot major tourist areas such as Mackinac Island, Michigan, and Bayfield, Wisconsin.

## 3.3 EOR REGION

### 3.3.1 STATE OF MINNESOTA

This section briefly outlines the typical architectural styles to be found throughout the large area encompassed by this study. The wide area subsumed by the project in Minnesota includes a wide range of architectural types such as agricultural, commercial, industrial, residential, tourism/recreation, religious, transportation, and civic/governmental. Architectural styles represented include all popular national styles ranging from frontier-type resource through the popular Craftsman and Prairie styles. Minnesota has distinctive grand lodges, hotels, resorts, health spas, camp facilities, dude ranches. These tourism/recreation resources include architect-designed buildings executed in rustic/park, frontier revival, and simple wood frame. One of the few residential examples of the Streamline Modern style in the state is located in study area (David and Wanda Park House, in Bemidji, Beltrami County). Other property types include agriculture, agricultural process, and resources related to the state's lumber industry. Examples of all popular national architectural styles are represented in the state. Distinctive architectural styles include log, subsistence (non-log early settlement structures), and rustic. Four National Historic Landmarks are located in the study area (Hull-Rust-Mahoning Mine, Soudan Mine, and Mountain Iron Mine in St. Louis County; Rabideau Civilian Conservation Corps Camp in Beltrami County). The harbor city of Duluth is the largest city in the northeastern region of the state and in the study area. Historic lighthouses are located on the northern shore of Lake Superior in Cook and Lake counties.

Northeastern Minnesota is known for its rich supply of iron ore and its historic mining industry. Historic resources associated with the mining industry remain in Minnesota's Iron Range region. The iron mining communities were developed by entrepreneurs and mining companies. The companies used standard designs for their mining operations as evidenced in company general offices. These model communities were established throughout in the northeastern region of the state. The northeastern region has abundant wilderness and lakes. Superior National Forest, with four million acres of woods and lake, and Chippewa National Forest are located in the study area. The Northwest region of Minnesota, where the north woods meet the western prairie, includes the state's largest lakes and the headwaters of the Mississippi River. The Red River Valley flows along the far northwest border of the state through a fertile agricultural region. Fargo-Moorhead and Grand Forks-East Grand Forks are the cultural and commercial centers of the valley. Vernacular and Queen Anne farmhouses are found in the Red River Valley.

Numerous historic-era lodges, resorts, and campgrounds are found in the northern part of the state. Northern Minnesota also has several scenic byways, which are dotted by small towns.

### 3.3.2 STATE OF NORTH DAKOTA

Architectural styles of historic structures and districts vary widely across the large are encompassed by this study. As North Dakota is a rural, agriculturally dependent state the majority of types of historic resources embraced by the project will likely be associated with farms and ranches. In the 1920s, North Dakota like other agricultural areas experienced economic failure and a decade-long draught. During the Great Depression of the 1930s, numerous Federal relief construction work programs were initiated in the state resulting in projects located in the area of the project. Two main stylistic tendencies, the Art Deco and WPA-Rustic, characterize most Depression-era architecture in North Dakota. One of the prominent historic industries in the state is the extraction industry (e.g. lignite), examples of which can be found in the project boundaries.

North Dakota's earliest industries were fur trading and agriculture. Nearly ninety percent of its land area is agricultural, which is reflected in the study area. Historic resources found in the study area will be associated with homesteads and the state's agricultural heritage. Grand Forks and Minot are the largest cities in the study area. Minot was founded in 1886 during the construction of the Great Northern Railway. Grand Forks was historically dependent on local agriculture and quickly expanded after the railroad's construction. These two cities hold the widest range of architectural styles in the study area spanning the period from ca. 1870 through the mid-twentieth century.

The northern part of North Dakota contains several scenic byways and backways. The Rendezvous Region Scenic Backway in northeastern portion of the state features historic and natural sites along the winding Pembina River. The Gingras Trading Post State Historic Site preserves the 1840s home and trading post of Métis legislator and businessman Antoine Blanc Gingras, northeast of Walhalla, Pembina County. The Turtle Mountain Scenic Byway in the north west-central part of the state passes farmsteads, pasture land, prairie, lakes, and wildlife and nature areas. A mill (Danish Mill) used by farmers to grind grains in the northwest region was constructed 1902 on a homestead eleven miles north of Kenmare.

### 3.3.3 STATE OF MONTANA

The study area in Montana embraces portions of three distinct ecological regions which include the following: grasslands of the east; high plains and isolated mountains of the central region; and rugged mountains and forested ridges of the west. Montana's distinctive geography, climate, and resources have shaped a varied history and culture in each region. A section of the Lewis and Clark Trail and its associated historic sites are located in the study area along the Missouri River and in northwestern Montana. In the 1830s, trading posts and missions began to raise cattle in Montana.

By the 1880s, all of the Montana's industries boomed (i.e. railroads, mines, smelters, logging, lumber, open range cattle raising). Montana's development corresponded with the country's westward expansion and the construction of railroad in the late nineteenth century. Historic ranches typically consisted of large homesteads with log structures, associated resources, and ranges. Numerous boom towns in the state which formed from mining and cattle industries diminished in the first half of the twentieth century. Remnants of these so called ghost towns are found across the state. From 1909 to 1917, Montana experienced a population surge with the arrival of homesteaders from Missouri, Pennsylvania, and Minnesota. Homesteaders brought generations of agricultural knowledge and transformed the landscape of the plains. Farms were established and small communities developed. School buildings and community halls were constructed. Other community establishments included volunteer fire departments and cooperatives. School buildings were often the first public building constructed in Montana towns in all settings (i.e. booming mining towns, rural ranching communities, prosperous merchant cities) and served as the central meeting place for social functions.

Missoula and Great Falls are the largest cities in the study area. Most of the communities in the Montana study area are located on U.S. Route 2, the primary east-west road across the northern portion of the state, and the smaller state and county roads off of this main transportation corridor. Northwestern Montana contains Glacier National Park as well as Flathead, Kaniksu and Lolo National Forests. Glacier National Park consists of over one million acres along the International Border; it is the National Park in the Montana section of the study area. Historic hotels and chalets in the park were constructed by the Great Northern Railway and are listed as National Historic Landmarks. A total of 350 locations in the park are listed on the National Register of Historic Places. The park also has several National Register Listed Ranger Station Historic Districts such as the Belly River Ranger Station Historic District.

## 3.4 WOR REGION

### 3.4.1 STATES OF WASHINGTON AND IDAHO

Historic property types include are categorized in Washington and Idaho under Contact and Exploration, Frontier Transportation, Agriculture, Industry and Manufacturing, Commerce and Trade, Domestic, Government, and Social and Cultural. During the Contact and Exploration period in the inland areas of Washington and northern Idaho, early traders often followed well-established overland routes and interacted with Native peoples of the region, sometimes establishing semi-permanent occupation sites that could include cabins as well as caches and storage structures. During this period any building construction most likely consisted of logs either laid horizontally or in the Hudson’s Bay Style with vertical log posts and horizontal log infill mortised to uprights. Property types relating to early exploration of the region include both temporary camps that would likely have only archaeological components and semi-permanent occupation sites that may consist of above-ground contributing resources such as caches, sheds or wooden shelters.

In the frontier period, fur trade companies erected a number of forts and smaller outposts to conduct the trade and provide a base of operations for employees. Missionaries sometimes built mission complexes at strategic locations. Semi-permanent and permanent occupation sites are property types that could include forts, trading posts, cabins and missions as well as associated storage, domestic and food-processing structures. Property types associated with the American Boundary Commission’s survey and marking of the border along the 49th parallel include temporary camp sites as well as markers, stone cairns and other transportation features.

The development of various transportation networks brought new settlement to Washington and Idaho and ultimately encouraged the growth of industry and commerce as improved water routes, roads and rail lines connected the region to the outside world. Property types in this section are divided into modes of transportation that correspond to travel by water, land and air. These categories are further subdivided, when appropriate, by the functions of construction (processes and equipment required to produce the transportation feature), engineering (the product of construction) and operation (features associated with use or continued operation of the transportation mode).

Agricultural property types reflect the environmental and geographic conditions that dictate the kinds of farming, grazing or other agricultural activities taking place in a specific area. Property types related to this theme include animal husbandry, grazing, and crop production properties as well as storage, processing and maintenance facilities associated with agricultural pursuits. Among the prominent features of animal-related agricultural properties are barns, corrals, birthing sheds and small animal pens. Grazing properties may include stock driveways, holding pens and chutes, fencing and pastures as well as salting areas. Contributing to crop-related properties are fields, orchards, gardens and fences. Storage properties are represented by barns, hay sheds, silos, granaries, and milk houses, while smokehouses and stills are examples of common processing properties. In addition, irrigation systems are a type of agricultural property prevalent in the arid and semi-arid portions of the region and contributing features may include dams, reservoirs and pump facilities as well as systems of ditches, canals, flumes and pipes. Many of these agricultural property types may also be associated with domestic buildings and structures such as dwellings, privies or other outbuildings that frequently characterize small farmsteads or independently run agricultural operations.

The early economies of Washington and Idaho relied on logging and mining as their primary industries, although fish and grain processing, concrete manufacturing and energy production were among a number of other industries that made use of the region's rich natural resources. Properties for each of these industries can be related to extraction, processing, maintenance, storage, and manufacture. A number of coastal cities as well Spokane in the interior became commercial centers not only for regional but also international trade. Towns of all sizes also developed commercial districts that provided retail, supply and storage facilities. Historic property types associated with commerce and trade include retail, wholesale, and professional properties as well as organizational and storage facilities

Early settlement in Idaho and Washington focused on river drainages and coastal lowlands, but generous land laws also encouraged claims in more remote areas and early dwellings were often built as a requirement for "proving up" on these properties. Many towns grew on transportation routes or were built by companies for their workers, and as cities grew, neighborhood development was often based on a variety of socio-economic factors. Domestic property types in the PEIS project area include single-family and multiple-occupancy dwellings as well as hotels, institutional housing and camps.

Various levels of government have affected life in the Northern Border PEIS project area and played a role in military defense, resource management, infrastructure development and political organization. Historic property types associated with the government's military functions include fortifications, battle sites, and arms storage as well as naval, air, coast guard and army facilities. Resource management functions are related to the operation of national parks, national forests, wildlife refuges and other public lands managed by federal, state and local governments.

Historic property types include administrative facilities, fire protection facilities, maintenance and work facilities, recreational facilities, interpretive features and landscape features. Among the property types associated with infrastructure development are post offices, custom houses, correctional facilities, fire protection facilities and public works, which are represented by generating plants, sewer systems, and dam sites as well as other types of features.

Social and cultural properties are broadly defined to include a range of types related to organizations, recreation, health, culture, education, religion and funerary practices as well as the contributions of the region's diverse population groups. Historic property types associated with social activities include organization facilities with contributing features such as meeting halls, clubhouses and civic facilities.

# 4 PALEONTOLOGIC RESOURCES

This Paleontological Identification section describes potential paleontological resources located in the northern border study area. This area includes the following states: Washington, Montana, Idaho, North Dakota, Minnesota, Wisconsin, Michigan, Ohio, Pennsylvania, New York, Vermont, New Hampshire, and Maine. The Paleontological Study Area (PSA) includes a 100-mile-wide zone along the northern border. While most paleontological studies focus on the most detailed information available, this study attempts to give a broad but useful overview of the paleontologically sensitive geological units by state.

Background research conducted for this study consisted of a literature and map review and a generalized fossil locality search. Most paleontological investigations commonly use a scale of 1:24,000 to describe the paleontological sensitivities of geological units. For the purpose of this study, such a resolution is not feasible. This research identified the geologic units at a scale of 1:25,000,000 and the types of fossils in geologic units that may be within or adjacent to the study area (see Figures H-12 through H-20). Creating a paleontological overview at the above scale has been a major challenge for paleontology and geology alike.

A research platform for creating a nationwide database, PaleoPortal is maintained by the University of California Museum of Paleontology (UCMP) and is the result of collaboration between UCMP, the Paleontological Society (PS), the Society of Vertebrate Paleontology (SVP), and the U.S. Geological Service (USGS). It gives access to dozens of museum-collection databases and records of fossil finds throughout the United States in correlation with geological maps by the USGS. The information presented in this document relies heavily on the peer-reviewed texts within the PaleoPortal platform (PaleoPortal, 2010).

Within the PSA four major geological groups were identified: sedimentary rocks, volcanic rocks, plutonic rocks, and metamorphic rocks. Of these rock groups, only sedimentary rocks have a high or moderate potential for containing paleontological materials. Both plutonic and volcanic rocks rarely contain fossils because igneous environments are not suitable for living things. Metamorphic rocks rarely contain fossils because the conditions of metamorphism tend to alter the texture of the rocks and destroy any fossils contained within. Consequently, only sedimentary units will be considered for the purpose of this study. Metamorphic or igneous rocks are mentioned in the rare cases when they do contain fossils.

## 4.1 PALEONTOLOGICAL SENSITIVITY

Paleontological resources include fossil plants and animals and other evidence of past life such as preserved animal tracks and burrows. The paleontological sensitivity of a geologic unit is determined by its potential to contain paleontological resources (SVP, 1995). The paleontological sensitivity of a geologic unit may be classified according to SVP guidelines (SVP, 2010) as follows:

High Potential - Rock units are considered to have a high potential for containing significant, nonrenewable, fossiliferous resources if vertebrate or significant invertebrate fossils or significant suites of plant fossils have been recovered. These units include, but are not limited to, sedimentary and volcanic formations that contain significant nonrenewable paleontological resources and sedimentary rock units temporally or lithologically suitable for the preservation of fossils. Sensitivity comprises both of the following: 1) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils that are large or small, vertebrate, invertebrate, or botanical, and 2) the importance of recovered evidence for new and significant taxonomic, phylogenetic, ecologic, or stratigraphic data. Areas that contain potentially datable organic remains older than recent and areas that may contain new vertebrate deposits, traces, or trackways are also classified as significant.

Undetermined Potential - Specific areas underlain by sedimentary rock units for which little information is available are considered to have undetermined fossiliferous potentials. Field surveys by a qualified vertebrate paleontologist to specifically determine the potentials of the rock units are required before mitigation programs to reduce impacts can be developed.

Low Potential - Reports in the paleontological literature or field surveys by a qualified vertebrate paleontologist may allow determination that some areas or units have low potentials for yielding significant fossils. Such units will be poorly represented by specimens in institutional collections. These deposits generally will not require protection or salvage operations (SVP, 2010).

The SVP identifies vertebrate fossils, their taphonomic and associated environmental data, and fossiliferous deposits as significant, nonrenewable, paleontological resources. Botanical and invertebrate fossils and assemblages may also be considered significant (SVP, 1995). Due to the rarity of fossils and the scientific information they provide, a paleontological resource can be considered significant (Scott and Springer, 2003) if the resource does any of the following:

- Provides data on the evolutionary relationships and developmental trends among organisms, both living and extinct;
- Provides data useful in determining the age(s) of the geologic unit or stratigraphy, as well as timing of associated geological events;
- Provides data on a community level;
- Demonstrates unusual or spectacular circumstances in the history of life; and/or,

Is not abundant or found in other geographic locations and may be in danger of being depleted or destroyed by the elements or by vandalism.

Paleontological resources must be evaluated to determine if any of the criteria above are applicable. Proper identification of paleontological resources is often difficult in the field; therefore, the recovery, preparation, and analysis of paleontological resources are necessary to determine their significance. This process must be done by, or under the supervision of, a qualified paleontologist (SVP, 1995). Microvertebrate fossils are generally not visible to the naked eye; although initial sifting may be conducted in the field, analysis for microinvertebrates requires laboratory processing of bulk samples from paleontologically sensitive geologic units (SVP, 1995; Scott and Springer, 2003).

## 4.2 PALEONTOLOGICAL RESOURCES WITHIN THE STUDY AREA

The following paragraphs describe only the geological units with a potentially high paleontological sensitivity within the PSA. Geological-mapping units are indicated with respect to the geological study-area maps at the end of this section. Multiple paleontologically sensitive geological units within the PSA do not occur on these maps due to the previously described selection of a large-scale resolution for the PSA. Generalized geological units and a PSA summary for each state are described below. The order in which the paleontologically relevant geologic ages occurred is found in Figure H-12.

**Figure H-12. Geologic Timeline for Eons, Eras, and Periods Important to the Paleontologic Resources of the Northern Border**

| EON | ERA | PERIOD | | MILLION YRS AGO |
|---|---|---|---|---|
| PHANEROZOIC | CENOZOIC | Quaternary | | 0.01 |
| | | Tertiary | Neogene | 5.3 |
| | | | Paleogene | 55.8 |
| | MESOZOIC | Cretaceous | | 65.5 |
| | | Jurassic | | 146 |
| | | Triassic | | 200 |
| | PALEOZOIC | Permian | | 252 |
| | | Carboniferous | Pennsylvanian | 299 |
| | | | Mississippian | 318 |
| | | Devonian | | 359 |
| | | Silurian | | 416 |
| | | Ordovician | | 444 |
| | | Cambrian | | 488 |
| PRECAMBRIAN | PROTEROZOIC | | | 542 |
| | ARCHEAN | | | 2,500 |
| | HADEAN | | | 4,500 |

### 4.2.1 NEW ENGLAND REGION

#### 4.2.1.1 Maine

Summary

Paleontologically sensitive geological units in Maine's PSA include Paleozoic and Cenozoic deposits. Fossiliferous Paleozoic deposits have been destroyed by metamorphism associated with *orogenies*, or mountain-building events, within the southern portion of the PSA only. In all other areas, the Paleozoic deposits are intact. Paleozoic deposits represent sea-level fluctuations and include habitats ranging from nearshore to deepwater. Fossils from these geological units include numerous invertebrates. Cenozoic deposits consist of retreating glacial deposits containing many different plant and large-vertebrate fossils.

Quaternary - Quaternary glaciation peaked in Maine nearly 20,000 years ago, leaving the state covered with a thick layer of ice. The weight of the overriding glaciers had temporarily depressed the crust, allowing the sea to flood areas far inland, and glacial clay was deposited on the seafloor. Common fossils include clams, snails, and barnacles, although mammoth, walrus, and seal remains have also been found (Churchill-Dickson, 2010).

Devonian - The fossiliferous deposits in Maine from this time represent a variety of habitats. Nearshore marine settings were dominated by brachiopods, although bivalves, corals, crinoids, conodonts, gastropods, ostracods, and trilobites have also been found. Fully terrestrial habitats existed as well, and fragmented plant fossils have been preserved in a few rock units (Churchill-Dickson, 2010).

Silurian - Common nearshore fauna of this time period included brachiopods, corals, bivalves, conodonts, gastropods, ostracods, trilobites, and stromatoporoids. Graptolites, trace fossils, and some brachiopods dominate the deepwater deposits (Churchill-Dickson, 2010).

Ordovician - All fossil-bearing deposits in Maine were formed in the marine realm and represent habitats ranging from nearshore to deepwater basins. The nearshore fauna are dominated by brachiopods but also contain snails, trilobites, corals, and clams. Graptolites and rare occurrences of brachiopods, trilobites, and conodonts are found in the deeper-water deposits (Churchill-Dickson, 2010).

Cambrian - Maine has a few deepwater fossils from this time (Churchill-Dickson, 2010).

Precambrian - During the Precambrian, Maine did not yet exist. The first parts of Maine were not assembled until the Ordovician, when ancient landmasses were accreted to North America during a mountain-building event. Preserved in a few places are Late Precambrian sediments that were likely deposited in deep water and that contain a few trace fossils (Churchill-Dickson, 2010).

### 4.2.1.2 New Hampshire

Summary

Paleontologically sensitive geological units in New Hampshire's PSA include only a very small area in the north of the state. These paleontologically sensitive units are only of Cenozoic age because metamorphism associated with the orogenies destroyed or altered any sediments formed during Paleozoic times. Cenozoic deposits consist of retreating glacial deposits containing many different plant and large-vertebrate fossils.

Quaternary - During much of the Quaternary, thick sheets of ice covered New Hampshire, and after the glaciers melted, the present sea level was reached approximately 3,000 to 5,000 years ago. The fossil evidence of plants and pollen from Pleistocene sediments in New Hampshire indicate that species of herbs and sedges, spruce, balsam poplar, willow, and dwarf birch trees grew in the area when the ice sheets periodically retreated (Springer, 2008a).

Devonian - During an episode of mountain building, igneous rocks were formed and older rocks were metamorphosed. These igneous and metamorphic rocks contain no fossils (Springer, 2008a).

Silurian - Rocks of this time interval are metamorphic and igneous and do not contain fossils (Springer, 2008a).

Ordovician - Rocks of this time interval are entirely metamorphic and igneous and do not contain fossils (Springer, 2008a).

Cambrian - There are no fossils in the few rocks in New Hampshire that may be of Cambrian age (Springer, 2008a).

Precambrian - Precambrian rocks in New Hampshire are predominantly metamorphic; no fossils are found in them (Springer, 2008a).

### 4.2.1.3 Vermont

Summary

Paleontologically sensitive geological units in Vermont's PSA include Paleozoic and Cenozoic deposits. Paleozoic deposits containing fossils are sparse in Vermont, and metamorphism associated with the orogenies destroyed or altered any sediments formed at this time. Paleozoic sediments include sandstone, siltstone, and mudstone and contain bryozoans, brachiopods, cephalopods, gastropods, sponges, and trilobites. Cenozoic deposits consist of Pleistocene glacial deposits containing large-vertebrate fossils.

Quaternary - During much of the Quaternary, a thick sheet of ice covered Vermont. The weight of the ice depressed the surface of the land, allowing ocean waters to infiltrate the lakes of this region. In westernmost Vermont, fossils in lake deposits indicate that the salinity fluctuated as lake waters mingled with ocean water entering through the St. Lawrence River to the north. As the glaciers melted, the land was able to rebound in elevation, building a barrier to the ocean so that freshwater-lake conditions returned. Sediments left by the melting ice can be found in many areas. Mastodons, ground sloths, and saber-toothed cats roamed the PSA (Mehrtens, 2008).

Silurian - Most rocks of Silurian age were metamorphosed during later tectonic activity, and few marine fossils are found in them (Mehrtens, 2008).

Ordovician - Tropical seas in Vermont were rich in marine life, including the some of the first corals as well as bryozoans, brachiopods, cephalopods, gastropods, sponges, and trilobites (Mehrtens, 2008).

Cambrian - Tracks and trails of trilobites are common in the muddy and sandy shoreline sediments deposited during this time (Mehrtens, 2008).

Precambrian - Precambrian rocks in Vermont are mostly metamorphic and do not contain any fossils (Mehrtens, 2008).

### 4.2.2 GREAT LAKES REGION

#### 4.2.2.1 New York

Summary

Paleontologically sensitive geological units in New York's PSA include predominantly Paleozoic and Cenozoic deposits. Paleozoic deposits represent a fast-rising and then eventually falling sea level. Fossils of trilobites, brachiopods, clams, and other marine organisms can be found in these rocks. Other geological units within the PSA represent early deltas that contained small-forest and other plants. Cenozoic deposits consist of Pleistocene glacial deposits, such as terminal and lateral moraines, containing large-vertebrate fossils.

Quaternary - Glacial deposits across New York and the northeastern United States record the movements of enormous ice sheets. The ice sheets helped to shape the landscape of New York, scraping off loose rock materials, gouging the bedrock beneath the ice as it advanced, and scouring river valleys. The Finger Lakes are a famous example of New York lakes formed by glacial scouring. Mammoths and mastodons roamed the landscape (Picconi, 2006). Fossil mastodons, bison, and other mammals may be found where unconsolidated deposits vary near the surface. Freshwater snail and clam fossils occur along old drainage systems (RASNY, 2010).

Carboniferous - Thick accumulations of peat were compressed over time and transformed into layers of coal. This geological unit is not known to contain fossils (Picconi, 2006).

Devonian - The most fossiliferous limestones include coral reefs and inter-reef deposits of shallower bottoms; deeper-water limestones contain abundant chert (flint) nodules. Relatively clear waters over the shallower shelf favored a profusion of brachiopods, bryozoans, corals, crinoids, and trilobites. Mollusks were more prominent east of the foreland basin (closer to shore) where silts and sands accumulated under more turbid waters (RASNY, 2010).

Silurian - With a changing sea level in the Silurian, the inland ocean covering western New York became extremely shallow, and circulation was poor (Picconi, 2006). Trace fossils, occasional brachiopods, nautiloids, and even rare jellyfish imprints may be found. Near the end of the Silurian, the sea became deeper but apparently remained very salty, and the shallowest areas were home to a strange fauna dominated by eurypterids (RASNY, 2010).

Ordovician - During the Early Ordovician, the rocks formed in New York were predominantly limestone and dolostone. Toward the end of the Ordovician, volcanic islands formed along a subduction zone between North America and Western Europe. Fossils from this time include trilobites, graptolites, and bryozoans (Picconi, 2006).

Cambrian - Early during the Late Cambrian, global sea level rose, flooding New York with a shallow sea. Sedimentary rocks were formed from sand, silt, and clay deposited in this sea (Picconi, 2006). The fossil record is scarce from this time period but includes numerous records of trilobites (Bassett et al., 1976).

Precambrian - The Grenville Mountains formed during the Precambrian as North America collided with an ancient supercontinent and the sandstone, shale, and limestone deposited earlier were squeezed and pushed up onto the margin of the early North-American continent. The intensity of the collision metamorphosed the rocks as follows: 1) sandstone became quartzite, gneiss, or schist; 2) limestone became marble; and 3) shale became gneiss and schist. These rocks are the oldest found in the PSA. The Precambrian fossil record in these rocks consists predominantly of bacteria or microfossils (Picconi, 2006).

#### 4.2.2.2 Pennsylvania

Summary

Paleontologically sensitive geological units in Pennsylvania's PSA include predominantly Paleozoic and Cenozoic deposits. Paleozoic deposits range from shallow marine deposits that contain limestone and mudstones to terrestrial sandstone deposits. Inscribed in the Cenozoic deposits of the PSA is also the continental collision of Gondwana. Fossils include many different marine forms, such as trilobites, and terrestrial deposits such as scale trees and ferns. Cenozoic deposits include glacial deposits containing large-vertebrate fossils.

Quaternary - Ice sheets covered much of the PSA during the Late Quaternary. Sediments left by the melting ice can be found in many areas. Mastodons, ground sloths, and saber-toothed cats roamed most of the state. Fossils of plants, such as willow and sedge, help paleontologists decipher the complex climatic history of Pennsylvania during the Quaternary (Springer, 2008b).

Jurassic – Jurassic-era deposits are found in Pennsylvania but not within the PSA (Springer, 2008b).

Triassic – Triassic-era deposits are found in Pennsylvania but not within the PSA (Springer, 2008b).

Permian - Since the Permian was primarily a time of erosion in the state, few outcrops of this age have been identified. However, ostracods and a few tiny fish teeth have been recovered (Springer, 2008b).

Carboniferous - Vast swamps developed in the lowland areas, and enormous amounts of plant matter accumulated, making the fossil record of today (Springer, 2008b).

Devonian - The muddy sea floor of Pennsylvania was home to brachiopods and tall, flower-like crinoids (Springer, 2008b).

Silurian - Colonial corals flourished on the limy sea floor as did bryozoans, brachiopods, and tiny ostracods (Springer, 2008b).

Cambrian - A shallow sea rose to cover the state, and sediments eroding off the land formed a sandy sea floor inhabited by trilobites, brachiopods, and other marine organisms. Cambrian rocks contain stromatolites typical of a shallow-water environment (Springer, 2008b).

#### 4.2.2.3 Ohio

Summary

Paleontologically sensitive geological units in Ohio’s PSA include only Paleozoic and Cenozoic sedimentary deposits. Paleozoic deposits ranging from sandstone and siltstone to mudstone reflect changing sea levels. Other sedimentary deposits also include deltas and swamp deposits. Cenozoic deposits represent the massive glacial advances and retreats and contain many different large-vertebrate fossils.

Quaternary - There were massive glacial advances and retreats in Ohio during the Early Quaternary (Pleistocene). The fossil record from these glacial times consists of mammoths, mastodons, ground sloths, giant beavers, and musk oxen (Ausich, 2006).

Permian - Layers of rocks are preserved from this time period and indicate that the area was fully terrestrial. Lakes, rivers, and other habitats dominated the landscape; fossils of ferns and horsetails are common (Ausich, 2006).

Carboniferous - During the Early Carboniferous, sediments from the eroding Appalachian Mountains to the east formed extensive marine deposits of muds and silts. Brachiopods are common fossils of this time. Other fossils include early trees and vines (Ausich, 2006).

Devonian - Shallow tropical seas continued to cover Ohio during the Early Devonian, producing thick deposits of limestones on the sea floor. Fossils of brachiopods, crinoids, trilobites, and placoderms (armored fish) are found in shales formed during this time (Ausich, 2006).

Silurian - Large coral and sponge reefs separated the shallower waters across much of Ohio from the deeper waters of the Michigan Basin to the north and the Appalachian Basin to the east. Corals, brachiopods, and stalked echinoderms are common fossils from these ancient reefs (Ausich, 2006).

Ordovician - Muds from the emerging Taconic Mountains in the northeast were deposited in shallow tropical seas teeming with abundant sea-floor life. Fossils of brachiopods, bryozoans, corals, and crinoids are common in the Ordovician rocks in southwestern Ohio (Ausich, 2006).

### 4.2.2.4 Michigan


Summary

Paleontologically sensitive geological units in Michigan's PSA include some of the oldest known fossils from the Precambrian, including filamentous algae. Most parts of the PSA are covered with Paleozoic-age rocks representing shallow, tropical seas as well as nearshore coal-forming swamps. Other deposits consist of Cenozoic glacial deposits containing large-vertebrate fossils.


Quaternary - There are abundant Quaternary glacial deposits in Michigan. Glaciers up to a mile thick advanced over Michigan at least four times during the Early Quaternary (Pleistocene), carving out the Great Lakes and sculpting the present-day landscape of lakes, hills, and swamps. Fossils from this time include freshwater clams, snails, fish, amphibians, and birds as well as mammals such as mammoths, mastodons, musk oxen, and giant beavers (Brandt, 2006).

Carboniferous - The shallow seas that had covered Michigan left behind invertebrate marine fossils such as crinoids, blastoids, clams, and corals. Plants dominate the fossil record of this time period (Brandt, 2006).

Devonian - Fossils are particularly abundant in the rocks of this time and include trilobites, many species of brachiopods, cephalopods, snails, crinoids, and *Hexagonaria*, the coral more commonly known as the Petoskey Stone, Michigan's state rock. The vertebrates are represented by fossilized plates of armored fish (Brandt, 2006).

Silurian - Coral reefs grew around shallow seas in Michigan. Fossils of this period include corals, bryozoans, crinoids, trilobites, brachiopods, clams, snails, and cephalopods (Brandt, 2006).

Ordovician - North America was positioned over the equator, and a shallow sea in Michigan was host to a diverse, tropical marine fauna dominated by brachiopods, trilobites, crinoids, and corals (Brandt, 2006).

Cambrian - Because North America was situated over the equator at this time, the climate was tropical, and invertebrate marine organisms such as trilobites and brachiopods proliferated (Brandt, 2006).

Precambrian - Some of the oldest rocks in North America are within the PSA. These metamorphic and igneous rocks are the remnants of mountain ranges raised during the Precambrian collision of landmasses that formed the beginnings of the North American continent. Partially metamorphosed sedimentary rocks contain fossil evidence of the earliest eukaryotes (organisms whose cells have a nucleus), a filamentous alga (Brandt, 2006).

#### 4.2.2.5 Wisconsin

Summary

Paleontologically sensitive geological units in Wisconsin's PSA include Paleozoic sandstone, siltstone, and mudstone representing shallow-sea environments. A large range of marine life from brachiopods to sharks as well as soft-bodied fossils has been found. Other deposits are of Cenozoic age and represent glacial deposits containing wooly mammoth and other large-vertebrate fossils.

Quaternary - During the Quaternary, massive glacial ice sheets influenced North America, and nowhere are their effects more striking than in Wisconsin. Glaciers deposited large boulders called erratics, created drumlins, gouged bedrock, and formed the scenic landscapes comprising moraines, eskers, and kettle lakes of today's Wisconsin. Animals adapted to a cold climate mark the fossil record of this time, such as the wooly mammoth, large beaver, and horses. Fossils of seal, walrus, and whale are found along the Great Lakes (Barreto, 2005).

Ordovician - A shallow sea covered Wisconsin, and sediments representing the nearshore environment contain fossils of colonial corals, bryozoans, and cephalopods (Barreto, 2005).

Cambrian - Wisconsin had a tropical climate and was covered by a shallow sea teeming with diverse life forms. Fine-grained sediments eroding from adjacent landmasses settled on the sea floor. The deposits of sandstone and shale preserve the remains and traces of intriguing ancient sea life and thin-shelled brachiopods. Studying Wisconsin's Cambrian fossil record reveals many mysteries of early evolution, ancient ancestors, and bizarre experimental life forms that left no living descendants (Barreto, 2005).

Precambrian - The earliest history of Wisconsin is recorded by ancient rocks of Precambrian age, but they do not contain fossils (Barreto, 2005).

### 4.2.3 EAST OF THE ROCKIES REGION

#### 4.2.3.1 Minnesota

Summary

Paleontologically sensitive geological units in Minnesota's PSA include predominantly Precambrian and Cenozoic deposits. Banded iron formations and stromatolites mark Precambrian deposits. Paleozoic deposits consist of tropical sandy coastline and shallow marine deposits. Limestone and dolostone are common from this age. Cenozoic deposits include mostly glacial deposits containing mastodons, mammoths, musk ox, and other large mammals.

Quaternary - The alternating advance and retreat of glaciers dominated the Quaternary of Minnesota. The glaciers left behind thick blankets of muddy sediment, as well as sand and gravel carried by streams formed from melting glacial ice. Enormous lakes formed south of the retreating ice sheets and streams flowing out of these lakes carved the major river valleys that we see in Minnesota today. Mastodons, mammoths, musk ox, and other large mammals roamed the Quaternary landscape (Runkel, 2006).

Cretaceous - A northeastern extension of the Western Interior Seaway frequently covered much of Minnesota during this time. A muddy coastline gave way to a shallow sea floor that was home to oysters, clams, ammonites, and crocodiles (Runkel, 2006).

Devonian - During the Devonian, a shallow sea covered parts of Minnesota. Within these waters, the skeletons of marine organisms slowly accumulated and contributed to the limy sediments on the sea floor. These sediments eventually formed limestone with a rich fossil record (Runkel, 2006).

Ordovician - A shallow, tropical sea covered most of Minnesota during the Ordovician and, at times, may have flooded the entire state. For much of this period, the skeletons of marine organisms accumulated and contributed to the limy sediments on the sea floor. Early in the Ordovician, microbial organisms that formed stromatolites and microbial mats dominated the sea. Later in Ordovician time, "shelly" fossils were most common, chiefly bryozoans, brachiopods, crinoids, and mollusks (Runkel, 2006).

Cambrian - The sediments that were deposited in the warm, shallow sea were mostly sandy and contain a record of life dominated by trilobites, brachiopods, and strange, shelled organisms called hyoliths (Runkel, 2006).

Precambrian - Sedimentary structures formed by the activity of bacteria, such as stromatolites, are common in Precambrian rocks. These fossils are typically primitive, single-celled organisms (Runkel, 2006).

#### 4.2.3.2 North Dakota

Summary

Paleontologically sensitive geological units in North Dakota's PSA consist predominantly of Mesozoic and Cenozoic deposits. Paleozoic deposits only exist in the PSA in the most eastern part of the state. Paleozoic deposits represent fluctuating sea levels with large assemblages of different marine invertebrates. Mesozoic deposits are predominantly of shallow marine origin and include many fishes, reptiles, and birds. Cenozoic deposits range from subtropical, swampy lowlands to glacial deposits.

Quaternary - Glaciers flowed across the northeastern two-thirds of North Dakota during the Quaternary, and debris deposited by the melting ice still covers much of the surface. Fossils of mastodons, mammoths, horses, bison, giant ground sloths, and camels have been recovered from Quaternary deposits in the state (Springer, 2006a).

Tertiary - Most of North Dakota was above sea level during the Tertiary, and volcanic ash deposits became layers of bentonite clay interbedded with the river and lake deposits derived from erosion of the rising Rocky Mountains. Fossils of freshwater mollusks, titanotheres, crocodile-like champsosaurs, and primitive trees such as sequoia, bald cypress, magnolia, and ginkgo can be found in these rocks (Springer, 2006a).

Cretaceous - During the Cretaceous, North Dakota was either completely or partially covered by a warm, shallow sea called the Western Interior Seaway. Fine-grained sediments, mostly silt and clay, were deposited on the seafloor. Entombed in these rocks are fossils of marine reptiles as well as sharks, rays, ratfish, birds, and numerous marine invertebrates (Springer, 2006a).

Jurassic - Fossils of gastropods, bivalves, echinoderms, and foraminifera are found in Jurassic rocks of North Dakota (Springer, 2006a).

Triassic - North Dakota's Triassic rocks are not commonly exposed at the surface, but information about them comes from drill cores (Springer, 2006a).

Silurian - Corals, trilobites, and other invertebrates inhabited the shallow, subtropical seas. Near the end of the Silurian, the seas receded, and karst topography developed on the eroding land surface. Silurian rocks are exposed at the surface only in a small area in the northeastern part of the state (Springer, 2006a).

Ordovician - Diverse assemblages of invertebrate animals including corals, cephalopods, trilobites, brachiopods, bryozoans, and graptolites inhabited the shallow marine environments. Ordovician rocks are exposed at the surface only in a small area at the eastern edge of the state (Springer, 2006a).

Cambrian - The most abundant fossils in Cambrian rocks are those of conodonts, but there are also remains of brachiopods and trilobites. Cambrian rocks are not exposed at the surface, but information about them comes from drill cores (Springer, 2006a).

#### 4.2.3.3 Montana

Summary

Paleontologically sensitive geological units in Montana's PSA consist predominantly of Precambrian, Cretaceous, and Tertiary sedimentary units. Precambrian sedimentary units include shallow-sea stromatolites and trace fossils. Paleozoic deposits are from warm and shallow marine waters that created a thin blanket over almost all of Montana. Mesozoic deposits are of terrestrial and tropical marine origin. The Cenozoic marks the retreat of the ocean and the onset of a colder period. Deposits from the Cenozoic thus range from those of tropical, shallow seas to glacial deposits.

Quaternary - Quaternary deposits are found primarily in the western regions of the state (Varricchio, 2006). During the Quaternary, the climate became increasingly wetter, and this wetness invigorated streams that began to carve deep valleys into the plains of Montana. Glaciers carved out serrated rows of jagged mountain peaks and flattened the northern third of the state. Several large, ice-dammed lakes occupied much of the state as well. Mammoths, dire wolves, and musk ox roamed the regions to the front of the ice sheets.

Tertiary - Tertiary vegetation varied significantly as climates alternated between wet and dry intervals. Large titanotheres, dogs, and other mammals mark the fossil record for the Tertiary in northern Montana (Varricchio, 2006).

Cretaceous - The Cretaceous was a geologically active time in Montana, and the western part of the state experienced mountain building and episodes of violent volcanism. Climates were warm, with wetter conditions near the coast and seas that existed in Montana at that time and seasonally arid ones in the shadow of the mountains. Terrestrial ecosystems supported a wide diversity of plants and animals, such as many dinosaurs including one of the most famous, *Tyrannosaurus rex* (Varricchio, 2006).

Jurassic - Warm, shallow seas covered much of Montana throughout most of the Jurassic. Small, sluggish rivers carried terrestrial sediments to the east and northeast, forming a low coastal plain. Montana's oldest dinosaur fossils are found among ferns (Varricchio, 2006).

Triassic - A hot, arid landscape stretched across Montana throughout most of the Triassic. Fossils from marine rocks include brachiopods and ammonites (Varricchio, 2006).

Carboniferous - For most of the Early Carboniferous, warm marine waters ranging from deep to shallow covered the state. The diverse marine fauna included algae, sponges, worms, arthropods, bivalves, cephalopods, brachiopods, and nearly 100 species of fish. Rainwater dissolved limestones, forming the karst topography seen today in parts of Montana (Varricchio, 2006).

Devonian - The Devonian Period in the PSA recorded a diversity of marine life, including crinoids, sponges, brachiopods, mollusks, and conodonts. Devonian deposits even include plant spores washed or blown in from nearby lands (Varricchio, 2006).

Silurian - Very little remains of any Silurian rocks in Montana due to high rates of erosion in the Devonian, although there are subsurface Silurian rock layers in the eastern third of the state (Varricchio, 2006).

Ordovician – Warm marine waters supported a diversity of algae, crinoids, bryozoans, brachiopods, and corals, and remnants of some of the earliest vertebrates also occur (Varricchio, 2006).

Cambrian - Shallow seas flooded over Montana, and limestones and shales were deposited. When the seas retreated, sandy beach deposits accumulated. Trilobites represent the most abundantly fossilized animals of the time, and their remains are common in many Cambrian rocks from the state.

Precambrian - From about 1.5 billion years ago to 800 million years ago, a thick sequence of sandy and muddy deposits accumulated in the western part of Montana. These sediments represent the west coast of the early North American continent and contain the oldest evidence of life in Montana. Fossils include stromatolites as well as traces left by marine animals crawling along the sea floor (Varricchio, 2006).

### 4.2.4 WEST OF THE ROCKIES REGION

#### 4.2.4.1 Idaho

Summary

Paleontologically sensitive geological units in Idaho's PSA include Precambrian, Paleozoic, Mesozoic, and Cenozoic deposits. Precambrian deposits contain stromatolites and trace fossils. Paleozoic deposits are terrestrial and marine and represent fluctuating sea levels. Mesozoic deposits are shallow marine sedimentary rocks. Cenozoic deposits consist of lake and river deposits as well as retreating glacial deposits containing large-vertebrate fossils.

Quaternary - Quaternary deposits include glacial valley sediments, layers of wind-blown glacial dust. Two hundred species of vertebrates are known from the Quaternary fossils of Idaho. The most common fossils are of mammoths, horses, camels, bison, mountain sheep, ground sloths, rodents, rabbits, birds, snakes, lizards, and fish (Springer, 2006b).

Tertiary - Tertiary river and lake sediments contain fossils of fish, rodents, rabbits, horses, rhinos, camels, pronghorns, oreodonts (sheep-like mammals), and plants (Springer, 2006b).

Jurassic - Outcrops of Jurassic rocks occur only in southern Idaho, not along the northern border (Springer, 2006b).

Triassic - Outcrops of Triassic rocks occur only in southern Idaho, not along the northern border (Springer, 2006b).

Permian - The Permian Phosphoria Formation of eastern Idaho is mined for its rich phosphate deposits and contains fossils of spiral-toothed sharks, fishes, corals, brachiopods, snails, bryozoa, octopus and squid, pelecypods, and ostracods (Springer, 2006b).

Devonian - Late Devonian rocks in Idaho are mostly shallow- to moderate-depth marine sediments. A variety of well-preserved marine fossils in these layers including corals, sponges, gastropods, pelecypods, ostracods, cephalopods, conodonts, and fishes have been found. Scattered river deposits have produced fossils of a variety of primitive fishes (Springer, 2006b).

Ordovician - A shallow sea covered parts of Idaho during the Ordovician, and large, thick deposits of Ordovician marine sediments are known. These deposits contain a variety of fossils including algae, brachiopods, trilobites, ostracods, graptolites, corals, gastropods, sponges, and very large trace fossils (Springer, 2006b).

Cambrian - A shallow sea covered parts of Idaho during the Cambrian. The northernmost outcrops are metamorphosed and yield only a sparse fauna, mostly trilobites and brachiopods (Springer, 2006b).

Precambrian - Slightly to moderately metamorphosed Precambrian sediments can be seen in northernmost Idaho. The only known Precambrian fossils in the state are stromatolites (Springer, 2006b).

### 4.2.4.2 Washington

Summary

Paleontologically sensitive geological units in Washington's PSA include Precambrian rocks; Paleozoic sandstone, shale, and limestone from ancient shorelines; and deep and shallow Mesozoic marine sediments. Cenozoic deposits include shallow marine sandstone and siltstone as well as glacial deposits containing large-vertebrate fossils.

Quaternary - During the Quaternary, glaciers carved the landscape of northernmost Washington and the Puget Sound area in the western part of the state. Larger mammals are represented in Pleistocene deposits by mammoth and mastodon teeth and tusks as well as the bones of giant sloths (Nesbitt, 2010).

Tertiary - Mountain building marks this period in Washington's PSA and many of the rocks formed during this time are igneous. Marine waters covered the state east of the Cascades during part of this time interval. The sedimentary rocks formed in these waters contain fossils of clams, snails, and crabs as well as a high diversity of whales and rare marine birds. Coastal swamps were home to a variety of plant and insect life. Fossil leaves, fruit seeds, flowers, and insects occur in great abundance in some of the rocks formed in these swamps. Footprints and rare teeth indicate that small mammals roamed the landscape (Nesbitt, 2010).

Cretaceous - Mid-Cretaceous marine ammonite and clam fossils are found east of Mt. Baker in the Cascades Range. Fossils of Late Cretaceous ammonites, clams, snails, and marine reptiles occur in the westernmost San Juan Islands, the adjacent Gulf Islands, and Vancouver Island of British Columbia (Haugerud et al., 2009; Nesbitt, 2010).

Jurassic and Triassic - The rocks of the Nooksack terrain include exposures of fossil-rich Jurassic sedimentary rocks on the west side of Mt. Baker. This thick sequence of marine sandstones and dark shales lies over volcanic rocks that were formed in an island arc. Fossils of clams, snails, and ammonites can be found in the black shales. No Triassic fossils have been found in Washington, as most Triassic rocks are volcanic in nature (Nesbitt, 2010).

Ordovician - Exposures of Ordovician slates occur in the northeastern-most corner of Washington. These rocks are metamorphosed shales formed from muds that were deposited in a deep ocean off the west coast of North America. In general fossils are abundant in these rocks; although trilobite fossils are rare (Nesbitt, 2010).

Precambrian - Most of the land that is now Washington State did not exist along the West Coast of North America until the Jurassic. Late Precambrian rocks from the ancient North-American continent extend a few kilometers into easternmost Washington. These rocks show mud cracks, ripple marks, and very rare trace fossils. These units are not paleontologically sensitive (Nesbitt, 2010).

Figure H-13. Geologically Relevant Strata along the Northern Border in Washington and Idaho

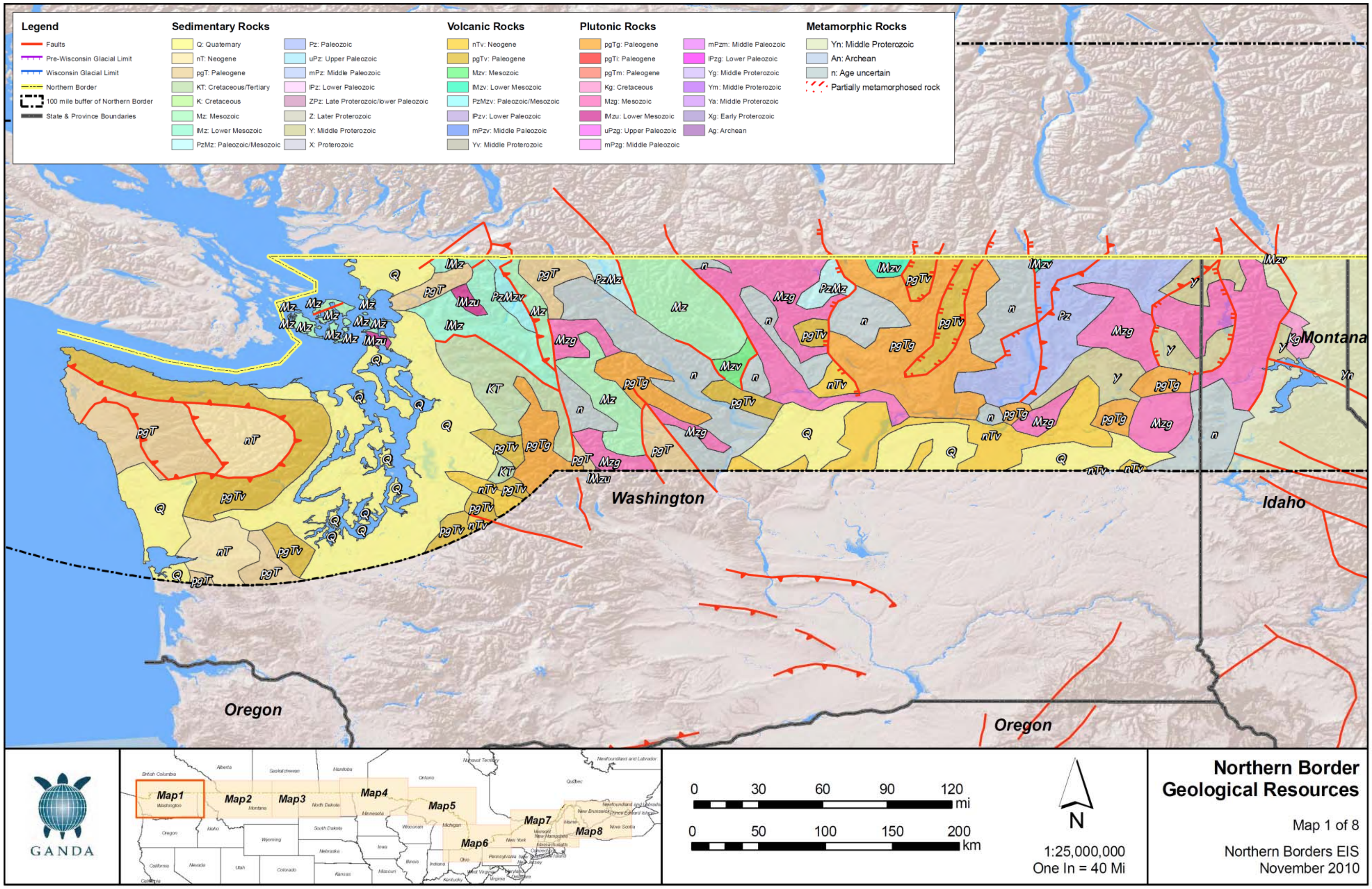
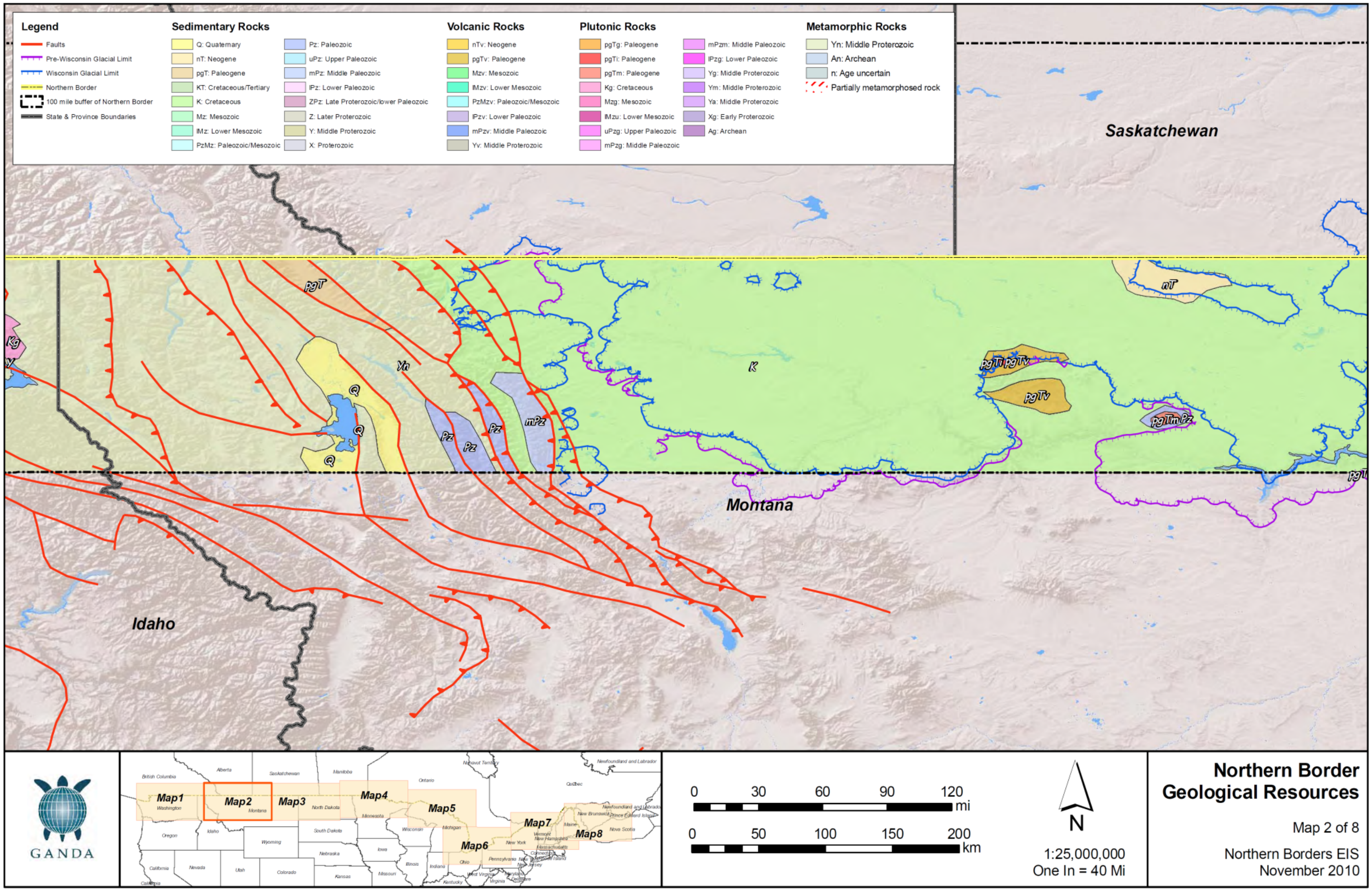



Figure H-14. Geologically Relevant Strata along the Northern Border in Western and Central Montana


Legend
Faults
Pre-Wisconsin Glacial Limit
Wisconsin Glacial Limit
Northern Border
100 mile buffer of Northern Border
State & Province Boundaries
Sedimentary Rocks
Q: Quaternary
nT: Neogene
pgT: Paleogene
KT: Cretaceous/Tertiary
K: Cretaceous
Mz: Mesozoic
lMz: Lower Mesozoic
PzMz: Paleozoic/Mesozoic
Pz: Paleozoic
uPz: Upper Paleozoic
mPz: Middle Paleozoic
lPz: Lower Paleozoic
ZPz: Late Proterozoic/lower Paleozoic
Z: Later Proterozoic
Y: Middle Proterozoic
X: Proterozoic
Volcanic Rocks
nTv: Neogene
pgTv: Paleogene
Mzv: Mesozoic
lMzv: Lower Mesozoic
PzMzv: Paleozoic/Mesozoic
lPzv: Lower Paleozoic
mPzv: Middle Paleozoic
Yv: Middle Proterozoic
Plutonic Rocks
pgTg: Paleogene
pgTi: Paleogene
pgTm: Paleogene
Kg: Cretaceous
Mzg: Mesozoic
lMzu: Lower Mesozoic
uPzg: Upper Paleozoic
mPzg: Middle Paleozoic
mPzm: Middle Paleozoic
lPzg: Lower Paleozoic
Yg: Middle Proterozoic
Ym: Middle Proterozoic
Ya: Middle Proterozoic
Xg: Early Proterozoic
Ag: Archean
Metamorphic Rocks
Yn: Middle Proterozoic
An: Archean
n: Age uncertain
Partially metamorphosed rock
Saskatchewan
Montana
Idaho
pgT
Yn
Q
Pz
mPz
K
nT
pgTi pgTv
pgTv
pgTm Pz
Kg
Map1
Map2
Map3
Map4
Map5
Map6
Map7
Map8
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N
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GANDA
Northern Border
Geological Resources
Map 2 of 8
Northern Borders EIS
November 2010

**Figure H-15. Geologically Relevant Strata along the Northern Border in Eastern Montana and Western and Central North Dakota**

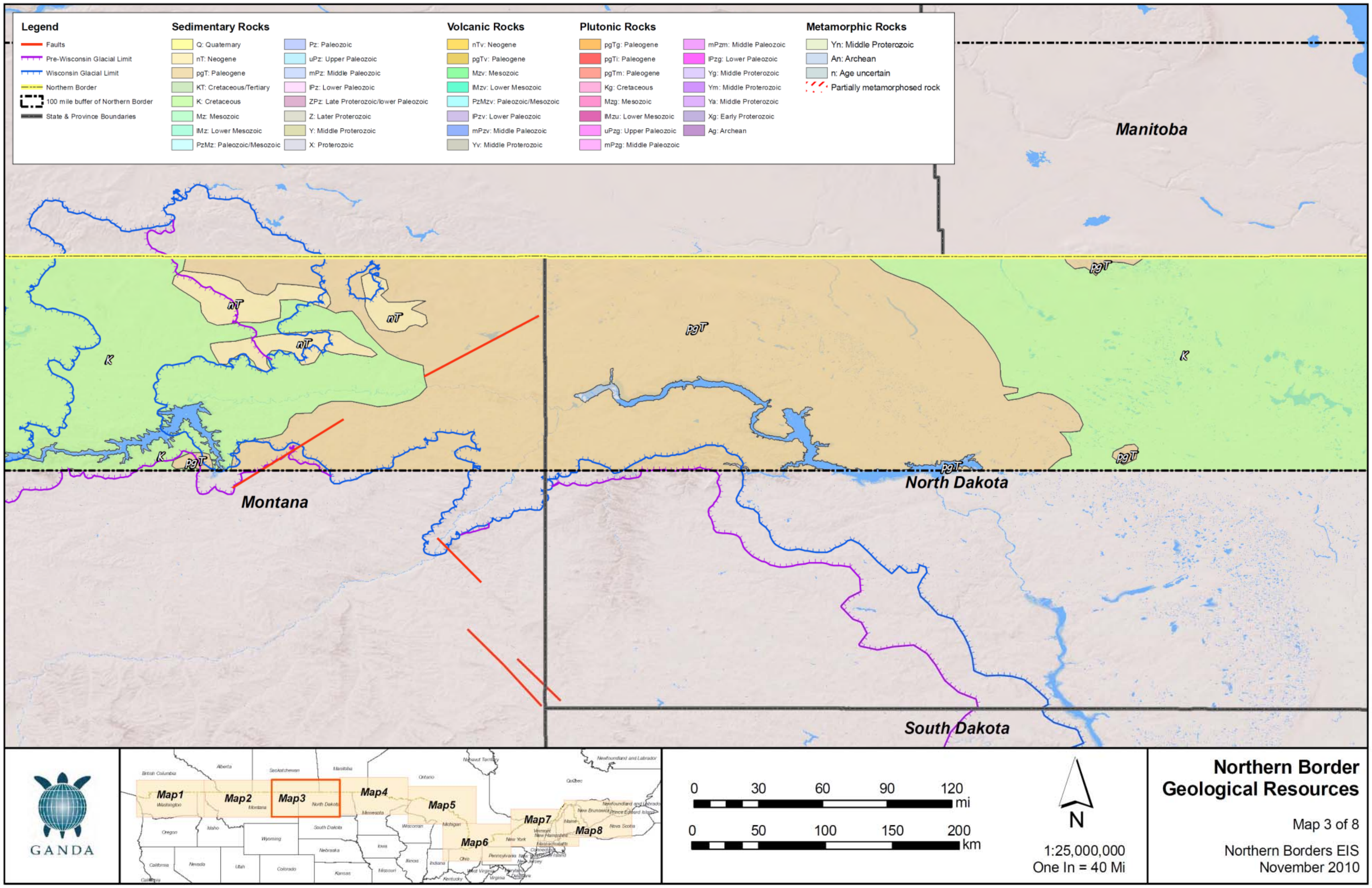


**Figure H-16. Geologically Relevant Strata along the Northern Border in Eastern North Dakota, Minnesota, and Western Wisconsin**

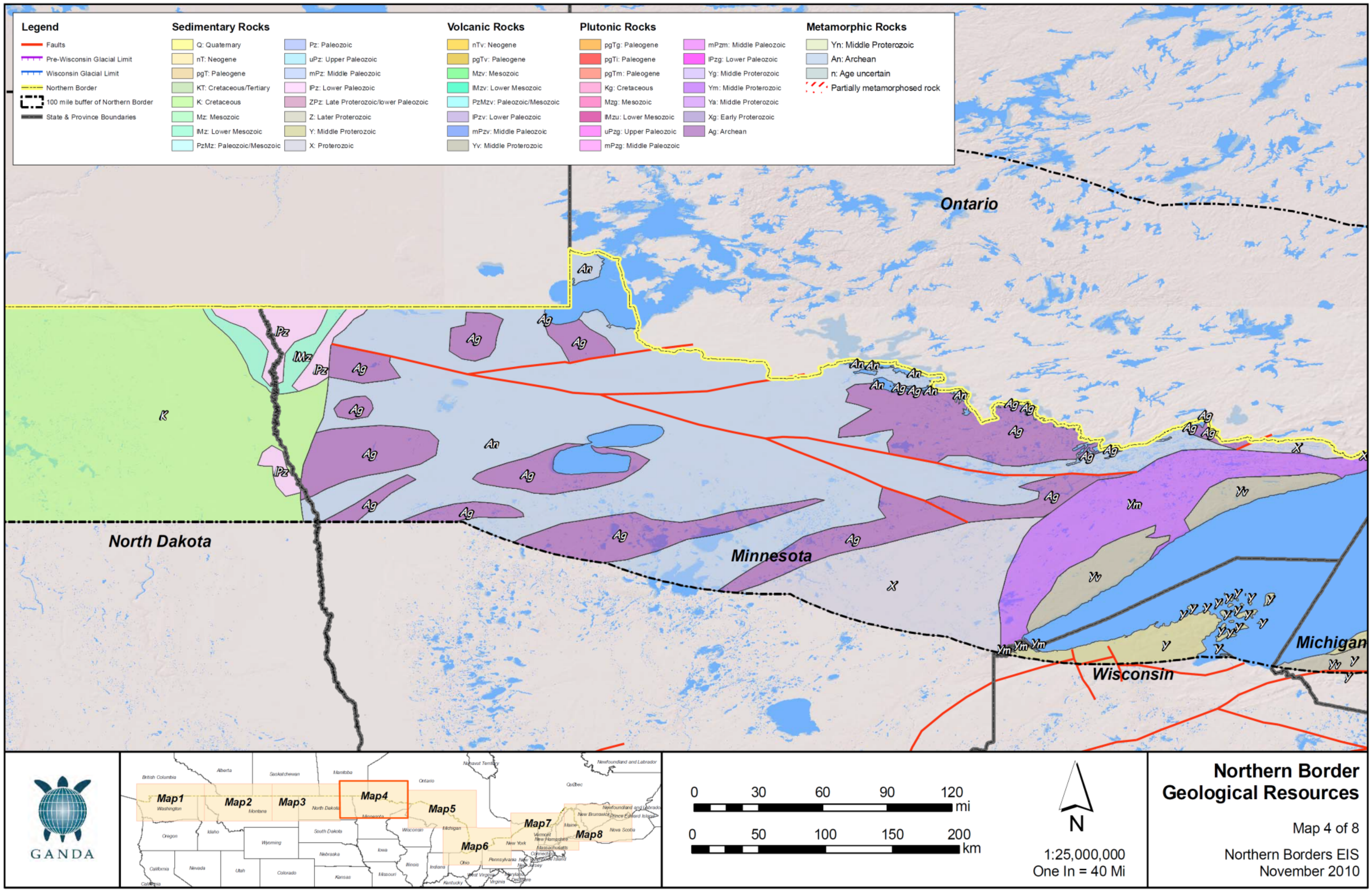


**Figure H-17. Geologically Relevant Strata along the Northern Border in Eastern Wisconsin and Upper Michigan**

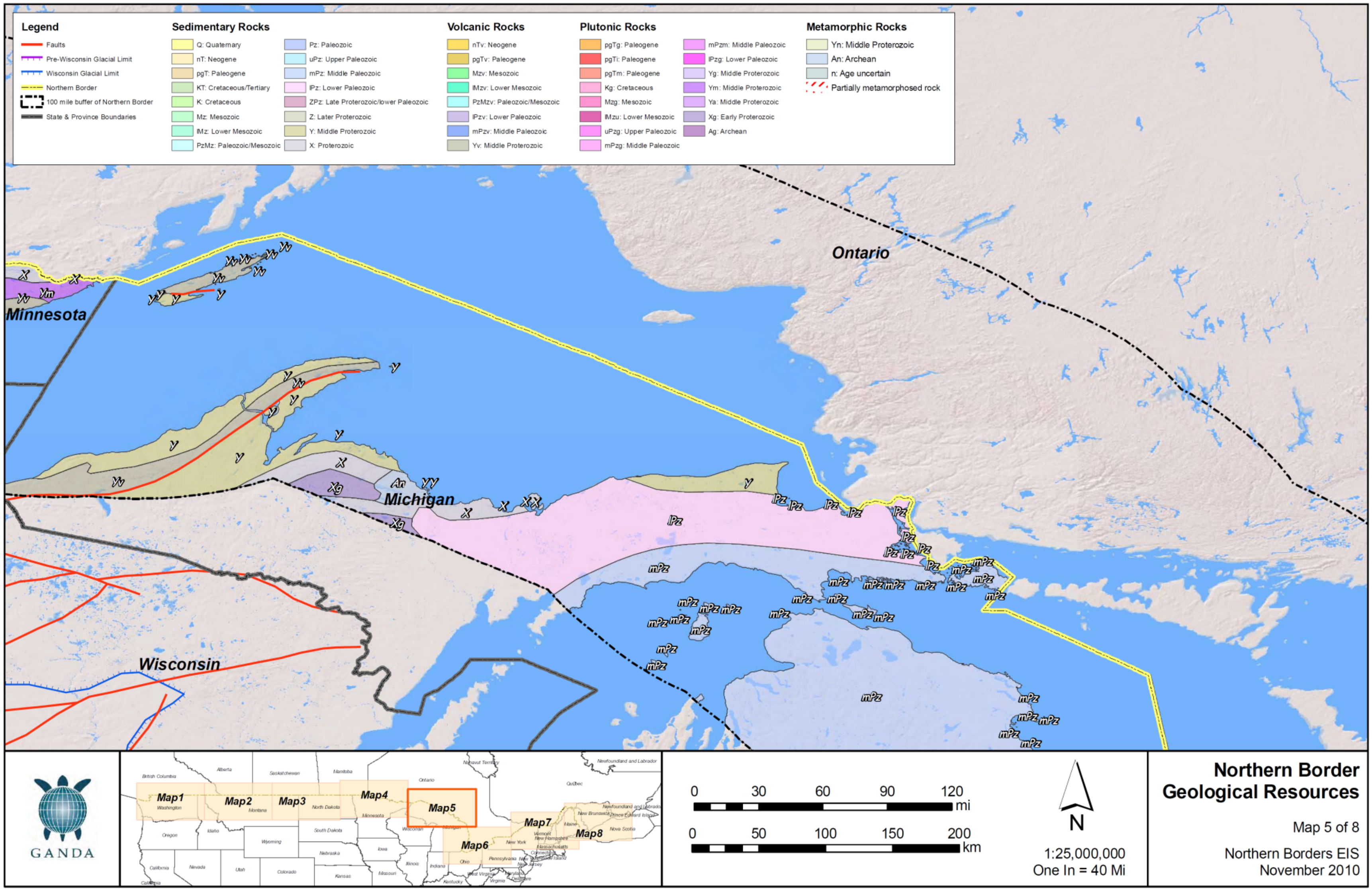


**Figure H-18. Geologically Relevant Strata along the Northern Border in Lower Michigan, Ohio, Pennsylvania, and Western New York**

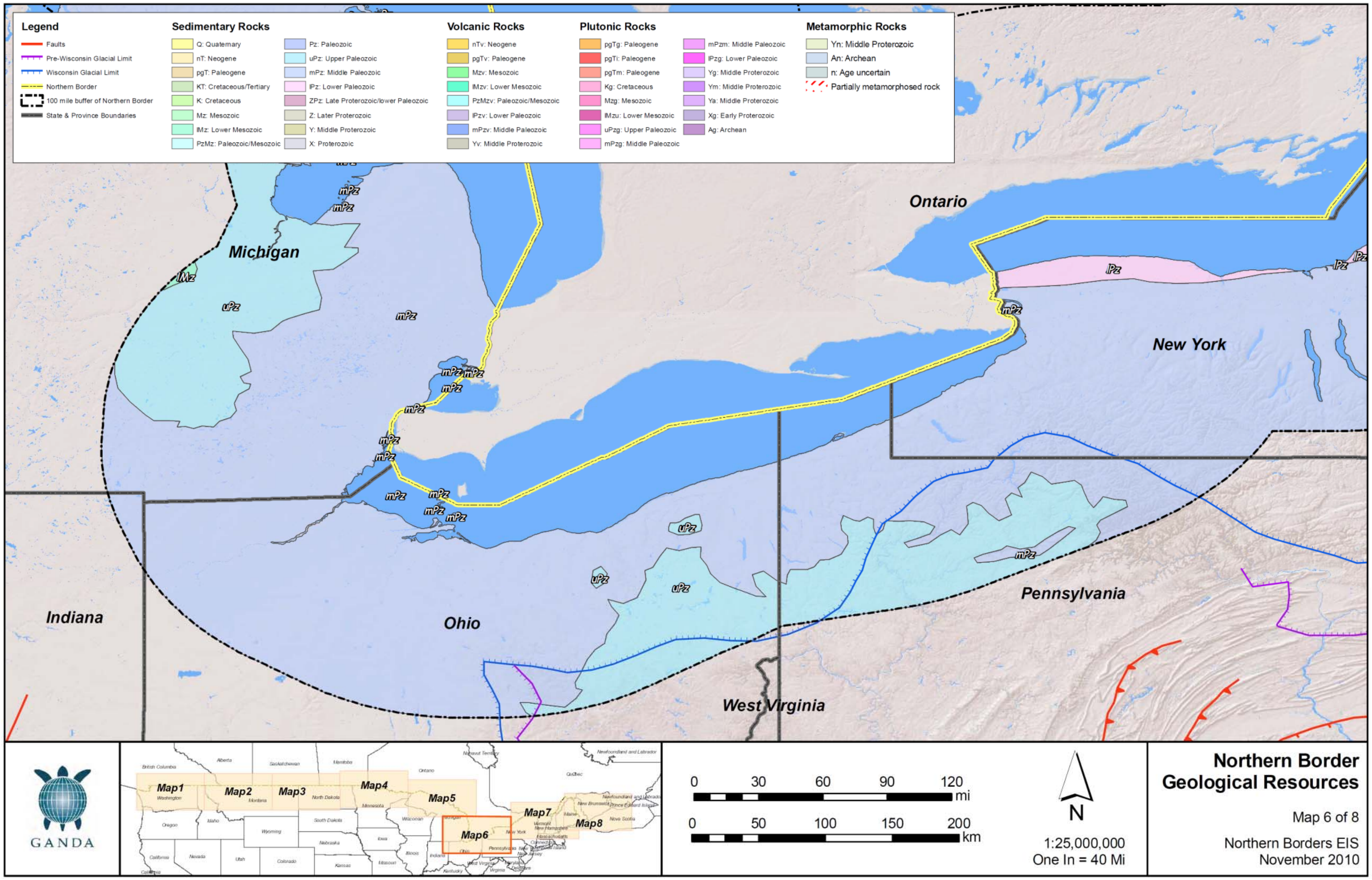
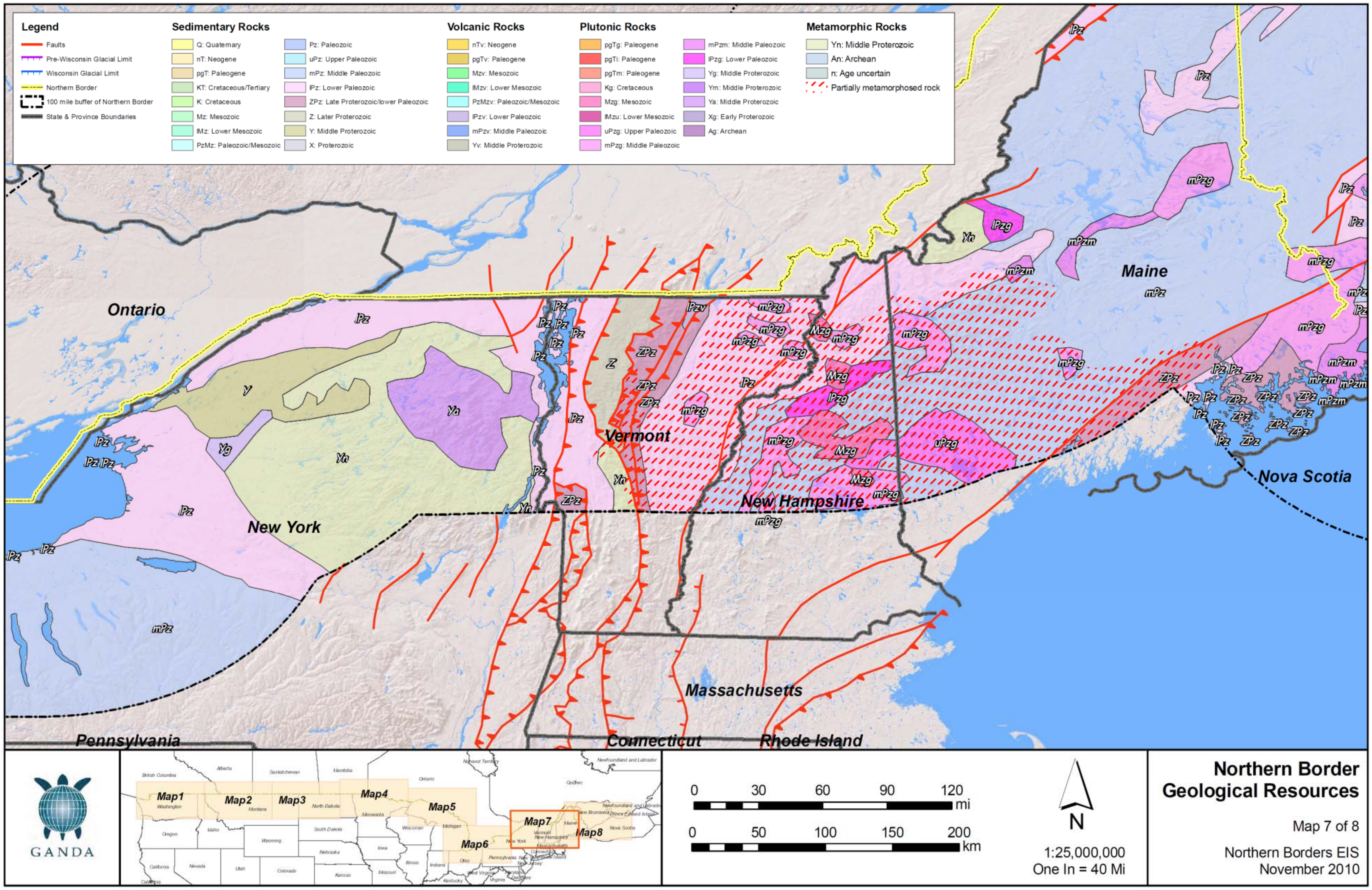
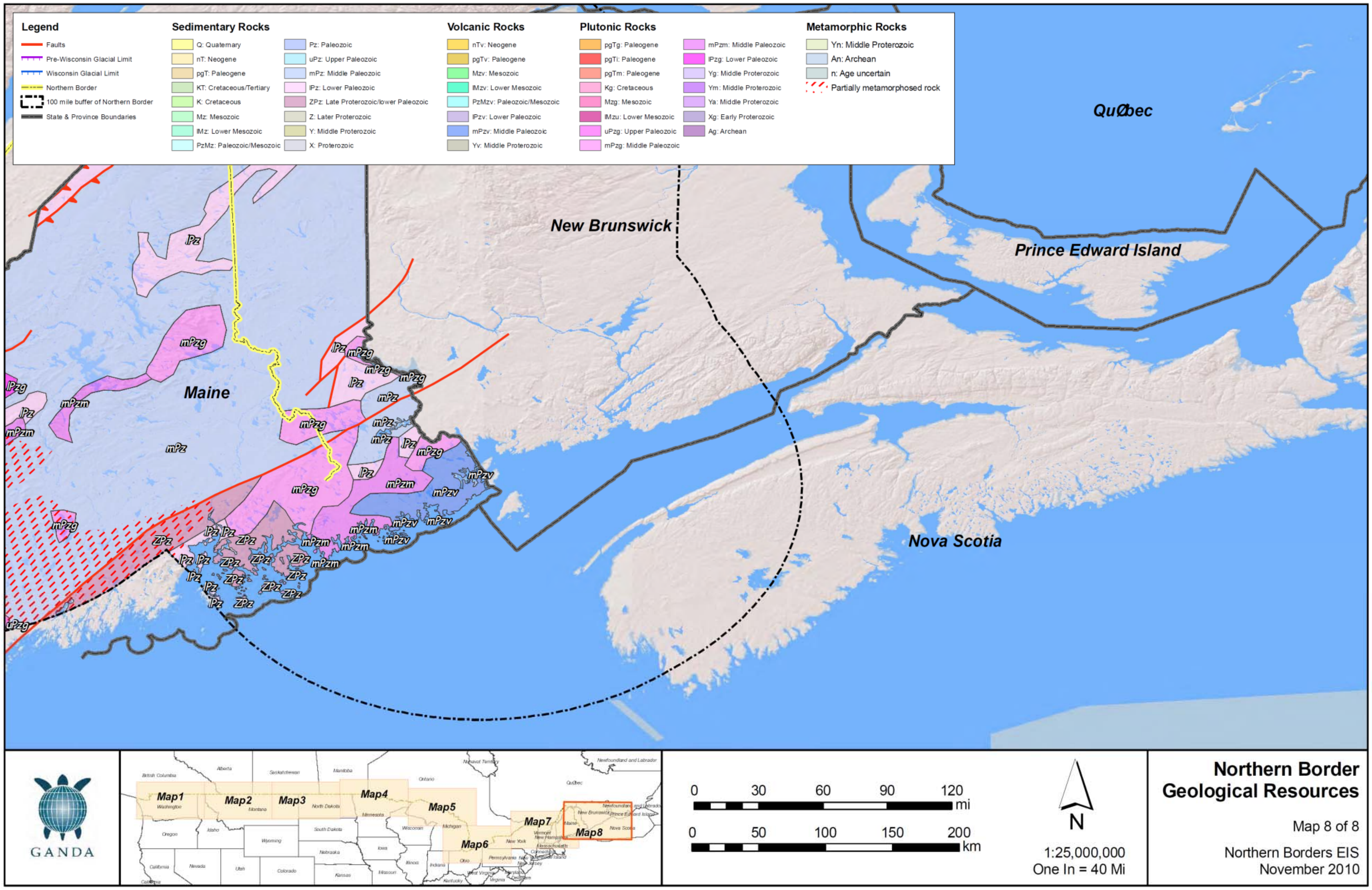


**Figure H-19. Geologically Relevant Strata along the Northern Border in Eastern New York, Vermont, New Hampshire, and Western and Central Maine**



## Figure H-20. Geologically Relevant Strata along the Northern Border in Eastern Maine



# 5 REGULATORY FRAMEWORK GOVERNING THE MANAGEMENT OF CULTURAL RESOURCES

This section lists and describes pertinent laws, regulations, Executive Orders (EO), guidelines, agreements, and treaties for which CBP is responsible as it carries out its mission and programs in the four geographic regions within the 100-mile corridor of the northern border project area. The section first describes the national regulatory framework that governs CBP action across the country and then provides a state-by-state account of the regulatory framework at state and local levels.

## 5.1 CULTURAL RESOURCES DEFINED

Cultural resources in the broadest sense include tangible elements (e.g., buildings, structures, sites, districts, and objects of significance in American history, architecture, archaeology, and engineering) and intangible elements (e.g., folklore and religious beliefs). Cultural resources may include relatively recent or historic places and items of cultural importance. In the context of this PEIS and CBP's stewardship responsibility, cultural resources refer to historic and prehistoric real property (e.g., buildings, structures, historic districts, ruins, archaeological sites, and traditional cultural and tribal places) and historic personal property (e.g., historic records and archaeological artifacts). The term "historic property" is used in place of "cultural resources" in the National Register of Historic Places (National Register) program, and is used in this PEIS when referring to any cultural resource identified as eligible for, or listed in, the National Register.

## 5.2 LEGAL SETTING FOR CULTURAL RESOURCES PROTECTION

From a legal perspective, cultural resources are defined in various EOs, Federal laws, DHS Directives System Directive 017-01: Historic Preservation in Asset Management and Operations (Directive 017-01) and DHS Directives System Instruction 017-01-001: Instruction Guide on the Historic Preservation in Asset Management and Operations (Instruction 017-01-001), and state laws.

Congress established the most comprehensive national policy on historic preservation with passage of the National Historic Preservation Act (NHPA) in 1966. One goal of the act is that Federal agencies act as responsible stewards of our Nation's resources when their actions may affect historic properties. CBP must comply with NHPA before issuing any license, permit, or approval, and before expending any funds apart from non-destructive planning activities.

Sections 106 and 110 of the NHPA establish Federal agency responsibilities for historic preservation. Section 106 requires Federal agencies account for the effects of their actions on historic properties—any district, site, building, structure, or object included or eligible for inclusion in the National Register.

Section 110 requires Federal agencies to assume responsibility for all historic properties under their control and integrate historic preservation into their mission and programs. Section 110 also sets out a series of broad preservation responsibilities for Federal agencies and requires them to establish a historic preservation program. By adhering to the requirements of Section 110, CBP will be able to fulfill its responsibilities for Section 106 more effectively and efficiently.

The nature of consultation in Section 106 review is dynamic, as CBP will provide information to others for review and concurrence or comment. It is CBP's position to comply with all applicable Federal laws and regulations.

## 5.3 CBP REQUIREMENTS

DHS developed Directive 017-01 and Instruction 017-01-001, which establish policy and procedures for appropriate consideration of historic properties and Native American sacred sites in the management and operation of DHS assets. Directive 017-01 and Instruction 017-01-001 establish appropriate DHS roles, responsibilities, and lines of accountability to apply the relevant requirements of historic preservation policy to DHS activities. They have a particular focus on NHPA (16 United States Code [U.S.C.] Sec. 470 *et seq.)* and the implementing regulations of Section 106 of the NHPA at 36 Code of Federal Regulations (CFR) 800, as well as EO 13007, Indian Sacred Sites.

The requirements in Directive 017-01 and Instruction 017-01-001 apply to all DHS components, including CBP. Thus, any CBP-specific policies, procedures, and other guidance must be consistent with Directive 017-01 and Instruction 017-01-001 and serve to supplement and further clarify the requirements laid out in them, as well as in NHPA, when meeting the requirements of Section 106 regulations.

## 5.4 NHPA AND RELATED LAWS AND REGULATIONS

Federal agencies must comply with several historic preservation laws and EOs. The NHPA along with some of the most common Federal laws dealing with historic and archaeological preservation are described below.

The NHPA promotes historic preservation by ensuring that Federal agencies consider historic properties when planning and making decisions. Among the provisions of the law most relevant to CBP:

- The NHPA created the National Register, an official listing of the Nation's historic properties. It defines a historic property as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register (36 CFR 800.16(l)). Stewardship of historic properties—identifying, evaluating, and protecting them—is the goal of Federal preservation legislation.
- The NHPA established SHPOs and Tribal Historic Preservation Officers (THPOs) with roles for each. CBP regularly communicates and consults with SHPOs and THPOs as part of the Section 106 review process.
- The NHPA authorized the Secretary of the Interior to establish standards for the preservation and treatment of historic properties and professional qualifications for those charged with such tasks. CBP must be familiar with these standards and qualifications when selecting cultural resource specialists and reviewing or developing proposals for preservation and treatment of historic properties.

The NHPA created the Advisory Council on Historic Preservation (ACHP), an independent Federal agency that serves as the primary policy advisor to the government on matters related to historic preservation. The ACHP oversees the implementation of the regulations guiding Section 106 review and, at times, participates in Section 106 reviews. CBP may be involved with the ACHP in different ways. Under certain circumstances, the ACHP will participate in specific Section 106 reviews and practitioners will need to include them in communications and consultations. CBP must supply the ACHP with documentation of findings of adverse effect and every memorandum of agreement (MOA)—an agreement that commits a Federal agency to carry out the agreed-upon measures to mitigate adverse effects on historic properties—must be filed with the ACHP.

The most relevant sections of NHPA to practitioners are Section 106 and Section 110. These sections specifically set out Federal agency responsibilities for historic preservation with the goal of thoroughly integrating historic preservation priorities into their overall missions and programs.

Section 106 of the NHPA requires Federal agencies to account for the effects of their actions on historic properties before issuance of any license or expenditure of Federal funds on the project. The ACHP must have a reasonable opportunity to comment on any Federal agency undertaking. These provisions form the foundation of Section 106 review, as implemented by the regulations in 36 CFR 800.

The Section 106 regulations establish a four-step process by which Federal agencies account for the effects of their actions on historic properties. Although the regulations do not mandate preservation in all cases, they integrate preservation values into planning and decision-making.

Section 110 of the NHPA contains several provisions that create a framework for Federal stewardship of historic properties. It sets out the broad historic preservation responsibilities of Federal agencies and ensures that historic preservation is fully integrated into the ongoing programs of all Federal agencies. Section 110 includes specific requirements governing agency compliance with Section 106. Its provisions requiring identification and evaluation of historic properties, and consultation with a variety of interested parties are reflected in the regulations implementing Section 106 reviews.

The Antiquities Act of 1906 was the first Federal law to promote preservation of archaeological and historic sites on Federal and Native American lands. It requires Federal agencies to preserve archaeological sites and historic structures on the lands that they manage. It also authorizes the creation of national monuments on Federal land to protect both cultural and natural resources and provided the foundation for later legislation, such as NHPA.

The Historic Sites, Buildings, and Antiquities Act (Historic Sites Act) expanded upon the Antiquities Act. It established a national policy to preserve historic sites, buildings, and objects of national significance for the public good, and organized most Federal preservation activities under the NPS.

The Archaeological Recovery Act of 1974 requires all Federal agencies to provide for archaeological data recovery and recordation of historic data that would otherwise be destroyed due to Federal construction projects or federally licensed activity. Although the salvage approach of this act has been superseded by the planning and consultation approach embodied in

NHPA and 36 CFR 800, it established the principle that Federal agencies are authorized to fund archaeological excavations and other mitigation measures.

The American Indian Religious Freedom Act (AIRFA) of 1978 protects the spiritual beliefs and practices of Native Americans and Native Hawaiians, as guaranteed by the First Amendment of the U.S. Constitution. Although it does not specifically prohibit any physical alteration of sacred sites or guarantee unlimited access to such sites, the law directs Federal agencies to consult with traditional religious leaders to ensure that agency policies and procedures protect and preserve traditional cultural practices, including access to sacred sites and use and possession of sacred objects. Projects with the potential to affect traditional religious or sacred sites will require careful consultation with the THPO or other designated tribal representatives to assure that the sites are not physically harmed and that access and use of the sites are not impeded.

The Archaeological Resources Protection Act (ARPA) of 1979 protects archaeological resources on Federal and Native American land from looting and vandalism. The part of the law most relevant to the practitioner is the requirement that all archaeological excavations on Federal or Native American lands are conducted in accordance with a permit from the land manager, such as the Bureau of Land Management (BLM). For projects involving archaeological field investigations/research, the practitioner must determine whether an ARPA permit is needed, and if so, which land management office issues the permit. If an ARPA permit is required, the practitioner must ensure that contracted cultural resources specialists meet the qualifications for an ARPA permit and that project schedules include the time needed to secure the permit or permits.

The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 and its implementing regulations (43 CFR 10) ensure the rights of Native American tribes and Native Hawaiian organizations to control the disposition of human remains, funerary objects, sacred objects, and objects of cultural patrimony (collectively referred to as cultural items) held by Federal agencies or found on Federal and tribal lands. NAGPRA requires that Native American tribes or Native Hawaiian organizations be consulted when archaeological investigations on Federal or tribal lands encounter or expect to encounter human remains or cultural items or if such items are unexpectedly discovered on Federal or tribal lands. If human remains are encountered, all work in the area must stop and the appropriate tribe(s) notified and brought in to consult on the disposition of the remains and associated funerary objects. Any excavation or removal of cultural items must be conducted under procedures required by ARPA.

The stipulations of NAGPRA strongly encourage that human remains and cultural items are not excavated or removed, but are preserved in place. To comply with NAGPRA in the course of Section 106 review, practitioners must carefully consult with the appropriate THPO or designated tribal representative, as well as with the SHPO and cultural resources specialists. Practitioners must also review any existing information regarding cultural resources for the project area to determine the likelihood of human remains or other cultural items. This assessment should be made as early as possible in the planning process. The Bureau of Indian Affairs (BIA) and the Department of the Interior (DOI) maintain a list of federally recognized Native American tribes.

## 5.5 EOS

**EO 11593 Protection and Enhancement of the Cultural Environment.** This 1971 EO directs Federal agencies to support preservation of cultural resources, identify and nominate historic properties under their jurisdiction to the National Register, and avoid inadvertent transfer, sale, demolition, or substantial alteration of eligible properties. This EO reiterates and emphasizes some of the provisions of NHPA and 36 CFR 800.

**EO 13006 Locating Federal Facilities on Historic Properties in our Nation's Central Cities.** This 1996 EO directs Federal agencies to use and maintain facilities in historic properties in urban business areas. In planning locations for facilities, agencies must give preference to historic properties within historic districts, make any alterations compatible with the surrounding district, and reduce regulatory barriers that may impede achieving this objective.

**EO 13007 Indian Sacred Sites.** This 1996 EO directs Federal agencies, to the extent practicable, to accommodate Native American ceremonial use of sacred sites under agency jurisdiction and avoid adverse effects to those sites. This EO emphasizes the importance of protecting both the physical integrity and the ongoing religious use of Native American sacred sites.

**EO 13175 Consultation and Coordination with Indian Tribal Governments.** This 2000 EO directs Federal agencies to strengthen the U.S. Government's government-to-government relationships with Native American tribes. Agencies must respect Native American tribal self-government and sovereignty and develop accountable processes of consultation to ensure meaningful and timely input from tribes. CBP uses the DHS Plan to Develop a Tribal Consultation and Coordination Policy Implementing EO 13175 as a consultation policy and guidance for meaningful consultation with Native American tribes. The document, developed in consultation with tribal governments, contains a plan of action for meeting goals specified in EO 13175. This plan includes developing a tribal consultation policy and dedicating staff resources to work with tribal governments, including designation of a principal tribal liaison within the Office of Intergovernmental Affairs and regional or local tribal liaisons within individual components including CBP.

## 5.6 LEGAL SETTING FOR PALEONTOLOGICAL PROTECTION

The Paleontological Resources Protection Act refers to Title VI, Subtitle D – "Paleontological Resources Preservation" of the Omnibus Public Land Management Act (OPLMA) of 2009, Public Law 111-011. Subtitle D (OPLMA-PRP), requires the Secretaries of the Interior and Agriculture to, "manage and protect paleontological resources on Federal land using scientific principles and expertise. The Secretary shall develop appropriate plans for inventory, monitoring, and the scientific and educational use of paleontological resources, in accordance with applicable agency laws, regulations, and policies. These plans shall emphasize interagency coordination and collaborative efforts where possible with non-Federal partners, the scientific community, and the general public" (16 USC 470aaa, Sec. 6302).

The OPLMA-PRP only applies to Federal lands and does not affect private lands. The act includes criminal and civil penalties for fossil theft and vandalism. However, it also includes provisions for casual collecting which means, "the collecting of a reasonable amount of common invertebrate and plant paleontological resources for non-commercial personal use, either by surface collection or the use of non-powered hand tools resulting in only negligible disturbance to the Earth's surface and other resources" (16 USC 470aaa, Sec. 6301[1]). Casual collecting is not allowed within national parks or other lands managed by the National Park Service (NPS). Any paleontological excavation beyond casual collecting requires a special permit as proscribed by the OPLMA-PRP.

## 5.7 STATE LAWS, REGULATIONS, GUIDELINES, AGREEMENTS, AND TREATIES

This section outlines state-level regulations and guidelines that may impact procedures relevant to CBPs cultural resources management compliance process. While there is relative uniformity regarding Section 106 compliance procedures and National Register determinations, other issues, such as access to information or survey permitting, have much greater variation.

### 5.7.1 NEW ENGLAND REGION

#### 5.7.1.1 Maine

**State Cultural Resource (CR) Laws, Statutes, and Regulations**

Numerous Federal and state laws, and the regulations and agreements emanating from them, govern the treatment of historic and archaeological resources in Maine. Such laws are generally restricted to the protection of cultural resources that may be threatened by Federal, state-funded, or state-permitted projects. Section 106 of the NHPA offers the broadest protection of cultural resources in the United States.

- Chapter 27 of the Maine Revised Statutes Annotated, sections 371-378 (27MRSA § 371-378). This statute is unofficially called "Maine's Antiquities Law": http://janus.state.me.us/legis/statutes/27/title27ch13sec0.html
- Regulation concerning Maine cemeteries and burials: http://janus.state.me.us/legis/statutes/13/title13sec1371-a.html
- Federal historic preservation laws applicable to Federal projects in Maine: www.cr.nps.gov/history/online_books/fhpl/contents.htm
- Regulations for archaeological work in Maine: www.maine.gov/sos/cec/rules/rules.html

Maine's Site Location of Development Law (Title 38, Chapter 3, §§ 481-490; www.maine.gov/dep/blwq/docstand/sitelawpage.htm#stat).

**State Historic Preservation Office**

The SHPO for Maine is the Maine Historic Preservation Commission (MHPC). The MHPC:

- Nominates properties to the National Register of Historic Places;
- Reviews and comments on the effect of Federal undertakings on historic properties;
- Assists owners of income-producing properties to obtain Federal and state rehabilitation tax credits;

- Oversees the identification and evaluation of archaeological sites as well as historic buildings, objects and districts; and,
- Promotes historic preservation through planning and public education.

The MHPC website is www.state.me.us/mhpc/index.shtml.

Inventory and evaluation (National Register) procedures:

- The MHPC project review procedures are at: www.state.me.us/mhpc/project_review/index.html.
- For information concerning archaeological survey guidelines, refer to www.state.me.us/mhpc/project_review/archaeological_survey_guidelines.html.
- For information concerning architectural survey guidelines and survey forms for project review, refer to www.maine.gov/mhpc/architectural_survey/index.html.

State preservation plan:

Maine's state preservation plan is entitled: *A Heritage for the Future: A Plan for Preserving Maine's Historic and Archaeological Resources*, found at www.state.me.us/mhpc/preservation_planning/state_plan/index.html.

Resources for identifying locations of cultural resources (GIS, web, database, etc.):

- The cultural architectural resource management archive (CARMA) is an online architectural survey database for Maine's historic above-ground resources that enables architectural historians and survey consultants to submit completed survey projects for Federal or state regulatory project reviews online for preliminary review. All surveys submitted to MHPC in fulfillment of Federal or state regulatory project review requirements must be entered into CARMA. Consultants and firms submitting survey projects must either attend a training session in Augusta, Maine or request a training packet.
- For state rules guiding the conduct of archaeological investigations, refer to www.state.me.us/mhpc/archaeology/professional/rules.html.
- For the Maine Prehistoric Archaeology Reports on File (a list of archaeological reports on file at MHPC and accessible by approved archaeologists), go to www.state.me.us/mhpc/archaeology/professional/mprehist.html.
- For information on Historical Contexts and National Register eligibility standards, refer to www.state.me.us/mhpc/archaeology/professional/contexts.html.

Guidance to Federal agencies for 106 and other compliance:

For MHPC project review procedures, refer to www.state.me.us/mhpc/project_review/index.html.

Special forms for SHPO 106 notification or identified cultural resources:

For above-ground culture resources survey forms, refer to www.state.me.us/mhpc/architectural_survey/survey_forms.html.

Requirements for research reports:

- For archaeological survey guidelines, refer to www.state.me.us/mhpc/project_review/archaeological_survey_guidelines.html.
- For architectural survey guidelines, refer to www.state.me.us/mhpc/architectural_survey/survey_guidelines.html.

Qualifications for cultural resources specialists:

For the approved list of consultants qualified to conduct archaeological and architectural surveys in Maine, refer to www.maine.gov/mhpc/project_review/arc_consultants.html.

Permit or other requirements for archaeological investigations:

None required.

**Tribal statutes and treaties**

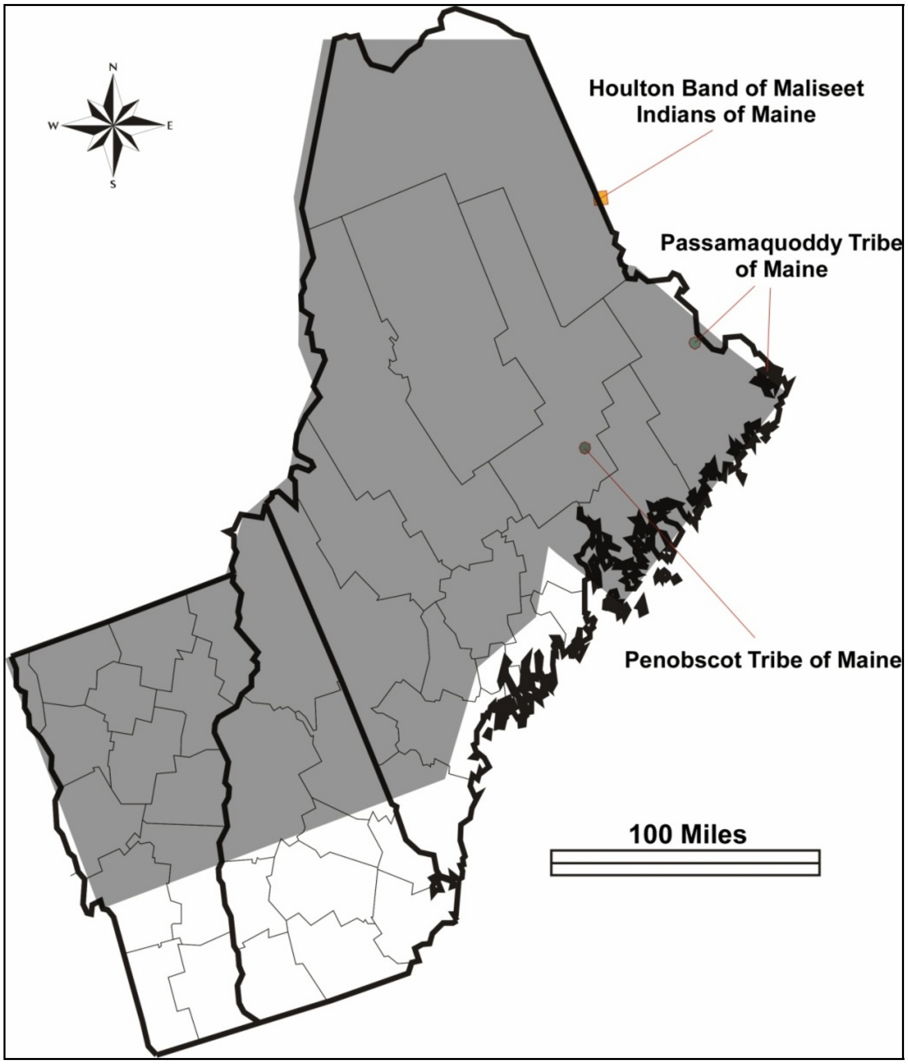
***Special Agreements between the Maine SHPO and Maine Tribes***

The MHPC currently has two agreements with Maine tribes. An agreement between the MHPC and the Penobscot Nation outlines that the Penobscot THPO will deal with cultural resource matters, including both archaeology and standing structures on Penobscot reservation and trust lands. Cultural resource issues on Penobscot fee land are commented on by both the MHPC and the THPO. A similar agreement exists between the MHPC and the Passamaquoddy Tribe with the Passamaquoddy THPO dealing with archaeological issues on reservation and trust lands and the MHPC handling standing structures on Passamaquoddy reservation and trust lands. Cultural resource matters on Passamaquoddy fee lands falls under the jurisdiction of both the MHPC and the THPO.

**Federal lands and agencies**

Maine has three federally recognized Native American tribes (Figure H-21). In 1980, with the aid of the United States, the Penobscot and the Passamaquoddy reached a compromise with the State of Maine resulting in the Maine Indian Land Claims Act signed by President Carter. A third tribe—the Houlton Band of Maliseet Indians—had not filed suit but was represented by counsel and was later included in the compromise. In 1991, the Aroostook Band of Micmacs Settlement Act settled all claims of the Aroostook Band of Micmacs resulting from the band's omission from the Maine Indian Claims Settlement Act of 1980.

**Figure H-21. Native-American Lands within the 100-mile PEIS Corridor of Maine, New Hampshire, and Vermont**




### 5.7.1.2 New Hampshire

**State Historic CR Laws, Statutes, and Regulations**

Numerous Federal and state laws—along with the regulations and agreements emanating from them—govern the treatment of historic and archaeological resources in New Hampshire. Such laws are generally restricted to protection of cultural resources that may be threatened by Federal, state-funded, or state-permitted projects. Section 106 of the NHPA offers the broadest protection of cultural resources in the United States.

- New Hampshire Revised Statutes Annotated 227-C:9, Directive for cooperation in the protection of historic resources as implemented by state administrative rules. Refer to

  http://maisonbisson.com/nhrsa/rsa/227-c-9-directive-for-cooperation-in-the-protection-of-historic-resources/.

- Cultural resource laws for New Hampshire (up to 2001) are also listed on the Indian burial and sacred grounds watch website, www.ibsgwatch.imagedjinn.com/learn/newhampshirelaw.htm.
- Several recent legal decisions recognize New Hampshire's Native Americans in ways that may affect northern border project consultation. The New Hampshire Recognition Bill HB1610 passed and was signed by Governor Lynch on July 10, 2010. This act established a New Hampshire commission on Native American affairs and recognized the Abenaki and other American Indian residents as a minority population in the state.

**State Historic Preservation Office**

The SHPO for New Hampshire is the New Hampshire Division of Historical Resources (NHDHR). The NHDHR preserves and enhances the state's historic and cultural heritage by:

- Assisting organizations and individuals in their efforts to preserve the state's heritage;
- Surveying and inventorying the state's archaeological and historical resources;
- Bringing Federal preservation programs, such as Preservation Tax Incentives and the National Register, to New Hampshire's residents;
- Offering several grant programs focused on historic preservation; and,
- Working with local governments and Federal and state agencies to preserve historical resources in their care;
    - Reviewing all Federal undertakings in the state to identify and protect historical resources; and,
    - Providing services of the state archaeologist and state architectural historian.

The NHDHR website is www.nh.gov/nhdhr/.

Inventory and evaluation (National Register) procedures:

For NHDHR inventory and review procedures, refer to www.nh.gov/nhdhr/review/106intro.html.

***State preservation plan:***

New Hampshire's 5-year preservation plan is entitled *Points of Interest and Touring Map* at: www.nh.gov/nhdhr/programs/documents/nh_preservation_plan2011to2015.pdf.

Resources for identifying locations of cultural resources (GIS, web, database, etc.):

GRANIT data mapper website.

Guidance to Federal agencies for 106 and other compliance:

- To initiate Section 106 review in New Hampshire, a completed request for project review form (RPR) must be submitted to NHDHR. The RPR must be submitted by mail (project submissions will not be accepted via fax or e-mail). The NHDHR submits its comments to project proponents in writing, not by telephone or e-mail. For more information, refer to www.nh.gov/nhdhr/review/documents/rpr_manual.pdf.

- For the RPR and instructions for completion, refer to www.nh.gov/nhdhr/review.
- For state rules on archaeological standards and guidelines, refer to www.nh.gov/nhdhr/review/documents/arch_standard_guidelines.doc.
- Archaeological consultants can refer to the NHDHR archaeology report requirements chart (www.nh.gov/nhdhr/review/documents/arch_report_chart.doc) for clarification on report submission requirements. NHDHR survey requirements are at www.nh.gov/nhdhr/review/documents/arch_standard_guidelines.doc.
- For a list of NHDHR-qualified archaeological consultants, refer to www.nh.gov/nhdhr/consultants_archaeology.html.
- For guidelines regarding the curation of artifacts, refer to www.nh.gov/nhdhr/review/documents/curation_guidelines.doc.
- For state rules on completion of architectural history surveys and the list of qualified consultants, refer to www.nh.gov/nhdhr/review/architectural_history.htm.

  Special forms for SHPO 106 notification or identified cultural resources:

- To initiate Section 106 review in New Hampshire, a completed request for a project review form (RPR) must be submitted to NHDHR. The RPR must be submitted by mail (project submissions will not be accepted via fax or e-mail). NHDHR submits its comments to project proponents in writing, not by telephone or e-mail. For more information, refer to www.nh.gov/nhdhr/review/documents/rpr_manual.pdf.

For the RPR and instructions for completion, refer to www.nh.gov/nhdhr/review.

Requirements for research reports:

- To streamline the project review process, the NHDHR has altered the Phase IA archaeology survey report requirements. If a Phase IA survey does not identify any archaeological sites or areas of archaeological sensitivity within the project area, a Phase IA "Short Report" can substitute for a full Phase IA report. The short report form has been grouped with the bibliography form to eliminate redundancy between the two submissions. For the combined bibliography form and short report, refer to www.nh.gov/nhdhr/review/documents/rpr_manual.pdf.
- Consultants can refer to the NHDHR archaeology report requirements chart for clarification on report submission requirements at www.nh.gov/nhdhr/review/documents/arch_report_chart.doc. Refer to the NHDHR's archaeological standards and guidelines for detailed report writing requirements at www.nh.gov/nhdhr/review/Archaeology.htm.

Qualifications for cultural resources specialists:

A consultant must request to be listed by the NHDHR and must provide documentation showing that recommended minimum standards (36 CFR 61) have been met.

Permit or other requirements for archaeological investigations:

It does not appear that a permit is required for archaeological investigations. For NHDHR survey requirements, refer to www.nh.gov/nhdhr/review/documents/arch_standard_guidelines.doc.

**Tribal statutes and treaties**

Native American Organizations with Geographical/Cultural Interests in New Hampshire at www.nh.gov/nhdhr/review/tribal_list.htm

**Federal lands and agencies**

New Hampshire contains Federal lands and reserves, but no Native American reservations. The NPS administers the partnership as well as the Saint-Gaudens National Historic Site in Cornish, New Hampshire, and the Appalachian National Scenic Trail through Vermont and New Hampshire.

Undertakings might also require consultation with certified local governments (CLGs) in New Hampshire. Information about CLGs in the state is available from their respective state historic preservation offices.

### 5.7.1.3 Vermont

**State Historic Cultural Resource Laws, Statutes, and Regulations**

Numerous Federal and state laws—and the regulations and agreements emanating from them—govern the treatment of historic and archaeological resources in Vermont. Such laws are generally restricted to protecting cultural resources that may be threatened by Federal, state-funded, or state-permitted projects. Section 106 of the NHPA offers the broadest protection of cultural resources in the United States.

- Act 250 (Title 10 of Vermont Statutes Annotated [VSA], Chapter 151);
- The Vermont Historic Preservation Act (22 VSA, Chapter 14);
- 30 VSA, Chapter 5, Section 248 (Public Service Board's Certificate of Public Good); and,
- State laws that protect burial sites (13 VSA, Chapter 81, Sections 3761, 3764, and 3765; and 18 VSA, Chapter 107, Sections 5201 and 5212).

Act 250 controls development proposed on a relatively large scale or in sensitive areas. The Act 250 process protects Vermont's environment and gives neighbors, municipalities, local and regional planning commissions, and other interested parties the opportunity to participate and express concerns. Development and land subdivision proposals that fall under the act's jurisdiction must apply for a land use permit. This permit can be granted, denied, or granted with conditions by one of Vermont's nine district environmental commissions made up of laypersons appointed by the governor. District commission decisions can be appealed to the Natural Resources Board.

A document on Vermont burial laws is at www.sec.state.vt.us/municipal/Digging_Deep.pdf. This document covers recent legislation concerning unmarked and ancient burials.

**State Historic Preservation Office**

The SHPO for Vermont is the Vermont Division for Historic Preservation (VDHP). It serves as advocate for historic and prehistoric properties in the state (www.historicvermont.org/).

Inventory and evaluation (National Register) procedures:

For VDHP's role in project review, refer to www.dhca.state.vt.us/DHP/programs/regulatory.html

State preservation plan:

Vermont's preservation plan is entitled *Using Vermont's Past to Build a Better Future: Vermont's State Plan for Heritage Stewardship, 2011-2015.* It can be found at www.historicvermont.org/VDHP_plan_FINAL%20March%201%20for%20web.pdf

Resources for identifying locations of cultural resources (GIS, web, database etc.):

For Vermont's environmental predictive model of archaeological site locations, refer to www.historicvermont.org/programs/model.pdf.

Guidance to Federal agencies for 106 and other compliance:

For state guidelines governing the conduct of archaeological investigation, refer to http://efotg.sc.egov.usda.gov//references/public/VT/guidelines_for_conducting_arch.pdf.

Special forms for SHPO 106 notification or identified cultural resources:

- Completed forms are required for archaeological sites identified during an investigation. Go to www.historicvermont.org/programs/APP%20I-%20VAI%20FORM.pdf.
- For the required form submitted summarizing the cultural resources report, refer to www.historicvermont.org/programs/APP%20K%20report%20database%20instructions.pdf.

Requirements for research reports:

For guidelines detailing the elements required for cultural resources reports, refer to www.historicvermont.org/programs/APP%20H-Phase%20I%20guidance.pdf.

Qualifications for cultural resources specialists:

For the state qualifications for cultural resources specialists, refer to www.historicvermont.org/programs/APP%20B%20consultants%20process.pdf.

Permit or other requirements for archaeological investigations:

- For the requirements and application to receive a digging permit under the Vermont Historic Preservation Act (22 VSA, Chapter 14), refer to www.historicvermont.org/programs/APP%20F-%20permit%20app-info.pdf.
- In addition, an Act 250 permit is required for certain kinds of development, for example, construction for commercial or industrial purposes on more than 10 acres (except for

farming or forestry). Some other situations require an Act 250 permit. An Act 250 district coordinator should be contacted to determine whether a permit is required. For information on Act 250, refer to www.nrb.state.vt.us/lup/index.htm.

**Tribal statutes and treaties**

Several recent legal decisions recognize Vermont's Native Americans in ways that may affect northern border project consultation. On May 3, 2006, Vermont's Governor Douglas signed S.117, a statute recognizing the Abenaki people and all other Native Americans living in the state as a minority population. The Abenaki Missisquoi band was denied Federal recognition in 2007. On May 14, 2010, Governor Douglas signed S. 222, an act relating to state recognition of Native American tribes in Vermont. This legislation reinterpreted S.117 in a way that may garner Federal approval for granting recognition to Vermont's Native American tribes and bands. The bill conferred official state recognition on four bands of the Abenaki Tribe and it allowed other bands to petition for state recognition in the future. The bill recognized the Abenaki Nation of Mississquoi St. Francis Sokoki Band comprising the Missisquoi, St. Francis, and Sokoki Bands (www.abenakination.org/); the Koasek Traditional Band of the Koas Abenaki Nation based in Newbury, Vermont (www.koasekabenaki.org/); the Nulhegan Band of the Abenaki Nation, also known as the Northern Coosuk/Old Philip's Band in northeastern Vermont; and the ELNU Abenaki Tribe of the Koasek (www.elnuabenakitribe.org/index.html).

**Federal lands and agencies**

Vermont contains Federal lands and reserves, but no Native American reservations. The Champlain Valley National Heritage Partnership area also exists within the northern border project area, but contains no Federal land. The NPS administers the partnership as well as the Marsh-Billings-Rockefeller National Historic Park in Woodstock, Vermont, and the Appalachian National Scenic Trail through Vermont and New Hampshire.

## 5.7.2 GREAT LAKES REGION

### 5.7.2.1 New York

**State Historic Cultural Resource Laws, Statutes, and Regulations**

In addition to the Federal regulatory framework governing the management of cultural resources, the state laws (and the regulations and agreements emanating from them) govern the treatment of historic and archaeological resources in New York. Such laws are generally restricted to protecting cultural resources that may be threatened by Federal, state-funded, or state-permitted projects. New York's cultural resources regulatory framework that may be relevant to CBP's mission and program are as follows:

- The New York State Historic Preservation Act of 1980, Section 14.09:

  http://nysparks.state.ny.us/shpo/environmental-review/preservation-legislation.aspx

  The New York State Historic Preservation Act of 1980 was established as a counterpart to the NHPA and declares historic preservation to be the public policy and in the public interest of the state. The act created the New York State Register of Historic Places—the official list of sites, buildings, structures, areas, or objects significant in the history, architecture, archeology, or culture of the state, its communities, or the Nation.

- State Environmental Quality Review Act (SEQRA) (6 New York Code of Rules and Regulations [NYCRR] Part 617):

  http://nysparks.state.ny.us/shpo/environmental-review/preservation-legislation.aspx

  The State Environmental Quality Review Act (SEQRA), 6NYCRR Part 617 of the New York State Environmental Conservation Law establishes a set of uniform regulations by which all state, county, and local governmental agencies incorporate environmental impact considerations into their planning, review, and decision-making processes. Impacts to historic resources, such as buildings listed on State or National Registers of Historic Places and archaeological sites, should be taken into account. To accomplish the goal of the act, SEQRA requires that all governmental agencies determine whether the action they directly undertake, fund, or approve may have a significant impact on the environment. If an action poses potential significant adverse impacts, agencies must prepare or request an environmental impact statement. The SEQRA applies to projects undertaken or permitted by county and local governments; consequently, many thousands of projects statewide that fall outside the purview of the state and national historic preservation acts are reviewed. New implementing regulations for SEQRA went into effect in 1996. Under this act, municipalities may request that a project be reviewed by the SHPO. All SHPO comments under this review are advisory only.

Federal historic preservation laws applicable to Federal projects in New York: www.cr.nps.gov/history/online_books/fhpl/contents.htm

Regulations for cultural resources work in New York:

Requirements/standards for cultural resources investigations in New York State are described in four documents:

- The New York Archaeological Council's (NYAC) Cultural Resource Standards Handbook: Guidance for Understanding and Applying the New York State Standards for Cultural Resource Investigations, 2000, available online at www.nyarchaeology.org/mainpages/about/standards.htm;
- NYAC's Standards for Cultural Resource Investigations and Curation of Archaeological Collections in New York State, 1994, available online at www.nyarchaeology.org/mainpages/about/standards.htm;
- New York State Historic Preservation Office (SHPO) Phase I Archaeological Report Format Requirements, 2005, available online at www.nysparks.com/shpo/; and,
- *Recommended Standards for* Historic *Resources Surveys*, 2010, available online at www.nysparks.com/shpo/survey-evaluation/

**State Historic Preservation Office**

The New York SHPO works to raise awareness of historic preservation issues, encourage community revitalization and heritage tourism, and instill in state citizens a sense of pride concerning its unique history. Towards these ends, it:

- Maintains the New York State Register of Historic Places;
- Consults with Federal and state agencies concerning the impacts of undertakings on historic properties; and,
- Promotes historic preservation through planning and public education.

The New York SHPO website is http://nysparks.state.ny.us/shpo/.

Inventory and evaluation (National Register) procedures:

Procedures for identification, inventory, and evaluation of National Register-eligible properties in New York State follow those outlined in the ACHP guidelines for the protection of Cultural and Historic Properties (36 CFR Part 800) and Part 427 of Section 14.09 of the New York State Historic Preservation Act. In New York State, the State Board for Historic Preservation reviews nominations to the State Register of Historic Places. All historic places listed on or nominated by the commissioner of Parks, Recreation, and Historic Preservation for inclusion on the National Register are also listed on the State Register. Additional information concerning inventory and evaluation procedures is available online at http://nysparks.state.ny.us/shpo.

State preservation plan:

The New York State Office of Parks, Recreation, and Historic Preservation (NYS OPRHP [New York SHPO]) prepared *Historic Preservation at a Crossroads: The 2009–2013 New York State Historic Preservation Plan* to assist all New Yorkers interested in identifying, protecting, enhancing, and promoting the state's historic and cultural resources. The preservation plan is available online at the New York SHPO website, http://nysparks.state.ny.us/shpo/preservation-plan/.

Resources for identifying locations of cultural resources (GIS, web, database etc.):

GIS database files that include most National Register-listed properties in New York State are available online from the New York State GIS Clearinghouse at www.nysgis.state.ny.us/gisdata/inventories/member.cfm?OrganizationID=588. The file is also available through an online interactive tool at www.oprhp.state.ny.us/nr/main.asp. However, the database includes neither archaeological sites nor properties that are National Register-eligible, but not yet been listed. A visit to the New York SHPO is typically necessary for identifying all known cultural resources.

Guidance to Federal agencies for 106 and other compliance:

General 106 guidance is available online at www.nysparks.com/shpo/environmental-review/preservation-legislation.aspx and www.nysparks.com/shpo/national-register/.

Special forms for SHPO 106 notification or identified cultural resources:

New York SHPO employs a series of inventory forms for maintaining and updating its catalog of known cultural resources. The inventory form for historical buildings and structures is online at www.nysparks.com/shpo/surveyevaluation/documents/HistoricResource InventoryForm.pdf.

Templates for inventory forms for prehistoric and historical archaeological sites may also be obtained by contacting the SHPO.

Qualifications for cultural resources specialists:

Principal investigators for cultural resources investigations conducted in New York State are required to meet the minimal qualifications described in 36 CFR Part 61.

Permit or other requirements for archaeological investigations:

The New York SHPO does not require a permit for archaeological investigations.

**Tribal statutes and treaties**

From 1777 to 1871, relations between the United States and Native American tribes were conducted through treaties. The Six Nations rights to lands in Central and Western New York were established through a series of treaties, such as the 1794 Treaty of Canandaigua, the 1797 Treaty of Big Tree, and the 1842 Buffalo Creek Treaty. The 1796 Treaty of New York City established the St. Regis Mohawk Reservation in the extreme northern part of the state. Following rejection of the 1934 Indian Reorganization Act by the reservation's inhabitants, it was reestablished in the 1960s and 1970s (e.g. http://srmt-nsn.gov/government/culture_and_history/; http://gallica.bnf.fr/ark:/12148/bpt6k276283.image).

Two tribes in New York State have THPOs: the St. Regis Mohawk Tribe and the Seneca Nation of Indians (www.nathpo.org/THPO/state_list.htm#NewYork). No special agreements exist between the THPO and the New York SHPO.

**Federal lands and agencies**

Three Federal agencies possess land in the project area in the New York State: the Department of Defense (DOD), including Army Corps of Engineers lakes, (Fort Drum, Mount Morris Lake, the Seneca Army Depot [closed], Plattsburgh Air Force Base [closed], Air Force Plant No. 38, the Camden Test Annex, Griffiss Air Force Base [closed], Hancock Field [owned by the Air Force], and a U.S. Marine Corps Reserve Training Center); the U.S. Fish and Wildlife Service (USFWS)(the Iroquois and Montezuma National Wildlife Reserves); and the U.S. Forest Service (USFS) (Finger Lakes National Forest) (www.nationalatlas.gov).

### 5.7.2.2 Pennsylvania

**State Historic Cultural Resources Laws, Statutes, and Regulations**

In addition to the Federal regulatory framework governing the management of cultural resources, state laws (and the regulations and agreements emanating from them) govern the treatment of historic and archaeological resources in Pennsylvania. Such laws are generally restricted to protecting cultural resources that may be threatened by Federal, state-funded, or state-permitted projects. Pennsylvania's cultural resources regulatory framework that may be relevant to CBP's mission and programs are:

- The Constitution of the Commonwealth of Pennsylvania

  http://sites.state.pa.us/PA_Constitution.html

Historic resources are addressed in Article 1, Section 27 of the Constitution of the Commonwealth of Pennsylvania, which states that, "The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people."

- The Pennsylvania History Code (Pennsylvania Consolidated Statute, Title 37, Historical and Museums)

  www.portal.state.pa.us/portal/server.pt/community/historic_preservation/3741/laws___regulations/418109

  The Pennsylvania History Code was established as a counterpart to the National Historic Preservation Act. Along with Article 1, Section 27 of the Constitution of Pennsylvania, it declares historic preservation to be the public policy and in the public interest of the state. The act created the Pennsylvania Register of Historic Places, the official list of sites, buildings, structures, areas, or objects significant in the history, architecture, archeology, or culture of the state, its communities, or the Nation.

**State Historic Preservation Office**

The SHPO for the Commonwealth of Pennsylvania is the Bureau for Historic Preservation (BHP), which is part of the Pennsylvania Historical and Museum Commission (PHMC). The BHP:

- Maintains Pennsylvania's cultural resource inventory;
- Prepares the state preservation plan;
- Nominates historic properties to the National Register;
- Reviews state and Federal actions for their effects on cultural resources;
- Assists in certifying historic building rehabilitation projects that seek tax incentives;
- Conducts archaeological investigations and surveys for other cultural resources;
- Oversees designations of historic districts under municipal ordinances;
- Advises local governments concerning preservation issues;
- Provides grants for restorations of historic buildings; and,
- Aids certified local governments with historic preservation programs.

The BHP website is www.portal.state.pa.us/portal/server.pt/community/historic_preservation/3741.

Inventory and evaluation (National Register) procedures:

Procedures for identification, inventory and evaluation of National Register-eligible properties in Pennsylvania follow those outlined in the ACHP guidelines for the protection of Cultural and Historic Properties (36 CFR Part 800) and Chapter 5 of the Pennsylvania History Code. Pennsylvania also has a "Request to Initiate Consultation Form," which they require prior to an agency's consultation with the BHP.  Additional guidance, along with a downloadable copy of the form is online at www.portal.state.pa.us/portal/server.pt/community/review_process/5071 and www.portal.state.pa.us/portal/server.pt/community/review_process/5071/section_106_of_nhpa/414261.  In Pennsylvania, the Historic Preservation Board reviews and recommends nominations of properties to the National Register and advises the PHMC on the inclusion of properties on the PRHC.

State preservation plan:

PHMC is currently developing its third statewide preservation plan.  The initial plan (2000–2005) was completed in 1999.  The second plan, *Pennsylvania's Historic Preservation Plan 2006–2011*, is available for download at www.portal.state.pa.us/portal/server.pt/community/preservation_plan/20240.

Resources for identifying locations of cultural resources (GIS, web, database etc.):

A map-based interactive inventory of historical and archaeological sites and surveys is available online through the BHP's Cultural Resources Geographic Information System (CRGIS).  Access to historic resource data is open to the public and archaeological site information is password protected. Additional information, as well as online access to the CRGIS, is at www.portal.state.pa.us/portal/server.pt/community/crgis/3802.

Guidance to Federal agencies for 106 and other compliance:

Guidance related to the Section 106 review process in the state is online at www.portal.state.pa.us/portal/server.pt/community/review_process/5071.

Special forms for SHPO 106 notification or identified cultural resources:

BHP employs a series of inventory forms for maintaining and updating its catalog of known cultural resources.  Forms are online at www.portal.state.pa.us/portal/server.pt/community/recording_resources/3683.

Requirements for research reports:

Requirements/standards for cultural resources investigations in Pennsylvania are described in three documents, available online at www.portal.state.pa.us/portal/server.pt/community/project_review_under_section_106_and_pa_history_code/3787/guidelines/415082:

The BHP's Guidelines for Archaeological Investigations in Pennsylvania, 2008;

Site Identification Criteria, Pennsylvania Archaeological Site Survey Files, 2001; and

PHMC's Curation Guidelines: Preparing Archaeological Collections for Submission to The State Museum of Pennsylvania, 2006.

Qualifications for cultural resources specialists:

Principal investigators for cultural resources investigations in Pennsylvania are required to meet the minimal qualifications described in 36 CFR Part 61.

Permit or other requirements for archaeological investigations:

The BHP does not require a permit for archaeological investigations.

**Tribal statutes and treaties**

There are no federally recognized Indian tribes in Pennsylvania. All of the commonwealth that includes the project area was ceded to the United States by the Six Nations of New York (i.e., the Iroquois Six Nations) by the 1784 Treaty of Fort Stanwix.

**Federal lands and agencies**

Three Federal agencies possess land in the project area in the Commonwealth of Pennsylvania: the DOD, including the Army Corps of Engineers lakes (Woodcock Creek Lake, Shenango Lake, Tionesta Lake, the Allegheny Reservoir, and the East Branch Clarion River Lake); the USFWS (the Erie National Wildlife Reserve); and the USFS (Allegheny National Forest and Allegheny National Recreation Area) (www.nationalatlas.gov).

### 5.7.2.3 Ohio

**State Historic Cultural Resources Laws, Statutes, and Regulations**

In addition to the Federal regulatory framework governing management of cultural resources, state laws (and the regulations and agreements emanating from them) govern \ treatment of historic and archaeological resources in Ohio. Such laws are generally restricted to the protection of cultural resources that may be threatened by Federal, state-funded, or state-permitted projects. Ohio's cultural resources regulatory framework that may be relevant to CBP's mission and programs are:

- Chapter 149.30, Title 1 of the Ohio Revised Code
- http://codes.ohio.gov/orc/149
- Chapter 149.30 of Title 1 of the Ohio Revised Code enumerates the public functions of the Ohio Historical Society (OHS). Although the legislation does not have its legal basis in the NHPA, it is closely related. Of the public functions of the OHS enumerated in the revised code that most closely relate to the NHPA is establishment of an "inventory, in cooperation with the Ohio arts council, the Ohio archaeological council, and the archaeological society of Ohio, of significant designated and undesignated state and local sites and keeping an active registry of all designated sites within the state." Chapter 149.301 of Title 1 created the Ohio Historic Site Preservation Advisory Board, members of which are appointed by the governor. The board's responsibilities include encouraging "the designation of suitable sites on the National Register of Historic Places and under related Federal programs. The advisory board shall provide general advice, guidance, and professional recommendations to the state historic preservation officer in conducting the comprehensive statewide survey, preparing the state historic preservation plan, and carrying out the other duties of the state historic preservation office."

**State Historic Preservation Office**

In Ohio, the Ohio Historic Preservation Office (OHPO), which is part of the OHS, serves as the SHPO. Unlike in other states in the project area, Ohio's SHPO is not a state agency, but acts on behalf of the state through a non-profit organization (the OHS). According to Chapter 149.30, Title 1 of the Ohio Revised Code, the OHS promotes "a knowledge of history and archaeology, especially of Ohio." Its public functions (http://codes.ohio.gov/orc/149) include:

- Creating and maintaining a system of state memorials for public use;
- Making alterations and improvements, marking, and protecting monuments and earthworks in its care;
- Serving as the archives administration for the state and its political subdivisions;
- Administering the state historical museum;
- Establishing a marking system to identify all designated historic and archaeological sites within the state;
- Publishing materials about history, archaeology, and natural science;
- Conducting research in history, archaeology, and natural science;
- Collecting, preserving, and making available all manuscript, print, or near-print library collections and all historical objects, specimens, and artifacts which pertain to the history of Ohio and its people;
- Promoting the development of county and local historical societies;
- Providing assistance to local societies for the preservation and restoration of historic and archaeological sites;
- Taking inventory of significant designated and undesignated state and local sites and keeping an active registry of all such designated sites within the state; and,
- Contracting with the owners or persons with an interest in designated historic or archaeological sites or property adjacent or contiguous to those sites, or otherwise acquiring easements in those sites or in property adjacent or contiguous to those sites, in order to control or restrict the use of those historic or archaeological sites, or adjacent or contiguous property.

The website for the OHPO is www.ohiohistory.org/resource/histpres/etcetera/about.html.

Inventory and evaluation (National Register) procedures:

> Procedures for identification, inventory, and evaluation of National Register-eligible properties in Ohio follow those outlined in the ACHP guidelines for the protection of Cultural and Historic Properties (36 CFR Part 800) and Chapter 149 of the Ohio Revised Code. In Ohio, the Ohio Historic Site Preservation Advisory Board (OHSPAB) advises the OHPO and the Ohio Historical Society on matters of historic preservation.

State preservation plan:

The OHPO Statewide Historic Preservation Plan, *A Future for Ohio's Past: A Historic Preservation Plan for Ohioans 2010–2014*, is available for download at www.ohiohistory.org/resource/histpres/toolbox/ppl/ppl-02.html.

Resources for identifying locations of cultural resources (GIS, web, database, etc.):

A map-based interactive inventory of historical and archaeological sites and surveys is available online through the OHPO's online mapping system. A paid subscription is required. Online access is at www.ohpo.org/gis/login.jsp.

Guidance to Federal agencies for 106 and other compliance:

Guidance related to the Section 106 review process in the state is online at www.ohiohistory.org/resource/histpres/services/s106-02.html.

Special forms for SHPO 106 notification or identified cultural resources:

The OHPO employs a downloadable application for reporting on identified cultural resources. The application, as well as instructions and links to other online resources, is online at www.ohpo.org/iform/.

Requirements for research reports:

Requirements/standards for cultural resources investigations in Ohio are described in *Archaeological Guidelines*, published by the OHPO in 1994. The guidelines are not available for download, but can be purchased online at www.ohiohistorystore.com/Archaeology-Guidelines-P7338C26.aspx.

Qualifications for cultural resources specialists:

Principal investigators for cultural resources investigations in Ohio are required to meet the minimal qualifications described in 36 CFR Part 61 or be certified by a professional archaeological association.

Permit or other requirements for archaeological investigations:

According to Ohio Revised Code §149.54, permits issued by the Director of the Ohio Historical Society are required for archaeological investigation "on any land that is owned, controlled, or administered by the state or any political subdivision of the state, or at any archaeological preserve, dedicated under section 149.52 of the Revised Code, or at any state archaeological landmark registered under section 149.51 of the Revised Code." Otherwise, the OHPO does not require a permit for archaeological investigations.

OHPO is not a government agency:

Unlike in other states, the SHPO in Ohio (i.e., the OHPO) is not a state agency. It is administered by the OHS, which acts in partnership with the state and performs duties related to historic preservation on the state's behalf.

**Tribal statutes and treaties**

Most important was the Treaty of Greenville (1795), which ceded the southern two-thirds of Ohio to the United States. The treaty, which followed the Indian defeat at Fallen Timbers, was signed by representatives (chiefs and headmen) of the Wyandot, Delaware, Shawnee, Ottawa, Chippewa, Potawatomi, Miami, Wea, Kickapoo, and Kaskaskia. General "Mad Anthony" Wayne represented the United States. No federally recognized Native American tribes or reservations exist in Ohio.

**Federal lands and agencies**

Three Federal agencies possess land in the project area in Ohio: the DOD, including the Army Corps of Engineers lakes (Charles Mill Lake, Mosquito Creek Lake, Pleasant Hill Lake, Beach City Lake, Berlin Lake, Mohawk Reservoir, Atwood Lake, Leesville Lake, and Ravenna Arsenal); the USFWS (the Ottawa and Cedar Point National Wildlife Refuges); and the NPS (Cuyahoga Valley National Park) (www.nationalatlas.gov).

### 5.7.2.4 Michigan

**State Historic Cultural Resource Laws, Statutes, and Regulations**

In Michigan, state regulations/standards related to cultural resources have their legislative basis in Federal law, specifically Section 106 of the NHPA. Such laws are restricted to protecting cultural resources that may be threatened by Federal, state-funded, or state-permitted projects. The governor appoints the Michigan SHPO.

**State Historic Preservation Office**

The Michigan SHPO is part of the Michigan State Housing Development Authority (MSHDA) of the Department of Energy, Labor and Economic Growth. Prior to 2009, the SHPO was part of the Department of History, Arts, and Libraries. The SHPO’s functions include (www.michigan.gov/mshda/0,1607,7-141-54317-53069--,00.html):

- Providing assistance to local communities to identify and protect historic resources in the state; and,
- Administering Federal and state tax incentive and grant programs.

Michigan’s MSHDA website is www.michigan.gov/mshda/0,1607,7-141-54317-53069--,00.html.

Inventory and evaluation (National Register) procedures:

> Procedures for identification, inventory and evaluation of National Register-eligible properties in Michigan follow those outlined in the ACHP guidelines for the protection of cultural and historic properties (36 CFR Part 800). In Michigan, the Michigan State Historic Preservation Review Board is responsible for reviewing and approving nominations to the National Register.

State preservation plan

Michigan's current (2007–2012) state historic preservation plan, *Preservation Shore to Shore: Making Michigan Competitive Through Historic Preservation*, is available for download at www.michigan.gov/mshda/0,1607,7-141-54317_54760_27123---,00.html.

Resources for identifying locations of cultural resources (GIS, web, database, etc.)

A map-based interactive partial inventory of above-ground historical resources is available through the Michigan Historical Center's historic sites online database at www.mcgi.state.mi.us/hso/map.asp. A visit to the SHPO or the Office of the State Archaeologist (OSA) is typically necessary for identifying archaeological sites and recently inventoried above-ground properties.

Guidance to Federal agencies for 106 and other compliance:

Guidance related to the Section 106 review process in the state is online at www.michigan.gov/mshda/0,1607,7-141-54317_54371-98336--,00.html and at http://mishporehab.wordpress.com/archaeology/.

Special forms for SHPO 106 notification or identified cultural resources:

As of June, 2011, the Michigan SHPO was revising its system of inventory forms for recording cultural resources. Updated forms are available by contacting the SHPO online at www.michigan.gov/mshda/0,1607,7-141-54317-97306--,00.html.

Requirements for research reports:

Requirements/standards for cultural resources investigations in Michigan are described in the SHPO's *Manual for Historic and Architectural Surveys in Michigan*, published in 2001. The manual is available for download at www.michigan.gov/mshda/0,1607,7-141-54317_20901---,00.html.

Qualifications for cultural resources specialists:

Principal investigators for cultural resources investigations in Michigan are required to meet the minimal qualifications described in 36 CFR Part 61.

Permit or other requirements for archaeological investigations:

The SHPO does not require a permit for archaeological investigations.

**Tribal statutes and treaties**

There are six Native American Reservations and other lands in the study area in Michigan, all of which were established by treaty and agreements with the U.S. government in the nineteenth and twentieth centuries. The Onontagon and L'Anse Reservations of the Keweenaw Bay Indian Community and the Lac Vieux Desert Band of Lake Superior Chippewa Indians was established by the Treaty of La Pointe, Wisconsin of 1854; the Bay Mills Indian Community of the Ojibwe and the Hannahville Community of the Potawatomi were organized with the Indian Reorganization Act of 1934; and the Isabella Reservation was established by a pair of treaties in

1855 and 1864 and was subsequently reorganized under the 1934 Indian Reorganization Act (http://gallica.bnf.fr/ark:/12148/bpt6k276283.image; www.law.cornell.edu/uscode/325/usc_sec_25_00001300---j000-.html).

Four tribes in Michigan have THPOs: the Keweenaw Bay Indian Community; the Lac Vieux Desert Band of Lake Superior Chippewa Indians; the Pokagon Band of Potawatomi Indians; and the Bay Mills Indian Community (http://mishporehab.wordpress.com/?s=THPO). No special agreements exist between any of the THPOs and the SHPO.

**Federal lands and agencies**

Four Federal agencies possess land in the project area in Michigan: the DOD (including the Army Corps of Engineers lakes) (K. I. Sawyer Air Force Base [closed], Camp Graying Military Reservation, Wurtsmith Air Force Base [closed], and Selfridge Air Force Base); the USFWS (the Shiawassee, Michigan Islands, and Seney National Wildlife Refuges); the USFS (Hiawatha, Ottawa, and Huron National Forests and the Upper Peninsula Experimental Forest), and the NPS (Isle Royale National Park and Pictured Rocks National Lakeshore) (www.nationalatlas.gov).

### 5.7.2.5 Wisconsin

**State Historic Cultural Resource Laws, Statutes, and Regulations**

In addition to the Federal regulatory framework governing the management of cultural resources, state laws (and the regulations and agreements emanating from them) govern the treatment of historic and archaeological resources in Wisconsin. Such laws are generally restricted to protecting cultural resources that may be threatened by Federal, state-funded, or state-permitted projects. Wisconsin's cultural resources regulatory framework that may be relevant to CBP's mission and program are:

- Subchapter II of Chapters 44.30 to 44.48, Wisconsin Statutes and Annotations, 1987:

  http://legis.wisconsin.gov/statutes/Stat0044.pdf

  Subchapter II of Chapter 44 of the Wisconsin Statutes and Annotations establishes the state's Historic Preservation Program as a counterpart to the NHPA and declares historic preservation to be the public policy and in the public interest of the state. The statute created the Wisconsin Inventory of Historic Places, the official list of sites, buildings, structures, areas, or objects significant in the history, architecture, archeology, or culture of the state, its communities, or the Nation.

Federal historic preservation laws applicable to Federal projects in Wisconsin: www.cr.nps.gov/history/online_books/fhpl/contents.htm.

**State Historic Preservation Office**

The SHPO for the State of Wisconsin is the Wisconsin Historical Society (WHS). The WHS:

- Maintains inventories of historic properties;
- Administers grants;
- Conducts and supports archaeological research;

- Provides technical assistance to local governments and owners of historic properties;
- Administers Federal and state tax credit programs for the rehabilitation of historic properties;
- Catalogs burial sites (including Native American mounds) and prehistoric sites and structures;
- Administers the Wisconsin Historical Markers Program;
- Administers the Certified Local Government Program; and,
- Nominates sites to the State and National Registers of Historic Places;

The WHS website is www.wisconsinhistory.org/hp/about.asp.

Inventory and evaluation (National Register) procedures:

The Wisconsin SHPO project review procedures are at www.wisconsinhistory.org/hp/protecting/106_intro.asp.

State preservation plan:

Wisconsin's state historic preservation plan is entitled *Wisconsin Historic Preservation Plan 2006–2015* and is at www.wisconsinhistory.org/hp/docs/plan.pdf.

Resources for identifying locations of cultural resources (GIS, web, database etc.):

- For state rules guiding the conduct of archaeological investigations, refer to

www.wisconsinhistory.org/archaeology/osa/index.asp.

- For state rules guiding the conduct of architectural and historical investigations, refer to www.wisconsinhistory.org/hp/survey-manual/.
- The Wisconsin Historic Preservation Database provides information on historic structures, archaeological sites and burials within the state for registered users. For information on access to the WHPD, refer to www.wisconsinhistory.org/hp/whpd/.
- For information on Architectural and Historic Inventory, refer to www.wisconsinhistory.org/ahi/.

For information on other historic research databases pertinent to Wisconsin, refer to www.wisconsinhistory.org/hp/professionals.asp.

Guidance to Federal agencies for 106 and other compliance:

- For SHPO project review procedures, refer to www.wisconsinhistory.org/hp/protecting/106_intro.asp.

Special forms for SHPO 106 notification or identified cultural resources:

- For forms required to initiate the 106 process in Wisconsin, refer to www.wisconsinhistory.org/hp/protecting/instructions.asp.

- For forms related to the conduct of archaeological investigations in Wisconsin, refer to www.wisconsinhistory.org/archaeology/archaeologists-consultants/arch-resources/forms.asp.

Requirements for research reports:

- For archaeological survey guidelines, refer to www.wisconsinhistory.org/archaeology/osa/index.asp.
- For architectural survey guidelines, refer to www.wisconsinhistory.org/ahi/.

Qualifications for cultural resources specialists:

- For the approved list of consultants qualified to conduct archaeological surveys in Wisconsin, refer to www.wisconsinhistory.org/archaeology/preserve/pdf/arch_consultants.pdf.
- For the approved list of consultants qualified to excavate burials, refer to

  www.wisconsinhistory.org/hp/burialsites/about/bs_burialexcavation.pdf
- For the approved list of consultants qualified to conduct architectural and historical surveys, refer to www.wisconsinhistory.org/hp/docs/architecture- history-consultants-list.pdf.

Permit or other requirements for archaeological investigations:

- For the procedures and forms to conduct archaeological investigations on public lands, refer to www.wisconsinhistory.org/archaeology/archaeologists-consultants/public-lands.asp.

**Tribal statutes and treaties**

Three Native American reservations and other lands exist in the study area in Wisconsin, all of which were established by treaty and agreements with the U.S. government in the nineteenth and twentieth centuries. The lands of the Bad River and Red Cliff Bands of Lake Superior Chippewa were established by the 1854 treaty of La Pointe and the territories of the Forest County Potawatomi Community of the Potawatomi were organized by the Indian Reorganization Act of 1934, although the community began acquiring the Forest County land as early as 1913 (http://witribes.wi.gov/docview.asp?docid=21285&locid=57; http://gallica.bnf.fr/ark:/12148/bpt6k276283.image). Wisconsin also shares an atypical government-to-government relationship with the Indian Nations within its boundaries; EO #39, issued in 2004, established the State-Tribal Consultation Initiative. "The goal of this Initiative will be greatly improved communications allowing for any potential issues to be corrected early on or avoided entirely on both sides. Through the Initiative, valuable state and tribal resources are put to more effective use delivering government services in a more streamlined, coordinated and economically efficient manner" (http://witribes.wi.gov/section.asp?linkid=283&locid=57).

Eight tribes in Wisconsin have THPOs: the Bad River Band of Lake Superior Chippewa Indians, the Ho-Chunk Nation, the Lac Courte Orielles Band of Lake Superior Chippewa Indians, the Lac du Flambeau Band of Lake Superior Chippewa Indians, the Menominee Indian Tribe of Wisconsin, the Oneida Nation of Wisconsin, the Red Cliff Band of Lake Superior Chippewa

Indians, and the Stockbridge-Munsee Community Band of Mohican Indians (see www.wisconsinhistory.org/hp/protecting/106_issues_2.asp). The Wisconsin SHPO does not have "review or consultative authority" in cases in which undertakings will be entirely inside one of these Nations or tribal territories (www.wisconsinhistory.org/hp/protecting/106_issues_2.asp). No special agreements exist between any of the THPOs and the SHPO.

**Federal lands and agencies**

Two Federal agencies possess land in the project area in Wisconsin: the USFS (Chequamegon and Nicolet National Forests) and the NPS (Apostle Islands National Lakeshore) (www.nationalatlas.gov).

### 5.7.3 EAST OF THE ROCKIES REGION

#### 5.7.3.1 Minnesota

**State Historic CR Laws, Statutes, and Regulations**

In addition to the Federal regulatory framework governing the management of cultural resources, state laws (and the regulations and agreements emanating from them) govern the treatment of historic and archaeological resources in Minnesota. Such laws are generally restricted to protecting cultural resources that may be threatened by Federal, state-funded, or state-permitted projects. Minnesota's cultural resources regulatory framework that may be relevant to CBP's mission and programs are:

- Minnesota Statutes, Chapter 138 designates the director of the Minnesota Historical Society (MHS) as the SHPO (MS 138.081) and places responsibility for Minnesota's historic preservation program with the MHS. Other sections pertaining to historic and archaeological resources are:

  Minnesota Field Archaeology Act (MS 138.31-138.42) establishes the office of the State Archaeologist; requires licenses to engage in archaeology on non-Federal public land; establishes ownership, custody, and use of objects and data recovered during survey; and requires state agencies to submit development plans to the state archaeologist, the MHS, and the Minnesota Indian Affairs Council for review when known or suspected archaeological sites exist in the area.

  Minnesota Historic Sites Act (MS 138.661-138.669) establishes the State Historic Sites Network and the State Register of Historic Places, and requires that state agencies consult with the MHS before undertaking or licensing projects that may affect properties on the network or on the State or National Registers of Historic Places.

  Minnesota Historic Districts Act (MS 138.71-138.75) designates certain historic districts and enables local governing bodies to create commissions to provide architectural control in these areas.

- Minnesota Statutes 471.193 enables local units of government to establish heritage preservation commissions.
- Minnesota Private Cemeteries Act (MS 307.08) protects all human burials or skeletal remains on public or private land.

**State Historic Preservation Office**

Minnesota's SHPO was created by state statute in 1969 to provide statewide leadership. The director of the MHS serves as SHPO. The mission of the Minnesota SHPO is to:

- Identify, evaluate, register, and protect Minnesota's historic and archaeological properties;
- Encourage development of local history organizations and activities; and,

Assist government agencies in carrying out their historic preservation responsibilities.

The agency's web address is www.mnhs.org/shpo/.

Inventory and evaluate (National Register) procedures:

The SHPO runs an ongoing statewide survey program that has recorded more than 50,000 historic structures and approximately 16,500 archaeological sites representing every county in Minnesota. Nearly 7,000 National Register properties exist in Minnesota, including individual properties and historic districts.

State preservation plan:

The Minnesota State preservation plan is entitled *Gaining Ground: A Preservation Plan for Minnesota's Historic Properties 2006–2010*, which assesses the progress made by all of Minnesota's preservation partners during the previous 5-year planning period and provides direction for the future. The current plan (2006) is accessible at: www.mnhs.org/shpo/planning/preservationplan_2006.pdf. The plan provides a framework for the ongoing work of historic preservation—resource identification, evaluation, registration, and protection—by all of Minnesota's preservation partners. The plan discusses Minnesota's three-tiered historic context framework:

- Broad statewide patterns encompassing three periods: Pre-Contact (9500 B.C.–A.D. 1650), Contact (1650–1837) and Post-Contact (1837–1945);
- Specific themes, identified as needed, to evaluate properties best understood in a framework smaller than statewide patterns; and

Contexts developed by a particular city or other local area for use in local planning, discussing six primary goals and objectives.

The goals of the Minnesota Plan include:

1. To create statewide awareness of and appreciation for the value of Minnesota's historic and archaeological resources;
2. To make historic preservation an integral part of all levels of planning to enhance the quality of life in Minnesota;
3. To strengthen the statewide network of organizations and individuals engaged in historic preservation;
4. To promote historic preservation as an economic development tool and provide economic incentives to encourage preservation;

5. To expand and enhance efforts to identify, evaluate, and designate historic and archaeological resources; and,
6. To encourage appropriate management and treatment of historic resources.

Resources for identifying locations of cultural resources (GIS, web, database etc.):

The Minnesota SHPO maintains architecture-history and archaeological databases in Microsoft Access. Various types of cultural resource searches can be requested by e-mail. The SHPO also maintains a reports database for both architecture and archaeology. The database is not accessible online; SHPO staff conduct searches upon request.

Guidance to Federal agencies for 106 and other compliance:

Guidance for review and compliance are contained in the Guidelines for History/Architecture Projects in Minnesota (2010) and the SHPO Manual for Archaeological Projects in Minnesota (2005).

Special forms for SHPO 106 notification or identified cultural resources:

Requirements for research reports in Minnesota are contained in the guidance cited above. Special forms include an archeological site form and architectural site form. Both can be downloaded from the agency website.

Qualifications for cultural resources specialists:

- The Minnesota SHPO maintains a list of individuals and firms who have expressed an interest in undertaking contract archaeology in Minnesota. The SHPO reserves the right to reject contract reports if the principal investigator or other contract personnel do not meet certain minimal qualifications standards listed in 36 CFR Part 61.
- The Minnesota Office of the State Archaeologist (OSA) requires that applicants for state archaeological licenses (see below) meet certain professional qualifications standards. These standards meet or exceed both 36 CFR Part 61 and Minnesota SHPO standards.

Permit or other requirements for archaeological investigations:

Separate licenses are required for each phase of archaeological investigation on non-Federal public land.

**Tribal statutes and treaties**

Numerous treaties with various Minnesota tribes were executed throughout the 1800s. These treaties, however, were all with the Federal Government. Ten reservations are associated with five tribes within the CBP 100-mile operational corridor: the Red Lake Band of Chippewa Indians (three non-contiguous reservation areas); the White Earth Band of Minnesota Chippewa; the Leech Lake Band of Chippewa Indians; the Boise Forte Band of Chippewa Indians (Deer Creek); the Boise Forte Band of Chippewa Indians (Nett Lake); the Boise Forte Band of Chippewa Indians (Vermilion Lake); the Fond du Lac Band; and the Grand Portage Band of Lake Superior Chippewa.

**Federal lands and agencies**

Several Federal agencies administer or maintain lands within the CBP 100-mile border corridor in Minnesota, including DOD, USFWS, USFS, and NPS.

#### 5.7.3.2 North Dakota

**State Historic Cultural Resource Laws, Statutes, and Regulations**

In addition to the Federal regulatory framework governing management of cultural resources, state laws (and the regulations and agreements emanating from them) govern the treatment of historic and archaeological resources in North Dakota. Such laws are generally restricted to protection of cultural resources that may be threatened by Federal, state-funded, or state state-permitted projects. North Dakota's cultural resources regulatory framework that may be relevant to CBP's mission and programs are:

- North Dakota Century Code 55-03-01 requires permits to investigate, evaluate, or mitigate adverse effect on cultural resources, historic buildings, structures, or objects under Section 106. It also requires permits to conduct investigations on state land.
- North Dakota Century Code 55-10-11 created the SHPO.
- North Dakota Century Code 23-06-27 protects unmarked human burials and establishes treatment procedures.
- North Dakota Century Code 55-02-07 protects prehistoric and historic sites on state land and restricts access to location data.
- North Dakota Century Code 55-02-09 establishes an emergency impact mitigation fund.

**State Historic Preservation Office**

The North Dakota State Historic Preservation Office (SHPO) is a division of the State Historical Society of North Dakota (SHSND). The duties of the North Dakota SHPO are to:

- Locate, survey, investigate, register, identify, preserve, and protect historic, architectural, archaeological and cultural sites, structures, and objects worthy of preservation;
- Evaluate historic properties for significance and nominate them to the National Register of Historic Places;
- Review all Federal undertakings permitted, funded, licensed or otherwise assisted;
- Administer Federal tax incentives for the preservation of historic buildings;
- Assist Federal and state agencies in their responsibility to identify and protect historic properties and archaeological sites that may be affected by their projects; and
- Provide preservation education, training, and technical assistance to individuals and groups as well as local, state, and Federal agencies and tribes.

The agency's web address is http://history.nd.gov/.

Inventory and evaluation (National Register) procedures:

The Archaeology and Historic Preservation Division (AHPD) of the SHSND maintains the database for cultural resources sites in North Dakota. Verified sites are indexed according to the Smithsonian Institution Trinomial System. This information does not appear to be available electronically or online.

State preservation plan

The North Dakota State preservation plan is entitled *Historic Preservation in North Dakota, 2010–2015: A Statewide Comprehensive Plan* and serves as a guide for preservation efforts at the state and local levels. The current plan (2010) is accessible at: http://history.nd.gov/hp/PDFinfo/ND2009CompHPPlan.pdf. It presents an overview of historic and prehistoric themes and discusses six primary goals and objectives, including:

1. To provide financial and non-financial incentives for participation in historic preservation efforts and program activities;
2. To increase awareness of the presence and value of cultural resources;
3. To increase the effectiveness of the state's preservation network;
4. To promote programs to identify, record, evaluate, and preserve significant cultural properties;
5. To increase appropriate treatment of historic properties; and
6. To increase regular inclusion of historic preservation concerns in the planning and decision-making processes of agencies, organizations, and individuals whose activities have a potential to affect significant cultural resources.

Resources for identifying locations of cultural resources (GIS, web, database, etc.):

The database of information for cultural resources sites in North Dakota (the NDCRS) is maintained by the AHPD of the SHSND. Verified sites are indexed according to the Smithsonian Institution Trinomial System.

Guidance to Federal agencies for 106 and other compliance:

Guidance for review and compliance are contained in the North Dakota SHPO Guidelines Manual for Cultural Resource Inventory Projects (2006).

Special forms for SHPO 106 notification or identified cultural resources:

Requirements for research reports in North Dakota are contained in the guidance cited above. Special forms include the archeological site form, the architectural site form, and the historic site form. Forms can be downloaded from the agency website.

Qualifications for cultural resources specialists:

All activities performed under a permit issued pursuant to North Dakota Century Code chapter 55-03 must be conducted by or under the direct supervision of a professionally qualified individual. The listed standards mirror the Federal standards in 36 CFR Part 61. A standard for paleontology has been added to these state standards.

Permit or other requirements for archaeological investigations:

Permits are required.

**Tribal statutes and treaties**

Several treaties with various North Dakota tribes were executed in the mid to late 1800s. These treaties, however, were all with the Federal government. Three reservations exist within the CBP 100-mile operational corridor: the Turtle Mountain Band of Chippewa Indians of North Dakota; the Three Affiliated Tribes of the Fort Berthold Reservation (Mandan, Arikara, and Hidatsa); and the Spirit Lake Tribe (Sioux).

**Federal lands and agencies**

Several Federal agencies administer or maintain lands within the CBP 100-mile border corridor in North Dakota, including the BLM, Bureau of Reclamation, DOD, USFWS, USFS, and NPS.

### 5.7.3.3 Montana

**State Historic Cultural Resource Laws, Statutes, and Regulations**

In addition to the Federal regulatory framework governing the management of cultural resources, state laws (and the regulations and agreements emanating from them) govern the treatment of historic and archaeological resources in Montana. Such laws are generally restricted to the protection of cultural resources that may be threatened by Federal, state-funded, or state-permitted projects. Montana's cultural resources regulatory framework that may be relevant to CBP's mission and programs are:

- Montana Antiquities Act, as amended (1995) addresses the responsibilities of the SHPO and other state agencies regarding historic and prehistoric sites including buildings, structures, paleontological sites, or archaeological sites on state-owned lands.
- Montana Human Skeletal Remains and Burial Site Protection Act (1999) provides legal protection to all unmarked burial sites regardless of age, ethnic origin, or religious affiliation by preventing unnecessary disturbance and prohibiting unregulated display of human skeletal remains. The Act created a 13-member Burial Preservation Board that determines the treatment and final disposition of any discovered human remains and associated burial materials.

**State Historic Preservation Office**

The Montana SHPO is a division of the Montana Historical Society. The duties of the Montana SHPO are:

- Preparing and implementing a statewide Historic Preservation Plan;
- Conducting and maintaining a statewide survey to identify and document historic buildings and archaeological sites;
- Evaluating historic properties for significance and nominating them to the National Register of Historic Places;
- Assisting local governments in development of local historic preservation programs;

- Administering Federal tax incentives for the preservation of historic buildings;
- Assisting Federal and state agencies in their responsibility to identify and protect historic properties and archaeological sites that may be affected by their projects; and,
- Providing preservation education, training, and technical assistance to individuals and groups as well as local, state, and Federal agencies and tribes.

The agency's web address is http://mhs.mt.gov/shpo/.

Inventory and evaluation (National Register) procedures:

The Montana SHPO maintains an inventory of more than 50,000 historic and archaeological site records, which is available to agencies for research and evaluation of potential project effects on cultural resources.

State preservation plan:

The Montana State preservation plan is entitled *Preserve Montana–The Montana Historic Preservation Plan, 2008–2012* and serves as a guide for preservation efforts at the state and local levels. The current plan (2008) is accessible at: http://mhs.mt.gov/shpo/surveyplanning/HistPresPlan.asp. It presents an overview of historic themes and discusses numerous goals and objectives.

Resources for identifying locations of cultural resources (e.g. GIS, web, database, etc.):

The Montana Antiquities Database contains cultural resource information on known historic and archaeological sites, previously conducted cultural resource inventories, National Register site status, and cultural resource management project information. The database consists of three parts, including the cultural resource information system (CRIS), which provides information on historical and archaeological sites; the cultural resource annotated bibliography system (CRABS), which contains information on previous surveys; and Project, Eligibility, and Effect Report, which includes information on the eligibility of sites and effects.

- Guidance to Federal offers guidance for consulting at both the state and Federal levels.

Special forms for SHPO 106 notification or identified cultural resources:

Requirements for research reports in Idaho are contained in *Guidelines for Documenting Archaeological and Historical Surveys*, which provides requirements and guidance for completing reports and forms, including:

File Search Request Form

Site Form Request

CRIS Form

CRABS Form

Historic Property Record Form

Isolated Find Form

Paleontological Form

Montana PaleoIndian Point Data Form

Stone Circle Forms

Forms can be downloaded from the agency website.

Qualifications for cultural resources specialists:

Montana maintains a list of contractors, but does not guarantee that they meet professional standards

Permit or other requirements for archaeological investigations:

Not required

**Tribal statutes and treaties**

Several treaties with various Montana tribes were executed in the mid-1800s. These treaties, however, were all with the Federal Government. There are five reservations within the CBP 100-mile operational corridor, including the Chippewa-Cree Indians of the Rocky Boy's Reservation; Fort Belknap Indian Community of the Fort Belknap Reservation of Montana; the Blackfeet Tribe of the Blackfeet Indian Reservation of Montana; Confederated Salish & Kootenai Tribes of the Flathead Reservation; and the Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation.

**Federal lands and agencies**

Several Federal agencies administer or maintain lands within the CBP 100-mile border corridor in Montana. These agencies include the BLM, Bureau of Reclamation (BOR), DOD, USFWS, USFS, and NPS.

## 5.7.4 WEST OF THE ROCKIES REGION

### 5.7.4.1 Idaho

**State Historic Cultural Resource Laws, Statutes, and Regulations**

In addition to the Federal regulatory framework governing the management of cultural resources, state laws (and the regulations and agreements emanating from them) govern the treatment of historic and archaeological resources in Idaho. Such laws are generally restricted to protecting cultural resources that may be threatened by Federal, state-funded, or state-permitted projects. Idaho's cultural resources regulatory framework that may be relevant to CBP’s mission and programs are:

- Idaho Statute 18-7035: Damaging Caves or Caverns;
- Idaho Statute 18-7027: Desecration of grave, cemetery, headstone, or place of burial;
- Idaho Statute 18-7028: Unlawful Removal of Human Remains; and
- Idaho Statute 27-502: Protection of Graves, Prohibited Acts.

**State Historic Preservation Office**

The Idaho SHPO is a division of the Idaho State Historical Society (ISHS) and functions on a grant from the NPS. The Idaho SHPO operates in six program areas:

- National Register of Historic Places Program;
- State historic and archaeological sites inventories;
- Certified local government (CLG) grants management;
- Preservation planning;
- Tax incentives; and,
- Federal historic preservation project review (Section 106 Review)

The agency's web address is http://history.idaho.gov/shpo.html.

Inventory and evaluation (National Register) procedures:

> The Idaho SHPO maintains an inventory of more than 50,000 historic and archaeological site records, which are available to agencies for research and evaluation of potential project effects on cultural resources.

State preservation plan:

> The Idaho State preservation plan is entitled *A View to the Future* and serves as a general guide for local governments, historical societies, and individuals interested in Idaho's history. The current plan (2008) is accessible at: http://history.idaho.gov/documents/2008PreservationPlan.pdf. The plan has ten stated goals that range from conducting inventory surveys to promoting training.

Resources for identifying locations of cultural resources (GIS, web, database, etc.):

> Site file searches can be conducted upon application with the SHPO and returned to the applicant via e-mail.

Guidance to Federal agencies for 106 and other compliance:

> No additional guidance is provided beyond normal 36 CFR 800 procedures.

Special forms for SHPO 106 notification or identified cultural resources:

> Requirements for research reports Idaho are contained in *Guidelines for Documenting Archaeological and Historical Surveys*, which provides requirements and guidance for completing reports and forms including: site report form, archaeology site inventory form; and determination of eligibility form. The forms can be downloaded from the agency website.

Qualifications for cultural resources specialists:

> Idaho does not maintain a list of qualified cultural resources specialists.

Permit or other requirements for archaeological investigations:

Permits are not required.

**Tribal statutes and treaties**

The Idaho State-Tribal Relations Act (Title 67, Chapter 40) is an agreement with the Coeur d'Alene Tribe, the Kootenai Tribe of Idaho, the Nez Perce Tribe, the Shoshone Bannock Tribes of the Fort Hall Reservation, or the Shoshone-Paiute Tribes of the Duck Valley Reservation. The Act created a Council on Indian Affairs, which includes tribal members. The purpose of the Council is to monitor and review legislation and state policies that impact state-tribal relations in the areas of jurisdiction, governmental sovereignty, taxation, natural resources, economic development, and other issues in which state government and tribal government interface as well as to advise the governor, legislature, and state departments and agencies on these issues. The Kootenai Tribe of Idaho has a reservation within the CBP 100-mile border corridor.

**Federal lands and agencies**

Several Federal agencies administer or maintain lands within the CBP 100-mile border corridor in the state. These agencies include the BLM, DOD, USFWS, and NPS.

#### 5.7.4.2 Washington

**State Historic Cultural Resource Laws, Statutes, and Regulations**

In addition to the Federal regulatory framework governing the management of cultural resources, state laws (and the regulations and agreements emanating from them) govern the treatment of historic and archaeological resources in Washington. Such laws are generally restricted to the protection of cultural resources that may be threatened by Federal, state-funded, or state-permitted projects. Washington's cultural resources regulatory framework that may be relevant to CBP’s mission and programs are:

- EO 05-05 requires state agencies with capital improvement projects to integrate the Department of Archaeology and Historic Preservation (DAHP), the Governor’s Office of Indian Affairs (GOIA), and concerned tribes into their capital project planning process.
- Revised Code of Washington (RCW) includes provision for the protection of historic cemeteries (RCW 68.60 as well as RCW 27.44) and outlines the treatment of discovered human remains.
- RCW 43.51A established the Office (now Department) of Archaeology and Historic Preservation and the establishment of a state ACHP.

**State Historic Preservation Office**

The SHPO for the State of Washington is the DAHP. The DAHP is a cabinet-level agency managed by a governor-appointed director. The DAHP:

- Advocates for the preservation of Washington’s significant and irreplaceable historic and cultural resources, including buildings, structures, sites, objects, and districts;
- Reviews and comments on the effect of Federal and state undertakings on historic properties;

- Oversees the identification and evaluation of archaeological sites as well as historic buildings, objects, and districts; and,
- Promotes historic preservation through planning and public education.

The DAHP web address is www.dahp.wa.gov/.

Inventory and evaluation (National Register) procedures:

WAC 25-12-060 outlines procedures for the nomination and designation of historic properties to the State or National Register.

State preservation plan:

The Washington State preservation plan is entitled *Sustaining Communities through Historic Preservation–the Washington State Historic Preservation Plan 2009–2013* and can be downloaded from the DAHP website. The plan has six primary goals:

1) To enhance the effectiveness of Historic Preservation efforts;

2) To strengthen the connections between historic preservation and sustainability;

3) To strengthen the role of historic preservation in local planning and community revitalization;

4) To boost promotion of heritage tourism;

5) To improve the identification and protection of archeological sites and cultural resources; and;

6) To increase the diversity of participation in historic preservation.

Resources for identifying locations of cultural resources (e.g. GIS, web, database, etc.):

DAHP uses the Historic Property Inventory Management System (2010) and GIS-Washington Information System for architectural and archaeological records data WISAARD, accessed at https://fortress.wa.gov/dahp/wisaard/.

Guidance to Federal agencies for 106 and other compliance:

No additional guidance is provided beyond normal 36 CFR 800 procedures.

Special forms for SHPO 106 notification or identified cultural resources:

The Washington State Standards for Cultural Resource Reporting (2010) provides requirements and guidance for completing reports and forms, including: cultural resources survey cover sheet (must accompany all reports); archaeology site inventory form; archaeology isolate inventory form; submerged historic archaeological resource registration form; cemetery inventory form; and historic property inventory form. The forms can be downloaded from the agency website. All reports must be submitted electronically as pdfs.

Qualifications for cultural resources specialists:

Washington does not maintain a list of qualified cultural resources specialists

Permit or other requirements for archaeological investigations:

Chapter 25-48 WAC establishes application and review procedures for issuance of archaeological excavation and removal permits.

**Tribal statutes and treaties**

There are 29 federally recognized tribes in Washington with 3 having reservations over 500,000 acres: Colville, Yakima, and Quinault.  The state has numerous agreements with many tribes primarily concerned with health and welfare, and taxes. The Governor's Office of Indian Affairs maintains a list of treaties as well as a tribal directory (www.goia.wa.gov/).  Most of the early land treaties were signed from 1854 (Treaty of Medicine Creek) to 1856 (Quinault Treaty).

**Federal lands and agencies**

Several Federal agencies administer or maintain lands within the CBP 100-mile border corridor. These agencies include the BLM, BOR, DOD, U.S. USFS, USFWS, and NPS.

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# APPENDIX I

# PROFILES OF PROTECTED AREAS ALONG THE NORTHERN BORDER

## I-1: U.S. PROTECTED AREAS BY STATE

## I-2: CANADIAN NATIONAL PARKS, PROVINCIAL PARKS, AND NATIONAL RESERVES

# I-1 U.S. PROTECTED AREAS BY STATE

## WASHINGTON

North Cascades National Park Complex

The region of the North Cascades National Park (NP) Complex adjacent to the border is primarily backcountry wilderness.  Most of the area is designated a cross-country II zone where small parties may hike, camp, boat and use private stock.  There are trails, minor roads, and backcountry campsites.  A smaller portion of this area of the park is designated as a trail zone with more established trails and many campgrounds.  Between 2000 and 2009, annual visitation ranged between 16,912 and 26,972 visitors per year (for the Park outside of Ross Lake National Recreation Area (NRA) and Lake Chelan NRA.  Most of this park can be categorized as low-impact use area or medium-impact use area (USDOI, 2010a; USDOI, 2009a).

Lake Chelan National Recreation Area

Lake Chelan NRA is the southern part of the North Cascades NP.  It does not touch the northern border.  This NRA contains both cross-country II zones for use by small parties as well as trail zones.  The entire recreation area has numerous campgrounds, picnic areas, developed lodging, and well-maintained trails.  Between 2000 and 2009, annual visitation ranged between 25,139 and 42,548 visitors per year.  Much of this park can be categorized as high-impact use area (USDOI, 2010a; USDOI 2009b).

Ross Lake National Recreation Area

Ross Lake NRA is a part of the North Cascades NP Complex and is divided into four major management zones.  The two zones found adjacent to the northern border are designated as backcountry and wilderness.  Backcountry zones have limited visitor facilities and structured opportunities for visitor recreation. Wilderness zones (the dominant zone in Ross Lake NRA) are dominated by natural conditions, with very limited primitive visitor facilities.  Both of these areas along the border are undeveloped with few campgrounds, roads, and trails.  Farther south, area along the North Cascades Highway is designated as “frontcountry” and is developed for a variety of recreation and educational visitor opportunities.  The Hydroelectric Zone is developed for hydroelectric power generation by Seattle City Light.  Ross Lake NRA also includes the Skagit River. This zone is managed for the preservation of the natural and cultural resources of the river.  It has been recommended that the Skagit River be designated as a Wild and Scenic River (WSR) from Gorge Powerhouse to the eastern boundary of the area. Between 2000 and 2009, annual visitation ranged between 253,333 and 387,216 visitors per year.  Most of this park (relevant to the northern border) can be categorized as low-impact use area with some medium-impact use area (USDOI, 2010a; USDOI, 2009c).

Lake Roosevelt National Recreation Area

Lake Roosevelt NRA is along the shoreline of Lake Roosevelt and the Columbia River. A small portion of the area is close to the northern border. Major recreation activities involve boating, fishing, camping, picnicking, swimming, and walking or hiking along the shoreline. The area of the NRA closest to the border is well-developed for visitor recreation. It includes boating facilities (such as fuel launches and marinas) as well as boat-in campsites on islands, visitor stations, trails, and paved and unpaved roads. Park visitation varies between 1.3 and 1.5 million visitors per year (2000 to 2009). Much of this park can be categorized as high-impact use area (USDOI, 2006a; USDOI, 2009d).

Mount Rainier National Park

Mount Rainier NP is not actually on the northern border, though it is a major park in a border state; Washington. Most of the park (97 percent) is designated wilderness and will continue to be managed according to the provisions of the Wilderness Act. Most of the structures within the park are listed on the National Register of Historic Places (NRHP). The Wilderness areas of the park include unmaintained, constructed trails and areas designated for research, primitive designated camping, and climbing. There are several high-use nonwilderness zones that are developed to include visitor centers, roads, parking lots, shuttles, trails for biking and hiking, and campgrounds. Most of the land on the northern border is designated as wilderness. Between 2000 and 2009, annual visitation ranged between 1,567,866 and 1,970,406 people. Most of this park can be categorized as low-impact use area with a few high-impact use areas (USDOI, 2011; USDOI, 2009e).

Olympic National Park

Olympic NP is on the northwest tip of Washington. While it does not physically touch the border, it is very close to Juan de Fuca Strait, which is crossed by the border (in water). The center of Olympic NP (95 percent) is designated as wilderness. The area of the park closer to the northern border is more developed and has more visitor facilities. This area includes both paved and unpaved roads, parking areas, campgrounds, well-developed visitor center facilities, and ranger stations. It includes areas designated for day use, development, and some wilderness area. Visitors engage in hiking, educational activities, camping, beachcombing, fishing, and driving along scenic routes. Overall the park contains 14 developed visitor areas, four lodges, 16 campgrounds, and 600 miles of trails. Between 2000 and 2009, visitation ranged between 2,749,197 and 3,691,310 visitors per year. Much of this area could be categorized as medium-impact use area (USDOI, 2009f; USDOI, 2010b).

Colville National Forest (NF)

Colville NF is in the upper northeast corner of Washington and crosses into Idaho. Colville NF currently has over 60 trails, most of which are suitable for hiking, horseback riding, and biking, and several which are suitable for skiing. As of 1981, when the National Forest Management Plan (FMP) was written, there were a total of 367 miles of trails in the forest, 41 of which were within wilderness. Currently, there are 28 developed campgrounds, which may include amenities such as highway access, boat launches, and picnic tables. There are also boating facilities and facilities developed for winter sports. As of the 1981 FMP, there were 67 developed recreational facilities in total. Other recreation activities include hunting, fishing, picnicking, and driving through scenic highways and roads. There is also backcountry camping and about two thirds of all recreation activities occur outside of developed campgrounds. In 1981, 30,613 acres of the park were allocated as the Salmo-Priest Wilderness, 857,544 acres were roaded non-wilderness, and 206,843 acres were unroaded non-wilderness. There were 41.5 miles of trails and an average of 1,800 visits per year in the Salmo-Priest Wilderness area as of 1981. Within the wilderness, there are zones designated as semi-primitive, non-motorized, primitive (trailed), and primitive (trail-less). In the FMP, a desire and plan was expressed for more developed trails to increase use. The annual visitation estimate for forest visits is 335,700 visits. Much of this area could be categorized as medium-impact use area (USDA, 2010a; USDA, 2010b).

Idaho Panhandle National Forest (includes Coeur d'Alene National Forest and Kaniksu National Forest)

This national forest stretches from approximately 25 miles south of the border (Kaniksu NF) south to the Coeur d'Alene NF. The NF includes part of the Salmo-Priest Wilderness (11,950 acres). There are also several others areas recommended for wilderness area designation (146,700 acres). Within the park are over 100 miles of trails suitable for biking. For camping, the forest includes rentable cabins, lookouts, campgrounds with amenities, campgrounds suitable for recreational vehicles (RV) camping, and backcountry camping. Other recreational activities include water sports, climbing, horse riding, hunting, scenic driving, and picnicking. The forest includes two Wild and Scenic Rivers (WSR), the St. Joe River and the Upper Priest River. In the 1987 FMP developed for the NF, the Coeur d'Alene River, the Little North Fork Clearwater River, and the Pack River were identified as having the potential to be WSRs. The annual visitation estimate for forest visits is 1,277,700 visits. Much of this area could be categorized as medium-impact use area (USDA, 2009a; USDA, 2009b).

Mount Baker- Snoqualmie National Forest

The Mount Baker-Snoqualmie NF extends from the northern border, adjacent to the Northern Cascades NP complex south to the Mount Rainier NP. The section of forest that is closest to the northern border includes two forest service centers. Part of the Skagit WSR flows through this park. In addition, 48 percent of the Mount Baker-Snoqualmie NF is designated as wilderness. This includes part or all of Alpine Lakes, Boulder River, Clearwater, Glacier Peak, Henry M. Jackson, Mount Baker and Noisy Diobsud, Norse Peak, and Wild Sky Wilderness areas. The forest contains over 30 different campgrounds as well as infrastructure for fishing, picnicking, and winter sports. There are 1,500 miles of trails, including trails suitable for mountain biking and off highway vehicles. Other recreation activities include mountain climbing and scenic driving. The park also includes Mount Baker NRA, which is managed for snowmobile and cross-country skiing. The annual visitation estimate for forest visits is 1,677,500 visits. Much of this park can be categorized as high-impact use area with sections of low- and medium-impact use areas (USDA, 2008a; USDA, 2009c).

Gifford Pinchot National Forest

This NF includes the 110,300-acre Mount St. Helens National Volcanic Monument and 180,600 acres of wilderness. These areas of designated wilderness are spread out into several regions, including wilderness in the Mount St. Helens Monument, Mount Adams, Indian Heaven, and Trapper Creeks. In 2010, there were 1,138,000 visitors to the forest. Recreational facilities include 1,475 miles of trails, 44 developed forest campgrounds, six group campsites, ten horse camps, and 16 Sno-parks. There are 4,101 miles of roads within the park. Much of this park can be categorized as high-impact use area (USDA, 2009d; USDA, 2010c).

Okanogan National Forest and Wenatchee National Forest (managed together as one forest)

The Okanogan portion of the NF is along the northern border, while the Wenatchee area is farther south. Approximately 40 percent of the forest is designated as wilderness, spread among eight areas. This forest includes a large part of the 529,477 acres of the Pasayten Wilderness (a small portion falls within Mount Baker-Snoqualmie NF). A major trail in the Pasayten Wilderness, the Boundary Trail goes north from the southeast corner along the Canadian border for a total of more than 73 miles. The forest also includes all or part of the Lake Chelan-Sawtooth (145,667 acres), the Goat Rocks Wilderness (105,633 acres), Glacier Peak Wilderness (576,900 acres), Henry M. Jackson Wilderness (103,591 acres total; 27,242 acres within Wenatchee), Norse Peak Wilderness (50,923 acres) and William O. Douglas Wilderness (166,000 acres). There are no roads or developments within wilderness areas. There are 800 miles of wilderness trails as well as well-maintained trails accessible to people with disabilities. The forest includes over 24 developed campgrounds and is open to backcountry camping as well. Other recreational activities include off-highway vehicle (OHV) use, fishing, climbing, mountain biking, horse riding, and small-scale prospecting. The annual visitation estimate for Okanogan NF is 678,900 visits and 2,312,200 visits per year for Wenatchee NF. Much of this park can be categorized as medium-impact use area and low-impact use area (USDA, 2010d; USDA, 2009e; USDA, 2009f).

Dungeness National Wildlife Refuge (NWR)

The Dungeness NWR is on a strip of land in the Dungeness Bay, approximately ten miles south of the marine Canadian border. The refuge consists of 636 acres. No camping is allowed in the refuge, but is allowed in the adjoining Dungeness Recreation Area. Jogging, swimming, and other beach activities are allowed only in selected areas during certain times of the year. Bikes, kites, and other sport equipment and pets are prohibited. The main recreation activities are hiking and walking. Most of this area can be categorized as low-impact use area (USDOI, 2010c).

Little Pend Oreille National Wildlife Refuge

The refuge is near the Colville NF, approximately 40 miles south of the border. This refuge consists of 41,568 acres. There are six established campgrounds where camping is allowed. Other recreational activities include hiking, hunting, fishing, biking, horseback riding, and snowmobile riding in certain areas. Much of this area could be categorized as medium-impact use area (USDOI, 2010d).

Nisqually National Wildlife Refuge

Nisqually NRW is also near Colville NF and is south of the border. The refuge has two miles of walking trails, one of which is a one-mile boardwalk trail. In addition to walking and hiking, recreation includes fishing from boats, boating, and waterfowl hunting. Most of this area can be categorized as low-impact use area (USDOI, 2010e).

Protection Island National Wildlife Refuge

Protection Island NWR is located in Discovery Bay in the Strait of Juan de Fuca. This 364-acre refuge includes 48-acre Zella M. Schultz Seabird Sanctuary. The refuge is closed to the public except for nine families and a research group, who were given special access when the NWR was established. Most of this area can be categorized as low-impact use area (USDOI, 2010f).

## MONTANA

Kootenai National Forest

The Kootenai NF is located in the northwest corner of Montana along the northern border. In the center of Kootenai NF is the 93,000-acre Cabinet Mountains Wilderness. In the forest, there are 39 developed campgrounds accessible by car or boat. There are also several rentable lookouts and cabins. There are also hundreds of miles of hiking, horse, and bicycle trails. Additional recreational activities include water recreation, fishing, rock climbing, scenic driving, gold panning, downhill and cross-country skiing, and snowmobiling. The annual visitation estimate is 919,300 visits. Much of this area could be categorized as medium-impact use area with some high-impact use areas (USDA, 2009g; USDA, 2008b).

Glacier National Park

Glacier NP is in north-central Montana along the northern border. Glacier NP provides many recreational activities including backcountry camping, camping at designated campgrounds, hiking along developed and undeveloped trails, skiing, snowshoeing, private and guided horseback riding, boating, and fishing. There are two main regions of the park near the Canada border. Goat Haunt-Belly River is largely made up of backcountry. Glacier NP is managed to protect its natural processes. There are some developments in this area, including trails, campsites, primitive signs, sanitation facilities, and patrol cabins. However, this area is largely undeveloped. Goat Haunt-Belly River region also has two small visitor service zones with limited services. This area includes more developed day-use trails as well as bridges, overlooks, sanitation facilities, contact and customs stations, boat docks, corrals, administrative facilities, and employee housing. These service areas are located in the upper northeast corner of the park on the border and near Waterton Lake. The other region on the border is the North Fork region. This area is also managed to preserve the wild character of the region. There are small rustic car campgrounds and a small visitor service area. However, most of this region is backcountry. The rustic areas of this region include paved and unpaved roads, small parking lots, trails and trailheads, employee housing, ranger stations, small boat launching facilities, interpretive signs, and campgrounds.

Overall, most of the area of Glacier NP along the northern border is undeveloped backcountry with unpaved trails, campsites, and primitive facilities. The middle fork of the Flathead River is designated as a WSR, however, this portion of the river is not in either border region. Glacier Park visitation ranged from 1,664,046 to 2,083,329 people per year between 2000 and 2009. This area (relevant to the northern border) can be categorized as low-impact use area (USDA, 2009g; USDOI, 2010g).

Flathead National Forest

Flathead NF starts just south of the northern border extending over 100 miles into Montana. Flathead NF manages the largest part of the Bob Marshall Wilderness Complex, which includes the Great Bear Wilderness, the Bob Marshall Wilderness and the Scapegoat Wilderness and a total of 1.5 million acres. In addition, the North Fork, Middle Fork, and portions of the South Fork of the Flathead River are within the National WSRs system and are used for floating excursions. Within the park there are 12 cabins to rent as well as 31 campgrounds. Backcountry camping is also permitted as well as downhill skiing, berry picking, hunting and fishing, and scenic driving through non-wilderness areas. The annual visitation estimate for forest visits is 1,077,000 visits. Much of this area could be categorized as low-impact use area (USDA, 2010e; USDA, 2009h).

Lewis and Clark National Forest

Lewis and Clark NF is a small park in the center of Montana over 100 miles south of the northern border. A small portion of the Bob Marshall Wilderness complex lies within the Lewis and Clark NF. This NF also includes 29 developed campsites and five rentable cabins. In addition to hiking, recreational activities also include winter sports such as skiing, scenic driving, and hunting. The annual visitation estimate is 406,800 visits. Much of this area could be categorized as medium-impact use area (USDA, 2009i; USDA, 2010f).

## MINNESOTA

Superior National Forest

Superior NF is in the upper northeast corner of Minnesota, adjacent to the northern border and Lake Superior. The Boundary Waters Canoe Area Wilderness (one million acres) lies within the forest. There are 2,000 miles of trails for different uses, including hiking, hunting, fishing, biking, horseback riding, cross-country skiing, snowmobile and all-terrain vehicle (ATV) riding, or observing nature. There are 23 developed "fee" campgrounds, 18 rustic campgrounds, and more than 277 backcountry campsites, most of which are on a body of water. Water recreation includes boating, fishing, swimming, or picnicking at one of 77 lake accesses, 13 fishing piers, ten swimming beaches, and 22 picnic areas. There are also three scenic byways in the park. The annual visitation estimate for forest visits is 1,375,900 visits. Much of this park can be categorized as high-impact use area (USDA, 2010g; USDA, 2009j).

## NORTH DAKOTA

<u>Lostwood National Wildlife Refuge</u>

Lostwood NWR is located approximately 20 miles south of the northern border in North Dakota. Lostwood is fairly small but was named one of America's Top 500 Globally Important Bird Areas by the American Bird Conservancy. The NWR habitat produces more ducks than any other region in lower 48 states. There are vehicle and hiking trails for the public as well as a sharp-tailed grouse blind. In addition, the wilderness areas offer hiking during certain months, as well as snowshoeing and cross-country skiing. Most of this area can be categorized as low-impact use area (USDOI, 2009h).

## MONTANA

<u>Medicine Lake National Wildlife Refuge</u>

Medicine Lake NWR complex includes Medicine Lake NWR, Northeast Montana Wetland Management District (WMD), and Lamesteer NWR. The complex includes a total of 31,702 acres and consists of two separate tracts. Common recreational activities include photography, observation, hunting, fishing, and environmental education. There is no camping allowed. Most of this area can be categorized as low-impact use area (USDOI, 2009i).

<u>UL Bend National Wildlife Refuge (inside Charles M. Russell National Wildlife Refuge)</u>

UL Bend NWR is a "refuge within a refuge" inside the Charles M. Russell NWR. UL Bend NWR contains 20,000 acres of designated wilderness. Some recreational opportunities include fishing, hunting, and a self-guided automobile tour. Most of this area can be categorized as low-impact use area (USDOI, 2009j).

## MICHIGAN

<u>Hiawatha National Forest</u>

This one million-acre NF lies in between Lake Superior and Like Michigan, near Canadian Marine boundaries. It includes five National WSRs including the Carp, Indian, Sturgeon, Tahquamenon, and Whitefish. It also includes Grand Island NRA, Whitefish Scenic Byway, and five wilderness areas including Big Island Lake Wilderness, Delirium Wilderness, Horseshoe Bay Wilderness, Mackinac Wilderness, Rock River Canyon Wilderness, and Round Island Wilderness. Recreational activities include beachcombing, mountain biking, climbing, fishing, hiking, hunting, off-highway vehicle (OHV) riding, picnicking, and nature viewing. In addition, the forest has two rentable cabins, 24 campground and group campsites, and 24 dispersed (primitive) campsites. There are also several boat launches and facilities for motorized boating. Non-motorized boating and swimming is allowed in many lakes and rivers. The annual visitation estimate for forest visits is 490,700 visits. Much of this area could be categorized as primarily a high-impact use area with some low- and medium-impact use areas (USDA, 2009k; USDOI, 2010h).

Huron-Manistee National Forest

This NF is in the upper northeast corner of Michigan, near the Canadian border that runs through Lake Huron. It is almost one million acres in size. Each year the forest receives approximately four million recreation visits. It includes the 3,450 acre Nordhouse Dunes Wilderness area and the Au Sable and Pere Marquette River National WSR. There are approximately ten miles of trails within the wilderness accessible from two developed trailheads. Within the forest as a whole, recreation activities include hiking, bicycling, beachcombing, horse riding, fishing, hunting, OHV riding, and picnicking. There are also over 30 campsites for campground camping and several sites for RV camping. Non-campground camping is allowed almost everywhere in the forest. Many developed campgrounds also include boat launches for motorized boats. In the winter, snowmobiling, cross-country skiing, and snowshoeing are also allowed. The annual visitation estimate for forest visits is 4,063,100 visits. Much of this park can be categorized as high-impact use area (USDA, 2010i; USDA, 2009k).

Ottawa National Forest

This almost one million-acre forest is located in the Western Upper Peninsula of Michigan. It borders Lake Superior, which includes the Canadian underwater border. The forest includes the Sylvania Wilderness and Sylvania Recreation Area, which, when combined, encompass 18,327 acres of wilderness. In addition, the forest includes the Sturgeon Wild and Scenic River, the Sturgeon River Gorge Wilderness (which includes few overgrown trails and one campground), and the McCormick Wilderness (also very rugged with a few unmaintained trails), the Lake Ottawa Recreation Area, and the Black River Harbor Campground Recreation Area. Overall, there are 22 developed campgrounds in the Ottawa NF. All are accessible by road and most service both tent and trailer campers. There is also one large group campground that can accommodate 100 campers, and dispersed camping is allowed in the forest. In addition there are more than 196 miles of hiking and backpacking trails as well as paved day-hiking trails from the Ottawa Lake Recreation Area. In addition, other recreation activities include bicycling, beachcombing, horse riding, fishing, hunting, OHV riding, and picnicking. There are also 450 miles of groomed snowmobile trails and areas for cross-country skiing and snowshoeing. The annual visitation estimate is 507,000 visits. Much of this park can be categorized as high-impact use area (USDA, 2009m; USDA, 2010j).

Isle Royale National Park

Isle Royale NP is on Isle Royale in Lake Superior. The island is less than ten miles from the underwater Canadian border and a little more than 20 miles from Canadian land. It is only accessible by boat or seaplane. The park is 132,018 acres of designated wilderness. In the wilderness there are 36 established primitive campgrounds and 170 miles of trail and shorelines. Canoeing and kayaking on Isle Royale is very popular (some campgrounds are only accessible by canoe or kayak). There are several dock campgrounds. Motorized canoeing is only allowed in Lake Superior. Other recreational activities include fishing, day hikes, and scuba diving to explore shipwrecks. Between 2000 and 2009, annual visitation ranged from 14,038 and 21,096 visitors per year. Most of this area can be categorized as low-impact use area (USDOI, 2006b; USDOI, 2009k).

## NEW YORK

Iroquois National Wildlife Refuge

This NWR is midway between Rochester and Buffalo, New York, near Lake Ontario. There are three nature trails and four wetland overlooks. Canoeing and kayaking without motors is allowed on Oak Orchard Creek. There is one skiing trail. Regulated hunting is also permitted. There is no camping allowed. There are also numerous interpretive activities and events. Most of this area can be categorized as low-impact use area (USDOI, 2010h).

Montezuma National Wildlife Refuge

Montezuma NWR lies between Rochester and Syracuse, approximately 20 miles from Lake Ontario. It is near Seneca Falls and the Finger Lakes. It contains 7,068 acres. There are six short trails (one mile or less) in the NWR. There is also a wildlife drive route, a visitor center, and several observation and photography locations. Most of this area can be categorized as low-impact use area (USDOI, 2010i).

## OHIO

Cuyahoga Valley National Park

This park is near Cleveland and Lake Erie. There are five primitive backcountry campsites at one campground. There is also an inn inside the park. Canoeing and kayaking are permitted, but discouraged due to potential pollution in the water. There are 125 miles of hiking trails in the NP. Other recreational activities including biking along designated bike paths, taking a scenic train ride, fishing, EarthCaching (geocaching), golfing on one of four golf courses within the park, horseback riding, and picnicking. There is also a winter sports center that supports activities such as cross-country skiing, sledding, and ice fishing. Between 2000 and 2009, annual visitation ranged from 2,468,816 and 3,206,175 visitors per year. Much of this area could be categorized as medium-impact use area (USDOI, 2010j; USDOI, 2009l).

Cedar Point National Wildlife Refuge

This small NWR is near Toledo, Ohio, on the shore of Lake Erie, approximately 20 miles from the underwater Canadian border. The NWR includes 2,445 acres of marsh. Most of it is closed to the public except for a fishing area which is open in the summer. Most of this area can be categorized as low-impact use area (USDOI, 2009m).

Ottawa National Wildlife Refuge

This NWR is slight south of Cedar Point NWR, on the shore of Lake Erie.  This NWR is part of the Ottawa NWR complex, which also manages Cedar Point NWR, West Sister Island NWR, and Schoonover Waterfowl Production Area.  In total, the complex includes over 9,000 acres. There are ten miles of gravel/grass trails, as well as monthly guided "hike the dikes" program in closed areas and a shuttle service for disabled visitors.  There is also a photo blind and monthly automobile tours for wildlife observation.  There is no camping or overnight use of any kind allowed.  OHV use is also not allowed.  Controlled and regulated hunting and fishing are allowed in certain areas.  Most of this area can be categorized as low-impact use area (USDOI, 2010k).

## WISCONSIN

Chequamegon-Nicolet National Forest

The Chequamegon-Nicolet NF is in the upper northeast corner of Wisconsin, close to the Michigan border.  It covers over 1.5 million acres.  It includes the Headwaters Wilderness (18,000 acres), Blackjack Springs Wilderness (5,800 acres), Porcupine Lake Wilderness (4,446 acre), Rainbow Lake Wilderness (6,583 acres), and Whisker Lake Wilderness (7,500 acres).  It also includes the well-developed and maintained Anvil National Recreation Trail and the Morgan Falls St. Peter's Dome Trail.  There are 800 miles of trails, 51 campgrounds, and eight rustic cabins.  Many campgrounds offer space for RVs.  Fishing and hunting are also popular. Certain trails are designated for mountain biking, horse riding, or OHV riding.  Other activities include boating (motorized and non-motorized), swimming, waterskiing, snowmobiling, cross-country skiing, and snowshoeing.  The annual visitation estimate for forest visits is 725,800 visits.  Much of this park can be categorized as high-impact use area with some designated low-impact use areas (USDA, 2010k; USDA, 2009m)

Apostle Islands National Lakeshore

The Apostle Islands are off the shores of Wisconsin in Lake Superior.  The park includes 21 islands and 12 miles of mainland.  There are established group and individual campsites as well as backcountry camping zones in the park.  Other recreation activities include boating, fishing, hiking, hunting, kayaking, and scuba diving.  There are 50 miles of maintained trails on the islands (including some boardwalks).  According to a visitor survey in 2004, the most common activities that visitors participated in during their visit included sightseeing (80 percent), walking on beaches (66 percent), and photography (57 percent).  Between 2000 and 2009, annual visitation ranged from 151,881 and 189,051 visitors per year.  Much of this area could be categorized as medium-impact use area (USDOI, 2009n; USDOI, 2010l).

## MAINE/VERMONT/NEW HAMPSHIRE

White Mountain National Forest

The White Mountain NF is in the northeast corner of Vermont, a little over 50 miles from the Canadian Border. This NF includes Great Gulf Wilderness (approximately 5,552 acres), Presidential Range-Dry River (29,000 acres), Pemigewasset Wilderness (45,000 acres), Sandwich Range and Sandwich Range Extension Wilderness (25,000 and 10,800 acres), Caribou Speckled Mountains Wilderness (14,000 acres), and the Wild River Wilderness (23,700 acres). It also includes the Wildcat Brook Wild and Scenic River. There are three cabins for rent, as well as 23 developed campgrounds and three group campsites, accessible by car. Backcountry camping is also permitted. There are also several facilities (campgrounds, trails, etc.) that are accessible for people in wheelchairs. Other recreational activities include biking, bird watching, hiking, climbing, fishing, hunting and trapping, geocaching, boating, swimming, skiing, and mountaineering. The annual visitation estimate for forest visits is 1,704,400 visits. Much of this area could be categorized as medium-impact use area (USDA, 2010l; USDA, 2009o).

## MAINE

Moosehorn National Wildlife Refuge

Moosehorn NWR is on the upper northeast corner of Maine, on the Canadian border. The NWR covers a total of 24,400 acres. In the park there are over 50 miles of dirt roads and trails available for walking, biking, and skiing. There are also two observation decks. Regulated hunting and fishing are allowed in certain locations at certain times. No camping or overnight parking, bicycling, or motorized vehicle use is permitted. Most of this area can be categorized as low-impact use area (USDOI, 2010m).

# I-2 CANADIAN NATIONAL PARKS, PROVINCIAL PARKS, AND NATIONAL RESERVES

## BRITISH COLUMBIA

Pacific Rim National Park Reserve

Pacific Rim National Park Reserve is located on the Southwest edge of Vancouver Island on the Pacific coast, approximately 20 miles from the border. The park includes a 75 mile backpacking trail, an archipelago of island accessible only by boat, a campground with many campsites and several interpretive centers. Wilderness camping is also permitted. Other recreational activities include birding, fishing, whale and sea lion walking, walking on trails and beaches, cycling, paddling. This area can be categorized as a low-impact use area (National Parks of Canada, 2007).

Carmanah Walbran Provincial Park

This large Provincial Park is located on Vancouver Island, on the shore of the Juan De Fuca Strait. There are several wilderness and car-camping campsites in the park. There are also several picnic areas and pit toilets. Wildlife viewing, hiking and hunting are popular recreational activities. This area can be categorized as a low-impact use area (British Columbia Ministry of Environment, 2010a).

Skagit Valley Provincial Park and EC Manning Provincial Park

These parks are a continuation of the North Cascades NP Complex on the Washington/British Columbia border. There are 3 drive-in campsites in Skagit Valley PP and 4 drive in campsite in EC Manning PP. There is one group camping site in Skagit Valley and 2 in EC Manning. Wilderness camping is available in both parks. Within EC Manning Provincial Park is Manning Park Resort with motel/cabin rentals and developments such as a pub, restaurant, grocery store and sport rentals. There is a boat launch in each park. Hiking, fishing, cycling, horseback riding, hunting, interpretive activities and swimming are popular recreational activities. This area can be categorized as a high-impact use area (British Columbia Ministry of Environment, 2010b).

Cathedral Park and Protected Area

This park is on the Washington Border and connects with the Okanogan NF. This park is a wilderness area with several strenuous hiking trails, campgrounds, and wilderness camping. Limited horseback riding is allowed and hunting in certain areas during certain times. Other recreation includes wildlife viewing and picnicking. There are very few facilities and developments in the park. This area can be categorized as a low-impact use area (British Columbia Ministry of Environment, 2010c).

Snowy Protected Area

Snowy protected area is adjacent to Cathedral Park and the Washington Border. It is a remote wilderness area with no facilities, encompassing a total of 25,889 hectares. There is one public, backcountry cabin, and several other cabins for the use of permitted guide outfitters or First Nations. Hunting and cattle grazing are permitted in this area, as is backcountry camping and hiking. This area can be categorized as a low-impact use area (British Columbia Ministry of Environment, 2009)**.**

## ALBERTA

<u>Waterton Lakes National Park</u>

Waterton Lakes National Park is on the Montana border and connects with Glacier NP on the US side. This park is highly developed and offers a large range of recreational activities such as boating, water skiing, climbing, cycling, fishing, horseback riding, picnicking, sail boating, scuba diving, tennis, swimming golf. There are 120 miles of hiking trails as well as four large developed campgrounds and wilderness camping. This area can be categorized as a high-impact use area (National Parks of Canada, 2011a)**.**

<u>Akamina Kishinena Provincial Park</u>

Akamina Kishinena Provincial Park is located in the southeast corner of the province. This wilderness area along with Waterton Lakes National Park and US Glacier National Park, preserves the Crown of the Continent UNESCO World Heritage site at the narrowest point of the Rocky Mountains. High spacious alpine ridges, deep secluded valleys and windswept passes provide habitat and connectivity to the last self-sustaining grizzly bear population in the United States. Exposed alpine ridges, southern latitude and southern exposure provide winter range for goats and big horn sheep.. (British Columbia Parks, 2011a)**. T**his area can be categorized as a low-impact use area

<u>Twin River Heritage Rangeland Natural Area</u>

This Natural Area is approximately 10 miles north of the Montana border. It has one day use site. This area can be categorized as a low-impact use area (Government of Alberta, 2011a)**.**

<u>Milk River Natural Area</u>

This Natural Area lies along the US-Canada border in Alberta, adjacent to Montana. There is a one day use site. The only other recreational activity is backcountry hiking. This area can be categorized as a low-impact use area (Government of Alberta, 2011b)**.**

<u>One four Heritage Rangeland Natural Area</u>

This Natural Area includes four parcels of land along the Montana border and in Alberta. There is only one day use area. This area can be categorized as a low-impact use area (Government of Alberta, 2011c)**.**

## SASKATCHEWAN

<u>Grasslands National Park</u>

This National Park is along the Montana border in Saskatchewan. The park is designated as a Dark Sky Preserve with limited light pollution and excellent constellation viewing, and astronomy is a popular activity. Other recreation includes photography, backcountry camping and hiking, camping in car designated car and recreational vehicle accessible campgrounds, horseback riding and hiking on trails. This area can be categorized as a medium-impact use area (National Parks of Canada, 2011b)**.**

## ONTARIO

Quetico Provincial Park

This substantial provincial park is on the Ontario/Minnesota border and is a continuation of Superior NF. It includes 107 campsites, 49 of which are highly developed with electricity, showers and laundry facilities. There are playgrounds and canoe rentals. There are over 16 miles of maintained hiking trails. Swimming, cycling, wildlife viewing, snowshoeing and cross country skiing are also popular recreational activities. This area can be categorized as a medium-impact use area (Ontario Parks, 2006).

Sleeping Giant Provincial Park

This park is on a peninsula on the Northwest shore of Lake Superior, approximately 15 miles from the underwater border. There are a total of 200 campsites, eighty five of which are electrically equipped and two of which have comfort facilities (shower and laundry). There are also three large group sites with amenities. There are 40 additional backcountry campsites scattered in the interior. There are also two playgrounds, a boat launch and canoe and kayak rentals. Fishing, educational programs, boating, swimming and wildlife viewing are common recreational activities. This area can be categorized as a high-impact use area (Ontario Parks, 2010a).

Pukaskwa National Park

This park lies on the shore of Lake Superior. The park includes 67 developed car camping sites at a campground as well as backcountry sites at developed and non-developed sites. Picnicking, paddling, boating and fishing are also common recreational activities. In the winter there is also cross-country skiing and snow shoeing. This area can be categorized as a medium-impact use area (National Parks of Canada, 2011c).

Lake Superior Provincial Park

This large Provincial park in on the eastern shore of Lake Superior, approximately 30 miles from the underwater border. There are three established campsites. Other recreational activities are hunting, fishing, paddling and hiking. This area can be categorized as a low-impact use area (Ontario Parks, 2010b).

Fathom Five National Marine Park

This small park is on an island in Lake Huron. There is a dock and seven tenting sites for camping. Diving and canoeing and kayaking are also popular recreational activities. There is a private boat tour that provides access to the island. This area can be categorized as a low-impact use area (National Parks of Canada, 2009).

Bruce Peninsula National Park

This park lies on Bruce Peninsula, between Lake Huron and the Georgian Bay, approximately 30 miles from the underwater border. It is adjacent to Cabot Head Provincial Nature Reserve and Johnston Harbour Pine Tree Point Provincial Nature Reserve. It is also near Fathom Five National Marine Park (Island in Lake Huron). Within the park, there are 242 primitively developed drive-in campsites at three campgrounds. Backcountry camping is also allowed. In addition, hiking, swimming, photography, picnicking, fishing, canoeing and kayaking, cross country skiing and snowshoeing are also popular recreational activities. This area can be categorized as a medium-impact use area (National Parks of Canada, 2011d).

Point Pelee National Park

This park lies on a pointed peninsula on the shore of Lake Erie, approximately 20 miles north of the underwater U.S.-Canada border. Recreational activities include canoeing and kayaking through marsh, bicycling, bird watching, hiking and walking, photography, picnicking and swimming. There is also a shuttle along the tip, as well a kayak and bike rental stations. This area can be categorized as a medium-impact use area (National Parks of Canada, 2011e).

Upper Canada Bird Sanctuary

This sanctuary is on the shore of the St. Lawrence River, near the New York border. There are 5 miles of hiking trails, 3 miles of ski trails as well as camping, canoeing and outdoor learning activities. This area can be categorized as a low-impact use area.

## QUEBEC

Lac Saint Francois National Wildlife Area

This NWA is approximately a mile from the New York border in Quebec. There are 6 miles of hiking, a boat ramp and lookout. Hunting, water sports, canoeing and wildlife observation are recreational activities. This area can be categorized as a medium-impact use area (Government of Quebec, No date given)**.**

Parc national du Mont-Megantic

This park lies approximately ten miles north of the Quebec/Vermont border. It is a designated dark sky reserve. The park includes over 18 miles of multi-purpose trails and 12 miles of hiking trails. There are also trails for snowshoeing, cross-country skiing and sledding. There are seven huts, four tent cabins and 13 campsites. Facilities also include a museum and observatory. This area can be categorized as a high-impact use area (Parcs Quebec, 2011)**.**

## NEW BRUNSWICK

Roosevelt Campobello International Park

This park lies nearly on the border of Maine and New Brunswick. It is operated jointly by the US and Canada. The main attraction is the Roosevelt Cottage, where Franklin Delano Roosevelt vacationed. There are also 8.4 miles of driving roads and eight miles of walking trails. This area can be categorized as a medium-impact use area (USDOI, 2006c)**.**

## NOVA SCOTIA

Kejimkujik National Park

This park lies in the center of Nova Scotia. The park includes campgrounds and group camp sites as well as wilderness camping. There are 15 day-use hiking trails. Other recreation includes canoeing, picnicking, swimming, bird watching, fishing, cross country skiing and snowshoeing. This area can be categorized as a **low-impact use area** (National Parks of Canada, 2011c)**.**

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# APPENDIX J

# AIR QUALITY SUPPORTING DOCUMENTATION

**J1: Emissions Calculations**

**J2: Construction and Non-Permitting Air Regulations by State**

# J1:  EMISSIONS CALCULATIONS

**Table J1-1.  Project Characteristics from Facilities Construction and Upgrades**

| Project Name | Duration [days] | Clearing Area [acres] | Building Area [sq ft] | Paving [acres] |
|---|---|---|---|---|
| Construct a new Port of Entry (POE) (clearing) | 365 | 0.92 | 20,000 | 2.3 |
| Modernize/upgrade existing POE (clearing) | 365 | 0.69 | 15,000 | 1.96 |
| Construct a new Border Patrol Station (BPS) (clearing) | 365 | 1.15 | 25,000 | 0.23 |
| Install SBInet monopole communications towers (clearing) | 45 | 0.12 | 2,500 | 0.14 |
| Set up permanent traffic checkpoints (clearing) | 180 | 0.28 | 6,000 | 0.12 |
| Construct facilities to support Office of Air and Marine (OAM) operations (clearing) | 365 | 0.92 | 20,000 | 0.12 |

**Table J1-2. Construction Emissions Roll-up**

| Activity | CO [tons] | $NO_x$ [tons] | $PM_{10}$ [tons] | $PM_{2.5}$ [tons] | $SO_2$ [tons] | VOC [tons] |
|---|---|---|---|---|---|---|
| Construct a new POE (clearing) | 0.3 | 0.6 | 0.2 | 0.1 | 0.1 | < 0.1 |
| Construct a new POE (building) | 1.2 | 1.5 | 0.1 | 0.1 | 0.2 | 0.2 |
| Construct a new POE (paving) | 0.4 | 0.8 | 0.1 | 0.1 | 0.1 | 0.1 |
| Modernize/upgrade existing POE (clearing) | 0.2 | 0.4 | 0.2 | < 0.1 | 0.1 | < 0.1 |
| Modernize/upgrade existing POE (building) | 0.9 | 1.1 | 0.1 | 0.1 | 0.1 | 0.2 |
| Modernize/upgrade existing POE (paving) | 0.4 | 0.7 | < 0.1 | < 0.1 | 0.1 | 0.1 |
| Construct a new BPS (clearing) | 0.4 | 0.7 | 0.3 | 0.1 | 0.1 | < 0.1 |
| Construct a new BPS (building) | 1.5 | 1.8 | 0.1 | 0.1 | 0.2 | 0.3 |
| Construct a new BPS (paving) | < 0.1 | 0.1 | < 0.1 | 0.0 | < 0.1 | < 0.1 |
| Install SBInet monopole communications towers (clearing) | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Install SBInet monopole communications towers (building) | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Install SBInet monopole communications towers (paving) | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Set up permanent traffic checkpoints (clearing) | < 0.1 | 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Set up permanent traffic checkpoints (building) | 0.2 | 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Set up permanent traffic checkpoints (paving) | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Construct facilities to support OAM operations (clearing) | 0.3 | 0.6 | 0.1 | < 0.1 | 0.1 | < 0.1 |
| Construct facilities to support OAM operations (building) | 1.2 | 1.5 | 0.1 | 0.1 | 0.2 | 0.2 |
| Construct facilities to support OAM operations (paving) | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |

**Table J1-3. Heavy Equipment Use from Facilities Construction and Upgrades**

| Clearing and Grading | New POE | Upgrade existing POE | New BPS | Monopole Communications Towers | Permanent Traffic Checkpoints | Construct OAM Facilities |
|---|---|---|---|---|---|---|
| Scrapers | 148 | 111 | 185 | 2 | 22 | 148 |
| Graders | 148 | 111 | 185 | 2 | 22 | 148 |
| Off-highway trucks | 148 | 111 | 185 | 2 | 22 | 148 |
| Tractors/loaders/ backhoes | 148 | 111 | 185 | 2 | 22 | 148 |
| Crawler tractor/dozers | 148 | 111 | 185 | 2 | 22 | 148 |
| Building | | | | | | |
| Generator sets | 322 | 242 | 403 | 5 | 48 | 322 |
| Air compressors | 184 | 138 | 230 | 3 | 27 | 184 |
| Plate compactors | 368 | 276 | 460 | 6 | 54 | 368 |
| Cement & mortar mixers | 644 | 483 | 805 | 10 | 95 | 644 |
| Cranes | 644 | 483 | 805 | 10 | 95 | 644 |
| Off-highway trucks | 644 | 483 | 805 | 10 | 95 | 644 |
| Tractors/loaders/ backhoes | 644 | 483 | 805 | 10 | 95 | 644 |
| Paving | | | | | | |
| Pavers | 370 | 315 | 37 | 3 | 9 | 19 |
| Plate compactors | 212 | 180 | 21 | 2 | 5 | 11 |
| Rollers | 741 | 630 | 74 | 5 | 18 | 37 |
| Off-highway trucks | 370 | 315 | 37 | 3 | 9 | 19 |

**Table J1-4. Heavy Equipment Emissions from Facilities Construction and Upgrades**

| Project | CO [tons] | $NO_x$ [tons] | $PM_{10}$ [tons] | $PM_{2.5}$ [tons] | $SO_2$ [tons] | VOC [tons] |
|---|---|---|---|---|---|---|
| Construct a new POE (clearing) | 0.2297 | 0.5636 | 0.0406 | 0.0394 | 0.0945 | 0.0381 |
| Construct a new POE (building) | 0.5392 | 1.4296 | 0.0992 | 0.0966 | 0.1972 | 0.1188 |
| Construct a new POE (paving) | 0.3192 | 0.7906 | 0.0585 | 0.0568 | 0.1292 | 0.0546 |
| Modernize/upgrade existing POE (clearing) | 0.1723 | 0.4227 | 0.0305 | 0.0296 | 0.0709 | 0.0286 |
| Modernize/upgrade existing POE (building) | 0.4044 | 1.0722 | 0.0744 | 0.0724 | 0.1479 | 0.0891 |
| Modernize/upgrade existing POE (paving) | 0.2713 | 0.672 | 0.0497 | 0.0482 | 0.1098 | 0.0464 |
| Construct a new BPS (clearing) | 0.2872 | 0.7045 | 0.0508 | 0.0493 | 0.1182 | 0.0477 |
| Construct a new BPS (building) | 0.674 | 1.7871 | 0.124 | 0.1207 | 0.2465 | 0.1485 |
| Construct a new BPS (paving) | 0.0319 | 0.0791 | 0.0059 | 0.0057 | 0.0129 | 0.0055 |
| Install SBInet monopole communications towers (clearing) | 0.0035 | 0.0087 | 0.0006 | 0.0006 | 0.0015 | 0.0006 |
| Install SBInet monopole communications towers (building) | 0.0083 | 0.022 | 0.0015 | 0.0015 | 0.003 | 0.0018 |
| Install SBInet monopole communications towers (paving) | 0.0024 | 0.0058 | 0.0004 | 0.0004 | 0.001 | 0.0004 |
| Set up permanent traffic checkpoints (clearing) | 0.034 | 0.0834 | 0.006 | 0.0058 | 0.014 | 0.0056 |
| Set up permanent traffic checkpoints (building) | 0.0798 | 0.2115 | 0.0147 | 0.0143 | 0.0292 | 0.0176 |
| Set up permanent traffic checkpoints (paving) | 0.0079 | 0.0195 | 0.0014 | 0.0014 | 0.0032 | 0.0013 |
| Construct facilities to support OAM operations (clearing) | 0.2297 | 0.5636 | 0.0406 | 0.0394 | 0.0945 | 0.0381 |
| Construct facilities to support OAM operations (building) | 0.5392 | 1.4296 | 0.0992 | 0.0966 | 0.1972 | 0.1188 |
| Construct facilities to support OAM operations (paving) | 0.016 | 0.0395 | 0.0029 | 0.0028 | 0.0065 | 0.0027 |
| **Total non-road emissions** | **3.85** | **9.91** | **0.7** | **0.68** | **1.48** | **0.76** |

**Table J1-5. Worker Trip Emissions from Facilities Construction and Upgrades**

| Project | Trips | VMT | CO [tons] | $NO_x$ [tons] | $PM_{10}$ [tons] | $PM_{2.5}$ [tons] | $SO_2$ [tons] | VOC [tons] |
|---|---|---|---|---|---|---|---|---|
| Construct a new POE (clearing) | 1 | 11,903 | 0.05 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Construct a new POE (building) | 14 | 149,040 | 0.66 | 0.05 | < 0.01 | < 0.01 | < 0.01 | 0.05 |
| Construct a new POE (paving) | 3 | 29,756 | 0.13 | 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.01 |
| Modernize/upgrade existing POE (clearing) | 1 | 8,927 | 0.04 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Modernize/upgrade existing POE (building) | 11 | 111,780 | 0.5 | 0.04 | < 0.01 | < 0.01 | < 0.01 | 0.04 |
| Modernize/upgrade existing POE (paving) | 2 | 25,293 | 0.11 | 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.01 |
| Construct a new BPS (clearing) | 1 | 14,878 | 0.07 | 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Construct a new BPS (building) | 18 | 186,300 | 0.83 | 0.06 | < 0.01 | < 0.01 | < 0.01 | 0.06 |
| Construct a new BPS (paving) | 0 | 2,976 | 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Install SBI*net* monopole communications towers (clearing) | 0 | 183 | 0 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Install SBI*net* monopole communications towers (building) | 2 | 2,297 | 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Install SBI*net* monopole communications towers (paving) | 0 | 220 | 0 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Set up permanent traffic checkpoints (clearing) | 0 | 1,761 | 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Set up permanent traffic checkpoints (building) | 4 | 22,050 | 0.1 | 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.01 |
| Set up permanent traffic checkpoints (paving) | 0 | 734 | 0 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Construct facilities to support OAM operations (clearing) | 1 | 11,903 | 0.05 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Construct facilities to support OAM operations (building) | 14 | 149,040 | 0.66 | 0.05 | < 0.01 | < 0.01 | < 0.01 | 0.05 |
| Construct facilities to support OAM operations (paving) | 0 | 1,488 | 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |

Source: USEPA, 2003; SQAQMD, 1993.

**Table J1-6. Architectural Coating Emissions (Paint) from Facilities Construction and Upgrades**

| Project | Heated Area | Wall Surface | EFVOC [lbs/1000 Square Feet] | VOC [tons] |
|---|---|---|---|---|
| Construct a new POE (building) | 20,000 | 40,000 | 55.5 | 0.04 |
| Modernize/upgrade existing POE (building) | 15,000 | 30,000 | 55.5 | 0.03 |
| Construct a new BPS (building) | 25,000 | 50,000 | 55.5 | 0.05 |
| Install SBInet monopole communications towers (building) | 2,500 | 5,000 | 55.5 | 0.01 |
| Set up permanent traffic checkpoints (building) | 6,000 | 12,000 | 55.5 | 0.01 |
| Construct facilities to support OAM operations (building) | 20,000 | 40,000 | 55.5 | 0.04 |

Source: SQAQMD, 1993.

**Table J1-7. Paving Off-gas Emissions from Facilities Construction and Upgrades**

| Project | Paved Area [acres] | EFVOC [lbs/acre] | VOC [tons] |
|---|---|---|---|
| Construct a new POE (paving) | 2.3 | 2.62 | 0.003 |
| Modernize/upgrade existing POE (paving) | 1.96 | 2.62 | 0.0026 |
| Construct a new BPS (paving) | 0.23 | 2.62 | 0.0003 |
| Install SBI*net* monopole communications towers (paving) | 0.14 | 2.62 | 0.0002 |
| Set up permanent traffic checkpoints ( paving) | 0.12 | 2.62 | 0.0002 |
| Construct facilities to support OAM operations (paving) | 0.12 | 2.62 | 0.0002 |

Source: SQAQMD, 1993.

**Table J1-8. Fugitive Dust Emissions from Facilities Construction and Upgrades**

| Project | $PM_{10}$/ TSP | $PM_{2.5}$/ $PM_{10}$ | EFTSP [lbs/acre/day] | Capture Fraction | Duration of Grading [days] | Cleared Area [acres] | $PM_{10}$ [tons] | $PM_{2.5}$ [tons] |
|---|---|---|---|---|---|---|---|---|
| Construct a new POE (clearing) | 0.45 | 0.15 | 80 | 0.5 | 230 | 0.92 | 0.19 | 0.03 |
| Modernize/upgrade existing POE (clearing) | 0.45 | 0.15 | 80 | 0.5 | 230 | 0.69 | 0.14 | 0.02 |
| Construct a new BPS (clearing) | 0.45 | 0.15 | 80 | 0.5 | 230 | 1.15 | 0.24 | 0.04 |
| Install SBInet monopole communications towers (clearing) | 0.45 | 0.15 | 80 | 0.5 | 28.36 | 0.12 | < 0.1 | < 0.1 |
| Set up permanent traffic checkpoints (clearing) | 0.45 | 0.15 | 80 | 0.5 | 113.42 | 0.28 | 0.03 | < 0.1 |
| Construct facilities to support OAM operations (clearing) | 0.45 | 0.15 | 80 | 0.5 | 230 | 0.92 | 0.19 | 0.03 |

Source: USEPA, 1995; USEPA, 2005.

## Table J1-9. Emissions from Fence Construction

| Construction Equipment Use | Number of Units | Days on Site | Hours Per Day | Operating Hours | | | |
|---|---|---|---|---|---|---|---|
| Generator sets | 2 | 365 | 8 | 5,840 | | | |
| Tractors/loaders/backhoes | 2 | 365 | 8 | 5,840 | | | |
| **Construction Equipment Emission Factors (lbs/hour)** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | **$CO_2$** |
| Cranes | 0.6011 | 1.6100 | 0.1778 | 0.0014 | 0.0715 | 0.0715 | 128.7 |
| Generator sets | 0.3461 | 0.6980 | 0.1075 | 0.0007 | 0.0430 | 0.0430 | 61.0 |
| Tractors/loaders/backhoes | 0.4063 | 0.7746 | 0.1204 | 0.0008 | 0.0599 | 0.0599 | 66.8 |
| Pavers composite | 0.5874 | 1.0796 | 0.1963 | 0.0009 | 0.0769 | 0.0769 | 77.9 |
| Paving equipment | 0.0532 | 0.1061 | 0.0166 | 0.0002 | 0.0063 | 0.0063 | 12.6 |
| **Construction Equipment Emissions (tons)** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | **$CO_2$** |
| Generator sets | 1.0106 | 2.0382 | 0.3138 | 0.0020 | 0.1256 | 0.1256 | 178.0986 |
| Tractors/loaders/backhoes | 1.1865 | 2.2617 | 0.3516 | 0.0023 | 0.1748 | 0.1748 | 195.0746 |
| **Total** | **2.20** | **4.30** | **0.67** | **0.0043** | **0.30** | **0.30** | **373.17** |

Source: CARB, 2007a; CARB 2007b.

## Table J1-10. Emissions from Construction of Roads, Bridges, Culverts, & Low Water Crossings

| Equipment Type | Number of Units | Days on Site | Hours Per Day | Operating Hours |
|---|---|---|---|---|
| Excavators composite | 1 | 230 | 4 | 920 |
| Rollers composite | 1 | 230 | 8 | 1,840 |
| Rubber tired dozers composite | 1 | 230 | 8 | 1,840 |
| Plate compactors composite | 2 | 230 | 4 | 1,840 |
| Trenchers composite | 2 | 230 | 8 | 3,680 |
| Air compressors | 1 | 230 | 4 | 920 |
| Cement & mortar mixer | 2 | 230 | 6 | 2,760 |
| Cranes | 1 | 230 | 7 | 1,610 |
| Generator sets | 2 | 230 | 4 | 1,840 |
| Tractors/loaders/backhoes | 2 | 230 | 7 | 3,220 |
| Pavers composite | 2 | 230 | 8 | 3,680 |
| Paving equipment | 2 | 230 | 8 | 3,680 |

**Construction Equipment Emission Factors (lbs/hour)**

| Equipment | CO | $NO_x$ | VOC | $SO_x$ |
|---|---|---|---|---|
| Excavators composite | 0.5828 | 1.3249 | 0.1695 | 0.0013 |
| Rollers composite | 0.4341 | 0.8607 | 0.1328 | 0.0008 |
| Rubber tired dozers composite | 1.5961 | 3.2672 | 0.3644 | 0.0025 |
| Plate compactors composite | 0.0263 | 0.0328 | 0.0052 | 0.0001 |
| Trenchers composite | 0.5080 | 0.8237 | 0.1851 | 0.0007 |
| Air compressors | 0.3782 | 0.7980 | 0.1232 | 0.0007 |
| Cement and Mortar Mixers | 0.0447 | 0.0658 | 0.0113 | 0.0001 |
| Cranes | 0.6011 | 1.6100 | 0.1778 | 0.0014 |
| Generator sets | 0.3461 | 0.6980 | 0.1075 | 0.0007 |
| Tractors/loaders/backhoes | 0.4063 | 0.7746 | 0.1204 | 0.0008 |
| Pavers composite | 0.5874 | 1.0796 | 0.1963 | 0.0009 |
| Paving equipment | 0.0532 | 0.1061 | 0.0166 | 0.0002 |

**Construction Equipment Emissions (tons)**

| Equipment | CO | $NO_x$ | VOC | $SO_x$ |
|---|---|---|---|---|
| Excavators composite | 0.2681 | 0.6095 | 0.0780 | 0.0006 |
| Rollers composite | 0.3994 | 0.7918 | 0.1222 | 0.0007 |
| Rubber tired dozers composite | 1.4684 | 3.0058 | 0.3353 | 0.0023 |
| Plate compactors composite | 0.0242 | 0.0302 | 0.0047 | 0.0001 |
| Trenchers composite | 0.9347 | 1.5156 | 0.3405 | 0.0013 |
| Air compressors | 0.1740 | 0.3671 | 0.0567 | 0.0003 |
| Cement and mortar mixers | 0.0617 | 0.0907 | 0.0156 | 0.0001 |
| Cranes | 0.4839 | 1.2961 | 0.1432 | 0.0011 |
| Generator sets | 0.3184 | 0.6422 | 0.0989 | 0.0006 |
| Tractors/loaders/backhoes | 0.6542 | 1.2470 | 0.1939 | 0.0012 |
| Pavers composite | 1.0809 | 1.9865 | 0.3612 | 0.0016 |
| Paving equipment | 0.0979 | 0.1952 | 0.0305 | 0.0003 |
| **Total** | **5.97** | **11.78** | **1.78** | **0.0103** |

Source: CARB, 2007a; CARB, 2007b.

**Table J1-11. Emissions from Heating**

| | POE | BPS | FOB | | | |
|---|---|---|---|---|---|---|
| Gross area | 20,000 | 25,000 | 10,000 | sf | | |
| Heating requirements | 99,000 | 99,000 | 99,000 | btu/sf | | |
| Total annual heat required | 1,980 | 2,475 | 990 | MMBTU | | |
| Heating value | 150 | 150 | 150 | MMBtu/1000 Gallons | | |
| Total #2 oil used | 13.2 | 16.5 | 6.6 | $10^3$ Gallons | | |
| **Pollutant** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission factor (lb/1000 gal) | 5 | 24 | 2.493 | 0.1 | 2 | 2 |
| POE | 0.03 | 0.16 | 0.02 | 0.00 | 0.01 | 0.01 |
| BPS | 0.04 | 0.20 | 0.02 | 0.00 | 0.02 | 0.02 |
| Forward Operating Base (FOB) | 0.02 | 0.08 | 0.01 | 0.00 | 0.01 | 0.01 |

Source: USEPA, 1995.

1. Emission factors for all pollutants were obtained from U.S. EPA's AP-42, Section 1.3. Conservatively assume that PM10 = PM.

2. Assumed sulfur concentration 1%

3. Heating requirements obtained from Commercial Buildings Energy Consumption Survey, DOE, 2003.

## Table J1-12. Emissions from Emergency Generators

| Pollutant | CO | $NO_x$ | VOC | $SO_x$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|---|
| Emission Factor [lb/hp-hr] | 0.0055 | 0.024 | 0.000705 | 0.00809 | 0.0007 | 0.0007 |
| **Generator Rating [kW]** | **Estimated Run Time (hr/yr)** | **Annual Power Output [kw-hr/yr]** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** |
| 750 | 100 | 75000 | 0.28 | 1.21 | 0.04 | 0.41 |
| Total Emissions [tpy] | | | 0.28 | 1.21 | 0.04 | 0.41 |

Source: USEPA, 1995.

## Table J1-13. Emissions from Worker Commutes

| | POE | BPS | FOB | | | |
|---|---|---|---|---|---|---|
| Number of workers | 30 | 50 | 20 | | | |
| Number of trips | 2 | 2 | 2 | | | |
| Miles per trip | 30 | 30 | 30 | | | |
| Days of work | 260 | 260 | 260 | | | |
| Total mi | 468,000 | 780,000 | 312,000 | | | |
| **Pollutant** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (lbs/mile) | 0.0105 | 0.0011 | 0.0011 | 0.0000 | 0.0001 | 0.0001 |
| POE | 2.47 | 0.26 | 0.25 | 0.00 | 0.02 | 0.01 |
| BPS | 4.11 | 0.43 | 0.42 | 0.00 | 0.03 | 0.02 |
| FOB | 1.65 | 0.17 | 0.17 | 0.00 | 0.01 | 0.01 |

Source: CARB, 2007.

**Table J1-14. Emissions from Facilities (POE, BPS, FOB)**

| Activity/Source | CO | $NO_x$ | VOC | $SO_x$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|---|
| POE | | | | | | |
| Boiler emissions | 0.03 | 0.16 | 0.02 | 0.00 | 0.01 | 0.01 |
| Emergency generators | 0.28 | 1.21 | 0.04 | 0.41 | 0.04 | 0.04 |
| Worker commutes | 2.47 | 0.26 | 0.25 | 0.00 | 0.02 | 0.01 |
| **Total Operational Emissions** | **2.78** | **1.62** | **0.30** | **0.41** | **0.07** | **0.06** |
| BPS | | | | | | |
| Boiler emissions | 0.04 | 0.20 | 0.02 | 0.00 | 0.02 | 0.02 |
| Emergency generators | 0.28 | 1.21 | 0.04 | 0.41 | 0.04 | 0.04 |
| Worker commutes | 4.11 | 0.43 | 0.42 | 0.00 | 0.03 | 0.02 |
| **Total Operational Emissions** | **4.43** | **1.84** | **0.48** | **0.41** | **0.08** | **0.07** |
| FOB | | | | | | |
| Boiler emissions | 0.02 | 0.08 | 0.01 | 0.00 | 0.01 | 0.01 |
| Emergency generators | 0.28 | 1.21 | 0.04 | 0.41 | 0.04 | 0.04 |
| Worker commutes | 1.65 | 0.17 | 0.17 | 0.00 | 0.01 | 0.01 |
| **Total Operational Emissions** | **1.94** | **1.46** | **0.21** | **0.41** | **0.06** | **0.05** |

**Table J1-15. Emissions from Unmanned Aircraft Systems (UAS) Missions**

| | | | | | | |
|---|---|---|---|---|---|---|
| Number of aircraft | 10 | | | | | |
| Maximum daily operations | 1 | | | | | |
| Number of training days per year | 230 | | | | | |
| Number of flights | 2,300 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Landing/Take-off (LTO) Emission Factors (kg/hour) | 2.50 | 0.56 | 1.59 | 0.05 | 0.09 | 0.09 |
| Time in mode/operation (min) | 5 | 5 | 5 | 5 | 5 | 5 |
| LTO Emission (tons) | 0.11 | 0.02 | 0.07 | 0.00 | 0.00 | 0.00 |
| Flight Emission Factors (kg/hour) | 0.48 | 2.80 | 0 | 0.22 | 0.40 | 0.40 |
| Time in mode/operation (min) | 115 | 115 | 115 | 115 | 115 | 115 |
| Flight Emissions (tons) | 0.48 | 2.81 | 0.00 | 0.22 | 0.40 | 0.40 |
| **Total** | **0.59** | **2.83** | **0.07** | **0.22** | **0.40** | **0.40** |

Source: USAF, 2006.

Note: RQ-7B Shadow Used as Surrogate UAS

**Table J1-16. Emissions from Manned Aerial Surveillance Patrols (New England Region)**

| No Action Alternative | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Cessna Citation** | **UH-60** | | | | | |
| Maximum daily operations | 13.8 | 1.2 | | | | | |
| Number of days per year | 230 | 230 | | | | | |
| Number of flights | 3174 | 276 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | |
| LTO Emission Factors (Citation) | 10.46 | 0.46 | 0.122 | 0.122 | 0.18 | 5.49 | kg/operation |
| LTO Emission (Citation) | 7.55 | 0.33 | 0.09 | 0.09 | 0.13 | 3.96 | tons |
| LTO Emission Factors (UH-60) | 4.385 | 0.431 | 0.115 | 0.115 | 0.15 | 6.674 | kg/operation |
| LTO Emission (UH-60) | 0.28 | 0.03 | 0.01 | 0.01 | 0.01 | 0.42 | tons |
| **Total** | **7.8** | 0.4 | **0.1** | **0.1** | **0.1** | **7.8** | tons |
| **Surveillance and Communications Technology Expansion Alternative** | | | | | | | |
| | **Cessna Citation** | **UH-60** | | | | | |
| Maximum daily operations | 21.16 | 1.84 | | | | | |
| Number of days per year | 230 | 230 | | | | | |
| Number of flights | 4866.8 | 423.2 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | |
| LTO Emission Factors (Citation) | 10.46 | 0.46 | 0.122 | 0.122 | 0.18 | 10.46 | kg/operation |
| LTO Emission (Citation) | 11.57 | 0.51 | 0.13 | 0.13 | 0.20 | 11.57 | tons |
| LTO Emission Factors (UH-60) | 4.385 | 0.431 | 0.115 | 0.115 | 0.15 | 4.385 | kg/operation |
| LTO Emission (UH-60) | 0.42 | 0.04 | 0.01 | 0.01 | 0.01 | 0.42 | tons |
| **Total** | **12.0** | **0.6** | **0.1** | **0.1** | **0.2** | **12.0** | **tons** |

| Flexible Direction Alternative | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Cessna Citation** | **UH-60** | | | | | |
| Maximum daily operations | 18.4 | 1.6 | | | | | |
| Number of days per year | 230 | 230 | | | | | |
| Number of flights | 4232 | 368 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | |
| LTO Emission Factors (Citation) | 10.46 | 0.46 | 0.122 | 0.122 | 0.18 | 5.49 | kg/operation |
| LTO Emission (Citation) | 11.57 | 0.51 | 0.13 | 0.13 | 0.20 | 6.07 | tons |
| LTO Emission Factors (UH-60) | 4.385 | 0.431 | 0.115 | 0.115 | 0.15 | 6.674 | kg/operation |
| LTO Emission (UH-60) | 0.42 | 0.04 | 0.01 | 0.01 | 0.01 | 0.42 | tons |
| **Total** | **12.0** | **0.6** | **0.1** | **0.1** | **0.2** | **12.0** | **tons** |

Source: EDMS, 2007.

## Table J1-17. Emissions from Waterborne Patrols (New England Region)

| No Action Alternative | | | | | | |
|---|---|---|---|---|---|---|
| Number of watercraft | 16 | | | | | |
| Hours per year | 50 | Hours | | | | |
| Power rating | 150 | hp | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 153.7 | 5.350 | 0.06 | 0.06 | 0.00 | 5.88 |
| | **8.1** | **0.3** | **0.0** | **0.0** | **0.0** | **0.3** |
| **Surveillance and Communications Technology Expansion Alternative** | | | | | | |
| Number of watercraft | 24 | | | | | |
| Hours per year | 50 | Hours | | | | |
| Power rating | 150 | hp | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 153.7 | 5.350 | 0.06 | 0.06 | 0.00 | 5.88 |
| | **12.2** | **0.4** | **0.0** | **0.0** | **0.0** | **0.5** |
| **Flexible Direction Alternative** | | | | | | |
| Number of watercraft | 24 | | | | | |
| Hours per year | 50 | Hours | | | | |
| Power rating | 150 | hp | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 153.7 | 5.350 | 0.06 | 0.06 | 0.00 | 5.88 |
| | **12.2** | **0.4** | **0.0** | **0.0** | **0.0** | **0.5** |

Source: USEPA 2002; USEPA, 2010a; USEPA, 2010b.

### Table J1-18. Emissions from Manned Aerial Surveillance Patrols (Great Lakes Region)

| No Action Alternative | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Cessna Citation** | **UH-60** | | | | | |
| Maximum daily operations | 13.8 | 1.2 | | | | | |
| Number of days per year | 230 | 230 | | | | | |
| Number of flights | 3174 | 276 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | |
| LTO Emission Factors (Citation) | 10.46 | 0.46 | 0.122 | 0.122 | 0.18 | 5.49 | kg/operation |
| LTO Emission (Citation) | 7.55 | 0.33 | 0.09 | 0.09 | 0.13 | 3.96 | tons |
| LTO Emission Factors (UH-60) | 4.385 | 0.431 | 0.115 | 0.115 | 0.15 | 6.674 | kg/operation |
| LTO Emission (UH-60) | 0.28 | 0.03 | 0.01 | 0.01 | 0.01 | 0.42 | tons |
| **Total** | **7.8** | **0.4** | **0.1** | **0.1** | **0.1** | **4.4** | **tons** |
| **Surveillance and Communications Technology Expansion Alternative** | | | | | | | |
| | **Cessna Citation** | **UH-60** | | | | | |
| Maximum daily operations | 18.4 | 1.6 | | | | | |
| Number of days per year | 230 | 230 | | | | | |
| Number of flights | 4232 | 368 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | |
| LTO Emission Factors (Citation) | 10.46 | 0.46 | 0.122 | 0.122 | 0.18 | 5.49 | kg/operation |
| LTO Emission (Citation) | 11.57 | 0.51 | 0.13 | 0.13 | 0.20 | 6.07 | tons |
| LTO Emission Factors (UH-60) | 4.385 | 0.431 | 0.115 | 0.115 | 0.15 | 6.674 | kg/operation |
| LTO Emission (UH-60) | 0.42 | 0.04 | 0.01 | 0.01 | 0.01 | 0.42 | tons |
| **Total** | **12.0** | **0.6** | **0.1** | **0.1** | **0.2** | **6.5** | **tons** |

| Flexible Direction Alternative | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Cessna Citation** | **UH-60** | | | | | |
| Maximum daily operations | 21.16 | 1.84 | | | | | |
| Number of days per year | 230 | 230 | | | | | |
| Number of flights | 4866.8 | 423.2 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | |
| LTO Emission Factors (Citation) | 10.46 | 0.46 | 0.122 | 0.122 | 0.18 | 5.49 | kg/operation |
| LTO Emission (Citation) | 11.57 | 0.51 | 0.13 | 0.13 | 0.20 | 6.07 | tons |
| LTO Emission Factors (UH-60) | 4.385 | 0.431 | 0.115 | 0.115 | 0.15 | 6.674 | kg/operation |
| LTO Emission (UH-60) | 0.42 | 0.04 | 0.01 | 0.01 | 0.01 | 0.42 | tons |
| **Total** | **12.0** | **0.6** | **0.1** | **0.1** | **0.2** | **6.5** | **tons** |

Source: EDMS, 2007.

**Table J1-19. Emissions from Waterborne Patrols (Great Lakes Region)**

| **No Action Alternative** | | | | | | |
|---|---|---|---|---|---|---|
| Number of watercraft | 24 | | | | | |
| Hours per year | 50 | Hours | | | | |
| Power rating | 150 | hp | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 153.7 | 5.350 | 0.06 | 0.06 | 0.00 | 5.88 |
| | **12.2** | **0.4** | **0.0** | **0.0** | **0.0** | **0.5** |
| **Surveillance and Communications Technology Expansion Alternative** | | | | | | |
| Number of watercraft | 24 | | | | | |
| Hours per year | 50 | Hours | | | | |
| Power rating | 150 | hp | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 153.7 | 5.350 | 0.06 | 0.06 | 0.00 | 5.88 |
| | **12.2** | **0.4** | **0.0** | **0.0** | **0.0** | **0.5** |
| **Flexible Direction Alternative** | | | | | | |
| Number of watercraft | 24 | | | | | |
| Hours per year | 50 | Hours | | | | |
| Power rating | 150 | hp | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 153.7 | 5.350 | 0.06 | 0.06 | 0.00 | 5.88 |
| | **12.2** | **0.4** | **0.0** | **0.0** | **0.0** | **0.5** |

Source: USEPA 2002; USEPA, 2010a, USEPA, 2010b.

**Table J1-20. Emissions from Manned Aerial Surveillance Patrols (East of the Rockies)**

| No Action Alternative | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Cessna Citation** | **UH-60** | | | | | |
| Maximum daily operations | 18.4 | 1.6 | | | | | |
| Number of days per year | 230 | 230 | | | | | |
| Number of flights | 4232 | 368 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | |
| LTO Emission Factors (Citation) | 10.46 | 0.46 | 0.122 | 0.122 | 0.18 | 5.49 | kg/operation |
| LTO Emission (Citation) | 10.06 | 0.44 | 0.12 | 0.12 | 0.17 | 5.28 | tons |
| LTO Emission Factors (UH-60) | 4.385 | 0.431 | 0.115 | 0.115 | 0.15 | 6.674 | kg/operation |
| LTO Emission (UH-60) | 0.37 | 0.04 | 0.01 | 0.01 | 0.01 | 0.56 | tons |
| **Total** | **10.4** | **0.5** | **0.1** | **0.1** | **0.2** | **5.8** | **tons** |
| **Surveillance and Communications Technology Expansion Alternative** | | | | | | | |
| | **Cessna Citation** | **UH-60** | | | | | |
| Maximum daily operations | 27.6 | 2.4 | | | | | |
| Number of days per year | 230 | 230 | | | | | |
| Number of flights | 6348 | 552 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | |
| LTO Emission Factors (Citation) | 10.46 | 0.46 | 0.122 | 0.122 | 0.18 | 5.49 | kg/operation |
| LTO Emission (Citation) | 15.09 | 0.66 | 0.18 | 0.18 | 0.26 | 7.92 | tons |
| LTO Emission Factors (UH-60) | 4.385 | 0.431 | 0.115 | 0.115 | 0.15 | 6.674 | kg/operation |
| LTO Emission (UH-60) | 0.55 | 0.05 | 0.01 | 0.01 | 0.02 | 0.56 | tons |
| **Total** | **15.6** | **0.7** | **0.2** | **0.2** | **0.3** | **8.5** | **tons** |

| Flexible Direction Alternative | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Cessna Citation** | **UH-60** | | | | | |
| Maximum daily operations | 27.6 | 2.4 | | | | | |
| Number of days per year | 230 | 230 | | | | | |
| Number of flights | 6348 | 552 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | |
| LTO Emission Factors (Citation) | 10.46 | 0.46 | 0.122 | 0.122 | 0.18 | 5.49 | kg/operation |
| LTO Emission (Citation) | 15.09 | 0.66 | 0.18 | 0.18 | 0.26 | 7.92 | tons |
| LTO Emission Factors (UH-60) | 4.385 | 0.431 | 0.115 | 0.115 | 0.15 | 6.674 | kg/operation |
| LTO Emission (UH-60) | 0.55 | 0.05 | 0.01 | 0.01 | 0.02 | 0.56 | tons |
| **Total** | **15.6** | **0.7** | **0.2** | **0.2** | **0.3** | **8.5** | **tons** |

Source: EDMS, 2007.

## Table J1-21. Emissions from Waterborne Patrols (East of the Rockies Region)

| **No Action Alternative** | | | | | | |
|---|---|---|---|---|---|---|
| Number of watercraft | 5 | | | | | |
| Hours per year | 50 | Hours | | | | |
| Power rating | 150 | hp | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 153.7 | 5.350 | 0.06 | 0.06 | 0.00 | 5.88 |
| | **2.5** | **0.1** | **0.0** | **0.0** | **0.0** | **0.1** |
| **Surveillance and Communications Technology Expansion Alternative** | | | | | | |
| Number of watercraft | 10 | | | | | |
| Hours per year | 50 | Hours | | | | |
| Power rating | 400 | hp | | | | |
| **Equipment/Tech Type** | **CO** | **NOx** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 153.7 | 5.350 | 0.06 | 0.06 | 0.00 | 5.88 |
| | **5.1** | **0.2** | **0.0** | **0.0** | **0.0** | **0.2** |
| **Flexible Direction Alternative** | | | | | | |
| Number of watercraft | 10 | | | | | |
| Hours per year | 50 | Hours | | | | |
| Power rating | 400 | hp | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 153.7 | 5.350 | 0.06 | 0.06 | 0.00 | 5.88 |
| | **5.1** | **0.2** | **0.0** | **0.0** | **0.0** | **0.2** |

Source: USEPA 2002; USEPA, 2010a; USEPA, 2010b.

**Table J1-22. Emissions from Manned Aerial Surveillance Patrols (West of the Rockies Region)**

| No Action Alternative | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Cessna Citation** | **UH-60** | | | | | |
| Maximum daily operations | 18.4 | 1.6 | | | | | |
| Number of days per year | 230 | 230 | | | | | |
| Number of flights | 4232 | 368 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | |
| LTO Emission Factors (Citation) | 10.46 | 0.46 | 0.122 | 0.122 | 0.18 | 5.49 | kg/operation |
| LTO Emission (Citation) | 10.06 | 0.44 | 0.12 | 0.12 | 0.17 | 5.28 | tons |
| LTO Emission Factors (UH-60) | 4.385 | 0.431 | 0.115 | 0.115 | 0.15 | 6.674 | kg/operation |
| LTO Emission (UH-60) | 0.37 | 0.04 | 0.01 | 0.01 | 0.01 | 0.56 | tons |
| **Total** | **10.4** | **0.5** | **0.1** | **0.1** | **0.2** | **5.8** | **tons** |
| **Surveillance and Communications Technology Expansion Alternative** | | | | | | | |
| | **Cessna Citation** | **UH-60** | | | | | |
| Maximum daily operations | 21.16 | 1.84 | | | | | |
| Number of days per year | 230 | 230 | | | | | |
| Number of flights | 4866.8 | 423.2 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | |
| LTO Emission Factors (Citation) | 10.46 | 0.46 | 0.122 | 0.122 | 0.18 | 5.49 | kg/operation |
| LTO Emission (Citation) | 11.57 | 0.51 | 0.13 | 0.13 | 0.20 | 6.07 | tons |
| LTO Emission Factors (UH-60) | 4.385 | 0.431 | 0.115 | 0.115 | 0.15 | 6.674 | kg/operation |
| LTO Emission (UH-60) | 0.42 | 0.04 | 0.01 | 0.01 | 0.01 | 0.56 | tons |
| **Total** | **12.0** | **0.6** | **0.1** | **0.1** | **0.2** | **6.6** | **tons** |

| Flexible Direction Alternative | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Cessna Citation | UH-60 | | | | | |
| Maximum daily operations | 21.16 | 1.84 | | | | | |
| Number of days per year | 230 | 230 | | | | | |
| Number of flights | 4866.8 | 423.2 | | | | | |
| | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** | |
| LTO Emission Factors (Citation) | 10.46 | 0.46 | 0.122 | 0.122 | 0.18 | 5.49 | kg/operation |
| LTO Emission (Citation) | 11.57 | 0.51 | 0.13 | 0.13 | 0.20 | 6.07 | tons |
| LTO Emission Factors (UH-60) | 4.385 | 0.431 | 0.115 | 0.115 | 0.15 | 6.674 | kg/operation |
| LTO Emission (UH-60) | 0.42 | 0.04 | 0.01 | 0.01 | 0.01 | 0.56 | tons |
| **Total** | **12.0** | **0.6** | **0.1** | **0.1** | **0.2** | **6.6** | **tons** |

Source: EDMS, 2007.

### Table J1-23. Emissions from Waterborne Patrols (West of the Rockies Region)

| | | | | | | |
|---|---|---|---|---|---|---|
| **No Action Alternative** | | | | | | |
| Number of watercraft | 14 | | | | | |
| Hours per year | 50 | Hours | | | | |
| Power rating | 400 | Hp | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 153.7 | 5.350 | 0.06 | 0.06 | 0.00 | 5.88 |
| | **7.1** | **0.2** | **0.0** | **0.0** | **0.0** | **0.3** |
| **Surveillance and Communications Technology Expansion Alternative** | | | | | | |
| Number of watercraft | 21 | | | | | |
| Hours per year | 50 | Hours | | | | |
| Power rating | 400 | Hp | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 153.7 | 5.350 | 0.06 | 0.06 | 0.00 | 5.88 |
| | **10.7** | **0.4** | **0.0** | **0.0** | **0.0** | **0.4** |
| **Flexible Direction Alternative** | | | | | | |
| Number of watercraft | 21 | | | | | |
| Hours per year | 50 | Hours | | | | |
| Power rating | 400 | Hp | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 153.7 | 5.350 | 0.06 | 0.06 | 0.00 | 5.88 |
| | **10.7** | **0.4** | **0.0** | **0.0** | **0.0** | **0.4** |

Source: USEPA 2002; USEPA, 2010a; USEPA, 2010b.

### Table J1-24. Emissions from All-Terrain Vehicle (ATV) Patrols

| | | | | | | |
|---|---|---|---|---|---|---|
| Number of ATVs | 50 | | | | | |
| Mileage per year | 1608 | | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/mile) | 52.7 | 0.340 | 55.7 | 0.00 | 0.022 | 0.022 |
| Total Emissions (tons) | **4.67** | **0.03** | **4.93** | **0.00** | **0.00** | **0.00** |

## Table J1-25. Emissions from Snowmobile Patrols

| | | | | | | |
|---|---|---|---|---|---|---|
| Number of snowmobiles | 22 | | | | | |
| Hours per year | 57 | Hours | | | | |
| Power rating | 100 | hp | | | | |
| **Equipment/Tech Type** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (grams/hp-hour) | 296.0 | 0.860 | 111.0 | 0.00 | 2.70 | 2.70 |
| | **40.88** | **0.12** | **15.33** | **0.00** | **0.37** | **0.37** |

Source: USEPA 2002; USEPA, 2010a; USEPA, 2010b.

## Table J1-26. Emissions from On-road Vehicle Patrols

| | | | | | | |
|---|---|---|---|---|---|---|
| Number of Workers | 30 | | | | | |
| Number of Patrols Per Day | 4 | | | | | |
| Mi per trip | 100 | | | | | |
| Days of Work | 230 | | | | | |
| Total mi | 2,760,000 | | | | | |
| **Pollutant** | **CO** | **$NO_x$** | **VOC** | **$SO_x$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Emission Factor (lbs/mile) | 0.0105 | 0.0011 | 0.0011 | 0.0000 | 0.0001 | 0.0001 |
| **Total Emissions** | **14.56** | **1.52** | **1.49** | **0.01** | **0.12** | **0.07** |

Source: CARB, 2007.

# J2: CONSTRUCTION AND NON-PERMITTING AIR REGULATIONS BY STATE

**TABLE J2-1. Construction and Non-permitting Air Regulations by State**

| Operations and Construction Regulations | Non-permitting Requirements |
|---|---|
| Idaho Department of Administration<br>http://adm.idaho.gov/adminrules/rules/idapa58/0101.pdf<br>• Permit Requirements  for New and Modified Stationery Sources (IDAPA 58.01.203)<br>• Procedure and requirements for permits to construct (IDAPA 58.01.200) | • Rules for Control of Fugitive Dust (IDAPA 58.01.650)<br>• Rules for Control of Open Burning (IDAPA 58.0106) |
| Maine Revised Statutes<br>http://www.maine.gov/dep/blwq/delegation/t38toc.pdf<br>• New Source performance standards (MSRA 38.2.143) | • Control of Visible Emissions (MSRA 38.2.101)<br>• Reasonably Available Control Technology for Facilities that Emit VOC (MRSA 38.2.134)<br>• Open Burning  (MSRA 38.2.102) |
| Michigan Department of Natural Resources and Environment Air Pollution Control Rules (APCR)<br>http://www.michigan.gov/deq/0,1607,7-135-3310_4108-97106--,00.html<br>• New Source Review Rule  (APCR 201) http://www.michigan.gov/deq/0,1607,7-135-3310_4108-97106--,00.html<br>• Renewable Operating Permit  (APCR 201) http://www.michigan.gov/deq/0,1607,7-135-3310_4108-97106--,00.html | • Emission Limitations and Prohibitions Particulate Matter ( R 336.1115)<br>• Emission Limitations and Prohibitions Existing sources of VOC (R 336.1601)<br>• Open Burning Model Ordinance (R 336.1115) |
| Minnesota State Air Rules (MSAR)<br>https://www.revisor.mn.gov/rules/?id=7007<br>• Sources required to obtain/ not obtain a permit (MAR 7007.0250-0300)<br>• Source Operation During Transition (MAR 7007.0350) | • Air Pollution Abatement. (MSAR116.061)<br>• VOC Material Balance (MAR 7019.3060)<br>• Open Burning Regulations (MSAR 8816) |
| MT Dept of Environmental Quality (MDEQ)<br>http://deq.mt.gov/AirQuality/AQPermits.mcpx<br>• General Air Quality Operating Permits (ARM 17.8.1211)<br>• Air Quality Operating Permit Program (ARM 17.8.1204) | • Visibility Impact Assessment (fugitive dust) (ARM  Title 17.8-1106)<br>• Open Burning (ARM Title 17.8-604) |

| Operations and Construction Regulations | Non-permitting Requirements |
|---|---|
| New Hampshire Air Program Rules (NHCAR)<br>http://des.nh.gov/organization/commissioner/legal/rules/index.htm" \l "air<br>• Statewide Permit System (Env-A 600)<br>• Testing and Monitoring Procedures (Env-A 800) | • Fugitive Dust (Env-A 101.87)<br>• VOC (Env-A 101.211)<br>• Open Burning (Env-A 1001) |
| NYSDEC<br>http://www.dec.ny.gov/regulations/50970.html<br>• Requirements for Emissions Sources (Chapter III-Subpart 231-1)<br>• Operations (Chapter III Subpart 231-3.2) | • Control of Particulate Emissions (NYSDEC Chapter III, Subpart 257-3)<br>• Control of Organic Emissions (NYSDEC Chapter III, Subpart 212)<br>• Control of Open Burning and Incineration (NYSDEC Chapter III, Part 215) |
| ND Air Pollution Control Rules<br>http://www.legis.nd.gov/information/acdata/html/33-15.html<br>• Permit to Construct (33-15-14)<br>• Standards of Performance for NSS (33-15-12) | • Emissions of Particulate Matter Restrict Emissions (33-15-05)<br>• Control of Organic Compounds (33-15-07)<br>• Open Burning Restrictions (33-15-04) |
| Ohio Air Pollution Regulations<br>http://www.epa.state.oh.us/dapc/regs/regs.aspx<br>• Permits to Install New Sources (OAC 3645-31)<br>• Air Permits to Operate and Variances (OAC 3645-35) | • Particulate Matter Standards (OAC 3745-17)<br>• Open Burning Standards (OAC 3745-19)<br>• $NO_x$ and VOC Emissions Statements (OAC 3745-24) |
| PA Air Pollution Regulations<br>http://www.pacode.com/secure/data/025/chapter123/chap123toc.html<br>• Construction, Modification, Reactivation and Operation of Sources (Article III Chapter 127) | • Fugitive Particulate Matter (PAC Article III, 123.2)<br>• Open Burning Operations ( PAC Article III, 123.1.6) |
| Vermont Air Pollution Control Regulations<br>http://www.anr.state.vt.us/air/docs/apcregs.pdf<br>• Review of Construction or Modification of Air Contaminant Sources (VAPCR 5-501)<br>• Operations and Procedures (VAPCR 5-401-406) | • Prohibition of Particulate Matter (VAPCR 5-231)<br>• Control of Volatile Organic Compounds (VAPCR 5-253)<br>• Permissible Open Burning (VAPCR 5-202) |
| Washington Regulations for Air Pollution Sources<br>http://apps.leg.wa.gov/wac/default.aspx?cite=173-400<br>• Operating permit regulation (173-401 WAC)<br>• Construction, General regulation for Air Pollution (173-400 WAC ) | • Ambient Air Quality Standards for Particulate Matter (WAC 173-470)<br>• Outdoor Burning (WAC 173-425) |

| Operations and Construction Regulations | Non-permitting Requirements |
|---|---|
| Wisconsin Department of Natural Resources Air Rules<br>http://www.legis.state.wi.us/rsb/code/nr/nr406.pdf<br>• NR 406.03 Permit requirements and exemptions for construction permits. (NR 406.03)<br>• Operations 440.01 Standards of Performance for New Stationery Sources (NR 440.01) | • Control of Particulate Emissions (WAC NR 415<br>• Control of Organic Compound Emissions from Surface Coating, Printing and Asphalt Paving Operations (WAC NR 419)<br>• Malodorous Emissions and Open Burning (WAC NR 429) |

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# APPENDIX K

# WETLANDS REGULATORY PROGRAM

# INTRODUCTION

The U.S. Army Corps of Engineers (USACE), with oversight by the U.S. Environmental Protection Agency (USEPA), regulates most wetlands and waterways in the United States. Many states also have wetland and waterway protection statutes, and in those states, the USACE has generally tailored its permit program, insofar as it is legal and reasonable, to complement the state programs and streamline the permit application process for the public. This appendix provides a brief summary of how the wetlands and waterways are regulated in each of the applicable states.

The USACE regulates through three primary statutory authorities:

- Section 404 of the Clean Water Act (CWA) (1977) (33 USC 1344) authorizes the USACE to issue permits, after notice and opportunity for public hearing, for the discharge of dredged or fill material into the "navigable waters of the United States" at specified sites.
- Section 10 of the Rivers and Harbors Act (RHA) (1899) (33 USC 403)authorizes the USACE, after notice and opportunity for public hearing, to prohibit the unauthorized obstruction or alteration of any "navigable water of the United States."
- Section 103 of the Marine Protection, Research, and Sanctuaries Act (1972) (33 USC 1413) authorizes the USACE to issue permits, after notice and opportunity for public hearing, for the transportation of dredged material for ocean disposal, where it is determined that the disposal will not unreasonably degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities.

Of these authorities, Section 404 of the CWA and Section 10 of the RHA are most likely to regulate CPB activities.

The term "navigable waters" has different meanings under the two statutes. For Section 10, the term refers to those waters that have been, are being, or could be used for the transport of goods in interstate commerce. These waters include waters subject to the ebb and flow of tide, certain rivers, canals, and lakes, etc., that the USACE has formally declared to be navigable under Section 10. For Section 404 of the CWA, the term is generally shortened to "waters of the U.S.," and includes any waterways with a surface water connection to those waters traditionally considered "navigable" under Section 10 of the RHA, plus their adjacent wetlands. It would also include isolated lakes and wetlands that straddle the border between two or more states. Isolated, intrastate waters, or wetlands are generally not considered waters of the U.S., nor are the extreme headwaters of streams (33 Code of Federal Regulations [CFR] Parts 320 – 330).

Projects permitted under Section 404 of the CWA must, under Section 401 of the CWA, first obtain a certification from the state agency with authority over water quality issues within the state that the proposed discharge will meet the state's water use standards. This is called the water quality certification or certificate. Projects permitted by the USACE under any of its authorities also require a Coastal Consistency Determination (CCD) if the project is proposed in the coastal zone of a state with an approved Coastal Zone Management (CZM) Program. CZM requirements for Federal agencies are addressed in Section 3.5, Water Resources, in the

Programmatic Environmental Impact Statement (PEIS). Because it is a Federal agency, U.S. Customs and Border Protection (CBP) would be required to obtain a CCD for projects within approved coastal zones even for those projects for which a USACE permit is not required.

Canada and many of its provinces also have wetland regulatory programs and requirements. However, with the exception of limited boat or ground vehicle patrol operations conducted in association with the Canadian Border Services Agency and the Canadian Royal Mounted Police, the activities being conducted or proposed by CBP have little or no potential to impact Canadian wetlands and waterways. Any facility construction would occur on the United States side of border, not on the Canadian side of the border.

Another potential wetland or waterway permit could result if the proposed activity were to impact a formally designated "Wild and Scenic River" (WSR). Any proposed, federally assisted project within the bed or banks of a WSR requires a formal consultation with the Federal WSR managing agency, unless it is very minor maintenance of an existing project. This review, required under Section 7 of the Wild and Scenic Rivers Act (WSRA), determines whether the project is likely to have a "direct and adverse" effect on the river's free-flowing character, water quality, or "outstandingly remarkable values." If the WSR managing agency finds that the project is likely to have a direct and adverse effect, the agency may suggest changes to the project's design in order to avoid the adverse impacts to these values and a revised proposal can be resubmitted for review. If the project cannot be revised to avoid direct and adverse effects on the WSR, Federal participation in the project cannot continue (National Wild and Scenic Rivers, 2010).

**Maine**

Maine's Natural Resources Protection Act (NRPA) requires a permit from the Maine Department of Environmental Protection when a project impacts 4,300 square feet or more of freshwater wetland; when a project is within 75 feet of a river, stream, or brook; or when a project is within 250 feet of a coastal wetland, great pond, or state-defined wetlands of special significance. There are three levels of permitting under this statute:

- Tier 1 applies to disturbances to up to 15,000 square feet of impact, so long as the wetland to be impacted is not a state-defined wetland of special significance.
- Tier 2 applies to disturbances between 15,000 and 43,560 square feet (one acre) of wetland so long as the wetland to be impacted is not a state-defined wetland of special significance.
- Tier 3 or individual permit –the project would impact more than one acre of wetland or waterway.

An additional permit, the "Site Location of Development Act" permit, is required for projects with a footprint larger than 20 acres. In unorganized townships, project proponents apply for a "Land Use Regulating Commission Development Permit" with thresholds similar to the NRPA permit. Compliance with the Coastal Zone Management Act and a Section 401 Water Quality Certification is required to obtain an NRPA permit.

The New England District of USACE has issued the Maine State Program General Permit (SPGP). Piggybacking on the state's own program, the USACE general permit categorizes projects with less than 15,000 square feet of wetland impact as Category 1, non-reporting (i.e., the project proponent can proceed without notifying the USACE, provided he or she obtains any necessary authorizations from the state). Category 2 projects are those projects that would cause between 15,000 square feet and 3 acres of impact (including secondary impacts) to inland waterways or wetlands; these require an application to the USACE, which can be filed concurrently with the Maine state permit application. Projects with over three acres of wetland impacts are required to file an application for an individual permit directly with the USACE.

**New Hampshire**

New Hampshire's Department of Environmental Services Wetlands Bureau requires a Dredge and Fill permit for projects impacting wetlands, and a Shoreland permit for construction, earthwork, and clearing of vegetation within 250 feet of public waters (lakes and ponds over ten acres, rivers, and fourth-order or larger streams). There are three categories of projects: projects in nontidal wetlands impacting less than 3,000 square feet of wetland or 50 feet of shoreline are considered minimum-impact projects; as long as no municipally defined Prime Wetlands are involved, these impacts may be permitted under an expedited review process. Projects impacting between 3,000 and 20,000 square feet of wetland are defined as minor-impact projects; these projects are also subject to a less intensive permitting process. Projects impacting more than 20,000 square feet of wetlands are considered major-impact projects; major projects require a standard Dredge and Fill permit. Any project with a footprint larger than 100,000 square feet (or 50,000 square feet if shoreland is included) also requires an Alteration of Terrain permit.

The USACE New England District New Hampshire SPGP parallels the state's thresholds for minor and minimum-impact projects, with a joint permitting process. The USACE defines major-impact projects as those between 20,000 square feet and 3 acres of impact. Individual permits are required for projects with more than three acres of impact.

**Vermont**

Vermont Wetland Rules and the associated permitting process were updated in 2010 to provide new guidance and revised permit application forms. The Vermont Wetland Rules identify and protect 10 functions and values of "significant" wetlands and establish a 3-tier wetland classification system to identify such wetlands. The applicant submits delineation and functional assessment information to the Agency of Natural Resources (ANR), which then determines the wetland class. The first two classes of wetlands (Class I and Class II) are considered significant and protected under the wetland rules, along with their buffer zones (generally 100-foot for Class I and 50-foot for Class II). Any projects impacting these wetlands would require a General or Individual permit, depending on the level of impact. The revised permit rules are still under development, so thresholds have not been finalized. Class III wetlands are not protected by the Vermont Wetland Rules and a Vermont Wetland permit is not required for projects in Class III wetlands.

The USACE New England District Vermont SPGP regulates all federally jurisdictional wetlands, regardless of Vermont classification. Category 1 projects are for wetland impacts on less than 3,000 square feet and are generally non-reporting provided they meet the other general terms and conditions of the SPGP. Certain activities are not eligible for coverage under Category 1 and are therefore subject to the Category 2 requirements. Category 2 projects require reporting; these projects have between 3,000 square feet and 1 acre of wetland impact or do not meet the Category 1 requirements for some other reason. Category 2 projects must meet the general requirements of the SPGP, require written authorization from the Corps, and are reviewed by the interagency review team which includes the USEPA and the U.S. Fish and Wildlife Service (USFWS). Projects with over one acre of wetland impacts are required to file an application for an Individual permit with the USACE.

The Vermont ANR has granted water quality certification for USACE SPGP Category 1 activities and has conditionally granted the Section 401 water quality certification for Category 2 activities, as long as the activity is reasonably likely to have minimal or no impact on water quality. The Vermont ANR retains the right to require an individual water quality certification for any Category 2 activity over which they have concern.

**New York**

Under the New York Freshwater Wetlands Act, either the New York Department of Environmental Conservation (NYDEC) or the Adirondack Park Agency regulates freshwater wetlands. The Adirondack Park Agency regulates wetlands within the boundaries of Adirondack Park, which includes a significant portion of the northeastern part of the state.

The NYDEC regulates wetlands 12.4 acres or larger, although smaller wetlands are protected if they have unusual local importance in providing valuable functions such as water quality maintenance or floodwater storage. The Adirondack Park Agency does not have a size threshold, and regulates certain activities within 100 feet of a wetland if they have the potential to adversely affect the wetland (NYDEC, 2010; Adirondack Park Agency Website, 2010).

The USACE New York and Buffalo Districts share implementation of the USACE wetland regulatory Program in New York State. There is no SPGP or other general permit keyed to the state wetlands permitting programs, although the state agencies and USACE do share a joint permit application form (USDOD, 2010a; USDOD, 2010b).

**Pennsylvania**

Wetlands in Pennsylvania are regulated by both the USACE and the Pennsylvania Department of Environmental Protection (DEP). (Federal wetland permits in the project area would be processed by the Pittsburgh District of the USACE.) Pennsylvania has a number of laws regulating wetlands. The Pennsylvania Dam Safety and Encroachments Act gives the Pennsylvania DEP the authority over wetlands of the state and authority over section 401 Water Quality Certifications. For exceptional wetlands, permits will only be granted when the project will not have an adverse impact, is water-dependent, there is no practicable alternative, will not cause or contribute to a violation of an applicable state water quality standard, will not contribute to ground and surface water pollution, will have no impairment of wetland’s exceptional value, and the applicants will replace the affected wetlands. Permits will be issued for other wetlands based on the areal extent of the wetland impacts, the wetland’s values and functions, the unique values to the area or region, and comments from other state and Federal agencies.

The Pittsburgh District of USACE has issued the Pennsylvania SPGP, which authorizes projects that result in less than 1 acre of impact to wetlands and 250 linear feet or less of stream. There are three categories based on the type of project and the level of review received through the Pennsylvania DEP.  Category 1 projects can generally proceed without review by the USACE provided the permittee receives state authorization for the project.  Category II projects require notification in the Pennsylvania Bulletin as required by the Pennsylvania Dam Safety and Encroachment Act.  The publication of the notice will provide the USACE and the state and Federal resource agencies (USEPA, USFWS, and National Oceanic and Atmospheric Administration-Fisheries) the opportunity to review these projects.  The third category of projects includes those activities the USACE wants to review and coordinate with the natural resources agencies, and determine on a case-by-case basis whether or not to authorize the impact under the SPGP or as an individual permit (Commonwealth of Pennsylvania, 2010; PDEP, 2003).

### Ohio

Wetlands in Ohio are regulated by several USACE districts (Buffalo, Huntington, and Pittsburgh Districts) and the Ohio Environmental Protection Agency (OEPA).  Ohio regulates and requires permits for those wetland and water areas beyond the reach of Federal jurisdiction, namely isolated wetlands.  It has also strengthened its role in the USACE permit process by strengthening its Section 401 certification process.

The Ohio Revised Code 6111.02 through 6111.028 gives the OEPA authority to regulate discharges of fill into isolated wetlands.  Isolated wetlands are not connected to other surface waters and the USACE has determined that most are not “waters of the US.”  For any projects involving the placement of fill into an isolated wetland, a permit from OEPA is needed. Under Ohio’s antidegradation rule, isolated wetlands are categorized as follows (USEPA, 2009; OEPA 2010):

- Category 1 are wetlands with minimal wetland function and/or integrity..
- Category 2 wetlands have moderate wetland function and/or integrity.
- Category 3 wetlands have superior wetland function and/or integrity.

Wetland categories are determined using the draft Ohio Rapid Assessment Method.

The USACE has not issued an SPGP in Ohio but has issued several regional activity-specific general permits for activities with minor impacts.

### Indiana

Wetlands in Indiana are regulated by the USACE (Chicago, Detroit, and Louisville Districts), the Indiana Department of Environmental Management (IDEM), and the Indiana Department of Natural Resources (IDNR).  Title 13 of the Indiana Code gives IDEM the authority to issue Section 401 Water Quality Certificates and gives the Indiana Water Pollution Control Board authority to adopt rules to protect water quality.  The Indiana Isolated Wetlands Law gives the IDEM authority to regulate isolated wetlands not regulated by the USACE.  It requires individuals to obtain a permit for any project that will result in a discharge to an isolated wetland.

The Indiana Lake Preservation Act gives the IDNR authority to regulate activities over, along, or lakeward of the shoreline of a public freshwater lake’s legal or average normal shoreline.

Certain activities within 10 feet landward of a lake's legal or average normal shoreline are also under IDNR regulation.

The Indiana Navigable Waterways Act gives the IDNR jurisdiction over any waterway that is considered a "navigable water" under Section 10 of the RHA. These waterways have formally been declared by the Indiana General Assembly as a "public highway." Other authorities give the IDNR control over specific activities or aspects (e.g., construction of artificial channels) in Indiana's navigable waterways.

The Chicago, Detroit, and Louisville Districts of the USACE have jointly issued a Regional General Permit for just about any activity limited to one acre or less impact to wetlands (or other "special aquatic sites") and less than 1,500 linear feet of stream channel (not to exceed 1 acre), provided the project proponent obtains a Section 401 Water Quality Certification from IDEM (IDEM, 2008; USDOD, 2009a).

**Illinois**

Wetlands in Illinois are regulated by the USACE, Illinois Environmental Protection Agency (IEPA), Illinois Department of Natural Resources, and local governments. The Illinois Rivers, Lakes, and Streams Act gives the Illinois Department of Natural Resources the authority to grant permits for any project dealing with dams, construction within a public body of water, and construction within floodways. In addition, Chapter 92, Part 704 of the Illinois Administrative Code **(**Regulation of Public Rules**)** establishes that any project in or along Lake Michigan requires a joint application to the Illinois Department of Natural Resources and the IEPA. The IEPA is also responsible for granting the CWA Section 401 water quality certification. Finally, many local governments have passed ordinances that feature wetland and wetland setback protection standards. These standards do not replace the Illinois Department of Natural Resources or the USACE authority; however, they may be more restrictive (FindLaw, 2010; IDNR et al., 2010).

**Michigan**

Michigan wetlands are regulated by the USACE, the USEPA, the State of Michigan, and local governments. Under Section 404(g) of the CWA the USEPA has transferred the authority to administer the Section 404 CWA program to the State of Michigan Department of Environmental Quality (DEQ) Water Resources Division, for those waters and wetlands the state regulates. The USACE retains Federal jurisdiction over traditionally navigable waters including the Great Lakes, connecting channels, other waters connected to the Great Lakes where navigational conditions are maintained, and to wetlands directly adjacent to these waters. The DEQ and USACE have a joint state and Federal permit process in waterways where both state and Federal jurisdiction apply, to streamline the application process for applicants. The DEQ Land and Water Management Division (LWMD) acts as a clearinghouse to determine if joint review is needed on a permit.

Under Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, the state regulates wetlands:

- Connected to one of the Great Lakes or Lake St. Clair;

- Located within 1,000 feet of one of the Great Lakes or Lake St. Clair;
- Connected to an inland lake, pond, river, or stream;
- Located within 500 feet of an inland lake, pond, river or stream;
- Not connected to one of the Great Lakes or Lake St. Clair, or an inland lake, pond, stream, or river, but more than five acres in size; and,
- Not connected to one of the Great Lakes or Lake St. Clair, or an inland lake, pond, stream, or river, and less than five acres in size, but the DEQ has determined that these wetlands are essential to the preservation of the state's natural resources and has notified the property owner.

In addition, local jurisdictions regulate wetlands by passing wetland ordinances. Wetlands regulated by local governments are less than five acres (MDNRE,2010).

**Wisconsin**

Wetlands in Wisconsin are regulated by the USACE, the Wisconsin Department of Natural Resources (WDNR), and local jurisdictions through the state-mandated Shoreland Zoning ordinances. The WDNR has regulatory authority over all wetlands, including isolated wetlands, in Wisconsin. As with the State of Michigan, the EPA has transferred the authority to administer the Section 404 CWA program to the State of Wisconsin under Section 404(g) for those waters and wetlands the state regulates. The USACE retains Federal jurisdiction over traditionally navigable waters under Section 10 of the RHA.

Under the navigable waters protection, Chapters 30 and 31 of the Wisconsin Statutes, the WDNR regulates most alterations to the state's navigable waters and wetlands. Navigable waters are defined as "any waterway capable of navigation by a recreational craft on a regularly recurring basis, including spring freshets." Wetlands are defined as "an area where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions." Chapters NR 299 and 103 of the Wisconsin Administrative Code gives authority to the WDNR to carry out the CWA provisions, while the Isolated Wetland Protection Provisions of Wisconsin Act 6 give the WDNR the authority to regulate isolated wetlands. The USACE nationwide permits have been suspended in Wisconsin, and the state has issued its own SPGP for activities with minor impacts. Applicants need a Water Quality Certification for both federally and nonfederally regulated projects (WDNR, 2010; Cain, 2008).

The Shoreland Wetland Zoning Program (Sections 281.21, 59.692, 61.351, 62.231 of the Wisconsin Statutes) requires that counties, villages, and cities have ordinances that prohibit fill in wetlands. This program is administered by local governments, with the WDNR having oversight authority. Protection areas include 1,000 feet from lakes and 300 feet from rivers or streams. In addition, many local jurisdictions have passed ordinances that feature wetland and wetland setback protection standards. These standards do not replace WDNR or USACE authority, but they may actually be more restrictive (Cain, 2008).

### Minnesota

Wetlands in Minnesota are regulated by the USACE, the Minnesota Department of Natural Resources, the Minnesota Pollution Control Agency, and local governments. Laws regulating wetlands include the Public Water Work Permit Program, Minnesota's Wetland Conservation Act, and Section 401 of the CWA. The first of these laws gives the Minnesota DNR authority to regulate projects that occur within the ordinary high water levels of public waters and public waters wetlands. Any project that includes filling, excavation, shore protection, bridges and culverts, structures, docks, marinas, water-level controls, dredging, or dams are subjected to regulation.

The Minnesota Wetland Conservation Act gives local governments the authority to administer regulations on all wetland draining and filling activities not protected by the Minnesota DNR. Exemptions are available for activities impacting wetlands of 400 square feet or less. Other exemptions ranging from 2,000 to 10,000 square feet of impacts are allowed depending upon wetland type and location.

The Minnesota Pollution Control Agency has the authority to determine whether projects comply with the state's water quality standards and to issue Water Quality Certifications. The agency also reviews and comments on USACE permit applications.

Two or more of these programs often cover the same wetland. In some cases, various portions of the same wetland are regulated by different programs. Additional local laws include watershed district rules, shoreland and floodplain ordinances, and municipal wetland ordinances.

The Minnesota USACE has established general permits and a letter of permission process that replaces the USACE's nationwide permits (MBWSR, 2010; USDOD, 2010c; MDNR, 2010).

### North Dakota

Wetlands in North Dakota are regulated by the USACE, the North Dakota Department of Health (NDDH), the North Dakota State Water Commission, the Local County Water Resource Boards, and the local Soil and Water Conservation Districts (USDA-NRCS). North Dakota includes wetlands in the State's definition of waters.

The North Dakota Century Code Sections #61-01-22, 61-02-14, and 61-02-20 establish that a permit is required from the local county water resource board and the North Dakota State Water Commission to drain any water of the state, while Century Code #61-32-01 establishes that proponents of any project occurring in a wetland compromising 80 acres or more shall first secure a permit. The NDDH is responsible for granting Section 401 Water Quality Certifications and uses the North Dakota Water Quality Standards to determine if a project meets the standards of the state.

The USACE has not developed any SPGPs for North Dakota, but has adopted regional conditions for the nationwide permits. The USACE nationwide permits cover a variety of activities, with maximum impacts of up to 0.5 acres. Projects with impacts greater than 0.5 acres require individual permits (Crooke, 2010).

### Montana

In addition to the USACE Sections 404 and 10 permits, the State of Montana has regulations for the protection of streams and waters, and permits may be required for work in and near wetlands and other waters. Under the Montana Water Quality Act, the Montana Department of Environmental Quality is charged with regulating the waterways of the state and issuing or denying permits. Wetlands are included in the definition of the state's waterways. A permit is required to discharge sewage, industrial waste, or other waste into state waters. Also, under the Natural Streambed and Land Preservation Act (i.e., the "310 Law"), any individual or corporation proposing construction in a perennial stream is required to apply for and obtain a 310 permit. Permitting is administered by local Montana Conservation Districts (MDNRC, 2010).

Under the Montana Stream Protection Act, any Federal, state, or local agency conducting a project that may impact the bed or banks of a stream must acquire a permit (Stream Protection Act 124 Permit) from Montana's Department of Fish and Wildlife (MT FWP, 2010). Under the Montana Lakeshore Protection Act, Montana has authorized counties to develop permit requirements for any development along the shorelines of lakes, rivers, and streams. Although most counties in Montana have not developed these requirements, Flathead County, which abuts the northern border, has enacted a Lakeshore Protection Act.

The USACE has not developed any SPGPs for Montana, but has adopted regional conditions for the nationwide permits. Montana has also developed a joint permit application for any project requiring permitting from multiple jurisdictions (MDEQ, 2010).

### Idaho

In addition to meeting the USACE Federal wetland permitting requirements, Idaho Stream Channel Protection Act gives the Idaho Department of Water Resources permitting authority over any project that will obstruct, diminish, destroy, alter, modify, relocate, or change the natural shape or direction of a stream channel flow. Projects within the ordinary high water marks of a continuously flowing stream, including recreation, dredging, or mining, require a permit.

The USACE has issued regional general permits for structures such as piers and docks in Lake Pend Oreille and some of the other waterways (USDOD, 2010d; USDOD, 2009b).

### Washington

In addition to the USACE Sections 404 and 10 permitting requirements, the State of Washington has several laws applicable to waters and wetlands. Waters of the State of Washington are defined as those fresh and salt waters below the ordinary high water mark within the boundaries of the state. Under the "Hydraulic Code", Washington's Department of Fish and Wildlife is authorized to protect fish and fish habitats from impacts associated with "construction of any form of hydraulic project or performance of other work that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state." Projects are conditioned or denied for the protection of fish life.

The Shoreline Management Act gives authority to local governments to develop a Shoreline Master Program (SMP). Activities that require permits are defined within SMP for each local jurisdiction.

Projects exceeding $5,718 fair market value along coastal shorelines, shorelines of streams or lakes, or wetlands are required to acquire a Shoreline Substantial Development Permit from the Washington State Department of Ecology. The cost of the permit is determined by the local issuing jurisdiction. The Washington State Department of Ecology does not have authority to approve or deny permit requests. However, the Department of Ecology can require compliance with the Washington State Environmental Policy Act (i.e., the project proponent may have to prepare an environmental impact review and possibly an environmental impact statement).

Under the Growth Management Act, local governments have authority to regulate wetlands as critical areas designated by the Department of Ecology.

Permitting for the various regulations is accomplished through a joint permitting process called the Joint Aquatic Resources Permits Application (WSGORA, 2010; USDOD, 2007).

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# APPENDIX L

# ECOREGION NARRATIVES

# 1 ECOREGIONS ALONG THE NORTHERN BORDER

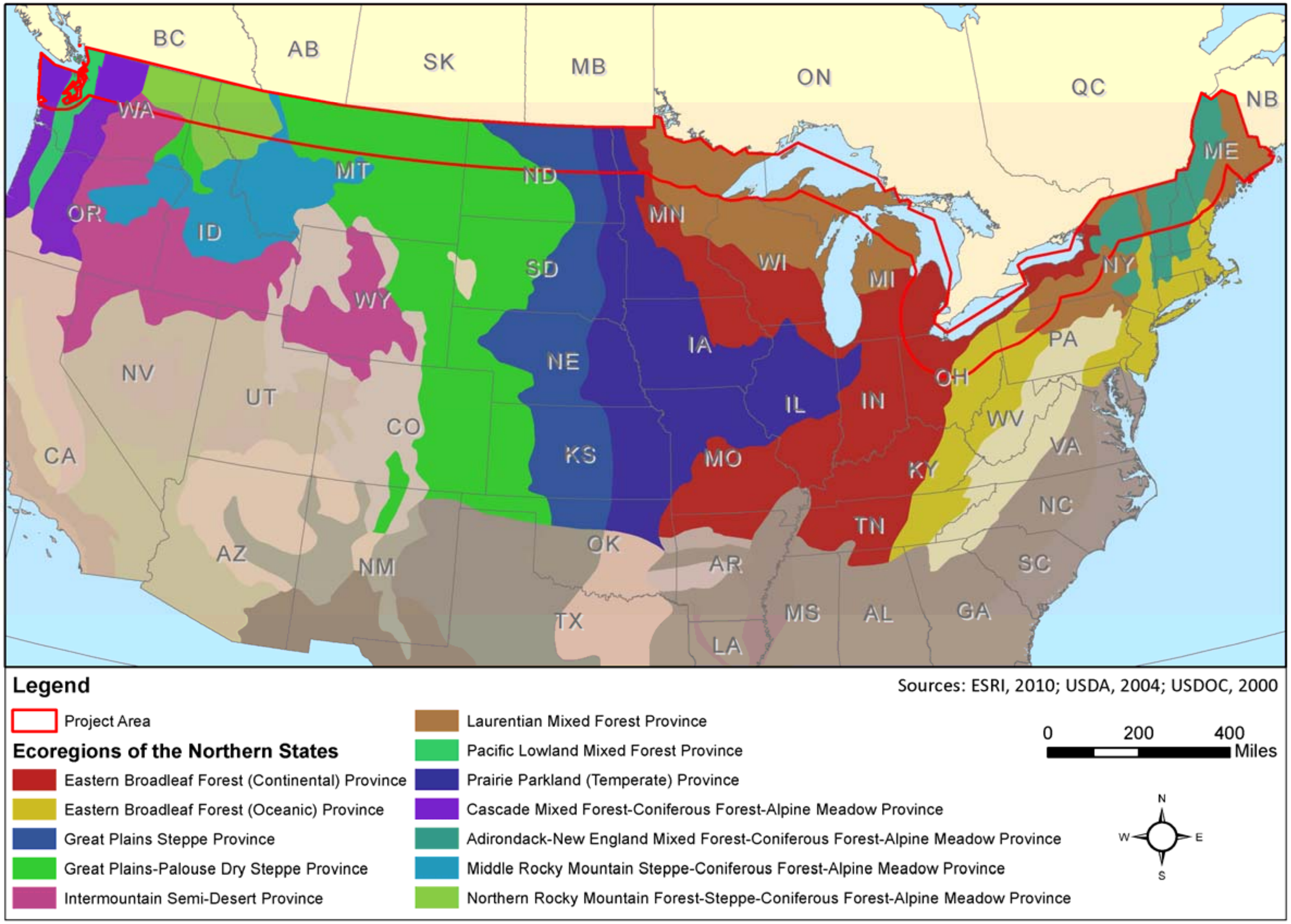
An ecoregion is a large area encompassing similar climate and ecosystem patterns. The similarities include types of plant and animal species, natural habitat types, climate, soils, and the general topography of the landscape. Dr. Robert G. Bailey, a geographer for the U.S. Forest Service (USFS), developed one of the most accepted systems to describe and map ecoregions (Bailey, 1995). Federal agencies and non-governmental organizations, including the USFS, U.S. Geological Survey (USGS), U.S. Fish and Wildlife Service (USFWS), The Sierra Club, and The Nature Conservancy, use this ecoregion-based land classification system. The ecoregion conceptual framework is used for projects such as biodiversity analysis, landscape planning, and regional forest planning.

Twelve ecoregions make up the northern border (Figure L-1), ranging from the Pacific Lowland Forests of Washington to the Laurentian Mixed Forests in Maine. Map resources for all the ecoregion figures in this Programmatic Environmental Impact Statement (PEIS) were developed using U.S. Census, USGS, and Economic and Social Research Institute (ESRI) data.

Each ecoregion has a unique set of biological, climatic, and topographic characteristics, along with unique challenges and opportunities for the U.S. Customs and Border Protection (CBP). Each ecoregion description presented here begins with a general overview of those unique characteristics followed by:

- Blocks of Regionally Significant Habitat;
- Sensitive Habitats;
- Threatened and Endangered Species;
- Wildlife;
- Vegetative Habitat;
- Wetlands and Waterways; and,
- Aquatic Resources.

**Figure L-1. Ecoregions along the Northern Border**

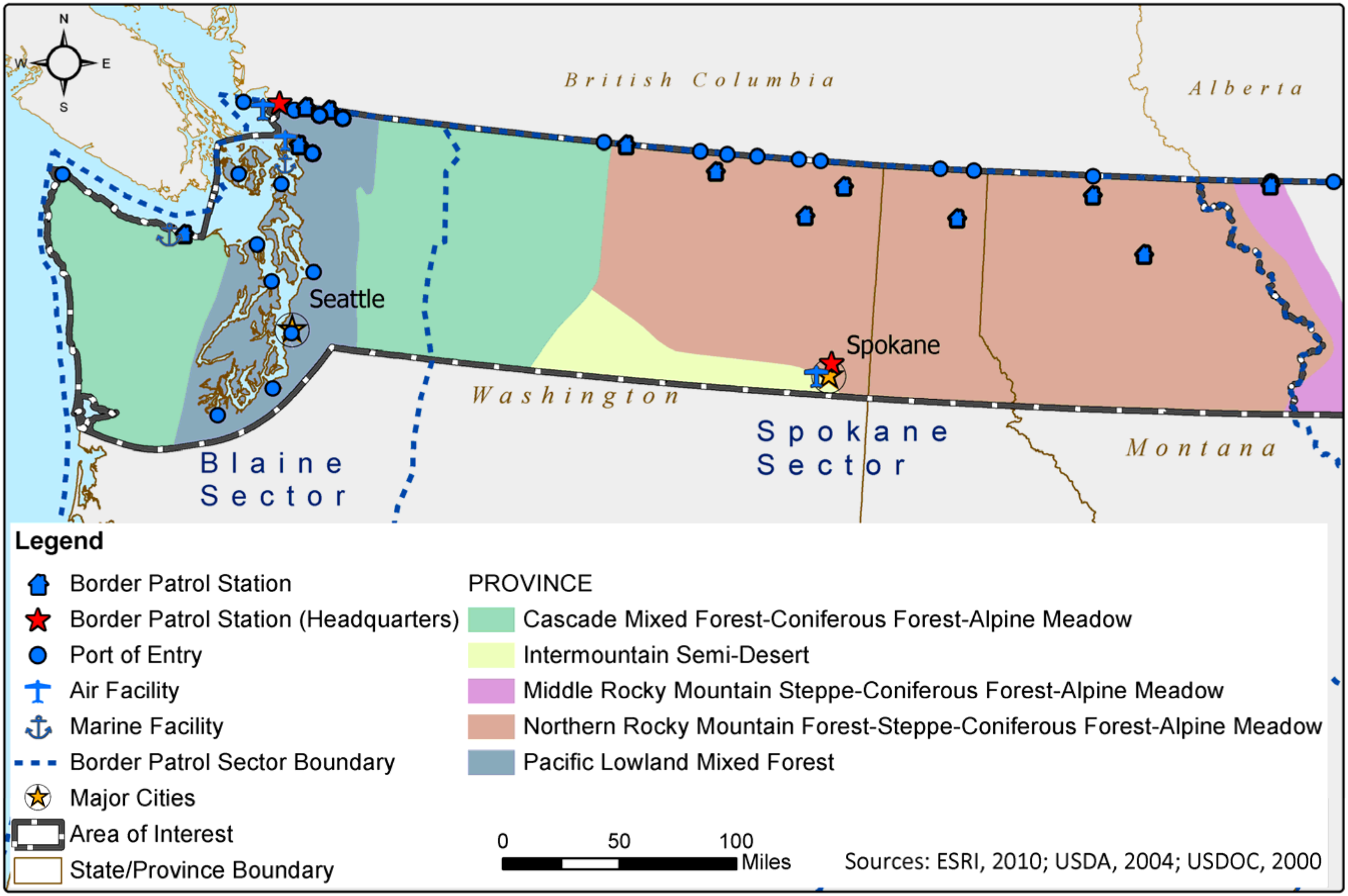


## 1.1 CASCADE MIXED FOREST–CONIFEROUS FOREST–ALPINE MEADOW ECOREGION (M242)

The Cascade Mixed Forest Ecoregion encompasses a rugged mountain region with a narrow coastal plain (Figure L-2). Mountains along the coast have elevations of up to 5,000 feet (1,500 meters) above sea level. The interior Cascade Range Mountains average 8,000 to 9,000 feet (2,400 to 2,700 meters), with a series of volcanoes of greater elevation (Bailey, 1995). Mt. Rainier, an immense volcano, towers more than 14,000 feet (4,300 meters) high. Some portions of this ecoregion have been extensively glaciated.

Washington is the only state within the 100-mile boundary in this PEIS.

**Figure L-2. Ecoregions in the West of Rockies Region**



Modified by its proximity to the Pacific Ocean, this ecoregion has milder temperatures that average 35 to 50 degrees Fahrenheit (2 to 10 degrees Celsius) throughout the year. Precipitation comes mostly as rain, with totals ranging from 30 to 150 inches (77 centimeters to 380 centimeters) per year, and the majority falling during winter. Further south, winter precipitation is primarily rain with little or no snow. Coastal fog provides some summer moisture (Bailey, 1995). In the ecoregion's north, summer conditions remain dry for a shorter period and the area experiences more snowfall in winter. On the eastern side of the Cascades, conditions are drier than the western slopes; as little as 20 inches (51 centimeters) of precipitation falls on eastern slopes each year.

A high proportion of the land within the 100-mile northern border region in Washington is either publically owned or part of a Native American reservation. Much of the public land is either national forest (USFS) or National Park Service (NPS) land (North Cascades National Park), with smaller parcels managed by the U.S. Department of Defense and U.S. Bureau of Land Management (BLM).

Marine and coastal waters form the northwestern portion of the U.S.-Canada border. The exposed coast along the Pacific stretches south from Cape Flattery to the mouth of the Columbia River. Much of this area has relatively shallow waters over the continental shelf; shorelines vary from sand beaches to heavily forested rocky shores. Much of this outer rocky shore is characterized by thick kelp beds, which constitute key habitat for many marine organisms, including sea otters (*Enhydra lutris)* and abalone (*Haliotis* spp.*)*.

### 1.1.1 REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT

The blocks of regionally significant habitat below are relatively undeveloped and intact habitats that are protected as wilderness, state parks, and state and national forests. Regionally significant or intact habitat refers to areas of largely unfragmented habitat with few alterations or disturbances, such as roads or other development. Most areas listed are protected by law (wilderness areas, national parks) and often cross state and country boundaries, while others may occupy large expanses of private land.

Selected regionally significant blocks that represent this region include:

- Mount Rainier National Park;
- Olympic National Park;
- North Cascades National Park;
- Mount Baker Wilderness;
- Glacier Peak Wilderness;
- Pasayten Wilderness;
- Lake Chelan-Sawtooth Wilderness;
- Stephen Mather Wilderness; and,
- Salmo-Priest Wilderness.

**Mount Rainier National Park**

(NPS)

### 1.1.2 SENSITIVE HABITATS

The Washington Department of Fish and Wildlife (WA DFW) designates certain areas as "priority habitats," which are habitat types with unique or significant value to many species. These habitats typically have a comparatively high fish and wildlife density or species diversity; contain important breeding habitat, seasonal ranges, or movement corridors; have limited availability or high vulnerability to habitat alteration; or provide habitat for unique species (WA DFW, 2008). Priority habitat designation can inform regulatory decisions (e.g., planning requirements under the Growth Management Act and Shoreline Management Act), but does not carry regulatory significance on its own. For each of these habitat types, certain features are considered priority due to their wildlife value.

Sensitive areas within this ecoregion include the following:

- Aspen stands–Pure or mixed stands of aspen greater than 0.4 hectare (1 acre);

**Aspen Stand**

- Biodiversity areas and corridors– Biologically diverse areas, or cities or urban growth areas with habitat valuable to fish or wildlife, mostly with native vegetation; corridors are zones of relatively undisturbed and unbroken tracks of vegetation that connect fish and wildlife habitat conservation areas, priority habitats, or areas identified as biologically diverse or valuable within city or urban growth areas;
- Eastside steppe–Non-forested vegetation dominated by forbs, perennial bunchgrasses, or a combination;
- Herbaceous balds–Variable-size patches of grasses and forbs on shallow soils over bedrock, commonly fringed by forest or woodland;
- Inland dunes–Sand dunes away from coastal areas;
- Juniper savannah–Juniper woodlands with a grassy understory;
- Old growth/mature forest–Forests of great age exhibiting specialized structural characteristics and rich biodiversity;
- Oregon white oak woodlands–Stands of oak or oak/conifer associations in which canopy coverage of the oak component exceeds 25 percent;
- Riparian–Areas adjacent to flowing or standing freshwater aquatic systems;
- Shrub-steppe–Non-forested vegetation consisting of one or more layers of perennial bunchgrasses and a conspicuous, but discontinuous, layer of shrubs;
- Westside prairie–Herbaceous, non-forested plant communities; either dry or wet prairie;
- Freshwater wetlands and fresh deepwater–lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or shallow water covers the land; deepwater habitats are permanently flooded lands below the deepwater boundary of wetlands;
- Coastal nearshore–Relatively undisturbed, nearshore estuaries of Washington’s outer coast; and,
- Open coast nearshore–Relatively undisturbed, non-estuarine nearshore areas of Washington’s outer coast

### 1.1.3 THREATENED AND ENDANGERED SPECIES

Appendix F3 lists the Federal and state-listed threatened and endangered species.

Each region of the USFS designates certain fish and wildlife species as sensitive. Sensitive species on USFS lands are species for which population viability has become a concern due to a significant downward trend in population or habitat capacity. These species require special management to maintain and improve their status on national forests and grasslands and prevent listing under the Endangered Species Act. The BLM also has a designation for sensitive species on their lands.

A prime example of a marine-endangered species is the leatherback turtle (*Dermochelys coriacea*), the only sea turtle capable of surviving in cold waters. It ranges more widely than other sea turtles, including in the Pacific Ocean north to the coasts of Washington and British Columbia. Leatherbacks live almost all of their lives in the marine environment, although females must return to shore to lay eggs. In the United States, the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service has jurisdiction over sea turtles at sea; the USFWS has jurisdiction of them on land (nesting beaches). Leatherbacks are listed as endangered in both the United States and Canada.

**Leatherback turtle hatchlings**

(Coral Reef Alliance)

The grizzly bear, a prominent, federally listed species in this ecoregion, requires contiguous, relatively undisturbed, mountainous habitat with significant vegetative and topographic diversity. Its habitat needs include valley bottoms, wetland and riparian areas, rugged montane areas, and alpine meadows. The USFWS identified recovery zones needed for revitalization of the grizzly bear population (USDOI, 2009). In Washington, there are two grizzly bear recovery zones: the northern Cascades zone, and the Selkirk zone in northeast Pend Oreille County. The northern Cascades zone currently has a remnant population of fewer than 20 bears (USDOI, 2010a), but is capable of supporting a larger population.

Also in this region are the federally listed spotted owl (*Strix occidentalis*) and the marbled murrelet (*Brachyramphus marmoratus*); both are species that depend on old-growth conifer forest habitat for breeding.

### 1.1.4 WILDLIFE

The Cascade Mixed Forests of this ecoregion are home to many wildlife species, including game (legally hunted) species, such as deer and elk, and non-game (legally protected, but not endangered or threatened) species, including birds and mammals, reptiles and amphibians, and invertebrates. Many bird species migrate into or out of this province in spring and fall each year, although avian migration here is not as temporally or geographically concentrated as many areas of the eastern United States. Several mammals and many permanent resident bird species remain in the province throughout the year.

**Mountain lion**

(NPS)

In the dominant coniferous forest habitats within the Cascade Province, elk (*Cervus candensis*), mountain lion (*Puma concolor*), Townsend's warbler (*Dendroica townsendi)*, and varied thrush (*Ixoreus naevius)* are a few of the sensitive species typical of this ecoregion. Steller's jay (*Cyanocitta stelleri*), chestnut-backed chickadee (*Poecile refescens*), and black-backed woodpecker (*Picoides arcticus*) are examples of permanent resident (non-migratory) bird species in the conifer forests .The black bear (*Ursus americanus*), boreal toad (*Anaxyrus boreas*), rough-skinned newt (*Taricha granulosa*), and brown elfin butterfly (*Callophrys augustinus*) offer additional examples of wildlife species living in various habitats of this ecoregion.

### 1.1.5 VEGETATIVE HABITAT

The Cascade Province is mountainous, with elevations varying from sea level to above 5,000 feet (1,500 meters). Douglas-fir (*Pseudotsuga menziesii*) is the most abundant species at low elevations in the region. At the lowest elevations, dense conifer forests of Douglas-fir, western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), grand fir (*Abies grandis*), silver fir (*A. amabilis)*, Sitka spruce (*Picea sitchensis)*, and Alaska-cedar (*Chamaecyparis nootkatensis)* grow. Numerous shrub species thrive in this forest and at its margins. In many places, this vegetation is practically impenetrable.

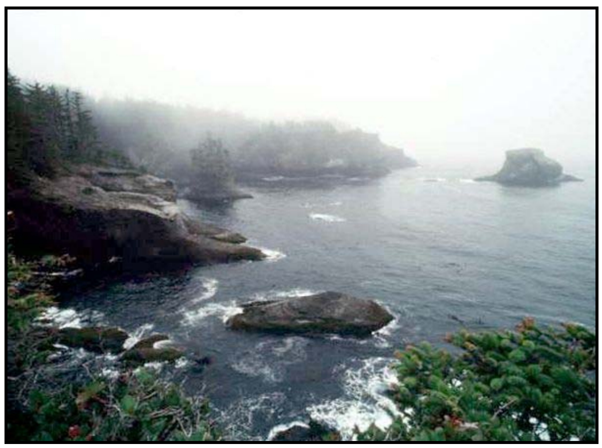
A dry forest of ponderosa pine (*Pinus ponderosa*) grows along the dry eastern slopes of the Cascades — typically open forest mixed with grass and shrubs. The high, snowcapped mountains of the Cascades have a well-marked subalpine forest belt that reaches into British Columbia. Important trees are mountain hemlock (*Tsuga mertensiana*), subalpine fir (*Abies* *lasiocarpa*), white-bark pine (*P. albicaulis*), and Alaska cedar or Nootka cypress (*Callitropsis nootkatensis*).

To the north, the subalpine forest becomes fragmented or disappears completely. Riparian forests in the Pacific Northwest provide an exception to the general rule that conifers dominate the region. Broadleaf species, such as black cottonwood (*Populus trichocarpa)* and red alder (*Alnus rubra),* grow along the many rivers and creeks.

Examples of invasive plants in this ecoregion include the following species, which have already caused or are expected to cause problems: wild chervil (*Anthriscus sylvestris)*, absinth wormwood (*Artemisia absinthium)*, kochia (*Kochia scoparia)*, plumeless thistle (*Carduus acanthoides)*, nodding thistle (*C. nutans)*, slenderflower thistle (*C. pycnocephalus)*, and longspine sandbur (*Cenchrus longispinus)* (USDA, 2010). Non-native invasive plant species can negatively affect natural areas, agriculture, and horticulture (Simberloff, 1996).

### 1.1.6 WETLANDS AND WATERWAYS

**Rocky coastline typical of Washington**



(National Geographic)

Wetlands in the Cascade Mixed Forest–Coniferous Forest–Alpine Meadow Province portion of the project area include approximately: 129,535 acres of forested or scrub-shrub wetland; 51,500 acres of emergent wetlands; 12,595 acres of ponds; 133,635 acres of lakes; and 45,275 acres of riverine habitats. Since this province extends around Puget Sound to the Pacific Ocean, it also includes 340 acres of marine and estuarine deepwater habitats and 6,025 acres of marine and estuarine wetlands (USDOI, 2010b).

In the study area, marine habitats are associated with the Strait of Juan de Fuca, Puget Sound (most of which lies within the Pacific Lowland Mixed Forest Province described in section 3.3.1.12), Haro Strait, Boundary Pass, the Strait of Georgia, and the Pacific Ocean. Overall, Washington State has 127 Marine Protected Areas that cover 6 million feet of coastline (Van Cleve et al., 2009).

The Skagit River, which crosses this province and the Pacific Lowland Mixed Forest Province, is a designated Wild and Scenic River. Lakes and reservoirs protected under the Washington

Shoreline Management Act in this province include Rock Island Pool, Wenatchee Lake, Chelan Lake, Wells Reservoir, Ozette Reservoir, and Baker Lake.

### 1.1.7 AQUATIC RESOURCES

The marine and coastal areas of northwest Washington form a complex marine border with the Canadian Province of British Columbia. The 100-mile area south from the Canadian border includes (from west to east) the outer coast of the Olympic Peninsula and the Pacific Ocean, and the Strait of Juan de Fuca between the Olympic Peninsula and Victoria Island. In general, 12 nautical miles off the coast is considered territorial waters of the United States; however, since the marine waters between Washington and British Columbia never surpass 24 nautical miles wide, the border is designated as the middle of the water body (i.e., less than 12 nautical miles from the shore). Washington State ownership extends three miles from its coastline.

The outer exposed coast along the Pacific stretches 150 miles south from Cape Flattery to the mouth of the Columbia River. Much of this area has relatively shallow waters over the continental shelf and shorelines that range from sand beaches to heavily forested rocky shores. Many areas are bordered by steep cliffs with isolated sea stacks and rugged headlands. Much of this outer rocky shore has thick kelp beds — key habitat for many marine organisms, including sea otters and abalone.

Rocky intertidal shorelines are shallow areas (by definition, exposed at some time between high and low tides) along rocky coasts that are usually steeper where wave action is so strong that sediment cannot accumulate. They provide important habitat for many marine organisms, such as chitons (class–Polyplacophora), sponges (phylum–Porifera), limpet (saltwater/freshwater snails), marine worms, anemones (order–Actiniaria), octopus (order–Octopoda), crabs (infraorder–Brachyura), and many rockfish (*Sebastes* spp.).

Sand beaches also occur along the outer Pacific Coast of Washington. Fewer animals live on sand and gravel beaches than on rocky shores, due to the lack of solid substrate for attachment. Several fish — important prey for salmon — lay eggs on high spring tides on sand beaches in Washington, including sand lance (family–Ammodytidae), smelt (family–Osmeridae), and herring (*Clupea harengus)*.

**Pacific harbor seal**

(The Marine Mammal Center)

In Washington, straits and estuaries have abundant eelgrass (*Zostera* spp.) communities that are highly productive for marine life and many birds. The Pacific harbor seal (*Phoca vitulina)* largely relies on estuaries and frequently hauls out in these areas.

The rivers of this ecoregion province are generally excellent freshwater fish habitat — high in dissolved oxygen and largely unpolluted — and provide ideal conditions for the Pacific Northwest's salmon and trout species. Fisheries and aquatic resources are of great importance in this ecoregion and the neighboring Pacific Lowland Ecoregion. Stream and river fishing for trout and salmon remain quite important in western Washington. From 2003 to 2004, Washington residents purchased 318,079 freshwater fishing licenses. State anglers catch large numbers of salmon and several trout species annually (State of Washington, 2003). Agricultural production that allows animals access to streams and rivers can cause streambank erosion and result in nutrient loading, which has a harmful effect on water quality and the habitat of salmon and trout (Knight, 2009).

Aquatic invasive species are a concern within estuaries, wetlands, and rivers. Many species have accidentally been introduced through release of ship ballast water. Aquatic invasive plants of concern include caulerpa seaweed (*Caulerpa taxifolia)*, Eurasian watermilfoil (*Myriophyllum spicatum*), hydrilla (*Hydrilla verticillata*), parrotfeather (*M. aquaticum)*, common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), and water chestnut (*Trapa natans)*. Aquatic invasive animals include mitten crab (*Eriocheir sinensis)*, New Zealand mud snail (*Potamopyrgus antipodarum)*, northern snakehead (*Channa argus*), nutria (*Myocastor coypus)*, rusty crayfish (*Orconectes rusticus*), zebra mussel (*Dreissena polymorpha*), and quagga mussel (*D. rostriformis bugensis*). Viral hemorrhagic septicemia (VHS) is a deadly fish virus of great concern in this region.

## 1.2 PACIFIC LOWLAND MIXED FOREST ECOREGION (242)

The Pacific Lowland Mixed Forest Ecoregion sits in a narrow north-south longitudinal depression between Washington's Coast Range and Cascade Mountains (Figure L-2). Elevations in this narrow band vary from sea level to approximately 1,500 feet (460 meters). The valley adjacent to the Puget Sound is a tableland covered by older glacial and lake deposits. The ecoregion incorporates some ranges of isolated hills and low mountains.

This ecoregion province includes part of Washington State within 100 miles of the northern border.

Lying near the Pacific Ocean, the Pacific Lowland Mixed Forest Province has a climate that is mild and generally without dramatic extremes throughout the year. Annual temperatures range between 48 and 55 degrees Fahrenheit (9 to 13 degrees Celsius). Rainfall is highest in winter; summer is dry by comparison. Mean annual rainfall varies from 15 to 60 inches (38 to 153 centimeters), but mostly ranges between 30 to 45 inches (76 to 115 centimeters). A mild rain-shadow effect caused by the coastal mountains produces the drier climatic conditions. Fog brings some moisture to the forests in this ecoregion during the summer dry period (Bailey, 1995).

The region's principal trees are western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and Douglas-fir (*Pseudotsuga menziesii*). The coniferous forest is less dense in interior valleys than along the coast and often contains deciduous trees, such as bigleaf maple (*Acer macrophyllum),* Oregon ash (*Fraxinus latifolia),* and black cottonwood (*Populus trichocarpa*). The prairies support open stands of oak or are broken by groves of Douglas-fir and other trees; principal indicator species are Oregon white oak (*Quercus garryana)* and Pacific madrone (*Arbutus menziesii).* Poorly drained sites with swamp or bog communities are also abundant.

Estuaries characterize much of this ecoregion in Washington State, including Puget Sound, Nisqually Delta, and Grays Harbor. Puget Sound is a large fjord formed by the retreat of glaciers, and contains many fingers. Estuaries feature a mixture of salt and fresh waters; they are extremely productive biologically and important to marine life. The state's estuaries contain deltas, mudflats, and salt marshes — all coastal wetlands.

**Shorebirds on a mudflat**

(USFWS)

### 1.2.1 REMAINING BLOCKS OF REGIONALLYSIGNIFICANT HABITAT

No major extensive or sizable blocks of regionally significant habitat remain in this heavily urbanized part of Washington State.

### 1.2.2 SENSITIVE HABITATS

Within the 100-mile zone adjacent to the U.S.-Canada border are several ecological communities described as sensitive habitats prone to disturbance. The WA DFW) has designated certain habitats as "priority habitats" — a type of habitat with unique or significant value to many species. These habitats typically have a comparatively high fish and wildlife density and/or species diversity; contain important breeding habitat, seasonal ranges, or movement corridors; have limited availability or high vulnerability to habitat alteration; or provide habitat for unique species (WADFW, 2008). Priority habitat designation may be used to inform regulatory decisions (e.g., planning requirements under the Growth Management Act and Shoreline Management Act), but does not carry regulatory significance on its own. Within each of these habitat types, certain features are also considered priority due to their wildlife value. Priority habitat features include caves, cliffs, snags and logs, and talus (WADFW, 2008).

Sensitive areas in this ecoregion include the following:

- North Pacific maritime mesic-wet Douglas-fir/western hemlock forest –A component of the lowland and lower-elevation montane forests of western Washington; not typical of drier sites; Douglas-fir and western hemlock especially common here;
- North Pacific lowland riparian forest and shrubland– Most abundant throughout low elevations west of the Cascades; includes red alder and bigleaf maple as dominant species;
- Oregon white oak woodlands – Stands of Oregon white oak or oak/conifer associations in which oaks comprise 25 percent of the trees in a given patch, or where the total canopy coverage of a given site is less than 25 percent, but oaks make up more than 50 percent of the canopy (WADFW, 2008);
- Riparian –Area adjacent to flowing or standing freshwater aquatic systems;
- Shrub-steppe –Non-forested vegetation type with one or more layers of perennial bunchgrasses and a conspicuous, but discontinuous, layer of shrubs;
- Freshwater wetlands and fresh deepwater–Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or shallow water covers the land; deepwater habitats are permanently flooded lands below the deepwater boundary of wetlands;
- Instream–Combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources; and,
- Puget Sound nearshore–Relatively undisturbed nearshore Puget Sound, including the Strait of Juan de Fuca, Admiralty Inlet, the San Juan Islands, and Hood Canal.

### 1.2.3 THREATENED AND ENDANGERED SPECIES

Appendix F3 lists the threatened and endangered species in this ecoregion. The USFWS designates certain fish and wildlife species as sensitive. Sensitive species on USFS lands are those species for which population viability is a concern, evidenced by a significant downward trend in population or habitat capacity. These species need special management to maintain and improve their status on national forests and grasslands to prevent listing under the Endangered Species Act. The BLM also has a designation for species considered sensitive and occurring on its lands. These species are in danger of extinction on all or part of their range.

Chinook are the largest salmon in North America, occupying Pacific and Arctic waters (Page and Burr, 1991). As anadromous fish, they return to freshwater streams and rivers to spawn after several years spent foraging in marine waters. In the project area, much of Puget Sound, the Strait of Juan de Fuca, Georgia Basin, and associated streams and rivers in Washington constitute critical habitat for the Chinook salmon (NOAA, 2007).

Many coniferous forests contain both Federal and state-listed species in this ecoregion. These species include the marbled murrelet (*Brachyramphus marmoratus*), spotted owl (*Strix occidentalis*), grizzly bear (*Ursus arctos horribilis*), and Canada lynx (*Lynx canadensis*).

Although some species are listed as endangered or threatened at either the Federal or state level, others are categorized differently as species of “conservation concern” or “special concern.”

### 1.2.4 WILDLIFE

The Pacific Lowland Mixed Forests of this ecoregion province are home to several wildlife species, which include game (legally hunted) species such as deer, and non-game (legally protected, but not endangered or threatened) species, including birds, mammals, reptiles, amphibians, fish, and representative species of other taxa. Many bird species migrate into or out of this province in spring and fall each year, although avian migration is generally not as temporally or geographically concentrated as the eastern United States. Many mammals and permanent resident bird species remain in the province throughout the year.

In the dominant lowland coniferous forest habitats in the Pacific Mixed Forest Province, Townsend’s warbler and varied thrush are a few of the sensitive species that could be affected, especially during the breeding season (generally from March through July). The riparian deciduous forest in this ecoregion is inhabited by sensitive species that include Hutton’s vireo (*Vireo huttoni)* and Wilson’s warbler (*Wilsonia pusilla*).

**A flock of snow geese**

(USFWS)

Thousands of snow geese (*Chen caerulescens)* and trumpeter swans (*Cygnus buccinator)* winter in the Skagit River estuary. The waterfowl feed on aquatic plants and crops in nearby agricultural fields. Wide arrays of migratory bird species use the wetlands and coastal areas in the province in spring and autumn. Mild weather allows many species, including seabirds, waterfowl, raptors, gulls and terns, shorebirds, and some relatively winter-hardy songbirds, to overwinter here. Other inhabitants include black bear *(Ursus americanus)*, raccoon (*Procyon lotor*), ringneck snake (*Diadophis punctatus*), and northwestern garter snake (*Thamnophis ordinoides*).

### 1.2.5 VEGETATIVE HABITAT

The Lowland Mixed Forest Province is situated primarily between prominent mountain ranges, varying in elevation from sea level to above 1,500 feet (460 meters). In Washington State, this area has been largely modified by human use and cultivation. At the lowest elevations with native forest cover, however, dense conifers include western red cedar, western hemlock, and Douglas-fir.

In the Puget Sound region and interior valleys, coniferous tree species are less abundant than in coastal areas. In these habitats, deciduous trees, such as bigleaf maple (*Acer macrophyllum*), Oregon ash (*Fraxinus latifolia*), and black cottonwood (*Populus trichocarpa*), become more common. Some remaining prairies have oaks, but also include groves of Douglas-fir. Oregon white oak (*Quercus garryana*) and Pacific madrone (*Arbutus menziesii*) also occur as do wetlands with swamp or bog plant communities (WWF, 2001).

Scotch broom (*Cytisus scoparius*) poses a serious threat to oak forests. An invasive shrub, scotch broom currently grows on more than 700,000 acres in the northwest coastal regions of the western coastal states. It displaces native plants, creating a serious dilemma for reforestation. Native to Europe and North Africa, this plant is a competitive species with the capacity to dominate a forest-shrub community and form dense monotypic stands.

**Scotch broom**

(University of California, Berkeley)

Examples of invasive species that have already caused or are expected to cause problems in this province include: wild chervil (*Anthriscus sylvestris)*, absinth wormwood (*Artemisia absinthium)*, kochia (*Kochia scoparia)*, plumeless thistle (*Carduus acanthoides)*, nodding thistle (also known as musk thistle, *C. nutans)*, slenderflower thistle (*C. pycnocephalus)*, and longspine sandbur (*Cenchrus longispinus)*, Russian knapweed (*Acroptilon repens*), and common bugloss (*Anchusa arvensis***)** (USDA, 2010). Non-native invasive plant species can negatively affect natural areas, agriculture, and horticulture (Simberloff, 1996).

### 1.2.6 WETLANDS AND WATERWAYS

Wetlands within the Pacific Lowland Mixed Forest are abundant and include approximately 1,831,340 acres of marine and estuarine deepwater (namely, the Puget Sound); 78,035 acres of marine and estuarine wetlands; 109,290 acres of forested or scrub-shrub wetland; 83,120 acres of freshwater emergent wetlands; 11,820 acres of ponds; 90,000 acres of lakes; and 88,770 acres of riverine habitats (USDOI, 2010b).

Puget Sound and its associated habitats represent an important marine resource in the project area and form the focus of multi-agency, multi-disciplinary, conservation efforts (Puget Sound Partnership, 2009).

The Skagit River is a designated Wild and Scenic River. Lakes and reservoirs protected under the Washington Shoreline Management Act within this province include Mud Mountain Reservoir, Chester Morse Lake Reservoir, along with Washington, Sammamish, Alder, American, Tapps, Shannon, and Whatcom lakes.

### 1.2.7 AQUATIC RESOURCES

The marine and coastal portion of Washington forms a complex marine border with the Canadian Province of British Columbia. The 100-mile area south of the Canadian border within the Pacific Lowland Mixed Forest Province includes (from west to east): the Strait of Juan de Fuca between the Olympic Peninsula and Victoria Island; Haro Strait between the San Juan Islands and Victoria Island; Boundary Pass between the San Juan Islands and Salt Spring Islands: the Strait of Georgia between the Washington coast near Bellingham and Blaine: and the Salt Spring

Islands of Canada. The U.S.-Canada border is the halfway point of these bodies of water. In general, the 12-nautical-mile zone off the coast makes up the territorial waters of the United States; however, since the marine waters between Washington and British Columbia never reach 24 nautical miles wide, the border is the middle of the water body (i.e., less than 12 nautical miles from the shore).

Also included within 100 miles of the Canadian border are many parts of Puget Sound and contiguous water bodies, such as Hood Canal. The area from the outer Pacific Coast to the Strait of Georgia (also called Georgia Basin) is a rich, productive, cold-water environment for many marine and coastal organisms. Much of it is also an area of considerable human use with extensive shipping channels, commercial and sport fisheries, and ferryboats.

Large estuaries, including Puget Sound, Nisqually Delta, and Grays Harbor, are located in this ecoregion province. Estuaries feature a mixture of salt and fresh water; they are biologically productive and important to marine life. Included in the estuaries of Washington State are deltas, mudflats, and salt marshes. Many estuaries have abundant eelgrass communities, which are also highly productive for marine life and many birds. The Pacific harbor seal largely relies on estuaries and frequently hauls out in these areas.

The fast-flowing major rivers of the Pacific Lowland Mixed Forest Province constitute important habitat for various salmon and trout species. Chum (*Oncorhynchus keta)*, coho (*O. kisutch)*, pink (*O. gorbuscha)*, sockeye (*O. nerka)*, and Chinook salmon species, along with steelhead, are among the Pacific Northwest's most sought-after fish. Rivers, such as the Skagit and Skykomish, are of great economic importance to the region's population and are also important for native salmon and steelhead. The Skagit, for example, is the only large river system in Washington that hosts all of the native salmon species and two trout species. Portions of the Skagit River in the project area are designated as a National Wild and Scenic River, in part because of abundant bald eagles (*Haliaeetus leucocephalus)* and an excellent fishery.

**Sockeye salmon**

(National Geographic)

Aquatic invasive species are a concern in estuaries, wetlands, and rivers with many species introduced from ballast water. Aquatic invasive plants of concern include caulerpa seaweed

(*Caulerpa taxifolia*), Eurasian watermilfoil (*Myriophyllum spicatum*), hydrilla (*Hydrilla verticillata*), parrotfeather (*M. aquaticum*), and common reed (*Phragmites australis*). Aquatic invasive animals include Atlantic salmon (*Salmo salar*), bullfrog (*Rana catesbeiana*), green crab (*Carcinus maenas*), mitten crab (*Eriocheir sinensis*), nutria (*Myocastor coypus*), rusty crayfish (*Orconectes rusticus*), zebra mussel (*Dreissena polymorpha*), and quagga mussel (*D.rostriformis bugensis*). VHS is a deadly fish virus of great concern in this region.

## 1.3 INTERMOUNTAIN SEMI-DESERT PROVINCE (342)

The Intermountain Semi-Desert Province sits in the northwestern United States and includes a narrow portion of Washington State within the 100-mile project area (Figure L-2).

**Intermountain semi-desert**

(USFS)

The Intermountain Semi-Desert Province includes broad plains and plateaus (mesas) of the Columbia/Snake River. These plateaus incorporate most of the northwest expanses of lava fields. Holocene Epochlava flows covered areas adjacent to the plateaus and folded into ridges.

The mean elevation is approximately 3,000 feet (900 meters). Towards the south of this ecoregion, the basins between mountain ranges jointly form a stream-dissected plateau.

Latitude and landscape features differentiate this area from nearby ecoregions with similar plant associations, such as the Great Basin Shrub Steppe (occupying parts of Nevada, Idaho, Utah, and northeastern and eastern California). The Intermountain Semi-Desert Ecoregion sits at a lower elevation. The Snake/Columbia River basin region lacks the plant diversity typical of the Great Basin Ecoregion province (Bailey, 1995).

The ecoregion is situated within the rain shadow of the Cascade Mountains, limiting precipitation. Mean precipitation varies from less than 10 inches (26 centimeters) in the west (within the rain shadow of the Cascade Range) to 20 inches (51 centimeters) in the east.

Precipitation is distributed throughout the seasons, but summer routinely has the lowest amount of rain.

Fire and cattle grazing, along with wide variations in rain, snowfall, and temperature, are sources of ecological disturbances in the ecoregion. Fire may stimulate the growth of grasses and hold back the spread of sagebrush, but the long-term decline of perennial grass species is an ecological problem driving biodiversity decline in this ecoregion (WWF, 2001).

The climate of the ecoregion is semiarid with a mean annual temperature of approximately 50 degrees Fahrenheit (10 degrees Celsius).

### 1.3.1 REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT

No large, regionally significant areas occur in this ecoregion within 100 miles of the northern border.

### 1.3.2 SENSITIVE HABITATS

Several ecological communities include sensitive habitats in this ecoregion. The sensitive habitats described here are home to many of the threatened and endangered species in the next section. For example, sagebrush steppe occurs in many areas in this broad geographic region and is home to rare plant species, such as the Piper's daisy **(***Erigeron piperianus)*, as well as a wide variety of common plant species, such as Indian ricegrass (*Oryzopsis hymenoides*). Some habitat names used below, such as eastside steppe, describe habitats across several regional boundaries and are more general. Others, such as the microphytic crust or cryptogams (a type of microscopic plant community), define much more specific ecological associations.

**Piper's daisy**

(University of Washington Botanic Gardens)

Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and diverse areas. The list of sensitive habitats is based on habitats enumerated and described by the World Wildlife Fund (WWF) (2001), ecological system descriptions within the NatureServe.org database, and each state’s respective natural resources agency.

- Columbia Plateau steppe and grassland–Fires inhibit shrub re-growth and largely determine the vegetative habitat of this system. A microphytic or cryptogam crust (a collection of microscopic plants forming a crust) is a unique feature in this plant community.
- Eastside steppe–Dominated by ground-layer plants (those species which are not grasses are sometimes referred to as forbs), perennial bunchgrasses, or both. Shrubs other than sagebrush (in some sections) are absent or occasionally scattered.
- Juniper savanna–Dominated by Utah juniper (*Juniperus osteosperma*) interspersed with species of perennial bunch grasses and forbs. Species of sagebrush are also common (Washington Natural Heritage Program, 2007; WADFW, 2008).

### 1.3.3 THREATENED AND ENDANGERED SPECIES

Appendix F3 itemizes Federal and state threatened and endangered species. The pygmy rabbit (*Brachylagus idahoensis*) and showy stickseed (*Hackelia venusta*) are federally listed endangered species in this ecoregion. Other important species include the northern spotted owl (*Strix occidentalis caurina*) and grizzly bear (*Ursus arctos horribilis*), which are federally listed threatened species and are also state-listed endangered species in this ecoregion. The upland sandpiper (*Bartramia longicauda*), and ferruginous hawk (*Buteo regalis*) are state-listed species; the populations of these species are in decline and have become increasingly rare. In the dominant sagebrush and grassland habitats within the ecoregion, the golden eagle (*Aquila chrysaetos*) and burrowing owl (*Athene cunicularia*) are state candidate species for threatened status listing. Both are considered sensitive species in this area.

### 1.3.4 WILDLIFE

Wildlife species in the Intermountain Semi-desert Ecoregion are similar to those in the Great Basin to the east. The sagebrush steppe, subalpine forests, and high-elevation grasslands in this ecoregion province are home to several wildlife species, which include game (legally hunted) and non-game (legally protected, but not endangered or threatened) species. Many bird species migrate into or out of this province in spring and fall each year. Several mammals and some permanent resident bird species remain in the region throughout the year. Common species are the white-tailed jackrabbit (*Lepus townsendii*), black-tailed prairie dog (*Cynomys ludovicianus*), and Brewer's sparrow (*Spizella breweri*), all of which are widespread throughout sagebrush habitat. Among reptiles, the western or prairie rattlesnake (*Crotalus viridis*) is fairly common and the bullsnake (*Pituophis catenifer sayi*) is more common.

**Black-tailed prairie dog**

(National Geographic)

### 1.3.5 VEGETATIVE HABITAT

The vegetation of this ecoregion, sometimes called sagebrush steppe, is largely sagebrush, the majority of which is big sagebrush (*Artemisia tridentata*) and shadscale (*Atriplex confertifolia)*, with some short grasses. In many areas, ground-layer vegetation makes up less than 25 percent of the total cover so shrubs constitute the dominant vegetation. Greasewood (*Sarcobatus vermiculatus*) often grows in wetter alkaline areas. Adjacent to streams near the mountains, willows (*Salix* spp*.)* and sedges line the valleys; greasewood and other alkaline-tolerant plants may replace them farther away from the mountains (McNab and Avers, 1994).

Various bunchgrass species vegetate areas in the Columbia River Basin that receive more than 10 inches (26 centimeters) of rainfall per year. In cultivated areas, these landscapes have been used successfully for growing wheat.

Bluebunch wheatgrass (*Pseudoroegneria spicata*) is especially common, as is Idaho fescue (*Festuca idahoensis*). Rough fescue (*F. campestris)* and Sandberg bluegrass (*Poa secunda)* are also important grassland components.

Forests of Douglas-fir (*Pseudotsuga menziesii*), subalpine fir (*Abies lasiocarpa*), and aspen (*Populus* spp.) cover the wetter parts of the mountain ranges. Cottonwoods (*P. deltoids* and other cottonwood species) and willows (*Salix* spp.) often border the riparian zones.
Invasive plants can harm native vegetation, wildlife, and entire ecosystems along the northern border, as elsewhere in the United States. These invasive species often displace native plants, degrade habitat for wildlife and livestock, and diminish opportunities for outdoor recreation. They can affect soils and increase the frequency of fire. Invasive plants threaten the existence of endangered plants and negatively modify biodiversity. One estimate suggests that invasive plant species have affected 420,000 acres of national forests and grasslands in the Pacific Northwest (Pacific Northwest Invasive Plant Council, 2010). Examples of invasive species in this ecoregion include: yellow starthistle (*Centaurea solstitialis*), velvetleaf (*Abutilon theophrasti)*, Russian knapweed (*Acroptilon repens*), jointed goatgrass (*Aegilops cylindrica)*, camelthorn (*Alhagi maurorum)*, garlic mustard (*Alliaria petiolata*), blackgrass (*Alopecurus myosuroides)*, and indigo bush (*Amorpha fruticosa)*.

**Velvetleaf**

(University of Wisconsin, Stevens Point)

### 1.3.6 WETLANDS AND WATERWAYS

Wetlands within the Intermountain Semi-desert Province portion of the project area include approximately: 840 acres of forested/scrub-shrub wetland; 11,655 acres of emergent wetlands; 1,810 acres of ponds; 93,590 acres of lakes; and only 430 acres of riverine habitat. The small acreages are due to the smaller amount of this ecoregion within the study area, but also the arid climate.

Washington State identifies some 300+ rivers, creeks, and other waterways as protected under the Shoreline Management Act. The Washington Administrative Code, Chapter 173-18, defines specific protected reaches of these waterways.

Lakes and reservoirs protected under the Washington Shoreline Management Act in this province include the Wanapum Dam Reservoir, Sprague Lake, and Stevens Lake. These lakes are protected under the State of Washington's Shoreline Management Act.

### 1.3.7 AQUATIC RESOURCES

Due to the arid nature of this ecoregion, surfacewater is of critical importance to fish and aquatic wildlife. Alpine lakes and streams, along with lakes and rivers of the Intermountain Semi-desert Province, are susceptible to disturbance from construction, which can affect water quality as well as fish and other aquatic organism populations. These activities can negatively influence streambed sedimentation, water quality, and invertebrates.

Stream, river, and lake fishing for trout, salmon, walleye, and other freshwater fish remain important in southeastern Washington. During 2003 to 2004, Washington residents purchased 318,079 freshwater fishing licenses. Between April 1, 2003 and March 31, 2004, a total of 342,884 salmon were caught in the state's fresh waters (State of Washington, 2003). State anglers also caught large numbers of several trout species, walleye, and bass.

## 1.4 NORTHERN ROCKY MOUNTAINS STEPPE–CONIFEROUS FOREST–ALPINE MEADOW PROVINCE (M333)

The Northern Rocky Mountain Steppe–Coniferous Forest–Alpine Meadow Ecoregion is largely composed of mountainous terrain with elevations up to 9,000 feet (2,700 meters) (Figure L-2**)**. Most of the region has prominent glacial features. The Rocky Mountain trenches have broad, flat-bottomed valleys, some of which are several miles in width (Bailey, 1995).

This ecoregion occupies sections of the northwestern states, including parts of Montana, Idaho, and Washington.

Severe winters are typical of this ecoregion. The average temperature of the coldest winter month is below 32 degrees Fahrenheit (0 degrees Celsius); the average temperature of the warmest summer month is below 72 degrees Fahrenheit (22 degrees Celsius). Summer days are very warm. Precipitation of annual rain and snow averages between 20 to 40 inches (51 to 102 centimeters), falling primarily in fall, winter, and spring. Summers are usually much drier. These factors result in a climate gradient from north to south and from east to west. Snowfall during winter is typically heavy, especially at higher elevations.

Natural areas in this ecoregion include intermountain valley systems, large rivers and their tributaries, riparian areas and associated wetlands, and alpine habitats. Denning habitat exists for bears (*Ursus* spp.*)*, wolverines (*Gulo gulo),* and other carnivores; the lower-elevation valleys provide winter range for ungulates. A variety of mixed-forest habitats offer shelter, forage, migration routes, breeding habitat, and cover for diverse sensitive species. Many of these natural areas have enhanced wildlife value due to their remote locations and rugged topography, with little or no human disturbance.

### 1.4.1 REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT

The blocks of regionally significant habitat listed below are relatively undeveloped and intact habitat protected as wilderness, state parks, and state and national forests. “Intact habitat” or regionally significant habitat refers to areas of largely unfragmented habitat with few alterations or disturbances, such as roads or other development. Most areas listed are protected by law (wilderness areas, national parks) and often cross state and country boundaries, while others may occupy large expanses of private lands.

Selected regionally significant blocks that represent this region include:

- Bob Marshall Wilderness–Montana;
- Part of Glacier National Park–Northern Montana;
- Selway-Bitterroot Wilderness–Northeastern Idaho; and,
- Cabinet Mountains Wilderness–Northwestern Montana.

**Glacier National Park**

(NPS)

### 1.4.2 SENSITIVE HABITATS

Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities that represent sensitive habitats. The sensitive habitats described here also exist in many of the larger intact habitat areas in the prior section, and are home to many of the threatened and endangered species in the next section. For example, these sensitive habitats house rare or protected species such as the lyre-leaf rockcress (*Arabidopsis lyrata*), as well as a wide variety of common plant species such as the shooting star (*Dodecatheon* spp.). Some habitat names used below, such as alpine meadows, describe habitats across several regional boundaries and are more general in meaning. Others, such as subalpine forest (a type of plant community), define much more specific ecological associations.

- Alpine meadows – Open meadows at and above the timberline;
- Great Plains ponderosa pine woodland and savanna – Ponderosa pine woodlands surrounded by grasslands;
- Rocky Mountain riparian woodland and shrubland – Within the flood zone of rivers, on islands, bars, and adjacent streambanks;
- Northern Rocky Mountain montane Douglas-fir forest and woodland – Mixed deciduous/coniferous montane forest;
- Rocky Mountain subalpine-montane fen – Mountain wetland fed by mineral-rich surface water or groundwater; below alpine areas in elevation;
- Subalpine forest – Northern Rocky Mountain subalpine dry parkland, Rocky Mountain lodgepole pine forest, Rocky Mountain subalpine dry-mesic spruce-fir forest and woodland;
- Rocky Mountain subalpine mesic spruce-fir forest and woodland – Forest of spruce and fir with a moderate moisture regime, just below timberline;
- Rocky Mountain wooded vernal pool – Temporary pools, usually devoid of fish, that allow development of natal amphibian and insect species;

- Alpine dwarf-shrubland – Dwarf shrubs or dwarf willows that form a heath-type ground cover;
- Spring Creek Canyon Natural Area Preserve (Washington) – Douglas-fir and ponderosa pine forest, as well as shrub-grassland ecosystems;
- Barker Mountain Natural Area Preserve (Washington) – Shrub-grassland ecosystems (“shrub-steppe”), including antelope bitterbrush/Idaho fescue habitat;
- Dry conifer forest – Northern Rocky Mountain western larch woodland; found in mountainous regions at 2,000 to 9,800 feet elevation;
- Northern mesic conifer forest – Northern Rocky Mountain hemlock-western red cedar forest
- Palouse prairie – Columbia Basin, western portion of north-central Idaho, on gentle, rolling terrain at elevations of 2000 to 3000 feet; and,
- Riparian woodland – Columbia Basin foothill riparian woodland and shrubland.

In Montana, Glacier National Park and the Bob Marshall Wilderness Area provide thousands of acres of habitat for a vast array of wildlife species, including endangered species such as the grizzly bear (*Ursus arctos horribilis*).

Approximately half of the land along the border in Idaho is federally owned; most of that is national forest. B LM has one wilderness study area (WSA): the Selkirk Crest WSA encompasses 720 acres about 18 miles northwest of Bonners Ferry.

The Selkirk Mountain area along the northern Idaho border has great value for wildlife. Adjacent to the Salmo-Priest Wilderness Area in Washington, it also extends into British Columbia. This area provides habitat for several federally listed threatened or endangered species, including bull trout (*Salvelinus confluentus)*, grizzly bear (*Ursus arctos horribilis*), gray wolf (*Canis lupus*), and mountain caribou (*Rangifer tarandus caribou).*

**Grizzly bear**

(National Geographic)

Only one USFWS National Wildlife Refuge exists in the 100-mile buffer zone within Idaho: the Kootenai National Wildlife Refuge.

Wildlife Management Areas (WMAs) are established in the project area of this ecoregion. These areas are managed for the protection of wildlife and recreation. In Idaho, the WMAs include Boundary Creek, McArthur Lake, Pend Oreille, Farragut, Coeur d'Alene River, St. Maries, and Snow Peak. In Montana, the WMAs include Kootenai Falls and Bull River. In Washington, the WMAs include Sherman and LeClerc creeks.

### 1.4.3 THREATENED AND ENDANGERED SPECIES

Appendix F3 lists threatened and endangered species in this ecoregion. Montana lists some species as "Species of Concern." The status represents a separate category, described as, "Potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas" (MTFWP, 2010).

Idaho does not list species as state endangered or threatened, but defers to Federal listings. The Idaho equivalent state ranking for species of concern is S2; an Idaho state rank of S1 denotes "Critically imperiled: at high risk because of extreme rarity."

Prime examples of endangered wildlife in this ecoregion are the grizzly bear (*Ursus arctos horribilis*) and the Selkirk Mountains population of the woodland caribou (*Rangifer tarandus caribou*). The grizzly bear population in the Selkirk recovery zone is estimated at 40 to 50 individuals (USDOI, 2010a). Woodland caribou in the Selkirks are at risk because their numbers are very low and they have a slow reproductive rate (Zager et al., 1995).

**Woodland caribou**

(Canadian Parks and Wilderness Society)

Although some species are listed as endangered or threatened at either the Federal or state level, others are categorized differently as species of "conservation concern" or "special concern" by both state and Federal agencies.

### 1.4.4 WILDLIFE

Wildlife species in the Northern Rocky Mountains Steppe Ecoregion are similar to those living elsewhere in the Rockies to the north and south. The alpine meadows, subalpine forests, and high-elevation grasslands are home to many wildlife species, including game and non-game species. Many songbird species migrate into or out of this province in spring and fall each year.

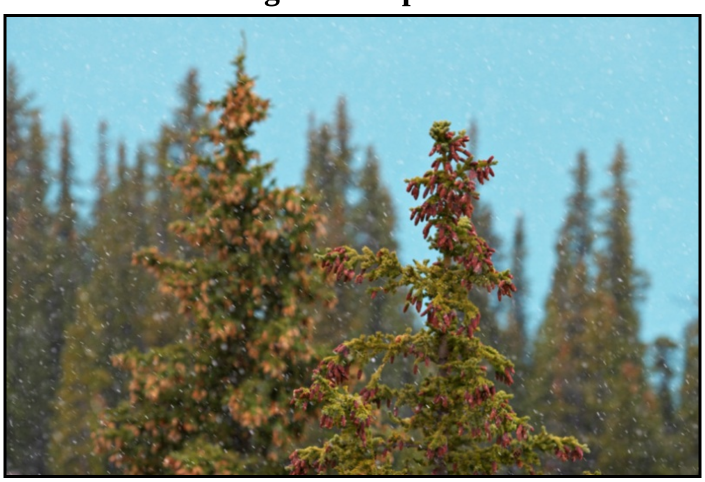
A wide variety of mammals and some permanent resident bird species remain in the province throughout the year. Common mammals in this ecoregion include mule deer (*Odocoileus hemionus*), yellow-bellied marmot (*Marmota flaviventris*), and pika (*Ochotona princeps*).

In forested habitats within the province, common birds include Steller's jay (*Cyanocitta stelleri*), black-headed grosbeak (*Pheucticus melanocephalus*), and broad-tailed hummingbird (*Selasphorus platycercus*). The northern goshawk (*Accipiter gentilis*), flammulated owl (*Otus flammeolus)*, and black-backed woodpecker (*Picoides arcticus*) are several of the more uncommon or sensitive species in this ecoregion. Mammals include mule deer (*Odocoileus hemionus*) and elk (*Cervus candensis*). Common reptiles and fish include the common garter snake (*Thamnophis sirtalis*), spiny softshell turtle (*Apalone spinifera*), bull trout (*Salvelinus confluentus*), and chum salmon (*Oncorhynchus keta*).

### 1.4.5 VEGETATIVE HABITAT

Mixed evergreen-deciduous forest is dominant in this ecoregion. The forests are primarily composed of fir (*Abies* spp.), cedar (*Thuja* spp.), and hemlock (*Tsuga* spp.). Well-marked altitudinal zones create a prominent feature of this ecoregion. No trees grow in the alpine zone. Engelmann spruce (*Picea engelmannii)* and subalpine fir (*Abies lasiocarpa)* dominate the subalpine zone, just below the alpine zone.

**Englemann spruce**



(University of British Columbia Botanical Garden)

In some sections of this ecoregion, mountain hemlock (*Tsuga mertensiana)* is the climax tree of the subalpine zone. Lodgepole pines grow primarily in the eastern part of the region. On the west side of the continental divide and below the zone of Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*) becomes dominant, making up a relatively drier forest. Grand fir (*Abies grandis*), western hemlock (*T. heterophylla*), western red cedar (*Thuja plicata),* mountain hemlock, and western white pine (*P. monticola)* also grow in the forested areas of this ecoregion. Larch (*Larix* spp.) invades areas that have experienced fire or been logged. White pine may eventually outcompete larch, which is then replaced by hemlock, red cedar, and lowland white fir (*A. concolor)*. Depending on latitude, lower slopes and valleys of the montane belt may be covered with grasses and sagebrush; these often constitute a "semi-desert" vegetation of sagebrush or grass-covered steppe (Bailey, 1995).

Conditions to the east of the Bitterroot Mountains are more arid; as a result, forests grow mostly on the northern and eastern slopes. Although the south and west-facing slopes receive similar amounts of rain or snowfall, temperatures are warmer. Fewer forests grow there due to the drier conditions, so shrubs and grasses dominate.

In addition to the extensive conifer forests, this ecoregion contains several other vegetation community types: alpine meadows, grasslands, wooded riparian stands, and higher-elevation tree-line and alpine communities. The consequences of the dramatic elevation changes include rain shadows, effects of prevailing winds, and thermal inversions (Peet, 1988).

Non-native invasive plant species can negatively impact natural areas, agriculture, and horticulture (Simberloff, 1996). Examples of invasive species in this ecoregion include: buffalo burr (*Solanum rostratum)*, common crupina (*Crupina vulgaris)*, eggleaf spurge (*Euphorbia oblongata)*, goat's-rue (*Tephrosia virginiana)*, Johnson grass (*Sorghum halepense)*, and Vochin knapweed (*Centaurea nigrescens*) (Idaho Weed Coordinating Committee, 2005; Washington State Noxious Weed Control Board, 2010).

### 1.4.6 WETLANDS AND WATERWAYS

Wetlands within the ecoregion project area include approximately: 72,735 acres of forested/scrub-shrub wetlands; 144,875 acres of emergent wetlands; 13,280 acres of ponds; 470,220 acres of lakes; and 28,110 acres of riverine habitats (USDOI, 2010b).

The Kootenai River is a major river in this province that flows from Canada to Montana, into Idaho, and then back across the Canadian border. Dammed near Libby, Montana, the river forms a large reservoir, Lake Koocanusa, which backs up into Canada.

**Kootenai River**

(Montana Department of Natural Resources and Conservation)

The Flathead Wild and Scenic River designation includes three forks within 100 miles of the northern border. The North Fork Flathead is designated from the Canadian border downstream to its confluence with the Middle Fork; the Middle Fork Flathead is designated from its headwaters to its confluence with the South Fork; and the South Fork Flathead is designated from its origin to the Hungry Horse Reservoir.

Other major rivers in the project area include a portion of the Clarke Fork, the Moyie River (which flows south from Canada), and the Flathead River system, along with the Coeur d'Alene, Pack, and Priest rivers. The Clark Fork River drains into Lake Pend Oreille; the Pend Oreille River drains out of Lake Pend Oreille.

The Similkameen River valley runs north-south across the northern border near the boundary of the Cascade Mixed Forest–Coniferous Forest–Alpine Meadow Province and the Northern Rocky Mountain Forest Steppe–Coniferous Forest–Alpine Meadow Province. One of the most biologically diverse ecosystems in Canada, the Similkameen River valley is also one of Canada's three most endangered natural systems (British Columbia Parks, 2010). The Ministry of Parks in British Columbia is an active participant in the South Okanogan-Similkameen Conservation Program.

Major lakes in the project area within this province include Lake Pend Oreille, along with Rufus Wood, Banks, Long, Palmer, Osoyoos, Callispell, Sullivan, Priest, and Hayden lakes, Boundary Reservoir, a portion of Coeur d'Alene Lake, and Little Bitterroot, Swan, Flathead, Whitefish, and Medicine lakes. Glacier National Park has a series of large lakes including Kintla, Bowman, Logging, McDonald, Sherburne, Mary, and Waterton, which crosses the northern border into Waterton Park in Canada. Within the Blackfeet Reservation (east of Glacier National Park) are Lower Saint Mary and Duck lakes. Major reservoirs include Lake Koocanusa and Hungry Horse Reservoir. Lakes in the State of Washington are protected under the state's Shoreline Management Act.

### 1.4.7 AQUATIC RESOURCES

Fisheries and aquatic resources are of great importance in this province. Idaho, Washington, and Montana are famous for their high-quality fishing. Anglers in the Rocky Mountain region increased 8.3 percent between 1991 and 1996, with 3,303,000 persons holding licenses in 1996 (USDOI, 2004). Numerous large natural lakes and reservoirs in these three states offer a variety of fishing opportunities for warm and cold-water species, including salmon and steelhead trout. Idaho's mountains contain more than 1,500 alpine lakes (IDFG, 2010).

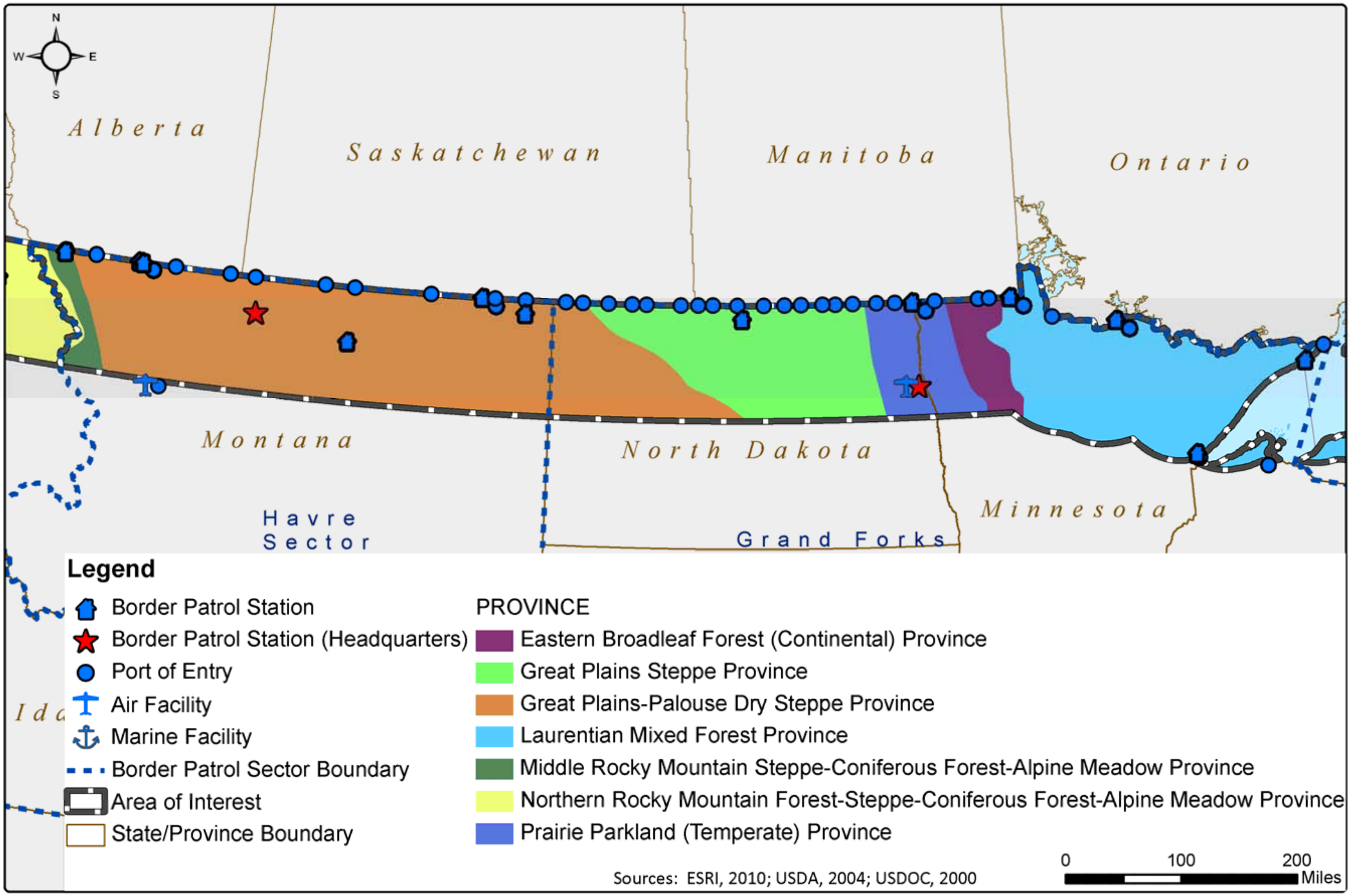
Two river systems within the project area are designated as National Wild and Scenic Rivers: the Flathead and Missouri rivers (see Wetlands and Waterways, above). The BLM's Lewistown Field Office manages these segments of the Missouri River in Montana.

## 1.5 MIDDLE ROCKY MOUNTAIN STEPPE–CONIFEROUS FOREST–ALPINE MEADOW ECOREGION (M332)

The mountainous region of the Middle Rocky Mountain Steppe–Coniferous Forest–Alpine Meadow Ecoregion has a great deal of landscape diversity (Figure L-3). A small portion of this ecoregion lies within 100 miles of the U.S-Canada border in Montana. The landscape is characterized by block fault mountain ranges and further shaped by glaciers. The ecoregion includes the eastern edge of Glacier National Park, part of the Lewis and Clark National Forest, and portions of the Blackfeet Indian Reservation.

The study area in this ecoregion includes parts of Montana.

**Figure L-3. Ecoregions in the East of the Rockies Region**



The Rocky Mountain front is mountainous with limestone ridges and many glacial features. Elevations vary from 5,500 to 8,500 feet (1,678 to 2,593 meters).

Despite the northern latitudes and high altitudes of this region, its climate is relatively mild due to the Pacific Ocean's proximity, with average annual temperatures of about 36 to 45 degrees Fahrenheit (2 to 7 degrees Celsius) and intense fluctuations of winter temperatures. The length of the growing season averages 120 days—about the same as a similar latitude on the Great Plains. Temperature and snowfall vary dramatically with change in altitude. Winds are predominately westerly, with much of their moisture precipitating on the eastern side of the ranges. As a result, much of this portion of the Rocky Mountains is characterized by semiarid climatic conditions. Valleys receive less than 20 inches (51 centimeters) of rain and snow each year, while up to 30 inches (77 centimeters) is typical in the mountains, mostly as snow. The climatic effects of topographic relief (for example, rain-shadow effects, effects of prevailing winds, and other climatic influences) similarly bear on altitudinal zonation (Peet, 1988; Bailey, 1995).

### 1.5.1 REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT

The blocks of regionally significant habitat below are relatively undeveloped and intact habitat protected as wilderness, state parks, and state and national forests. Regionally significant or intact habitat refers to areas of largely unfragmented habitat with few alterations or disturbances, such as roads or other development. Most areas listed are protected by law (wilderness areas, national parks), often crossing state and country boundaries, while others may occupy large expanses of private lands.

Selected regionally significant blocks that represent this region include:

- Part of Glacier National Park–Montana;
- Parts of Lewis and Clark National Forest–Montana; and,
- Wetland areas on the Blackfeet Indian Homeland/Reservation–Montana.

### 1.5.2 SENSITIVE HABITATS

Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities that represent sensitive habitats. The sensitive habitats described here occur in many of the larger intact habitat areas in the prior section, and are home to many of the threatened and endangered species in the next section. For example, alpine meadows grow in many open areas above the timberline in this geographic region and house protected species, such as the three-flowered rush (*Juncus triglumis*), as well as a wide variety of other species, such as the Iceland lichen. Some habitat names used below, such as alpine meadows, describe habitats that occur across several regional boundaries and are more general in meaning. Others, such as Rocky Mountain subalpine-montane fen (a type of wetland community), define much more specific ecological associations.

Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and diverse areas. The list of sensitive habitats is based on those enumerated and described by the World Wildlife Fund (WWF) (2001), ecological system descriptions within the NatureServe.org database, and each state's respective natural resources agency.

- Alpine meadows–Open meadows at and above timberline;
- Great Plains ponderosa pine woodland and savanna–Ponderosa pine woodlands surrounded by grasslands;
- Rocky Mountain riparian woodland and shrubland–Within the flood zone of rivers, on islands, bars, and adjacent streambanks;
- Middle Rocky Mountain montane Douglas-fir forest and woodland–Mixed deciduous/coniferous montane forest;
- Rocky Mountain subalpine-montane fen–Mountain wetland fed by mineral-rich surface water or groundwater, below alpine areas in elevation;
- Rocky Mountain wooded vernal pool–Temporary pools, usually devoid of fish, that allow natal amphibians and insects to develop; and,
- Alpine dwarf-shrubland–Dwarf-shrubs or dwarf willows which form a heath-type ground cover.

**Ponderosa pine woodland**

(U.S. Forest Service)

Portions of several preservation areas of national and regional importance lie within this ecoregion, including Glacier National Park. Disturbance of grasslands, savannas, and shrub-dominated landscapes has altered the species composition of formerly intact natural communities. Aggressive burning and fire suppression can also dramatically affect ecological community structure and species composition.

Loss or deterioration of riparian forest habitats and associated water sources deleteriously affects wildlife. Permanent loss of keystone species, such as black-tailed prairie dogs (*Cynomys ludovicianus*), can cause major impacts on natural communities, of both animals and plants (Olson et al., 2000). These characteristics suggest that the sensitive ecological communities require additional safeguards when considering human activities that could disturb the habitat since disturbance regimes are catalysts of rapid ecological change (Turner, 2010).

The major ecological threats to this area include reduced connectivity among habitat blocks and additional human recreational activity due to increasing commercial development, mining, and energy resource use.

### 1.5.3 THREATENED AND ENDANGERED SPECIES

Appendix F3 lists the threatened and endangered species in this ecoregion. In forested habitats within the Middle Rocky Mountain Steppe–Coniferous Forest–Alpine Meadow Ecoregion, the northern goshawk (*Accipiter gentilis*), great gray owl (*Strix nebulosa*), and black-backed woodpecker (*Picoides arcticus*) are some of the area's sensitive species. Examples of other rare species in Montana include the flammulated owl (*Otus flammeolus*), red-headed woodpecker (*Melanerpes erythrocephalus*), and yellow-billed cuckoo (*Coccyzus americanus*).

**Great gray owl**

(Idaho Fish & Game)

Although some species are listed as endangered or threatened at either the Federal or state level, others are categorized differently as species of "conservation concern" or "special concern."

### 1.5.4 WILDLIFE

Wildlife species in the Middle Rocky Mountains Steppe Ecoregion are similar to those inhabiting the Rockies to the north and south; however, parts of this inter-mountain ecoregion have mountain ranges isolated by stretches of arid territory. A unique array of species often populate each set of mountain ranges; some of these species may be found only on a single range.

The alpine meadows, subalpine forests, and high-elevation grasslands in this ecoregion are home to several wildlife species, which include game (legally hunted) and non-game (legally protected, but not endangered or threatened) species. Many birds, such as the northern saw-whet owl (*Aegolius acadicus*), belted kingfisher (*Ceryle alcyon*), cliff swallow (*Petrochelidon pyrrhonota*), Cooper's hawk (*Accipiter cooperi*), Swainson's hawk (*Buteo swainsoni*) migrate into or out of this ecoregion in spring and fall each year or are permanent residents, although the avian migration is not as temporally concentrated as in many areas of the eastern United States.

A wide variety of mammals and some permanent-resident bird species remain in the province throughout the year, such as the coyote (*Canis latrans*), red fox (*Vulpes vulpes*), and bobcat (*Lynx rufus*).

### 1.5.5 VEGETATIVE HABITAT

Altitudinal zones are prominent in this ecoregion. Below the subalpine zone, Douglas-fir (*Pseudotsuga menziesii)* is the dominant coniferous tree species. Grand fir (*Abies grandis)* is an important component on the west side of the continental divide and western red cedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla)* are the most typical species of the montane zone or belt. Lodgepole pines (*Pinus contorta)* grow primarily in the eastern area. On the west side of the continental divide and below the zone of Douglas-firs, ponderosa pine (*P. ponderosa*) becomes the dominant tree, making up a dry-forest type. Semi-desert vegetation of sagebrush or grass-covered steppe covers the lower-elevation slopes of the mountains and plains (Bailey, 1995).

**Sagebrush steppe**

(Montana Department of Natural Resource and Conservation)

Forests inhabit mostly northern and eastern slopes. Although the south- and west-facing slopes receive similar amounts of rain or snowfall, their temperatures are much warmer. They support few trees due to the drier conditions; instead, shrubs or grasses vegetate these slopes.

In addition to the extensive conifer forests, the ecoregion contains several other plant communities: alpine meadows, grasslands, wooded riparian stands, and higher-elevation tree-line and alpine communities. Vertical zonation of vegetation is typical and strongly evident. Secondary climatic effects of elevation change due to rain shadows, prevailing winds, and thermal inversions are also evident (Peet, 1988).

Examples of invasive species in this region include: spotted knapweed (*Centaurea maculosa*), leafy spurge (*Euphorbia esula*), Dalmatian toadflax (*Linaria dalmatica*), orange hawkweed (*Pilosella aurantiaca*), meadow hawkweed (*Hieracium caespitosum*), Canada thistle (*H. caespitosum*), yellow toadflax (*L. vulgaris)*, Russian knapweed (*Acroptilon repens*), houndstongue (*Cynoglossum officinale)*, field bindweed (*Convolvulus arvensis)*, dyer's woad

(*Isatis tinctoria*), and perennial pepperweed (*Lepidium* spp.) (Center for Invasive Plant Management, 2010).

### 1.5.6 WETLANDS AND WATERWAYS

Wetlands within the Middle Rocky Mountain Steppe Province portion of the project area include approximately: 13,515 acres of forested/scrub-shrub wetlands; 16,375 acres of emergent wetlands; 4,205 acres of ponds; 8,730 acres of lakes; and 2,210 acres of riverine habitats (USDOI, 2010b).

These acreages appear much lower than other ecoregions, but this is partially due to only a small portion of the province lying within the proposed project area. It is also partially due to the rugged topography.

Coeur d'Alene Lake is a large natural lake, which was enlarged in the early 20$^{th}$ century by a relatively small dam at the outlet (Post Falls Dam) that raised the water level about 8 feet and inundated a large area in the panhandle of Idaho. The lake extends between the boundary of this ecoregion and the Northern Rocky Mountain Forest Steppe–Coniferous Forest–Alpine Meadow Ecoregion.

### 1.5.7 AQUATIC RESOURCES

Fisheries and aquatic resources are of great importance in this ecoregion. Montana is famous for fishing. Rocky Mountain anglers increased 8.3 percent between 1991 and 1996, with 3,303,000 persons holding licenses in the region in 1996 (USFWS, 2004). Mountains in this ecoregion contain alpine lakes with good fishing. Numerous large natural lakes and reservoirs in both states offer fishing for warm and cold-water species, including the northern pike (*Esox lucius*), goldeye (*Hiodon alosoides*), mountain whitefish (*Prosopium williamsoni*), and steelhead trout (also known as rainbow trout, *Oncorhynchus mykiss)*.

## 1.6 GREAT PLAINS–PALOUSE DRY STEPPE ECOREGION (331)

This region has rolling plains and tablelands in a broad swath that slopes gradually eastward from an altitude of 5,500 feet (1,520 meters) near the foot of the Rocky Mountains to 2,500 feet (760 meters) in the western Great Plains (Figure L-3). The plains are flat, but occasional valleys punctuate the plains with their associated canyons and buttes. In North Dakota and Montana, badlands and isolated mountains provide topographic relief (Bailey, 1995).

The states in this ecoregion are North Dakota, Montana, and Washington.

This region contains three distinct areas in North Dakota and Montana: the northern glaciated plains (to the northeast and east of the northwestern glaciated plains in North Dakota); the northwestern glaciated plains (the northern parts of Montana and North Dakota and extending east from the Missouri River); and the northwestern Great Plains (south of the northwestern glaciated plains and extending to the Missouri River in North Dakota). They are characterized by rolling, glacial-till plains shifting to gently sloping, rolling hills and dissected shale plains. The northern glaciated plains in eastern to central North Dakota have steep slopes adjacent to major stream valleys with elevations of 2,000 to 6,000 feet (610 to 1,830 meters). The northwestern glaciated plains include northwestern North Dakota and most of the northern border of Montana; they have steep slopes bordering some of the large rivers, and elevations of

2,500 to 5,000 feet (763 to 1,525 meters). The northwestern Great Plains, in southwest North Dakota east of the Missouri River and the east and central portions of Montana, contain gently sloping dissected shale plains with elevations from 1,500 to 3,900 feet (458 to 1,200 meters) (Bailey, 1995).

The Palouse Prairie portion of this ecoregion lies in western Washington at the southern end of the 100-mile zone of the northern border. This area consists of large, isolated hills and low mountains surrounded by igneous rocks, dissected loess-covered basalt basins, undulating plateaus, and river breaklands— areas of steep rocky slopes and strongly dissected topography. Elevations range from 1,200 to 6,000 feet (366 to 1,830 meters), with increasing elevation approaching the mountains.

**North Dakota badlands**

(NPS)

Most of this ecoregion lies in the rain shadow east of the Cascade Range and the Rocky Mountains. The climate is cold continental with warm, dry summers. The winters are extremely frigid and have desiccating winds and snow. A minimum of 10 inches (25 centimeters) falls during the year with an average maximum of 20 inches (51 centimeters) in both the northern and northwestern glaciated plains; in the northwestern Great Plains, precipitation drops to 15 inches (38 centimeters). Average temperatures in these areas range from 37 to 48 degrees Fahrenheit (3 to 7 degrees Celsius). The growing seasons vary in each area. The northern glaciated plains have a growing season of 110 to 135 days; the northwestern glaciated plains run 100 to 130 days; and the season for the northwestern Great Plains lasts 110 to 160 days.

The climate of the Palouse Prairie is temperate-warm with a maritime influence. Summers in this area are relatively dry; however, approximately 10 to 30 inches (25 to 76 centimeters) of precipitation is evenly distributed through the fall, winter, and spring. Precipitation during the winter usually falls as snow. The growing season in this area lasts about 100 to 170 days (Bailey, 1995).

Dry-land farming and raising livestock are the ecoregion's primary economic activities. At least 85 percent of the northwestern Great Plains and about 90 percent of the Palouse Prairie are used for farming and grazing of livestock (McNab and Avers, 1994). Much of the natural vegetation of the northern Great Plains has been altered for crop production and rangeland (Donofrio and Ojima, 1997).

### 1.6.1 REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT

The blocks of regionally significant habitat below are relatively undeveloped and intact habitat protected as wilderness, state parks, and state and national forests. "Intact habitat" or regionally significant habitat refers to areas of largely unfragmented habitat with few alterations or disturbances, such as roads or other development. Most areas listed are protected by law (wilderness areas, national parks) and often cross state and country boundaries, while others may occupy large expanses of private lands.

Considerable potential exists for habitat recovery of areas with only partially modified grazing lands in this ecoregion. While little to no unaltered habitat remains, the potential for rapid recovery still exists since much of the habitat is degraded rather than converted. A few exotic species have invaded; however, most of the dominant plant species still grow on rangelands. Many of the plant species of this ecoregion have evolved to withstand intense grazing by bison (*Bison bison*). It is not surprising, therefore, that previously dominant plants still persist and are likely to become reestablished with restoration efforts.

Selected regionally significant blocks that represent this region and are somewhat intact include:

- Audubon National Wildlife Refuge–Central North Dakota;
- Bowdoin National Wildlife Refuge–Northern Montana;
- Charles M. Russell National Wildlife Refuge–Northern Montana;
- Comertown Pothole Prairie Preserve–Montana;
- H.R. Morgan State Nature Preserve–North Dakota;
- Little Missouri National Grassland–Western North Dakota;
- Lostwood National Wildlife Refuge–Northwest North Dakota;
- Lower Yellowstone River–Eastern Montana (the largest section of intact Missouri River, undammed, and with a population of endangered paddlefish);
- Medicine Lake National Wildlife Refuge–Northeastern Montana;
- Missouri Coteau–South-central North Dakota;
- Northern Montana Prairies–Montana;
- Pine Butte Swamp Preserve–Montana; and,
- Theodore Roosevelt National Park, within the Little Missouri National Grassland–Western North Dakota.

### 1.6.2 SENSITIVE HABITATS

Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities that represent sensitive habitats. The sensitive habitats described here occur in many of the larger intact or somewhat intact habitat areas in the prior section, and are home to many of the threatened and endangered species in the next section. For example, the H.R. Morgan State Nature Preserve houses protected species such as the lady-fern (*Athyrium filix-femina*), as well as a wide variety of common plant species, such as big bluestem (*Andropogon gerardii*). Some site names, such as the steppe, include a range of habitats found across a large area and are more general.

Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and diverse areas. The list of sensitive habitats is based on those enumerated and described by the WWF (2001), ecological system descriptions within the NatureServe.org database, and each state's respective natural resources agency.

- Steppe–Sometimes referred to as short-grass prairie; and,
- Brush prairie**–** Sagebrush and rabbitbrush, with mixed, short grasses, with many gradations or combinations of these low-height shrubs and grasses.

### 1.6.3 THREATENED AND ENDANGERED SPECIES

Appendix F3 lists the threatened and endangered species in this ecoregion. Many grassland species, such as the peregrine falcon (*Falco peregrinus*), sharp-tailed grouse (*Tympanuchus phasianellus*), swift fox (*Vulpes velox*), and Western hognose snake (*Heterodon nasicus*) are sensitive species in this ecoregion. Some fish and mussel species also occur in areas where the Missouri River reaches into the 100-mile project area. Some of these species include blue sucker (*Cycleptus elongatus*), flathead catfish (*Pylodictis olivaris*), flathead chub (*Platygobio gracilis*), threeridge (*Amblema plicata*), and the Wabash pigtoe (*Fusconaia flava*).

The whooping crane (*Grus americana*) is an endangered and highly monitored species in both Montana and North Dakota; the sandhill crane (*G. canadensis)* is monitored and endangered in Washington. Both species inhabit open marshes and wetlands during breeding season as well as grain fields, shallow lakes, and meadows during the winter and while migrating. They feed on mollusks, crustaceans, small vertebrates, and waste grain.

North Dakota uses a system that ranks species by greatest need of conservation from Level I (greatest need) to Level III (moderate need). Within these ranks, North Dakota also denotes the abundance of these species as rare, uncommon, fairly common, common, and abundant. Some federally endangered or threatened species may be listed as Level I, II, or III, depending on the current funding and recovery plan status of that species. For example, the piping plover is a Level II uncommon species in North Dakota, meaning that it has a recovery plan in effect but still has a moderate to high priority of conservation.

**Whooping crane**

(USFWS)

The gray wolf (*Canis lupus*) is also an endangered species in this ecoregion. Since this wolf is a federally listed species and is designated as a rare Level III species in North Dakota, national forests and wildlife refuges have plans in place for either monitoring or furthering the recovery of wolf populations (or both). These plans are on the North Dakota Game and Fish Department website.

### 1.6.4 WILDLIFE

Both game (legally hunted) and non-game (legally protected but not endangered or threatened) animals live in the prairies and grasslands of this ecoregion. Over 300 species of birds — especially insectivorous species—breed in, migrate through, or winter in this ecoregion. A wide variety of wildlife remains in the ecoregion throughout the year.

Waterfowl, herons, and shorebirds are among the important bird species in the wetlands of this ecoregion. They most commonly inhabit open marshes and prairie pothole wetlands (Igl and Johnson, 1998). Many common mammals, reptiles, and amphibians also make this ecoregion their home. Examples include the thirteen-lined ground squirrel (*Ictidomys tridecemlineatus*), pronghorn (*Antilocapra americana*), northern pocket gopher (*Thomomys talpoides*), coyote (*Canis latrans*), common garter snake (*Thamnophis sirtalis*), northern leopard frog (*Rana pipiens*), and the Great Plains toad (*Bufo cognatus*).

### 1.6.5 VEGETATIVE HABITAT

Several sections are delineated in this ecoregion: the Palouse Prairie; northwestern Great Plains; and northern glaciated plains.

Grasses, including typical grassland and meadow-steppe vegetation, dominate the Palouse Prairie. Idaho fescue (*Festuca idahoensis)* and bluebunch wheatgrass (*Pseudoroegneria spicata)* are prominent in the arid western portion. In areas of higher precipitation, Idaho fescue and common snowberry (*Symphoricarpos albus*) dominate; however, these areas are still too dry to support forest vegetation on the deep loamy soils. Agricultural crops have replaced much of the native vegetation of this region.

The northwestern Great Plains house a wider array of natural prairie species than other ecoregions of similar type. Along with the previously mentioned common species are basin wild-rye (*Elymus cinereus*) and buffalo grass (*Bouteloua dactyloides*). In the more-shallow soils, side-oats grama (*B. curtipendula*) may also grow. Buffaloberry (*Shepherdia* spp.*)*, chokecherry (*Prunus virginiana)*, and sagebrush (*Artemisia* spp.*)* are all common shrubs growing in draws and along streams. Ponderosa pine (*Pinus ponderosa)*, juniper (*Juniperus communis)*, and some aspen may also grow in this area of North Dakota. About 90 percent of this meadow-steppe and grassland has been converted to cropland.

The northern glaciated plains are characterized by a group of grassland species that includes western wheatgrass (*Pascopyrum smithii)*, needle-and-thread (*Hesperostipa comata*), green needlegrass (*Nassella viridula)*, and blue grama (*Bouteloua gracilis*). Areas with sloping or thinner soils support little bluestem (*Schizachyrium scoparium*). In wetter parcels, prairie cordgrass (*Spartina pectinata)*, northern reedgrass (*Calamagrostis stricta*), and slim sedge (*Carex acuta)* occur. Western snowberry (*Symphoricarpos occidentalis)* and prairie rose (*Rosa arkansana)* are the common shrubs (McNab and Avers, 1994)**.**

**North Dakota grasslands**

(National Geographic)

Examples of invasive plants include the following species: yellow starthistle (*Centaurea solstitialis)*, dyer's woad (*Isatis tinctoria)*, flowering rush (*Butomus umbellatus*), Japanese knotweed complex (*Fallopia japonica*), purple loosestrife (*Lythrum salicaria*), rush skeletonweed (*Chondrilla juncea)*, Eurasian watermilfoil (*Myriophyllum spicatum)*, Scotch broom (*Cytisus scoparius*), curly pondweed (*Potamogeton crispus*), tansy ragwort (*Senecio jacobaea)*, meadow hawkweed complex (*Hieracium caespitosum*), orange hawkweed (*Pilosella aurantiaca*), tall buttercup (*Ranunculus acris)*, perennial pepperweed (*Lepidium latifolium)*, blueweed (*Echium vulgare)*, and hoary alyssum (*Berteroa incana)* (Center for Invasive Plant Management, 2010). Non-native invasive plant species can negatively affect natural areas, agriculture, and horticulture (Simberloff, 1996).

### 1.6.6 WETLANDS AND WATERWAYS

Wetlands within the Great Plains Steppe Ecoregion of the project area include approximately: 6,190 acres of primarily scrub-shrub as opposed to forested swamp; 692,945 acres of emergent wetlands, occurring primarily as depression wetlands; 34,325 acres of ponds; 166,535 acres of lakes; and 7,875 acres of riverine habitats.  Prairie pothole wetlands are the most common type (USDOI, 2010b).

Major rivers within the state of Montana include the Missouri River (a portion of the river in the project area is protected under the Wild and Scenic Rivers Act, as are the three forks of the Flathead River).  In eastern Montana, close to the North Dakota border, the Missouri River (though not designated here as Wild and Scenic) lies within 100 miles of the border.  The entire Missouri River, including this section in eastern Montana, is under scrutiny by the Army Corps of Engineers (ACOE) (Omaha District) to improve its natural functioning through the ACOE's Missouri River Recovery Program.

Several other major rivers cross the northern border, including the Milk River in Montana, which flows north into Canada. After 168 miles, it flows back south across the northern border into eastern Montana.  The St. Mary River originates in the alpine areas of Glacier National Park and flows through several large lakes in Montana and north into Canada.  Other major rivers in the project area include the Marias River in Montana and North Dakota (it flows into the Wild and Scenic portion of the Missouri River), the Little Muddy and White Earth in North Dakota, the Yellowstone in both North Dakota and Montana, and the Judith and Teton rivers in Montana.

Further east in Montana are Lake Bowdoin on the Bowdoin National Wildlife Reserve and Medicine Lake, part of the Medicine Lake National Wildlife Refuge.  Major reservoirs in Montana in the project area include the Tiber, Fresno, Lake Frances, and Nelson.

**Bowdoin National Wildlife Reserve**

(USFWS)

### 1.6.7 AQUATIC RESOURCES

Several different types of aquatic resources occur across the northern glaciated plains, northwestern glaciated plains, and northwestern Great Plains of this ecoregion.  In the northern glaciated plains, low-to-medium density, dendritic drainage leads to more complex, high-density drainage southeast through the northwestern glaciated plains in North Dakota, and into the northwestern Great Plains of North Dakota and Montana.  The high-density, dendritic, drainage in the northwestern glaciated plains typically occurs in areas of exposed marine shales, leading towards the northwestern Great Plains where the high-density, first-order streams feed into long, structurally controlled second and third-order streams with low gradients.

The paddlefish (*Polyodon spathula*) is a primary large fish species of concern in the Missouri River of Montana and North Dakota. The cause of decline for this species is loss of habitat due to channelization and impoundment.

Fishing is important on the major rivers of this region; it is also an important activity on the reservoirs along the Missouri River, with these species of interest throughout the ecoregion: walleye (*Sander vitreus*), northern pike (*Esox lucius*), channel catfish (*Ictalurus punctatus*), smallmouth bass (*Micropterus dolomieu*), and paddlefish. Data for walleye at Fort Peck Lake, a large reservoir on the Missouri River, demonstrate the importance of the fishery. Approximately 40 million young walleyes are stocked in Montana annually (Montana Outdoors, 2006). The Montana Department of Fish, Wildlife & Parks manages the Fort Peck Reservoir fishery. Nearly 50 species of fish live in the reservoir, most of which are native to the Missouri River. Sixteen introduced species, mostly game fish, have been planted to enhance the fishing (MTFWP, 2002).

## 1.7 GREAT PLAINS STEPPE ECOREGION (332)

The Great Plains Steppe Ecoregion consists of flat and rolling plains with a relief of less than 300 feet (90 meters) (Figure L-3). Elevations in this ecoregion range between 700 feet (214 meters) and 2,300 feet (704 meters). Glaciers covered this area during parts of the Pleistocene Epoch.

The state in this portion of the ecoregion is North Dakota.

The Great Plains Steppe Ecoregion, which encompasses much of central and northern North Dakota, is covered by nearly level to rolling glacial till and lake plains with steep slopes adjacent to rivers and streams and areas of pothole lakes. The sub-humid conditions give rise to a broad region of grassland transitional between tallgrass and short-grass prairie (Bailey, 1995). Extensive concentrations of temporary and seasonal wetlands create favorable conditions for waterfowl nesting and migratory stopover habitats. Though the glacial-till-derived soil is quite fertile, agricultural production varies due to annual climatic fluctuations. Much of the ecoregion has shifted to agriculture, and relatively few areas of native grassland remain outside of wildlife refuges or nature preserves—either federally or state-owned or in private ownership, such as The Nature Conservancy.

This ecoregion is intermediate in growing season length, vegetation structure, and rainfall with drier conditions persisting to the west and the more-moist tallgrass prairie to the east and southeast. Climate separates this region from the Central and Southern Mixed Grasslands; these more southerly ecotypes are characterized by warmer climates and longer growing seasons. The climate in the Great Plains Steppe has warm summers followed by cold winters, much as in the Great Plains–Palouse Dry Steppe Ecoregion to the west. Average temperatures typically range between 36 and 45 degrees Fahrenheit (2 to 7 degrees Celsius). Average precipitation in this area is 15 to 20 inches (38 to 51 centimeters) per year with more than half falling during the 100 to 140-day growing season. The rest of the precipitation usually falls as snow. Naturally occurring droughts and fires also take place—both of which play important roles in determining native vegetation (Bailey, 1995).

**Bison**

(USFWS)

Fire regimes dramatically influenced the original development of northern Great Plains vegetation. Variation in precipitation across the region also determines the growth and expanse of trees and shrubs, shaping the grass-dominated native vegetation in areas where agriculture does not take place. In the short-grass and mixed-grass portions of the region, woody plants are primarily restricted to areas of higher elevation and areas with higher precipitation, including both riparian zones and north-facing slopes. Fire suppression has allowed woody plants to encroach in some areas where they did not exist for many centuries (Higgins et al., 2006).

### 1.7.1 REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT

The blocks of regionally significant habitat below are relatively undeveloped and intact habitat protected as wilderness, state parks, and state and national forests. Regionally significant or intact habitat refers to areas of largely unfragmented habitat with few alterations or disturbances, such as roads or other development. Most areas listed are protected by law (wilderness areas, national parks) and often cross state and country boundaries, while others may occupy large expanses of private lands.

Selected regionally significant blocks that represent this region include:

- Turtle Mountain–Northern North Dakota/southern Manitoba, on the border of the ecoregion;
- J. Clark Salyer National Wildlife Refuge–North-central North Dakota;
- Pembina Gorge–Northeastern North Dakota;
- Mirror Pool Wildlife Management Area–Eastern North Dakota;
- Oakville Prairie–Eastern North Dakota;
- Sully’s Hill National Game Preserve–Eastern North Dakota;
- Forest River Biology Area–Eastern North Dakota; and,
- Gunlogson Arboretum Nature Preserve–Northeastern North Dakota.

**Sandhill cranes (*Grus canadensis*)**

(USFWS)

### 1.7.2 SENSITIVE HABITATS

Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities that represent sensitive habitats. The sensitive habitats described here occur in many of the larger intact habitat areas in the prior section, and are home to many of the threatened and endangered species in the next section. For example, Eastern Great Plains Tallgrass Aspen Parkland houses protected species, such as the western prairie fringed orchid (*Platanthera praeclara*), as well as a wide variety of common plant species, such as little bluestem (*Schizachyrium scoparium*). The habitat names used below, such as Northwestern Great Plains Mixed-grass Prairie, describe habitats found among very diverse areas of regional boundaries and represent specific ecological associations.

**Tallgrass prairie**

(USFWS)

Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and diverse areas. The list of sensitive habitats is based on those enumerated and described by the WWF (2001), ecological system descriptions within the NatureServe.org database, and each state's respective natural resources agency.

- Northwestern Great Plains Mixed-grass Prairie – Grassland type of medium-height grasses on fine-textured and well-drained soils;

- Eastern Great Plains Tallgrass Aspen Parkland–Mosaic or combination of tallgrass prairie, brush prairie, aspen-oak mixed woodlands, and wet prairie;
- Eastern Great Plains Wet Meadow, Prairie and Marsh–Distinguished from upland prairie systems by having seasonal inundation (wetlands with near-surface groundwater), in conjunction with silty, dense-clay, often hydric soils; and,
- Great Plains Sand Prairie–Often considered part of the tallgrass or mixed-grass regions in the Great Plains, with a mixture of elements from the Western Great Plains Short-grass Prairie, Central Mixed-grass Prairie, and Northwestern Great Plains Mixed-grass Prairie and soils derived from sandstone weathering.

Few extensive areas of native grassland still exist and these are relatively small compared to their original extent; for these reasons alone, the grasslands are threatened and of high ecological value. Conversion of native grassland to agriculture has been widespread throughout all Great Plains regions (WWF, 2001).

### 1.7.3 THREATENED AND ENDANGERED SPECIES

Appendix F3 lists the threatened and endangered species within this ecoregion. Many important grassland and wetland habitat species are sensitive to disturbance, including the whooping crane (*Grus americana*), peregrine falcon (*Falco peregrines*), and the Nelson's sharp-tailed sparrow (*Ammodramus nelsoni*).

**Nelson's sharp-tailed sparrow**

(Avian Research & Education Institute)

The gray wolf (*Canis lupus*) is an example of a rare species in North Dakota. Since this wolf is a federally listed species and is designated a rare Level III species in North Dakota, national forests and wildlife refuges already have plans in place for monitoring or recovery of wolf populations (or both). These plans are on the North Dakota Game and Fish Department website.

North Dakota uses a system that ranks species by the greatest need of conservation from Level I (greatest need) to Level III (moderate need). Within these ranks, North Dakota also designates the abundance of these species as rare, uncommon, fairly common, common, or abundant. Some federally endangered and threatened species may be listed in Level I, II, or III, depending on the current funding and recovery plan status of that particular species. For example, the piping plover is listed as a Level II uncommon species in North Dakota, meaning that it has a recovery plan in effect, but still has a moderate to high priority of conservation.

### 1.7.4 WILDLIFE

Many birds, especially insectivorous species, migrate through this ecoregion twice each year. Some species, such as the greater prairie-chicken (*Tympanuchus cupido*), are year-round permanent residents. While the greater prairie-chicken is not threatened or endangered in North Dakota, it is an important bird in this ecoregion, with its populations in flux. An experimental hunting season has been held periodically, although it was closed for 2010. The wetlands and prairie grasslands in this ecoregion are home to a variety of wildlife, including both game (legally hunted) and non-game (legally protected but not endangered or threatened and not hunted) species.

Large game animals, such as deer, moose (*Alces alces*), elk (*Cervus canadensis),* and mountain lion (*Pumas concolor),* live in this ecoregion. The long-eared myotis bat (*Myotis evotis)*, long-legged myotis bat (*M. volans)*, northern prairie skink (*Eumeces septentrionalis*), silver chub (*Macrhybopsis storeriana)*, pearl dace (*Margariscus margarita)*, northern redbelly snake (*Storeria occipitomaculata)*, yellow rail (*Coturnicops noveboracensis)*, black-billed cuckoo (*Coccyzus erythropthalmus)*, and red-headed woodpecker (*Melanerpes erythrocephalus)* are other sensitive species in this ecoregion.

### 1.7.5 VEGETATIVE HABITAT

Vegetative cover within the Great Plains Steppe Ecoregion is dominated by nearly level and rolling plains habitats. Most of this land consists of young glacial drift and dissected till plains. Typical vegetative cover consists of various tall and short grasses, including little bluestem (*Schizachyrium scoparium*) and blue grama (*Bouteloua gracilis)*. Other species include buffalograss (*B. dactyloides)*, needle-and-thread grass (*Hesperostipa comata)*, galleta (*Pleuraphis jamesii)*, sunflower (*Helianthus annuus)*, and goldenrods (*Solidago* spp.*)*. Wetlands in this ecoregion include pothole lakes and streams where Kentucky bluegrass (*Poa pratensis)*, Canada anemone (*Anemone canadensis)*, and northern reedgrass (*Calamagrostis stricta)* thrive (Stewart and Kantrudi, 1972).

**Sunflower**

(Missouri Plants)

Common invasive species of concern include saltcedar (*Tamarix* spp.*)*, garlic mustard (*Alliaria petiolata*), Eurasian watermilfoil (*Myriophyllum spicatum*), Russian knapweed (*Acroptilon repens*), spotted knapweed (*Centaurea maculosa*), bull thistle (*Cirsium vulgare)*, yellow sweet clover (*Melilotus officinalis)*, reed canary grass (*Phalaris arundinacea*), curly pondweed (*Potamogeton crispus*), Siberian elm (*Ulmus pumila)*, puncturevine (*Tribulus terrestris)*, and black medic (*Medicago lupulina)* among others. New invasive species likely to become problems include orange hawkweed (*Pilosella aurantiaca*), meadow hawkweed (*Hieracium caespitosum)*, two-leaf watermilfoil (*M. heterophyllum)*, buckthorn (*Rhamnus* spp.), hybrid cattail (*Typha angustifolia)*, Japanese knotweed (*Fallopia japonica*), and giant knotweed (*F. sachalinensis*) (Center for Invasive Plant Management, 2010; USDA, 2003a). The North Dakota Century Code lists at least seven noxious weeds in northern North Dakota counties, including Canada thistle (*C. arvense*), leafy spurge (*Euphorbia esula*), Russian knapweed, and spotted knapweed).

### 1.7.6 WETLANDS AND WATERWAYS

Wetlands within the Great Plains Steppe Ecoregion portion of the project area include approximately: 6,190 acres of primarily scrub-shrub as opposed to forested swamp; 692,945 acres of emergent wetlands, occurring primarily as depression wetlands; 34,325 acres of ponds; 166,535 acres of lakes; and 7,875 acres of riverine habitats. Prairie pothole wetlands are the most common type (USDOI, 2010b).

**Yellow-headed blackbird**

(USFWS)

Of the relatively few major rivers in the ecoregion, the Des Lacs, Souris, and Sheyenne are the largest. Devils Lake, the largest lake in the 100-mile section south of the northern border, remains important to nesting wetland birds, especially the American white pelican (*Pelecanus erythrorhynchos*), which has a very large nesting colony here.

### 1.7.7 AQUATIC RESOURCES

Aquatic resources are highly regarded within the Great Plains Steppe Ecoregion, luring hunters, anglers, and camping enthusiasts from all over the United States due to the abundance of ducks and other waterfowl.

The aquatic resources of the ecoregion support a diverse fishery. Notable fish species include walleye (*Sander vitreus*), perch (*Perca* spp.), and paddlefish (*Polyodon spathula)*. Various native reptiles, amphibians, water birds, aquatic insects, mussels, and crustaceans also thrive in these waters.

Accidental introductions of invasive species create negative impacts on aquatic resources, damaging fisheries and native habitats. Common invasive aquatic plant species of concern include two-leaf watermilfoil (*Myriophyllum heterophyllum*), Eurasian watermilfoil (*M. spicatum*), hybrid cattail (*Typha x glauca*), reed canary grass (*Phalaris arundinacea*), curly pondweed (*Potamogeton crispus*), and Brazilian waterweed (also known as Brazilian elodea, *Egeria densa*). Invasive animal species of concern, called aquatic nuisance species, listed in North Dakota, include the grass carp (*Ctenopharyngodon idella*), common carp (*Cyprinus carpio*), and rusty crayfish (*Orconectes rusticus*). The North Dakota Game and Fish Department also lists several species found close to North Dakota currently being watched for in wetlands, rivers, and lakes. These species include the round goby (*Neogobius melanostomus*), silver carp (*Hypophthalmichthys molitrix*), Asian clam (*Corbicula fluminea)*, and spiny water flea (*Bythotrephes longimanus*) (USDA, 2003b).

## 1.8 PRAIRIE PARKLAND (TEMPERATE) ECOREGION (251)

The Prairie Parkland (Temperate) Ecoregion is a formerly glaciated area with gently rolling plains and steep bluffs bordering the valleys (Figure L-3). Most of this area consists of alternating prairie and deciduous forest. Elevation ranges from 825 to 1,150 feet (250 to 350 meters) with a local relief of 3 to 25 feet (1 to 8 meters).

States in this ecoregion include Minnesota and North Dakota.

The Prairie Parkland (Temperate) Ecoregion has areas of intermingled prairie with deciduous forests near streams and on north-facing slopes. The forest cover consists of an oak-hickory association and prairies composed primarily of grasses. Aquatic resources include streams, wetlands, and dunes with a few lakes. Part of this province has limestone bedrock covered by thin soils that do not support tree growth; however, the floodplains and moist hillsides can support deciduous forests. Tall grasses are prominent and usually grow in bunches. Many of the prairies in this ecoregion appear to be areas that have not yet become forested. The Red River Valley, adjacent to the Red River separating Minnesota from North Dakota, has alluvial fans in the west where rivers once entered the glacial lakes. Beach and moraine ridges border the east.

Agriculture is the primary economic activity in this ecoregion and has replaced most areas of native prairie. The Red River Valley contains fertile soils, the building blocks of which were deposited by meltwater from Glacial Lake Agassiz. In the till plains, especially in the central dissected areas, about half of the land has been altered for agricultural use.

Summers are usually hot in the Red River Valley; the winters are particularly cold. The mean annual temperature ranges from 36 to 45 degrees Fahrenheit (2 to 7 degrees Celsius) with an average of 18 to 23 inches (47 to 58 centimeters) of precipitation. About 40 percent of this falls during the 111 to 136-day growing period. Precipitation during winter comes almost entirely from snow.

### 1.8.1 REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT

The blocks of regionally significant habitat below are relatively undeveloped and intact habitat protected as wilderness, state parks, and state and national forests. Regionally significant or intact habitat refers to areas of largely unfragmented habitat with few alterations or disturbances, such as roads or other development. Most areas listed are protected by law (wilderness areas, national parks) and often cross state and country boundaries, while others may occupy large expanses of private lands.

In this province, no large blocks of intact habitat remain in this ecoregion within 100 miles of the northern border. Most original native tallgrass prairies have been converted to cropland. A few areas of limited size include:

- Agassiz Beach Ridges–Northwestern Minnesota, fragmented glacial lake ridges;
- Pembina Trail Preserve–Western Minnesota; and,
- Malmberg Prairie–Western Minnesota.

### 1.8.2 SENSITIVE HABITATS

Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities representing sensitive habitats. The sensitive habitats described here occur in many of the larger intact habitat areas in the prior section and are home to many of the threatened and endangered species in the next section. For example, prairie potholes occur in many grassy areas in this geographic region and house species such as the big bluestem (*Andropogon gerardii*) and Indian grass (*Sorghastrum nutans*). Some habitat names used below, such as wooded areas, describe habitats found across regional boundaries and are more general in meaning. Others, such as the Red River Valley shoreline (an area of fertile soils), define much more specific ecological associations.

Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and diverse areas. The list of sensitive habitats is based on those enumerated and described by the WWF (2001), ecological system descriptions within the NatureServe.org database, and each state's respective natural resources agency.

- The Red River Valley shoreline–Area of fertile soils adjacent to the Red River that is subject to flooding;
- Prairie Potholes–Water-holding depressions of glacial origin, primary wetland habitat;
- Wooded areas–Commonly found on moist hillsides;
- Shorelines/dunes/cliffs/talus/rock outcrops–Sparsely vegetated native plant communities;
- Icelandic State Park–North Dakota; and,
- Bluestem Prairie Scientific and Natural Area–Native prairie that once covered a large area of western Minnesota and the Dakotas (The Nature Conservancy, 2010c).

**An aerial view of prairie potholes**

(NASA)

### 1.8.3 THREATENED AND ENDANGERED SPECIES

Appendix F3 lists the threatened and endangered species within this ecoregional province.

Additional wildlife species sensitive to habitat loss include the whooping crane (*Grus americana)*, piping plover (*Charadrius melodus*), loggerhead shrike (*Lanius ludovicianus*), and burrowing owl (*Athene cunicularia*), gray wolf (*Canis lupus*), and Canada lynx (*Lynx canadensis*), along with an array of invertebrate, mussel, and plant species. The piping plover is an example of a species with existing plans for monitoring or recovery. Both North Dakota and Minnesota list this bird as a federally threatened species since it is not part of the Great Lakes watershed in this ecoregion.

North Dakota uses a different system to rank species in greatest need of conservation from Level I (greatest need) to Level III (moderate need). Within these ranks, North Dakota also states the abundance of the species as rare, uncommon, fairly common, common, and abundant. Some federally endangered or threatened species may be listed in Level I, II, or III, depending on the current funding and recovery plan status of that particular species. For example, the piping plover is a Level II uncommon species in North Dakota, meaning it has a recovery plan in effect, but still has a moderate to high priority of conservation.

### 1.8.4 WILDLIFE

Many birds, especially waterfowl such as the northern pintail (*Anas acuta)*, green-winged teal (*A. crecca)*, and American wigeon (*A. americana)*, and songbirds, such as the chestnut-collared longspur (*Calcarius ornatus)*, migrate through this province twice each year. Some other birds, mammals, reptiles, and amphibians remain in the province year-round. Species such as the canvasback (*Aythya valisineria*), while not threatened or endangered in Minnesota or North Dakota, could be affected by diminishing wetland habitat. The prairie pothole wetlands and grasslands in this ecoregion are home to a variety of wildlife species, including both game (legally hunted) and non-game (legally protected but not endangered or threatened and not hunted) species. Hunting remains an important economic activity (North Dakota Game and Fish Department, 2010).

Although not listed as endangered or threatened at either the Federal or state level, some rare or non-endangered or threatened species are categorized differently. Those species of "conservation concern" or "special concern" are potentially highly vulnerable to some activities. The marbled godwit (*Limosa fedoa)*, black tern (*Chlidonias niger)*, loggerhead shrike (*Lanius ludovicianus*), northern goshawk (*Accipiter gentilis*), and black-backed woodpecker (*Picoides arcticus*), lake sturgeon (*Acipenser fulvescens*), gophersnake (*Pituophis catenifer*), and the plains pocket gopher (*Geomys bursarius*) are some of these sensitive species.

**Black tern**

(Idaho Fish and Game)

Many fish, mammals, reptiles, and amphibians live in these areas, as well. The river otter (*Lontra canadensis*), white-tailed deer (*Odocoileus virginianus*), channel catfish (*Ictalurus punctatus*), lake sturgeon (*Acipenser fulvescens*), Canadian Toad (*Bufo hemiophrys*), common snapping turtle (*Chelydra serpentina*), and the northern redbelly snake (*Storeria occipitomaculata occipitomaculata*) are representative.

### 1.8.5 VEGETATIVE HABITAT

Vegetative cover within the Prairie Parkland (Temperate) Province is dominated by tallgrass prairie and some riparian deciduous forest habitats in areas where native plants persist. Typical grassland cover includes big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), and Indian grass (*Sorghastrum nutans*). Extensive areas of prairie-pothole wetlands and oak-hickory forests still remain. The original vegetation was primarily a mosaic of bluestem-dominated prairie grassland and oak-hickory forest, with the oak-hickory forest growing along rivers and streams. An estimated 60 percent of the land surface was bluestem (tallgrass) prairie, with bur oak (*Quercus macrocarpa*) and white oak (*Q. alba*) savannas interspersed and in transitional areas. Upland forest (white oak-shagbark hickory) occurred on more-dissected land, grading into bottomland forests and wet bottomland prairies along rivers.

**Big bluestem**

(University of British Columbia Botanical Garden)

Glacial Lake Agassiz was the last in a series of pro-glacial lakes to fill the Red River Valley. Thick beds of lake sediments on top of glacial till created the flat Lake Agassiz plain. Intensive row-crop agriculture has replaced the historic tallgrass prairie. The Red River Valley drains to the north; the area is flat, dry, and quite fire prone. Wooded communities grow only in the deepest river valleys. Marsh and wet meadow communities occupy river bottoms and shallow depressions.

Examples of invasive species of concern that cause problems for the natural biodiversity in this ecoregion include Russian knapweed (*Acroptilon repens)*, absinth wormwood (*Artemisia absinthium*), Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans)* (also known as nodding thistle*)*, flowering rush (*Butomus umbellatus*), purple loosestrife (*Lythrum salicaria*), leafy spurge (*Euphorbia esula*), yellow star-thistle (*Centaurea solstitialis*), diffuse knapweed (*C. diffusa)*, yellow toadflax (*Linaria vulgaris)*, and spotted knapweed (*Centaurea maculosa*). Some new invasive species are Brazilian elodea (also known as Brazilian waterweed, *Egeria densa)*, Eurasian watermilfoil (*Myriophyllum spicatum*), and yellow flag iris (*Iris pseudacorus)*

(Center for Invasive Plant Management, 2010; MNDNR, 2009; NRCS, 2003). Non-native invasive plant species can affect natural areas, agriculture, forestry, and horticulture negatively (Simberloff, 1996). Invasive aquatic species pose a similar threat to aquatic resources (USDA, 2010).

### 1.8.6 WETLANDS AND WATERWAYS

Wetlands within the Prairie Parkland Temperate Ecoregion portion of the project area include approximately: 89,245 acres of forested and scrub-shrub wetlands; 72,635 acres of emergent wetlands; 39,450 acres of lakes; 13,330 acres of ponds; and 33,845 acres of riverine habitats (USDOI, 2010b). The wetlands are generally smaller and scattered, sitting in isolated depressions known as prairie potholes. Swamps tend to be scrub-shrub swamps rather than forested.

**Scrub-shrub wetland**

(Wisconsin Dept. of Natural Resources)

This region has high concentrations of temporary and seasonal emergent pothole and kettle wetlands that create favorable conditions for duck nesting and migration (Bryce et al., 1996; Woods et al., 2002). Flat plains with lakes, pothole and kettle wetlands, and ponds occur in the area to the west of the Red River Valley.

### 1.8.7 AQUATIC RESOURCES

Aquatic resources are highly regarded within the Prairie Parkland (Temperate) Ecoregion. Wetlands with rivers and tributaries, along with small lakes, form the dominant aquatic features of this landscape. Many of the original wetlands in this area, however, have been drained for agricultural use. The remaining resources lure hunting and fishing enthusiasts. Many migratory game bird species also use the Red River Valley; abundant fish live in the Red River. Mollusks are well represented in the aquatic habitats (Northern Prairie Wildlife Resource Center, 2006) with 44 species accounted for with mapped ranges.

These aquatic resources support a diverse fishery. Notable fish species include channel catfish (*Ictalurus punctatus*), walleye (*Sander vitreus*), largemouth bass (*Micropterus salmoides*), rock bass (*Ambloplites rupestris*), and lake sturgeon (*Acipenser fulvescens*). The Red River has become internationally renowned for its trophy-size catfish. International anglers also fish for carp, a common and highly desirable game fish in many parts of the world. A variety of native reptiles, amphibians, birds, aquatic insects, mussels, and crustaceans also thrive in and around these waters. The Canadian toad (*Bufo hemiophrys*), snapping turtle (*Chelydra serpentina*), northern prairie skink (*Eumeces septentrionalis*), smooth green snake (*Opheodrys vernalis*), silver-spotted skipper (*Hesperia comma)*, sleepy duskywing (*Erynnis propertius)*, great blue heron (*Ardea herodias*), killdeer (*Charadrius vociferous*), three-ridge mussel (*Amblema neislerii)*, and giant floater mussel (*Pyganodon grandis*) are all species of aquatic habitats in this area, especially around the Red River.

**Snapping turtle**

(USGS)

Common invasive plant species of concern include Eurasian watermilfoil (*Myriophyllum spicatum*), reed canary grass (*Phalaris arundinacea*), curly pondweed (*Potamogeton crispus*), and flowering rush (*Butomus umbellatus*). Invasive animal species of concern may include zebra mussel (*Dreissena polymorpha*) (recently found in the Red River, although south of the 100-mile buffer area), goldfish (*Carassius auratus auratus*), and rusty crayfish (*Orconectes rusticus*), among others.

## 1.9 EASTERN BROADLEAF FOREST (CONTINENTAL) ECOREGION (222)

The Eastern Broadleaf Forest (Continental) Ecoregion is a deciduous forest with rolling hills and nearly flat areas (Figure L-3). Savanna-like in the northwesternmost region of Minnesota, it is dominated by drought-resistant oak-hickory forest. To the south, increasingly large areas of beech-maple forests inhabit formerly glaciated areas, such as Ohio. Glaciers once covered most of this area. Elevations range from 80 to 1,650 feet (24 to 502 meters) above sea level.

States in this ecoregion include New York, Pennsylvania, Ohio, Michigan, and Minnesota.

The Eastern Broadleaf Forest (Continental) Province is dominated by deciduous forest, favoring a drought-resistant oak-hickory association due to lower amounts of precipitation. Some formerly glaciated areas throughout the region have beech-maple forests where greater rainfall occurs. In these areas, oak and hickory grow on poorer sites with low fertility levels.

Silviculture is one of the dominant economic activities in the midwestern states of this province, especially in Minnesota and Michigan. These forests range from the cool, nearly boreal forests of northern Minnesota to the warm, oak-hickory forests of southern Michigan, and span both the Laurentian Mixed Forest and the Eastern Broadleaf Forest (Continental) ecoregions.

This ecoregion shares many characteristics with the oceanic broadleaf forest to the east; however, precipitation decreases in quantity and effectiveness inland. The average annual temperature in the northern portions is 40 degrees Fahrenheit (4 degrees Celsius) with 65 degrees Fahrenheit (18 degrees Celsius) as an average in the south. Summers are typically very warm, and this region experiences frequent tornadoes. Precipitation ranges from about 20 inches (51 centimeters) in northwestern Minnesota to approximately 40 inches (102 centimeters) annually in Ohio (Bailey, 1995).

### 1.9.1 REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT

The blocks of regionally significant habitat below are relatively undeveloped and intact habitat protected as wilderness, state parks, and state and national forests. Regionally significant or intact habitat refers to areas of largely unfragmented habitat with few alterations or disturbances, such as roads or other development. Most areas listed are protected by law (wilderness areas, national parks) and often cross state and country boundaries, while others may occupy large expanses of private lands.

Selected regionally significant blocks that represent this region include:

- Hayes Lake State Park–Northern Minnesota;
- Zippel Bay State Park–Northern Minnesota;
- Garden Island State Recreation Area–Northern Minnesota;
- Seven Lakes State Park–Southeastern Michigan;
- Maybury State Park–Southeastern Michigan;
- Van Buren Lake State Park–Northern Ohio; and,

- Lake Erie Islands State Park –Northern Ohio.

### 1.9.2 SENSITIVE HABITATS

Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities representing sensitive habitats. The sensitive habitats described here occur in many of the larger intact habitat areas in the prior section and are home to many of the threatened and endangered species in the next section. For example, hardwood swamps exist in many forested areas in this broad geographic region where species such as green ash (*Fraxinus pennsylvanica*) and cattail sedge (*Carex typhina*), as well as a wide variety of other common plant species, such as sphagnum mosses (*Sphagnum* spp.), live. Some habitat names, such as hardwood swamp, describe habitats found across several regional boundaries and are more general in meaning. Others, such as Great Lakes shorelines (a type of wetland plant community), define much more specific ecological associations.

Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and diverse areas. The list of sensitive habitats is based on those enumerated and described by the WWF (2001), ecological system descriptions within the NatureServe.org database, and each state's respective natural resources agency.

- Inland lake shorelines–Inland lakes with fluctuating water levels and specialized biota adapted to sandy or gravelly habitats;
- Great Lakes shorelines–Adjacent to margins of lakes Huron, Erie, and Ontario;
- Hardwood swamps–Dominated by trees with deciduous leaves;
- Wetlands–Marshes, swamps, or bogs characterized by wetness, soils, and specific vegetation;
- Prairies–Predominately treeless grasslands;
- Natural arches and bridges–Naturally formed bridges, such as Rockbridge in Ohio; and,
- Freshwater estuaries–Especially along the Great Lakes where lake waters meet river mouths.

**Hardwood swamp**

(Michigan State University)

### 1.9.3 THREATENED AND ENDANGERED SPECIES

Appendix M lists the threatened and endangered species in this ecoregion. An example of a state threatened or endangered species within this province that may be disturbed by human activity is the peregrine falcon (*Falco peregrinus*), which is listed as state endangered in Minnesota and Ohio and threatened in Michigan and New York. These falcons prefer open habitats around water, with tall cliffs where they nest on ledges jutting from bare, steep rock walls. Since the young are completely dependent on their parents, any disturbance during the breeding season may decrease nesting sites and local populations.

The piping plover (*Charadrius melodus*), a federally listed species, also occurs in this region. The piping plover offers a primary example of the interaction between threatened and endangered species and human activities. Since the piping plover is federally listed, wildlife refuges already have plans in place for monitoring or recovery of the piping plover's populations.

Other federally listed species in this province live in forested areas near lakeshores and marshes, including other bird species, such as the merlin (*Falco columbarius*), osprey (*Pandion haliaetus*), and whooping crane (*Grus america*). Other mammals, reptiles, and insects also occur in these habitats, such as the Indiana bat (*Myotis sodalist*), bog turtle (*Glyptemys muhlenbergii*), and Karner blue butterfly (*Lycaeides melissa samuelis*), along with many species of mussels.

**Whooping crane**

(USFWS)

Although some species are listed as endangered or threatened at either the Federal or state level, others are categorized differently as species of "conservation concern" or "special concern."

### 1.9.4 WILDLIFE

Both game (legally hunted) and non-game (legally protected, but not threatened or endangered) animals make their homes in the primary forests and wetlands of this ecoregion. Insectivorous species, among other birds, migrate into or out of this province twice each year. This province also contains a wide variety of year-round wildlife residents. Over 350 species of birds breed in, migrate through, or winter in this ecoregion (NYSOS, 2010).

The coniferous forests house numerous species. Some of the mammals include white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), fox, shrews, and squirrel. Common amphibians include the spotted salamander (*Ambystoma maculatum*) and the American toad (*Bufo americanus)*.

Broadleaf forests are rich in wildlife diversity. Red (*Tamiasciurus hudsonicus*), gray (*Sciurus carolinensis*), and fox squirrels (*S. niger)* as well as eastern chipmunk (*Tamias striatus)* are locally abundant. Various songbirds, woodpeckers, and owls also live in these forests, which provide good shelter, nesting, and foraging habitat.

### 1.9.5 VEGETATIVE HABITAT

Vegetative cover within the Eastern Broadleaf Forest Province is dominated by forested habitats, but also includes grasslands and wetlands. Typical cover consists mainly of oak-hickory forests with increasing numbers of maple-beech forests. Wetter sites can include elm (*Ulmus* spp.) and tulip tree (*Liriodendron tulipifera*). This province typically has a well-developed understory of flowering dogwood (*Cornus florida)*, sassafras (*Sassafras albidum)*, and hophornbeam (*Ostrya virginiana)*, along with other shrubs, evergreens, and wildflowers. Existing wetland types include cattail marshes, wooded wetlands and swamps, and wet meadows (EOE, 2009).

**Tulip tree flowers**

(University of British Columbia Botanical Garden)

Land alterations have greatly affected oak trees (*Quercus* spp.) in this province. Changes due to climate, land use, and natural area disturbance have all contributed to the decline of white oak (*Q. alba*) trees (Abrams, 2003). Northern red (*Q. rubra*) and chestnut oaks (*Q. prinus*) have replaced white oaks in these areas; however, red oaks are more susceptible to a pathogen known as sudden oak death (*Phytophothora ramorum)* (McShea et al., 2007).

Common invasive species of concern include garlic mustard (*Alliaria petiolata*), honeysuckle (*Lonicera* spp.), common (*Rhamnus cathartica*) and glossy buckthorn (*R. frangula*), orange hawkweed (*Hieracium lachenalii*), common reed (*Phragmites australis)*, purple loosestrife (*Lythrum salicaria*), and Canada thistle (*Cirsium arvense)* among others.

New invasive species to watch for include autumn olive (*Elaeagnus umbellate)*, leafy spurge (*Euphorbia esula*), giant hogweed (*Heracleum mantegazzianum)*, Japanese knotweed (*Polygonum cuspidatum)*, giant knotweed (*P. sachalinense)*, and garden valerian (*Valeriana officinalis)* (Center for Invasive Plant Management, 2010; MNDNR, 2009; USDA, 2003a). For example, Minnesota has a list of prohibited invasive species, which includes the European wild boar and a list of regulated invasive species, including the koi (*Cyprinus carpio)*, goldfish (*Carassius auratus auratus)*, rusty crayfish (*Orconectes rusticus*), and mute swan (*Cygnus olor)*.

### 1.9.6 WETLANDS AND WATERWAYS

Wetlands within the Eastern Broadleaf Forest (Continental) Province portion of the project area include approximately: 2,316,695 acres of forested and scrub-shrub wetlands; 946,175 acres of emergent wetlands; 4,280,190 acres of lakes; 205,830 acres of ponds; and 174,395 acres of riverine habitats (USDOI, 2010b). All types of wetlands are prevalent, but lake habitat is especially abundant because this ecoregion encompasses shoreline along four of the five Great Lakes.

Major rivers include the Grand, Cuyahoga, Sandusky, and Maumee in Ohio, the Shiawassee in Michigan, and the Upper Mississippi, Crow Wing, and Rum in Minnesota. Numerous smaller rivers, streams, and tributaries flow through the area. In addition to the Great Lakes, numerous smaller lakes and ponds also dot the region.

### 1.9.7 AQUATIC RESOURCES

Aquatic resources are of high quality in the Eastern Broadleaf Province. Abundant lakes, rivers, ponds, and wetlands constitute dominant features of the landscape. Four of the Great Lakes border this province: Michigan, Huron, Erie, and Ontario. These resources attract many outdoor enthusiasts for hunting, fishing, and camping.

Many wetland habitats in this region have been disturbed, largely due to agricultural land use practices and urbanization. Wetlands are especially sensitive to disturbances, such as channelization and ditching.

The aquatic resources of this region support a diverse fishery. Notable fish species include walleye (*Sander vitreus*), northern pike (*Esox lucius*), muskellunge (*E. masquinongy*) the non-native coho (*Oncorhynchus kisutch)* and chinook salmon (*O. tshawytscha)*, smallmouth (*Micropterus dolomieu*) and largemouth bass (*M. salmoides*), brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta)*, yellow perch (*Perca flavescens*), and emerald shiner (*Notropis atherinoides)*. Habitat for sunfish (*Lepomis* spp.), and mudminnows (*Umbra* spp.) also exists. A variety of native reptiles, amphibians, waterbirds, aquatic insects, mussels, and crustaceans thrive in these waters and wetlands.

**Zebra mussels**

(University of Michigan)

Accidental introductions of invasive species have serious impacts on aquatic resources, damaging fisheries and native habitats. These species pose a great threat to both aquatic and terrestrial resources (USDA, 2010). Common invasive plants of concern include marsh thistle (*Cirsium palustre)*, purple loosestrife (*Lythrum salicaria*), reed canarygrass (*Phalaris arundinacea*), common reed (*Phragmites australis*), curly pondweed (*Potamogeton crispus*), and flowering rush (*Butomus umbellatus*). Invasive aquatic animal species of concern include the rusty crayfish (*Orconectes rusticus*), sea lamprey (*Petromyzon marinus)*, round goby (*Neogobius melanostomus*), zebra mussel (*Dreissena polymorpha*), and quagga mussel (*D.rostriformis bugensis*) among others.

## 1.10 LAURENTIAN MIXED FOREST ECOREGION (212)

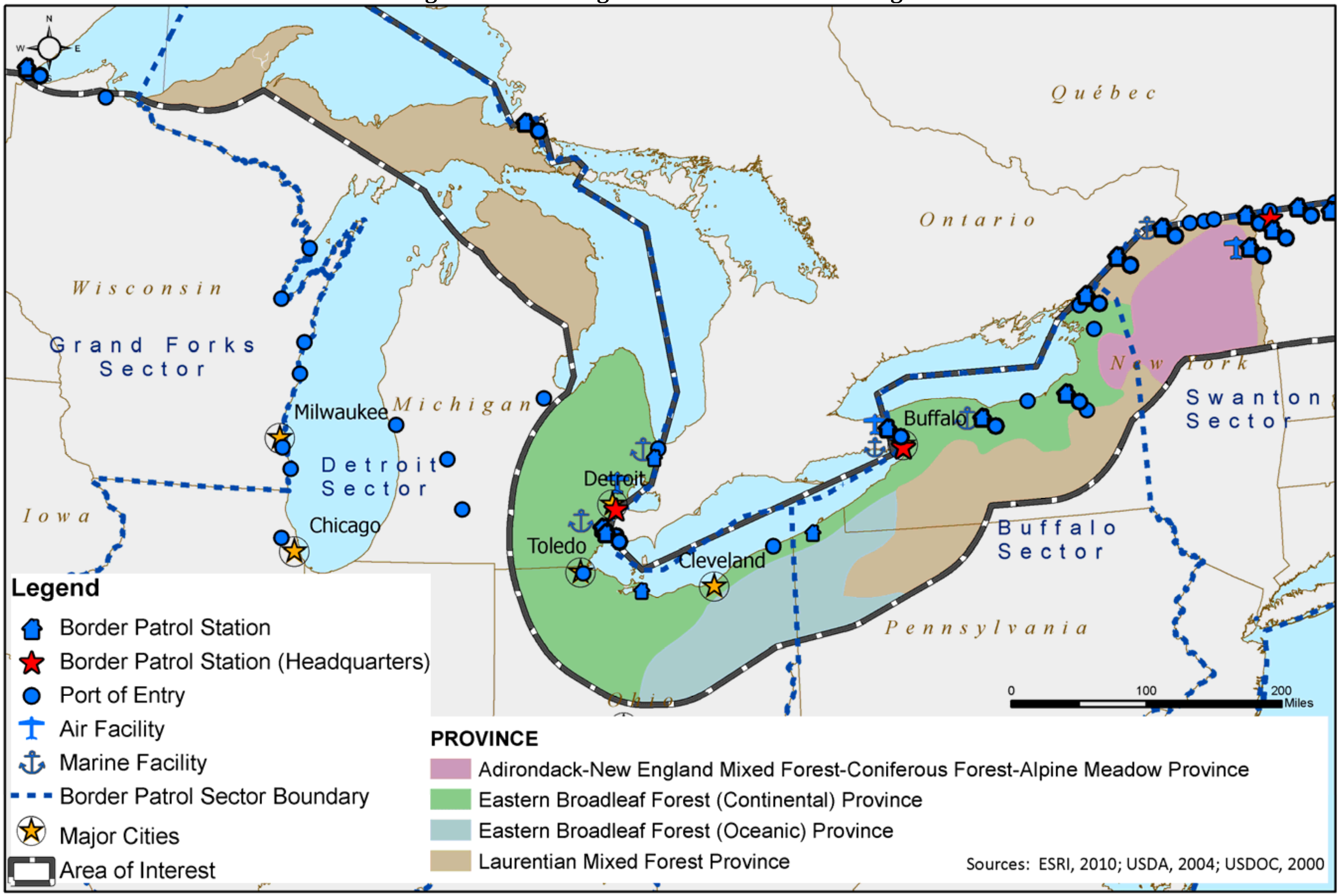
The Laurentian Mixed Forest Ecoregion forms a "transition zone" between true boreal forest to the north (predominately coniferous northern forest type) and broad-leaved deciduous forest ecoregions to the south (Figure L-3, Figure L-4, and Figure L-5). It incorporates some characteristics of each.

States in this ecoregion include Maine, Vermont, New York, Pennsylvania, Michigan, Wisconsin, and Minnesota.

**Laurentian Mixed Forest**

(University of Minnesota)

**Figure L-4. Ecoregions in the Great Lakes Region**



Most of this ecoregion is characterized by low relief, with rolling hills in many areas. Many large and small lakes, wetland depressions, moraines, eskers, kames, outwash plains, drumlins, and other glacial features make up the landscape. Glaciers covered this area during parts of the Pleistocene (Bailey, 1995).

The climate of the Laurentian Mixed Forest Ecoregion is moderated by proximity to the Great Lakes to the west and the Atlantic Ocean to the east. Winters in this ecoregion are moderately long and fairly severe, but more than one-third of the year has temperatures above 50 degrees Fahrenheit (10 degrees Celsius). Mean temperatures range from 35 to 50 degrees Fahrenheit (2 to 10 degrees Celsius). A brief growing season restricts agriculture; the frost-free season only lasts from 100 to 140 days. Snow generally persists all winter. Average annual precipitation is moderate, ranging from 24 to 45 inches (61 to 115 centimeters), with most precipitation falling in summer (Bailey, 1995).

Agriculture and forestry comprise two of the dominant economic activities in the Laurentian region. Common agricultural practices include row crop, dairy, grazing, orchard, and vegetable crop production. Silviculture and forestry practices are common on publically and federally owned hardwood and coniferous forests in the Great Lakes area as well as the northeastern states.

Approximately 20 percent of the Western Great Lakes Laurentian forests remain as intact habitat. Minnesota, for example, has 2630 square kilometers (650,000 acres) of extant old-growth forest, more than any other state in the eastern third of the nation (Davis, 1996). A large portion of this habitat is concentrated in the Boundary Waters/Quetico Provincial area, which is legally protected on both sides of the Minnesota-Ontario boundary. Similarly, with 17.7 million acres of forest, Maine is the most heavily forested state in the Nation with 90 percent still forested. The state's forest has remained essentially stable over recent decades (USDA, 2003c).

**Boundary Waters Canoe Area Wilderness**

(Jim Brandenberg)

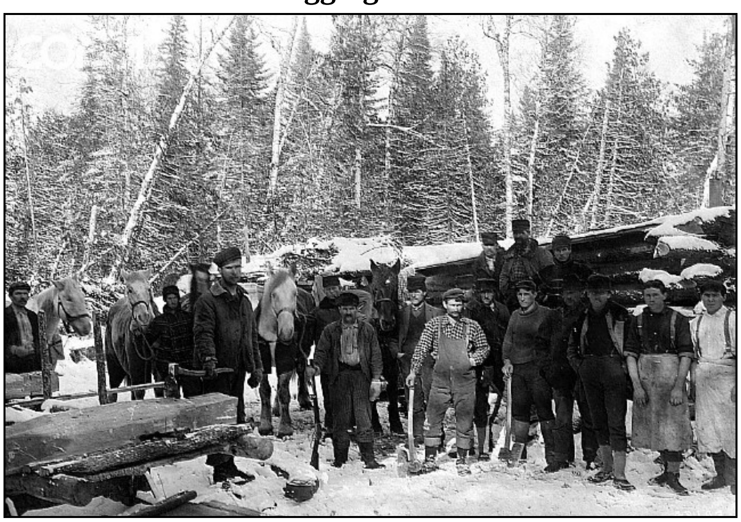
The historical forests of the Laurentian Mixed Forest Ecoregion were diverse due to the variety of landforms, soils, disturbance regimes, and reproductive strategies of the tree species in this area.  Fires are part of an important disturbance regime in the region, particularly within coniferous stands.  Fire suppression and human-induced changes in the composition and structure of the landscape have made modern fire rotations many times longer than those of the historical record for ecosystems in the Laurentian Ecoregion.  In a Michigan study—representative of the ecoregion as a whole—natural fire rotations have increased from approximately 250 years in the postglacial past to approximately 3,000 years currently (Cleland et al., 2004).

Pines, especially jack pine, are often the pioneer species that revegetate burned areas or abandoned farmland.  Fires from lightning storms are common in this ecoregion, particularly where sandy soils dominate.

A significant aspect of forest conversion in this ecoregion is the change from mature pine to aspen forest.  Logging is the dominant cause of this conversion.  Many thousands of hectares of the forest, outside of core, protected areas, have been converted to young successional stands.

In some areas, particularly in the northern reaches of the ecoregion, extensive areas of coniferous forest still exists, but much of the landscape has transitioned from its pre-European settlement status to that of an actively managed forest.  The majority of the original white and red pine forest was logged in the last two decades of the 19th century and has been replaced by a mixed forest, with remnants of scattered pine species.  This conversion has taken place across much of the region and caused extensive ecological change, with pre-settlement (“original”) plant communities replaced or extensively altered.

**1920s–1930s logging crew in Minnesota**



(Corbis Images)

Mixed stands, by their nature, include additional coniferous and deciduous species, especially in the southern portions of the region.  Some of these coniferous species are eastern red cedar (*Juniperus virginiana*) in New York, northern white cedar (*Thuja occidentalis*) in Vermont, and eastern hemlock (*Tsuga canadensis*) in Maine and New York.

### 1.10.1 REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT

The blocks of regionally significant habitat below are relatively undeveloped and intact habitat protected as wilderness, state parks, and state and national forests. Intact habitat or regionally significant habitat refers to areas of largely unfragmented habitat with few alterations or disturbances, such as roads or other development. Most areas listed are protected by law (wilderness areas, national parks) and often cross state and country boundaries, while others may occupy large expanses of private lands.

Selected regionally significant blocks that represent this region include:

- Boundary Waters Canoe Area Wilderness–Northeastern Minnesota - (U.S. area is contiguous to Ontario's Quetico Provincial Park);
- Quetico Provincial Park–Southeastern Ontario (on the U.S.-Canada border);
- Chequamegon/Nicolet National Forest–Northern Wisconsin;
- Superior National Forest–Northeastern Minnesota;
- Chippewa National Forest–Northern Minnesota;
- Ottawa National Forest–Northwestern Michigan;
- Hiawatha National Forest–Northwestern Michigan;
- Great Lakes: Lake Superior, Lake Michigan, and Lake Huron;
- Voyageurs National Park–Northern Minnesota;
- Isle Royale National Park–Northern Michigan;
- Apostle Islands National Park–Northern Wisconsin;
- Porcupine Mountains State Park–Northern Michigan;
- Baxter State Park–Maine;
- Finger Lakes –New York; and,
- Acadia National Park–Maine.

**Acadia National Park**

(NPS)

### 1.10.2 SENSITIVE HABITATS

Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities that represent sensitive habitats. The sensitive habitats described here occur in many of the larger intact habitat areas in the prior section and are home to many of the threatened and endangered species in the next section. For example, cedar/tamarack swamps exist in many forested areas in this broad geographic region and house protected species, such as the ram's-head lady's slipper (*Cypripedium arietinum*), as well as various common plant species, such as sphagnum mosses (*Sphagnum* spp.). Some habitat names used below, such as the cedar/tamarack swamp, describe habitats found across several regional boundaries, and are more general in meaning. Others, such as calcareous fens (a rare type of wetland plant community), define much more specific ecological associations.

Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and diverse areas. The list of sensitive habitats is based on those enumerated and described by the WWF (2001), ecological system descriptions within the NatureServe.org database, and each state's respective natural resources agency.

- Bogs–Wetland that accumulates acidic peat with deposits built of dead plant material;
- Calcareous fens–Rarest wetland community in Minnesota and Wisconsin, with input of alkaline mineral-rich groundwater;
- Cedar/tamarack swamps–Forested wetland characterized by one or both of these tree species;
- Sedge meadow–Wetland dominated by sedges growing on saturated soils typically composed of peat or muck;
- Hardwood swamps–Deciduous forested wetland;
- Flowages–Series of connected lakes;
- Freshwater estuaries–Ecological community where lake and river waters mix;

- Boreal forests–Predominately coniferous forest of the Northern Hemisphere;
- Great Lakes beaches and shorelines–Great Lakes beach natural community at the interface of land and water and found at margins of lakes Michigan, Huron, and Superior and often associated with sparsely vegetated dune systems; and,
- Inland lake shorelines–Beaches of inland lakes characterized by water-level fluctuations preventing development of stable shoreline plant communities, and instead supporting a more-specialized biota adapted to sandy or gravelly shorelines.

These sensitive ecological communities are less likely to withstand the effects of mechanized human activities and disturbance at a water-soil interface without sustaining damage than are broad agricultural zones, deciduous forests, grasslands, or other more generalized areas of vegetation or land use.

Wetlands can prove very sensitive to disturbance with a greater likelihood of slow repair (Maryland Dept. of Environment, 2010; Sheldon et al., 2005). Half of the nation's original 221 million acres of wetlands are estimated to have been lost (Feierabend, 1992).

### 1.10.3 THREATENED AND ENDANGERED SPECIES

Appendix F3 lists the threatened and endangered species in this ecoregion. The piping plover (*Charadrius melodus*), a federally listed species, is also found in this region, especially along the shores of the Great Lakes. Since this species nests on wide, flat, open sandy beaches, human activities that alter or disturb their habitat may affect populations nesting in or migrating through the area. Landscape alterations may also increase mortality of their young. The piping plover offers a primary example of the interaction between threatened and endangered species and human activities. Since this bird is a federally listed species, wildlife refuges have plans in place for monitoring or recovery of piping plover populations.

**Young piping plover**

(USFWS)

Federally listed endangered species in Wisconsin, Michigan, Pennsylvania, Ohio, and New York include the piping plover. Examples of state-listed endangered species in Wisconsin include the peregrine falcon, Caspian tern (*Sterna caspia*), and Forster's tern (*S. forsteri*). Michigan, Ohio, Pennsylvania, New York, and Wisconsin all list the loggerhead shrike (*Lanius ludovicianus*) in the state endangered category. Development and other human activities may affect endangered or threatened species if impacts occur within the habitats used by these species. Also vulnerable are breeding colonies of common terns (*S. hirundo*), which breed and nest on sand beaches similar to those of the piping plover.

In forested habitats within the Laurentian Ecoregion, the merlin (*Falco columbarius*), Kirtland's warbler (*Dendroica kirtlandii* (found only locally in Michigan and Wisconsin), spruce grouse (*Falcipennis candensis*), northern goshawk (*Accipiter gentilis*), and black-backed woodpecker (*Picoides arcticus*) are some of the sensitive species that could be affected by construction or other human disturbances, especially during the breeding season (generally from March through July).

Although some species are listed as endangered or threatened at either the Federal or state level, other species are categorized differently as of "conservation concern" or "special concern."

### 1.10.4 WILDLIFE

The primary forests and wetlands in this ecoregion are home to various wildlife species, including both game (legally hunted) species and non-game (legally protected but not endangered or threatened) species. Many birds, especially insectivorous species, migrate into or out of this ecoregion twice each year, with over 300 avian species throughout the year, either during breeding season, spring or fall migration, or winter (NYSOS, 2010). A wide variety of wildlife species remain in the ecoregion throughout the year.

The coniferous woodlands of the ecoregion are characterized by long winters and a short growing season. The forest stands provide good shelter, nesting, and foraging habitat. Common mammals include black bear (*Ursus americanus*), white-tailed deer (*Odocoileus virginianus*), fisher (*Martes pennanti*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), foxes, shrews, and squirrels. Amphibians include red-backed salamander (*Plethodon cinerus*), spotted salamander (*Ambystoma maculatum*), red-spotted newt (*Notophthalmus viridescens*), and American toad (*Bufo americanus*). Common garter snakes (*Thamnophis* spp.) and wood turtles (*Glyptemis insculpta*) are adapted to this northern climate.

### 1.10.5 VEGETATIVE HABITAT

Forests dominate the vegetative cover in the Laurentian Ecoregion. Mixed forest stands are comprised of several species of conifers, particularly white pine (*Pinus strobus*) in the Great Lakes region, along with a mix of deciduous species. Typical vegetative cover consists of mixed pine with aspen-birch (*Populus* spp. and *Betula* spp.); white pine and red pine (*P. resinosa*); jack pine (*P. banksiana*); black spruce (*Picea mariana*); eastern hemlock (*Tsuga canadensis*); balsam fir (*Abies balsamea*); northern white cedar (*Thuja occidentalis*); sugar maple (*Acer saccharum*); beech (*Fagus* spp.); birch (*Betula* spp.); white, red, and jack pine (*Quercus* spp.); and oak and hickory (*Carya* spp.) cover types among others.

**Ram's-head lady slipper, a state endangered plant in Maine**

(Maine Natural Areas Program)

Mixed forest stands are common with species assemblages highly dependent on the soil. Deciduous species typically favor nutrient-rich soils, while conifers thrive in poor soils. Pine trees are common in areas frequented by fire. Shrub and herbaceous layers add to the vegetative diversity in each of these forests (Bailey, 1995; EOE, 2009). Mixed stands, by their nature, include additional coniferous and deciduous species, especially in the southern portions of the region. Such coniferous species include eastern redcedar (*Juniperus virginiana*) in the New York regions, northern white cedar in Vermont, and eastern hemlock in Maine and New York.

Land use changes in the region have led to broad-scale changes in forest patch or block sizes (Mladenoff et al., 1993), diminished plant and ecological community diversity (White and Mladenoff, 1994), and a general simplification of ecological communities, including the loss of some native species (Schultz et al. 2001, Anderson and Loucks, 1979). The landscape-wide, mixed coniferous-deciduous forest has, with a few exceptions, lost extensive areas of its conifers due to these changes.

Common invasive species of concern include garlic mustard (*Alliaria petiolata*), Japanese barberry (*Berberis thunbergii*), honeysuckle (*Lonicera* spp.), common buckthorn (*Rhamnus cathartica*), and glossy buckthorn (*Frangula alnus*), spotted knapweed (*Centaurea maculosa*), orange hawkweed (*Pilosella aurantiaca*), Canada thistle (*Cirsium arvense*), and sweet clovers (*Melilotus* spp.). New invasive species of increasing concern include wild chervil (*Anthriscus sylvestris*), purple crownvetch (*Securigera varia*), autumn olive (*Elaeagnus umbellata*), leafy spurge (*Euphorbia esula*), giant hogweed (*Heracleum mantegazzianum*), Dame's Rocket (*Hesperis matronalis*), Japanese knotweed (*Fallopia japonica*), giant knotweed (*F. sachalinensis*), and garden valerian (*Valeriana officinalis*). These plants are only representatives of a growing list (USDA, 2003a). For example, Minnesota has a list of prohibited invasive species that includes the sea lamprey (*Petromyzon marinus*), New Zealand mud snail (*Potamopyrgus antipodarum*), European wild boar (*Sus scrofa*), and tubenose goby (*Proterorhinus marmoratus*).

### 1.10.6 WETLANDS AND WATERWAYS

Wetlands within the project area of the Laurentian Mixed Forest Ecoregion include approximately: 143 acres of marine and estuarine deepwater habitats; 2,433 acres of marine and estuarine marshes, beaches, and intertidal flats; over 7,159,520 acres of palustrine forested/scrub shrub wetlands (swamps and wooded bogs); over 613,540 acres of palustrine emergent wetlands (marshes, fens, wet meadows, sedge meadows, wet prairies); 1,373,290 acres of lacustrine wetlands (lakes); 171,325 acres of palustrine open water (ponds); and 152,625 acres of riverine habitat (rivers and streams) (USDOI, 2010b). The marine and estuarine systems within the ecoregion occur along the southeast coast of Maine, a portion of which sits within the project area. The other wetland types are distributed widely with Maine, Michigan, and Wisconsin having the greatest share.

**Forested wetland**

(Cedarburg Science/Lesley Brotkowski)

Several different types of wetlands in this ecoregion not only contain some rare species, but also function as important aquatic resources. These wetlands include lacustrine shallow and open-water communities, which are especially important for waterfowl production, along with palustrine forested coniferous swamps. Some of the rare plant species in these wetlands are lake cress, autumnal water-starwort, prickly hornwort, ram’s head lady slipper, and the round-leaved orchid. Estuarine wetlands can include algal beds, cordgrass, salt marshes, and rushes.

Several major rivers run through the northeast part of this ecoregion, including the Aroostook, Narragaugus, St. Croix, and St. John in Maine; the White, Winooski, and Connecticut in Vermont; and the St. Lawrence, Black, and Raquette in New York. The large water bodies classified as lacustrine include the Cranberry, West Grand, and Big lakes in Maine. Wetlands of special significance include maritime slope bogs, coastal plateau bogs, circumneutral fens, peat bogs, and Atlantic white cedar wetlands. Wetlands such as the Appleton Bog in Maine are well known and draw visitors. Maine designates emergent wetlands over 20,000 square feet as wetlands of special significance (Maine Natural Areas Program, 2005).

In the Great Lakes part of the ecoregion, major rivers include the Allegheny in New York and Pennsylvania; the Black, Au Sable, and Ontonagon in Michigan; the St. Louis in Wisconsin and Minnesota; and the Big Fork, Little Fork, and Rainy in Minnesota. Several large lakes are within the Minnesota portion of the project area: Mullet, Gogebic, Mud, Kabetogama, Rainy, Vermilion, Red Lakes, and Lake of the Woods.

### 1.10.7 AQUATIC RESOURCES

Aquatic resources are highly regarded within the Laurentian Ecoregion, luring outdoor enthusiasts to the region for hunting and fishing. Abundant lakes, rivers, ponds, and wetlands, along with the remnants of glacial recession, are dominant features on the landscape. Three of the Great Lakes (Superior, Michigan, and Huron), the St. Lawrence Seaway, and the Atlantic Ocean border portions of this ecoregion.

**Forested Stream**

(Cedarburg Science/Lesley Brotkowski)

These aquatic resources support a diverse fishery. Notable fish species include the lake sturgeon (*Acipenser fulvescens*), walleye (*Sander vitreus*), northern pike (*Esox lucius*), muskellunge (*E. masquinongy*), salmon (*Salmo salar*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*M. salmoides*), brook trout (*Salvelinus fontinalis*), lake trout (*S. namaycush*), yellow perch (*Perca flavescens*), white sucker (*Catostomus commersonii*), mottled sculpin (*Cottus bairdii*), common shiner (*Luxilus cornutus*), and creek chub (*Semotilus atromaculatus*). Various native reptiles, amphibians, waterbirds, aquatic insects, mussels, and crustaceans also thrive in these waters (NOAA, 2010).

While shifting water levels in the Great Lakes have an important ecological role, inlet and outlet controls within the basin have stabilized water levels to some degree, leading to significant changes in lakeshore ecology. These changes include alteration of spawning areas for some fish species. Natural raising and lowering of water levels allow some aquatic species to gain footholds for brief periods. With dropping water level, aquatic vegetation can grow farther from shore, providing new habitat for fish when water levels rise again.

Wetlands are also abundant within the Laurentian Ecoregion. Typical wetland habitats include bogs, coniferous swamps, hardwood swamps, and fens. These wetlands are high-quality natural areas that are particularly sensitive to disturbance. Dominant species include northern white cedar (*Thuja occidentalis*), black spruce (*Picea mariana*), and tamarack (*Larix laricina*, along with various shrubs, sedges, rushes, grasses, mosses, and forbs (WWF and TNC, 2008).

Communities, such as dunes, beaches, and upland marshes, characterize the Maine coast and may include American beachgrass (*Ammophila breviligulata*), bayberry (*Myrica pensylvanica*), beach plum (*Prunus maritima*), and annual marsh elder (*Iva annua* var. *annua*). Ocean tides strongly influence coastal regions in Maine, which is dramatically different from inland areas adjacent to the Great Lakes. For example, tides in the Lubec embayment in Maine reach six meters on full and new moon spring tides — the maximum tidal range on the U.S. East Coast. (Maine Geological Survey, 2005).

Accidental introductions of invasive species have negative impacts on aquatic resources, damaging fisheries and native habitats. Common invasive plant species of concern include marsh thistle (*Cirsium palustre*), purple loosestrife (*Lythrum salicaria*), spike water milfoil (*Myriophyllum spicatum*), reed canary grass (*Phalaris arundinacea*), curly pondweed (*Potamogeton crispus*), and flowering rush (*Butomus umbellatus*). Invasive animal species of concern include the rusty crayfish (*Orconectes rusticus*), sea lamprey (*Petromyzon marinus*), round goby (*Neogobius melanostomus*), zebra mussel (*Dreissena polymorpha*), quagga mussel (*D. rostriformis bugensis*), and water flea (*Daphnia pulex*) among others.

The Asian carp (*Hypophthalmichthys spp.*) poses a significant and highly visible threat to the aquatic resources of the Great Lakes region. This species has invaded the Illinois River, which lies outside of the Laurentian Ecoregion; however, it is nearing Lake Michigan and is a serious invasive threat. Zebra and quagga mussels have already seriously affected Great Lakes ecosystems, water treatment facilities, and water-based infrastructure and municipal equipment, with the potential for similar damage to inland waterways (Robinson, 2003).

## 1.11 EASTERN BROADLEAF FOREST (OCEANIC) ECOREGION (221)

The Eastern Broadleaf Forest (Oceanic) Province is a beech-maple forest with rounded hills, ridges, and broad valleys (Figure L-4). Appalachian Oak, oak-hickory, northern hardwood, and mixed-deciduous forest also make up portions of this province. Elevations in this province range from 650 to 1,000 feet (200 to 300 meters) with local relief of 6 to 50 feet (2 to 15 meters).

States in this ecoregion include Maine, New Hampshire, New York, Pennsylvania, and Ohio.

**Eastern broadleaf forest**

(Radford University)

The Appalachian Plateau portion (west of the Appalachian Mountains from New York into Ohio within the 100-mile project area) of the Eastern Broadleaf Forest (Oceanic) Province has extensive areas of deciduous forest cover. Aquatic resources range from small natural lakes to wetlands. Numerous steep headwater and low-gradient streams flow into the Ohio River and Lake Erie. Deep course sand and gravel underlie most of these streams. Deciduous trees in this province include beech (*Fagus* spp.), maple (*Acer* spp.), oak (*Quercus* spp.), and hickory (*Carya* spp.). Naturally occurring disturbances include flooding, droughts, and windstorms that may knock down trees.

The climate in the Eastern Broadleaf Forest (Oceanic) Province is moderated by the Atlantic Ocean to the east and has cold winters and warm summers. The average annual temperature is around 50 degrees Fahrenheit (10 degrees Celsius). Precipitation of either rain or snow is consistent year round and ranges from 35 to 40 inches (90 to 102 centimeters) per year in the Appalachian Plateau. The growing season runs for approximately 160 days with frost as a determining factor. About 50 percent of this region is used for agriculture and 25 percent is forested. Half of the forested areas are small woodlots.

The New England portion of the ecoregion, an area within the 100-mile project area in southern Maine and eastern New Hampshire, is very similar. The average annual temperature is influenced by elevation and proximity to the Atlantic Ocean and ranges from 45 to 50 degrees Fahrenheit (7 to 10 degrees Celsius). Annual precipitation ranges from 35 to 50 inches (82 to 127 centimeters) from both rain and snow. The amount of snow rises as elevation increases and varies from 36 to 100 inches (91.5 to 254 centimeters). The growing season usually extends from 120 to 180 days with elevation and frost creating some restrictions. Nearly 75 percent of this area is forested, with about 15 percent used for agriculture and 10 percent urbanized.

Rounded hills and valleys characterize most of the Appalachian Plateau. Glaciers covered this area approximately 8,000 to 10,000 years ago. This glaciation created the wide and dendritic drainages on the flat, homogenous, subsurface material. Gentle slopes cover about 50 to 80 percent of the area.

**Appalachian Plateau**

(Emporia State University)

### 1.11.1 REMAINING BLOCKS REGIONALLY SIGNIFICANT HABITAT

The blocks of regionally significant habitat below are relatively undeveloped and intact habitat that are protected as wilderness, state parks, and state and national forests. Regionally significant or intact habitat refers to areas of largely unfragmented habitat with few alterations or disturbances, such as roads or other development. Most areas are protected by law (wilderness areas, national parks) and often cross state and country boundaries, while others may occupy large expanses of private lands.

Selected regionally significant blocks that represent this region include:

- Kyle (Arthur) Woods State Nature Preserve–Ohio;
- Eagle Creek State Nature Preserve–Ohio;
- Bear Run Nature Reserve–Western Pennsylvania; and,
- Raccoon Creek State Park–Western Pennsylvania.

### 1.11.2 SENSITIVE HABITATS

Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities representing sensitive habitats. The sensitive habitats described here occur in many of the larger intact habitat areas in the prior section and are home to many of the threatened and endangered species in the next section. For example, hardwood swamps exist in many forested areas in this geographic region and house many plant species, such as Pennsylvania bitter cress (*Cardamine pensylvanica*), jack-in-the-pulpit (*Arisaema triphyllum*), and oakfern (*Gymnocarpium dryopteris).* Some habitat names, such as hardwood swamps, describe habitats found across several regional boundaries and are more general in meaning. Others, such as "black swamp" forest (a rare type of forest remnants), define much more specific ecological associations.

**Jack-in-the-pulpit**

(Cedarburg Science, Lesley Brotkowski)

Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and diverse areas. The list of sensitive habitats is based on those enumerated and described by the WWF (2001), ecological system descriptions within the NatureServe.org database, and each state's respective natural resources agency.

- Barrier beach and Great Lakes beaches–Great Lakes beach and dune complex characterized by pioneering beach and dune vegetation adjacent to lakes Michigan, Ontario, and Erie;
- Riverine marsh–Riverside deep-marsh wetland;
- Sedge meadow–Wetland dominated by sedges on saturated soils typically composed of peat or muck
- Wet prairie–Wet grassland habitat, dominated by sedges and rushes;
- "Black Swamp" forest–Forest remnants remaining from extensive post-glacial lake plains southwest of Lake Erie;
- Hardwood swamps–Deciduous forested wetland;
- Bogs–Wetland that accumulates acidic peat with deposits of dead plant material; and,
- Freshwater estuaries–Ecological community where lake and river waters mix

### 1.11.3 THREATENED AND ENDANGERED SPECIES

Appendix F3 lists the threatened and endangered species in this ecoregion. The piping plover (*Charadrius melodus*) is a federally listed species in this region, especially on sandy beaches along lakes. The federally listed shortnose sturgeon (*Acipenser brevirostrum*) inhabits large rivers connected to marine estuaries. It is the smallest sturgeon species in eastern North America at a maximum length of about 4.7 feet, but is often mistaken for the Atlantic sturgeon. As an anadromous fish spending time in both marine and freshwater environments, human activities, such as boating and fishing, may disturb this species.

Other aquatic federally listed species in Maine, New Hampshire, New York, Pennsylvania, and Ohio include the northern riffleshell (*Epioblasma torulosa rangiana*) and clubshell (*Pleurobema* *perovatum*) mollusks. The lake sturgeon (*A. fulvescens*) is a state-listed species in both Pennsylvania and Ohio.

**Lake sturgeon**

(USFWS)

In forested and wetland habitats, several other federally listed species exist, including the least bittern (*Ixobrychus exilis*), Canada lynx (*Lynx canadensis*), Karner blue butterfly (*Lycaeides melissa samuelis*), and eastern prairie fringed orchid (*Platanthera leucophaea*). Other state-listed species may include the short-eared owl (*Asio flammeus*), Persius duskywing butterfly (*Erynnis persius*), and Appalachian shoestring fern (*Vittaria appalachiana*).

Although some species are listed as endangered or threatened at either the Federal or state level, other species are categorized differently as of "conservation concern" or "special concern."

### 1.11.4 WILDLIFE

Many birds, especially species such as the white-throated sparrow (*Zonotrichia albicollis*), migrate through this province twice each year. Bird populations are diverse and include raptors, game birds, and songbirds. Wild turkey (*Meleagris gallopavo*), ruffed grouse (*Bonasa umbellus*), woodcock (*Scolopax minor*), bobwhite quail (*Colinus virginianus*), mourning dove (*Zenaida macroura*), and many passerines are common (USEPA, 2010). The Cooper's hawk (*Accipiter cooperi*), sharp-shinned hawk (*A. striatus*), great horned owl (*Bubo virginianus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), American toad (*Bufo americanus*), and painted turtle (*Chrysemys picta*) are other birds, mammals, amphibians, and reptiles that remain in the province year-round.

**American toad**

(New York City Department of Parks & Recreation)

### 1.11.5 VEGETATIVE HABITAT

Temperate deciduous forests dominate the vegetative cover in the Eastern Broadleaf Forest (Oceanic) Ecoregion. This mixed vegetative cover occupies moist and well-drained sites, especially in the New England portion. Species in these areas are American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), northern red oak (*Quercus rubra),* white oak (*Q. alba),* sweet buckeye (*Aesculus flava),* American basswood (*Tilia americana),* red cedar (*Juniperus virginiana*), and hemlock (*Tsuga* spp.) and white pine (*Pinus strobus*) species. Various oaks (*Quercus* spp.) are also common in some small oak-hickory (*Carya* spp.) associations in the Appalachian Plateau. Pine-oak forests grow on the Appalachian Plateau in dry sandy soils with thick shrubs beneath. Wetlands sit in areas with poorer drainage and generally have a smaller geographic extent.

Land use changes have increased erosion in the Midwest. Ohio's Hueston Woods State Park at the base of the Upper Four Mile Creek watershed, for example, is experiencing serious erosion problems due to row crops (Medley et al., 2003). These land-use alterations have also resulted in significantly more small, lower-diversity forest patches when compared to intact old-growth landscapes (White and Mladenoff, 1994).

Common invasive species of concern include garlic mustard (*Alliaria petiolata*), Japanese barberry (*Berberis thunbergii)*, honeysuckle (*Lonicera* spp.*)*, knotweed (*Polygonum* spp.), common and glossy buckthorn (*Rhamnus cathartica and R. frangula)*, Eurasian watermilfoil (*Myriophyllum spicatum*), sweet clovers (*Melilotus* spp.*)*, among others. New invasive species that require vigilance include spotted knapweed (*Centaurea stoebe)*, kudzu (*Pueraria lobata)*, mile-a-minute vine (*Persicaria perfoliata)*, and leafy spurge (*Euphorbia esula)*.

### 1.11.6 WETLANDS AND WATERWAYS

Many of the dominant and important plant species in this province grow in different types of wetland communities. These wetlands include floodplain forests, shallow, open-water communities, and hardwood and coniferous swamps that include species such as silver maple (*Acer saccharinum)*, American elm (*Ulmus americana)*, yellow birch (*Betula alleghaniensis)*, red maple (*A. rubra)*, white water-lily (*Nymphaea odorata)*, and sedges (*Carex* spp.). These areas are also important to many waterfowl species that may migrate through or nest in the area.

Wetlands in the Eastern Broadleaf Forest (Oceanic) Ecoregion portion of the project area include approximately: 365,390 acres of forested and scrub-shrub wetlands; 54,190 acres of emergent wetlands; 239,745 acres of lakes; 53,850 acres of ponds; and 38,355 acres of riverine habitats (USDOI, 2010b). This area sits too far from the coast to have any marine and estuarine systems.

**Floodplain forest**

(NH Dept. of Forests and Lands)

The Batten Kill River, the Champlain Canal, and Cossayuna Lake in New York State are within this province and the project area.

The Ohio River in Ohio and Pennsylvania sits at the southern extreme of the study area and the upper Cuyahoga also flows through both of these states within the study area. Other rivers in Pennsylvania include the Shenango, Beaver, and Allegheny, and the French and Neshannock creeks. Other rivers in Ohio include Little Beaver and Sandy creeks, the Tuscarawas River, and the Mahoning River.

Important lakes in Pennsylvania include: the Shenango River, Mahoning Creek, Crooked Creek, and Woodcock Creek lakes, along with lakes Tionesta, Arthur, and Wilhelm. Important lakes in Ohio include Atwood, Berlin, Salt Fork, Piedmont, Mosquito Creek, Senecaville, Tappan, and Leesville.

### 1.11.7 AQUATIC RESOURCES

Aquatic resources are highly regarded within the ecoregion due to the area’s excellent fish diversity. The abundant rivers and estuaries offer fishing for many freshwater and marine species.

Accidental introductions of invasive species have negative impacts on aquatic resources, damaging fisheries and native habitats. Common invasive plant species of concern in this province include purple loosestrife (*Lythrum salicaria*), yellow loosestrife (*Lysimachia vulgaris*), reed canary grass (*Phalaris arundinacea*), curly pondweed (*Potamogeton crispus*), and flowering rush (*Butomus umbellatus*). Invasive animal species of concern include the Asian clam

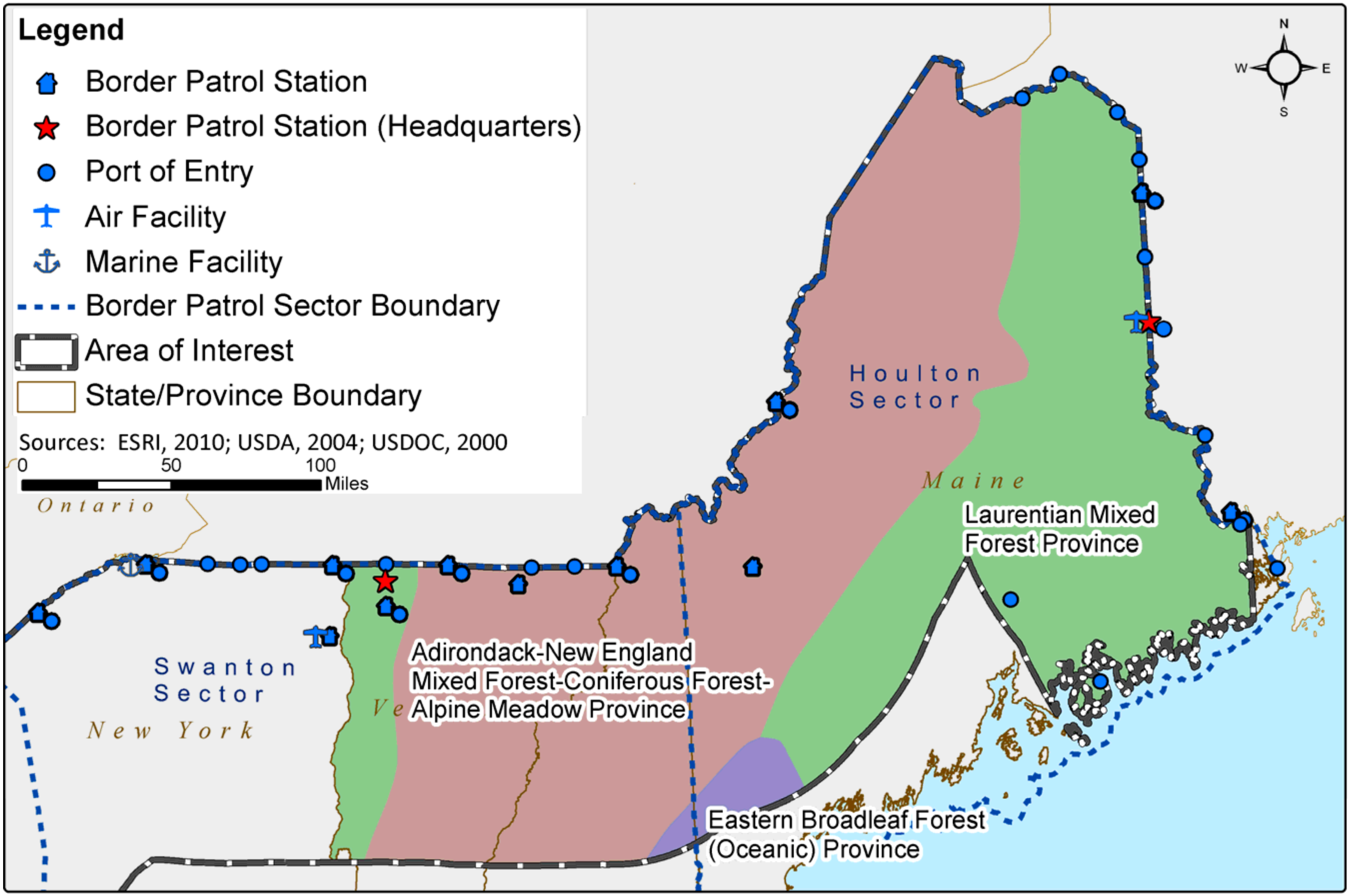
(*Corbicula fluminea)*, rusty crayfish (*Orconectes rusticus*), northern snakehead (*Channa argus)*, zebra mussel (*Dreissena polymorpha*), and quagga mussel (*D. rostriformis bugensis)* among others. Species such as the rusty crayfish reduce the amount of aquatic vegetation and compete with native crayfish.

## 1.12 ADIRONDACK- NEW ENGLAND MIXED FOREST CONIFEROUS FOREST–ALPINE MEADOW ECOREGION (M212)

The Adirondack–New England Mixed Forest–Coniferous Forest-Alpine Meadow Ecoregion has areas of both coniferous and deciduous forest cover with some alpine meadows near the timberline (Figure L-4 and Figure L-5). Aquatic resources, similar to those in the Laurentian region, range from lakes to conifer bogs and swamps

States in this province include Maine, New Hampshire, Vermont, and New York.

**Figure L-5. Ecoregions in the New England Region**



The Adirondack–New England Mixed Forest Coniferous Forest–Alpine Meadow Ecoregion is a mountainous region that transitions between true spruce-fir forest in the north to deciduous forest in the south. The growth forms and species of this forested province are similar to those further north, but red spruce (*Picea rubens)* grows here instead of white spruce (*P. glauca)*. Vegetation zones occur, with both elevation and latitudinal aspects. Mountain slopes at lower elevations are mixed forest, typically composed of spruce, fir, maple (*Acer* spp.*)*, and birch (*Betula* spp.*)*. The effect of latitude is also noticeable; for example, from north to south, the approximate limit of spruce and fir is 500 feet (150 meters) on Mt. Katahdin, 2,500 feet (800 meters) in the White Mountains, 3,000 feet (900 meters) in the Adirondack Mountains, and 3,500 feet (1,100 meters) in the Catskills. A stunted forest zone occurs above the mixed-forest zone, with underdeveloped stands of balsam fir and red spruce at higher elevations.

**White Mountains in New Hampshire**

(New Hampshire Historical Society)

The historic forests of the ecoregion are recovering from an array of previous disturbances, including forest clearing for agriculture, logging, and fires of the 18th and 19th centuries (Niering, 1998). Landscapes in this region have shifted from largely forested during pre-colonial times to agricultural in the 19th century; they are currently re-establishing as forest (Latty et al., 1994).

The climate of this province is defined by its warm summers and cold winters. Nearby moist air masses above the northwestern Atlantic cause precipitation to be fairly evenly distributed throughout the seasons. This aspect of the climate differs from that of the Laurentian Mixed Forest Province. Winters in this region are often severely cold, but moderate towards the ocean. Average annual temperatures range from 37 to 52 degrees Fahrenheit (3 to 11 degrees Celsius). The frost-free period is about 100 days on average. Precipitation near Albany, New York averages 35 inches (89 centimeters) per year, while snowfall averages above 100 inches (255 centimeters) each year.

Agriculture and silviculture comprise two of the dominant economic activities in the Laurentian region. Common agricultural practices include row crop, dairy, grazing, orchard, and vegetable crop production.  Silviculture is common on publicly and federally owned lands in hardwood and coniferous forests.

Historic fire regimes have been suppressed in forests in this area in recent times.  These forests are characterized by large blowdowns from severe wind as well as smaller blowdowns.  Higher-elevation forests often exhibit an even-aged windthrow disturbance known as fir waves.  Insect and disease damage has resulted from gypsy moth (*Lymantria dispar)*, Eastern spruce budworm (*Choristoneura fumiferana)*, spruce beetle (*Dendroctonus rufipennis)*, severe beech bark disease (*Nectria coccinea)*, and butternut canker (*Sirococcus clavigignenti-juglandacearum)* infestations. Forests at lower elevations have been influenced by agriculture since colonial times and more recently by farm abandonment, as well as by selective logging of certain species (McNab and Avers, 1994).

Across this region, the distributions of both modern-day and pre-settlement forest types are similar, but 250 years of land use has affected forest structure and composition.  Both selective and intensive logging has taken place for more than 200 years.  Forest has been cleared and the land farmed dating to early Euro-American settlement.  Since approximately the 1870s, land not suitable for farming has been abandoned and, in many cases, allowed to return to forest. Deciduous forests are more extensive now than in pre-settlement times due to logging of conifers through the start of the 20$^{th}$ century, followed by periods of fire.

### 1.12.1  REMAINING BLOCKS OF REGIONALLY SIGNIFICANT HABITAT

The blocks of regionally significant habitat listed below are relatively undeveloped and intact habitat protected as wilderness, state parks, and state and national forests.  “Intact habitat” or regionally significant habitat refers to areas of largely unfragmented habitat with few alterations or disturbances, such as roads or other development.  Most areas listed are protected by law (wilderness areas, national parks) and often cross state and country boundaries, while others may occupy large expanses of private lands.

Selected regionally significant blocks that represent this region include:

- Adirondack Park–New York;
- Baxter State Park–Maine;
- Big Reed Forest–Maine;
- Green Mountains–Vermont;
- Mahoosuc Mountains–Maine;
- Nash Stream Forest–New Hampshire; and,
- White Mountains–New Hampshire.

**Adirondack Park**

(New York Department of Conservation)

### 1.12.2 SENSITIVE HABITATS

Within a 100-mile zone adjacent to the U.S.-Canada border are several ecological communities that represent sensitive habitats. The sensitive habitats described here occur in many of the larger intact habitat areas in the prior section and house many of the threatened and endangered species in the next section. For example, hardwood swamps occupy many forested areas in this broad geographic region and are home to rare or protected species, such as the sharp-scaled manna-grass (*Glyceria acutiflora*), as well as a wide variety of common plants, such as cinnamon fern (*Osmunda cinnamomea*). Some habitat names used below, such as hardwood swamp, can describe habitats across several regional boundaries and are more general in meaning. Others, such as subalpine krummholz (stunted coniferous trees near the tree line), define much more specific ecological associations.

**Cinnamon fern**

(Wisconsin State Herbarium)

Many of these habitats are very fine in scale and form a patchwork of biologically sensitive and diverse areas. The list of sensitive habitats is based on those enumerated and described by the WWF (2001), ecological system descriptions within the NatureServe.org database, and each state's respective natural resources agency.

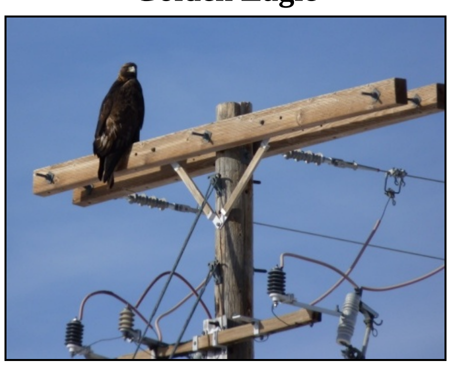
- Hardwood swamps–Deciduous forested wetlands;
- Limestone bluff cedar-pine forests–Forests of these species on limestone bedrock;
- Alpine Meadow–Open areas on Adirondack Province mountains, generally above 3,500 feet where cold temperatures and high winds favor a community of ground-layer plants that can tolerate such conditions;
- Subalpine krummholz–Stunted wind-shaped coniferous forest below the timberline;
- Montane yellow birch-red spruce forest – Birch-fir forests on mountain slopes;
- Montane spruce-fir forest–Spruce-fir forest on mountain slopes;
- Cold-air talus woodland–Talus areas with large, ice-cooled boulders where the microclimate supports black and red spruce, heaths, and evergreen shrubs;
- Pitch pine-oak-heath rocky summit–Lower-elevation transition zone with pitch pine, oak, and an associated shrub zone;
- Acadian-Appalachian montane spruce-fir forest–Spruce-fir forest on mountain slopes;
- Acadian-Appalachian alpine tundra–Tundra vegetation above the timberline; and,
- Northeastern interior pine barrens–Dry pine forest on sandy, acidic, nutrient-poor soil

### 1.12.3 THREATENED AND ENDANGERED SPECIES

Appendix F3 lists the threatened and endangered species in this ecoregional province. Examples of federally listed species in this region include the Karner blue butterfly (*Lycaeides melissa samuelis*), Indiana bat (*Myotis sodalis*), and Canada lynx (*Lynx canadensis*). The eastern mountain lion (*Puma concolor*), a federally listed species, also lives in this region. Since the eastern mountain lion is a federally listed species, wildlife refuges already have plans in place for monitoring or recovery of the species' population.

Examples of state-listed endangered species include the peregrine falcon in Maine; the golden eagle (*Aquila chrysaetos*) and common nighthawk (*Chordeiles minor*) in New Hampshire; and the spruce grouse (*Falcipennis candensis*) in Vermont and New York.

**Golden Eagle**



(Kevin Kowalchuk)

Although some species are listed as endangered or threatened at either the Federal or state level, other species are categorized differently as of "conservation concern" or "special concern."

### 1.12.4 WILDLIFE

The spruce-fir forests of this province have a well-developed canopy. Examples of wildlife species using this habitat at higher elevations include grouse and woodpeckers. Black bear (*Ursus americanus*), snowshoe hare (*Lepus americanus*), salamanders, and turtles are just a few of the many species that occupy lower-elevation forests.

In forested habitats, the merlin (*Falco columbarius*), the northern goshawk (*Accipiter gentilis*), and black-backed woodpecker (*Picoides arcticus*) represent some of the sensitive species. Many bird species migrate into or out of this province twice each year, including more than 20 species of warblers, the rose-breasted grosbeak (*Pheucticus ludovicianus*), golden-crowned kinglet (*Regulus satrapa*), and hermit thrush (*Catharus guttatus*). More than 300 total bird species breed in, migrate through, or overwinter in this ecoregion (LePage, 2011). Some bird species ("permanent residents"), most mammal species other than migratory bats, reptiles, and amphibians remain in the province year-round.

### 1.12.5 VEGETATIVE HABITAT

Northern hardwood-spruce and northeastern spruce-fir forest dominate the vegetative cover within the province. Regionally defined important vegetation communities include highland spruce-fir, lowland spruce-fir, northern hardwood-conifer, alpine krummholz (stunted coniferous trees near the tree line), and alpine meadow habitat. Typically dominant species include sugar maple (*Acer saccharum)* and American beech (*Fagus grandiflora)*, with some stands containing Canadian hemlock (*Tsuga canadensis*).

**Sugar maple**

(Cindy Kowalchuk)

Common invasive species of concern include purple loosestrife (*Lythrum salicaria)*, hydrilla (*Hydrilla verticillata)*, flowering rush (*Butomus umbellatus)*, goutweed (*Aegopodium podagraria)*, crofton weed (*Ageratina adenophora)*, tree of heaven (*Ailanthus altissima)*, reed canarygrass (*Phalaris arundinacea)*, orange hawkweed (*Hieracium aurantiacum)*, garlic mustard

(*Alliaria petiolata)*, Oriental bittersweet (*Celastrus orbiculatus),* dodder (*Cuscuta* spp.*)*, curly pondweed (*Potamogeten crispus)*, and Eurasian watermilfoil (*Myriophyllum spicatum*), among others.

### 1.12.6 WETLANDS AND WATERWAYS

Wetlands in the study area include approximately: 781,790 acres of forested and scrub-shrub wetlands; 123,175 acres of emergent wetlands; 734,400 acres of lakes; 39,380 acres of ponds; and 365,000 acres of riverine habitats (USDOI, 2010b). This area is too far from the coast for marine and estuarine systems, but lakes and forested wetlands are abundant.

Major rivers in this ecoregion include: the Allagash in Maine; the Androscoggin, Pemigewasset, Saco, Merrimack, and Ammonoosuc in New Hampshire; the Connecticut between New Hampshire and Vermont; the Missisquoi and Passumpsic in Vermont; and the Saranac and St. Regis in New York. Important lakes include: Mooselookmeguntic, Flagstaff, Brassua, and Moosehead in Maine; the Connecticut Lakes, Winnipesaukee, Ossipee, Sunapee, Newfound, and Umbagog in New Hampshire; Saranac and Oneida in New York; and Champlain and Memphremagog in Vermont. Notable wetlands include: the large tertiary peat bogs of Maine; the Hurlbert (Atlantic white cedar) Swamp in New Hampshire (The Nature Conservancy, 2010b); the LaPlatte River Marsh and Gillette Swamp in Vermont; and the Spring Pond Bog in New York (The Nature Conservancy, 2010c).

**Spring Pond Bog**

(Edwin Romanowicz)

### 1.12.7 AQUATIC RESOURCES

The aquatic resources in this province are highly regarded due to the richly diverse fish populations. Large lakes, rivers, and streams constitute important habitat for freshwater fish in this province. Fish species include largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), walleye (*Sander vitreus*), northern pike (*Esox lucius*), brook trout (*Salvelinus fontinalis*), and rainbow trout (*Oncorhynchus mykiss)*.

Invasive plants and animals alter habitat quality and suitability for a wide variety of native plant and animal species.  Some of the invasive aquatic species with the potential for introduction include the giant snakehead (*Channa micropeltes*).

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# APPENDIX M

# LIST OF THREATENED AND ENDANGERED SPECIES BY STATE IN THE NORTHERN BORDER AREA

## Table M–1. Threatened and Endangered Species in Idaho

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| White sturgeon | *Acipenser transmontanus* | Fish | Kootenai River system; swift currents with large cobbles | SE | FE | Boundary | ID | | WOR |
| Bull trout | *Salvelinus confluentus* | Fish | High-altitude, cold-water streams. Designated critical habitat: 69 FR 59996 60076; 70 FR 56212 56311; and 75 FR 63898 64070. | ST | FT | Bonner, Boundary, Kootenai, Shoshone | ID | | WOR |
| Gray wolf | *Canis lupus* | Mammal | Northern forests | SE | FE | Bonner, Kootenai, Shoshone | ID | Idaho.gov website says this mammal is endangered north of I-90 | WOR |
| Canada lynx | *Lynx canadensis* | Mammal | Northern forests. Designated critical habitat: 74 FR 8616 8702. | ST | FT | Bonner, Boundary, Kootenai, Shoshone | ID | | WOR |
| Woodland caribou | *Rangifer tarandus caribou* | Mammal | Old-growth cedar and hemlock forests near mountains | SE | FE | Bonner, Boundary | ID | | WOR |
| Grizzly bear | *Ursus arctos horribilis* | Mammal | Northern woodlands, meadows, and mountains | ST | FT | Bonner, Boundary | ID | | WOR |
| Bog rosemary | *Andromeda polifolia* | Plant | Bogs in cold, peat-accumulating areas | S1 | | Bonner, Boundary | ID | | WOR |
| Maidenhair spleenwort | *Asplenium trichomanes* | Plant | Acidic rocks such as sandstone, basalt, and granite; very rarely on calcareous rocks | S1 | | Boundary | ID | | WOR |
| Bourgov's milkvetch | *Astragalus bourgovii* | Plant | On rocky crests and summits, talus slopes, cliff ledges, and open rocky hillsides | S1 | | Shoshone | ID | | WOR |
| Litte grapefern | *Botrychium simplex* | Plant | Open habitats in pastures, meadows, orchards, prairies, wetlands, fens, sand dunes, and in lake and stream edge vegetation | S2 | | Bonner, Boundary | ID | | WOR |
| Creeping sedge | *Carex chordorrhiza* | Plant | Fens, bogs, floating mats on lakeshores, emergent sedge marshes; usually in very wet sites, often in shallow water | S1 | | Bonner, Boundary, Kootenai | ID | | WOR |
| Longhair sedge | *Carex comosa* | Plant | Marshes, lake shores, and wet meadows | S1 | | Bonner, Boundary | ID | | WOR |
| Hairy sedge | *Carex lacustris* | Plant | Open swamps, wet, open thickets, marsh edges, sedge meadows, fens; shores of streams, ponds, and lakes | S1 | | Bonner, Boundary | ID | USDA only lists Boundary | WOR |
| Boreal Bog sedge | *Carex magellanica* ssp. *irrigua* | Plant | Marshes, bogs, fens, wet meadows, and swampy areas | S2 | | Bonner, Boundary | ID | | WOR |
| Greater yellow lady's-slipper | *Cypripedium parviflorum* var. *pubescens* | Plant | Fens, damp mossy woods, seepage areas, and moist forest-meadow ecotones in the valley to lower montane zones | S1 | | Bonner, Boundary, Kootenai, Shoshone | ID | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Spoonleaf sundew | *Drosera intermedia* | Plant | Shallow water in bogs and seeps | S1 | | Boundary | ID | | WOR |
| Thinleaf cottonsedge | *Eriophorum viridi-carinatum* | Plant | Wet meadows, swampy woods, bogs, fens | S1 | | Bonner, Boundary | ID | | WOR |
| Creeping snowberry | *Gaultheria hispidula* | Plant | Cool, damp, wet woods and boggy places; often on rotting logs, sphagnum hummocks, and other moss-covered substrates | S2 | | Bonner, Boundary | ID | | WOR |
| Water howellia | *Howellia aquatilis* | Plant | Glacial potholes and former river oxbows | ST | FT | Kootenai, Shoshone | ID | | WOR |
| Lung lichen | *Lobaria scrobiculata* | Plant | On shaded northern aspects; talus and rubble slopes | S2 | | County data not available | ID | | WOR |
| Manyfruit primrose-willow | *Ludwigia polycarpa* | Plant | Prairies, meadows, fields | S1 | | Kootenai | ID | | WOR |
| Inundated clubmoss | *Lycopodiella inundata* | Plant | Wet, organic soil of nutrient-poor fens in the valley and lower montane zones | S2 | | Bonner, Boundary, Kootenai | ID | | WOR |
| False lily of the valley | *Maianthemum dilatatum* | Plant | Moist soil in shady wooded areas | S1 | | Bonner | ID | | WOR |
| Wingstem monkeyflower | *Mimulus alsinoides* | Plant | Shaded mossy slopes | S1 | | Shoshone | ID | | WOR |
| Threeleaf woodsorrel | *Oxalis trilliifolia* | Plant | Dense conifer forests at low to mid elevations | S1 | | Bonner, Boundary | ID | | WOR |
| Long beechfern | *Phegopteris connectilis* | Plant | Moist, strongly to moderately acid soil; on rocks in shaded rock crevices | S2 | | Bonner, Boundary | ID | | WOR |
| Nail lichen | *Pilophorus acicularis* | Plant | On rocks in *Thuja* forest, rocks near streams, and moist, shady areas | S2 | | County data not available | ID | | WOR |
| Nail lichen or tapered matchstick | *Pilophorus clavatus* | Plant | Within mossy ground-layer colonies | S1 | | County data not available | ID | | WOR |
| Braun's hollyfern | *Polystichum braunii* | Plant | Cool, moist northern forests; rocky substrates | S2 | | Bonner, Boundary | ID | | WOR |
| Cartilage lichen | *Ramalina pollinaria* | Plant | On bark, twigs, and wood of conifers, hardwoods, shrubs, and, rarely, rocks | S2 | | County data not available | ID | | WOR |
| Naked rhizomnium moss | *Rhizomnium nudum* | Plant | Boreal and temperate forests on soil, humus, or rotten logs; often along streams or in damp depressions | S2 | | *Bonner, Boundary, Kootenai, Shoshone | ID | Only Kootenai is listed on the Idaho.gov page. | WOR |
| White beaksedge | *Rhynchospora alba* | Plant | Acid, sphagnous, boggy, open sites; poor fens; often on floating mats or peaty interstices of rocky shores | S1 | | Bonner, Boundary, Kootenai | ID | | WOR |
| Redflower currant | *Ribes sanguineum* | Plant | Well-drained sunny forest edges or rocky slopes at mid to low elevations | S1 | | Bonner, Kootenai | ID | | WOR |
| Salmonberry | *Rubus spectabilis* | Plant | Moist to wet places from streambanks to wooded areas, from low to subalpine elevations | S1 | | *Bonner, Boundary, Kootenai | ID | USDA only lists Bonner | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Bog willow | *Salix pedicellaris* | Plant | Neutral bogs, sedge meadows, and willow thickets at the edge of wet meadows | S2 | | Bonner, Boundary | ID | | WOR |
| Rannoch-rush | *Scheuchzeria palustris* | Plant | Sphagnum bogs, marshes, and lake margins | S2 | | Bonner, Boundary, Kootenai | ID | | WOR |
| Spalding's silene | *Silene spaldingii* | Plant | Mesic grassland prairies | ST | FT | Kootenai, Shoshone | ID | | WOR |
| Peatmoss | *Sphagnum mendocinum* | Plant | Montane bog community; perennially wet seepage area | S2 | | Bonner | ID | | WOR |
| Purple meadow-rue | *Thalictrum dasycarpum* | Plant | Deciduous, riparian woods, damp thickets, swamps, wet meadows, and prairies | S1 | | Bonner, Boundary, Kootenai | ID | | WOR |
| Whiteworm lichen | *Thamnolia subuliformis* | Plant | Alpine soils | S1 | | Shoshone | ID | | WOR |
| Sticky tofieldia | *Triantha occidentalis* ssp. *brevistyla* | Plant | Moist tundra in the alpine zone | S1 | | Bonner | ID | | WOR |
| Alpine bulrush | *Trichophorum alpinum* | Plant | Open or shaded, wet, peaty/gravelly fens, bogs, sheltered banks of lakes, ponds, and streams, tending to occur on lime-rich substrates | S1 | | Boundary | ID | | WOR |
| Largespore ulota moss | *Ulota megalospora* | Plant | On twigs and branches in the canopy of old-growth forests at low to mid elevations | S1 | | County data not available | ID | | WOR |
| Small cranberry | *Vaccinium oxycoccos* | Plant | Moist to very wet, nitrogen-poor soils and high surface groundwater; coniferous swamps | S2 | | Bonner, Boundary, Kootenai | ID | | WOR |
| Selkirk's violet | *Viola selkirkii* | Plant | Moist, shaded ravines and cold boreal and hardwood forests throughout its North American distribution | S1 | | County data not available | ID | | WOR |

Sources: IDFG, 2009; IDFG, 2010; IDFG, 2011

Some discrepancy exists between U.S. Fish and Wildlife Service (USFWS) and state agency lists concerning status and county locations for certain species. Status designations do not include state-designated sensitive species or monitored species. Refer to ID Fish and Game Dept. for those species

**THREAT STATUS DESIGNATIONS**

SE State Endangered
ST State Threatened
S1 State Priority: Taxa in danger of becoming extinct or extirpated from Idaho in the foreseeable future if identifiable factors contributing to their decline continue to operate; these are taxa with populations at critically low levels or with required habitats degraded or depleted to a significant degree.
S2 2 = State Priority. Taxa likely to be classified as Priority 1 within the foreseeable future in Idaho, if factors contributing to their population decline or habitat degradation or loss continue.

FE Federally Endangered
FT Federally Threatened
FC Federal Candidate Species
* See note column

**NORTHERN BORDER PEIS REGIONS**

GL Great Lakes
EOR East of the Rockies
NE New England
WOR West of the Rockies

## Table M–2. Threatened and Endangered Species in Maine

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| American pipit | *Anthus rubescens* | Bird | Arctic or alpine tundra; grass and sedge meadows | SE | | Piscataquis | ME | Breeding population only | NE |
| Arctic tern | *Sterna paradisaea* | Bird | Treeless islands with low-growing vegetation | ST | | Cumberland, Hancock, Sagadahoc, Washington, Waldo | ME | Southern coastline | NE |
| Atlantic puffin | *Fratercula arctica* | Bird | Isolated, rocky islands | ST | | Waldo, Hancock | ME | Southern coastline | NE |
| Barrow's goldeneye | *Bucephala islandica* | Bird | Isolated islands and shorelines | ST | | Aroostook, Hancock, Kennebec, Somerset, Penobscot, Piscataquis, Washington | ME | Southern coastline | NE |
| Black tern | *Chlidonias niger* | Bird | Marine and coastal areas surrounded by densely vegetated still waters | SE | | Aroostook, Kennebec, Penobscot, Piscataquis, Somerset, Waldo, Washington | ME | | NE |
| Black-crowned night heron | *Nycticorax nycticorax* | Bird | Fresh and salt waters, marshes, swamps, lakes, and streams | ST | | County information unavailable | ME | | NE |
| Common moorhen | *Gallinula chloropus* | Bird | Freshwater wetlands with emergent vegetation | ST | | County information unavailable | ME | | NE |
| Golden eagle | *Aquila chrysaetos* | Bird | Mountainous areas with rugged and open topography; tundra and alpine areas | SE | | Aroostook, Franklin, Oxford, Piscataquis, Somerset | ME | Range in Maine, although no known locations. | NE |
| Grasshopper sparrow | *Ammodramus savannarum* | Bird | Grasslands of 30 acres or more with short, native bunch grasses, patches of bare ground, scattered forbs, and short shrubs | SE | | Cumberland, Kennebec, Sagadahoc, York | ME | Only four known locations | NE |
| Great cormorant | *Phalacrocorax carbo* | Bird | Isolated islands and shorelines on larger, open bodies of water | ST | | County information unavailable | ME | Breeding population only | NE |
| Harlequin duck | *Histrionicus histrionicus* | Bird | Exposed rock shorelines of coastal islands | ST | | Cumberland, Hancock, Sagadahoc, Washington, York | ME | Along entire coastline | NE |
| Least bittern | *Lxobrychus exilis* | Bird | Freshwater wetlands with emergent vegetation, such as bogs, swamps, and wet meadows | SE | | County information unavailable | ME | | NE |
| Least tern | *Sterna antillarum* | Bird | Shallow, open-water areas, stream and river outlets, tidal ponds, and salt marshes | SE | | Cumberland, Sagadahoc, York | ME | Coastal bird. Locations just outside buffer, but range is within buffer | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Peregrine falcon | *Falco peregrinus* | Bird | Cliffs or overhangs close to water | SE | | Franklin, Hancock, Oxford, Penobscot, Piscataquis, Somerset, Washington | ME | Breeding population only | NE |
| Piping plover | *Charadrius melodus* | Bird | Beaches, mudflats, sandflats, tidal ponds, and salt marshes; nest sites include open sand, gravel, or shell-covered beaches above high tide; preferred sites include sand spits, barrier islands, blowout areas in dunes, and dredge spoil | SE | FT | Cumberland, Sagadahoc, York | ME | Breeding population only | NE |
| Razorbill | *Alca torda* | Bird | Rocky isolated islands with deep rock fissures | ST | | Washington | ME | 330 nesting pairs in Gulf of Maine | NE |
| Roseate tern | *Sterna dougallii* | Bird | Salt marsh islands; beaches with sparse vegetation | SE | FE | Cumberland, Hancock, Sagadahoc, Washington, York | ME | | NE |
| Sedge wren | *Cistothorus platensis* | Bird | Upland boarders of freshwater meadows; tall grasses and shrubs; little to no standing water preferred. | SE | | Statewide | ME | Occur statewide but with patchy distribution | NE |
| Short-eared owl | *Asio flammeus* | Bird | Open country, prairies, savannas, marshes with available perches | ST | | County information unavailable | ME | Breeding population only | NE |
| Upland sandpiper | *Bartramia longicauda* | Bird | Large, shortgrass areas | ST | | Androscoggin, Aroostook, Cumberland, Hancock, Franklin, Kennebec, Penobscot, Somerset, Waldo, Washington, York | ME | | NE |
| Atlantic salmon | *Salmo salar* | Fish | Large, cool (freshwater) rivers for spawning; salt water for feeding and growth | | FE | Androscoggin, Aroostook, Cumberland, Franklin, Hancock, KennebecPenobscot, Piscataquis, Sagadahoc, Somerset, Waldo, Washington, York | ME | | NE |
| Redfin pickerel | *Esox americanus americanus* | Fish | Thick, vegetated, slow-moving streams; shallows of lakes and ponds | SE | | County information unavailable | ME | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Shortnose sturgeon | *Acipenser brevirostrum* | Fish | Large rivers and associated estuaries | | FE | USFWS lists as statewide; ME lists Hancock, Kennebec, Penobscot, Sagadahoc, Waldo only; the Kennebec River system which includes the Androscoggin and Sheepscot Rivers, and Penobscot River in Maine | ME | | NE |
| Swamp darter | *Etheostoma fusiforme* | Fish | Weedy, freshwater swamps, ponds, and slow-moving streams | ST | | York | ME | | NE |
| Boreal snaketail | *Ophiogomphus colubrinus* | Insect | Rapid-flowing streams in boreal forests | ST | | County information unavailable | ME | | NE |
| Clayton's copper | *Lycaena dorcas claytoni* | Insect | Found only in association with shrubby cinquefoil, which requires limestone soils | SE | | Aroostook, Penobscot, Piscataquis | ME | | NE |
| Edwards' hairstreak | *Satyrium edwardsii* | Insect | Dry oak thickets in pine woodlands or open areas; host plant is the scrub oak | SE | | Oxford, York | ME | Only three known populations | NE |
| Roaring brook mayfly | *Epeorus frisoni* | Insect | High-gradient, clear, mountain stream; large boulders and granite bottom | SE | | Piscataquis | ME | Currently known only from Roaring Brook at the base of Mt. Katahdin | NE |
| Juniper hairstreak | *Callophrys gryneus* | Insect | Open, mature fields with variety of nectar sources; host plant is red cedar | SE | | County information unavailable | ME | | NE |
| Katahdin arctic | *Oeneis polixenes katahdin* | Insect | Treeless, alpine, tundra-like habitat; edge and grass meadows with moss -covered, granite boulders | SE | | Piscataquis | ME | Katahdin subspecies found nowhere else in the world except the summit of Mt. Katahdin in Baxter State Park | NE |
| Pine barrens zanclognatha | *Zanclognatha martha* | Insect | Pine barrens in sandy soils | ST | | Oxford, York | ME | | NE |
| Purple lesser fritillary | *Boloria chariclea grandis* | Insect | Wet meadows and bogs with sufficient nectar sources | ST | | County information unavailable | ME | | NE |
| Rapids clubtail | *Gomphus quadricolor* | Insect | Clean, cool streams with rapids, exposed rock, and quiet pools | SE | | County information unavailable | ME | | NE |
| Ringed boghaunter | *Williamsonia lintneri* | Insect | Fens, bogs, and wetlands with sphagnum mosses | ST | | Oxford, York | ME | Found at only six sites in York and southern Oxford counties | NE |
| Sleepy duskywing | *Erynnis brizo* | Insect | Forest edges, oak savannas | ST | | County information unavailable | ME | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Tomah mayfly | *Siphlonisca aerodromia* | Insect | Small rivers and streams bordered by flooding sedge meadows | ST | | Aroostook, Franklin, Hancock, Penobscot, Piscataquis, Somerset, Washington | ME | | NE |
| Twilight moth | *Lycia rachelae* | Insect | Pine-scrub oak barrens | ST | | Oxford, York | ME | | NE |
| Canada lynx | *Lynx canadensis* | Mammal | Boreal forests. Designated critical habitat: 74 FR 8616 8702. | | FT | Aroostook, Franklin, Oxford, Penobscot, Piscataquis, Somerset, Washington | ME | | NE |
| Finback whale | *Balaenoptera physalus* | Mammal | Oceans, offshore | | FE | Cumberland, Hancock, Sagadahoc, Washington, York | ME | | NE |
| Humpback whale | *Megaptera novaeangliae* | Mammal | Oceans, nearshore | | FE | Cumberland, Hancock, Sagadahoc, Washington, York | ME | | NE |
| New England cottontail | *Sylvilagus transitionalis* | Mammal | Native shrublands or wetlands; regenerated forests and dense thickets | SE | | County information unavailable | ME | | NE |
| Northern bog lemming | *Synaptomys borealis* | Mammal | Wet meadows or boggy areas associated with spruce forests | ST | | Franklin, Piscataquis | ME | | NE |
| Right whale | *Balaena glacialis* | Mammal | Temperate-cool seas at ocean surface | | FE | Cumberland, Hancock, Sagadahoc, Washington, York | ME | | NE |
| Brook floater | *Alasmidonta varicosa* | Mollusk | Small to large rivers with clean water and sandy-gravel substrates | ST | | County information unavailable | ME | | NE |
| Tidewater mucket | *Leptodea ochracea* | Mollusk | Coastal lakes, ponds, and slow rivers; variety of bottom types | ST | | Aroostook, Hancock, Kennebec, Penobscot, Piscataquis, Sagadahoc, Somerset, Waldo | ME | | NE |
| Yellow lampmussel | *Lampsilis cariosa* | Mollusk | Coastal lakes, ponds, and slow rivers; variety of bottom types | ST | | Aroostook, Hancock, Kennebec, Penobscot, Piscataquis, Sagadahoc, Somerset, Waldo, Washington | ME | | NE |
| Alaskan clubmoss | *Diphasiastrum sitchense* | Plant | Barrens, mountain slopes and summits; open thickets | ST | | Aroostook, Piscataquis | ME | | NE |
| Aleutian maidenhair fern | *Adiantum aleuticum* | Plant | Serpentine or other magnesian rock; magnesian limestone; ascending to subalpine areas | SE | | County information unavailable | ME | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Allegheny vine | *Adlumia fungosa* | Plant | Wet or recently burned woods; rocky wooded slopes | ST | | Aroostook, Cumberland, Hancock, Franklin, Kennebec, Oxford, Penobscot, Waldo | ME | | NE |
| Alpine azalea | *Loiseleuria procumbens* | Plant | Peaty or rocky exposed habitats | ST | | Piscataquis | ME | | NE |
| Alpine bearberry | *Arctostaphylos alpina* | Plant | Alpine areas | ST | | Piscataquis | ME | | NE |
| Alpine bistort | *Persicaria vivipara* | Plant | Cool or damp slopes; gravels or wet rock; subalpine and alpine areas | SE | | Piscataquis | ME | | NE |
| Alpine bitter-cress | *Cardamine bellidifolia* | Plant | Alpine brooks; in cold ravines or on wet, mossy rocks | SE | | Penobscot, Piscataquis | ME | | NE |
| Alpine clubmoss | *Huperzia selago* | Plant | Damp or mossy rocks, barrens, cold woods | ST | | Franklin, Hancock, Oxford, Piscataquis, Somerset, Washington | ME | | NE |
| Alpine cudweed | *Omalotheca supina* | Plant | Alpine places | SE | | Piscataquis | ME | | NE |
| Alpine marsh violet | *Viola palustris* | Plant | Alpine brooksides and damp slopes | SE | | County information unavailable | ME | | NE |
| Alpine rush | *Juncus alpinoarticulatus* | Plant | Wet meadows, sand and gravel calcareous shores, fens, and clayey pools over rock | ST | | Aroostook, Kennebec, Sagadahoc | ME | | NE |
| Alpine speedwell | *Veronica wormskjoldii* | Plant | Cool ravines, wet moss, and alpine rocks | SE | | Piscataquis | ME | | NE |
| Alpine sweet-grass | *Hierochloe alpina* | Plant | On siliceous rock, dry peat, and mountains | ST | | Franklin, Oxford, Piscataquis, Somerset | ME | | NE |
| Alpine willow-herb | *Epilobium anagallidifolium* | Plant | Damp moss; on wet rock in alpine areas | SE | | Franklin, Piscataquis | ME | | NE |
| American ginseng | *Panax quinquefolius* | Plant | Rich, shady northern hardwood forests | SE | | Androscoggin, Franklin, Kennebec, Oxford, Piscataquis, Somerset | ME | | NE |
| American sea-blite | *Suaeda calceoliformis* | Plant | Rocky or gravelly saltmarshes and sea-strands | ST | | Cumberland, Hancock, Sagadahoc | ME | | NE |
| Anticosti aster | *Symphyotrichum anticostense* | Plant | Circumneutral, cobble river shores | SE | | County information unavailable | ME | | NE |
| Arctic red fescue | *Festuca prolifera* | Plant | Moist alpine rills above treeline | SE | | County information | ME | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| | | | | | | unavailable | | | |
| Arctic sandwort | *Minuartia rubella* | Plant | Calcareous or magnesian rocks and gravel; rocky summits and outcrops | ST | | County information unavailable | ME | | NE |
| Arctic willow | *Salix arctophila* | Plant | Barrens, meadows, and alpine regions | SE | | Piscataquis | ME | | NE |
| Auricled twayblade | *Listera auriculata* | Plant | Alluvial banks, calcareous silts or crevices, alder-thickets, and swamps | ST | | Aroostook, Franklin, Hancock, Penobscot, Piscataquis, Somerset | ME | | NE |
| Autumn coral-root | *Corallorrhiza odontorhiza* | Plant | Dry woodlands | SE | | York | ME | | NE |
| Back's sedge | *Carex backii* | Plant | Dry, rocky, open, or shaded slopes, ridges, and barrens; hardwood, mixed, or coniferous forests; acidic and calcareous substrates | SE | | Franklin, Oxford, Penobscot, York | ME | | NE |
| Barren-strawberry | *Waldsteinia fragarioides* | Plant | Woods, thickets, and clearings | SE | | Kennebec | ME | | NE |
| Beach plum | *Prunus maritima* | Plant | Sandy soil along or near the coast | SE | | Cumberland, York | ME | | NE |
| Bearberry willow | *Salix uva-ursi* | Plant | Barrens and alpine areas | ST | | Franklin, Piscataquis, Somerset | ME | | NE |
| Blue-leaf willow | *Salix myricoides* | Plant | Banks of streams, pond-shores, and low thickets | SE | | Aroostook, Franklin, Somerset, Washington | ME | | NE |
| Blunt-lobed woodsia | *Woodsia obtusa* | Plant | Rocky woods and ledges; dry, wooded slopes | ST | | Kennebec, York | ME | | NE |
| Boott's rattlesnake root | *Prenanthes boottii* | Plant | Alpine regions | SE | | Franklin, Piscataquis, Somerset | ME | | NE |
| Boreal bentgrass | *Agrostis mertensii* | Plant | Alpine areas, gravelly or rocky substrates | ST | | Franklin, Penobscot, Piscataquis, Somerset | ME | | NE |
| Bottlebrush grass | *Elymus hystrix* | Plant | Woods with light shade; moist to slightly dry, loamy or rocky soils | ST | | Cumberland, Franklin, Kennebec, Somerset, Waldo, York | ME | | NE |
| Bulrush sedge | *Carex scirpoidea* | Plant | Wide variety | ST | | Aroostook, Piscataquis | ME | | NE |
| Bur-reed sedge | *Carex sparganioides* | Plant | Rich woods, usually maple-basswood-ash association | SE | | Cumberland, Franklin, Kennebec, Oxford, Penobscot, Somerset | ME | | NE |
| Canada buffaloberry | *Shepherdia canadensis* | Plant | Calcareous rocks and banks | SE | | Somerset | ME | | NE |
| Canada burnet | *Sanguisorba canadensis* | Plant | Peaty or boggy soils | ST | | Aroostook, Franklin, Somerset, York | ME | | NE |
| Capillary sedge | *Carex capillaris* | Plant | Mesic to moist tundra; seeps on cliffs, rocks, | ST | | Aroostook, Piscataquis | ME | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
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| | | | | State | Fed. | | | | |
| | | | and slopes; fens, meadows, shores, prairie sloughs; edges of sphagnum mats; moist woods | | | | | | |
| Chestnut oak | *Quercus montana* | Plant | Rocky, upland forest; dry ridges; mixed deciduous forests on shallow soils | ST | | Oxford, York | ME | | NE |
| Clammy azalea | *Rhododendron viscosum* | Plant | Swamps, thickets, and damp clearings | SE | | York | ME | | NE |
| Clothed sedge | *Carex vestita* | Plant | Dry, sandy woods and clearings | SE | | Cumberland, York | ME | | NE |
| Coast-blite goosefoot | *Chenopodium rubrum* | Plant | Salt marshes or saline soils | ST | | County information unavailable | ME | | NE |
| Columbian water-meal | *Wolffia columbiana* | Plant | Mesotrophic to eutrophic, quiet waters in temperate to subtropical regions | ST | | Cumberland | ME | | NE |
| Common butterwort | *Pinguicula vulgaris* | Plant | Wet, circumneutral rocks and ledges in subalpine areas | ST | | County information unavailable | ME | | NE |
| Crawe's sedge | *Carex crawei* | Plant | Calcareous shores, gravels, meadows and glades | SE | | Aroostook | ME | | NE |
| Creeping spike-moss | *Selaginella apoda* | Plant | Meadows, lawns, and streambanks | SE | | Androscoggin, Cumberland, Kennebec, York | ME | | NE |
| Cut-leaved anemone | *Anemone multifida* | Plant | Dryish slaty or calcareous gravel and ledges | ST | | Aroostook | ME | | NE |
| Cut-leaved toothwort | *Cardamine concatenata* | Plant | Rich woods, wooded bottoms, and calcareous rocky banks | SE | | County information unavailable | ME | | NE |
| Cutler's goldenrod | *Solidago multiradiata* | Plant | Gravelly, rocky barrens of alpine areas | ST | | County information unavailable | ME | | NE |
| Dioecious sedge | *Carex sterilis* | Plant | Fens; openings in white-cedar swamps; wet, calcareous prairies; fresh interdunal meadows; calcareous seeps; lake and river shores; wet, sunny limestone outcrops | ST | | Aroostook | ME | | NE |
| Douglas' knotweed | *Polygonum douglasii* | Plant | Dry, often disturbed places; rock outcrops; sandy ground | ST | | Oxford, York | ME | | NE |
| Dry land sedge | *Carex siccata* | Plant | Open, sandy oak, oak-pine, or pine forests and savannas; dry prairies, sand dunes, sandy fields, and sunny rock outcrops; alpine or subalpine meadows | ST | | Androscoggin, Aroostook, Hancock, Oxford, Penobscot, Piscataquis, Washington | ME | | NE |
| Dwarf bulrush | *Lipocarpha micrantha* | Plant | Emergent shorelines, rarely freshwater tidal shores | ST | | Oxford, York | ME | | NE |

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| Dwarf rattlesnake root | *Prenanthes nana* | Plant | Rocky or mossy exposed places in alpine areas | SE | | County information unavailable | ME | | NE |
| Dwarf white birch | *Betula minor* | Plant | Acidic. rocky barrens; peats and alpine summits of higher mountains | SE | | County information unavailable | ME | | NE |
| Dwarf willow | *Salix herbacea* | Plant | Arctic regions; mossy alpine areas on granitic, siliceous, or schistose mountains | ST | | Piscataquis | ME | | NE |
| Early crowfoot | *Ranunculus fascicularis* | Plant | Thin soil in open woods; exposed hills and ledges | ST | | Oxford | ME | | NE |
| Eastern joe-pye weed | *Eupatoriadelphus dubius* | Plant | Wet meadows | ST | | Waldo, York | ME | | NE |
| Prairie white-fringed orchid | *Platanthera leucophaea* | Plant | Mesic prairies and wetlands | SE | FT | Aroostook | ME | | NE |
| Eaton's bur-marigold | *Bidens eatonii* | Plant | Borders of estuaries, marshes, tidal flats | ST | | Waldo, York | ME | | NE |
| Ebony sedge | *Carex eburnea* | Plant | Calcareous ledges, gravels or sands | SE | | County information unavailable | ME | | NE |
| English sundew | *Drosera anglica* | Plant | Circumneutral fens and peaty areas | SE | | County information unavailable | ME | | NE |
| Dwarf bulrush | *Fimbristylis autumnalis* | Plant | Sandy or peaty shores and low ground | ST | | Androscoggin, Cumberland, Franklin, Hancock, Oxford, Penobscot, York | ME | | NE |
| Featherfoil | *Hottonia inflata* | Plant | Pools and ditches | ST | | Washington, York | ME | | NE |
| Few-flowered spike-sedge | *Eleocharis quinqueflora* | Plant | Fens, wet meadows, seeps, springs, hot springs | SE | | County information unavailable | ME | | NE |
| Flowering dogwood | *Cornus florida* | Plant | Acidic woods | SE | | York | ME | | NE |
| Fries' pondweed | *Potamogeton friesii* | Plant | Calcareous or brackish waters | SE | | Aroostook | ME | | NE |
| Furbish's lousewort | *Pedicularis furbishiae* | Plant | Moist, unstable, semi-shaded, eroding banks subject to flooding, and ice-scouring | SE | FE | Aroostook | ME | Only on the shores of the upper St. John River in Maine and New Brunswick | NE |
| Giant rattlesnake-plantain | *Goodyera oblongifolia* | Plant | Shallow water or very wet soil | SE | | Aroostook, York | ME | | NE |
| Great rhododendron | *Rhododendron maximum* | Plant | Damp woods, swamps, and pond margins | ST | | Cumberland, Franklin, Somerset, York | ME | | NE |

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| Green spleenwort | *Asplenium trichomanes-ramosum* | Plant | Crevices and talus of calcareous rock | ST | | Somerset | ME | | NE |
| Hairy arnica | *Arnica lanceolata* | Plant | Ledgy or gravelly shores or wet cliffs; often subalpine | ST | | Aroostook, Franklin, Piscataquis, Somerset | ME | | NE |
| Hoary willow | *Salix candida* | Plant | Calcareous bogs and thickets | ST | | Aroostook | ME | | NE |
| Horned beak-rush | *Rhynchospora capillacea* | Plant | Calcareous swamps, bogs, and shores | ST | | Aroostook, Kennebec | ME | | NE |
| Hornemann's willow-herb | *Epilobium hornemannii* | Plant | Damp rocks; margins of small brooks | SE | | County information unavailable | ME | | NE |
| Indian grass | *Sorghastrum nutans* | Plant | Dry slopes, prairies, and borders of woods | SE | | Androscoggin, Penobscot, Somerset | ME | | NE |
| Ink-berry | *Ilex glabra* | Plant | Moist to wet, acidic soils | ST | | | ME | | NE |
| Intermediate sedge | *Carex norvegica* | Plant | Mossy, often calcareous, woods, thickets and shores | SE | | County information unavailable | ME | | NE |
| Jacob's ladder | *Polemonium vanbruntiae* | Plant | Wooded swamps, bottoms, sphagnous bogs, and mossy glades | SE | | County information unavailable | ME | | NE |
| Silverleaf willow | *Salix argyrocarpa* | Plant | Mostly tidelands, brackish to saline marshes, beaches | SE | | Piscataquis | ME | | NE |
| Tiny love-grass | *Eragrostis capillaris* | Plant | Dry sandy or rocky soils | SE | | Androscoggin, Oxford, York | ME | | NE |
| Lance-leaved draba | *Draba cana* | Plant | Calcareous cliffs and slopes | SE | | Piscataquis | ME | | NE |
| Lapland buttercup | *Ranunculus lapponicus* | Plant | Subarctic regions, moss and wet woods, usually under cedar | ST | | Aroostook | ME | | NE |
| Lapland rosebay | *Rhododendron lapponicum* | Plant | Arctic and subarctic regions, barrens, and cliffs | ST | | County information unavailable | ME | | NE |
| Small purple bladderwort | *Utricularia resupinata* | Plant | Emergent wetlands, in muddy ground or shallow water at pond edges | SE | | Androscoggin, Franklin, Hancock, Kennebec, Oxford | ME | | NE |
| Long's bulrush | *Scirpus longii* | Plant | Meadows, swamps, and fresh marshes | ST | | County information unavailable | ME | | NE |
| Long-tubercled spike-rush | *Eleocharis tuberculosa* | Plant | Wet sandy and peaty shores and swamps | SE | | County information unavailable | ME | | NE |
| Low spike-moss | *Selaginella selaginoides* | Plant | Damp shores, mossy banks | ST | | Aroostook | ME | | NE |
| Male fern | *Dryopteris filix-mas* | Plant | Rich woods, glades, upland pastures, and | SE | | Oxford, Penobscot | ME | | NE |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| | | | rocky slopes | | | | | | |
| Marsh felwort | *Lomatogonium rotatum* | Plant | Turfy or sandy seashores | ST | | Hancock | ME | | NE |
| Marsh felwort | *Chenopodium humile* | Plant | Wetlands | ST | | Cumberland | ME | | NE |
| Long-spined sandbar | *Cenchrus longispinus* | Plant | Sandy, open areas; disturbed sites | ST | | York | ME | | NE |
| Missouri rockcress | *Arabis missouriensis* | Plant | Circumneutral bluffs, ledges, or rocky woods | ST | | Oxford, York | ME | | NE |
| Moonwort | *Botrychium lunaria* | Plant | Open turfy, gravelly or ledgy slopes, shores and meadows, chiefly calcareous | SE | | County information unavailable | ME | | NE |
| Moss bell-heather | *Harrimanella hypnoides* | Plant | Mossy alpine areas | ST | | Piscataquis | ME | | NE |
| Mountain heath | *Phyllodoce caerulea* | Plant | Arctic regions, alpine rocks and peat | ST | | Piscataquis | ME | | NE |
| Mountain honeysuckle | *Lonicera dioica* | Plant | Rocky banks, dry woods and thickets | SE | | Cumberland, Kennebec, York | ME | | NE |
| Mountain timothy | *Phleum alpinum* | Plant | Meadows, damp shores, and slopes | ST | | Aroostook, Piscataquis | ME | | NE |
| Muhlenberg sedge | *Carex muehlenbergii* | Plant | Dry grasslands, open forests; commonly on sand | ST | | York | ME | | NE |
| Nantucket shadbush | *Amelanchier nantucketensis* | Plant | Pine barrens, pond margins, fields, edges, and thickets | ST | | County information unavailable | ME | | NE |
| Narrow-leaved goldenrod | *Euthamia tenuifolia* | Plant | Outwash plain pondshores; in moist sand, usually below seasonal high-water level | ST | | Cumberland, Oxford, York | ME | | NE |
| Neglected reed-grass | *Calamagrostis stricta* ssp. *stricta* | Plant | Swales and shores; usually circumneutral | ST | | Aroostook, Piscataquis | ME | | NE |
| New England northern reed grass | *Calamagrostis stricta* ssp. *inexpansa* | Plant | Damp woods and shaded cliffs | SE | | Hancock, Piscataquis | ME | | NE |
| New Jersey tea | *Ceanothus americanus* | Plant | Dry, open woods and gravelly or rocky banks; rocky summits and outcrops | ST | | Oxford, Penobscot | ME | | NE |
| Nodding pogonia | *Triphora trianthophora* | Plant | Northern hardwood forests, usually dominated by beech, often in deep litter | ST | | Cumberland, Oxford | ME | | NE |
| Alpine blueberry | *Vaccinium boreale* | Plant | Headlands; open, rocky uplands; alpine heaths and meadows; forest-tundra | ST | | County information unavailable | ME | | NE |
| Northern gentian | *Gentianella amarella* | Plant | Damp turf, gravel, beaches, dunes, wet rocks | SE | | Aroostook | ME | | NE |
| Northern stickseed | *Hackelia deflexa* | Plant | Rich woods | SE | | Oxford | ME | | NE |
| Northern wild comfrey | *Cynoglossum virginianum* | Plant | Rich, upland woods | SE | | Androscoggin, Aroostook, Franklin, Penobscot | ME | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Northern wood-rush | *Luzula confusa* | Plant | Alpine meadows and slopes | ST | | County information unavailable | ME | | NE |
| Northern woodsia | *Woodsia alpina* | Plant | Shaded or exposed, damp to dry slaty or calcareous rocky banks | ST | | Aroostook, Penobscot | ME | | NE |
| Nova Scotia false-foxglove | *Agalinis neoscotica* | Plant | Damp sand, peat, or sphagnous pockets near the shore; above the usual tidal zone | ST | | County information unavailable | ME | | NE |
| Oake's eyebright | *Euphrasia oakesii* | Plant | Exposed turfy or gravelly slopes or crests; alpine areas | SE | | Piscataquis | ME | | NE |
| Orono sedge | *Carex oronensis* | Plant | Fields, meadows, and clearings | ST | | Hancock, Penobscot, Waldo | ME | | NE |
| Pendulous bulrush | *Scirpus pendulus* | Plant | Marshes and wet meadows | SE | | Penobscot | ME | | NE |
| Pickering's reed bent-grass | *Calamagrostis pickeringii* | Plant | Acid peats or sands, gravels, and shores | ST | | County information unavailable | ME | | NE |
| Prairie sedge | *Carex prairea* | Plant | Circumneutral fens, meadows, and wet thickets | ST | | Aroostook | ME | | NE |
| Prototype quillwort | *Isoetes prototypus* | Plant | Shallow, low-nutrient ponds on sandy substrates | ST | | County information unavailable | ME | | NE |
| Purple false-oats | *Trisetummelicoides* | Plant | Rich hardwood forests | SE | | Aroostook, Franklin, Piscataquis | ME | | NE |
| Pygmy water-lily | *Nymphaea leibergii* | Plant | Pond margins and swamps | ST | | Aroostook, Piscataquis, Somerset | ME | | NE |
| Ram's-head lady's-slipper | *Cypripedium arietinum* | Plant | Damp or mossy woods or bogs | SE | | Aroostook, Hancock, Kennebec, Oxford, Penobscot | ME | | NE |
| Rattlesnake hawkweed | *Hieracium venosum* | Plant | Dry, open pine or oak woods and barrens; usually in grassy openings | SE | | Cumberland, York | ME | | NE |
| Red-root flatsedge | *Cyperuserythrorhizos* | Plant | Emergent shorelines | ST | | Waldo | ME | | NE |
| Rock whitlow-grass | *Draba arabisans* | Plant | Calcareous or argillaceous rocks | ST | | Aroostook, Franklin, Piscataquis, Somerset | ME | | NE |
| Russett sedge | *Carex saxatilis* | Plant | Peaty, sandy, gravelly or damp shores and margins of pools | SE | | County information unavailable | ME | | NE |
| Sandbar willow | *Salix interior* | Plant | Sandbars, mudbars, and moist alluvial soils | SE | | Aroostook | ME | | NE |
| Savinleaf groundpine | *Diphasiastrumsabinifolium* | Plant | North temperate and subarctic | SE | | Aroostook, Cumberland, Franklin, Oxford, Penobscot, Piscataquis, Somerset | ME | | NE |

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|---|---|---|---|---|---|---|---|---|---|
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| Scarlet oak | *Quercus coccinea* | Plant | Dry, sandy soil | SE | | County information unavailable | ME | | NE |
| Screwstem | *Bartonia paniculata* | Plant | Wet peat and sand | ST | | Cumberland, York | ME | | NE |
| Seneca snakeroot | *Polygala senega* | Plant | Dry, rocky, or gravelly, chiefly calcareous areas | SE | | Aroostook | ME | | NE |
| Shining ladies'-tresses | *Spiranthes lucida* | Plant | Alluvial or damp, rocky shores and slopes; rich damp thickets and meadows | ST | | Aroostook, Kennebec, Penobscot, Piscataquis, York | ME | | NE |
| Showy lady's-slipper | *Cypripedium reginae* | Plant | Circumneutral peatlands or sunlit openings of mossy woods | ST | | Androscoggin, Aroostook, Hancock, Kennebec, Oxford, Penobscot, Piscataquis, Somerset | ME | | NE |
| Showy orchis | *Galearis spectabilis* | Plant | Rich, mostly calcareous woods | SE | | Franklin, Kennebec, Oxford, Somerset | ME | | NE |
| Silverling | *Paronychia argyrocoma* | Plant | Bare granitic slopes, mountain tops, or sandy riverbanks | ST | | Franklin, Oxford | ME | | NE |
| Slender blue flag | *Iris prismatica* | Plant | Swampy, peaty soil | ST | | Washington, York | ME | | NE |
| Slender cliffbrake | *Cryptogramma stelleri* | Plant | Cool and shaded calcareous rock or springy slopes; hardwood to mixed forest; non-tidal river shores | ST | | Aroostook, Oxford | ME | | NE |
| Slender pondweed | *Stuckenia filiformis* ssp. *occidentalis* | Plant | Alkaline ponds and streams | SE | | County information unknown | ME | | NE |
| Slender rush | *Juncus subtilis* | Plant | Margins of ponds and shores; open wetland | ST | | Aroostook, Somerset | ME | | NE |
| Slender-leaved sundew | *Drosera linearis* | Plant | Circumneutral fens and wet limy shores | SE | | Aroostook | ME | | NE |
| Small round-leaved orchis | *Amerorchis rotundifolia* | Plant | Mossy calcareous swamps and woods | ST | | Aroostook, Piscataquis | ME | | NE |
| Small whorled pogonia | *Isotria medeoloides* | Plant | Acidic soils of elder hardwood forests | SE | FT | Cumberland, Kennebec, Oxford, York | ME | | NE |
| Small yellow water crowfoot | *Ranunculus gmelinii* | Plant | Springy rills; clear, cold ponds, shores, and meadows | ST | | Aroostook, Penobscot | ME | | NE |
| Smooth rockcress | *Arabis laevigata* | Plant | Rich woods and slopes or shaded ledges | ST | | County information unavailable | ME | | NE |
| Smooth woodsia | *Woodsia glabella* | Plant | Thin moss or humus on calcareous cliffs; often at crests of shaded cliffs | ST | | Aroostook, Penobscot, Somerset | ME | | NE |

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| Soft-leaf muhly | *Muhlenbergia richardsonis* | Plant | Circumneutral gravel or ledges; often along rivershores | ST | | Aroostook, Kennebec | ME | | NE |
| Spiked wood-rush | *Luzula spicata* | Plant | Gravel talus and peaty openings in alpine areas | ST | | Piscataquis | ME | | NE |
| Spotted pondweed | *Potamogeton pulcher* | Plant | Peaty or muddy acid waters or shores | ST | | County information unavailable | ME | | NE |
| Spotted wintergreen | *Chimaphila maculata* | Plant | Dry woods; hardwood to mixed forest | SE | | York | ME | | NE |
| Spreading sedge | *Carex laxiculmis* | Plant | Rich woods and glades; streambanks | SE | | Hancock, Somerset, York | ME | | NE |
| Squirrel-corn | *Dicentra canadensis* | Plant | Rich woods; cave forests with sugar maple; and often ash and/or basswood | ST | | County information unavailable | ME | | NE |
| St. John oxytrope | *Oxytropis campestris* | Plant | Calcareous rocks and gravels along St. John River | ST | | County information unavailable | ME | | NE |
| Star saxifrage | *Saxifraga foliolosa* | Plant | Mossy alpine rocks | SE | | Piscataquis | ME | | NE |
| Straight-leaved pondweed | *Potamogeton strictifolius* | Plant | Calcareous waters | ST | | Aroostook | ME | | NE |
| Summer grape | *Vitis aestivalis* | Plant | Dry woods and thickets | SE | | County information unavailable | ME | | NE |
| Swamp white oak | *Quercus bicolor* | Plant | Bottomlands, stream margins, and swamps | ST | | Cumberland, Oxford, Waldo | ME | | NE |
| Swarthy sedge | *Carex adusta* | Plant | Dry, open places | SE | | Hancock, Penobscot, Washington | ME | | NE |
| Mountain sweet-cicely | *Osmorhiza berteroi* | Plant | Moist, cool forests | ST | | Aroostook, Franklin, Oxford, Piscataquis, Somerset | ME | | NE |
| Longleaf dropseed | Sporobolus asper | Plant | Dry, sandy, or rocky soils | SE | | County information unavailable | ME | | NE |
| Tall beak-rush | *Rhynchospora macrostachya* | Plant | Acidic, sunny wetlands; mostly pond shores, seeps, bogs, marshlands | SE | | York | ME | | NE |
| Tall white violet | *Viola canadensis* | Plant | Rich, mesic, hardwood forests | SE | | County information unavailable | ME | | NE |
| Tea-leaved willow | *Salix planifolia* | Plant | Damp thickets and streambanks, some sub-acid areas | ST | | Aroostook, Franklin, Piscataquis, Penobscot, Somerset, Washington | ME | | NE |

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| Trumpet honeysuckle | *Lonicera sempervirens* | Plant | Woods, thickets | SE | | York | ME | | NE |
| Tundra dwarf birch | *Betula glandulosa* | Plant | Acidic rocky barrens, crests, and summits | SE | | County information unavailable | ME | | NE |
| Upright bindweed | *Calystegia spithamaea* | Plant | Sandy or rocky open soil, thin woods | ST | | Androscoggin, Cumberland, Franklin, Oxford, York | ME | | NE |
| Variable sedge | *Carex polymorpha* | Plant | Downslope seeps and upslope mixed oak/ huckleberry forest | SE | | Cumberland, York | ME | | NE |
| Vasey rush | *Juncus vaseyi* | Plant | Damp shores, thickets | SE | | Aroostook, Franklin, Penobscot, Washington | ME | | NE |
| Vasey's pondweed | *Potamogeton vaseyi* | Plant | Quiet waters of lakes, ponds, rivers | ST | | Androscoggin, Aroostook, Kennebec, Penobscot, Somerset | ME | | NE |
| Wavy bluegrass | *Poa fernaldiana* | Plant | Summits of higher mountains | SE | | Piscataquis | ME | | NE |
| White adder's-mouth | *Malaxis monophyllos ssp. brachypoda* | Plant | Damp, calcareous gravels, talus, peats, swales and fens | SE | | County information unavailable | ME | | NE |
| Livelong saxifrage | *Saxifraga paniculata* | Plant | Rocky ledges and crevices; often calcareous areas | SE | | Oxford, Piscataquis | ME | | NE |
| Large white-trillium | *Trilliumgrandiflorum* | Plant | Rich deciduous or mixed coniferous-deciduous upland woods, floodplains, roadsides | SE | | Franklin | ME | | NE |
| White-topped aster | *Sericocarpus asteroides* | Plant | Dry, sandy, clay, and shaley open soils in fields, open-mixed forest, pine woods, road margins, eastern deciduous forest | SE | | York | ME | | NE |
| Wild coffee | *Triosteum aurantiacum* | Plant | Rich woods and thickets | SE | | Aroostook, Cumberland, York | ME | | NE |
| Wild ginger | *Asarum canadense* | Plant | Rich woods and in the vicinity of shaded calcareous ledges | ST | | Aroostook, Franklin, Kennebec, Oxford, Somerset, Waldo | ME | | NE |
| Yellow-eyed grass | *Xyris smalliana* | Plant | Sandy or peaty shallows, shores of ponds, sluggish acidic streams | SE | | York | ME | | NE |
| Northern black racer | *Coluber constrictor* | Reptile | Open grasslands, power line rights-of-way, orchards, rocky ridges, edges between forests and fields | SE | | Cumberland, Oxford, York | ME | | NE |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Blanding's turtle | *Emys blandingii* | Reptile | Small, acidic wetlands and vernal pools located in large blocks of forested habitat | SE | | Androscoggin, Cumberland, Oxford, York | ME | | NE |
| Box turtle | *Terrapene carolina* | Reptile | Moist woodlands and wet, brushy fields, especially with sandy soils | SE | | Cumberland, Oxford, York | ME | Very rare; suspected in southwest region of the state | NE |
| Green sea turtle | *Chelonia mydas* | Reptile | Fairly shallow waters (except when migrating) inside reefs, bays, and inlets | | FT | Cumberland, Hancock, Sagadahoc, Waldo, Washington, York | ME | | NE |
| Hawksbill sea turtle | *Eretmochelys imbricata* | Reptile | Rocky areas, coral reefs, shallow coastal areas, lagoons, oceanic islands, and narrow creeks and passes | | FE | Cumberland, Hancock, Sagadahoc, Waldo, Washington, York | ME | | NE |
| Leatherback sea turtle | *Dermochelys coriacea* | Reptile | Adult females require sandy nesting beaches backed with vegetation, with proximity to deep water and rough seas | | FE | Cumberland, Hancock, Sagadahoc, Waldo, Washington, York | ME | | NE |
| Loggerhead sea turtle | *Caretta caretta* | Reptile | Mid-ocean and inshore areas, such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers | | FT | Cumberland, Hancock, Sagadahoc, Waldo, Washington, York | ME | | NE |
| Spotted turtle | *Clemmys guttata* | Reptile | Acidic wetlands and vernal pools located in large, intact, forested landscapes | ST | | Androscoggin, Cumberland, Hancock, Franklin, Kennebec, Oxford, Penobscot, Sagadahoc, Somerset, Waldo, York | ME | | NE |

Sources: ME DIFW, 2011; USDA 2011a; USDOI, 2011b; eFloras.org, 2011

Disclaimer: Species list derived from best available sources (listed above). Some discrepancy exists between USFWS and state agencies concerning status and county locations for certain species. Status designation does not include State Special Concern Species.

**THREAT STATUS DESIGNATIONS**

SE State Endangered
ST State Threatened
FE Federally Endangered
FT Federally Threatened
FC Federal Candidate Species
* See note column

**NORTHERN BORDER PEIS REGIONS**

GL Great Lakes
EOR East of the Rockies
NE New England
WOR West of the Rockies

## Table M–3. Threatened and Endangered Species in Michigan

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Blanchard's cricket frog | *Acris crepitans blanchardi* | Amphibian | Open or partially vegetated mud flats with emergent aquatic vegetation | ST | | Hillsdale, Ingham, Jackson, Kent, Lapeer, Lenawee, Livingston, Monroe, Oakland, St. Clair, Washtenaw | MI | | GL |
| Smallmouth salamander | *Ambystoma texanum* | Amphibian | Forested bottomlands and floodplains; temporary shallow waters, rotting logs, and leaf litter | SE | | Hillsdale, Monroe, Washtenaw, Wayne | MI | | GL |
| Henslow's sparrow | *Ammodramus henslowii* | Bird | Open fields and pastures; meadows with scattered shrubs | SE | | Alpena, Bay, Genesee, Hillsdale, Huron, Ingham, Jackson, Lenawee, Livingston, Mason, Oakland, Saginaw, Sanilac, St. Clair, Tuscola, Washtenaw, Wayne | MI | | GL |
| Short-eared owl | *Asio flammeus* | Bird | Open areas with low-growing vegetation and abundant small mammals | SE | | Chippewa, Hillsdale | MI | | GL |
| Long-eared owl | *Asio otus* | Bird | Associated with conifers and deciduous trees; wooded areas near open grasslands | ST | | Mackinac, Macomb, Oakland | MI | | GL |
| Red-shouldered hawk | *Buteo lineatus* | Bird | Mature forests near wet meadows and swamps | ST | | Statewide | MI | | GL |
| Piping plover | *Charadrius melodus* | Bird | Open sandy beaches, sparse vegetation. Designated critical habitat: 66 FR 22938 22969. | SE | FT | Alger, Alpena, Charlevoix, Cheboygan, Chippewa, Delta, Emmet, Huron, Iosco, Luce, Mackinac, Mason, Presque Isle, Schoolcraft | MI | Federally designated critical habitat established for certain counties. | GL |
| Yellow rail | *Coturnicops noveboracensis* | Bird | Northern wet meadows | ST | | Chippewa, Delta, Luce, Mackinac, Schoolcraft | MI | | GL |
| Trumpeter swan | *Cygnus buccinator* | Bird | Marshes, ponds, lakes | ST | | Alcona, Delta,Iosco, Ogemaw, Oscoda, Washtenaw | MI | | GL |
| Cerulean warbler | *Dendroica cerulea* | Bird | Mature deciduous forests | ST | | Alger,Hillsdale, Jackson, Kent,Lapeer, Livingston, Mason, Oakland, St. Clair, Tuscola,Washtenaw | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Prairie warbler | *Dendroica discolor* | Bird | Young pine plantations and clearcuts | SE | | Alcona, Cheboygan, Delta, Iosco, Mason, Oakland, Oscoda, Presque Isle, Schoolcraft, Washtenaw | MI | | GL |
| Kirtland's warbler | *Dendroica kirtlandii* | Bird | Large jack pine stands | SE | FE | Alcona, Baraga, Chippewa, Crawford, Delta, Iosco, Luce, Marquette, Montmorency, Ogemaw, Oscoda, Otsego, Presque Isle, Schoolcraft | MI | | GL |
| Merlin | *Falco columbarius* | Bird | Near lakeshores and semi-open areas where prey is abundant | ST | | Charlevoix, Chippewa, Kent, Keweenaw, Luce, Schoolcraft | MI | | GL |
| Peregrine falcon | *Falco peregrinus* | Bird | Cliff faces with open surroundings; thrive in urban areas | SE | | Alger, Bay, Chippewa, Delta, Genesee, Houghton, Ingham, Kent, Keweenaw, Macomb, Marquette, Monroe, Ontonagon, St. Clair, Washtenaw, Wayne | MI | | GL |
| Common moorhen | *Gallinula chloropus* | Bird | Emergent lakes and ponds with grassy edges | ST | | Arenac, Baraga, Bay, Charlevoix, Huron, Ingham, Jackson, Mason, Monroe, Saginaw, St. Clair, Washtenaw, Wayne | MI | | GL |
| Common loon | *Gavia immer* | Bird | Islands on undeveloped lakes | ST | | Alcona, Alger, Alpena, Antrim Baraga, Charlevoix, Cheboygan, Chippewa, Crawford, Delta, Emmet, Gogebic, Houghton, Iosco, Keweenaw, Luce, Mackinac, Marquette, Mason, Montmorency, Oakland, Ogemaw, Ontonagon, Oscoda, Otsego, Presque Isle, Schoolcraft | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Least bittern | *Ixobrychus exilis* | Bird | Coastal plains, Great Lakes, and emergent vegetation marshes | ST | | Arenac, Bay, Chippewa, Delta, Huron, Jackson, Mason, Monroe, Schoolcraft, St. Clair, Tuscola, Washtenaw, Wayne | MI | | GL |
| Migrant loggerhead shrike | *Lanius ludovicianus migrans* | Bird | Grasslands and open agricultural areas; shrubs and scattered trees for perching and nesting; short grasses in parks, cemeteries, and golf courses | SE | | Alpena, Chippewa, Emmet, Huron, Presque Isle | MI | | GL |
| King rail | *Rallus elegans* | Bird | Great Lakes coastal wetlands | SE | | Bay, Emmet, Huron, Ingham, Jackson, Kent, Lapeer, Livingston, Macomb, Marquette, Monroe, Saginaw, Sanilac, Schoolcraft, St. Clair, Washtenaw, Wayne | MI | | GL |
| Louisiana waterthrush | *Seiurus motacilla* | Bird | Broadleafed forests near open streams | ST | | Hillsdale, Kent, St. Clair, Tuscola, Washtenaw | MI | | GL |
| Caspian tern | *Sterna caspia* | Bird | Offshore islands throughout Great Lakes | ST | | Alcona, Alpena, Arenac, Bay, Charlevoix, Cheboygan, Delta, Mackinac | MI | | GL |
| Forster's tern | *Sterna forsteri* | Bird | Great Lakes shorelines and marshes | ST | | Arenac, Bay, Huron, Mackinac, Macomb, St. Clair, Tuscola, Wayne | MI | | GL |
| Common tern | *Sterna hirundo* | Bird | Shorelines and islands | ST | | Alpena, Arenac, Bay, Charlevoix, Cheboygan, Chippewa, Delta, Emmet, Huron, Mackinac, Macomb, Monroe, Presque Isle, Schoolcraft, St. Clair, Tuscola, Wayne | MI | | GL |
| Barn owl | *Tyto alba* | Bird | Wide array of habitat types; less common near intensive agriculture | SE | | Lapeer, Monroe | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Lake sturgeon | *Acipenser fulvescens* | Fish | Large rivers in deep, unvegetated runs and pools; rock and gravel bottoms | ST | | Alpena, Baraga, Cheboygan, Chippewa, Delta, Houghton, Huron, Iosco, Kent, Luce, Mackinac, Macomb, Presque Isle, Schoolcraft, St. Clair, Wayne | MI | | GL |
| Eastern sand darter | *Ammocrypta pellucida* | Fish | Slow-moving waters; downstream associated near sand deposits | ST | | Hillsdale, Lenawee, Livingston, Macomb, Monroe, Oakland, Sanilac, St. Clair, Wayne | MI | | GL |
| Redside dace | *Clinostomus elongatus* | Fish | High-gradient streams with overhanging vegetation and rocky structures | SE | | Gogebic, Hillsdale, Lenawee, Oakland, Washtenaw, Wayne | MI | | GL |
| Lake herring or cisco | *Coregonus artedii* | Fish | Great Lakes and deep inland lakes | ST | | Alger, Alpena, Antrim, Charlevoix, Cheboygan, Chippewa, Crawford, Gogebic, Hillsdale, Houghton, Huron, Iosco, Jackson, Kent, Keweenaw, Livingston, Luce, Mackinac, Marquette, Montmorency, Oakland, Ontonagon, Schoolcraft, Washtenaw | MI | | GL |
| Siskiwit lake cisco | *Coregonus bartletti* | Fish | Deep, cold water over clay substrates | ST | | Keweenaw | MI | | GL |
| Ives lake cisco | *Coregonus hubbsi* | Fish | Deep cool water | ST | | Marquette | MI | | GL |
| Shortjaw cisco | *Coregonus zenithicus* | Fish | Deep, cold water over clay substrates | ST | | Keweenaw | MI | | GL |
| Western creek chubsucker | *Erimyzon claviformis* | Fish | Warm headwaters and small tributary streams | SE | | Hillsdale, Jackson, Lenawee, Monroe | MI | | GL |
| Mooneye | *Hiodon tergisus* | Fish | Cool, clearwater lakes and rivers; in deeper pools of rivers; usually within 1 mile of shoreline, under 10 m of water | ST | | Delta, Macomb, Presque Isle, St. Clair | MI | | GL |
| River redhorse | *Moxostoma carinatum* | Fish | Larger rivers with moderate current; prefers deep runs | ST | | Iosco, Hillsdale, Kent, St. Clair, Wayne | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Pugnose shiner | *Notropis anogenus* | Fish | Clear lakes and vegetated runs of low-gradient streams | SE | | Alpena, Cheboygan, Hillsdale, Ingham, Kent, Lenawee, Macomb, Montmorency, Oakland, Presque Isle, Shiawassee, St. Clair, Washtenaw, Wayne | MI | | GL |
| Silver shiner | *Notropis photogenis* | Fish | Medium-large streams with moderate gradients; in pools below riffles | SE | | Hillsdale, Livingston, Monroe, Washtenaw | MI | | GL |
| Northern madtom | *Noturus stigmosus* | Fish | Strong-current rivers with sand, gravel, rocky bottoms | SE | | St. Clair, Washtenaw, Wayne | MI | | GL |
| Pugnose minnow | *Opsopoeodus emiliae* | Fish | Shallow, clear waters with sand and organic substrates | SE | | Hillsdale, Monroe, Wayne | MI | | GL |
| Channel darter | *Percina copelandi* | Fish | Fine sand and gravel bottoms of rivers and large creeks | SE | | Alcona, Alpena, Arenac, Cheboygan, Huron, Iosco, Macomb, Monroe, Ogemaw, Saginaw, St. Clair, Tuscola, Wayne | MI | | GL |
| River darter | *Percina shumardi* | Fish | Fast-flowing, deep, large streams with rocky cobbles and boulders | SE | | Huron, Iosco, Macomb, Monroe, Saginaw, Tuscola, Wayne | MI | | GL |
| Southern redbelly dace | *Phoxinus erythrogaster* | Fish | Cool, permanent headwaters of spring-fed streams; undercut and overhang banks | SE | | Lenawee, Livingston, Monroe, Washtenaw | MI | | GL |
| Sauger | *Sander canadensis* | Fish | Semi-turbid lakes and rivers | ST | | Bay, Cheboygan, Delta, Houghton, Huron, Mackinac, Monroe, St. Clair, Wayne | MI | | GL |
| Hungerford's crawling water beetle | *Brychius hungerfordi* | Insect | Riffles of cool, alkaline streams | SE | FE | Emmet, Montmorency, Presque Isle | MI | | GL |
| Persius dusky wing | *Erynnis persius persius* | Insect | Oak-pine barrens near prairies; blue lupine is host plant | ST | | Bay, Kent, Livingston | MI | | GL |
| Dukes' skipper | *Euphyes dukesi* | Insect | Forested, shady wetlands; hardwood swamps | ST | | Jackson, Lenawee, Monroe, Washtenaw, Wayne | MI | | GL |
| Huron River leafhopper | *Flexamia huroni* | Insect | Found only with mat muhly grass | ST | | Oakland | MI | | GL |
| Henry's elfin | *Incisalia henrici* | Insect | Open oak-pine barrens and openings; swamp borders where nectaring plants grow | ST | | Baraga, Crawford, Kent, Oscoda, Presque Isle | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Frosted elfin | *Incisalia irus* | Insect | Oak savannas, forest edges where lupines and false indigo grow | ST | | Bay, Kent, Monroe | MI | | GL |
| Northern blue | *Lycaeides idas nabokovi* | Insect | Open, sandy rock areas; dwarf bilberry is host plant | ST | | Alger, Keweenaw, Marquette, Schoolcraft | MI | | GL |
| Karner Blue butterfly | *Lycaeides melissa samuelis* | Insect | Wild lupine plant range | ST | FE | Kent, Mason, Monroe, | MI | | GL |
| Mitchell's satyr butterfly | *Neonympha mitchellii mitchellii* | Insect | Rare wetlands called fens, rich in dissolved nutrients | SE | FE | Jackson, Lenawee, Washtenaw | MI | | GL |
| Poweshiek skipperling | *Oarisma poweshiek* | Insect | Sedge meadows and tall-grass prairies | ST | | Jackson, Kent, Lenawee, Livingston, Oakland, Washtenaw | MI | | GL |
| Silphium borer moth | *Papaipema silphii* | Insect | Prairie fens and mesic prairies | ST | | Jackson, Monroe, Tuscola, Washtenaw | MI | | GL |
| Hine's emerald dragonfly | *Somatochlora hineana* | Insect | Spring-fed marshes and sedge meadows | SE | FE | Alcona, Alpena, Mackinac, Presque Isle | MI | | GL |
| Regal fritillary | *Speyeria idalia* | Insect | Open prairie and sandy areas | SE | | Jackson, Lenawee, Livingston, Oakland, Shiawassee, Washtenaw, Wayne | MI | | GL |
| Lake Huron locust | *Trimerotropis huroniana* | Insect | Sparsely vegetated, high-quality sand dunes | ST | | Alcona, Alger, Alpena, Antrim, Charlevoix, Cheboygan, Chippewa, Emmet, Iosco, Huron, Luce, Mackinac, Mason, Presque Isle, Schoolcraft | MI | | GL |
| Least shrew | *Cryptotis parva* | Mammal | Dry upland meadows with dense vegetation; near marsh and wood edges | ST | | Ingham, Jackson, Livingston, Oakland, Washtenaw | MI | | GL |
| Canada lynx | *Lynx canadensis* | Mammal | Northern forests | SE | FT | Alger, Baraga, Chippewa, Delta, Gogebic, Houghton, Keweenaw, Luce, Mackinac, Marquette, Ontonagon, Schoolcraft | MI | | GL |
| Indiana bat | *Myotis sodalis* | Mammal | Wooded areas; seek caves for hibernation. | SE | FE | Bay, Genesee, Hillsdale, Huron, Ingham, Jackson, Lapeer, Lenawee, Livingston, Macomb, | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| | | | | | | Mason, Monroe, Oakland, Saginaw, Sanilac, St. Clair, Shiawassee, Tuscola, Washtenaw, Wayne | | | |
| Smoky shrew | *Sorex fumeus* | Mammal | Hardwood and boreal forests with thick leaf litter | ST | | Chippewa | MI | | GL |
| Slippershell | *Alasmidonta viridis* | Mollusk | Creeks and headwaters of gravel-bottom rivers | ST | | Chippewa, Crawford, Hillsdale, Ingham, Jackson, Kent, Lapeer, Lenawee, Livingston, Mackinac, Macomb, Monroe, Oakland, Ogemaw, Presque Isle, Sanilac, Shiawassee, St. Clair, Tuscola, Washtenaw | MI | | GL |
| Pleistocene catinella | *Catinella exile* | Mollusk | Calcium-rich wetlands and rocky beaches' associated with sage-leaved willows | ST | | Chippewa, Delta, Mackinac | MI | | GL |
| Purple wartyback | *Cyclonaias tuberculata* | Mollusk | Medium-large rivers with sand and gravel mixture | ST | | Jackson, Kent,Lenawee, Macomb, Monroe, Washtenaw, Wayne | MI | | GL |
| White catspaw | *Epioblasma obliquata perobliqua* | Mollusk | Little known of required habitat | SE | | Monroe, Wayne | MI | | GL |
| Northern riffleshell | *Epioblasma torulosa rangiana* | Mollusk | Sand and gravel river bottoms | SE | FE | Bay, Lenawee, Monroe, Oakland, Sanilac, Wayne | MI | | GL |
| Snuffbox | *Epioblasma triquetra* | Mollusk | Small to medium rivers with sand, gravel, and cobble substrates | SE | FE* | Huron, Kent, Livingston, Macomb, Monroe, Oakland, Saginaw, St. Clair, Washtenaw, Wayne | MI | Proposed as Endangered | GL |
| Land snail (no common name) | *Euconulus alderi* | Mollusk | Calcareous wetlands dominated by tamarack and sedges, speckled alder, and white cedar | ST | | Chippewa, Delta, Keweenaw, Mackinac, Schoolcraft | MI | | GL |
| Lambda snaggletooth | *Gastrocopta holzingeri* | Mollusk | Wooded cliffs | SE | | Delta | MI | | GL |
| Sterki's granule | *Guppya sterkii* | Mollusk | Calcium-rich slopes and taluses | SE | | Delta, Schoolcraft | MI | | GL |
| Cherrystone drop | *Hendersonia occulta* | Mollusk | Forested calcareous slopes with a layer of | ST | | Delta | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| | | | humus near rivers | | | | | | |
| Wavyrayed lampmussel | *Lampsilis fasciola* | Mollusk | Small to medium streams in and near riffles; swift currents with gravel substrate | ST | | Hillsdale, Jackson, Lenawee, Livingston, Macomb, Monroe, Oakland, Sanilac, St. Clair, Washtenaw, Wayne | MI | | GL |
| Eastern pondmussel | *Ligumia nasuta* | Mollusk | Lakes, rivers, ponds, streams with sandy-gravelly substrates | SE | | Alger, Arenac, Bay, Cheboygan, Emmet, Huron, Iosco, Macomb, Monroe, Montmorency, Ogemaw, Saginaw, St. Clair, Wayne | MI | | GL |
| Black sandshell | *Ligumia recta* | Mollusk | Rivers and lakes; prefer sand and gravel substrates but also found on clays | SE | | Livingston, Luce, Oakland, Washtenaw | MI | | GL |
| Three-horn wartyback | *Obliquaria reflexa* | Mollusk | Beech-maple, oak-pine forests; lowland and mesic hardwoods | SE | | Monroe, Wayne | MI | | GL |
| Hickorynut | *Obovaria olivaria* | Mollusk | Large rivers and lakes with sand and gravel bottoms | SE | | Macomb, Monroe, Saginaw, Washtenaw, Wayne | MI | | GL |
| Round hickorynut | *Obovaria subrotunda* | Mollusk | Mouths of medium to large rivers in sand and gravel substrate | SE | | Lenawee, Macomb, Monroe, Sanilac, St. Clair, Wayne | MI | | GL |
| Acorn rams-horn | *Planorbella multivolvis* | Mollusk | Deeper water | SE | | Marquette | MI | | GL |
| Aquatic snail (no common name) | *Planorbella smithi* | Mollusk | Marl, sand, mud substrates along shores of oligotrophic lakes | SE | | Cheboygan | MI | | GL |
| Clubshell | *Pleurobema clava* | Mollusk | Sand and gravel river bottoms | SE | FE | Hillsdale | MI | | GL |
| Pink papershell | *Potamilus ohiensis* | Mollusk | Medium to large rivers; silt, sand, or clay bottoms | ST | | St. Clair | MI | | GL |
| Salamander mussel | *Simpsonaias ambigua* | Mollusk | Medium to large rivers and lakes; in silt under flat stones | SE | | Lenawee, Monroe, Sanilac, St. Clair, Wayne | MI | | GL |
| Deepwater pondsnail | *Stagnicola contracta* | Mollusk | Medium to large lakes around 30 ft | SE | | Charlevoix | MI | | GL |
| Petoskey pondsnail | *Stagnicola petoskeyensis* | Mollusk | Calcium-rich, spring-fed streams | SE | | Emmet | MI | | GL |
| Purple lilliput | *Toxolasma lividus* | Mollusk | Small to medium streams with shallow waters and sandy bottoms | SE | | Hillsdale, Monroe, Oakland, Tuscola | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Lilliput | *Toxolasma parvus* | Mollusk | Rivers, lakes, and ponds with sand and fine gravel | SE | | Lenawee, Macomb, Monroe, Wayne | MI | | GL |
| Fawnsfoot | *Truncilla donaciformis* | Mollusk | Larger rivers with sand-gravel substrate | ST | | Monroe, Wayne | MI | | GL |
| Land snail (no common name) | *Vallonia gracilicosta albula* | Mollusk | Forested calcareous cliffs and algific talus slopes | SE | | Chippewa, Delta, Mackinac | MI | | GL |
| Hubricht's vertigo | *Vertigo hubrichti* | Mollusk | Glacial cliffsides and crevices; associated with decaying leaves | SE | | Chippewa, Delta, Schoolcraft | MI | | GL |
| Land snail (no common name) | *Vertigo modesta parietalis* | Mollusk | Open talus slope at the base of basalt cliffs; organic-rich soil accumulations between talus fragments | SE | | Keweenaw | MI | | GL |
| Six-whorl vertigo | *Vertigo morsei* | Mollusk | Pond and marsh edges | SE | | Mackinac | MI | | GL |
| Rayed bean | *Villosa fabalis* | Mollusk | Shallow rivers near riffles and vegetation; wave-swept shorelines | SE | F* | Hillsdale, Lenawee, Macomb, Monroe, Oakland, St. Clair, Wayne | MI | F* Proposed as Endangered | GL |
| Land snail (no common name) | *Vertigo modesta modesta* | Mollusk | Open talus slope at the base of basalt cliffs; organic-rich soil accumulations between talus fragments | SE | | Keweenaw | MI | | GL |
| Gattinger's gerardia | *Agalinis gattingeri* | Plant | Sand, rock, and clay slopes; open woods and barrens | SE | | Macomb, Monroe, Oakland, St. Clair | MI | | GL |
| Skinner's gerardia | *Agalinis skinneriana* | Plant | Lakeplain prairie landscapes | SE | | St. Clair | MI | | GL |
| Prairie or pale agoseris | *Agoseris glauca* | Plant | Jack pine savannas and open shrub-grasslands | ST | | Chippewa, Crawford, Montmorency, Oscoda, Otsego | MI | | GL |
| Beaked agrimony | *Agrimonia rostellata* | Plant | Sandy openings in oak-hickory forests | ST | | Hillsdale, Lenawee | MI | | GL |
| Wild chives | *Allium schoenoprasum* | Plant | Alvar grasslands and Lake Superior shores | ST | | Delta, Houghton, Keweenaw, Marquette | MI | | GL |
| Small round-leaved orchis | *Amerorchis rotundifolia* | Plant | Cold swamps and large peatlands | SE | | Alger, Chippewa, Delta, Emmet, Keweenaw, Marquette, Oscoda | MI | | GL |
| Rosy pussytoes | *Antennaria rosea* | Plant | Dry, rocky ridgetops above slash zones | SE | | Keweenaw | MI | | GL |
| Short’s rockcress | *Arabis perstellata* | Plant | Floodplains with steep banks, thick canopies, and thin ground cover | ST | | Ingham, Kent | MI | | GL |
| Three-awned grass | *Aristida longespica* | Plant | Remnant lakeplain prairies | ST | | Monroe, Oakland, St. Clair, Wayne | MI | | GL |
| Virginia snakeroot | *Aristolochia* | Plant | Dry-mesic forests above wetlands; edges of | ST | | Kent, Lenawee, | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| | *serpentaria* | | floodplains on slopes | | | Washtenaw, Wayne | | | |
| Lake cress | *Armoracia lacustris* | Plant | Quiet, shallow backwaters in lakes and slow-moving streams | ST | | Alpena, Cheboygan, Iosco, Luce, Mackinac, Macomb, Marquette, Mason, Presque Isle | MI | | GL |
| Heart-leaved arnica | *Arnica cordifolia* | Plant | Second-growth forests with gravelly loam soils | SE | | Keweenaw | MI | | GL |
| Western mugwort | *Artemisia ludoviciana* | Plant | Dry remnant prairies and barrens | ST | | Lenawee, Washtenaw | MI | | GL |
| Tall green milkweed | *Asclepias hirtella* | Plant | Sandy loam soils | ST | | Bay, Huron, Jackson, Monroe, Tuscola, Wayne | MI | | GL |
| Purple milkweed | *Asclepias purpurascens* | Plant | Prairies with mesic soils | ST | | Ingham, Jackson, Lenawee, Livingston, Monroe, St. Clair, Washtenaw | MI | | GL |
| Sullivant's milkweed | *Asclepias sullivantii* | Plant | Remnant lakeplain prairies in sandy soils | ST | | Lenawee, Monroe, Oakland, St. Clair, Tuscola, Washtenaw, Wayne | MI | | GL |
| Walking fern | *Asplenium rhizophyllum* | Plant | Large, moss-covered boulders in hardwoods | ST | | Alpena, Chippewa, Delta, Houghton, Mackinac | MI | | GL |
| Wall-rue | *Asplenium ruta-muraria* | Plant | Cliffs, boulders, talus dolomite, limestone, and calcareous shales | SE | | Chippewa | MI | | GL |
| Hart's tongue fern | *Asplenium scolopendrium* var. *americanum* | Plant | Shaded, mature forests near rock edges | SE | FT | Chippewa, Mackinac | MI | | GL |
| Drummond's aster | *Aster drummondii* | Plant | Sandy oak savannas, open areas of oak forests; along sandy roadsides and powerlines | ST | | Kent | MI | | GL |
| Forked aster | *Aster furcatus* | Plant | Riparian areas | ST | | Monroe | MI | | GL |
| Great northern aster | *Aster modestus* | Plant | Rocky shores and open fields on Isle Royale; adjacent to cedar swamps | ST | | Keweenaw | MI | | GL |
| Western silvery aster | *Aster sericeus* | Plant | Found in openings within oak-pine barrens, often in bowl prairies, dry banks, and old fields | ST | | Kent | MI | | GL |
| Canadian milk-vetch | *Astragalus canadensis* | Plant | Open areas near rich, moist soil covering limestone | ST | | Alger, Delta, Kent, Lapeer, Livingston, | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| | | | | | | Lenawee, Oakland, Ontonagon, Oscoda, Washtenaw | | | |
| Panicled screw-stem | *Bartonia paniculata* | Plant | Coastal plain marshes, shallow lakes, and intermittent wetlands | ST | | Chippewa, Luce | MI | | GL |
| Slough grass | *Beckmannia syzigachne* | Plant | Open wetland habitats | ST | | Bay, Chippewa, Emmet, Keweenaw, Mackinac, St. Clair | MI | | GL |
| Cut-leaved water-parsnip | *Berula erecta* | Plant | Typically within prairie fens in unshaded marshy borders of cold streams and springs | ST | | Kent, Mason | MI | | GL |
| Kitten-tails | *Besseya bullii* | Plant | Oak savanna remnants adjacent to large rivers | SE | | Jackson, Kent | MI | | GL |
| Acute-leafved moonwort | *Botrychium acuminatum* | Plant | Large open dune fields | SE | | Alger | MI | | GL |
| Prairie moonwort or dunewort | *Botrychium campestre* | Plant | Dunes of Lake Michigan | ST | | Alger, Chippewa, Delta | MI | | GL |
| Western moonwort | *Botrychium hesperium* | Plant | Large dune systems and disturbed sandy areas | ST | | Alger, Alpena, Chippewa | MI | | GL |
| Goblin moonwort | *Botrychium mormo* | Plant | Mature northern hardwood forests with soil rich in humus | ST | | Alger, Baraga, Crawford, Chippewa, Cheboygan, Delta, Gogebic, Luce, Mackinac, Otsego | MI | | GL |
| Spathulate moonwort | *Botrychium spathulatum* | Plant | Grassy swales near white cedars or low shrubs | ST | | Alcona, Alger, Chippewa, Mackinac | MI | | GL |
| Side-oats grama grass | *Bouteloua curtipendula* | Plant | Oak barrens and hillside prairies | SE | | Jackson, Kent, Livingston, Oakland,Washtenaw | MI | | GL |
| Low northern rock-cress | *Braya humilis* | Plant | Sunny, exposed bedrock shores of Lake Superior | ST | | Keweenaw | MI | | GL |
| Pumpelly's bromegrass | *Bromus pumpellianus* | Plant | Great Lakes dunes | ST | | Antrim, Charlevoix, Emmet | MI | | GL |
| Northern reedgrass | *Calamagrostis lacustris* | Plant | Mossy crevices and openings on rock and sand shorelines | ST | | Houghton, Keweenaw, Marquette | MI | | GL |
| Narrow-leaved reedgrass | *Calamagrostis stricta* | Plant | Rocky shorelines of Lake Superior; among streams, marshes, and prairie fens | ST | | Keweenaw | MI | | GL |
| Large water-starwort | *Callitriche heterophylla* | Plant | Shallow, slow-moving water in rivers | ST | | Emmet, Lapeer, St. Clair | MI | | GL |

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| Yellow marsh marigold | *Caltha palustris L. var. palustris* | Plant | Shallow-water creeks, pools, ditches, and lake backwaters; muddy, silty and clay bottoms | ST | | Baraga | MI | | GL |
| Calypso or fairy-slipper | *Calypso bulbosa* | Plant | Moist coniferous forests with cool soils | ST | | Alcona, Alger, Alpena, Antrim, Charlevoix, Cheboygan, Chippewa, Crawford, Delta, Emmet, Gogebic, Keweenaw, Mackinac, Marquette, Montmorency, Presque Isle, Schoolcraft | MI | | GL |
| Wild-hyacinth | *Camassia scilloides* | Plant | Floodplain forests with open canopy; river bottoms and streambanks | ST | | Lenawee, Monroe, Wayne | MI | | GL |
| Greenish-white sedge | *Carex albolutescens* | Plant | Moist rock crevices; sheltered, shaded areas | ST | | Alcona, Lenawee, Schoolcraft | MI | | GL |
| Assiniboia sedge | *Carex assiniboinensis* | Plant | Northern hardwood and floodplain forests | ST | | Gogebic | MI | | GL |
| Sedge | *Carex atratiformis* | Plant | Moist rock crevices; sheltered, shaded areas | ST | | Keweenaw, Marquette | MI | | GL |
| Sedge | *Carex conjuncta* | Plant | Moist rock crevices; sheltered, shaded areas | ST | | Hillsdale, Lenawee | MI | | GL |
| Raven's-foot sedge | *Carex crus-corvi* | Plant | Floodplains and marshes | SE | | Ingham, Monroe | MI | | GL |
| Hudson Bay sedge | *Carex heleonastes* | Plant | Open sedge-dominated fens | SE | | Alger | MI | | GL |
| False hop sedge | *Carex lupuliformis* | Plant | Floodplain forests and swamp bottoms | ST | | Bay, Genesee, Hillsdale, Ingham, Macomb, Oakland, Washtenaw | MI | | GL |
| Sedge | *Carex media* | Plant | Moist rock crevices; sheltered, shaded areas | ST | | Keweenaw | MI | | GL |
| Black sedge | *Carex nigra* | Plant | Near Great Lakes peatlands and shorelines | SE | | Alcona, Schoolcraft | MI | | GL |
| New England sedge | *Carex novae-angliae* | Plant | Disturbed soils in moist, shaded hardwoods | ST | | Chippewa, Schoolcraft | MI | | GL |
| Broad-leaved sedge | *Carex platyphylla* | Plant | Mesic forests | SE | | St. Clair | MI | | GL |
| Ross's sedge | *Carex rossii* | Plant | Dry, sunny rock crevices on the Upper Peninsula | ST | | Keweenaw | MI | | GL |
| Bulrush sedge | *Carex scirpoidea* | Plant | Limestone and northern fen communities | ST | | Alpena, Chippewa, Delta, Keweenaw, Mackinac, Presque Isle | MI | | GL |
| Sedge | *Carex seorsa* | Plant | Moist rock crevices; sheltered, shaded areas | ST | | Washtenaw | MI | | GL |
| Cat-tail sedge | *Carex typhina* | Plant | Bottomland forests | ST | | Ingham | MI | | GL |
| American chestnut | *Castanea dentata* | Plant | Upland forests | SE | | Chippewa, Crawford, | MI | | GL |

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| | | | | | | Ingham, Lenawee, Monroe, Oakland, St. Clair, Wayne Washtenaw, | | | |
| Pale Indian paintbrush | *Castilleja septentrionalis* | Plant | Rock ledges in thin coastal forests | ST | | Keweenaw | MI | | GL |
| Redstem ceanothus or Wild lilac | *Ceanothus sanguineus* | Plant | Rocky openings with partial shade | ST | | Keweenaw | MI | | GL |
| Keweenaw Rock-rose | *Chamaerhodos nuttallii* var. *keweenawensis* | Plant | Exposed, eroding conglomerate cliffs | SE | | Keweenaw | MI | | GL |
| Purple turtlehead | *Chelone obliqua* | Plant | Huron River floodplains | SE | | Washtenaw | MI | | GL |
| Pitcher's thistle | *Cirsium pitcheri* | Plant | Open sand dunes and beaches | ST | FT | Alcona, Alger, Alpena, Antrim, Arenac, Charlevoix, Cheboygan, Chippewa, Delta, Emmet, Huron, Iosco, Mackinac, Mason, Presque Isle, Schoolcraft | MI | | GL |
| Small blue-eyed Mary | *Collinsia parviflora* | Plant | Rocky ridge tops with bare soils near eroding rock | ST | | Keweenaw, Marquette, Ontonagon, Schoolcraft | MI | | GL |
| American rock-brake | *Cryptogramma acrostichoides* | Plant | Dry sunny bedrock near Lake Superior | ST | | Keweenaw | MI | | GL |
| White lady-slipper | *Cypripedium candidum* | Plant | Alkaline wetlands and lakeplain prairies in coastal areas | ST | | Genesee, Hillsdale, Huron, Ingham, Jackson, Kent, Lenawee, Livingston, Oakland, St. Clair, Tuscola, Washtenaw | MI | | GL |
| False-violet | *Dalibarda repens* | Plant | Moist, acidic duffs within pine stands; associated with hummocks | ST | | Alcona, Antrim, Charlevoix, Chippewa, Crawford, Emmet, Ogemaw | MI | | GL |
| Mullein foxglove | *Dasistoma macrophylla* | Plant | Grass openings in floodplain forests | SE | | Wayne | MI | | GL |
| Hay-scented fern | *Dennstaedtia punctilobula* | Plant | Acidic soils in full sun or partially shaded areas | ST | | Jackson, Shiawassee | MI | | GL |
| Large toothwort | *Dentaria maxima* | Plant | Deciduous hardwoods | ST | | Arenac, Gogebic, Ontonagon, St. Clair | MI | | GL |

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| Obovate beakgrain | *Diarrhena obovata* | Plant | Moist streamside deciduous forests | ST | | Ingham, Kent, Lapeer, Lenawee, Monroe, St. Clair, Tuscola, Wayne | MI | | GL |
| Leiberg's panic grass | *Dichanthelium leibergii* | Plant | Dry prairies or open savannas | ST | | Hillsdale, Jackson, Monroe, St. Clair, Washtenaw | MI | | GL |
| Round-seed panic grass | *Dichanthelium polyanthes* | Plant | Seasonal wetlands in glacial landscapes and outwashes | SE | | Lenawee | MI | | GL |
| Ashy whitlow-grass | *Draba cana* | Plant | Exposed limestone and dolomite cliffs | ST | | Chippewa, Delta, Schoolcraft | MI | | GL |
| Smooth whitlow-grass | *Draba glabella* | Plant | Bedrock beaches and crevices | SE | | Keweenaw | MI | | GL |
| Twisted whitlow-grass | *Draba incana* | Plant | Outcrop islands on Lake Superior | ST | | Keweenaw | MI | | GL |
| Creeping whitlow-grass | *Draba reptans* | Plant | Oak-savannas near river banks | ST | | Kent, Livingston, St. Clair | MI | | GL |
| Flattened spike-rush | *Eleocharis compressa* | Plant | Limestone pavement in crevices | ST | | Cheboygan, Chippewa, Kent, Mackinac | MI | | GL |
| Slender spike-rush | *Eleocharis nitida* | Plant | Wet, peaty sands | SE | | Schoolcraft | MI | | GL |
| Black crowberry | *Empetrum nigrum* | Plant | Cedar and black spruce swamps; sandy soils | ST | | Alger, Keweenaw, Luce, Mackinac | MI | | GL |
| Bitter fleabane | *Erigeron acris* | Plant | Rocky or sandy shaded areas; clearings in birch woods | ST | | Keweenaw | MI | | GL |
| Hyssop-leaved fleabane | *Erigeron hyssopifolius* | Plant | Calcium-rich fens and white cedar swamps | ST | | Mackinac | MI | | GL |
| Hollow-stemmed joe-pye-weed | *Eupatorium fistulosum* | Plant | Hardwood swamps with plentiful sunlight | ST | | Lenawee, Oakland | MI | | GL |
| Upland boneset | *Eupatorium sessilifolium* | Plant | Oak savannas and wooded slopes | ST | | Jackson, Washtenaw | MI | | GL |
| Tinted spurge | *Euphorbia commutata* | Plant | Hillsides and mesic forests near rivers and open woodlands | ST | | Kent, Wayne | MI | | GL |
| Eyebright | *Euphrasia hudsoniana* | Plant | Sheltered rock shorelines on Isle Royale | ST | | Keweenaw | MI | | GL |
| Common eyebright | *Euphrasia nemorosa* | Plant | Moist, low-lying pools on rocky shores of Isle Royale | ST | | Keweenaw | MI | | GL |
| Rough fescue | *Festuca scabrella* | Plant | Pine barren remnants | ST | | Alcona, Chippewa, Crawford, Montmorency, Ogemaw, Oscoda, | MI | | GL |

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| | | | | | | Otsego | | | |
| Queen-of-the-prairie | *Filipendula rubra* | Plant | Prairie fens in southwest lower Michigan; principally in glacial interlobate areas where these alkaline, groundwater-fed systems usually occur, especially in association with lake and river complexes and other large drainages | ST | | Kent | MI | | GL |
| Pumpkin ash | *Fraxinus profunda* | Plant | Lower parts of floodplain forests and deciduous swamps | ST | | Hillsdale, Macomb, Oakland, Wayne | MI | | GL |
| Dwarf umbrella-sedge | *Fuirena pumila* | Plant | Peaty, mucky shores of inland lakes with fluctuating water levels | ST | | Kent, Oakland, Washtenaw | MI | | GL |
| Showy orchis | *Galearis spectabilis* | Plant | Deciduous woods near seasonal spring ponds | ST | | Baraga, Bay, Genesee, Gogebic, Hillsdale, Ingham, Kent, Lenawee, Macomb, Oakland, Ontonagon, Saginaw, Shiawassee, St. Clair, Tuscola, Washtenaw, Wayne | MI | | GL |
| Bedstraw | *Galium kamtschaticum* | Plant | Cold pools and springs in hardwood forests | SE | | Chippewa | MI | | GL |
| White gentian | *Gentiana flavida* | Plant | Mesic prairies and oak woodlands | SE | | Kent, St. Clair, Washtenaw | MI | | GL |
| Narrow-leaved gentian | *Gentiana linearis* | Plant | Spring-fed bogs and wet meadows; streamside of rivers | ST | | Baraga, Keweenaw, Marquette | MI | | GL |
| Downy gentian | *Gentiana puberulenta* | Plant | Coastal plain marshes in oak barren areas | SE | | Kent, Macomb, Oakland, Washtenaw | MI | | GL |
| Stiff gentian | *Gentianella quinquefolia* | Plant | Marshy meadows, streambanks, and woodland edges | ST | | Kent, Macomb, Monroe, Oakland, St. Clair, Washtenaw, Wayne | MI | | GL |
| Prairie-smoke | *Geum triflorum* | Plant | Dry sand prairies with seasonal wet soils | ST | | Chippewa, Kent | MI | | GL |
| Cudweed | *Gnaphalium sylvaticum* | Plant | Openings in mixed and hardwood forests | ST | | Alger, Gogebic | MI | | GL |
| Hedge-hyssop | *Gratiola aurea* | Plant | Shallow, sandy shores of ponds and lakes | ST | | Gogebic | MI | | GL |
| Northern oak fern | *Gymnocarpium jessoense* | Plant | Igneous outcrops in cool, acidic to neutral soils | SE | | Marquette | MI | | GL |
| Limestone oak fern | *Gymnocarpium robertianum* | Plant | White cedar swamps or cedar limestone ledges | ST | | Alger, Charlevoix, Cheboygan, Chippewa, | MI | | GL |

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| | | | | | | Delta, Emmet, Mackinac, Marquette, Montmorency, St. Clair | | | |
| Alpine sainfoin | *Hedysarum alpinum* | Plant | Partially shaded river edges | SE | | Delta | MI | | GL |
| Downy sunflower | *Helianthus mollis* | Plant | Open, disturbed sandy ground | ST | | Jackson, Monroe, Ontonagon | MI | | GL |
| Allegheny hawkweed | *Hieracium paniculatum* | Plant | Oak woods with sandy soils | ST | | Macomb, Oakland | MI | | GL |
| Goldenseal | *Hydrastis canadensis* | Plant | Moist ravines and riparian forests | ST | | Genesee, Ingham, Jackson, Kent, Lapeer, Lenawee, Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, Wayne | MI | | GL |
| Lakeside daisy | *Hymenoxys herbacea* | Plant | Dry, rocky prairie grasslands | SE | FT | Mackinac | MI | | GL |
| Round-fruited St. John's-wort | *Hypericum sphaerocarpum* | Plant | Openings in thickets along streams | SE | | Monroe | MI | | GL |
| Dwarf lake iris | *Iris lacustris* | Plant | Cool, sandy lakeshores | ST | FT | Alpena, Charlevoix, Cheboygan, Chippewa, Delta, Emmet, Mackinac, Schoolcraft, Presque Isle | MI | | GL |
| Whorled pogonia | *Isotria verticillata* | Plant | Successional bogs; acidic soils | ST | | Genesee, Kent, Montmorency, Saginaw, Washtenaw | MI | | GL |
| Short-fruited rush | *Juncus brachycarpus* | Plant | Fluctuating water tables; coastal marshes, swales, and intermittent wetlands | ST | | Mason, Monroe, St. Clair, Wayne | MI | | GL |
| Bayonet rush | *Juncus militaris* | Plant | Intermittent wetlands | ST | | Cheboygan, Presque Isle | MI | | GL |
| Scirpus-like rush | *Juncus scirpoides* | Plant | Fluctuating water tables; coastal marshes, swales, and intermittent wetlands | ST | | St. Clair | MI | | GL |
| Moor rush | *Juncus stygius* | Plant | Cedar-black spruce-tamarack fens; on sedge-sphagnum floating mats in peatland complexes | ST | | Delta, Luce, Mackinac, Marquette | MI | | GL |
| Vasey's rush | *Juncus vaseyi* | Plant | Intermittent wetlands; marshy flats | ST | | Cheboygan, Chippewa, Crawford, Delta, Mason, Schoolcraft, Shiawassee, Wayne | MI | | GL |
| Water-willow | *Justicia americana* | Plant | Large river systems on muddy banks and | ST | | Livingston, Monroe, | MI | | GL |

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| | | | shorelines | | | Washtenaw, Wayne | | | |
| Woodland lettuce | *Lactuca floridana* | Plant | Lakeplain areas and sandy soil oak woods | ST | | Lenawee, Monroe, Wayne | MI | | GL |
| Leggett's pinweed | *Lechea pulchella* | Plant | Edges of seasonal wetlands | ST | | Monroe | MI | | GL |
| Virginia flax | *Linum virginianum* | Plant | Open oak, upland, and riparian forests | ST | | Ingham, Kent, Livingston, Macomb, Oakland, Washtenaw | MI | | GL |
| Black twinberry | *Lonicera involucrata* | Plant | Cool wetland habitats | ST | | Keweenaw | MI | | GL |
| Small-flowered wood rush | *Luzula parviflora* | Plant | Swamp woods and slopes of Lake Superior | ST | | Alger, Keweenaw | MI | | GL |
| Northern prostrate clubmoss | *Lycopodiella margueritae* | Plant | Seasonally flooded wetlands in glacial landscapes | ST | | St. Clair | MI | | GL |
| Virginia water-horehound | *Lycopus virginicus* | Plant | First and second bottoms of floodplain forests | ST | | Ingham, Lenawee, Shiawassee, Wayne | MI | | GL |
| Virginia bluebells | *Mertensia virginica* | Plant | First and second bottoms of riparian forests | SE | | Kent, Lenawee | MI | | GL |
| Michigan monkey flower | *Mimulus glabratus Kunth var. michiganensis* | Plant | Mucky soil near cold, flowing spring water | SE | FE | Charlevoix, Cheboygan, Emmet, Mackinac | MI | | GL |
| Big-leaf sandwort | *Moehringia macrophylla* | Plant | Rocky outcrops near wooded shores | ST | | Baraga, Keweenaw, Marquette | MI | | GL |
| Red mulberry | *Morus rubra* | Plant | River floodplains | ST | | Ingham, Lenawee, Livingston, Kent, Monroe, Oakland, Washtenaw, Wayne | MI | | GL |
| Mat muhly | *Muhlenbergia richardsonis* | Plant | Limestone communities and prairie fens | ST | | Delta, Jackson, Livingston, Mackinac, Oakland, Washtenaw | MI | | GL |
| Farwell's water-milfoil | *Myriophyllum farwellii* | Plant | Shallow lakes and ponds with muck and peat bottoms | ST | | Alger, Baraga, Chippewa, Gogebic, Houghton, Keweenaw, Luce, Marquette, Ontonagon, Schoolcraft | MI | | GL |
| American lotus | *Nelumbo lutea* | Plant | Marshes and quiet backwaters | ST | | Genesee, Monroe, Wayne | MI | | GL |
| Small yellow pond-lily | *Nuphar pumila* | Plant | Soft-water lakes | SE | | Gogebic, Luce, Marquette, Ontonagon | MI | | GL |
| Leiberg’s water lily | *Nymphaea leibergii* | Plant | Cold waters; Isle Royale | SE | | Keweenaw | MI | | GL |

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| Southeastern adder's-tongue | *Ophioglossum vulgatum* | Plant | Rich, disturbed woodlands | SE | | Lenawee | MI | | GL |
| Devil's-club | *Oplopanax horridus* | Plant | Shaded birch forests | ST | | Keweenaw | MI | | GL |
| Fragile prickly pear | *Opuntia fragilis* | Plant | Steep, south-facing granite bedrock slopes | SE | | Marquette, Ogemaw | MI | | GL |
| Fascicled broomrape | *Orobanche fasciculata* | Plant | Great Lakes sand dunes | ST | | Charlevoix, Mason | MI | | GL |
| Canada rice-grass | *Oryzopsis canadensis* | Plant | Moist, sandy areas cleared of pine forest | ST | | Baraga, Chippewa, Delta, Marquette, Schoolcraft | MI | | GL |
| Sweet cicely | *Osmorhiza depauperata* | Plant | Mixed forest and thickets | ST | | Keweenaw | MI | | GL |
| Ginseng | *Panax quinquefolius* | Plant | Rich, shaded, and loamy soils in dense forest | ST | | Alcona, Antrim, Chippewa, Crawford, Gogebic, Hillsdale, Ingham, Iosco, Jackson, Kent, Mason, Monroe, Oakland, St. Clair, Tuscola, Washtenaw, Wayne | MI | | GL |
| Philadelphia panicgrass | *Panicum philadelphicum* | Plant | Alvar areas with sparse vegetation | ST | | Chippewa | MI | | GL |
| Marsh grass-of-parnassus | *Parnassia palustris* | Plant | White cedar swamps and moist sandy soils near lakeshores | ST | | Keweenaw | MI | | GL |
| Purple cliff-brake | *Pellaea atropurpurea* | Plant | Alkaline outcrops | ST | | Chippewa, Keweenaw | MI | | GL |
| Smooth beard tongue | *Penstemon calycosus* | Plant | Open prairie remnants | ST | | Kent, St. Clair | MI | | GL |
| Sweet coltsfoot | *Petasites sagittatus* | Plant | Intermittent wetlands and small depressions; large peatland complexes | ST | | Chippewa, Gogebic, Mackinac, Ontonagon, Schoolcraft | MI | | GL |
| Franklin's phacelia | *Phacelia franklinii* | Plant | Rocky and gravel edges near shorelines and roadways | ST | | Keweenaw | MI | | GL |
| Heart-leaved plantain | *Plantago cordata* | Plant | Large river floodplains and mucky streams | SE | | Hillsdale, Macomb, Shiawassee, St. Clair, Tuscola | MI | | GL |
| Orange or yellow fringed orchid | *Platanthera ciliaris* | Plant | Acidic swamps with bog vegetation | SE | | Bay, Jackson, Kent, Lapeer, Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw | MI | | GL |

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| Prairie fringed orchid | *Platanthera leucophaea* | Plant | Mesic prairies and wetlands | SE | FT | Bay, Cheboygan, Genesee, Huron, Livingston, Monroe, Oakland, Saginaw, St. Clair, Tuscola, Washtenaw, Wayne | MI | | GL |
| Alpine bluegrass | *Poa alpina* | Plant | Limestone and basaltic crevices surrounding Great Lakes | ST | | Chippewa, Keweenaw | MI | | GL |
| Canby's bluegrass | *Poa canbyi* | Plant | Mossy crevices of volcanic rock | SE | | Keweenaw | MI | | GL |
| Bog bluegrass | *Poa paludigena* | Plant | Wet woodlands and swamps, near moss-covered wood | ST | | Cheboygan, Ingham, Jackson, Keweenaw, Livingston, Oakland, St. Clair, Washtenaw | MI | | GL |
| Jacob's ladder or greek-valerian | *Polemonium reptans* | Plant | Fens, wet prairies, and floodplains | ST | | Lapeer, Lenawee, Oakland, Washtenaw | MI | | GL |
| Carey's smartweed | *Polygonum careyi* | Plant | Lakeshores, sandy marshes, and beaver ponds | ST | | Kent, St. Clair | MI | | GL |
| Alpine bistort | *Polygonum viviparum* | Plant | Alpine and mountainous areas | ST | | Keweenaw | MI | | GL |
| Yellow-flowered leafcup | *Polymnia uvedalia* | Plant | Ravines, moist thickets, and along the banks of streams or rivers | ST | | Kent | MI | | GL |
| Swamp or black cottonwood | *Populus heterophylla* | Plant | Vernal pools and buttonbrush depressions | SE | | Lenawee, Washtenaw | MI | | GL |
| Hill's pondweed | *Potamogeton hillii* | Plant | Sand bottoms, alkaline streams; cold, shallow waters | ST | | Charlevoix, Cheboygan, Emmet, Mackinac, Otsego, Presque Isle | MI | | GL |
| Spotted pondweed | *Potamogeton pulcher* | Plant | Peat-bottom lakes | SE | | Cheboygan, Emmet | MI | | GL |
| Vasey's pondweed | *Potamogeton vaseyi* | Plant | Small, moderate-depth lakes with soft water | ST | | Kent, Oakland | MI | | GL |
| Sand cinquefoil | *Potentilla paradoxa* | Plant | Loose sands on shores | ST | | Monroe, Wayne | MI | | GL |
| Prairie cinquefoil | *Potentilla pensylvanica* | Plant | Sparsely vegetated, rocky areas | ST | | Keweenaw | MI | | GL |
| Fairy bells | *Prosartes hookeri* | Plant | Mesic northern forests dominated by hemlock and sugar maple | SE | | Ontonagon | MI | | GL |
| Roughfruit fairybells | *Disporum trachycarpum* | Plant | Forests and glades on gentle and steep slopes | ST | | Keweenaw | MI | | GL |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Pine-drops | *Pterospora andromedea* | Plant | Pine-dominated, dry woodlands; near shorelines and backdunes | ST | | Alcona, Alpena, Antrim, Baraga, Chippewa, Delta, Emmet, Iosco, Keweenaw, Mackinac, Marquette, Ontonagon, Presque Isle, Schoolcraft, St. Clair | MI | | GL |
| Mountain mint | *Pycnanthemum muticum* | Plant | Fen-like areas with moist, calcium-rich soils | ST | | Huron | MI | | GL |
| Hairy mountain-mint | *Pycnanthemum pilosum* | Plant | Shaded riverbanks and upland fields | ST | | Monroe, Saginaw | MI | | GL |
| Spearwort | *Ranunculus ambigens* | Plant | Wet clay soils near ditches and streams | ST | | St. Clair | MI | | GL |
| Seaside crowfoot | *Ranunculus cymbalaria* | Plant | Boggy lakeshores, wet meadows, and marshes | ST | | Charlevoix, Gogebic | MI | | GL |
| Lapland buttercup | *Ranunculus lapponicus* | Plant | White cedar swamps near cool seeps and springs | ST | | Chippewa, Delta, Mackinac | MI | | GL |
| Macoun's buttercup | *Ranunculus macounii* | Plant | Wet grounds, marshes, streamsides, and shorelines | ST | | Keweenaw | MI | | GL |
| Prairie buttercup | *Ranunculus rhomboideus* | Plant | Prairie remnants on hillsides adjacent to lakes and rivers | ST | | Gogebic, Kent, Keweenaw, Ontonagon, St. Clair, Washtenaw | MI | | GL |
| Bald-rush | *Rhynchospora scirpoides* | Plant | Fluctuating water tables, plain marshes, and sandy lake edges | ST | | Kent, Oakland, Washtenaw | MI | | GL |
| Dwarf raspberry | *Rubus acaulis* | Plant | Bogs and conifer swamps | SE | | Alger, Chippewa, Schoolcraft | MI | | GL |
| Hairy ruellia | *Ruellia humilis* | Plant | Dry areas such as prairies, bluffs, hillsides and clearings with oaks and white pines | ST | | Washtenaw, Wayne | MI | | GL |
| Smooth ruellia | *Ruellia strepens* | Plant | Rich lowlands and shaded floodplains | SE | | Lenawee | MI | | GL |
| Western dock | *Rumex occidentalis* | Plant | Wet soils | SE | | Marquette | MI | | GL |
| Widgeon-grass | *Ruppia maritima* | Plant | Coastal and estuarine environments | ST | | Mackinac | MI | | GL |
| Rose-pink | *Sabatia angularis* | Plant | Dune depressions and sandy shorelines of lakes | ST | | Washtenaw | MI | | GL |
| Pearlwort | *Sagina nodosa* | Plant | Wet rock crevices on Lake Superior shores | ST | | Keweenaw, Marquette | MI | | GL |
| Hooded arrowhead | *Sagittaria calycina var. calycina* | Plant | Shallow wetlands | ST | | Monroe, Wayne | MI | | GL |
| Tea-leaved willow | *Salix planifolia* | Plant | Rocky shorelines along Lake Superior | ST | | Keweenaw | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Canadian burnet | *Sanguisorba canadensis* | Plant | Wet prairies | SE | | Washtenaw, Wayne | MI | | GL |
| Encrusted saxifrage | *Saxifraga paniculata* | Plant | Rocky shorelines along Lake Superior islands | ST | | Keweenaw | MI | | GL |
| Prickly saxifrage | *Saxifraga tricuspidata* | Plant | Exposed, sunny bedrock shores | ST | | Keweenaw | MI | | GL |
| Olney's bulrush | *Scirpus olneyi* | Plant | Seasonally inundated graminoid-dominated salt marshes | SE | | Kent | MI | | GL |
| Few-flowered nut-rush | *Scleria pauciflora* | Plant | Sandy edges of seasonal wetlands and depressions | SE | | St. Clair, Wayne | MI | | GL |
| Skullcap | *Scutellaria nervosa* | Plant | Forest floodplain remnants | SE | | Hillsdale | MI | | GL |
| Heart-leaved skullcap | *Scutellaria ovata* | Plant | Mesic woods | ST | | Lenawee | MI | | GL |
| Small skullcap | *Scutellaria parvula* | Plant | Limestone areas in crevices and depressions | ST | | Chippewa, Ingham | MI | | GL |
| Rayless mountain ragwort | *Senecio indecorus* | Plant | Variety of habitats including partially shaded woodlands, rocky shores, and cliffs | ST | | Alger, Delta, Houghton, Keweenaw, Schoolcraft | MI | | GL |
| Starry campion | *Silene stellata* | Plant | Dry, open woodlands above the floodplain | ST | | Hillsdale, Jackson, | MI | | GL |
| Fire pink | *Silene virginica* | Plant | Dry, open woods with sandy soils and hillsides | SE | | Bay, Wayne | MI | | GL |
| Rosinweed | *Silphium integrifolium* | Plant | Prairies, fens, and mesic sandy soils | ST | | Macomb, Washtenaw | MI | | GL |
| Compass-plant | *Silphium laciniatum* | Plant | Mesic prairies in full sunlight | ST | | Delta, Washtenaw, Wayne | MI | | GL |
| Cup-plant | *Silphium perfoliatum* | Plant | Floodplains, forest openings and edges, and prairies | ST | | Ingham, Lenawee, Monroe, Washtenaw, Wayne | MI | | GL |
| White goldenrod | *Solidago bicolor* | Plant | Dry, sandy woodlands and banks | SE | | St. Clair | MI | | GL |
| Houghton's goldenrod | *Solidago houghtonii* | Plant | Interdunal wetlands; sandy soils along Great Lakes | ST | FT | Charlevoix, Cheboygan, Chippewa, Crawford, Emmet, Mackinac, Presque Isle, Schoolcraft | MI | | GL |
| Missouri goldenrod | *Solidago missouriensis* | Plant | Mesic to dry black soil prairies, dolomite prairies, hill prairies, limestone glades, prairie remnants along railroads, and thickets | ST | | Kent | MI | | GL |
| Lesser ladies'-tresses | *Spiranthes ovalis* | Plant | Abandoned fields, old roadsides; open, sandy soils | ST | | Washtenaw | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Fleshy stitchwort | *Stellaria crassifolia* | Plant | Cold springs and seepages along river banks | SE | | Chippewa, Crawford, Luce | MI | | GL |
| Awlwort | *Subularia aquatica* | Plant | Shallow water of cold, sand-and-gravel-bottom lakes | SE | | Chippewa, Keweenaw | MI | | GL |
| Lake Huron tansy | *Tanacetum huronense* | Plant | Open dunes and sandy beaches of Great Lakes shorelines | ST | | Alger, Alpena, Antrim, Charlevoix, Cheboygan, Chippewa, Delta, Emmet, Luce, Mackinac, Marquette, Presque Isle, Schoolcraft | MI | | GL |
| False asphodel | *Tofieldia pusilla* | Plant | Moist crevices of Great Lakes shorelines | ST | | Keweenaw | MI | | GL |
| False pennyroyal | *Trichostema brachiatum* | Plant | Dry prairies; sandy and disturbed areas | ST | | Alpena, Chippewa, Lenawee | MI | | GL |
| Bastard pennyroyal | *Trichostema dichotomum* | Plant | Oak savanna | ST | | Oakland | MI | | GL |
| Snow trillium | *Trillium nivale* | Plant | Floodplains and mesic forests; rich and moist soil ravines | ST | | Shiawassee | MI | | GL |
| Prairie trillium | *Trillium recurvatum* | Plant | Floodplains; moist ravines and bluffs | ST | | Wayne | MI | | GL |
| Toadshade | *Trillium sessile* | Plant | Floodplains; mesic forest ravines and bluffs | ST | | Lenawee, Oakland,Washtenaw | MI | | GL |
| Painted trillium | *Trillium undulatum* | Plant | Acidic, humus-rich soils in most hardwoods | SE | | St. Clair | MI | | GL |
| Three-birds orchid | *Triphora trianthophora* | Plant | Rich, deciduous forests | ST | | Kent | MI | | GL |
| Dwarf bilberry | *Vaccinium cespitosum* | Plant | Open or semi-open areas with dry sandy soil; meadow-like areas near dry northern forests | ST | | Alger, Keweenaw, Marquette, Ontonagon, Schoolcraft | MI | | GL |
| Alpine blueberry | *Vaccinium uliginosum* | Plant | Cracks in bedrock shorelines | ST | | Keweenaw | MI | | GL |
| Mountain-cranberry | *Vaccinium vitis-idaea* | Plant | Sphagnum mats in wet, rich, conifer swamps | SE | | Keweenaw | MI | | GL |
| Edible valerian | *Valeriana edulis* var. *ciliata* | Plant | Alkaline fens | ST | | Hillsdale, Jackson, Lenawee, Livingston, Oakland, Washtenaw | MI | | GL |
| Goosefoot corn-salad | *Valerianella chenopodiifolia* | Plant | Wet, forested floodplains with somewhat open overstory | ST | | Kent | MI | | GL |
| Corn-salad | *Valerianella umbilicata* | Plant | Floodplain forest | ST | | Monroe | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Squashberry or mooseberry | *Viburnum edule* | Plant | Boreal forests; sides of streams and lakeshores | ST | | Keweenaw | MI | | GL |
| Northern marsh violet | *Viola epipsila* | Plant | Rich and moist woodlands on Maitou Island | SE | | Keweenaw | MI | | GL |
| New England violet | *Viola novae-angliae* | Plant | Moist lowlands with exposed limestone; wet-mesic sand prairies | ST | | Chippewa, Crawford, Delta, Gogebic, Houghton,Marquette | MI | | GL |
| Prairie birdfoot violet | *Viola pedatifida* | Plant | Grass clearings over limestone; mesic soil prairies | ST | | Delta, Oakland | MI | | GL |
| Frost grape | *Vitis vulpina* | Plant | Mesic southern forests | ST | | St. Clair | MI | | GL |
| Wisteria | *Wisteria frutescens* | Plant | Bottomlands, swamps, floodplains, and wooded ravines | ST | | Wayne | MI | | GL |
| Northern woodsia | *Woodsia alpina* | Plant | Rocky substrate and boreal woods in partial shade | SE | | Keweenaw, Marquette | MI | | GL |
| Blunt-lobed woodsia | *Woodsia obtusa* | Plant | Dry, shady cliffs and crevices | ST | | Chippewa, Emmet, Huron, Keweenaw, Marquette | MI | | GL |
| Wild-rice | *Zizania aquatica* var. *aquatica* | Plant | Silty rivers, streams, ponds, lakes in less than 2 ft of water | ST | | Iosco, Jackson, Monroe, St. Clair, Washtenaw, Wayne | MI | | GL |
| Prairie golden alexanders | *Zizia aptera* | Plant | Oak-pine, steep, rocky hillsides | ST | | Kent, Mackinac | MI | | GL |
| Six-lined racerunner | *Aspidoscelis sexlineata* | Reptile | Dry, bare, rocky areas; roadsides surrounded by mesic forest | ST | | Tuscola | MI | | GL |
| Spotted turtle | *Clemmys guttata* | Reptile | Shallow, standing water with mud bottoms and aquatic vegetation; open lowlands | ST | | Genesee, Ingham, Jackson, Kent, Lapeer, Lenawee, Livingston, Macomb, Mason, Oakland, Saginaw, St. Clair, Tuscola, Washtenaw, Wayne | MI | | GL |
| Kirtland's snake | *Clonophis kirtlandii* | Reptile | Open wetlands, wet prairies, and meadows; forested wetland edges with emergent vegetation | SE | | Lenawee, Washtenaw | MI | | GL |
| Copperbelly water snake | *Nerodia erythrogaster neglecta* | Reptile | Lowland swamps | SE | FT | Hillsdale, Oakland | MI | | GL |
| Eastern massasauga | *Sistrurus catenatus* | Reptile | Nests in young stands of jack pine | | FC | Alcona, Alpena, Antrim, Arenac, Cheboygan, Crawford, | MI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| | | | | | | Emmet, Genesee, Hillsdale, Huron, Ingham, Iosco, Jackson, Lapeer, Lenawee, Livingston, Mackinac, Macomb, Mason, Montmorency, Oakland, Oscoda, Presque Isle, Saginaw, Shiawassee, Washtenaw, Wayne | | | |

Sources: MI DNRE, 2009; USDOI, 2011c

Species list derived from best available sources (listed above). Some discrepancy exists between USFWS and state agency lists concerning status and county locations for certain species. Status designation does not include State Special Concern Species.

**THREAT STATUS DESIGNATIONS**

SE State Endangered
ST State Threatened
FE Federally Endangered
FT Federally Threatened
FC Federal Candidate Species
* See note column

**NORTHERN BORDER PEIS REGIONS**

GL Great Lakes
EOR East of the Rockies
NE New England
WOR West of the Rockies

## Table M–4.  Threatened and Endangered Species in Minnesota

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Baird's sparrow | *Ammodramus bairdii* | Bird | Dry native grasslands with dense, long grass | SE | | Polk, Roseau | MN | | EOR |
| Burrowing owl | *Speotyto cunicularia* | Bird | Open, grazed pastures; native, mixed grass prairies | SE | | Polk, Roseau | MN | | EOR |
| Chestnut-collared longspur | *Calcarius ornatus* | Bird | Native prairie in well-drained sites away from trees and shrubs | SE | | Polk | MN | | EOR |
| Common tern | *Sterna hirundo* | Bird | Isolated and lightly vegetated islands for nesting; open edges of sandy or gravelly beaches or dredge spoil areas also used | ST | | Cass, Lake of the Woods, St. Louis | MN | | EOR |
| Henslow's sparrow | *Ammodramus henslowii* | Bird | Uncultivated grasslands and old fields with stalks and substantial litter layer | SE | | Hubbard, Red Lake | MN | | EOR |
| Horned grebe | *Podiceps auritus* | Bird | Marshes and lakes; in larger bodies of water, typically found in bays and inlets in shallow water for their floating nests | ST | | Kittson, Marshall, Pennington, Roseau | MN | | EOR |
| Loggerhead shrike | *Lanius ludovicianus* | Bird | Upland grasslands and agricultural areas with short grass vegetation | ST | | Polk | MN | | EOR |
| Peregrine falcon | *Falco peregrinus* | Bird | Cliff ledges along rivers and lakes | ST | | Cook, Itasca, Lake, St. Louis | MN | | EOR |
| Piping plover | *Charadrius melodus* | Bird | Open sandy beaches; sparse vegetation. Designated critical habitat:  67 FR 57638 57717. | SE | FE | Lake of the Woods, Marshall, St. Louis | MN | Federally designated critical habitat proposed for certain counties. | EOR |
| Sprague's pipit | *Anthus spragueii* | Bird | Mixed or tall-grass upland prairies with light to moderate levels for grazing | SE | FC | Polk, Roseau | MN | | EOR |
| Trumpeter Swan | *Cygnus buccinator* | Bird | Small ponds and lakes or bays on large water bodies with extensive beds of cattails, bulrush, sedges, or horsetails | ST | | Beltrami, Cass, Clearwater, Hubbard, Itasca, Marshall, Polk, St. Louis | MN | | EOR |
| Assiniboia skipper | *Hesperia comma assiniboia* | Insect | Native dry prairie with mid-height and short grasses | SE | | Kittson, Polk | MN | | EOR |
| Crimson saltflat tiger beetle | *Cicindela fulgida westbournei* | Insect | Open, lightly vegetated, moist salt flats with saltgrass, red saltwort, and a thin magnesium sulfate crust | ST | | Kittson | MN | | EOR |
| Dakota skipper | *Hesperia dacotae* | Insect | Native dry-mesic to dry prairie, where mid-height grasses dominate | ST | FC | Kittson, Polk | MN | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Garita skipper | *Oarisma garita* | Insect | Dry and moist prairies; typically in hollows or bases of hills in dry prairies | ST | | Kittson | MN | | EOR |
| Headwaters chilostigman caddisfly | *Chilostigma itascae* | Insect | Rich swamps to poor fens in a large, acid to minerotrophic peatland complex | SE | | Clearwater, Lake | MN | | EOR |
| Laurentian tiger beetle | *Cicindela denikei* | Insect | Openings in northern coniferous forest in abandoned gravel and sand pits | ST | | Koochiching, Lake, Lake of the Woods, St. Louis | MN | | EOR |
| Little white tiger beetle | *Cicindela lepida* | Insect | Steep, open, blowing sand dunes | ST | | Polk | MN | | EOR |
| Sandy tiger beetle | *Cicindela limbata nympha* | Insect | Steep, open, blowing sand dunes | SE | | Polk | MN | | EOR |
| No common name | *Caloplaca parvula* | Lichen | Old-age, deciduous forest swamps | SE | | St. Louis | MN | | EOR |
| No common name | *Dermatocarpon moulinsii* | Lichen | Bare, exposed rock outcrops; occasionally on the north side of rock cliffs | SE | | Statewide | MN | | EOR |
| No common name | *Leptogium apalachense* | Lichen | Shaded, moist, limestone cliffs | SE | | Statewide | MN | Rare habitat | EOR |
| No common name | *Parmelia stictica* | Lichen | Grows on rocks along Lake Superior | SE | | Cook, Lake | MN | | EOR |
| Punctured rock tripe | *Umbilicaria torrefacta* | Lichen | Bare, sunny, exposed rocks on nearly vertical faces on rocky ridges | SE | | Cook | MN | | EOR |
| Salted shell lichen | *Coccocarpia palmicola* | Lichen | Bases of deciduous trees and mossy rocks in shade | ST | | Cook | MN | | EOR |
| Yellow ribbon lichen | *Cetraria oakesiana* | Lichen | Shady, moist undisturbed forests near Lake Superior | ST | | Cook | MN | | EOR |
| Yellow specklebelly | *Pseudocyphellaria crocata* | Lichen | Moist, shady, often foggy areas | SE | | Cook, Koochiching, Lake, St. Louis | MN | | EOR |
| Canada lynx | *Lynx canadensis* | Mammal | Northern forests. Designated critical habitat: 74 FR 8616 8702 and 71 FR 66008 66061. | | FT | Cass, Cook, Beltrami, Itasca, Koochiching, Lake, Lake of the Woods, Marshall, Roseau, St. Louis | MN | | EOR |
| Eastern spotted skunk | *Spilogale putorius* | Mammal | Open lands with sufficient cover | ST | | Hubbard, Roseau | MN | | EOR |
| Mucket | *Actinonaias ligamentina* | Mussel | Course sand and gravel substrate of medium to large rivers | ST | | St. Louis | MN | | EOR |
| Alpine bilberry | *Vaccinium uliginosum* var. *alpinum* | Plant | Moist crevices on rhyolite outcrops along Lake Superior | ST | | Cook | MN | | EOR |
| Alpine milk-vetch | *Astragalus alpinus* | Plant | Rocky and gravelly margins of shallow | SE | | Lake | MN | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| | | | groundwater-fed ponds | | | | | | |
| Annual skeletonweed | *Shinnersoseris rostrata* | Plant | Open sand dunes in a prairie landscape | ST | | Polk | MN | | EOR |
| Auricled twayblade | *Listera auriculata* | Plant | Mouths of streams above high-water line in sandy or mossy banks under forest trees | SE | | Cook, Lake, St. Louis | MN | | EOR |
| Awlwort | *Subularia aquatica* var. *americana* | Plant | Shallow water as deep as 90 cm | ST | | Cook, Itasca, Lake, St. Louis | MN | | EOR |
| Beach grass | *Ammophila breviligulata* | Plant | Sand dunes on the shores of Lake Superior | ST | | St. Louis | MN | | EOR |
| Beaked spike-rush | *Eleocharis rostellata* | Plant | Fens maintained by surface discharge of calcareous or circumneutral groundwater | ST | | Clearwater, Koochiching, Polk | MN | | EOR |
| Black crowberry | *Empetrum nigrum* | Plant | Island composed of Precambrian rock on Lake Superior | SE | | Cook | MN | | EOR |
| Black hawthorn | *Crataegus douglasii* | Plant | Rocky or gravelly streambanks, shrub thickets, forest margins, and rock outcrops | ST | | Cook, Lake | MN | | EOR |
| Blunt-lobed grapefern | *Botrychium oneidense* | Plant | Sugar maple, yellow birch, black ash, northern red oak, and basswood forests; also in red maple, green ash, aspen, pine, bur oak, and northern white cedar associations | SE | | Cass, Itasca, St. Louis | MN | | EOR |
| Bog adder's-mouth | *Malaxis paludosa* | Plant | Rich conifer forests; swamps of black spruce and tamarack; generally occurs on hummocks of sphagnum moss | SE | | Beltrami, Cass, Clearwater, Hubbard | MN | | EOR |
| Braun's holly fern | *Polystichum brauni* | Plant | Small ledges and cracks on steep walls of river gorges; base of cliffs; shaded rockslides; in a drainage of lowland black ash and white cedar; moist, rocky draws and ephemeral rocky streams in sugar maple and yellow birch forests | SE | | Cook, Lake | MN | | EOR |
| Chilean sweet cicely | *Osmorhiza bertero* | Plant | Northern mesic forests of sugar maple; moist soils on south-facing slopes | SE | | Cook | MN | | EOR |
| Cloudberry | *Rubus chamaemoru* | Plant | Sphagnum bogs of black spruce, speckled alder, bog birch, and northern white cedar | ST | | Cook, Lake, St. Louis | MN | | EOR |
| Common moonwort | *Botrychium lunaria* | Plant | Gravelly banks, rocky ledges, and talus; also found in open, sparsely vegetated areas of grasses and scattered shrubs | ST | | Cook, Lake of the Woods, St. Louis | MN | | EOR |
| Encrusted saxifrage | *Saxifraga paniculata* | Plant | Rock crevices and small ledges on shady cliffs facing north | ST | | Cook, Lake | MN | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Floating marsh-marigold | *Caltha natans* | Plant | Shallow, slow-moving water; typically roots in mud, silt, or clay | SE | | St. Louis | MN | | EOR |
| Frenchman's Bluff moonwort | *Botrychium gallicomontanum* | Plant | Dry, sandy to gravelly prairie | SE | | Kittson | MN | | EOR |
| Garber's sedge | *Carex garberi* | Plant | Rich fen complexes with redgrass species and twig rush | ST | | Kittson, St. Louis | MN | | EOR |
| Gray ragwort | *Senecio canus* | Plant | Upper slopes of hills in dry prairie remnants in sandy or gravelly soil | SE | | Marshall, Polk | MN | | EOR |
| Hair-like beak-rush | *Rhynchospora capillacea* | Plant | Calcareous fens | ST | | Clearwater, Koochiching, Marshall, Polk, Pennington, Roseau | MN | | EOR |
| Handsome sedge | *Carex formosa* | Plant | Moist areas in deciduous woodlands | SE | | Clearwater | MN | | EOR |
| Holboell's rock-cress | *Arabis holboellii* var. *retrofracta* | Plant | Dry north and east-facing diabase cliffs | ST | | Cook, Kittson, Lake | MN | | EOR |
| Indian ricegrass | *Oryzopsis hymenoides* | Plant | Very dry sand dunes in prairie regions | SE | | Polk | MN | | EOR |
| Katahdin sedge | *Carex katahdinensis* | Plant | Gravelly or sandy beaches near normal waterlines | ST | | Cook, Lake, St. Louis | MN | | EOR |
| Knotty pearlwort | *Sagina nodosa* ssp. *borealis* | Plant | Shores of Lake Superior in rock crevices away from direct wave action | SE | | Cook, Lake | MN | | EOR |
| Lance-leaved violet | *Viola lanceolata* | Plant | Low, moist meadows with sandy substrate; moist swales in sand dunes and savannas; sometimes on sandy lakeshores | ST | | Lake, St. Louis | MN | | EOR |
| Large-leaved sandwort | *Moehringia macrophylla* | Plant | Sheltered cliffs of slate | ST | | Cook, Lake | MN | | EOR |
| Long-leaved arnica | *Arnica lonchophylla* | Plant | On mossy ledges or in crevices and cracks on cliffs of slate, diabase, or basalt | ST | | Cook, Lake | MN | | EOR |
| Luminous moss | *Schistostegia pennata* | Plant | Humid habitats, such as caves and cavities created by uprooted trees | SE | | Cook, Lake | MN | | EOR |
| Maidenhair spleenwort | *Asplenium trichomanes* | Plant | North to east-facing cliffs on ledges and crevices | ST | | Cook, Lake | MN | | EOR |
| Neat spike-rush | *Eleocharis nitida* | Plant | Wet soil and shallow water; away from dense vegetation | ST | | Cook, Lake, St. Louis | MN | | EOR |
| Nodding saxifrage | *Saxifraga cernua* | Plant | Cracks, seams, small shelves, and fine, crumbly talus of a north-facing, diabase cliff | SE | | Cook | MN | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Northern paintbrush | *Castilleja septentrionalis* | Plant | Thin soils among boulders or fractured bedrock along the shores of Lake Superior | SE | | Cook | MN | | EOR |
| Northern spikemoss | *Selaginella selaginoides* | Plant | Moist crevices of exposed rock along the shores of Lake Superior | SE | | Cook | MN | | EOR |
| Norwegian whitlow-grass | *Draba norvegica* | Plant | Only on an island composed of Precambrian rock in Lake Superior | SE | | Cook | MN | | EOR |
| Olivaceous spike-rush | *Eleocharis olivacea* | Plant | Shorelines with peat, sand, silt, or mud substrates | ST | | Cass, Clearwater, Itasca | MN | | EOR |
| Pale moonwort | *Botrychium pallidum* | Plant | Open fields to mixed deciduous-hardwood forests | SE | | Beltrami, Cass, Cook, Itasca, Koochiching, Lake, Polk, Roseau, St. Louis | MN | | EOR |
| Pale sedge | *Carex pallescens* | Plant | Margins of fire-dependent forests of pine, spruce, aspen, and birch adjacent to the shores of Lake Superior | SE | | Cook, Lake, St. Louis | MN | | EOR |
| Pigmyweed | *Crassula aquatica* | Plant | Mud flats, muddy margins, or vernal pools; rooted in muck and shallow water up to 0.9 m in bays, channels, and creeks | ST | | St. Louis | MN | | EOR |
| Purple crowberry | *Empetrum eamesii* | Plant | Small group of islands in Lake Superior; crevices of barren shore rocks; cliff ledges away from intense wave action | SE | | Cook | MN | | EOR |
| Ram's-head lady's-slipper | *Cypripedium arietinum* | Plant | Swamps, bogs, or lowland forests dominated by northern white cedar, tamarack, balsam fir, or black spruce | ST | | Beltrami, Cass, Clearwater, Cook, Hubbard, Itasca, Koochiching, Lake, Lake of the Woods, Roseau, St. Louis | MN | | EOR |
| Red saltwort | *Salicornia rubra* | Plant | Salt flats, alkaline depressions, exposed shores of alkaline lakes, and saline swales | ST | | Kittson | MN | | EOR |
| Rock clubmoss | *Huperzia porophila* | Plant | Moist and well-shaded northerly facing, wooded habitats | ST | | Cook, Lake, St. Louis | MN | | EOR |
| Rocky mountain woodsia | *Woodsia scopulina* | Plant | Extremely localized and very abundant on some cliffs | ST | | Cook | MN | | EOR |
| Sea milkwort | *Glaux maritima* | Plant | Alkaline or saline soils in low meadows, prairies, dry streambeds, and lakeshores | SE | | Kittson | MN | | EOR |
| Siberian yarrow | *Achillea sibirica* | Plant | Open woods, shallow swamps, wet areas, and meadows | ST | | Marshall, Roseau | MN | | EOR |
| Small false asphodel | *Tofieldia pusilla* | Plant | Outcrops of volcanic bedrock on the shores | SE | | Cook, Lake | MN | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| | | | of Lake Superior | | | | | | |
| Small white waterlily | *Nymphaea leibergii* | Plant | Shallow, protected bays in lakes and slow-moving streams | ST | | Beltrami, Cook, Itasca, Lake, Lake of the Woods, Roseau | MN | | EOR |
| Smooth woodsia | *Woodsia glabella* | Plant | North-facing wet, calcareous, slate cliffs | ST | | Cook, Lake | MN | | EOR |
| Snailseed pondweed | *Potamogeton bicupulatus* | Plant | Clear, soft-water lakes | SE | | Cass | MN | | EOR |
| St. Lawrence grapefern | *Botrychium rugulosum* | Plant | Low, moist habitats in brushy or grassy areas and open forests | ST | | Cass, Cook, Itasca, Lake, St. Louis | MN | | EOR |
| Sterile sedge | *Carex sterilis* | Plant | Mineral-rich calcareous fens | ST | | Clearwater, Koochiching, Marshall, Pennington, Polk, Roseau | MN | | EOR |
| Sticky locoweed | *Oxytropis viscida* | Plant | North to northwest-facing cliff face; at the top of a corresponding talus slope | SE | | Cook | MN | | EOR |
| Lichen | *Lobaria scrobiculata* | Plant | Trees and mossy rocks in moist areas and cliffs at swamp margins; near the shores of Lake Superior in undisturbed coniferous forests | SE | | Cook | MN | | EOR |
| Triangle moonwort | *Botrychium lanceolatum* | Plant | Low areas of moist, shady, mature northern hardwood forests | ST | | Beltrami, Cass, Cook, Itasca, Lake, St. Louis | MN | | EOR |
| Tubercled rein-orchid | *Platanthera flava* var. *herbiola* | Plant | Wet prairies and meadows; swales in mesic prairies; sandy or peaty edges of marshes, swamps, or lakeshores | SE | | Itasca | MN | | EOR |
| Western Jacob's-ladder | *Polemonium occidentale* ssp. *Lacustre* | Plant | Forested swamps with black spruce, tamarack, and northern white cedar | SE | | Itasca, St. Louis | MN | | EOR |
| Western prairie fringed orchid | *Platanthera praeclara* | Plant | Mesic-wet, unplowed, tallgrass prairies and meadows | SE | FT | Kittson, Lake, Pennington, Polk, Red Lake | MN | | EOR |
| Whorled nut-rush | *Scleria verticillata* | Plant | Calcareous fens | ST | | Polk | MN | | EOR |
| Wild chives | *Allium schoenoprasum* var. *sibiricum* | Plant | Exposed mat of tundra-like vegetation on shore rocks | ST | | Cook, Lake, St. Louis | MN | | EOR |
| Blanding's turtle | *Emydoidea blandingii* | Reptile | Calm, shallow waters and wetlands associated with rivers and streams having rich, aquatic vegetation | ST | | Beltrami, Cass, Hubbard, Itasca, St. Louis | MN | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Wood turtle | *Clemmys insculpta* | Reptile | Small to medium, fast-moving rivers and streams with adjacent deciduous or coniferous forests | ST | | Lake, St. Louis | MN | | EOR |

Sources: MN DNR, 2010; USDOI, 2011d

Species list derived from best available sources (listed above). Some discrepancy exists between USFWS and state agencies about status and county locations for certain species. Status designation does not include State-Special Concern Species.Status Designations

**THREAT STATUS DESIGNATIONS**
SE State Endangered
ST State Threatened
FE Federally Endangered
FT Federally Threatened
FC Federal Candidate Species
* See note column

**NORTHERN BORDER PEIS REGIONS**
GL Great Lakes
EOR East of the Rockies
NE New England
WOR West of the Rockies

## Table M–5. Threatened and Endangered Species in Montana

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Least tern | *Sterna antillarum* | Bird | Sparsely vegetated sandbars and shorelines | S1 | FE | Dawson, Garfield, McCone, Richland, Roosevelt, Sheridan, Valley | MT | | EOR |
| Mountain plover | *Charadrius montanus* | Bird | Shortgrass prairie with areas of bare soil | S2 | F* | Statewide | | Proposed for listing | EOR, WOR |
| Piping plover | *Charadrius melodus* | Bird | Open, sandy beaches; sparse vegetation. Designated critical habitat: 67 FR 57638 57717. | S2 | FT | Garfield, McCone, Phillips, Pondera, Richland, Roosevelt, Sheridan, Valley | MT | | EOR |
| Whooping crane | *Grus americana* | Bird | Northern tallgrass prairie and eastern aspen parklands | S1 | FE | Daniels, McCone, Phillips, Richland, Roosevelt, Sheridan, Valley | MT | | EOR |
| Bull trout | *Salvelinus confluentus* | Fish | High-altitude, cold-water streams. Designated critical habitat: 69 FR 59996 60076; 70 FR 56212 56311; and 75 FR 63898 64070. | S2 | FT | Flathead, Glacier, Lake, Lincoln, Lewis and Clark, Missoula, Powell, Sanders | MT | | WOR |
| Pallid sturgeon | *Scaphirhynchus albus* | Fish | Large, turbid rivers with swift current | S1 | FE | Blaine, Dawson, Fergus, Lincoln, Richland, Petroleum, Roosevelt, Valley | MT | | EOR |
| White sturgeon | *Acipenser transmontanus* | Fish | Streams, rivers, estuarine habitat, marine waters | S1 | FE | Lincoln | MT | | WOR |
| Black-footed ferret | *Mustela nigripes* | Mammal | Shortgrass prairies | S1 | FE | Blaine, Chouteau, Fergus, Garfield, Hill, Clark, Liberty, Lewis and McCone, Petroleum, Phillips, Toole, Valley | MT | | EOR |
| Canada lynx | *Lynx canadensis* | Mammal | Northern forests. Designated critical habitat: 74 FR 8616 8702 and 71FR 66008 66061. | S3 | FT | Flathead, Glacier, Lake, Lincoln, Lewis and Clark, Missoula, Pondera, Sanders, Teton | MT | | EOR, WOR |
| Grizzly bear | *Ursus arctos horribilis* | Mammal | Northern woodlands, meadows, and mountains | S2 | FT | Flathead, Glacier, Lake, Lewis and Clark, Lincoln, Missoula, Pondera, Powell, Sanders, Teton | MT | | EOR, WOR |
| Northern adderstongue | *Ophioglossum pusillum* | Plant | Wet meadows, margins of fens, and gravelly moist soils | S2 | | Flathead, Lake, Lincoln, Missoula | MT | | WOR |
| Adnate moonwort | *Botrychium adnatum* | Plant | Well-drained native shortgrass prairies | S1 | | Flathead | MT | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Aliona moss | *Aloina brevirostris* | Plant | On calcareous soils and overturned tree bases | S1 | | Lincoln, Flathead | MT | | WOR |
| Alpine glacier poppy | *Papaver pygmaeum* | Plant | Sparsely vegetated, stony soil on exposed slopes and ridges in the alpine zone | S1 | | Flathead, Glacier | MT | | EOR, WOR |
| Angled paludella moss | *Paludella squarrosa* | Plant | In fens among sphagnum mosses | S1 | | Flathead | MT | | EOR, WOR |
| Arctic buttercup | *Ranunculus grayi* | Plant | Gravelly, moist sparsely vegetated soils of benches, moraines, and open slopes near the timberline/ alpine zone | S2 | | Flathead, Glacier | MT | | EOR, WOR |
| Arctic eyebright | *Euphrasia subarctica* | Plant | Open soil in grasslands, meadows, and tundra in the alpine zone | S1 | | Glacier | MT | | EOR |
| Arctic pearlwort | *Sagina nivalis* | Plant | Moist, open, gravelly soils in the alpine zone | S1 | | Glacier | MT | | EOR |
| 7Arctic sweet coltsfoot | *Petasites frigidus* var. *frigidus* | Plant | Swamps, fen margins, riparian seeps in open forests and meadows in valleys and foothills | S1 | | Flathead, Glacier | MT | | EOR, WOR |
| Austin's knotweed | *Polygonum austiniae* | Plant | Gravelly, often shale-derived soils of open slopes and banks in montane zone | S2 | | Flathead, Lewis and Clark, Pondera, Teton | MT | | EOR |
| Autumn willow | *Salix serissima* | Plant | Fens and swamps in valleys and foothills | S2 | | Glacier, Teton | MT | | EOR |
| Banff loose-flowered bluegrass | *Poa laxa* ssp. *banffiana* | Plant | North-facing mudstone slopes in the alpine zone | S1 | | Glacier | MT | | EOR |
| Barratt's willow | *Salix barrattiana* | Plant | Cold, moist soils in the alpine zone | S1 | | Flathead | MT | | WOR |
| Beaked spikerush | *Eleocharis rostellata* | Plant | Wet, alkaline soils associated with warm springs or fens in valleys and foothills | S1 | | Flathead, Lake, Lincoln, Sanders, Teton | MT | | EOR, WOR |
| Beck water-marigold | *Bidens beckii* | Plant | Still or slow-moving water of lakes, rivers, and sloughs from 0.1 to 3 m deep | S2 | | Flathead, Lake, Lincoln | MT | | WOR |
| Big-leaf sedge | *Carex amplifolia* | Plant | Open areas of moist riparian forests in valleys | S1 | | Sanders | MT | | WOR |
| Bloom peak douglasia | *Douglasia conservatorum* | Plant | Open, subalpine ridges and slopes with shallow, gravelly soils | S1 | | Sanders | MT | | WOR |
| Blunt-leaved pondweed | *Potamogeton obtusifolius* | Plant | Shallow waters of lakes, ponds, and sloughs in valleys, foothills, and mountains | S2 | | Flathead, Glacier, Lake | MT | | EOR, WOR |
| Bractless hedge hyssop | *Gratiola ebracteata* | Plant | Drying mud around ponds in foothills and on plains | S1 | | Flathead, Glacier, Teton | MT | | EOR, WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Bristly sedge | *Carex comosa* | Plant | Marshes in valleys | S1 | | Flathead | MT | | WOR |
| Britton's dry rock moss | *Grimmia brittoniae* | Plant | Calcareous rock outcrops at low elevations | S2 | | Flathead, Sanders | MT | | WOR |
| Camouflage lichen | *Melanelia commixta* | Plant | On rock in open, alpine areas | S1 | | Flathead, Glacier | MT | | EOR, WOR |
| Chaffweed | *Centunculus minimus* | Plant | Vernally wet, sparsely vegetated soil around ponds and along rivers and streams in valleys and on plains | S2 | | Daniels, Lake, Powell, Sheridan, Valley | MT | | EOR |
| Chocolate chip lichen | *Solorina bispora* | Plant | On calcareous soil or humus on moist sites in alpine to subalpine habitats | S1 | | Flathead, Glacier, Lake | MT | | EOR, WOR |
| Clustered lady's slipper | *Cypripedium fasciculatum* | Plant | Warm, dry, mid-seral montane forest of Douglas fir-ninebark and grand fir-ninebark habitats | S2 | | Lake, Sanders | MT | | WOR |
| Coastal sand sedge | *Carex incurviformis* | Plant | Wet rock ledges and moist tundra in the alpine zone | S1 | | Glacier, Teton | MT | | EOR |
| Collared glass whiskers lichen | *Sclerophora amabilis* | Plant | In bark fissures of *Populus* at low-elevation riparian sites | S1 | | Lincoln | MT | | WOR |
| Columbia locoweed | *Oxytropis campestris* var. *columbiana* | Plant | Gravelly shorelines along major lakes and rivers | S1 | | Lake | MT | | WOR |
| Columbia onion | *Allium columbianum* | Plant | Moist swales; along vernal ponds and streams in valleys | S1 | | Sanders | MT | | WOR |
| Columbia water meal | *Wolffia columbiana* | Plant | Fresh, shallow waters of ponds and sloughs in valleys | S2 | | Flathead, Lake, Missoula | MT | | WOR |
| Common blue-cup | *Githopsis specularioides* | Plant | Shallow, seasonally moist soils on cliffs | S1 | | Sanders | MT | | WOR |
| Crawe's sedge | *Carex crawei* | Plant | Grows in wet, gravelly or sandy soils along streams or pond margins | S2 | | Pondera, Teton | MT | | EOR |
| Creeping sedge | *Carex chordorrhiza* | Plant | Wet, organic soil of fens in montane zones | S2 | | Flathead, Lincoln | MT | | WOR |
| Crested shieldfern | *Dryopteris cristata* | Plant | Moist, wet organic soils at forest margins of fens and swamps | S2 | | Flathead, Lake, Lincoln | MT | | WOR |
| Cushion Townsend daisy | *Townsendia condensata* | Plant | Open, rocky, often limestone-derived soils of exposed ridges and slopes near or above the treeline | S1 | | Glacier | MT | | WOR |
| Dense-leaf draba | *Draba densifolia* | Plant | Gravelly, open soils of rocky slopes and exposed ridges in montane-alpine zones | S2 | | Flathead, Glacier, Lewis and Clark, Powell | MT | | EOR, WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Diamond clarkia | *Clarkia rhomboidea* | Plant | Dry, open forest slopes with gravelly soils in montane zone | S2 | | Lincoln, Sanders | MT | | WOR |
| Douglas bladderpod | *Physaria douglasii* | Plant | Sandy soils in open, ponderosa pine woodlands | S1 | | Lincoln | MT | | WOR |
| Douglas' neckera moss | *Neckera douglasii* | Plant | Habit: Epiphytic. Habitat: Usually on tree trunks or branches, but may occur on rocks | S1 | | Flathead, Lake | MT | | WOR |
| Dwarf saw-wort | *Saussurea densa* | Plant | Calcareous soil of talus slopes/rocky open slopes in alpine zone | S1 | | Lewis and Clark, Pondera, Teton | MT | | EOR |
| Dwarf woolly-heads | *Psilocarphus brevissimus* | Plant | Drying mud of ponds and other vernally wet soil in valleys and plains | S1 | | Cascade, Phillips, Sanders | MT | | EOR, WOR |
| Easter lichen | *Stereocaulon paschale* | Plant | Loosely attached on soil and humus among mosses | S1 | | Lake | MT | | WOR |
| Elmer's ragwort | *Senecio elmeri* | Plant | Rocky, alpine slopes | S1 | | Lincoln, Sanders | MT | | WOR |
| English sundew | *Drosera anglica* | Plant | With sphagnum moss in wet, organic soils of fens in the montane zone | S1 | | Flathead, Lake, Lincoln, Sanders | MT | | WOR |
| Fendler Cat's-eye | *Cryptantha fendleri* | Plant | Open areas of sand dunes; occupies a range of sparsely vegetated sites/successional stages | S2 | | Sheridan | MT | | EOR |
| Few-seeded bittercress | *Cardamine oligosperma* var. *kamtschatica* | Plant | Moist, sparsely vegetated cliffs and talus slopes at or above timberline. | S1 | | Flathead | MT | | WOR |
| Five-leaf cinquefoil | *Potentilla nivea* var. *pentaphylla* | Plant | Dry, gravelly soil of exposed ridges/slopes in montane to alpine zones | S1 | | Glacier, Pondera | MT | | EOR |
| Flat-leaved bladderwort | *Utricularia intermedia* | Plant | Shallow water of peatlands in the valley to montane zones | S1 | | Flathead, Lincoln | MT | | WOR |
| Foxtail lichen | *Nodobryoria subdivergens* | Plant | Primarily on alpine sod. Also present near a falls in a low elevation, canyon bottom | S1 | | Lincoln | MT | | WOR |
| Frenchman's bluff moonwort | *Botrychium gallicomontanum* | Plant | High diversity natural prairie areas | S1 | | Flathead | MT | | WOR |
| Fringed chocolate chip lichen | *Solorina spongiosa* | Plant | In moist moss mats on soil, near springs/ seeps/ waterfalls/creeks in alpine/subalpine zones | S1 | | Flathead, Lake | MT | | WOR |
| Geyer's biscuitroot | *Lomatium geyeri* | Plant | Vernally moist soil in open/partially shaded habitats in montane zone. | S2 | | Lincoln | MT | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Geyer's milkvetch | *Astragalus geyeri* | Plant | Loose, sandy soils with little/no organic matter and soil development | S2 | | Garfield | MT | | EOR |
| Giant helleborine | *Epipactis gigantea* | Plant | Streambanks/lake margins/fens with springs/seeps, often near thermal waters | S2 | | Flathead, Lake, Sanders, Teton | MT | | WOR |
| Glaucous gentian | *Gentiana glauca* | Plant | Wet, boggy tundra in the alpine zone | S1 | | Flathead | MT | | WOR |
| Glaucus beaked sedge | *Carex rostrata* | Plant | Wet, organic soils of fens in montane zone, including floating peat mats | S1 | | Flathead, Lincoln, Missoula | MT | | WOR |
| Goose-grass sedge | *Carex lenticularis* var. *dolia* | Plant | Shallow, wet, stony soil around streams in the alpine zone | S1 | | Flathead | MT | | WOR |
| Gray lungwort lichen | *Lobaria hallii* | Plant | Moist lowland riparian areas. | S2 | | Flathead, Glacier, Lake, Lincoln, Sanders | MT | | EOR, WOR |
| Great Basin downingia | *Downingia laeta* | Plant | Shallow water/drying mud around ponds/lakes in valleys and on plains | S1 | | Lewis and Clark, Teton | MT | | EOR |
| Great-spurred violet | *Viola selkirkii* | Plant | Montane, riparian forests | S1 | | Flathead, Lincoln | MT | | WOR |
| Green-leaf manzanita | *Arctostaphylos patula* | Plant | Rocky soil in open coniferous forests in montane zones | S1 | | Lake, Sanders | MT | | WOR |
| Greville's dicranella moss | *Dicranella grevilleana* | Plant | Wet soil of banks, especially roadside ditches, or in crevices of cliffs; medium to high elevations | S1 | | Glacier | MT | | EOR |
| Guadalupe water-nymph | *Najas guadalupensis* | Plant | Submerged in shallow, fresh waters of oxbow sloughs, ponds, and reservoirs in valleys | S1 | | Cascade, Flathead, Lake | MT | | EOR, WOR |
| Heart-leaved buttercup | *Ranunculus cardiophyllus* | Plant | Moist meadows and grasslands often associated with wetlands in foothills | S1 | | Choteau, Glacier, Toole | MT | | EOR |
| Hooded ramalina lichen | *Ramalina obtusata* | Plant | On tree and shrub bark in low-elevation riparian forests | S2 | | Flathead, Lake | MT | | WOR |
| Hot spring phacelia | *Phacelia thermalis* | Plant | Open to partially wooded settings | S1 | | Fergus, Garfield, Phillips | MT | | EOR |
| Hudson's Bay bulrush | *Trichophorum alpinum* | Plant | Wet, cold, organic soils of fens and slopes in montane and subalpine zones | S1 | | Flathead, Glacier | MT | | EOR, WOR |
| Hutchinsia | *Hornungia procumbens* | Plant | Vernally moist, alkaline soils of sagebrush steppe in valley to lower montane zones | S1 | | Flathead, Powell | MT | | WOR |
| Jelly lichen | *Collema curtisporum* | Plant | Moist, riparian forests, often in narrow sheltered valleys | S1 | | Flathead, Glacier, Lake, Sanders | MT | | EOR, WOR |
| Kruckeberg's swordfern | *Polystichum kruckebergii* | Plant | Cliff crevices and talus slopes in montane and alpine zones | S1 | | Lake, Lincoln | MT | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Lackschewitz' milkvetch | *Astragalus lackschewitzii* | Plant | Open, gravelly, calcareous soils and talus on ridges and slopes in alpine and subalpine zones | S2 | | Teton | MT | | EOR |
| Lake-bank sedge | *Carex lacustris* | Plant | Marshes and fens | S1 | | Lake | MT | | WOR |
| Latah tule pea | *Lathyrus bijugatus* | Plant | Open ponderosa pine and western larch forests in valley and lower montane zones | S1 | | Flathead, Lincoln | MT | | WOR |
| Lead lichen | *Parmeliella triptophylla* | Plant | In moist environments at tree bases, on rocks, and on moss over rocks | S1 | | Glacier, Lake | MT | | WOR |
| Leucolepis umbrella moss | *Leucolepis acanthoneuron* | Plant | Forms small colonies on soil, rotting logs, tree bases; function as epiphytes in some trees | S1 | | Lincoln | MT | | WOR |
| Linearleaf moonwort | *Botrychium lineare* | Plant | Mid-height grasslands, grazed rangelands, limestone shelves, woodland trails, roadside gravels, and under conifers | S1 | | Glacier, Lake, Lincoln | MT | | EOR, WOR |
| Linear-leaved sundew | *Drosera linearis* | Plant | Wet, organic soil in nutrient-poor fens of the montane zone | S1 | | Flathead | MT | | WOR |
| Little Indian breadroot | *Psoralea hypogaea* | Plant | Loose, sandy soil of grasslands and open-pine woodlands on plains; below sandstone outcrops and in blowouts | S2 | | Cascade, Chouteau, Fergus | MT | Synonym for *Pediomelum hypogaeum var. hypogaeum* | EOR |
| Loesel's twayblade | *Liparis loeselii* | Plant | Wet, organic soils of calcareous fens in valley and montane zones | S1 | | Lake | MT | | WOR |
| Long-sheath waterweed | *Elodea bifoliata* | Plant | Shallow water of ponds and lakes on plains | S1 | | Glacier, Liberty, Phillips | MT | | EOR |
| Macoun's draba | *Draba macounii* | Plant | Wet rock ledges and moist tundra in the alpine zone | S1 | | Flathead, Glacier | MT | | EOR, WOR |
| Macoun's gentian | *Gentianopsis macounii* | Plant | Wet, organic soil of calcareous fens in valley and foothill zones | S1 | | Glacier, Teton | MT | | EOR |
| Magellan's peatmoss | *Sphagnum magellanicum* | Plant | In open, relatively acidic habitats; on tops and sides of large hummocks; in older, drier, more acidic parts of bogs | S1 | | Glacier | MT | | EOR |
| Many-headed sedge | *Carex sychnocephala* | Plant | Moist soil of meadows along streams and ponds in valleys and on plains | S1 | | Flathead, Lake, Lincoln | MT | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Meadow larkspur | *Delphinium burkei* | Plant | Moist meadows in valley and lower montane zones usually where soils are saturated in spring and desiccated in summer | S1 | | Flathead | MT | | WOR |
| Meesia moss | *Meesia longiseta* | Plant | Fens, swamps, and shores | S1 | | Flathead, Glacier, Lincoln | MT | | EOR, WOR |
| Michigan moonwort | *Botrychium michiganense* | Plant | Among grasses and forbs in open meadows | S1 | | Flathead, Glacier, Lincoln | MT | | EOR, WOR |
| Moosewort | *Botrychium tunux* | Plant | Sparsely vegetated alpine scree slopes in mountains | S1 | | Glacier | MT | Recently documented in Glacier National Park | EOR |
| Moss | *Syntrichia papillosissima* | Plant | Dry soil, rock at moderate to high elevations | S1 | | Sanders | MT | Synonym for *Tortula papillosissima* | WOR |
| Mountain holly-fern | *Polystichum scopulinum* | Plant | Moist rock crevices in subalpine zone | S1 | | Sanders | MT | | WOR |
| Myurella moss | *Myurella tenerrima* | Plant | On soil in rock crevices and fens in the arctic-alpine zone | S1 | | Glacier | MT | | EOR |
| Nannyberry | *Viburnum lentago* | Plant | Openings in riparian forests on the plains | S1 | | Richland, Roosevelt | MT | | EOR |
| Netted specklebelly lichen | *Pseudocyphellaria anomala* | Plant | On deciduous trees and shrubs; occasionally on conifers; rarely on rock | S1 | | Lake | MT | | WOR |
| Northern beechfern | *Phegopteris connectilis* | Plant | Mesic, western red-cedar forests and shaded cliffs | S2 | | Flathead, Glacier, Lincoln, Sanders | MT | | EOR, WOR |
| Northern blue-eyed-grass | *Sisyrinchium septentrionale* | Plant | Low prairie zone of prairie wetland margins | S1 | | Sheridan | MT | | EOR |
| Northern bog clubmoss | *Lycopodium inundatum* | Plant | Wet organic soil of nutrient-poor fens in valleys and the lower montane zone | S1 | | Flathead | MT | | WOR |
| Northern buttercup | *Ranunculus pedatifidus* | Plant | Moist meadows and open woodlands in montane to alpine zones | S1 | | Chouteau, Glacier, Liberty, Toole | MT | | EOR |
| Northern fescue | *Festuca viviparoidea* | Plant | Moist alpine tundra | S1 | | Flathead, Glacier | MT | | EOR, WOR |
| Northern rattlesnake-plantain | *Goodyera repens* | Plant | North-facing, mossy forested slopes in the montane zone | S2 | | Flathead | MT | | WOR |
| Northern wildrye | *Elymus innovatus* | Plant | Moist meadows, forest margins, and openings along rivers and streams in valley and lower montane zones | S1 | | Cascade, Glacier, Pondera | MT | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Norwegian tortula moss | *Tortula norvegica* | Plant | Soil and rocks at high elevation | S1 | | Glacier, Lake | MT | | WOR |
| One-flowered cinquefoil | *Potentilla uniflora* | Plant | Open, gravelly slopes and ridgetops in the alpine zone | S1 | | Glacier, Teton | MT | | EOR |
| Oregon checker-mallow | *Sidalcea oregana* | Plant | Grasslands in valley and montane zones | S1 | | Lake | MT | | WOR |
| Ovalleaf milkweed | *Asclepias ovalifolia* | Plant | Open-pine woodlands, prairies, and dry riparian terraces | S1 | | Sheridan | MT | | EOR |
| Pale corydalis | *Corydalis sempervirens* | Plant | Open, sometimes disturbed meadows, recently-burned forests, and avalanche areas in the montane zone | S2 | | Flathead, Glacier, Lincoln, Powell | MT | | EOR, WOR |
| Pale moonwort | *Botrychium pallidum* | Plant | Fescue grassland in the valley zone | S1 | | Flathead, Lincoln | MT | | WOR |
| Pale-spiked lobelia | *Lobelia spicata* | Plant | Moist meadows on the plains | S1 | | Richland, Sheridan | MT | | EOR |
| Paraleucobryum moss | *Paraleucobryum enerve* | Plant | Usually on soil or soil over boulders, and noncalcareous outcrops and cliffs; sometimes in bogs and fens | S1 | | Flathead, Glacier | MT | | EOR, WOR |
| Peculiar moonwort | *Botrychium paradoxum* | Plant | Mesic meadows associated with spruce and lodgepole pine forests in montane and subalpine zones | S2 | | Flathead, Glacier, Lincoln, Teton | MT | | EOR, WOR |
| Plains phlox | *Phlox andicola* | Plant | Sandy soils in grasslands and ponderosa pine woodlands | S2 | | Dawson, Sheridan | MT | | EOR |
| Platyhypnidium moss | *Platyhypnidium riparioides* | Plant | Aquatic | S1 | | Lincoln | MT | | WOR |
| Pod grass | *Scheuchzeria palustris* | Plant | Wet, organic soil of fens in valley and montane zones; usually with sphagnum moss | S2 | | Flathead, Lake, Lincoln, Missoula | MT | | WOR |
| Powdery twig lichen | *Ramalina pollinaria* | Plant | On coniferous and deciduous trees and shrubs in low-elevation riparian forests | S1 | | Lake | MT | | WOR |
| Prairie moonwort | *Botrychium campestre* | Plant | Moist meadows in the valley zone | S1 | | Flathead, Glacier, Lincoln | MT | | EOR, WOR |
| Prairie sedge | *Carex prairea* | Plant | Rich fens with alluvium from calcareous glacial till in the valley zone | S2 | | Flathead, Lincoln | MT | | WOR |
| Pregnant sedge | *Carex gravida* | Plant | Green ash ravines and wooded draws | S1 | | Richland | MT | | EOR |
| Pygmy water-lily | *Nymphaea leibergii* | Plant | Quiet, fresh water of lakes and backwater sloughs in valleys | S1 | | Flathead, Lake, Missoula | MT | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Red alder | *Alnus rubra* | Plant | Moist, low montane valleys | S1 | | Lincoln, Sanders | MT | | WOR |
| Rock sedge | *Carex petricosa* | Plant | Dry, calcareous barrens, cliffs, and talus slopes in alpine and subalpine zones | S1 | | Glacier | MT | | EOR |
| Rolland's bulrush | *Trichophorum pumilum* | Plant | Calcareous fens in the foothills | S1 | | Glacier, Teton | MT | | EOR |
| Roundleaf water hyssop | *Bacopa rotundifolia* | Plant | Muddy shores of ponds and streams in valleys and on plains | S1 | | Cascade, Garfield, Phillips | MT | | EOR |
| Round-leaved orchis | *Amerorchis rotundifolia* | Plant | Spruce forest around seeps or along streams; often in soil derived from limestone | S2 | | Flathead, Glacier, Lake, Lewis and Clark, Lincoln, Pondera, Teton | MT | | EOR, WOR |
| Running-pine | *Lycopodium lagopus* | Plant | Turf along drainages; moist slopes in the alpine zone | S1 | | Flathead, Lincoln | MT | | WOR |
| Sand springbeauty | *Claytonia arenicola* | Plant | Mossy, forested, north-facing talus slopes in the lower montane zone | S1 | | Sanders | MT | | WOR |
| Scalepod | *Idahoa scapigera* | Plant | Vernally moist, open soil on rock ledges in the lower montane zone | S1 | | Flathead | MT | | WOR |
| Scarlet ammannia | *Ammannia robusta* | Plant | Drying mud around shallow ponds | S1 | | Phillips, Valley | MT | | EOR |
| Schweinitz' flatsedge | *Cyperus schweinitzii* | Plant | Sparsely vegetated, sandy soil, prairie grasslands on ridges and slopes | S2 | | Sheridan | MT | | EOR |
| Scorpidium moss | *Scorpidium scorpioides* | Plant | On wet soil in calcareous seeps and fens | S1 | | Flathead, Glacier, Lake, Lincoln, Teton | MT | | EOR, WOR |
| Scribner's panic grass | *Dichanthelium oligosanthes var. scribnerianum* | Plant | Collected in sandy pinelands in Lake County | S1 | | Lake | MT | | WOR |
| Shadow lichen | *Phaeophyscia kairamoi* | Plant | On rock, soil, or moss over rock | S2 | | Flathead, Lake | MT | | WOR |
| Sheathed sedge | *Carex vaginata* | Plant | Spruce swamps | S1 | | Lincoln | MT | | WOR |
| Short-pointed flatsedge | *Cyperus acuminatus* | Plant | Wet soil of pond margins, lakes, sloughs in valleys, and on plains | S1 | | Sanders | MT | | WOR |
| Short-styled thistle | *Cirsium brevistylum* | Plant | Meadows and disturbed forests in valley and montane zones | S1 | | Flathead, Missoula, Sanders | MT | | WOR |
| Silky prairie clover | *Dalea villosa* | Plant | Sandy soils of prairies and open woodlands; often near sandstone outcrops; on dunes and roadsides | S1 | | Richland, Sheridan | MT | | EOR |
| Simple kobresia | *Kobresia simpliciuscula* | Plant | Montane fens to moist tundra in the alpine zone | S2 | | Flathead, Glacier, Teton | MT | | EOR, WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Slender bulrush | *Schoenoplectus heterochaetus* | Plant | Marshes and edges of lakes and ponds on plains | S1 | | Lake | MT | | WOR |
| Slender cottongrass | *Eriophorum gracile* | Plant | Wet, organic soil of fens in valley and montane zones | S2 | | Flathead, Lake, Lincoln | MT | | WOR |
| Slender hareleaf | *Lagophylla ramosissima* | Plant | Open or disturbed places in dry grasslands in valleys. | S1 | | Sanders | MT | | WOR |
| Slender-branched popcorn-flower | *Plagiobothrys leptocladus* | Plant | Drying mud on shores of ponds in plains and foothills | S1 | | Phillips | MT | | EOR |
| Small dropseed | *Sporobolus neglectus* | Plant | Grasslands in valleys and on plains | S1 | | Sanders | MT | | WOR |
| Small tofieldia | *Tofieldia pusilla* | Plant | Moist tundra in the alpine zone | S2 | | Flathead, Glacier | MT | | EOR, WOR |
| Smooth goosefoot | *Chenopodium subglabrum* | Plant | Extremely loose, sandy soils; occupies early successional, sparsely vegetated habitats | S1 | | Cascade, Sheridan | MT | | EOR |
| Spalding's catchfly | *Silene spaldingii* | Plant | Mesic grassland prairies | S1 | FT | Flathead, Lake, Lincoln | MT | | WOR |
| Sparrow's-egg lady's slipper | *Cypripedium passerinum* | Plant | Mossy, moist, seepy places in coniferous forests; often on calcareous substrates | S2 | | Flathead, Glacier, Lewis and Clark, Pondera, Teton | MT | | EOR, WOR |
| Speck moss | *Verrucaria kootenaica* | Plant | On calcareous rocks near streams | S1 | | Flathead, Lake | MT | | WOR |
| Sphagnum moss | *Sphagnum centrale* | Plant | In coniferous fens and sedge fens; low to high elevations | S1 | | Flathead | MT | | WOR |
| Spoon-leaf moonwort | *Botrychium spathulatum* | Plant | Meadows and open forests | S1 | | Glacier, Lake | MT | | EOR, WOR |
| Square-stem monkeyflower | *Mimulus ringens* | Plant | Riparian areas of streams and rivers on the plains | S1 | | Flathead, Lincoln | MT | | WOR |
| Stalked moonwort | *Botrychium pedunculosum* | Plant | Moist or dry meadows, along perennial streams, and in coniferous forests | S1 | | Flathead, Lincoln, Sanders | MT | | WOR |
| Stalked-pod locoweed | *Oxytropis podocarpa* | Plant | Gravelly ridges and slopes; often on limestone; in alpine zone. | S1 | | Teton | MT | | EOR |
| Stalk-leaved monkeyflower | *Mimulus ampliatus* | Plant | Open seeps of montane valleys | S1 | | Flathead, Lincoln | MT | | WOR |
| Tapered rush | *Juncus acuminatus* | Plant | Wet soil on the margins of ponds and marshes in valleys and on plains | S1 | | Teton | MT | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Tapertip onion | *Allium acuminatum* | Plant | Dry, open forests and grasslands in the montane zone | S1 | | Sanders | MT | | WOR |
| Textured lungwort lichen | *Lobaria scrobiculata* | Plant | Tree bases, mossy rocks, and soil | S1 | | Lake | MT | | WOR |
| Thin-flowered sedge | *Carex tenuiflora* | Plant | Wet, organic soil of sphagnum-dominated fens in the montane zone | S1 | | Flathead | MT | | WOR |
| Thorn cladonia lichen | *Cladonia uncialis* | Plant | On soil and mosses; on talus slopes with cold-air drainage | S1 | | Lake | MT | | WOR |
| Three-flowered rush | *Juncus albescens* | Plant | Peatlands and moist, well-developed turf in the alpine zone | S1 | | Flathead, Glacier | MT | | EOR, WOR |
| Toothcup | *Rotala ramosior* | Plant | Open, wet, gravelly soil around ponds and sloughs in the valley zone | S1 | | Lake, Missoula | MT | | WOR |
| Trailing black currant | *Ribes laxiflorum* | Plant | Rocky montane shrubland slopes | S1 | | Lincoln | MT | | WOR |
| Tree-like clubmoss | *Lycopodium dendroideum* | Plant | Moist, coniferous forest in valley and lower montane zones | S1 | | Flathead, Glacier, Lincoln | MT | | EOR |
| Tufted club-rush | *Trichophorum cespitosum* | Plant | Wet meadows and sphagnum-dominated fens in montane and alpine zones | S1 | | Flathead, Glacier, Lake, Teton | MT | | EOR, WOR |
| Water bulrush | *Schoenoplectus subterminalis* | Plant | Open water, boggy margins of ponds, lakes and sloughs in valley, foothill, and montane zones | S2 | | Flathead, Lake, Lincoln | MT | | WOR |
| Water howellia | *Howellia aquatilis* | Plant | Glacial potholes and former river oxbows | S2 | FT | Lake, Lincoln, Missoula | MT | | WOR |
| Water star-grass | *Heteranthera dubia* | Plant | Shallow, slow-moving water of rivers and valley sloughs | S1 | | Flathead, Sanders | MT | | WOR |
| Watershield | *Brasenia schreberi* | Plant | Shallow water of lakes, sloughs, and slow-moving rivers in the valley zone | S1 | | Flathead, Lake, Lincoln, Missoula | MT | | WOR |
| Wavy moonwort | *Botrychium crenulatum* | Plant | Montane, moist, early-successional habitats | S2 | | Flathead, Glacier, Lake, Lincoln, Missoula, Sanders | MT | | EOR, WOR |
| Wedge-leaved saltbush | *Atriplex truncata* | Plant | Vernally moist, alkaline soils near ponds and along valley streams | S1 | | Lake | MT | | WOR |
| Western moonwort | *Botrychium hesperium* | Plant | Dry and moist, gravelly, and lightly disturbed soil of grasslands, meadows, and mid-succession gravel bars | S2 | | Flathead, Glacier, Lincoln, Sanders | MT | | EOR, WOR |
| Western pearl-flower | *Heterocodon rariflorum* | Plant | Vernally moist grassland slopes, mossy ledges, and riparian swales in valley, foothill and montane zones | S2 | | Lincoln, Sanders | MT | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Wooden soldier moss | *Cladonia botrytes* | Plant | On rotten wood; occasionally on humus-rich soil | S1 | | Lincoln | MT | | WOR |
| Wulf's peatmoss | *Sphagnum wulfianum* | Plant | Most dry-growing species in North America; typically in association with *Sphagnum centrale*, *S. girgensohnii*, *S. russowii*, and *S. squarrosum*; conifer swamp habitat | S1 | | Lake | MT | | WOR |
| Yakutat moonwort | *Botrychium yaaxudakeit* | Plant | Open to lightly wooded meadows; sparsely vegetated scree slopes | S1 | | Glacier | MT | | EOR |
| Yerba buena | *Satureja douglasii* | Plant | Partial to deep shade of moist forests in montane zone; sometimes in second growth | S2 | | Sanders | MT | | WOR |

Sources: MT, 2010; USDA, 2011a; USDOI, 2011e

Species list derived from best available sources (listed above). Some discrepancy exists between USFWS and state agencies concerning status and county locations for certain species. Status designation does not include State Special Concern Species.

**THREAT STATUS DESIGNATIONS**

SE State Endangered
ST State Threatened
S1 State Priority: At high risk because of extremely limited and/or rapidly declining population numbers, range and/or habitat, making it highly vulnerable to global extinction or extirpation in Montana.
S2 State Priority: At risk because of very limited and/or potentially declining population numbers, range and/or habitat, making it vulnerable to global extinction or extirpation in Montana.
S3 State Priority: Potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas of Montana.

FE Federally Endangered
FT Federally Threatened
FC Federal Candidate Species
* See note column

**NORTHERN BORDER PEIS REGIONS**

GL Great Lakes
EOR East of the Rockies
NE New England
WOR West of the Rockies

## Table M–6. Threatened and Endangered Species in New Hampshire

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| American three-toed woodpecker | *Picoides dorsalis* | Bird | Spruce-fir forests, bogs, and logged areas with standing dead trees | ST | | Carroll, Coos, Grafton | NH | | NE |
| Bald eagle | *Haliaetus leucocephalus* | Bird | Forested areas near bodies of open water | ST | | Statewide | NH | | NE |
| Common loon | *Gavia immer* | Bird | Clear water; medium-size lakes with islands | ST | | Statewide | NH | | NE |
| Common nighthawk | *Chordeiles minor* | Bird | Open areas, grasslands, agricultural fields, and clear cuts | SE | | Carroll, Coos | NH | | NE |
| Golden eagle | *Aquila chrysaetos* | Bird | Open and mountainous areas with cliffs for nesting | SE | | Statewide | NH | Potential habitat with historical occurrences | NE |
| Northern harrier | *Circus cyaneus* | Bird | Open country grasslands, wetlands, meadows | SE | | Coos | NH | | NE |
| Peregrine falcon | *Falco peregrinus* | Bird | Variety of habitats; cliffs and bluffs needed for nesting; urbanized areas | ST | | Statewide | NH | | NE |
| Pied-billed grebe | *Podilymbus podiceps* | Bird | Ponds and slackwaters of streams and rivers; cattail marshes and seasonal wetlands | ST | | Belknap, Carroll, Coos, Grafton, Merrimack, Sullivan | NH | | NE |
| Upland sandpiper | *Bartramia longicauda* | Bird | Large grasslands with mixed tall and short grasses free of dense litter layers; singing perches also necessary | SE | | Coos, Grafton | NH | Potential habitat with historical occurrences | NE |
| Bridle shiner | *Notropis bifrenatus* | Fish | Densely vegetated, slow-moving water | ST | | Belknap, Coos | NH | Historical evidence | NE |
| Cobblestone tiger beetle | *Cicindela marginipennis* | Insect | Sandy cobble beaches on upstream islands and riverbanks | SE | | Grafton , Sullivan | NH | Connecticut River valley | NE |
| Frosted elfin butterfly | *Callophrys irus* | Insect | Pine barrens with ample patches of blue lupine | SE | | Merrimack | NH | | NE |
| Persius duskywing skipper (butterly) | *Erynnis persius* | Insect | Grassy openings in pine barrens | SE | | Merrimack | NH | | NE |
| Pine pinion moth | *Lithophane lepida lepida* | Insect | Pine barrens, early-successional communities associated with pitch pine and scrub oak | ST | | Belknap, Carroll, Grafton | NH | | NE |
| Puritan tiger beetle | *Cicindela puritana* | Insect | Wide or narrow sand beaches adjacent to clay banks or bluffs along the bends of big rivers | SE | | Sullivan | NH | Historical data | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| White mountain arctic | *Oeneis melissa semidea* | Insect | Alpine and sub-alpine communities with dwarf shrub and sedge meadows | ST | | Carroll, Coos, Grafton | NH | White Mountain range | NE |
| White mountain fritillary | *Boloria titania montinus* | Insect | Wet-mesic alpine areas above 1,000 m | SE | | Coos | NH | White Mountain National Forest, Presidential Range | NE |
| American marten | *Martes americana* | Mammal | Mature conifer forests; successional mixed harwood forests; cedar swamps | ST | | Carroll, Coos, Grafton | NH | | NE |
| Canada lynx | *Lynx canadensis* | Mammal | Northern boreal forests | SE | FT | Statewide | NH | Potential habitat with historical occurrences | NE |
| New England cottontail | *Sylvilagus tranisitionalis* | Mammal | Early successional habitat, shrublands, shrub wetlands | SE | FC | *Statewide | NH | Mainly southeastern NH | NE |
| Small-footed bat | *Myotis leibii* | Mammal | Woodlands; small streams and rivers; adjacent to rock crevices; caves or mines required for hibernation | SE | | Belknap, Carroll, Coos, Grafton | NH | | NE |
| Dwarf wedge mussel | *Alasmidonta heterodon* | Mollusk | Unpolluted rivers with high dissolved oxygen, moderate currents, course substrates | SE | FE | Coos, Grafton, Sullivan | NH | Connecticut River valley | NE |
| Brook floater | *Alasmidonta varicosa* | Mollusk | Gravel and sand between larger cobbles in riffles; along shaded banks; in higher-gradient streams; in sandy flow refuges behind large boulders | SE | | Merrimack, Sullivan | NH | | NE |
| Acadian quillwort | *Isoetes acadiensis* | Plant | Shallow water (0.5 to 2 m) along the borders of acidic, low-nutrient ponds and lakes | SE | | County data unavailable | NH | | NE |
| Alpine azalea | *Loiseleuria procumbens* | Plant | Dry to mesic alpine/subalpine areas | ST | | Coos | NH | | NE |
| Alpine bearberry | *Arctostaphylos alpina* | Plant | Dry to mesic alpine/subalpine areas | ST | | Coos | NH | | NE |
| Alpine bitter-cress | *Cardamine bellidifolia* | Plant | Wet alpine, acidic cliffs | SE | | Coos, Grafton | NH | | NE |
| Alpine blueberry | *Vaccinium boreale* | Plant | Headlands; open, rocky uplands, alpine heaths. and meadows; forest-tundra | ST | | County data unavailable | NH | | NE |
| Alpine brook saxifrage | *Saxifraga rivularis* | Plant | Damp cliffs, rock crevices, and talus near snowbanks; alpine slopes, cracks, and shaded cliffs | SE | | County data unavailable | NH | | NE |
| Alpine marsh violet | *Viola palustris* | Plant | Wet alpine terrain | ST | | Coos | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Alpine meadow grass | *Poa pratensis* ssp. *alpigena* | Plant | Dry to mesic alpine/subalpine areas | SE | | Statewide | NH | | NE |
| Alpine speedwell | *Veronica wormskjoldii* | Plant | Dry to mesic alpine/subalpine areas | SE | | Grafton | NH | | NE |
| Alpine sweet grass | *Anthoxanthum monticola* | Plant | Alpine meadows, often on very thin soil with extensive exposed bedrock | ST | | Coos, Grafton | NH | | NE |
| Alpine timothy | *Phleum alpinum* | Plant | Wet alpine | SE | | Coos | NH | | NE |
| Alpine willowherb | *Epilobium anagallidifolium* | Plant | Moist rockslides, talus slopes, and gravelly areas near streams or seeps in high montane and alpine regions | SE | | Coos, Grafton | NH | | NE |
| Ambiguous sedge | *Carex amphibola* | Plant | Mesic deciduous forests; usually in acidic loams on flood plains, slopes above streams, and uplands | ST | | Grafton | NH | | NE |
| American winter-cress | *Barbarea orthoceras* | Plant | Wet alpine areas | SE | | Coos | NH | | NE |
| Arethusa | *Arethusa bulbosa* | Plant | Acid bogs, fens, and seeps | SE | | Belknap, Carroll, Grafton, Merrimack | NH | | NE |
| Arnica | *Arnica lanceolata* | Plant | Wet alpine areas | ST | | Carroll, Coos, Grafton | NH | | NE |
| Auricled twayblade | *Listera auriculata* | Plant | Rich swamps, floodplain forests, and riverbanks | SE | | Coos | NH | | NE |
| Autumn coral-root | *Corallorrhiza odontorhiza* | Plant | Rich deciduous woods, mixed woods, and conifer plantations | SE | | Statewide | NH | | NE |
| Awlwort | *Subularia aquatica* ssp. *americana* | Plant | Muddy pool margins, rocky gravelly bottoms, shallow stream pools, wet sedge meadows, shallow sandy water flats, muddy tidal flats, salt marshes, gravelly lake beaches, stream shorelines, pools and lakes to 1.5 m | SE | | Belknap, Carroll, Grafton, Merrimack | NH | Historical records | NE |
| Back's sedge | *Carex backii* | Plant | Dry, rocky, open, or shaded slopes, ridges, and barrens; in hardwood, mixed, or coniferous forests, including pine plantations; on acidic and calcareous substrates | SE | | Belknap, Carroll, Coos, Grafton, Merrimack | NH | | NE |
| Bailey's sedge | *Carex baileyi* | Plant | Rich fens and seeps | ST | | Grafton | NH | | NE |
| Baked apple berry | *Rubus chamaemorus* | Plant | Alpine, dry to mesic subalpine areas | SE | | Coos | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Bald spike-rush | *Eleocharis erythropoda* | Plant | Non-calcareous or calcareous fresh or brackish shores, marshes, meadows, fens, disturbed places | SE | | Coos | NH | | NE |
| Balsam groundsel | *Packera paupercula* | Plant | Rich fens and seeps and calcareous riverside seeps | ST | | Grafton, Merrimack | NH | | NE |
| Barren strawberry | *Waldsteinia fragarioides* | Plant | Woods thickets and clearings | ST | | Grafton | NH | | NE |
| Bashful clubsedge | *Trichophorum planifolium* | Plant | Mesic to dry hardwood forests, usually with oak component and often on hillsides | SE | | County data unavailable | NH | | NE |
| Bearberry willow | *Salix uva-ursi* | Plant | Barrens and alpine areas | ST | | Coos, Grafton | NH | | NE |
| Bearded flatsedge | *Cyperus squarrosus* | Plant | Moist, disturbed soils, gravelly roadsides, floodplains, edges of puddles, muddy places | SE | | Grafton | NH | | NE |
| Bebb's sedge | *Carex bebbii Olney ex Fernald* | Plant | Rich swamps | ST | | Coos, Grafton | NH | | NE |
| Bigelow's sedge | *Carex bigelowii* | Plant | Dry to moist alpine or arctic tundra | ST | | Coos, Grafton | NH | | NE |
| Black maple | *Acer nigrum* | Plant | Floodplain forests | ST | | County data unavailable | NH | | NE |
| Black sedge | *Carex atratiformis* | Plant | Forest margins, open woodlands, calcareous ledges, streambanks, lakeshores, wet cliffs, high-elevation seeps | SE | | Coos | NH | | NE |
| Bladdernut | *Staphylea trifolia* | Plant | Moist woods, thickets, and floodplains | ST | | Grafton, Sullivan | NH | | NE |
| Blunkleaf pondweed | *Potamogeton obtusifolius* | Plant | Medium to low-alkaline waters of lakes and slow-flowing streams | SE | | Carroll, Coos, Grafton | NH | Historical records | NE |
| Blunt-leaved milkweed | *Asclepias amplexicaulis* | Plant | Sandplain openings, including coastal sand dunes, sandy river shores, openings in pine barrens and other sandy woods, as well as sandy roadsides and inactive sand pits | ST | | Carroll, Merrimack | NH | | NE |
| Blunt-lobe woodsia | *Woodsia obtusa* | Plant | Most woodlands with leaf litter | SE | | Grafton, Sullivan | NH | | NE |
| Boott's rattlesnake-root | *Prenanthes boottii* | Plant | Alpine | SE | | Coos, Grafton | NH | | NE |
| Bristle grass | *Graphephorum melicoides* | Plant | Moist, cool streambanks; gravelly shores; shaded rock ledges (especially calcareous ones); and damp woods | SE | | Grafton | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Budding pondweed | *Potamogeton pusillus* ssp. *gemmiparus* | Plant | Aquatic beds | SE | | Carroll | NH | | NE |
| Bulbous bitter-cress | *Cardamine bulbosa* | Plant | Rich swamps | SE | | Coos | NH | | NE |
| Bur sedge | *Carex sparganioides* | Plant | Dry to moist deciduous and mixed forests; forest edges; neutral or basic soils | SE | | Coos, Grafton | NH | | NE |
| Butterfly-weed | *Asclepias tuberosa* | Plant | Sandplain openings including coastal sand dunes, sandy river shores, openings in pine barrens and other sandy woods, sandy roadsides, and inactive sand pits | SE | | Carroll | NH | | NE |
| Buxbaum's sedge | *Carex buxbaumii Wahlenb.* | Plant | Rich fens and seeps | SE | | Coos | NH | | NE |
| Canadian mountain-rice | *Piptatherum canadense* | Plant | Rocky ridges, outcrops, and slabs | SE | | Carroll | NH | | NE |
| Carolina cranesbill | *Geranium carolinianum* | Plant | Circumneutral cliffs, acidic cliffs, rocky ridges, outcrops, slabs, and dry sandplain openings | SE | | Coos, Grafton | NH | | NE |
| Case's lady's-tresses | *Spiranthes casei* | Plant | Rich fens and seeps | SE | | Coos | NH | | NE |
| Chestnut sedge | *Carex castanea Wahlenb.* | Plant | Rich fens and seeps | SE | | Statewide | NH | | NE |
| Ciliated aster | *Symphyotrichum ciliolatum* | Plant | Open areas and woodlands | ST | | Coos, Grafton | NH | | NE |
| Ciliated willow-herb | *Epilobium ciliatum* | Plant | Wet habitats, including wet meadows and along the shores of rivers and lakes | ST | | Belknap, Coos, Carroll, Grafton | NH | | NE |
| Climbing fumitory | *Adlumia fungosa* | Plant | Rich woods and talus, including rich mesic forests, dry rich forests, and enriched talus communities | SE | | Belknap, Coos, Carroll, Grafton, Merrimack | NH | | NE |
| Cluster sanicle | *Sanicula odorata* | Plant | Shade; dry woods | SE | | Grafton, Sullivan | NH | | NE |
| Coast-barnyard grass | *Echinochloa walteri* | Plant | Wet places, often in shallow water and brackish marshes | SE | | County data unavailable | NH | Historical records | NE |
| Coast-blite goosefoot | *Chenopodium rubrum* | Plant | Moist open areas, salt marshes, some weedy areas | SE | | Belknap, Coos | NH | | NE |
| Common butterwort | *Pinguicula vulgaris* | Plant | Rich fens and seeps | SE | | Carroll, Grafton | NH | | NE |
| Common mare's-tail | *Hippuris vulgaris* | Plant | Aquatic beds | ST | | Coos, Sullivan | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Common sandbur | *Cenchrus longispinus* | Plant | Sandy woods, fields, and waste ground | SE | | Merrimack | NH | | NE |
| Creeping juniper | *Juniperus horizontalis* | Plant | Circumneutral cliffs, rocky ridges, outcrops, and slabs | SE | | Grafton | NH | | NE |
| Creeping muhly | *Muhlenbergia sobolifera* | Plant | Aquatic beds | SE | | Belknap | NH | | NE |
| Creeping sedge | *Carex chordorrhiza* | Plant | Fens, bogs, floating mats on lakeshores, emergent sedge marshes; usually in very wet sites; often in shallow water | SE | | County data unavailable | NH | | NE |
| Cushion draba | *Draba breweri* | Plant | Rock, gravel, ledges | SE | | Coos | NH | | NE |
| Cutleaf toothwort | *Dentaria laciniata* | Plant | Rich woods and talus including rich mesic forests, dry rich forests, and enriched talus communities | SE | | Grafton | NH | | NE |
| Cutleaf toothwort | *Cardamine concatenata* | Plant | Rich woods and talus including rich mesic forests, dry rich forests, and enriched talus communities | SE | | Grafton, Sullivan | NH | | NE |
| Cutler's goldenrod | *Solidago cutleri* | Plant | Higher elevations of alpine terrains | ST | | Coos, Grafton | NH | | NE |
| Douglas' knotweed | *Polygonum douglasii Greene* | Plant | Rocky ridges, outcrops, and slabs | ST | | Carroll, Coos, Grafton | NH | | NE |
| Downy false foxglove | *Aureolaria virginica* | Plant | Dry, open woods | SE | | Merrimack | NH | | NE |
| Duckweed | *Lemna valdiviana* | Plant | Aquatic beds | SE | | Coos | NH | | NE |
| Dwarf bilberry | *Vaccinium cespitosum* | Plant | Black spruce, balsam fir-white spruce, paper birch -balsam fir, oak-maple, and Eastern hemlock forests | ST | | Carroll, Coos, Grafton | NH | | NE |
| Dwarf birch | *Betula glandulosa* | Plant | Dry to mesic alpine/subalpine areas | ST | | County data unavailable | NH | Northern NH | NE |
| Dwarf bulrush | *Lipocarpha micrantha* | Plant | Emergent shorelines, rarely freshwater tidal shores | SE | | Carroll, Grafton | NH | Historical records | NE |
| Dwarf cudweed | *Omalotheca supina* | Plant | Dry to mesic alpine and subalpine areas | SE | | Grafton | NH | | NE |
| Dwarf ragwort | *Senecio pauperculus* | Plant | Rich fens and seeps; calcareous riverside seeps | ST | | Grafton | NH | | NE |
| Dwarf willow | *Salix herbacea* | Plant | Alpine, dry to mesic and subalpine areas | SE | | Coos, Grafton | NH | | NE |
| Ebony sedge | *Carex eburnea Boott* | Plant | Circumneutral cliffs | SE | | Belknap | NH | | NE |
| Fairy slipper | *Calypso bulbosa* | Plant | Rich fens and seeps | SE | | Coos, Grafton | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| False pimpernel | *Lindernia anagallidea* | Plant | Wet shores and sandy soils | SE | | Carroll, Merrimack | NH | | NE |
| Farwell's milfoil | *Myriophyllum farwellii* | Plant | Aquatic beds | ST | | Carroll, Coos | NH | | NE |
| Fern-leaved foxglove | *Aureolaria pedicularia* | Plant | Open, rocky habitats, including cliffs and ridgetops | SE | | Statewide | NH | | NE |
| Fescue sedge | *Carex festucacea* | Plant | Wet or seasonally wet places, poorly drained fields, open woods | SE | | County data unavailable | NH | | NE |
| Few-flowered nutrush | *Scleria pauciflora* var. *pauciflora* | Plant | Dry to mostly wet pinelands, savannas, mesic woods, meadows, bogs, and prairies | SE | | County data unavailable | NH | | NE |
| Few-flowered spike-rush | *Eleocharis pauciflora* | Plant | Fens, wet meadows, seeps, springs, hot springs | SE | | Statewide | NH | | NE |
| Few-flowered spike-rush | *Eleocharis quinqueflora* | Plant | Fens, wet meadows, seeps, springs, hot springs | SE | | Statewide | NH | | NE |
| Five-angled dodder | *Cuscuta pentagona* | Plant | Fields and roadsides | SE | | Carroll | NH | | NE |
| Flat-leaved rush | *Juncus dichotomus* | Plant | Ditches, shores, clearings, and other open areas; usually in sandy, well-drained (but frequently wet) soils | SE | | County data unavailable | NH | | NE |
| Flatstem pondweed | *Potamogeton zosteriformis* | Plant | Aquatic beds | SE | | Belknap, Carroll, Coos, Grafton, Merrimack, Sullivan | NH | | NE |
| Four-leaved milkweed | *Asclepias quadrifolia* | Plant | *Dry, upland woods | SE | | Sullivan | NH | | NE |
| Fragrant fern | *Dryopteris fragrans* | Plant | Shaded cliffs and talus, often of limestone | ST | | Coos, Grafton, Merrimack | NH | | NE |
| Fringed gentian | *Gentiana crinita* | Plant | Moist meadows, woods, and streambanks | ST | | Carroll, Coos, Grafton, Merrimack | NH | | NE |
| Gall-of-the-earth | *Nabalus serpentarius* | Plant | *Open, rocky woodlands | SE | | Coos | NH | | NE |
| Garber's sedge | *Carex garberi* | Plant | Moist shores, meadows, fens; on base-rich soils | ST | | Sullivan | NH | | NE |
| Georgia bulrush | *Scirpus georgianus* | Plant | Moist meadows, marshes, ditches | SE | | County data unavailable | NH | | NE |
| Giant pinedrops | *Pterospora andromedea* | Plant | *Deep humus of coniferous forests; especially common under ponderosa pines in the West | SE | | Grafton | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Giant rhododendron | *Rhododendron maximum* | Plant | *Moist, dense woods; steep streambanks; mountain slopes | ST | | Carroll, Grafton, Merrimack, Sullivan | NH | | NE |
| Giant Solomon's seal | *Polygonatum biflorum* var. *commutatum morong* | Plant | Rich woodland soil | SE | | Grafton | NH | | NE |
| Ginseng | *Panax quinquefolius* | Plant | Rich woods and talus including rich mesic forests, dry rich forests, and enriched talus communities | ST | | Belknap, Carroll, Coos, Grafton, Merrimack | NH | | NE |
| Golden corydalis | *Corydalis aurea* | Plant | Talus slopes, ledges, rocky hillsides, forest clearings, open shores, creek bottoms, gravel pits, road cuts, and burned-over areas; in loose, often gravelly soil | SE | | County data unavailable | NH | | NE |
| Golden-fruited sedge | *Carex aurea* | Plant | Rich fens and seeps | ST | | Grafton, Sullivan | NH | | NE |
| Golden-heather | *Hudsonia ericoides* | Plant | Sandplain openings including coastal sand dunes, sandy river shores, openings in pine barrens and other sandy woods, sandy roadsides, and inactive sand pits | SE | | Carroll | NH | | NE |
| Goldie's fern | *Dryopteris goldiana* | Plant | Dense, moist woods, especially ravines, limey seeps, or edges of swamps | ST | | Carroll, Coos, Grafton | NH | | NE |
| Goodenough's sedge | *Carex nigra* | Plant | Wet meadows | SE | | Carroll, Sullivan | NH | | NE |
| Granular sedge | *Carex granularis* | Plant | Rich fens and seeps | SE | | Grafton | NH | | NE |
| Grassleaf goldenrod | *Euthamia caroliniana* | Plant | *Sunny shores and beaches; sandy soils | ST | | Carroll | NH | | NE |
| Grass-of-Parnassus | *Parnassia glauca* | Plant | Rich fens and seeps, rich wet meadows, and calcareous riverside seeps | ST | | Grafton, Sullivan | NH | | NE |
| Great St. John's-wort | *Hypericum ascyron* | Plant | Calcareous riverside seeps | SE | | Grafton, Sullivan | NH | | NE |
| Greater fringed gentian | *Gentianopsis crinita* | Plant | Moist meadows, woods, and streambanks | ST | | Carroll, Coos, Grafton | NH | | NE |
| Green adder's-mouth | *Malaxis unifolia* | Plant | Rich fens, and seeps; acid bogs, fens, and seeps; rich woods and talus including rich mesic forests, dry rich forests, and enriched talus communities; acidic mesic forests; and rich and poor swamps | ST | | Belknap, Carroll, Coos, Grafton, Merrimack, Sullivan | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Green dragon | *Arisaema dracontium* | Plant | Along the Connecticut River at some sites in low floodplain terraces among ostrich ferns | SE | | Coos, Grafton | NH | | NE |
| Gregarious black snakeroot | *Sanicula gregaria* | Plant | Rich mesic forests; dry rich forests; enriched talus communities | ST | | Grafton | NH | | NE |
| Gackberry | *Celtis occidentalis* | Plant | In rich moist soils along streams; on floodplains, rock, and wooded hillsides; in woodlands | ST | | Grafton | NH | | NE |
| Hair-like sedge | *Carex capillaris* | Plant | Dry to mesic alpine and subalpine areas | SE | | Coos | NH | | NE |
| Hairy brome-grass | *Bromus pubescens* | Plant | Sandplain openings, including coastal sand dunes, sandy river shores, openings in pine barrens and other sandy woods, as well as sandy roadsides and inactive sand pits | SE | | County data unavailable | NH | | NE |
| Hairy hudsonia | *Hudsonia tomentosa* | Plant | Sandplain openings, including coastal sand dunes, sandy river shores, openings in pine barrens and other sandy woods, as well as sandy roadsides and inactive sand pits; sandy pondshores; sandplain basin marshes, and riverbanks | ST | | Carroll | NH | | NE |
| Hairy rock-cress | *Arabis hirsuta* | Plant | Rich woods and talus including rich mesic forests, dry rich forests, and enriched talus communities | SE | | Coos, Grafton | NH | | NE |
| Hairy-fruited sedge | *Carex trichocarpa* | Plant | Openings in bottomlands, marshes, wet meadows, wet thickets along streams and rivers, wet prairies along streams; rarely occurring far from streams | SE | | County data unavailable | NH | | NE |
| Harsh bluejoint | *Calamagrostis canadensis* var. *langsdorfii* | Plant | *Riparian and cool, moist forest communities | SE | | County data unavailable | NH | | NE |
| Hay sedge | *Carex siccata* | Plant | Open, sandy oak, oak-pine, or pine forests; dry prairies, savannas, sand dunes, sandy fields, sunny rock outcrops, alpine, and subalpine meadows | SE | | Carroll, Coos | NH | | NE |
| Head-like sedge | *Carex capitata L.* ssp. *arctogena (Harry Sm.) Hiitonen* | Plant | Dry to mesic alpine and subalpine areas | SE | | Coos, Grafton | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Heart-leaved twayblade | *Listera cordata* | Plant | Acid bogs, fens and seeps, and poor swamps | SE | | Carroll, Coos, Grafton | NH | | NE |
| Heller's sweet everlasting | *Pseudognaphalium micradenium* | Plant | Dry woods and openings; roadsides | SE | | Carroll | NH | | NE |
| Hidden sedge | *Carex umbellata* | Plant | Dry to mesic, circumneutral to calcareous, clayey, sandy, and rocky fields, pastures, tall-grass prairies, glades, ridges, slopes, bluffs, dunes, barrens, open deciduous and mixed woodlands; also on serpentine and basalt, often at edges of ant hills | SE | | Belknap, Carroll, Coos, Grafton, Merrimack | NH | | NE |
| Hitchcock's sedge | *Carex hitchcockiana* | Plant | Mesic, usually rocky, deciduous forests, usually with highly diverse vascular plant communities; often in calcium-rich loams on slopes above streams | SE | | County data unavailable | NH | | NE |
| Hog-peanut | *Amphicarpaea bracteata* | Plant | Rich woods and talus including rich mesic forests, dry rich forests, and enriched talus communities | ST | | Carroll, Coos, Grafton | NH | | NE |
| Hornemann willow-herb | *Epilobium hornemannii* | Plant | Wet alpine areas, acid bogs, fens, seeps, and northern river banks | ST | | Belknap, Carroll, Coos, Grafton | NH | | NE |
| Houghton's umbrella-sedge | *Cyperus houghtonii* | Plant | Sand bars, lakeshores, sand dunes, sandy openings in woods, especially among Jack pines | SE | | Grafton | NH | | NE |
| Hound's-tongue | *Cynoglossum boreale* | Plant | Woods, uplands | SE | | Coos, Grafton | NH | | NE |
| Incurved umbrella-sedge | *Cyperus aristatus* | Plant | Moist, disturbed soils, gravelly roadsides, floodplains, edges of puddles, muddy places | ST | | Grafton | NH | | NE |
| Inkberry | *Ilex glabra* | Plant | *Bogs; wet woods of coastal plains | SE | | County data unavailable | NH | | NE |
| Jack pine | *Pinus banksiana* | Plant | Rocky ridges, outcrops, and slabs | ST | | Carroll, Coos, Grafton | NH | | NE |
| Jesup's milkvetch | *Astragalus robbinsii jesupi* | Plant | Banks of the Connecticut River | SE | FE | Sullivan | NH | | NE |
| Kalm's brome-grass | *Bromus kalmii* | Plant | Sandplain openings, including coastal sand dunes, sandy river shores, openings in pine barrens and other sandy woods, sandy roadsides, and inactive sand pits | SE | | Grafton | NH | | NE |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Kalm's lobelia | *Lobelia kalmii* | Plant | Rich fens and seeps, wet meadows, and calcareous riverside seeps | ST | | Coos, Sullivan | NH | | NE |
| Kidney-leaved violet | *Viola nephrophylla* | Plant | Wet, cold, acidic areas | SE | | Coos, Grafton | NH | | NE |
| Knotty pondweed | *Potamogeton nodosus* | Plant | Clear to turbid waters of lakes, streams, rivers, and sloughs | ST | | Coos, Grafton, Sullivan | NH | | NE |
| Lance-leaved draba | *Draba lanceolata* | Plant | Rock, gravel, ledges | SE | | Coos | NH | | NE |
| Lapland diapensia | *Diapensia lapponica* | Plant | Dry to mesic alpine and subalpine areas; acidic cliffs | ST | | Coos, Grafton | NH | | NE |
| Lapland rosebay | *Rhododendron lapponicum* | Plant | *Limestone slopes, rocky tundra, barrens | SE | | County data unavailable | NH | | NE |
| Large marsh bedstraw | *Galium obtusum* | Plant | Waters of emergent marshes | SE | | Belknap | NH | | NE |
| Large toothwort | *Cardamine maxima* | Plant | *Woods; rich soils | SE | | Grafton | NH | | NE |
| Large yellow lady's-slipper | *Cypripedium parviflorum* var. *pubescens* | Plant | Mesic deciduous and coniferous forests, openings, thickets, prairies, meadows, fens | ST | | Carroll, Coos, Grafton, Merrimack | NH | | NE |
| Large-flowered bellwort | *Uvularia grandiflora* | Plant | Rich and moist soils in healthy woodlands | SE | | Grafton | NH | | NE |
| Large-spored quillwort | *Isoetes lacustris* | Plant | Aquatic beds | SE | | Grafton, Carroll | NH | | NE |
| Leafy pondweed | *Potamogeton foliosus* | Plant | Aquatic beds | SE | | Coos | NH | | NE |
| Lesser panicled sedge | *Carex diandra Schrank* | Plant | Rich fens and seeps | SE | | Coos | NH | | NE |
| Lesser yellow lady's slipper | *Cypripedium parviflorum* | Plant | Mesic deciduous and coniferous forest, openings, thickets, prairies, meadows, fens | SE | | Carroll, Coos, Grafton | NH | | NE |
| Lily-leaved twayblade | *Listera convallarioides* | Plant | Acid bogs, fens, seeps, and poor swamps | ST | | Coos | NH | | NE |
| Livelong saxifrage | *Saxifraga paniculata* | Plant | Cliffs | SE | | Coos | NH | | NE |
| Livid sedge | *Carex livida* | Plant | Boreal fens; calcareous floating mats | SE | | County data unavailable | NH | | NE |
| Loesel's twayblade | *Liparis loeselii* | Plant | Rich fens and seeps, rich swamps, wet meadows, and calcareous riverside seeps | ST | | Belknap, Coos, Grafton, Sullivan | NH | | NE |
| Long-fruited anemone | *Anemone cylindrica* | Plant | Prairies; dry, open woods, pastures, roadsides | SE | | Carroll, Grafton | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Long-leaved bluets | *Houstonia longifolia* | Plant | *Dry prairies and barrens; rocky, sandy soil | SE | | ***Carroll | NH | | NE |
| Long-leaved panic grass | *Panicum rigidulum* var. *pubescens* | Plant | *Wet sands and peat soil | SE | | Carroll | NH | | NE |
| Long's bulrush | *Scirpus longii* | Plant | Marshes | SE | | County data unavailable | NH | | NE |
| Low bindweed | *Calystegia spithamaea* ssp. *spithamaea* | Plant | Dry forests, woods, fields; rocky, sandy soil | ST | | Carroll, Grafton | NH | | NE |
| Male fern | *Dryopteris filix-mas* ssp. *brittonii* | Plant | Dense woods and talus slopes on limestone | SE | | Coos | NH | | NE |
| Many leaved bulrush | *Scirpus polyphyllus* | Plant | Rich swamps | SE | | Grafton, Sullivan | NH | | NE |
| Marsh horsetail | *Equisetum palustre* | Plant | Marshes and swamps | SE | | Coos | NH | | NE |
| Marsh valerian | *Valeriana uliginosa* | Plant | Wet meadows, swamps, and fens with limey soils | SE | | Grafton | NH | | NE |
| Matted spike-rush | *Eleocharis intermedia* | Plant | Fresh, wet, often marly places along streams, lakeshores, tidal meadows, disturbed areas | SE | | Coos, Grafton, Merrimack | NH | Historical records | NE |
| Meadow horsetail | *Equisetum pratense* | Plant | Meadows, wet woodlands | ST | | Belknap, Coos, Grafton | NH | | NE |
| Meadow sedge | *Carex granularis* | Plant | Rich fens and seeps | SE | | Grafton | NH | | NE |
| Meagre sedge | *Carex exilis* | Plant | Acid bogs, fens, and seeps | SE | | Carroll, Coos | NH | | NE |
| Mermaid-weed | *Proserpinaca pectinata Lam.* | Plant | Sandy pond shores; sandplain basin marshes | SE | | Carroll | NH | | NE |
| Missouri rock-cress | *Arabis missouriensis* | Plant | Rich woods and talus including rich mesic forests, dry rich forests, and enriched talus communities | ST | | Belknap, Carroll, Coos, Grafton | NH | | NE |
| Moor rush | *Juncus stygius* ssp. *Americanus* | Plant | Wet moss, bogs, and bog pools | SE | | County data unavailable | NH | | NE |
| Moss bell-heather | *Cassiope hypnoides* | Plant | Dry to mesic alpine and subalpine areas | ST | | Coos | NH | | NE |
| Moss bell-heather | *Harrimanella hypnoides* | Plant | Dry to mesic alpine and subalpine areas | SE | | Coos | NH | | NE |
| Moss campion | *Silene acaulis* | Plant | Arctic and alpine tundra, gravelly, often wet places, rocky ledges | SE | | Coos | NH | | NE |
| Moss love grass | *Eragrostis hypnoides* | Plant | *Muddy or sandy shores of lakes and rivers and in moist, disturbed sites of 10 to 1600 m | SE | | Grafton | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Mossy-cup oak | *Quercus macrocarpa* | Plant | Bottomlands, riparian slopes, poorly drained areas, prairies; usually on limestone or calcareous clays | SE | | Belknap, Grafton | NH | | NE |
| Mountain avens | *Geum peckii* | Plant | Dry to mesic alpine and subalpine areas, wet alpine areas, northern river banks | ST | | Carroll, Coos, Grafton | NH | | NE |
| Mountain cudweed | *Gnaphalium supinum* | Plant | Dry to mesic alpine and subalpine areas | SE | | Grafton | NH | | NE |
| Mountain hairgrass | *Vahlodea atropurpurea* | Plant | *Moist to wet, open woods, forest edges, streamsides, snowbeds, and meadows; montane to alpine and subarctic habitats | SE | | Coos | NH | | NE |
| Mountain sorrel | *Oxyria digyna* | Plant | Dry to mesic alpine, subalpine, and wet alpine | SE | | Coos | NH | | NE |
| Mountain sweet-cicely | *Osmorhiza berteroi* | Plant | Rich woods and talus including rich mesic forests, dry rich forests, and enriched talus communities | SE | | Coos | NH | | NE |
| Mountain-heath | *Phyllodoce caerulea* | Plant | Alpine, dry to mesic and subalpine | ST | | Coos, Grafton | NH | | NE |
| Mucronated blue-eyed grass | *Sisyrinchium mucronatum* | Plant | Prairies, roadsides, moist open woods, rocky and sandy open shores | SE | | Coos, Grafton | NH | Historical records | NE |
| Muskflower | *Mimulus moschatus* | Plant | *Streambanks and pond shores | SE | | Sullivan | NH | | NE |
| Narrow false oats | *Trisetum spicatum* | Plant | Alpine meadows and slopes, descending to lower plains and lakeshores | SE | | Statewide | NH | | NE |
| Narrow-leaved cotton-grass | *Eriophorum angustifolium* | Plant | Marshes, bogs, fens, meadows, shores | SE | | Statewide | NH | | NE |
| Narrow-leaved spleenwort | *Diplazium pycnocarpon* | Plant | Moist woods and slopes in neutral soils | SE | | Grafton | NH | | NE |
| Neat spike-rush | *Eleocharis nitida* | Plant | Fresh bog pools, streams, disturbed places | SE | | County data unavailable | NH | | NE |
| Needle beak sedge | *Rhynchospora capillacea* | Plant | Moist to wet calcareous fens, seeps over limestones or calcareous rock, marsh meadows | SE | | Sullivan | NH | | NE |
| Neglected reed bent-grass | *Calamagrostis stricta* ssp. *inexpansa* | Plant | Wet alpine | SE | | County data unavailable | NH | | NE |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Neglected reedgrass | *Calamagrostis stricta* ssp. *stricta* | Plant | Wet alpine | SE | | County data unavailable | NH | | NE |
| Netted nutsedge | *Scleria reticularis* | Plant | Moist or wet sandy or sandy-peaty soil of pond and lake margins, wet savannas, and moist swales | SE | | County data unavailable | | | NE |
| Nodding saxifrage | *Saxifraga cernua* L. | Plant | Cliffs | SE | | Coos | NH | | NE |
| Nodding stickseed | *Hackelia deflexa* ssp. *Americana* | Plant | *Moist woods, thickets, hillsides | SE | | County data unavailable | NH | | NE |
| Northeastern bulrush | *Scirpus ancistrochaetus* | Plant | Open, tall herb-dominated wetlands | SE | FE | Sullivan | NH | | NE |
| Northern adder's tongue | *Ophioglossum pusillum* | Plant | Open fens, marsh edges, pastures, and grassy shores and roadside ditches | SE | | Belknap, Carroll, Coos, Grafton, Merrimack | NH | | NE |
| Northern blazing star | *Liatris novae-angliae* | Plant | Sandy fields, woods, railroads, road banks | SE | | Merrimack | NH | | NE |
| Northern comandra | *Geocaulon lividum* | Plant | Wet bogs, and cold, coniferous woods | SE | | Coos | NH | | NE |
| Northern firmoss | *Huperzia selago* | Plant | Sandy borrow pits, ditches, lakeshore swales, and conifer swamps; rarely on acidic igneous rock or calcareous coast cliffs | SE | | County data unavailable | NH | | NE |
| Northern slender pondweed | *Stuckenia filiformis* | Plant | Quiet waters from 3 to 7 ft deep | SE | | Coos | NH | | NE |
| Northern waterleaf | *Hydrophyllum virginianum* | Plant | Rich woods and talus including rich mesic forests, dry rich forests, and enriched talus communities | ST | | Grafton, Sullivan | NH | | NE |
| Northern woodrush | *Luzula confusa* | Plant | Dry to mesic alpine and subalpine areas | SE | | Coos | NH | Distribution restricted to one location (Sargents Purchase) | NE |
| Nuttall's reedgrass | *Calamagrostis cinnoides* | Plant | *Open areas including bogs, peaty meadows, wet rocks, and shores | SE | | Coos | NH | | NE |
| Oakes' eyebright | *Euphrasia oakesii* | Plant | Dry to mesic subalpine areas | SE | | Grafton | NH | | NE |
| One-leaf orchis | *Amerorchis rotundifolia* | Plant | Moist, often calcareous, coniferous forests, thickets, fens, tundra | SE | | County data unavailable | NH | | NE |
| One-sided rush | *Juncus secundus* | Plant | Acidic cliffs; rocky ridges, outcrops, and slabs; dry sandplain openings; dry acidic forests; and acidic talus | SE | | Carroll | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Ovoid spike-rush | *Eleocharis ovata* | Plant | Fresh, often drying shores, lake and stream beds, bogs, tidal estuaries, disturbed places | SE | | Belknap, Carroll, Coos, Grafton, Merrimack, Sullivan | NH | | NE |
| Pale early violet | *Viola affinis Leconte* | Plant | Moist woods and meadows | SE | | Carroll, Coos, Grafton | NH | | NE |
| Pale green orchis | *Platanthera flava* | Plant | Rich swamps | ST | | Coos | NH | | NE |
| Pale painted-cup | *Castilleja septentrionalis* | Plant | Wet alpine areas | SE | | Coos | NH | | NE |
| Peat moss | *Sphagnum andersonianum* | Plant | *Low hummocks in very poor ericaceous fens | ST | | County data unavailable | NH | | NE |
| Peat moss | *Sphagnum angermanicum* | Plant | *Low-elevation and montane sedge, shrub-graminoid, and poor dwarf-medium shrub fens | SE | | County data unavailable | NH | | NE |
| Peat moss | *Sphagnum brevifolium* | Plant | *Poor and intermediate fen habitats | SE | | County data unavailable | NH | Historical records | NE |
| Peat moss | *Sphagnum contortum* | Plant | Wet, rich fens near water | ST | | County data unavailable | NH | | NE |
| Peat moss | *Sphagnum flavicomans* | Plant | *Medium to tall hummocks in bogs and poor fens | SE | | County data unavailable | NH | | NE |
| Peat moss | *Sphagnum lindbergii* | Plant | *Restricted to alpine and subalpine peatlands | SE | | County data unavailable | NH | | NE |
| Peat moss | *Sphagnum majus* ssp. *norvegicum* | Plant | *Lawns in poor sedge fens and along pond margins | ST | | County data unavailable | NH | | NE |
| Peat moss | *Sphagnum pylaesii* | Plant | *Over moist or wet rock or submerged in fen pools | ST | | County data unavailable | NH | | NE |
| Peat moss | *Sphagnum riparium* | Plant | *Wet minerotrophic sites such as open bog mats | ST | | County data unavailable | NH | | NE |
| Peat moss | *Sphagnum subfulvum* | Plant | *Bogs and fens | SE | | County data unavailable | NH | Historical records | NE |
| Peat moss | *Sphagnum wulfianum* | Plant | Coniferous forests; low to moderate elevations | ST | | County data unavailable | NH | | NE |
| Pennsylvania cinquefoil | *Potentilla litoralis* | Plant | *Waters of emergent marshes | SE | | Belknap, Coos | NH | Historical records | NE |
| Perfoliate bellwort | *Uvularia perfoliata* | Plant | Deciduous woods and upland thickets | SE | | Sullivan | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Philadelphia panic-grass | *Panicum philadelphicum* | Plant | Sandplain openings, including coastal sand dunes, sandy river shores, openings in pine barrens and other sandy woods, sandy roadsides, and inactive sand pits; dry acidic forests, poor wet meadows, sandy pondshores; sandplain basin marshes and riverbanks | SE | | Belknap, Carroll, Coos, Grafton, Merrimack | NH | | NE |
| Pickering's reed bent-grass | *Calamagrostis pickeringii* | Plant | Dry to mesic alpine subalpine areas | ST | | Coos, Grafton | NH | | NE |
| Pink azalea | *Rhododendron periclymenoides* | Plant | Dry acidic forest | SE | | Carroll | NH | | NE |
| Pink wintergreen | *Pyrola asarifolia* | Plant | Rich woods and talus including rich mesic forests, dry rich forests, and enriched talus communities | SE | | Coos, Grafton | NH | | NE |
| Pond reed bent-grass | *Calamagrostis lacustris* | Plant | Calcareous wetlands, including fens and wet meadows; sandy or cobbly lake, pond, or river shores; cliffs, krummholz, and alpine meadows in high peaks of the Adirondacks; wet meadows, marshes, damp woods | ST | | Distribution undefined | NH | | NE |
| Prickly rose | *Rosa acicularis* | Plant | Boreal forest | SE | | Coos, Sullivan | NH | | NE |
| Proliferous fescue | *Festuca prolifera* | Plant | Wet alpine areas | SE | | Carroll, Coos, Grafton, Merrimack, Sullivan | NH | | NE |
| Prolific knotweed | *Polygonum prolificum* | Plant | Salt marshes, mudflats, and borders | SE | | County data unavailable | NH | | NE |
| Purple clematis | *Clematis occidentalis* | Plant | Calcareous cliffs, rock ledges, talus slopes, gravelly embankments, rocky woods, and clearings | SE | | Carroll, Coos, Grafton | NH | | NE |
| Purple crowberry | *Empetrum atropurpureum* | Plant | Sand dunes, sandy terraces, exposed mountain slopes near the treeline | ST | | Carroll, Coos, Grafton | NH | | NE |
| Purple screwstem | *Bartonia iodandra* | Plant | *Patterned fens and intermittent wetlands | SE | | County data unavailable | NH | | NE |
| Pursh's goldenrod | *Solidago purshii Porter* | Plant | Wet bogs, meadows, and fens | ST | | Grafton | NH | | NE |
| Quill-leaved sagittaria | *Sagittaria teres* | Plant | Sandy pond shores and swamps of acid waters | SE | | County data unavailable | NH | | NE |
| Ram's-head lady's-slipper | *Cypripedium arietinum* | Plant | Dry to moist open coniferous and mixed forests, coniferous fens, beach thickets | SE | | Belknap, Carroll, Coos, Grafton, Merrimack | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Reversed bladderwort | *Utricularia resupinata* | Plant | *Shores, shallows, quiet water, muddy soils | SE | | Carroll, Grafton, Merrimack, Sullivan | NH | | NE |
| River bank quillwort | *Isoetes riparia* | Plant | Aquatic bed, sandy pond shores, sandplain basin marshes, brackish marshes, mudflats, and borders | SE | | Belknap, Coos | NH | | NE |
| Robbins' cinquefoil | *Potentilla robbinsiana* | Plant | Alpine areas | SE | | Coos | NH | Only place it occurs in U.S. | NE |
| Robinson's hawkweed | *Hieracium robinsonii* | Plant | Calcareous riverside seeps | SE | | Coos | NH | | NE |
| Rock sandwort | *Minuartia stricta* | Plant | Moist, granitic gravels, sedge meadows, heath, alpine and arctic tundra | SE | | Carroll, Coos, Grafton | NH | | NE |
| Round-leaved ragwort | *Packera obovata* | Plant | *Calcareous rocks, slopes, rich wooded banks; usually in limestone soils; moist, well-drained loam, clay | SE | | County data unavailable | NH | | NE |
| Sago pondweed | *Stuckenia pectinata* | Plant | Quiet waters 3 to 7 ft deep | SE | | Belknap, Grafton, Sullivan | NH | | NE |
| Salt-loving spike-rush | *Eleocharis uniglumis* | Plant | Coastal, brackish shores; marshes | ST | | County data unavailable | NH | | NE |
| Sandbar willow | *Salix exigua* ssp. *interior* | Plant | *Wet soils, especially riverbanks, sandbars, and silt flats | SE | | County data unavailable | NH | | NE |
| Satin willow | *Salix pellita* | Plant | Calcareous riverside seeps | SE | | Coos | NH | | NE |
| Scirpus-like sedge | *Carex scirpoidea* | Plant | Dependent on elevation; calcareous soils | ST | | Carroll, Coos, Grafton | NH | | NE |
| Sclerolepis | *Sclerolepis uniflora* | Plant | *Mesotrophic or oligotrophic deep-water lakes | SE | | Merrimack | NH | | NE |
| Seaside mallow | *Hibiscus moscheutos* | Plant | *Swampy forests, wet meadows, marshes | SE | | County data unavailable | NH | | NE |
| Sessile-fruited arrowhead | *Sagittaria rigida* | Plant | Calcareous or brackish shallow water and shores of ponds, swamps, and rivers; occasionally in deep water | SE | | Belknap, Carroll, Merrimack, Sullivan | NH | | NE |
| Sheldon's sedge | *Carex albursina* | Plant | Moist deciduous or deciduous-evergreen forests; on steep slopes; often around limestone escarpments, washes, slides, or cave entrances | SE | | County data unavailable | NH | | NE |
| Shinning ladies' tresses | *Spiranthes lucida* | Plant | Rocky and sandy riverbanks, calcareous seeps, fens | SE | | Sullivan | NH | | NE |
| Short-fruited rush | *Juncus brachycephalus* | Plant | Calcareous marshes, wet meadows, and wetland shores | SE | | Carroll, Coos, Grafton, Sullivan | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Showy lady's-slipper | *Cypripedium reginae* | Plant | Coniferous and hardwood fen forests, openings, fen meadows, hillside seeps, meadows, prairies, dune lags, seeping cliffs | SE | | Grafton | NH | | NE |
| Showy orchis | *Galearis spectabilis* | Plant | Moist, calcareous woodlands, thickets, and old fields | ST | | Carroll, Grafton | NH | | NE |
| Sibbaldia | *Sibbaldia procumbens* | Plant | Alpine tundra | SE | | Grafton | NH | | NE |
| Siberian chives | *Allium schoenoprasum* | Plant | Wet meadows, rocky or gravelly streambanks and lakeshores; circumboreal | SE | | Carroll, Grafton, Sullivan | NH | | NE |
| Silver willow | *Salix argyrocarpa* | Plant | Wet alpine areas | SE | | Coos | NH | | NE |
| Silverling | *Paronychia argyrocoma* var. *albimontana* | Plant | Dry to mesic alpine and subalpine areas; acidic cliffs and talus; riverbanks | ST | | Carroll, Coos, Grafton | NH | | NE |
| Silvery nailwort | *Paronychia argyrocoma* | Plant | Dry to mesic alpine and subalpine areas; acidic cliffs and talus; riverbanks | ST | | Carroll, Coos, Grafton | NH | | NE |
| Sitka clubmoss | *Diphasiastrum sitchense* | Plant | Alpine meadows, open rocky barrens, conifer woods | SE | | County data unavailable | NH | | NE |
| Skydrop aster | *Symphyotrichum patens* | Plant | Sandy, loamy, shaley, or clayey soils; dry woods; open oak and pine woods; fields; roadsides; disturbed habitats | ST | | Merrimack | NH | | NE |
| Slender blue flag | *Iris prismatica* | Plant | Emergent marshes, wet meadows, salt marshes, mudflats, and borders | SE | | Grafton | NH | | NE |
| Slender cliff-brake | *Cryptogramma stelleri* | Plant | Sheltered calcareous cliff crevices and rock ledges; typically in coniferous forest or other boreal habitats | SE | | Coos | NH | | NE |
| Slightly hairy sedge | *Carex hirsutella* | Plant | Meadows; dry to mesic woods; neutral to basic soils | SE | | Statewide | NH | | NE |
| Small bidens | *Bidens discoidea* | Plant | Ponds, swamps, other relatively wet sites | SE | | Carroll | NH | | NE |
| Small birch | *Betula minor* | Plant | Rocky slopes, barrens, and subalpine summits | ST | | County data unavailable | NH | | NE |
| Small bur-reed | *Sparganium natans* | Plant | Cool, quiet, slightly acid to somewhat basic waters of bays, pools, ditches, and peat bogs; usually in shallow water but sometimes to 60 cm depth | ST | | Belknap, Carroll, Coos, Grafton | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Small drop-seed | *Sporobolus neglectus* | Plant | Sandy soils; river shores; and dry, open areas | SE | | Coos | NH | | NE |
| Small whorled pogonia | *Isotria medeoloides* | Plant | Acidic mesic forests | ST | FT | Belknap, Carroll, Grafton, Merrimack | NH | | NE |
| Small yellow lady's-slipper | *Cypripedium parviflorum* | Plant | Mesic to dry, deciduous and deciduous-hemlock forests; usually on slopes | SE | | Carroll, Coos, Grafton | NH | | NE |
| Small-crested sedge | *Carex cristatella* | Plant | Moist to wet meadows, marshes, thickets, streambanks, ditches | SE | | Sullivan | NH | | NE |
| Smooth rock cress | *Boechera laevigata* | Plant | Rocky bluffs, cedar glades, wooded hillsides, floodplains | SE | | County data unavailable | NH | | NE |
| Smooth sandwort | *Minuartia glabra* | Plant | Rocky ridges, outcrops, and slabs | SE | | Carroll, Coos, Grafton | NH | | NE |
| Smooth woodsia | *Woodsia glabella* | Plant | Shaded cracks and ledges on cliffs and calcareous rock | SE | | Coos | NH | | NE |
| Smooth-forked chickweed | *Paronychia canadensis* | Plant | Dry to mesic alpine and subalpine areas; acidic cliffs and talus; riverbanks | SE | | Carroll, Grafton | NH | | NE |
| Snowy aster | *Aster ptarmicoides* | Plant | Circumneutral cliffs and rocky ridges, outcrops, and slabs | SE | | Grafton | NH | | NE |
| Spiked woodrush | *Luzula spicata* | Plant | Dry to mesic alpine and subalpine areas; acidic talus | SE | | Carroll, Coos, Grafton | NH | | NE |
| Sprout muhlenbergia | *Muhlenbergia sobolifera* | Plant | Rich woods and talus including rich mesic forests, dry rich forests, and enriched talus communities | ST | | Belknap | NH | | NE |
| Spurred gentian | *Halenia deflexa* | Plant | Rich fens and seeps, rich swamps, wet meadows and calcareous riverside seeps | SE | | Coos | NH | | NE |
| Square-stem goldenrod | *Solidago patula* | Plant | *Wet meadows, prairies, fields, swamps, marshes, bog, fens | SE | | Carroll | NH | Historical records | NE |
| Squaw-root | *Conopholis americana* | Plant | Dry woods; rich soil | ST | | Carroll, Grafton | NH | | NE |
| Squirrel-corn | *Dicentra canadensis* | Plant | Deciduous woods, often among rock outcrops; rich loam soils | ST | | Coos, Grafton | NH | | NE |
| Stickseed | *Hackelia virginiana* | Plant | **Upland woods | SE | | Grafton, Sullivan | NH | | NE |
| Sticky-false asphoel | *Triantha glutinosa* | Plant | Marshes, wet meadows, calcareous soils | SE | | Sullivan | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Stiff gentian | *Gentianella quinquefolia* | Plant | *Hill prairies, upland savannas, thinly wooded slopes, rocky meadows, streambanks in wooded areas, calcareous seeps, and cliff edges | SE | | Grafton | NH | | NE |
| Swamp birch | *Betula pumila* | Plant | Rich fens and seeps | SE | | County data unavailable | NH | | NE |
| Swarthy sedge | *Carex adusta* | Plant | Dry, acidic, sandy soils of open woods and clearings; moist shores | SE | | Carroll | NH | | NE |
| Sweet coltsfoot | *Petasites frigidus* var. *palmatus* | Plant | Rich swamps | SE | | Coos, Merrimack | NH | | NE |
| Swollen-beaked sedge | *Carex rostrata* | Plant | Fens (especially in flarks in patterned fens); bogs and bog pools; lake and stream shores; shallow waters; on floating mats | SE | | County data unavailable | NH | | NE |
| Tall wormwood | *Artemisia campestris* | Plant | Lakeshores | SE | | Coos | NH | | NE |
| Tea-leaved willow | *Salix planifolia* | Plant | Wet alpine | ST | | Coos, Grafton | NH | | NE |
| Thin-flowered sedge | *Carex tenuiflora* | Plant | Mires (especially sphagnum bogs); wet woodlands; lowlands | SE | | County data unavailable | NH | | NE |
| Thin-leaved alpine pondweed | *Potamogeton alpinus Balbis* | Plant | Aquatic beds | SE | | Coos, Sullivan | NH | | NE |
| Thin-leaved sedge | *Carex cephaloidea* | Plant | Dry to mesic deciduous and mixed forests and forest margins on neutral or basic soils | ST | | County data unavailable | NH | | NE |
| Three-birds orchid | *Triphora trianthophora* | Plant | Rich woodlands, swamp edges, and floodplains | ST | | Belknap, Carroll, Grafton | NH | | NE |
| Three-leaved black snakeroot | *Sanicula trifoliata* | Plant | Rich mesic forests, dry rich forests, enriched talus communities | ST | | Grafton, Merrimack, Sullivan | NH | | NE |
| Three-seeded mercury | *Acalypha virginica* | Plant | Sandplain openings, including coastal sand dunes, sandy river shores, openings in pine barrens and other sandy woods, sandy roadsides, and inactive sand pits | SE | | Grafton | NH | | NE |
| Tiny cowlily | *Nuphar microphylla* | Plant | Ponds, lakes, sluggish streams, sloughs, ditches, and occasionally tidal waters | SE | | Carroll, Coos | NH | | NE |
| Troublesome sedge | *Carex molesta* | Plant | Fields, roadsides, bottomlands, and open woods; on dry to wet, often heavy, calcareous soils | SE | | County data unavailable | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Trumpetweed | *Eupatoriadelphus fistulosus* | Plant | Alluvial woods; meadows; bogs and marshes; streambanks | SE | | Coos, Merrimack, Sullivan | NH | | NE |
| Tubercled spike-rush | *Eleocharis tuberculosa* | Plant | Wet soil, freshwater, ponds, lakeshores, streams, meadows, pine woods, grasslands, disturbed places, bogs | SE | | Carroll | NH | | NE |
| Tubular thoroughwort | *Eupatorium fistulosum Barratt* | Plant | Alluvial woods; meadows; bogs and marshes; streambanks | SE | | Coos | NH | | NE |
| Tufted loosestrife | *Lysimachia thyrsiflora* | Plant | Rich fens and seeps; acid bogs, fens, and seeps; rich and poor swamps; medium-depth and deep, emergent swamps | ST | | Carroll, Sullivan | NH | | NE |
| Twining screwstem | *Bartonia paniculata* | Plant | *Wet peat and sand | SE | | Carroll | NH | | NE |
| Umbrella-sedge | *Cyperus erythrorhizos* | Plant | Emergent shorelines | SE | | County data unavailable | NH | | NE |
| Upland boneset | *Eupatorium sessilifolium* | Plant | Dry, open edges of mesic woods | SE | | Merrimack | NH | | NE |
| Vasey pondweed | *Potamogeton vaseyi* | Plant | Aquatic beds | SE | | Carroll, Coos, Grafton, Sullivan | NH | | NE |
| Viviparous knotweed | *Polygonum viviparum* | Plant | Wet alpine | SE | | Coos | NH | | NE |
| Walking fern | *Asplenium rhizophyllum* | Plant | Circumneutral cliffs | SE | | Coos, Grafton, Sullivan | NH | | NE |
| Walking-fern spleenwort | *Camptosorus rhizophyllus* | Plant | Shaded; moss-covered boulders and ledges; limestone or other basic rocks; occasionally on sandstone or other acidic rocks; rarely on fallen tree trunks | SE | | Coos, Grafton | NH | | NE |
| Walter's sedge | *Carex striata* | Plant | Open swamps, sedge meadows, bogs, and boggy depressions; acidic, often peaty soils | SE | | County data unavailable | NH | | NE |
| Wapato | *Sagittaria cuneata* | Plant | Aquatic beds | SE | | Coos | NH | | NE |
| Water marigold | *Bidens beckii* | Plant | *Clear water to 12 ft; soft-sediment soil | ST | | Carroll, Grafton, Merrimack | NH | | NE |
| Water-stargrass | *Heteranthera dubia* | Plant | Riverbank and aquatic beds | SE | | County data unavailable | NH | | NE |
| Wavy bluegrass | *Poa fernaldiana* | Plant | Dry to mesic alpine and subalpine areas | SE | | Carroll, Coos, Grafton | NH | | NE |
| White adder's-mouth | *Malaxis monophyllos* var. *brachypoda* | Plant | Rich swamps | SE | | Statewide | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| White bluegrass | *Poa glauca* | Plant | Dry to mesic alpine and subalpine areas | ST | | Carroll, Coos | NH | | NE |
| White-flower willowherb | *Epilobium lactiflorum* | Plant | *Streambanks, slopes | SE | | County data unavailable | NH | | NE |
| White-stem pondweed | *Potamogeton praelongus* | Plant | Neutral to alkaline waters of lakes, rivers, and streams | SE | | Carroll, Coos, Grafton | NH | Historical records | NE |
| Wiegand's sedge | *Carex wiegandii* | Plant | Dry to mesic, circumneutral to calcareous, clayey, sandy, and rocky fields, pastures, tallgrass prairies, glades, ridges, slopes, bluffs, dunes, barrens, open deciduous and mixed woodlands, and on serpentine and basalt, often at edges of ant hills | SE | | Carroll, Grafton | NH | | NE |
| Wild campion | *Silene caroliniana* ssp. *pensylvanica* | Plant | Open, often gravelly or rocky, mainly deciduous woodlands | SE | | County data unavailable | NH | Historical records | NE |
| Wild comfrey or hound's-tongue | *Cynoglossum boreale* | Plant | Woods, uplands | SE | | Coos, Grafton | NH | Boreal CYVI is SE; CYVI is not listed in NH | NE |
| Wild lupine | *Lupinus perennis* | Plant | Sandplain openings, including coastal sand dunes, sandy river shores, openings in pine barrens, and other sandy areas | ST | | Carroll, Coos, Merrimack | NH | | NE |
| Wild senna | *Senna hebecarpa* | Plant | Moist open woods, roadsides, streambanks; sandy, loamy soils | SE | | Belknap, Carroll, Merrimack | NH | | NE |
| Woodland hound's-tongue | *Hackelia virginiana* | Plant | Rich woods and talus including rich mesic forests, dry rich forests, enriched talus communities, and floodplain forests | ST | | Grafton | NH | | NE |
| Wright's spike-rush | *Weieocharis diandra* | Plant | Fresh, mostly sandy shores of large lakes and streams; sometimes slightly tidal | SE | | County data unavailable | NH | Historical records | NE |
| Yellow parilla | *Menispermum canadense* | Plant | Deciduous woods and thickets, along streams, bluffs, and rocky hillsides; fence rows; shade tolerant | SE | | County data unavailable | NH | Historical records | NE |
| Yellow rattle | *Rhinanthus minor* ssp. *groenlandicus* | Plant | *Snowbank and wet meadow communities in the alpine and subalpine zones | SE | | Coos | NH | Historical data | NE |
| Yellow thistle | *Cirsium horridulum* | Plant | Shores, marshes, sandy, or peaty fields | SE | | Statewide | NH | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Black racer | *Coluber constrictor* | Reptile | Dry brushy pastures, rock ledges, and woodlands; inhabit large areas of preferred habitat | ST | | Carroll, Merrimack | NH | | NE |
| Blanding's turtle | *Emydoidea blandingii* | Reptile | Wetlands with permanent shallow waters and emergent vegetation; marshes, swamps, bogs, and ponds | SE | | Belknap, Carroll, Grafton | NH | | NE |
| Spotted turtle | *Clemmys guttata* | Reptile | Wetlands with permanent shallow waters and emergent vegetation; marshes, swamps, bogs, and ponds | ST | | Belknap, Carroll, Grafton, Merrimack | NH | | NE |
| Timber rattlesnake | *Crotalus horridus* | Reptile | Rocky areas and mixed hardwood forests | SE | | Carroll, Coos | NH | Historic evidence and potential habitat; White Mountain range | NE |

Sources: NH GFD, 2010; NH NHB, 2011; efloras.org, 2011; USDA, 2011A; USDOI, 2011f

Species list derived from best available sources (listed above). Some discrepancy exists between USFWS and State Agencies concerning status and county locations for certain species. Status designation does not include State Special Concern Species.

**THREAT STATUS DESIGNATIONS**

SE State Endangered
ST State Threatened
FE Federally Endangered
FT Federally Threatened
FC Federal Candidate Species
* See note column

**NORTHERN BORDER PEIS REGIONS**

GL Great Lakes
EOR East of the Rockies
NE New England
WOR West of the Rockies

## Table M–7. Threatened and Endangered Species in North Dakota

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Canadian toad | *Bufo hemiophrys* | Amphibian | Margins of lakes and ponds; variety of wetlands | S Level-I | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Grand Forks, Griggs, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Towner, Trail, Walsh, Ward, Wells, Williams | ND | | EOR |
| Plains spadefoot | *Spea bombifrons* | Amphibian | Dry grasslands with sandy or loose soil | S Level-I | | Benson, Bottineau, Burke, Divide, Eddy, Foster, McHenry, McLean, Mountrail, Pierce, Renville, Rolette, Sheridan, Ward, Wells, Williams | ND | | EOR |
| Western small-footed myotis | *Myotis ciliolabrum* | Bat | Rock crevices, mines, caves, or buildings, occasionally uses abandoned swallow's nest for roosting | S Level-III | | No county data available | ND | | EOR |
| American avocet | *Recurvirostra americana* | Bird | Ponds or lakes with exposed, sparsely vegetated shorelines | S Level-II | | Statewide | ND | | EOR |
| American bittern | *Botaurus lentiginosus* | Bird | Variety of wetlands, particularly larger ones with tall emergent vegetation; nest in tall, dense grasslands | S Level-I | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Grand Forks, Griggs, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Towner, Trail, Walsh, Ward, Wells, Williams | ND | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| American white pelican | *Pelecanus erythrorhynchos* | Bird | Isolated, barren islands or peninsulas in largelakes or reservoirs | S Level-1 | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Grand Forks, Griggs, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Towner, Trail, Steele, Walsh, Ward, Wells, Williams | ND | | EOR |
| Baird's sparrow | *Ammodramus bairdii* | Bird | Extensive tracts of native mixed-grass prairie or lightly grazed pastures | S Level-I | | Statewide | ND | | EOR |
| Bald eagle | *Haliaeetus leucocephalus* | Bird | Large rivers and lakes bordered by mature stands of trees (e.g., cottonwood) | S Level-II | | Benson, Bottineau, Burke, Cavalier, Divide, Dunn, Eddy, Foster, Grand Forks, Griggs, McHenry, McKenzie, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Trail, Towner, Walsh, Ward, Wells, Williams | ND | | EOR |
| Black tern | *Chlidonias niger* | Bird | Shallow wetlands surrounded by grassland | S Level-I | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Grand Forks, Griggs, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Towner, Trail, Steele, Walsh, Ward, Wells, Williams | ND | | EOR |
| Black-billed cuckoo | *Coccyzus erythropthalmus* | Bird | Brushy margins or woodland openings; thickets of small trees and prairie shrubs | S Level-I | | Statewide | ND | | EOR |
| Bobolink | *Dolichonyx oryzivorus* | Bird | Tallgrass prairie, hayland, and retired cropland | S Level-II | | Statewide | ND | | EOR |
| Brewer's sparrow | *Spizella breweri* | Bird | Sagebrush shrubland | S Level-III | | No county data available | ND | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Burrowing owl | *Athene cunicularia* | Bird | Shortgrass or grazed mixed-grass prairie with burrows dug by mammals | S Level-II | | Burke, Divide, Dunn, McKenzie, Mountrail, Ward, Williams | ND | | EOR |
| Canvasback | *Aythya valisineria* | Bird | Semi-permanent wetlands, small lakes, or deepwater marshes containing emergent cover (e.g., bulrush and cattails) | S Level-II | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Grand Forks, Griggs, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Towner, Trail, Steele, Walsh, Ward, Wells, Williams | ND | | EOR |
| Chestnut-collared longspur | *Calcarius ornatus* | Bird | Grazed or hayed mixed-grass prairie, shortgrass prairie | S Level-I | | Statewide | ND | | EOR |
| Dickcissel | *Spiza americana* | Bird | Alfalfa, sweet clover, and other brushy grasslands | S Level-II | | Statewide | ND | | EOR |
| Ferruginous hawk | *Buteo regalis* | Bird | Large tracts of native prairie | S Level-I | | Benson, Bottineau, Burke, Cavalier, Divide, Dunn, Eddy, Foster, Griggs, McHenry, McKenzie, McLean, Mountrail, Nelson, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Towner, Ward, Wells, Williams | ND | | EOR |
| Franklin's gull | *Larus pipixcan* | Bird | Large wetlands with semi-open emergent cover; often feeds in cultivated agricultural fields | S Level-I | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Grand Forks, Griggs, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Towner, Trail, Steele, Walsh, Ward, Wells, Williams | ND | | EOR |
| Golden eagle | *Aquila chrysaetos* | Bird | Rugged portions of the badlands, buttes overlooking native prairie, large trees; often associated with prairie dog towns | S Level-II | | Dunn, McKenzie | ND | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Grasshopper sparrow | *Ammodramus savannarum* | Bird | Idle or lightly grazed tall or mixed-grass prairie, shrub prairie meadows, and hayfields | S Level-I | | Statewide | ND | | EOR |
| Greater prairie chicken | *Tympanuchus cupido* | Bird | Relatively undisturbed, native tallgrass prairie in association with cropland | S Level-II | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Grand Forks, Griggs, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Towner, Trail, Steele, Walsh, Ward, Wells, Williams | ND | | EOR |
| Horned grebe | *Podiceps auritus* | Bird | Ponds and wetlands with beds of emergent vegetation and substantial areas of open water | S Level-I | | Benson, Bottineau, Burke, Cavalier, Divide, Dunn, Eddy, Foster, Grand Forks, Griggs, McHenry, McKenzie, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Towner, Trail, Walsh, Ward, Wells, Williams | ND | | EOR |
| Least tern (interior) | *Sterna antillarum* | Bird | Sparsely vegetated sandbars and shorelines | | FE | Dunn, McKenzie, McLean, Mountrail, Williams | ND | | EOR |
| Lark bunting | *Calamospiza melanocorys* | Bird | Sagebrush communities or mixed-grass prairie interspersed with shrubs, roadsides, and retired cropland | S Level-I | | Statewide | ND | | EOR |
| Le conte's sparrow | *Ammodramus leconteii* | Bird | Fens, wet meadows, and marshes of sedge grasses | S Level-II | | Statewide | ND | | EOR |
| Least tern | *Sterna antillarum* | Bird | Sparsely vegetated sandbars or shorelines | S Level-II | | Dunn, McKenzie | ND | | EOR |
| Loggerhead shrike | *Lanius ludovicianus* | Bird | Open country with thickets of small trees, shrubs, and shelterbelts | S Level-II | | Statewide | ND | | EOR |
| Long-billed curlew | *Numenius americanus* | Bird | Shortgrass prairie or shrub-steppe prairie on gently rolling terrain | S Level-I | | Dunn, McKenzie | ND | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Marbled godwit | *Limosa fedoa* | Bird | Forage in a variety of wetlands; commonly nest on grazed native prairie | S Level-I | | Statewide | ND | | EOR |
| McCown's longspur | *Calcarius mccownii* | Bird | Open areas including beaches, tundra, short grass, or bare fields | S Level-III | | No county data available | ND | | EOR |
| Mountain plover | *Charadrius montanus* | Bird | Short grass prairie with some areas of bare soil | | F* | Statewide | ND | Proposed for listing | EOR |
| Nelson's sharp-tailed sparrow | *Ammodramus nelsonii* | Bird | Fens, shallow-marsh and wet meadow zones of wetlands | S Level-I | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Grand Forks, Griggs, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Trail, Towner, Walsh, Ward, Wells, Williams | ND | | EOR |
| Northern harrier | *Circus cyaneus* | Bird | Open grasslands, wet meadows, marshes, and areas not heavily grazed | S Level-II | | Benson, Bottineau, Burke, Cavalier, Divide, Dunn, Eddy, Foster, Griggs, McHenry, McKenzie, McLean, Mountrail, Nelson, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Towner, Trail, Ward, Wells, Williams | ND | | EOR |
| Northern pintail | *Anas acuta* | Bird | Wetland complexes of open water and associated upland prairie | S Level-II | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Grand Forks, Griggs, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Towner, Trail, Steele, Walsh, Ward, Wells, Williams | ND | | EOR |
| Peregrine falcon | *Falco peregrinus* | Bird | Arctic tundra, tropical ecosystems, deserts, wetlands, grasslands, mountainous regions, continental forests, maritime islands, and urban areas | S Level-III | | No county data available | ND | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Piping plover | *Charadrius melodus* | Bird | Sandy or gravelly beaches and sandbars or alkaline wetlands. Designated critical habitat: 67 FR 57638 57717. | S Level-II | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Griggs, McHenry, McLean, Mountrail, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Towner, Trail, Ward, Wells, Williams | ND | | EOR |
| Prairie falcon | *Falco mexicanus* | Bird | Expanses of native prairie, the badlands, and high cliffs along stream valleys or isolated buttes | S Level-II | | Dunn, McKenzie | ND | | EOR |
| Redhead | *Aythya americana* | Bird | Semipermanent and deep seasonal wetlands | S Level-II | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Griggs, McHenry, McLean, Mountrail, Nelson, Ramsey, Renville, Rolette, Pierce, Sheridan, Steele, Towner, Trail, Walsh, Ward, Wells, Williams | ND | | EOR |
| Red-headed woodpecker | *Melanerpes erythrocephalus* | Bird | Natural stands of mature deciduous trees along river bottoms, shelterbelts, wooded areas of towns | S Level-II | | Statewide | ND | | EOR |
| Sedge wren | *Cistothorus platensis* | Bird | Wet meadows of tall grasses and sedges | S Level-II | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Grand Forks, Griggs, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Towner, Trail, Walsh, Ward, Wells, Williams | ND | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Sharp-tailed grouse | *Tympanuchus phasianellus* | Bird | Mixed-grass prairie interspersed with shrubs | S Level-II | | Benson, Bottineau, Burke, Cavalier, Divide, Dunn, Eddy, Foster, Grand Forks, Griggs, McHenry, McKenzie, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Towner, Trail, Walsh, Ward, Wells, Williams | ND | | EOR |
| Short-eared owl | *Asio flammeus* | Bird | Open grasslands, native prairie, wet meadows, and hayfields | S Level-II | | Statewide | ND | | EOR |
| Sprague's pipit | *Anthus spragueii* | Bird | Extensive tracts of native mixed-grass prairie; ungrazed or lightly grazed prairie | S Level-I | | Statewide | ND | | EOR |
| Swainson's hawk | *Buteo swainsoni* | Bird | Native prairie and cropland with thickets of trees | S Level-I | | Benson, Bottineau, Burke, Cavalier, Divide, Dunn, Eddy, Foster, Grand Forks, Griggs, McHenry, McKenzie, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Towner, Trail, Walsh, Ward, Wells, Williams | ND | | EOR |
| Upland sandpiper | *Bartramia longicauda* | Bird | Dry, open, mixed-grass prairie; wooden fence posts used for viewing | S Level-I | | Statewide | ND | | EOR |
| Whooping crane | *Grus americana* | Bird | Northern tallgrass prairie and eastern aspen parklands | S Level-III | FE | Statewide | ND | | EOR |
| Willet | *Cataptrophorus semipalmatus* | Bird | Variety of wetlands associated with upland native grassland | S Level-I | | Statewide | ND | | EOR |
| Wilson's phalarope | *Phalaropus tricolor* | Bird | Shallow wetlands and mudflats; nest in wetland margins | S Level-I | | Statewide | ND | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Yellow rail | *Coturnicops noveboracensis* | Bird | Fens or wet meadows with emergent vegetation, shallow water, and moist soil | S Level-I | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Grand Forks, Griggs, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Towner, Trail, Walsh, Ward, Wells, Williams | ND | | EOR |
| Blacknose shiner | *Notropis heterolepsis* | Fish | Small creeks; weedy shallows of lakes and ponds | S Level-III | | No county data available | ND | | EOR |
| Blue sucker | *Cycleptus elongatus* | Fish | Deep areas with swift current on medium to large turbid rivers; sand or gravel substrate; confluences of larger tributaries used for spawning | S Level-I | | Dunn, McKenzie, McLean, Mountrail | ND | | EOR |
| Central stoneroller | *Campostoma anomalum* | Fish | Rocky riffles, runs, and pools of headwaters, creeks, and small to large rivers | S Level-III | | No county data available | ND | | EOR |
| Chestnut lamprey | *Ichthyomyzon castaneus* | Fish | Large reservoirs and rivers | S Level-III | | No county data available | ND | | EOR |
| Finescale dace | *Phoxinus neogaeus* | Fish | Lakes, ponds, and sluggish pools of headwaters, creeks, and small rivers; usually over silt and near vegetation | S Level-III | | No county data available | ND | | EOR |
| Flathead catfish | *Pylodictis olivaris* | Fish | Deep pools of streams, rivers, canals, lakes, and reservoirs, where water is turbid and currents are slow | S Level-III | | No county data available | ND | | EOR |
| Flathead chub | *Platygobio gracilis* | Fish | Large turbid rivers with sand or gravel bottoms | S Level-II | | Dunn, McKenzie, McLean | ND | | EOR |
| Hornyhead chub | *Nocomis biguttatus* | Fish | Rocky pools, runs of creeks, and small to medium rivers | S Level-III | | No county data available | ND | | EOR |
| Logperch | *Percina caprodes* | Fish | Generally over gravel and sand in medium rivers but can occur from small, fast-flowing rock-bottomed streams to vegetated lakes | S Level-III | | No county data available | ND | | EOR |
| Northern redbelly dace | *Phoxinus eos* | Fish | Slow-moving stretches of river with clear water over silt bottoms with vegetation nearby; sometimes in pools and impoundments | S Level-II | | Cavalier, Dunn, Grand Forks, McKenzie, Nelson, Pembina, Trail, Walsh | ND | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Paddlefish | *Polyodon spathula* | Fish | Large rivers | S Level-II | | Dunn, McKenzie, McLean, Mountrail | ND | | EOR |
| Pallid sturgeon | *Scaphirhynchus albus* | Fish | Large turbid rivers with swift currents | | FE | Dunn, McKenzie, McLean, Mercer, Mountrail, Williams | ND | | EOR |
| Pearl dace | *Margariscus margarita* | Fish | Pools of streams and small rivers, usually with sand or gravel substrates; ponds and lakes | S Level-I | | Bottineau, Cavalier, Grand Forks, McHenry, Nelson, Pembina, Renville, Rolette, Steele, Trail, Walsh, Ward | ND | | EOR |
| Pugnose shiner | *Notropis anogenus* | Fish | Weedy shoals of glacial lakes and low-gradient streams over bottoms of mud, sand, cobble, silt, and clay | S Level-III | | No county data available | ND | | EOR |
| River darter | *Percina shumardi* | Fish | Rocky riffles of small to large rivers | S Level-III | | No county data available | ND | | EOR |
| Rosyface shiner | *Notropis rubellus* | Fish | Rocky runs and flowing pools of small to medium rivers; upland areas; clear streams with fast currents | S Level-III | | No county data available | ND | | EOR |
| Sicklefin chub | *Macrhybopsis meeki* | Fish | Large turbid rivers, usually with sand or gravel bottoms | S Level-I | | McKenzie, Williams | ND | | EOR |
| Silver chub | *Macrhybopsis storeriana* | Fish | Sand, silt, and sometimes gravel-bottomed pools and backwaters of small to large rivers or lakes | S Level-II | | Benson, Eddy, Grand Forks, Griggs, Nelson, Sheridan, Steele, Walsh, Wells | ND | | EOR |
| Silver lamprey | *Ichthyomyzon unicuspis* | Fish | Large streams and lakes | S Level-III | | No county data available | ND | | EOR |
| Sturgeon chub | *Macrhybopsis gelida* | Fish | Large turbid rivers, usually with sand or gravel bottoms | S Level-I | | McKenzie, Williams | ND | | EOR |
| Trout-perch | *Percopsis omiscomaycus* | Fish | Lakes; sometimes in deeper pools of rivers and streams; substrate is normally sand | S Level-II | | Benson, Bottineau, Eddy, Griggs, McHenry, Nelson, Renville, Sheridan, Ward, Wells | ND | | EOR |
| Yellow bullhead | *Ameiurus natalis* | Fish | Pools, backwaters, and sluggish currents over soft substrate in creeks and small to large rivers; oxbows, ponds, and impoundments | S Level-III | | No county data available | ND | | EOR |
| Arctic shrew | *Sorex arcticus* | Mammal | Grass-sedge marshes, wet meadows, and other moist openings in and adjacent to boreal forest | S Level-III | | No county data available | ND | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Black-footed ferret | *Mustela nigripes* | Mammal | Short-grass prairies | S Level-II | FE | Dunn, McKenzie, Mercer | ND | | EOR |
| Black-tailed prairie dog | *Cynomys ludovicianus* | Mammal | Short and mixed grasslands; usually well-grazed lands | S Level-I | | Dunn, McKenzie | ND | | EOR |
| Eastern spotted skunk | *Spilogale putoris* | Mammal | Brushy, rocky, woody habitats with extensive vegetation | S Level-III | | No county data available | ND | | EOR |
| Gray wolf | *Canis lupus* | Mammal | Northern forests | S Level-III | FE | Benson, Bottineau, Burke, Cavalier, Divide, Dunn, Eddy, Foster, Grand Forks, McHenry, McKenzie, McLean, Mercer, Mountrail, Nelson, Pembina, Pierce, Renville, Rolette, Sheridan, Towner, Walsh, Ward, Wells, Williams | ND | | EOR |
| Hispid pocket mouse | *Chaetodipus hispidus* | Mammal | Areas of sand or other friable soils covered with scattered to moderate stands of herbaceous vegetation | S Level-III | | No county data available | ND | | EOR |
| Long-eared myotis | *Myotis evotis* | Mammal | Forested areas | S Level-III | | No county data available | ND | | EOR |
| Long-legged myotis | *Myotis volans* | Mammal | Coniferous forest; sometimes in oak or streamside woodlands, or deserts | S Level-III | | No county data available | ND | | EOR |
| Plains pocket mouse | *Perognathus flavenscens* | Mammal | Open habitats with loose, sandy soil and little to moderate vegetation | S Level-III | | No county data available | ND | | EOR |
| Pygmy shrew | *Sorex hoyi* | Mammal | Prefer forested areas, but are adaptable and found in many habitat types | S Level-II | | Benson, Bottineau, Burke, Cavalier, Eddy, Foster, Grand Forks, Griggs, McHenry, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Steele, Towner, Trail, Walsh, Ward, Wells | ND | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Richardson's ground squirrel | *Spermophilus richardsonii* | Mammal | Prefers native mixed-grass prairie; commonly in areas that are heavily grazed | S Level-II | | Benson, Bottineau, Burke, Cavalier, Divide, Eddy, Foster, Grand Forks, Griggs, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Rolette, Sheridan, Steele, Towner, Trail, Walsh, Ward, Wells, Williams | ND | | EOR |
| River otter | *Lutra canadensis* | Mammal | Variety of aquatic habitats, including rivers, streams, backwater sloughs, wetlands, lakes and ponds based on food availability (primarily fish and crustaceans), year-round water supply, and adequate cover | S Level-II | | Mountrail, Trail, Williams | ND | | EOR |
| Sagebrush vole | *Lemmiscus curtatus* | Mammal | Semiarid, partly brushy habitat | S Level-III | | No county data available | ND | | EOR |
| Swift fox | *Vulpes velox* | Mammal | Large tracts of short and mixed-grass prairie | S Level-II | | Statewide | ND | | EOR |
| Creek heelsplitter | *Lasmigona compressa* | Mollusk | Pembina, Forest, Wintering, and Sheyenne rivers; headwaters of small streams with sandy bottoms | S Level-II | | Benson, Cavalier, Eddy, Grand Forks, Griggs, McHenry, Nelson, Pembina, Sheridan, Walsh, Wells | ND | | EOR |
| Pink papershell | *Potamilus ohiensis* | Mollusk | Medium to large rivers in silt, mud, or sand | S Level-III | | No county data available | ND | | EOR |
| Threeridge | *Amblema plicata* | Mollusk | Prefer small to large rivers with mud, sand or gravel substrate; confined to larger rivers in North Dakota | S Level-II | | Dunn, Eddy, Griggs, McKenzie, McLean, Mountrail, Nelson, Sheridan, Wells, Williams | ND | | EOR |
| Wabash pigtoe | *Fusconaia flava* | Mollusk | Large rivers with mud or sand bottoms | S Level-II | | Benson, Dunn, Eddy, Grand Forks, McKenzie, McLean, Mountrail, Nelson, Pembina, Trail, Walsh, Wells, Williams | ND | | EOR |
| Great plains white fringed orchid | *Platanthera praeclara* | Plant | Unplowed, calcareous prairies and sedge meadows; soil moisture determines growth, flowering, and distribution | | FT | Ransom, Richland | ND | | EOR |
| Common snapping turtle | *Chelydra serpentina* | Reptile | Warm water in permanent lakes or rivers with mud bottoms and adequate aquatic vegetation | S Level-II | | Statewide | ND | | EOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| False map turtle | *Graptemys pseudogeographica* | Reptile | Large rivers with sand, gravel, and coble substrates | S Level-III | | No county data available | ND | | EOR |
| Northern redbelly snake | *Storeria occipitomaculata* | Reptile | Moist woodlands | S Level-II | | Benson, Bottineau, Cavalier, Eddy, Foster, Grand Forks, Griggs, McHenry, Nelson, Pembina, Pierce, Ramsey, Rolette, Sheridan, Steele, Towner, Trail, Walsh, Wells | ND | | EOR |
| Northern sagebrush lizard | *Sceloporus graciosus* | Reptile | Sagebrush and other types of shrublands, mainly in the mountains; open areas with scattered low bushes and lots of sun | S Level-III | | No county data available | ND | | EOR |
| Short-horned lizard | *Phrynosoma douglassi* | Reptile | Semi-arid, shortgrass prairie in rough terrain | S Level-II | | Dunn, McKenzie, Williams | ND | | EOR |
| Smooth green snake | *Liochlorophis vernalis* | Reptile | Grassland, upland hills | S Level-I | | Statewide | ND | | EOR |
| Smooth softshell turtle | *Apalone mutica* | Reptile | Rivers and large streams with sand substrate, bars, and banks | S Level-III | | No county data available | ND | | EOR |
| Western hognose snake | *Heterodon nasicus* | Reptile | Dry grasslands with sandy or gravelly soil | S Level-I | | Benson, Bottineau, Burke, Divide, Dunn, Eddy, Foster, McHenry, McKenzie, McLean, Mountrail, Pierce, Renville, Sheridan, Ward, Wells, Williams | ND | | EOR |

Sources: ND GFD, 2010; USDOI, 2011g

Species list derived from best available sources (listed above). Some discrepancy exists between USFWS and state agencies concerning status and county locations for certain species. Status designations do not include State Special Concern Species.

**THREAT STATUS DESIGNATIONS**

SE State Endangered
ST State Threatened
S Level I State Priority: Species in greatest need of conservation
S Level II State Priority: Species in need of conservation, but that have had support from other wildlife programs.
S Level III State Priority: Species in moderate need of conservation, but that are on the edge of their range in North Dakota.

FE Federally Endangered
FT Federally Threatened
FC Federal Candidate Species
* See note column

**NORTHERN BORDER PEIS REGIONS**

GL Great Lakes
EOR East of the Rockies
NE New England
WOR West of the Rockies

## Table M–8. Threatened and Endangered Species in New York

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Black tern | *Chlidonias niger* | Bird | Inland marshes, ponds, river mouths, shores of large lakes | SE | | Clinton, Erie, Genesee, Jefferson, Lewis, Monroe, Niagara, Orleans, Oswego, Seneca, St. Lawrence, Wayne | NY | | GL |
| Common tern | *Sterna hirundo* | Bird | Islands, marshes, lake beaches | ST | | Cayuga, Chautauqua, Erie, Jefferson, Monroe, Niagara, Orleans, Oswego, St. Lawrence, Wayne | NY | Coast of lakes Erie and Ontario | GL |
| Golden eagle | *Aquila chrysaetos* | Bird | Open and mountainous areas with cliffs for nesting | SE | | Statewide | NY | Only found during migration; no active nests currently known | GL |
| Henslow's sparrow | *Ammodramus henslowii* | Bird | Fallow, weedy, often moist fields and meadows | ST | | Chenango, Erie, Jefferson, Livingston, Tompkins, Yates | NY | Confirmed sightings in these counties | GL |
| King rail | *Rallus elegans* | Bird | Fairly shallow (0 to 25 cm of water) fresh and brackish marshes with well-developed areas of emergent vegetation | ST | | Erie, Genesee, Monroe, Niagara, Ontario, Onondaga, Orleans, Oswego, Seneca, Wayne | NY | | GL |
| Least bittern | *Ixobrychus exilis* | Bird | Emergent marshes, freshwater tidal marshes (lower Hudson River), or brackish tidal marshes (Long Island) | ST | | Statewide | NY | | GL |
| Least tern | *Sterna antillarum* | Bird | Sandy lake beaches | ST | | Monroe, Orleans, Wayne | NY | Sightings around these counties. Federally endangered in interior U.S. only, not on coast | GL |
| Loggerhead shrike | *Lanius ludovicianus* | Bird | Agricultural areas with hedgerows, hayfields, pastures, and scattered trees and shrubs for breeding habitat | SE | | *location undetermined | NY | Active nests have not been found in the state in recent years | GL |
| Northern harrier | *Circus cyaneus* | Bird | Open grasslands; shrublands; salt and freshwater marshes | ST | | Statewide | NY | | GL |
| Peregrine falcon | *Falco peregrinus* | Bird | Variety of habitats; cliffs and bluffs needed for nesting; urbanized areas | SE | | Erie, Essex, Clinton, Monroe, Warren, | NY | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Pie-billed grebe | *Podilymbus podiceps* | Bird | Quiet marshes, marshy pond shores, shallow lakes, marshy bays, and slow-moving streams with sedgy banks or adjacent marshes | ST | | Statewide | NY | | GL |
| Piping plover | *Charadrius melodus* | Bird | Open sandy beaches; sparse vegetation. Designated critical habitat: 66 FR 22938 22969. | ST | FT | Statewide | NY | | GL |
| Sedge wren | *Cistothorus platensis* | Bird | Dense, tall sedges in grasses and wet meadows, hayfields, and marshes | ST | | Chautauqua, Clinton, Erie, Jefferson, Monroe, Orleans | NY | Confirmed sightings in these counties | GL |
| Short-eared owl | *Asio flammeus* | Bird | Prairies, coastal grasslands, heathlands, shrub-steppe, and tundra | SE | | Cayuga, Erie, Oneida, Oswego, Wayne | NY | | GL |
| Spruce grouse | *Falcipennis canadensis* | Bird | Coniferous boreal forests | SE | | Clinton, Franklin, Hamilton, St. Lawrence | NY | | GL |
| Upland sandpiper | *Bartramia longicauda* | Bird | Grasslands; agricultural areas | ST | | Clinton, Erie, Franklin, Herkimer, Jefferson, Lewis, Livingston, Madison, Oneida, Onondaga, Orleans, Oswego, Seneca, St. Lawrence, Washington, Wyoming | NY | Confirmed in these counties; seen on migration routes throughout the state | GL |
| Bluebreast darter | *Etheostoma camurum* | Fish | Streams with fast-flowing currents, sandy gravel, and large stones | SE | | Allegany, Cattaraugus | NY | Only found in Allegany River in New York | GL |
| Deepwater sculpin | *Myoxocephalus thompsoni* | Fish | Deep, cool-water lakes | SE | | Cayuga, Chautauqua, Erie, Jefferson, Monroe, Niagara, Onondaga, Orleans, Oswego, Wayne | NY | | GL |
| Eastern sand darter | *Ammocrypta pellucida* | Fish | Sand-bottom streams | ST | | Washington | NY | In New York, occurs in six locations: Lake Erie, Metawee and Poultney rivers near Lake Champlain, St. Regis and Salmon rivers near Quebec, and Grasse River | GL |
| Gravel chub | *Erimystax x-punctata* | Fish | Medium to large streams; gravel or firm sand-gravel substrate | ST | | Allegany, Cattaraugus, Chautauqua | NY | | GL |

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| Lake chubsucker | *Erimyzon sucetta* | Fish | Natural lakes and slow-water sections of large streams | ST | | *location undetermined | NY | Could be found on southern shore of Lake Ontario and Lake Erie drainage basin, but not caught in over 60 years | GL |
| Lake sturgeon | *Acipenser fulvescens* | Fish | Fresh waters | ST | | Statewide | NY | | GL |
| Longear sunfish | *Lepomis megalotis* | Fish | Densely weeded areas with gravel or sand bottoms | ST | | Erie, Niagara, Wyoming | NY | In New York, repeatedly found in Tonawanda Creek, while the other few locations have not been documented a second time. | GL |
| Longhead darter | *Percina macrocephala* | Fish | Clear waters with gravel and boulder bottoms | ST | | Allegany, Cattaraugus, Chautauqua | NY | In New York, only occurs in the Allegheny River, a few larger tributaries, and French Creek | GL |
| Mooneye | *Hiodon tergisus* | Fish | Fresh waters | ST | | Statewide | NY | | GL |
| Pugnose shiner | *Notropis anogenus* | Fish | Clear, slow-water areas of large streams; lakes with heavy vegetation | SE | | Cayuga, Chautauqua, Erie, Jefferson, Monroe, Niagara, Onondaga, Orleans, Oswego, Wayne | NY | *Range restricted to Great Lakes drainage basin | GL |
| Round whitefish | *Prosopium cylindraceum* | Fish | Cold water; Adirondacks | SE | | Herkimer, Jefferson, Oswego, St. Lawrence | NY | *Restricted to seven lakes in New York as well as Lake Ontario | GL |
| Silver chub | *Macrhybopsis storeriana* | Fish | Sand, silt, gravel-bottomed pools and backwaters of small to large rivers and lakes; most often in large silty rivers | SE | | Chautauqua, Erie | NY | | GL |
| Spotted darter | *Etheostoma maculatum* | Fish | Fast rocky riffles in small to medium streams | ST | | Chautauqua | NY | In New York, only found in French Creek in the extreme southwest part of the state | GL |
| Frosted elfin | *Callophrys irus* | Insect | Open woods, forest edges, fields, scrub | ST | | Oneida, Tompkins | NY | | GL |
| Grizzled skipper | *Pyrgus centaureae wyandot* | Insect | Open areas near woods, valley bottoms, barrens, meadows, grassy hillsides, tundra, scrub oak | SE | | Cortland, Erie, Tompkins | NY | | GL |

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| Karner blue butterfly | *Lycaeides melissa samuelis* | Insect | Wild lupine plant range | SE | FE | Warren | NY | | GL |
| Persius duskywing | *Erynnis persius* | Insect | Open areas including mountain grasslands, marshes, sandplains, seeps, streamsides | SE | | Allegany, Cayuga, Chautauqua, Cattaraugus, Chenango, Clinton, Cortland, Erie, Essex, Franklin, Genesee, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Schuyler, Seneca, St. Lawrence, Tompkins, Steuben, Warren, Washington, Wayne, Wyoming, Yates | NY | | GL |
| Pine pinion moth | *Lithophane lepida lepida* | Insect | Clintonville pitch pine-heath barrens | SE | | Clinton* | NY | Only site in New York is in the Clintonville pitch pine-heath barrens | GL |
| Tomah mayfly | *Siphlonisca aerodromia* | Insect | Extensive alluvial floodplains carpeted by sedges | SE | | *Location undetermined | NY | Reported at only one location in northern New York | GL |
| Canada lynx | *Lynx canadensis* | Mammal | Northern forests | ST | FT | Statewide | NY | | GL |
| Eastern puma | *Puma concolor couguar* | Mammal | Marshes, mountains, and forests | SE | FE | Listed for state but not known to occur | NY | | GL |
| Gray wolf | *Canis lupus* | Mammal | Northern woods | SE | | Listed for state but not known to occur | NY | | GL |
| Indiana bat | *Myotis sodalis* | Mammal | Wooded areas; caves for hibernation | SE | FE | Cayuga, Clinton, Essex, Jefferson, Lewis, Madison, Oneida, Oswego, Onondaga, St. Lawrence, Seneca, Warren, Washington, Wayne | NY | | GL |
| Brook floater | *Alasmidonta varicosa* | Mollusk | Running water with gravelly riffles in creeks, small rivers | ST | | Chenango, Cortland, Madison | NY | | GL |

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| Clubshell | *Pleurobema clava* | Mollusk | Small to medium streams with gravel-sand substrate and relatively little silt | SE | FE | Cattaraugus, Chautauqua | NY | | GL |
| Green floater | *Lasmigona subviridis* | Mollusk | Slow water or pools; eddies; substrate gravelly or sandy | ST | | Allegany, Cayuga, Chenango, Cortland, Herkimer, Madison, Oneida, Schuyler, Steuben, Tompkins | NY | | GL |
| Pink mucket | *Lampsilis abrupta* | Mollusk | Gravel or sand | SE | | Allegany, Cayuga, Chautauqua, Cattaraugus, Chenango, Clinton, Cortland, Erie, Essex, Franklin, Genesee, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Schuyler, Seneca, St. Lawrence, Tompkins, Steuben, Warren, Washington, Wayne, Wyoming, Yates | NY | No searches show this species in NY. Only DEC, NY list it in NY. It is listed as being in OH according to zipcodezoo and other sources so it is probable that it occurs in NY. | GL |
| Rayed bean | *Villosa fabalis* | Mollusk | Lakes, small to large streams; mud, sand, gravel substrates; associated with water willow stands | SE | FE* | Cattaraugus, Chautauqua | NY | Candidate for Federal list | GL |
| Wavy-rayed lampmussel | *Lampsilis fasciola* | Mollusk | Solid sand and gravel bottom in riffles and rapid waters in Great Lakes drainage basin | ST | | Cayuga, Chautauqua, Erie, Jefferson, Monroe, Niagara, Onondaga, Orleans, Oswego, Wayne | NY | | GL |
| Alpine azalea | *Loiseleuria procumbens* | Plant | Alpine and arctic tundra; gravelly slopes | SE | | Essex | NY | | GL |
| Alpine sweetgrass | *Anthoxanthum monticolum* | Plant | Fell tundra gravels, crags, moors, rocky outcrops and sandbanks along stream margins in the forest belt | SE | | Essex | NY | | GL |
| Alpine willow-herb | *Epilobium hornemannii* | Plant | Rock outcrops; waterfalls and cliffs in the Adirondacks | SE | | Essex, Herkimer, Jefferson | NY | | GL |

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| Alpine woodsia | *Woodsia alpina* | Plant | Crevices and ledges on cliffs (occasionally on rocky slopes); mostly slatey and calcareous rocks | SE | | Essex | NY | | GL |
| American crab | *Malus glaucescens* | Plant | Streambanks, open woods, woodland edges | SE | | Cattaraugus, Chautauqua, Erie, Genesee, Livingston, Ontario, Onondaga, Steuben, Tompkins, Washington | NY | | GL |
| American dragonhead | *Dracocephalum parviflorum* | Plant | Dry; disturbed areas; railroad ballast; limey, rocky soil | SE | | Erie, Essex, Jefferson, Lewis, Oneida, Tompkins | NY | | GL |
| American hart's-tongue fern | *Asplenium scolopendrium* | Plant | Shaded mature forests near rock edges | | FT | Madison, Niagara, Onondaga | NY | | GL |
| American shore-grass | *Littorella uniflora* | Plant | Wet environments; shores, shallows, soft water | SE | | Chautauqua, Clinton, Hamilton | NY | | GL |
| American strawberry-bush | *Euonymus americana* | Plant | Deciduous woods; low, sandy thickets; swamps | SE | | Erie, Monroe | NY | | GL |
| American waterwort | *Elatine americana* | Plant | Muddy tidal shores and margins of ponds and streams | SE | | Oneida | NY | | GL |
| Angled spikerush | *Eleocharis quadrangulata* | Plant | Shallow, artificial ponds along rocky shorelines of lakes | SE | | Cayuga, Oswego | NY | | GL |
| Appalachian vittaria | *Vittaria appalachiana* | Plant | Dark moist cavities and rock shelters in noncalcareous rocks; occasionally epiphytic on tree bases in narrow ravines | SE | | Cattaraugus, Chautauqua | NY | | GL |
| Arnica | *Arnica lanceolata* | Plant | Areas with constantly available moisture; rocky riverbanks, gravel bars, beaches, and alluvial flats of rivers and streams; hornblende schist in gullies; perpetually wet cliffs and headwalls of ravines; and subalpine and alpine meadows | SE | | Essex | NY | | GL |
| Auricled twayblade | *Listera auriculata* | Plant | Low woods or along riverbanks; often under hemlocks or near coniferous swamps or alder thickets | SE | | Lewis, Warren | NY | | GL |
| Autumnal water-starwort | *Callitriche hermaphroditica* | Plant | Quiet water; in muddy, sandy soil | SE | | Clinton, Jefferson, Madison, St. Lawrence | NY | | GL |
| Awned sedge | *Carex atherodes* | Plant | Marshes, shrub swamps, wet successional fields, and pond and stream edges; sometimes in standing water | SE | | Chautauqua, Jefferson, Monroe, Oneida, St. Lawrence | NY | | GL |

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| Barratt's sedge | *Carex barrattii* | Plant | Pine barrens, bogs, wet depressions, along streams; associated with openings and disturbances such as fire breaks, trails, roads, and railroads | SE | | Yates | NY | | GL |
| Basil-balm | *Monarda clinopodia* | Plant | Dry fields, thickets, and clearings, usually on limey soil | SE | | Cattaraugus, Cayuga, Erie, Genesee, Livingston, Monroe, Niagara, Ontario, Steuben, Tompkins, Warren, Yates | NY | | GL |
| Bear's-foot | *Polymnia uvedalia* | Plant | Ravines, moist thickets, and banks of streams or rivers | SE | | Cattaraugus, Cayuga, Chautauqua, Erie, Ontario, Onondaga | NY | | GL |
| Beggar-lice | *Desmodium obtusum* | Plant | Maritime grasslands, openings in oak forests, and successional old field (where it associated with asters, goldenrods, and grasses) | SE | | Erie, Monroe, Onondaga, Oswego | NY | | GL |
| Bent sedge | *Carex styloflexa* | Plant | Stream edges, wet pine barrens, damp thickets, swampy woods on the border of a brook, edge of rich woods, and a sphagnum bog | SE | | Madison | NY | | GL |
| Black sedge | *Carex nigra* | Plant | Wet, open, short, graminoid-dominated habitat, including roadsides; wet meadows | SE | | Erie, Oneida, Wayne | NY | | GL |
| Black sedge | *Carex atratiformis* | Plant | Forest margins, open woodlands, calcareous ledges, streambanks, lakeshores, wet cliffs, high-elevation seeps | SE | | Essex | NY | | GL |
| Black-edge sedge | *Carex nigromarginata* | Plant | Rocky, dry-mesic to mesic, deciduous forests | SE | | Clinton, Jefferson | NY | | GL |
| Black-eyed-Susan | *Rudbeckia hirta* var. *hirta* | Plant | Open woodlands, fields, roadsides | SE | | Cattaraugus, Madison | NY | | GL |
| Blue-eyed-Mary | *Collinsia verna* | Plant | Damp open woods | SE | | Chautauqua, Erie, Herkimer, Madison, Monroe, Niagara, Oneida, Tompkins | NY | | GL |
| Bluegrass | *Poa cuspidata* | Plant | Forest openings | SE | | Yates | NY | | GL |
| Blue-hearts | *Buchnera americana* | Plant | Sandy or gravelly soils of upland woods or prairies | SE | | Chenango, Erie, Madison, Monroe, Ontario, Yates | NY | | GL |

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| Blunt-lobe grape fern | *Botrychium oneidense* | Plant | Mixed-deciduous hardwood forests; lower slopes of maple forests; secondary forests; wet woods along stream corridors; creek gorges; other rich, moist forests | SE | | Allegany, Cattaraugus, Cayuga, Chautauqua, Chenango, Cortland, Erie, Essex, Genesee, Hamilton, Herkimer, Lewis, Livingston, Madison, Monroe, Oneida, Onondaga, Orleans, St. Lawrence, Steuben, Tompkins, Warren, Washington, Wyoming | NY | | GL |
| Boott's rattlesnake-root | *Prenanthes boottii* | Plant | Restricted to the alpine zone of a few of the Adirondacks' highest peaks in open, grassy meadows, near rock outcrops, in seeps at the bases of cliffs, adjacent to krummholz, on ledges and crevices in cliffs, and along trails | SE | | Essex | NY | | GL |
| Brightgreen spleenwort | *Asplenium trichomanes-ramosum* | Plant | Limestone and other basic rocks | SE | | Lewis | NY | | GL |
| Broad-lipped twayblade | *Listera convallarioides* | Plant | White cedar swamps; mossy areas on sandy soils near streams or wet depressions | SE | | Chautauqua, Essex, Hamilton, Herkimer, Jefferson, Lewis, Onondaga | NY | | GL |
| Bushy cinquefoil | *Potentilla paradoxa* | Plant | Prairies and along lakeshores | SE | | Cayuga, Chautauqua, Erie, Monroe, Niagara, Wayne | NY | | GL |
| Button sedge | *Carex bullata* | Plant | Bogs and boggy meadows; open swamp forests; peaty or sandy pond and lakeshores; seeps | SE | | Monroe, Oneida, Ontario | NY | | GL |
| Buttonbush dodder | *Cuscuta cephalanthi* | Plant | Shrub swamps to streamsides, wet meadows, and marshes | SE | | Cayuga, Monroe, Onondaga, Ontario, Seneca, Tompkins, Washington | NY | | GL |

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| Calico aster | *Aster lateriflorus* var. *hirsuticaulis* | Plant | Fields, clearings, shores; sandy, loamy, clayey soils | SE | | Cattaraugus, Cayuga, Chenango, Clinton, Cortland, Erie, Essex, Franklin, Genesee, Hamilton, Herkimer, Jefferson, Livingston, Madison, Monroe, Niagara, Oneida, Onondaga, Ontario, Seneca, St. Lawrence, Steuben, Warren, Washington | NY | | GL |
| Calypso | *Calypso bulbosa* | Plant | Thick duff and mossy ground in cool, damp, mainly coniferous woods | SE | | Clinton, Genesee, Herkimer, Jefferson, Lewis, Oneida, Onondaga, Oswego, St. Lawrence | NY | | GL |
| Canada ricegrass | *Oryzopsis canadensis* | Plant | Grasslands and open woods | SE | | Essex, Franklin, St. Lawrence | NY | | GL |
| Canadian single-spike sedge | *Carex scirpoidea* | Plant | Calcareous, wet or seepy cliffs and ledges; thin soil over rocks in alpine meadows; openings in rich forests on thin soils over calcareous rocks | SE | | Essex, Washington | NY | | GL |
| Carolina clubmoss | *Lycopodiella caroliniana* | Plant | Inundated portions of a large dwarf-shrub bog | SE | | Washington | NY | | GL |
| Carolina redroot | *Lachnanthes caroliniana* | Plant | Lakeshores, longleaf pine savannas, woods, bogs, swales, coastal plains | SE | | Washington | NY | | GL |
| Carolina sedge | *Carex caroliniana* | Plant | Ditches, shores | SE | | Cattaraugus | NY | | GL |
| Catfoot | *Gnaphalium helleri* var. *micradenium* | Plant | Dry woods; often in sandy soil | SE | | Oneida, Tompkins | NY | | GL |
| Champlain beachgrass | *Ammophila champlainensis* | Plant | Sandy soils among other grasses | SE | | Clinton, Oswego | NY | | GL |
| Climbing fern | *Lygodium palmatum* | Plant | Poorly drained, acidic soils, especially after disturbance | SE | | Chenango, Oneida, Onondaga | NY | | GL |
| Clinton's clubrush | *Scirpus clintonii* | Plant | Open, dry to mesic prairies, meadows, riverbanks, rock outcrops, lime-rich substrates | SE | | Erie, Hamilton, St. Lawrence, Warren | NY | | GL |

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| Cloud sedge | *Carex haydenii* | Plant | Marshes, bogs, sedge meadows, edges of swamps, edges of streams and lakes | SE | | Cattaraugus, Chenango, Essex, Franklin, Hamilton, Herkimer, Jefferson, Lewis, Madison, Niagara, Onondaga, Steuben | NY | | GL |
| Compact hawthorn | *Crataegus compacta* | Plant | Old fields, pastures, open wooded areas, and rights-of-way | SE | | Erie, Livingston | NY | | GL |
| Cooper's milkvetch | *Astragalus neglectus* | Plant | Lakeshore; streambanks; cool ravines; limestone cliff ledges; limestone barrens; savannas overlying limestone bedrock; steep, eroding, shale slopes | SE | | Cayuga, Erie, Genesee, Livingston, Monroe, Niagara, Oneida, Onondaga, Ontario, Seneca, Tompkins, Yates | NY | | GL |
| Cornel-leaved aster | *Aster puniceus* var. *firmus* | Plant | Woods, forests, meadows, streambanks | SE | | Cattaraugus, Cayuga, Chenango, Clinton, Erie, Essex, Franklin, Genesee, Hamilton, Herkimer, Jefferson, Lewis, Madison, Monroe, Onondaga, Ontario, Oswego, Seneca, St. Lawrence, Warren, Washington, Yates | NY | | GL |
| Corn-salad | *Valerianella umbilicata* | Plant | Partial sun or dappled sunlight, consistently moist conditions, and soil containing organic matter with some sand or rocky material | SE | | Chenango, Oneida, Washington | NY | | GL |
| Cranefly orchid | *Tipularia discolor* | Plant | Humus-rich soil of deciduous woodlands; frequently in sandy, acid oak-pine woods of southeast; depressions under sweet gum trees | SE | | Monroe, Onondaga | NY | | GL |
| Cut-leaf evening-primrose | *Oenothera laciniata* | Plant | Disturbed ground, fields, and fencerows; well-drained sandy and limestone soils | SE | | Cattaraugus, Erie | NY | | GL |
| Cypress-knee sedge | *Carex decomposita* | Plant | Edges of ponds or lakes on floating logs or the bases of *Cephalanthus* or *Decodon* shrubs | SE | | Livingston, Monroe, Oneida, Seneca, Yates | NY | | GL |
| Daisy fleabane | *Erigeron hyssopifolius* | Plant | Open woods, river gravel, rock ledges and crevices, gravel barrens, and roadsides | SE | | Essex, Hamilton | NY | | GL |

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| Downy lettuce | *Lactuca hirsuta* | Plant | Open woods, clearings, thickets, powerline and pipeline rights-of-way, and ridgetops | SE | | Cattaraugus, Clinton, Erie, Essex, Oneida, St. Lawrence, Tompkins, Warren, Washington | NY | | GL |
| Downy phlox | *Phlox pilosa* | Plant | Dry prairies, woods, and inland sands | SE | | Chautauqua, Niagara, St. Lawrence | NY | | GL |
| Downy wood-mint | *Blephilia ciliata* | Plant | Disturbed areas with shallow soil over limestone; oak woodlands, borders, thickets, banks, clearings, meadows, and borders of fens | SE | | Essex, Livingston, Ontario, Warren, Washington | NY | | GL |
| Drummond's rock cress | *Arabis drummondii* | Plant | Rocky open woods; dry ledges and cliffs; sandy or rocky riverbanks; open fields; and open sand dunes | SE | | Cattaraugus, Clinton, Franklin, Jefferson, Niagara, Onondaga, Ontario, St. Lawrence, Warren, Washington | NY | | GL |
| Dwarf blueberry | *Vaccinium cespitosum* | Plant | Banks of large rivers; rocky streambanks in high-elevation fir-dominated forests and krummholz openings, but primarily in alpine meadows; crater rims; volcanic ash; talus slopes; rocky ledges; alpine sedge meadows; edges of valley glaciers; alpine herb mats; edges of coniferous forests, subalpine heaths; and open pine woods | SE | | Essex, Oneida, Warren | NY | | GL |
| Dwarf bulrush | *Lipocarpha micrantha* | Plant | Moist, sandy substrates at pond edges and riverbanks; artificial ponds | SE | | Essex, Madison, Oneida, Oswego, Warren | NY | | GL |
| Dwarf rattlesnake-root | *Prenanthes nana* | Plant | Exposed rocky or mossy alpine and subalpine areas | SE | | Essex | NY | | GL |
| Dwarf white birch | *Betula minor* | Plant | Open alpine meadows; subalpine krummholz often among rock outcrops | SE | | Essex, St. Lawrence | NY | | GL |
| Dwarf willow | *Salix herbacea* | Plant | Snowbeds and places with good snow protection; well-drained riverbanks; sand beaches; granite boulder ridges; steep bouldery slopes; marshes; usually on non-calcareous substrates and places exposed to sea spray | SE | | Essex | NY | | GL |
| Elk sedge | *Carex garberi* | Plant | Calcareous rocks and soils near edges of large rivers; limestone pavements; fens | SE | | Cayuga, Clinton, Erie, Jefferson, Niagara, Tompkins, Warren, Wayne | NY | | GL |

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| Emory's sedge | *Carex emoryi* | Plant | Edges of large rivers, including backwater channels in sand gravel bars | SE | | Cattaraugus, Clinton, Livingston | NY | | GL |
| Erect knotweed | *Polygonum erectum* | Plant | Dry, waste ground | SE | | Cattaraugus, Cayuga, Chenango, Cortland, Erie, Herkimer, Jefferson, Livingston, Madison, Niagara, Oneida, Onondaga, Ontario, Oswego, St. Lawrence, Tompkins, Warren, Washington, Yates | NY | | GL |
| False lettuce | *Lactuca floridana* | Plant | Rich woods, thickets, and clearings | SE | | Seneca | NY | | GL |
| Fernald's bluegrass | *Poa fernaldiana* | Plant | Summit of Mount Marcy; alpine meadow at the base of anorthosite ledges; sheltered places between boulders | SE | | Essex | NY | | GL |
| Fir clubmoss | *Huperzia selago* | Plant | Sandy borrow pits, ditches, lakeshore swales, and conifer swamps; rarely on acidic, igneous rock or calcareous coast cliffs | SE | | Essex, Franklin, St. Lawrence | NY | | GL |
| Floating pennywort | *Hydrocotyle ranunculoides* | Plant | Marshes, ponds, and wet ground | SE | | Chautauqua | NY | | GL |
| Four-flowered loosestrife | *Lysimachia quadriflora* | Plant | Wet meadows, prairies, fields, swamps, marshes | SE | | Erie, Niagara | NY | | GL |
| Fragrant cliff fern | *Dryopteris fragrans* | Plant | Cool, moist sandstone cliff faces; often near waterfalls or dry shaded cliffs | SE | | Essex, Franklin, Hamilton | NY | | GL |
| Frank's sedge | *Carex frankii* | Plant | Wet swales, wet fields and meadows, marshes, roadsides, adjacent to a freshwater tidal swamp | SE | | Madison, Oneida, Tompkins, Wayne | NY | | GL |
| Georgia bulrush | *Scirpus georgianus* | Plant | Full sun in mesic to damp fields and meadows; edges of wet forests; marsh edges; moist meadows, marshes, and ditches | SE | | Cattaraugus, Erie, Essex, Genesee, Tompkins, Oswego, Washington | NY | | GL |

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| | | | | State | Fed. | | | | |
| Giant pine-drops | *Pterospora andromedea* | Plant | Deep humus of coniferous forests; especially common under ponderosa pine in the west | SE | | Cattaraugus, Clinton, Cortland, Erie, Essex, Herkimer, Lewis, Livingston, Monroe, Niagara, Oneida, Ontario, Oswego, Tompkins, Warren, Washington, Wyoming, Yates | NY | | GL |
| Glaucous sedge | *Carex flaccosperma var. glaucodea* | Plant | Wet to dry-mesic deciduous forests and old fields; edges of seasonal swamps; seasonally wet depressions in open environments | SE | | Tompkins | NY | | GL |
| Globe flatsedge | *Cyperus echinatus* | Plant | Disturbed, sunny sites in mesic places; well-drained soils | SE | | Franklin | NY | | GL |
| Glomerate sedge | *Carex aggregata* | Plant | Meadows, thickets, open forests; usually on calcareous soils | SE | | Jefferson, Oneida, Onondaga | NY | | GL |
| Golden dock | *Rumex maritimus var. fueginus* | Plant | Alluvial, riparian, and coastal habitats, mostly as a ruderal species | SE | | Cayuga, Erie, Genesee, Seneca, Steuben, Wayne | NY | | GL |
| Golden puccoon | *Lithospermum caroliniense ssp. Croceum* | Plant | Dry prairies, woods, and inland sands; sandy soil | SE | | Genesee, Monroe, Niagara, Onondaga | NY | | GL |
| Goosefoot corn-salad | *Valerianella chenopodiifolia* | Plant | Wet sites in forested floodplains with a somewhat open overstory | SE | | Chenango, Erie, Genesee, Monroe, Niagara, Oneida, Onondaga | NY | | GL |
| Green parrot's-feather | *Myriophyllum pinnatum* | Plant | Small ponds and ditches; large lakes and the Hudson River | SE | | Warren, Washington | NY | | GL |
| Ground-cherry | *Physalis pubescens var. integrifolia* | Plant | Sand and gravel bars, rocky woods, alluvial soils bordering streams, cultivated fields, fallow fields, waste ground, railroads | SE | | Erie, Monroe, Niagara, Tompkins, Oneida, Onondaga, Oswego | NY | | GL |
| Gypsy-wort | *Lycopus rubellus* | Plant | Marshes, fens, and flooded swamps; cracks in stone wall of a dock along the Hudson River | SE | | Erie, Franklin, Herkimer, Madison, Niagara | NY | | GL |
| Hair-like sedge | *Carex capillaris* | Plant | Calcareous wet sand at the top of talus slopes; ledges at the base of cliffs; floating and submerged logs at the edge of marl ponds; calcareous streams | SE | | Cayuga, Cortland, Hamilton, Onondaga | NY | | GL |

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| Harbinger-of-spring | *Erigenia bulbosa* | Plant | Moderate moisture; woods | SE | | Erie, Monroe, Niagara | NY | | GL |
| Heart sorrel | *Rumex hastatulus* | Plant | Dry to moist alluvial and ruderal habitats; river valleys, sandy plains, meadows, waste places | SE | | Onondaga, St. Lawrence | NY | | GL |
| Hoary skullcap | *Scutellaria incana* | Plant | Open woods, sandy areas, pinelands, dry bluffs | SE | | Cattaraugus | NY | | GL |
| Holly-leaved naiad | *Najas marina* | Plant | Brackish or highly alkaline waters of ponds and lakes | SE | | Cayuga, Monroe, Onondaga, Seneca, Wayne | NY | | GL |
| Hooker's orchid | *Platanthera hookeri* | Plant | Dry to moist woodlands and forest | SE | | Cattaraugus, Cayuga, Chenango, Clinton, Cortland, Erie, Essex, Genesee, Herkimer, Livingston, Madison, Monroe, Niagara, Oneida, Onondaga, Ontario, Oswego, Seneca, St. Lawrence, Tompkins, Warren, Washington, Wayne, Wyoming, Yates | NY | | GL |
| Houghton's goldenrod | *Solidago houghtonii* | Plant | Interdunal wetlands, sandy soils along Great Lakes | SE | FT | Genesee, Orleans | NY | | GL |
| Hyssop-skullcap | *Scutellaria integrifolia* | Plant | Clearings, open woods | SE | | Schuyler, Yates | NY | | GL |
| Inland bluegrass | *Poa interior* | Plant | Boreal forests to low alpine; subxeric to mesic habitats such as mossy rocks and scree; usually in forests | SE | | Essex, Livingston | NY | | GL |

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| Jacob's-ladder | *Smilax pulverulenta* | Plant | Rich woods, thickets; usually in calcareous soils | SE | | Allegany, Cattaraugus, Cayuga, Chautauqua, Chenango, Clinton, Cortland, Erie, Essex, Genesee, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Niagara, Oneida, Onondaga, Ontario, Oswego, Seneca, St. Lawrence, Steuben, Tompkins, Warren, Washington, Wayne, Yates | NY | | GL |
| Kentucky coffee tree | *Gymnocladus dioica* | Plant | Floodplains; moist woods; lower slopes | SE | | Cayuga, Jefferson, Oneida, Onondaga, Ontario, Tompkins | NY | | GL |
| Lance-leaved loosestrife | *Lysimachia hybrida* | Plant | Wet sloughs, woods, prairies | SE | | Allegany, Clinton, Essex, Oneida, Washington | NY | | GL |
| Lapland rosebay | *Rhododendron lapponicum* | Plant | Arctic and alpine tundra; rocky barrens and heaths or thickets; raised beach ridges; sandy streambanks | SE | | Essex | NY | | GL |
| Large twayblade | *Liparis lilifolia* | Plant | Red maple-dominated swamps with a substrate of sphagnous peat growing on hummocks; dry woods on limestone-influenced soil and wooded talus slopes; along railroad grades at the edge of swamps | SE | | Monroe, Oneida, Onondaga, Oswego, Seneca, Tompkins | NY | | GL |
| *Leedy's roseroot* | *Rhodiola integrifolia Raf ssp. leedyi* | Plant | Cool cliffs with cracked rock that bring up cold air from underground caves; cool water-fed limestone cliffs; talus slopes or cliffs where groundwater maintains a cool, wet environment in summer | SE | FT | Schuyler, Yates | NY | Only in six locations in MN and NY | GL |
| Leiberg's panic grass | *Panicum leibergii* | Plant | Wet meadow; dry opening of woods in a cemetery | SE | | Schuyler | NY | | GL |
| Lesser fringed gentian | *Gentianopsis procera* | Plant | Cold fens, seeps, and meadows in calcareous areas | SE | | Erie, Monroe, Niagara, St. Lawrence | NY | | GL |

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| Leucospora | *Lemna valdiviana* | Plant | Prairie swales; sand and gravel bars along rivers; muddy borders of ponds; edges of springs in wooded areas; rocky depressions in limestone bluffs; sandy ditches | SE | | Madison | NY | | GL |
| Lindley's aster | *Symphyotrichum ciliolatum* | Plant | Woodlands, prairies, meadows, fields | SE | | Jefferson, Onondaga, St. Lawrence, Wayne, Washington | NY | | GL |
| Live-forever | *Sedum telephioides* | Plant | Dry rocky places | SE | | Oneida, Washington | NY | | GL |
| Livid sedge | *Carex livida* var. *radicaulis* | Plant | Open peaty wetlands that are somewhat mineral rich, including rich to medium fens | SE | | Essex, Herkimer, Jefferson, Madison, Monroe, Ontario, Oswego | NY | | GL |
| Log fern | *Dryopteris celsa* | Plant | Seepage slopes; hammocks and logs in swamps | SE | | Cayuga, Genesee, Monroe, Ontario, Seneca | NY | | GL |
| Low nutrush | *Scleria verticillata* | Plant | Open woods, sandy areas, pinelands, dry bluffs | SE | | Genesee, Monroe, Ontario, Seneca, Schuler, Yates | NY | | GL |
| Low sand-cherry | *Prunus pumila* var. *pumila* | Plant | Sandy, acid, dry to wet, open places; thickets, railroad grades, borders, and sand dunes | SE | | Genesee, Monroe, Ontario, Seneca, Schuler, Yates | NY | | GL |
| Lowland fragile fern | *Cystopteris protrusa* | Plant | Moist, deciduous forests | SE | | Erie, Tompkins | NY | | GL |
| Many-head sedge | *Carex sychnocephala* | Plant | Swamps; marly soils adjacent to large rivers | SE | | Herkimer, Jefferson, Oneida, St. Lawrence | NY | | GL |
| Mare's-tail | *Hippuris vulgaris* | Plant | Emergent to submersed; muddy substrates; damp shores; shallow, quiet waters of ponds and streams | SE | | Essex, Franklin, Lewis, Ontario, Seneca, St. Lawrence, Washington | NY | | GL |
| Marsh valerian | *Valeriana uliginosa* | Plant | Various wetland types sharing certain characteristics: alkaline or calcareous groundwater, peaty, saturated soils; calcareous swamps and wet woods, chiefly with *Larix* and *Thuja* | SE | | Genesee, Herkimer, Lewis, Madison, Monroe, Onondaga, Ontario, Wayne | NY | | GL |
| Mead's sedge | *Carex meadii* | Plant | Calcareous prairies, fens, cedar glades, open woodlands, moist depressions | SE | | Erie, Herkimer, Yates | NY | | GL |
| Melic-oats | *Trisetum melicoides* | Plant | Gravelly shores, river thickets | SE | | Clinton, Essex | NY | | GL |

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| Michaux's blue-eyed-grass | *Sisyrinchium mucronatum* | Plant | Herb-dominated or shrub and sapling-dominated, open, non-forested habitats, including fields, hayfields, successional fields, pastures, roadsides, forest edges, and maritime grasslands; ditches and disturbed soils that are quite dry to at least seasonally wet and acidic to calcareous | SE | | Erie, Herkimer, Monroe, Ontario, Schuyler, Steuben, St. Lawrence | NY | | GL |
| Michigan lily | *Lilium michiganense* | Plant | Tallgrass prairies; stream sides; swamps, moist woodland edges; lakeshores; ditches along roads and railways | SE | | Jefferson, Monroe, Onondaga | NY | | GL |
| Midland sedge | *Carex mesochorea* | Plant | Dry sandy soils of maritime grasslands, oak woods, mowed cemeteries, paths, and fields | SE | | Onondaga | NY | | GL |
| Mingan moonwort | *Botrychium minganense* | Plant | Northern white cedar forests; casually grazed open pastures; calcareous bedrock | SE | | Onondaga | NY | | GL |
| Minute duckweed | *Lemna perpusilla* | Plant | Mesotrophic to eutrophic, quiet waters | SE | | Monroe | NY | | GL |
| Missouri goosefoot | *Chenopodium album* var. *missouriense* | Plant | Disturbed sites, gardens | SE | | Cortland, Niagara | NY | | GL |
| Moonwort | *Botrychium lunaria* | Plant | Northern white cedar forests; casually grazed open pastures; calcareous bedrock | SE | | Genesee, Onondaga | NY | | GL |
| Moor-rush | *Juncus stygius* ssp. *Americanus* | Plant | Wet moss, bogs, and bog-pools | SE | | Essex, Herkimer, Jefferson | NY | | GL |
| Mountain goldenrod | *Solidago simplex* var. *racemosa* | Plant | Calcareous rocks, ledges, and cliffs along rivers | SE | | Hamilton, Herkimer, Essex, Washington | NY | | GL |
| Mountain meadowsweet | *Spiraea septentrionalis* | Plant | Swamps, wet meadows, and shores | SE | | Essex | NY | | GL |
| Mountain pyrola | *Pyrola minor* | Plant | Woodland | SE | | Essex | NY | | GL |
| Mountain watercress | *Cardamine rotundifolia* | Plant | Sandy or muddy streamsides, beaver wetlands, spring seeps, oxbows | SE | | Cattaraugus, Erie, Ontario | NY | | GL |
| Muenscher's naiad | *Najas guadalupensis* var. *muenscheri* | Plant | Shallow water of rivers | SE | | Washington | NY | | GL |
| Narrow-leaf cottongrass | *Eriophorum angustifolium* ssp. *Scabriusculum* | Plant | Marshes, bogs, fens, meadows, shores | SE | | Chautauqua, Franklin, Jefferson, Monroe, Seneca, Oneida | NY | | GL |
| Narrow-leaved sedge | *Carex amphibola* | Plant | Upland slopes near the edges of freshwater tidal marshes and tidal mudflats; slopes in mesic forests | SE | | Cattaraugus, Cayuga, Oneida, Tompkins | NY | | GL |
| New England violet | *Viola novae-angliae* | Plant | Shores of lakes and rivers | SE | | Warren | NY | | GL |

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|---|---|---|---|---|---|---|---|---|---|
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| Ninebark | *Physocarpus opulifolius* var. *intermedius* | Plant | Streambanks, rocky hillsides, woodland edges | SE | | Cattaraugus, Erie, Niagara | NY | | GL |
| Nodding pogonia | *Triphora trianthophora* | Plant | Ephemeral plant of dry to moist beech-maple mesic forests, moist leaf-mold pockets of mixed-hardwood forests, hemlock-northern hardwood forests in shale ravines; deep mucky soil under yellow birch; sandy woods of the Great Lakes plains; and white cedar-tamarack swamps | SE | | Cattaraugus, Cayuga, Erie, Genesee, Monroe, Oneida, Onondaga, Tompkins, Warren, Washington, Wayne | NY | New York Natural Heritage Program. 2009. Online Conservation Guide for *Triphora trianthophora* | GL |
| Nodding rattlesnake-root | *Prenanthes crepidinea* | Plant | Moist, rich, deciduous woods; lowland or upland woods; thickets, low prairies; wet areas in rich soil | SE | | Cattaraugus, Erie | NY | | GL |
| Nodding trillium | *Trillium flexipes* | Plant | Rich wooded slopes; floodplains in deciduous forests, especially over limestone | SE | | Cattaraugus, Chenango, Erie, Genesee, Monroe, Wayne | NY | | GL |
| Northeastern bulrush | *Scirpus ancistrochaetus* | Plant | Small wetlands, usually one acre or less, where the water level is high in spring and drops through the summer | | FE | Steuben | NY | | GL |
| Northern bog sedge | *Carex gynocrates* | Plant | Hummocks and bases of trees in rich *Thuja occidentalis*-dominated swamps | SE | | Genesee, Herkimer, Lewis, Monroe, Onondaga, Ontario, Oswego, Seneca, Wayne, Yates | NY | | GL |
| Northern bog violet | *Viola nephrophylla* | Plant | Cold, wetland habitats, including open marl fens within larger swamps, northern white-cedar swamps, and wet pastures; calcareous shoreline outcrops; boreal heath barrens; gravelly shores; slopes; bogs; open low grounds | SE | | Erie, Essex, Franklin, Genesee, Hamilton, Herkimer, Jefferson, Madison, Monroe, Oneida, Onondaga, Seneca, St. Lawrence, Tompkins, Washington, Wayne, Wyoming | NY | Habitat info: New York Natural Heritage Program. 2009. Online Conservation Guide for *Viola nephrophylla* | GL |
| Northern clustered sedge | *Carex arcta* | Plant | Low wet woods along island margins; flats along rivers; swales; around reservoirs and other bodies of water; wet depressions | SE | | Cattaraugus, Cortland, Essex, Franklin, Herkimer, St. Lawrence, Tompkins | NY | | GL |
| Northern holly-fern | *Polystichum lonchitis* | Plant | In rock crevices or at base of boulders, mostly in boreal and subalpine coniferous forests or alpine regions | SE | | Cattaraugus | NY | | GL |

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| Northern reedgrass | *Calamagrostis stricta* ssp. *Stricta* | Plant | Calcareous wetlands, including fens and wet meadows; on sandy or cobbly lake, pond, and river shores; cliffs, krummholz, and alpine meadows in high peaks of the Adirondacks | ST | | Clinton, Essex, Franklin, Hamilton, Herkimer, Monroe, St. Lawrence, Washington, Wayne, Yates | NY | | GL |
| Northern running-pine | *Lycopodium complanatum* | Plant | Dry rocky ridgetops, powerlines; open summits; along trails through mountain spruce-fir forest; white pine and hemlock-northern hardwood forests | SE | | Cortland, Essex, Lewis, Oneida, Washington | NY | | GL |
| Northern stickseed | *Hackelia deflexa* var. *americana* | Plant | Moist woods, thickets, hillsides | SE | | Clinton, Jefferson | NY | | GL |
| Northern tansey-mustard | *Descurainia pinnata* ssp. *Brachycarpa* | Plant | Dry, disturbed areas | SE | | Clinton, Erie, Essex, Schuyler, Tompkins | NY | | GL |
| Northern wild comfrey | *Cynoglossum virginianum* var. *boreale* | Plant | Clearings in forests and forest edges | SE | | Cattaraugus, Clinton, Erie, Essex, Franklin, Genesee, Jefferson, Lewis, Livingston, Madison, Madison, Monroe, Niagara, Oneida, Onondaga, Schuyler, Tompkins, Warren, Washington, Yates | NY | | GL |
| Northern wild-licorice | *Galium kamtschaticum* | Plant | Moist, cold, coniferous forests and mossy places | SE | | Essex, Hamilton | NY | | GL |
| Nuttall's tick-clover | *Desmodium nuttallii* | Plant | *Habitat unavailable | SE | | Herkimer, Seneca, Yates | NY | | GL |
| Ogden's pondweed | *Potamogeton ogdenii* | Plant | Alkaline waters, including slow streams, calcareous ponds, muddy shorelines, and lakes without high-horsepower boats. | SE | | Oswego, Washington | NY | Habitat info: New York Natural Heritage Program. 2009. Online Conservation Guide for *Potamogeton ogdenii* | GL |
| Orache | *Atriplex subspicata* | Plant | Alkali areas | SE | | Ontario | NY | | GL |
| Orange fringed orchis | *Platanthera ciliaris* | Plant | Moist sandy and peaty meadows, marshes, prairies, pine savannas, open woods, wet wooded flats, seeping slopes, roadsides, dry wooded slopes, sphagnum bogs | SE | | Madison, Monroe, Oneida, Onondaga, Seneca, Washington, Yates | NY | | GL |
| Panic grass | *Panicum scabriusculum* | Plant | Wet, sandy, open sites, including shores, streambanks, swamps, and bogs | SE | | Oneida, Oswego | NY | | GL |

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| Pink wild bean | *Strophostyles umbellata* | Plant | Sandy soil; thickets and open woods | SE | | Wayne | NY | | GL |
| Porter's reedgrass | *Calamagrostis porteri* ssp. *Porteri* | Plant | Oak-hickory forest leaf litter zones; moss and lichen-dominated substrates, including sphagnum | SE | | Steuben | NY | | GL |
| Prairie dunewort | *Botrychium campestre* | Plant | Prairies, dunes, grassy railroad sidings, fields over limestone | SE | | Onondaga | NY | | GL |
| Prairie fringed orchid | *Platanthera leucophaea* | Plant | Tallgrass silt-loam or sand prairies; sedge meadows; fens; lakeshore grasslands; occasionally sphagnum bogs in the eastern part of its range | SE | FT | Genesee, Niagara, Onondaga, Orleans, Oswego, Wayne | NY | Listed as FT but does not occur in the state | GL |
| Prairie redroot | *Ceanothus herbaceus* | Plant | Dry prairies; sandy, rocky soil | SE | | Clinton, Essex, Jefferson | NY | | GL |
| Prairie wedgegrass | *Sphenopholis obtusata* var. *obtusata* | Plant | Very generalized; moist to dry soil of open woods, prairies, old fields, and fen meadows | SE | | Herkimer, Monroe, Niagara, Tompkins, Yates | NY | | GL |
| Prickly rose | *Rosa acicularis* ssp. *sayi* | Plant | Sun, part shade, shade | SE | | Clinton, Essex, Genesee, Warren, Washington | NY | | GL |
| Prostrate juniper | *Juniperus horizontalis* | Plant | Marl fens; rich sloping fens; along river banks; wetlands associated with limestone | SE | | Chenango, Genesee, Livingston, Madison, Monroe, Oneida, Onondaga | NY | | GL |
| Purple bluets | *Houstonia purpurea* var. *purpurea* | Plant | Moist or open rocky woods, rocky slopes, streambanks | SE | | Monroe, Washington | NY | | GL |
| Purple bluets (a.k.a. Southern bluets or Venus' pride) | *Houstonia purpurea* var. *calycosa* | Plant | Moist or open rocky woods, rocky slopes, streambanks | SE | | Essex, Tompkins, Washington | NY | | GL |
| Purple comandra | *Geocaulon lividum* | Plant | Alpine meadows; under dwarfed trees in alpine and subalpine habitats; openings in krummholz; high-elevation bogs | SE | | Essex | NY | | GL |
| Purple crowberry | *Empetrum eamesii* ssp. *Atropurpureum* | Plant | Alpine meadows; often associated with extensive exposed granite bedrock | SE | | Essex | NY | | GL |
| Purple everlasting | *Gnaphalium purpureum* | Plant | Wet or stony sites in forest margins and clearings; lawns; pastures; cultivated areas; riverbeds | SE | | Cattaraugus, Onondaga, Ontario | NY | | GL |

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| Purple mountain-saxifrage | *Saxifraga oppositifolia* | Plant | Arctic and alpine tundra, mountain ledges, rock crevices, calcareous gravel, raised beach ridges | SE | | Hamilton | NY | | GL |
| Puttyroot | *Aplectrum hyemale* | Plant | Moist, deciduous, upland to swampy forests | SE | | Cayuga, Chautauqua, Cortland, Erie, Essex, Genesee, Jefferson, Lewis, Livingston, Madison, Monroe, Niagara, Oneida, Onondaga, Ontario, Orleans, Oswego, Seneca, Tompkins, Washington, Wayne, Yates | NY | | GL |
| Quillwort | *Isoetes riparia* | Plant | Pond margins, cobble shorelines of large rivers, tidal mudflats, and shallow gravelly areas of lakes | SE | | Clinton, Essex, St. Lawrence, Washington | NY | | GL |
| Rattlebox | *Crotalaria sagittalis* | Plant | Open, disturbed sites with sandy soils, including pine plantations, pastures, and mowed fields | SE | | Lewis | NY | | GL |
| Reflexed sedge | *Carex retroflexa* | Plant | Dry-mesic to mesic deciduous forests and open forests; openings and edges of forests | SE | | Cayuga, Clinton, Erie, Hamilton, Monroe, Niagara, Onondaga, Ontario, Tompkins, Warren, Washington, Yates | NY | | GL |
| Rock-cress | *Draba glabella* | Plant | Limestone cliffs and woodland adjacent to Lake Champlain | SE | | Clinton, Washington | NY | | GL |
| Roseroot | *Sedum rosea* | Plant | Found at only a few sites in New York, all cliffs and all but one near waterfalls; shaded, cool sites of calcareous and acidic rock | SE | | Madison | NY | Habitat info: New York Natural Heritage Program. 2009. Online Conservation Guide for *Rhodiola rose*a | GL |
| Rough avens | *Geum virginianum* | Plant | Appalachian oak-hickory forests, northern-hardwood forests, woodlands on limestone bedrock and sand dunes, muddy riverbanks, forested swamps, marshes, roadsides | SE | | Cayuga, Erie, Jefferson, Livingston, Niagara, Monroe, Oneida, Onondaga, Ontario, Schuyler, St. Lawrence | NY | | GL |
| Rough rush-grass | *Sporobolus clandestinus* | Plant | Sandy openings in oak barrens | SE | | Warren | NY | | GL |

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| Rough veiny vetchling | *Lathyrus venosus* | Plant | Sandy, open ground, shady banks, oak-hickory woods, ridges, thickets | SE | | Livingston | NY | | GL |
| Rough-leaf dogwood | *Cornus drummondii* | Plant | Bottomland thickets, gravelly creek banks, floodplains, low-lying islands within rivers, seepage areas on slopes and slope bases | SE | | Cattaraugus, Erie, Niagara | NY | | GL |
| Rugulose grape fern | *Botrychium rugulosum* | Plant | Old pastures, lightly grazed areas, meadows, successional northern hardwood forests | SE | | Essex, Hamilton, Herkimer, Madison, Onondaga, St. Lawrence, Warren | NY | | GL |
| Salt-meadow grass | *Diplachne maritima* | Plant | Beaches and salt ponds | SE | | Cayuga, Erie, Onondaga, Wayne | NY | | GL |
| Sand dune willow | *Salix cordata* | Plant | Limited to dunes and beaches of Lake Ontario; sandy and alluvial shores; sand dunes; river banks and lakeshores in sandy, silty, or gravelly soils | SE | | Cayuga, Jefferson, Oswego, Wayne | NY | Habitat info: New York Natural Heritage Program. 2009. Online Conservation Guide for *Salix cordata* | GL |
| Scarlet Indian-paintbrush | *Castilleja coccinea* | Plant | Open, usually calcareous sites, on limestone bedrock in alvar grasslands, old fields at the edge of a fen, mowed right-of-way on sandy logging road | SE | | Cayuga, Erie, Genesee, Jefferson, Livingston, Madison, Monroe, Niagara, Onondaga, Ontario, Seneca, Steuben, St. Lawrence, Tompkins, Yates | NY | | GL |
| Scirpus-like rush | *Juncus scirpoides* | Plant | Wet sandy soil, salt marshes, lakeshores, ditches, meadows, wet woods | SE | | Herkimer | NY | | GL |
| Seaside bulrush | *Scirpus maritimus* | Plant | Brackish to saline coastal and inland shores, marshes | SE | | Cayuga, Erie, Onondaga, Seneca, Wayne | NY | | GL |
| Seaside crowfoot | *Ranunculus cymbalaria* | Plant | Bogs, marshes, ditches, streambanks; often saline | SE | | Cayuga, Onondaga, Seneca, Wayne | NY | | GL |
| Sheathed pondweed | *Potamogeton filiformis* var. *occidentalis* | Plant | Calcareous waters, mainly in cold, slow to fast-flowing streams and rivers; occasionally in standing waters of ponds and lakes | SE | | Chautauqua, Cortland, Erie, Genesee, Jefferson, Niagara, Madison, Seneca, Onondaga, Oswego, St. Lawrence, Tompkins | NY | | GL |
| Sheathed sedge | *Carex vaginata* | Plant | Cedar swamps near rich fens | SE | | Essex, Genesee, Lewis, Monroe | NY | | GL |

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| Sheep fescue | *Festuca saximontana* | Plant | Most commonly on dry anorthosite cliff in the high peaks of the Adirondacks | SE | | Essex, Hamilton, Ontario, Tompkins, Washington | NY | | GL |
| Shining bedstraw | *Galium concinnum* | Plant | Hemlock-northern hardwood and oak-hickory forests; along roadsides, trails, riverside meadows | SE | | Cattaraugus, Monroe, Onondaga, Ontario | NY | | GL |
| Short's sedge | *Carex shortiana* | Plant | Moist woods and roadside ditches | SE | | Cayuga, Jefferson, Livingston, Madison, Monroe, Oneida, Onondaga, Oswego, Ontario, Seneca, Wayne, Yates | NY | | GL |
| Side-oats grama | *Bouteloua curtipendula* | Plant | Riverside bluffs, shale cliffs and barrens, cedar glades, limestone pavements; abandoned sandpits and pastures, railroads, powerlines | SE | | Jefferson, Monroe | NY | | GL |
| Sitka clubmoss | *Lycopodium sitchense* | Plant | Alpine meadows, open rocky barrens, conifer woods | SE | | Essex, Franklin, St. Lawrence | NY | | GL |
| Sky-blue aster | *Aster oolentangiensis* | Plant | Prairies; meadows in sandy loamy soils | SE | | Erie, Livingston, Monroe, Niagara, Oneida | NY | | GL |
| Slender beadgrass | *Paspalum setaceum* var. *psammophilum* | Plant | Open woods, open ground, old fields, ditches, wood borders | SE | | Cattaraugus, Cayuga, Jefferson, Livingston, Monroe, Oneida, Ontario, Onondaga, Oswego, Seneca, Warren, Washington | NY | | GL |
| Slender blazing-star | *Liatris cylindracea* | Plant | Prairies; dry, open places | SE | | Niagara | NY | | GL |
| Slender bulrush | *Scirpus heterochaetus* | Plant | Fresh, often calcareous marshes and lakes; often emergent in water to 1.5 m | SE | | Clinton, Essex, Franklin, Jefferson, Oswego, Schuyler, St. Lawrence, Steuben, Washington, Wayne | NY | | GL |
| Slender marsh bluegrass | *Poa paludigena* | Plant | Bogs, swamps, wet woods, wet meadows, and along streams | SE | | Cayuga, Monroe, Tompkins, Wayne | NY | | GL |
| Slender pondweed | *Potamogeton filiformis* var. *alpinus* | Plant | Typically in shallow, standing, or slow-moving water | SE | | Cayuga, Erie, Jefferson, Livingston, Niagara, Ontario, Seneca, St. Lawrence | NY | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Small white ladyslipper | *Cypripedium candidum* | Plant | Mesic to wet prairies and fen meadows; very rarely open wooded slopes | SE | | Erie, Genesee, Livingston, Onondaga, Ontario, Warren | NY | | GL |
| Small whorled pogonia | *Isotria medeoloides* | Plant | Semi-open, mesic forests; calcium-rich sites | SE | FT | Onondaga, Washington | NY | | GL |
| Small yellow ladyslipper | *Cypripedium parviflorum* var. *parviflorum* | Plant | Mesic to dry deciduous and deciduous-hemlock forests; usually on slopes | SE | | Cattaraugus, Clinton, Erie, Essex, Genesee, Herkimer, Lewis, Livingston, Madison, Monroe, Oneida, Onondaga, Ontario, St. Lawrence, Tompkins, Warren, Wyoming | NY | | GL |
| Small-flowered tick-clover | *Desmodium pauciflorum* | Plant | Rich, moist woods, ravines, bases of bluffs | SE | | Cayuga, Genesee, Monroe, Seneca, Wayne | NY | | GL |
| Small's knotweed | *Polygonum buxiforme* | Plant | Roadsides, vacant lots, sidewalks, packed and non-drifting sands, borders of marshes and dunes | SE | | Chautauqua, Erie, Livingston, Oneida, Onondaga, Warren, Washington | NY | | GL |
| Smartweed dodder | *Cuscuta polygonorum* | Plant | Forested lowland | SE | | Monroe, Niagara | NY | | GL |
| Smooth blue aster | *Aster laevis* var. *concinnus* | Plant | Prairies, savannas, openings in upland and sandy forests, woodland edges, thickets, limestone glades, roadside embankments | SE | | Statewide | NY | | GL |
| Smooth scouring rush | *Equisetum laevigatum* | Plant | Moist prairies, riverbanks, roadsides | SE | | Cattaraugus, Cayuga, Jefferson, Lewis, Madison, Monroe, Niagara, Oneida, Ontario, Oswego, Seneca, Tompkins, Warren, Wayne | NY | | GL |
| Smooth woodsia | *Woodsia glabella* | Plant | Shaded cracks and ledges on cliffs; mostly calcareous rocks, especially limestone | SE | | Essex, Hamilton, Herkimer | NY | | GL |
| Soapwort gentian | *Gentiana saponaria* | Plant | Moist depressions; margins of woodland creeks and ponds | SE | | Erie | NY | | GL |
| Soft fox sedge | *Carex conjuncta* | Plant | Swales; moist to wet meadows, marshes, thickets, and streambanks; damp open woods | SE | | Herkimer, Oneida | NY | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Southern blueflag | *Iris virginica var. schrevei* | Plant | Marshes, swamps, meadows | SE | | Erie, Monroe | NY | | GL |
| Southern naiad | *Najas guadalupensis* var. *olivacea* | Plant | Lakes and rivers | SE | | Cayuga, Seneca | NY | | GL |
| Southern twayblade | *Listera australis* | Plant | Bogs, poor fens, and wet woods | SE | | Cattaraugus, Cayuga, Chenango, Cortland, Erie, Hamilton, Madison, Oneida, Onondaga, Oswego, Seneca, St. Lawrence, Wayne, Wyoming | NY | | GL |
| Sparse-flowered sedge | *Carex tenuiflora* | Plant | Cedar swamps, rich shrub fens, and shrub swamps | SE | | Erie, Essex, Lewis, Madison, Oneida, St. Lawrence, Warren | NY | | GL |
| Spiked woodthrush | *Luzula spicata* | Plant | Alpine slopes and heath;, dry or damp areas among grasses, herbs, or lichens; subalpine forests | SE | | Essex | NY | | GL |
| Spreading chervil | *Chaerophyllum procumbens* | Plant | Moist; woods; alluvial soils | SE | | Chenango, Erie, Genesee, Monroe, Onondaga, Tompkins, Wayne | NY | | GL |
| Spring avens | *Geum vernum* | Plant | Woods in rich soil | SE | | Chautauqua, Herkimer, Livingston, Niagara, Oneida, Onondaga, Ontario, Tompkins | NY | | GL |
| Spurred gentian | *Halenia deflexa* | Plant | Rich fens and seeps | SE | | Clinton, Essex, Herkimer, Oneida, Warren | NY | | GL |
| Sticky false asphodel | *Tofieldia glutinosa* | Plant | Marshes, wet meadows, calcareous soils | SE | | Erie, Genesee, Onondaga, Warren | NY | | GL |
| Straight-leaf pondweed | *Potamogeton strictifolius* | Plant | Alkaline waters of lakes and slow-moving streams | SE | | Cayuga, Clinton, Cortland, Essex, Jefferson, Monroe, Oneida, Onondaga, Seneca, St. Lawrence, Warren, Washington, Yates | NY | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Straw sedge | *Carex straminea* | Plant | Swamp margins and marshes | SE | | Cayuga, Livingston, Ontario, Oswego, Washington, Wayne, Yates | NY | | GL |
| Striped coralroot | *Corallorhiza striata* | Plant | Cedar swamps and possibly beech woods along Lake Ontario | SE | | Jefferson, Lewis, Madison, Monroe, Orleans | NY | | GL |
| Swamp aster | *Aster radula* | Plant | Wet woods or swamps | SE | | St. Lawrence | NY | | GL |
| Swamp buttercup | *Ranunculus hispidus* var. *nitidus* | Plant | Wet woods, swamps, ditches | SE | | Cattaraugus, Chautauqua, Orleans, St. Lawrence, Tompkins, Warren, Wyoming | NY | | GL |
| Swamp oats | *Sphenopholis pensylvanica* | Plant | Grasslands, sedge meadows, and wet prairies | SE | | Herkimer, Monroe, Niagara, Tompkins, Yates | NY | | GL |
| Swamp smartweed | *Polygonum setaceum* var. *interjectum* | Plant | Alluvial woods, swamp forests | SE | | Erie, Madison, Niagara, Onondaga, Oneida, Orleans, Oswego, Sarasota, Wyoming | NY | | GL |
| Sweet coltsfoot | *Petasites frigidus* var. *palmatus* | Plant | Edges of forested, calcareous, northern swamps; wetter, open sites within upland forests | SE | | Cattaraugus, Clinton, Essex, Genesee, Madison, Onondaga, Steuben, St. Lawrence, Tompkins, Warren, Washington, Yates | NY | | GL |
| Sweet-scented Indian-plantain | *Cacalia suaveolens* | Plant | Wet meadows and streambanks | SE | | Cattaraugus, Chenango, Genesee, Livingston, Monroe, Onondaga | NY | | GL |
| Tall hairy goldenrod | *Solidago rugosa* var. *sphagnophila* | Plant | Sandy and boggy soils, cedar woods, and wet ground | SE | | Ontario, Seneca, Wayne | NY | | GL |
| Tall ironweed | *Vernonia gigantea* | Plant | Full sun to light shade, moist to mesic; fertile loamy soil | SE | | Chautauqua, Cattaraugus, Herkimer, Lewis, Monroe, Oneida, Wayne | NY | | GL |
| Tall white aster | *Aster lanceolatus* var. *interior* | Plant | Streambanks, ditches, marshes, and moist spots | SE | | St. Lawrence | NY | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Three-ribbed spikerush | *Eleocharis tricostata* | Plant | Wet sandy or peaty depressions, pond margins, pine barrens, savannas, mostly coastal plains | SE | | Seneca | NY | | GL |
| Toad-shade | *Trillium sessile* | Plant | Rich woodlands; limestone districts, calcareous soils, floodplains, riverbanks, clayey alluvium, less-fertile soils; high, dry limestone woods; persists under light pasturing, in fencerows, and brushy areas after lumbering | SE | | Chautauqua, Monroe | NY | | GL |
| Toothed rock-cress | *Arabis shortii* | Plant | Moist woods in rich soils | SE | | Oneida | NY | | GL |
| Torrey's beakrush | *Rhynchospora torreyana* | Plant | Sands and peats of low meadows, savannas, flatwoods, pond shores, ditch banks | SE | | Ontario | NY | | GL |
| Torrey's mountain-mint | *Pycnanthemum torrei* | Plant | Dry, open habitats, including red cedar barrens, rocky summits, trails, and roadsides; fertile woods and thickets | SE | | Genesee | NY | Habitat info: New York Natural Heritage Program. 2009. Online Conservation Guide for *Pycnanthemum torrei* | GL |
| Tundra dwarf birch | *Bartonia paniculata* | Plant | Upland habitats; dry, open areas | SE | | Essex | NY | | GL |
| Veiny meadow-rue | *Thalictrum venulosum* | Plant | Cobbly shorelines, wet meadows, and calcareous rock outcrops along or near Lake Champlain; rocky or gravelly soil, often along shores; alluvial or rocky river shores; talus | SE | | Clinton, Essex | NY | Habitat info: New York Natural Heritage Program. 2009. Online Conservation Guide for *Thalictrum venulosum* | GL |
| Virginia false gromwell | *Onosmodium virginianum* | Plant | Inland red cedar barrens; calcareous soil with exposed bedrock and a mixture of trees; grasses and herbs | SE | | Herkimer, Niagara, Oneida, Onondaga | NY | | GL |
| Wafer-ash | *Ptelea trifoliata* | Plant | Alluvial thickets, rocky slopes, gravelly places | SE | | Chautauqua, Erie, Monroe, Niagara, Warren, Wyoming | NY | | GL |
| Water awlwort | *Subularia aquatica* var. *americana* | Plant | Submerged in streams, lake shorelines, and shallow ponds with gravelly substrates | SE | | Essex, Franklin, Hamilton, Warren, Washington | NY | | GL |
| Water-pennywort | *Hydrocotyle verticillata* | Plant | Sand or gravel lakeshores just above or below the waterline | SE | | Livingston | NY | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Water-thread pondweed | *Potamogeton diversifolius* | Plant | Primarily on margins of ponds where the water is shallow; deep emergent marshes, some with dense aquatic vegetation; ditches, ponds, lakes, streams, and rivers | SE | | Cattaraugus, Cayuga, Cortland, Essex, Franklin, Hamilton, Herkimer, Oneida, Warren, Washington, Wyoming | NY | Habitat info: New York Natural Heritage Program. 2009. Online Conservation Guide for *Potamogeton diversifolius* | GL |
| Wellow milkwort | *Polygala lutea* | Plant | Damp sandy or peaty soil | SE | | Washington | NY | | GL |
| White bluegrass | *Poa glauca* | Plant | Dry habitats; tolerates disturbance well; circumborea;, boreal forest to alpine and high arctic | SE | | Essex | NY | | GL |
| White mountain-saxifrage | *Saxifraga paniculata* | Plant | Single verified site in New York is a nearly vertical, immense, south to southeast-facing, primarily anorthosite cliff with plants on rock ledges and in cracks; exposed, calcareous gravel and rocks | SE | | Essex | NY | Habitat info: New York Natural Heritage Program. 2009. Online Conservation Guide for *Saxifraga paniculata* ssp. *neogaea* | GL |
| Whorled mountain-mint | *Pycnanthemum verticillatum* var. *pilosum* | Plant | Fens, interdunal swales, and other open, calcareous wetlands; usually on wet sandy substrates; dry to moist thickets, clearings, swales or wet peat, upland woods, abandoned fields, swampy meadows, marshes, and woods | SE | | Wayne | NY | | GL |
| Wiegand's sedge | *Carex wiegandii* | Plant | Shade of conifers or alder thickets; hummocks and depressions in wetlands | SE | | Franklin, Lewis | NY | | GL |
| Wild comfrey | *Cynoglossum virginianum* var. *virginianum* | Plant | Upland woods and other shady areas | SE | | Cortland, Ontario | NY | | GL |
| Wild flax | *Linum medium* var. *medium* | Plant | Powerline right-of-ways, roadsides, and pasturelands; dry upland woods and beaches | SE | | Chautauqua, Erie | NY | | GL |
| Wild hydrangea | *Hydrangea arborescens* | Plant | Slopes of forested ravines adjacent to the Pennsylvania border; upper headwater ravines close to the stream, along ravine slopes, or on ledges | SE | | Chenango, Steuben, Wyoming | NY | | GL |
| Wild leek | *Allium burdickii* | Plant | Wooded areas in rich soil | SE | | Chautauqua | NY | | GL |
| Wild potato-vine | *Ipomoea pandurata* | Plant | Dry fields, slopes, and thickets | SE | | Cattaraugus, Erie, Monroe | NY | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Wild sweet-William | *Phlox maculata* | Plant | Open or shrubby wet sites, including fens, wet meadows, shrub swamps, cattail marshes, roadside seeps, and wet thickets | SE | | Cattaraugus, Chautauqua, Chenango, Erie, Essex, Hamilton, Lewis, Madison, Oneida, Onondaga, Tompkins | NY | | GL |
| Willow-herb | *Epilobium ciliatum* ssp. *Glandulosum* | Plant | Disturbed areas and roadsides | SE | | Allegany, Cattaraugus, Chenango, Essex, Jefferson, Madison, Monroe, Onondaga, Ontario, Oswego, St. Lawrence, Tompkins, Washington, Wayne | NY | | GL |
| Wood reedgrass | *Calamagrostis perplexa* | Plant | Dry, rocky, west-facing ridges | SE | | Tompkins | NY | | GL |
| Woodland bluegrass | *Poa sylvestris* | Plant | Deciduous forests, usually associated with calcareous or other rich soil types | SE | | Cayuga, Erie, Lewis, Livingston, Monroe, Niagara, Onondaga, Tompkins, Wyoming | NY | | GL |
| Woodland cudweed | *Gnaphalium sylvaticum* | Plant | Open woods, boggy woods, rocky slopes, clearings, fields, borders of woods, roadsides, muddy banks, disturbed sites | SE | | Herkimer | NY | | GL |
| Woods-rush | *Juncus subcaudatus* | Plant | Forested seeps and small wetlands, streamsides, and edges of natural and artificial ponds | SE | | Cattaraugus, Erie, Herkimer, Oneida | NY | | GL |
| Blandings' turtle | *Emydoidea blandingii* | Reptile | Shores of Lake Erie | ST | | Chautauqua, Erie, Niagara | NY | | GL |
| Bog turtle | *Clemmys muhlenbergii* | Reptile | Spring seeps and open, marshy meadows | SE* | FT | Cayuga, Genesee, Oswego, Onondaga, Seneca, Wayne | NY | Federally Threatened, State Endangered | GL |
| Eastern massasauga | *Sistrurus catenatus* | Reptile | Wet prairies, marshes and low areas along rivers and lakes with adjacent uplands | SE* | | Genesee, Onondaga | NY | Candidate for Federal list | GL |
| Queen snake | *Regina septemvittata* | Reptile | Semi-aquatic; found where crayfish are abundant | SE | | Cattaraugus, Erie, Genesee, Monroe | NY | | GL |
| Timber rattlesnake | *Crotalus horridus* | Reptile | Mountainous or hilly deciduous, mixed deciduous-coniferous forests with rocky outcropps, steep ledges, rock slides | ST | | Allegany, Cattaraugus, Essex, Livingston, Ontario, Schuyler, Steuben, Warren, Washington, Yates | NY | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Chittenango ovate amber snail | *Succinea chittenangoensis* | Snail | ** | SE | FT | Madison | NY | Live specimens can only be found at one location: a 100 -foot-high waterfall in central New York | GL |

Sources: NYDEC, 2009; USDA, 2011a; USDOI, 2011h

Species list derived from best available sources (listed above). Some discrepancy exists between USFWS and state agencies concerning status and county locations for certain species. Status designation does not include State Special Concern Species.

**THREAT STATUS DESIGNATIONS**
SE State Endangered
ST State Threatened
FE Federally Endangered
FT Federally Threatened
FC Federal Candidate Species

* See note column
**NORTHERN BORDER PEIS REGIONS**
GL Great Lakes
EOR East of the Rockies
NE New England
WOR West of the Rockies

## Table M–9. Threatened and Endangered Species in Ohio

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Blue-spotted salamander | *Ambystoma laterale* | Amphibian | Wet prairies, vernal pools | SE | | Henry, Lucas, Williams | OH | | GL |
| American bittern | *Botaurus lentiginosus* | Bird | Undisturbed wetlands that have scattered pools within the vegetation | SE | | Lucas, Mahoning, Ottawa, Portage, Sandusky, Summit, Seneca, Trumbull | OH | | GL |
| Bald eagle | *Haliaeetus leucocephalus* | Bird | Breeds in forested areas near large bodies of water' winters along large rivers and unfrozen lakes | ST | * | Statewide | OH | Marsh region of Lake Erie is a stronghold;* removed from the Federal list of threatened and endangered species due to recovery; continued protection by the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act | GL |
| Barn owl | *Tyto alba* | Bird | Grasslands, marshes, agricultural fields, and other open habitats | ST | | Statewide | OH | Year-round resident | GL |
| Bewick's wren | *Thryomanes bewickii* | Bird | Pine-oak forests | SE | | Statewide | OH | | GL |
| Black tern | *Chlidonias niger* | Bird | Undisturbed inland marshes with dense vegetation | SE | | Erie, Lucas, Ottawa, Sandusky | OH | Casual to rare occurrences in the counties listed; does migrate through the state | GL |
| Black-crowned night-heron | *Nycticorax nycticorax* | Bird | Freshwater marshes, swamps, streams, lakes, and agricultural fields | ST | | Erie, Ottawa, Sandusky, Statewide (migration) | OH | Lake Erie Islands and Turning Point Island in Sandusky Bay | GL |
| Cattle egret | *Bubulcus ibis* | Bird | Wetlands; in dry pastures following cattle, horses, and tractors | SE | | Statewide | OH | | GL |
| Common tern | *Sterna hirundo* | Bird | Islands, marshes, and beaches of lakes and oceans | SE | | Statewide | OH | Nests mainly in counties bordering Lake Erie | GL |
| Dark-eyed junco | *Junco hyemalis* | Bird | Open woodlands, fields, roadsides, and parks | ST | | Statewide | OH | Wintering habitat; confirmed sighting in Headlands Beach State Park in Ohio | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Golden-winged warbler | *Vermivora chrysoptera* | Bird | Shrubby fields, marshes, and bogs | SE | | Statewide | OH | Summer breeding range can occur anywhere in Ohio | GL |
| Hermit thrush | *Catharus guttatus* | Bird | Interiors of deciduous mixed and coniferous forests; winters in open woodlands and forests | ST | | Statewide | OH | | GL |
| King rail | *Rallus elegans* | Bird | Near cattails and other marsh vegetation | SE | | Statewide | OH | | GL |
| Kirtland's warbler | *Dendroica kirtlandii* | Bird | Low scrub, thickets, and some deciduous woodlands | SE | FE | Statewide | OH | Observed in Headlands Beach State Park in 2006 | GL |
| Lark sparrow | *Chondestes grammacus* | Bird | Grasslands with scattered shrub layers and disturbed open areas | SE | | Statewide | OH | | GL |
| Least bittern | *Ixobrychus exilis* | Bird | Freshwater or brackish marshes with tall vegetation | ST | | Statewide | OH | | GL |
| Least flycatcher | *Empidonax minimus* | Bird | Semi-open woodlands, woodland edges, orchards, and brushland | ST | | Statewide | OH | Confirmed sighting in MaGee Marsh in Ohio | GL |
| Loggerhead shrike | *Lanius ludovicianus* | Bird | Open woodlands | SE | | Statewide | OH | | GL |
| Northern harrier | *Circus cyaneus* | Bird | Grasslands | SE | | Statewide | OH | | GL |
| Osprey | *Pandion haliaetus* | Bird | Sites near water with abundant fish | ST | | Statewide | OH | Confirmed sighting in Geauga County | GL |
| Peregrine falcon | *Falco peregrinus* | Bird | Open habitats with tall cliffs | ST | | Statewide | OH | Confirmed sighting in Trumbull | GL |
| Piping plover | *Charadrius melodus* | Bird | Open sand beaches; sparse vegetation. Designated critical habitat: 66 FR 22938 22969. | SE | FE | Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa, Sandusky | OH | Federally designated critical habitat established for certain counties. | GL |
| Sandhill crane | *Grus canadensis* | Bird | Wetlands and agricultural fields | SE | | Statewide | OH | Observed in Hardin County in 2008 | GL |
| Snowy egret | *Egretta thula* | Bird | Western Lake Erie marshes | SE | | Statewide | OH | Stable colony on West Sister Island; can be seen along the coast of Lake Erie | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Trumpeter swan | *Cygnus buccinator* | Bird | Freshwater marshes along ponds and lakes | SE | | Statewide | OH | | GL |
| Upland sandpiper | *Bartramia longicauda* | Bird | Native prairies and dry grasslands | ST | | Statewide | OH | Northern Ohio is a part of its summer habitat | GL |
| Yellow-bellied sapsucker | *Sphyrapicus varius* | Bird | Wet deciduous forests; bogs with yellow birch, beech, and aspen | SE | | Statewide | OH | | GL |
| Yellow-crowned night-heron | *Nyctanassa violacea* | Bird | Marshes | ST | | Statewide | OH | Rare species in Ohio as the state sits at its northernmost limit | GL |
| American eel | *Anguilla rostrata* | Fish | Medium to large rivers with continuous flow and moderately clear water | ST | | Statewide | OH | | GL |
| Bigmouth shiner | *Notropis dorsalis* | Fish | Pools around sandy substrates | ST | | Cuyahoga*, Lorain | OH | Confirmed in the Rocky and Black River drainages of Lake Erie; other drainage areas along Lake Erie may also contain this species | GL |
| Blackchin shiner | *Notropis heterodon* | Fish | Clear water with an abundance of submerged vegetation | SE | | Stark | OH | Small population found in Myers Lake in the 1980's | GL |
| Bluebreast darter | *Etheostoma camurum* | Fish | Medium to large streams and rivers | ST | | Statewide | OH | Found in the Ohio River drainage basin | GL |
| Brook trout | *Salvelinus fontinalis* | Fish | Inland waters and small spring-fed streams | ST | | Ashtabula* | OH | Originally the last small population existed here; ten breeding populations currently exist in northeast Ohio | GL |
| Channel darter | *Percina copelandi* | Fish | Large course sand or fine gravel bars within large rivers, along the shores of Lake Erie | ST | | Statewide | OH | Small remnant populations may occur in the Lake Erie drainage | GL |
| Cisco | *Coregonus artedi* | Fish | Fresh water | SE | | Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa | OH | Lake Erie areas | GL |
| Goldeye | *Hiodon alosoides* | Fish | Large rivers; tolerate turbid conditions | SE | | Statewide | OH | | GL |
| Greater redhorse | *Moxostoma valenciennesi* | Fish | Pools with clean sand or gravel substrate | ST | | Statewide | OH | Mainly in the Lake Erie basin in northern Ohio | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Lake chubsucker | *Erimyzon sucetta* | Fish | Natural lakes, very sluggish streams, or marshes with dense aquatic vegetation and clear waters | ST | | Holmes*, Portage, Wayne, Williams | OH | Confirmed in lakes and marshes of these counties; may occur in natural lakes and potholes in northern counties | GL |
| Lake sturgeon | *Acipenser fulvescens* | Fish | Bottoms of lakes and large rivers | SE | | Statewide | OH | Mainly in Lake Erie; not found in the Ohio River since 1971 | GL |
| Longnose sucker | *Catostomus catostomus* | Fish | Lake Erie | SE | | Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa | OH | | GL |
| Mountain brook lamprey | *Ichthyomyzon greeleyi* | Fish | Freshwater streams and rivers | SE | | Statewide | OH | | GL |
| Mountain madtom | *Noturus eleutherus* | Fish | Deep, swift riffles of large rivers | SE | | Statewide | OH | Tributaries of the Walhonding River | GL |
| Northern brook lamprey | *Ichthyomyzon fossor* | Fish | Clear gravel riffles and runs of small rivers | SE | | Statewide | OH | | GL |
| Pugnose minnow | *Opsopoeodus emiliae* | Fish | Clear water with aquatic vegetation | SE | | Statewide | OH | Mainly in the Lake Erie areas and northwest Ohio | GL |
| River darter | *Percina shumardi* | Fish | Gravel or rocky bottoms in depths of large rivers of 3 ft. or more | ST | | Statewide | OH | Mainly found in the southern half of Ohio around the Ohio River, but has appeared in the western Lake Erie tributaries | GL |
| Spotted gar | *Lepisosteus oculatus* | Fish | Clear waters with large amounts of vegetation | SE | | Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa | OH | Mainly found in Lake Erie | GL |
| Tippecanoe darter | *Etheostoma tippecanoe* | Fish | Medium to large streams and rivers | ST | | Statewide | OH | Found in the Ohio River drainage basin | GL |
| Western banded killifish | *Fundulus diaphanus menona* | Fish | Rooted aquatic vegetation with clear water | SE | | Sandusky, Wood | OH | | GL |
| American emerald | *Cordulia shurtleffi* | Insect | Ponds and boggy lakes | SE | | Geauga, Portage | OH | | GL |
| Brush-tipped emerald | *Somatochlora walshii* | Insect | Open swamps and bogs | SE | | Ashtabula, Portage | OH | | GL |
| Caddisfly | *Psilotreta indecisa* | Insect | Cool, running-water streams | ST | | Statewide | OH | | GL |
| Caddisfly | *Hydroptila albicornis* | Insect | Cool, running-water streams | ST | | Statewide | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Caddisfly | *Hydroptila artesa* | Insect | Cool, running-water streams | ST | | Statewide | OH | | GL |
| Caddisfly | *Hydroptila koryaki* | Insect | Cool, running-water streams | ST | | Statewide | OH | | GL |
| Caddisfly | *Hydroptila talledaga* | Insect | Cool, running-water streams | ST | | Statewide | OH | | GL |
| Caddisfly | *Hydroptila valhalla* | Insect | Cool, running-water streams | ST | | Statewide | OH | | GL |
| Caddisfly | *Chimarra socia* | Insect | Cool to warm streams; permanent lakes and marshes; and permanent and temporary ponds | SE | | Statewide | OH | | GL |
| Caddisfly | *Oecetis eddlestoni* | Insect | Cool to warm streams; permanent lakes and marshes; and permanent and temporary ponds | SE | | Statewide | OH | | GL |
| Caddisfly | *Brachycentrus numerosus* | Insect | Cool to warm streams; permanent lakes and marshes; and permanent and temporary ponds | SE | | Statewide | OH | | GL |
| Canada darner | *Aeshna canadensis* | Insect | Wooded lakes and ponds with abundant vegetation | SE | | Cuyahoga, Defiance, Lucas, Williams | OH | | GL |
| Chalk-fronted corporal | *Ladona julia* | Insect | Ponds, swamps, marshes, lakes, and bogs | SE | | Portage, Summit, Williams | OH | | GL |
| Elfin skimmer | *Nannothemis bella* | Insect | Bogs and fens | SE | | Summit | OH | | GL |
| Frosted elfin | *Incisalia irus* | Insect | Oak savannas with blue lupine | SE | | Lucas | OH | | GL |
| Frosted whiteface | *Leucorrhinia frigida* | Insect | Vegetated ponds and lakes | SE | | Geauga, Portage | OH | | GL |
| Grizzled skipper | *Pyrgus cantaureae wyandot* | Insect | Mature oak forests | SE | | Cuyahoga | OH | | GL |
| Hairy-necked tiger beetle | *Cicindela hirticollis* | Insect | Sand bars | ST | | Statewide | OH | Most likely found along sand bars and sandy beaches | GL |
| Hebard's noctuid moth | *Erythroecia hebardi* | Insect | Wetlands, grasslands, forests | SE | | Statewide | OH | | GL |
| Karner blue butterfly | *Lycaeides melissa samuelis* | Insect | Wild lupine plant range | SE | FE | Lucas | OH | | GL |
| Kramer's cave beetle | *Pseudanophthalmus krameri* | Insect | Limestone caves | SE | | Statewide | OH | | GL |
| Lily-pad forktail | *Ischnura kellicotti* | Insect | Lakes and ponds with lily pads | SE | | Williams | OH | | GL |
| Mayfly | *Rhithrogena pellucida* | Insect | Well-oxygenated clear and clean water | SE | | Statewide | OH | | GL |
| Midge | *Rheopelopia acra* | Insect | Bottom muds of lakes and ponds as larvae; similar habitats to mosquitoes as adults | SE | | Statewide | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Midge | *Bethbilbeckia floridensis* | Insect | Bottom muds of lakes and ponds as larvae; similar habitats to mosquitoes as adults | ST | | Statewide | OH | | GL |
| Midge | *Apsectrotanypus johnsoni* | Insect | Bottom muds of lakes and ponds as larvae; similar habitats to mosquitoes as adults | ST | | Statewide | OH | | GL |
| Midge | *Radotanypus florens* | Insect | Bottom muds of lakes and ponds as larvae; similar habitats to mosquitoes as adults | ST | | Statewide | OH | | GL |
| Moth | *Spartiniphaga inops* | Insect | Wetlands, grasslands | SE | | Statewide | OH | | GL |
| Moth | *Hypocoena enervata* | Insect | Wetlands, grasslands | SE | | Statewide | OH | | GL |
| Moth | *Papaipema silphii* | Insect | Wetlands, grasslands | SE | | Statewide | OH | | GL |
| Moth | *Papaipema beeriana* | Insect | Wetlands, grasslands | SE | | Statewide | OH | | GL |
| Moth | *Lithophane semiusta* | Insect | Wetlands, grasslands | SE | | Statewide | OH | | GL |
| Moth | *Trichoclea artesta* | Insect | Wetlands, grasslands | SE | | Statewide | OH | | GL |
| Moth | *Tricholita notata* | Insect | Wetlands, grasslands | SE | | Statewide | OH | | GL |
| Moth | *Melanchra assimilis* | Insect | Wetlands, grasslands | SE | | Statewide | OH | | GL |
| Moth | *Ufeus plicatus* | Insect | Wetlands, grasslands | SE | | Statewide | OH | | GL |
| Moth | *Ufeus satyricus* | Insect | Wetlands, grasslands | SE | | Statewide | OH | | GL |
| Moth | *Spartiniphaga panatela* | Insect | Wetlands, grasslands | ST | | Statewide | OH | | GL |
| Moth | *Fagitana littera* | Insect | Wetlands, grasslands | ST | | Statewide | OH | | GL |
| Mottled darner | *Aeshna clepsydra* | Insect | Marshes and bogs with open water, lakes, and bays | SE | | Lorain, Williams | OH | | GL |
| Ohio cave beetle | *Pseudanophthalmus ohioensis* | Insect | Limestone caves | SE | | Statewide | OH | | GL |
| Persius duskywing | *Erynnis persius* | Insect | Oak savannas with blue lupine | SE | | Lucas | OH | | GL |
| Plains clubtail | *Gomphus externus* | Insect | Large, slow, muddy streams and rivers | SE | | Paulding | OH | | GL |
| Pointed swallow | *Epiglaea apiata* | Insect | Woodlots, forests | SE | | Statewide | OH | | GL |
| Purplish copper | *Lycaena helloides* | Insect | Disturbed moist areas | SE | | Delaware, Fulton, Lucas, Marrow, Williams, Wyandot | OH | | GL |
| Racket-tailed emerald | *Dorocordulia libera* | Insect | Ponds, lake coves, bogs, and bog-edged streams | SE | | Geauga, Summit | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Regal fritillary | *Speyeria idalia* | Insect | Tall-grass prairies, damp meadows, marshes, wet fields | SE | | Ashland, Ashtabula, Carroll, Columbia, Coshocton, Crawford, Cuyahoga, Defiance, Erie, Holmes, Lorain, Mahoning, Marion, Medina, Paulding, Portage, Richland, Stark, Summit, Tuscarawas, Wayne, Williams | OH | | GL |
| River jewelwing | *Calopteryx aequabilis* | Insect | Medium rivers and streams | SE | | Geauga, Portage, Summit, Williams | OH | | GL |
| Seepage dancer | *Argia bipunctulata* | Insect | Wooded grassy seeps and boggy areas | SE | | Stark | OH | | GL |
| Silver-bordered fritillary | *Boloria selene* | Insect | Wet meadows, bogs, and marshes | ST | | Ashtabula, Carroll, Columbiana, Fulton, Huron, Knox, Lucas, Medina, Paulding, Portage, Stark, Trumbull, Wayne, Williams | OH | | GL |
| Swamp metalmark | *Calephelis muticum* | Insect | Bogs, marshes, swamps, and wet meadows | SE | | Seneca | OH | | GL |
| The pink-streak | *Faronta rubripennis* | Insect | Wetlands, grasslands | ST | | Statewide | OH | | GL |
| Wayward nymph | *Catocala antinympha* | Insect | Acid-soil habitats along coasts; rare, but occurs in inland areas | ST | | Statewide | OH | | GL |
| Mitchell's satyr | *Neonympha mitchellii* | Insect | Sedge swamps, marshes | SE | FE | Portage | OH | | GL |
| Elegant sunburst lichen | *Xanthoria elegans* | Lichen | Exposed to somewhat sheltered sites on rocks | SE | | Erie, Ottawa | OH | | GL |
| Lea's shadow lichen | *Phaeophyscia leana* | Lichen | Coastal wet areas | SE | | Statewide | OH | | GL |
| Bobcat | *Lynx rufus* | Mammal | Upland forests | SE | | Statewide | OH | Was extirpated; maybe returning | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Indiana bat | *Myotis sodalis* | Mammal | Wooded areas; caves for hibernation | SE | FE | Allen, Ashland, Carroll, Coshocton, Crawford, Cuyahoga, Defiance, Eire, Fulton, Hancock, Hardin, Henry, Holmes, Huron, Knox, Lorain, Lucas, Marion, Medina, Morrow, Ottawa, Paulding, Richland, Sandusky, Seneca, Summit, Tuscarawas, Williams, Wood, Wyandot | OH | | GL |
| Snowshoe hare | *Lepus americanus* | Mammal | Forested areas with dense, woody undergrowth | SE | | Ashtabula | OH | | GL |
| Black sandshell | *Ligumia recta* | Mollusk | Medium to large rivers in riffles over gravel or sand | ST | | Statewide | OH | | GL |
| Butterfly | *Ellipsaria lineolata* | Mollusk | Large sandy or gravelly rivers | SE | | Statewide | OH | | GL |
| Clubshell | *Pleurobema clava* | Mollusk | Sand and gravel river bottoms | SE | FE | Ashtabula, Coshocton, Defiance, Hancock, Hardin, Tuscarawas, Trumbull, Williams | OH | | GL |
| Eastern pondmussel | *Ligumia nasuta* | Mollusk | Quiet water in estuaries, canals, lakes, or slow streams | SE | | Statewide | OH | Confirmed collection in Ottawa County and around Lake Erie | GL |
| Ebonyshell | *Fusconaia ebena* | Mollusk | Large sandy or gravelly rivers | SE | | Statewide | OH | | GL |
| Elephant-ear | *Elliptio crassidens crassidens* | Mollusk | Large, muddy, sandy, or fine gravelly rivers | SE | | Statewide | OH | | GL |
| Fanshell | *Cyprogenia stegaria* | Mollusk | Deep, sandy, large river bottoms | SE | FE | Coshocton | OH | | GL |
| Long-solid | *Fusconaia maculata maculata* | Mollusk | Large rivers in gravel | SE | | Statewide | OH | | GL |
| Monkeyface | *Quadrula metanevra* | Mollusk | Medium to large rivers in gravel or mixed sand and gravel | SE | | Statewide | OH | Distribution reaches into the northeastern corner of Ohio | GL |
| Northern riffleshell | *Epioblasma torulosa rangiana* | Mollusk | Sand and gravel river bottoms | SE | FE | Defiance, Williams | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Ohio pigtoe | *Pleurobema cordatum* | Mollusk | Large rivers in sand or gravel with moderate flow | SE | | Statewide | OH | Most commonly found around Ohio river, but has been found in the state's northeast on the border of Ohio and Pennsylvania | GL |
| Pyramid pigtoe | *Pleurobema rubrum* | Mollusk | Medium to large rivers with sand, gravel, and a good current | SE | | Statewide | OH | Most commonly found around the Ohio River and its tributaries, but has been found in the northeastern corner of Ohio | GL |
| Rabbitsfoot | *Quadrula cylindrica* | Mollusk | Medium to large rivers in mixed sand and gravel | SE | FC | Statewide | OH | Mainly found in the southern half of Ohio but does extend into the northern half | GL |
| Rayed bean | *Villosa fabalis* | Mollusk | Lakes and small to large streams in sand or gravel | SE | FE* | Statewide | OH | Mainly occurs in the southern half of the state, but does extend into the central portion of the state; Proposed for federal listing | GL |
| Sharp-ridged pocketbook | *Lampsilis ovata* | Mollusk | Large rivers with course sand and gravel | SE | | Statewide | OH | | GL |
| Sheepnose | *Plethobasus cyphyus* | Mollusk | Medium to large rivers with sand and gravel | SE | FE* | Statewide | OH | Proposed for federal listing | GL |
| Snuffbox | *Epioblasma triquetra* | Mollusk | Sand, gravel, cobble substrates in small to medium-sized rivers | SE | FE* | Statewide | OH | Confirmed collection in northeastern Ohio near Lake Erie; proposed for federal listing | GL |
| White catspaw | *Epioblasma obliquata perobliqua* | Mollusk | Little is known of their required habitat | SE | FE | Defiance, Williams | OH | | GL |
| Yellow sandshell | *Lampsilis teres* | Mollusk | Fine sediments in large rivers, can be found in slow moving currents | SE | | Statewide | OH | | GL |
| American beach grass | *Ammophila breviligulata* | Plant | Beaches, dunes along Lake Erie | ST | | Ashtabula, Cuyahoga, Erie, Lake, Lucas, Ottawa | OH | | GL |
| American cuckoo-flower | *Cardamine pratensis* var. *palustris* | Plant | Bogs, fens and swamps | SE | | Summit | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| American reed grass | *Phragmites australis* ssp. *americanus* | Plant | Moist areas along river banks and lake margins | ST | | Statewide | OH | | GL |
| American water-milfoil | *Myriophyllum sibiricum* | Plant | Ponds, lakes, quiet streams | ST | | Ashtabula, Erie, Geauga, Holmes, Lorain, Ottawa, Portage, Stark, Williams | OH | | GL |
| Appalachian quillwort | *Isoetes engelmannii* | Plant | Shallow bodies of water; pond margins, ditches | SE | | Mahoning, Portage, Trumbull | OH | | GL |
| Ashy sunflower | *Helianthus mollis* | Plant | Dry prairies, railroad embankments, roadsides, woods borders, clearings | ST | | Ashtabula, Erie, Lake, Wyandot | OH | | GL |
| Atlantic blue-eyed-grass | *Sisyrinchium atlanticum* | Plant | Damp to dry meadows, fields, swales, marshes, low open woods | SE | | Lucas, Stark | OH | | GL |
| Awned dichelyma moss | *Dibaeis absoluta* | Plant | Streams, lakes, boggy depressions | ST | | Statewide | OH | | GL |
| Balsam popular | *Populus balsamifera* | Plant | Wet woods, riverbanks, sandbars, bog and swamp margins, shores | SE | | Ashtabula, Geauga, Lucas, Ottawa | OH | | GL |
| Balsam squaw-weed | *Packera paupercula* | Plant | Cliffs, quarries, rocky shores near Lake Erie | ST | | Erie, Geauga, Ottawa | OH | | GL |
| Bartley's reed grass | *Calamintha arkansana* | Plant | old limestone quarries, fields, and rock exposures | ST | | Erie, Delaware, Fulton, Ottawa | OH | | GL |
| Bayberry | *Myrica pensylvanica* | Plant | Beaches, alkaline fens | SE | | Ashtabula, Portage, Summit | OH | | GL |
| Beach wormwood | *Artemisia campestris* | Plant | Dry, sandy coastal dunes and prairies | ST | | Ashtabula, Cuyahoga, Erie, Lucas, Ottawa | OH | | GL |
| Bearded wheat grass | *Elymus trachycaulus* | Plant | Dry to very boggy areas | ST | | Ashtabula, Cuyahoga, Geauga, Henry, Holmes, Lucas, Marion, Portage, Summit | OH | | GL |
| Bicknell's crane's-bill | *Geranium bicknellii* | Plant | Open woods, clearings, disturbed sites | SE | | Ashtabula, Erie, Lorain, Lucas | OH | | GL |
| Bicknell's panic-grass | *Panicum bicknellii* | Plant | Dry woods, thickets, openings | ST | | Columbiana, Lucas, Lorain | OH | | GL |
| Bicknell's sedge | *Carex bicknellii* | Plant | prairies, sandy knolls, sand dunes | ST | | Crawford, Erie, Lucas, Wood | OH | | GL |
| Bird-foot violet | *Viola pedata* | Plant | Open woods, fields, prairie remnants, along paths, roadsides; especially on road cuts through shales, sandstones | ST | | Carroll, Fulton, Henry, Lucas, Lorain | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Blue false indigo | *Baptisia australis* | Plant | Open areas of rocky, gravelly, or sandy soils | SE | | Lake | OH | | GL |
| Bluebead-lily | *Clintonia borealis* | Plant | wet woods and thickets; hemlock and tamarack woods, alder thickets, hummocks in swamp woods | SE | | Ashtabula | OH | | GL |
| Bluehearts | *Buchnera americana* | Plant | Sandy or gravelly soils of upland woods and prairies | ST | | Lucas, Fulton | OH | | GL |
| Bog bedstraw | *Galium labradoricum* | Plant | Open areas of sphagnum bogs, fens, and arbor vitae swamps | ST | | Columbiana, Geauga, Portage, Stark | OH | | GL |
| Bog willow | *Salix pedicellaris* | Plant | Neutral bogs, sedge meadows, willow thickets at the edge of wet meadows | SE | | Ashland, Ashtabula, Huron, Portage, Stark, Summit, Wayne, Williams | OH | | GL |
| Bowman's-root | *Porteranthus trifoliatus* | Plant | Dry or moist upland woods and clearings, wooded cliffs, slopes, roadbanks | ST | | Carroll, Columbiana, Lake, Mahoning, Trumbull | OH | | GL |
| Bristly sarsaparilla | *Aralia hispida* | Plant | Clearings, rocky woods, tops of cliffs, sand dunes, recently-burned areas, even freshly bulldozed areas | SE | | Ashtabula, Cuyahoga, Geauga, Lake, Wayne | OH | | GL |
| Bristly smartweed | *Persicaria setacea* | Plant | Open shores of natural lakes; less frequently in swamp forests | SE | | Ashtabula, Geauga, Portage | OH | | GL |
| Brownish sedge | *Carex brunnescens* | Plant | Shrub borders of bogs, swamp woods, seepages | SE | | Lake, Trumbull | OH | | GL |
| Buckbean | *Menyanthes trifoliata* | Plant | Bogs, quarries, shallow water, pond margins; outer edges of floating sphagnum mats | ST | | Ashland, Ashtabula, Geauga, Huron, Lake, Lorain, Portage, Richland, Stark, Summit | OH | | GL |
| Buffalo clover | *Trifolium reflexum* | Plant | Rocky open woods, prairies | SE | | Ashtabula, Delaware, Lucas, Lake, Ottawa | OH | | GL |
| Bug-on-a-stick | *Buxbaumia aphylla* | Plant | Decaying wood, rock outcrops, or directly on the soil of disturbed areas | ST | | Statewide | OH | | GL |
| Bullhead lily | *Nuphar variegata* | Plant | Pond margins, slow streams, pools, marshes | SE | | Erie, Lucas, Ottawa, Summit | OH | | GL |
| Bunchberry | *Cornus canadensis* | Plant | Moist acidic woods and bogs | SE | | Ashtabula, Cuyahoga, Geauga, Lake, Portage, Stark, Summit, Williams | OH | | GL |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Bunchflower | *Melanthium virginicum* | Plant | Wet woods, low thickets, meadows, swales, savannas | ST | | Portage, Richland, Summit, Wayne | OH | | GL |
| Bush’s sedge | *Carex bushii* | Plant | Moist prairies, fields, meadows | ST | | Medina, Summit | OH | | GL |
| Bushy aster | *Symphyotrichum dumosum* | Plant | Wet meadows, scrubby fields, thickets | ST | | Columbiana, Erie, Henry, Lake, Lorain, Lucas, Ottawa | OH | | GL |
| Bushy cinquefoil | *Potentilla paradoxa* | Plant | Riverbanks, lake and pond shores, sandbars, low fields | ST | | Ashtabula, Erie, Lake, Lucas, Ottawa | OH | | GL |
| Canada frostweed | *Helianthemum canadense* | Plant | Open upland woods, dunes, clearings, railroad embankments, sandy riverbanks | ST | | Ashtabula, Erie, Henry, Lucas, Portage, Richland, Summit, Williams, Wood | OH | | GL |
| Canada hawkweed | *Hieracium umbellatum* | Plant | Open oak woods, beaches, dunes, sandy fields; rarely in prairie remnants | ST | | Ashtabula, Cuyahoga, Erie, Ottawa, Sandusky, Wood | OH | | GL |
| Canada plum | *Prunus nigra* | Plant | Thickets, stream-banks, woodland borders | SE | | Geauga, Fulton, Lucas, Wood | OH | | GL |
| Canadian St. John's-wort | *Hypericum canadense* | Plant | Borders of swamps, lakeshores, wet meadows | SE | | Ashtabula, Erie, Lake, Lucas, Summit | OH | | GL |
| Caribbean spike-rush | *Eleocharis geniculata* | Plant | Shores, mudflats, temporary ponds in limestone quarries | SE | | Erie, Ottawa | OH | | GL |
| Carolina catchfly | *Silene caroliniana* ssp. *pensylvanica* | Plant | Dry open woods, gravelly, rocky or shaley banks, clearings | ST | | Columbiana, Lake, Summit | OH | | GL |
| Carolina whitlow-grass | *Draba reptans* | Plant | fields, pastures, open woods, roadsides, and waste ground | ST | | Erie, Lucas, Ottawa | OH | | GL |
| Chalky ramalina | *Ramalina pollinaria* | Plant | Sandstone, cliff face or boulders below a cliff | ST | | Cuyahoga | OH | | GL |
| Cleland's evening-primrose | *Oenothera clelandii* | Plant | Upland sand prairies, sandy hill prairies, sand dunes, upland sandy savannas, abandoned sandy fields, areas along sandy paths, and areas along railroads | SE | | Statewide | OH | | GL |
| Clinton's wood fern | *Dryopteris clintoniana* | Plant | Swamp woods | SE | | Ashtabula, Geauga, Lake, Lorain, Mahoning, Portage, Wayne | OH | | GL |
| Coarse smartweed | *Persicaria robustior* | Plant | Margins of streams, lakes, ponds | ST | | Ashtabula, Geauga, Lake, Summit, Trumbull | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Coastal little bluestem | *Schizachyrium littorale* | Plant | Beaches, sand dunes | SE | | Ashtabula, Erie, Lake | OH | | GL |
| Common oak fern | *Gymnocarpium dryopteris* | Plant | Mesic woods and slopes | SE | | Ashtabula, Columbiana, Erie, Lake, Loraine, Mahoning, Portage, Wayne | OH | | GL |
| Commons' panic-grass | *Panicum commonsianum* | Plant | Dry, open prairies, sparsely vegetated sand barrens | SE | | Erie, Lucas | OH | | GL |
| Compass-plant | *Silphium laciniatum* | Plant | Pastures, dry prairies, railroad embankments | SE | | Erie, Summit | OH | | GL |
| Cooper's milk-vetch | *Astragalus neglectus* | Plant | Lakeshores, stream banks, cool ravines and some limestone cliff ledges, limestone barrens, in savannas overlying limestone bedrock, or on steep, eroding shale slopes | SE | | Ashtabula, Cuyahoga, Geauga, Lake, Lorain | OH | | GL |
| Coppery St. John's-wort | *Hypericum denticulatum* | Plant | Low woods, bogs, marshes | SE | | Ashland | OH | | GL |
| Cow-wheat | *Melampyrum lineare* | Plant | Dry to moist, slightly acid soil along riverbanks, rocky oak woods and on their margins | ST | | Ashtabula, Cuyahoga, Geauga, Henry, Lake, Lorain, Lucas, Summit | OH | | GL |
| Cross-leaved milkwort | *Polygala cruciata* | Plant | Open to semi-open areas in damp or wet, sandy or peaty soil | SE | | Lucas, Wood | OH | | GL |
| Curved tortella | *Tortella inclinata* | Plant | Alvars , sandy openings | SE | | Ottawa | OH | Marblehead Peninsula | GL |
| Cuspidate dodder | *Cuscuta cuspidata* | Plant | Growing on Aster species and other hosts in openings on creeks and streams | SE | | Paulding | OH | | GL |
| Diffuse rush | *Juncus diffusissimus* | Plant | Shallow water and shores of ponds, ditches, quiet streams | ST | | Erie, Knox, Lucas | OH | | GL |
| Dotted horsemint | *Monarda punctata* | Plant | Dry, sandy soils in open to semi-open areas | SE | | Cuyahoga, Fulton, Lucas, Wood | OH | | GL |
| Dotted ramalina | *Ramalina farinacea* | Plant | Bark or weathered wood, open woods | SE | | Cuyahoga, Erie | OH | | GL |
| Downy carrion-flower | *Smilax pulverulenta* | Plant | Open woods, thickets, roadsides | SE | | Columbiana, Erie, Hardin, Huron, Lorain, Lucas, Ottawa, Union, Wood | OH | | GL |
| Downy white beard-tongue | *Penstemon pallidus* | Plant | Fields, roadsides, open woods | ST | | Fulton | OH | | GL |
| Dragon's-mouth | *Arethusa bulbosa* | Plant | sphagnum bogs, wettest parts | SE | | Lorain, Portage | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Drooping wood sedge | *Carex arctata* | Plant | Dry to moist, open woods and the tops of rock ledges | SE | | Erie, Geauga, Hancock, Portage, Summit | OH | | GL |
| Drummond's dwarf bullrush | *Lipocarpha drummondii* | Plant | Flat, sparsely vegetated lacustrine sand plain influenced by a high water table | SE | | Lucas, Henry | OH | | GL |
| Drummond's aster | *Symphyotrichum drummondii* | Plant | Prairies, open woods, woods edges, thickets; roadsides | ST | | Delaware, Lucas, Stark, Mahoning, Portage, Tuscarawas, Wayne | OH | | GL |
| Drummond's rock cress | *Arabis drummondii* | Plant | Moist to dry, open to semi-open areas that include rocky open woods, dry ledges and cliffs, sandy or rocky riverbanks, open fields, and sand dunes | SE | | Lucas, Lorain, Ottawa | OH | Mainly on Lake Erie islands | GL |
| Dusty goldenrod | *Solidago puberula* | Plant | Rocky woods, sand barrens, prairies | SE | | Cuyahoga | OH | | GL |
| Dwarf bulrush | *Lipocarpha micrantha* | Plant | Fields, sand pits, lake margins, ditches | ST | | Ashtabula, Erie, Henry, Lake, Lucas | OH | | GL |
| Dwarf dandelion | *Krigia virginica* | Plant | Open woods, prairie remnants, dunes, meadows, fallow fields | ST | | Fulton, Henry, Lorain, Lucas | OH | | GL |
| Ear-leaved-foxglove | *Agalinis auriculata* | Plant | Mesic prairies, dry fields, open woodlands; often associated with disturbance | SE | | Ottawa | OH | | GL |
| Early buttercup | *Ranunculus fascicularis* | Plant | Prairies, pastures, and dry, open woods; calcareous rock outcrops | ST | | Carroll, Columbiana, Erie, Lake, Ottawa | OH | | GL |
| Early coral-root | *Corallorhiza trifida* | Plant | Coniferous woods, shrub borders of bogs, and damp thickets | SE | | Ashtabula, Cuyahoga, Geauga, Portage, Summit | OH | | GL |
| Early panic-grass | *Panicum praecocius* | Plant | Dry open prairies, fields, sand barrens | SE | | Lucas | OH | | GL |
| Eastern prairie fringed orchid | *Platanthera leucophaea* | Plant | Mesic prairies and wetlands | | FT | Holmes, Lucas, Ottawa, Sandusky, Wayne | OH | | GL |
| Elliott's bent grass | *Agrostis elliottiana* | Plant | Dry, open waste areas, sterile soil, fields | SE | | Cuyahoga | OH | | GL |
| Elliptic-leaved arrowhead | *Sagittaria platyphylla* | Plant | Emergent in streams, lakes | SE | | Huron | OH | | GL |
| Engelmann's spike-rush | *Eleocharis engelmannii* | Plant | Mudflats along margins of ponds and lakes | SE | | Lucas, Seneca | OH | | GL |
| False arrow-feather | *Aristida necopina* | Plant | Oak openings | SE | | Lucas | OH | | GL |
| False garlic | *Nothoscordum bivalve* | Plant | Disturbed areas, open slopes, roadsides, prairies, and open woodlands | ST | | Statewide | OH | | GL |
| False melic | *Schizachne purpurascens* | Plant | Woodlands, sandy or rocky openings | ST | | Portage, Sandusky | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Fernald’s sedge | *Carex merritt-fernaldii* | Plant | Borders of woods; open, dry meadows and sandy hillsides | SE | | Lucas | OH | | GL |
| Few-flowered spikerush | *Eleocharis quinqueflora* | Plant | Fens, wet prairies, sedge meadows | ST | | Seneca, Williams | OH | | GL |
| Few-flowered St. John's-wort | *Hypericum ellipticum* | Plant | Swamps, lake margins, beaver ponds, meadows, bogs | ST | | Ashtabula, Lake | OH | | GL |
| Few-seeded sedge | *Carex oligosperma* | Plant | Peat bogs, marshes, bog lakes | ST | | Defiance, Portage, Stark, Summit | OH | | GL |
| Field sedge | *Carex conoidea* | Plant | Fens, wet prairies, meadows, borders | ST | | Erie, Fulton, Henry, Lucas, Lake, Stark, Wood | OH | | GL |
| Filmy fissidens | *Fissidens hyalinus* | Plant | Cool, moist sheltered forest ravines | SE | | Lake | OH | | GL |
| Fire sedge | *Carex lucorum* | Plant | Open, sandy fields and woods | SE | | Lucas | OH | | GL |
| Fireweed | *Epilobium angustifolium* | Plant | Man-made clearings, roadsides, logged and burnt-over areas; lakes, marshes; occasionally sandy soils in open woods and woods borders | SE | | Ashtabula, Carroll, Coshocton, Columbiana, Crawford, Cuyahoga, Defiance, Erie, Fulton, Knox, Lake, Lorain, Medina, Ottawa, Portage, Stark, Summit, Trumbull, Wayne, Williams | OH | | GL |
| Five-angled dodder | *Cuscuta pentagona* | Plant | Variety of dry areas | ST | | Ashtabula, Cuyahoga, Erie, Mahoning, Marion, Wayne, Wood | OH | | GL |
| Flat-leaved bladderwort | *Utricularia intermedia* | Plant | Bogs and fens; floating or rooted in mud in quiet, shallow waters | ST | | Lake, Portage, Stark, Summit, Wayne, Williams | OH | | GL |
| Flat-leaved rush | *Juncus platyphyllus* | Plant | Lakeshores, streambanks, mud flats, floodplains, wet meadows, roadsides, gravelly banks | SE | | Cuyahoga, Erie, Geauga, Mahoning, Portage, Stark | OH | | GL |
| Flat-stemmed pondweed | *Potamogeton zosteriformis* | Plant | Shallow to deep waters of lakes, rivers, creeks, wet swales | ST | | Geauga, Ottawa, Portage, Stark, Summit, Williams | OH | | GL |
| Fuzzy hypnum moss | *Tomentypnum nitens* | Plant | Sedge meadows in weakly and minerotrophic peatlands | SE | | Portage | OH | | GL |
| Garber's sedge | *Carex garberi* | Plant | Limestone exposures, quarries, seepages, beach pools, interdunal swales | SE | | Ashtabula, Erie, Ottawa | OH | | GL |

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|---|---|---|---|---|---|---|---|---|---|
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| Gattinger's-foxglove | *Agalinis gattingeri* | Plant | Moist to dry, open to semi-open habitats | ST | | Lucas, Delaware | OH | | GL |
| Gaywings | *Polygala paucifolia* | Plant | Mesic, deciduous, or coniferous woods | SE | | Lucas | OH | | GL |
| Glomerate dodder | *Cuscuta glomerata* | Plant | Prairies and fens | ST | | Wyandot | OH | | GL |
| Golden-knees | *Chrysogonum virginianum* | Plant | Rich woods, shaded rocks | ST | | Summit | OH | | GL |
| Grass-leaf arrowhead | *Sagittaria graminea* | Plant | Shallow water of ponds, marshes, ditches, and on their wet shores | SE | | Cuyahoga, Media, Ottawa, Lucas, Portage, Wyandot | OH | | GL |
| Grass-like pondweed | *Potamogeton gramineus* | Plant | Deep or shallow waters of lakes, ponds, streams | SE | | Lucas, Seneca, Summit | OH | | GL |
| Grass-pink | *Calopogon tuberosus* | Plant | Open wet areas with constant water supply; sphagnum bogs, wet prairies, fens, road ditches, and sandy seepages | ST | | Ashtabula, Cuyahoga, Erie, Fulton, Geauga, Henry, Holmes, Huron, Lake, Lorain, Lucas, Portage, Stark, Summit | OH | | GL |
| Great Lakes goldenrod | *Euthamia remota* | Plant | prairie remnants, openings, and open woods | ST | | Erie, Henry, Lake, Lucas | OH | | GL |
| Green spike-rush | *Eleocharis flavescens* | Plant | Shores, pond margins, bog mats, fields | ST | | Cuyahoga, Erie, Geauga, Ottawa, Portage, Stark, Summit, Williams | OH | | GL |
| Green water-milfoil | *Myriophyllum verticillatum* | Plant | Shallow waters of acid to circumneutral lakes | SE | | Ottawa, Summit | OH | | GL |
| Greene's rush | *Juncus greenei* | Plant | Shores, swales, fields, clearings, dunes, interdunal depressions; along railroads, roadsides | ST | | Fulton, Lucas, Marion, Wood | OH | | GL |
| Green-flowered wintergreen | *Pyrola chlorantha* | Plant | Dry woods | SE | | Lucas | OH | | GL |
| Ground juniper | *Juniperus communis* | Plant | Sandy shores, dunes, gravelly banks, oak-hickory woods, pastures, old fields | SE | | Cuyahoga, Erie, Geauga, Lorain, Lucas, Portage, Summit | OH | | GL |
| Hairy tall lettuce | *Lactuca hirsuta* | Plant | Dry open woods, woodland clearings, fields | SE | | Lake | OH | | GL |
| Hairy tick-trefoil | *Desmodium glabellum* | Plant | Dry woods and borders | SE | | Statewide | OH | | GL |

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| Harebell | *Campanula rotundifolia* | Plant | Shaded, moist limestone cliffs and rocky shores | ST | | Ottawa, Lorain, Paulding, Seneca, Summit | OH | | GL |
| Hay sedge | *Carex siccata* | Plant | Well-drained, open areas in sandy or rocky soil | SE | | Erie, Lucas | OH | | GL |
| Heart-leaf plantain | *Plantago cordata* | Plant | Basic rock or pebble substrates of clear, slow moving streams; mud-bottomed streams and in wooded floodplains | SE | | Erie, Lorain, Lucas | OH | | GL |
| Hill's pondweed | *Potamogeton hillii* | Plant | Cold, clear, slow-moving water in streams, ponds, and beaver ponds with muddy substrate | SE | | Ashtabula, Geauga | OH | | GL |
| Hoary mountain mint | *Pycnanthemum verticillatum* var. *pilosum* | Plant | Dry to moist woods, thickets, clearings | ST | | Carroll, Coshocton, Geauga, Ottawa, Stark | OH | | GL |
| Hobblebush | *Viburnum alnifolium* | Plant | Woods near swamps, stream banks, dense shaded hemlock woods, ravines | ST | | Ashland, Cuyahoga, Geauga, Lake, Portage, Summit | OH | | GL |
| Hooded ladies'-tresses | *Spiranthes romanzoffiana* | Plant | Alkaline fens, rich open woods, wet sands | SE | | Ashtabula, Erie, Geauga, Lake, Medina, Portage | OH | | GL |
| Horned bladderwort | *Utricularia cornuta* | Plant | Peaty, sandy or muddy shores of bogs | SE | | Portage, Summit | OH | | GL |
| Inland beach-pea | *Lathyrus japonicus* | Plant | Sandy beaches of Lake Erie | ST | | Ashtabula, Cuyahoga, Erie, Lake | OH | | GL |
| Inland rush | *Juncus interior* | Plant | Roadsides, prairies, meadows, fallow fields, clearings, upland woods | SE | | Cuyahoga, Defiance, Sandusky | OH | | GL |
| Junegrass | *Koeleria macrantha* | Plant | Prairies, open woods, sandy soil | SE | | Erie, Lucas, Ottawa | OH | | GL |
| Kalm's St. John's-wort | *Hypericum kalmianum* | Plant | Shores, swales, dunes, low prairies | ST | | Erie, Henry, Lucas, Ottawa | OH | | GL |
| Keeled bur-reed | *Sparganium androcladum* | Plant | Muddy or peaty shores, swamps, marshes, shallow water | ST | | Ashland, Erie, Geauga, Lake, Lorain, Summit | OH | | GL |
| Labrador-tea | *Ledum groenlandicum* | Plant | Peat bogs, wet shores | SE | | Ashtabula, Lake, Portage | OH | | GL |
| Lake cress | *Armoracia lacustris* | Plant | Shores of ponds, slow streams, and quiet waters | ST | | Paulding, Coshocton, Erie, Lorain, Lucas | OH | | GL |

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|---|---|---|---|---|---|---|---|---|---|
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| Lakeside daisy | *Hymenoxys herbacea* | Plant | Dry, rocky prairie grasslands | ST | FT | Erie, Ottawa | OH | Some authorities treat this species and *Tetraneuris herbacea* as synonyms | GL |
| Eastern fournerved daisy | *Tetraneuris herbacea* | Plant | Limestone and dolomite quarries and exposures; dry prairies | SE | | Ottawa | OH | Kelley's Island in Lake Erie in quarr, and Marblehead Peninsula | GL |
| Large sedge | *Carex gigantea* | Plant | Wetlands | SE | | Statewide | OH | Obligate wetland indicator | GL |
| Leafy blue flag | *Iris brevicaulis* | Plant | Swamps, swampy stream terraces, floodplains, borders of rich woods, shores | ST | | Erie, Henry, Ottawa, Paulding | OH | | GL |
| Leafy goldenrod | *Solidago squarrosa* | Plant | Rocky upland woods, thickets, clearings | ST | | Ashland, Ashtabula, Cuyahoga, Erie, Geauga, Holmes, Lake, Lorain, Summit | OH | | GL |
| Least grape-fern | *Botrychium simplex* | Plant | Weedy thickets, mesophytic woods | SE | | Ashtabula, Erie, Geauga, Lucas | OH | | GL |
| Least spike-rush | *Eleocharis parvula* | Plant | Wet sand, occasionally in brackish soils | SE | | Lake | OH | | GL |
| Least St. John's-wort | *Hypericum gymnanthum* | Plant | Moist to wet sandy, muddy or peaty low grounds | SE | | Cuyahoga, Erie | OH | | GL |
| Leathery grape-fern | *Botrychium multifidum* | Plant | Meadows and open woods | SE | | Ashtabula, Carroll, Columbiana, Cuyahoga, Erie, Fulton, Henry, Lorain, Lucas, Summit, Tuscarawas | OH | | GL |
| Leggett's pinweed | *Lechea pulchella* | Plant | Dry to moist sandy plains, shores, open woods | ST | | Henry, Lucas, Mahoning, Portage, Stark, Summit, Wayne, Wood | OH | | GL |
| Leiberg's panic-grass | *Panicum leibergii* | Plant | Dry to wet prairies, open woods, meadows; sometimes on railroad embankments | ST | | Marion, Wood | OH | | GL |
| Lesser bladderwort | *Utricularia minor* | Plant | Bogs and fens; floating or rooted in mud in quiet, shallow waters | ST | | Columbiana, Geauga, Portage, Summit, Williams | OH | | GL |
| Lesser panicled sedge | *Carex diandra* | Plant | Fens, wet prairies, meadows | ST | | Ashtabula, Clark, Erie, Geauga, Lake, Lorain, Portage, Summit, Williams | OH | | GL |

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| | | | | State | Fed. | | | | |
| Limestone adder's-tongue | *Ophioglossum engelmannii* | Plant | Open fields , pastures | SE | | Statewide | OH | | GL |
| Limestone rock cress | *Arabis divaricarpa* | Plant | Open to semi-open areas with sandy or gravelly soils | SE | | Erie, Lucas, Ottawa | OH | | GL |
| Lindheimer's panic-grass | *Panicum lindheimeri* | Plant | Open, moist, gravelly, often calcareous shores | ST | | Erie, Lucas | OH | | GL |
| Lined sedge | *Carex striatula* | Plant | Mesic woods | SE | | Portage, Trumbull | OH | | GL |
| Little prickly sedge | *Carex echinata* | Plant | Open sphagnum mats in bogs | SE | | Holmes, Lake, Lorain, Portage, Richland, Summit, Trumbull | OH | | GL |
| Log fern | *Dryopteris celsa* | Plant | Moist, shaded swamp forests and woodland seeps | SE | | Lake | OH | | GL |
| Long's sedge | *Carex longii* | Plant | Moist fields and ditches and in sand | SE | | Lucas, Portage | OH | | GL |
| Long-bearded hawkweed | *Hieracium longipilum* | Plant | Prairies, open woods, fallow fields | SE | | Fulton, Williams | OH | | GL |
| Long-bracted orchid | *Coeloglossum viride* | Plant | Mesic to wet woodlands, thickets, and shrub borders; rarely found in mature woodlands | SE | | Allen, Erie, Henry, Lucas, Lorain, Medina, Portage, Summit | OH | | GL |
| Long-panicled panic-grass | *Panicum perlongum* | Plant | Dry, open prairies, fields, sand barrens | SE | | Lucas | OH | | GL |
| Louisiana sedge | *Carex louisianica* | Plant | Swamp woods, shaded alluvial areas | SE | | Ashtabula, Cuyahoga | OH | | GL |
| Low spearwort | *Ranunculus pusillus* | Plant | Low wet ground, swamps, shallow pools | SE | | Ashtabula | OH | | GL |
| Lyre-leaved rock cress | *Arabis lyrata* | Plant | Sand dunes and rock outcroppings | SE | | Ashtabula, Columbiana, Delaware, Erie, Lake, Lucas, Wood | OH | | GL |
| Male fern | *Dryopteris filix-mas* | Plant | Moist, rich woods | SE | | Richland, Summit | OH | | GL |
| Marsh bedstraw | *Galium palustre* | Plant | Wet meadows, marshy stream banks | SE | | Ashtabula | OH | | GL |
| Marsh St. John's-wort | *Triadenum tubulosum* | Plant | Swamp woods, buttonbush swamps, thickets, streambanks | ST | | Trumbull | OH | | GL |
| Midland sedge | *Carex mesochorea* | Plant | Well drained openings and clearings | SE | | Erie, Summit | OH | | GL |
| Missouri ironweed | *Vernonia missurica* | Plant | Mesic prairies and grassy roadsides; oak openings region and in a remnant of big bluestem prairie along a railroad | SE | | Defiance, Erie, Fulton, Lucas, Wood | OH | | GL |
| Missouri rock cress | *Arabis missouriensis* | Plant | Open sand barrens | SE | | Lucas | OH | | GL |
| Mitchell's sedge | *Carex mitchelliana* | Plant | Seepage meadows | SE | | Ashtabula | OH | | GL |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Mountain bindweed | *Fallopia cilinodis* | Plant | Dry woods, thickets, rocky slopes, borders of woods, roadsides | SE | | Ashtabula, Portage, Summit | OH | | GL |
| Mountain phlox | *Phlox latifolia* | Plant | Open woods, thickets, occasionally alluvial meadows | SE | | Fulton, Henry, Lucas, Paulding, Williams | OH | | GL |
| Mountain-fringe | *Adlumia fungosa* | Plant | Well drained openings and clearings. Disturbed sites after logging and fires. | ST | | Ashland, Columbiana, Coshocton, Cuyahoga, Geauga, Lake, Lorain, Knox, Portage, Richland, Summit | OH | | GL |
| Mud sedge | *Carex limosa* | Plant | Sphagnum mats in bogs, sometimes in fens | SE | | Ashland, Ashtabula, Geauga, Portage, Wayne | OH | | GL |
| Narrow-headed panic-grass | *Panicum spretum* | Plant | Alder thickets, edges of bogs | SE | | Lucas, Summit | OH | Tolerant of moderate disturbance | GL |
| Narrow-leaved blue-eyed-grass | *Sisyrinchium mucronatum* | Plant | Fields, meadows, open woods, sandy places, moist calcareous flats, open boggy thickets; disturbed areas | SE | | Cuyahoga, Erie, Geauga, Ottawa, Portage | OH | | GL |
| Narrow-necked Pohl's moss | *Pohlia elongata* var. *elongata* | Plant | Moist areas | SE | | Statewide | OH | | GL |
| Navelwort | *Hydrocotyle umbellata* | Plant | Pond-shores, ditches, wet meadows | SE | | Ashtabula, Geauga, Lake, Portage, Stark | OH | | GL |
| Necklace sedge | *Carex projecta* | Plant | Meadows, stream banks, clearings in wet woods, thickets | ST | | Ashtabula, Columbiana, Crawford, Erie, Geauga, Lake, Lorain, Medina, Summit, Trumbull | OH | | GL |
| Nodding sedge | *Carex gynandra* | Plant | Wetlands | SE | | Statewide | OH | | GL |
| Northern adder’s-tongue | *Ophioglossum pusillum* | Plant | Wet meadows, fens, ditches | SE | | Cuyahoga, Erie, Huron, Lake, Lucas, Portage | OH | | GL |
| Northern appressed club-moss | *Lycopodiella subappressa* | Plant | Borrow pits; wet, acidic ditches | SE | | Lucas | OH | | GL |
| Northern bearded sedge | *Carex pseudocyperus* | Plant | Swamps, wet thickets, streams, ponds, lakeshores, depressions in wet meadows, marshes, often in shallow water | SE | | Erie, Lucas, Seneca | OH | | GL |
| Northern blue-eyed-grass | *Sisyrinchium montanum* | Plant | Sandy or gravelly shores, rock crevices, meadows, mixed woods; disturbed areas and clearings, old railroad beds, banks of ditches, roadsides through wet ground | ST | | Cuyahoga, Erie, Portage, Summit | OH | | GL |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Northern bog violet | *Viola nephrophylla* | Plant | Crevices in limestone exposures along the shore of the Lake Erie islands; often in areas sprayed by waves | ST | | Erie, Ottawa, Sandusky | OH | Lake Erie islands | GL |
| Northern croton | *Croton glandulosus* | Plant | Old river terraces, sandy open woods, fallow and cultivated fields, pastures, waste ground, roadsides, and along railroads | SE | | Lucas | OH | | GL |
| Northern fox sedge | *Carex alopecoidea* | Plant | Openings in wet woods and swamp forests | SE | | Hancock, Lucas | OH | | GL |
| Northern poison-ivy | *Toxicodendron rydbergii* | Plant | Bluffs and beaches along Lake Erie | SE | | Ashtabula, Lake | OH | | GL |
| Northern prostrate club-moss | *Lycopodiella appressa* | Plant | Quarries, borrow pits | SE | | Geauga, Lake, Portage | OH | | GL |
| Northern St. John's-wort | *Hypericum boreale* | Plant | Shallow water, marshes; peaty, sandy or mucky lakeshores | ST | | Defiance, Delaware, Geauga, Lucas, Mahoning, Portage, Stark, Summit, Williams, Wayne | OH | | GL |
| Northern wild monkshood | *Aconitum noveboracense* | Plant | Shaded cliffs and cool streamsides. | SE | FT | Summit, Portage | OH | | GL |
| Northern wood-reed | *Cinna latifolia* | Plant | boggy places, wet woods, seepy slopes | SE | | Ashtabula, Summit | OH | | GL |
| Old-field toadflax | *Linaria canadensis* | Plant | Fields, floodplains, dry woods borders, weedy roadsides | SE | | Crawford, Lucas | OH | | GL |
| Olney's three-square | *Schoenoplectus americanus* | Plant | Shallow pools on Lake Erie beaches | SE | | Lucas, Ottawa | OH | | GL |
| One-cone clubmoss | *Lycopodium lagopus* | Plant | Openings in woodlands, fields | SE | | Ashtabula, Coshocton, Geauga, Knox, Portage, Trumbull, Tuscarawas | OH | | GL |
| Large-leaved mountain-rice | *Oryzopsis asperifolia* | Plant | Dry to moist open woods and clearings | ST | | Statewide | OH | | GL |
| Ovate spike-rush | *Eleocharis ovata* | Plant | Open, muddy, other moist places | SE | | Erie, Ottawa | OH | | GL |
| Painted trillium | *Trillium undulatum* | Plant | Hemlock-white pine-northern hardwoods forest | SE | | Ashtabula | OH | | GL |
| Pale umbrella-sedge | *Cyperus acuminatus* | Plant | Shores, seepages, fields | ST | | Lucas | OH | | GL |
| Pasture bluegrass | *Poa saltuensis* ssp. *saltuensis* | Plant | Young woods, thickets, and recently disturbed land | SE | | Erie, Lake, Portage, Trumbull | OH | | GL |

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|---|---|---|---|---|---|---|---|---|---|
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| Philadelphia panic-grass | *Panicum philadelphicum* | Plant | Open woods, fields, rocky sandy ground, to moist soil on shores of lakes, streams | SE | | Ashland, Carroll, Coshocton, Erie, Lucas, Marion, Ottawa, Portage | OH | | GL |
| Pinxter-flower | *Rhododendron periclymenoides* | Plant | Oak woods, woods borders, shrub borders of bogs | ST | | Ashtabula, Lake, Geauga, Trumbull, Stark | OH | | GL |
| Pipsissewa | *Chimaphila umbellata* | Plant | sandy, acidic soils in dry woods/pine woods | ST | | Ashtabula, Columbiana, Fulton, Lucas, Summit | OH | | GL |
| Plains muhlenbergia | *Muhlenbergia cuspidata* | Plant | Prairies, dry sandy to gravelly areas, bluffs | SE | | Lucas | OH | Last recorded in 1967 | GL |
| Plains puccoon | *Lithospermum caroliniense* | Plant | Beach ridges, barrens, fields, roadsides | ST | | Ashtabula, Fulton, Lake, Lucas, Wood | OH | | GL |
| Porcupine grass | *Hesperostipa spartea* | Plant | Prairies, dunes, oak woods; beach ridges of postglacial lakes | SE | | Erie, Fulton, Lucas | OH | | GL |
| Prairie fern-leaved false foxglove | *Aureolaria pedicularia* var. *ambigens* | Plant | Sandy woods, thickets, prairie patches, and dunes | SE | | Fulton, Lucas, Wood | OH | | GL |
| Prairie fringed orchid | *Platanthera leucophaea* | Plant | Mesic to wet prairies, marshes, fens, old fields | ST | | Erie, Holmes, Lucas, Ottawa, Sandusky, Wayne | OH | | GL |
| Prairie gentian | *Gentiana puberulenta* | Plant | Prairies, barrens, sandy ridges, dry upland woods | SE | | Erie, Lucas, Wood | OH | | GL |
| Prairie ironweed | *Vernonia fasciculata* | Plant | Wet prairies; occasionally in marshes | ST | | Ashland, Cuyahoga, Defiance, Erie, Marion, Paulding, Summit, Wood, Wyandot | OH | | GL |
| Prairie thimbleweed | *Anemone cylindrica* | Plant | Dry open woods, slopes, prairies, sandy ridges, quarries, and roadsides | ST | | Cuyahoga, Erie, Fulton, Hancock, Lucas, Ottawa, Wood, Wyandot | OH | | GL |
| Prairie violet | *Viola pedatifida* | Plant | Dry prairies, clifftops, cedar glades | SE | | Ottawa | OH | | GL |
| Prairie wedge grass | *Sphenopholis obtusata* var. *obtusata* | Plant | Open woods, prairies, old fields, fen meadows | ST | | Henry, Lorain, Lucas, Marion, Ottawa, Wood | OH | | GL |
| Primrose-leaved violet | *Viola primulifolia* | Plant | Meadows, edges of ponds, streams, marshes, swamps | SE | | Ashtabula, Portage | OH | | GL |

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| Racemed milkwort | *Polygala polygama* | Plant | Open woods, woods borders, dunes, banks, and fields | ST | | Ashtabula, Cuyahoga, Fulton, Lake, Lucas, Williams | OH | | GL |
| Red baneberry | *Actaea rubra* | Plant | Moist, rich woods and thickets | ST | | Ashtabula, Columbiana, Erie, Lucas, Ottawa, Sandusky | OH | | GL |
| Reflexed bladder sedge | *Carex retrorsa* | Plant | Swamp woods, alder thickets, shrub borders of bogs, streambanks | SE | | Lucas | OH | | GL |
| Riverweed | *Podostemum ceratophyllum* | Plant | Rock exposures and stones in the bottoms of swiftly-flowing streams | SE | | Ashtabula | OH | | GL |
| Robbins' pondweed | *Potamogeton robbinsii* | Plant | Deep to shallow, quiet, muddy waters of lakes, ponds, rivers | SE | | Erie, Geauga, Portage, Summit | OH | | GL |
| Robbins's spike-rush | *Eleocharis robbinsii* | Plant | Shallow water of glacial lakes | SE | | Portage | OH | | GL |
| Robin-run-away | *Dalibarda repens* | Plant | Swamps and moist woods | SE | | Ashtabula, Geauga, Lake | OH | | GL |
| Rock ramalina | *Ramalina intermedia* | Plant | Light shade on sandstone | SE | | Cuyahoga | OH | | GL |
| Rose pogonia | *Pogonia ophioglossoides* | Plant | Sphagnum bogs, sandy seepages | ST | | Lucas, Portage, Summit, Wayne | OH | | GL |
| Rose twisted-stalk | *Streptopus lanceolatus* | Plant | Remnants of the hemlock-white pine-northern hardwoods forest; roadside, powerline clearing through woods | SE | | Ashtabula | OH | | GL |
| Rough rattlesnake-root | *Prenanthes aspera* | Plant | Open rocky woods, prairie remnants, barrens, along roadsides and railroads | SE | | Erie | OH | | GL |
| Round-fruited hedge-hyssop | *Gratiola virginiana* | Plant | Stream margins, pools, ditches, swamps | ST | | Ashtabula, Erie | OH | | GL |
| Roundleaf spurge | *Euphorbia serpens* | Plant | Moist, alluvial or rich soils; disturbed areas | SE | | Erie, Henry, Lucas, Marion, Ottawa, Putnam | OH | | GL |
| Royal catchfly | *Silene regia* | Plant | Prairies and open woods; prairie remnants, cemeteries, railroad and powerline rights-of-way, roadsides | ST | | Holmes, Tuscarawas, Union | OH | | GL |
| Sand cherry | *Prunus pumila* var. *cuneata* | Plant | Thickets, railroad grades, borders, sand dunes | SE | | Erie, Fulton, Henry, Lucas, Ottawa | OH | | GL |
| Scheuchzeria | *Scheuchzeria palustris* | Plant | Sphagnum bog mats | SE | | Ashland, Ashtabula, Geauga, Lorain, Portage, Wayne | OH | | GL |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Schweinitz’s umbrella-sedge | *Cyperus schweinitzii* | Plant | shores, beaches, barrens, railroad embankments | ST | | Ashtabula, Crawford, Cuyahoga, Erie, Lucas, Ottawa | OH | | GL |
| Seaside arrow-grass | *Triglochin maritimum* | Plant | Marshes, fens, wet sandy beaches, interdunal swales, springheads | ST | | Lake, Stark, Summit | OH | | GL |
| Sessile tick-trefoil | *Desmodium sessilifolium* | Plant | prairies, open woods, along roadsides and railroad tracks | ST | | Fulton, Lucas | OH | | GL |
| Shale barren aster | *Symphyotrichum oblongifolium* | Plant | Bluffs, open slopes, prairie remnants | ST | | Mahoning | OH | | GL |
| Shale barren pussy-toes | *Antennaria virginica* | Plant | West or south facing calcareous shales | ST | | Carroll, Columbiana | OH | | GL |
| Sharp-glumed manna-grass | *Glyceria acutiflora* | Plant | Shallow water of ponds, swamps | ST | | Holmes, Lorain, Morrow, Portage, Richland, Stark, Summit | OH | | GL |
| Shore-growing peat moss | *Sphagnum riparium* | Plant | Open bog mats, roadside ditches | SE | | Stark, Summit | OH | | GL |
| Showy lady's-slipper | *Cypripedium reginae* | Plant | Shrub borders of fens, wet prairies, seepages, roadbanks, thickets | ST | | Cuyahoga, Erie, Geauga, Fulton, Lake, Lorain, Lucas, Portage, Summit | OH | | GL |
| Silvery sedge | *Carex argyrantha* | Plant | Oak woods, aspen thickets, rock ledges, along trails, clearings, borders; dry to moist areas | ST | | Coshocton, Erie, Geauga, Holmes, Lake, Portage, Summit | OH | | GL |
| Simple willow-herb | *Epilobium strictum* | Plant | Swamps, bogs, mossy thickets, sedge marshes, wet meadows | ST | | Columbiana, Cuyahoga, Geauga, Mahoning, Portage, Summit, Stark, Trumbull | OH | | GL |
| Skinner's-foxglove | *Agalinis skinneriana* | Plant | Dry and moist usually sandy areas | SE | | Fulton, Lucas, Wood | OH | | GL |
| Slender spike-rush | *Eleocharis tenuis* | Plant | Wet meadows, shores of ponds, ditches and disturbed moist, habitats | ST | | Carroll, Erie, Columbiana, Coshocton, Delaware, Geauga, Mahoning, Williams | OH | | GL |
| Slender willow | *Salix petiolaris* | Plant | Streams and shores, wet marly meadows, wet prairies; roadsides and RR rights-of-way | ST | | Ashtabula, Erie, Fulton, Henry, Lorain, Lucas, Summit, Williams, Wood | OH | | GL |
| Small bur-reed | *Sparganium emersum* | Plant | Muddy or peaty shores, swamps, marshes, shallow water | SE | | Portage, Williams | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Small cranberry | *Vaccinium oxycoccos* | Plant | Sphagnum mounds in bogs | ST | | Ashland, Geauga, Lorain, Portage, Stark, Summit, Wayne | OH | | GL |
| Small purple fringed orchid | *Platanthera psycodes* | Plant | Swamp woods; alder thickets; shrub borders of bogs | ST | | Ashtabula, Carroll, Columbiana, Cuyahoga, Erie, Geauga, Lake, Lorain, Lucas, Mahoning, Medina, Morrow, Portage, Richland, Summit, Wayne, Williams | OH | | GL |
| Small purple-foxglove | *Agalinis purpurea* var. *parviflora* | Plant | Shores, fens, and barrens | SE | | Erie, Huron, Lucas, Ottawa, Stark, Williams, Wood | OH | | GL |
| Small yellow lady's-slipper | *Cypripedium parviflorum* var. *parviflorum* | Plant | Wet openings and borders in fens and swamp forest; wet prairies; arbor vitae thickets | SE | | Geauga, Lorain, Portage, Summit | OH | | GL |
| Smith's bulrush | *Schoenoplectus smithii* | Plant | Sandy or muddy shores, beaches, interdunal swales, mudflats | SE | | Ottawa | OH | | GL |
| Smooth rose | *Rosa blanda* | Plant | Rocky shores, prairies, railroad grades, roadbanks, and old limestone quarries | ST | | Erie, Fulton, Huron, Knox, Lorain, Ottawa, Union, Wood | OH | | GL |
| Snowy campion | *Silene nivea* | Plant | Rich woods and alluvium, disturbed floodplains, streambanks | SE | | Ashtabula, Wood | OH | | GL |
| Soapwort gentian | *Gentiana saponaria* | Plant | Alder thickets, open woods, glades, sandy swamps, shores, roadsides | SE | | Lucas | OH | | GL |
| Soft-leaved arrow-wood | *Viburnum opulus* var. *americanum* | Plant | Cool woods, thickets; rocky shores; slopes | SE | | Ashtabula, Columbiana, Cuyahoga, Erie, Geauga, Lake, Mahoning, Medina, Portage, Stark, Summit, Trumbull, Tuscarawas | OH | | GL |
| Southern hairy panic-grass | *Panicum meridionale* | Plant | Dry open woods, fields, sand barrens | ST | | Ashtabula, Erie, Lucas, Portage, Summit, Wood | OH | | GL |
| Southern woodrush | *Luzula bulbosa* | Plant | Open oak woods, clearings, fields | ST | | Columbiana, Mahoning, Portage, Summit | OH | | GL |
| Sparse-lobe grape-fern | *Botrychium biternatum* | Plant | Low woods, mesic ravines, wooded floodplains, thickets. | SE | | Coshocton | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Spathulate-leaved sundew | *Drosera intermedia* | Plant | Wet acidic sandy soils or sphagnum moss | SE | | Geauga, Lake, Lucas, Portage, Summit, Wayne | OH | | GL |
| Speckled wood-lily | *Clintonia umbellulata* | Plant | mature, mesic woods, often with hemlocks; tolerant of deep shade; ravines, slopes | ST | | Ashland, Columbiana, Coshocton, Holmes, Mahoning, Portage, Summit, Trumbull, Tuscarawas, Wayne | OH | | GL |
| Spotted pondweed | *Potamogeton pulcher* | Plant | Peaty or muddy, acid waters or shores | SE | | Ashtabula, Wayne | OH | | GL |
| Spreading globe-flower | *Trollius laxus* | Plant | Moist, sunny meadows, bogs, and openings | SE | | Ashtabula, Columbiana, Mahoning, Stark, Wayne | OH | | GL |
| Sprengel's sedge | *Carex sprengelii* | Plant | Stream terraces, hummocks in buttonbush swamps, sandstone rocks, sandy soils in oak woods, and mesic forests; associated with limestone rocks and soils | ST | | Coshocton, Lucas, Ottawa, Portage, Stark, Tuscarawas, Wayne, Williams | OH | | GL |
| Striped maple | *Acer pensylvanicum* | Plant | Cool, moist woods with rich understories | SE | | Ashtabula | OH | Associated with hemlock and yellow birch | GL |
| Swamp birch | *Betula pumila* | Plant | Shrubby margins of bogs and wooded swamps | ST | | Portage, Seneca, Stark, Summit, Williams, Wyandot | OH | | GL |
| Swamp red currant | *Ribes triste* | Plant | Swampy woods, wet hollows, seepy slopes, alder thickets | SE | | Ashtabula, Geauga | OH | | GL |
| Swaying-rush | *Schoenoplectus subterminalis* | Plant | Lakes, bog ponds, usually in neutral to calcareous waters | SE | | Williams | OH | | GL |
| Sweet-fern | *Comptonia peregrina* | Plant | Open woodlands, pastures, old fields, and clearings | SE | | Ashland, Ashtabula, Erie, Fulton, Henry, Holmes, Knox, Lake, Portage, Wayne, Woods | OH | | GL |
| Tall cinquefoil | *Potentilla arguta* | Plant | Dry woods and prairies; disturbed areas such as limestone quarries and sand and gravel pits | SE | | Cuyahoga, Erie, Henry, Lake, Ottawa, Portage | OH | | GL |
| Tall grass-like beak-rush | *Rhynchospora recognita* | Plant | Fields, bogs, borders, clearings | SE | | Erie, Lucas | OH | | GL |
| Thread-like naiad | *Najas gracillima* | Plant | Clear water of natural, soft-water lakes | SE | | Ottawa, Wayne | OH | | GL |
| Three-flowered melic | *Melica nitens* | Plant | Dry rocky woods, dry clearings, dry to mesic prairies | ST | | Erie, Marion | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Thyme-leaf pinweed | *Lechea minor* | Plant | Dry, sandy woods, clearings, roadside banks | ST | | Henry, Holmes, Lucas, Woods | OH | | GL |
| Timid sedge | *Carex timida* | Plant | Dry to mesic woods and cedar woodlands | ST | | Delaware | OH | | GL |
| Torrey's bulrush | *Schoenoplectus torreyi* | Plant | Lake margins, beach pools, peaty shores | SE | | Erie, Lake, Ottawa | OH | | GL |
| Triangle grape-fern | *Botrychium lanceolatum* | Plant | Mesophytic woods | ST | | Ashtabula, Geauga, Portage | OH | | GL |
| Tuckerman's panic-grass | *Panicum tuckermanii* | Plant | Open, moist sandy shores, fields | ST | | Erie, Lucas, Ottawa, Summit | OH | | GL |
| Tufted fescue sedge | *Carex brevior* | Plant | Upland prairies, sand dunes, limestone and dolomite bluffs, and alvars. It is rare in wetlands | ST | | Ashtabula, Columbiana, Delaware, Erie, Lake, Ottawa | OH | | GL |
| Tufted moisture-loving moss | *Philonotis fontana* var. *caespitosa* | Plant | Wet areas, seeps, roadsides | SE | | Statewide | OH | | GL |
| Twisted teeth moss | *Barbula indica* var. *indica* | Plant | Calcareous soils in disturbed areas | SE | | Erie | OH | | GL |
| Twisted yellow-eyed-grass | *Xyris torta* | Plant | Fields, ditches, seepage banks, pond margins; often on freshly exposed soil | ST | | Lucas, Wood | OH | | GL |
| Two-flowered bladderwort | *Utricularia geminiscapa* | Plant | Open Sphagnum mats of bogs | SE | | Portage | OH | | GL |
| Two-leaved water-milfoil | *Myriophyllum heterophyllum* | Plant | Ponds, lakes, streams, ditches; often in calcareous waters | SE | | Ashtabula | OH | | GL |
| Two-seeded sedge | *Carex disperma* | Plant | Bogs and swamps | SE | | Ashtabula, Fulton, Portage, Stark, Summit | OH | | GL |
| Variable yellow-eyed-grass | *Xyris difformis* | Plant | Pond margins, ditches, sphagnum mats | SE | | Geauga, Portage, Summit | OH | | GL |
| Variegated scouring-rush | *Equisetum variegatum* | Plant | Wet thickets, bogs, sandy shores | SE | | Lucas, Ottawa | OH | | GL |
| Velvet-leaf blueberry | *Vaccinium myrtilloides* | Plant | Moist woods, swamps, clearings; rarely, dry upland woods | SE | | Ashtabula, Geauga | OH | | GL |
| Villous panic grass | *Panicum villosissimum* | Plant | Open woods, openings, dunes | SE | | Ashtabula, Cuyahoga, Erie, Lucas | OH | | GL |
| Walter's St. John's-wort | *Triantha glutinosa* | Plant | Fens, calcareous ledges, shores | ST | | Lucas, Portage, Stark, Summit | OH | | GL |
| Wapato | *Sagittaria cuneata* | Plant | Creeks, rivers, ditches, and lakes; Sometimes muddy shores, lakes | ST | | Erie, Lucas, Ottawa, Wayne | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Water-starwort | *Callitriche verna* | Plant | Shallow quiet waters or muddy shores | ST | | Ashtabula, Columbiana, Geauga, Lake, Lorain, Mahoning, Trumbull, Wayne | OH | | GL |
| Western hairy rock cress | *Arabis hirsuta* var. *pycnocarpa* | Plant | Moist to dry calcareous areas including open woods, stream banks, ledges, cliffs, bluffs, and floodplains | SE | | Cayuga, Defiance, Erie, Fulton, Summit, Wood, Wyandot | OH | | GL |
| Western mountain-ash | *Sorbus decora* | Plant | Swampy or damp woods and borders, rocky slopes, shores | SE | | Ashtabula, Geauga, Lake, Trumbull | OH | | GL |
| Western rock-jasmine | *Androsace occidentalis* | Plant | Well drained, exposed ledges and sand barrens | ST | | Defiance, Fulton, Wood | OH | | GL |
| White fringed orchid | *Platanthera blephariglottis* | Plant | Cranberry or tamarack bogs | SE | | Ashtabula, Geauga, Lucas, Portage, Summit | OH | | GL |
| White lady's-slipper | *Cypripedium candidum* | Plant | Wet prairies, calcareous fens, open tamarack bogs, limestone barrens. | SE | | Erie, Lucas, Portage, Trumbull, Wyandot | OH | | GL |
| White wood-sorrel | *Oxalis montana* | Plant | Moist, mossy woods; frequently with hemlocks | SE | | Ashtabula | OH | | GL |
| White-buttons | *Eriocaulon aquaticum* | Plant | Glacial lakes, peaty shores | SE | | Portage, Summit | OH | | GL |
| White-stem pondweed | *Potamogeton praelongus* | Plant | Cold, deep waters of lakes, rivers | SE | | Ashtabula, Erie, Ottawa, Stark | OH | | GL |
| Wild pea | *Lathyrus venosus* | Plant | Open upland woods, prairies | SE | | Erie, Lake, Lucas, Williams | OH | | GL |
| Wild rice | *Zizania aquatica* | Plant | Water no more than two feet deep; constant movement of the water in the spring and fall; seeds must remain in water over winter | ST | | Ashtabula, Erie, Lake, Lorain, Lucas, Stark, Summit, Tuscarawas | OH | | GL |
| Winged cudweed | *Pseudognaphalium macounii* | Plant | Open woods, clearings, pastures, fields | SE | | Cuyahoga, Ottawa | OH | | GL |
| Wood-lily | *Lilium philadelphicum* | Plant | Woods, thickets; some variations grow in prairies, bogs, fens, meadows, shores | SE | | Erie, Fulton, Lucas, Ottawa, Portage, Sandusky, Stark, | OH | | GL |
| Woolly plaintain | *Plantago patagonica* | Plant | Dry plains, openings, prairies | SE | | Lucas, Williams, Wood | OH | | GL |
| Wrinkled-leaved marsh hypnum | *Hypnum pratense* | Plant | Rich fens and sedgy meadows | SE | | Statewide | OH | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Yellow fringed orchid | *Platanthera ciliaris* | Plant | Pastures, wet fields, depressions, seepage areas, roadbanks; require a constant water supply | ST | | Fulton, Lake, Lucas | OH | | GL |
| Yellow vetchling | *Lathyrus ochroleucus* | Plant | Dry upland woods, thickets, wooded slopes, rocky banks | SE | | Ashland, Ashtabula, Cuyahoga, Lake, Lorain, Ottawa, Trumbull, Williams | OH | | GL |
| Yellowish gentian | *Gentiana alba* | Plant | Mesic prairies, savannas, grass meadows, damp woods | ST | | Lucas | OH | | GL |
| Blanding's turtle | *Emydoidea blandingi* | Reptile | Marshy shorelines, inland streams, and wet meadows | ST | | Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa, Sandusky | OH | Restricted to northern counties along Lake Erie in Ohio | GL |
| Copperbelly water snake | *Nerodia erythrogaster neglecta* | Reptile | Lowland swamps | SE | FE | Defiance, Hardin, Williams | OH | | GL |
| Eastern massasauga | *Sistrurus catenatus catenatus* | Reptile | Wet prairies, sedge meadows | SE | FC | Ashtabula, Crawford, Cuyahoga, Defiance, Erie, Fulton, Hardin, Huron, Lorain, Ottawa, Marion, Medina, Paulding, Portage, Sandusky, Seneca, Stark, Trumbull | OH | | GL |
| Kirtland's snake | *Clonophis kirtlandii* | Reptile | Glaciated areas | ST | | Lucas | OH | Found in western glaciated areas of the state | GL |
| Lake Erie watersnake | *Nerodia sipedon insularum* | Reptile | Rock ledges and shorelines on Lake Erie | SE | * | Erie, Ottawa | OH | Only located on Lake Erie islands; federally delisted due to recovery | GL |
| Plains garter snake | *Thamnophis radix* | Reptile | Wet woodlands, meadows, bogs, and marshes | SE | | Marion, Wyandot | OH | | GL |
| Spotted turtle | *Clemmys guttata* | Reptile | Shallow, sluggish waters of ditches and streams, marshes, bogs, and pond edges | ST | | Statewide | OH | | GL |

Sources: OH DNR, 2010; OH DNR, 2011; USDA, 2011a; USDOI, 2011i

Species list derived from best available sources (listed above). Some discrepancy exists between USFWS and state agencies concerning status and county locations for certain species. Status designation does not include State Special Concern Species.

**THREAT STATUS DESIGNATIONS**

| | |
|---|---|
| SE | State Endangered |
| ST | State Threatened |
| FE | Federally Endangered |
| FT | Federally Threatened |
| FC | Federal Candidate Species |

| | |
|---|---|
| * | See note column |

**NORTHERN BORDER PEIS REGIONS**

| | |
|---|---|
| GL | Great Lakes |
| EOR | East of the Rockies |
| NE | New England |
| WOR | West of the Rockies |

## Table M–10. Threatened and Endangered Species in Pennsylvania

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Blue-spotted salamander | *Ambystoma laterale* | Amphibian | Moist deciduous hardwoods and swamp woodlands, preferably with access to vernal ponds | SE | | McKean, Warren | PA | | GL |
| American bittern | *Botaurus lentiginosus* | Bird | Marshes and wetland borders along lakes, ponds, rivers, and streams | SE | | Butler, Crawford, Erie, Jefferson, Lawrence, Mercer, Potter | PA | | GL |
| Arctic peregrine falcon | *Falco peregrinus tundrius* | Bird | Extreme polar regions, high mountains, and tropical rainforest | SR* | * | Beaver, Butler, Cameron, Clarion, Clearfield, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Potter, Venango, Warren | PA | Federally delisted due to recovery | GL |
| Bald eagle | *Haliaeetus leuciceohalus* | Bird | Near large bodies of open water | ST | * | Armstrong, Beaver, Butler, Cameron, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango, Warren | PA | Federally delisted due to recovery; afforded continued protection by the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act | GL |
| Black tern | *Childonias niger* | Bird | Marshes with 50 percent emergent aquatic vegetation (e.g., cattails, reeds, and rushes) and 50 percent open water | SE | | Crawford, Erie | PA | | GL |
| Common tern | *Sterna hirundo* | Bird | Over lakes, slow-moving rivers, or occasionally marshes; perched on beaches, sand pits, or mudflats | SE | | Erie | PA | | GL |
| Dickcissel | *Spiza americana* | Bird | Large, grassy fields, including hayfields or strip mines recently reclaimed with grass | SE | | Beaver, Clarion, Erie, Jefferson, Lawrence, Mercer | PA | | GL |
| King rail | *Rallus elegans* | Bird | Freshwater and brackish marshes; marshy fields; and roadside ditches | SE | | Butler, Crawford, Lawrence, Mercer | PA | | GL |
| Least bittern | *Ixobrychus exilis* | Bird | Dense marshland ecosystems with cattails and reeds; along the coast and inland | SE | | Butler, Crawford, Erie, Lawrence, Mercer | PA | | GL |
| Migrant loggerhead shrike | *Lanius ludovicianus migrans* | Bird | Short-grass pastures with scattered shrubs and fencerows or small utility lines | SE | | Beaver, Crawford, Erie, Lawrence, Mercer | PA | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Osprey | *Pandion haliaetus* | Bird | Lakes, ponds, rivers and marshes bordered by trees | ST | | Armstrong, Beaver, Butler, Clarion, Crawford, Elk, McKean, Mercer, Venango | PA | | GL |
| Peregrine falcon | *Falco peregrinus* | Bird | Tundra, savannas, and large metropolitan areas; open conifer forests, rock outcrops, and cliffs | SE | | Beaver | PA | | GL |
| Piping plover | *Charadrius melodus* | Bird | Open, sandy beaches; sparse vegetation. Designated critical habitat: 66 FR 22938 22969 | | FE | Erie | PA | | GL |
| Sedge wren | *Cistothorus platensis* | Bird | Damp meadows or marshes where sedges and grasses intermix with small shrubs; don't thrive in cattail marshes | SE | | Butler, Crawford, Elk, Erie | PA | | GL |
| Short-eared owl | *Asio flammeus* | Bird | Reclaimed strip mines; open, uncut grassy fields; large meadows; airports; occasionally, marshland | SE | | Clarion, Crawford, Lawrence | PA | | GL |
| Upland sandpiper | *Bartramia longicauda* | Bird | Open country; characteristic of short-grass prairie; large fallow fields, pastures, and grassy areas. | ST | | Butler, Clarion, Crawford, Erie, Lawrence, Mercer, Venango | PA | | GL |
| Yellow-bellied flycatcher | *Empidonax flaviventris* | Bird | Coniferous forests, alder thickets, and high mountain bogs | SE | | McKean | PA | | GL |
| Bigmouth shiner | *Notropis dorsalis* | Fish | Small, clear streams with sand or small gravel substrate | ST | | Crawford, McKean, Potter | PA | | GL |
| Black bullhead | *Ameiurus melas* | Fish | Lakes and ponds with low oxygen and/or muddy conditions | SE | | Beaver, Lawrence, Mercer | PA | | GL |
| Blackchin shiner | *Notropis heterodon* | Fish | Lakes, impoundments, and quiet pools in streams and rivers | SE | | Crawford, Erie | PA | | GL |
| Bluebreast darter | *Etheostoma camurum* | Fish | Clean, medium to large rivers with swift flow, high bottom velocities, and a substrate of large rocks, rubble, and coarse to fine gravel | ST | | Armstrong, Beaver, Clarion, Crawford, Erie, Forest, Mercer, Venango, Warren | PA | | GL |
| Brindled madtom | *Noturus miurus* | Fish | Slow-moving rivers with soft substrates and scattered emergent vegetation | ST | | Crawford, Erie, Mercer | PA | | GL |
| Burbot | *Lota lota* | Fish | Northern deep, clean, cold lakes | SE | | Erie, McKean, Potter, Warren | PA | | GL |
| Cisco or lake herring | *Coregonus artedi* | Fish | Deep inland lakes; the Great Lakes | SE | | Erie | PA | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Eastern sand darter | *Etheostoma pellucida* | Fish | Natural lakes, backwaters, streams | SE | | Erie | PA | | GL |
| Gilt darter | *Percina evides* | Fish | Clear, moderate to large streams | ST | | Clarion, Crawford, Erie, Forest, Venango, Warren | PA | | GL |
| Gravel chub | *Erimystax x-punctatus* | Fish | Strong currents of riffles and fast runs in shallow, medium to large rivers over pea-gravel substrate | SE | | Venango, Warren | PA | | GL |
| Iowa darter | *Etheostoma exile* | Fish | Cool, slow-moving, vegetated waters with little to no turbidity and sand or gravel substrates, but can use a variety of habitats | SE | | Erie | PA | | GL |
| Lake sturgeon | *Acipenser fulvescens* | Fish | Moderately clear, large rivers and lakes | SE | | Erie | PA | | GL |
| Longear sunfish | *Lepomis megalotis* | Fish | Clear, shallow, well-vegetated headwaters of low-gradient streams; rocky and sandy pools | SE | | Beaver, Mercer | PA | | GL |
| Mountain brook lamprey | *Ichthyomyzon greeleyi* | Fish | Large rivers | SE | | Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Potter, Venango, Warren | PA | | GL |
| Mountain madtom | *Noturus eleutherus* | Fish | Clean, moderate to swift-flowing large streams or rivers with substrates of large stones, rubble, gravel and sand | SE | | Crawford, Erie, Forest, Mercer, Venango | PA | | GL |
| Northern brook lamprey | *Ichthyomyzon fossor* | Fish | Clean headwaters of creeks and small rivers with gravel-rock substrates | SE | | Crawford, Erie | PA | | GL |
| Northern madtom | *Noturus stigmosus* | Fish | Small rivers and creeks | SE | | Crawford, Erie, Forest, Mercer, Venango | PA | | GL |
| Northern redbelly dace | *Phoxinus eos* | Fish | Boggy lakes, ponds, pools of headwaters, and creeks | SE | | Erie, Warren | PA | | GL |
| Redfin shiner | *Lythrurus umbratilis* | Fish | Middle to upper reaches of small to medium streams | SE | | Crawford, Erie, Mercer | PA | | GL |
| Southern redbelly dace | *Phoxinus erythrogaster* | Fish | Clear, cool permanent headwaters of river systems | ST | | Beaver, Butler, Crawford, Lawrence, McKean, Mercer Warren | PA | | GL |
| Spotted darter | *Etheostoma maculatum* | Fish | Large unpolluted streams in deep riffles or pools just downstream; gravel-rubble bottom predominates; low bottom current velocity | ST | | Crawford, Erie Forest, Mercer, Venango, Warren | PA | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Spotted gar | *Lepisosteus oculatus* | Fish | Clear pools of shallow water in creeks, rivers, and lakes | SE | | Erie | PA | | GL |
| Spotted sucker | *Minytrema melanops* | Fish | Creeks, small rivers, overflow lakes, and impoundments | ST | | Crawford | PA | | GL |
| Tadpole madtom | *Noturus gyrinus* | Fish | Pools and backwaters of sluggish creeks and small to large rivers; shallow areas of lakes | SE | | Crawford, Erie | PA | | GL |
| Tippecanoe darter | *Etheostoma tippecanoe* | Fish | Riffle areas four to 20 in deep; in clean rivers and large creeks with bottoms of pea-sized, clean gravel and a high bottom current velocity | ST | | Armstrong, Crawford, Erie, Forest, Mercer, Venango, Warren | PA | | GL |
| Warmouth | *Lepomis gulosus* | Fish | Wide variety of aquatic habitats | SE | | Crawford, Erie, Mercer | PA | | GL |
| Karner Blue butterfly | *Lycaeides melissa samuelis* | Insect | Wild lupine plant range | | FE | Listed for state but not known to occur | PA | | GL |
| Allegheny woodrat | *Neotoma magister* | Mammal | Rocky outcrops associated with mountain ridges (e.g., cliffs, caves, talus slopes, and mines) | ST | | Cameron, Venango | PA | | GL |
| Eastern puma | *Puma concolor couguar* | Mammal | Marshes, mountains, and forests | | FE | Listed for state but not known to occur | PA | | GL |
| Indiana bat | *Myotis sodalis* | Mammal | Wooded areas; seek caves for hibernation | SE | FE | County data unavailable | PA | | GL |
| Least shrew | *Cryptotis parva* | Mammal | Grassy, weedy, or brushy fields | SE | | Beaver, Crawford, Mercer | PA | | GL |
| Northern flying squirrel | *Glaucomys sabrinus* | Mammal | Old-growth boreal forests with a heavy coniferous component, moist soils, and lots of downed woody debris | SE | | McKean, Potter, Warren | PA | | GL |
| Small-footed bat | *Myotis leibii* | Mammal | Summer roosts include caves and mines, hollow trees, spaces under bark, cracks and crevices in rock walls, and ridge-top talus fields | ST | | Armstrong | PA | | GL |
| Clubshell | *Pleurobema clava* | Mollusk | Sand and gravel river bottoms | SE | FE | Armstrong, Beaver, Butler, Clarion, Crawford, Erie, Forest, Lawrence, Mercer, Venango, Warren | PA | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Crackling pearlymussel | *Hemistena lata* | Mollusk | Sand bottom, slow-flowing streams | | FE | Beaver, Butler, Cameron, Clarion, Clearfield, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Potter, Venango, Warren | PA | | GL |
| Northern riffleshell | *Epioblasma torulosa rangiana* | Mollusk | Sand and gravel river bottoms | SE | FE | Armstrong, Clarion, Crawford, Erie, Forest, Lawrence, Mercer, Venango, Warren | PA | | GL |
| Pink mucket | *Lampsilis abrupta* | Mollusk | Shallow riffles in silt-free streams | | FE | Armstrong, Beaver | PA | | GL |
| Rabbitsfoot | *Quadrula cylindrical cylindrical* | Mollusk | Medium to large rivers in mixed sand and gravel | SE | | Armstrong, Beaver, Crawford, Erie, Lawrence, Mercer, Venango, Warren | PA | | GL |
| Rayed bean | *Villosa fabalis* | Mollusk | Swift-flowing, silt-free streams | | FE* | Armstrong, Clarion, Crawford, Erie, Forest, Lawrence, Mercer, Venango, Warren | PA | Proposed for federal listing | GL |
| Ring pink | *Obovaria retusa* | Mollusk | Sand and gravel, silt-free river bottoms | | FE | County data unavailable | PA | | GL |
| Rough pigtoe | *Pleurobema plenum* | Mollusk | Firmly packed sand-gravel river bottoms. | | FE | Armstrong, Beaver | PA | | GL |
| Salamander mussel | *Simpsonaias ambigua* | Mollusk | Medium to large rivers and lakes | SE | | Armstrong, Crawford | PA | | GL |
| Sheepnose mussel | *Plethobasus cyphyus* | Mollusk | Large rivers | ST | | Armstrong, Beaver, Forest, Lawrence, Venango | PA | | GL |
| Snuffbox | *Epioblasma triquetra* | Mollusk | Sand, gravel, or cobble substrates in swift, small and medium rivers | SE | | Armstrong, Beaver, Clarion, Crawford, Erie, Lawrence, Mercer, Venango | PA | | GL |
| Orangefoot pimpleback | *Plethobasus cooperianus* | Mollusk | Gravel bottoms on silt-free river beds | | FE | Beaver | PA | | GL |
| A sedge | *Carex foenea* | Plant | Dry to moist, acidic sands, gravels, open disturbed places, grasslands, open woods | SE | | Potter | PA | | GL |
| A sedge | *Carex tetanica* | Plant | Calcareous fens, bogs, and swales | ST | | Butler, Crawford, Lawrence, Mercer | PA | | GL |

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| | | | | State | Fed. | | | | |
| American beachgrass | *Ammophila breviligulata* | Plant | Back beaches and sand dunes on the Atlantic coast and the lower Great Lakes | ST | | Erie | PA | | GL |
| American columbo | *Swertia caroliniensis* | Plant | Rocky, open woods | SE | | Butler, Clarion, Forest, Lawrence, Mercer, Venango | PA | | GL |
| American gromwell | *Lithospermum latifolium* | Plant | Rich, deciduous woodlands; wooded slopes; and shaded riverbanks | SE | | Beaver | PA | | GL |
| Appalachian blue violet | *Viola appalachiensis* | Plant | Serpentine barrens and rich forests in the southern Appalachian Mountains; disturbed areas, including ground that is regularly mowed, dirt roads, and old fields | ST | | Crawford, Erie, Mercer, Potter, Warren | PA | | GL |
| Appalachian gametophyte fern | *Vittaria appalachiana* | Plant | Dark, moist cavities and rock shelters in noncalcareous rocks; occasionally epiphytic on tree bases in narrow ravines | ST | | Beaver, Butler, Lawrence | PA | | GL |
| Aster-like boltonia | *Boltonia asteroides* | Plant | Sandy or gravelly; moist to wet places | SE | | Erie | PA | | GL |
| Autumn willow | *Salix serissima* | Plant | Swamps, bogs | ST | | Crawford, Erie, Lawrence, Mercer, Venango, Warren | PA | | GL |
| Awned sedge | *Carex atherodes* | Plant | Marshes; wet prairies and meadows; open swamps; wet, open thickets; open stream, pond, and lakeshores; ditches | SE | | Erie, Lawrence, Warren | PA | | GL |
| Backward sedge | *Carex retrorsa* | Plant | Swamps, wet thickets, along streams, marshes, sedge meadows, shores of streams, ponds, and lakes | SE | | Erie, Potter, Warren | PA | | GL |
| Balsam poplar | *Populus balsamifera* | Plant | Open, rich, low woods; cool, seasonally wet soils; bog margins in boreal forests; aspen parklands; montane streamsides; rocky slopes; gallery forests within tundra | SE | | Butler, Elk, Erie, Forest, Lawrence, McKean, Venango | PA | | GL |
| Beach peavine | *Lathyrus japonicus* | Plant | Great Lake shores; sandy soils | ST | | Crawford, Erie | PA | | GL |
| Beach wormwood | *Artemisia campestris* ssp. *Caudata* | Plant | Dry, sandy habitats such as Lake Erie coastal dunes; dry and sandy prairies | SE | | Erie | PA | | GL |
| Beaked spike-rush | *Eleocharis rostellata* | Plant | Very wet, calcareous or brackish fens, springs, shores | SE | | Lawrence | PA | | GL |
| Bebb's sedge | *Carex bebbii* | Plant | Wet places with calcareous or neutral soils, gravelly lakeshores, streambanks, meadows, forest seeps | SE | | Crawford, Erie, Warren | PA | | GL |
| Beck's water-marigold | *Megalodonta beckii* | Plant | Lakeshores, ponds, and slow-flowing streams | SE | | Crawford, Erie | PA | | GL |

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| Bicknell's hoary rockrose | *Helianthemum bicknellii* | Plant | Dry prairies, woods, inland sands; sandy soils | SE | | Beaver, Venango | PA | | GL |
| Bog bluegrass | *Poa paludigena* | Plant | Wet, cool habitats | ST | | Crawford, Lawrence, Mercer, Warren | PA | | GL |
| Bog sedge | *Carex paupercula* | Plant | Bogs, fens, marshes; usually associated with sphagnum | ST | | Elk, Forest, Warren | PA | | GL |
| Branching bur-reed | *Sparganium androcladum* | Plant | Shores and shallow, quiet, circumneutral waters | SE | | Erie, Lawrence, Mercer | PA | | GL |
| Broad-leaved water-milfoil | *Myriophyllum heterophyllum* | Plant | Water to 16 ft. deep; in sediment soil | SE | | Erie | PA | | GL |
| Broad-winged sedge | *Carex alata* | Plant | Peaty shores, marshes, wet thickets, woods | ST | | Butler, Crawford, Erie, Lawrence | PA | | GL |
| Brook lobelia | *Lobelia kalmii* | Plant | Wet bogs, shores, meadows; in limey soil | SE | | Butler, Erie | PA | | GL |
| Bushy cinquefoil | *Potentila paradoxa* | Plant | Moist or wet soil in full sun; riverbanks; lake, and pond shores; sandbars, low fields | SE | | Erie | PA | | GL |
| Bushy naiad | *Najas gracillima* | Plant | Clear, healthy, soft-water lakes where impacts from shoreline development or agriculture are minimal | ST | | Erie, Mercer | PA | | GL |
| Canada buffalo-berry | *Shepherdia canadensis* | Plant | Dunes, gravelly-rocky shores, rock outcrops (especially limestone), open woods, slump bluffs, ridges, and cliffs | SE | | Erie | PA | | GL |
| Capillary beaked-rush | *Rhynchospora capillacea* | Plant | Moist to wet calcareous fens, seeps over limestones or calcareous rock, marsh meadows | SE | | Erie, Lawrence | PA | | GL |
| Capitate spike-rush | *Eleocharis caribaea* | Plant | Brackish creeks, canal banks, dune depressions, hammocks, irrigation ditches, lakeshores | SE | | Erie | PA | | GL |
| Carey's sedge | *Carex careyana* | Plant | Moist deciduous and deciduous-evergreen forests; slopes, limestone escarpments, rocky woods, washes, sinks, and cave entrances | SE | | Elk, McKean | PA | | GL |
| Carey's smartweed | *Polygonum careyi* | Plant | Low thickets, swamps, bogs, moist shorelines, clearings, recent burns, cultivated ground | SE | | Erie | PA | | GL |
| Carolina grass-of-Parnassus | *Parnassia glauca* | Plant | Wet bogs, meadows, shores; in limey soil | SE | | Butler, Erie, Lawrence | PA | | GL |
| Carolina leaf-flower | *Phyllanthus* | Plant | Alluvial ground, gravel bars, low thickets, | SE | | Beaver, Butler | PA | | GL |

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| | *caroliniensis* | | fallow fields, cultivated fields, ditches, moist depressions in valleys | | | | | | |
| Case's ladies'-tresses | *Spiranthes casei* | Plant | Mesic to dry, open sites in meadows, barrens, woodlands, outcrops, roadsides, sand pits, old fields | SE | | Elk, McKean, Potter | PA | | GL |
| Cattail sedge | *Carex typhina* | Plant | Wet woods | SE | | Armstrong, Beaver, Crawford, Elk, Mercer | PA | | GL |
| Cluster fescue | *Festuca paradoxa* | Plant | Prairies, open woods, thickets, and low, open ground. | SE | | Erie, Venango | PA | | GL |
| Common hemicarpa | *Lipocarpha micrantha* | Plant | Emergent shorelines; rarely freshwater tidal shores | SE | | Erie | PA | | GL |
| Common hop-tree | *Ptelea trifoliata* | Plant | Alluvial thickets; rocky slopes; gravelly places | ST | | Erie | PA | | GL |
| Common shooting-star | *Dodecatheon meadia* | Plant | Moist or dry hardwoods, prairies, and limestone slopes and cliff faces | SE | | Butler | PA | | GL |
| Cranesbill | *Geranium bicknellii* | Plant | Woodland openings; typical and sandy savannas; rocky outcrops | SE | | Erie, Potter | PA | | GL |
| Crepis rattlesnake-root | *Prenanthes crepidinea* | Plant | Moist, rich, deciduous woods; lowland or upland woods; thickets; low prairies; wet areas in rich soil | SE | | Beaver, Butler, Lawrence, McKean, Mercer, Venango | | | GL |
| Cuckooflower | *Cardamine pratensis* var. *palustris* | Plant | Conifer or mixed forests; occasionally fens, stable dunes and alvar; on neutral or calcareous substrates | SE | | Crawford, Erie | PA | | GL |
| Cypress-like sedge | *Carex pseudocyperus* | Plant | Swamps; wet thickets; stream, pond, and lakeshores; depressions in wet meadows; marshes; shallow water or on emergent stumps; floating logs; floating mats of vegetation | SE | | Butler, Crawford, Erie | PA | | GL |
| Downy willow-herb | *Epilobium strictum* | Plant | Wet bogs, swamps | SE | | Butler, Cameron, Crawford, Elk, Erie, Lawrence, McKean, Mercer, Potter, Warren | PA | | GL |
| Ebony sedge | *Carex eburnea* | Plant | Conifer or mixed forests; occasionally fens; stable dunes and alvar; neutral or calcareous substrates | SE | | Erie | PA | | GL |
| Elk sedge | *Carex garberi* | Plant | Moist shores, meadows, fens, base-rich soils | SE | | Erie | PA | | GL |
| Few flowered nutrush | *Scleria pauciflora* | Plant | Dry to mostly wet pinelands, savannas, mesic woods, meadows, bogs, and prairies | ST | | Venango | PA | | GL |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Few-flowered sedge | *Carex pauciflora* | Plant | Sphagnum bogs and acidic peat, usually on open mats; in partial shade of conifers | SE | | Warren | PA | | GL |
| Few-flowered spike-rush | *Eleocharis pauciflora* var. *fernaldii* | Plant | Fens, wet meadows, seeps, springs, hot springs | SE | | Erie | PA | | GL |
| Few-seeded sedge | *Carex oligosperma* | Plant | Bogs, sometimes in acidic, sandy, or peaty soils in open swamps, marshes, lakeshores, riverbanks | ST | | Mercer | PA | | GL |
| Flat-leaved bladderwort | *Utricularia intermedia* | Plant | Lakes, ponds, ditches | ST | | Crawford, Erie | PA | | GL |
| Flat-stemmed spike-rush | *Eleocharis compressa* | Plant | Damp soil to shallow water of seasonally wet seeps and depressions in calcareous grasslands, meadows, limestone and dolomite barrens, glades, fens, ditches, waste places | SE | | Crawford, Venango | PA | | GL |
| Four-angled spike-rush | *Eleocharis quadrangulata* | Plant | Shallow water of fresh lake and pond shores; marshes | SE | | Erie, Mercer | PA | | GL |
| Fries' pondweed | *Potamogeton friesii* | Plant | Calcareous to brackish waters of lakes and slow-flowing streams | SE | | Crawford, Erie | PA | | GL |
| Golden-fruited sedge | *Carex aurea* | Plant | Moist, open, or shaded habitats, especially meadows and seepage slopes; usually on basic soils | SE | | Erie | PA | | GL |
| Grassy pondweed | *Potamogeton gramineus* | Plant | Ponds, lakes, streams, and rivers | SE | | Crawford, Erie, Forest, Jefferson, Mercer, Warren | PA | | GL |
| Green sedge | *Carex viridula* | Plant | Open, wet areas on calcareous or sandy substrates; exposed, nearly barren areas; fens, wet prairies, quarries, beach pools, interdunal swales | SE | | Erie | PA | | GL |
| Harbinger-of-spring | *Erigenia bulbosa* | Plant | Moderate moisture; woods; in rich soil | ST | | Armstrong, Beaver, Butler, Crawford, Erie | PA | | GL |
| Hard-stemmed bulrush | *Schoenoplectus acutus* | Plant | Fresh, often calcareous to brackish marshes; fens, lakes, and slow streams; often emergent in water to 1.5 m. | SE | | Butler, Crawford, Erie, Lawrence | PA | | GL |
| Hemlock-parsley | *Conioselinum chinense* | Plant | Swamps, bogs, wet meadows | SE | | Crawford | PA | | GL |
| Hill's pondweed | *Potamogeton hillii* | Plant | Alkaline waters of marshes, ponds, lakes, and slow-moving streams | SE | | Crawford, Erie, Warren | PA | | GL |
| Hispid gromwell | *Lithospermum* | Plant | Sandy grasslands; open woods | SE | | Erie, Mercer | PA | | GL |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| | *caroliniense* | | | | | | | | |
| Hoary willow | *Salix candida* | Plant | Sun to part shade in wet or damp soils. | ST | | Erie | PA | | GL |
| Hooded ladies'-tresses | *Spiranthes romanzoffiana* | Plant | Moist to wet meadows, tundra, marshes, fens, prairies, streambanks, seeps, coastal bluffs, dunes | SE | | Crawford, Erie, Lawrence, Warren | PA | | GL |
| Hooker's orchid | *Platanthera hookeri* | Plant | Dry to mesic coniferous and deciduous forests | SE* | | Butler, Erie | PA | Proposed endangered | GL |
| Houghton's flatsedge | *Cyperus houghtonii* | Plant | Riverbanks, sand bars, lakeshores, sand dunes, sandy openings in woods, especially among Jack pines | SE | | Crawford | PA | | GL |
| Labrador marsh bedstraw | *Galium labradoricum* | Plant | Wet, cold bogs, swamps, thickets | SE | | Crawford, Erie | PA | | GL |
| Larger Canadian St. John's wort | *Hypericum majus* | Plant | Wet meadows, shores | ST | | Erie | PA | | GL |
| Leafy white orchid | *Platanthera dilatata* | Plant | Wet meadows, tundra, marshes, fens, streambanks, shores, ditches, seeping slopes, roadsides | SE | | Crawford, Erie | PA | | GL |
| Lesser panicled sedge | *Carex diandra* | Plant | Swampy, marshy, or boggy areas, especially wet meadows, fens, muskegs, floating mats, and peaty or marly lakeshores (often in shallow, sometimes brackish water); less often in swales, springy thickets, ditches, and wet sandy beaches of nonalkaline lakes | ST | | Crawford, Erie, Mercer, Warren | PA | | GL |
| Little-spike spike-rush | *Eleocharis parvula* | Plant | Brackish or saline, mostly coastal tidal marshes, shores, mudflats, swamps, ponds, ditches | SE | | Erie | PA | | GL |
| Long-fruited anemone | *Anemone cylindrica* | Plant | Prairies, dry, open woods, pastures, roadsides | SE | | Erie | PA | | GL |
| Long-lobed arrow-head | *Sagittaria calycina* ssp. *spongiosa* | Plant | Swamps, on muddy banks; occasionally in wet sand | SE | | Erie | PA | | GL |
| Matted spike-rush | *Eleocharis intermedia* | Plant | Fresh, wet, often marly places along streams, lakeshores, tidal meadows, disturbed areas | ST | | Crawford, Erie, Mercer, Warren | PA | | GL |
| Mitchell's sedge | *Carex mitchelliana* | Plant | Swamps, floodplain forests, wet meadows, stream edges, margins of lakes and ponds, roadside ditches | SE | | Crawford | PA | | GL |
| Mountain fly honeysuckle | *Lonicera villosa* | Plant | Forest edges, swamps, marshes, bogs, fens, lakeshores | SE | | Crawford, Warren | PA | | GL |

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| | | | | State | Fed. | | | | |
| Naked bishop's-cap | *Mitella nuda* | Plant | Wet forests, bogs; often in moss. | SE | | Warren | PA | | GL |
| Narrow-leaved pondweed | *Potamogeton strictifolius* | Plant | Alkaline waters of lakes and slow-moving streams | SE | | Erie | PA | | GL |
| New England grape | *Vitis novae-angliae* | Plant | Riparian areas | SE | | Armstrong, Butler | PA | | GL |
| Nodding pogonia | *Triphora trianthophora* | Plant | Rich woods, swamp edges, and floodplains | SE | | Forest | PA | | GL |
| Northeastern sedge | *Carex cryptolepis* | Plant | Acidic, sandy, or organic substrates on open, emergent shorelines | ST | | Crawford | PA | | GL |
| Northern water-milfoil | *Myriophyllum sibiricum* | Plant | Lakes ( shallow to more than 16 ft. deep); fairly clear water; in soft sediment soil | SE | | Beaver, Crawford, Erie | PA | | GL |
| Northern water-plantain | *Alisma triviale* | Plant | Shallow muddy ponds, stream margins, marshes, and ditches | SE | | Butler, Clarion, Crawford, Erie, McKean, Mercer, Potter, Venango, Warren | PA | | GL |
| Oblique milkvine | *Matelea obliqua* | Plant | Limestone glades, open woodlands, and thickets | SE | | Beaver, Warren | PA | | GL |
| Oblong-fruited serviceberry | *Amelancheir bartramiana* | Plant | Swamps, marshes, bogs, fens, lakeshores | SE | | McKean | PA | | GL |
| Pod-grass | *Scheuchzeria palustris* | Plant | Sphagnum bogs, marshes, and lake margins | SE | | Erie, Warren | PA | | GL |
| Prairie sedge | *Carex prairea* | Plant | Wet meadows, peaty ground; usually in calcareous marshes, prairies, fens, and swales; often on borders of lakes and streams or in open conifer swamps (*Larix, Picea, Thuja*); thickets and ditches | ST | | Crawford, Erie, Lawrence, Mercer, Warren | PA | | GL |
| Purple rocket | *Iodanthus pinnatifidus* | Plant | Shaded banks, thickets, wooded ravines, limestone or sandstone bluffs, bottomland woods, swamps, floodplains, creeks, streamsides | SE | | Beaver, Lawrence | PA | | GL |
| Purple sandgrass | *Triplasis purpurea* | Plant | Sand dunes | SE | | Erie | PA | | GL |
| Red currant | *Ribes triste* | Plant | Moist woods and rocky slopes at mid to high elevations | ST | | Crawford, Erie, McKean, Porter, Warren | PA | | GL |
| Red-head pondweed | *Potamogeton richardsonii* | Plant | Alkaline waters of lakes, streams, and rivers | ST | | Armstrong, Crawford, Erie, Forest, Mercer Venango, Warren | PA | | GL |

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|---|---|---|---|---|---|---|---|---|---|
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| Richardson's rush | *Juncus alpinoarticulatus* ssp. *Nodulosus* | Plant | Wet, open, to semi-open places; sandy, usually calcareous soil; shores of lakes and ponds; marshes, ditches, wet meadows; and wet areas of abandoned limestone quarries | ST | | Erie | PA | | GL |
| Rough cotton-grass | *Eriophorum tenellum* | Plant | Bogs and wet, peaty substrates | SE | | Warren | PA | | GL |
| Rush aster | *Symphyotrichum boreale* | Plant | Cold bogs | SE | | Crawford, Erie | PA | | GL |
| Scouring-rush | *Equisetum x ferrissii* | Plant | Moist roadsides, riverbanks, lakeshores, woodlands | SS1 | | Beaver, Butler, Crawford, Erie, Lawrence, Mercer, Porter, Venango, Warren | PA | | GL |
| Showy lady's-slipper | *Cypripedium reginae* | Plant | Coniferous and hardwood fen forests, openings, fen meadows, hillside seeps, meadows, prairies, dune lags, seeping cliffs | ST | | Butler, Crawford, Erie, Lawrence, Mercer | PA | | GL |
| | *Sorbus decora* | Plant | Wet to mesic woods; cool, moist slopes; lakeshores | SE | | Crawford, Erie | PA | | GL |
| Shumard's oak | *Quercus shumardii* | Plant | Mesic slopes and bottom; streambanks and poorly-drained uplands | SE | | Crawford, Erie | PA | | GL |
| Silverweed | *Potentilla anserina* | Plant | Sun; moist to wet; beaches; sandy soil | ST | | Erie | PA | | GL |
| Slender cotton-grass | *Eriophorum gracile* | Plant | Meadows, bogs, shores; usually peaty, acidic substrates | SE | | Erie, Warren | PA | | GL |
| Slender cotton-grass | *Eriophorum gracile* | Plant | Meadows, bogs, shores; usually peaty, acidic substrates | SE | | Erie, Warren | PA | | GL |
| Slender spike-rush | *Eleocharis elliptica* | Plant | Wet, fresh, often calcareous meadows, swales, springy places, woods, prairie, serpentine barrens, ditches | SE | | Butler, Crawford, Erie, Lawrence, Venango | PA | | GL |
| Slender spike-rush | *Eleocharis tenuis* var. *verrucosa* | Plant | Fresh, often calcareous, shores, wet woods, ditches | SE | | Butler | PA | | GL |
| Small sea-side spurge | *Chamaesyce polygonifolia* | Plant | Dunes, beaches; sandy soil along Lake Michigan | ST | | Erie | PA | | GL |
| Small whorled pogonia | *Isotria medeoloides* | Plant | Acidic soils of elder hardwood forests | SE | FT | Venango | PA | | GL |
| Small yellow lady's-slipper | *Cypripedium calceolus* var. *parviflorum* | Plant | Mesic to dry deciduous and deciduous-hemlock forests, usually on slopes | SE | | Beaver, Crawford, Erie, Forest, Mercer, Venango, Warren | PA | | GL |
| Small-flowered false-foxglove | *Agalinis paupercula* | Plant | Sun; moist; bogs, shores, barrens; sandy soil | SE | | Erie, Mercer | PA | | GL |

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|---|---|---|---|---|---|---|---|---|---|
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| Small-headed rush | *Juncus brachycephalus* | Plant | Calcareous marshes, wet meadows, and wetland shores | ST | | Erie | PA | | GL |
| Smith's bulrush | *Schoenoplectus smithii* | Plant | Coastal, freshwater tidal flats and inland sandy or muddy shores with large fluctuations in water levels | SE | | Erie | PA | | GL |
| Southern twayblade | *Listera australis* | Plant | Rich humus of low moist woods, marshes, sphagnum bogs, in association with cinnamon fern and royal fern | SE | | Warren | PA | | GL |
| Spotted pondweed | *Potamogeton pulcher* | Plant | Stagnant to slow-flowing waters of streams, lakes, ponds, and small rivers | SE | | Crawford | PA | | GL |
| Spreading globeflower | *Trollius laxus* | Plant | Woodland, wet meadow, prairie, field, riparian, swamp, marsh, bog, fen, alpine areas | SE | | Erie, Lawrence | PA | | GL |
| Stalked bulrush | *Scirpus pedicellatus* | Plant | Lowland marshes in stream valleys, edges of bogs, boggy meadows, and wet sandy shorelines | ST | | Armstrong, Erie, Forest, McKean, Porter, Venango, Warren | PA | | GL |
| Sterile sedge | *Carex sterilis* | Plant | Fens, openings in white-cedar swamps, wet calcareous prairies, fresh interdunal meadows, calcareous seeps, lake and rivershores, wet sunny limestone outcrops | ST | | Erie, Lawrence, Mercer | PA | | GL |
| Swamp fly honeysuckle | *Lonicera oblongifolia* | Plant | Woodland, swamps, marshy areas, bogs, and fens | SE | | Crawford, Erie, Venango, Warren | PA | | GL |
| Swamp-pink | *Arethusa bulbosa* | Plant | Sphagnum bogs; coniferous swamps; calcareous treed to open fens; and moist, acid, sandy meadows | SE | | Crawford, Erie | PA | | GL |
| Sweet bay magnolia | *Magnolia virginiana* | Plant | Swamps, bays, low wet woods, savannahs; chiefly in Coastal Plain and lower Piedmont | ST | | Lawrence, Mercer | PA | | GL |
| Sweet flag | *Acorus americanus* | Plant | Wet open areas, marshes, swales, and along edges of quiet water | SE | | Crawford, Erie | PA | | GL |
| Tall gramma | *Bouteloua curtipendula* | Plant | Prairies, open brush, forest openings, rocky slopes | ST | | Venango | PA | | GL |
| Tall larkspur | *Delphinium exaltatum* | Plant | Rocky slopes in open deciduous woods and barrens; on calcareous substrates and shale, mafic, and ultramafic rocks | SE | | Beaver, Butler | PA | | GL |
| Tennessee pondweed | *Potamogeton tennesseensis* | Plant | Slow to fast-moving streams and rivers | SE | | Beaver | PA | | GL |
| Thin-leaved cotton-grass | *Eriophorum viridicarinatum* | Plant | Marshes, meadows, bogs, fens, wet woods | ST | | Butler, Crawford, Erie, Lawrence, Mercer, | PA | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered State | Threatened/ Endangered Fed. | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Warren | | | |
| Torrey's bulrush | *Schoenoplectus torreyi* | Plant | Emergent in fresh ponds and marshes that often have fluctuating water levels | SE | | Erie | PA | | GL |
| Torrey's rush | *Juncus torreyi* | Plant | Wet sandy shores; sloughs, along slightly alkaline water courses; swamps, clay soils, calcareous wet meadows, and alkaline soils | ST | | Beaver, Erie, Lawrence, Mercer | PA | | GL |
| Tuckerman's panic-grass | *Panicum tuckermanii* | Plant | Open, moist, sandy shores and fields | ST | | Erie, Warren | PA | | GL |
| Tufted buttercup | *Ranunculus fascicularis* | Plant | Grassland or deciduous forest | SE | | Venango | PA | | GL |
| Twig rush | *Cladium mariscoides* | Plant | Open acidic to alkaline wetlands; brackish upper edges of tidal marshes | SE | | Butler, Crawford, Erie | PA | | GL |
| Twinflower | *Linnaea borealis* | Plant | Cool, moist woods; peat knolls | ST | | Erie | PA | | GL |
| Umbrella flatsedge | *Cyperus diandrus* | Plant | Emergent shorelines in sandy, peaty, or slightly brackish areas, though seldom where disturbed | SE | | Erie | PA | | GL |
| Vanilla sweet-grass | *Hierochloe odorata* | Plant | Moist meadows; swales; fresh or brackish shores | SE | | Lawrence | PA | | GL |
| Variegated horsetail | *Equisetum variegatum* | Plant | Lakeshores, riverbanks, ditches, wet woods, tundra | SE | | Erie | PA | | GL |
| Vase-vine leather-flower | *Clematis viorna* | Plant | Wooded cliffs and streambanks | SE | | Beaver | PA | | GL |
| Vasey's pondweed | *Potamogeton vaseyi* | Plant | Quiet waters of lakes, ponds, and rivers | SE | | Crawford, Erie | PA | | GL |
| Virginia spiraea | *Spiraea virginiana* | Plant | Flood-scoured, high-gradient, rocky riverbanks; braided areas of lower stream reaches; gorges, canyons, disturbed rights-of-way | | FT | Beaver, Butler, Cameron, Clarion, Clearfield, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Potter, Venango, Warren | PA | | GL |
| Walter's barnyard-grass | *Echinochloa walteri* | Plant | Emergent aquatic | SE | | Erie | PA | | GL |
| Water sedge | *Carex aquatilis* | Plant | Marshes, bogs, wet meadows, shallow water along shores; usually in acidic substrates | ST | | Erie, Warren | PA | | GL |
| White twisted-stalk | *Streptopus amplexifolius* | Plant | Shaded streambanks and moist thickets | ST | | McKean, Potter | PA | | GL |
| Whorled nutrush | *Scleria verticillata* | Plant | Wet, marly, sandy, or peaty soils in marshes, bogs, savannas, moist meadows, wet pinelands, and lakeshores | SE | | Erie | PA | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Whorled water-milfoil | *Myriophyllum verticillatum* | Plant | Shallow waters of acid to circumneutral lakes | SE | | Crawford, Erie | PA | | GL |
| Wiegands sedge | *Carex wiegandii* | Plant | Bogs; openings in acidic conifer; mixed or alder swamps; wet acidic sandy or peaty meadows | ST | | Elk, McKean | PA | | GL |
| Wild bleeding-hearts | *Dicentra eximia* | Plant | Dry to moist, rocky, mountain woods, often in rock crevices at cliff bases | SE | | Beaver | PA | | GL |
| Wild hyacinth | *Camassia scilloides* | Plant | Prairies | ST | | Lawrence | PA | | GL |
| Wild-pea | *Lathyrus ochroleucus* | Plant | Dry woods, forests, and cliffs | ST | | Crawford, Warren | PA | | GL |
| Yellow sedge | *Carex flava* | Plant | Moist to wet habitats, such as open meadows, fens, partially shaded shrub carrs, swamps; on lime-rich soils | ST | | Crawford, Erie | PA | | GL |
| Baltic rush | *Juncus arcticus* var. *littoralis* | Plant | Shores, stream margins, wet meadows, fens, marshes, often slightly alkaline soils | ST | | Erie | PA | | GL |
| Bog turtle | *Glyptemys muhlenbergii* | Reptile | Calcareous wetlands (areas containing lime), including meadows, bogs, marshes, and spring seeps | SE | | Crawford, Mercer, Lawrence | PA | | GL |
| Eastern massasauga | *Sistrurus catenatus* | Reptile | Wet areas, including wet prairies, marshes, and low areas along rivers and lakes | SE | | Armstrong, Butler, Crawford, Lawrence, Mercer, Venango | PA | | GL |
| Kirtland's snake | *Clonophis kirtlandii* | Reptile | Moist, open meadow or wet prairie habitats | SE | | Butler, Clarion, Forest, Jefferson | PA | | GL |

Sources: PA NHP, 2010; PA DCNR, 2010; USDA, 2011a; USDOI, 2011j

Species list derived from best available sources (listed above). Some discrepancy exists between USFWS and state agencies concerning status and county locations for certain species. Status designation does not include State-Special Concern Species.

**THREAT STATUS DESIGNATIONS**

SE State Endangered
ST State Threatened
FE Federally Endangered
FT Federally Threatened
FC Federal Candidate Species
* See note column

**NORTHERN BORDER PEIS REGIONS**

GL Great Lakes
EOR East of the Rockies
NE New England
WOR West of the Rockies

## Table M–11. Threatened and Endangered Species in Vermont

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Taconic cave amphipod | *Stygobromus borealis* | Amphipod | Subterranean drainage systems of karst terrain in Taconic Mountains | SE | | County data unavailable | VT | | NE |
| Bald eagle | *Haliaeetus leucocephalus* | Bird | Near lakes and rivers with large trees for nesting and perching | SE | * | Statewide | VT | Federally delisted due to recovery | NE |
| Black tern | *Chlidonias niger* | Bird | Emergent vegetation wetlands with floating areas for nesting | SE | | County data unavailable | VT | Sightings in Missisquoi National Wildlife Refuge | NE |
| Common tern | *Sterna hirundo* | Bird | Isolated islands and beaches with little vegetation | SE | | County data unavailable | VT | | NE |
| Grasshopper sparrow | *Ammodramus savannarum* | Bird | Grasslands, pastures, old fields, and airfields | ST | | Statewide | VT | | NE |
| Henslow's sparrow | *Ammodramus henslowii* | Bird | Wet, grassy meadows, old fields, tall and dense grasslands with scattered shrubs | SE | | *Statewide | VT | Very rare and sporadic sitings | NE |
| Loggerhead shrike | *Lanius ludovicianus* | Bird | Open grasslands with scattered shrubs; prefer thorny shrubs to impale prey | SE | | County data unavailable | VT | | NE |
| Sedge wren | *Cistothorus platensis* | Bird | Dense, tall sedge and grass meadows; hedgerows, hayfields, and coastal marshes | SE | | County data unavailable | VT | | NE |
| Spruce grouse | *Falcipennis canadensis* | Bird | Boreal forests with dense spruce-fir forests substituting for jack pine stands | SE | | County data unavailable | VT | | NE |
| Upland sandpiper | *Bartramia longicauda* | Bird | Variety of large grassland areas | SE | | County data unavailable | VT | | NE |
| American brook lamprey | *Lampetra appendix* | Fish | Clear, cool-water rivers and streams with groundwater inflow | ST | | County data unavailable | VT | | NE |
| Channel darter | *Percina copelandi* | Fish | Areas in warmer rivers with gravel and sand substrates; moderate currents necessary to prevent siltation | SE | | County data unavailable | VT | | NE |
| Eastern sand darter | *Ammocrypta pellucida* | Fish | Fine sand areas of rivers with slow to moderate currents; gather in areas of sedimentation | ST | | County data unavailable | VT | | NE |
| Lake sturgeon | *Acipenser fulvescens* | Fish | Bottoms of large rivers and lakes; spawning sites require rocky substrate on river beds | SE | | County data unavailable | VT | | NE |
| Northern brook lamprey | *Ichthyomyzon fossor* | Fish | Small to moderate clear streams | SE | | County data unavailable | VT | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Stonecat | *Noturus flavus* | Fish | Moderate currents of medium-large rock bottom streams; lakes near gravel shorelines with wave action | SE | | County data unavailable | VT | | NE |
| Hairy-necked Tiger beetle | *Cicindela hirticollis* | Insect | Sand beaches at river mouths; lake shorelines | ST | | Chittenden, Franklin, Grand Isle | VT | Winooski Valley Park District | NE |
| Cobblestone tiger beetle | *Cicindela marginipennis* | Insect | Cobblestone shorelines and islands | ST | | *Statewide | VT | Lower Connecticut, White, West, and single Winooski rivers. Southern Vermont Piedmont and northern Green Mountains | NE |
| American marten | *Martes americana* | Mammal | Large, unfragmented woodlands with downed wood; deep snow necessary | SE | | *Caledonia, Essex, Orleans | VT | Extirpated; extremely low levels in northeast Vermont | NE |
| Canadian lynx | *Lynx canadensis* | Mammal | Soft-mixed hardwoods; deep snow necessary | SE | FT | Caledonia, Essex, Franklin, Lamoille, Orleans | VT | Believed to be extirpated; rare sitings | NE |
| Eastern mountain lion | *Puma concolor couguar* | Mammal | Large-scale, remote, undisturbed, hilly woodlands | SE | FE | *Statewide | VT | Presumed to be extirpated | NE |
| Eastern small-footed bat | *Myotis leibii* | Mammal | Caves and roost trees near bodies of water and right-of-ways | ST | | *Statewide | VT | Wide dispersal range | NE |
| Indiana bat | *Myotis sodalis* | Mammal | Caves and shag bark roost trees near bodies of water and right-of-ways | SE | FE | *Statewide | VT | USFWS lists this species statewide | NE |
| Black sandshell | *Ligumia recta* | Mollusk | Large rivers with sand, gravel, and mud bottoms | SE | | Addison, Chittenden, Franklin, Grand Isle, Lamoille, Washington | VT | Missisquoi River, Otter Creek, Poultney River, and Hospital Creek | NE |
| Brook floater | *Alasmidonta varicosa* | Mollusk | High-relief streams among boulders in sand | ST | | County data unavailable | VT | | NE |
| Cylindrical papershell | *Anodontoides ferussacianus* | Mollusk | Rivers, creeks, and shallow lakes; silt and silty sand bottoms with slow currents | SE | | Caledonia, Chittenden, Franklin, Grand Isle, Lamoille, Orleans, Washington | VT | Mostly below first waterfalls, but also found above barrier in the Lamoille River | NE |
| Dwarf wedgemussel | *Alasmidonta heterodon* | Mollusk | Large rivers with mud, silt-sand bottoms with moderate currents | | FE | Essex, Orange, Windsor | VT | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Eastern pearlshell | *Margaritifera margaritifera* | Mollusk | Cold-water streams with sand and gravel substrates; streams that support trout | ST | | *Statewide | VT | Winooski River and Lewis Creek systems of the Champlain basin; Passumpsic, West, and Nulhegan river systems of the Connecticut River basin | NE |
| Fluted-shell | *Lasmigona costata* | Mollusk | Medium to large streams above and below waterfall boundaries; wide variety of substrates | SE | | Addison, Chittenden, Franklin, Lamoille, Rutland, Washington | VT | Lamoille and Winooski rivers; Otter and Lewis creeks, and Poultney River | NE |
| Fragile papershell | *Leptodea fragilis* | Mollusk | Large rivers and their deltas in a variety of substrates | SE | | Addison, Chittenden, Franklin, Grand Isle, Lamoille, Rutland, Washington | VT | Lake Champlain; Missisquoi, Lamoille, and Winooski Rivers; Otter Creek; and Poultney River | NE |
| Giant floater | *Pyganodon grandis* | Mollusk | Large rivers and lakes; on a variety of substrates | ST | | Addison, Chittenden, Franklin, Grand Isle, Lamoille, Rutland, Washington | VT | Lake Champlain; Missisquoi, Lamoille, and Winooski rivers; Otter and East creeks; and Poultney River. Reported above the principal fall line only in Otter Creek and Lamoille River | NE |
| Pink heelsplitter | *Potamilus alatus* | Mollusk | Large rivers and their deltas in a variety of substrates | SE | | Addison, Chittenden, Franklin, Grand Isle, Lamoille, Rutland, Washington | VT | Lake Champlain; Missisquoi, Lamoille, and Winooski rivers; Otter, Lewis, and Hospital creeks; and Poultney River | NE |
| Pocketbook | *Lampsilis ovata* | Mollusk | Larger rivers and river deltas; shallow areas on main lakes; sand, sand-gravel, and silty substrates | SE | | Addison, Chittenden, Franklin, Grand Isle, Lamoille, Washington | VT | Lake Champlain tributaries to the first boundary | NE |
| A moss | *Plagiobryum zieri* | Plant | Damp, shaded crevices of rock outcrops and cliffs | SE | | County data unavailable | VT | | NE |
| A peatmoss | *Sphagnum nitidum* | Plant | Minerotrophic and hygrophytic; forming hummocks in shrubby and wooded, medium and rich fens; low to moderate elevations | SE | | County data unavailable | VT | | NE |
| Alaskan clubmoss | *Lycopodium sitchense Rupr.* | Plant | Alpine meadows, rocky open barrens, and conifer woods | ST | | County data unavailable | VT | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Allegheny crowfoot | *Ranunculus allegheniensis* | Plant | Woodlands and pastures | ST | | Rutland | VT | | NE |
| Alpine sweet-grass | *Hierochloe alpina* | Plant | Alpine meadows and exposed rock cliff faces | ST | | Lamoille | VT | | NE |
| Alpine woodsia | *Woodsia alpina* | Plant | Crevices and ledges on cliffs (occasionally on rocky slopes); mostly slaty and calcareous rocks | SE | | Lamoille, Orleans, Windsor | VT | | NE |
| American dragonhead | *Dracocephalum parviflorum* | Plant | Dry, disturbed areas with rocky soils | ST | | County data unavailable | VT | | NE |
| Arethusa | *Arethusa bulbosa* | Plant | Sphagnum bogs, coniferous swamps, and calcium-rich fens and meadows | ST | | Addison, Caledonia, Chittenden, Orleans, Rutland, Windsor | VT | | NE |
| Auricled twayblade | *Listera auriculata* | Plant | Low-lying, moist, hardwood and mixed-hardwood forests; shrub swamps, sphagnum bogs, and areas where soils are cool in summer | SE | | Washington | VT | | NE |
| Autumn coral-root | *Corallorhiza odontorhiza* | Plant | Mesic, forested uplands | ST | | Chittenden, Washington, Windsor | VT | | NE |
| Autumn fimbristylis | *Fimbristylis autumnalis* | Plant | Moist to wet sands, peats, silts, seeps, ditches, savannas, and reservoirs | SE | | Rutland | VT | | NE |
| Barbed-bristle bulrush or northeastern bulrush | *Scirpus ancistrochaetus* | Plant | Wet depressions, bogs, sinkhole ponds, adjacent to pools | SE | FE | Windsor | VT | | NE |
| Bashful bulrush | *Scirpus verecundus* | Plant | Mesic to dry hardwood forests, usually with oak component; often on hillsides | SE | | Chittenden | VT | | NE |
| Beach heather | *Hudsonia tomentosa* | Plant | Sand dunes and poor soil openings | SE | | Chittenden | VT | | NE |
| Beach pea | *Lathyrus maritimus* | Plant | Shores, beaches, and inland sandy soils | ST | | County data unavailable* | VT | Data suggest population near Lake Champlain valley | NE |
| Bearberry willow | *Salix uva-ursi* | Plant | Moist lowlands and wetlands | SE | | Lamoille | VT | | NE |
| Bentgrass | *Calamagrostis stricta* | Plant | Wetlands, mesic prairies | SE | | Lamoille, Orleans | VT | | NE |
| Bird's-eye primrose | *Primula mistassinica* | Plant | Rocky cliffs, shores, and ledges with limestone soils | ST | | Caledonia, Orleans | VT | | NE |
| Blackish sedge | *Carex atratiformis* | Plant | Open woodlands, streambanks, lakeshores, calcareous cliffs and ledges | ST | | County data unavailable | VT | | NE |
| Blunt sphenopholis | *Sphenopholis obtusata* | Plant | Beech forests, northern lowland forests, prairies, marshes, dunes, and waste places | SE | | Orleans | VT | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Blunt-leaved milkweed | *Asclepias amplexicaulis* | Plant | Dry prairies and woods; sandy soils | ST | | Chittenden | VT | | NE |
| Bog bedstraw | *Galium labradoricum* | Plant | Cool bogs, swamps, and thickets | ST | | Addison | VT | | NE |
| Bog wintergreen | *Pyrola asarifolia* | Plant | Damp, open, mossy forests and streambanks | ST | | Addison, Caledonia, Essex, Orange, Orleans, Rutland, Windsor | VT | | NE |
| Boott's rattlesnake-root | *Prenanthes boottii* | Plant | Higher elevation alpine uplands | SE | | Lamoille | VT | | NE |
| Bronze sedge | *Carex foenea* | Plant | Dry to moist acidic sand-gravel areas; open grasslands, woodlands, and disturbed areas | SE | | Addison, Rutland, Windsor | VT | | NE |
| Butterfly-weed | *Asclepias tuberosa* | Plant | Dry fields | ST | | County data unavailable | VT | | NE |
| Buxbaum's sedge | *Carex buxbaumii* | Plant | Wet meadows, marshes, and fens | SE | | Chittenden, Rutland | VT | | NE |
| Canadian milk-vetch | *Astragalus canadensis* | Plant | Moist prairies, open woodlands, and streambanks | ST | | Addison, Chittenden, Grand Isle, Orleans | VT | | NE |
| Capillary beak-rush | *Rhynchospora capillacea* | Plant | Moist, calcareous fens and seeps over limestone rock | ST | | Chittenden, Orleans, Windsor | VT | | NE |
| Capillary sedge | *Carex capillaris* | Plant | Moist tundra, cliff seeps, and rocky slopes; prairie sloughs, meadows, and shorelines | ST | | County data unavailable | VT | | NE |
| Champlain beach grass | *Ammophila champlainensis* | Plant | Top and front of dunes; along sand beaches | SE | | County data unavailable | VT | | NE |
| Climbing fern | *Lygodium palmatum* | Plant | Moist, open woodlands and thickets with full sunlight | SE | | Lamoille | VT | | NE |
| Contracted sedge | *Carex arcta* | Plant | Swampy, coniferous woods and thickets; wet meadows | SE | | Caledonia, Franklin, Grand Isle | VT | | NE |
| Creeping sedge | *Carex chordorrhiza* | Plant | Fens, bogs, floating mats, emergent sedge marshes; very wet, shallow areas | SE | | Addison, Chittenden | VT | | NE |
| Culver's-root | *Veronicastrum virginicum* | Plant | Moist to mesic, black soil prairies; sand prairies, openings, and edges of woodlands; thickets, savannas, and swampy meadows along rivers and ditches; not often seen in highly disturbed habitats | SE | | Chittenden, Rutland | VT | | NE |
| Deerberry | *Vaccinium stamineum* | Plant | Dry, open woods; floodplains; thickets | SE | | County data unavailable | VT | | NE |
| Diapensia | *Diapensia lapponica* | Plant | Bare ledges; exposed gravel and rocky peaks | SE | | Chittenden, Lamoille | VT | | NE |
| Douglas knotweed | *Polygonum douglasii* | Plant | Rocky outcrops, sandy soils, and disturbed areas | SE | | Addison, Chittenden, Rutland | VT | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Drummond's rock-cress | *Arabis drummondii* | Plant | Rocky edges and cliffs; calcareous woodlands | SE | | Addison, Chittenden, Orange, Rutland, Windsor | VT | | NE |
| Dwarf chinkapin oak | *Quercus prinoides* | Plant | Open areas, open woods, sandy soils | SE | | County data unavailable | VT | | NE |
| Early thimbleweed | *Anemone multifida* | Plant | Dry gravel sites, open woods, and limestone ridges | SE | | Chittenden, Windsor | VT | | NE |
| Eastern Jacob's ladder | *Polemonium van-bruntiae* | Plant | Variety of wetlands, including shrub swamps, marshes, lakeshores, and wooded floodplains | ST | | Addison | VT | | NE |
| Eight-flowered fescue | *Vulpia octoflora* | Plant | Dry upland prairies (including hill prairies, gravel prairies, and sand prairies), rocky glades, thinly wooded rocky slopes, sandy or gravelly areas | SE | | Chittenden | VT | | NE |
| Engelmann's quillwort | *Isoetes engelmannii* | Plant | Temporary pools, bogs, marshes, stream edges, and swamps; along wet roadsides | ST | | Addison | VT | | NE |
| Fairy slipper | *Calypso bulbosa* | Plant | Leaf litter, mossy grounds in cool, damp coniferous forests | ST | | Addison, Chittenden, Orleans, Rutland | VT | | NE |
| Felwort | *Gentianella amarella* | Plant | Meadows and moist areas in higher elevations | ST | | Lamoille | VT | | NE |
| Few-flowered spikerush | *Eleocharis quinqueflora* | Plant | Fens, wet meadows, seeps, and springs | ST | | County data unavailable | VT | | NE |
| Few-fruited sedge | *Carex oligocarpa* | Plant | Dry-mesic deciduous forests, calcium-rich soils near streams | SE | | Addison, Chittenden, Rutland | VT | | NE |
| Fringe-top closed gentian | *Gentiana andrewsii* | Plant | Moist, shaded, meadows, damp prairies, and shorelines | ST | | County data unavailable | VT | | NE |
| Garber's sedge | *Carex garberi* | Plant | Moist shores, meadows, and fens with rich soils | ST | | County data unavailable | VT | | NE |
| Golden corydalis | *Corydalis aurea* | Plant | Gravelly hillsides near rocks and brush; creek bottoms | ST | | Addison, Chittenden, Grand Isle, Rutland, Windsor | VT | | NE |
| Golden-seal | *Hydrastis canadensis* | Plant | Mesic, deciduous forests with clay soils | SE | | Addison, Chittenden | VT | | NE |
| Great laurel | *Rhododendron maximum* | Plant | Moist, dense woodlands; steep streambanks; mountain slopes | ST | | Caledonia, Franklin, Orleans, Washington | VT | | NE |
| Great St. John's-wort | *Hypericum ascyron* | Plant | Moist woodlands near openings and streambanks | ST | | Addison, Chittenden, Franklin, Lamoille, Orange, Rutland, Windsor | VT | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Green dragon | *Arisaema dracontium* | Plant | Mesic-wet deciduous hardwoods, thickets, and lowlands | ST | | Addison, Rutland, Windsor | VT | | NE |
| Green mountain | *Adiantum viridimontanum* | Plant | Rock crevices, talus slopes, and serpentine soils | ST | | Lamoille | VT | | NE |
| Green spleenwort | *Asplenium trichomanes-ramosum* | Plant | Limestone and basic rock areas | ST | | Lamoille, Orleans, Windsor | VT | | NE |
| Hairy bush-clover | *Lespedeza hirta* | Plant | Meadow and prairies with savanna openings | ST | | Addison, Rutland | VT | | NE |
| Hairy lettuce | *Lactuca hirsuta* | Plant | Dry-mesic open woodlands | ST | | Addison, Chittenden | VT | | NE |
| Hairy wood-mint | *Blephilia hirsuta* | Plant | Mesic-deciduous hardwoods | ST | | Addison, Chittenden, Windsor | VT | | NE |
| Harsh sunflower | *Helianthus strumosus* | Plant | Dry, open, upland woods and edges | ST | | Chittenden | VT | | NE |
| Hay sedge | *Carex siccata* | Plant | Oak and oak-pine savannas and prairies; sand dunes and rocky outcrops | SE | | Addison, Rutland, Windsor | VT | | NE |
| Hooker's orchis | *Platanthera hookeri* | Plant | Dry to mesic coniferous and deciduous forests | ST | | Addison, Caledonia, Chittenden, Essex, Franklin, Orange, Orleans, Rutland, Washington, Windsor | VT | | NE |
| Houghton's cyperus | *Cyperus houghtonii* | Plant | Riverbanks, sand shorelines, and dunes; openings in woods, especially jack pines | ST | | Chittenden, Rutland | VT | | NE |
| Jack pine | *Pinus banksiana* | Plant | Fire-successional boreal forests; dry flats with sandy soils | ST | | Addison, Franklin | VT | | NE |
| Jesup's milk-vetch | *Astragalus robbinsii* var. *jesupi* | Plant | Calcareous, steep bedrock slopes of the Connecticut River | SE | FE | Windsor | VT | | NE |
| Lake-cress | *Neobeckia aquatica* | Plant | Quiet waters and nearshore areas no deeper than 7 ft. | ST | | Addison, Chittenden, Franklin | VT | | NE |
| Lance-leaved violet | *Viola lanceolata* | Plant | Open, moist, sandy areas in pastures, meadows, and prairie remnants; bog pond margins; usually in acidic substrates | ST | | Essex | VT | | NE |
| Lanceolate cress | *Draba cana* | Plant | Dry, open meadows and rock crevices; usually at high elevation | ST | | Lamoille, Orleans | VT | | NE |
| Large whorled pogonia | *Isotria verticillata* | Plant | Acidic soils in dry-mesic forests; seeps and sphagnum bogs | ST | | Addison, Chittenden | VT | | NE |
| Large-bracted tick-trefoil | *Desmodium cuspidatum* | Plant | Dry woods and thickets; savanna prairie | SE | | Rutland | VT | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Lesser bur-reed | *Sparganium natans* | Plant | Cool, quiet, slightly acid to somewhat basic waters of bays, pools, ditches, and peat bogs; usually in shallow water but sometimes to 60 cm depth where less floriferous; abundant in its northern range | ST | | Addison, Caledonia, Essex, Orleans, Rutland, Windsor | VT | | NE |
| Lesser pyrola | *Pyrola minor* | Plant | Moist tamarack, coniferous swamps | SE | | Addison, Lamoille | VT | | NE |
| Lily-leaved twayblade | *Liparis liliifolia* | Plant | Mature moist, mesic deciduous forests and pine woods; open or disturbed habitats during deforestation | ST | | Addison, Chittenden, Rutland, Windsor | VT | | NE |
| Low bindweed | *Calystegia spithamaea* | Plant | Dry forests and fields with sandy soils | ST | | Chittenden, Rutland, Windsor | VT | | NE |
| Low cyperus | *Cyperus diandrus* | Plant | Sand and peat brackish areas | SE | | Chittenden, Essex, Franklin | VT | | NE |
| Male fern | *Dryopteris filix-mas* | Plant | Dense and open woodlands with talus slopes of limestone and granite | ST | | Rutland, Washington, Windsor | VT | | NE |
| Many-fruited false-loosestrife | *Ludwigia polycarpa* | Plant | Swamps, marshes, moist prairies, and streambanks | SE | | County data unavailable | VT | | NE |
| Marble sandwort | *Minuartia rubella* | Plant | Arctic lowlands; rocky ridges; arctic and alpine tundras; coastal limestone barrens | ST | | County data unavailable | VT | | NE |
| Marcescent sandwort | *Minuartia marcescens* | Plant | Ultramafic ledges and barrens | ST | | County data unavailable | VT | | NE |
| Mare's-tail | *Hippuris vulgaris* | Plant | Streams, ponds, and shallow lakes | SE | | Caledonia, Orleans | VT | | NE |
| Marsh horsetail | *Equisetum palustre* | Plant | Marshes and swamps; wet areas | ST | | Addison, Chittenden, Essex, Orleans, Windsor | VT | | NE |
| Marsh valerian | *Valeriana uliginosa* | Plant | Boreal open, marly (calcareous) fens and glades in wooded swamps; usually associated with *Thuja occidentalis, Larix aricina* and several species of *Carex* | SE | | Rutland | VT | | NE |
| Marsh vetchling | *Lathyrus palustris* | Plant | Wet to moist meadows, shorelines, and marshes | ST | | Addison, Chittenden, Grand Isle, Orange, Rutland | VT | | NE |
| Moonwort | *Botrychium lunaria* | Plant | Open fields, occasional forests | SE | | Orleans, Windsor | VT | | NE |
| Mountain spleenwort | *Asplenium montanum* | Plant | Acidic soil in crevices on shaded cliffs | ST | | County data unavailable | VT | | NE |
| Muehlenberg's sedge | *Carex muehlenbergii* | Plant | Dry woodlands and fields; artially forested uplands | ST | | Chittenden, Windsor | VT | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Needle-spine rose | *Rosa acicularis* | Plant | Thickets, streambanks, rocky bluffs, and wooded hillsides | SE | | Addison, Chittenden, Rutland | VT | | NE |
| Nodding stickseed | *Hackelia deflexa* var. *americana* | Plant | Moist woods, thickets, and hillsides | ST | | Addison, Orange, Orleans | VT | | NE |
| Northern cinquefoil | *Potentilla pensylvanica* var. *prectinata* | Plant | Alpine; higher elevations | SE | | County data unavailable | VT | | NE |
| Northern rock-cress | *Braya humilis* | Plant | Calcareous, sandy areas with moderate disturbance | ST | | Orleans | VT | | NE |
| Northern wild comfrey | *Cynoglossum virginianum* var. *boreale* | Plant | Uplands and woods | ST | | Addison, Chittenden, Grand Isle, Orange, Rutland | VT | | NE |
| Northern yellow-eyed grass | *Xyris montana* | Plant | Sphagnum bogs, tamarack swamps | ST | | Essex | VT | | NE |
| Obedience | *Physostegia virginiana* | Plant | Riverbanks, wet thickets, and moist prairies | ST | | Addison, Chittenden, Grand Isle | VT | | NE |
| Pale painted-cup | *Castilleja septentrionalis* | Plant | Rock crevices in thin woodlands; conglomerate bedrock | ST | | Lamoille | VT | | NE |
| Pale sedge | *Carex livida* | Plant | Boreal fens, calcareous floating mats | ST | | Addison, Washington | VT | | NE |
| Pinedrops | *Pterospora andromedea* | Plant | Humus soils of coniferous forests | SE | | Chittenden | VT | | NE |
| Plains frostweed | *Helianthemum bicknellii* | Plant | Dry, inland, sandy soils in prairies and woodlands | ST | | Chittenden, Rutland, Washington, Windsor | VT | | NE |
| Pod-grass | *Scheuchzeria palustris* ssp. *Americana* | Plant | Sphagnum bogs, marshes, and lake margins | ST | | Addison, Caledonia, Chittenden, Essex, Rutland, Windsor | VT | | NE |
| Prairie redroot | *Ceanothus herbaceus* | Plant | Dry prairies with sandy-rocky soils | SE | | Chittenden | VT | | NE |
| Prostrate tick-trefoil | *Desmodium rotundifolium* | Plant | Acid soils, dry rocky woods, ridges, hilltops | ST | | County data unavailable | VT | | NE |
| Purple giant hyssop | *Agastache scrophulariifolia* | Plant | Open grasslands with short-growth shrubs | ST | | Addison, Chittenden, Washington | VT | | NE |
| Putty-root | *Aplectrum hyemale* | Plant | Moist to swampy deciduous forests | ST | | Addison, Chittenden, Rutland | VT | | NE |
| Pygmy water-lily | *Nymphaea leibergii* | Plant | Shallow, protected bays in lakes and slow-moving streams | SE | | County data unavailable | VT | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Ram's head lady's-slipper | *Cypripedium arietinum* | Plant | Dry to moist, open, coniferous and mixed woodlands | ST | | Addison, Caledonia, Chittenden, Orange, Orleans, Rutland | VT | | NE |
| Red mulberry | *Morus rubra* | Plant | Within or near riparian areas | ST | | County data unavailable | VT | | NE |
| Richardson's sedge | *Carex richardsonii* | Plant | Grassland communities | SE | | County data unavailable | VT | | NE |
| Roseroot | *Sedum rosea* | Plant | Moist, rocky ledges and talus of coastal cliffs in the north and on north-facing cliffs | ST | | Windsor | VT | | NE |
| Rough dropseed | *Sporobolus asper* | Plant | Black soil to sandy soil prairies and savannas; rocky upland areas and limestone glades | SE | | County data unavailable | VT | | NE |
| Secund rush | *Juncus secundus* | Plant | Exposed sites with well- drained soils and shallow bedrock | SE | | Chittenden, Rutland | VT | | NE |
| Sessile-leaved boneset | *Eupatorium sessilifolium* | Plant | Woods and hills; away from wet habitats | SE | | County data unavailable | VT | | NE |
| Sharp manna-grass | *Glyceria acutiflora* | Plant | Wet soils and shallow waters | SE | | Rutland | VT | | NE |
| Sheathed sedge | *Carex vaginata* | Plant | Calcareous swamps, bogged thickets, and woodlands | SE | | Caledonia, Orleans | VT | | NE |
| Shiny wedgegrass | *Sphenopholis nitida* | Plant | Rocky, fertile soils on basalt bedrock, on steep slopes and ridge crests in deciduous forests | SE | | County data unavailable | VT | | NE |
| Short-styled snakeroot | *Sanicula canadensis* | Plant | Dry, open, and partially shaded woodlands | ST | | Addison, Chittenden | VT | | NE |
| Slender mountain-rice | *Oryzopsis pungens* | Plant | Open, rocky grasslands | ST | | Addison, Chittenden, Windsor | VT | | NE |
| Small whorled pogonia | *Isotria medeoloides* | Plant | Dry-mesic deciduous forests with light leaf litter, relatively open canopy on flats or slope bases | SE | FT | Chittenden | VT | | NE |
| Smooth draba | *Draba glabella* | Plant | Calcareous outcrops, cliffs, and talus adjacent to water | ST | | County data unavailable | VT | | NE |
| Soldier rush | *Juncus militaris* | Plant | Intermittent wetlands and soft-water lakes | SE | | County data unavailable | VT | | NE |
| Southern twayblade | *Listera australis* | Plant | Humus soils in low moist woodlands, marshes, and bogs | SE | | Lamoille | VT | | NE |
| Squashberry | *Viburnum edule* | Plant | Moist, wooded areas in open or closed coniferous forests, primarily in white spruce (*Picea glauca*), also in lodgepole pine (*Pinus contorta*) or western red cedar (*Thuja plicata*) habitats | ST | | Lamoille, Rutland | VT | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Sticky false-asphodel | *Tofieldia glutinosa* | Plant | Marshes, wet meadows, calcareous soil | ST | | Addison, Caledonia, Windsor | VT | | NE |
| Stiff gentian | *Gentianella quinquefolia* | Plant | Rich woodlands with gravelly soils | ST | | Addison, Caledonia, Chittenden, Orange, Rutland, Windsor | VT | | NE |
| Stiff witch-grass | *Panicum flexile* | Plant | Moist to dry open woods, meadows, limestone bluffs, calcareous fens, and sandy plains | SE | | Grand Isle | VT | | NE |
| Swamp birch | *Betula pumila* var. *glandulifera* | Plant | Bogs, calcareous fens, wooded swamps, and lakeshores | SE | | County data unavailable | VT | | NE |
| Sweet coltsfoot | *Petasites frigidus var. palmatus* | Plant | Moderate to wet forests and forested meadows | ST | | Addison, Caledonia, Chittenden, Orleans, Rutland | VT | | NE |
| Tea-leaved willow | *Salix planifolia* | Plant | Swamps, marshes, bogs, fens, and lakeshores | ST | | Chittenden, Lamoille | VT | | NE |
| Three-bird orchid | *Triphora trianthophora* | Plant | Moist, rich, deciduous forests | ST | | County data unavailable | VT | | NE |
| Torrey's rush | *Juncus torreyi* | Plant | Wet shorelines, slough edges, swamps, and alkaline watersheds | SE | | Addison, Chittenden, Rutland | VT | | NE |
| Tubercled orchis | *Platanthera flava* | Plant | Wet prairies and meadows; marsh, swamp, and lakeshore margins; full sun to partial shade with scattered shrubs | ST | | Addison, Caledonia, Chittenden, Essex, Grand Isle, Orange, Orleans, Rutland, Windsor | VT | | NE |
| Violet bush-clover | *Lespedeza violacea* | Plant | Meadow and prairies with savanna openings | ST | | Addison, Chittenden, Rutland | VT | | NE |
| Virginia chain-fern | *Woodwardia virginica* | Plant | Swamps, marshes, bogs, and roadside ditches over noncalcareous substrates | ST | | Addison, Chittenden, Franklin, Rutland | VT | | NE |
| Virginia meadow-beauty | *Rhexia virginica* | Plant | Moist meadows and ditches; wet sandy-peat soils | ST | | Rutland | VT | | NE |
| White adder's mouth | *Malaxis brachypoda* | Plant | Damp woods, bogs, and calcareous swamps | ST | | Addison, Chittenden, Rutland | VT | | NE |
| White-flowered leafcup | *Polymnia canadensis* | Plant | Moist woodlands; with canopy openings and cliff edges | SE | | Rutland | VT | | NE |
| Wild garlic | *Allium canadense* | Plant | Open woodlands and prairies | ST | | Rutland | VT | | NE |
| Wild lupine | *Lupinus perennis* | Plant | Woods and prairies with sandy soils; dry to moderate soils in full sunlight | SE | | Chittenden, Essex, Windsor | VT | | NE |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Wild plum | *Prunus americana* | Plant | Woodland edges, stream banks, upland pastures | ST | | Grand Isle, Windsor | VT | | NE |
| Wild senna | *Senna hebecarpa* | Plant | Full to partial sun; moderate moisture to moist; open woods, roadsides, streambanks; sandy, loamy soil | ST | | Addison, Orange, Rutland | VT | | NE |
| Woodland cudweed | *Omalotheca sylvatica* | Plant | Open, boggy woods; rock slopes, fields, and woodland edges | SE | | Essex | VT | | NE |
| Yellow giant hyssop | *Agastache nepetoides* | Plant | Openings in woodlands; moist, rich soils; disturbed areas | ST | | Addison | VT | | NE |
| Yellow pimpernel | *Taenidia integerrima* | Plant | Dry to moderate moisture; woods, open rocky slopes. | ST | | Addison, Chittenden, Grand Isle | VT | | NE |
| Common five-lined skink | *Plestiodon fasciatus* | Reptile | Talus slopes and cliff faces with nearby water and hardwoods; southwest-facing rock exposures | SE | | Rutland | VT | | NE |
| Eastern racer | *Coluber constrictor* | Reptile | Open, grasslands | ST | | County data unavailable | VT | | NE |
| Eastern ratsnake | *Pantherophis alleghaniensis* | Reptile | Wetland edges near rocky woodlands in large, undisturbed areas | ST | | Addison, Chittenden, Franklin, Grand Isle, Rutland | VT | | NE |
| Spiny softshell turtle | *Apalone spinifera* | Reptile | Lakes, rivers, wetlands with sufficient basking areas | ST* | | Grand Isle | VT | Only known from Lake Champlain, Missisquoi Bay | NE |
| Spotted turtle | *Clemmys guttata* | Reptile | Shallow aquatic habitats | SE | | County data unavailable | VT | | NE |
| Timber rattlesnake | *Crotalus horridus* | Reptile | Low, sparsely populated woodlands | SE | | Addison, Chittenden, Rutland | VT | | NE |

Sources: VT FWD, 2011; USDA, 2011a; USDA, 2011b; USDOI, 2011k

Species list derived from best available sources (listed above). Some discrepancy exists between USFWS and state agencies about status and county locations for certain species. Status designation does not include State Special Concern Species.

**THREAT STATUS DESIGNATIONS**

SE State Endangered
ST State Threatened
FE Federally Endangered
FT Federally Threatened
FC Federal Candidate Species
* See note column

**NORTHERN BORDER PEIS REGIONS**

GL Great Lakes
EOR East of the Rockies
NE New England
WOR West of the Rockies

## Table M–12. Threatened and Endangered Species in Washington

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Oregon spotted frog | *Rana pretiosa* | Amphibian | In or near a perennial water body with shallow areas and emergent or floating aquatic plants | SE | | Eastern Puget Sound counties | WA | Mostly extirpated in Washington | WOR |
| Marbled murrelet | *Brachyramphus marmoratus* | Bird | Nests in old-growth forests having large trees, multiple canopy layers, and moderate to high canopy closure.. Designated critical habitat: 61 FR 26257 26320. | ST | FT | Chelan, Clallam, Grays Harbor, Island, Jefferson, Kitsap, Kittitas, Lewis, Mason, Okanogan, Pacific, Pierce, San Juan, Skagit, Snohomish, Thurston, King, Whatcom | WA | | WOR |
| Greater sage grouse | *Centrocercus urophasianus* | Bird | Shrub-steppe and meadow-steppe habitats with low, rolling hills adjacent to valleys | ST | FC | Douglas | WA | | WOR |
| Western snowy plover | *Charadrius alexandrinus nivosus* | Bird | Coastal beaches on sand pits, dune-backed beaches, sparsely vegetated dunes, from southern Washington to southern California | SE* | FT | Grays Harbor, Pacific | WA | State only lists snowy plover as SE, not subspecies | WOR |
| Streaked horned lark | *Eremophila alpestris strigata* | Bird | Prairies, sandbars, and grassy ocean dunes | SE | | Grays Harbor, Mason, Pierce, Thurston | WA | | WOR |
| Brown pelican | *Pelecanus occidentalis* | Bird | Bays, offshore islands, spits, breakwaters, and open sandy beaches; nests on the ground or cliffs | SE | * | Clallam, Jefferson, Grays Harbor | WA | Federally delisted due to recovery | WOR |
| Short-tailed albatross | *Phoebastria albatrus* | Bird | Open ocean; islands | | FE | Clallam, Grays Harbor, Jefferson, Pacific | WA | | WOR |
| Northern spotted owl | *Strix occidentalis caurina* | Bird | Older forested habitats with multi-layered, multi-species canopy and moderate to high canopy closure. Designated critical habitat: 57 FR 1796 1838 and 73 FR 47326 47522. | SE | FT | Clallam, Chelan, Grays Harbor, Jefferson, King, Kitsap, Kittitas, Mason, Okanogan, Pacific, Pierce, Skagit, Snohomish, Thurston, Whatcom | WA | | WOR |
| North American green sturgeon | *Acipenser medirostris* | Fish | San Francisco Bay/delta and Sacramento-San Joaquin river system; both freshwater and saltwater habitat | | FT | Statewide | WA | | WOR |
| Chum salmon | *Oncorhynchus keta* | Fish | Spawning sites near springs; migrate to estuarine and ocean waters | | FT | Statewide | WA | | WOR |
| Coho salmon | *Oncorhynchus kisutch* | Fish | Freshwater, nearshore, and offshore environments | | FT | Statewide | WA | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Steelhead | *Oncorhynchus mykiss* | Fish | Clean, cool streams. Designated critical habitat: 65 FR 7764 7787 | | FT | Statewide | WA | | WOR |
| Sockeye salmon | *Oncorhynchus nerka* | Fish | Stream, lake, and estuarine habitat; offshore waters | | FE/FT | Statewide | WA | | WOR |
| Chinook salmon | *Oncorhynchus tshawytscha* | Fish | Freshwater streams and estuaries. Designated critical habitat: 57 FR 57051 57056; 58 FR 68543 68554; 64 FR 57399 57403; and 65 FR 7764 7787. | | FE/FT* | Statewide | WA | Endangered depending on location (in spring of upper Columbia River) | WOR |
| Bull trout | *Salvelinus confluentus* | Fish | High-altitude, cold-water streams. Designated critical habitat: 69 FR 59996 60076 and 70 FR 56212 56311. | | FT | Chelan, Clallam, Douglas, Ferry, Grant, Greys Harbor, Island, Jefferson, King, Kitsap, Kittitas, Lewis, Lincoln, Mason, Okanogan, Pacific, Pend Oreille, Pierce, San Juan, Skagit, Snohomish, Spokane, Stevens, Thurston, Whatcom | WA | | WOR |
| Canary rockfish | *Sebastes pinniger* | Fish | Ocean and offshore waters | | FT* | Island, King, Pierce, San Juan, Skagit, Snohomish, Whatcom | WA | Newly designated federally threatened species | WOR |
| Yelloweye rockfish | *Sebastes ruberrimus* | Fish | Ocean and offshore waters | | FT* | Island, King, Pierce, San Juan, Skagit, Snohomish, Whatcom | WA | Newly designated federally threatened species | WOR |
| Oregon silverspot butterfly | *Speyeria zerene hippolyta* | Insect | Coastal meadow habitats | SE | FT | Grays Harbor, Pacific | WA | | WOR |
| Black right whale | *Balaena glacialis* | Mammal | Oceans, coastal waters | SE | | Clallam, Gray's Harbor, Island, Jefferson, Pacific, San Juan | WA | | WOR |
| Sei whale | *Balaenoptera borealis* | Mammal | Oceans, coastal waters | SE | | Clallam, Jefferson, Gray's Harbor, Island, Pacific, San Juan | WA | | WOR |
| Fin whale | *Balaenoptera physalus* | Mammal | Oceans, coastal waters | SE | | Clallam, Jefferson, Gray's Harbor, Island, Pacific, San Juan | WA | | WOR |
| Gray wolf | *Canis lupus* | Mammal | Northern forests | SE | FE | Statewide | WA | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Southern sea otter | *Enhydra lutris nereis* | Mammal | Cold, coastal marine waters in kelp forests | SE* | FT | Statewide | WA | state lists sea otter as SE, not subspecies | WOR |
| Steller sea-lion | *Eumetopias jubatus* | Mammal | Cool, coastal waters of the North Pacific and rocky islands. | ST | FT* | Statewide | WA | *Has a western population that is endangered | WOR |
| Canada lynx | *Lynx canadensis* | Mammal | Northern forests. Designated critical habitat: 71 FR 66008 66061 and 74 FR 8616 8702. | ST | FT | Chelan, Ferry, Lewis, King, Kittitas, Okanogan, Pend Oreille, Pierce, Skagit, Snohomish, Stevens, Whatcom | WA | | WOR |
| Fisher | *Martes pennanti* | Mammal | Thick coniferous or mixed coniferous and hardwood forests | SE | | Statewide | WA | *Listed in WA | WOR |
| Humpback whale | *Megaptera novaeangliae* | Mammal | Oceans, nearshore | SE | FE | Statewide | WA | | WOR |
| Killer whale | *Orcinus orca* | Mammal | Oceans, coastal waters. Desiginated critical habitat: 71 FR 69054 69070. | SE | FE | Clallam, Island, Jefferson, King, Kitsap, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, Whatcom | WA | | WOR |
| Sperm whale | *Physeter macrocephalus* | Mammal | Oceans, coastal waters | SE | | Clallam, Jefferson, Gray's Harbor, Island, Pacific, San Juan | WA | | WOR |
| Woodland caribou | *Rangifer tarandus caribou* | Mammal | Mountain forests | SE | FE | Pend Oreille | WA | One small herd in the Selkirk Mountains of northern Idaho, eastern Washington, and southern British Columbia | WOR |
| Tacoma western pocket gopher | *Thomomys mazama tacomensis* | Mammal | Open grassy areas, including pastures, prairies, savannas, and open early seral woodlands and forests | ST | FC | Statewide | WA | | WOR |
| Grizzly bear | *Ursus arctos horribilis* | Mammal | Northern woodlands, meadows, and mountains | SE | FT | Chelan, King, Kittitas, Okanogan, Pend Oreille, Skagit, Snohomish, Stevens, Whatcom | WA | | WOR |
| Pink sand-verbena | *Abronia umbellata* var. *breviflora* | Plant | Sandy soils, coastal scrub, in the lee of dunes near strand | SE | | Clallam | WA | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Northern bent grass | *Agrostis borealis* | Plant | Moist areas of arctic-alpine ecosystems | ST | | Okanogan | WA | | WOR |
| Grand red stem | *Ammannia robusta* | Plant | Riparian mudflat wetlands dominated by annual species | ST | | Spokane | WA | | WOR |
| Pasqueflower | *Anemone patens* var. *multifida* | Plant | Ponderosa pine-Douglas fir forests and grasslands | ST | | Chelan | WA | | WOR |
| Meadow pussy-toes | *Antennaria corymbosa* | Plant | Moist meadows, streamsides, and moist, open woodlands | ST | | Pend Oreille | WA | | WOR |
| Northern bog aster, rush aster | *Aster borealis* | Plant | Cold bogs, calcareous bogs, calcareous fens | ST | | Pend Oreille, Pierce, San Juan | WA | | WOR |
| Palouse milk-vetch | *Astragalus arrectus* | Plant | Grassy hillsides, sagebrush flats, river bluffs, and open ponderosa pine/Douglas fir forests | ST | | Chelan, Lincoln | WA | | WOR |
| Cotton's milk-vetch | *Astragalus australis* var. *olympicus* | Plant | Talus slopes and ridges | ST | | Clallam | WA | | WOR |
| Loose-flower milk-vetch | *Astragalus tenellus* | Plant | Alkaline clay; on calcareous soil in grasslands | ST | | Douglas | WA | | WOR |
| Western moonwort | *Botrychium hesperium* | Plant | Sagebrush shrubland and moist and dry meadows | ST | | Ferry, Pend Oreille, Stevens | WA | | WOR |
| Skinny moonwort | *Botrychium lineare* | Plant | Deep grass and forbs of meadows; under trees in woods; and on limestone cliff shelves; mainly at higher elevations | ST | | Ferry | WA | Only one known occurrence in Washington. | WOR |
| Two-spiked moonwort | *Botrychium paradoxum* | Plant | Late-seral western red cedar forests on floodplains, terraces near perennial or intermittent streams | ST | | Chelan, Ferry, Okanogan, Pend Oreille, Stevens | WA | Grazing and recreation (trampling and ORV use) pose the greatest threats to the species in Washington | WOR |
| Hair-like sedge | *Carex capillaris* | Plant | Streambanks, wet meadows, wet ledges, and marshy lakeshores | ST | | Okanogan | WA | | WOR |
| Large-awn sedge | *Carex macrochaeta* | Plant | Moist or wet, open places, often near coast | ST | | Grays Harbor, Whatcom | WA | | WOR |
| Smokey mountain sedge | *Carex proposita* | Plant | Open, rocky slopes and ridges, often on talus or granite substrate; near or above timberline | ST | | Chelan, Snohomish | WA | | WOR |
| Quill sedge | *Carex tenera* var. *tenera* | Plant | Wet prairie and dry upland wood species | ST | | Pend Oreille | WA | | WOR |
| Sparse-leaved sedge | *Carex tenuiflora* | Plant | Bogs, fens, swamps, wet grassy areas | ST | | Okanogan | WA | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Clubmoss cassiope | *Cassiope lycopodioides* | Plant | Rock faces in moist areas at high elevations | ST | | King | WA | | WOR |
| Golden paintbrush | *Castilleja levisecta* | Plant | Upland prairies; generally flat grasslands with mounded topography* | SE | FT | Island, Jefferson, King, San Juan, Skagit | WA | Only in Washington and British Columbia | WOR |
| Chaffweed | *Centunculus minimus* | Plant | Freshwater riparian areas, floodplains, around vernal pools | ST | | Chelan, Pend Oreille | WA | | WOR |
| Pacific lanceleaved springbeauty | *Claytonia multiscapa* ssp. *pacifica* | Plant | Moist to dry grasslands and montane coniferous forests; often in swales with heavy, poorly drained clay soils in the south and wet, rocky tundra in the north | ST | | Clallam, Gray's Harbor, Jefferson, Mason | WA | | WOR |
| Goldthread | *Coptis trifolia* | Plant | Muskegs; deep woods, cedar bogs | ST | | Clallam | WA | | WOR |
| Yellow lady's-slipper | *Cypripedium parviflorum* | Plant | Bogs and wet forests | ST | | Ferry, Okanogan, Spokane, Stevens | WA | | WOR |
| Wenatchee larkspur | *Delphinium viridescens* | Plant | Moist meadows; moist microsites in open coniferous forests; springs, seeps, and riparian areas | ST | | Chelan | WA | | WOR |
| Frigid shootingstar | *Dodecatheon austrofrigidum* | Plant | Under overhanging cliffs; rock crevices on steep basalt slopes along rivers and ridges | ST | | Gray's Harbor | WA | | WOR |
| Long-stalked draba | *Draba longpipes* | Plant | Moist meadows and rocky slopes and cliffs | ST* | | Clallam | WA | | WOR |
| Quinault fawnily | *Erythronium quinaultense* | Plant | Rock ledges in coniferous forests at 1640 to 2953 ft. | ST | | Gray's Harbor, Jefferson | WA | | WOR |
| Long-bract frog orchid | *Habenaria viridis* var. *bracteata* | Plant | Aspen stands within coniferous areas | ST | | Okanogan | WA | | WOR |
| Taylor's stickseed | *Hackelia* sp. | Plant | Unstable, granitic sand and granite cliffs on the middle/lower slopes of Tumwater Canyon, in Chelan County | ST | | Chelan | WA | | WOR |
| Showy stickseed | *Hackelia venusta* | Plant | Steep slopes of the Washington Cascades | SE | FE | Chelan | WA | | WOR |
| Puzzling-rockcrest | *Halimolobos perplexa* | Plant | Lithosol and bare clayish soil with scattered rock | ST | | Douglas | WA | | WOR |
| Palouse goldenweed | *Haplopappus liatriformis* | Plant | Typically open sites on lower to upper portions of moderate slopes | ST | | Spokane | WA | | WOR |
| Howelia | *Howelia aquatitis* | Plant | Wetlands within the forested portions of the channeled scablands | ST | | Spokane, Thurston | WA | | WOR |
| Water howellia | *Howellia aquatilis* | Plant | Glacial potholes and former river oxbows | | FT | Pierce, Spokane, Thurston | WA | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Dwarf rush | *Juncus hemiendytus* var. *hemiendytus* | Plant | Prefers mud flats, edges of vernal pools, and moist/wet meadows | ST | | Spokane | WA | | WOR |
| Tiehm's dwarf rush | *Juncus tiehmii* | Plant | Seepy, moss-covered silt at the base of basalt cliffs | ST | | Douglas | WA | | WOR |
| Torrey's peavine | *Lathyrus torreyi* | Plant | Somewhat open areas within Douglas fir-dominated sites | ST | | Pierce | WA | | WOR |
| Pacific pea | *Lathyrus vestitus* ssp. *bolanderi* | Plant | Dry, open to wooded areas | SE | | Thurston | WA | | WOR |
| Water lobelia | *Lobelia dortmanna* | Plant | Shallow water at the margins of lakes and ponds | ST | | Clallam, King, Mason, Snohomish, Skagit, Whatcom | WA | | WOR |
| Alpine azalea | *Loiseleuria procumbens* | Plant | Alpine slopes | ST | | Skagit | WA | | WOR |
| Sandberg desert-parsley | *Lomatium sandbergii* | Plant | Dry, rocky, or open slopes and ridges | ST | | Pend Oreille | WA | | WOR |
| Kincaid's lupine | *Lupinus sulphureus kincaidii* | Plant | Native grasslands dominated by red fescue | | FT | Lewis | WA | | WOR |
| White meconella | *Meconella oregana* | Plant | Open grassland to forest/grassland | ST | | Island, Lewis | WA | | WOR |
| Red poverty-weed | *Monolepis pusilla* | Plant | Desert regions; saline or alkaline soils | ST | | Douglas, Grant | WA | | WOR |
| Adder's-tongue | *Ophioglossum pusillum* | Plant | Roadside ditches, floodplain woods in seasonally wet, acidic soil | ST | | Mason, Okanogan, San Juan, Stevens | WA | | WOR |
| Rosy owl-clover | *Orthocarpus bracteosus* | Plant | Moist meadows in transition zone between wetlands and uplands | SE | | San Juan, Whatcom | WA | | WOR |
| Western yellow oxalis | *Oxalis suksdorfii* | Plant | Meadows, moist woods, and open slopes | ST | | Clallam | WA | | WOR |
| Columbia crazyweed | *Oxytropis campestris* | Plant | Gravel bars and stony river shores or lakeshores | ST | | Ferry, Okanogan, Stevens | WA | | WOR |
| Kotzebue's grass of Parnassus | *Parnassia kotzebuei* | Plant | Moist sub-alpine areas in meadows, thickets, and along creeks in boggy soil | ST | | Okanogan | WA | | WOR |
| Sticky phacelia | *Phacelia lenta* | Plant | Open rocky habitats | ST | | Douglas | WA | | WOR |
| American pillwort | *Pilularia americana* | Plant | Middle zones of vernal pools from 1930 to 2310 ft. | ST | | Lincoln, Spokane | WA | | WOR |
| Choris' bog-orchid | *Platanthera chorisiana* | Plant | Wettest regions of sphagnum bogs; along streamsides | ST | | King, Snohomish | WA | | WOR |
| Canyon bog-orchid | *Platanthera sparsiflora* | Plant | Open, wet areas, seeps and bogs | ST | | Whatcom | WA | | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Great polemonium | *Polemonium carneum* | Plant | Woody thickets,<br>open and moist forests, prairie edges, roadsides, and elevations from 200 to 2000 ft. | ST | | Clallam, Gray's Harbor, Lewis | WA | | WOR |
| Washington polemonium | *Polemonium pectinatum* | Plant | Coulee floors, upland creek terraces, midslope depressions, draws with ephemeral creeks | ST | | Lincoln, Spokane | WA | | WOR |
| Austin's knotweed | *Polygonum austiniae* | Plant | Dry to moist flats or banks, from the sagebrush plains into the lower mountains | ST | | Grant | WA | | WOR |
| Five-leaved cinquefoil | *Potentilla quinquefolia* | Plant | Alpine and subalpine gravelly meadows and river bars | ST | | Okanogan | WA | | WOR |
| California buttercup | *Ranunculus californicus* | Plant | Bluffs, open grasslands along the coast | ST | | Island, San Juan, Skagit | WA | | WOR |
| Idaho gooseberry | *Ribes oxyacanthoides* L. ssp. *irriguum* | Plant | Streams; meadow openings associated with streams; slopes of moist to dry canyons | ST | | Ferry, Okanogan, Spokane, Stevens | WA | | WOR |
| Lowland toothcup | *Rotala ramosior* | Plant | Damp areas in fine sand and silt, wet/swampy places, lakes and pond margins | ST | | Chelan, Spokane, Whatcom | WA | | WOR |
| Nagoonberry | *Rubus acaulis* | Plant | Tundra to mountain meadows, bogs, and woods | ST | | Okanogan | WA | | WOR |
| Hoary willow | *Salix candida* | Plant | Bogs, fens, and swampy areas in peat soils | ST | | Pend Oreille, Stevens | WA | | WOR |
| Menzies' burnet | *Sanguisorba menziesii* | Plant | Coastal bogs on the Olympic Peninsula in moist soil | ST | | Clallam, Gray's Harbor | WA | | WOR |
| Bear's-foot sanicle | *Sanicula arctopoides* | Plant | Coastal bluffs, grassy sand dunes | ST | | Gray's Harbor | WA | | WOR |
| Strawberry saxifrage | *Saxifragopsis fragarioides* | Plant | Cracks and crevices on cliffs and in rock outcrops | ST | | Chelan | WA | | WOR |
| Little bluestem | *Schizachyrium scoparium* | Plant | Canyons and rocky slopes | ST | | Douglas, Stevens | WA | | WOR |
| Rocky Mountain bulrush | *Scirpus saximontanus* | Plant | Damp soils, freshwater ponds, ditches, and vernally moist areas | ST | | Spokane | WA | | WOR |
| Northwestern yellowflax | *Sclerolinon digynum* | Plant | Margins of vernal pools in grasslands; mound and swale topography | ST | | Spokane | WA | | WOR |
| Nelson's checker-mallow | *Sidalcea nelsoniana* | Plant | Olympic Mountains in Clallam County | | FT | Lewis | WA | | WOR |
| Wenatchee Mountains checker-mallow | *Sidalcea oregana calva* | Plant | Moist meadows with surface water/saturated upper soil profiles<br>into early summer | | FE | Chelan | WA | Endemic; found only in mid-elevation wetlands and moist meadows within Chelan County in eastern Washington | WOR |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Spalding's catchfly | *Silene spaldingii* | Plant | Mesic grassland prairies at low to mid elevations | | FT | Lincoln, Spokane | WA | | WOR |
| Strict blue-eyed grass | *Sisyrinchium montanum* | Plant | Steep western-facing slopes in a small natural seep/spring | ST | | Douglas, Pend Oreille | WA | | WOR |
| Water bur-reed | *Sparganium fluctuans* | Plant | Ponds, lakeshores, and slow-moving streams in lowland and montane zones | ST | | Clallam | WA | Known from fewer than five recent occurrences in Washington, and limited to a small geographic area | WOR |
| Ute ladies'-tresses | *Spiranthes diluvialis* | Plant | Streamside habitats that are periodically grazed* | ST | FT | Chelan, Douglas, Ferry, Grant, Kittitas, Lincoln, Okanogan, Spokane, Stevens | WA | Very sensitive to invasive species competition | WOR |
| Cut-leaf synthyris | *Synthyris pinnatifida* var. *lanuginosa* | Plant | Dry, rocky places at elevations from 5500 to 9300 ft. | ST | | Clallam, Jefferson | WA | | WOR |
| Thompson’s clover | *Trifolium thompsonii* | Plant | Open ponderosa pine woods to areas dominated by grasses and herbs | ST | | Chelan, Douglas | WA | | WOR |
| Tall bitter fleabane | *Trimorpha elata* | Plant | Wet, swampy places in open areas and along creeks | ST | | Okanogan | WA | | WOR |
| Loggerhead sea turtle | *Caretta caretta* | Reptile | Adult females require sandy nesting beaches | ST | | Clallam, Grays Harbor, Island, Jefferson, Pacific, San Juan | WA | | WOR |
| Green sea turtle | *Chelonia mydas* | Reptile | Fairly shallow waters (except when migrating) inside reefs, bays, and inlets | ST | FT | Clallam, Grays Harbor, Island, Jefferson, Pacific, San Juan | WA | | WOR |
| Leatherback sea turtle | *Dermochelys coriacea* | Reptile | Adult females require sandy nesting beaches backed by vegetation near deep water and rough seas | SE | FE | Clallam, Island, Jefferson, San Juan, Grays Harbor | WA | | WOR |
| Western (or Pacific) pond turtle | *Actinemys (formerly Clemmys ) marmorata* | Reptile | Marshes, streams, rivers, ponds, and lakes | SE | | Clallam, Gray's Harbor, Island, Jefferson, Pacific, San Juan; partially extirpated from some counties in Puget Sound region | WA | | WOR |

Sources: WA DFW, 2010; USDOI, 2011l

Species list derived from best available sources (listed above). Some discrepancy exists between USFWS and state agencies about status and county locations for certain species. Status designation does not include State Special Concern Species.

**THREAT STATUS DESIGNATIONS** SE State Endangered

| | |
|---|---|
| ST | State Threatened |
| FE | Federally Endangered |
| FT | Federally Threatened |
| FC | Federal Candidate Species |
| * | See note column |

**NORTHERN BORDER PEIS REGIONS**

| | |
|---|---|
| GL | Great Lakes |
| EOR | East of the Rockies |
| NE | New England |
| WOR | West of the Rockies |

## Table M–13. Threatened and Endangered Species in Wisconsin

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Piping plover | *Charadrius melodus* | Bird | Shorelines and lake islands. Designated critical habitat: 66 FR 22938 22969. | SE | FE | Ashland, Douglas | WI | Federally designated critical habitat established for certain counties. | GL |
| Yellow rail | *Coturnicops noveboracensis* | Bird | Large sedge meadows free of shrubbery | ST | | Bayfield, Douglas | WI | | GL |
| Cerulean warbler | *Dendroica cerulea* | Bird | Deciduous forests in uplands and floodplains; near small openings in the canopy of medium-large stands | ST | | Ashland, Bayfield, Douglas | WI | | GL |
| Kirtland's warbler | *Dendroica kirtlandii* | Bird | Potential breeding in jack pine | | FE | Douglas | WI | | GL |
| Spruce grouse | *Falcipennis canadensis* | Bird | Large coniferous forests with swampy regions | ST | | Ashland, Bayfield, Douglas | WI | | GL |
| Loggerhead shrike | *Lanius ludovivianus* | Bird | Grassy country with scattered, thorny shrubbery | SE | | Ashland | WI | | GL |
| Caspian tern | *Sterna caspia* | Bird | Open, unvegetated islands | SE | | Ashland, Douglas | WI | | GL |
| Common tern | *Sterna hirundo* | Bird | Isolated, sparsely vegetated islands | SE | | Ashland, Bayfield, Douglas | WI | | GL |
| Greater redhorse | *Moxostoma valenciennesi* | Fish | Clear, medium-large streams with rocky substrates | ST | | Douglas | WI | | GL |
| Pugnose shiner | *Notropis anogenus* | Fish | Weeded shoals of glacial lakes; mud, sand, silt, cobble bottoms in low-gradient streams | ST | | Bayfield | WI | | GL |
| Gilt darter | *Percina evides* | Fish | Moderate-fast, deep riffles in large streams; silt-free bottoms with rocky substrate | ST | | Douglas | WI | | GL |
| Pygmy snaketail | *Ophiogomphus howei* | Insect | Clean, fast-flowing larger streams in forested watersheds | ST | | Ashland, Douglas | WI | | GL |
| Warpaint emerald | *Somatochlora incurvata* | Insect | Spring-fed bogs and fens associated with sphagnum moss | SE | | Ashland, Bayfield | WI | | GL |
| Gray wolf | *Canis lupus* | Mammal | Northern forests | | FE | Ashland, Bayfield, Douglas | WI | | GL |
| Canada lynx | *Lynx canadensis* | Mammal | Northern forests | | FT | Ashland, Bayfield, Douglas | WI | | GL |
| American marten | *Martes americana* | Mammal | Mature, dense conifer forests, mixed conifer-hardwood forests | SE | | Bayfield, Douglas | WI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Purple wartyback | *Cyclonaias tuberculata* | Mollusk | Medium-size rivers with slow to moderate currents with rocky substrate | SE | | Ashland, Douglas | WI | | GL |
| Round-leaved orchis | *Amerorchis rotundifolia* | Plant | Cold, mixed-conifer swamps | ST | | Ashland | WI | | GL |
| Lake-cress | *Armoracia lacustris* | Plant | Still waters of lakes, rivers, and estuaries | SE | | Bayfield | WI | | GL |
| Dwarf milkweed | *Asclepias ovalifolia* | Plant | Periodically brushed areas, rights-of-way | ST | | Douglas | WI | | GL |
| Alpine milkvetch | *Astragalus alpinus* | Plant | Sand or gravel lakeshores with fluctuating water levels | SE | | Bayfield | WI | | GL |
| Moonwort grape-fern | *Botrychium lunaria* | Plant | Moist, cool woods; small, grassy gaps in forest openings | SE | | Ashland | WI | | GL |
| Little goblin moonwort | *Botrychium mormo* | Plant | Mature hardwood forests; prefer silt-capped drumlins | SE | | Ashland | WI | | GL |
| Floating marsh-marigold | *Caltha natans* | Plant | Shallows of creeks, ditches, and lake backwaters; mud, silt, or clay bottoms | SE | | Douglas | WI | | GL |
| Fairy slipper | *Calypso bulbosa* | Plant | Found only in old-growth white cedar swamps | ST | | Ashland, Bayfield, Douglas | WI | | GL |
| Beautiful sedge | *Carex concinna* | Plant | Brushy white cedar thickets and swampy swales | ST | | Ashland | WI | | GL |
| Coast sedge | *Carex exilis* | Plant | Coastal bogs and fen mats of the Great Lakes | ST | | Ashland | WI | | GL |
| Shore sedge | *Carex lenticularis* | Plant | Rock splash pools on Great Lakes and on inland beaches | ST | | Ashland, Bayfield | WI | | GL |
| Michaux sedge | *Carex michauxiana* | Plant | Bog and fen mats near Lake Superior | ST | | Ashland, Bayfield | WI | | GL |
| Drooping sedge | *Carex prasina* | Plant | Ravine bottoms in deciduous mixed woods | ST | | Ashland | WI | | GL |
| Hill's thistle | *Cirsium hillii* | Plant | Dry prairies, pine, and oak barrens | ST | | Douglas | WI | | GL |
| Pitcher’s thistle | *Cirsium pitcheri* | Plant | Lake Michigan dunes | ST | FT | Douglas | WI | | GL |
| Ram's-head lady's-slipper | *Cypripedium arietinum* | Plant | Basic substrates in various habitats; conifer swamps | ST | | Ashland, Douglas | WI | | GL |
| English sundew | *Drosera anglica* | Plant | Cold, open peat in sphagnum and mature bogs | ST | | Ashland, Bayfield | WI | | GL |
| Slenderleaf sundew | *Drosera linearis* | Plant | Open bog and fen mats | ST | | Ashland, Bayfield | WI | | GL |
| Slender spike-rush | *Eleocharis nitida* | Plant | Ditches, marshes, and alder thickets with exposed clays | SE | | Douglas | WI | | GL |
| Auricled twayblade | *Listera auriculata* | Plant | Stabilized, alluvial, streamside sands under alders | SE | | Bayfield | WI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Broad-leaved twayblade | *Listera convallarioides* | Plant | Seepage slopes and ravine bottoms of hardwoods and mixed forests | ST | | Ashland, Bayfield | WI | | GL |
| Fly honeysuckle | *Lonicera involucrata* | Plant | Moist forests, swamps, and thickets | SE | | Bayfield | WI | | GL |
| Smith melic grass | *Melica smithii* | Plant | Rich hardwoods; Penokee Range | SE | | Ashland | WI | | GL |
| Large-leaved sandwort | *Moehringia macrophylla* | Plant | Partially exposed cliffs; rocky soils | SE | | Ashland | WI | | GL |
| Fassett's locoweed | *Oxytropis campestris* var. *chartacea* | Plant | Fluctuating sand shorelines | SE | FT | Bayfield | WI | | GL |
| Marsh grass-of-Parnassus | *Parnassia palustris* | Plant | Clay bluffs, northern fens, and calcareous sandy areas | ST | | Ashland, Bayfield, Douglas | WI | | GL |
| Arrow-leaved sweet-coltsfoot | *Petasites sagittatus* | Plant | Cold marshes and swamp openings | ST | | Bayfield, Douglas | WI | | GL |
| Common butterwort | *Pinguicula vulgaris* | Plant | Moist ledges and moss boulders of shaded sandstone in the Apostle Islands | SE | | Ashland, Douglas | WI | | GL |
| Pale green orchid | *Platanthera flava* var. *herbiola* | Plant | Prairies, sedge meadows, shrub-carrs, alder thickets, and ditches; conifer swamp borders | ST | | Ashland | WI | | GL |
| Braun's holly-fern | *Polystichum braunii* | Plant | Ravine bottoms of rich hardwoods and mixed conifers | ST | | Ashland, Bayfield | WI | | GL |
| Algae-like pondweed | *Potamogeton confervoides* | Plant | Shallow water of acidic inland lakes | ST | | Bayfield | WI | | GL |
| Lesser wintergreen | *Pyrola minor* | Plant | Sphagnum tamarack swamps | SE | | Bayfield, Douglas | WI | | GL |
| Seaside crowfoot | *Ranunculus cymbalaria* | Plant | Sand or mud shoes and marshes; ditches and harbors | ST | | Douglas | WI | | GL |
| Small yellow water crowfoot | *Ranunculus gmelinii* | Plant | Cold brooks and springs; ditches, streams, and shorelines | SE | | Ashland, Bayfield, Douglas | WI | | GL |
| Lapland buttercup | *Ranunculus lapponicus* | Plant | White cedar swamps near seeps and springs; associated with sphagnum mosses | SE | | Douglas | WI | | GL |
| Canada gooseberry | *Ribes oxyacanthoides* | Plant | Talus forest, bluff edges, and sandscapes; cool, open areas | ST | | Ashland, Douglas | WI | | GL |
| Satiny willow | *Salix pellita* | Plant | Sand-gravel shores, riverbanks, and swamps | SE | | Ashland | WI | | GL |
| Tea-leaved willow | *Salix planifolia* | Plant | Bedrock shorelines of Apostle Islands | ST | | Ashland, Douglas | WI | | GL |
| Northern bur-reed | *Sparganium glomeratum* | Plant | Cold ditches and pools in sedge meadows, willow-alder thickets, and tamarack stands; clay soils | ST | | Douglas | WI | | GL |

| Common Name | Scientific Name | Taxon | Habitat | Threatened/ Endangered | | County | State | Notes | Region |
|---|---|---|---|---|---|---|---|---|---|
| | | | | State | Fed. | | | | |
| Narrow false oats | *Trisetum spicatum* | Plant | Moist, shaded sandstone ledges of Lake Superior | ST | | Ashland, Bayfield | WI | | GL |
| Mountain cranberry | *Vaccinium vitis-idaea* ssp. *minus* | Plant | Mossy cliffs of Lake Superior shores; conifer swamps inland | SE | | Ashland, Bayfield, Douglas | WI | | GL |
| Wood turtle | *Clemmys insculpta* | Reptile | Lowland hardwood forests near wet meadows associated with moderate-flowing streams | ST | | Ashland, Bayfield, Douglas | WI | | GL |

Sources: WIDNR, 2011; USDOI, 2011m

Disclaimer: Species list derived from best available sources (listed above). Some discrepancy exists between USFWS and state agency lists concerning status and county locations for certain species. Status designations do not include State Special Concern Species.

**THREAT STATUS DESIGNATIONS**
SE State Endangered
ST State Threatened
FE Federally Endangered
FT Federally Threatened
FC Federal Candidate Species
* See note column
**NORTHERN BORDER PEIS REGIONS**
GL Great Lakes
EOR East of the Rockies
NE New England
WOR West of the Rockies

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# APPENDIX N

# GEOLOGY, TOPOGRAPHY, AND SOILS

**Table N-1. Soil Types and Descriptions**

| Karst Type | Description |
|---|---|
| absent_1 | Fissures, tubes, and caves generally absent; where present in small isolated areas, less than 50 ft (15 m) long; less than 50 ft (15 m) vertical extent; in crystalline, highly siliceous intensely folded carbonate rock |
| absent_2 | Fissures, tubes, and caves generally absent; where present in small isolated areas, less than 50 ft (15 m) long; less than 50 ft (15 m) vertical extent; in moderately to steeply dipping beds of carbonate rock |
| absent_3 | Fissures, tubes, and caves generally absent; where present in small isolated areas, less than 50 ft (15 m) long; less than 50 ft (15 m) vertical extent; in gently dipping to flat-lying beds of carbonate rock |
| long_1 | Fissures, tubes, and caves over 1,000 ft (300 m) long; 50 ft (15 m) to over 250 ft (75 m) vertical extent; in metamophosed limestone, dolostone, and marble |
| long_2 | Fissures, tubes, and caves over 1,000 ft (300 m) long; 50 ft (15 m) to over 250 ft (75 m) vertical extent; in moderately to steeply dipping beds of carbonate rock |
| long_3 | Fissures, tubes, and caves over 1,000 ft (300 m) long; 50 ft (15 m) to over 250 ft (75 m) vertical extent; in gently dipping to flat-lying beds of carbonate rock |
| long_4 | Fissures, tubes, and caves over 1,000 ft (300 m) long; 50 ft (15 m) to over 250 ft (75 m) vertical extent; in gently dipping to flat-lying beds of carbonate rock beneath an overburden of noncarbonate material 10 ft (3 m) to 200 ft (60 m) thick |
| long_5 | Fissures, tubes, and caves over 1,000 ft (300 m) long; 50 ft (15 m) to over 250 ft (75 m) vertical extent; in moderately to steeply dipping beds of gypsum |
| long_6 | Fissures, tubes, and caves over 1,000 ft (300 m) long; 50 ft (15 m) to over 250 ft (75 m) vertical extent; in gently dipping to flat-lying beds of gypsum |
| pseudo_1 | Fissures and voids present to a depth of 250 ft (75 m) or more in areas of subsidence from piping in thick, unconsolidated material |

| Karst Type | Description |
|---|---|
| pseudo_2 | Fissures and voids present to a depth of 50 ft (15 m) in areas of subsidence from piping in thick, unconsolidated material |
| pseudo_3 | Fissures, tubes, and tunnels present to a depth of 250 ft (75m) or more in lava |
| pseudo_4 | Fissures, tubes, and tunnels present to a depth of 50 ft. (15 m) in lava |
| short_1 | Fissures, tubes and caves generally less than 1,000 ft (300 m) long; 50 ft (15 m) or less vertical extent; in metamorphosed limestone, dolostone, and marble |
| short_2 | Fissures, tubes and caves generally less than 1,000 ft (300 m) long; 50 ft (15 m) or less vertical extent; in crystalline, highly siliceous, intensely folded carbonate rock |
| short_3 | Fissures, tubes and caves generally less than 1,000 ft (300 m) long; 50 ft (15 m) or less vertical extent; in moderately to steeply dipping beds of carbonate rock |
| short_4 | Fissures, tubes and caves generally less than 1,000 ft (300 m) long; 50 ft (15 m) or less vertical extent; In gently dipping to flat-lying beds of carbonate rock |
| short_5 | Fissures, tubes and caves generally less than 1,000 ft (300 m) long; 50 ft (15 m) or less vertical extent; In gently dipping to flat-lying beds of carbonate rock beneath an overburden of noncarbonate material 10 ft (3 m) to 200 ft (60 m) thick |
| short_6 | Fissures, tubes and caves generally less than 1,000 ft (300 m) long; 50 ft (15 m) or less vertical extent; in moderately to steeply dipping beds of gypsum |
| short_7 | Fissures, tubes and caves generally less than 1,000 ft (300 m) long; 50 ft (15 m) or less vertical extent; in gently dipping to flat-lying beds of gypsum |
| short_8 | Fissures, tubes and caves generally less than 1,000 ft (300 m) long; 50 ft (15 m) or less vertical extent; in gently dipping to flat-lying beds of gypsum beneath an overburden of nongypsiferous material |
| short_9 | Fissures, tubes and caves generally less than 1,000 ft (300 m) long; 50 ft (15 m) or less vertical extent; in carbonate zones in highly calcitic granite |
| short_10 | Fissures, tubes and caves generally less than 1,000 ft (300 m) long; 50 ft (15 m) or less vertical extent; in moderately to steeply dipping beds of carbonate rock with a thin cover of glacial till and frost derived residual soil |

| Karst Type | Description |
|---|---|
| absent_1 | Fissures, tubes, and caves generally absent; where present in small isolated areas, less than 50 ft (15 m) long; less than 50 ft (15 m) vertical extent; in crystalline, highly siliceous intensely folded carbonate rock |

## REGIONAL SEISMOLOGY AND TECTONICS

Seismic action along the northern border of the United States can occur in the following three locations:

- Cascadia Subduction zone;
- Intermountain Seismic belt; and,
- New England (unidentified ancient faults).

The first and most significant of the seismic hazard zones is called the Cascadia Subduction Zone. As part of the larger "Ring of Fire," the cause of seismic activity in this zone is the creation of the subterranean Juan de Fuca Range. The development of this range off of the coasts of Washington and Oregon force the Juan de Fuca plate to move under the North American plate in what is known as subduction plate tectonics. In this type of tectonic action, an oceanic plate slides under either a continental plate or another oceanic plate. In the Juan de Fuca region, the oceanic plate is sliding beneath, or subducting, under the North American Plate along the Cascadia subduction zone. Subduction zone earthquakes can be the most powerful quakes, at times exceeding 9.0 on the Richter scale. The last catastrophic earthquake known in this range occurred around 300 years ago but the accepted frequency for significant earthquakes in this region is about once every 400 years (Pacific Northwest Seismic Network, 2002).

The Intermountain Seismic Belt is another region with significant seismic hazard. While much of the activity occurs in central and southern Montana, earthquakes do occur in the northeastern part of the state (State of Montana, 2004). The cause of the seismic activity can be traced to the tectonic actions occurring along the western coast of the United States, although it is not along a plate boundary. The frequency of strong earthquakes in northern Montana is low when compared to southwestern portions of the state.

The cause of New England's seismic activity is not completely understood. There have not been adequate associations with specific faults to earthquakes in the region. The types of earthquakes here are known as intraplate quakes. The commonly accepted reason for seismic activity in this case is that ancient faults release strain due to modern day stresses. The ancient faults may have been created either during the creation or separation of the supercontinent, Pangaea. The potential for damaging earthquakes in this region are low, although the potential still exists (Kafka, 2004).

## SOIL ORDERS ALONG THE NORTHERN BORDER

Soil taxonomy is the science of classifying soils based on physical qualities and characteristics. There are 12 soil orders that categorize soils for identification. Along the northern border of the United States, there are nine soil orders that have been identified (Fig. 3.4.2.2-1). These include:

- Inceptisols;
- Andisols;
- Ultisols;
- Mollisols;
- Aridisols;
- Alfisols;
- Histosols;
- Spodosols; and,
- Entisols.

In the Pacific Northwest, and specifically Washington, the dominant soil orders are inceptisols, ultisols, andisols, and mollisols. Inceptisols are the second most common soil type in the world. They are often found on steep slopes and areas that are young in terms of no horizon development. Soil orders can be further divided in to suborders. In this region, cryepts are the most common type of inceptisol. These are specific to cold climates. Typically inceptisols will not have extensive development with regard to soil horizons (University of Idaho, No Date[a]). These soils are found in almost all climates with the exception of arid climates. Mass movement (landslides, falls) and soil erosion are two processes that typically occur in this soil order (University of Wisconsin, 1999).

Andisols are soils of volcanic origin. This soil order is the least common of the classifications. Typically there is a high concentration of glass found in andisols and the ability to retain water is also a unique trait of the soil (University of Idaho, No Date[b]). These soils can be found in any climate that saw past or present volcanic activity, with the exception of permafrost environments. They develop through the weathering of volcanic parent material, mainly pyroclastic ejections (University of Wisconsin, 1999).

Ultisols are soils with a high acid content, low fertility, and have been leached of minerals by the processes of weathering. Low soil fertility is due to a lack of nutrients in the soil resulting in the decreased ability to support plant life. While not as productive as agricultural lands, ultisols are often found in highly productive forested areas (University of Idaho, No Date[c]). They can be found in any climate that has periods of time when precipitation exceeds the evapotranspiration rate and the soil's water storage capacity. A small organic layer followed by clays is typical of this soil order (University of Wisconsin, 1999).

Mollisols appear while moving westward in Washington state. These soils are common in grassland regions and are extremely agriculturally productive. In the United States, this is the most common soil order. The thick upper horizon (or layer) is a result of the decayed organic materials (University of Idaho, No Date[d]). The development of this order is most often related to the weathering of sedimentary parent rock, and in some cases the weathering of glacial deposits. Mollisol soil texture can vary to a great degree from sandy to fine loams (See table 3.4.2-1). This soil order is prone to erosion, especially by water in cultivated areas (University of Wisconsin, 1999).

Moving westward into the north-central border region, the soil order that continues to be dominant is the mollisol order. Western Montana and northwestern North Dakota have relatively small areas where there are alfisols present. Alfisols are often found in forested areas, but can also be found in prairies and grasslands. Most often located in temperate climates, they can develop in sub-tropical and tropical areas as well (University of Idaho, No Date[e]). The primary component of this soil order is clay as a result of mineral weathering (University of Wisconsin, 1999).

Aridisols can also be found in these two states in relatively small areas. This soil order is not agriculturally productive due to their location in arid regions. A major component of these soils is calcium carbonate in addition to clays, silica, and other soluble salts (University of Idaho, No Date[f]). They tend to have low permeability and low nutrient content (University of Wisconsin, 1999).

In the Great Lakes region, spodosols, alfisols, and inceptisols dominate. Small areas of northern Minnesota and Michigan also contain histosols and entisols. Spodosols are acidic soils that are found in forested areas. They are not agriculturally productive without management because of the high acid content, but have sub layers of humus, or stable organic matter (University of Idaho, No Date[g]). Spodosol textures are sandy to loamy, sometimes with clay (University of Wisconsin, 1999).

The histosols in the region are mainly found in areas of poor drainage. This water accumulation decomposes organic materials and creates peaty and mucky conditions. They have a low weight-bearing capacity and if drained of water, land subsidence may occur (University of Idaho, No Date[h]).

Entisols are soils that do not fit into any of the other 12 soil orders. These are young soils and have only an A horizon. Entisols are the most extensive soils in the world, and can be very diverse based on the parent material from which they develop (University of Idaho, No Date[i]). This soil order is often the transition layer between soils and non-soil parent rock.

The New England region's soils are dominated by spodosols as well as alfisols. Spodosols in this area are classified further as orthods. These are well-drained and typically infertile without the application of cultivation nutrients (USDA, No Date).

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# APPENDIX O

# NOISE SUPPORTING DOCUMENTATION

# NOISE SUPPORTING DOCUMENTATION

**Table O-1. County Sound Levels with Population by State**

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| Idaho | Bonner | 37480 | 1919.6 | 19.5 | <47 |
| Idaho | Boundary | 9933 | 1277.9 | 7.8 | <47 |
| Idaho | Kootenai | 125892 | 1315.7 | 95.7 | <47 |
| Idaho | Shoshone | 13360 | 2635.5 | 5.1 | <47 |
| Illinois | Boone | 49455 | 277.05 | 178.5 | <47 |
| Illinois | Champaign | 187870 | 992.34 | 189.3 | <47 |
| Illinois | Cook | 5268513 | 964.95 | 5459.9 | 59 |
| Illinois | De Kalb | 99485 | 627.31 | 158.6 | <47 |
| Illinois | Du Page | 922589 | 334.12 | 2761.3 | 56 |
| Illinois | Ford | 13975 | 495.50 | 28.2 | <47 |
| Illinois | Grundy | 43443 | 428.84 | 101.3 | <47 |
| Illinois | Iroquois | 30331 | 1,108.46 | 27.4 | <47 |
| Illinois | Kane | 475350 | 529.46 | 897.8 | 52 |
| Illinois | Kankakee | 108453 | 679.58 | 159.6 | <47 |
| Illinois | Kendall | 79054 | 324.69 | 243.5 | <47 |
| Illinois | La Salle | 111660 | 1,141.76 | 97.8 | <47 |
| Illinois | Lake | 691815 | 459.72 | 1504.9 | 54 |
| Illinois | Lee | 34863 | 725.25 | 48.1 | <47 |
| Illinois | Livingston | 38236 | 1,055.71 | 36.2 | <47 |
| Illinois | McHenry | 301741 | 602.33 | 501.0 | 49 |
| Illinois | McLean | 159374 | 1,174.23 | 135.7 | <47 |
| Illinois | Ogle | 53358 | 758.75 | 70.3 | <47 |
| Illinois | Vermilion | 81696 | 896.60 | 91.1 | <47 |
| Illinois | Will | 631397 | 847.32 | 745.2 | 51 |
| Indiana | Winnebago | 289422 | 518.74 | 557.9 | 49 |
| Indiana | Allen | 342894 | 684.42 | 501.0 | 49 |
| Indiana | Benton | 8837 | 412.97 | 21.4 | <47 |
| Indiana | Carroll | 20056 | 384.60 | 52.1 | <47 |
| Indiana | Cass | 39680 | 410.63 | 96.6 | <47 |
| Indiana | Clinton | 33800 | 408.19 | 82.8 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| Indiana | De Kalb | 41382 | 366.79 | 112.8 | <47 |
| Indiana | Elkhart | 193541 | 464.94 | 416.3 | 48 |
| Indiana | Fountain | 17210 | 399.93 | 43.0 | <47 |
| Indiana | Fulton | 20272 | 365.02 | 55.5 | <47 |
| Indiana | Grant | 69955 | 414.12 | 168.9 | <47 |
| Indiana | Howard | 84348 | 311.29 | 271.0 | <47 |
| Indiana | Huntington | 37975 | 366.54 | 103.6 | <47 |
| Indiana | Jasper | 31273 | 551.95 | 56.7 | <47 |
| Indiana | Kosciusko | 75475 | 564.35 | 133.7 | <47 |
| Indiana | La Porte | 109145 | 618.76 | 176.4 | <47 |
| Indiana | Lagrange | 36311 | 377.55 | 96.2 | <47 |
| Indiana | Lake | 487695 | 492.42 | 990.4 | 52 |
| Indiana | Marshall | 46317 | 456.91 | 101.4 | <47 |
| Indiana | Miami | 36558 | 364.86 | 100.2 | <47 |
| Indiana | Montgomery | 37848 | 506.13 | 74.8 | <47 |
| Indiana | Newton | 14208 | 412.69 | 34.4 | <47 |
| Indiana | Noble | 47399 | 423.36 | 112.0 | <47 |
| Indiana | Porter | 155717 | 435.13 | 357.9 | 48 |
| Indiana | Pulaski | 13771 | 422.63 | 32.6 | <47 |
| Indiana | St. Joseph | 264832 | 446.77 | 592.8 | 50 |
| Indiana | Starke | 23390 | 310.52 | 75.3 | <47 |
| Indiana | Steuben | 33543 | 330.29 | 101.6 | <47 |
| Indiana | Tippecanoe | 156397 | 507.52 | 308.2 | 47 |
| Indiana | Wabash | 33476 | 413.01 | 81.1 | <47 |
| Indiana | Warren | 8619 | 353.48 | 24.4 | <47 |
| Indiana | White | 24153 | 491.33 | 49.2 | <47 |
| Maine | Whitley | 31994 | 339.72 | 216.1 | <47 |
| Maine | Aroostook | 72717 | 6828.7 | 10.6 | <47 |
| Maine | Cumberland | 279231 | 920.7 | 303.3 | 47 |
| Maine | Franklin | 29480 | 1744.3 | 16.9 | <47 |
| Maine | Hancock | 54449 | 1688.8 | 32.2 | <47 |
| Maine | Kennebec | 120515 | 951.3 | 126.7 | <47 |
| Maine | Oxford | 56533 | 2175.2 | 26 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| Maine | Penobscot | 146891 | 3556.2 | 41.3 | <47 |
| Maine | Piscataquis | 17329 | 4377.6 | 4 | <47 |
| Maine | Sagadahoc | 37026 | 287.9 | 128.6 | <47 |
| Maine | Somerset | 50901 | 4095.2 | 12.4 | <47 |
| Maine | Waldo | 38580 | 755.4 | 51.1 | <47 |
| Maine | Washington | 33436 | 2748.2 | 12.2 | <47 |
| Maine | York | 197731 | 1017.5 | 194.3 | <47 |
| Michigan | Alcona | 11692 | 693.9 | 16.8 | <47 |
| Michigan | Alger | 9796 | 935.3 | 10.5 | <47 |
| Michigan | Allegan | 113780 | 842.5 | 135.1 | <47 |
| Michigan | Alpena | 30985 | 593.3 | 52.2 | <47 |
| Michigan | Antrim | 24645 | 525 | 46.9 | <47 |
| Michigan | Arenac | 16967 | 367.6 | 46.2 | <47 |
| Michigan | Baraga | 8790 | 917.5 | 9.6 | <47 |
| Michigan | Barry | 60240 | 577.1 | 104.4 | <47 |
| Michigan | Bay | 111194 | 448 | 248.2 | <47 |
| Michigan | Benzie | 17462 | 347.4 | 50.3 | <47 |
| Michigan | Berrien | 162731 | 579.8 | 280.7 | <47 |
| Michigan | Branch | 47646 | 519.6 | 91.7 | <47 |
| Michigan | Calhoun | 140105 | 718.4 | 195 | <47 |
| Michigan | Cass | 53180 | 508.4 | 104.6 | <47 |
| Michigan | Charlevoix | 27926 | 452.6 | 61.7 | <47 |
| Michigan | Cheboygan | 27313 | 795.7 | 34.3 | <47 |
| Michigan | Chippewa | 39336 | 1573.7 | 25 | <47 |
| Michigan | Clare | 31635 | 575.1 | 55 | <47 |
| Michigan | Clinton | 71459 | 574.5 | 124.4 | <47 |
| Michigan | Crawford | 14854 | 563.3 | 26.4 | <47 |
| Michigan | Delta | 38211 | 1173.3 | 32.6 | <47 |
| Michigan | Dickinson | 27159 | 777.1 | 34.9 | <47 |
| Michigan | Eaton | 108402 | 579.3 | 187.1 | <47 |
| Michigan | Emmet | 34523 | 482.2 | 71.6 | <47 |
| Michigan | Genesee | 459190 | 649.4 | 707.1 | 50 |
| Michigan | Gladwin | 27813 | 516.1 | 53.9 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| Michigan | Gogebic | 17212 | 1144.1 | 15 | <47 |
| Michigan | Grand Traverse | 86007 | 489.9 | 175.6 | <47 |
| Michigan | Gratiot | 42501 | 571.6 | 74.4 | <47 |
| Michigan | Hillsdale | 48556 | 607 | 80 | <47 |
| Michigan | Houghton | 35983 | 1041.7 | 34.5 | <47 |
| Michigan | Huron | 35068 | 836.5 | 41.9 | <47 |
| Michigan | Ingham | 281954 | 560.8 | 502.8 | <47 |
| Michigan | Ionia | 65230 | 580.2 | 112.4 | <47 |
| Michigan | Iosco | 26585 | 566.6 | 46.9 | <47 |
| Michigan | Iron | 12293 | 1211.1 | 10.2 | <47 |
| Michigan | Isabella | 69437 | 577.8 | 120.2 | <47 |
| Michigan | Jackson | 166240 | 723.6 | 229.7 | <47 |
| Michigan | Kalamazoo | 248004 | 580.3 | 427.4 | 48 |
| Michigan | Kalkaska | 17525 | 570.7 | 30.7 | <47 |
| Michigan | Kent | 605937 | 872 | 694.9 | 50 |
| Michigan | Keweenaw | 2142 | 553.9 | 3.9 | <47 |
| Michigan | Lake | 11519 | 574.5 | 20.1 | <47 |
| Michigan | Lapeer | 93141 | 662.9 | 140.5 | <47 |
| Michigan | Leelanau | 22697 | 369.2 | 61.5 | <47 |
| Michigan | Lenawee | 101461 | 761.3 | 133.3 | <47 |
| Michigan | Livingston | 183556 | 585.5 | 313.5 | 47 |
| Michigan | Luce | 7050 | 927.3 | 7.6 | <47 |
| Michigan | Mackinac | 11608 | 1051.6 | 11 | <47 |
| Michigan | Macomb | 839345 | 483.9 | 1734.4 | 54 |
| Michigan | Manistee | 25347 | 556.9 | 45.5 | <47 |
| Michigan | Marquette | 63635 | 1869 | 34 | <47 |
| Michigan | Mason | 29299 | 510.1 | 57.4 | <47 |
| Michigan | Mecosta | 42330 | 571.2 | 74.1 | <47 |
| Michigan | Menominee | 25320 | 1051.8 | 24.1 | <47 |
| Michigan | Midland | 86285 | 528 | 163.4 | <47 |
| Michigan | Missaukee | 15383 | 573.8 | 26.8 | <47 |
| Michigan | Monroe | 748249 | 666.3 | 1123.1 | 53 |
| Michigan | Montcalm | 64363 | 720.9 | 89.3 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| Michigan | Montmorency | 10412 | 562.5 | 18.5 | <47 |
| Michigan | Muskegon | 177800 | 527.5 | 337.1 | 47 |
| Michigan | Newaygo | 50866 | 861.7 | 59 | <47 |
| Michigan | Oakland | 1248576 | 907.2 | 1376.3 | 53 |
| Michigan | Oceana | 28360 | 546.3 | 51.9 | <47 |
| Michigan | Ogemaw | 21835 | 574.8 | 38 | <47 |
| Michigan | Ontonagon | 7300 | 1328.6 | 5.5 | <47 |
| Michigan | Osceola | 24120 | 573.1 | 42.1 | <47 |
| Michigan | Oscoda | 9176 | 571.5 | 16.1 | <47 |
| Michigan | Otsego | 25338 | 526 | 48.2 | <47 |
| Michigan | Ottawa | 261436 | 576.8 | 453.3 | 49 |
| Michigan | Presque Isle | 14348 | 685 | 20.9 | <47 |
| Michigan | Roscommon | 26926 | 579.9 | 46.4 | <47 |
| Michigan | Saginaw | 211136 | 815.9 | 258.8 | <47 |
| Michigan | Sanilac | 45351 | 963.8 | 47.1 | <47 |
| Michigan | Schoolcraft | 8695 | 1221.5 | 7.1 | <47 |
| Michigan | Shiawassee | 72727 | 540.8 | 134.5 | <47 |
| Michigan | St. Clair | 174759 | 723.3 | 241.6 | <47 |
| Michigan | St. Joseph | 63791 | 521.1 | 122.4 | <47 |
| Michigan | Tuscola | 58959 | 814.2 | 72.4 | <47 |
| Michigan | Van Buren | 80483 | 623.2 | 129.2 | <47 |
| Michigan | Washtenaw | 344854 | 722.4 | 477.4 | 49 |
| Michigan | Wayne | 2053080 | 617.3 | 3326 | 57 |
| Michigan | Wexford | 32934 | 575.8 | 57.2 | <47 |
| Minnesota | Aitkin | 17032 | 1995.2 | 8.5 | <47 |
| Minnesota | Beltrami | 42783 | 3055.7 | 14 | <47 |
| Minnesota | Carlton | 34174 | 875.3 | 39 | <47 |
| Minnesota | Cass | 30329 | 2413.8 | 12.6 | <47 |
| Minnesota | Chisago | 49961 | 442.5 | 112.9 | <47 |
| Minnesota | Clearwater | 8351 | 1029.9 | 8.1 | <47 |
| Minnesota | Cook | 5478 | 1605.4 | 3.4 | <47 |
| Minnesota | Hubbard | 19538 | 999.4 | 19.5 | <47 |
| Minnesota | Itasca | 45558 | 2928.1 | 15.6 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| Minnesota | Kanabec | 16229 | 533.6 | 30.4 | <47 |
| Minnesota | Kittson | 4994 | 1103.3 | 4.5 | <47 |
| Minnesota | Koochiching | 14195 | 3154.3 | 4.5 | <47 |
| Minnesota | Lake | 229866 | 231.1 | 994.7 | 52 |
| Minnesota | Lake of the Woods | 4489 | 1775.2 | 2.5 | <47 |
| Minnesota | Marshall | 9905 | 1813 | 5.5 | <47 |
| Minnesota | Mille Lacs | 25202 | 681.6 | 37 | <47 |
| Minnesota | Pennington | 13798 | 618.2 | 22.3 | <47 |
| Minnesota | Pine | 28391 | 1434.4 | 19.8 | <47 |
| Minnesota | Polk | 31404 | 1997.7 | 15.7 | <47 |
| Minnesota | Red Lake | 4266 | 432.3 | 9.9 | <47 |
| Minnesota | Roseau | 16781 | 1678.3 | 10 | <47 |
| Minnesota | St. Louis | 200541 | 6737.9 | 29.8 | <47 |
| Montana | Blaine | 6743 | 4238.9 | 1.6 | <47 |
| Montana | Cascade | 79787 | 2711.7 | 29.4 | <47 |
| Montana | Chouteau | 5789 | 3997 | 1.4 | <47 |
| Montana | Daniels | 1874 | 1426.5 | 1.3 | <47 |
| Montana | Dawson | 8585 | 2383.2 | 3.6 | <47 |
| Montana | Fergus | 11830 | 4350.4 | 2.7 | <47 |
| Montana | Flathead | 79196 | 5256.5 | 15.1 | <47 |
| Montana | Garfield | 1276 | 4847.5 | 0.3 | <47 |
| Montana | Glacier | 12950 | 3037 | 4.3 | <47 |
| Montana | Hill | 16317 | 2916.1 | 5.6 | <47 |
| Montana | Lake | 11472 | 2288.1 | 5 | <47 |
| Montana | Lewis and Clark | 57367 | 3498 | 16.4 | <47 |
| Montana | Liberty | 2073 | 1447.2 | 1.4 | <47 |
| Montana | Lincoln | 19066 | 3675.1 | 5.2 | <47 |
| Montana | McCone | 1927 | 2682.8 | 0.7 | <47 |
| Montana | Missoula | 102866 | 2618.3 | 39.3 | <47 |
| Montana | Petroleum | 488 | 1674.1 | 0.3 | <47 |
| Montana | Phillips | 4404 | 5212.1 | 0.8 | <47 |
| Montana | Pondera | 6233 | 1639.9 | 3.8 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| Montana | Powell | 7165 | 2332.5 | 3.1 | <47 |
| Montana | Richland | 9315 | 2103 | 4.4 | <47 |
| Montana | Roosevelt | 10472 | 2369.6 | 4.4 | <47 |
| Montana | Sanders | 10257 | 2790 | 3.7 | <47 |
| Montana | Sheridan | 3691 | 1706.3 | 2.2 | <47 |
| Montana | Teton | 6377 | 2292.4 | 2.8 | <47 |
| Montana | Toole | 5347 | 1945.9 | 2.7 | <47 |
| Montana | Valley | 7441 | 5061.9 | 1.5 | <47 |
| New Hampshire | Belknap | 61246 | 469.3 | 130.5 | <47 |
| New Hampshire | Carroll | 46748 | 993 | 47.1 | <47 |
| New Hampshire | Coos | 33237 | 1830.8 | 18.2 | <47 |
| New Hampshire | Grafton | 84384 | 1750.7 | 48.2 | <47 |
| New Hampshire | Merrimack | 147739 | 956 | 154.5 | <47 |
| New Hampshire | Sullivan | 41784 | 551.6 | 75.7 | <47 |
| New York | Allegany | 50109 | 1034.4 | 48.4 | <47 |
| New York | Broome | 197709 | 715.4 | 276.4 | <47 |
| New York | Cattaraugus | 83590 | 1322.5 | 63.2 | <47 |
| New York | Cayuga | 80800 | 734.3 | 110 | <47 |
| New York | Chautauqua | 138778 | 1084.7 | 127.9 | <47 |
| New York | Chemung | 91342 | 410.9 | 222.3 | <47 |
| New York | Chenango | 51239 | 898.6 | 57 | <47 |
| New York | Clinton | 83368 | 1117.5 | 74.6 | <47 |
| New York | Cortland | 49162 | 501.4 | 98.1 | <47 |
| New York | Erie | 79386 | 256 | 310.2 | 47 |
| New York | Essex | 39868 | 1916.5 | 20.8 | <47 |
| New York | Franklin | 50149 | 1697.4 | 29.5 | <47 |
| New York | Genesee | 60419 | 495.3 | 122 | <47 |
| New York | Hamilton | 5022 | 1807.7 | 2.8 | <47 |
| New York | Herkimer | 64642 | 1458.6 | 44.3 | <47 |
| New York | Jefferson | 112417 | 1286.2 | 87.4 | <47 |
| New York | Lewis | 27169 | 1290.3 | 21.1 | <47 |
| New York | Livingston | 66422 | 640.4 | 103.7 | <47 |
| New York | Madison | 70473 | 661.3 | 106.6 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| New York | Monroe | 156964 | 554.7 | 283 | 47 |
| New York | Niagara | 220284 | 526.5 | 418.4 | 48 |
| New York | Oneida | 236373 | 1257.3 | 188 | <47 |
| New York | Onondaga | 465053 | 805.7 | 577.2 | 50 |
| New York | Ontario | 103732 | 662.4 | 156.6 | <47 |
| New York | Orleans | 43749 | 392.8 | 111.4 | <47 |
| New York | Oswego | 126536 | 1014.5 | 124.7 | <47 |
| New York | Otsego | 65662 | 1015.2 | 64.7 | <47 |
| New York | Schuyler | 19113 | 342.4 | 55.8 | <47 |
| New York | Seneca | 35038 | 390.5 | 89.7 | <47 |
| New York | St. Lawrence | 114595 | 2806.3 | 40.8 | <47 |
| New York | Steuben | 98297 | 1404 | 70 | <47 |
| New York | Tioga | 52486 | 522.9 | 100.4 | <47 |
| New York | Tompkins | 101856 | 491.5 | 207.2 | <47 |
| New York | Warren | 66475 | 931.5 | 71.4 | <47 |
| New York | Washington | 62282 | 846.1 | 73.6 | <47 |
| New York | Wayne | 95854 | 607 | 157.9 | <47 |
| New York | Wyoming | 43315 | 596.2 | 72.7 | <47 |
| New York | Yates | 25080 | 375.8 | 66.7 | <47 |
| North Dakota | Benson | 6610 | 1439.3 | 4.6 | <47 |
| North Dakota | Bottineau | 6509 | 1697.8 | 3.8 | <47 |
| North Dakota | Burke | 2008 | 1129.2 | 1.8 | <47 |
| North Dakota | Cavalier | 4257 | 1510.1 | 2.8 | <47 |
| North Dakota | Divide | 2090 | 1294.2 | 1.6 | <47 |
| North Dakota | Dunn | 3396 | 2082.2 | 1.6 | <47 |
| North Dakota | Eddy | 2483 | 644.1 | 3.9 | <47 |
| North Dakota | Foster | 3351 | 646.8 | 5.2 | <47 |
| North Dakota | Grand Forks | 65551 | 1439.8 | 45.5 | <47 |
| North Dakota | Griggs | 2505 | 716.3 | 3.5 | <47 |
| North Dakota | McHenry | 5724 | 1911.8 | 3 | <47 |
| North Dakota | McKenzie | 5422 | 2860.9 | 1.9 | <47 |
| North Dakota | McLean | 8750 | 2327.8 | 3.8 | <47 |
| North Dakota | Mercer | 8272 | 1112.4 | 7.4 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| North Dakota | Mountrail | 6371 | 1941.2 | 3.3 | <47 |
| North Dakota | Nelson | 3374 | 1008.7 | 3.3 | <47 |
| North Dakota | Pembina | 8007 | 1121.7 | 7.1 | <47 |
| North Dakota | Pierce | 4352 | 1082.2 | 4 | <47 |
| North Dakota | Ramsey | 11254 | 1300.9 | 8.7 | <47 |
| North Dakota | Renville | 2429 | 892 | 2.7 | <47 |
| North Dakota | Rolette | 13642 | 939.3 | 14.5 | <47 |
| North Dakota | Sheridan | 1510 | 1005.8 | 1.5 | <47 |
| North Dakota | Steele | 2041 | 715.5 | 2.9 | <47 |
| North Dakota | Towner | 2627 | 1041.6 | 2.5 | <47 |
| North Dakota | Traill | 8248 | 862.5 | 9.6 | <47 |
| North Dakota | Walsh | 11458 | 1294.2 | 8.9 | <47 |
| North Dakota | Ward | 57455 | 2056.4 | 27.9 | <47 |
| North Dakota | Wells | 4654 | 1290.6 | 3.6 | <47 |
| North Dakota | Williams | 18670 | 2148 | 8.7 | <47 |
| Ohio | Allen | 108488 | 406.8 | 266.7 | <47 |
| Ohio | Ashland | 52901 | 426.7 | 124 | <47 |
| Ohio | Ashtabula | 103569 | 709.2 | 146 | <47 |
| Ohio | Auglaize | 46971 | 402 | 116.8 | <47 |
| Ohio | Belmont | 67263 | 541.4 | 124.2 | <47 |
| Ohio | Carroll | 29189 | 399 | 73.2 | <47 |
| Ohio | Champaign | 39809 | 429.8 | 92.6 | <47 |
| Ohio | Columbiana | 110236 | 534.7 | 206.2 | <47 |
| Ohio | Coshocton | 36780 | 567.6 | 64.8 | <47 |
| Ohio | Crawford | 45989 | 402.8 | 114.2 | <47 |
| Ohio | Cuyahoga | 1358434 | 459.2 | 2958.1 | 57 |
| Ohio | Defiance | 39067 | 414.2 | 94.3 | <47 |
| Ohio | Delaware | 148328 | 457 | 324.6 | 47 |
| Ohio | Erie | 280455 | 803.8 | 348.9 | 47 |
| Ohio | Franklin | 1152479 | 543.5 | 2120.3 | 55 |
| Ohio | Fulton | 42727 | 407.3 | 104.9 | <47 |
| Ohio | Geauga | 94945 | 408.3 | 232.6 | <47 |
| Ohio | Guernsey | 41342 | 528.3 | 78.3 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| Ohio | Hancock | 72825 | 533.7 | 136.5 | <47 |
| Ohio | Hardin | 31671 | 470.7 | 67.3 | <47 |
| Ohio | Harrison | 15273 | 410.7 | 37.2 | <47 |
| Ohio | Henry | 29147 | 419.7 | 69.4 | <47 |
| Ohio | Holmes | 39392 | 424 | 92.9 | <47 |
| Ohio | Huron | 60119 | 495 | 121.5 | <47 |
| Ohio | Jefferson | 71749 | 410.9 | 174.6 | <47 |
| Ohio | Knox | 58009 | 529.8 | 109.5 | <47 |
| Ohio | Lake | 27969 | 1653.8 | 16.9 | <47 |
| Ohio | Licking | 156855 | 687.5 | 228.2 | <47 |
| Ohio | Logan | 46509 | 466.8 | 99.6 | <47 |
| Ohio | Lorain | 299618 | 494.9 | 605.4 | 50 |
| Ohio | Lucas | 456146 | 346.4 | 1316.7 | 53 |
| Ohio | Madison | 41802 | 466.2 | 89.7 | <47 |
| Ohio | Mahoning | 250796 | 424.5 | 590.7 | 50 |
| Ohio | Marion | 66402 | 403.9 | 164.4 | <47 |
| Ohio | Medina | 166609 | 422.9 | 393.9 | 48 |
| Ohio | Mercer | 41293 | 473.5 | 87.2 | <47 |
| Ohio | Morrow | 32754 | 407.2 | 80.4 | <47 |
| Ohio | Muskingum | 84597 | 672.6 | 125.8 | <47 |
| Ohio | Ottawa | 40146 | 263.8 | 152.2 | <47 |
| Ohio | Paulding | 20318 | 418.8 | 48.5 | <47 |
| Ohio | Portage | 158091 | 505.7 | 312.6 | <47 |
| Ohio | Putnam | 34726 | 484.3 | 71.7 | <47 |
| Ohio | Richland | 127516 | 500.1 | 255 | <47 |
| Ohio | Sandusky | 61505 | 412 | 149.3 | <47 |
| Ohio | Seneca | 57923 | 552.8 | 104.8 | <47 |
| Ohio | Shelby | 48318 | 410.8 | 117.6 | <47 |
| Ohio | Stark | 379220 | 580.5 | 653.3 | 50 |
| Ohio | Summit | 551971 | 420.1 | 1313.8 | 53 |
| Ohio | Trumbull | 219857 | 635.8 | 345.8 | 47 |
| Ohio | Tuscarawas | 92048 | 571.6 | 161 | <47 |
| Ohio | Union | 46480 | 436.9 | 106.4 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| Ohio | Van Wert | 28734 | 410.4 | 70 | <47 |
| Ohio | Wayne | 114581 | 556.8 | 205.8 | <47 |
| Ohio | Williams | 39294 | 423.1 | 92.9 | <47 |
| Ohio | Wood | 125967 | 620.7 | 202.9 | <47 |
| Ohio | Wyandot | 23029 | 407.6 | 56.5 | <47 |
| Oregon | Clatsop | 36449 | 936.2 | 38.9 | <47 |
| Oregon | Columbia | 47787 | 688.5 | 69.4 | <47 |
| Oregon | Multnomah | 689024 | 465.5 | 1480.1 | 54 |
| Oregon | Tillamook | 26083 | 1104.4 | 23.6 | <47 |
| Oregon | Washington | 494721 | 726.4 | 681.1 | 50 |
| Pennsylvania | Allegheny | 1260063 | 744.5 | 1692.5 | 54 |
| Pennsylvania | Armstrong | 72222 | 664.2 | 108.7 | <47 |
| Pennsylvania | Beaver | 179923 | 444.1 | 405.1 | 48 |
| Pennsylvania | Bradford | 62577 | 1161 | 53.9 | <47 |
| Pennsylvania | Butler | 184045 | 794.6 | 231.6 | <47 |
| Pennsylvania | Cameron | 5563 | 398.5 | 14 | <47 |
| Pennsylvania | Clarion | 40968 | 609.1 | 67.3 | <47 |
| Pennsylvania | Clearfield | 82260 | 1154 | 71.3 | <47 |
| Pennsylvania | Crawford | 90927 | 1037.9 | 87.6 | <47 |
| Pennsylvania | Elk | 33989 | 831.8 | 40.9 | <47 |
| Pennsylvania | Erie | 948132 | 1046.5 | 906 | 52 |
| Pennsylvania | Forest | 4984 | 431.6 | 11.5 | <47 |
| Pennsylvania | Jefferson | 45627 | 656.8 | 69.5 | <47 |
| Pennsylvania | Lawrence | 93577 | 362.9 | 257.9 | <47 |
| Pennsylvania | McKean | 45679 | 984.2 | 46.4 | <47 |
| Pennsylvania | Mercer | 120855 | 682.5 | 177.1 | <47 |
| Pennsylvania | Potter | 18084 | 1081.6 | 16.7 | <47 |
| Pennsylvania | Susquehanna | 42283 | 832.4 | 50.8 | <47 |
| Pennsylvania | Tioga | 41136 | 1137.4 | 36.2 | <47 |
| Pennsylvania | Venango | 56747 | 683 | 83.1 | <47 |
| Pennsylvania | Warren | 42433 | 897.7 | 47.3 | <47 |
| Vermont | Addison | 37354 | 809.1 | 46.2 | <47 |
| Vermont | Caledonia | 30323 | 655.2 | 46.3 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| Vermont | Chittenden | 154440 | 616 | 250.7 | <47 |
| Vermont | Essex | 6397 | 673.5 | 9.5 | <47 |
| Vermont | Franklin | 47324 | 694.1 | 68.2 | <47 |
| Vermont | Grand Isle | 7398 | 195.2 | 37.9 | <47 |
| Vermont | Lamoille | 24890 | 462.5 | 53.8 | <47 |
| Vermont | Orange | 28754 | 691.9 | 41.6 | <47 |
| Vermont | Orleans | 26312 | 718.2 | 36.6 | <47 |
| Vermont | Rutland | 62704 | 944.2 | 66.4 | <47 |
| Vermont | Washington | 58769 | 702.9 | 83.6 | <47 |
| Vermont | Windsor | 57783 | 975.7 | 59.2 | <47 |
| Washington | Chelan | 68646 | 2993.7 | 22.9 | <47 |
| Washington | Clallam | 68232 | 1764.4 | 38.7 | <47 |
| Washington | Clark | 395707 | 656.3 | 602.9 | 50 |
| Washington | Cowlitz | 96113 | 1166.2 | 82.4 | <47 |
| Washington | Douglas | 35219 | 1848.7 | 19.1 | <47 |
| Washington | Ferry | 7347 | 2257.3 | 3.3 | <47 |
| Washington | Grant | 81821 | 2791.5 | 29.3 | <47 |
| Washington | Grays Harbor | 69881 | 1929.2 | 36.2 | <47 |
| Washington | Island | 78149 | 211.3 | 369.8 | 48 |
| Washington | Jefferson | 28169 | 1818.7 | 15.5 | <47 |
| Washington | King | 1828516 | 2190.4 | 834.8 | 51 |
| Washington | Kitsap | 245278 | 403.9 | 607.2 | 50 |
| Washington | Kittitas | 37701 | 2333.1 | 16.2 | <47 |
| Washington | Lewis | 70750 | 2436.2 | 29 | <47 |
| Washington | Lincoln | 10493 | 2339.4 | 4.5 | <47 |
| Washington | Mason | 53236 | 973.3 | 54.7 | <47 |
| Washington | Okanogan | 39942 | 5315 | 7.5 | <47 |
| Washington | Pacific | 20855 | 960.3 | 21.7 | <47 |
| Washington | Pend Oreille | 12255 | 1425.2 | 8.6 | <47 |
| Washington | Pierce | 757734 | 1693.3 | 447.5 | 49 |
| Washington | San Juan | 15413 | 173.3 | 89 | <47 |
| Washington | Skagit | 111356 | 1753.1 | 63.5 | <47 |
| Washington | Skamania | 10300 | 1683.9 | 6.1 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| Washington | Snohomish | 661444 | 2107.7 | 313.8 | 47 |
| Washington | Spokane | 441141 | 1780.7 | 247.7 | <47 |
| Washington | Stevens | 41007 | 2540.8 | 16.1 | <47 |
| Washington | Thurston | 226721 | 736.5 | 307.8 | 47 |
| Washington | Wahkiakum | 3900 | 286.7 | 13.6 | <47 |
| Washington | Whatcom | 185545 | 2162.3 | 85.8 | <47 |
| Washington | Yakima | 229624 | 4311.6 | 53.3 | <47 |
| Wisconsin | Ashland | 16526 | 1011.4 | 16.3 | <47 |
| Wisconsin | Barron | 47856 | 890 | 53.8 | <47 |
| Wisconsin | Bayfield | 15515 | 1511.2 | 10.3 | <47 |
| Wisconsin | Brown | 242320 | 535.4 | 452.6 | 49 |
| Wisconsin | Burnett | 16768 | 880.4 | 19 | <47 |
| Wisconsin | Calumet | 44911 | 397 | 113.1 | <47 |
| Wisconsin | Chippewa | 59325 | 1041.3 | 57 | <47 |
| Wisconsin | Columbia | 55674 | 795.7 | 70 | <47 |
| Wisconsin | Dane | 464775 | 1238.4 | 375.3 | 48 |
| Wisconsin | Dodge | 88365 | 907.1 | 97.4 | <47 |
| Wisconsin | Door | 29382 | 488.5 | 60.1 | <47 |
| Wisconsin | Douglas | 44526 | 1336.9 | 33.3 | <47 |
| Wisconsin | Florence | 5016 | 497.5 | 10.1 | <47 |
| Wisconsin | Fond du Lac | 100038 | 765.9 | 130.6 | <47 |
| Wisconsin | Forest | 10039 | 1046.4 | 9.6 | <47 |
| Wisconsin | Green Lake | 19118 | 380.5 | 50.2 | <47 |
| Wisconsin | Iron | 6877 | 802.7 | 8.6 | <47 |
| Wisconsin | Jefferson | 79830 | 582.6 | 137 | <47 |
| Wisconsin | Kenosha | 160893 | 278.1 | 578.6 | 50 |
| Wisconsin | Kewaunee | 20772 | 343.9 | 60.4 | <47 |
| Wisconsin | Langlade | 21154 | 887.9 | 23.8 | <47 |
| Wisconsin | Lincoln | 30265 | 907 | 33.4 | <47 |
| Wisconsin | Manitowoc | 83600 | 595.7 | 140.3 | <47 |
| Wisconsin | Marathon | 131133 | 1576.3 | 83.2 | <47 |
| Wisconsin | Marinette | 44212 | 1429.7 | 30.9 | <47 |
| Wisconsin | Marquette | 15366 | 464.4 | 33.1 | <47 |

| State | County | Population (2005) | Area (sq mile) | Population Density | Estimated Background Sound Level (dBA) |
|---|---|---|---|---|---|
| Wisconsin | Menominee | 4561 | 365 | 12.5 | <47 |
| Wisconsin | Milwaukee | 929978 | 242.9 | 3829.1 | 58 |
| Wisconsin | Oconto | 38589 | 1017.2 | 37.9 | <47 |
| Wisconsin | Oneida | 38360 | 1235.9 | 31 | <47 |
| Wisconsin | Outagamie | 173640 | 644.6 | 269.4 | <47 |
| Wisconsin | Ozaukee | 87081 | 235.4 | 369.9 | 48 |
| Wisconsin | Polk | 45105 | 956.4 | 47.2 | <47 |
| Wisconsin | Portage | 69742 | 822.7 | 84.8 | <47 |
| Wisconsin | Price | 15891 | 1278.4 | 12.4 | <47 |
| Wisconsin | Racine | 194134 | 340.5 | 570.1 | 50 |
| Wisconsin | Rock | 157789 | 726.2 | 217.3 | <47 |
| Wisconsin | Rusk | 15640 | 930.9 | 16.8 | <47 |
| Wisconsin | Sawyer | 17506 | 1350.3 | 13 | <47 |
| Wisconsin | Shawano | 42230 | 909.4 | 46.4 | <47 |
| Wisconsin | Sheboygan | 115777 | 517.4 | 223.8 | <47 |
| Wisconsin | Taylor | 19593 | 984.5 | 19.9 | <47 |
| Wisconsin | Vilas | 22042 | 1017.9 | 21.7 | <47 |
| Wisconsin | Walworth | 100361 | 576.5 | 174.1 | <47 |
| Wisconsin | Washburn | 18371 | 853.1 | 21.5 | <47 |
| Wisconsin | Washington | 125926 | 435.7 | 289 | 47 |
| Wisconsin | Waukesha | 384811 | 580.6 | 662.8 | 50 |
| Wisconsin | Waupaca | 53575 | 765.2 | 70 | <47 |
| Wisconsin | Waushara | 24003 | 637.4 | 37.7 | <47 |
| Wisconsin | Winnebago | 163934 | 578.7 | 283.3 | 47 |

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# APPENDIX P

# REGIONAL ECONOMIC PROFILES OF SELECTED PORTS OF ENTRY AND BORDER PATROL STATIONS

## REGIONAL ECONOMIC PROFILES OF SELECTED POES AND BP STATIONS

This appendix provides tables summarizing key economic sector data and trade statistics for the ports of entry (POEs) and Border Patrol stations (BPS) profiled in Sections 4.9, 5.9, 6.9, and 7.9 of this report. The 21 profiled sites represent many of the most heavily utilized POEs along the U.S.-Canada border in terms of total crossings and the total value of trade, as well as a sampling of smaller, more rural, POEs and POEs that occur in geographically distinct areas. Specifically, the 21 sites with 22 POEs and 9 BPSs, include:

- The most heavily trafficked POEs, with more than 80 percent of all individual crossings;
- The most economically significant POEs, with more than 90 percent of the trade value of cargo;
- Sites that have an active BPS, but are located in a state without a land POE;
- The port that accounts for the greatest number of international ferry crossings; and,
- One site with a POE on Tribal lands.

The tables in this appendix are organized by geographic region of the profiled POE and BPS sites from west to east, following the discussion included in Section 3.9.3.5. The following geographic regions contain the profiled sites:

- West of the Rockies: This region includes six of the profiled POEs: Port Angeles (with co-located BPS), Blaine (with co-located BPS), Sumas (with co-located BPS), Roosville (with co-located BPS), Port Roberts, and Porthill.

- East of the Rockies: This region includes four of the profiled POEs: Piegan, Sweetwater, Pembina, and International Falls.

- Great Lakes: This region includes seven of the profiled POEs: Sault Ste. Marie (with co-located BPS), Detroit (with co-located BPS), Port Huron, Buffalo-Niagara Falls, Alexandria Bay/Cape Vincent, Massena, and Champlain-Rouses Point. The region also includes the Sandusky and Erie BPSs, which do not include a POE.

- New England: This region includes two of the profiled POEs: Calais and Derby Line.

Tables P-1 through P-18 describe the top economic sectors (by payroll and employment) for the U.S. counties or Metropolitan Statistical Areas (MSAs) along the border that contain the 21 profiled sites from west to east. Tables P-19 through P-24 provide this same information for the relevant Canadian provinces. Finally, Tables P-25 through P-43 summarize the trade value of major commodities that are transported across the border at each of the profiled POEs by rail, truck, mail, foreign trade zone, or other means of surface transportation (excluding air, pipeline, or vessel). All monetary values are expressed in 2009 U.S. dollars.

## Table P-1. Top U.S. Economic Sectors by Contribution to Regional Income: Clallam County, WA – Port Angeles POE*

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 3,981 | 127.2 | 21.1 | 22.5 | 62.6 | 92.8 |
| | | State | 353,362 | 15,341.5 | 13.9 | 13.2 | 25.5 | 40.3 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Retail trade | Site | 3,630 | 95.4 | 19.2 | 16.9 | 19.7 | 21.8 |
| | | State | 332,049 | 8,780.5 | 13.1 | 7.5 | 5.9 | -1.1 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 3 | Manufacturing | Site | 1,691 | 72.4 | 8.9 | 12.8 | 46.3 | 42.6 |
| | | State | 253,102 | 13,530.2 | 10.0 | 11.6 | -19.7 | -20.5 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 4 | Construction | Site | 1,881 | 66.4 | 9.9 | 11.8 | 36.4 | 32.0 |
| | | State | 198,559 | 10,100.5 | 7.8 | 8.7 | 26.1 | 30.6 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 5 | Accommodation and food services | Site | 2,204 | 32.8 | 11.7 | 5.8 | 1.2 | 12.8 |
| | | State | 244,068 | 3,978.6 | 9.6 | 3.4 | 21.0 | 22.3 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 6 | Professional, scientific, and technical services | Site | 714 | 27.5 | 3.8 | 4.9 | 28.2 | 46.2 |
| | | State | 163,770 | 11,199.7 | 6.5 | 9.6 | 19.9 | 27.3 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Finance and insurance | Site | 646 | 24.3 | 3.4 | 4.3 | 18.1 | 23.0 |
| | | State | 112,071 | 7,773.6 | 4.4 | 6.7 | 13.2 | 32.4 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| 8 | Other services (except public administration) | Site | 978 | 20.5 | 5.2 | 3.6 | 13.9 | 16.3 |
| | | State | 111,503 | 2,990.7 | 4.4 | 2.6 | 3.5 | 4.7 |
| | | Total U.S. | 5,452,603 | 144,443.9 | 4.5 | 2.8 | 3.0 | 6.3 |
| 9 | Transportation and warehousing | Site | 535 | 19.6 | 2.8 | 3.5 | 10.8 | 22.1 |
| | | State | 89,643 | 3,945.4 | 3.5 | 3.4 | 9.8 | 6.4 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |
| 10 | Hunting, fishing, forestry, and support activities for agriculture | Site | 410 | 17.0 | 2.2 | 3.0 | -29.8 | -27.1 |
| | | State | 14,227 | 580.4 | 0.6 | 0.5 | -12.5 | -11.6 |
| | | Total U.S. | 167,039 | 5,656.6 | 0.1 | 0.1 | -9.0 | -2.3 |
| NA | Agricultural production | Site | 601 | 3.3 | | | | |
| | | State | 238,428 | 1,187.3 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-2. Top U.S. Economic Sectors by Contribution to Regional Income: Whatcom County, WA – Blaine, Point Roberts, and Sumas POEs***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Manufacturing | Site | 9,437 | 460.1 | 12.7 | 17.1 | 3.9 | 15.5 |
| | | State | 253,102 | 13,530.2 | 10.0 | 11.6 | -19.7 | -20.5 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 2 | Construction | Site | 8,304 | 436.1 | 11.2 | 16.2 | 46.8 | 61.1 |
| | | State | 198,559 | 10,100.5 | 7.8 | 8.7 | 26.1 | 30.6 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 3 | Health care and social assistance | Site | 9,958 | 391.9 | 13.4 | 14.5 | 56.0 | 85.8 |
| | | State | 353,362 | 15,341.5 | 13.9 | 13.2 | 25.5 | 40.3 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 4 | Retail trade | Site | 11,240 | 276.1 | 15.1 | 10.2 | 15.7 | 18.1 |
| | | State | 332,049 | 8,780.5 | 13.1 | 7.5 | 5.9 | -1.1 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 5 | Professional, scientific, and technical services | Site | 3,615 | 182.0 | 4.9 | 6.8 | 26.7 | 39.1 |
| | | State | 163,770 | 11,199.7 | 6.5 | 9.6 | 19.9 | 27.3 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |
| 6 | Wholesale trade | Site | 3,518 | 152.5 | 4.7 | 5.7 | 11.5 | 6.2 |
| | | State | 137,976 | 7,769.0 | 5.4 | 6.7 | 10.3 | 16.1 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Finance and insurance | Site | 2,911 | 150.1 | 3.9 | 5.6 | 25.1 | 42.0 |
| | | State | 112,071 | 7,773.6 | 4.4 | 6.7 | 13.2 | 32.4 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| 8 | Accommodation and food services | Site | 8,971 | 135.5 | 12.1 | 5.0 | 31.6 | 50.5 |
| | | State | 244,068 | 3,978.6 | 9.6 | 3.4 | 21.0 | 22.3 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 9 | Administrative, waste management, and remediation services | Site | 3,671 | 116.4 | 4.9 | 4.3 | 74.9 | 128.4 |
| | | State | 173,209 | 6,844.2 | 6.8 | 5.9 | 31.3 | 61.6 |
| | | Total U.S. | 10,224,557 | 316,811.5 | 8.5 | 6.1 | 11.9 | 21.8 |
| 10 | Transportation and warehousing | Site | 2,308 | 86.7 | 3.1 | 3.2 | 45.8 | 29.5 |
| | | State | 89,643 | 3,945.4 | 3.5 | 3.4 | 9.8 | 6.4 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |
| NA | Agricultural production | Site | 6,830 | 48.5 | | | | |
| | | State | 238,428 | 1,187.3 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-3. Top U.S. Economic Sectors by Contribution to Regional Income: Boundary County, ID – Porthill POE***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 568 | 14.5 | 22.7 | 21.8 | 160.6 | 146.1 |
| | | State | 76,735 | 2,653.9 | 14.3 | 15.0 | 44.7 | 47.7 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Manufacturing | Site | 339 | 10.7 | 13.5 | 16.2 | -20.4 | -37.3 |
| | | State | 63,460 | 2,796.5 | 11.8 | 15.8 | -5.4 | -20.5 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 3 | Retail trade | Site | 415 | 10.1 | 16.6 | 15.3 | 16.2 | 26.2 |
| | | State | 81,646 | 1,909.4 | 15.2 | 10.8 | 16.7 | 14.6 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 4 | Construction | Site | 249 | 8.3 | 9.9 | 12.6 | 10.2 | 26.0 |
| | | State | 43,509 | 1,538.1 | 8.1 | 8.7 | 10.5 | 5.0 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 5 | Hunting, fishing, forestry, and support activities for agriculture | Site | 146 | 5.1 | 5.8 | 7.7 | -33.6 | -9.1 |
| | | State | 3,243 | 105.5 | 0.6 | 0.6 | -32.2 | -29.8 |
| | | Total U.S. | 167,039 | 5,656.6 | 0.1 | 0.1 | -9.0 | -2.3 |
| 6 | Professional, scientific, and technical services | Site | 92 | 2.3 | 3.7 | 3.5 | 109.1 | 151.5 |
| | | State | 32,256 | 1,585.8 | 6.0 | 8.9 | 26.1 | 27.9 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Transportation and warehousing | Site | 88 | 2.3 | 3.5 | 3.4 | -16.2 | -2.3 |
| | | State | 17,054 | 544.7 | 3.2 | 3.1 | 34.7 | 43.3 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |
| 8 | Wholesale trade | Site | 47 | 2.1 | 1.9 | 3.1 | -56.1 | -43.2 |
| | | State | 25,883 | 1,126.1 | 4.8 | 6.3 | 6.0 | 7.7 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |
| 9 | Finance and insurance | Site | 67 | 2.0 | 2.7 | 3.0 | 34.0 | 49.6 |
| | | State | 23,245 | 1,007.1 | 4.3 | 5.7 | 41.1 | 41.5 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| 10 | Educational services | Site | 43 | 1.3 | 1.7 | 2.0 | -83.4 | -82.4 |
| | | State | 9,724 | 189.6 | 1.8 | 1.1 | 46.2 | 42.3 |
| | | Total U.S. | 3,141,297 | 102,699.7 | 2.6 | 2.0 | 24.0 | 34.1 |
| NA | Agricultural production | Site | 828 | 8.6 | | | | |
| | | State | 46,934 | 515.1 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007

Table P-4. Top U.S. Economic Sectors by Contribution to Regional Income: Lincoln County, MT – Roosville POE*

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 763 | 22.3 | 17.6 | 18.9 | 26.7 | 59.6 |
| | | State | 60,681 | 2,134.3 | 16.9 | 19.1 | 25.7 | 39.7 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Hunting, fishing, forestry, and support activities for agriculture | Site | 361 | 14.7 | 8.3 | 12.5 | -26.3 | -11.4 |
| | | State | 1,644 | 69.4 | 0.5 | 0.6 | -12.5 | 17.4 |
| | | Total U.S. | 167,039 | 5,656.6 | 0.1 | 0.1 | -9.0 | -2.3 |
| 3 | Retail trade | Site | 713 | 14.1 | 16.4 | 12.0 | 7.9 | 16.6 |
| | | State | 60,438 | 1,392.3 | 16.8 | 12.5 | 15.8 | 22.4 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 4 | Construction | Site | 349 | 11.4 | 8.0 | 9.6 | 115.4 | 127.7 |
| | | State | 29,449 | 1,179.6 | 8.2 | 10.6 | 57.6 | 62.1 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 5 | Accommodation and food services | Site | 543 | 6.9 | 12.5 | 5.9 | 14.1 | 37.2 |
| | | State | 47,158 | 615.2 | 13.1 | 5.5 | 22.1 | 29.6 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 6 | Manufacturing | Site | 181 | 6.2 | 4.2 | 5.2 | -73.8 | -77.4 |
| | | State | 20,156 | 806.1 | 5.6 | 7.2 | -4.1 | 1.4 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Finance and insurance | Site | 199 | 5.2 | 4.6 | 4.4 | 46.3 | 41.0 |
| | | State | 17,391 | 772.4 | 4.8 | 6.9 | 21.1 | 37.5 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| 8 | Administrative, waste management, and remediation services | Site | 59 | 4.8 | 1.4 | 4.1 | 73.5 | 937.7 |
| | | State | 19,704 | 476.0 | 5.5 | 4.3 | 58.4 | 93.7 |
| | | Total U.S. | 10,224,557 | 316,811.5 | 8.5 | 6.1 | 11.9 | 21.8 |
| 9 | Transportation and warehousing | Site | 212 | 3.6 | 4.9 | 3.1 | 123.2 | 52.6 |
| | | State | 12,179 | 390.9 | 3.4 | 3.5 | 21.8 | 17.6 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |
| 10 | Information | Site | 97 | 3.5 | 2.2 | 2.9 | -4.0 | 28.5 |
| | | State | 9,143 | 379.7 | 2.5 | 3.4 | 15.7 | 33.2 |
| | | Total U.S. | 3,434,234 | 235,783.2 | 2.8 | 4.6 | -3.1 | -8.9 |
| NA | Agricultural production | Site | 92 | 0.7 | | | | |
| | | State | 22,377 | 169.2 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-5. Top U.S. Economic Sectors by Contribution to Regional Income: Glacier County, MT – Piegan POE***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 415 | 21.0 | 20.2 | 28.5 | 1.0 | 20.9 |
| | | State | 60,681 | 2,134.3 | 16.9 | 19.1 | 25.7 | 39.7 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Retail trade | Site | 492 | 10.4 | 23.9 | 14.1 | 4.9 | 18.0 |
| | | State | 60,438 | 1,392.3 | 16.8 | 12.5 | 15.8 | 22.4 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 3 | Accommodation and food services | Site | 242 | 8.7 | 11.8 | 11.8 | -20.7 | 70.2 |
| | | State | 47,158 | 615.2 | 13.1 | 5.5 | 22.1 | 29.6 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 4 | Mining, quarrying, and oil and gas extraction | Site | 152 | 7.2 | 7.4 | 9.8 | 137.5 | 224.3 |
| | | State | 6,834 | 483.1 | 1.9 | 4.3 | 57.2 | 82.0 |
| | | Total U.S. | 629,271 | 47,971.4 | 0.5 | 0.9 | 38.0 | 75.6 |
| 5 | Utilities | Site | 69 | 4.5 | 3.4 | 6.1 | -4.2 | -0.1 |
| | | State | 2,901 | 209.8 | 0.8 | 1.9 | -6.4 | -3.3 |
| | | Total U.S. | 639,403 | 55,449.7 | 0.5 | 1.1 | -2.4 | 10.3 |
| 6 | Construction | Site | 84 | 4.1 | 4.1 | 5.6 | -3.4 | 9.8 |
| | | State | 29,449 | 1,179.6 | 8.2 | 10.6 | 57.6 | 62.1 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Other services (except public administration) | Site | 133 | 2.7 | 6.5 | 3.7 | 6.4 | 7.2 |
| | | State | 15,176 | 329.7 | 4.2 | 2.9 | 8.7 | 12.5 |
| | | Total U.S. | 5,452,603 | 144,443.9 | 4.5 | 2.8 | 3.0 | 6.3 |
| 8 | Wholesale trade | Site | 47 | 2.0 | 2.3 | 2.7 | -39.0 | -11.3 |
| | | State | 14,630 | 605.8 | 4.1 | 5.4 | -3.0 | 13.0 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |
| 9 | Professional, scientific, and technical services | Site | [a] | 1.4 | [a] | 1.9 | [a] | -33.0 |
| | | State | 18,228 | 759.6 | 5.1 | 6.8 | 23.8 | 41.2 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |
| 10 | Finance and insurance | Site | 41 | 1.3 | 2.0 | 1.8 | -43.8 | -47.2 |
| | | State | 17,391 | 772.4 | 4.8 | 6.9 | 21.1 | 37.5 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| NA | Agricultural production | Site | 450 | 3.2 | | | | |
| | | State | 22,377 | 169.2 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-6. Top U.S. Economic Sectors by Contribution to Regional Income: Toole County, MT – Sweetgrass POE***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 243 | 8.4 | 14.9 | 16.8 | 19.1 | 29.7 |
| | | State | 60,681 | 2,134.3 | 16.9 | 19.1 | 25.7 | 39.7 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Mining, quarrying, and oil and gas extraction | Site | 177 | 8.0 | 10.9 | 15.9 | 78.8 | 148.3 |
| | | State | 6,834 | 483.1 | 1.9 | 4.3 | 57.2 | 82.0 |
| | | Total U.S. | 629,271 | 47,971.4 | 0.5 | 0.9 | 38.0 | 75.6 |
| 3 | Transportation and warehousing | Site | 163 | 6.0 | 10.0 | 12.0 | -25.9 | -2.2 |
| | | State | 12,179 | 390.9 | 3.4 | 3.5 | 21.8 | 17.6 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |
| 4 | Retail trade | Site | 183 | 3.8 | 11.2 | 7.5 | -24.7 | -10.6 |
| | | State | 60,438 | 1,392.3 | 16.8 | 12.5 | 15.8 | 22.4 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 5 | Accommodation and food services | Site | 221 | 3.4 | 13.6 | 6.9 | 56.7 | 192.0 |
| | | State | 47,158 | 615.2 | 13.1 | 5.5 | 22.1 | 29.6 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 6 | Finance and insurance | Site | 54 | 1.9 | 3.3 | 3.8 | -11.5 | -16.4 |
| | | State | 17,391 | 772.4 | 4.8 | 6.9 | 21.1 | 37.5 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Professional, scientific, and technical services | Site | 46 | 1.7 | 2.8 | 3.4 | 24.3 | 168.0 |
| | | State | 18,228 | 759.6 | 5.1 | 6.8 | 23.8 | 41.2 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |
| 8 | Construction | Site | 36 | 1.1 | 2.2 | 2.2 | -2.7 | -10.4 |
| | | State | 29,449 | 1,179.6 | 8.2 | 10.6 | 57.6 | 62.1 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 9 | Arts, entertainment, and recreation | Site | 28 | 0.6 | 1.7 | 1.1 | [a] | [a] |
| | | State | 9,953 | 149.7 | 2.8 | 1.3 | 32.4 | 33.0 |
| | | Total U.S. | 2,069,346 | 62,914.9 | 1.7 | 1.2 | 18.8 | 17.8 |
| 10 | Other services (except public administration) | Site | 39 | 0.5 | 2.4 | 1.0 | 34.5 | 20.3 |
| | | State | 15,176 | 329.7 | 4.2 | 2.9 | 8.7 | 12.5 |
| | | Total U.S. | 5,452,603 | 144,443.9 | 4.5 | 2.8 | 3.0 | 6.3 |
| NA | Agricultural production | Site | 298 | 1.9 | | | | |
| | | State | 22,377 | 169.2 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-7. Top U.S. Economic Sectors by Contribution to Regional Income: Pembina County, ND – Pembina POE***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Wholesale trade | Site | 552 | 15.7 | 17.4 | 15.1 | 148.6 | 116.1 |
| | | State | 18,841 | 859.3 | 6.2 | 8.5 | 7.1 | 30.7 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |
| 2 | Construction | Site | 183 | 10.7 | 5.8 | 10.2 | 13.7 | 16.6 |
| | | State | 17,886 | 875.6 | 5.9 | 8.6 | 22.9 | 44.0 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 3 | Retail trade | Site | 443 | 8.6 | 14.0 | 8.2 | -28.5 | -22.8 |
| | | State | 44,968 | 974.7 | 14.7 | 9.6 | 7.4 | 9.6 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 4 | Transportation and warehousing | Site | 228 | 7.3 | 7.2 | 7.0 | -27.2 | -20.8 |
| | | State | 11,469 | 430.9 | 3.8 | 4.2 | 42.2 | 59.4 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |
| 5 | Health care and social assistance | Site | 371 | 6.8 | 11.7 | 6.5 | 3.3 | 7.3 |
| | | State | 51,935 | 1,871.7 | 17.0 | 18.4 | 10.2 | 27.7 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 6 | Finance and insurance | Site | 124 | 4.9 | 3.9 | 4.7 | -14.5 | -2.0 |
| | | State | 19,153 | 836.6 | 6.3 | 8.2 | 40.3 | 56.9 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Administrative, waste management, and remediation services | Site | 68 | 1.6 | 2.1 | 1.5 | [a] | [a] |
| | | State | 12,529 | 288.4 | 4.1 | 2.8 | 17.9 | 17.9 |
| | | Total U.S. | 10,224,557 | 316,811.5 | 8.5 | 6.1 | 11.9 | 21.8 |
| 8 | Accommodation and food services | Site | 175 | 1.5 | 5.5 | 1.4 | -2.8 | -10.4 |
| | | State | 32,192 | 383.1 | 10.6 | 3.8 | 25.1 | 35.8 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 9 | Other services (except public administration) | Site | 82 | 1.0 | 2.6 | 1.0 | -21.2 | -11.2 |
| | | State | 13,291 | 260.6 | 4.4 | 2.6 | -3.4 | 5.9 |
| | | Total U.S. | 5,452,603 | 144,443.9 | 4.5 | 2.8 | 3.0 | 6.3 |
| 10 | Professional, scientific, and technical services | Site | [a] | 0.7 | [a] | 0.7 | [a] | -26.8 |
| | | State | 11,133 | 481.2 | 3.7 | 4.7 | 22.6 | 49.8 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |
| NA | Agricultural production | Site | 1,667 | 13.9 | | | | |
| | | State | 23,706 | 175.3 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

## Table P-8. Top U.S. Economic Sectors by Contribution to Regional Income: Koochiching County, MN – International Falls POE*

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 701 | 19.7 | 15.6 | 14.7 | 0.3 | 15.7 |
| | | State | 396,082 | 15,198.3 | 15.7 | 13.8 | 22.2 | 27.7 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Retail trade | Site | 750 | 14.9 | 16.6 | 11.1 | -7.5 | -10.5 |
| | | State | 304,368 | 6,849.4 | 12.1 | 6.2 | 0.0 | -7.4 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 3 | Finance and insurance | Site | [a] | 10.2 | [a] | 7.6 | [a] | -8.3 |
| | | State | 153,756 | 11,392.9 | 6.1 | 10.3 | 12.4 | 23.8 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| 4 | Construction | Site | [a] | 8.0 | [a] | 6.0 | [a] | 2.2 |
| | | State | 119,776 | 6,849.4 | 4.8 | 6.2 | 0.1 | 3.1 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 5 | Accommodation and food services | Site | 502 | 6.9 | 11.1 | 5.1 | 0.2 | 6.0 |
| | | State | 221,789 | 3,162.6 | 8.8 | 2.9 | 15.9 | 16.9 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 6 | Transportation and warehousing | Site | [a] | 6.2 | [a] | 4.6 | [a] | -7.3 |
| | | State | 80,398 | 3,233.2 | 3.2 | 2.9 | 2.2 | -4.6 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Hunting, fishing, forestry, and support activities for agriculture | Site | 184 | 5.3 | 4.1 | 3.9 | [a] | [a] |
| | | State | 2,274 | 76.2 | 0.1 | 0.1 | 6.3 | 21.7 |
| | | Total U.S. | 167,039 | 5,656.6 | 0.1 | 0.1 | -9.0 | -2.3 |
| 8 | Other services (except public administration) | Site | 201 | 2.7 | 4.5 | 2.0 | -2.9 | -1.3 |
| | | State | 145,845 | 4,425.5 | 5.8 | 4.0 | 23.1 | 59.6 |
| | | Total U.S. | 5,452,603 | 144,443.9 | 4.5 | 2.8 | 3.0 | 6.3 |
| 9 | Information | Site | 70 | 2.4 | 1.6 | 1.8 | -15.7 | -23.2 |
| | | State | 72,408 | 4,467.5 | 2.9 | 4.0 | 26.6 | 40.1 |
| | | Total U.S. | 3,434,234 | 235,783.2 | 2.8 | 4.6 | -3.1 | -8.9 |
| 10 | Wholesale trade | Site | [a] | 2.1 | [a] | 1.6 | [a] | [a] |
| | | State | 138,175 | 8,800.5 | 5.5 | 8.0 | 0.8 | 11.2 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |
| NA | Agricultural production | Site | 73 | [a] | | | | |
| | | State | 76,808 | 538.1 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-9. Top U.S. Economic Sectors by Contribution to Regional Income: Chippewa County, MI – Sault Ste. Marie POE***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 1,769 | 54.6 | 20.6 | 23.8 | 38.0 | 27.6 |
| | | State | 558,609 | 23,107.4 | 15.4 | 15.5 | 14.3 | 21.6 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Accommodation and food services | Site | 2,396 | 46.3 | 27.9 | 20.1 | 97.5 | 233.5 |
| | | State | 340,197 | 4,494.3 | 9.4 | 3.0 | 4.6 | 4.0 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 3 | Retail trade | Site | 1,678 | 36.8 | 19.5 | 16.0 | 2.1 | 6.1 |
| | | State | 466,350 | 10,454.1 | 12.8 | 7.0 | -14.4 | -20.7 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 4 | Manufacturing | Site | 577 | 20.6 | 6.7 | 9.0 | -20.6 | -18.0 |
| | | State | 560,342 | 28,066.9 | 15.4 | 18.8 | -31.6 | -39.9 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 5 | Construction | Site | 323 | 16.5 | 3.8 | 7.2 | -30.7 | -28.3 |
| | | State | 145,960 | 7,279.5 | 4.0 | 4.9 | -28.4 | -30.9 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 6 | Finance and insurance | Site | [a] | 10.5 | [a] | 4.6 | [a] | 27.3 |
| | | State | 170,315 | 9,265.6 | 4.7 | 6.2 | 3.7 | 1.9 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Other services (except public administration) | Site | 346 | 5.5 | 4.0 | 2.4 | -37.7 | -46.2 |
| | | State | 162,141 | 3,958.7 | 4.5 | 2.7 | -12.1 | -17.8 |
| | | Total U.S. | 5,452,603 | 144,443.9 | 4.5 | 2.8 | 3.0 | 6.3 |
| 8 | Professional, scientific, and technical services | Site | 235 | 5.4 | 2.7 | 2.3 | 32.8 | 8.4 |
| | | State | 256,261 | 16,546.9 | 7.0 | 11.1 | 22.9 | 35.3 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |
| 9 | Wholesale trade | Site | 116 | 4.5 | 1.3 | 2.0 | -57.0 | -30.4 |
| | | State | 170,557 | 9,811.8 | 4.7 | 6.6 | -10.6 | -10.7 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |
| 10 | Information | Site | 176 | 4.4 | 2.0 | 1.9 | [a] | 3.1 |
| | | State | 76,673 | 4,539.3 | 2.1 | 3.0 | -17.8 | -14.5 |
| | | Total U.S. | 3,434,234 | 235,783.2 | 2.8 | 4.6 | -3.1 | -8.9 |
| NA | Agricultural production | Site | 306 | 0.6 | | | | |
| | | State | 86,072 | 625.7 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-10. Top U.S. Economic Sectors by Contribution to Regional Income: Detroit-Warren-Livonia Metropolitan Statistical Area, MI – Port Huron and Detroit POEs***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Manufacturing | Site | 221,027 | 12,098.1 | 13.0 | 15.3 | -35.8 | -44.8 |
| | | State | 560,342 | 28,066.9 | 15.4 | 18.8 | -31.6 | -39.9 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 2 | Professional, scientific, and technical services | Site | 166,858 | 11,867.5 | 9.8 | 15.0 | 25.3 | 39.4 |
| | | State | 256,261 | 16,546.9 | 7.0 | 11.1 | 22.9 | 35.3 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |
| 3 | Health care and social assistance | Site | 245,178 | 10,705.2 | 14.4 | 13.5 | 11.8 | 17.9 |
| | | State | 558,609 | 23,107.4 | 15.4 | 15.5 | 14.3 | 21.6 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 4 | Management of companies and enterprises | Site | 78,094 | 7,485.7 | 4.6 | 9.5 | -31.3 | -36.2 |
| | | State | 114,528 | 10,986.4 | 3.1 | 7.4 | -31.1 | -32.2 |
| | | Total U.S. | 2,887,407 | 275,772.3 | 2.4 | 5.3 | 0.5 | 5.5 |
| 5 | Wholesale trade | Site | 85,486 | 5,308.6 | 5.0 | 6.7 | -18.1 | -21.9 |
| | | State | 170,557 | 9,811.8 | 4.7 | 6.6 | -10.6 | -10.7 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |
| 6 | Finance and insurance | Site | 91,194 | 5,295.1 | 5.3 | 6.7 | 0.0 | -4.5 |
| | | State | 170,315 | 9,265.6 | 4.7 | 6.2 | 3.7 | 1.9 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Administrative, waste management, and remediation services | Site | 145,532 | 5,209.0 | 8.5 | 6.6 | -15.0 | -11.5 |
| | | State | 306,339 | 9,081.5 | 8.4 | 6.1 | -2.8 | -7.4 |
| | | Total U.S. | 10,224,557 | 316,811.5 | 8.5 | 6.1 | 11.9 | 21.8 |
| 8 | Retail trade | Site | 203,844 | 4,817.5 | 12.0 | 6.1 | -14.7 | -23.2 |
| | | State | 466,350 | 10,454.1 | 12.8 | 7.0 | -14.4 | -20.7 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 9 | Construction | Site | 58,678 | 3,496.8 | 3.4 | 4.4 | -39.8 | -37.2 |
| | | State | 145,960 | 7,279.5 | 4.0 | 4.9 | -28.4 | -30.9 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 10 | Information | Site | 41,069 | 2,800.0 | 2.4 | 3.5 | -23.7 | -18.3 |
| | | State | 76,673 | 4,539.3 | 2.1 | 3.0 | -17.8 | -14.5 |
| | | Total U.S. | 3,434,234 | 235,783.2 | 2.8 | 4.6 | -3.1 | -8.9 |
| NA | Agricultural production | Site | 6,187 | 43.2 | | | | |
| | | State | 86,072 | 625.7 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-11. Top U.S. Economic Sectors by Contribution to Regional Income: Erie County, OH – Sandusky BP Station***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Manufacturing | Site | 6,415 | 330.7 | 20.8 | 31.9 | -35.2 | -40.9 |
| | | State | 742,787 | 35,405.3 | 15.7 | 19.3 | -24.9 | -27.6 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 2 | Health care and social assistance | Site | 4,795 | 168.3 | 15.6 | 16.2 | 29.0 | 17.9 |
| | | State | 766,608 | 29,521.9 | 16.2 | 16.1 | 18.4 | 25.2 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 3 | Retail trade | Site | 4,848 | 104.6 | 15.7 | 10.1 | 1.9 | 6.0 |
| | | State | 585,496 | 13,182.0 | 12.4 | 7.2 | -9.2 | -10.4 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 4 | Accommodation and food services | Site | 5,626 | 73.2 | 18.2 | 7.1 | 41.9 | 21.2 |
| | | State | 435,067 | 5,349.4 | 9.2 | 2.9 | 4.4 | 0.6 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 5 | Wholesale trade | Site | 1,015 | 45.0 | 3.3 | 4.3 | -9.4 | 9.2 |
| | | State | 232,035 | 12,170.8 | 4.9 | 6.6 | -11.1 | -5.7 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |
| 6 | Construction | Site | 851 | 35.4 | 2.8 | 3.4 | -45.4 | -40.5 |
| | | State | 207,520 | 10,109.6 | 4.4 | 5.5 | -16.3 | -9.8 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Administrative, waste management, and remediation services | Site | 1,196 | 32.8 | 3.9 | 3.2 | 1.4 | 51.0 |
| | | State | 346,084 | 9,248.1 | 7.3 | 5.0 | -3.6 | 6.3 |
| | | Total U.S. | 10,224,557 | 316,811.5 | 8.5 | 6.1 | 11.9 | 21.8 |
| 8 | Professional, scientific, and technical services | Site | 717 | 30.5 | 2.3 | 2.9 | 12.7 | 14.1 |
| | | State | 236,177 | 13,523.1 | 5.0 | 7.4 | 2.9 | 9.2 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |
| 9 | Finance and insurance | Site | 677 | 26.1 | 2.2 | 2.5 | -19.2 | 2.5 |
| | | State | 267,122 | 15,791.1 | 5.6 | 8.6 | 6.9 | 23.1 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| 10 | Other services (except public administration) | Site | 1,205 | 23.1 | 3.9 | 2.2 | -29.6 | -27.4 |
| | | State | 216,973 | 5,109.6 | 4.6 | 2.8 | -7.9 | -4.6 |
| | | Total U.S. | 5,452,603 | 144,443.9 | 4.5 | 2.8 | 3.0 | 6.3 |
| NA | Agricultural production | Site | 553 | 4.2 | | | | |
| | | State | 58,271 | 424.8 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-12. Top U.S. Economic Sectors by Contribution to Regional Income: Erie County, PA – Erie BP Station***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Manufacturing | Site | 25,426 | 1,265.8 | 21.4 | 32.2 | -24.9 | -19.9 |
| | | State | 638,681 | 30,189.6 | 12.2 | 13.9 | -20.0 | -20.2 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 2 | Health care and social assistance | Site | 21,987 | 825.1 | 18.5 | 21.0 | 22.5 | 27.3 |
| | | State | 905,622 | 36,146.2 | 17.3 | 16.6 | 21.8 | 32.4 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 3 | Retail trade | Site | 15,856 | 330.8 | 13.3 | 8.4 | -5.1 | -1.3 |
| | | State | 676,811 | 15,388.7 | 12.9 | 7.1 | 1.3 | -0.9 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 4 | Construction | Site | 3,844 | 163.2 | 3.2 | 4.2 | -18.0 | -18.8 |
| | | State | 257,229 | 13,181.0 | 4.9 | 6.1 | 1.1 | 12.8 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 5 | Wholesale trade | Site | 3,464 | 145.7 | 2.9 | 3.7 | -18.6 | -19.0 |
| | | State | 247,957 | 14,177.7 | 4.7 | 6.5 | 2.0 | 11.5 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |
| 6 | Administrative, waste management, and remediation services | Site | 7,366 | 134.2 | 6.2 | 3.4 | -1.0 | -16.1 |
| | | State | 307,181 | 8,756.8 | 5.9 | 4.0 | 2.7 | 7.6 |
| | | Total U.S. | 10,224,557 | 316,811.5 | 8.5 | 6.1 | 11.9 | 21.8 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Accommodation and food services | Site | 11,159 | 120.7 | 9.4 | 3.1 | 9.8 | 13.9 |
| | | State | 432,215 | 6,080.7 | 8.3 | 2.8 | 15.3 | 18.4 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 8 | Professional, scientific, and technical services | Site | 4,002 | 116.4 | 3.4 | 3.0 | 22.7 | -0.5 |
| | | State | 313,614 | 21,324.5 | 6.0 | 9.8 | 6.2 | 10.7 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |
| 9 | Educational services | Site | 5,619 | 111.5 | 4.7 | 2.8 | 19.3 | 30.7 |
| | | State | 235,908 | 8,317.5 | 4.5 | 3.8 | 20.3 | 35.1 |
| | | Total U.S. | 3,141,297 | 102,699.7 | 2.6 | 2.0 | 24.0 | 34.1 |
| 10 | Other services (except public administration) | Site | 5,076 | 101.4 | 4.3 | 2.6 | -8.9 | -6.8 |
| | | State | 245,690 | 5,812.4 | 4.7 | 2.7 | -1.3 | 1.8 |
| | | Total U.S. | 5,452,603 | 144,443.9 | 4.5 | 2.8 | 3.0 | 6.3 |
| NA | Agricultural production | Site | 2,281 | 12.5 | | | | |
| | | State | 60,721 | 609.3 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

## Table P-13. Top U.S. Economic Sectors by Contribution to Regional Income: Erie and Niagara Counties, NY – Buffalo-Niagara Falls POE*

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 83,714 | 2,954.5 | 17.8 | 17.4 | 12.1 | 19.2 |
| | | State | 1,345,569 | 58,302.2 | 17.7 | 13.1 | 13.8 | 21.7 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Manufacturing | Site | 59,029 | 2,911.3 | 12.6 | 17.1 | -24.9 | -33.8 |
| | | State | 511,209 | 24,480.9 | 6.7 | 5.5 | -27.6 | -28.0 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 3 | Finance and insurance | Site | 28,234 | 1,477.9 | 6.0 | 8.7 | 16.0 | 20.1 |
| | | State | 594,917 | 114,881.8 | 7.8 | 25.8 | 0.7 | 22.9 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| 4 | Retail trade | Site | 64,658 | 1,360.0 | 13.8 | 8.0 | -0.7 | 1.7 |
| | | State | 892,335 | 23,301.6 | 11.7 | 5.2 | 5.7 | 4.0 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 5 | Wholesale trade | Site | 25,979 | 1,317.5 | 5.5 | 7.8 | -5.1 | 4.3 |
| | | State | 394,390 | 23,981.5 | 5.2 | 5.4 | -6.6 | -7.4 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |
| 6 | Professional, scientific, and technical services | Site | 25,639 | 1,256.0 | 5.5 | 7.4 | 8.6 | 23.0 |
| | | State | 582,925 | 45,941.9 | 7.7 | 10.3 | 8.8 | 9.4 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Construction | Site | 17,596 | 972.2 | 3.7 | 5.7 | -8.1 | 3.5 |
| | | State | 350,934 | 20,518.8 | 4.6 | 4.6 | 10.4 | 17.2 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 8 | Administrative, waste management, and remediation services | Site | 33,037 | 951.2 | 7.0 | 5.6 | -8.2 | 4.5 |
| | | State | 518,877 | 21,126.2 | 6.8 | 4.8 | 0.4 | 19.6 |
| | | Total U.S. | 10,224,557 | 316,811.5 | 8.5 | 6.1 | 11.9 | 21.8 |
| 9 | Management of companies and enterprises | Site | 9,214 | 667.3 | 2.0 | 3.9 | 19.2 | 21.5 |
| | | State | 175,450 | 21,860.6 | 2.3 | 4.9 | -0.2 | -0.1 |
| | | Total U.S. | 2,887,407 | 275,772.3 | 2.4 | 5.3 | 0.5 | 5.5 |
| 10 | Accommodation and food services | Site | 47,691 | 637.1 | 10.2 | 3.8 | 19.7 | 27.1 |
| | | State | 626,195 | 12,346.1 | 8.2 | 2.8 | 25.3 | 24.5 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| NA | Agricultural production | Site | 3,825 | 34.7 | | | | |
| | | State | 119,366 | 1,202.5 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-14. Top U.S. Economic Sectors by Contribution to Regional Income: Jefferson County, NY – Alexandria Bay/Cape Vincent POE***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 5,681 | 204.7 | 18.4 | 21.9 | 6.4 | 8.4 |
| | | State | 1,345,569 | 58,302.2 | 17.7 | 13.1 | 13.8 | 21.7 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Retail trade | Site | 7,141 | 156.6 | 23.1 | 16.8 | 28.6 | 30.6 |
| | | State | 892,335 | 23,301.6 | 11.7 | 5.2 | 5.7 | 4.0 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 3 | Manufacturing | Site | 2,620 | 111.0 | 8.5 | 11.9 | -28.8 | -27.8 |
| | | State | 511,209 | 24,480.9 | 6.7 | 5.5 | -27.6 | -28.0 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 4 | Construction | Site | 2,351 | 102.7 | 7.6 | 11.0 | 63.0 | 107.2 |
| | | State | 350,934 | 20,518.8 | 4.6 | 4.6 | 10.4 | 17.2 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 5 | Accommodation and food services | Site | 3,419 | 50.5 | 11.1 | 5.4 | 15.5 | 17.6 |
| | | State | 626,195 | 12,346.1 | 8.2 | 2.8 | 25.3 | 24.5 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 6 | Transportation and warehousing | Site | 1,236 | 44.2 | 4.0 | 4.7 | 28.2 | 19.2 |
| | | State | 240,237 | 9,507.6 | 3.2 | 2.1 | 5.1 | 3.1 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Wholesale trade | Site | 1,080 | 41.2 | 3.5 | 4.4 | 22.6 | 30.3 |
| | | State | 394,390 | 23,981.5 | 5.2 | 5.4 | -6.6 | -7.4 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |
| 8 | Finance and insurance | Site | 863 | 38.6 | 2.8 | 4.1 | 4.0 | 5.8 |
| | | State | 594,917 | 114,881.8 | 7.8 | 25.8 | 0.7 | 22.9 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| 9 | Administrative, waste management, and remediation services | Site | [a] | 37.1 | [a] | 4.0 | [a] | 291.7 |
| | | State | 518,877 | 21,126.2 | 6.8 | 4.8 | 0.4 | 19.6 |
| | | Total U.S. | 10,224,557 | 316,811.5 | 8.5 | 6.1 | 11.9 | 21.8 |
| 10 | Information | Site | 840 | 34.2 | 2.7 | 3.7 | 0.5 | 9.8 |
| | | State | 289,745 | 24,021.1 | 3.8 | 5.4 | -8.1 | -8.1 |
| | | Total U.S. | 3,434,234 | 235,783.2 | 2.8 | 4.6 | -3.1 | -8.9 |
| NA | Agricultural production | Site | 939 | 12.8 | | | | |
| | | State | 119,366 | 1,202.5 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-15. Top U.S. Economic Sectors by Contribution to Regional Income: St. Lawrence County, NY – Massena POE***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 6,206 | 210.0 | 22.0 | 23.2 | 8.0 | 19.1 |
| | | State | 1,345,569 | 58,302.2 | 17.7 | 13.1 | 13.8 | 21.7 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Manufacturing | Site | 3,287 | 187.9 | 11.7 | 20.8 | -30.8 | -30.7 |
| | | State | 511,209 | 24,480.9 | 6.7 | 5.5 | -27.6 | -28.0 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 3 | Retail trade | Site | 5,257 | 117.3 | 18.6 | 13.0 | 2.0 | 13.4 |
| | | State | 892,335 | 23,301.6 | 11.7 | 5.2 | 5.7 | 4.0 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 4 | Educational services | Site | 3,112 | 83.6 | 11.0 | 9.2 | 20.7 | 13.1 |
| | | State | 361,429 | 13,336.6 | 4.7 | 3.0 | 22.5 | 29.3 |
| | | Total U.S. | 3,141,297 | 102,699.7 | 2.6 | 2.0 | 24.0 | 34.1 |
| 5 | Construction | Site | 1,207 | 66.8 | 4.3 | 7.4 | -2.7 | 21.2 |
| | | State | 350,934 | 20,518.8 | 4.6 | 4.6 | 10.4 | 17.2 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 6 | Accommodation and food services | Site | 3,054 | 32.9 | 10.8 | 3.6 | 31.6 | 19.1 |
| | | State | 626,195 | 12,346.1 | 8.2 | 2.8 | 25.3 | 24.5 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Finance and insurance | Site | 758 | 27.2 | 2.7 | 3.0 | -4.3 | 2.7 |
| | | State | 594,917 | 114,881.8 | 7.8 | 25.8 | 0.7 | 22.9 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| 8 | Other services (except public administration) | Site | 1,114 | 21.5 | 3.9 | 2.4 | 2.6 | 15.6 |
| | | State | 355,505 | 11,273.6 | 4.7 | 2.5 | 4.9 | 9.2 |
| | | Total U.S. | 5,452,603 | 144,443.9 | 4.5 | 2.8 | 3.0 | 6.3 |
| 9 | Mining, quarrying, and oil and gas extraction | Site | 413 | 20.7 | 1.5 | 2.3 | 123.2 | 103.8 |
| | | State | 4,678 | 271.0 | 0.1 | 0.1 | 25.9 | 31.3 |
| | | Total U.S. | 629,271 | 47,971.4 | 0.5 | 0.9 | 38.0 | 75.6 |
| 10 | Transportation and warehousing | Site | 680 | 20.5 | 2.4 | 2.3 | 27.1 | 46.6 |
| | | State | 240,237 | 9,507.6 | 3.2 | 2.1 | 5.1 | 3.1 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |
| NA | Agricultural production | Site | 1,313 | 11.1 | | | | |
| | | State | 119,366 | 1,202.5 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-16. Top U.S. Economic Sectors by Contribution to Regional Income: Clinton County, NY – Champlain-Rouses Point POE***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 4,900 | 186.8 | 18.6 | 22.6 | 19.2 | 31.4 |
| | | State | 1,345,569 | 58,302.2 | 17.7 | 13.1 | 13.8 | 21.7 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Manufacturing | Site | 3,838 | 150.1 | 14.6 | 18.1 | -10.9 | -10.9 |
| | | State | 511,209 | 24,480.9 | 6.7 | 5.5 | -27.6 | -28.0 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 3 | Retail trade | Site | 5,136 | 107.0 | 19.5 | 12.9 | 23.2 | 17.6 |
| | | State | 892,335 | 23,301.6 | 11.7 | 5.2 | 5.7 | 4.0 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 4 | Transportation and warehousing | Site | 2,056 | 63.6 | 7.8 | 7.7 | 54.9 | 38.5 |
| | | State | 240,237 | 9,507.6 | 3.2 | 2.1 | 5.1 | 3.1 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |
| 5 | Construction | Site | 1,058 | 58.1 | 4.0 | 7.0 | 3.1 | -4.7 |
| | | State | 350,934 | 20,518.8 | 4.6 | 4.6 | 10.4 | 17.2 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 6 | Wholesale trade | Site | 1,262 | 50.4 | 4.8 | 6.1 | -6.9 | 21.1 |
| | | State | 394,390 | 23,981.5 | 5.2 | 5.4 | -6.6 | -7.4 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Accommodation and food services | Site | 2,562 | 35.8 | 9.7 | 4.3 | 2.8 | 15.2 |
| | | State | 626,195 | 12,346.1 | 8.2 | 2.8 | 25.3 | 24.5 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 8 | Information | Site | 623 | 22.1 | 2.4 | 2.7 | 21.7 | -3.1 |
| | | State | 289,745 | 24,021.1 | 3.8 | 5.4 | -8.1 | -8.1 |
| | | Total U.S. | 3,434,234 | 235,783.2 | 2.8 | 4.6 | -3.1 | -8.9 |
| 9 | Administrative, waste management, and remediation services | Site | 1,483 | 19.0 | 5.6 | 2.3 | 42.7 | -22.4 |
| | | State | 518,877 | 21,126.2 | 6.8 | 4.8 | 0.4 | 19.6 |
| | | Total U.S. | 10,224,557 | 316,811.5 | 8.5 | 6.1 | 11.9 | 21.8 |
| 10 | Finance and insurance | Site | 500 | 18.6 | 1.9 | 2.2 | -7.7 | 15.8 |
| | | State | 594,917 | 114,881.8 | 7.8 | 25.8 | 0.7 | 22.9 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| NA | Agricultural production | Site | 933 | 15.3 | | | | |
| | | State | 119,366 | 1,202.5 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-17. Top U.S. Economic Sectors by Contribution to Regional Income: Orleans County, VT – Derby Line POE***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 1,636 | 56.2 | 20.7 | 25.4 | 35.9 | 60.0 |
| | | State | 48,862 | 1,653.2 | 17.9 | 17.3 | 35.8 | 42.7 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Retail trade | Site | 1,412 | 33.0 | 17.9 | 14.9 | 14.0 | 13.6 |
| | | State | 40,642 | 972.4 | 14.9 | 10.2 | 6.0 | 4.9 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 3 | Construction | Site | 474 | 23.3 | 6.0 | 10.6 | -8.0 | 25.3 |
| | | State | 14,743 | 676.3 | 5.4 | 7.1 | 3.1 | 13.6 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 4 | Accommodation and food services | Site | 941 | 13.4 | 11.9 | 6.1 | 4.9 | 26.8 |
| | | State | 30,718 | 474.8 | 11.3 | 5.0 | 5.4 | 12.6 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 5 | Wholesale trade | Site | 315 | 11.6 | 4.0 | 5.3 | 27.0 | 40.0 |
| | | State | 11,079 | 513.3 | 4.1 | 5.4 | -0.7 | 3.6 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |
| 6 | Finance and insurance | Site | 248 | 9.5 | 3.1 | 4.3 | 14.8 | 47.9 |
| | | State | 9,636 | 584.9 | 3.5 | 6.1 | 2.0 | 21.9 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Transportation and warehousing | Site | 282 | 8.8 | 3.6 | 4.0 | -5.7 | -1.6 |
| | | State | 6,230 | 206.7 | 2.3 | 2.2 | 18.2 | 22.9 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |
| 8 | Professional, scientific, and technical services | Site | 150 | 5.3 | 1.9 | 2.4 | 11.1 | 23.3 |
| | | State | 20,244 | 1,005.7 | 7.4 | 10.5 | 81.4 | 87.3 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |
| 9 | Other services (except public administration) | Site | 335 | 5.2 | 4.2 | 2.4 | 24.5 | 4.2 |
| | | State | 9,106 | 226.5 | 3.3 | 2.4 | -5.2 | 4.2 |
| | | Total U.S. | 5,452,603 | 144,443.9 | 4.5 | 2.8 | 3.0 | 6.3 |
| 10 | Educational services | Site | 173 | 4.2 | 2.2 | 1.9 | -17.2 | 7.3 |
| | | State | 14,012 | 388.1 | 5.1 | 4.1 | 14.0 | 26.2 |
| | | Total U.S. | 3,141,297 | 102,699.7 | 2.6 | 2.0 | 24.0 | 34.1 |
| NA | Agricultural production | Site | 610 | 6.8 | | | | |
| | | State | 8,343 | 74.6 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

**Table P-18. Top U.S. Economic Sectors by Contribution to Regional Income: Washington County, ME – Calais POE***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Health care and social assistance | Site | 2,067 | 62.9 | 27.1 | 29.2 | 9.1 | 22.9 |
| | | State | 105,736 | 3,969.4 | 20.8 | 22.2 | 21.8 | 35.7 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 2 | Manufacturing | Site | 827 | 39.4 | 10.8 | 18.3 | -40.0 | -41.9 |
| | | State | 58,774 | 2,583.6 | 11.5 | 14.5 | -26.2 | -25.3 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 3 | Retail trade | Site | 1,822 | 37.6 | 23.9 | 17.4 | 5.6 | 15.6 |
| | | State | 85,002 | 1,948.6 | 16.7 | 10.9 | 10.1 | 9.7 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 4 | Finance and insurance | Site | 313 | 11.3 | 4.1 | 5.3 | 19.0 | 34.2 |
| | | State | 27,181 | 1,505.5 | 5.3 | 8.4 | 15.6 | 29.5 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| 5 | Construction | Site | 334 | 11.1 | 4.4 | 5.1 | -13.9 | -23.0 |
| | | State | 27,711 | 1,148.9 | 5.4 | 6.4 | 3.2 | 4.2 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 6 | Transportation and warehousing | Site | 236 | 8.6 | 3.1 | 4.0 | 11.3 | 27.9 |
| | | State | 15,861 | 558.4 | 3.1 | 3.1 | 47.2 | 55.9 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 7 | Hunting, fishing, forestry, and support activities for agriculture | Site | 220 | 8.4 | 2.9 | 3.9 | -39.6 | -27.5 |
| | | State | 3,642 | 131.9 | 0.7 | 0.7 | -5.6 | 4.6 |
| | | Total U.S. | 167,039 | 5,656.6 | 0.1 | 0.1 | -9.0 | -2.3 |
| 8 | Accommodation and food services | Site | 615 | 7.0 | 8.1 | 3.3 | -15.6 | -13.2 |
| | | State | 47,710 | 814.5 | 9.4 | 4.6 | 10.0 | 14.0 |
| | | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 9 | Educational services | Site | 300 | 5.6 | 3.9 | 2.6 | 82.9 | 19.1 |
| | | State | 14,482 | 380.2 | 2.8 | 2.1 | 14.2 | 19.3 |
| | | Total U.S. | 3,141,297 | 102,699.7 | 2.6 | 2.0 | 24.0 | 34.1 |
| 10 | Professional, scientific, and technical services | Site | 144 | 5.1 | 1.9 | 2.4 | 89.5 | 155.6 |
| | | State | 23,429 | 1,206.0 | 4.6 | 6.8 | 13.2 | 22.9 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |
| NA | Agricultural production | Site | 3,323 | 11.7 | | | | |
| | | State | 15,634 | 93.1 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* Data from Census exclude self-employed persons, employees of private households, and railroad, agricultural production, and most government employees. Data from the Department of Agriculture are not directly comparable due to a different sample year, and therefore are not included in the contribution totals.

[a] Indicates data are withheld by the Census to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: USCB, 2000; USCB, 2008; USDA, 2007.

## Table P-19. Top Canadian Economic Sectors by Contribution to Regional Income: British Columbia*

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Manufacturing | Province: | 189,120 | 8,230.6 | 8.6 | 10.2 | -2.7 | 35.6 |
| | | Total Canada: | 2,005,980 | 88,585.5 | 11.7 | 14.1 | -7.7 | 34.5 |
| 2 | Professional, scientific, and technical services | Province: | 162,435 | 7,921.9 | 7.4 | 9.8 | 18.6 | 65.8 |
| | | Total Canada: | 1,716,255 | 57,618.2 | 10.0 | 9.2 | 13.6 | 42.5 |
| 3 | Health care and social assistance | Province: | 213,085 | 7,478.6 | 9.7 | 9.3 | 6.5 | 33.9 |
| | | Total Canada: | 1,122,445 | 55,681.2 | 6.5 | 8.9 | 14.3 | 52.6 |
| 4 | Construction | Province: | 166,095 | 7,102.0 | 7.6 | 8.8 | 39.9 | 133.9 |
| | | Total Canada: | 1,069,095 | 46,977.2 | 6.2 | 7.5 | 21.6 | 100.3 |
| 5 | Educational services | Province: | 152,565 | 6,473.8 | 7.0 | 8.0 | 9.2 | 64.7 |
| | | Total Canada: | 1,150,535 | 45,443.2 | 6.7 | 7.2 | 12.7 | 57.4 |
| 6 | Retail trade | Province: | 248,955 | 5,763.3 | 11.4 | 7.2 | 6.9 | 40.1 |
| | | Total Canada: | 978,615 | 45,455.7 | 5.7 | 7.2 | 8.2 | 54.9 |
| 7 | Public administration | Province: | 110,585 | 5,202.2 | 5.0 | 6.5 | -2.0 | 42.3 |
| | | Total Canada: | 1,917,170 | 42,083.5 | 11.2 | 6.7 | 9.2 | 43.2 |
| 8 | Transportation and warehousing | Province: | 114,915 | 4,933.0 | 5.2 | 6.1 | 0.6 | 39.8 |
| | | Total Canada: | 820,195 | 33,414.6 | 4.8 | 5.3 | 5.9 | 51.3 |
| 9 | Wholesale trade | Province: | 92,020 | 3,885.8 | 4.2 | 4.8 | 11.6 | 48.6 |
| | | Total Canada: | 739,305 | 32,672.1 | 4.3 | 5.2 | 7.7 | 48.3 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 10 | Finance and insurance | Province: | 84,215 | 3,830.3 | 3.8 | 4.8 | 4.5 | 29.8 |
| | | Total Canada: | 689,210 | 32,001.9 | 4.0 | 5.1 | 8.4 | 32.7 |
| 11 | Agriculture, forestry, fishing and hunting | Province: | 76,485 | 3,631.8 | 3.5 | 4.5 | -2.7 | 113.1 |
| | | Total Canada: | 819,880 | 24,900.9 | 4.8 | 4.0 | 9.6 | 77.7 |
| 12 | Other services (except public administration) | Province: | 109,900 | 3,538.9 | 5.0 | 4.4 | 11.8 | 90.1 |
| | | Total Canada: | 722,695 | 21,190.5 | 4.2 | 3.4 | 19.3 | 97.5 |
| 13 | Administrative, waste management, and remediation services | Province: | 97,310 | 2,954.0 | 4.4 | 3.7 | 20.4 | 115.3 |
| | | Total Canada: | 417,320 | 19,464.5 | 2.4 | 3.1 | 0.0 | 43.0 |
| 14 | Information | Province: | 58,905 | 2,867.7 | 2.7 | 3.6 | -5.3 | 40.3 |
| | | Total Canada: | 523,650 | 23,102.0 | 3.1 | 3.7 | -7.8 | 138.3 |
| 15 | Accommodation and food services | Province: | 180,055 | 2,702.5 | 8.2 | 3.4 | 7.7 | 30.3 |
| | | Total Canada: | 1,126,695 | 16,455.7 | 6.6 | 2.6 | 7.7 | 38.7 |

* Data from Statistics Canada exclude individuals primarily involved in agriculture, fishing and trapping, private household services, religious organizations and military personnel.

[a] Indicates data are withheld to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: StatCan, 2001a; StatCan, 2001b; StatCan, 2006; StatCan, 2010.

## Table P-20. Top Canadian Economic Sectors by Contribution to Regional Income: Alberta*

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Mining, quarrying, and oil and gas extraction | Province: | 134,620 | 9,295.2 | 7.0 | 11.8 | 56.6 | 117.0 |
| | | Total Canada: | 2,005,980 | 88,585.5 | 11.7 | 14.1 | -7.7 | 34.5 |
| 2 | Construction | Province: | 169,420 | 8,402.8 | 8.8 | 10.7 | 30.3 | 120.3 |
| | | Total Canada: | 1,716,255 | 57,618.2 | 10.0 | 9.2 | 13.6 | 42.5 |
| 3 | Professional, scientific, and technical services | Province: | 145,475 | 7,755.7 | 7.5 | 9.9 | 22.3 | 72.8 |
| | | Total Canada: | 1,122,445 | 55,681.2 | 6.5 | 8.9 | 14.3 | 52.6 |
| 4 | Manufacturing | Province: | 138,365 | 6,544.3 | 7.2 | 8.3 | 2.5 | 54.7 |
| | | Total Canada: | 1,069,095 | 46,977.2 | 6.2 | 7.5 | 21.6 | 100.3 |
| 5 | Health care and social assistance | Province: | 175,200 | 5,787.5 | 9.1 | 7.4 | 16.8 | 54.5 |
| | | Total Canada: | 1,150,535 | 45,443.2 | 6.7 | 7.2 | 12.7 | 57.4 |
| 6 | Retail trade | Province: | 206,655 | 4,941.0 | 10.7 | 6.3 | 12.9 | 58.9 |
| | | Total Canada: | 978,615 | 45,455.7 | 5.7 | 7.2 | 8.2 | 54.9 |
| 7 | Educational services | Province: | 120,460 | 4,696.9 | 6.2 | 6.0 | 10.5 | 59.9 |
| | | Total Canada: | 1,917,170 | 42,083.5 | 11.2 | 6.7 | 9.2 | 43.2 |
| 8 | Transportation and warehousing | Province: | 98,870 | 4,205.4 | 5.1 | 5.3 | 7.0 | 51.0 |
| | | Total Canada: | 820,195 | 33,414.6 | 4.8 | 5.3 | 5.9 | 51.3 |
| 9 | Wholesale trade | Province: | 85,510 | 4,101.1 | 4.4 | 5.2 | 13.0 | 64.5 |
| | | Total Canada: | 739,305 | 32,672.1 | 4.3 | 5.2 | 7.7 | 48.3 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 10 | Public administration | Province: | 89,800 | 4,036.9 | 4.7 | 5.1 | 15.9 | 62.5 |
| | | Total Canada: | 689,210 | 32,001.9 | 4.0 | 5.1 | 8.4 | 32.7 |
| 11 | Agriculture, forestry, fishing and hunting | Province: | 75,875 | 3,702.3 | 3.9 | 4.7 | -10.3 | 158.6 |
| | | Total Canada: | 819,880 | 24,900.9 | 4.8 | 4.0 | 9.6 | 77.7 |
| 12 | Other services (except public administration) | Province: | 99,050 | 3,177.7 | 5.1 | 4.0 | 19.9 | 93.6 |
| | | Total Canada: | 722,695 | 21,190.5 | 4.2 | 3.4 | 19.3 | 97.5 |
| 13 | Finance and insurance | Province: | 59,560 | 2,956.8 | 3.1 | 3.8 | 11.0 | 57.1 |
| | | Total Canada: | 417,320 | 19,464.5 | 2.4 | 3.1 | 0.0 | 43.0 |
| 14 | Administrative, waste management, and remediation services | Province: | 71,365 | 2,420.2 | 3.7 | 3.1 | 11.8 | 107.5 |
| | | Total Canada: | 523,650 | 23,102.0 | 3.1 | 3.7 | -7.8 | 138.3 |
| 15 | Accommodation and food services | Province: | 127,630 | 1,995.8 | 6.6 | 2.5 | 4.4 | 43.4 |
| | | Total Canada: | 1,126,695 | 16,455.7 | 6.6 | 2.6 | 7.7 | 38.7 |

* Data from Statistics Canada exclude individuals primarily involved in agriculture, fishing and trapping, private household services, religious organizations and military personnel.

[a] Indicates data are withheld to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: StatCan, 2001a; StatCan, 2001b; StatCan, 2006; StatCan, 2010.

## Table P-21. Top Canadian Economic Sectors by Contribution to Regional Income: Manitoba*

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Manufacturing | Province: | 62,585 | 2,400.1 | 10.4 | 11.7 | -7.9 | 44.1 |
| | | Total Canada: | 2,005,980 | 88,585.5 | 11.7 | 14.1 | -7.7 | 34.5 |
| 2 | Health care and social assistance | Province: | 75,910 | 2,335.1 | 12.6 | 11.3 | 5.9 | 41.6 |
| | | Total Canada: | 1,716,255 | 57,618.2 | 10.0 | 9.2 | 13.6 | 42.5 |
| 3 | Public administration | Province: | 41,600 | 1,799.8 | 6.9 | 8.7 | 3.4 | 51.1 |
| | | Total Canada: | 1,122,445 | 55,681.2 | 6.5 | 8.9 | 14.3 | 52.6 |
| 4 | Educational services | Province: | 47,365 | 1,712.9 | 7.9 | 8.3 | 11.2 | 55.7 |
| | | Total Canada: | 1,069,095 | 46,977.2 | 6.2 | 7.5 | 21.6 | 100.3 |
| 5 | Retail trade | Province: | 65,475 | 1,374.9 | 10.9 | 6.7 | 8.1 | 44.2 |
| | | Total Canada: | 1,150,535 | 45,443.2 | 6.7 | 7.2 | 12.7 | 57.4 |
| 6 | Transportation and warehousing | Province: | 34,410 | 1,334.5 | 5.7 | 6.5 | 1.3 | 35.2 |
| | | Total Canada: | 978,615 | 45,455.7 | 5.7 | 7.2 | 8.2 | 54.9 |
| 7 | Construction | Province: | 32,310 | 1,272.8 | 5.4 | 6.2 | 12.7 | 88.5 |
| | | Total Canada: | 1,917,170 | 42,083.5 | 11.2 | 6.7 | 9.2 | 43.2 |
| 8 | Professional, scientific, and technical services | Province: | 25,640 | 1,115.3 | 4.3 | 5.4 | 16.0 | 70.4 |
| | | Total Canada: | 820,195 | 33,414.6 | 4.8 | 5.3 | 5.9 | 51.3 |
| 9 | Finance and insurance | Province: | 23,345 | 997.8 | 3.9 | 4.8 | 11.9 | 61.6 |
| | | Total Canada: | 739,305 | 32,672.1 | 4.3 | 5.2 | 7.7 | 48.3 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 10 | Wholesale trade | Province: | 23,040 | 896.7 | 3.8 | 4.4 | -2.5 | 33.8 |
| | | Total Canada: | 689,210 | 32,001.9 | 4.0 | 5.1 | 8.4 | 32.7 |
| 11 | Other services (except public administration) | Province: | 28,375 | 790.0 | 4.7 | 3.8 | 4.2 | 65.2 |
| | | Total Canada: | 819,880 | 24,900.9 | 4.8 | 4.0 | 9.6 | 77.7 |
| 12 | Administrative, waste management, and remediation services | Province: | 21,900 | 673.9 | 3.6 | 3.3 | 12.2 | 149.4 |
| | | Total Canada: | 722,695 | 21,190.5 | 4.2 | 3.4 | 19.3 | 97.5 |
| 13 | Accommodation and food services | Province: | 39,630 | 554.3 | 6.6 | 2.7 | 1.1 | 49.9 |
| | | Total Canada: | 417,320 | 19,464.5 | 2.4 | 3.1 | 0.0 | 43.0 |
| 14 | Information | Province: | 12,740 | 535.1 | 2.1 | 2.6 | 5.7 | 60.4 |
| | | Total Canada: | 523,650 | 23,102.0 | 3.1 | 3.7 | -7.8 | 138.3 |
| 15 | Real estate and rental and leasing | Province: | 8,160 | 242.6 | 1.4 | 1.2 | 3.1 | 37.5 |
| | | Total Canada: | 1,126,695 | 16,455.7 | 6.6 | 2.6 | 7.7 | 38.7 |

* Data from Statistics Canada exclude individuals primarily involved in agriculture, fishing and trapping, private household services, religious organizations and military personnel.

[a] Indicates data are withheld to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: StatCan, 2001a; StatCan, 2001b; StatCan, 2006; StatCan, 2010.

## Table P-22. Top Canadian Economic Sectors by Contribution to Regional Income: Ontario*

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Manufacturing | Province: | 899,670 | 42,203.9 | 13.9 | 16.9 | -8.6 | 26.0 |
| | | Total Canada: | 2,005,980 | 88,585.5 | 11.7 | 14.1 | -7.7 | 34.5 |
| 2 | Professional, scientific, and technical services | Province: | 471,620 | 24,062.1 | 7.3 | 9.6 | 9.9 | 35.2 |
| | | Total Canada: | 1,716,255 | 57,618.2 | 10.0 | 9.2 | 13.6 | 42.5 |
| 3 | Health care and social assistance | Province: | 611,740 | 21,459.5 | 9.4 | 8.6 | 15.0 | 39.2 |
| | | Total Canada: | 1,122,445 | 55,681.2 | 6.5 | 8.9 | 14.3 | 52.6 |
| 4 | Educational services | Province: | 433,485 | 17,616.1 | 6.7 | 7.0 | 16.8 | 57.8 |
| | | Total Canada: | 1,069,095 | 46,977.2 | 6.2 | 7.5 | 21.6 | 100.3 |
| 5 | Construction | Province: | 384,780 | 17,397.3 | 5.9 | 7.0 | 15.8 | 80.1 |
| | | Total Canada: | 1,150,535 | 45,443.2 | 6.7 | 7.2 | 12.7 | 57.4 |
| 6 | Public administration | Province: | 350,075 | 16,911.7 | 5.4 | 6.8 | 13.3 | 56.9 |
| | | Total Canada: | 978,615 | 45,455.7 | 5.7 | 7.2 | 8.2 | 54.9 |
| 7 | Retail trade | Province: | 720,230 | 15,707.6 | 11.1 | 6.3 | 7.2 | 30.8 |
| | | Total Canada: | 1,917,170 | 42,083.5 | 11.2 | 6.7 | 9.2 | 43.2 |
| 8 | Finance and insurance | Province: | 316,170 | 15,309.3 | 4.9 | 6.1 | 8.1 | 20.0 |
| | | Total Canada: | 820,195 | 33,414.6 | 4.8 | 5.3 | 5.9 | 51.3 |
| 9 | Wholesale trade | Province: | 307,465 | 14,414.7 | 4.7 | 5.8 | 10.3 | 43.5 |
| | | Total Canada: | 739,305 | 32,672.1 | 4.3 | 5.2 | 7.7 | 48.3 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 10 | Transportation and warehousing | Province: | 307,480 | 12,744.1 | 4.7 | 5.1 | 9.8 | 55.0 |
| | | Total Canada: | 689,210 | 32,001.9 | 4.0 | 5.1 | 8.4 | 32.7 |
| 11 | Other services (except public administration) | Province: | 303,515 | 9,701.1 | 4.7 | 3.9 | 11.1 | 71.7 |
| | | Total Canada: | 819,880 | 24,900.9 | 4.8 | 4.0 | 9.6 | 77.7 |
| 12 | Administrative, waste management, and remediation services | Province: | 314,005 | 9,340.7 | 4.9 | 3.7 | 22.2 | 87.6 |
| | | Total Canada: | 722,695 | 21,190.5 | 4.2 | 3.4 | 19.3 | 97.5 |
| 13 | Information | Province: | 172,795 | 8,502.5 | 2.7 | 3.4 | 0.6 | 40.9 |
| | | Total Canada: | 417,320 | 19,464.5 | 2.4 | 3.1 | 0.0 | 43.0 |
| 14 | Accommodation and food services | Province: | 414,970 | 5,851.2 | 6.4 | 2.3 | 9.2 | 31.1 |
| | | Total Canada: | 523,650 | 23,102.0 | 3.1 | 3.7 | -7.8 | 138.3 |
| 15 | Agriculture, forestry, fishing and hunting | Province: | 114,345 | 5,001.8 | 1.8 | 2.0 | -7.5 | 137.5 |
| | | Total Canada: | 1,126,695 | 16,455.7 | 6.6 | 2.6 | 7.7 | 38.7 |

* Data from Statistics Canada exclude individuals primarily involved in agriculture, fishing and trapping, private household services, religious organizations and military personnel.

[a] Indicates data are withheld to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: StatCan, 2001a; StatCan, 2001b; StatCan, 2006; StatCan, 2010.

**Table P-23. Top Canadian Economic Sectors by Contribution to Regional Income: Quebec***

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Manufacturing | Province: | 573,550 | 23,431.8 | 14.6 | 17.2 | -10.5 | 38.7 |
| | | Total Canada: | 2,005,980 | 88,585.5 | 11.7 | 14.1 | -7.7 | 34.5 |
| 2 | Health care and social assistance | Province: | 441,705 | 13,987.6 | 11.2 | 10.2 | 18.7 | 42.6 |
| | | Total Canada: | 1,716,255 | 57,618.2 | 10.0 | 9.2 | 13.6 | 42.5 |
| 3 | Professional, scientific, and technical services | Province: | 246,795 | 11,559.0 | 6.3 | 8.5 | 14.5 | 65.2 |
| | | Total Canada: | 1,122,445 | 55,681.2 | 6.5 | 8.9 | 14.3 | 52.6 |
| 4 | Public administration | Province: | 244,345 | 11,188.5 | 6.2 | 8.2 | 6.5 | 54.9 |
| | | Total Canada: | 1,069,095 | 46,977.2 | 6.2 | 7.5 | 21.6 | 100.3 |
| 5 | Educational services | Province: | 270,900 | 10,287.6 | 6.9 | 7.5 | 12.4 | 53.0 |
| | | Total Canada: | 1,150,535 | 45,443.2 | 6.7 | 7.2 | 12.7 | 57.4 |
| 6 | Retail trade | Province: | 472,025 | 9,871.1 | 12.0 | 7.2 | 13.8 | 52.1 |
| | | Total Canada: | 978,615 | 45,455.7 | 5.7 | 7.2 | 8.2 | 54.9 |
| 7 | Construction | Province: | 205,665 | 8,406.1 | 5.2 | 6.2 | 22.2 | 102.8 |
| | | Total Canada: | 1,917,170 | 42,083.5 | 11.2 | 6.7 | 9.2 | 43.2 |
| 8 | Wholesale trade | Province: | 173,190 | 7,003.3 | 4.4 | 5.1 | 3.8 | 50.1 |
| | | Total Canada: | 820,195 | 33,414.6 | 4.8 | 5.3 | 5.9 | 51.3 |
| 9 | Transportation and warehousing | Province: | 181,470 | 6,943.7 | 4.6 | 5.1 | 5.2 | 52.9 |
| | | Total Canada: | 739,305 | 32,672.1 | 4.3 | 5.2 | 7.7 | 48.3 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 10 | Finance and insurance | Province: | 153,975 | 6,710.0 | 3.9 | 4.9 | 11.9 | 51.2 |
| | | Total Canada: | 689,210 | 32,001.9 | 4.0 | 5.1 | 8.4 | 32.7 |
| 11 | Other services (except public administration) | Province: | 195,045 | 5,394.9 | 5.0 | 4.0 | 6.6 | 73.7 |
| | | Total Canada: | 819,880 | 24,900.9 | 4.8 | 4.0 | 9.6 | 77.7 |
| 12 | Information | Province: | 99,490 | 4,470.0 | 2.5 | 3.3 | 3.7 | 48.4 |
| | | Total Canada: | 722,695 | 21,190.5 | 4.2 | 3.4 | 19.3 | 97.5 |
| 13 | Agriculture, forestry, fishing and hunting | Province: | 96,995 | 4,029.0 | 2.5 | 3.0 | -4.6 | 141.7 |
| | | Total Canada: | 417,320 | 19,464.5 | 2.4 | 3.1 | 0.0 | 43.0 |
| 14 | Administrative, waste management, and remediation services | Province: | 141,945 | 3,829.1 | 3.6 | 2.8 | 15.0 | 81.7 |
| | | Total Canada: | 523,650 | 23,102.0 | 3.1 | 3.7 | -7.8 | 138.3 |
| 15 | Accommodation and food services | Province: | 246,725 | 3,606.3 | 6.3 | 2.6 | 10.5 | 44.6 |
| | | Total Canada: | 1,126,695 | 16,455.7 | 6.6 | 2.6 | 7.7 | 38.7 |

* Data from Statistics Canada exclude individuals primarily involved in agriculture, fishing and trapping, private household services, religious organizations and military personnel.

[a] Indicates data are withheld to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: StatCan, 2001a; StatCan, 2001b; StatCan, 2006; StatCan, 2010.

## Table P-24. Top Canadian Economic Sectors by Contribution to Regional Income: New Brunswick*

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Manufacturing | Province: | 40,700 | 1,573.5 | 10.8 | 12.5 | -11.3 | 51.0 |
| | | Total Canada: | 2,005,980 | 88,585.5 | 11.7 | 14.1 | -7.7 | 34.5 |
| 2 | Health care and social assistance | Province: | 43,030 | 1,391.2 | 11.4 | 11.1 | 6.7 | 61.4 |
| | | Total Canada: | 1,716,255 | 57,618.2 | 10.0 | 9.2 | 13.6 | 42.5 |
| 3 | Public administration | Province: | 29,865 | 1,297.4 | 7.9 | 10.3 | 4.8 | 56.9 |
| | | Total Canada: | 1,122,445 | 55,681.2 | 6.5 | 8.9 | 14.3 | 52.6 |
| 4 | Retail trade | Province: | 44,290 | 940.7 | 11.7 | 7.5 | 8.1 | 65.2 |
| | | Total Canada: | 1,069,095 | 46,977.2 | 6.2 | 7.5 | 21.6 | 100.3 |
| 5 | Educational services | Province: | 24,615 | 936.5 | 6.5 | 7.5 | 2.2 | 60.5 |
| | | Total Canada: | 1,150,535 | 45,443.2 | 6.7 | 7.2 | 12.7 | 57.4 |
| 6 | Construction | Province: | 25,410 | 930.6 | 6.7 | 7.4 | 9.0 | 87.6 |
| | | Total Canada: | 978,615 | 45,455.7 | 5.7 | 7.2 | 8.2 | 54.9 |
| 7 | Transportation and warehousing | Province: | 20,020 | 779.1 | 5.3 | 6.2 | 0.0 | 62.3 |
| | | Total Canada: | 1,917,170 | 42,083.5 | 11.2 | 6.7 | 9.2 | 43.2 |
| 8 | Professional, scientific, and technical services | Province: | 14,905 | 690.1 | 4.0 | 5.5 | 15.7 | 88.3 |
| | | Total Canada: | 820,195 | 33,414.6 | 4.8 | 5.3 | 5.9 | 51.3 |
| 9 | Wholesale trade | Province: | 13,500 | 525.4 | 3.6 | 4.2 | 6.6 | 82.6 |
| | | Total Canada: | 739,305 | 32,672.1 | 4.3 | 5.2 | 7.7 | 48.3 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (%) | Change in Annual Payroll (%) |
|---|---|---|---|---|---|---|---|---|
| 10 | Other services (except public administration) | Province: | 18,675 | 476.4 | 5.0 | 3.8 | -4.9 | 61.5 |
| | | Total Canada: | 689,210 | 32,001.9 | 4.0 | 5.1 | 8.4 | 32.7 |
| 11 | Administrative, waste management, and remediation services | Province: | 21,295 | 476.1 | 5.6 | 3.8 | 24.0 | 108.8 |
| | | Total Canada: | 819,880 | 24,900.9 | 4.8 | 4.0 | 9.6 | 77.7 |
| 12 | Accommodation and food services | Province: | 25,440 | 361.1 | 6.7 | 2.9 | 5.0 | 61.6 |
| | | Total Canada: | 722,695 | 21,190.5 | 4.2 | 3.4 | 19.3 | 97.5 |
| 13 | Information | Province: | 7,225 | 321.7 | 1.9 | 2.6 | 0.5 | 67.8 |
| | | Total Canada: | 417,320 | 19,464.5 | 2.4 | 3.1 | 0.0 | 43.0 |
| 14 | Arts, entertainment, and recreation | Province: | 5,595 | 103.4 | 1.5 | 0.8 | -3.6 | 55.2 |
| | | Total Canada: | 523,650 | 23,102.0 | 3.1 | 3.7 | -7.8 | 138.3 |
| 15 | Management of companies and enterprises | Province: | 390 | 13.7 | 0.1 | 0.1 | 129.4 | [a] |
| | | Total Canada: | 1,126,695 | 16,455.7 | 6.6 | 2.6 | 7.7 | 38.7 |

* Data from Statistics Canada exclude individuals primarily involved in agriculture, fishing and trapping, private household services, religious organizations and military personnel.

[a] Indicates data are withheld to avoid disclosure of individual companies (in which case data are included in the higher level totals).

Source: StatCan, 2001a; StatCan, 2001b; StatCan, 2006; StatCan, 2010.

## Table P-25. U.S.-Canada Trade by Surface Modes of Transportation: Port Angeles POE

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Fertilizers | 2.2 | 12.7 | 0.1 |
| 2 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 1.2 | 6.9 | 0.0 |
| 3 | Edible vegetables and certain roots and tubers | 1.2 | 6.8 | 0.0 |
| 4 | Optical, photographic, cinematographic, measuring, checking, precision, medical instruments | 1.1 | 6.6 | 0.0 |
| 5 | Articles of stone, plaster, cement, asbestos, mica or similar materials | 1.1 | 6.1 | 0.1 |
| 6 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 1.0 | 6.0 | 0.0 |
| 7 | Preparations of vegetables, fruit, nuts, or other parts of plants | 0.9 | 5.2 | 0.0 |
| 8 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof. | 0.8 | 4.8 | 0.0 |
| 9 | Wood and articles of wood, wood charcoal | 0.8 | 4.7 | 0.0 |
| 10 | Arms and ammunition, parts and accessories thereof | 0.7 | 4.0 | 0.2 |
| | Total Trade | 17.4 | 100.0 | 0.0 |

Source: USDOT, 2009

**Table P-26. U.S.-Canada Trade by Surface Modes of Transportation: Point Roberts POE**

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 1.4 | 16.8 | 0.0 |
| 2 | Ships, boats, and floating structures | 1.3 | 15.9 | 0.2 |
| 3 | Natural or cultured pearls, precious or semiprecious stones, precious metals, articles thereof | 0.7 | 7.8 | 0.0 |
| 4 | Aircraft, spacecraft, and parts thereof | 0.6 | 7.6 | 0.0 |
| 5 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 0.5 | 6.3 | 0.0 |
| 6 | Printed books, newspapers, pictures and other products of the printing industry, manuscripts | 0.5 | 6.0 | 0.0 |
| 7 | Optical, photographic, cinematographic, measuring, checking, precision, medical instruments | 0.4 | 5.0 | 0.0 |
| 8 | Toys, games and sports equipment, parts and accessories thereof | 0.4 | 4.4 | 0.0 |
| 9 | Plastics and articles thereof | 0.3 | 3.9 | 0.0 |
| 10 | Tools, implements, cutlery, spoons and forks, of base metal, parts thereof of base metal | 0.3 | 3.2 | 0.0 |
| | Total Trade | 8.4 | 100.0 | 0.0 |

Source: USDOT, 2009

## Table P-27. U.S.-Canada Trade by Surface Modes of Transportation: Blaine POE

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 1,550.4 | 10.6 | 3.5 |
| 2 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 1,084.3 | 7.4 | 4.8 |
| 3 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 1,055.9 | 7.2 | 1.7 |
| 4 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 893.7 | 6.1 | 7.2 |
| 5 | Plastics and articles thereof | 739.4 | 5.1 | 4.5 |
| 6 | Wood and articles of wood, wood charcoal | 728.3 | 5.0 | 11.6 |
| 7 | Toys, games and sports equipment, parts and accessories thereof | 668.5 | 4.6 | 23.5 |
| 8 | Fish and crustaceans, mollusks and other aquatic invertebrates | 583.1 | 4.0 | 24.3 |
| 9 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 513.7 | 3.5 | 5.2 |
| 10 | Edible fruit and nuts, peel of citrus fruit or melons | 410.6 | 2.8 | 14.1 |
| | Total Trade | 14,617.8 | 100.0 | 4.3 |

Source: USDOT, 2009

**Table P-28. U.S.-Canada Trade by Surface Modes of Transportation: Sumas POE**

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Wood and articles of wood, wood charcoal | 435.2 | 22.0 | 6.9 |
| 2 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 203.6 | 10.3 | 0.5 |
| 3 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 144.1 | 7.3 | 0.2 |
| 4 | Edible fruit and nuts, peel of citrus fruit or melons | 102.0 | 5.1 | 3.5 |
| 5 | Plastics and articles thereof | 99.4 | 5.0 | 0.6 |
| 6 | Edible vegetables and certain roots and tubers | 83.8 | 4.2 | 2.7 |
| 7 | Special classification provisions | 76.9 | 3.9 | 0.7 |
| 8 | Articles of iron or steel | 73.6 | 3.7 | 1.0 |
| 9 | Articles of stone, plaster, cement, asbestos, mica or similar materials | 61.9 | 3.1 | 4.2 |
| 10 | Live animals | 44.2 | 2.2 | 3.0 |
| | Total Trade | 1,980.4 | 100.0 | 0.6 |

Source: USDOT, 2009

## Table P-29. U.S.-Canada Trade by Surface Modes of Transportation: Porthill POE

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Beverages, spirits and vinegar | 4.9 | 38.4 | 0.3 |
| 2 | Wood and articles of wood, wood charcoal | 4.8 | 37.7 | 0.1 |
| 3 | Oil seeds and oleaginous fruits, miscellaneous grains, seeds and fruit, industrial plants | 1.1 | 9.0 | 0.1 |
| 4 | Rubber and articles thereof | 0.4 | 3.1 | 0.0 |
| 5 | Furniture, bedding, mattress supports, cushions and similar stuffed furnishings, lighting fittings | 0.4 | 3.0 | 0.0 |
| 6 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 0.3 | 2.1 | 0.0 |
| 7 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 0.2 | 1.3 | 0.0 |
| 8 | Pharmaceutical products | 0.1 | 1.0 | 0.0 |
| 9 | Articles of iron or steel | 0.1 | 0.8 | 0.0 |
| 10 | Plastics and articles thereof | 0.1 | 0.7 | 0.0 |
| | Total Trade | 12.7 | 100.0 | 0.0 |

Source: USDOT, 2009

**Table P-30. U.S.-Canada Trade by Surface Modes of Transportation: Roosville POE**

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Wood and articles of wood, wood charcoal | 27.0 | 54.3 | 0.4 |
| 2 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 8.3 | 16.6 | 0.1 |
| 3 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 3.2 | 6.5 | 0.0 |
| 4 | Pulp of wood or of other fibrous cellulosic material, waste and scrap of paper or paperboard | 2.7 | 5.4 | 0.1 |
| 5 | Articles of stone, plaster, cement, asbestos, mica or similar materials | 1.1 | 2.2 | 0.1 |
| 6 | Fertilizers | 0.8 | 1.6 | 0.0 |
| 7 | Inorganic chemicals, organic or inorganic compounds of precious metals, of rare-earth metals | 0.8 | 1.6 | 0.0 |
| 8 | Furniture, bedding, mattress supports, cushions and similar stuffed furnishings, lighting fittings | 0.7 | 1.5 | 0.0 |
| 9 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 0.7 | 1.4 | 0.0 |
| 10 | Optical, photographic, cinematographic, measuring, checking, precision, medical instruments | 0.7 | 1.3 | 0.0 |
| | Total Trade | 49.8 | 100.0 | 0.0 |

Source: USDOT, 2009.

## Table P-31. U.S.-Canada Trade by Surface Modes of Transportation: Piegan POE

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 9.3 | 80.4 | 0.1 |
| 2 | Printed books, newspapers, pictures and other products of the printing industry, manuscripts | 0.4 | 3.5 | 0.0 |
| 3 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 0.3 | 2.8 | 0.0 |
| 4 | Plastics and articles thereof | 0.2 | 1.5 | 0.0 |
| 5 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 0.2 | 1.3 | 0.0 |
| 6 | Wood and articles of wood, wood charcoal | 0.1 | 1.1 | 0.0 |
| 7 | Edible fruit and nuts, peel of citrus fruit or melons | 0.1 | 1.0 | 0.0 |
| 8 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 0.1 | 0.9 | 0.0 |
| 9 | Miscellaneous edible preparations | 0.1 | 0.8 | 0.0 |
| 10 | Articles of stone, plaster, cement, asbestos, mica or similar materials | 0.1 | 0.8 | 0.0 |
| | Total Trade | 11.6 | 100.0 | 0.0 |

Source: USDOT, 2009.

## Table P-32. U.S.-Canada Trade by Surface Modes of Transportation: Sweetgrass POE

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 2,451.6 | 26.9 | 5.6 |
| 2 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 609.0 | 6.7 | 2.7 |
| 3 | Meat and edible meat offal | 597.0 | 6.5 | 21.3 |
| 4 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 543.6 | 6.0 | 0.9 |
| 5 | Special classification provisions | 430.2 | 4.7 | 3.6 |
| 6 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 424.8 | 4.7 | 4.3 |
| 7 | Articles of iron or steel | 377.8 | 4.1 | 4.9 |
| 8 | Edible fruit and nuts, peel of citrus fruit or melons | 279.5 | 3.1 | 9.6 |
| 9 | Optical, photographic, cinematographic, measuring, checking, precision, medical instruments | 270.2 | 3.0 | 4.4 |
| 10 | Plastics and articles thereof | 269.9 | 3.0 | 1.6 |
|  | Total Trade | 9,123.3 | 100.0 | 2.7 |

Source: USDOT, 2009.

**Table P-33. U.S.-Canada Trade by Surface Modes of Transportation: Pembina POE**

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 3,110.9 | 20.4 | 7.1 |
| 2 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 1,760.7 | 11.5 | 2.8 |
| 3 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 898.4 | 5.9 | 4.0 |
| 4 | Plastics and articles thereof | 755.3 | 5.0 | 4.6 |
| 5 | Special classification provisions | 598.2 | 3.9 | 5.1 |
| 6 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 550.7 | 3.6 | 5.5 |
| 7 | Articles of iron or steel | 469.9 | 3.1 | 6.1 |
| 8 | Fertilizers | 437.6 | 2.9 | 13.6 |
| 9 | Animal or vegetable fats and oils and their cleavage products, prepared edible fats, animal waxes | 398.1 | 2.6 | 21.7 |
| 10 | Miscellaneous chemical products | 368.4 | 2.4 | 9.0 |
| | Total Trade | 15,251.3 | 100.0 | 4.5 |

Source: USDOT, 2009.

**Table P-34. U.S.-Canada Trade by Surface Modes of Transportation: International Falls POE**

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Plastics and articles thereof | 1,102.7 | 16.0 | 6.7 |
| 2 | Fertilizers | 880.7 | 12.7 | 27.5 |
| 3 | Wood and articles of wood, wood charcoal | 740.8 | 10.7 | 11.8 |
| 4 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 674.4 | 9.8 | 6.8 |
| 5 | Pulp of wood or of other fibrous cellulosic material, waste and scrap of paper or paperboard | 619.2 | 9.0 | 30.3 |
| 6 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 543.3 | 7.9 | 4.4 |
| 7 | Copper and articles thereof | 310.8 | 4.5 | 11.3 |
| 8 | Articles of iron or steel | 277.0 | 4.0 | 3.6 |
| 9 | Organic chemicals | 273.4 | 4.0 | 5.9 |
| 10 | Cereals | 216.6 | 3.1 | 13.6 |
| | Total Trade | 6,912.2 | 100.0 | 2.0 |

Source: USDOT, 2009.

**Table P-35. U.S.-Canada Trade by Surface Modes of Transportation: Sault Ste. Marie POE**

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Iron and steel | 391.6 | 20.6 | 5.7 |
| 2 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 259.5 | 13.7 | 2.1 |
| 3 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 244.5 | 12.9 | 0.6 |
| 4 | Articles of iron or steel | 166.9 | 8.8 | 2.2 |
| 5 | Wood and articles of wood, wood charcoal | 155.3 | 8.2 | 2.5 |
| 6 | Ores, slag and ash | 111.2 | 5.8 | 13.7 |
| 7 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 94.9 | 5.0 | 0.2 |
| 8 | Aluminum and articles thereof | 54.9 | 2.9 | 0.7 |
| 9 | Inorganic chemicals, organic or inorganic compounds of precious metals, of rare-earth metals | 52.5 | 2.8 | 1.8 |
| 10 | Special classification provisions | 38.6 | 2.0 | 0.3 |
| | Total Trade | 1,901.3 | 100.0 | 0.6 |

Source: USDOT, 2009.

**Table P-36. U.S.-Canada Trade by Surface Modes of Transportation: Port Huron POE**

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 10,637.9 | 20.2 | 17.0 |
| 2 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 6,380.3 | 12.1 | 14.6 |
| 3 | Plastics and articles thereof | 3,467.9 | 6.6 | 21.0 |
| 4 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 3,290.1 | 6.3 | 14.6 |
| 5 | Aluminum and articles thereof | 2,742.5 | 5.2 | 36.8 |
| 6 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 2,129.0 | 4.1 | 17.3 |
| 7 | Organic chemicals | 1,808.9 | 3.4 | 39.3 |
| 8 | Iron and steel | 1,441.5 | 2.7 | 20.9 |
| 9 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 1,181.9 | 2.2 | 11.9 |
| 10 | Rubber and articles thereof | 1,037.7 | 2.0 | 18.0 |
| | Total Trade | 52,558.0 | 100.0 | 15.6 |

Source: USDOT, 2009.

**Table P-37. U.S.-Canada Trade by Surface Modes of Transportation: Detroit POE**

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 29,394.0 | 34.7 | 47.0 |
| 2 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 13,456.8 | 15.9 | 30.8 |
| 3 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 6,820.3 | 8.1 | 30.2 |
| 4 | Plastics and articles thereof | 3,390.7 | 4.0 | 20.5 |
| 5 | Iron and steel | 2,071.0 | 2.4 | 30.0 |
| 6 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 1,932.9 | 2.3 | 15.7 |
| 7 | Rubber and articles thereof | 1,910.8 | 2.3 | 33.1 |
| 8 | Furniture, bedding, mattress supports, cushions and similar stuffed furnishings, lighting fittings | 1,860.5 | 2.2 | 28.4 |
| 9 | Optical, photographic, cinematographic, measuring, checking, precision, medical instruments | 1,703.8 | 2.0 | 27.6 |
| 10 | Articles of iron or steel | 1,505.5 | 1.8 | 19.6 |
| | Total Trade | 84,658.6 | 100.0 | 25.1 |

Source: USDOT, 2009.

**Table P-38. U.S.-Canada Trade by Surface Modes of Transportation: Buffalo-Niagara Falls POE**

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 12,877.0 | 22.8 | 20.6 |
| 2 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 6,226.8 | 11.0 | 14.3 |
| 3 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 3,370.5 | 6.0 | 14.9 |
| 4 | Pharmaceutical products | 3,178.1 | 5.6 | 39.4 |
| 5 | Plastics and articles thereof | 3,074.3 | 5.4 | 18.6 |
| 6 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 2,090.3 | 3.7 | 16.9 |
| 7 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 1,551.3 | 2.7 | 15.6 |
| 8 | Iron and steel | 1,408.1 | 2.5 | 20.4 |
| 9 | Optical, photographic, cinematographic, measuring, checking, precision, medical instruments | 1,307.7 | 2.3 | 21.2 |
| 10 | Special classification provisions | 1,160.2 | 2.1 | 9.8 |
| | Total Trade | 56,516.3 | 100.0 | 16.7 |

Source: USDOT, 2009.

## Table P-39. U.S.-Canada Trade by Surface Modes of Transportation: Alexandria Bay / Cape Vincent POE

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 1,035.0 | 10.5 | 8.4 |
| 2 | Aluminum and articles thereof | 970.9 | 9.9 | 13.0 |
| 3 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 898.1 | 9.1 | 2.1 |
| 4 | Natural or cultured pearls, precious or semiprecious stones, precious metals, articles thereof | 786.9 | 8.0 | 21.5 |
| 5 | Plastics and articles thereof | 653.9 | 6.6 | 4.0 |
| 6 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 597.1 | 6.1 | 1.0 |
| 7 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 506.2 | 5.1 | 2.2 |
| 8 | Rubber and articles thereof | 293.6 | 3.0 | 5.1 |
| 9 | Special classification provisions | 226.9 | 2.3 | 1.9 |
| 10 | Articles of iron or steel | 221.9 | 2.3 | 2.9 |
| | Total Trade | 9,846.1 | 100.0 | 2.9 |

Source: USDOT, 2009.

**Table P-40.  U.S.-Canada Trade by Surface Modes of Transportation: Massena POE**

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Copper and articles thereof | 146.6 | 34.2 | 5.3 |
| 2 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 75.2 | 17.5 | 0.8 |
| 3 | Special classification provisions | 23.4 | 5.4 | 0.2 |
| 4 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 19.1 | 4.4 | 0.0 |
| 5 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 18.5 | 4.3 | 0.1 |
| 6 | Pulp of wood or of other fibrous cellulosic material, waste and scrap of paper or paperboard | 18.2 | 4.2 | 0.9 |
| 7 | Plastics and articles thereof | 16.3 | 3.8 | 0.1 |
| 8 | Aluminum and articles thereof | 13.2 | 3.1 | 0.2 |
| 9 | Optical, photographic, cinematographic, measuring, checking, precision, medical instruments | 7.5 | 1.8 | 0.1 |
| 10 | Animal or vegetable fats and oils and their cleavage products, prepared edible fats, animal waxes | 7.2 | 1.7 | 0.4 |
| | Total Trade | 428.9 | 100.0 | 0.1 |

Source: USDOT, 2009.

## Table P-41. U.S.-Canada Trade by Surface Modes of Transportation: Champlain-Rouses Point POE

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 1,917.0 | 10.0 | 4.4 |
| 2 | Natural or cultured pearls, precious or semiprecious stones, precious metals, articles thereof | 1,651.8 | 8.6 | 45.1 |
| 3 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 1,367.7 | 7.1 | 2.2 |
| 4 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 1,190.8 | 6.2 | 12.0 |
| 5 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 1,151.6 | 6.0 | 9.3 |
| 6 | Plastics and articles thereof | 934.0 | 4.9 | 5.7 |
| 7 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 933.7 | 4.9 | 4.1 |
| 8 | Aluminum and articles thereof | 769.2 | 4.0 | 10.3 |
| 9 | Pharmaceutical products | 721.0 | 3.8 | 8.9 |
| 10 | Copper and articles thereof | 495.7 | 2.6 | 18.1 |
| | Total Trade | 19,157.3 | 100.0 | 5.7 |

Source: USDOT, 2009.

## Table P-42. U.S.-Canada Trade by Surface Modes of Transportation: Derby Line POE

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 282.2 | 16.5 | 2.3 |
| 2 | Wood and articles of wood, wood charcoal | 246.8 | 14.4 | 3.9 |
| 3 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 136.4 | 8.0 | 0.2 |
| 4 | Articles of iron or steel | 127.2 | 7.4 | 1.7 |
| 5 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 102.9 | 6.0 | 0.2 |
| 6 | Plastics and articles thereof | 101.4 | 5.9 | 0.6 |
| 7 | Sugars and sugar confectionery | 77.6 | 4.5 | 7.9 |
| 8 | Articles of stone, plaster, cement, asbestos, mica or similar materials | 66.9 | 3.9 | 4.6 |
| 9 | Furniture, bedding, mattress supports, cushions and similar stuffed furnishings, lighting fittings | 55.2 | 3.2 | 0.8 |
| 10 | Aluminum and articles thereof | 49.0 | 2.9 | 0.7 |
| | Total Trade | 1,707.8 | 100.0 | 0.5 |

Source: USDOT, 2009.

**Table P-43. U.S.-Canada Trade by Surface Modes of Transportation: Calais POE**

| Rank | Top Commodities | Total Value of Trade ($ Millions) | Percent of Trade at POE (%) | Percent of Total Trade (%) |
|---|---|---|---|---|
| 1 | Fish and crustaceans, mollusks and other aquatic invertebrates | 730.3 | 30.9 | 30.4 |
| 2 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 185.8 | 7.9 | 0.4 |
| 3 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 180.5 | 7.6 | 1.5 |
| 4 | Rubber and articles thereof | 166.1 | 7.0 | 2.9 |
| 5 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 138.0 | 5.8 | 1.4 |
| 6 | Articles of iron or steel | 117.3 | 5.0 | 1.5 |
| 7 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 96.6 | 4.1 | 0.2 |
| 8 | Plastics and articles thereof | 75.4 | 3.2 | 0.5 |
| 9 | Preparations of meat, of fish, or of crustaceans, mollusks or other aquatic invertebrates | 60.8 | 2.6 | 6.0 |
| 10 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 60.2 | 2.6 | 0.3 |
| | Total Trade | 2,360.8 | 100.0 | 0.7 |

Source: USDOT, 2009.

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# APPENDIX Q

# UNITED STATES AND CANADA TRADE STATISTICS

## UNITED STATES AND CANADA TRADE STATISTICS

This appendix provides information on trade statistics for surface modes of transportation between the United States and Canada. The flow of goods, services, and people across the border contributes significantly to economic activity in border communities. Canada is the largest trading partner of the United States. In 2009, the total value of merchandise trade with Canada was approximately $429.6 billion—$204.7 billion in exports and $224.9 billion in imports. Shipments by surface modes of transportation, excluding pipelines, account for approximately 79 percent of total merchandise trade with Canada. The top exports to Canada by surface modes of transportation are automobiles and automotive parts and accessories, and other machinery, appliances, and equipment (Table Q-1). The top imports from Canada are automobiles and automotive parts and accessories, other machinery and appliances, and processed paper and pulp products (Table Q-2). On average, approximately $930 million in merchandise crosses the northern border by surface modes of transportation every day.

The automobile manufacturing industry has been significantly integrated along the northern border due to the Automotive Products Trade Agreement and later the North American Free Trade Agreement. Automobiles and auto parts account for the largest component of trade between the United States and Canada. While vehicles and parts cross the border in both directions, parts are primarily exported to Canada for assembly, and vehicles are primarily exported back the United States. Canada's motor vehicle assembly plants are among the most competitive in North America. Ontario, Canada is the largest North American automobile manufacturer, ahead of Michigan and all of Mexico (GOO, 2010).

Tables Q-1 and Q-2 summarize top U.S. exports to and imports from Canada, respectively. Tables Q-3 and Q-4 describe the top economic sectors within 100 miles north and south of the border (the "study area"). These tables provide insight into the relative dependence of the regional economies on the trade commodities described in Tables Q-1 and Q-2.

In the U.S. study area (i.e., the area within 100 miles of the border with Canada), the economic sectors with the largest annual payrolls are manufacturing ($72.5 billion); health care and social assistance ($69.8 billion); professional, scientific, technical services ($37.7 billion); and retail trade ($34.4 billion), as shown in Table Q-3. These sectors account for approximately half of all payrolls and private, non-farm jobs in the study area. Other sectors that are economically dependent on border activity account for lesser, but significant contributions to overall payrolls: wholesale trade ($26.4 billion), accommodation and food services ($14.6 billion), transportation and warehousing ($13.2 billion), and arts, entertainment, and recreation ($5.0 billion).

Table Q-3 also describes changes in payroll and employment by economic sector between 2000 and 2008. Private, non-farm jobs in the study area have declined approximately 3.3 percent since 2000. Manufacturing, the largest economic sector in the study area, has experienced a major contraction since 2000, shedding over 548,000 jobs and $34.4 billion in payrolls. Construction, management of companies and enterprises, retail trade, and wholesale trade also experienced job losses and lower payroll growth than for the United States as a whole. Meanwhile, service sectors in the study area, such as health care and social assistance, professional, scientific, and technical services, and accommodation and food services have increased payrolls over the last decade. The increasing importance of service sector jobs is consistent with job growth trends in the United States as a whole.

The U.S.-Canada border also plays a vital role in the Canadian economy. The manufacturing sector provides the greatest annual payrolls ($87.2 billion) and the most jobs within the study area in Canada (Table Q-4). The next greatest economic sectors by annual payroll are health care and social assistance ($56.2 billion); professional, scientific, technical services ($54.9 billion); and construction ($45.8 billion). These four sectors account for approximately 40 percent of total annual payrolls and 35 percent of employment in the study area.

The Canadian manufacturing sector experienced a significant decline in employment, losing 166,000 jobs between 2000 and 2006. Nonetheless, with the exception of manufacturing and agriculture, the number of jobs in the study area increased in all the other sectors between 2000 and 2006. Annual payrolls also increased in every sector by more than 50 percent on average; however, this may reflect appreciation of the Canadian dollar over the U.S. dollar more than a real increase in income.

**Table Q-1. Top U.S. Exports to Canada by Surface Modes of Transportation***

| Rank | Commodity Description | Total Value of Exports ($ Millions) | Percent of Exports (%) |
|---|---|---|---|
| 1 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 31,037 | 17.1 |
| 2 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 29,477 | 16.2 |
| 3 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 16,490 | 9.1 |
| 4 | Plastics and articles thereof | 9,014 | 5.0 |
| 5 | Special classification provisions | 5,545 | 3.0 |
| 6 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 4,842 | 2.7 |
| 7 | Optical, photographic, cinematographic, measuring, checking, precision, medical instruments | 4,812 | 2.6 |
| 8 | Articles of iron or steel | 4,640 | 2.5 |
| 9 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 4,036 | 2.2 |
| 10 | Iron and steel | 3,976 | 2.2 |
| 11 | Pharmaceutical products | 3,652 | 2.0 |
| 12 | Furniture, bedding, mattress supports, cushions and similar stuffed furnishings, lighting fittings | 3,616 | 2.0 |
| 13 | Rubber and articles thereof | 3,412 | 1.9 |
| 14 | Miscellaneous chemical products | 2,913 | 1.6 |
| 15 | Edible fruit and nuts, peel of citrus fruit or melons | 2,656 | 1.5 |
| 16 | Organic chemicals | 2,575 | 1.4 |
| 17 | Printed books, newspapers, pictures and other products of the printing industry, manuscripts | 2,530 | 1.4 |
| 18 | Toys, games and sports equipment, parts and accessories thereof | 2,468 | 1.4 |
| 19 | Aircraft, spacecraft, and parts thereof | 2,269 | 1.2 |
| 20 | Aluminum and articles thereof | 2,181 | 1.2 |
| | **Total exports (surface modes of transportation)** | **182,021** | |
| | **Total exports (all modes of transportation)** | **204,727** | |

* Statistics include total merchandise trade by surface modes of transportation, excluding pipelines. Surface modes of transportation include shipments made by rail, truck, mail, foreign trade zones, other and unknown modes of transportation.

Source: USDOT, 2009a; USDOT, 2009b.

## Table Q-2. Top U.S. Imports from Canada by Surface Modes of Transportation*

| Rank | Commodity Description | Total Value of Exports ($ Millions) | Percent of Exports (%) |
|---|---|---|---|
| 1 | Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof | 31,512 | 20.3 |
| 2 | Nuclear reactors, boilers, machinery and mechanical appliances, parts thereof | 14,210 | 9.1 |
| 3 | Paper and paperboard, articles of paper pulp, of paper or of paperboard | 7,496 | 4.8 |
| 4 | Plastics and articles thereof | 7,486 | 4.8 |
| 5 | Special classification provisions | 6,276 | 4.0 |
| 6 | Electrical machinery and equipment and parts thereof, sound recorders and reproducers | 6,086 | 3.9 |
| 7 | Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes | 5,887 | 3.8 |
| 8 | Aluminum and articles thereof | 5,277 | 3.4 |
| 9 | Wood and articles of wood, wood charcoal | 4,444 | 2.9 |
| 10 | Pharmaceutical products | 4,407 | 2.8 |
| 11 | Aircraft, spacecraft, and parts thereof | 4,350 | 2.8 |
| 12 | Temporary legislation, temporary modifications established pursuant to trade legislation | 3,855 | 2.5 |
| 13 | Articles of iron or steel | 3,060 | 2.0 |
| 14 | Furniture, bedding, mattress supports, cushions and similar stuffed furnishings, lighting fittings | 2,926 | 1.9 |
| 15 | Iron and steel | 2,919 | 1.9 |
| 16 | Fertilizers | 2,802 | 1.8 |
| 17 | Natural or cultured pearls, precious or semiprecious stones, precious metals, articles thereof | 2,592 | 1.7 |
| 18 | Rubber and articles thereof | 2,357 | 1.5 |
| 19 | Organic chemicals | 2,031 | 1.3 |
| 20 | Preparations of cereals, flour, starch or milk, bakers’ wares | 1,940 | 1.2 |
| | **Total imports (surface modes of transportation)** | **155,458** | |
| | **Total imports (all modes of transportation)** | **224,910** | |

* Statistics include total merchandise trade by surface modes of transportation, excluding pipelines. Surface modes of transportation include shipments made by rail, truck, mail, foreign trade zones, other and unknown modes of transportation.

Source: USDOT, 2009a; USDOT, 2009b.

### Table Q-3. Employment and Annual Payrolls by Economic Sector in the United States, Ranked by Annual Payroll*

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (2000 to 2008) (%) | Change in Annual Payroll (2000 to 2008) (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Manufacturing | Study area | 1,475,612 | 72,494.6 | 13.6 | 16.7 | -27.1 | -32.2 |
| | | Total U.S. | 13,096,159 | 628,012.9 | 10.8 | 12.1 | -20.5 | -21.1 |
| 2 | Health care and social assistance | Study area | 1,777,383 | 69,836.4 | 16.3 | 16.1 | 17.0 | 26.2 |
| | | Total U.S. | 17,217,256 | 713,207.9 | 14.2 | 13.8 | 22.0 | 33.7 |
| 3 | Professional, scientific, and technical services | Study area | 614,625 | 37,658.9 | 5.6 | 8.7 | 12.5 | 23.1 |
| | | Total U.S. | 8,032,847 | 544,010.3 | 6.6 | 10.5 | 17.8 | 21.5 |
| 4 | Retail trade | Study area | 1,489,397 | 34,402.5 | 13.7 | 7.9 | -3.4 | -6.8 |
| | | Total U.S. | 15,614,757 | 372,674.8 | 12.9 | 7.2 | 5.2 | -0.4 |
| 5 | Finance and insurance | Study area | 498,755 | 29,241.3 | 4.6 | 6.7 | 3.8 | 14.0 |
| | | Total U.S. | 6,511,616 | 527,087.4 | 5.4 | 10.2 | 9.2 | 22.9 |
| 6 | Construction | Study area | 530,039 | 27,019.9 | 4.9 | 6.2 | -8.3 | -3.4 |
| | | Total U.S. | 7,043,631 | 336,136.5 | 5.8 | 6.5 | 7.2 | 13.3 |
| 7 | Wholesale trade | Study area | 501,288 | 26,401.4 | 4.6 | 6.1 | -7.3 | -5.6 |
| | | Total U.S. | 6,165,204 | 356,298.3 | 5.1 | 6.9 | 0.9 | 6.7 |
| 8 | Management of companies and enterprises | Study area | 245,125 | 22,248.3 | 2.3 | 5.1 | -18.9 | -21.0 |
| | | Total U.S. | 2,887,407 | 275,772.3 | 2.4 | 5.3 | 0.5 | 5.5 |
| 9 | Information | Study area | 292,342 | 21,262.2 | 2.7 | 4.9 | -1.9 | -24.7 |
| | | Total U.S. | 3,434,234 | 235,783.2 | 2.8 | 4.6 | -3.1 | -8.9 |
| 10 | Administrative, waste management, and remediation services | Study area | 672,344 | 21,148.7 | 6.2 | 4.9 | -6.0 | 6.6 |
| | | Total U.S. | 10,224,557 | 316,811.5 | 8.5 | 6.1 | 11.9 | 21.8 |
| 11 | Accommodation and food | Study area | 1,050,606 | 14,648.0 | 9.7 | 3.4 | 10.9 | 11.9 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | services | Total U.S. | 11,926,329 | 184,908.6 | 9.9 | 3.6 | 20.7 | 19.1 |
| 12 | Transportation and warehousing | Study area | 333,416 | 13,197.9 | 3.1 | 3.0 | 9.8 | 4.2 |
| | | Total U.S. | 4,438,903 | 177,780.0 | 3.7 | 3.4 | 17.1 | 14.5 |
| 13 | Other services (except public administration) | Study area | 480,917 | 11,419.0 | 4.4 | 2.6 | -6.4 | -6.6 |
| | | Total U.S. | 5,452,603 | 144,443.9 | 4.5 | 2.8 | 3.0 | 6.3 |
| 14 | Real estate and rental and leasing | Study area | 167,710 | 5,801.5 | 1.5 | 1.3 | 3.6 | 11.5 |
| | | Total U.S. | 2,196,314 | 89,645.7 | 1.8 | 1.7 | 13.1 | 22.4 |
| 15 | Educational services | Study area | 215,814 | 5,714.8 | 2.0 | 1.3 | -3.8 | -5.1 |
| | | Total U.S. | 3,141,297 | 102,699.7 | 2.6 | 2.0 | 24.0 | 34.1 |
| 16 | Arts, entertainment, and recreation | Study area | 177,215 | 5,000.9 | 1.6 | 1.2 | 10.7 | 11.0 |
| | | Total U.S. | 2,069,346 | 62,914.9 | 1.7 | 1.2 | 18.8 | 17.8 |
| 17 | Utilities | Study area | 16,478 | 1,403.2 | 0.2 | 0.3 | -47.8 | -40.6 |
| | | Total U.S. | 639,403 | 55,449.7 | 0.5 | 1.1 | -2.4 | 10.3 |
| 18 | Mining, quarrying, and oil and gas extraction | Study area | 18,171 | 1,236.0 | 0.2 | 0.3 | 27.8 | 70.8 |
| | | Total U.S. | 629,271 | 47,971.4 | 0.5 | 0.9 | 38.0 | 75.6 |
| 19 | Hunting, fishing, forestry, and support activities for agriculture | Study area | 17,546 | 787.5 | 0.2 | 0.2 | -21.4 | -4.3 |
| | | Total U.S. | 167,039 | 5,656.6 | 0.1 | 0.1 | -9.0 | -2.3 |
| 20 | Industries not classified | Study area | 762 | 20.3 | 0.0 | 0.0 | -91.5 | -93.1 |
| | | Total U.S. | 15,378 | 288.4 | 0.0 | 0.0 | -89.3 | -94.1 |
| N/A | Agricultural production | Study area | 295,846 | 2,018.6 | | | | |
| | | Total U.S. | 2,636,509 | 22,560.8 | | | | |

* The study area includes counties that overlap the area within 100 south of the northern border. Data obtained from County Business Patterns exclude self-employed persons, employees of private households, railroad employees, agricultural production workers, and most government employees. Employment data for agricultural production obtained from the U.S. Department of Agriculture are not directly comparable—the sample years and populations are different—and therefore are not included in the contribution totals. Percentages do not add up to 100 because data at the county level are sometimes withheld by the Census to avoid disclosing data for individual companies (in which case data are included in the higher level totals) or because the estimate did not meet publication standards.

Source: Source: USCB, 2000; USCB, 2008; USDA, 2007.

## Table Q-4. Employment and Annual Payrolls by Economic Sector in Canada, Ranked by Annual Payroll*

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (2000 to 2006) (%) | Change in Annual Payroll (2000 to 2006) (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Manufacturing | Study area | 1,975,575 | 87,228.8 | 12.0 | 14.5 | -7.8 | 33.7 |
| | | Total Canada | 2,005,980 | 88,585.5 | 11.7 | 14.1 | -7.7 | 34.5 |
| 2 | Health care and social assistance | Study area | 1,673,770 | 56,173.0 | 10.2 | 9.3 | 13.8 | 42.2 |
| | | Total Canada | 1,716,255 | 57,618.2 | 10.0 | 9.2 | 13.6 | 42.5 |
| 3 | Professional, scientific, and technical services | Study area | 1,108,905 | 54,946.4 | 6.7 | 9.1 | 14.3 | 52.0 |
| | | Total Canada | 1,122,445 | 55,681.2 | 6.5 | 8.9 | 14.3 | 52.6 |
| 4 | Construction | Study area | 1,043,585 | 45,822.4 | 6.3 | 7.6 | 22.0 | 99.2 |
| | | Total Canada | 1,069,095 | 46,977.2 | 6.2 | 7.5 | 21.6 | 100.3 |
| 5 | Educational services | Study area | 1,124,395 | 44,478.0 | 6.8 | 7.4 | 12.9 | 57.7 |
| | | Total Canada | 1,150,535 | 45,443.2 | 6.7 | 7.2 | 12.7 | 57.4 |
| 6 | Public administration | Study area | 938,935 | 43,586.5 | 5.7 | 7.2 | 8.4 | 54.2 |
| | | Total Canada | 978,615 | 45,455.7 | 5.7 | 7.2 | 8.2 | 54.9 |
| 7 | Retail trade | Study area | 1,872,925 | 41,092.8 | 11.4 | 6.8 | 9.4 | 42.6 |
| | | Total Canada | 1,917,170 | 42,083.5 | 11.2 | 6.7 | 9.2 | 43.2 |
| 8 | Transportation and warehousing | Study area | 802,230 | 32,696.0 | 4.9 | 5.4 | 5.9 | 50.8 |
| | | Total Canada | 820,195 | 33,414.6 | 4.8 | 5.3 | 5.9 | 51.3 |
| 9 | Wholesale trade | Study area | 730,265 | 32,263.1 | 4.4 | 5.3 | 8.0 | 48.3 |
| | | Total Canada | 739,305 | 32,672.1 | 4.3 | 5.2 | 7.7 | 48.3 |
| 10 | Finance and insurance | Study area | 681,700 | 29,804.2 | 4.1 | 4.9 | 8.4 | 31.6 |
| | | Total Canada | 689,210 | 32,001.9 | 4.0 | 5.1 | 8.4 | 32.7 |

| Rank | Sector | | Number of Paid Employees | Annual Payroll ($ Millions) | Contribution to Employment (%) | Contribution to Income (%) | Change in Employment (2000 to 2006) (%) | Change in Annual Payroll (2000 to 2006) (%) |
|---|---|---|---|---|---|---|---|---|
| 11 | Other services (except public administration) | Study area | 802,405 | 24,353.2 | 4.9 | 4.0 | 10.0 | 77.0 |
| | | Total Canada | 819,880 | 24,900.9 | 4.8 | 4.0 | 9.6 | 77.7 |
| 12 | Administrative, waste management, and remediation services | Study area | 708,115 | 20,736.1 | 4.3 | 3.4 | 18.9 | 95.7 |
| | | Total Canada | 722,695 | 21,190.5 | 4.2 | 3.4 | 19.3 | 97.5 |
| 13 | Information | Study area | 410,040 | 19,179.9 | 2.5 | 3.2 | 0.1 | 42.8 |
| | | Total Canada | 417,320 | 19,464.5 | 2.4 | 3.1 | 0.0 | 43.0 |
| 14 | Agriculture, forestry, fishing and hunting | Study area | 500,020 | 16,364.8 | 3.0 | 2.7 | -7.7 | 136.9 |
| | | Total Canada | 523,650 | 23,102.0 | 3.1 | 3.7 | -7.8 | 138.3 |
| 15 | Accommodation and food services | Study area | 1,101,280 | 16,005.7 | 6.7 | 2.7 | 7.7 | 37.5 |
| | | Total Canada | 1,126,695 | 16,455.7 | 6.6 | 2.6 | 7.7 | 38.7 |
| 16 | Mining, quarrying, and oil and gas extraction | Study area | 228,060 | 12,862.3 | 1.4 | 2.1 | 40.2 | 101.6 |
| | | Total Canada | 238,810 | 15,463.2 | 1.4 | 2.5 | 40.5 | 103.1 |
| 17 | Real estate and rental and leasing | Study area | 298,555 | 9,748.7 | 1.8 | 1.6 | 16.9 | 42.6 |
| | | Total Canada | 303,510 | 10,529.9 | 1.8 | 1.7 | 17.0 | 44.4 |
| 18 | Utilities | Study area | 129,640 | 7,461.7 | 0.8 | 1.2 | 12.1 | 71.4 |
| | | Total Canada | 132,950 | 8,764.8 | 0.8 | 1.4 | 11.9 | 70.2 |
| 19 | Arts, entertainment, and recreation | Study area | 339,730 | 7,443.1 | 2.1 | 1.2 | 14.1 | 56.0 |
| | | Total Canada | 346,315 | 7,542.7 | 2.0 | 1.2 | 14.0 | 56.2 |
| 20 | Management of companies and enterprises | Study area | 20,180 | 1,041.2 | 0.1 | 0.2 | 33.7 | 36.3 |
| | | Total Canada | 20,530 | 1,052.4 | 0.1 | 0.2 | 34.0 | 35.9 |

* The study area includes provinces that overlap the area within 100 north of the border. Annual data are not available at the Census Division level.

Source: StatCan, 2001a; StatCan, 2001b; StatCan, 2006; StatCan, 2010.

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# APPENDIX R

# INTENTIONAL DESTRUCTIVE ACTS

**THE PURPOSE OF THIS APPENDIX IS TO EVALUATE THE HUMAN HEALTH IMPACTS OF INTENTIONAL DESTRUCTIVE ACTS (IDAS) ALONG THE** northern border. The term “IDA” is used to include intentional malevolent acts, intentional malicious acts, and acts of terrorism.

Introduction

In accordance with recent U.S. Department of Energy (DOE) National Environmental Policy Act (NEPA) guidance (DOE 2006), this appendix was developed to explicitly consider the potential impacts of intentional destructive acts (IDAs) along the U.S.-Canada border. A wide range of IDA scenarios — from the release of radiological or toxic chemical materials to the use of weaponry — can be postulated for the northern border. Each scenario involves an action by terrorists that affects buildings, roads, human health and safety, and wildlife along the northern border.

The amount of radiological or chemical material available for dispersal, the means of dispersing it to the environment, and the type of weaponry control the human-health impacts of an IDA. Other factors that affect the magnitude of these impacts include population density, distance to the population, and meteorology.

As with all American infrastructure, border-crossing stations and other locations along the border are potential targets of terrorist attacks or sabotage. If a fire, explosion, or chemical release occurs from a terrorist attack, such events could cause injury or death of workers. The risk to workers or the public from accidental or intentional actions by outside parties at border-crossing stations is low because public access is controlled by a fence and sites are monitored. It is “reasonably foreseeable,” however, that terrorists will procure or assemble a weapon of mass destruction and attempt to bring it into the United States for use against a high-profile target.

## REASONABLY FORESEEABLE INTENTIONAL DESTRUCTIVE ACTS

Reasonably foreseeable IDAs include the following:

### FIRES CAUSED BY TERRORISTS OR VEHICULAR ACCIDENTS DURING INTERDICTIONS

Potential targets include ports of entry (POEs) and traffic checkpoints with possible damage to existing infrastructure, escaped fires leading to loss of vegetation, water, and air quality degradation, and injury to or fatality of wildlife. Effects on human health and safety due to fires caused by terrorists or vehicular accidents during interdictions are:

- Loss of human life; and,
- Personal injury or illness (respiratory illness, burns, etc.).

**BOMB EXPLOSIONS**

Potential targets include POEs, large population centers, urban areas, large public venues, highways, etc. Potential results include damage to existing infrastructure, loss of vegetation, water and air quality degradation, injury to or fatality of wildlife, traffic congestion or disruption, and socioeconomic impacts. Effects on human health and safety from bomb explosions are:

- Loss of human life;
- Personal injury or illness (loss of hearing, burns, etc.); and,
- Falling debris causing injury or death.

**RELEASE OF AIRBORNE PATHOGENS**

Potential targets include urban areas, large public venues, and centers of government. Potential results include water and air quality contamination along with the illness and fatality of wildlife. Effects on human health and safety from the release of airborne pathogens are:

- Loss of human life; and,
- Personal illness.

**USE OF WEAPONRY (SHOOTINGS, AIRCRAFT CRASH, ETC.)**

Potential targets include POEs and Border Patrol stations, urban areas, large public venues, and centers of government. Potential results include damage to existing infrastructure, water and air quality degradation, injury or fatality of wildlife, traffic congestion or disruption, socioeconomic impacts. Effects on human health and safety from use of weaponry are:

- Loss of human life; and,
- Personal injury.

**CONTAMINATION OF WATER SUPPLY**

Potential targets include large population centers and urban areas. Potential results are water quality contamination, vegetation loss, illness and fatality of wildlife, and public utility disruption. Effects on human health and safety from contamination of the water supply are:

- Loss of human life; and,
- Personal injury.

**INTENTIONAL DESTRUCTIVE ACTS EMERGENCY PLANNING, RESPONSE, AND SECURITY**

In the aftermath of the tragic events of September 11, 2001, U.S. Customs and Border Protection (CBP) continues to consider measures that minimize the risk and consequences of a terrorist attack. All CBP facilities, existing and proposed, offer unique features from a safeguards perspective: restricted access afforded by Federal land ownership, restricted airspace above the site, and access to a highly effective rapid-response security force. CBP will continue to identify safeguards, security measures, and design features that will further protect the population and CBP facilities from terrorist attack and other forms of sabotage.

CBP's existing preventive and mitigative measures (or procedural controls) against accidents or IDAs include:

- Use of manpower: intelligence gathering (CBP's own and partnerships); ground, air, and marine patrols; interdiction of cross-border violators and other suspects; canine teams; vehicle inspections; Forward Operating Bases; set-up of tactical checkpoints; and weapons and interdiction training for agents.
- Use of technology: personal radiation detectors and radiation isotope identification devices; remote video surveillance system and mobile surveillance system; underground sensors; Vehicle Cargo Inspection System (VACIS®); camera and radio systems; defensive weaponry for agents and guards; Integrated Automated Fingerprint Identification System; Advanced Passenger Information System; and chemical agent and radiological sensors.
- Use of infrastructure: fencing/barriers; and border-crossing stations.
- Other: proper disposal of confiscated dangerous materials; agricultural inspections; coordination with emergency responders (firefighters, EMS, law enforcement, construction workers, federal and state agencies, etc.); proper use of all methods and equipment; completion of all required training; maintenance of all technology and weaponry; and personal protective equipment.

A site-specific emergency response plan would be developed to address any local incidents. The plan would be coordinated with the local emergency response agencies and include training for first responders. Response measures to minimize risks and quickly contain any accidental release would also greatly reduce potential economic losses.

# APPENDIX S

# TRANSPORTATION SUPPORTING DOCUMENTATION

## S1: DEPARTMENT OF TRANSPORTATION AND HIGHWAY DESIGN GUIDELINES FOR LPOES

## S2: PORT OF ENTRY LEVEL OF SERVICE BY TRANSPORTATION MODE

**Table S-1. Department of Transportation (DOT) and Highway Design Guidelines for Ports Of Entry (POE)**

| State | Transportation Office | Roadway Specifications |
|---|---|---|
| Idaho | Idaho DOT<br>http://itd.idaho.gov | Idaho Roadway Manuals<br>http://itd.idaho.gov/manuals/ManualsOnline.htm |
| Maine | Maine DOT<br>http://www.state.me.us/mdot/ | Maine Roadway Manuals<br>http://www.maine.gov/mdot/cpo/designbuild/ |
| Michigan | Michigan DOT<br>http://www.michigan.gov/mdot/ | Michigan Roadway Specifications<br>http://mdotwas1.mdot.state.mi.us/public/specbook/ |
| Minnesota | Minnesota DOT<br>http://www.dot.state.mn.us/ | Minnesota Roadway Specifications<br>http://www.dot.state.mn.us/pre-letting/spec/2005/2021-2360.pdf |
| Montana | Montana DOT<br>http://www.mdt.mt.gov/ | Montana Roadway Guidelines<br>http://www.mdt.mt.gov/other/const/external/design-build_cr_va/db_guidelines.pdf |
| New Hampshire | New Hampshire DOT<br>http://www.nh.gov/dot/ | New Hampshire Highway Design Standards<br>http://www.nh.gov/dot/org/projectdevelopment/highwaydesign/standardplans/ |
| New York | New York State DOT<br>https://www.nysdot.gov/index | New York State Standard Specifications<br>https://www.nysdot.gov/main/businesscenter/engineering/specifications |
| North Dakota | North Dakota DOT<br>http://www.dot.nd.gov/ | North Dakota Highway Regulations<br>http://ops.fhwa.dot.gov/freight/publications/size_regs_final_rpt/ |
| Ohio | Ohio DOT<br>http://www.dot.state.oh.us/Pages/Home.aspx | Ohio Roadway Design<br>http://www.dot.state.oh.us/Pages/Home.aspx |
| Pennsylvania | Pennsylvania DOT<br>http://www.dot.state.pa.us/ | Pennsylvania Roadway Design<br>http://www.dot.state.pa.us/Internet/Bureaus/pdDesign.nsf/DesignHomepage |
| Vermont | Vermont Agency of Transportation<br>http://www.aot.state.vt.us/ | Vermont Highway Standards<br>http://www.aot.state.vt.us/caddhelp/DownLoad/Standards/VAOT_IFM_2007.pdf |
| Washington | Washington State DOT<br>http://www.wsdot.wa.gov/ | Washington Roadway Design<br>http://www.wsdot.wa.gov/design/policy/ |
| Wisconsin | Wisconsin DOT<br>http://www.dot.state.wi.us/ | Wisconsin Roadway Design<br>http://www.dot.wisconsin.gov/business/engrserv/roadway-design-files.htm |

## Table S-2. POE Level of Service by Transportation Mode

| Port | Trucks | Trains | Buses | Personal Vehicles | Pedestrians |
|---|---|---|---|---|---|
| ID: Eastport | 47,237 | 967 | 122 | 89,857 | 150 |
| ID: Porthill | 11,153 | | 82 | 154,261 | 287 |
| ME: Bar Harbor | | | 15 | 3,302 | |
| ME: Bridgewater | 12,620 | | 7 | 55,912 | |
| ME: Calais | 72,506 | 37 | 740 | 890,247 | 16,665 |
| ME: Eastport | 2,308 | | 95 | 150,307 | 285 |
| ME: Fort Fairfield | 16,050 | | 9 | 141,495 | |
| ME: Fort Kent | 9,601 | | 57 | 186,552 | 4,088 |
| ME: Houlton | 82,678 | | 238 | 295,055 | 216 |
| ME: Jackman | 96,860 | 162 | 128 | 125,365 | 488 |
| ME: Limestone | 2,993 | | 1 | 36,371 | |
| ME: Madawaska | 22,464 | | 91 | 570,182 | 1,576 |
| ME: Portland | | | 26 | 7,199 | |
| ME: Van Buren | 14,597 | 295 | 6 | 238,319 | 664 |
| ME: Vanceboro | 2,994 | 249 | 2 | 47,003 | 587 |
| MI: Detroit | 1,197,967 | 2,074 | 29,777 | 4,082,030 | 16,529 |
| MI: Port Huron | 625,642 | 3,064 | 2,552 | 1,570,273 | |
| MI: Sault Ste. Marie | 44,097 | 352 | 4,514 | 787,692 | |
| MN: Baudette | 7,555 | 993 | 63 | 165,224 | 381 |
| MN: Grand Portage | 14,098 | | 1,880 | 222,708 | 26 |
| MN: International Falls | 21,735 | 3,286 | 219 | 453,695 | 15,247 |
| MN: Lancaster | 5,751 | | 57 | 42,461 | |
| MN: Pinecreek | 185 | | | 5,134 | 93 |
| MN: Roseau | 5,974 | | 4 | 36,708 | |
| MN: Warroad | 12,154 | 2,277 | 438 | 110,797 | 41 |
| MT: Del Bonita | 798 | | | 17,532 | |
| MT: Morgan | 584 | | 5 | 6,393 | 2,792 |
| MT: Opheim | 356 | | 7 | 3,435 | |
| MT: Piegan | 946 | | 202 | 102,721 | |
| MT: Raymond | 10,863 | | 32 | 21,562 | 1 |
| MT: Roosville | 9,041 | | 93 | 109,723 | 399 |
| MT: Scobey | 384 | | 1 | 4,318 | |

| Port | Trucks | Trains | Buses | Personal Vehicles | Pedestrians |
|---|---|---|---|---|---|
| MT: Sweetgrass | 118,678 | 344 | 275 | 262,615 | 1,855 |
| MT: Turner | 876 | | 12 | 6,529 | |
| MT: Whitetail | 61 | | | 1,194 | |
| MT: Whitlash | 114 | | | 628 | 1 |
| MT: Wildhorse | 2,206 | | 3 | 15,457 | |
| MT: Willow Creek | 4 | | | 3,804 | |
| ND: Ambrose | 213 | | 1 | 1,399 | |
| ND: Antler | 1,308 | | | 9,996 | |
| ND: Carbury | 559 | | 8 | 11,320 | |
| ND: Dunseith | 23,765 | | 131 | 56,850 | |
| ND: Fortuna | 2,035 | | 42 | 10,521 | |
| ND: Hannah | 35 | | 1 | 2,020 | |
| ND: Hansboro | 1,487 | | 181 | 7,865 | |
| ND: Maida | 1,350 | | 3 | 13,022 | |
| ND: Neche | 13,454 | | 2 | 44,223 | 55 |
| ND: Noonan | 5,719 | | 7 | 32,072 | 4 |
| ND: Northgate | 18,950 | | 3 | 23,198 | |
| ND: Pembina | 189,393 | 1,003 | 1,280 | 265,210 | |
| ND: Portal | 72,546 | 1,884 | 212 | 80,758 | 3,486 |
| ND: Sarles | 1,263 | | 61 | 4,177 | |
| ND: Sherwood | 7,540 | | 2 | 17,724 | |
| ND: St. John | 1,551 | | 6 | 14,423 | |
| ND: Walhalla | 14,179 | | 7 | 34,236 | |
| ND: Westhope | 7,729 | | | 9,736 | |
| NY: Alexandria Bay/Cape Vincent | 177,822 | | 1,791 | 646,851 | |
| NY: Buffalo-Niagara Falls | 846,114 | 2,312 | 28,534 | 5,291,623 | 244,697 |
| NY: Champlain-Rouses Pt. | 294,970 | 1,294 | 8,565 | 1,040,154 | 1,826 |
| NY: Massena | 26,329 | | 1,336 | 809,696 | 164 |
| NY: Ogdensburg | 38,652 | | 157 | 265,008 | 79 |
| NY: Trout River/Fort Covington/Chateaugay | 14,314 | 436 | 3 | 191,545 | |
| VT: Beecher Falls | 13,779 | | 11 | 67,181 | 134 |
| VT: Derby Line | 95,635 | | 1,743 | 552,942 | 242 |
| VT: Highgate Springs | 87,857 | 345 | 1,803 | 477,134 | |

| Port | Trucks | Trains | Buses | Personal Vehicles | Pedestrians |
|---|---|---|---|---|---|
| VT: Norton | 11,788 | 243 | 14 | 56,773 | 298 |
| VT: Richford | 7,404 | 179 | 6 | 95,909 | 2,958 |
| WA: Anacortes | 363 | | 12 | 27,137 | 14,412 |
| WA: Blaine | 310,075 | 1,349 | 15,159 | 2,842,631 | |
| WA: Boundary | 84 | 250 | 21 | 65,218 | 156 |
| WA: Danville | 412 | | | 50,848 | 528 |
| WA: Ferry | 19 | | 14 | 8,972 | 181 |
| WA: Friday Harbor | | | 1 | 2,356 | 3,557 |
| WA: Frontier | 18,661 | | 98 | 37,798 | 112 |
| WA: Laurier | 2,240 | 83 | 35 | 46,191 | 86 |
| WA: Lynden | 47,127 | | 9 | 546,850 | 2,154 |
| WA: Metaline Falls | 4,506 | | 69 | 24,109 | 134 |
| WA: Nighthawk | 1 | | | 10,110 | 36 |
| WA: Oroville | 28,662 | | 233 | 328,342 | 726 |
| WA: Point Roberts | 17,500 | | 815 | 722,725 | 11,648 |
| WA: Port Angeles | 1,393 | | 83 | 57,232 | |
| WA: Sumas | 128,236 | 238 | 1,128 | 672,262 | 27,022 |
| Total | 5,020,633 | 24,034 | 116,355 | 26,698,239 | 379,902 |

Source: BTS, 2009; 2010.

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