

# Building Resilience to Climate Change Through Off-Base Natural Infrastructure Solutions



A REPI guide for installations and partners



**REPI**

READINESS AND ENVIRONMENTAL  
PROTECTION INTEGRATION PROGRAM

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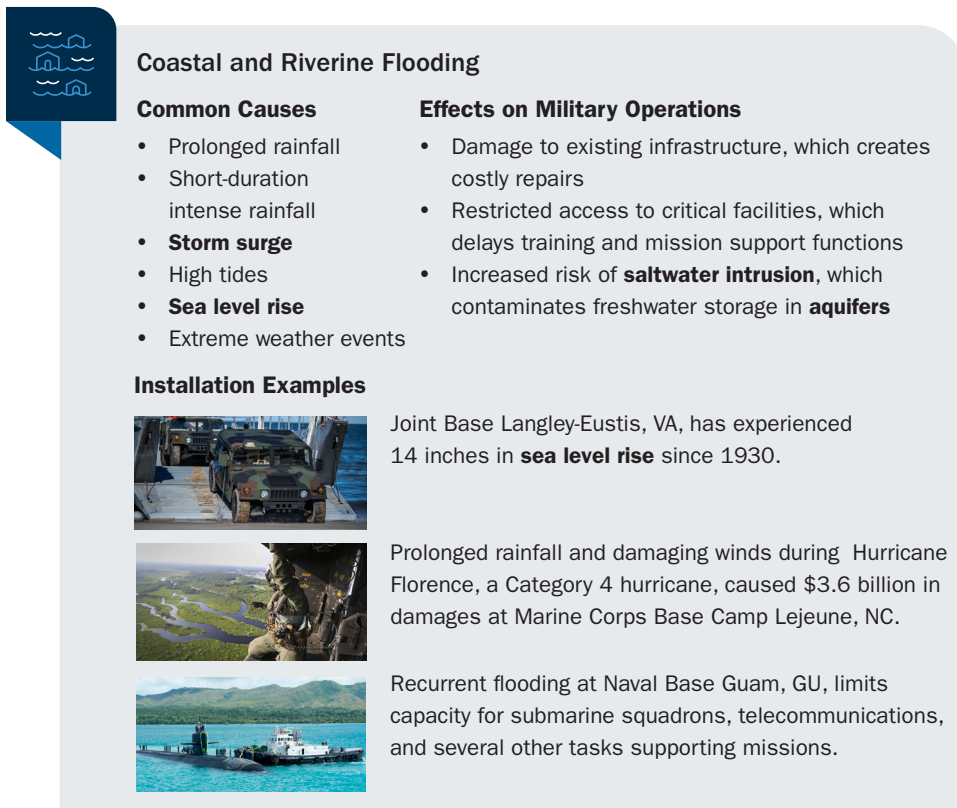


# Climate Change as a National Security Threat

**Climate change** is a national security threat that has tangible impacts on military readiness. In 2019, the Department of Defense (DoD) examined climate vulnerabilities at numerous military **installations** across the country.<sup>1</sup> Of the 79 sites surveyed, over two-thirds are vulnerable to future recurrent flooding and more than one-half are vulnerable to future droughts and wildfires. Extreme weather events like these cause damage to defense facilities that undermine their operational capacity. For example, in 2018, Hurricane Michael devastated Tyndall Air Force Base—compromising training grounds, impairing valuable equipment, and creating hazardous conditions for personnel. This event prevented military units from conducting critical training activities and led to almost \$5 billion in repairs, diverting resources away from other mission-critical efforts.<sup>2</sup>

Numerous **climate change** impacts threaten military **installations**. The most common are outlined in Figure 1, below.

**Figure 1: Climate Change** Impacts That Threaten Military Activities



Definitions of **bolded** terms may be found in the glossary in Appendix A.

1. Report on Effects of a Changing Climate to the Department of Defense, Department of Defense, 10 January 2019.

2. Air Force Stops All New Tyndall Rebuilding Efforts Starting May 1, U.S. Air Force, 30 April 2018.

**Figure 1: Climate Change Impacts That Threaten Military Activities, continued**



### Drought

#### Common Causes

- Little or no rainfall
- Warmer temperatures
- Depleted soil moisture levels

#### Effects on Military Operations

- Decreased water supplies, which creates health and safety risks
- Increased temperatures, which contributes to heat-related illnesses
- Increased land management requirements, which requires additional funding and resources
- Increased potential for wildfires, which threatens facilities and community infrastructure

#### Installation Examples



In 2011, during a severe drought, wildfires burned over 15 acres of forest and threatened homes on Eglin Air Force Base, FL. The region was 15 inches below normal rainfall for the year.



In 2014, Altus Air Force Base, OK, experienced a stage-three drought leaving the City's water source, the Tom Steed Reservoir, at 27.2 percent capacity. The low water levels increased the concentration of organic matter and chemicals in the reservoir, causing the water quality to fall below U.S. Environmental Protection Agency standards.



### Desertification

#### Common Causes

- Land degradation
- Overgrazing
- Urbanization
- **Flash droughts**

#### Effects on Military Operations

- Increased soil fragility, which limits future testing exercises
- Increased runoff from precipitation events, which affects the suitability of the landscape for off-road use
- Increased dust levels generated from land use activities, which can cause negative health impacts

#### Installation Example



About 27 percent of White Sands Missile Range, NM, is covered by grasslands. **Desertification** from past grazing practices and changes in precipitation patterns has led to an increase in the number of shrubs and cacti, which are highly vulnerable to wildfire spread.

**Figure 1: Climate Change Impacts That Threaten Military Activities, continued**



### Wildfires

#### Common Causes

- Human-caused fires
- Warmer temperatures
- Lightning
- Unmanaged forests

#### Effects on Military Operations

- Damage to electrical power lines, which increases maintenance costs
- Increased threat to public and personnel safety, which can impact mission execution
- Increased flash flood risk, which impacts outdoor training events

#### Installation Examples



Vandenberg Air Force Base, CA, was affected by wildfires in both 2016 and 2017 that burned over 10,000 acres.



In 2012, the Waldo Canyon Fire consumed over 18,000 acres, threatening the U.S. Air Force Academy, CO. The damage cost over \$16 million and several Air Force resources were mobilized including Air National Guard personnel, ground vehicles, and C-130s.



In 2020, more than 200 U.S. Army North Soldiers from Joint Base Lewis-McChord, WA, were deployed to California to support wildland fire ground response operations in the August Complex. The August Complex of fires began as 37 lightning-ignited fires and burned more than 1 million acres.



### Thawing Permafrost

#### Common Causes

- Warmer temperatures
- Infrastructure placement
- Climate variability

#### Effects on Military Operations

- Decreased structural stability, which threatens existing infrastructure
- Increased ground saturation and standing water areas, rendering training lands inoperable

#### Installation Example



Frozen soil beneath Eielson Air Force Base, AK, is thawing at a rate of at least 0.81 feet/year. This thawing can cause buildings to shift and settle unevenly, decreasing their structural integrity. It also causes previously solid training lands to liquify, creating hazardous conditions for training.

## How REPI Helps DoD Build Resilience to Climate Change

As stated in the 2021 Interim National Security Guidance, reducing the impacts of **climate change** and extreme weather events on military readiness is a top priority for DoD.<sup>3</sup> To help accomplish this, DoD uses the resources, expertise, and legal authorities of the Readiness and Environmental Protection Integration (REPI) program.

### *What Is the REPI Program?*

DoD established the REPI program in 2005 to combat **encroachment**, which it defines as pressures that adversely affect the military's use of its training and testing lands. Traditionally, the program has focused on **encroachment** risks stemming from land use conversion around military bases—namely, incompatible development and habitat loss. Incompatible development around defense facilities causes light pollution, spectrum interference, airspace obstructions, and other challenges that may disrupt testing, training, and operations on base. Habitat loss, meanwhile, causes imperiled species to migrate onto DoD land, potentially triggering environmental restrictions on military activities.

Using authority from Congress, the REPI program funds cost-sharing partnerships between the Military Services and state agencies, local governments, or private organizations that identify and address **encroachment** risks. These partnerships acquire real property interests, typically in the form of conservation **easements**, from willing landowners and, when applicable, conduct natural resource restoration work on the land. As REPI projects mature, they form areas of protected or restored land in the vicinity of military **installations** that reduce the likelihood of land-use conflicts between the base and surrounding communities.

### *How Can the REPI Program Enhance Climate Resilience?*

**Climate change** impacts, like incompatible development and habitat loss, have evolved into a significant **encroachment** threat for DoD.<sup>4</sup> The military's access to its land, air, and sea-based training facilities is increasingly at risk due to climate-related issues. Failing to adapt to these conditions will limit DoD's ability to respond effectively to domestic and foreign crises. Recognizing this vulnerability, Congress, at DoD's request, expanded REPI's primary legal authority, 10 U.S.C. § 2684a, in 2019 to include **climate change adaptation** as a core focus of the REPI program.

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3. *Interim National Security Strategic Guidance*, White House, 3 March 2021.

4. *Report on Effects of a Changing Climate to the Department of Defense*, Department of Defense, 10 January 2019.



The statutory amendment granted under 10 U.S.C. § 2684a gives the REPI program authority to fund projects that maintain or improve “**military installation resilience**”—increasing the ability of an **installation** to withstand extreme weather events or changes in environmental conditions. Because resilience projects take different forms in practice, the REPI program has specified that it will exclusively focus on enhancing or developing off-base natural infrastructure.



To celebrate Earth Day, Deputy Defense Secretary Kathleen Hicks, REPI program Director Kristin Thomasgard, Naval Air Station Patuxent River Commanding Officer CAPT John Brabazon, and a selection of conservation partners visited the Middle Chesapeake Sentinel Landscape. Deputy Defense Secretary Kathleen Hicks acknowledged that *“REPI funds can also be leveraged by our partners to satisfy any matching or cost-sharing requirement of any conservation or resilience program of any Federal agency. This presents an incredible opportunity for DoD to collaborate with our inter-agency partners, and enhance state, local, and non-governmental initiatives that complement REPI’s climate resilience efforts.”*

## **What Are Natural Infrastructure Solutions?**

Natural infrastructure is an evolving term that lacks a universal definition and may also be referred to as green infrastructure or nature-based solutions. Within the context of addressing **climate change** effects, it refers to the use of naturally occurring features or landscapes that forestall the adverse effects of **climate change**—for example, tidal marshes that slow the rate of erosion or healthy forests that reduce the risk of wildfires. Other examples of natural infrastructure solutions can be seen in Figure 2, below. Restoring or enhancing these systems is among the most cost-effective, sustainable ways to make military **installations** more resilient to **climate change**.<sup>5,6,7</sup> The reason for this

**Military installation resilience** is defined as the capability of a military installation to avoid, prepare for, minimize the effect of, adapt to, and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions, that do, or have the potential to, adversely affect the military installation or essential transportation, logistical, or other necessary resources outside of the military installation that are necessary in order to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions.

5. *Army Climate Resilience Handbook*, U.S. Army Corps of Engineers, August 2020.

6. *DoD Installation Exposure to Climate Change at Home and Abroad*, Department of Defense, 19 April 2021.

7. *NAVFAC Installation Adaptation & Resilience Climate Change Planning*, Department of Defense, January 2017.

is twofold. First, natural infrastructure solutions create an initial line-of-defense for DoD's built infrastructure by amplifying existing ecological benefits, meaning they often cost less than "grey" infrastructure alternatives. And second, natural infrastructure solutions fuel economic productivity and enhance well-being for local communities, many of which have strong ties to the military's presence.<sup>8</sup>

**Figure 2:** Examples of Natural Infrastructure Solutions<sup>9</sup>



**Solution: Constructing Living Shorelines**

**Climate Impact: Coastal and Riverine Flooding**

A **living shoreline** is a stabilized shoreline made of plants or organic materials, such as oyster shells. **Living shorelines** reduce the risk of flooding from **storm surge** and erosion by absorbing **wave energy** and acting as a natural buffer to upland areas. They also store carbon, improve water quality, and provide habitat for aquatic species.



**Solution: Restoring Wetlands**

**Climate Impact: Coastal and Riverine Flooding**

**Wetland** restoration reestablishes a **wetland** that has been destroyed or degraded. Restored **wetlands** control erosion and flooding by moderating groundwater levels and storing floodwater, thereby reducing flood risk in coastal areas from **storm surge**.



**Solution: Enhancing Riparian Buffers**

**Climate Impact: Coastal and Riverine Flooding**

**Riparian buffers** are composed of the natural vegetation that separate streams from the surrounding forest or landscape. The vegetation controls erosion by stabilizing **substrate**, reducing the impacts of flooding through temporary water storage, and improving water quality.



**Solution: Restoring Dunes**

**Climate Impact: Coastal and Riverine Flooding**

Dunes are dynamic interfaces between the land and sea that buffer inland areas from the effects of storm waves. Restoring dunes usually involves re-establishing native plants, creating sand fencing, or reusing dredged material to reduce risk from flooding and erosion.

8. *Green Infrastructure Cost-Benefit Resources*, U.S. Environmental Protection Agency, November 2020.

9. *Green Infrastructure Design and Implementation*, U.S. Environmental Protection Agency, 21 July 2021.

**Figure 2:** Examples of Natural Infrastructure Solutions, continued



**Solution: Removing Hazardous Fuel Loads**

**Climate Impact: Wildfires**

Hazardous fuel loads are overstocked stands or the woody material present on the forest floor. Installing firebreaks and thinning the woody biomass and understory vegetation can help prevent the possibility and spread of catastrophic wildfires.



**Solution: Conducting Prescribed Burns**

**Climate Impact: Wildfires**

Prescribed fire, or **prescribed burning**, is a tool for managing overgrown vegetation on fire-prone landscapes. Prescribed fires reduce brush, shrubs, and trees that would otherwise contribute to the intensity and spread of wildfires.



**Solution: Installing Stormwater Detention Basins**

**Climate Impact: Drought**

Stormwater basins provide storage of stormwater runoff by holding and releasing water. The basins can provide a stable water supply by retaining a permanent pool of water.



**Solution: Recharging Aquifers**

**Climate Impact: Drought**

**Aquifer** recharge is the manmade or natural process of redirecting water to **aquifers** to replenish groundwater supplies. Recharge efforts can also include reducing water usage, leaving uncultivated lands, and improving grazing techniques. Replenishing groundwater supplies and encouraging more efficient water usage increases drought resilience and can prevent **saltwater intrusion**.



**Solution: Conducting Soil Rehabilitation**

**Climate Impact: Desertification**

Soil rehabilitation requires increasing the organic matter content in the soil or establishing vegetation to cover the soil. Changing the organic matter content or replanting vegetation improves soil structure, water retention, and nutrient quality, preventing the common causes of **desertification**.



**Solution: Building Retention Berms**

**Climate Impact: Thawing Permafrost**

Retention berms are made of gravel or a draining material that can accommodate extreme rain or heavy snow runoff. When ice-rich **permafrost** melts, it is restricted to the area inside the berm and prevents the pooling of water, which creates **wetland** areas.

## Legal Authorities Used in REPI Resilience Projects

The REPI program’s ability to finance **climate adaptation** projects lies in three different legal authorities from Congress as seen in Figure 3, below. The first, and most commonly used, is 10 U.S.C. § 2684a. This statute allows DoD to fund natural infrastructure projects on parcels already protected by the REPI program. DoD typically allocates funding under this authority in a single lump sum.

However, because natural infrastructure projects are long-term initiatives, **partners** may wait to use the money to cover future costs associated with their project. In such situations, **partners** can place DoD REPI funds in interest-bearing accounts but must spend any interest accrued on the same purpose for which the funding was originally allocated.

The second legal authority that can be used for a REPI resilience project is 16 U.S.C. § 670c-1, known as the “Sikes Act.” Like 10 U.S.C. § 2684a, the Sikes Act allows DoD to provide funding to natural resource management, including natural infrastructure projects. A recipient of such funds will also have the ability place the money in interest-bearing accounts, when necessary. 10 U.S.C. § 2684a requires DoD to have permanently protected or acquired a restrictive **easement** on the parcel where the natural infrastructure project will occur—the Sikes Act, on the other hand, does not. Instead, Sikes Act projects can happen on state, local government, tribal, and private lands that are not protected by DoD.

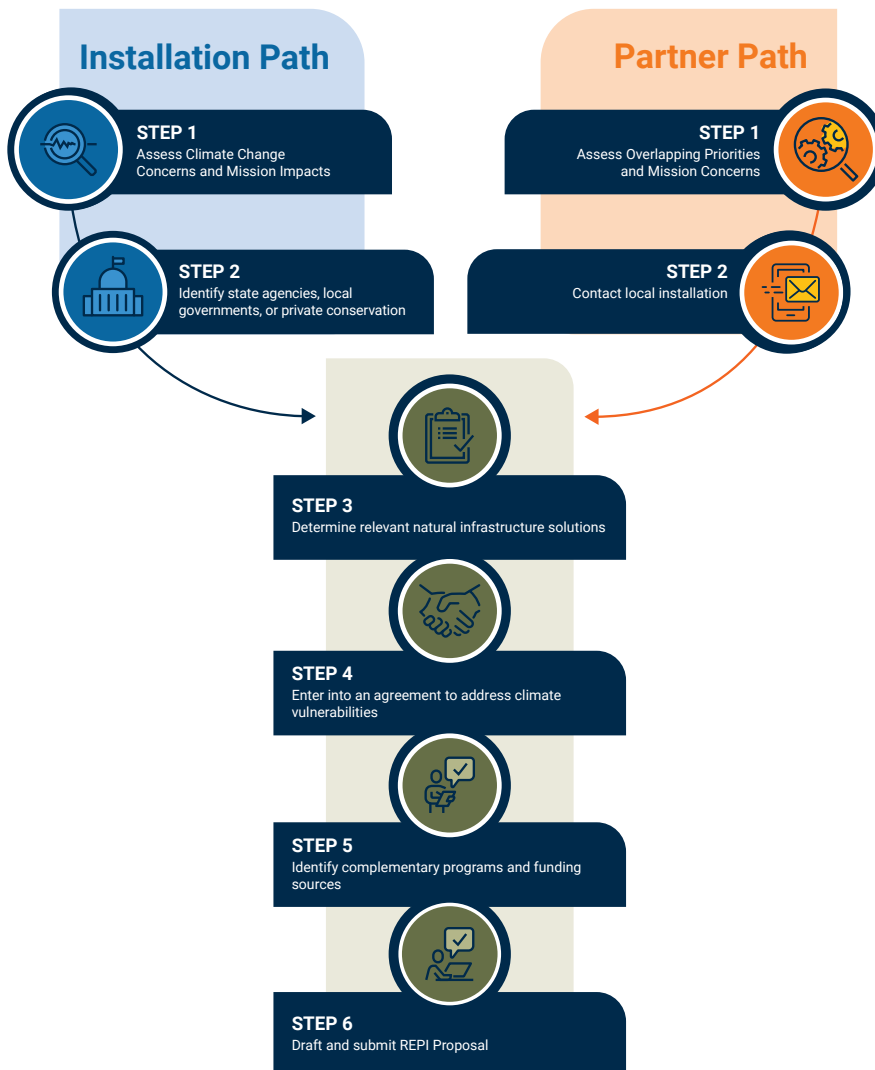
**Figure 3:** Legal Authorities Used by REPI Resilience Projects

	10 U.S.C. § 2684a	16 U.S.C. § 670 c-1 (The Sikes Act)	10 U.S.C. § 2679 (IGSAs)
Agreement Type	<b>Cost-sharing agreements</b>	<b>Cooperative agreements</b> or interagency agreements	<b>Intergovernmental Support Agreements (IGSAs)</b>
Eligible Entities	State or local governments and non-governmental organizations	State or local governments, Indian tribes, non-governmental organizations, and other federal agencies	State or local governments
Resilience Opportunities	DoD can build <b>installation</b> resilience by funding activities that enhance off-base natural infrastructure.	DoD can build <b>installation</b> resilience by funding activities that restore high value habitat or natural resources.	DoD can fund public services typically administered by state or local governments that build resilience to <b>climate change</b> in areas with <b>installations</b> .
Eligible Land	Projects can take place on properties already protected by the REPI program.	Projects can take place on state land, local government land, tribal land, and private land.	N/A

The third legal authority that REPI resilience projects may use is 10 U.S.C. § 2679, which authorizes **Intergovernmental Support Agreements** (IGSAs). IGSAs allow DoD to participate in and fund public services typically administered by state or local governments that build resilience to **climate change** in areas with military **installations**.

## How to Develop a REPI Resilience Project

The graphic below outlines the steps that **installations** and their **partners** should take to pursue funding from the REPI program for a climate resilience project. It is important to note that these steps serve as guidance and may not be the same for every **installation** or **partner**. Adapting these steps to fit your specific needs is not only recommended but encouraged.



## ***Step 1A (Installations): Assess Climate Change Concerns and Mission Impacts***

As an **installation** representative, one of the first steps in developing a REPI resilience project is to evaluate how extreme weather events and **climate change** vulnerabilities impact mission requirements. To carry out this assessment, **installations** can leverage DoD’s Climate Assessment Tool, or “DCAT.”

DCAT is an application that allows users to explore **installations’** exposure to eight different climate hazards: coastal flooding, riverine flooding, heat, energy demand, drought, wildfire, historical extreme conditions, and land degradation. DCAT is CAC-enabled, meaning it is only available DoD personnel and contractors. The tool uses weighting techniques and indicator data from past extreme weather events, historic modeled climate, and future modeled climate to produce hazard scores. To increase accuracy, **installations** can adjust the assessment to reflect different temporal and emissions scenarios. For example, an **installation** can evaluate climate exposure in the near-term (2035-2065) or long-term (2070-2100) and under “high” global emissions levels or “low” global emissions levels. The REPI team has compiled exposure scores for all REPI project sites across the country. If you need assistance using DCAT or would like to access your **installation’s** score, please email the REPI office at [osd.repi@mail.mil](mailto:osd.repi@mail.mil).

While conducting a DCAT assessment, **installations** may find that the areas of greatest concern to the **installation** are also problematic for local businesses, communities, and other government agencies. For this reason, **installations** can use the DCAT results to prioritize resilience efforts internally, then use public-facing mapping applications and assessment tools to engage with **partners** and secure community buy-in for natural infrastructure projects.

## ***Step 1B (Partners): Assess Overlapping Priorities and Mission Concerns***

As a **partner**, the first step in developing a REPI resilience project is to learn about climate-driven issues in your region and, from there, explore how these challenges are also impacting nearby military **installations**. There are three publicly available tools that may be useful during this evaluation, in addition to potential internal resources:

### **1. REPI Interactive Map**

- a.** This public mapping application features geospatial layers that display data on military **installation** footprints, sentinel landscapes, wildlife habitat, public lands, DoD partnerships, and climate risks such as **sea level rise**, wildfire hazards, and flooding.

REPI Interactive Map:  
<https://repimap.org/>

## 2. National Fish and Wildlife Foundation Coastal Resilience Evaluation and Siting Tool

- a. This public tool helps users identify areas of open space where coastal resilience projects will have the greatest benefits to human communities and wildlife species.

## 3. Federal Emergency Management Agency National Risk Index for Natural Hazards

- a. This public tool helps users identify communities most at risk to 18 natural hazards. The application also displays natural hazard risk metrics and includes data about expected annual losses, social vulnerabilities, and community resilience.

If this is an initial engagement with the REPI program, it is recommended that **partners** explore the program's website. The website contains webinars, fact sheets, and Congressional reports that will help **partners** better understand the program. For a deep dive on traditional REPI **easement** projects, the REPI program suggests reviewing the *REPI Encroachment Management Partnerships* primer.

### *Step 2A (Installations): Identify a Partner*

Next, an **installation** representative should work to identify a **partner** for their REPI resilience project that shares similar climate concerns and has complementary goals or solution sets. The most common REPI **partners** are state agencies, local governments, and private conservation organizations. An **installation's** engagement with a prospective **partner** will depend on the type of organization. The REPI program offers several extensive guides that outline best practices for this process:

1. *Collaborative Land Use Planning: A Guide for Military Installations and Local Governments*
2. *Commander's Guide to Community Involvement*
3. *Working with Land Trusts: A Guide for Military Installations and Land Trusts*
4. *Working with Local Governments: A Practical Guide for Installations*
5. *Working with Conservation Districts: A Guide for Military Installations*
6. *Working with State Legislatures: A Guide for Military Installations and State Legislatures*

Several national organizations have resources that interested parties can access to better understand potential **partners**. The National Association of Counties provides information on county-level initiatives that center on climate-related issues, while the National Conference of State Legislatures does the same for

National Fish and Wildlife Foundation Coastal Resilience Evaluation Tool:

<https://resilientcoasts.org/>

Federal Emergency Management Agency National Risk Index for Natural Hazards:

<https://hazards.fema.gov/nri/>

REPI Website:

<https://www.repi.mil/>

REPI Encroachment Management Partnerships primer:

<https://repiprimers.org/repi101/>

REPI Primers:

<https://www.repi.mil/Resources/Primers/>

State and local governments are encouraged to explore the OLDCC Military Installation Sustainability Program, which includes funding for developing Compatible Use Plans and Military Installation Resilience Reviews. Both of these studies only require a 10 percent cost share and are excellent tools for assessing compatibility and resiliency challenges.

<https://oldcc.gov/our-programs/military-installation-sustainability>

states. In addition, the National Association of Conservation Districts provides instructive materials on how to engage with conservation districts, which frequently help landowners carry out natural resource management projects.

### **Step 2B (Partners): Contact Local Installation**

A **partner's** next step is to contact your local military **installation** to ask about opportunities to **partner** on a REPI resilience project. The **installation** representative with whom a **partner** should speak with will depend on which Military Service operates the base. For the Navy, Marine Corps, and Air Force, a **partner** should contact the Community Plans and Liaison Officer, for the Army, the Plans, Analysis, and Integration Officer. A limited number of **installations** do not host these positions. In that case, a **partner** can contact the Public Affairs Office.

During initial conversations with the **installation, partners** should inquire whether the base has recently participated in a Compatible Use Study, formerly known as a “Joint Land Use Study” or “JLUS.” Sponsored by the Office of Local Defense Community Cooperation (OLDCC), Compatible Use Studies are planning initiatives between military **installations** and their surrounding jurisdictions, residents, and state agencies. These studies only require a 10 percent cost share and provide land-use recommendations that support the military’s mission and community growth, making them excellent resources for REPI partnerships interested in developing a resilience project.

### **Step 3: Determine Relevant Natural Infrastructure Solutions**

The next step is to develop a plan for a natural infrastructure solution that will help **installations** and their **partners** adapt to climate challenges. This process will look different for each partnership. Not only are successful natural infrastructure solutions tailored to regional climate issues, they are also integrated into local ecosystems, economies, and human populations. As a result, a REPI partnership should conduct independent research as to how to best meet the **installation's** and local community’s needs. To assist with this step, the REPI program has created a catalog of educational materials that can be found in the Resilience Resources Library on [www.REPIPrimers.org](http://www.REPIPrimers.org).

When developing a natural infrastructure solution, a partnership should also consider the following best practices:

- First, it is important to keep in mind that natural infrastructure solutions are long-term efforts. For that reason, a project should include clear goals, an implementation plan, a vehicle to monitor progress, and a strategy for future operations and maintenance.



- Second, no matter what natural infrastructure solution a partnership selects, it will need to engage a wide range of stakeholders to deliver successful results. These groups include but are not limited to local planning authorities, community groups, academic institutions, and conservation organizations. A diverse coalition of local **partners** will allow the team to draw on the expertise of individuals who have worked on **climate adaptation** efforts in the past and may be familiar with best practices, scientific studies, and data relevant to your needs.
- And third, a REPI partnership should plan and budget for environmental compliance activities—namely, assessments conducted under the National Environmental Policy Act (NEPA), or state equivalent, and authorizations or permits required by federal, state, and local laws. While traditional REPI projects oftentimes receive a NEPA categorical exclusion, REPI resilience projects typically alter existing landscapes and, therefore, may be subject to environmental assessments or environmental impact statements.

#### ***Step 4: Enter into a Legal Agreement***

The next step is for the **installation** and **partner** to enter into a legal agreement. This a crucial prerequisite for any REPI project, including resilience efforts. Most REPI projects are executed using 10 U.S.C. § 2684a. But, under certain circumstances, a team may use two other legal authorities to spend REPI funds: 16 U.S.C. § 670c-1, commonly known as the Sikes Act, and 10 U.S.C. § 2679, which authorizes **IGSAs**. It is important to note that REPI legal agreements may vary slightly depending on the Military Service that operates the **installation** involved.

#### ***Step 5: Explore Complementary Resilience Programs***

The next step is for a team to explore opportunities to collaborate with other public and private **climate adaptation** programs that may complement their project. There are two overarching ways to approach such collaborations.

The first method is to use REPI's federal-funds-as-match authority. Similar to REPI, many federal climate resilience programs fund **cost-sharing agreements** between their parent agency and **partner** entities. For the most part, these programs mandate that the cost-share requirement be met by non-federal dollars. Under 10 U.S.C. § 2684a(h), however, REPI funds are allowed to serve as the match for such programs, creating a unique opportunity for REPI projects to **partner** across the Federal Government.

The second, less formal, method is to engage in strategic planning efforts with other public and private resilience programs. Many climate initiatives that produce similar outcomes to REPI operate in areas around military **installations**.

By establishing channels of communication with these organizations, a team can reduce duplicative work and use taxpayer dollars more efficiently. This is the central idea behind the Sentinel Landscapes Partnership, which offers tools and best practices for all REPI partnerships, even those without an official sentinel landscape designation.

To learn about specific complementary federal programs, please visit the Resilience Resources Library at [www.REPIPrimers.org](http://www.REPIPrimers.org).

### ***Step 6: Draft and Submit a REPI Proposal***

The next step is to draft and submit a proposal to the REPI office requesting funding for the resilience project. This is a time-intensive process that a team should start months in advance. Typically, **installation** representatives begin working with their **partners** in the spring and then submit their proposals by the end of July. All proposals must be submitted by an **installation** representative to their respective Military Service Headquarters. The Military Service Headquarters will then review the submissions and transfer them to the REPI office by September 30<sup>th</sup>. The REPI office evaluates all proposals starting in October, determines final funding levels by March the following year, and distributes funding around July.

In addition to the standard REPI proposal process, a resilience project may also be eligible for funding through the REPI Challenge. Established in 2012, the REPI Challenge finances projects that align with a set of “focus areas” released by the REPI Office on an annual basis. Competitive REPI Challenge proposals also use creative financing tools and leverage new, innovative REPI **partners**. Unlike traditional REPI proposals, REPI challenge projects may be submitted by state and local governments, corporations, private investors, and conservation groups in coordination with the local **installation** or **range**. To learn more about the REPI Challenge, please visit the REPI website.

*REPI Website:*  
<https://www.repi.mil/>

Throughout the proposal process, please keep in mind that REPI funding opportunities are highly competitive. Every year, the REPI office receives a total funding request that far exceeds the amount of money that it is allocated from Congress. If a project does not receive full or partial funding, the REPI office strongly advises that teams continue to develop their partnerships and consider reapplying the following year.

## REPI Resilience Project Examples

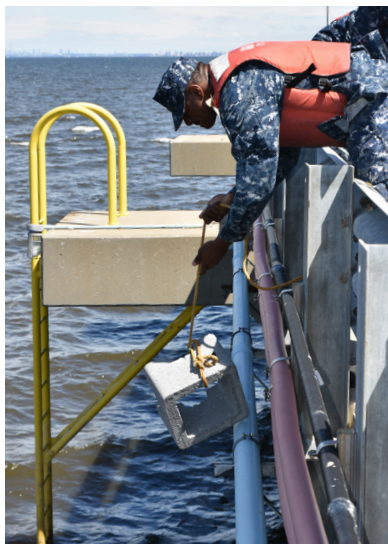
Since Congress expanded 10 U.S.C. § 2684a in Fiscal Year 2019, the REPI program has funded several successful resilience projects across the country. You can find details on several such initiatives below. For updates on new and existing resilience efforts, please view the REPI project fact sheets on the REPI website.



### *Building Resilience to Hurricanes*

#### Naval Weapons Station Earle, New Jersey

In 2012, Naval Weapons Station (NWS) Earle and the surrounding community sustained roughly \$50 million in damages from Hurricane Sandy. To mitigate future costs from storm damage, the Navy is working with Monmouth County to purchase conservation **easements** that will preserve critical nearby **wetlands**. Protecting this land will also secure the base's sensitive drinking water supply



from over-withdrawal and salt intrusion and enhance storm water capacity across multiple watersheds. NWS Earle and a consortium of DoD **installations** and **ranges** were allocated \$2 million through the 2020 REPI Challenge to fund an **IGSA** under 10 U.S.C. § 2679 with the State of New Jersey. The agreement and funding support beach nourishment, **living shoreline** establishment, **storm surge** reduction, stormwater management and storage capacity enhancement, and wildfire mitigation. These resilience initiatives span over 1.6 million acres and will improve and maintain the waterways along NWS Earle's 2.9-mile-long Pier Complex.

- Key Partners:
  - Monmouth County, New Jersey
  - Monmouth Conservation Fund

REPI Website:  
<https://www.repi.mil/>

NWS Earle Fact Sheet:  
[https://www.repi.mil/Portals/44/Documents/Buffer\\_Fact\\_Sheets/Navy/NWSEarle.pdf](https://www.repi.mil/Portals/44/Documents/Buffer_Fact_Sheets/Navy/NWSEarle.pdf)

NWS Earle Website:  
[https://www.cnic.navy.mil/regions/cnrma/installations/nws\\_earle.html](https://www.cnic.navy.mil/regions/cnrma/installations/nws_earle.html)

Monmouth County,  
New Jersey:  
<https://co.monmouth.nj.us/Index.aspx>

Monmouth Conservation  
Fund:  
<http://www.monmouthconservation.org/>



## Reducing Flood Risk

### Naval Weapons Station Yorktown, Virginia

NWS Yorktown  
Fact Sheet:

[https://www.repi.mil/  
Portals/44/Documents/  
Buffer\\_Fact\\_Sheets/  
Navy/NWSYorktown.pdf](https://www.repi.mil/Portals/44/Documents/Buffer_Fact_Sheets/Navy/NWSYorktown.pdf)

NWS Yorktown Website:

[https://www.cnic.navy.  
mil/Yorktown/](https://www.cnic.navy.mil/Yorktown/)

NWS Yorktown, National Fish and Wildlife Foundation, and Virginia Institute of Marine Science received funding from the 2020 and 2021 REPI Challenge to conserve and restore shoreline and nearshore areas critical protecting to NWS Yorktown's infrastructure and mission. This project will implement natural infrastructure solutions to stabilize Penniman Spit, which has lost over 86% of its area since 1937. The project design will also incorporate **living shoreline** (e.g. marsh plantings and wetland restoration) and install oyster reef habitat structures to restore and enhance over 2,900 linear feet of shoreline, increase oyster recruitment, and improve water quality within the York River ecosystem. Restoring and protecting this shoreline from erosion complements ongoing habitat and oyster restoration efforts by other federal and state agencies in the York River area, while also improving **installation** resilience.



Virginia Institute of  
Marine Science:

<https://www.vims.edu/>

National Fish and  
Wildlife Foundation:

<https://www.nfwf.org/>

York County, Virginia:

[https://www.yorkcounty.  
gov/](https://www.yorkcounty.gov/)

- Key Partners:
  - Virginia Institute of Marine Science
  - National Fish and Wildlife Foundation
  - York County, Virginia



## Water Conservation and Wildfire Risk Reduction

Fort Huachuca, Arizona



Working with the Bureau of Land Management, Fort Huachuca's **partners**, including Arizona Land and Water Trust and the U.S. Department of Agriculture's Natural Resources Conservation Service, have purchased **easements** to protect crucial groundwater supplies within the San Pedro Riparian National

Conservation Area. By reducing groundwater pumping, the project protects the future of the San Pedro and Babocomari Rivers. Fort Huachuca was also allocated \$2.1 million through the 2020 REPI Challenge to fund an interagency agreement with the U.S. Forest Service. This innovative interagency agreement supports wildfire mitigation strategies to decrease wildfire risk in the nearby Coronado National Forest where the Army conducts no impact, critical testing activities. Protecting these compatible lands will also help maintain the low levels of electromagnetic and signals interference, which are necessary for operations at Fort Huachuca.

- Key Partners:
  - Arizona Land and Water Trust
  - U.S. Department of Agriculture's Natural Resources Conservation Service
  - The Bureau of Land Management

Fort Huachuca Fact Sheet:  
[https://www.repi.mil/Portals/44/Documents/Buffer\\_Fact\\_Sheets/Army/FortHuachuca.pdf](https://www.repi.mil/Portals/44/Documents/Buffer_Fact_Sheets/Army/FortHuachuca.pdf)

Fort Huachuca Website:  
<https://home.army.mil/huachuca/index.php>

Arizona Land and Water Trust:  
<https://www.alwt.org/>

U.S. Department of Agriculture's Natural Resources Conservation Service:  
<https://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/>

The Bureau of Land Management:  
<https://www.blm.gov/>



## *Building a Living Shoreline to Support Mission Readiness*

### Marine Corps Air Station Cherry Point, North Carolina

Marine Corps Air Station (MCAS) Cherry Point is situated on the coast of eastern North Carolina—an area threatened by erosion, **storm surge**, and **saltwater intrusion**. These threats directly impact the special warfare training and operational capabilities of MCAS Cherry Point, Piney Island Bombing Range, and Brant Shoal Bombing Range. To adapt to these threats, the North Carolina Sentinel Landscape Committee and North Carolina Coastal Federation were allocated \$1 million in 2020 REPI Challenge funding to build a **living shoreline** along the Neuse River. This **living shoreline** will buffer 2,100 linear



feet of eroding shoreline using REPI Challenge funds and an additional 5,600 linear feet through hurricane recovery commitments, contributing to the strategic goals of the Eastern North Carolina Sentinel Landscape and improving the resilience of MCAS Cherry Point. To see the construction of the **living shoreline** at MCAS Cherry Point, please watch this video at <https://www.dvidshub.net/video/792712/living-shoreline-cherry-point>.

- Key Partners:
  - North Carolina Sentinel Landscape Partnership
  - North Carolina Coastal Federation

MCAS Cherry Point  
Fact Sheet:

[https://www.repi.mil/Portals/44/Documents/Buffer\\_Fact\\_Sheets/Marine%20Corps/MCASCherryPoint.pdf](https://www.repi.mil/Portals/44/Documents/Buffer_Fact_Sheets/Marine%20Corps/MCASCherryPoint.pdf)

MCAS Cherry Point  
Website:

<https://www.cherrypoint.marines.mil/>

North Carolina Sentinel  
Landscape Partnership:

<https://sentinellandscapes.org/landscapes/eastern-north-carolina/>

North Carolina  
Coastal Federation:

<https://www.nccoast.org/>

## Appendix A: Glossary and Acronyms

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**Disclaimer:** Unless otherwise noted, these terms and their definitions are for the purposes of this primer only.

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## A

**Aquifer** An aquifer is a water-bearing rock or sediment that is saturated and permeable enough to store water.

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## C

**Climate Change** Variations in average weather conditions that persist over multiple decades or longer that encompass increases and decreases in temperature, shifts in precipitation, and changing risk of certain types of severe weather events.

**Climate Adaptation** Adjustment in natural or human systems in anticipation of or response to a changing environment in a way that effectively uses beneficial opportunities or reduces negative effects.

**Cooperative Agreement** A cooperative agreement is a legal instrument of financial assistance between a federal awarding agency and a recipient.

**Cost-Sharing Agreement** A cost-sharing agreement is an agreement under which parties agree to share a percentage of the total project cost.

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## D

**Desertification** Desertification is the process by which fertile land becomes desert, typically as a result of drought, deforestation, or unsustainable agriculture.

**DoD** Department of Defense

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## E

**Easement** An easement is a legal right to use another's land for a specific limited purpose; when an entity is granted an easement, it is allowed the legal right to use the property, but the legal title to the land itself remains with the owner of the land. In this case, easements granted to REPI and its partners allow the program to protect the land by limiting the uses of the land.

**Encroachment** External, as well as internal, DoD factors and influences that constrain or have the potential to inhibit the full access or operational use of the live training and test domain. Examples include, but are not limited to, endangered species and critical habitat, unexploded ordnance and munitions, radio frequency spectrum, maritime or airspace restrictions, air quality, airborne noise, urban growth, physical obstructions, and renewable energy projects.

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## F

**Flash Drought** A flash drought is the rapid onset or intensification of drought. It often starts with low rates of precipitation followed by abnormally high temperatures, winds, and radiation.

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## I

**Installation** This is a general term used to indicate a base, fort, camp, or other DoD facility.

**Intergovernmental Support Agreement** An Intergovernmental Support Agreement (IGSA) is a partnership agreement between installations and their State or local governments to receive, provide, or share installation support services.

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## L

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**Living Shoreline** A living shoreline is a stabilized coastal edge made of natural materials such as plants, sand, or rock.

## M

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**Military Installation Resilience** The capability of a military installation to avoid, prepare for, minimize the effect of, adapt to, and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions, that do, or have the potential to, adversely affect the military installation or essential transportation, logistical, or other necessary resources outside of the military installation that are necessary in order to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions.

## P

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**Partner(s)** A partner is a private or governmental entity that provides financial, technical, real estate, legal, or other significant support to a Military Service in the pursuit or conduct of a REPI project or transaction. Examples include federal agencies, state and local authorities, national nonprofit conservation organizations, and local land trusts. Eligible entities under Section 2684a are a defined subset of partners.

**Permafrost** Permafrost is any ground that remains completely frozen for a period of two or more years.

**Prescribed Burn** A prescribed burn is a fire set intentionally for purposes of forest management, farming, or ecosystem restoration.

## R

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**Range** The term “range”, when used in a geographic sense, means a designated land or water area that is set aside, managed, and used for range activities of the Department of Defense. Such term includes the following: firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access, exclusionary areas, and airspace areas designated for military use in accordance with regulations and procedures prescribed by the Administrator of the Federal Aviation Administration.

**Riparian Buffer** A riparian buffer is an area adjacent to a river or stream that contains a combination of trees, shrubs, or other vegetation.

## S

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**Saltwater Intrusion** Saltwater intrusion is the encroachment of saltwater into groundwater or a freshwater aquifer. The intrusion of saltwater contaminates the freshwater stored in aquifers, making the resource unsuitable for use.

**Sea Level Rise** Sea level rise is the increase in sea levels over time due to added water from melting ice sheets and glaciers and the expansion of seawater as it warms. Both phenomena can be attributed to global warming.

**Storm Surge** Storm surge is the abnormal rise in seawater level during a storm, caused primarily by winds pushing water onshore.

**Substrate** A substrate is a surface or base where an organism lives or grows.

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## U

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*U.S.C.* United States Code

## W

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*Wave Energy* Wave energy refers to energy passing through ocean water, causing it to move in a circular motion.

*Wetlands* Wetlands are areas where water covers the soil or is present near the surface of the soil for an extended period of time.

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This primer is one of a series designed in cooperation with DoD's Sustainable Ranges Initiative.

The primer series includes:

- ❖ **Collaborative Land Use Planning:** A Guide for Military Installations and Local Governments
- ❖ Commander's Guide to Community Involvement
- ❖ Commander's Guide to Understanding and Supporting Working Forests
- ❖ Commander's Guide to Renewable Energy
- ❖ **Outreach for Mission Sustainability:** Working to Balance Military and Civilian Community Needs
- ❖ Partner's Guide to the Department of Defense's Readiness and Environmental Protection Integration (REPI) Program Encroachment Management Partnerships
- ❖ **Working to Preserve Farm, Forest and Ranch Lands:** A Guide for Military Installations
- ❖ **Working with Conservation Districts:** A Guide for Military Installation
- ❖ **Working with Land Trusts:** A Guide for Military Installations and Land Trusts
- ❖ **Working with Local Governments:** A Practical Guide for Installations
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(571) 969-6774

**[www.REPI.mil](http://www.REPI.mil)**

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