

Monitoring the Birds of the Black Hills: 2007 Field Season Report



December 2007



Rocky Mountain Bird Observatory

14500 Lark Bunting Lane

PO Box 1232

Brighton, CO 80603

303.659.4348

www.rmbo.org

Tech. Rep. M-MBBH07-01

MONITORING THE BIRDS OF THE BLACK HILLS: YEAR 7

ROCKY MOUNTAIN BIRD OBSERVATORY

The mission of the Rocky Mountain Bird Observatory (RMBO) is the conservation of Rocky Mountain and Great Plains Birds and their habitats. RMBO promotes a broad, balanced approach to bird conservation and accomplishes its work through daily cooperation with other nonprofit organizations, schools, private landowners, and state and federal natural resource agencies. RMBO accomplishes its mission by working in four arenas:

- Research:** *RMBO conducts scientific research on bird distribution and abundance in relation to habitat, habitat changes, and other ecological patterns and processes relevant to bird conservation.*
- Monitoring:** *RMBO conducts long-term, broad-scale monitoring of bird populations to track population trends in Colorado, Wyoming, Utah, Kansas, Nebraska, South Dakota, New Mexico and Oklahoma.*
- Education:** *RMBO provides active, experiential, education programs for K-12 students in order to create an awareness and appreciation for birds, with a goal of their understanding of the need for bird conservation.*
- Outreach:** *RMBO shares the latest information in land management and bird conservation practices with private landowners, land managers, and resource professionals at natural resource agencies. RMBO develops voluntary, working partnerships with these individuals and groups for habitat conservation throughout the Great Plains and Rocky Mountains.*

Suggested Citation:

Giroir, G., White, C., Sparks, R. 2007. Monitoring the Birds of the Black Hills, 2007 Field Season Report. Tech. Rep. M-MBBH07-01. Rocky Mountain Bird Observatory, Brighton, CO, 81 pp.

Cover Photos:

(From left to right) Red-naped Sapsucker, Yellow-rumped Warbler - Jeff Jones, jjones@jonestc.com

Contact Information:

Glenn Giroir	glenn.giroir@rmbo.org
Chris White	chris.white@rmbo.org
Rob Sparks	rob.sparks@rmbo.org
RMBO Fort Collins Office	
230 Cherry Street	
Fort Collins, CO 80521	
970.482.1707	

EXECUTIVE SUMMARY

In 2007, Rocky Mountain Bird Observatory (RMBO), in conjunction with its funding partner, the Black Hills National Forest (BHNF), implemented the seventh year of Monitoring the Birds of the Black Hills (MBBH), as delineated by Panjabi et al. (2001). RMBO has designed the program to provide statistically rigorous long-term trend data for populations of most diurnal, regularly breeding bird species in the Black Hills including several U.S. Forest Service Region 2 Sensitive Species, BHNF Management Indicator Species, and BHNF Species of Local Concern. The program provides information such as spatial distribution, abundance, and habitat relationships of bird species that is needed to effectively manage and conserve bird populations in the Black Hills. This cooperative project supports the BHNF's efforts to comply with requirements set forth in the National Forest Management Act and other statutes and regulations. It also contributes to RMBO's broader landscape-scale breeding bird monitoring program.

This year, we surveyed seven of the ten habitats targeted under the monitoring plan. We conducted 136 point-count transects (1,930 point counts) in the seven habitats (Aspen, Burn Area, Late-successional Pine, Pine North, Pine South, Pine-juniper Shrubland, and White Spruce) in the Black Hills. We conducted the surveys between 27 May and 13 July. We detected 22,155 individual birds of 109 species on the point-count transects. Fifty-one species were detected in sufficient numbers to estimate density in at least one habitat. The total number of species detected in each habitat in 2007 ranged from 61 in Aspen and White Spruce to 52 in Pine North. Of the seven habitats surveyed in 2007, the species richness (average number of species detected per point-count and per transect) was greatest in Pine-juniper Shrubland and lowest in Late-successional Pine (Table 2).

This year, in a departure from our usual analytical methods, we pooled the 2001-2007 point-count data to determine density estimates for each year. This allowed us to calculate density estimates for some low-density species that did not have large enough sample sizes to calculate density estimates using only the 2007 data. The pooled 2001-2007 data yielded robust density estimates (CV<50%) for 44 species and moderately robust estimates (CV=50-75%) for 4 additional species. We should be able to effectively monitor these 48 species, which represent 30 percent of all species detected on point-count transects in the Black Hills during 2001-2007, but represents more than 90 percent of all *individual birds* observed during 2001-2007.

ACKNOWLEDGEMENTS

This project was funded by the U.S. Forest Service, through a cooperative agreement with Black Hills National Forest and Rocky Mountain Bird Observatory.

We sincerely thank Steve Hirtzel and Cara Staab, of the U.S. Forest Service, for their support and involvement in the program, as well as for logistical assistance provided during and after the field season. We also thank Dan Licht, of the National Park Service, for his continued interest to integrate National Park Service lands into the program. We are especially grateful to Bob Paulson, Elaine Ebbert, and Mark Keffeler of the Nature Conservancy, for the generous use of their comfortable facilities at the Whitney Preserve, and especially to Elaine Ebbert for the use of her cabin during the field season. We also thank the 2007 field crew: Jennifer Adams, Ken Behrens, Cameron Cox, Helen Davis, Mike Freiberg, Brian Gibbons, Angela Johnson, and Beth Stallman who spent many weeks in the field, sometimes under difficult conditions, conducting surveys. We sincerely appreciate the generosity of Jeff Jones for providing the cover photos for this report. We are especially appreciative to Chandman Sambuu of RMBO for his efforts to improve the data entry system and maintain a high quality data base.

TABLE OF CONTENTS

Executive Summary	i
Acknowledgements	ii
Table of Contents	iii
Introduction	1
Program History.....	1
Reasons for Monitoring.....	1
Monitoring Objectives.....	2
Methods	4
Study Area.....	4
Aspen.....	5
Burn Area.....	5
Late-successional Pine.....	5
Ponderosa Pine - Northern Hills.....	5
Ponderosa Pine - Southern Hills.....	6
Pine-Juniper Shrubland.....	6
White Spruce.....	6
Field Personnel.....	6
Point-count Transect Protocol.....	6
Data Analysis.....	7
Results	8
Aspen (AS).....	9
Burn Area (BU).....	12
Late-successional Pine (LS).....	16
Pine North (PN).....	19
Pine South (PS).....	23
Pine-juniper Shrubland (SH).....	27
White Spruce (WS).....	30
Species Accounts	34
Ruffed Grouse.....	36
Sharp-shinned Hawk.....	37
Cooper’s Hawk.....	38
Northern Goshawk.....	39
Broad-winged Hawk.....	40
Upland Sandpiper.....	41
White-throated Swift.....	42
Broad-tailed Hummingbird.....	43
Lewis’s Woodpecker.....	44
Red-headed Woodpecker.....	45
Red-naped Sapsucker.....	46
American Three-toed Woodpecker.....	47
Black-backed Woodpecker.....	48
Hammond’s Flycatcher.....	49
Dusky Flycatcher.....	50
Plumbeous Vireo.....	52

MONITORING THE BIRDS OF THE BLACK HILLS: YEAR 7

Pygmy Nuthatch.....	53
Brown Creeper.....	54
Golden-crowned Kinglet.....	55
Mountain Bluebird.....	56
Townsend’s Solitaire	57
Virginia’s Warbler	58
MacGillivray’s Warbler.....	59
Vesper Sparrow.....	60
Lark Sparrow	61
Song Sparrow.....	62
Dark-eyed Junco (White-winged).....	63
Western Meadowlark.....	64
Discussion and Recommendations	65
Unique Values of Each Habitat.....	65
Aspen	65
Burn Areas	65
Late-successional Pine	65
Pine North.....	66
Pine South.....	66
Pine-juniper Shrubland	66
White Spruce.....	66
Prospects for Population Monitoring.....	67
Literature Cited	69
Appendix A.....	72
Appendix B.....	76

INTRODUCTION

Program History

In 2007, Rocky Mountain Bird Observatory (RMBO), in cooperation with its partner, the Black Hills National Forest (BHNF), implemented year seven of a habitat-based bird monitoring program designed to provide rigorous population trend data on most diurnal, regularly occurring breeding bird species in the Black Hills (Panjabi et al. 2001). Modeled after *Monitoring Colorado's Birds* (Leukering et al. 2000), the program is entitled *Monitoring the Birds of the Black Hills (MBBH)*. MBBH is consistent with goals emphasized in the Partners in Flight National Landbird Monitoring Strategy (Bart et al. 2001), and in addition to monitoring bird populations, generates information useful for managing birds (e.g., habitat associations, spatial distribution). This report details the findings from the seventh year of what is designed to be a long-term, cooperative effort to monitor bird populations in the Black Hills.

Reasons for Monitoring

Birds can be excellent indicators of biological integrity and ecosystem health (Morrison 1986, Croonquist and Brooks 1991, Bureau of Land Management 1998, Hutto 1998, O'Connell et al. 2000, Rich 2002, U.S. EPA 2002, Birdlife International 2003). Because they comprise a diverse group of niche specialists, occupy a broad range of habitats, are sensitive to both physical and chemical impacts on the environment, and often reflect the abundance and diversity of other organisms with which they coexist, birds can be useful barometers for environmental change and measuring the sustainability of human activities on ecosystems.

Bird communities reflect an integration of a broad array of ecosystem conditions, including productivity, vegetation structure and composition, water quality, and landscape integrity (Adamus et al. 2001). The response of bird communities to changes in the environment can be examined at a variety of spatial scales, making them a powerful and practical tool for evaluating the broader effects of resource management, conservation and restoration activities, or other environmental changes. And because birds are generally abundant, conspicuous, and relatively easy to identify, they offer tremendous logistical and economic advantages over other taxonomic groups for monitoring their populations. Also, birds are popular with the public, and there is a strong and growing interest, both nationally and internationally, to manage and conserve bird populations, many of which are exhibiting long-term population declines (Sauer et al. 2003).

Aside from serving as ecological indicators, birds are a tremendous economic resource in and of themselves. A recent federal economic report found that 46 million birdwatchers across America spent \$32 billion in 2001 on bird watching and related activities (USFWS 2003). This spending generated \$85 billion in overall economic output and \$13 billion in federal and state income taxes, and supported more than 863,000 jobs. In addition to being an economic attraction,

birds also pollinate, disperse seeds, and consume pests of ecologically and economically important plants, thereby providing ecosystem services worth many billions of dollars. Thus declines in bird populations diminish a valuable economic resource that could have profound negative implications for regional and local economies, both directly and indirectly.

In order for birds to be conserved on a global scale, people in all areas must assume responsibility to conserve the species and habitats for which they are stewards. Population monitoring forms the backbone of avian conservation. Without current monitoring data, conservation efforts may be misguided and inefficient. For these and other reasons, monitoring is mandated by legislation such as the National Environmental Policy Act (1969), Endangered Species Act (ESA; 1973), and the Forest Management Act (1976), as well as by various state laws, Forest plans, preserve management plans, and other long-range plans (Sauer 1993, Manley et al. 1993).

Effective conservation depends on adequate monitoring information. Historically, resource managers relied on data derived from the Breeding Bird Surveys (BBS), for bird population information. The BBS, however, is a road-based, volunteer-dependent survey that does not effectively sample many species or habitats (Robbins et al. 1993, Sauer 1993), and does not reliably reveal population trends at small geographic scales (Sauer 2000). Furthermore, the design and implementation of the BBS are such that results generated from these efforts are often inconclusive due to the difficulty associated with interpreting index counts (Sauer 2000) and numerous confounding variables (Robbins et al. 1986, Bohning-Gaese et al. 1993, Sauer et al. 1994, James et al. 1996, Thomas 1996). For these reasons, BBS data are generally insufficient to guide local or regional management decisions.

Given the declines of many species of North American breeding birds, there is an urgent need for monitoring programs that serve as an “early-warning” system to identify declining species and the causes of declines so that natural resource managers can proactively prevent further declines. RMBO’s monitoring programs are designed to be comparable, repeatable, data rich, long-term, multi-scale, and accessible, so that managers can make informed decisions to effectively conserve birds and their habitats.

Monitoring Objectives

RMBO’s bird monitoring programs are designed to provide population trend or status data on all regularly-occurring breeding species within each program area. Initially, we expect to collect data to provide “early-warning” information for all species that can be monitored through a habitat-based approach. After establishing this monitoring framework, we anticipate collecting more demographic information and testing *a priori* hypotheses to determine the possible reasons for known declines and to better inform management decisions. Herein we discuss the initial “early-warning” monitoring framework, the

monitoring goals and progress. In the future, with the initial trend information, we hope to develop and establish the second phase of the program to gather demographic and other information to address specific management issues.

The specific objectives of RMBO's monitoring program are:

- 1.) To integrate existing bird monitoring efforts in the region to provide better information on distribution and abundance of all breeding birds, especially for priority species;
- 2.) To provide basic habitat association data for most bird species to address habitat management issues;
- 3.) To provide long-term status and trend data on all regularly occurring breeding species in the region, with a target of detecting a minimum rate of population change of 3.0% per year over a maximum time period of 30 years;
- 4.) To maintain a high-quality database that is accessible to all of our collaborators as well as the public on the worldwide web in the form of raw and summarized data and,
- 5.) To generate decision support tools such as habitat models that help guide conservation efforts and provide a better measure of our conservation success.

METHODS

Study Area

In January 2001, RMBO, in coordination with biologists from the U.S. Forest Service and other agencies, selected 10 habitats (Aspen, Burn Areas, Mixed-grass Prairie, Ponderosa Pine - Northern Hills, Ponderosa Pine - Southern Hills, Late-successional Ponderosa Pine, Pine-juniper Shrubland, Riparian, Wet Meadows, and White Spruce) in which to implement the bird monitoring effort (Panjabi et al. 2001). In 2002, Wet Meadows were dropped from the sampling scheme due to poor on-the-ground representation of this habitat, and Riparian was split into two discrete habitats, Montane Riparian and Foothills Riparian, due to differences in the bird communities across this elevational gradient (Panjabi 2003a). In 2007, seven of the 10 habitats originally targeted for monitoring were sampled: Aspen (AS), Burn Areas (BU), Late-successional Pine (LS), Ponderosa Pine - Northern Hills (PN), Ponderosa Pine - Southern Hills (PS), Pine-juniper Shrubland (SH), and White Spruce (WS) (Figure1).

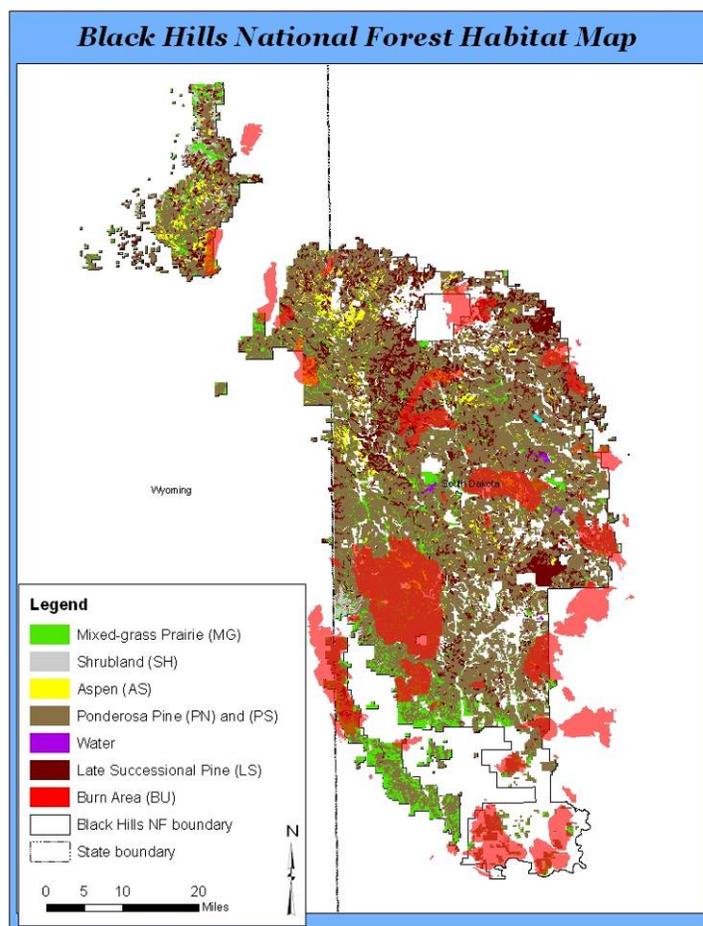


Figure 1. Distribution of habitats targeted for bird monitoring under *Monitoring the Birds of the Black Hills* (note: Foothills Riparian and Montane Riparian habitats not included).

Aspen

Aspen habitat (AS) consists of forest stands dominated by quaking aspen (*Populus tremuloides*) ranging in seral stage from 'shrub-seedling' to 'old-growth' (Buttery and Gillam 1983). Aspen stands are rarely monotypic; other tree species that typically occur within or adjacent to AS include ponderosa pine (*Pinus ponderosa*), white spruce (*Picea glauca*) and paper birch (*Betula papyrifera*). Stands of quaking aspen in the Black Hills are typically small and most host fewer than 15 point count stations. Many aspen stands have a woody understory, consisting of a variety of shrubs including common juniper (*Juniperus communis*), beaked hazelnut (*Corylus cornuta*), gooseberry (*Ribes* spp.), and chokecherry (*Prunus virginiana*). Other stands have only an herbaceous understory.

Burn Area

Burn Area habitat (BU) is located mostly within areas affected by the Jasper Fire, which burned approximately 83,000 acres in 2000. The Jasper Burn Area is a mosaic of patches of charred, heat-killed, and live trees (mostly ponderosa pine) that ranged in seral stage from 'shrub-seedling' to 'mature' (Buttery and Gillam 1983) prior to being burned. By 2002, herbaceous and woody ground cover had resprouted in much of the Burn Area.

Late-successional Pine

Late-successional Pine (LS) refers to stands of ponderosa pine where seral stage is classified as either 4c (mature, closed canopy) or 5 (old growth) (Buttery and Gillam 1983). These stands typically have more large-diameter trees, coarse fallen debris, and large-diameter standing snags than do earlier-successional stands (Buttery and Gillam 1983). Because certain bird species in the Black Hills may occur primarily in such late-successional stands, we sampled LS in order to generate sufficient data to allow us to monitor these species. Additionally, independent random sampling of LS should allow for comparisons of bird densities between LS and PN/PS forests, to assess whether some species are limited in their distribution to LS.

Ponderosa Pine - Northern Hills

Ponderosa Pine - Northern Hills (PN), or "pine north," refers to the mesic forest dominated by ponderosa pine occurring north of the Mystic Ranger District. Although predominantly pine, this habitat incorporates natural ecotonal variation in the landscape, such as small groves of aspen or oak, drainages with birch and hazelnut, and riparian corridors. Nonetheless, transects in this habitat primarily sample pine forest. We separated the northern ponderosa pine habitat from the southern pine habitat because of structural and physiognomic differences that contribute to differences in the composition of the two bird communities. The northern hills receive more rainfall than do the southern hills, and the northern pine forest often supports an extensive under- and mid-story of bur oak (*Quercus macrocarpa*), aspen, paper birch, and/or other small deciduous trees. This deciduous component contributes to a bird community that is substantially different than in the south.

Ponderosa Pine - Southern Hills

Ponderosa Pine - Southern Hills (PS), or “pine south,” refers to the arid forest dominated by ponderosa pine occurring south of the Northern Hills Ranger District. Similar to pine-north, this habitat incorporates natural variations in the landscape, such as small groves of aspen or oak, drainages with birch and hazelnut, and riparian corridors. Nonetheless, transects in this habitat primarily sample pine forest. The southern hills receive less rainfall than in the north, and the southern pine forest typically has a grassy understory, with little or no woody undergrowth. In some areas, the southern pine forest intergrades with native mixed-grass prairies forming a unique landscape not found elsewhere in the Black Hills.

Pine-Juniper Shrubland

Pine-juniper Shrubland (SH) refers to the arid habitats on canyon slopes and mesa tops in the southernmost Black Hills, particularly in the southwest. This habitat is dominated by mountain mahogany (*Cercocarpus montanus*) and skunkbrush sumac (*Rhus trilobata*) with a relatively sparse (but ecologically significant) component of Rocky Mountain juniper (*Juniperus scopulorum*) and ponderosa pine. Native grasses, such as blue grama, are also prevalent.

White Spruce

White Spruce (WS) refers to coniferous forests dominated by white spruce, also known as Black Hills spruce. Often there is a significant component of ponderosa pine in this habitat and, to a lesser degree, aspen. White spruce stands typically occur at mid- to high elevations, especially in drainages and on cool north-facing slopes. Most of this habitat occurs in a semi-continuous belt extending through the north-central and western Black Hills, although isolated pockets exist further south. Stringers of white spruce also occur in moist, narrow canyons along the eastern edge of the Black Hills.

Field Personnel

Experienced biological technicians with excellent aural and visual bird-identification skills comprised the RMBO staff who executed the field component of MBBH in 2007. Each technician also completed a ten training program at the beginning of the season to ensure full understanding of the field protocols and to practice distance estimation.

Point-count Transect Protocol

RMBO staff conducted point-count transects (Buckland et al. 1993) in order to sample bird populations in each habitat selected for monitoring. Each transect was surveyed by one observer following protocol established by Leukering (2000) and modified by Panjabi (2005). RMBO technicians conducted all transects in the mornings, between ½-hour before sunrise and 11 AM; most surveys were completed before 10 AM. To maximize efficiency, observers located the selected stand on the ground prior to the morning of the survey. On the morning of the survey, the observer began the point transect at the first count station and then continued along the pre-selected bearings for all remaining points.

Observers conducted 15 five-minute point counts at stations located at 250 m intervals along each point transect. Birds flying over, but not using the immediate surrounding landscape were recorded, but excluded from analyses of density. For each bird detected, observers recorded its species, sex, how it was detected (e.g., call, song, drumming, etc.), and distance from the observation point. Whenever possible, they measured distances using laser rangefinders. When it was not possible to measure the distance to a bird, observers used rangefinders to gauge distance estimates by measuring to some closer object.

Observers recorded atmospheric data (i.e., temperature in degrees Fahrenheit, cloud cover, precipitation, and wind--Beaufort scale) and the time at the start and end of each transect. They measured distances between count stations using hand-held Global Positioning System units. All GPS data were recorded in Universal Transverse Mercator (UTM) North American Datum 1927. At each count station, observers recorded UTM coordinates, whether or not the station was within 100m of a road, and vegetation data, including the structural stage and canopy closure of the forest, mean canopy height, the types and relative proportions of overstory trees, the sub-canopy volume and tree species composition, and the percent coverage and types of shrubs within a 50 m radius of the point. Observers recorded these data prior to beginning each point count.

Data Analysis

We used program DISTANCE 5.0 (Thomas et al. 2006) to generate density estimates (D) using only data collected at point count stations. The notation, concepts, and analysis methods of DISTANCE were developed by Buckland et al. (1993). In DISTANCE analysis, a unique detection function is fit to each distribution of distances associated with a species in a given habitat. Because the detection function is unique to each species in each habitat, DISTANCE analysis avoids some serious problems inherent in traditional analyses of point count data (e.g., unquantifiable differences in detectability among habitats, species, and years). DISTANCE analysis relies on three assumptions, all of which are reasonably well met by MBBH: 1) all birds at distance=0 are detected, 2) distances of birds close to the point are measured accurately, and 3) birds do not move in response to the observer's presence.

This year, in a departure from our usual analyses methods, we pooled the 2001-2007 point-count transect data to determine density estimates for each year. This allowed us to calculate density estimates for some low-density species that would not have had large enough sample sizes to calculate density estimates if we had used only the 2007 data. As a general rule, density estimates were generated only for species for which there was a minimum of 60 independent detections across all years (2001-2007).

RESULTS

In 2007, our seventh year of bird monitoring in the Black Hills, we conducted 1,930 point counts along 136 point-count transects in 7 different habitats. We conducted all of the surveys between 27 May and 13 July (Table 1).

Table 1. Bird sampling periods and effort in the Black Hills, summer 2007.

Habitat	Dates Sampled	#Transects	#Point Counts
Aspen	12 June – 13 July	22	298
Burn Area	5 June – 12 June	18	269
Late-successional Pine	9 June – 11 July	13	181
Pine North	11 June – 9 July	18	268
Pine South	27 May – 5 July	24	336
Pine-juniper Shrubland	29 May – 14 June	15	221
White Spruce	13 June – 12 July	26	357
All Habitats	27 May – 13 July	136	1930

We detected 22,155 individual birds of 109 species on point-count transects (Table 2). Fifty-two species were detected in sufficient numbers to estimate density in at least one habitat (Tables 3-9).

The total number of species detected in each habitat in 2007 ranged from 61 in Aspen and White Spruce to 52 in Pine North (Table 2). Of the seven habitats surveyed in 2007, the average number of species detected per point-count and per transect was highest in Pine-juniper Shrubland and lowest in Late-successional Pine (Table 2). Note that some species were detected in very low numbers outside of their primary habitat(s).

The pooled 2001-2007 data yielded robust density estimates (CV<50%) for 44 species and moderately robust estimates (CV=50-75%) for 4 additional species. We should be able to effectively monitor these 48 species, which represent 30 percent of all species detected on point-count transects in the Black Hills during 2001-2007, but represent more than 90 percent of all *individual birds* observed during 2001-2007.

Table 2. Counts of birds detected, by habitat, in the Black Hills, summer 2007.

Habitat	# birds detected	Avg. # birds per point	# species detected	Avg. # species per point	Avg. # species per transect
Aspen	3091	10.4	61	7.9	23.6
Burn Area	3328	12.4	59	9.1	29.5
Late-successional Pine	1760	9.7	56	7.5	23.2
Pine North	3061	11.4	52	8.4	26.6
Pine South	3632	10.8	60	8.1	25.3
Pine-juniper Shrubland	3220	14.6	60	9.3	29.6
White Spruce	4023	11.3	61	7.9	23.3
All Habitats	22,115	11.5	109	8.3	25.9

Aspen (AS)

We conducted 298 point counts along 22 transects in Aspen between 12 June and 13 July, 2007 (Table 1). We detected 3,091 individual birds, with an average of 10.4 birds per point count (Table 2). We detected 61 species with an average of 7.9 species per point count and 23.6 species per transect (Table 2).

The pooled 2001-2007 point-count transect data from Aspen yielded robust density estimates (CV<50%) for 26 species and moderately robust estimates (CV=50-75%) for three additional species (Table 3). We should be able to effectively monitor these 29 species, which represent 37% of all species detected on point-count transects in Aspen during 2001-2007.

Chipping Sparrow, Warbling Vireo, Dark-eyed Junco, Red Crossbill, and Dusky Flycatcher had the highest estimated densities of all species detected in Aspen (listed in order of highest to lowest density). Six species – Red-naped Sapsucker, Warbling Vireo, American Crow, Black-capped Chickadee, MacGillivray’s Warbler, and Black-headed Grosbeak – had higher estimated densities in Aspen than in any of the other six habitats surveyed. If density is assumed to be positively correlated with habitat quality, then Aspen provides optimal habitat for these species in the Black Hills.

Table 3. Estimated densities of breeding birds in Aspen habitat in the Black Hills, 2001-2007¹.

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	%CV	<i>n</i>
Red-naped Sapsucker	2001	101.2	24.6	415.8	104	46
	2002	87.0	21.8	346.5	101	38
	2004	108.4	27.1	432.7	101	62
	2007	66.6	16.4	270.9	103	27
Hairy Woodpecker	2001	1.5	0.7	3.1	46	6
	2002	5.5	3.3	9.1	32	21
	2004	6.0	3.6	9.8	31	31
	2007	5.9	3.5	10.0	33	20

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	%CV	<i>n</i>
Northern Flicker	2001	1.1	0.6	1.9	34	17
	2002	0.7	0.4	1.2	34	10
	2004	1.8	1.1	2.9	31	33
	2007	2.6	1.6	4.4	31	36
Western Wood-Pewee	2001	1.2	0.5	2.8	56	10
	2002	1.3	0.6	2.9	50	11
	2004	0.7	0.4	1.4	43	8
	2007	4.0	2.1	7.8	40	31
Dusky Flycatcher	2001	23.4	16.8	32.6	20	120
	2002	39.2	28.3	54.2	20	158
	2004	30.8	22.5	42.1	19	151
	2007	48.2	30.5	76.2	28	93
Cordilleran Flycatcher	2001	7.6	4.1	13.8	37	28
	2002	5.3	2.4	11.9	51	19
	2004	8.1	4.6	14.2	35	39
	2007	6.0	3.1	11.9	42	20
Warbling Vireo	2001	94.1	80.6	109.7	9	389
	2002	70.6	48.6	102.4	23	499
	2004	94.8	80.7	111.3	10	599
	2007	53.7	33.9	85.1	28	355
Gray Jay	2001	4.7	2.8	8.0	32	24
	2002	2.9	1.5	5.3	38	14
	2004	3.6	1.9	7.1	42	16
	2007	3.3	1.7	6.4	40	12
American Crow	2001	0.7	0.4	1.1	32	42
	2002	0.3	0.2	0.5	28	18
	2004	0.5	0.3	0.8	28	38
	2007	1.0	0.6	1.5	27	45
Black-capped Chickadee	2001	19.7	14.9	26.0	17	87
	2002	23.5	17.7	31.3	17	100
	2004	22.3	17.2	28.8	15	117
	2007	29.9	23.6	37.9	14	112
Red-breasted Nuthatch	2001	12.0	7.3	19.9	31	110
	2002	16.8	13.2	21.3	14	114
	2004	10.0	7.5	13.4	17	116
	2007	38.7	26.9	55.7	22	177
White-breasted Nuthatch	2001	1.5	0.8	2.9	41	10
	2002	1.7	1.0	2.8	30	11
	2004	1.0	0.5	2.1	43	9
	2007	4.1	2.5	6.8	29	25
Ruby-crowned Kinglet	2001	1.8	1.0	3.4	39	27
	2002	4.9	2.8	8.6	34	70
	2004	5.2	3.1	8.5	30	99
	2007	6.0	3.6	10.1	32	77
Townsend's Solitaire	2001	2.5	1.8	3.6	20	33
	2002	3.5	2.4	4.9	21	43
	2004	5.8	4.7	7.2	12	97
	2007	4.5	3.3	6.1	18	52
Swainson's Thrush	2001	5.3	3.5	8.0	25	52

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	%CV	<i>n</i>
Swainson's Thrush (cont'd)	2002	3.5	1.9	6.6	39	33
	2004	5.6	3.4	9.3	31	71
	2007	2.1	1.1	3.9	39	18
American Robin	2001	28.1	19.9	39.6	21	146
	2002	9.6	7.1	13.0	18	101
	2004	31.1	23.4	41.5	18	177
	2007	45.9	34.7	60.7	17	206
Yellow-rumped Warbler	2001	22.1	14.9	32.7	24	130
	2002	17.0	7.8	37.1	50	147
	2004	22.3	17.6	28.2	14	155
	2007	40.2	29.0	55.7	20	219
American Redstart	2001	25.3	15.4	41.6	31	51
	2002	19.6	10.1	38.1	41	38
	2004	18.7	10.2	34.5	38	49
	2007	7.2	2.9	18.3	59	13
Ovenbird	2001	50.0	39.3	63.5	14	333
	2002	36.7	28.1	48.1	16	289
	2004	41.4	33.4	51.1	13	413
	2007	24.8	16.5	37.5	24	191
MacGillivray's Warbler	2001	8.7	5.1	14.8	33	33
	2002	18.4	10.1	33.3	37	51
	2004	40.4	22.7	71.9	36	50
	2007	10.8	4.9	23.8	49	23
Common Yellowthroat	2001	2.0	1.1	3.8	39	14
	2002	3.0	1.5	5.9	42	20
	2004	2.3	1.1	4.8	45	21
	2007	0.5	0.2	1.2	58	3
Western Tanager	2001	4.3	2.7	6.7	27	54
	2002	2.3	1.5	3.5	26	28
	2004	3.7	2.7	5.1	19	61
	2007	5.3	3.6	7.8	23	60
Spotted Towhee	2001	2.4	1.1	5.5	51	12
	2002	3.8	1.5	9.5	58	18
	2004	2.4	1.0	5.4	53	14
	2007	4.6	2.5	8.4	37	20
Chipping Sparrow	2001	43.7	20.8	91.9	47	76
	2002	41.3	20.6	82.9	44	69
	2004	66.4	31.9	138.6	47	140
	2007	91.6	45.7	183.6	44	139
Dark-eyed Junco	2001	30.8	23.6	40.2	16	147
	2002	15.7	11.4	21.8	20	113
	2004	35.9	25.7	50.0	20	175
	2007	52.7	41.4	67.2	15	217
Black-headed Grosbeak	2001	4.9	2.9	8.3	31	31
	2002	8.4	5.5	12.9	26	51
	2004	2.6	1.5	4.4	32	20
	2007	4.3	1.9	9.8	51	24
Brown-headed Cowbird	2001	5.8	3.7	9.0	27	38
	2002	6.5	4.3	9.8	25	49

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Brown-headed Cowbird (cont'd)	2004	13.0	4.1	41.5	78	40
	2007	17.9	10.5	30.6	33	69
Red Crossbill	2001	19.6	12.1	31.5	29	130
	2002	21.5	10.5	44.3	46	107
	2004	13.9	7.8	24.7	36	70
	2007	51.2	33.6	77.9	26	84
Pine Siskin	2001	14.0	8.0	24.4	34	37
	2002	17.3	10.2	29.5	33	44
	2004	1.7	0.8	3.8	49	5
	2007	8.5	4.7	15.3	36	19
Red Squirrel	2001	12.9	8.3	20.0	27	21
	2002	14.0	8.0	24.5	34	22
	2004	11.3	6.6	19.3	33	24
	2007	70.0	41.1	119.3	32	102

¹*D* = estimated density (birds/km²); *LCL* and *UCL* = lower and upper 90% confidence limits on *D*; %*CV* = percent coefficient of variation of *D*; *n* = number of observations used to estimate *D*.

Burn Area (BU)

We conducted 269 point counts along 18 transects in Burn Areas between 5 June and 12 June, 2007 (Table 1). We detected 3,328 individual birds, with an average of 12.4 birds per point count (Table 2). We detected 59 species with an average of 9.1 species per point count and 29.5 species per transect (Table 2).

The pooled 2001-2007 point-count transect data from Burn Areas yielded robust density estimates (CV<50%) for 28 species and moderately robust estimates (CV=50-75%) for three additional species (Table 4). We should be able to effectively monitor these 31 species, which represent 33% of all species detected on point-count transects in Burn Areas during 2001-2007.

Chipping Sparrow, Dark-eyed Junco, Red Crossbill, Mountain Bluebird, and Brown-headed Cowbird had the highest estimated densities of all species detected in Burn Areas (listed in order of highest to lowest density). Twelve species – Red-headed Woodpecker, Hairy Woodpecker, Black-backed Woodpecker, Northern Flicker, Western Wood-Pewee, White-breasted Nuthatch, House Wren, Eastern Bluebird, Mountain Bluebird, Western Tanager, Vesper Sparrow, and Western Meadowlark – had higher estimated densities in Burn Areas relative to the other six habitats surveyed. If density is assumed to be positively correlated with habitat quality, then Burn Areas provides optimal habitat for these species in the Black Hills.

Table 4. Estimated densities of breeding birds in Burn Area habitat in the Black Hills, 2001-2007¹.

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Mourning Dove	2001	0.2	0.1	0.6	57	8

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Mourning Dove (cont'd)	2002	1.2	0.7	1.8	26	36
	2003	1.1	0.7	1.7	29	35
	2004	2.2	1.6	3.2	22	68
	2005	0.6	0.3	1.1	43	17
	2007	2.4	1.7	3.4	21	45
Red-headed Woodpecker	2001	0.3	0.1	0.7	52	14
	2002	0.6	0.3	1.0	37	25
	2003	0.7	0.5	1.1	26	33
	2004	0.6	0.4	1.0	28	27
	2005	1.0	0.7	1.5	24	43
	2007	1.5	1.0	2.2	23	36
Hairy Woodpecker	2001	2.4	1.6	3.5	24	24
	2002	15.5	11.6	20.7	17	148
	2003	13.6	10.9	17.1	13	136
	2004	15.5	12.7	19.0	12	142
	2005	10.9	9.1	13.2	11	105
	2007	20.5	16.2	25.9	14	113
Black-backed Woodpecker	2001	0.4	0.2	1.0	53	5
	2002	5.5	3.7	8.1	24	57
	2003	3.7	2.4	5.7	26	40
	2004	3.3	2.2	4.9	24	35
	2005	2.7	1.7	4.2	27	29
	2007	2.4	1.2	4.9	42	16
Northern Flicker	2001	1.6	1.1	2.3	23	35
	2002	2.3	1.7	3.3	21	48
	2003	3.0	2.1	4.2	21	64
	2004	4.8	3.7	6.1	15	99
	2005	9.2	7.4	11.3	13	191
	2007	7.5	6.0	9.4	14	94
Western Wood-Pewee	2001	1.3	0.6	2.9	48	30
	2002	2.1	1.1	3.8	37	44
	2003	5.4	3.9	7.5	19	119
	2004	9.9	8.0	12.2	12	214
	2005	4.4	3.1	6.3	21	97
	2007	13.4	10.7	16.8	13	173
Dusky Flycatcher	2001	7.0	4.7	10.3	23	72
	2002	11.6	8.6	15.7	18	98
	2003	12.9	9.7	17.2	18	139
	2004	12.6	8.7	18.5	23	96
	2005	11.4	6.2	20.7	38	140
	2007	26.3	17.6	39.2	24	102
Plumbeous Vireo	2001	4.6	3.0	6.8	24	51
	2002	4.9	3.3	7.1	23	51
	2003	6.4	4.1	10.1	27	70
	2004	3.4	2.1	5.4	28	37
	2005	4.7	3.0	7.5	28	51
	2007	4.7	2.9	7.8	30	31
Warbling Vireo	2001	3.5	2.0	5.9	33	55
	2002	3.4	1.8	6.1	37	50

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	%CV	<i>n</i>
Warbling Vireo (cont'd)	2003	3.2	1.9	5.3	31	50
	2004	5.6	3.5	8.8	28	84
	2005	3.1	1.8	5.1	32	47
	2007	8.3	5.1	13.5	29	77
Gray Jay	2001	3.9	2.0	7.9	44	26
	2002	4.8	2.6	8.9	38	30
	2003	4.2	2.2	8.0	41	27
	2004	3.0	1.5	5.8	42	15
	2005	2.3	1.2	4.7	43	11
	2007	0.5	0.1	2.2	103	1
American Crow	2001	0.2	0.1	0.3	33	39
	2002	0.1	0.1	0.2	25	26
	2003	0.2	0.2	0.4	25	47
	2004	0.2	0.1	0.3	29	26
	2005	0.1	0.1	0.2	32	24
	2007	0.2	0.1	0.3	26	26
Violet-green Swallow	2001	0.5	0.1	2.1	107	1
	2002	5.2	1.3	20.8	99	10
	2003	10.9	4.4	27.3	59	22
	2004	14.5	6.3	33.7	54	16
	2005	9.1	3.3	25.0	67	9
	2007	4.1	1.4	12.3	73	3
Black-capped Chickadee	2001	8.5	6.1	11.9	20	94
	2002	12.6	9.8	16.2	15	137
	2003	5.7	3.9	8.5	24	72
	2004	27.0	18.6	39.2	23	79
	2005	5.1	3.6	7.2	21	67
	2007	8.7	6.0	12.6	23	55
Red-breasted Nuthatch	2001	2.8	2.1	3.9	19	57
	2002	5.3	3.8	7.4	20	100
	2003	2.6	1.8	3.7	22	51
	2004	2.2	1.5	3.3	24	42
	2005	3.7	2.6	5.3	22	72
	2007	3.3	2.2	4.9	24	39
White-breasted Nuthatch	2001	7.1	2.4	21.2	74	31
	2002	12.5	4.3	36.0	71	51
	2003	17.8	6.4	49.9	69	76
	2004	14.6	5.3	40.7	69	62
	2005	16.6	6.0	46.0	68	70
	2007	25.7	9.1	72.8	70	66
Rock Wren	2001	0.1	0.0	0.2	75	3
	2002	0.2	0.1	0.5	69	6
	2003	0.4	0.2	0.7	37	15
	2004	1.9	1.3	2.8	25	73
	2005	2.3	1.4	3.7	29	88
	2007	0.5	0.3	0.9	32	12
House Wren	2001	0.1	0.0	0.5	98	2
	2002	0.5	0.2	1.0	42	7
	2003	1.4	0.9	2.3	29	21

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	%CV	<i>n</i>
House Wren (cont'd)	2004	6.2	4.7	8.1	16	90
	2005	7.4	5.1	10.6	22	108
	2007	11.6	8.2	16.5	20	104
Eastern Bluebird	2001	1.4	0.6	3.2	51	24
	2002	2.3	1.3	4.0	34	36
	2003	2.8	1.8	4.2	25	45
	2004	3.3	2.1	5.2	27	54
	2005	3.3	2.4	4.6	19	51
	2007	2.3	1.2	4.3	37	23
Mountain Bluebird	2001	8.4	5.5	12.9	26	39
	2002	12.9	8.0	20.8	29	56
	2003	12.8	8.8	18.6	23	58
	2004	26.5	20.4	34.4	16	110
	2005	41.1	31.1	54.5	17	170
	2007	47.8	35.2	64.8	18	111
Townsend's Solitaire	2001	7.0	5.7	8.5	12	153
	2002	8.4	6.7	10.4	13	172
	2003	8.3	6.6	10.4	13	178
	2004	7.1	5.9	8.7	12	151
	2005	3.4	2.5	4.5	17	71
	2007	5.2	3.6	7.4	21	66
American Robin	2001	16.1	12.9	20.2	13	274
	2002	19.8	16.1	24.3	12	325
	2003	22.9	19.9	26.4	8	383
	2004	22.3	19.6	25.4	8	310
	2005	20.2	17.1	23.7	10	321
	2007	13.4	10.4	17.3	15	123
Yellow-rumped Warbler	2001	27.6	22.9	33.1	11	373
	2002	27.3	19.4	38.6	21	359
	2003	12.5	9.9	15.9	14	252
	2004	6.8	5.1	9.1	18	118
	2005	7.6	5.4	10.6	20	142
	2007	9.2	6.1	13.8	25	105
Western Tanager	2001	16.7	10.7	26.0	27	158
	2002	18.8	12.3	28.7	26	167
	2003	31.5	21.4	46.4	24	292
	2004	16.7	11.1	25.1	25	147
	2005	17.1	11.3	25.9	26	156
	2007	15.8	10.1	24.6	27	88
Chipping Sparrow	2001	47.9	35.5	64.5	18	168
	2002	37.6	28.0	50.6	18	246
	2003	93.1	78.2	111.0	11	407
	2004	117.5	89.2	154.9	17	346
	2005	136.2	100.8	184.1	18	482
	2007	157.7	116.8	212.9	18	229
Vesper Sparrow	2001	1.7	1.0	2.9	34	38
	2002	2.7	1.6	4.4	30	56
	2003	3.5	2.4	4.9	22	76
	2004	4.7	3.6	6.2	17	102

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Vesper Sparrow (cont'd)	2005	6.6	4.9	8.9	18	143
	2007	14.4	10.4	19.8	19	190
Dark-eyed Junco	2001	22.4	15.2	33.1	24	227
	2002	19.6	15.9	24.3	13	252
	2003	62.2	48.1	80.3	16	295
	2004	79.1	59.5	105.0	17	336
	2005	65.9	49.9	87.0	17	337
	2007	88.1	65.9	118.3	18	293
Western Meadowlark	2002	0.2	0.1	0.6	63	11
	2003	0.4	0.2	0.8	44	20
	2004	1.8	1.1	3.0	32	92
	2005	2.0	1.1	3.4	33	102
	2007	1.6	1.0	2.6	29	50
Brown-headed Cowbird	2001	26.3	20.6	33.7	15	150
	2002	20.8	15.5	28.0	18	146
	2003	18.3	14.1	23.8	16	191
	2004	42.5	29.4	61.6	23	148
	2005	22.1	16.6	29.4	17	173
	2007	34.8	26.6	45.6	16	136
Red Crossbill	2001	30.6	19.1	49.2	29	275
	2002	83.5	58.5	119.1	21	702
	2003	3.4	1.4	8.5	57	30
	2004	86.9	61.1	123.6	21	236
	2005	10.3	5.3	19.7	41	34
	2007	55.6	42.0	73.7	17	109
Pine Siskin	2001	6.9	4.3	11.3	29	48
	2002	13.9	9.2	21.0	25	90
	2003	4.6	2.8	7.6	31	31
	2004	0.6	0.2	1.5	60	4
	2005	6.7	3.9	11.5	33	35
	2007	2.7	1.1	6.7	56	10
American Goldfinch	2001	1.5	1.0	2.5	29	14
	2002	3.0	1.7	5.5	37	26
	2003	4.6	3.1	6.9	24	41
	2004	0.5	0.2	1.0	48	4
	2005	3.1	1.9	5.0	30	26
	2007	3.7	1.8	7.9	46	16
Red Squirrel	2002	1.6	0.6	4.2	61	7
	2003	1.3	0.6	3.1	53	6
	2004	2.2	1.1	4.4	42	10
	2005	0.9	0.3	2.3	61	4
	2007	9.9	5.8	16.9	32	27

¹*D* = estimated density (birds/km²); *LCL* and *UCL* = lower and upper 90% confidence limits on *D*; %*CV* = percent coefficient of variation of *D*; *n* = number of observations used to estimate *D*.

Late-successional Pine (LS)

We conducted 181 point counts along 13 transects in Late-successional Pine between 9 June and 11 July, 2007 (Table 1). We detected 1,760 individual birds,

with an average of 9.7 birds per point count (Table 2). We detected 56 species with an average of 7.5 species per point count and 23.2 species per transect (Table 2).

The pooled 2001-2007 point-count transect data from Late-successional Pine yielded robust density estimates (CV<50%) for 19 species and moderately robust estimates (CV=50-75%) for seven additional species (Table 5). We should be able to effectively monitor these 26 species, which represent 34% of all species detected on point-count transects in Late-successional Pine during 2001-2007.

Yellow-rumped Warbler, Dark-eyed Junco, Red-breasted Nuthatch, Chipping Sparrow, and Red Crossbill had the highest estimated densities of all species detected in Late-successional Pine (listed in order of highest to lowest density). Five species – Red-eyed Vireo, Red-breasted Nuthatch, Brown Creeper, Yellow-rumped Warbler, and Ovenbird – had higher estimated densities in Late-successional Pine relative to the other six habitats surveyed. If density is assumed to be positively correlated with habitat quality, then Late-successional Pine provides optimal habitat for these species in the Black Hills.

Table 5. Estimated densities of breeding birds in Late-successional Pine habitat in the Black Hills, 2001-2007¹.

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	%CV	<i>n</i>
Red-naped Sapsucker	2001	10.9	3.1	38.1	88	19
	2002	10.6	3.2	35.5	84	19
	2004	19.1	5.8	62.9	82	40
	2007	22.8	6.3	82.8	91	20
Hairy Woodpecker	2001	1.7	1.0	2.9	34	12
	2002	5.2	3.4	7.8	25	38
	2004	4.9	3.3	7.3	24	39
	2007	7.8	5.2	11.8	24	27
Western Wood-Pewee	2001	1.4	0.4	4.1	73	15
	2002	2.7	1.1	6.6	56	31
	2004	2.2	1.3	3.8	33	29
	2007	6.7	2.9	15.0	48	37
Dusky Flycatcher	2001	7.8	5.1	11.8	25	42
	2002	10.1	6.7	15.2	25	56
	2004	10.9	7.2	16.6	25	71
	2007	15.8	10.4	24.0	24	43
Cordilleran Flycatcher	2001	6.8	4.0	11.6	33	27
	2002	11.5	6.8	19.5	33	47
	2004	9.0	5.3	15.1	32	43
	2007	5.0	2.5	10.0	42	10
Warbling Vireo	2001	15.5	11.4	21.1	19	181
	2002	14.0	9.6	20.5	23	163
	2004	24.3	16.8	35.0	22	253
	2007	27.6	18.7	40.7	23	125
Red-eyed Vireo	2001	1.8	0.8	4.0	52	10
	2002	3.9	1.9	8.1	45	23
	2004	2.8	1.2	6.2	51	16

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	%CV	<i>n</i>
Red-eyed Vireo (cont'd)	2007	1.7	0.7	4.5	59	5
Gray Jay	2001	4.4	2.2	8.8	43	20
	2002	5.4	3.0	9.5	36	25
	2004	7.6	3.7	15.3	44	22
	2007	3.1	1.1	8.3	64	5
Black-capped Chickadee	2001	11.7	8.9	15.4	16	83
	2002	13.9	10.5	18.2	16	101
	2004	13.2	10.2	17.1	16	109
	2007	12.9	9.3	18.0	19	45
Red-breasted Nuthatch	2001	16.1	12.8	20.3	14	182
	2002	14.1	11.3	17.7	14	203
	2004	31.3	23.5	41.6	17	204
	2007	42.3	32.4	55.2	16	150
White-breasted Nuthatch	2001	6.2	2.5	15.6	60	13
	2002	6.5	2.8	15.4	55	14
	2004	10.4	3.8	28.0	66	24
	2007	15.2	6.1	37.9	59	13
Brown Creeper	2001	12.3	8.5	17.9	22	34
	2002	13.4	9.2	19.5	23	38
	2004	16.9	11.7	24.4	22	56
	2007	2.9	1.0	8.0	62	4
Ruby-crowned Kinglet	2001	2.0	1.0	3.9	42	20
	2002	6.2	3.5	11.1	35	65
	2004	7.4	4.7	11.7	27	90
	2007	6.2	3.3	11.7	37	32
Townsend's Solitaire	2001	5.9	4.5	7.5	15	87
	2002	7.8	5.9	10.3	17	119
	2004	8.9	6.9	11.5	16	155
	2007	3.5	2.1	5.7	28	26
Swainson's Thrush	2001	4.0	2.4	6.5	30	49
	2002	3.9	2.2	6.7	34	49
	2004	4.8	3.0	7.7	28	71
	2007	5.8	2.5	13.6	52	36
American Robin	2001	13.8	9.1	20.9	25	116
	2002	17.2	12.6	23.4	19	165
	2004	28.2	22.0	36.2	15	212
	2007	23.3	14.2	38.3	29	79
Yellow-rumped Warbler	2001	38.7	30.3	49.4	15	244
	2002	22.8	16.4	31.6	20	282
	2004	29.1	23.3	36.4	13	266
	2007	51.7	34.4	77.5	25	167
American Redstart	2001	3.3	1.6	7.1	47	23
	2002	1.7	0.8	3.5	45	12
	2004	3.4	1.6	7.0	45	28
	2007	2.6	0.9	7.6	67	9
Ovenbird	2001	25.8	17.5	37.9	23	250
	2002	22.0	15.4	31.4	21	219
	2004	21.5	14.9	31.0	22	250
	2007	27.1	14.3	51.4	37	132

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
MacGillivray's Warbler	2001	3.4	1.5	7.7	52	16
	2002	3.5	1.9	6.4	37	17
	2004	4.0	1.9	8.7	47	23
	2007	5.9	2.2	15.8	61	14
Western Tanager	2001	8.2	5.4	12.6	26	93
	2002	6.3	4.4	9.0	21	109
	2004	9.4	6.3	14.0	24	97
	2007	11.8	7.5	18.5	27	63
Chipping Sparrow	2001	13.1	7.0	24.5	39	53
	2002	21.0	7.2	61.3	72	86
	2004	68.2	35.5	131.1	41	152
	2007	34.2	16.5	71.0	46	63
Dark-eyed Junco	2001	15.8	12.6	19.9	14	171
	2002	50.4	22.9	111.0	51	193
	2004	59.6	31.2	113.7	41	208
	2007	46.2	31.8	67.2	22	125
Brown-headed Cowbird	2001	4.5	2.8	7.2	29	26
	2002	5.6	2.9	10.5	39	33
	2004	3.8	2.1	6.8	36	26
	2007	9.3	5.8	14.8	28	27
Red Crossbill	2001	35.0	21.4	57.3	30	205
	2002	18.3	11.3	29.5	29	160
	2004	26.1	18.6	36.7	21	108
	2007	29.2	17.6	48.3	30	73
Pine Siskin	2001	11.9	7.6	18.7	27	53
	2002	8.8	5.1	15.0	33	40
	2004	2.3	0.9	5.4	56	12
	2007	6.3	3.1	12.8	42	13
Red Squirrel	2001	16.3	10.9	24.5	24	41
	2002	20.5	12.6	33.4	29	53
	2004	11.9	7.9	18.2	25	36
	2007	77.6	48.5	124.2	27	98

¹*D* = estimated density (birds/km²); *LCL* and *UCL* = lower and upper 90% confidence limits on *D*; %*CV* = percent coefficient of variation of *D*; *n* = number of observations used to estimate *D*.

Pine North (PN)

We conducted 268 point counts along 18 transects in Pine North habitat between 11 June and 9 July, 2007 (Table 1). We detected 3,061 individual birds, with an average of 11.4 birds per point count (Table 2). We detected 52 species with an average of 8.4 species per point count and 26.6 species per transect (Table 2).

The pooled 2001-2007 point-count transect data from Pine North habitat yielded robust density estimates (CV<50%) for 27 species and moderately robust estimates (CV=50-75%) for four additional species (Table 6). We should be able to effectively monitor these 31 species, which represent 36% of all species detected on point-count transects in Pine North habitat during 2001-2007.

Dark-eyed Junco, Chipping Sparrow, Red Crossbill, Warbling Vireo, and American Robin had the highest estimated densities of all species detected in Pine North habitat (listed in order of highest to lowest density). Four species – Gray Jay, Townsend’s Solitaire, American Redstart, and Pine Siskin – had higher estimated densities in Pine North habitat relative to the other six habitats surveyed. If density is assumed to be positively correlated with habitat quality, then Pine North provides optimal habitat for these species in the Black Hills.

Table 6. Estimated densities of breeding birds in Pine North habitat in the Black Hills, 2001-2007¹.

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Red-naped Sapsucker	2001	17.3	9.4	31.5	38	50
	2002	16.6	9.5	29.0	35	45
	2003	22.9	13.1	39.9	35	70
	2005	19.6	11.5	33.3	33	58
	2007	14.3	6.9	29.8	46	27
Hairy Woodpecker	2001	4.4	2.6	7.6	33	27
	2002	5.4	3.4	8.8	30	31
	2003	5.0	3.1	7.9	28	32
	2005	8.8	5.6	14.0	28	54
	2007	7.8	4.7	13.0	31	30
Northern Flicker	2001	0.9	0.5	1.6	37	24
	2002	0.4	0.2	0.9	47	11
	2003	0.6	0.4	1.0	29	18
	2005	1.5	0.9	2.5	31	43
	2007	0.7	0.4	1.2	34	12
Western Wood-Pewee	2001	2.3	1.1	4.7	45	39
	2002	4.5	2.6	7.8	33	82
	2003	3.5	2.1	5.8	31	95
	2005	3.2	1.9	5.4	32	84
	2007	13.1	7.9	21.7	31	108
Dusky Flycatcher	2001	21.0	14.6	30.1	22	161
	2002	27.3	20.2	36.8	18	153
	2003	16.1	11.9	21.8	18	144
	2005	13.2	9.4	18.4	20	141
	2007	38.8	25.1	59.9	27	99
Cordilleran Flycatcher	2001	3.2	2.1	5.0	27	22
	2002	3.4	2.0	5.9	33	22
	2003	5.5	3.4	9.0	30	40
	2005	6.1	3.7	9.9	30	43
	2007	3.1	1.9	5.1	29	14
Plumbeous Vireo	2001	2.3	1.3	4.2	36	29
	2002	0.8	0.4	1.6	47	9
	2003	0.9	0.5	1.6	32	12
	2005	1.6	1.0	2.6	28	21
	2007	0.7	0.3	1.8	54	6
Warbling Vireo	2001	35.1	27.3	45.2	15	393
	2002	36.9	29.0	46.8	14	358
	2003	35.5	23.3	53.9	26	345

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	%CV	<i>n</i>
Warbling Vireo (cont'd)	2005	48.0	36.3	63.4	17	383
	2007	45.3	35.6	57.7	14	261
Red-eyed Vireo	2001	5.7	2.9	11.2	41	36
	2002	2.9	1.3	6.6	51	17
	2003	2.9	1.2	6.8	55	19
	2005	3.1	1.5	6.4	46	20
	2007	1.2	0.4	3.4	64	5
Gray Jay	2001	27.9	9.9	78.9	69	40
	2002	11.9	4.1	35.1	73	16
	2003	15.2	5.3	43.2	70	23
	2005	18.8	6.5	54.7	72	18
	2007	19.3	6.6	56.6	72	12
American Crow	2001	0.5	0.3	0.8	27	34
	2002	0.2	0.1	0.4	38	15
	2003	0.3	0.2	0.5	27	25
	2005	0.2	0.1	0.3	45	11
	2007	0.5	0.3	0.9	34	19
Black-capped Chickadee	2001	10.5	8.1	13.6	15	105
	2002	12.0	9.7	14.8	13	114
	2003	11.9	9.4	15.1	14	127
	2005	20.7	15.9	26.9	16	183
	2007	19.0	13.4	26.9	21	75
Red-breasted Nuthatch	2001	14.7	11.9	18.3	13	220
	2002	19.3	15.6	23.9	13	230
	2003	15.5	11.5	21.0	18	175
	2005	14.4	11.7	17.7	13	197
	2007	24.9	18.7	33.2	18	163
White-breasted Nuthatch	2001	2.1	1.4	3.2	24	20
	2002	3.2	1.8	5.4	33	28
	2003	6.4	4.3	9.4	23	64
	2005	1.8	1.1	3.0	31	17
	2007	4.2	2.9	6.1	22	26
Brown Creeper	2001	3.1	1.6	6.0	41	14
	2002	5.2	3.1	8.9	33	22
	2003	6.5	4.0	10.5	30	31
	2005	6.2	3.8	10.1	30	29
	2007	2.4	1.1	5.2	48	7
Ruby-crowned Kinglet	2001	3.6	1.9	6.5	38	54
	2002	9.5	6.2	14.5	26	97
	2003	4.6	2.8	7.7	31	76
	2005	22.3	13.1	37.7	33	94
	2007	9.0	5.7	14.2	28	58
Townsend's Solitaire	2001	6.6	5.1	8.4	15	112
	2002	16.9	9.3	30.9	38	115
	2003	9.6	6.5	14.2	24	192
	2005	4.5	3.2	6.3	20	115
	2007	9.0	6.8	11.9	17	84
Swainson's Thrush	2001	2.4	1.4	4.2	34	41
	2002	2.7	1.9	3.8	21	43

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	%CV	<i>n</i>
Swainson's Thrush (cont'd)	2003	3.2	2.1	4.8	24	58
	2005	1.8	1.2	2.7	24	32
	2007	2.3	1.5	3.7	27	26
American Robin	2001	21.5	17.6	26.3	12	241
	2002	19.7	16.3	23.9	11	229
	2003	20.4	17.0	24.5	11	257
	2005	27.4	22.3	33.8	13	246
	2007	44.3	33.5	58.6	17	185
Yellow-rumped Warbler	2001	40.7	33.7	49.0	11	328
	2002	43.0	35.2	52.6	12	352
	2003	43.2	31.8	58.6	19	336
	2005	44.6	37.2	53.3	11	408
	2007	38.5	20.7	71.7	39	243
American Redstart	2001	9.0	5.0	16.4	37	49
	2002	5.9	2.7	12.7	48	30
	2003	6.3	3.0	13.1	46	36
	2005	8.1	4.6	14.3	34	46
	2007	8.2	3.6	18.6	50	29
Ovenbird	2001	17.7	12.3	25.5	22	286
	2002	18.6	12.8	27.1	23	226
	2003	25.8	16.7	40.1	27	301
	2005	27.2	17.7	41.8	26	289
	2007	11.2	6.2	20.5	36	136
MacGillivray's Warbler	2001	13.5	8.3	22.2	30	40
	2002	9.8	5.3	18.1	38	27
	2003	11.5	6.0	22.4	41	36
	2005	11.7	6.6	20.9	35	35
	2007	8.8	4.0	19.6	49	17
Western Tanager	2001	8.7	5.9	12.7	23	96
	2002	10.2	7.1	14.6	22	95
	2003	12.5	7.2	21.9	35	155
	2005	15.1	9.5	24.0	28	137
	2007	8.4	5.4	13.1	27	84
Chipping Sparrow	2001	34.8	24.9	48.6	20	142
	2002	23.4	18.2	30.1	15	144
	2003	58.2	44.1	76.8	17	230
	2005	63.4	47.4	84.6	18	250
	2007	50.2	37.8	66.7	17	164
Dark-eyed Junco	2001	27.5	23.1	32.6	10	244
	2002	47.9	33.6	68.4	22	184
	2003	51.2	38.8	67.7	17	302
	2005	28.1	22.6	34.9	13	245
	2007	56.6	45.9	69.8	13	232
Black-headed Grosbeak	2001	3.1	1.6	5.7	39	33
	2002	1.3	0.7	2.4	40	13
	2003	1.2	0.6	2.6	47	14
	2005	1.5	0.8	2.8	38	17
	2007	1.6	0.7	3.6	52	11
Brown-headed Cowbird	2001	23.0	14.0	37.9	31	85

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Brown-headed Cowbird (cont'd)	2002	10.0	6.1	16.4	30	64
	2003	9.4	6.3	14.1	25	94
	2005	8.1	5.1	12.7	28	62
	2007	28.1	19.3	41.0	23	71
Red Crossbill	2001	66.2	41.2	106.5	29	255
	2002	151.0	94.8	240.6	28	293
	2003	11.1	7.3	17.0	26	176
	2005	15.2	9.9	23.1	26	112
	2007	45.5	31.5	65.7	22	84
Pine Siskin	2001	30.3	21.1	43.6	22	119
	2002	24.0	15.8	36.4	25	88
	2003	4.8	2.3	10.1	46	20
	2005	19.4	12.4	30.3	27	63
	2007	23.9	14.4	39.7	31	30
Red Squirrel	2001	17.7	12.4	25.3	21	58
	2002	13.1	8.4	20.4	27	40
	2003	9.8	4.0	24.1	57	34
	2005	4.7	2.9	7.7	29	15
	2007	47.0	31.5	70.2	24	99

¹*D* = estimated density (birds/km²); *LCL* and *UCL* = lower and upper 90% confidence limits on *D*; %*CV* = percent coefficient of variation of *D*; *n* = number of observations used to estimate *D*.

Pine South (PS)

We conducted 336 point counts along 24 transects in Pine North habitat between 27 May and 5 July, 2007 (Table 1). We detected 3,632 individual birds, with an average of 10.8 birds per point count (Table 2). We detected 60 species with an average of 8.1 species per point count and 25.3 species per transect (Table 2).

The pooled 2001-2007 point-count transect data from Pine South habitat yielded robust density estimates (CV<50%) for 27 species and moderately robust estimates (CV=50-75%) for four additional species (Table 7). We should be able to effectively monitor these 31 species, which represent 32% of all species detected on point-count transects in Pine South habitat during 2001-2007.

Dark-eyed Junco, Dusky Flycatcher, Chipping Sparrow, Red Crossbill, and Yellow-rumped Warbler had the highest estimated densities of all species detected in Pine South habitat (listed in order of highest to lowest density). Two species – Wild Turkey and Lark Sparrow – had higher estimated densities in Pine South habitat relative to the other six habitats surveyed. If density is assumed to be positively correlated with habitat quality, then Pine South provides optimal habitat for these species in the Black Hills.

Table 7. Estimated densities of breeding birds in Pine South habitat in the Black Hills, 2001-2007¹.

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Wild Turkey	2001	0.1	0.1	0.2	74	10

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Wild Turkey (cont'd)	2002	0.1	0.1	0.1	44	8
	2003	0.1	0.1	0.1	47	13
	2005	0.1	0.1	0.1	46	11
	2007	0.1	0.1	0.1	76	3
Mourning Dove	2001	1.7	1.0	3.1	36	29
	2002	2.0	1.1	3.6	35	36
	2003	1.4	0.9	2.4	31	28
	2005	3.6	2.2	5.8	30	61
	2007	3.7	2.7	5.2	20	53
Hairy Woodpecker	2001	2.7	1.6	4.3	30	35
	2002	4.1	2.5	6.6	30	27
	2003	3.5	2.4	5.0	22	48
	2005	3.4	2.4	5.0	22	54
	2007	9.5	5.8	15.6	30	41
Northern Flicker	2001	0.9	0.5	1.7	39	29
	2002	0.5	0.3	0.9	36	16
	2003	0.5	0.3	0.8	29	19
	2005	1.1	0.7	1.8	28	42
	2007	0.8	0.5	1.4	32	23
Western Wood-Pewee	2001	0.7	0.3	1.5	52	14
	2002	1.0	0.4	2.7	65	22
	2003	2.8	2.0	4.1	22	69
	2005	2.0	1.1	3.8	39	49
	2007	3.5	2.1	5.8	31	62
Dusky Flycatcher	2001	9.6	6.1	15.0	28	95
	2002	4.7	2.9	7.4	28	49
	2003	11.9	8.3	17.1	22	145
	2005	7.5	5.0	11.5	26	100
	2007	47.9	36.3	63.1	17	176
Cordilleran Flycatcher	2001	0.8	0.4	1.3	32	11
	2002	0.3	0.1	0.9	62	5
	2003	2.1	1.4	3.1	24	35
	2005	0.1	0.0	0.2	100	1
	2007	0.2	0.0	1.2	117	3
Plumbeous Vireo	2001	7.7	5.3	11.2	22	106
	2002	6.4	4.9	8.3	16	92
	2003	7.8	5.7	10.8	19	125
	2005	7.5	5.5	10.3	19	119
	2007	8.2	6.2	10.8	16	97
Warbling Vireo	2001	7.1	4.9	10.3	22	101
	2002	5.0	2.8	8.8	34	74
	2003	7.8	5.1	11.7	25	128
	2005	6.8	4.5	10.3	25	111
	2007	8.5	5.9	12.1	21	104
Gray Jay	2001	5.4	3.2	9.2	33	17
	2002	9.1	5.2	16.0	35	30
	2003	16.2	10.1	25.8	28	59
	2005	8.0	4.7	13.6	33	21
	2007	2.9	1.3	6.6	51	4

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
American Crow	2001	0.3	0.2	0.6	31	40
	2002	0.4	0.2	0.7	34	31
	2003	0.1	0.1	0.2	29	34
	2005	0.3	0.1	0.4	33	37
	2007	0.2	0.1	0.4	33	23
Violet-green Swallow	2001	2.8	0.7	11.8	106	3
	2002	10.6	2.8	40.2	95	12
	2003	28.1	8.2	96.7	86	35
	2005	27.5	7.7	97.6	89	26
	2007	7.5	1.9	29.7	99	3
Black-capped Chickadee	2001	14.1	11.3	17.5	13	140
	2002	15.8	12.1	20.7	16	160
	2003	8.3	6.5	10.7	15	143
	2005	15.5	12.2	19.8	15	161
	2007	14.4	10.9	18.9	17	130
Red-breasted Nuthatch	2001	10.1	7.7	13.1	16	146
	2002	15.3	13.0	18.2	10	233
	2003	11.3	9.0	14.3	14	190
	2005	12.1	9.8	14.8	12	200
	2007	18.0	14.7	22.0	12	224
White-breasted Nuthatch	2001	3.9	2.4	6.3	29	31
	2002	5.7	3.9	8.4	23	48
	2003	11.0	8.6	14.2	15	102
	2005	8.0	6.2	10.5	16	73
	2007	13.6	9.8	18.9	19	94
Brown Creeper	2001	3.2	1.8	5.6	35	12
	2002	4.3	2.0	9.3	48	17
	2003	6.1	3.3	11.3	37	27
	2005	2.3	1.2	4.2	37	10
	2007	1.2	0.5	3.1	59	4
Rock Wren	2001	0.2	0.1	0.5	63	7
	2002	0.3	0.2	0.8	52	13
	2003	0.3	0.2	0.6	38	14
	2005	0.8	0.5	1.5	37	34
	2007	0.5	0.2	0.9	40	14
Ruby-crowned Kinglet	2001	0.4	0.1	1.7	99	7
	2002	0.7	0.3	1.8	63	12
	2003	1.3	0.6	2.8	47	25
	2005	0.4	0.2	1.0	55	8
	2007	1.0	0.4	2.4	57	14
Mountain Bluebird	2001	0.9	0.4	1.9	46	8
	2002	1.3	0.6	2.6	42	12
	2003	1.7	0.8	4.0	52	18
	2005	8.4	5.6	12.6	24	76
	2007	6.0	3.1	11.5	39	43
Townsend's Solitaire	2001	6.8	5.0	9.2	18	98
	2002	6.4	4.2	9.8	26	163
	2003	10.4	7.8	13.7	17	188
	2005	5.5	4.2	7.2	17	135

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	%CV	<i>n</i>
Townsend's Solitaire (cont'd)	2007	7.2	5.4	9.6	17	119
American Robin	2001	6.2	4.6	8.3	17	104
	2002	10.5	7.8	14.2	18	185
	2003	14.1	11.4	17.5	13	275
	2005	9.4	7.4	11.9	14	182
	2007	11.9	9.7	14.6	12	170
Yellow-rumped Warbler	2001	19.9	16.4	24.3	12	250
	2002	30.8	25.6	37.1	11	379
	2003	43.7	33.5	57.0	16	475
	2005	41.4	33.6	51.0	13	414
	2007	24.1	19.8	29.3	12	277
Ovenbird	2001	11.9	8.4	16.8	21	183
	2002	9.3	6.3	13.6	23	194
	2003	9.1	6.6	12.7	20	178
	2005	4.7	3.3	6.8	21	129
	2007	3.1	2.0	4.7	26	81
Western Tanager	2001	10.1	7.3	13.9	19	135
	2002	8.7	6.0	12.7	23	122
	2003	15.1	10.9	21.0	20	234
	2005	8.3	6.0	11.6	20	128
	2007	14.5	10.4	20.2	20	164
Spotted Towhee	2001	0.6	0.3	1.4	54	9
	2002	1.1	0.6	2.3	42	18
	2003	1.7	0.8	3.8	49	30
	2005	1.0	0.5	2.2	48	18
	2007	2.6	1.5	4.7	35	34
Chipping Sparrow	2001	57.5	41.5	79.9	20	130
	2002	47.0	33.0	66.9	22	194
	2003	66.9	51.9	86.3	16	225
	2005	108.8	82.0	144.5	17	324
	2007	46.9	35.3	62.2	17	236
Vesper Sparrow	2001	0.7	0.4	1.2	37	16
	2002	0.7	0.4	1.5	43	18
	2003	1.0	0.5	1.9	41	26
	2005	1.0	0.5	2.1	46	26
	2007	2.0	1.2	3.4	32	40
Lark Sparrow	2001	3.5	1.1	11.1	77	10
	2002	4.4	1.5	12.9	72	13
	2003	4.6	1.6	13.2	70	15
	2005	6.5	2.5	16.8	62	18
	2007	4.5	1.3	15.2	83	11
Dark-eyed Junco	2001	32.6	24.8	42.9	17	181
	2002	29.2	22.8	37.5	15	170
	2003	32.8	25.8	41.7	15	211
	2005	31.3	24.8	39.5	14	196
	2007	64.7	50.3	83.1	15	301
Western Meadowlark	2001	0.1	0.1	0.1	59	4
	2002	0.1	0.1	0.3	50	11
	2003	0.1	0.1	0.3	58	11

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Western Meadowlark (cont'd)	2005	0.4	0.2	1.0	53	41
	2007	0.1	0.1	0.3	56	9
Brown-headed Cowbird	2001	24.6	17.9	33.9	19	118
	2002	13.6	9.2	20.1	23	126
	2003	8.9	6.3	12.4	21	105
	2005	18.6	13.9	25.1	18	170
	2007	19.8	14.4	27.1	19	144
Red Crossbill	2001	13.9	8.6	22.5	29	140
	2002	104.5	67.4	162.1	26	101
	2003	11.1	6.4	19.0	33	129
	2005	21.4	16.3	28.3	17	138
	2007	32.0	23.9	43.0	18	160
Pine Siskin	2001	12.4	6.4	24.2	41	58
	2002	6.9	4.4	11.0	28	34
	2003	2.6	1.5	4.6	35	14
	2005	8.2	4.9	13.8	32	38
	2007	4.0	2.1	7.6	39	13
American Goldfinch	2001	1.6	0.7	3.6	52	10
	2002	0.9	0.4	2.1	55	6
	2003	1.1	0.5	2.2	43	8
	2005	6.8	4.0	11.6	33	39
	2007	4.2	2.5	7.1	33	17
Red Squirrel	2001	4.4	2.0	9.3	47	20
	2002	6.9	4.5	10.6	26	33
	2003	4.5	2.6	7.9	34	24
	2005	4.9	2.9	8.3	32	24
	2007	21.8	15.9	29.9	19	87

¹*D* = estimated density (birds/km²); *LCL* and *UCL* = lower and upper 90% confidence limits on *D*; %*CV* = percent coefficient of variation of *D*; *n* = number of observations used to estimate *D*.

Pine-juniper Shrubland (SH)

We conducted 221 point counts along 15 transects in Pine-juniper Shrubland habitat between 29 May and 14 June, 2007 (Table 1). We detected 3,220 individual birds, with an average of 14.6 birds per point count (Table 2). We detected 60 species with an average of 9.3 species per point count and 29.6 species per transect (Table 2).

The pooled 2001-2007 point-count transect data from Pine-juniper Shrubland yielded robust density estimates (CV<50%) for 24 species and moderately robust estimates (CV=50-75%) for two additional species (Table 8). We should be able to effectively monitor these 26 species, which represent 29% of all species detected on point-count transects in Pine-juniper Shrubland habitat during 2001-2007.

Chipping Sparrow, Dusky Flycatcher, Spotted Towhee, Brown-headed Cowbird, and Dark-eyed Junco had the highest estimated densities of all species detected in Pine-juniper Shrubland (listed in order of highest to lowest density). Eleven species – Mourning Dove, White-throated Swift, Dusky Flycatcher, Plumbeous Vireo, Violet-

green Swallow, Rock Wren, Virginia's Warbler, Spotted Towhee, Chipping Sparrow, Brown-headed Cowbird, and American Goldfinch – had higher estimated densities in Pine-juniper Shrubland relative to the other six habitats surveyed. If density is assumed to be positively correlated with habitat quality, then Pine-juniper Shrubland provides optimal habitat for these species in the Black Hills.

Table 8. Estimated densities of breeding birds in Pine-juniper Shrubland habitat in the Black Hills, 2001-2007¹.

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Mourning Dove	2001	6.5	4.0	10.7	29	42
	2002	8.3	6.2	11.2	18	98
	2004	7.3	5.0	10.7	22	89
	2007	7.1	5.7	8.8	13	77
White-throated Swift	2001	2.8	1.2	6.8	54	9
	2002	21.7	9.5	49.7	51	126
	2004	15.8	8.5	29.2	38	29
	2007	10.2	6.0	17.3	33	24
Dusky Flycatcher	2001	88.1	60.0	129.2	22	156
	2002	105.0	83.0	132.7	14	339
	2004	77.8	63.8	94.8	12	299
	2007	134.1	114.2	157.6	10	389
Plumbeous Vireo	2001	11.2	7.2	17.4	26	35
	2002	14.4	10.2	20.3	20	82
	2004	12.3	9.5	16.0	16	84
	2007	14.8	11.5	19.1	15	78
Warbling Vireo	2001	6.7	1.9	23.3	82	19
	2002	5.0	2.8	9.0	35	26
	2004	7.8	4.5	13.3	32	48
	2007	13.5	7.3	24.9	36	65
American Crow	2001	0.6	0.4	0.9	26	20
	2002	0.2	0.1	0.5	44	14
	2004	0.1	0.1	0.3	50	11
	2007	0.3	0.2	0.4	28	15
Violet-green Swallow	2001	21.4	11.1	41.3	40	22
	2002	70.3	50.3	98.3	20	132
	2004	58.0	35.2	95.6	31	49
	2007	32.2	18.6	55.5	33	34
Black-capped Chickadee	2001	11.4	8.0	16.1	20	34
	2002	15.4	11.8	20.2	16	84
	2004	11.1	8.1	15.2	19	68
	2007	24.4	19.8	30.0	12	111
Red-breasted Nuthatch	2001	2.4	1.0	5.5	51	12
	2002	9.8	7.3	13.1	17	89
	2004	2.9	1.5	5.4	39	30
	2007	13.1	9.8	17.5	17	106
White-breasted Nuthatch	2001	2.8	1.6	4.8	33	14
	2002	5.1	3.4	7.5	24	47
	2004	2.8	1.8	4.4	27	31
	2007	5.8	4.0	8.4	22	50

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Rock Wren	2001	0.3	0.1	1.1	72	3
	2002	1.9	1.0	3.6	39	30
	2004	1.3	0.8	2.3	33	25
	2007	1.4	0.7	2.8	45	20
Mountain Bluebird	2001	6.3	3.2	12.2	40	11
	2002	4.1	2.1	8.1	41	13
	2004	16.3	9.8	27.0	30	53
	2007	14.5	7.4	28.1	40	42
Townsend's Solitaire	2001	2.6	1.1	6.0	52	11
	2002	3.2	1.8	5.8	35	25
	2004	6.2	4.0	9.6	26	51
	2007	5.5	3.4	8.9	28	40
American Robin	2001	5.1	2.7	9.9	40	30
	2002	5.1	3.1	8.2	29	38
	2004	6.6	4.4	10.0	25	47
	2007	15.5	9.7	24.8	29	107
Virginia's Warbler	2001	21.9	12.0	40.0	36	32
	2002	27.8	16.6	46.5	31	74
	2004	36.8	25.2	53.6	23	116
	2007	29.8	19.6	45.2	25	74
Yellow-rumped Warbler	2001	20.6	14.9	28.6	19	66
	2002	28.1	21.5	36.6	15	164
	2004	20.2	14.5	28.1	19	136
	2007	30.3	24.2	38.0	13	164
Ovenbird	2001	7.9	4.8	12.8	29	64
	2002	11.1	8.2	15.1	18	165
	2004	9.6	7.3	12.6	16	170
	2007	9.2	6.6	12.8	19	127
Western Tanager	2001	15.5	10.3	23.1	23	64
	2002	17.0	13.7	21.1	13	128
	2004	10.2	7.9	13.2	15	90
	2007	14.1	10.3	19.2	18	96
Spotted Towhee	2001	80.8	56.5	115.6	21	172
	2002	64.7	48.7	86.0	17	345
	2004	137.4	105.8	178.5	16	335
	2007	72.2	57.6	90.6	13	337
Chipping Sparrow	2001	189.2	156.7	228.5	11	114
	2002	201.2	166.6	243.0	11	221
	2004	218.1	172.5	275.7	14	237
	2007	263.6	208.4	333.5	14	251
Vesper Sparrow	2001	4.4	2.8	6.9	27	26
	2002	2.7	1.6	4.6	32	29
	2004	1.9	0.9	3.8	43	24
	2007	3.1	1.3	7.2	52	31
Dark-eyed Junco	2001	4.9	2.4	9.9	44	14
	2002	15.1	7.9	28.9	40	43
	2004	37.6	21.1	67.0	35	30
	2007	42.6	32.1	56.5	17	150
Western Meadowlark	2001	1.4	0.7	2.9	43	13

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Western Meadowlark (cont'd)	2002	2.0	1.1	3.7	36	34
	2004	1.4	0.7	2.7	41	28
	2007	0.4	0.2	1.1	58	7
Brown-headed Cowbird	2001	51.7	36.4	73.4	21	54
	2002	38.9	24.9	60.6	27	74
	2004	35.2	27.0	45.9	16	75
	2007	58.0	44.2	76.1	16	100
Red Crossbill	2001	14.8	7.4	29.8	43	26
	2002	37.2	20.5	67.5	35	379
	2004	17.3	9.5	31.6	38	46
	2007	29.6	20.1	43.4	23	66
American Goldfinch	2001	4.3	2.7	7.0	29	10
	2002	8.3	4.1	16.7	43	35
	2004	4.6	2.2	9.2	44	19
	2007	8.1	5.1	12.9	28	21

¹*D* = estimated density (birds/km²); *LCL* and *UCL* = lower and upper 90% confidence limits on *D*; %*CV* = percent coefficient of variation of *D*; *n* = number of observations used to estimate *D*.

White Spruce (WS)

We conducted 357 point counts along 26 transects in White Spruce habitat between 13 June and 12 July, 2007 (Table 1). We detected 4,023 individual birds, with an average of 11.3 birds per point count (Table 2). We detected 61 species with an average of 7.9 species per point count and 23.3 species per transect (Table 2).

The pooled 2001-2007 point-count transect data from White Spruce yielded robust density estimates (CV<50%) for 27 species and moderately robust estimates (CV=50-75%) for two additional species (Table 9). We should be able to effectively monitor these 29 species, which represent 34% of all species detected on point-count transects in White Spruce habitat during 2001-2007.

Chipping Sparrow, Dark-eyed Junco, Red Crossbill, American Robin, and Yellow-rumped Warbler had the highest estimated densities of all species detected in White Spruce habitat (listed in order of highest to lowest density). Eight species – Cordilleran Flycatcher, Golden-crowned Kinglet, Ruby-crowned Kinglet, Swainson's Thrush, American Robin, Common Yellowthroat, Song Sparrow, and Red Crossbill – had higher estimated densities in White Spruce habitat relative to the other six habitats surveyed. If density is assumed to be positively correlated with habitat quality, then White Spruce provides optimal habitat for these species in the Black Hills.

Table 9. Estimated densities of breeding birds in White Spruce habitat in the Black Hills, 2001-2007¹.

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Red-naped Sapsucker	2001	7.3	4.1	13.0	35	22
	2002	4.4	2.6	7.5	32	15
	2003	7.6	4.4	13.2	33	30

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Red-naped Sapsucker (cont'd)	2005	3.6	1.7	7.7	47	13
	2007	4.5	2.6	7.9	34	15
Hairy Woodpecker	2001	5.1	2.4	10.5	46	34
	2002	5.2	2.9	9.6	37	31
	2003	1.8	1.4	2.3	16	38
	2005	2.5	1.7	3.6	23	42
	2007	11.2	7.0	18.1	29	56
American Three-toed Woodpecker	2001	0.9	0.4	2.0	50	5
	2002	3.3	1.9	5.9	35	21
	2003	4.6	3.1	6.8	24	34
	2005	5.5	3.7	8.3	25	39
	2007	1.6	0.8	3.2	41	10
Northern Flicker	2001	6.1	3.8	9.9	29	46
	2002	1.7	1.0	2.8	31	19
	2003	1.0	0.6	1.6	31	33
	2005	1.7	0.9	3.4	43	36
	2007	1.5	0.8	2.7	39	23
Dusky Flycatcher	2001	1.8	0.8	3.9	49	8
	2002	4.8	2.6	8.7	37	24
	2003	2.0	0.9	4.5	49	12
	2005	4.0	2.2	7.1	35	23
	2007	8.9	5.9	13.2	24	44
Cordilleran Flycatcher	2001	8.5	4.5	15.9	39	43
	2002	6.9	4.2	11.3	30	76
	2003	15.9	9.1	27.6	34	98
	2005	9.0	4.5	18.0	43	65
	2007	20.0	12.8	31.1	27	97
Warbling Vireo	2001	8.3	5.2	13.2	28	55
	2002	9.3	6.6	13.2	21	69
	2003	10.3	7.5	14.3	19	89
	2005	7.2	4.8	10.8	24	61
	2007	11.7	8.0	17.0	23	85
Gray Jay	2001	46.9	29.7	74.0	28	74
	2002	9.0	5.8	14.0	27	50
	2003	12.5	7.3	21.1	33	57
	2005	4.1	2.0	8.3	44	23
	2007	9.9	5.9	16.7	32	29
American Crow	2001	0.3	0.2	0.5	33	19
	2002	0.3	0.1	0.5	36	18
	2003	0.3	0.2	0.5	32	22
	2005	0.4	0.2	0.8	37	29
	2007	0.4	0.2	0.7	33	21
Black-capped Chickadee	2001	15.9	11.5	22.0	20	124
	2002	8.1	6.1	10.7	17	86
	2003	13.3	9.5	18.6	21	155
	2005	13.3	9.3	18.9	22	113
	2007	21.5	14.2	32.4	25	104
Red-breasted Nuthatch	2001	18.9	15.1	23.5	13	242
	2002	15.4	12.2	19.5	14	176

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Red-breasted Nuthatch (cont'd)	2003	15.2	12.7	18.2	11	251
	2005	6.9	5.4	8.6	14	135
	2007	35.8	29.3	43.9	12	268
White-breasted Nuthatch	2001	0.2	0.1	0.7	69	2
	2002	0.8	0.4	1.8	49	8
	2003	1.4	0.6	3.0	48	15
	2005	0.6	0.2	1.3	55	6
	2007	3.1	1.6	6.0	40	28
Brown Creeper	2001	6.3	3.9	10.2	29	26
	2002	9.3	6.2	13.9	25	43
	2003	10.6	7.2	15.6	24	57
	2005	8.1	5.3	12.6	27	42
	2007	2.2	1.1	4.4	42	10
Golden-crowned Kinglet	2001	24.1	16.6	34.8	22	65
	2002	23.2	16.3	33.0	21	70
	2003	55.9	43.9	71.2	15	196
	2005	66.7	55.6	80.0	11	222
	2007	5.4	2.2	13.2	56	16
Ruby-crowned Kinglet	2001	49.9	30.2	82.3	31	274
	2002	42.3	34.6	51.8	12	408
	2003	39.1	27.0	56.7	23	367
	2005	59.8	42.4	84.4	21	470
	2007	34.4	28.1	42.1	12	281
Townsend's Solitaire	2001	3.0	1.8	5.0	31	55
	2002	3.1	2.3	4.2	18	65
	2003	3.5	2.8	4.4	14	84
	2005	2.5	1.8	3.3	17	58
	2007	2.1	1.5	2.9	21	42
Swainson's Thrush	2001	13.4	10.2	17.6	16	149
	2002	14.6	12.3	17.4	10	182
	2003	18.5	15.8	21.6	9	267
	2005	12.4	10.3	15.0	11	177
	2007	15.5	12.8	18.9	11	189
American Robin	2001	50.0	41.2	60.7	12	257
	2002	47.6	39.3	57.6	11	273
	2003	37.2	30.8	44.8	11	248
	2005	44.7	36.1	55.2	13	281
	2007	54.7	44.2	67.9	13	301
Yellow-rumped Warbler	2001	26.1	19.1	35.7	19	207
	2002	37.6	30.7	46.1	12	246
	2003	47.1	38.6	57.6	12	366
	2005	25.8	20.8	31.9	13	270
	2007	41.3	34.0	50.3	12	255
Ovenbird	2001	0.3	0.1	0.7	58	4
	2002	0.2	0.1	0.6	58	4
	2003	1.1	0.5	2.4	47	22
	2005	0.8	0.4	1.5	42	15
	2007	1.2	0.6	2.4	43	20
Common Yellowthroat	2001	2.4	0.8	6.8	68	6

Species	Year	<i>D</i>	<i>LCL</i>	<i>UCL</i>	% <i>CV</i>	<i>n</i>
Common Yellowthroat (cont'd)	2002	1.4	0.4	4.7	81	4
	2003	5.2	2.2	12.4	56	17
	2005	10.6	4.0	28.1	63	34
	2007	12.0	5.2	27.5	53	33
Western Tanager	2001	0.2	0.1	0.5	59	3
	2002	0.1	0.0	0.4	68	2
	2003	0.9	0.4	2.0	49	17
	2005	1.2	0.5	2.7	52	21
	2007	2.3	1.2	4.3	39	35
Chipping Sparrow	2001	69.9	49.8	98.3	20	136
	2002	57.1	44.8	72.8	14	124
	2003	87.9	68.9	112.2	15	222
	2005	95.8	75.4	121.8	14	229
	2007	162.0	126.9	206.7	15	330
Song Sparrow	2001	5.4	2.7	10.9	43	22
	2002	4.4	2.1	9.1	45	20
	2003	8.5	4.2	17.3	44	45
	2005	14.8	8.2	26.5	36	77
	2007	10.7	5.8	19.8	37	48
Dark-eyed Junco	2001	27.0	20.8	35.0	16	151
	2002	24.9	19.0	32.6	16	156
	2003	46.3	33.0	65.0	21	226
	2005	42.4	29.2	61.6	23	175
	2007	88.1	70.4	110.3	13	314
Brown-headed Cowbird	2001	1.7	0.9	3.0	35	9
	2002	3.0	1.8	5.2	33	18
	2003	2.6	1.7	4.1	28	18
	2005	3.1	1.7	5.5	36	17
	2007	6.0	4.0	8.9	24	34
Red Crossbill	2001	64.1	48.1	85.4	17	424
	2002	47.5	33.8	66.8	20	351
	2003	51.1	42.0	62.2	12	439
	2005	12.2	8.8	16.9	20	69
	2007	65.0	48.6	86.8	18	133
Pine Siskin	2001	43.4	27.0	69.8	29	176
	2002	30.3	21.8	42.2	20	142
	2003	5.7	2.9	11.2	42	36
	2005	12.9	8.1	20.3	28	77
	2007	15.1	8.8	25.9	34	50
Red Squirrel	2001	37.9	26.9	53.4	20	90
	2002	33.2	23.8	46.3	20	88
	2003	62.3	47.4	81.8	16	192
	2005	5.6	2.9	10.7	40	17
	2007	107.0	84.2	136.0	14	277

¹*D* = estimated density (birds/km²); *LCL* and *UCL* = lower and upper 90% confidence limits on *D*; %*CV* = percent coefficient of variation of *D*; *n* = number of observations used to estimate *D*.

SPECIES ACCOUNTS

In this section we present one-page accounts for each bird species detected in 2007 that is of management interest, as designated by either the U.S. Forest Service, the U.S. Fish and Wildlife Service, the South Dakota Dept. of Game, Fish, and Parks, the Black Hills National Forest, Partners in Flight, or Wyoming Partners in Flight. Each of these organizations has a stake in maintaining healthy populations of birds in the Black Hills. For the U.S. Forest Service, we include designations for Region 2 Sensitive Species. For the U.S. Fish and Wildlife Service, we include designations for Birds of Conservation Concern for Bird Conservation Region 17 (BCR17; USFWS 2002). For the South Dakota Department of Game, Fish, and Parks, we include designations for State Threatened or Endangered Species and Species of Greatest Conservation Need (South Dakota Comprehensive Wildlife Conservation Plan, 2006). For the Black Hills National Forest we include designations for Management Indicator Species and Species of Local Concern (as per the phase II amendment of the Forest Plan). For Partners in Flight we include designations from the Partners in Flight Species Assessment Database for Bird Conservation Region 17, (PIF Species Assessment Database 2005). For Wyoming Partners in Flight we included designations from the Bird Conservation Plan (2003; this designation included only for Level I and II priority species that were recorded in the Wyoming portion of the Black Hills).

In a few cases, we provide comparisons with available historical accounts of the avifauna of the Black Hills (Grinnell 1875; Pettingill and Whitney 1965) to provide a historical perspective in which to interpret the current findings.

The geographic distribution maps in the following accounts depict the locations and relative abundance of species of management interest that were detected on point transects in 2007. The relative abundance scale used in the maps is based on the number of points *along each transect* where the species was detected. It should also be noted that the location of the dots do not indicate the precise location of the point at which the species was observed, but rather the access point of the transect on which the species was observed. It is important to keep in mind that the maps only reflect the abundance and distribution of the species across the sites we surveyed, and should not necessarily be construed to suggest anything about the areas in between.

In each table we provide two numbers pertaining to the number of observations for each species in 2007: *N*, the number of individuals observed, and *n*, the number of independent observations used to estimate density. These numbers may be different as often several individuals are detected in a single observation, as when birds are in a flock. In addition, a small percent of long-range observations are truncated from the data in order to calculate density. It should also be noted that the number of individuals observed (*N*) includes flyovers and between point detections. While the number of individuals observed is often of interest, especially for rare species, density estimates are derived using only independent observations.

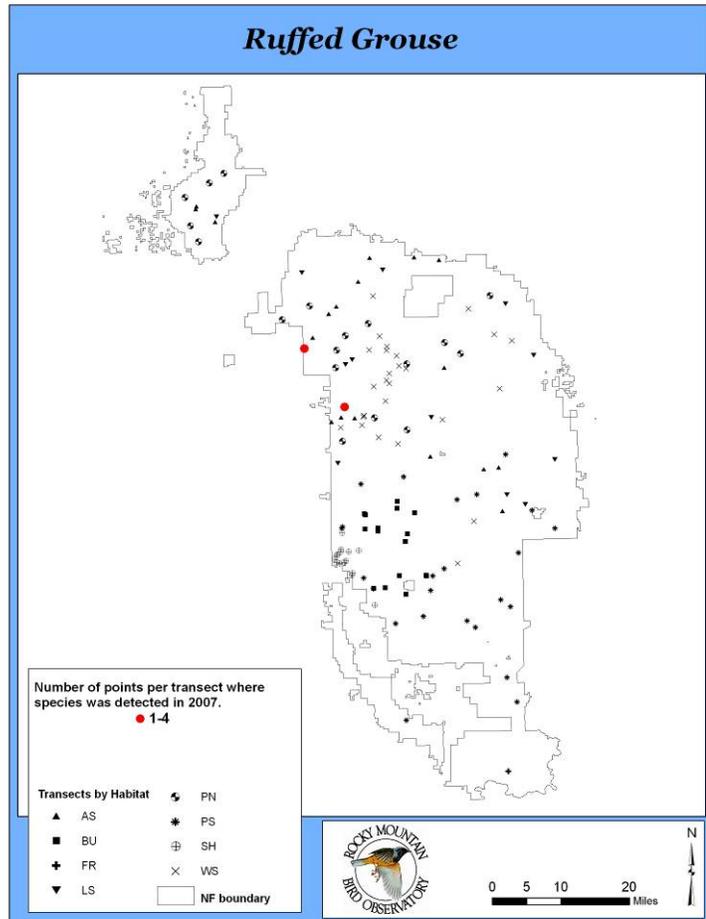
This year we pooled the point-count transect data from 2001 through 2007 in order to determine density estimates for each year. This allowed us to calculate density estimates for some species that would not have had large enough sample sizes if we had used only the 2007 data. This explains why we were able to calculate density estimates for some species, even though they have a small n for 2007. There are many species accounts that do not include density estimates. Unfortunately, there were not enough independent observations of these species to get estimate density. In these cases, n is not included in the table, since it is the number of observations used to calculate density, and this calculation was not performed.

Ruffed Grouse

(BHNF Management Indicator Species)

Ruffed Grouse occurs in low abundance throughout much of the northern Black Hills. In 2007, we only recorded 2 Ruffed Grouse. Both were observed in Aspen habitat on two different transects. In 2002, we detected 62 birds, the highest number in the history of the program, including 17 in Aspen, 16 in pine north and 11 in white spruce.

Ruffed Grouse is difficult to monitor under MBBH because the timing of our surveys does not correspond well with the period of peak detectability of Ruffed Grouse, which occurs earlier in the spring. Thus, the species probably goes undetected on many of our late-spring/early summer surveys. Therefore, these data should not be relied upon to reflect abundance as many individuals are likely missed during our surveys.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Ruffed Grouse for the MBBH monitoring project, 2007.

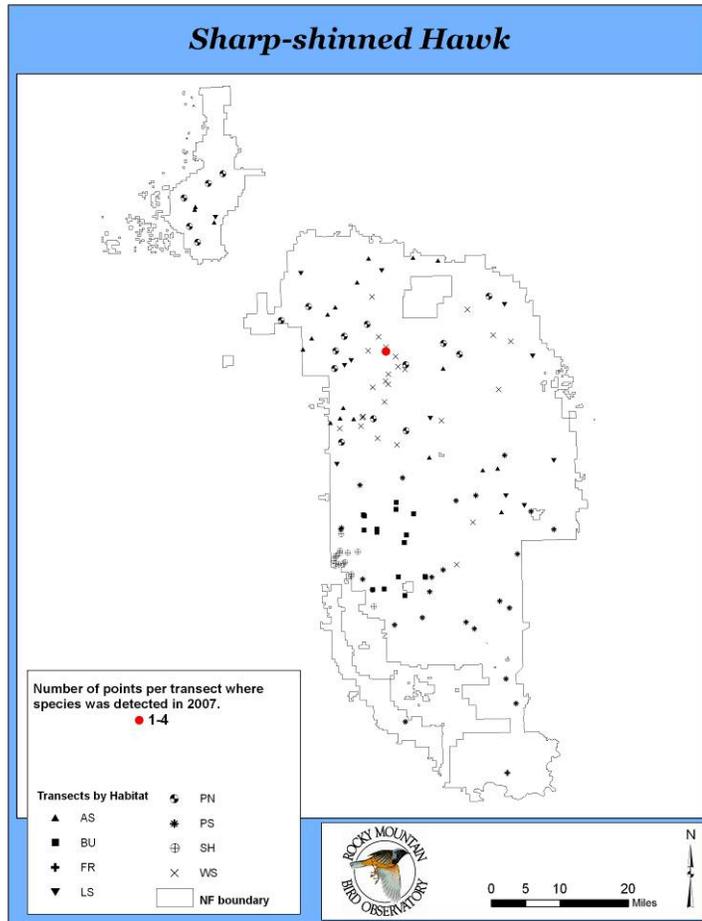
Habitat	D	LCL	UCL	CV	n	N
AS	ID	--	--	--	--	2

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Sharp-shinned Hawk

(BHNH Species of Local Concern)

Sharp-shinned Hawk occurs throughout the Black Hills, but it is perhaps the rarest Accipiter on the National Forest. Only one Sharp-shinned Hawk was observed on transects in 2007. Too few were observed this year to estimate density either within or across habitats. The cumulative observations of Sharp-shinned Hawk across the seven years of MBBH indicate that it is the least common of the three Accipiters (Cooper's Hawk and Northern Goshawk and Sharp-shinned Hawk) in the Black Hills (Appendix B). Interestingly, earlier accounts of this species suggest it was formerly more common (Grinnell 1875, Cary 1901, Pettingil and Whitney 1965). Data from the full spectrum of habitat-based point transect surveys across the Black Hills may provide a means to loosely track the status of Sharp-shinned Hawk over time. Effective



monitoring, however, will likely require more intensive and focused efforts, probably involving call-response surveys or occupancy modeling. Given interest, such a program could be implemented cost-effectively as part of MBBH, with observers using playback to detect this and other forest raptors at count stations after point transect surveys.

Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Sharp-shinned Hawk for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
WS	ID	--	--	--	--	1

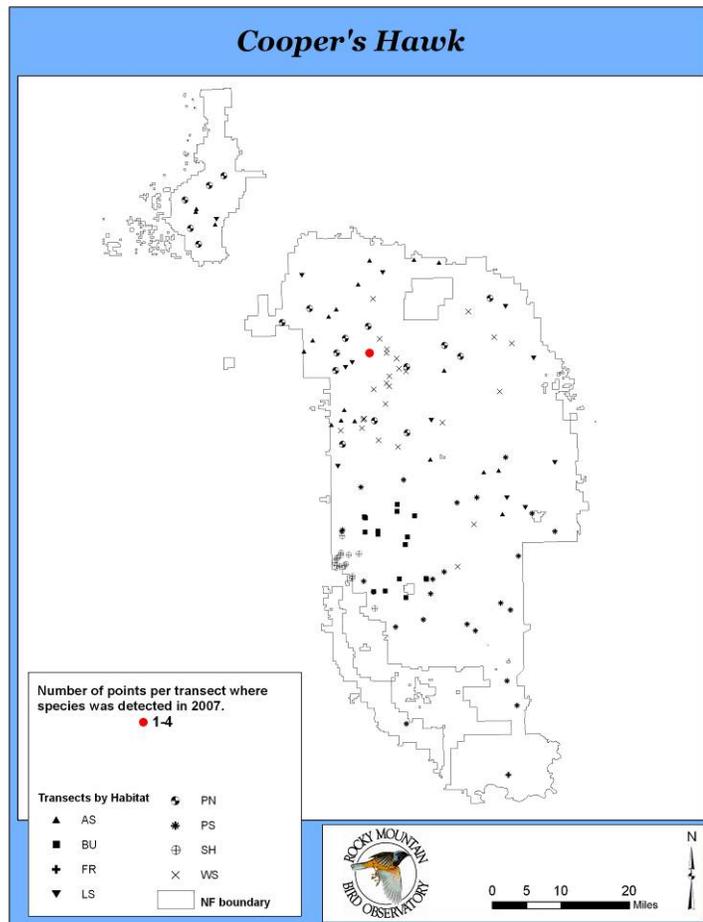
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Cooper's Hawk

(BHNH Species of Local Concern)

Cooper's Hawk occurs throughout the Black Hills; however, Pettingill and Whitney (1965) described this species as "probably uncommon to rare". In 2007 we observed three individuals, one each in burn area, pine-juniper shrubland, and white spruce habitats.

Effective monitoring of the Cooper's Hawk will likely require more intensive and focused efforts, probably involving call-response surveys or occupancy modeling. Given interest, such a program could be implemented cost-effectively as part of MBBH, with observers using playback to detect Cooper's Hawks and other forest raptors at count stations after point-transect surveys.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Copper's Hawk for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	--	1
SH	ID	--	--	--	--	1
WS	ID	--	--	--	--	1

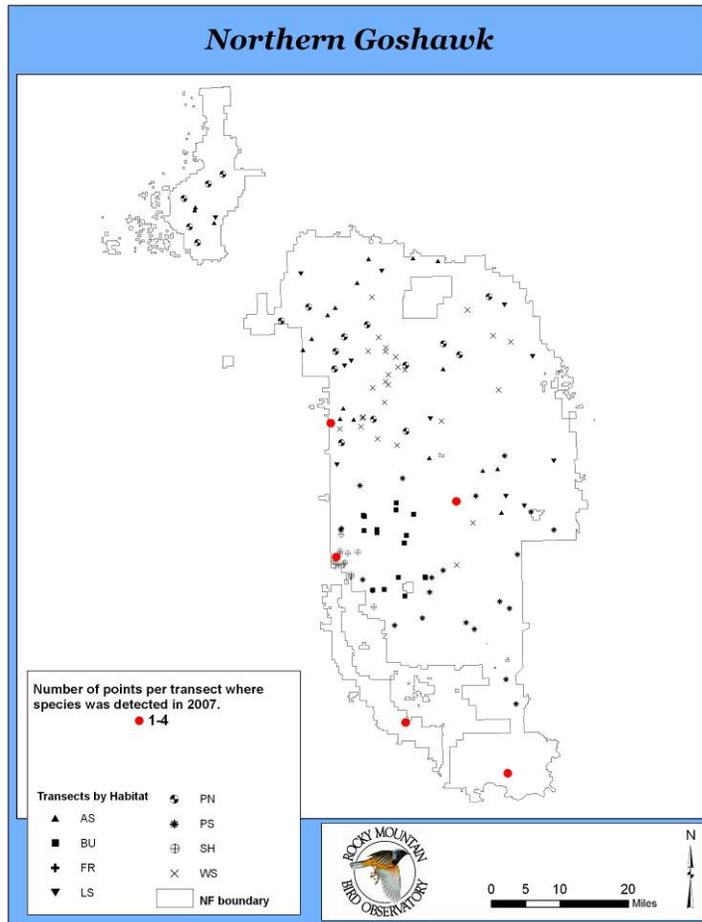
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Northern Goshawk
 (USFS Region 2 Sensitive Species)
 (PIF Species of Regional Concern)
 (WY-PIF Level I Priority)
 (SDGFP Species of Greatest Conservation Need)

Northern Goshawk occurs widely in the Black Hills, although it is rare to uncommon throughout. In 2007, we observed six individuals. Four were observed in ponderosa pine – southern hills. More Northern Goshawk has been observed in MBBH in this habitat type than any other. Montane riparian has the second highest number, but this habitat was not surveyed in 2007.

Northern Goshawk has consistently been the most frequently observed species of *Accipiter* that breeds in the Black Hills, and thus may be more abundant than either Cooper’s Hawk or Sharp-shinned Hawk.

Effective monitoring for this species will likely require more intensive and focused efforts, probably involving call-response surveys such as those implemented through the region-wide Northern Goshawk monitoring program.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Northern Goshawk for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
AS	ID	--	--	--	--	1
PS	ID	--	--	--	--	4
SH	ID	--	--	--	--	1

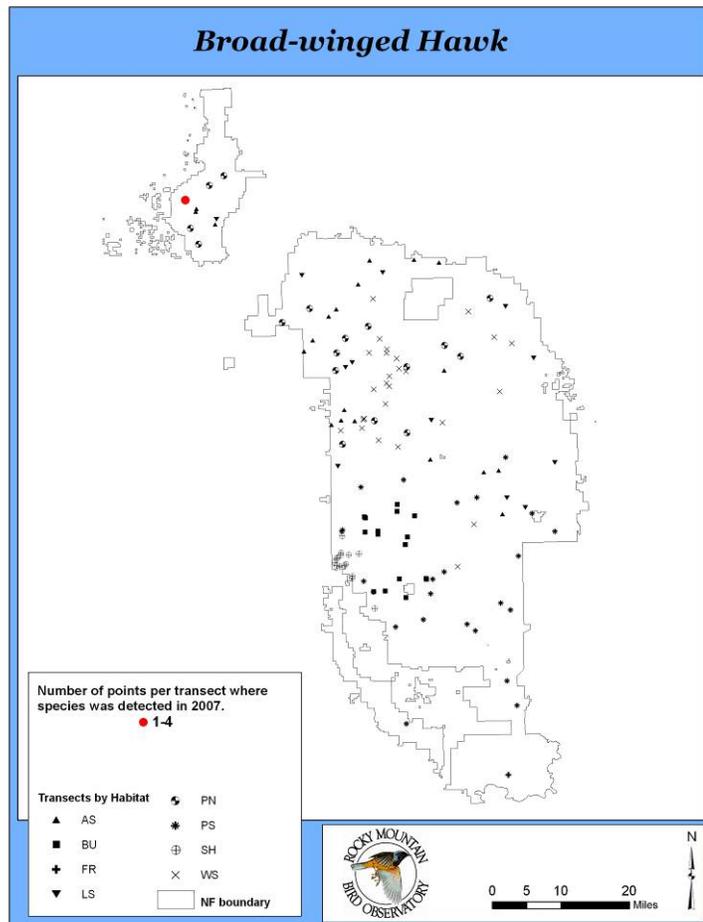
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Broad-winged Hawk

(BHNH Species of Local Concern)

Broad-winged Hawk occurs primarily in the northern Black Hills and Bear Lodge mountains, where it is an uncommon to fairly common summer resident, although the species has been observed in other parts of the Black Hills as well. We observed a cluster of 2 Broad-winged Hawks on the late-successional ponderosa pine transect LS22. This species has been observed on this transect in 2001, 2002, and 2004. In previous years, aspen and late-successional pine habitats have had the highest numbers of Broad-winged Hawks. This year none were observed in aspen.

As with most raptors, Broad-winged Hawks are observed too infrequently to be adequately monitored through point transects in any single habitat. Given interest, it would be possible to reliably monitor Broad-winged Hawks and other forest raptors cost-effectively as part of MBBH. Such a program could be implemented by conducting broadcast surveys for Broad-winged Hawks and other forest raptors along existing MBBH point transects.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Broad-winged Hawk for the MBBH monitoring project, 2007.

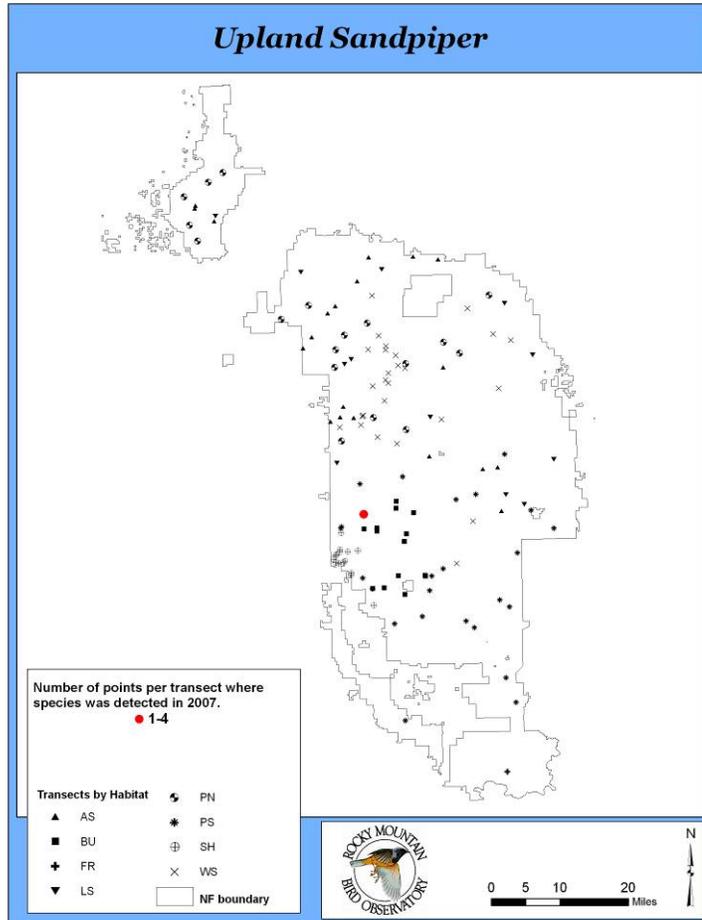
Habitat	D	LCL	UCL	CV	n	N
LS	ID	--	--	--	--	2

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Upland Sandpiper
(WY-PIF Level I Priority)
(USFWS Bird of Conservation Concern for BCR 17)

Upland Sandpiper occurs locally in the Black Hills, primarily in the south, where the species is restricted to large expanses of mixed-grass prairie. In 2007, only one individual was detected in burn area habitat. Upland Sandpiper has been observed most often in mixed-grass prairie, but that habitat was not surveyed in 2007.

While Upland Sandpipers are generally more abundant on the plains surrounding the BHNH, the central plains region, which includes the Black Hills, is considered to be the single most important area for breeding and migratory stopover of this species in North America (Brown et al. 2001). No other Bird Conservation Region (BCR) has a higher average density of this species than BCR17.



Given continued effort in this habitat, it should be possible to calculate density estimates for Upland Sandpiper on the BHNH through the current array of point-transects in mixed-grass prairie. When we pool data over the years, at least 60 detections are required for a sufficient sample size. There were a total of 51 detections in mixed – grass prairie from 2001 to 2006.

Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Upland Sandpiper for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	N	N
BU	ID	--	--	--	--	1

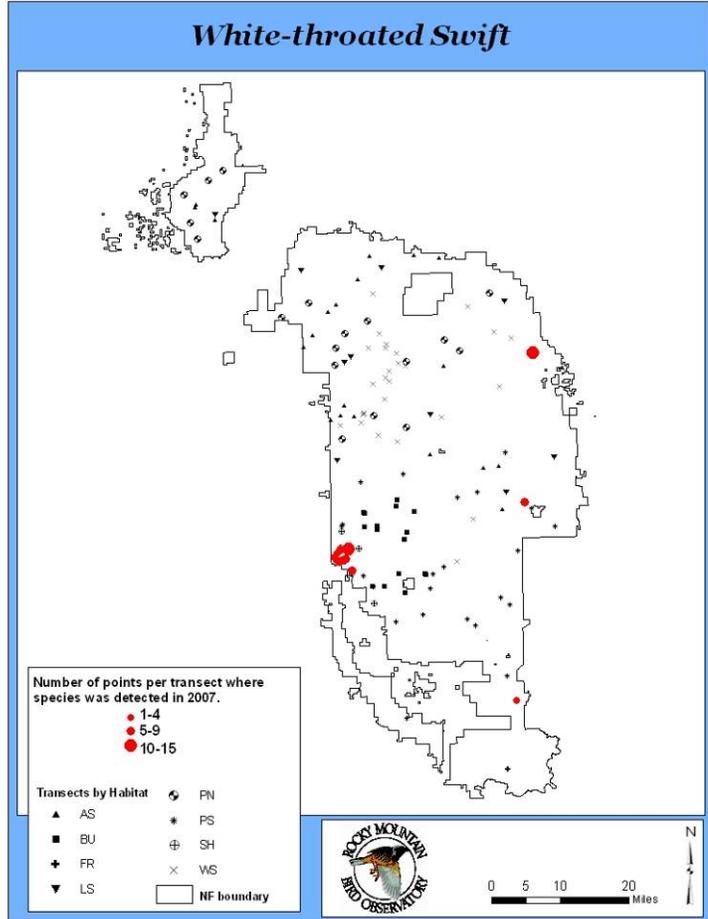
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

White-throated Swift

(PIF Species of Continental Concern)
 (PIF Continental Watch List)
 (WY-PIF Level II Priority)

White-throated Swift is locally common in the Black Hills, particularly at lower elevations, where high cliffs provide suitable nesting sites. Of the habitats surveyed in 2007, detections of White-throated Swifts were sufficient to calculate density only in pine-juniper shrubland. Previous surveys have shown they also occur in high density in foothills riparian habitat. This habitat was not surveyed in 2007.

Because White-throated Swifts are typically observed in flocks, the number of independent observations is often considerably lower than the number of individuals recorded. Effective monitoring of White-throated Swift will best be accomplished through point transects in pine-juniper shrubland and foothills riparian, or through complimentary techniques that specifically target cliff-nesting birds.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for White-throated Swift for the MBBH monitoring project, 2007.

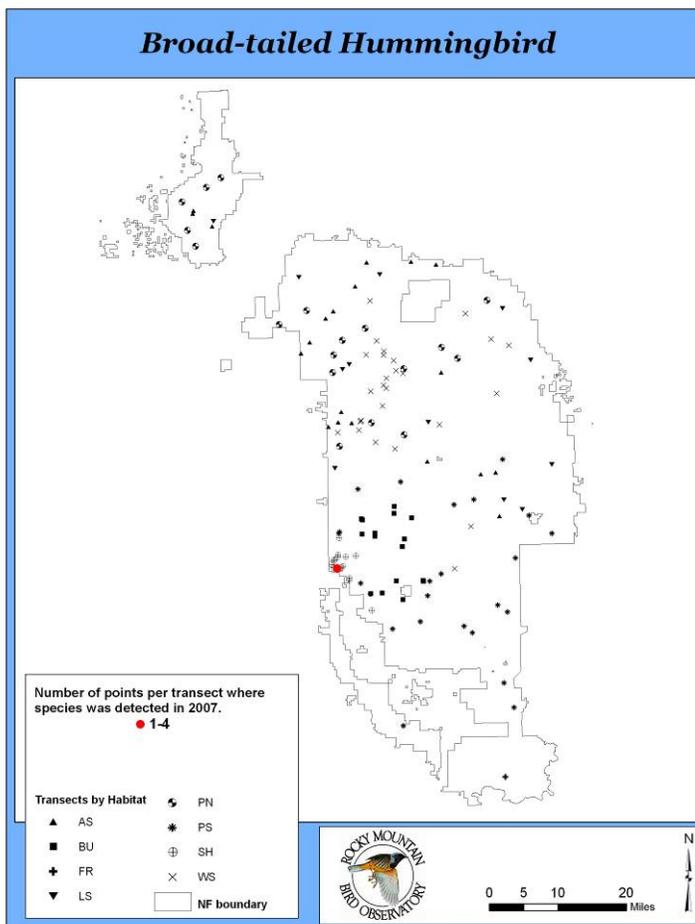
Habitat	D	LCL	UCL	CV	n	N
AS	6.3	3.0	13	46	67	3
BU	ID	--	--	--	--	3
LS	ID	--	--	--	--	13
PS	ID	--	--	--	--	2
SH	10.2	6.0	17.3	33	24	61
WS	ID	--	--	--	--	1

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Broad-tailed Hummingbird (WY-PIF Level II Priority)

Broad-tailed Hummingbird is considered rare in the Black Hills, which represents the extreme northeastern edge of its range. The status of this species in the Black Hills is still not fully clear, but annual sightings of the species during the breeding season and observations of displaying male birds suggest a small but regular breeding population exists. In 2007, RMBO staff recorded only three individuals on two pine-juniper shrubland transects.

It is not likely that this species will be recorded in sufficient numbers to estimate a density on this project. However, transects may provide a means to loosely track the distribution of Broad-tailed Hummingbirds in the Black Hills.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Broad-tailed Hummingbird for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
SH	ID	--	--	--	--	3

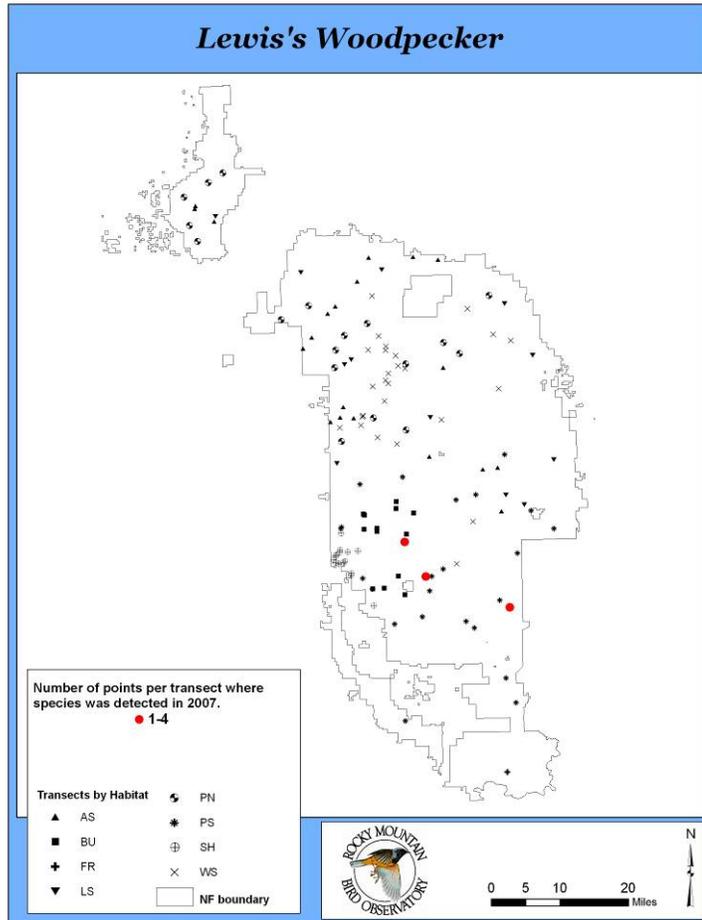
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Lewis's Woodpecker

(USFS Region 2 Sensitive Species)
 (USFWS Bird of Conservation Concern for BCR 17)
 (PIF Species of Continental and Regional Concern)
 (PIF Continental Watch List)
 (WY-PIF Level II Priority)
 (SDGFP Species of Greatest Conservation Need)

Lewis's Woodpecker reaches the most northeasterly extent of its global distribution in the Black Hills, where it is generally uncommon to rare. In 2007, we observed nine individuals on the BBNF. Five were detected in burn area, the habitat where most Lewis's Woodpecker detections have occurred over the years. There were also four individuals detected on one ponderosa pine – southern hills transect, PS44.

Given enough time, burn area transects may provide a means to track Lewis's Woodpecker in the Black Hills, but it is unlikely this will be the case for any other habitat types.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Lewis's Woodpecker for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	--	5
PS	ID	--	--	--	--	4

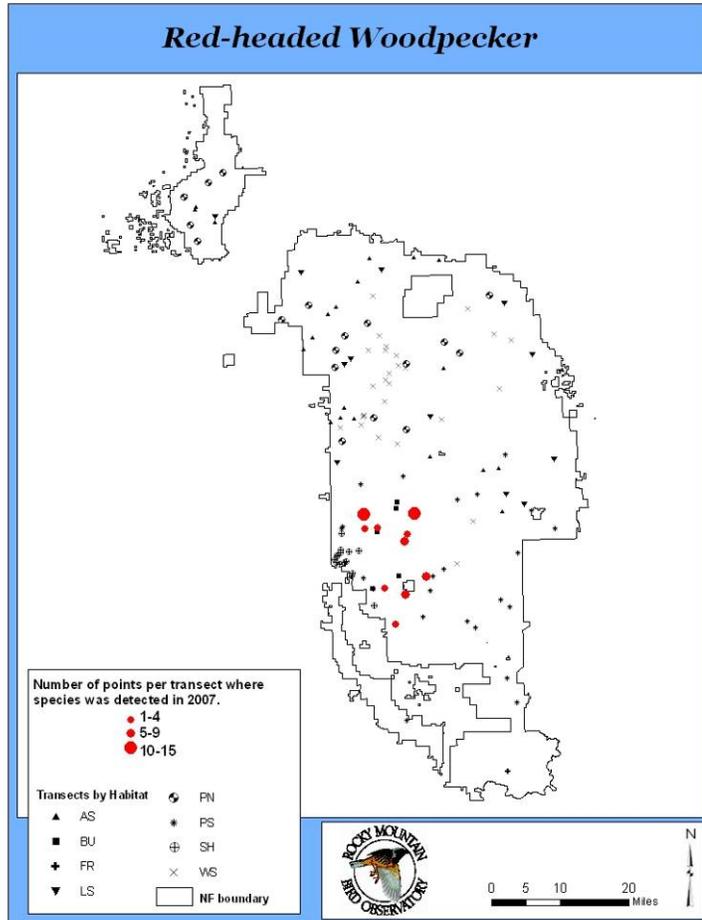
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Red-headed Woodpecker

(PIF Species of Continental and Regional Concern)
(PIF Continental Watch List)

Red-headed Woodpecker occurs locally in the Black Hills, where it is generally uncommon to rare. At present, it occurs in very low densities, primarily in burn areas. In 2007, 48 individuals were detected, 46 of which occurred in burn area habitat. The other two individuals were observed on one ponderosa pine – southern hills transect, PS33.

Red-headed Woodpecker should be effectively monitored under MBBH through point transects in burn areas. As with the other fire-dependent woodpeckers, a sampling scheme that considers all potentially suitable burn areas (e.g., those <20 years old) will likely yield a more accurate picture of this species' population status and trend at the Forest level.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Red-headed Woodpecker for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
BU	1.5	1.0	2.2	23	36	46
PS	ID	--	--	--	--	2

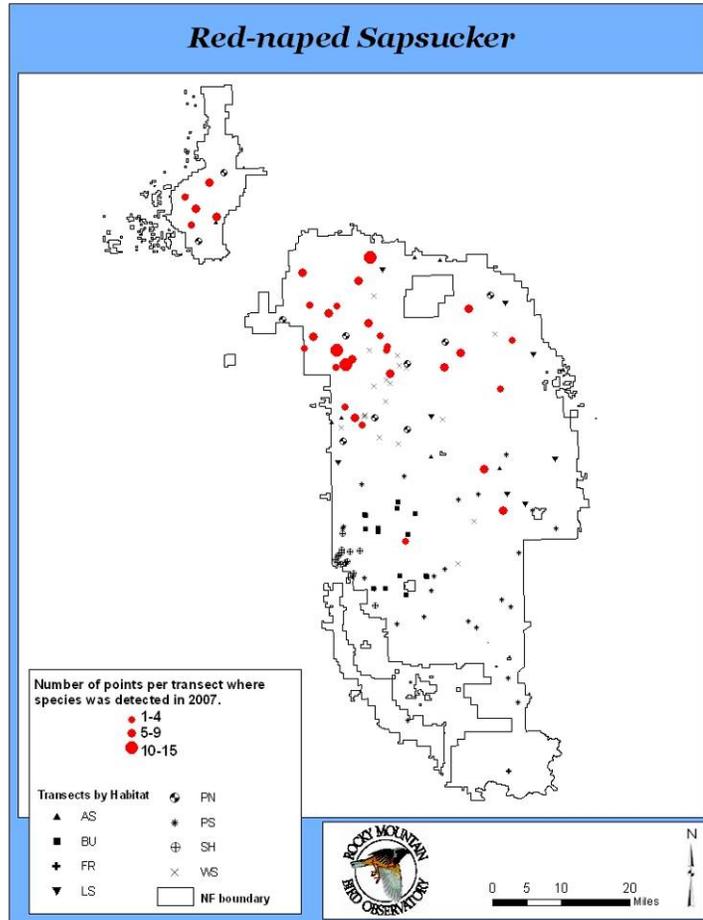
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Red-naped Sapsucker

(USFWS Bird of Conservation Concern for BCR 17)
(WY-PIF Level II Priority)

Red-naped Sapsucker occurs in much of the Black Hills, typically in low to moderate density, but it is most abundant and widespread in the north. The abundance and distribution of Red-naped Sapsucker are largely tied to the availability of broad-leaved, woody vegetation, especially aspen and willows.

Of the habitats surveyed in 2007, Red-naped Sapsucker occurred in highest density in aspen habitat. This species should be effectively monitored under MBBH by point transects in a range of habitats. This year we were able to calculate density estimates for this species in aspen, ponderosa pine – northern hills, late-successional pine, and white spruce. In the past, montane riparian habitat has had the second highest number of individuals, but this habitat was not surveyed in 2007.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Red-naped Sapsucker for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
AS	66.6	16.4	270.1	103	27	50
BU	--	--	--	--	--	2
LS	22.8	6.3	82.8	91	20	22
PN	14.3	6.9	29.8	46	27	28
WS	4.5	2.6	7.9	34	15	16

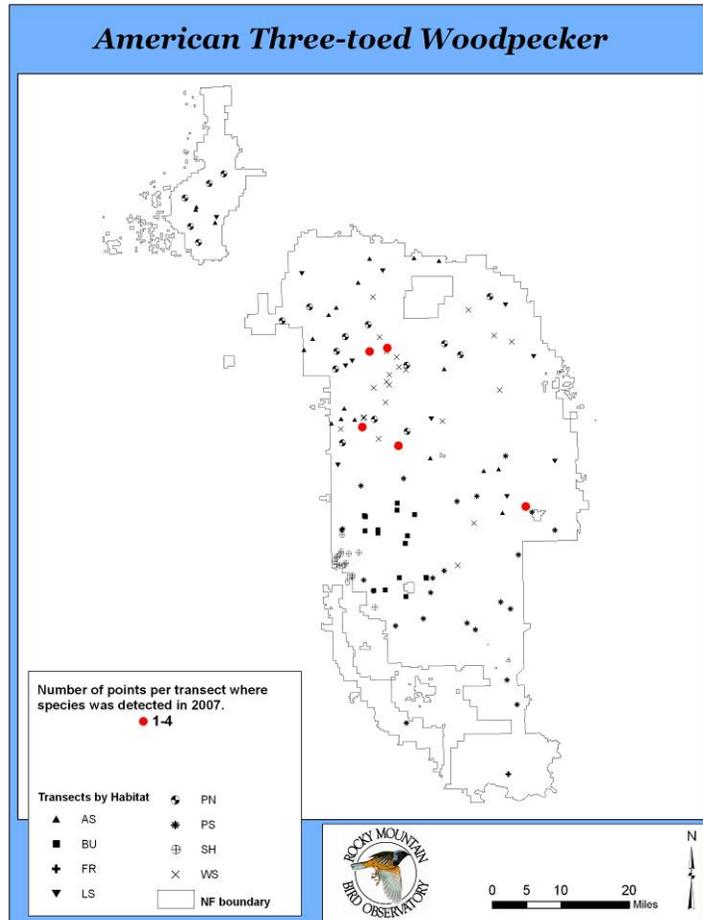
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

American Three-toed Woodpecker

(USFS Region 2 Sensitive Species)
 (SDGFP Species of Greatest Conservation Need)
 (WY-PIF Level II Priority)

In the Black Hills, American Three-toed Woodpecker occurs almost exclusively in mature stands of white spruce, where it is generally found in low abundance. In 2007, there were ten individuals observed in white spruce and one in late-successional pine habitat.

American Three-toed Woodpeckers apparently do not exploit burned ponderosa pine forests in the Black Hills, as none have been recorded to date in the Jasper burn. American Three-toed Woodpecker should be effectively monitored under MBBH through point transects in white spruce. This year we were able to calculate a density estimate for American Three-toed Woodpecker in white spruce.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for American Three-toed Woodpecker for the MBBH monitoring project, 2007.

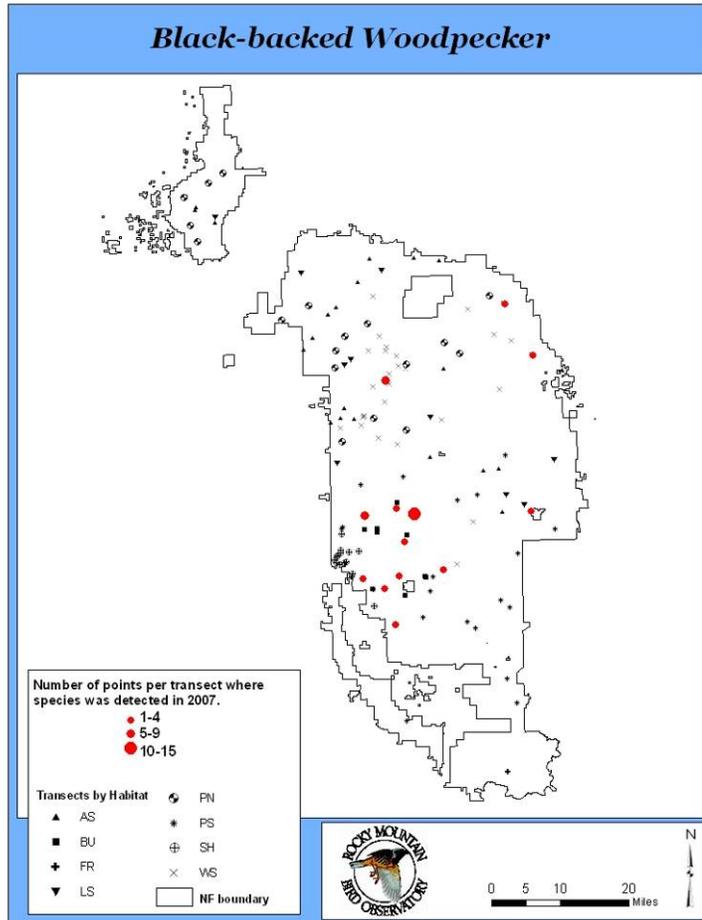
Habitat	D	LCL	UCL	CV	n	N
LS	ID	--	--	--	--	1
WS	1.6	0.8	3.2	41	10	10

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Black-backed Woodpecker
 (USFS Region 2 Sensitive Species)
 (SDGFP Species of Greatest Conservation Need)
 (BHNF Management Indicator Species)
 (PIF Species of Regional Concern)
 (WY-PIF Level II Priority)

Black-backed Woodpecker occurs widely in the Black Hills, but is rare outside of burn areas. In 2007, we recorded 38 individuals, 24 of which occurred in burn area habitat. Eight individuals were observed in ponderosa pine – southern hills habitat.

As conditions change in the Jasper burn it will become necessary to focus effort on other burn areas in order to monitor this species at the Forest-level in the Black Hills. Alternatively, a greater number of sites randomly selected from known burned areas on the Forest may provide a means to monitor Black-backed Woodpeckers and other high priority species that also depend on burns. For example, Lewis’s and Red-headed Woodpeckers depend on older burns. Surveying a random selection of all available burns should allow for inference to Forest-wide population status and trends for a variety of burn-dependent species.



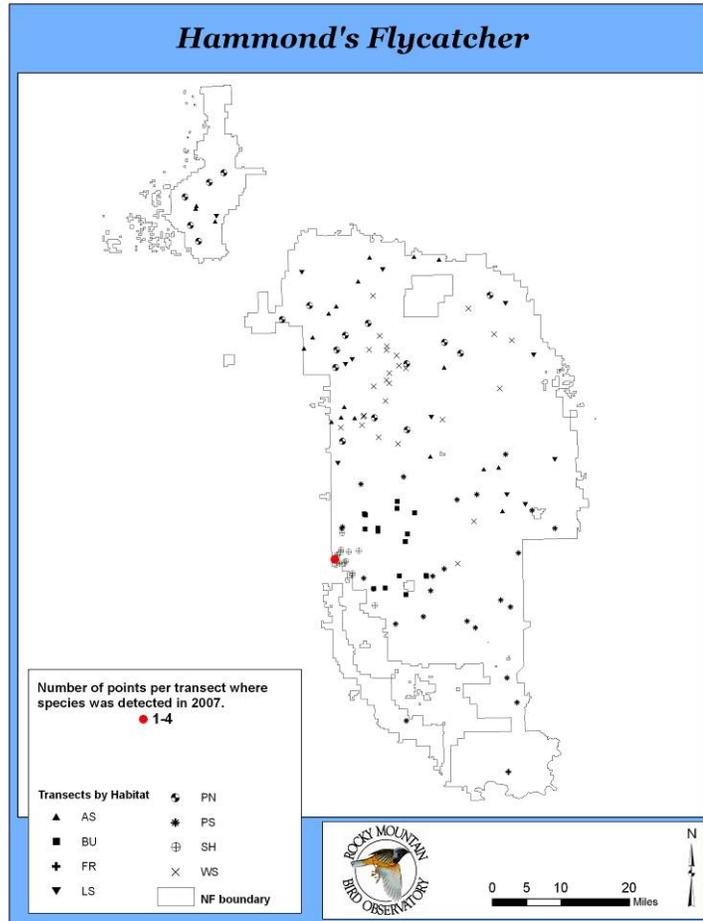
Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Black-backed Woodpecker for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
AS	ID	--	--	--	--	1
BU	2.4	1.2	4.9	42	16	24
LS	ID	--	--	--	--	2
PS	ID	--	--	--	--	8
WS	ID	--	--	--	--	3

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Hammond's Flycatcher (WY-PIF Level II Priority)

There were only two individual Hammond's Flycatchers detected in the Black Hills in 2007. They were detected in ponderosa pine – southern hills and pine-juniper shrubland habitats. We have never detected Hammond's Flycatcher in either of these habitats until this year. Only one transect was conducted in foothills riparian, the habitat where we most commonly observe this species. Hammond's Flycatcher is not previously known to breed in this region, but the recent discovery in 2005 and 2006 of this species at multiple locations in the Black Hills suggests a regular breeding population may exist. However, careful identification by observers will be necessary to determine the extent of the species' population in the Black Hills. Because of the similarity of this species to the more common and widespread Dusky Flycatcher, RMBO will continue to heavily emphasize identification of these two species in future training sessions.



It is not likely that this species will be recorded in sufficient numbers to estimate a density on this project. However, transects may provide a means to loosely track Hammond's Flycatcher in the Black Hills.

Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Hammond's Flycatcher for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
PS	ID	--	--	--	--	1
SH	ID	--	--	--	--	1

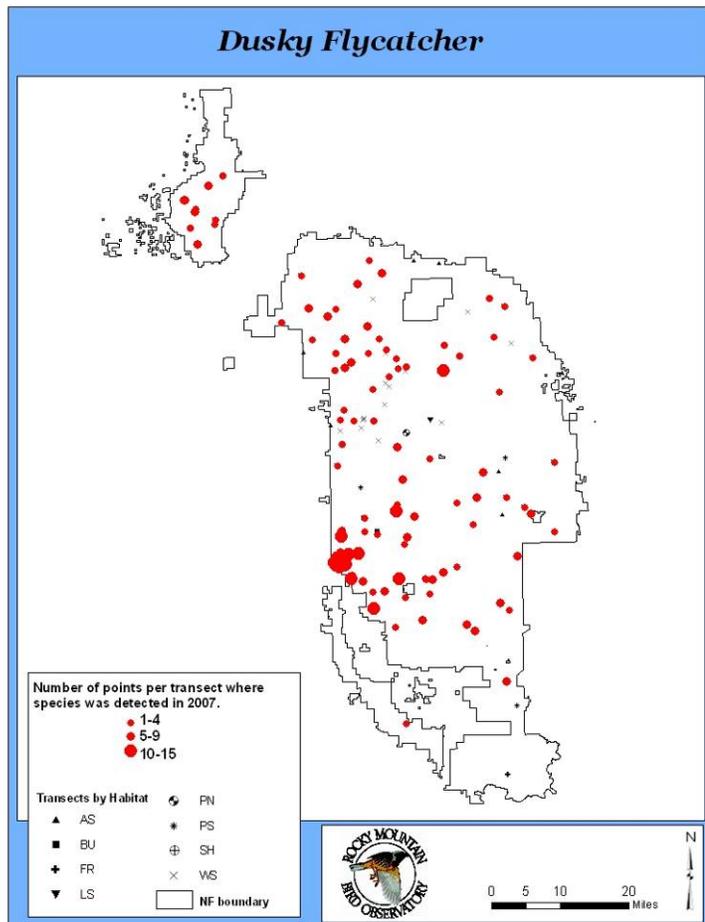
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Dusky Flycatcher (WY-PIF Level II Priority)

Dusky Flycatcher occurs widely throughout the Black Hills, and is generally common to abundant, although its density varies considerably among habitats. The abundance of this species appears to be tied with the prevalence of broad-leaved, deciduous vegetation of almost any kind.

Of the habitats surveyed in 2007, density was greatest in pine-juniper shrubland. We were able to calculate density estimates for this species in seven habitats this year. Montane riparian habitat, which has the second highest number of observations for Dusky Flycatcher, was not surveyed in 2007.

Dusky Flycatcher should be effectively monitored through point-transects in a wide range of habitats under MBBH, especially pine-juniper-shrubland, montane riparian, and aspen.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Dusky Flycatcher for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
AS	48.2	30.5	76.2	28	93	93
BU	26.3	17.6	39.2	24	102	104
LS	15.8	10.4	24.0	24	43	47
PN	38.8	25.1	59.9	27	99	103
PS	47.9	36.3	63.1	17	176	184
SH	134.1	114.2	157.6	9	389	405
WS	8.9	5.9	13.2	24	44	44

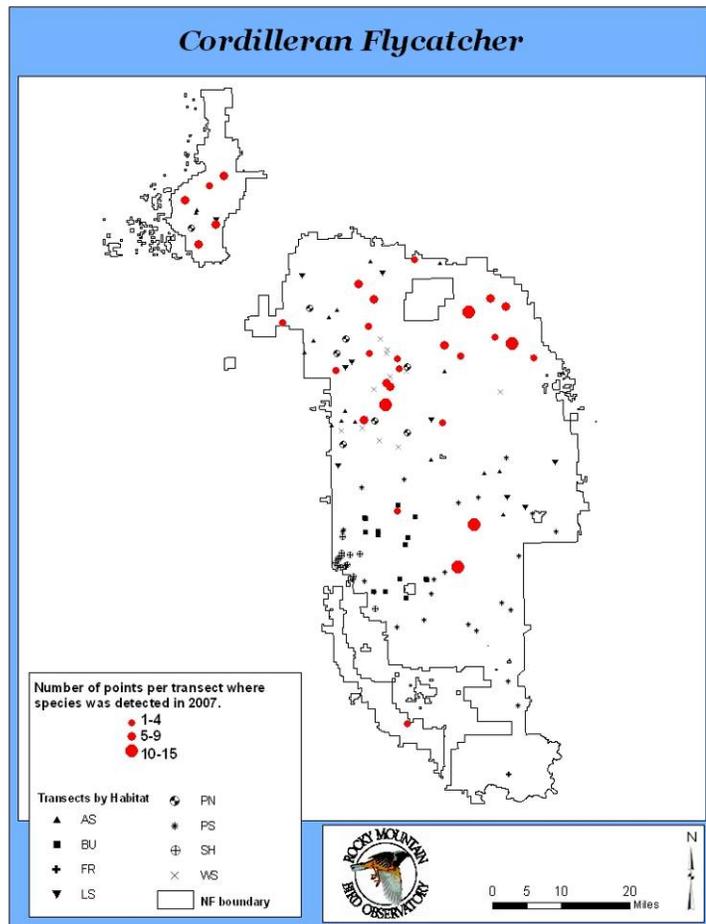
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Cordilleran Flycatcher (WY-PIF Level II Priority)

Cordilleran Flycatcher occurs widely in the Black Hills, but its distribution is tied closely to the availability of broad-leaved, deciduous vegetation in close proximity to suitable nest sites, primarily cliffs, rock outcrops, and other ledges, including human-built structures. The species seems to have a strong preference for moist canyons with abundant broad-leaved, deciduous vegetation.

Of the habitats surveyed in 2007, estimated density was highest in white spruce habitat. Cordilleran Flycatchers are most abundant along the bottoms of steep canyons which are prevalent in most foothills riparian sites in the Black Hills. This year we did not survey foothills riparian or montane riparian habitat.

Cordilleran Flycatcher should be effectively monitored under MBBH through point-transects in a range of habitats, especially foothills riparian, montane riparian, and white spruce.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Cordilleran Flycatcher for the MBBH monitoring project, 2007.

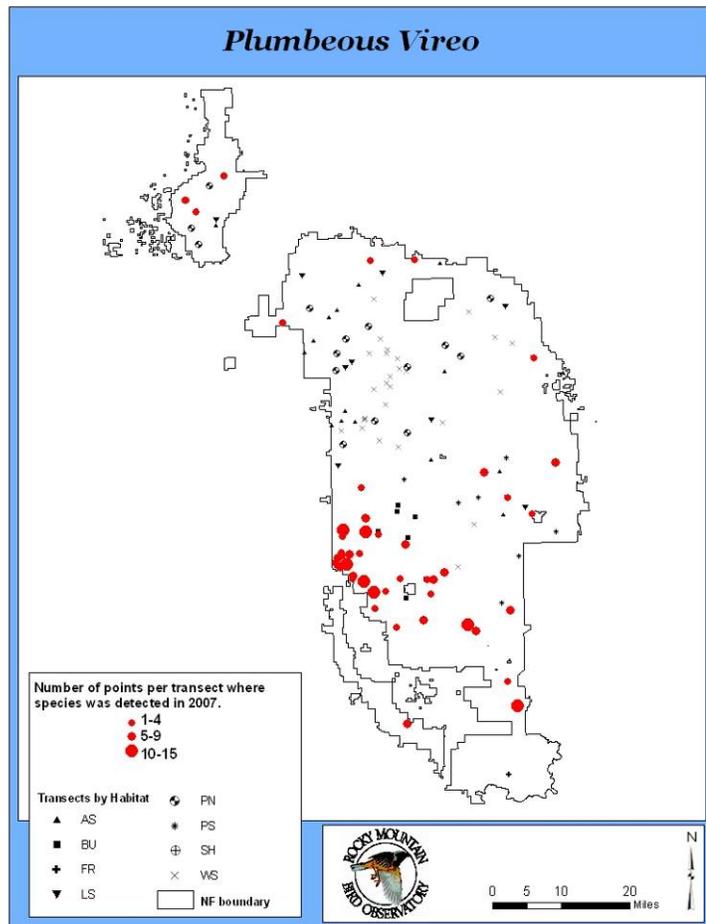
Habitat	D	LCL	UCL	CV	n	N
AS	6.0	3.1	11.9	42	20	20
BU	ID	--	--	--	--	2
LS	5.0	2.5	10.0	42	10	10
PN	3.1	1.9	5.1	29	14	16
PS	0.2	0.1	1.2	117	3	3
SH	ID	--	--	--	--	2
WS	20.0	12.8	31.1	27	97	98

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Plumbeous Vireo (WY-PIF Level II Priority)

Plumbeous Vireo occurs in ponderosa pine forests throughout the Black Hills in low to moderate abundance, but it is most abundant at lower elevations, especially in the southwest. The species is often recorded in a variety of habitats, but its presence is tied to the availability of pine forests. In 2007, we detected this species in all seven habitat types surveyed, and we were able to calculate density estimates for four of these habitats. Overall, Plumbeous Vireo achieves its highest density in the Black Hills in the pine-juniper shrubland of the southwestern hills, although they are also fairly common in the southern ponderosa pine forests (Panjabi 2003, 2004).

Plumbeous Vireo should be effectively monitored under MBBH through point-transects in a range of habitats, such as burn area, pine south, and pine-juniper shrubland.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Plumbeous Vireo for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
AS	ID	--	--	--	--	8
BU	4.7	2.9	7.8	30	31	36
LS	ID	--	--	--	--	9
PN	0.7	0.3	1.8	54	6	6
PS	8.2	6.2	10.8	16	97	102
SH	14.8	11.5	19.1	15	78	81
WS	ID	--	--	--	--	2

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

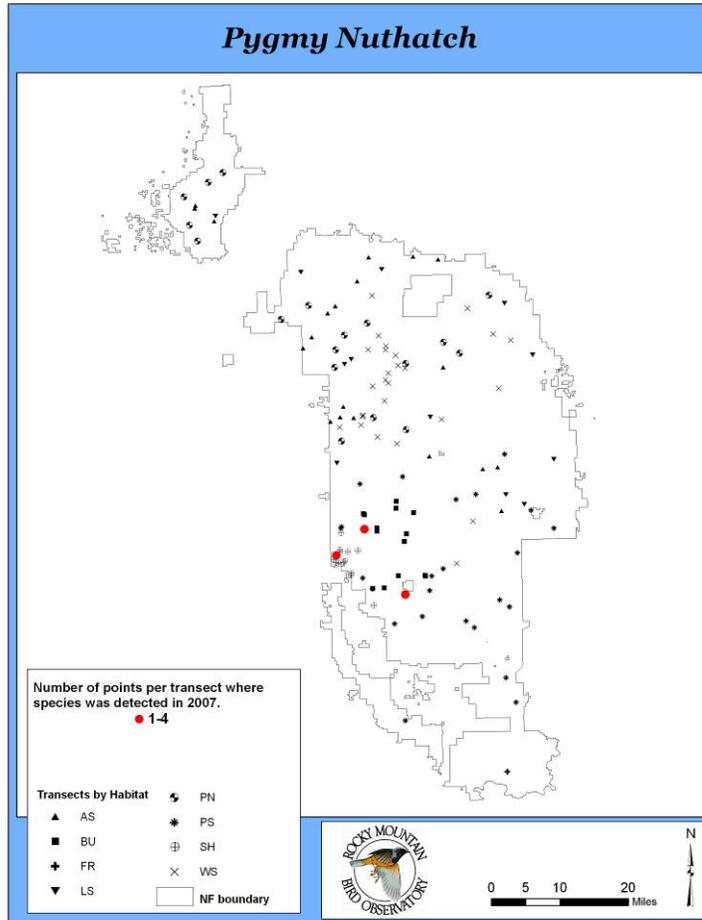
Pygmy Nuthatch

(BHNF Species of Local Concern)
(WY-PIF Level II Priority)

Pygmy Nuthatch is a rare but regular, and apparently widespread, resident in the Black Hills. In 2007, we observed six Pygmy Nuthatches, five in burn area and one in pine-juniper shrubland habitat.

Contrary to a published account (Tallman et al. 2002), data generated from MBBH (Panjabi 2001, 2003a) suggest this species is not restricted to only the eastern and southern edges of the Black Hills, as it has been recorded on point transects away from these areas in both the central and northwestern hills. Since the inception of MBBH in 2001, 19 Pygmy Nuthatches have been observed in total across eight different habitat types.

Due to its rarity, localized nature, and unpredictable distribution, Pygmy Nuthatch will not likely be rigorously monitored using point transects under MBBH. Monitoring pairs or colonies at known nesting sites, which are few in number, could provide information on the persistence of localized populations. More focused research on the demography and habitat requirements of this species in the Black Hills is warranted, especially given its well-documented preference for ponderosa pine in other locations throughout the region.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Pygmy Nuthatch for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	--	5
SH	ID	--	--	--	--	1

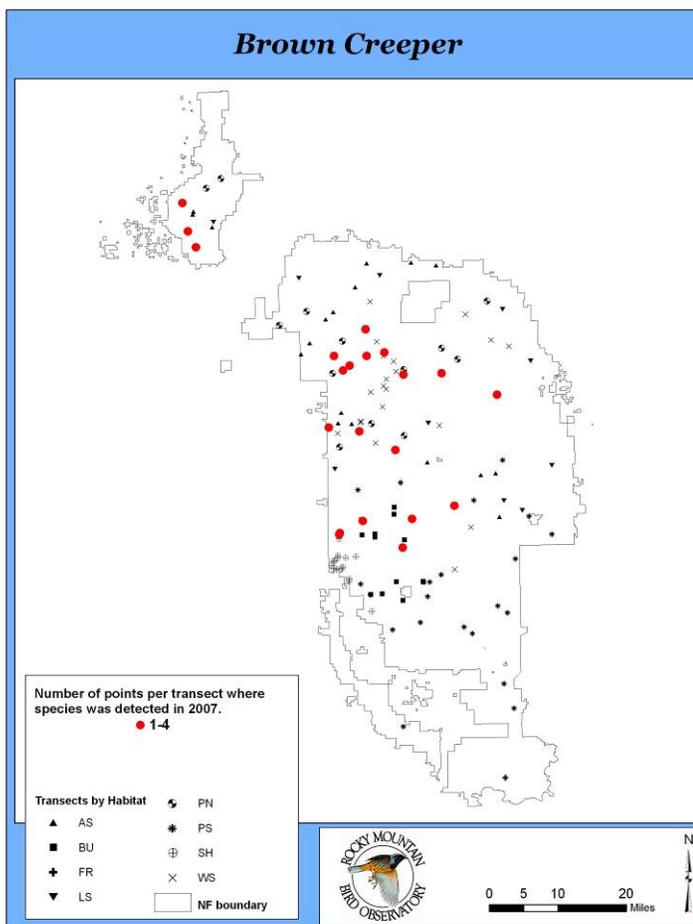
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Brown Creeper

(BHNH Management Indicator Species)
(WY-PIF Level II Priority)

Brown Creeper occurs in low abundance in coniferous forests throughout the Black Hills, but its presence is strongly tied to mature and old-growth forest conditions. In 2007, we detected 35 Brown Creeper across six different habitat types. Surveys in previous years have shown that they occur in highest densities in late-successional pine stands, which typically contain a high proportion of mature and old-growth forest conditions (Panjabi 2001, 2003).

Brown Creeper should be effectively monitored through point transects under MBBH, particularly in ponderosa pine – northern hills, white spruce, and late-successional pine stands.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Brown Creeper for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
AS	ID	--	--	--	--	3
BU	ID	--	--	--	--	3
LS	2.9	1.0	8.0	62	4	6
PN	2.4	1.1	5.2	48	7	8
PS	1.2	.5	3.1	59	4	5
WS	2.2	1.1	4.4	42	10	10

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

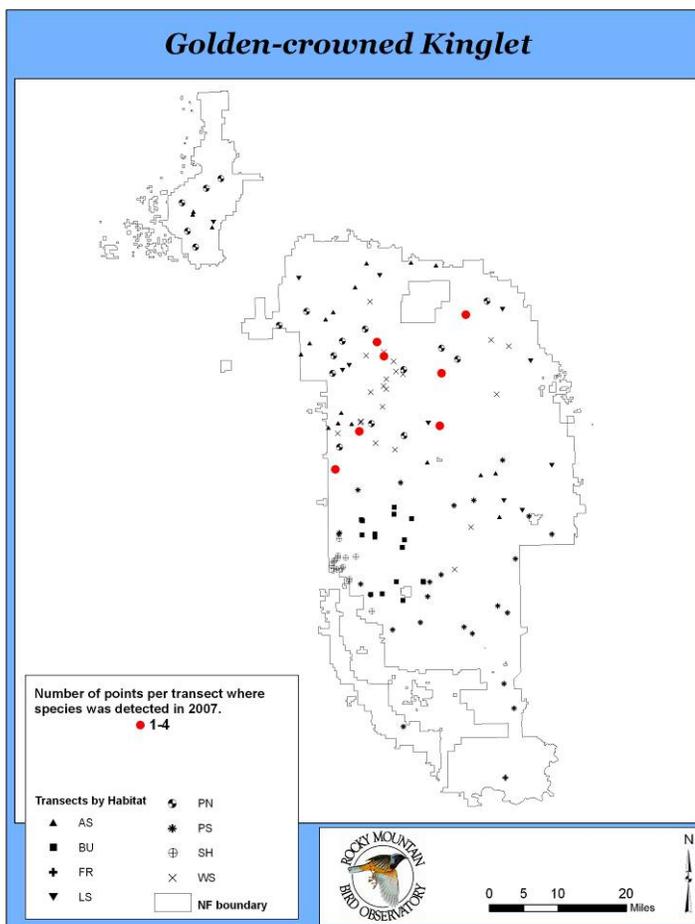
Golden-crowned Kinglet

(BHNH Management Indicator Species)
(WY-PIF Level II Priority)

Golden-crowned Kinglet breeds almost exclusively in white spruce forests in the Black Hills. Observations of individuals in other habitats reflect the prevalence of white spruce at sites within other habitats.

In 2007, we observed 21 individuals, 16 of which occurred in white spruce habitat. We were able to calculate a density estimate for Golden-crowned Kinglets in this habitat in 2007.

Golden-crowned Kinglet should be effectively monitored through point transects in white spruce habitat, and possibly in foothills riparian, montane riparian, and ponderosa pine – northern hills habitats.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Golden-crowned Kinglet for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
AS	ID	--	--	--	--	2
LS	ID	--	--	--	--	3
WS	5.4	2.2	13.2	56	16	16

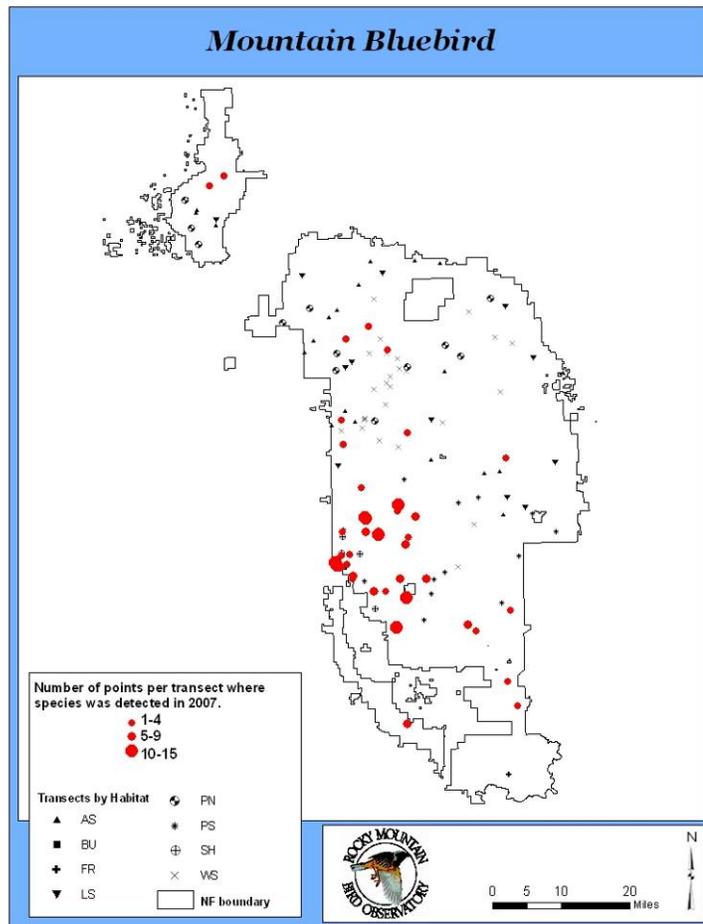
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Mountain Bluebird

(PIF Species of Regional Concern)

Mountain Bluebird occurs locally throughout the Black Hills, occupying burned areas, grassland, shrubland, and other open areas. Of the habitats surveyed in 2007, density was greatest in burn area habitat. This year we analyzed data collected since 2001, and according to our calculations species' density has risen steadily each year until 2007. The density estimate for 2005 was about the same as in 2007 (this habitat was not surveyed in 2006). We anticipate the density of Mountain Bluebirds in the Jasper Burn will stabilize and decrease as the burn ages.

Mountain Bluebird is a secondary cavity nester and requires open landscapes for hunting, thus it is not surprising that it has responded positively to the Jasper burn. Mountain Bluebird should be effectively monitored under MBBH through point transects in a variety of habitats, including mixed-grass prairie and burn area.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Mountain Bluebird for the MBBH monitoring project, 2007.

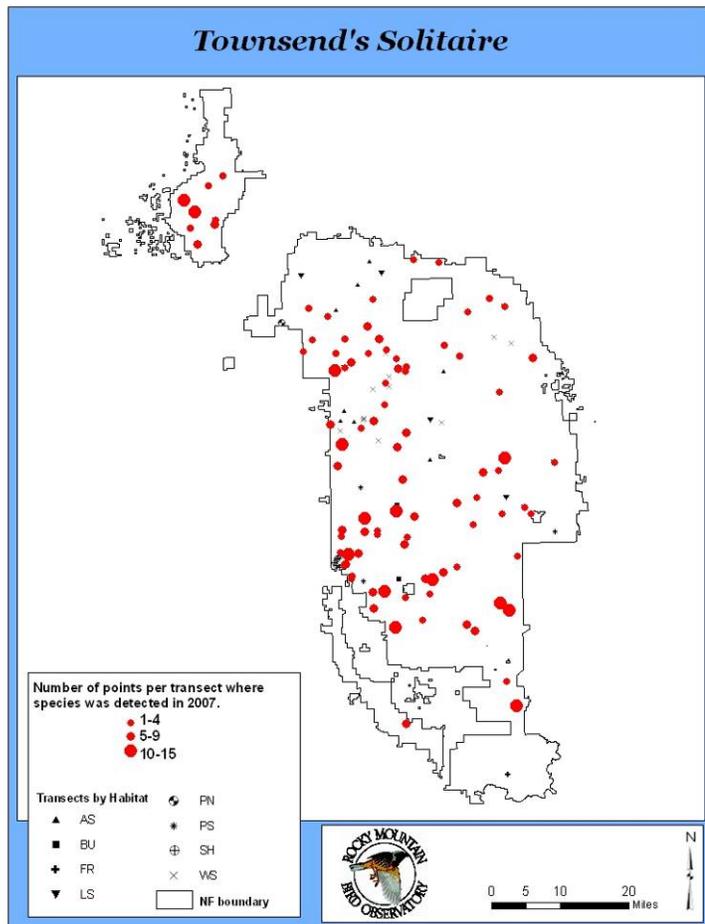
Habitat	D	LCL	UCL	CV	n	N
AS	ID	--	--	--	--	4
BU	47.8	35.2	64.8	18	111	144
LS	ID	--	--	--	--	1
PN	ID	--	--	--	--	11
PS	6.0	3.1	11.5	39	43	47
SH	14.5	7.4	28.1	40	42	53
WS	ID	--	--	--	--	5

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Townsend's Solitaire (WY-PIF Level II Priority)

Townsend's Solitaire occurs throughout the Black Hills in low to moderate abundance. We observed 491 individuals across all seven habitat types surveyed in 2007. We were able to calculate density estimates for this species in all seven habitats. Estimated density was highest in ponderosa pine – northern hills,

Townsend's Solitaire should be effectively monitored under MBBH through point-transects in a variety of habitats including aspen, ponderosa pine, and pine-juniper shrubland.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Townsend's Solitaire for the MBBH monitoring project, 2007.

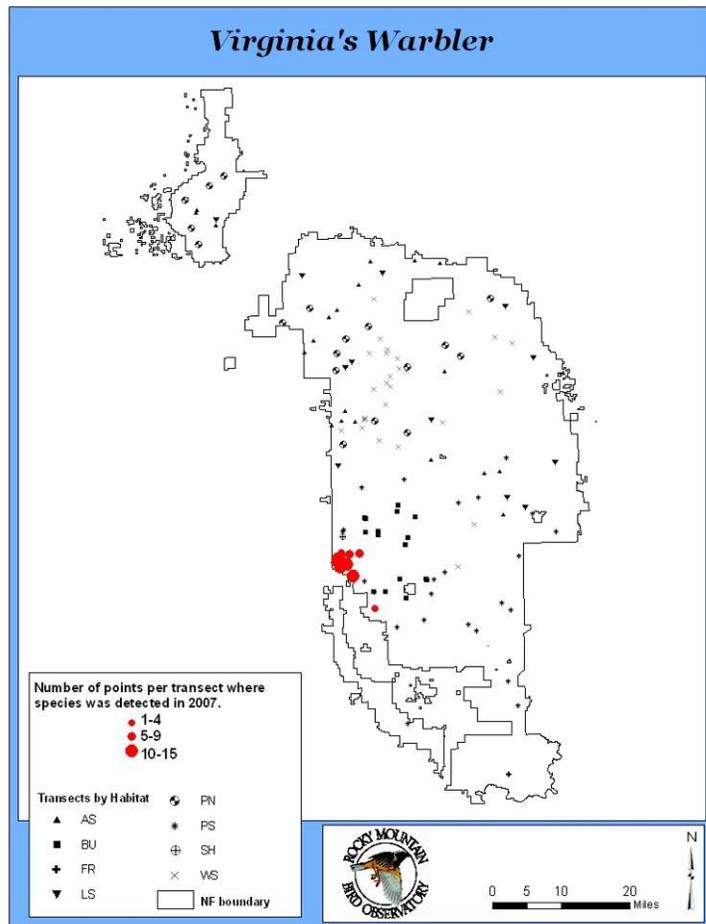
Habitat	D	LCL	UCL	CV	n	N
AS	4.5	3.3	6.1	18	52	56
BU	5.2	3.6	7.4	21	66	87
LS	3.5	2.1	5.7	28	26	29
PN	9.0	6.8	11.9	17	84	87
PS	7.2	5.4	9.6	17	119	137
SH	5.5	3.4	8.9	28	40	53
WS	2.1	1.5	2.9	21	42	42

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Virginia's Warbler (PIF Continental Watch List)

Virginia's Warbler reaches the most northeasterly extent of its global breeding range in the Black Hills. It is fairly common to common in the pine-juniper shrubland habitat of the southwest and does not occur in areas lacking a mountain mahogany and skunkbrush understory. The species was only discovered breeding in the Black Hills as recently as 1990, but it is unclear whether it was simply overlooked previously or whether it is a recent colonizer of this area.

In 2007, there were 79 observations of Virginia's Warbler, 78 of which occurred in pine-juniper shrubland. Virginia's Warbler should be adequately monitored under MBBH through point transects in pine-juniper shrubland. We have collected sufficient data to calculate density estimates for this species in this habitat.



Virginia's Warbler is on the Partners in Flight North American Watch List due to its small population size and restricted distribution. Although it is not presently known to be highly threatened, there is inadequate data to assess its population trend at the continental level.

Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Virginia's Warbler for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
PS	ID	--	--	--	--	1
SH	29.8	19.6	45.2	25	74	78

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

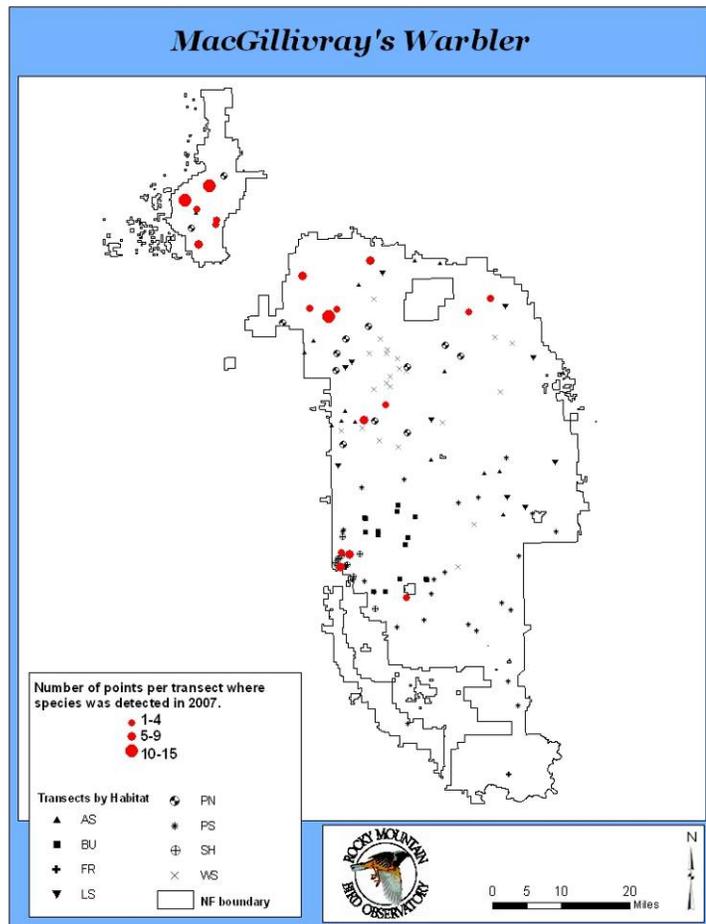
MacGillivray's Warbler

(WY-PIF Level II Priority)

MacGillivray's Warbler ranges throughout much of the Black Hills, but it is fairly local outside of the northern hills. It is most abundant in the northwestern Black Hills and Bear Lodge Mountains.

MacGillivray's Warbler is found primarily in riparian habitats, where it can occur in moderately high density. It also occupies brushy clearings, especially with oaks, both within coniferous and broad-leaved forests. Of the habitats surveyed in 2007, density was highest in aspen, followed closely by ponderosa pine – northern hills. This year we did not survey any riparian habitats.

MacGillivray's Warblers should be effectively monitored under MBBH through point-transects in a variety of habitats, especially montane riparian and foothills riparian.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for MacGillivray's Warbler for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
AS	10.8	4.9	23.8	49	23	26
BU	ID	--	--	--	--	2
LS	5.9	2.2	15.8	61	14	14
PN	8.8	4.0	19.6	49	17	22
SH	ID	--	--	--	--	14
WS	ID	--	--	--	--	9

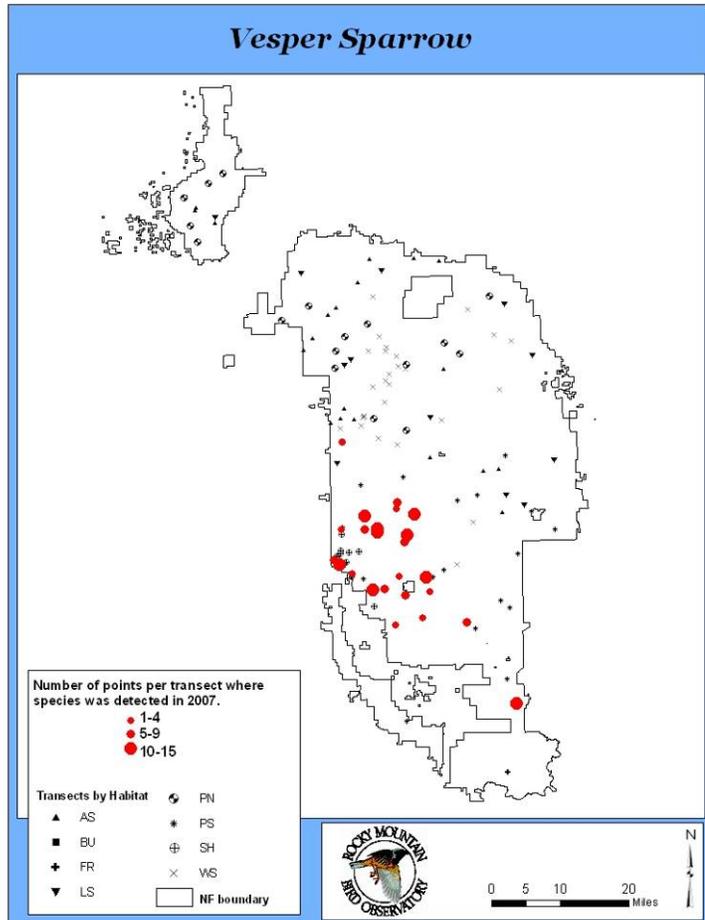
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Vesper Sparrow

(PIF Species of Regional Concern)
 (PIF Regional Stewardship Species)
 (WY-PIF Level II Priority)

Vesper Sparrow occurs widely in the Black Hills, primarily in grassy openings, and especially in the native prairies of the southern and central hills. While the species does require grassland, it seems to be less common in wide-open prairies with no trees than in the prairie-forest ecotone. Densities of this species are generally highest in the mixed-grass prairie and burn area. This year we did not survey mixed-grass prairie.

Vesper Sparrow should be effectively monitored under MBBH through point-transects in mixed-grass prairie and burn area.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Vesper Sparrow for the MBBH monitoring project, 2007.

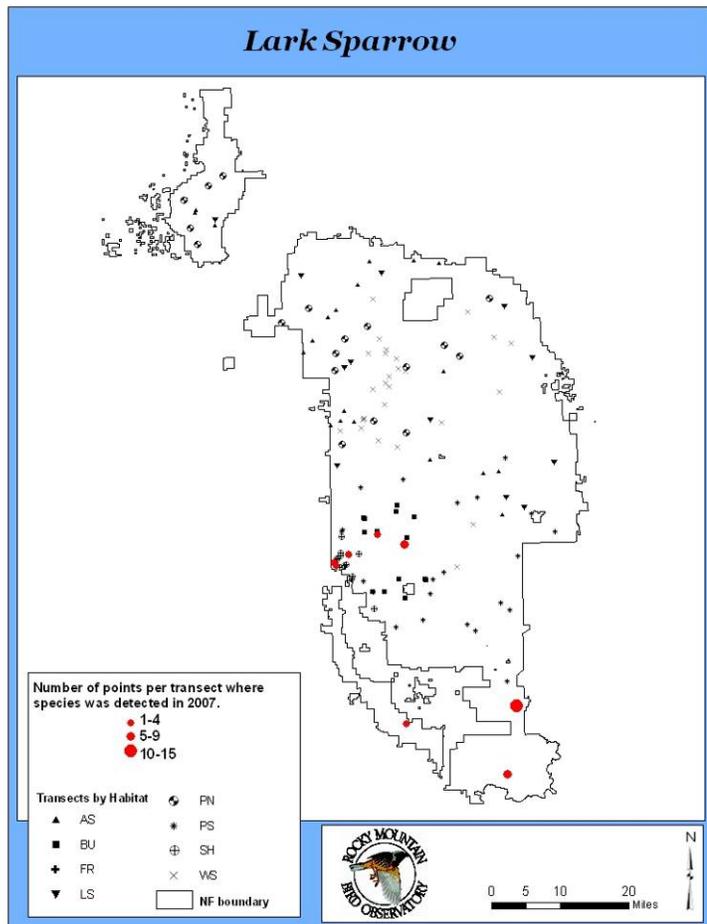
Habitat	D	LCL	UCL	CV	n	N
AS	ID	--	--	--	--	1
BU	14.4	10.4	19.8	19	190	206
PN	ID	--	--	--	--	2
PS	2.0	1.2	3.4	32	40	45
SH	3.1	1.3	7.2	52	31	35

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Lark Sparrow

(WY-PIF Level II Priority)

Lark Sparrow has a limited distribution in the Black Hills, occurring mainly in the southern portion of the survey area in foothills riparian and mixed-grass prairie habitats. However, it can be found in a variety of locations including prairies, roadsides, farms, open woodlands, and mesas. This year neither foothills riparian nor mixed-grass prairie was surveyed. However, we still detected 21 individuals in three habitats. We were able to estimate density of Lark Sparrow in one habitat, ponderosa pine – southern hills. This species is well-monitored under MBBH through point transects, especially in mixed-grass prairie and foothills riparian habitat.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Lark Sparrow for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	--	5
PS	4.5	1.3	15.2	83	11	12
SH	ID	--	--	--	--	4

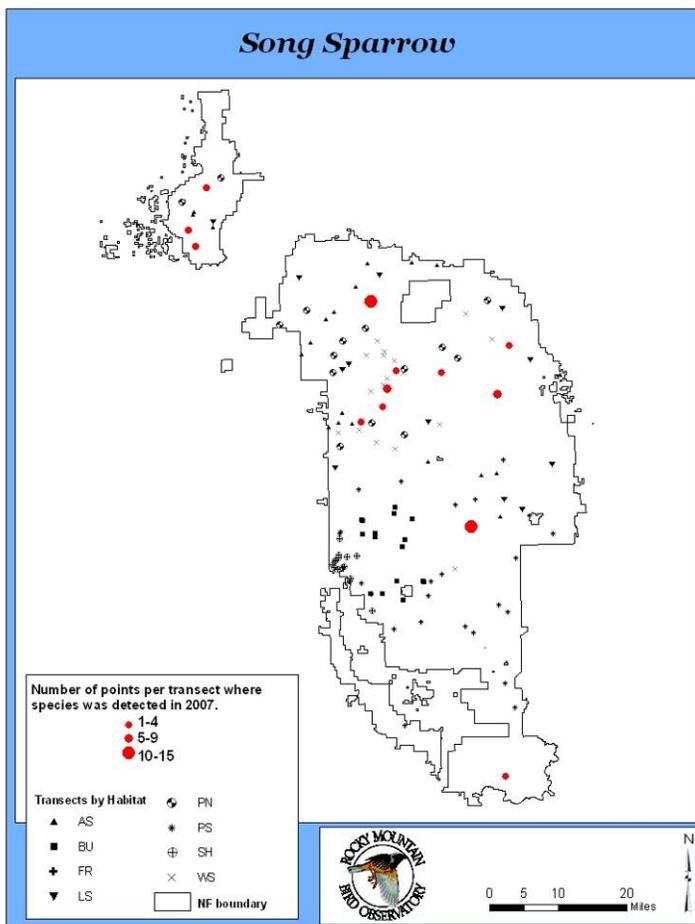
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Song Sparrow

(BHNH Management Indicator Species)

Song Sparrow ranges throughout much of the Black Hills, but it is perhaps more abundant and widespread in the north, especially in dense streamside vegetation at middle elevations. Due to its strong association with shrubby willows along riparian areas, Song Sparrow is an excellent indicator of environmental change for riparian habitat.

In 2007, we did not survey any riparian habitats. However, we observed 64 individuals, with 56 of these occurring in white spruce habitat. We were able to calculate a density estimate for this species in white spruce. Song Sparrow is found in fairly high densities in riparian and white spruce habitats in the Black Hills and it should be well-monitored under MBBH in these habitats.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Song Sparrow for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
AS	ID	--	--	--	--	5
PN	ID	--	--	--	--	3
WS	10.7	5.8	19.8	37	48	56

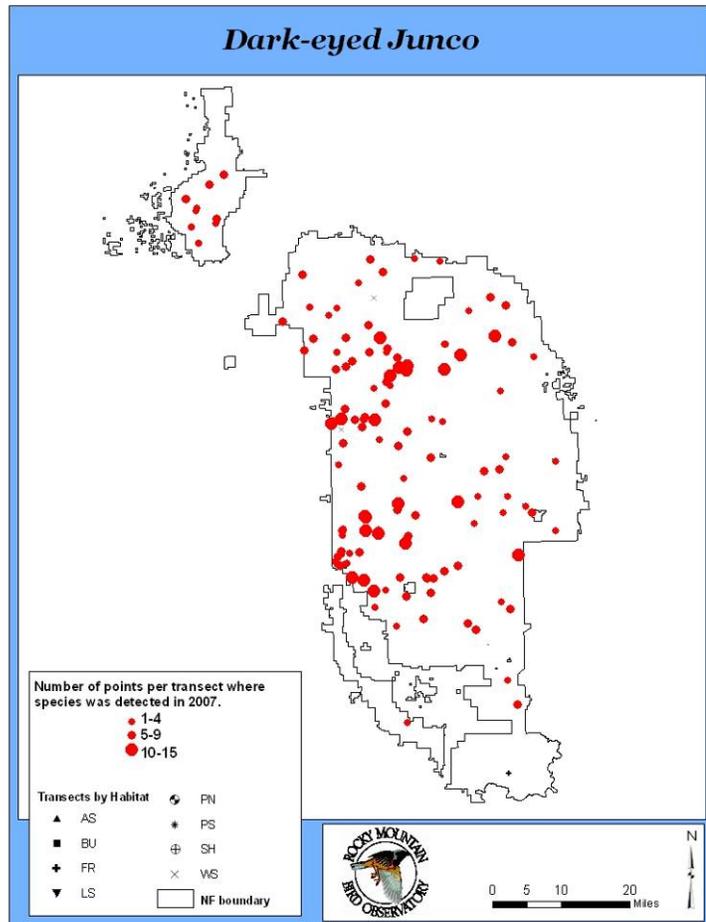
D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

Dark-eyed Junco (White-winged)

Subspecies endemic to the Black Hills
(SDGFP Species of Greatest Conservation Need)

The “white-winged” subspecies of the Dark-eyed Junco occurs widely in the Black Hills. It is generally fairly common to abundant in most wooded habitats. In 2007, this species was detected in large numbers across all seven habitat types we surveyed. We were able to calculate density estimates across all seven habitats.

This distinctive endemic subspecies breeds nowhere else except in the Black Hills region, from northwestern Nebraska to southeastern Montana. The Black Hills contain the majority of habitat for this subspecies, and thus support almost its entire global population. Because of its highly adaptable nature, the white-winged subspecies of the Dark-eyed Junco is largely secure across its range. Dark-eyed Juncos should be effectively monitored under MBBH in a range of habitat types.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Dark-eyed Junco for the MBBH monitoring project, 2007

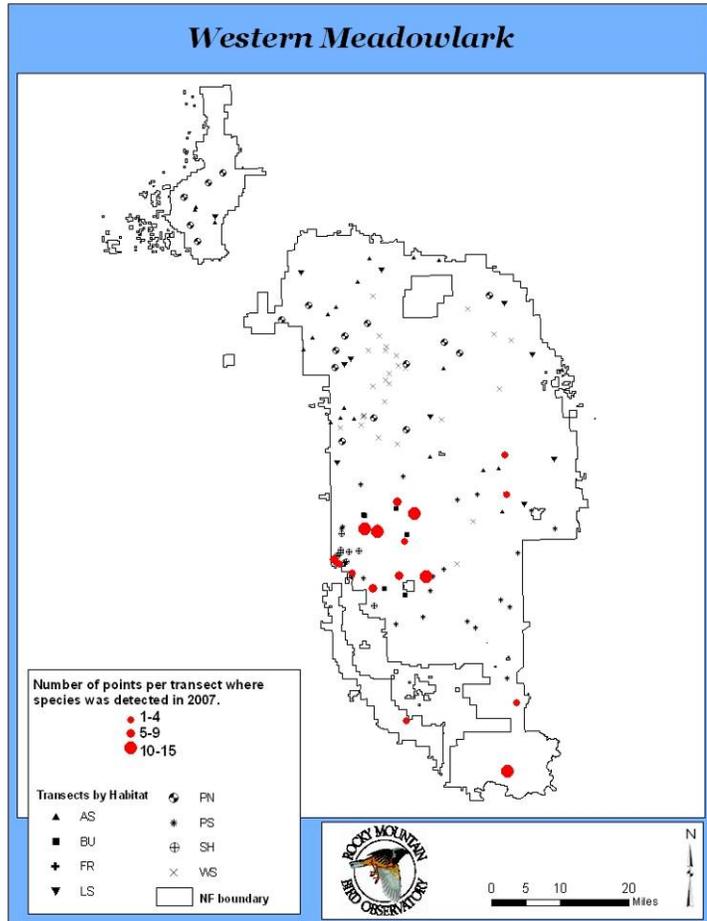
Habitat	D	LCL	UCL	CV	n	N
AS	52.7	41.4	67.2	14	217	252
BU	88.3	65.9	118.3	18	293	353
LS	46.2	31.8	67.2	22	125	145
PN	56.6	45.9	69.8	13	232	255
PS	64.7	50.3	83.1	15	301	348
SH	42.6	32.1	56.5	17	150	178
WS	88.1	70.4	110.3	13	314	352

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data

Western Meadowlark

(PIF Regional Stewardship Species)

Western Meadowlark occurs throughout the Black Hills, especially in the larger grasslands; however, it is most widespread in the southwest. Western Meadowlark typically breeds in native grasslands, semi-desert shrubland and sage shrubland. In 2007, we did not survey mixed-grass prairie habitat. However, we observed 70 individuals in five habitats and were able to calculate density estimates for three of these habitats. Western Meadowlark should be effectively monitored under MBBH in a range of habitats, including mixed-grass prairie.



Total number of independent detections used to estimate density, number of individuals, and habitat-specific density estimates for Western Meadowlark for the MBBH monitoring project, 2007.

Habitat	D	LCL	UCL	CV	n	N
AS	ID	---	---	---	---	1
BU	1.6	1.0	2.6	29	50	50
LS	ID	--	--	--	--	1
PS	.1	.1	.3	56	9	10
SH	.4	.2	1.1	58	7	8

D = estimated density (birds/km²); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections used to estimate D; N = number of individuals; ID = insufficient data.

DISCUSSION AND RECOMMENDATIONS

Unique Values of Each Habitat

While the number of species and densities of birds vary across habitats, each habitat supports unique assemblages of birds and other attributes that contribute to the overall biological diversity in the Black Hills. Some highlights pertaining to each habitat surveyed in 2007 follow.

Aspen

In 2007, Ruffed Grouse, Least Flycatcher, and Chestnut-sided Warbler were observed exclusively in Aspen habitat, and many other species, including Warbling Vireo, Ovenbird, and Red-naped Sapsucker, were most abundant in this habitat. In 2007, the following species reached their highest densities in Aspen Habitat: Red-naped Sapsucker, Warbling Vireo, American Crow (this species has historically reached its highest density in Montane Riparian habitat, which was not surveyed in 2007), Black-capped Chickadee (this species has historically reached its highest density in Foothills Riparian habitat, which was not surveyed in 2007), MacGillivray's Warbler (this species has historically reached its highest density in Montane Riparian habitat, which was not surveyed in 2007), and Black-headed Grosbeak (this species has historically reached its highest density in Foothills Riparian habitat, which was not surveyed in 2007).

Burn Areas

In 2007, Killdeer and Upland Sandpiper were observed exclusively in Burn Areas habitat, and many other species, including Mountain Bluebird, Hairy Woodpecker, Red-headed Woodpecker, and Black-backed Woodpecker were most abundant in this habitat. In 2007, the following species reached their highest densities in Burn Areas habitat: Red-headed Woodpecker, Hairy Woodpecker, Black-backed Woodpecker, Northern Flicker, Western Wood-Pewee, White-breasted Nuthatch, House Wren (this species has historically reached its highest density in Montane Riparian habitat, which was not surveyed in 2007), Eastern Bluebird, Mountain Bluebird, Western Tanager, Vesper Sparrow (this species has historically reached its highest density in Montane Grassland habitat, which was not surveyed in 2007), and Western Meadowlark (this species has historically reached its highest density in Montane Grassland habitat, which was not surveyed in 2007).

Late-successional Pine

In 2007, Broad-winged Hawk and Cliff Swallow were observed exclusively in Late-successional Pine habitat. In 2007, the following species reached their highest densities in Late-successional Pine habitat: Red-eyed Vireo (this species has historically reached its highest density in Foothills Riparian habitat, which was not surveyed in 2007), Red-breasted Nuthatch, Brown Creeper, Yellow-rumped Warbler, and Ovenbird (this species has historically reached its highest density in Foothills Riparian habitat, which was not surveyed in 2007).

Pine North

In 2007, Hermit Thrush was observed exclusively in Pine North habitat, and many other species, including American Redstart, Yellow Warbler, and Veery, were most abundant in this habitat. In 2007, the following species reached their highest densities in Pine North habitat: Gray Jay, Townsend's Solitaire, American Redstart (this species has historically reached its highest density in Montane Riparian habitat, which was not surveyed in 2007), and Pine Siskin (this species has historically reached its highest density in Montane Riparian habitat, which was not surveyed in 2007).

Pine South

In 2007, several species, including Yellow-rumped Warbler, Western Tanager, Black-capped Chickadee, Townsend's Warbler, and Plumbeous Vireo were most abundant in this habitat. In 2007, the following species reached their highest densities in Pine South habitat: Wild Turkey and Lark Sparrow (this species has historically reached its highest density in Montane Grassland habitat, which was not surveyed in 2007).

Pine-juniper Shrubland

In 2007, Broad-tailed Hummingbird, Field Sparrow, Yellow-breasted Chat, Blue-gray Gnatcatcher, and Common Poorwill were observed exclusively in Pine-juniper Shrubland, and many other species, including Dusky Flycatcher, Spotted Towhee, Violet-green Swallow, Mourning Dove, Virginia's Warbler, and White-throated Swift were most abundant in this habitat. In 2007, the following species reached their highest densities in Pine-juniper Shrubland: Mourning Dove (this species has historically reached its highest density in Montane Grassland habitat, which was not surveyed in 2007), White-throated Swift (this species has historically reached its highest density in Montane Riparian habitat, which was not surveyed in 2007), Dusky Flycatcher, Plumbeous Vireo, Violet-green Swallow (this species has historically reached its highest density in Foothills Riparian habitat, which was not surveyed in 2007), Rock Wren, Virginia's Warbler, Spotted Towhee, Chipping Sparrow, Brown-headed Cowbird, and American Goldfinch (this species has historically reached its highest density in Foothills Riparian habitat, which was not surveyed in 2007).

White Spruce

In 2007, Sharp-shinned Hawk and Gray Catbird were observed exclusively in White Spruce, and many other species, including Red-crossbill, Chipping Sparrow, American Robin, Ruby-crowned Kinglet, Red-breasted Nuthatch, Swainson's Thrush, Cordilleran Flycatcher, and Pine Siskin were most abundant in this habitat. In 2007, the following species reached their highest densities in White Spruce: Cordilleran Flycatcher (this species has historically reached its highest density in Foothills Riparian habitat, which was not surveyed in 2007), Golden-crowned Kinglet, Ruby-crowned Kinglet, Swainson's Thrush, American Robin (this species has historically reached its highest density in Foothills Riparian habitat, which was not surveyed in 2007), Common Yellowthroat (this species has historically reached its highest density in Montane Riparian habitat, which was not surveyed in 2007), Song Sparrow (this species has historically reached its highest density in Montane Riparian habitat, which was not surveyed in 2007), and Red Crossbill.

Prospects for Population Monitoring

The habitat-stratified point transects produced excellent results with low coefficients of variation ($\leq 50\%$) for 44 bird species, and moderate results (CV=50-75%) for another four species in at least one habitat surveyed in 2007. We should be able to detect habitat-specific population trends for these species within our maximum target of 30 years. For many species, the population may be more effectively monitored in a habitat not surveyed this year. These 48 species represent 30 percent of *all species* observed in the seven habitats surveyed in 2007, but represent more than 90 percent of all *individual birds* observed. The other 70 percent of species (~10% of birds observed) fall into one of the following categories:

- 1) Species that are adequately monitored in one of the other habitats covered by MBBH
- 2) Low-density, highly localized species (e.g., Golden Eagle)
- 3) Low-density, widespread species (e.g., Northern Goshawk)
- 4) Irregular species (e.g., Bobolink);
- 5) Vagrant breeders (e.g., Northern Parula)
- 6) Species that occur mainly outside the Black Hills in the low foothills or on the Great Plains (e.g., Long-billed Curlew);
- 7) Nocturnal species (e.g., Northern Saw-whet Owl);
- 8) Wetland-obligate species (e.g., Sora); and
- 9) Species that are readily detectable only prior to late May (e.g., Ruffed Grouse).

Species in these groups (other than the first category) could possibly be monitored through additional effort using one or more of the following survey techniques:

- 1) Additional point transects in existing habitats;
- 2) Censusing small but localized populations;
- 3) Censusing birds at nesting sites (e.g., colonies, eyries, etc);
- 4) Species-specific call-response surveys;
- 5) Nocturnal surveys;
- 6) Wetland surveys; and
- 7) Early-season (i.e., winter/spring) surveys.

For species with small populations, such as Golden Eagle and Prairie Falcon, monitoring could be achieved by locating active nests and visiting a subset during the spring and summer as necessary to evaluate the outcome of each. Nests would first be located by consulting with local biologists, birders, and other experts, and then as part of the field effort, additional suitable habitat could be searched to locate previously unrecorded nests. Ultimately, the majority of active nests would be included in the monitoring scheme and a random subset would be visited each year to check for occupancy and outcome.

For some rare species, such as Black-billed Cuckoo, a brief call-response survey could be used to detect the presence and breeding status of this or other similar species across the areas already covered by the habitat-stratified point transects.

LITERATURE CITED

- Adamus, P. R., T. J. Danielson, and A. Gonyaw. 2001. Indicators for monitoring biological integrity of inland, freshwater wetlands: A survey of North American technical literature (1990-2000). U.S. Environmental Protection Agency, Office of Water, Wetlands Division. Washington, D.C. EPA 843-R-01.
- Bart, J., M.A. Howe, and C.J. Ralph. 2001. The Partners In Flight Landbird Monitoring Strategy. Office of Migratory Bird Management, U.S. Fish and Wildlife Service, Washington, D.C.
- Birdlife International. 2003. Biodiversity indicator for Europe: population trends of wild birds. http://www.birdlife.net/action/science/indicators/eu_briefing_bird_indicator.pdf
- Bohning-Gaese, K., M.L. Taper, and J.H. Brown. 1993. Are declines in insectivorous songbirds due to causes on the breeding range? *Conservation Biology* 7:76-86.
- Brown, S, C. Hickey, B. Harrington, and R. Gill, eds. 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.
- Buckland, S.T., D.R. Anderson, K.P. Burnham, and J.L. Laake. 1993. *Distance Sampling: Estimating Abundance of Biological Populations*. Chapman and Hall, London, reprinted 1999 by RUWPA, University of St. Andrews, Scotland. 446pp.
- Bureau of Land Management. 1998. Birds as indicators of riparian vegetation condition in the western U.S. Bureau of Land Management, Partners in Flight, Boise, Idaho. BLM/ID/PT-98/004+6635. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. <http://www.npwrc.usgs.gov/resource/1998/ripveg/ripveg.htm> (Version 15DEC98).
- Buttery, R.F. and B.C. Gillam. 1983. Ecosystem descriptions. Pages 43-71 in R.L. Hoover and D.L. Wills, ed., *Managing Forested Lands for Wildlife*. Colo. Div. of Wildl. in cooperation with USDA For. Ser., Rocky Mount. Reg., Denver, Colo. Cary, Merritt. 1901. Birds of the Black Hills. *Auk* 18:231-238.
- Croonquist, M., and R. Brooks. 1991. Use of avian and mammalian guilds as indicators of cumulative impacts in riparian wetland areas. *Environmental Management* 15(5):701-714.
- Grinnell, G.B. 1875. Chapter 2: Birds. Pages 85-102 in Ludlow, W. Report of a Reconnaissance of the Black Hills of Dakota Made in the Summer of 1874. Engr. Dept. U.S. Army, Washington, D.C.
- Hutto, R. L. 1998. Using landbirds as an indicator species group. Pp. 75-92 in Marzluff, J. M., and R. Sallabanks (eds.), *Avian conservation: Research and Management*. Island Press, Washington, DC.
- James, F.C., C.E. McCullough, and D.A. Weidenfeld. 1996. New approaches to the analysis of population trends in landbirds. *Ecology* 77:13-27.
- Leukering, T. 2000. Point transect protocol for *Monitoring Colorado's Birds*. Unpubl. document, Rocky Mountain Bird Observatory, Brighton, CO. 16 pp.
- Manley, P.N., W.M. Block, F.R. Thompson, G.S. Butcher, C. Paige, L.H. Suring, D.S. Winn, D. Roth, C.J. Ralph, E. Morris, C.H. Flather, and K. Byford. 1993. Guidelines for Monitoring Populations of Neotropical Migratory Birds on National Forest System Lands. USDA Forest Service, Washington. 35 pp.
- Morrison, M. 1986. Bird populations as indicators of environmental change. *Curr. Ornithology* 3:429-451.

- North American Bird Conservation Initiative. 2000. North American Birds Conservation Initiative: Bird Conservation Region descriptions. U.S. Fish and Wildlife Service, Washington DC.
- O'Connell, T.J., L.E. Jackson, and R.P. Brooks. 2000. Bird Guilds as indicators of ecological condition in the central Appalachians. *Ecological Applications* 10:1706-1721.
- Panjabi, A., M. Carter, T. Leukering, and D. Faulkner. 2001. Monitoring the Birds of the Black Hills: The Plan for Count-based Monitoring. Unpubl. Document, Rocky Mountain Bird Observatory, Brighton, CO. 14 pp.
- Panjabi, A. 2001. Monitoring the birds of the Black Hills: Year 1. Final Report submitted to Black Hills National Forest. Rocky Mountain Bird Observatory, Brighton, Colorado. 96 pp.
- Panjabi, A. 2003. Monitoring the birds of the Black Hills: Year 2. Final Report submitted to Black Hills National Forest. Rocky Mountain Bird Observatory, Brighton, Colorado. 125 pp.
- Panjabi, A. 2004. Monitoring the birds of the Black Hills: Year 3. Final Report submitted to Black Hills National Forest. Rocky Mountain Bird Observatory, Brighton, Colorado. 58 pp.
- Panjabi, A. 2005. Point transect protocol for *Monitoring the Birds of the Black Hills*, Revised March 2005. Unpublished document. Rocky Mountain Bird Observatory. Brighton, Colorado. 28 pp.
- Partners In Flight. 2005. Species Assessment Database. <http://www.rmbo.org/pif/pifdb.html>
- Pettingill, O.S and N.R. Whitney. 1965. Birds of the Black Hills. Cornell University, Ithaca, NY.
- Rich, T. 2002. Using breeding land birds in the assessment of western riparian systems. *Wildlife Society Bulletin*. 30(4):1128-1139.
- Righter, R, R Levad, C. Dexter, and K. Potter. 2004. Birds of Western Colorado Plateau and Mesa Country. Grand Valley Audubon Society. Grand Junction, Colorado. 214 pp.
- Robbins, C.S., D. Bystrak, and P.H. Geissler. 1986. The Breeding Bird Survey: Its first fifteen years, 1965-1979. U.S. Fish and Wildlife Resource Publication 157. 196 pp.
- Robbins, C.S., J.R. Sauer, and B.G. Peterjohn. 1993. Population trends and management opportunities for Neotropical migrants. In Finch, D.M. and P.W. Stangel (eds.) *Status and Management of Neotropical Migratory Birds*; 1992 Sept. 21-25; Estes Park, CO. Gen. Tech. Rep. RM-229. Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 422 pp.
- Sauer, J.R. 1993. Monitoring Goals and Programs of the U.S. Fish and Wildlife Service. In Finch, D.M. and P.W. Stangel (eds.) *Status and Management of Neotropical Migratory Birds*; 1992 Set. 21-25; Estes Park, Co. Gen. Tech. Rep. RM-229. Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 422 pp.
- Sauer, J.R., B.G. Peterjohn, and W.A. Link. 1994. Observer differences in the North American Breeding Bird Survey. *Auk* 111:50-62.
- Sauer, J.R. 2000. Combining information from monitoring programs: complications associated with indices and geographic scale. In R. Bonney et al. (eds.), *Strategies*

- for Bird Conservation: The Partners in Flight Planning Process. Proceedings of the 3rd Partners In Flight Workshop; 1995 Oct. 1-5, Cape May, NJ. USDA Forest Service, Rocky Mountain Research Station. 281 pp.
- Sauer, J.R., J.E. Hines, and J. Fallon. 2003. The North American Breeding Bird Survey, Results and Analysis 1966-2002. Version 2002.1, USGS Patuxent Wildlife Research Center, Laurel, MD.
- South Dakota Department of Game, Fish and Parks. 2006. South Dakota Comprehensive Wildlife Conservation Plan. South Dakota Dept. of Game, Fish and Parks, Pierre, Wildlife Division Report 2006-2008.
- Tallman, D.A., D.L. Swanson, J.S. Palmer. 2002. Birds of South Dakota. North Dakota State University, Aberdeen, SD.
- Thomas, L. 1996. Monitoring long-term population change: why are there so many analysis methods? *Ecology* 77:49-58.
- Thomas, L., Laake, J.L., Strindberg, S., Marques, F.F.C., Buckland, S.T., Borchers, D.L., Anderson, D.R., Burnham, K.P., Hedley, S.L., Pollard, J.H., Bishop, J.R.B. and Marques, T.A. 2006. Distance 5.0. Release 2. Research Unit for Wildlife Population Assessment, University of St. Andrews, UK. <http://www.ruwpa.st-and.ac.uk/distance/>
- U.S.D.A. Forest Service. 1998. Rocky Mountain Resource Information System Data Dictionary with Appendices and Indices. March 1998.
- U.S. Environmental Protection Agency. 2002. Methods for evaluating wetland condition: biological assessment methods for birds. Office of Water, U.S. Environmental Protection Agency, Washington. D.C. EPA-822-R-02-023.
- U.S. Fish and Wildlife Service. 2002. Birds of Conservation Concern 2002. Division of Migratory Bird Management, Arlington, VA. 99 pp. <http://migratorybirds.fws.gov/reports/bcc2002.pdf>
- U.S. Fish & Wildlife Service. 2003. Birding in the United States: A Demographic and Economic Analysis. Addendum to the 2001 National Survey of Fishing, Hunting and Wildlife-Associated Recreation. Report 2001-1. Washington, D.C. 24 pp.
- Wyoming Partners In Flight. 2003. Wyoming Bird Conservation Plan, version 2.0. compiled by Sharon Nicholoff. <http://www.blm.gov/wildlife/plan/WY/menu.htm>

APPENDIX A. List of all bird species observed on point counts in the Black Hills from 2001-2007, with management designation.

Common Name ¹	Species Management Designation ²						Status ³
	USFS	USFWS	SDGFP	BHNF	PIF	WY-PIF	
Canada Goose							B
Wood Duck							B
Gadwall							PB
Mallard							B
Ring-necked Duck							PB
Common Merganser							B
Ring-necked Pheasant							B
Ruffed Grouse				MIS			B
Sharp-tailed Grouse					CS,RS	WY-I	B
Wild Turkey							B
Western Grebe							PB
American White Pelican			SoGCN			WY-II	TM
American Bittern	R2SS					WY-I	B
Great Blue Heron							B
Turkey Vulture							B
Osprey			SoGCN, ST				B
Bald Eagle			SoGCN, ST			WY-I	PB
Northern Harrier	R2SS				RC		B
Sharp-shinned Hawk				SOLC			B
Cooper's Hawk				SOLC			B
Northern Goshawk	R2SS		SoGCN		RC	WY-I	B
Broad-winged Hawk				SOLC			B
Swainson's Hawk					CC,CWL	WY-I	PB
Red-tailed Hawk							B
Golden Eagle		BCC-BCR17			RC		B
American Kestrel							B
Merlin						WY-II	B
Prairie Falcon		BCC-BCR17					B
Sora							B
American Coot							B
Killdeer							B
Spotted Sandpiper							TM
Upland Sandpiper		BCC-BCR17				WY-I	B
Long-billed Curlew		BCC-BCR17	SoGCN			WY-I	VB
Pectoral Sandpiper							TM
Wilson's Snipe							B
Franklin's Gull						WY-I	TM
Rock Pigeon							B
Mourning Dove							B
Black-billed Cuckoo		BCC-BCR17			RC	WY-II	B
Great Horned Owl							B
Burrowing Owl	R2SS	BCC-BCR17	SoGCN		RC	WY-I	B
Common Nighthawk							B

Common Name ¹	Species Management Designation ²						Status ³
	USFS	USFWS	SDGFP	BHNF	PIF	WY-PIF	
Common Poorwill							B
Chimney Swift							B
White-throated Swift					CC,CWL	WY-II	B
Broad-tailed Hummingbird						WY-II	B
Belted Kingfisher							B
Lewis's Woodpecker	R2SS	BCC-BCR17	SoGCN		CC,RC,CWL	WY-II	B
Red-headed Woodpecker					CC,RC,CWL		B
Williamson's Sapsucker						WY-II	TM
Red-naped Sapsucker		BCC-BCR17				WY-II	B
Downy Woodpecker							B
Hairy Woodpecker							B
American Three-toed Woodpecker	R2SS		SoGCN			WY-II	B
Black-backed Woodpecker	R2SS		SoGCN	MIS	RC	WY-II	B
Northern Flicker							B
Western Wood-Pewee							B
Alder Flycatcher							TM
Least Flycatcher							B
Hammond's Flycatcher						WY-II	VB
Dusky Flycatcher						WY-II	B
Cordilleran Flycatcher						WY-II	B
Eastern Phoebe							B
Say's Phoebe					RS		B
Cassin's Kingbird						WY-II	B
Western Kingbird							B
Eastern Kingbird							B
Loggerhead Shrike	R2SS				RC	WY-II	B
Plumbeous Vireo						WY-II	B
Warbling Vireo							B
Red-eyed Vireo							B
Gray Jay							B
Blue Jay							B
Pinyon Jay					CC,RC,CWL		B
Clark's Nutcracker							B
Black-billed Magpie					RC		B
American Crow							B
Horned Lark							B
Tree Swallow							B
Violet-green Swallow							B
Northern Rough-winged Swallow					RC		B
Bank Swallow							B
Cliff Swallow							B
Barn Swallow							B
Black-capped Chickadee							B
Red-breasted Nuthatch							B
White-breasted Nuthatch							B
Pygmy Nuthatch				SOLC		WY-II	B

Common Name ¹	Species Management Designation ²						Status ³
	USFS	USFWS	SDGFP	BHNF	PIF	WY-PIF	
Brown Creeper				MIS		WY-II	B
Rock Wren							B
Canyon Wren							B
House Wren							B
Winter Wren							B
American Dipper			SoGCN, ST	SOLC		WY-II	B
Golden-crowned Kinglet				MIS		WY-II	B
Ruby-crowned Kinglet							B
Blue-gray Gnatcatcher							B
Eastern Bluebird							B
Mountain Bluebird					RC		B
Townsend's Solitaire						WY-II	B
Veery							B
Swainson's Thrush							B
Hermit Thrush							VB
American Robin							B
Gray Catbird							B
Brown Thrasher							B
European Starling							B
Cedar Waxwing							B
Golden-winged Warbler					CWL		VB
Tennessee Warbler							TM
Orange-crowned Warbler							VB
Virginia's Warbler					CWL		B
Northern Parula							VB
Yellow Warbler							B
Chestnut-sided Warbler							B
Magnolia Warbler							VB
Black-throated Blue Warbler							VB
Yellow-rumped Warbler							B
Black-and-white Warbler				SOLC			B
American Redstart							B
Ovenbird							B
MacGillivray's Warbler						WY-II	B
Common Yellowthroat							B
Yellow-breasted Chat							B
Western Tanager							B
Spotted Towhee							B
Chipping Sparrow							B
Clay-colored Sparrow							TM
Field Sparrow							B
Vesper Sparrow					RC, RS	WY-II	B
Lark Sparrow						WY-II	B
Lark Bunting			SoGCN		RC,CS,RS	WY-II	B
Grasshopper Sparrow	R2SS	BCC-BCR17		MIS	RC,CS,RS	WY-II	B
Song Sparrow				MIS			B

Common Name ¹	Species Management Designation ²						Status ³
	USFS	USFWS	SDGFP	BHNF	PIF	WY-PIF	
White-crowned Sparrow							TM
Dark-eyed Junco (White-winged)			SoGCN				B
Northern Cardinal							VB
Rose-breasted Grosbeak							B
Black-headed Grosbeak							B
Blue Grosbeak							B
Lazuli Bunting							B
Indigo X Lazuli Bunting Hybrid							B
Indigo Bunting							B
Dickcissel		BCC-BCR17			CC,RC,CWL	WY-II	B
Bobolink						WY-II	B
Red-winged Blackbird							B
Western Meadowlark					RS		B
Yellow-headed Blackbird							B
Brewer's Blackbird							B
Common Grackle							B
Brown-headed Cowbird							B
Orchard Oriole							B
Bullock's Oriole							B
Cassin's Finch							B
House Finch							B
Red Crossbill							B
White-winged Crossbill							B
Pine Siskin							B
Lesser Goldfinch							B
American Goldfinch							B
Evening Grosbeak							B
House Sparrow							B
Red Squirrel							B

¹ Common names are from the A.O.U. Check-list of North American Birds, Seventh Edition (2003)

² Special management designations: USFS=United States Forest Service, R2SS=US Forest Service Region 2 Sensitive Species; USFWS=U.S. Fish and Wildlife Service, BCC-BCR17= Bird of Conservation Concern for Bird Conservation Region 17; SDGFP=South Dakota Dept. of Game, Fish, and Parks, SoGCN=Species of Greatest Conservation Need (South Dakota Comprehensive Wildlife Conservation Plan 2006), ST=State Threatened Species, SE=State Endangered Species; BHNF=Black Hills National Forest, MIS=Black Hills National Forest Management Indicator Species, SOLC=Species of Local Concern; PIF=Partners In Flight (from the Species Assessment Database version 2005 found at www.rmbo.org, for BCR17 and in order of priority from highest to lowest), CC=Continental Concern Species, RC=Regional Concern Species, CS=Continental Stewardship Species, RS = Regional Stewardship Species, CWL = Continental Watch List; WY-PIF=Wyoming Partners in Flight, WY-I= Wyoming Partners In Flight Level I Priority (Conservation Action), WY-II= Wyoming Partners In Flight Level II Priority (Monitoring).

³ Residency status: B=(probably) breeding; VB=vagrant, possibly breeding; TM=transient migrant.

APPENDIX B. List of all bird species observed on point counts in the Black Hills from 2001-2007, with species totals.

Common Name ¹	Total #individuals observed per habitat ² , 2007							Total #individuals observed per year (in all habitats surveyed ³)						
	AS	BU	LS	PN	PS	SH	WS	2001	2002	2003	2004	2005	2006	2007
Canada Goose						4			11		2	1		4
Wood Duck								1	12			1		
Gadwall									1					
Mallard		2					1	11	54	2		22	10	3
Ring-necked Duck								2						
Common Merganser								8	8			9	1	
Ring-necked Pheasant								2	2					
Ruffed Grouse	2							45	62	15	6	4	1	2
Sharp-tailed Grouse									2		6	1	4	
Wild Turkey	3	2	5	5	3		7	46	58	26	28	29	53	25
Western Grebe									1					
American White Pelican											20			
American Bittern									1					
Great Blue Heron							3	2	13	11	3	12	13	3
Turkey Vulture	7	2	1	1	20	21	1	44	84	14	43	88	37	53
Osprey												2		
Bald Eagle												2		
Northern Harrier								1					1	
Sharp-shinned Hawk							1	2	4	3	6	3		1
Cooper's Hawk		1				1	1	10	4	3	9	9	2	3
Northern Goshawk	1				4	1		14	5	8	10	15	3	6
Broad-winged Hawk			2					3	6		24	19	3	2
Swainson's Hawk												1	1	
Red-tailed Hawk	1	4		3	3	4	8	8	29	21	32	57	32	23
Golden Eagle								1		1		2	6	
American Kestrel		4			4			5	10	9	17	20	10	8
Merlin									1					
Prairie Falcon								2	3	2	6	9	5	

Common Name ¹	Total #individuals observed per habitat ² , 2007							Total #individuals observed per year (in all habitats surveyed ³)						
	AS	BU	LS	PN	PS	SH	WS	2001	2002	2003	2004	2005	2006	2007
Sora													2	
American Coot												1	1	
Killdeer		1						8	18	1	8	4	2	1
Spotted Sandpiper									1	2			1	
Upland Sandpiper		1						4	20		19		12	1
Long-billed Curlew													7	
Pectoral Sandpiper								25						
Wilson's Snipe								3	8	4		5	8	
Franklin's Gull									1					
Rock Pigeon								1	9	4	1	8	10	
Mourning Dove	7	51	14	12	69	80	6	185	362	117	270	166	185	239
Black-billed Cuckoo													1	
Great Horned Owl			2		1			1	2		1	2	4	3
Burrowing Owl											1			
Common Nighthawk		8	2	5	6	3		19	20	6	33	34	42	24
Common Poorwill						1								1
Chimney Swift												1		
White-throated Swift	3	3	13		2	61	1	124	261	93	157	460	203	83
Broad-tailed Hummingbird						3			3	2		6	1	3
Belted Kingfisher								3	17	10	1	21	15	
Lewis's Woodpecker		5			4			3	4	9	4	8	7	9
Red-headed Woodpecker		46			2			25	38	50	55	66	10	48
Williamson's Sapsucker													1	
Red-naped Sapsucker	50	2	22	28			16	400	222	245	212	210	118	118
Downy Woodpecker	3	4	2	4		1	2	13	29	16	13	37	23	16
Hairy Woodpecker	26	143	30	42	47	3	70	138	391	324	276	384	94	361
American Three-toed Woodpecker			1				10	12	27	44	8	47		11
Black-backed Woodpecker	1	24	2		8		3	24	132	75	68	46	3	38
Northern Flicker	37	110	8	12	23	10	23	176	203	193	198	447	178	223
Western Wood-Pewee	34	190	44	114	63	8	4	106	360	373	339	379	191	457
Alder Flycatcher									2	1		1	2	

Common Name ¹	Total #individuals observed per habitat ² , 2007							Total #individuals observed per year (in all habitats surveyed ³)						
	AS	BU	LS	PN	PS	SH	WS	2001	2002	2003	2004	2005	2006	2007
Least Flycatcher	1							1	11	4	1	14	9	1
Hammond's Flycatcher					1	1						6	3	2
Dusky Flycatcher	93	104	47	103	184	405	44	1186	1407	723	720	933	359	980
Cordilleran Flycatcher	20	2	10	16	3	2	98	297	364	325	100	454	342	151
Eastern Phoebe								3			1	4		
Say's Phoebe								1			1		3	
Cassin's Kingbird											1			
Western Kingbird								6	7		17	9	4	
Eastern Kingbird								24	78	8	16	16	32	
Loggerhead Shrike								1						
Plumbeous Vireo	8	36	9	6	102	81	2	347	385	230	167	273	82	244
Warbling Vireo	396	89	141	289	115	68	87	1034	1959	960	1073	1590	563	1185
Red-eyed Vireo			5	6		1		89	227	102	31	216	121	12
Gray Jay	17	3	7	24	9	4	50	197	197	204	129	135	16	114
Blue Jay	4		3	2	2	1	1	48	63	34	19	39	52	13
Pinyon Jay								12	47	3	43	3	24	
Clark's Nutcracker		2	3		5	4		22	49	5	17	34	4	14
Black-billed Magpie								2	1		26	2	18	
American Crow	58	28	8	24	23	17	25	233	242	194	180	142	139	183
Horned Lark								7	4		11		38	
Tree Swallow		3				3	1	13	30	8	4	7	22	7
Violet-green Swallow	3	5	1		9	87	20	147	565	162	256	399	383	125
Northern Rough-winged Swallow								1	17		13	9	13	
Bank Swallow									1		1		2	
Cliff Swallow			3					21	3		28	3	23	3
Barn Swallow			1				1	3	25	5	8	11	28	2
Black-capped Chickadee	132	62	52	91	157	129	120	705	1118	672	476	940	397	743
Red-breasted Nuthatch	204	43	167	198	251	113	288	946	1520	817	468	1013	361	1264
White-breasted Nuthatch	28	81	16	29	99	51	34	159	261	335	162	232	140	338
Pygmy Nuthatch		5				1		3	2		1	4	3	6
Brown Creeper	3	3	6	8	5		10	154	143	135	97	131	7	35

Common Name ¹	Total #individuals observed per habitat ² , 2007							Total #individuals observed per year (in all habitats surveyed ³)						
	AS	BU	LS	PN	PS	SH	WS	2001	2002	2003	2004	2005	2006	2007
Rock Wren	1	13			14	20		31	102	44	196	160	80	48
Canyon Wren	1		3		4	8	2	10	59	21	12	27	43	18
House Wren	8	110		5	16	15	1	32	147	74	124	183	65	155
Winter Wren									2			3		
American Dipper									2	4		5	3	
Golden-crowned Kinglet	2		3				16	131	99	224	55	346	7	21
Ruby-crowned Kinglet	80	1	37	71	14	1	325	395	911	716	219	1005	185	529
Blue-gray Gnatcatcher						19		2	2		14			19
Eastern Bluebird		26		1	1			42	57	57	72	63	3	28
Mountain Bluebird	4	144	1	11	47	53	5	159	169	116	292	333	255	265
Townsend's Solitaire	56	87	29	87	137	53	42	739	850	783	544	610	119	491
Veery	10		4	12			6	36	94	104	28	73	61	32
Swainson's Thrush	20	1	37	32	10		211	331	448	507	170	405	269	311
Hermit Thrush				1				2	1	1	4	2	15	1
American Robin	215	150	91	207	187	118	339	1832	2098	1670	993	1922	874	1307
Gray Catbird							3	12	20	27		43	59	3
Brown Thrasher								2	3	3	3		1	
European Starling								2	22		18	34	9	
Cedar Waxwing	4	1	3	6	1	12	2	44	124	61	37	62	72	29
Golden-winged Warbler												3		
Tennessee Warbler									30		3			
Orange-crowned Warbler									1					
Virginia's Warbler					1	78		44	80	2	185	6		79
Northern Parula								1		1		1		
Yellow Warbler	6			11	3	6	9	58	216	35	8	114	71	35
Chestnut-sided Warbler	2							5	2	2		3		2
Magnolia Warbler								1				1		
Black-throated Blue Warbler									1					
Yellow-rumped Warbler	244	112	177	284	307	177	275	1502	2462	1831	871	1674	351	1576
Black-and-white Warbler								5	7	2	3	6	7	
American Redstart	13		9	33				212	406	242	92	608	377	63

Common Name ¹	Total #individuals observed per habitat ² , 2007							Total #individuals observed per year (in all habitats surveyed ³)						
	AS	BU	LS	PN	PS	SH	WS	2001	2002	2003	2004	2005	2006	2007
Ovenbird	254	1	140	154	89	138	23	1079	1719	838	948	1191	550	799
MacGillivray's Warbler	26	2	14	22		14	9	356	267	206	103	226	105	87
Common Yellowthroat	3		1	5	1		36	80	278	219	30	321	224	46
Yellow-breasted Chat						23		11	73	4	25	29	23	23
Western Tanager	62	96	69	91	190	102	36	658	919	856	537	697	260	646
Spotted Towhee	20	11	4	18	35	352	1	293	632	152	430	221	217	441
Chipping Sparrow	156	283	76	206	288	311	373	874	1623	1523	1339	2026	606	1693
Clay-colored Sparrow									2		4	1		
Field Sparrow						1		1	1	1	5			1
Vesper Sparrow	1	206		2	45	35		197	362	131	394	204	264	289
Lark Sparrow		5			12	4		25	86	21	114	46	162	21
Lark Bunting								2			1	5	9	
Grasshopper Sparrow								6	75		121		382	
Song Sparrow	5			3			56	237	268	258	38	396	292	64
White-crowned Sparrow										1				
Dark-eyed Junco	252	353	146	255	348	178	352	1639	1500	1320	936	1335	196	1884
Dark-eyed Junco (White-winged)	252	353	145	255	348	178	352	1639	1500	1320	936	1215	167	1883
Northern Cardinal										1				
Rose-breasted Grosbeak								2	1	1		1		
Black-headed Grosbeak	29		3	12	6		7	130	326	116	36	260	182	57
Blue Grosbeak								1						
Lazuli Bunting	2			1		12	1	9	50	13	7	19	30	16
Indigo X Lazuli Bunting Hybrid													7	
Indigo Bunting								1	1				1	
Dickcissel									11				31	
Bobolink									17	10	6	11	61	
Red-winged Blackbird	8			13			4	69	297	78	17	138	96	25
Western Meadowlark	1	50	1		10	8		104	475	44	892	197	461	70
Yellow-headed Blackbird									5		1			
Brewer's Blackbird								5	33	13	73	20	36	
Common Grackle								41	61	6	7	4	5	

Common Name ¹	Total #individuals observed per habitat ² , 2007							Total #individuals observed per year (in all habitats surveyed ³)						
	AS	BU	LS	PN	PS	SH	WS	2001	2002	2003	2004	2005	2006	2007
Brown-headed Cowbird	86	170	28	83	157	116	37	512	635	591	447	680	164	677
Orchard Oriole								12	18	1		6	2	
Bullock's Oriole								17	21		1	15	9	
Cassin's Finch		4			2	2		14	7	3	4	12	1	8
House Finch								1	12			1	2	
Red Crossbill	215	344	122	206	329	136	479	1480	4618	984	1698	926	211	1831
White-winged Crossbill	3		1				7	13	9	11		15		11
Pine Siskin	27	20	17	66	19	19	93	454	632	158	38	522	225	261
Lesser Goldfinch													2	
American Goldfinch	18	20	1	15	27	33	9	97	184	71	49	183	105	123
Evening Grosbeak								6				1	2	
House Sparrow								2	1					
Red Squirrel	112	30	112	121	99	10	301	221	315	271	107	87	121	785

¹ Common names are from the A.O.U. Check-list of North American Birds, Seventh Edition (2003)

² Habitats: AS=aspen; BU=burn area; LS=late-successional ponderosa pine; PN=ponderosa pine (north); PS=ponderosa pine (south); SH=pine-juniper shrubland; WS=white spruce

³ The number and types of habitats surveyed each year may vary.