Monitoring the Birds of the Black Hills: Year 4

Annual Report
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Executive Summary

Birds can be excellent indicators of environmental quality and change. In addition, they are one of the most highly visible valued components of our native wildlife. Monitoring birds provides data needed not only to effectively manage bird populations, but also to understand the effects of human activities on the ecosystem and to gauge their sustainability. Because bird communities reflect an integration of a broad array of ecosystem conditions, monitoring entire bird communities at the habitat level offers a cost-effective means for monitoring biological integrity at a variety of scales.

In 2004, Rocky Mountain Bird Observatory (RMBO), in conjunction with its funding partner, the Black Hills National Forest (BHNF), implemented the fourth year of *Monitoring the Birds of the Black Hills* (MBBH), as delineated by Panjabi et al. (2001). RMBO has designed this program to provide statistically rigorous long-term trend data for populations of most diurnal, regularly breeding bird species in the Black Hills, including some U.S. Forest Service Region 2 Sensitive Species and BHNF Management Indicator Species (MIS). In the short term, this program provides information needed to effectively manage and conserve bird populations in the Black Hills, including the spatial distribution, abundance, and relationship to important habitat characteristics for each species. 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, which currently includes 11 states in the Rocky Mountains and Great Plains regions.

As in 2003, RMBO surveyed 5 of the 10 habitats targeted under the monitoring plan, maintaining a level of effort consistent with funding. RMBO staff conducted 140 point transect surveys (2,036 point counts) in five habitats within the Black Hills (aspen, burn area, late-successional ponderosa pine, mixed-grass prairie, and pine-juniper shrubland). RMBO did not survey four habitats covered in 2002 (ponderosa pine-north, ponderosa pine-south, montane riparian, white spruce) or the foothill riparian habitat that was last surveyed in 2002. New survey sites were added and others were dropped in aspen, late-successional pine, mixed-grass prairie, and pine-juniper shrubland.

RMBO staff recorded a total of 111 breeding bird species on point transects in the five habitats, many of which were observed on only a few occasions. The habitat-stratified point transect data provided good results (CV of ≤ 50% in at least one habitat) on 47 bird species, including two BHNF Management Indicator Species (MIS) and two Region 2 Sensitive Species, and fair results (CV of 51-100% in at least one habitat) on two additional species. The 47 species should be effectively monitored under the current program in at least one of the five habitats surveyed this year, although some of these may be better monitored in other habitats not surveyed this year. Four additional species, including one BHNF MIS and one BHNF (proposed) species of local concern, should be adequately monitored across two or more habitat types. The total number of species monitored by MBBH in the habitats sampled this year represents approximately 44% of the total number of breeding species in the Black Hills (Panjabi 2003a). An additional 14% are monitored only in one or more habitats surveyed in 2003, while an additional 7% can be adequately monitored only in the foothill riparian habitat.

Introduction

Much like the canary in the coalmine, birds can serve as 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 of environmental change and for 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 by 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 in aiding our ability to monitor 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 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 South Dakota, there were an estimated 271,000 bird watchers in 2001, of which 32% came from out of state. In Wyoming, 67% of the state's 388,000 bird watchers in 2001 were non-residents who came to that state to watch birds. Thus, bird watching, and by necessity the birds that people travel to watch, contributes significantly to local economies. Statewide and nationally, the Black Hills is a popular destination for bird watchers, as it offers opportunities to see many birds that are rare or absent elsewhere in the U.S. 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, and bird watching related activities, 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. The Black Hills host a unique avifauna and plays a critical role in conserving populations of many bird species. Well-designed count-based monitoring studies provide a scientific foundation for informed decision-making by providing the information needed to effectively manage and conserve birds.

In 2004, Rocky Mountain Bird Observatory (RMBO), in cooperation with its partner, the Black Hills National Forest (BHNF), implemented Year 4 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), this 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 in managing birds (e.g., habitat associations, spatial distribution). This report details the findings from the fourth year of what is designed to be a long-term, cooperative effort to monitor bird populations in the Black Hills.

The Habitats

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, southern ponderosa pine, northern ponderosa pine, late-successional ponderosa pine, pine-juniper shrublands, riparian, wet meadows, and white spruce) in which to implement this 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 foothill riparian, due to differences in the bird communities across this elevational gradient (Panjabi 2003a). In 2004, five of the 10 habitats originally targeted for monitoring were sampled: aspen, burn areas, late-successional ponderosa pine, mixed-grass prairie, and pine-juniper shrubland (Figure 1).

Aspen (AS)

Aspen habitat 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 aspen stands 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 irregularly shaped. Some aspen stands have a woody understory, consisting of a variety of shrubs including common juniper (*Juniperus communis*), beaked hazelnut

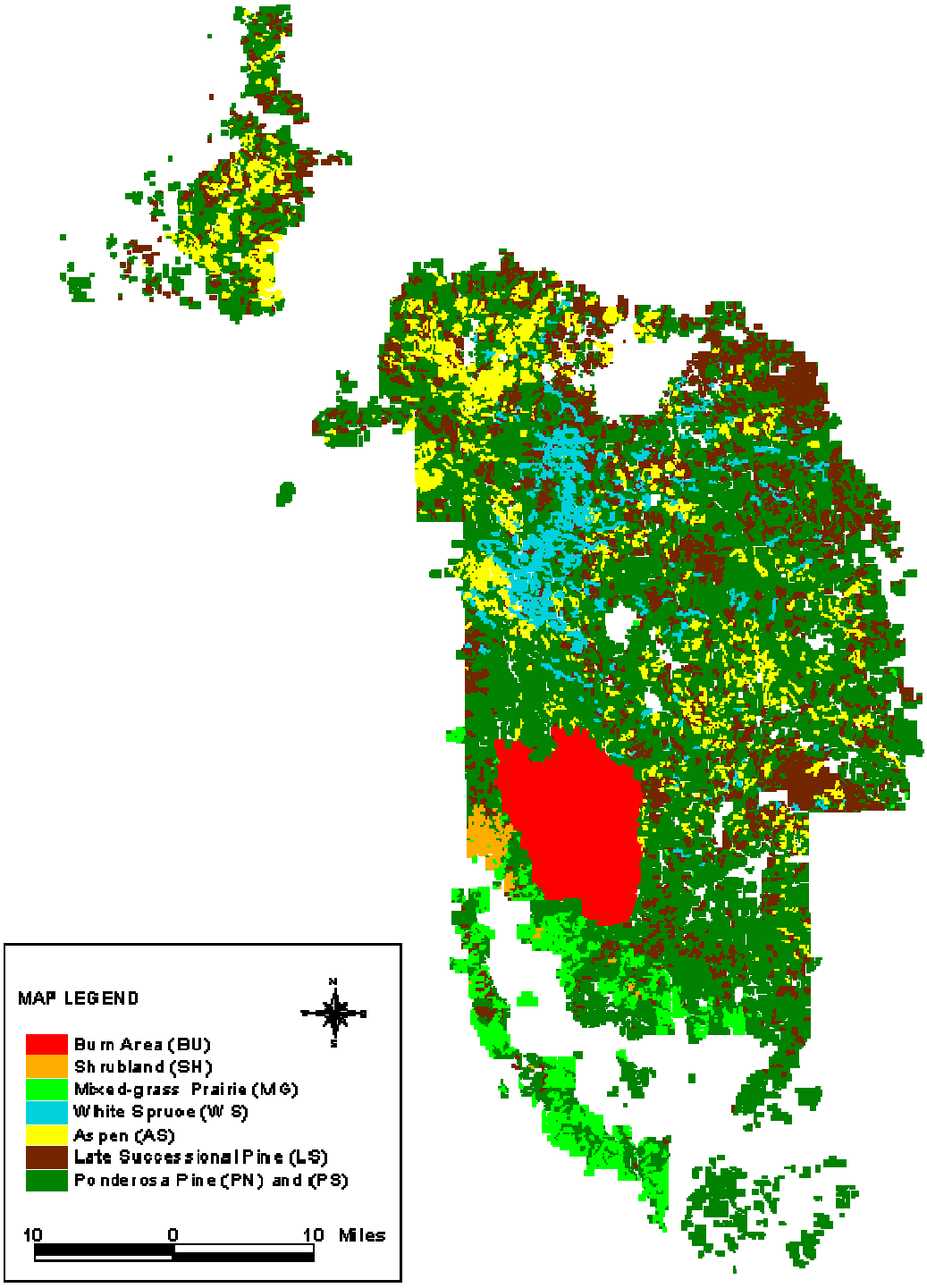


Figure 1. Distribution of habitats targeted for bird monitoring under *Monitoring the Birds of the Black Hills* (note: Foothills Riparian and Montane Riparian habitats not included).

(*Corylus cornuta*), gooseberry (*Ribes* spp.), and chokecherry (*Prunus virginiana*), while others have only an herbaceous understory.

Burn areas (BU)

Burn areas consist of previously forested landscapes that have been recently impacted by wildfire. Currently, all burn sites but one are located in the Jasper burn area, which covers approximately 83,000 acres that burned in 2000. The other is located in the nearby Elk Mountain burn area. These burn areas are a mosaic of patches of charred, heat-killed, and live trees (mostly ponderosa pine, *Pinus ponderosa*) that ranged in seral stage from 'shrub-seedling' (2) to 'mature' (4; USDA Forest Service 1998) prior to being burned. Some of the Jasper burn area has been cleared in the years following the fire through salvage logging and right-of-way clearing. Herbaceous and woody ground cover has resprouted throughout much of the Jasper burn area.

Late-successional pine (LS)

Late-successional pine 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 rare or uncommon bird species in the Black Hills may occur primarily in such late-successional stands, we independently sampled late-successional pine stands in an attempt to generate sufficient data to allow us to monitor these species. Additionally, independent random sampling of late-successional pine stands should allow for comparisons between these stands and the pine forest at large to assess whether there are differences in bird densities between these two types of forest. All late-successional stands surveyed were identified using the BHNF RIS database.

Mixed-grass prairie (MG)

Mixed-grass prairie refers to the expansive open areas of the Black Hills that are dominated by a variety of native, upland grasses, such as blue grama (*Bouteloua gracilis*), western wheatgrass (*Pascopyrum smithii*), and junegrass (*Koeleria macrantha*) (Larson and Johnson 1999). Mixed-grass prairies are fairly common within the Black Hills, especially in the south, although much of this habitat is in private ownership. Some of these grasslands are contiguous with the surrounding prairie of the Great Plains; others are surrounded by the forests of the Black Hills, and are isolated from the larger prairie landscape. Differences in the bird communities of the grasslands are apparent as one moves away from the forest-grassland ecotone and into the more expansive prairies where trees are absent.

Pine-juniper shrubland (SH)

Pine-juniper shrubland (SH) refers to the arid brushy 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 sparse yet significant overstory of Rocky Mountain juniper (*Juniperus scopulorum*) and ponderosa pine. Native grasses, such as blue grama, are also prevalent.

Methods

Field Personnel

Four experienced biological technicians with excellent aural and visual bird-identification skills, plus the author, comprised the RMBO staff who executed the field component of MBBH in 2004. All had worked on RMBO monitoring projects in previous years and brought with them considerable experience, familiarity with the protocol, and knowledge of the local birds. Each completed a two-day training program at the beginning of the season to ensure full understanding of the field protocols and to practice distance estimation.

Site Selection

Survey sites were selected in 2001 and 2002 according to procedures described by Panjabi (2001, 2003a). Additional changes were made to the sampling scheme in 2004 (Table 1). Three new sites were added in the aspen category, and one site that was deemed unsuitable was dropped, while another (AS01) was entirely re-established near the original site to better target the existing habitat. Twelve new sites were added in the late-successional pine category in 2004, while eleven sites surveyed in 2002 were dropped. The late-successional sites that were dropped were either primarily not late-successional pine forest, too dangerous to traverse, or otherwise inaccessible. Sixteen new sites were

Table 1. Changes to the habitat-stratified bird-sampling scheme in 2004.

Habitats	Sites dropped in 2004	New sites added in 2004
Aspen	AS48	AS49, AS53, AS99
Late-successional pine	LS01, LS09, LS29, LS37, LS40, LS44, LS47, LS49, LS51, LS56, LS60	LS30, LS31, LS32, LS33, LS34, LS35, LS93, LS94, LS95, LS96, LS97, LS98
Mixed-grass prairie	MG24, MG98	MG12, MG13, MG14, MG15, MG16, MG17, MG18, MG19, MG20, MG21, MG22, MG23, MG26, MG27, MG28, MG97
Pine-juniper shrubland	SH86, SH88, SH91, SH93, SH95	SH40, SH50, SH83, SH84, SH85

added in the mixed-grass prairie category, while two sites that were deemed to be unrepresentative of the targeted habitat type were dropped. Five new sites were added in the pine-juniper shrubland category, while five sites without adequate representation of the targeted habitat type were dropped from this category.

Our goal of establishing 30 long-term monitoring sites in each habitat category has been reached in three of the five habitats surveyed this year: burn areas, aspen and mixed-grass prairie. However, due to the limited extent and small patch size of the pine-juniper shrubland stands on the BHNF, it does not seem likely that we will achieve 30 independent sites in this category on the BHNF alone. Nonetheless, it appears that the existing sites in this habitat (n=20) will be adequate to monitor most unique species associated with this habitat. And while the targeting of late-successional pine stands has improved somewhat since years past, there are still several transects in this category that sample some other types of forest. This appears to be due at least in part to some inaccurate information in the RIS database, but also due to difficulties in establishing transects in some of these stands. Because most of the late-successional pine forest on the BHNF exists in small, narrow, and oddly-shaped stands, often on exceedingly steep and rugged slopes, they can pose considerable challenges for travel, orientation, and safety. However, we continue to find numerous problems with the stand typing in the RIS database (2002). It is not uncommon that areas typed as 4c stands in the RIS database are classified by observers on the ground as 4b and 4a stands. Similarly, several areas identified as structural stage 5 in the RIS database, including those in the Black Elk Wilderness and the Norbeck Wildlife Preserve, were classified on the ground as either mature pine (4a, 4b or 4c) or even white spruce. The stand in the Norbeck had also just been heavily logged, according to the report by the technician visiting this stand. So while we established and surveyed 30 transects at sites identified as late-successional ponderosa pine, sometimes the late-successional habitat indicated in the database did not exist on the ground. Given that this was our third attempt at establishing sites in this habitat type, and we were still not able to entirely restrict our samples to the targeted habitat using the best available sources of information, it is questionable whether it will be possible to accurately target these specific structural stages of pine forest on the BHNF.

National Park Service lands

In 2004, RMBO staff surveyed two point transects at sites on National Park Service lands in the Black Hills region, one in the Jasper burn area in Jewel Cave National Monument, and one in mixed-grass prairie in Wind Cave National Park. Data from these two sites were included in the respective analyses of bird densities in each habitat in this report.

Point Transect Protocol

RMBO staff conducted point 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 (2003b). Staff conducted all transect surveys in the morning, 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. For new transects, observers used this pre-survey visit to establish an access point for each stand, and a random distance and bearing from the access point (between 0-400 m) at which the first point count station would be located. On the morning of the survey, the observer began the point transect at the first count station and then continued along the pre-selected bearing for all remaining points if possible. In many cases, the pre-selected bearing eventually would lead the transect out of the target habitat, or to some obstruction (e.g., cliff or private land), forcing the observer to change the bearing of the transect. When this happened, the observer back-tracked to the last completed point count and randomly turned the transect right or left, at an angle perpendicular to the original bearing, and then alternated right or left if additional turns were necessary. In some small or linear stands (e.g., riparian sites), the size and shape of the stand determined the location and course of the transect.

Observers conducted up to 15 five-minute point counts at stations located at 250-m intervals along each point transect, recording all bird detections on standardized forms. Fly-overs (birds flying over, but not using the immediate surrounding landscape) were recorded, but excluded from analyses of density. For each bird detected, observers recorded the species, sex, how it was detected (e.g., call, song, drumming, etc.), and distance from the observation point. Whenever possible, they measured distances using Bushnell® Yardage Pro 500™ laser rangefinders. When it was not possible to measure the distance to a bird, staff used rangefinders to gauge distance estimates by measuring to some closer object. Observers treated the 250-m intervals between count stations as parts of a line transect, and recorded individuals of a short list of low-density species (all grouse, raptors, woodpeckers, and a few other rare or uncommon species) and measured the distance and bearing to each from where it was detected along the transect line. They also recorded bearings and distances to individuals of the same low-density species when they were detected at count stations. Birds initially detected on points that were again detected while moving between points were not included in the line-transect data. However, birds detected between points, but then again during the subsequent point count, were removed from the line-transect data, and included only on the point count.

A departure in the bird data collection protocol from previous years was that starting in 2004, we now treat all non-independent detections of individual birds as part of a 'cluster' together with the first independently observed bird, rather

than as separate independent observations of those individuals. This means that if the detection of an individual bird is dependent upon the previous detection of another individual, the resulting observation is recorded as one independent detection with a cluster size of *C*, where *C* is the original individual detected plus the sum of any additional individuals whose detection was dependent upon the first individual revealing its presence. For example, a bird sings, and is thus detected independently. The observer then looks over to that bird, and as a result, detects a second individual. The resulting observation is recorded as one detection of a cluster of two birds. This practice ensures that we adhere more strictly to the assumption inherent in random sampling that all observations are independent of each other.

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 Garmin® E-trex™ Global Positioning System units. All GPS data were logged 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 vegetative 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 % coverage and types of shrubs within a 50 m radius of the point. Observers recorded these data prior to beginning each bird count.

Data Analysis

I used program DISTANCE (Thomas et al. 1998-99) 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.

As a general rule, I generated density estimates only for species for which there was a minimum of *24 independently detected observations* as recorded from count stations in a given habitat (not including fly-overs or between-point observations, and prior to truncation or removal of outliers). Because we considered only independent detections in our analyses of density, the number of *observations* (n) reported for each species may be lower than the number of *individuals* (N) observed. This is especially true for species that tend to

associate in groups (e.g., sharp-tailed grouse, swifts, swallows, crossbills, etc.) Both numbers may be useful, especially for low-density species, and thus both are reported in the "Species Accounts" section. Note however, that in the habitat accounts in the "Results" section, the number of observations reported (n) reflects only the number of independent detections *used to estimate density* (i.e., after any truncation or removal of outliers), and may be less than the total number of independent detections or the total number of individuals observed.

Results

RMBO staff conducted a total of 2,036 point counts along 140 point transects in 5 different habitats (Table 2, Figure 2) between 23 May and 7 July, 2004. They recorded a total of 18,621 birds of 114 species on these point transects (Appendix A). Three species, American Pipit, Tennessee Warbler and Clay-colored Sparrow, occurred only as transient migrants, and were not included in further analyses. The remaining 111 species were probably all breeding in the area. Forty-nine species were observed in sufficient numbers to estimate density in at least one habitat. Ten additional breeding or summering species, Golden Eagle, Merlin, Common Poorwill, Belted Kingfisher, Broad-tailed Hummingbird, Alder Flycatcher, Hammond's Flycatcher, American Dipper, Orchard Oriole, and Evening Grosbeak, were observed on BHNF lands outside of the standardized surveys. In total, RMBO has documented 165 species since 2001 that have either bred or summered in the Black Hills.

Table 2. Bird sampling periods and effort in each habitat in 2004.

Habitat	Dates sampled	# point transects	# point counts
Aspen	15 June – 5 July	30	433
Burn area	3 June – 16 June	30	444
Late-successional pine	2 June – 7 July	30	430
Mixed-grass prairie	23 May – 6 June	30	446
Pine-juniper shrubland	24 May – 10 June	20	283
All habitats	23 May – 7 July	140	2036

The total number of species detected in each habitat in 2004 ranged from 60 in late-successional pine to 85 in mixed-grass prairie (Table 3). These totals communicate the magnitude of the spectrum of possible species across a range of sites within a habitat type, but it should be understood that some species included in each total were largely peripheral to that habitat. Thus, cumulative species totals reflect both the within-habitat and between-habitat diversity at the sites surveyed in each habitat category.

Of the habitats surveyed in 2004, more individual birds were detected in the burn area than in any other habitat surveyed, although average species richness, both

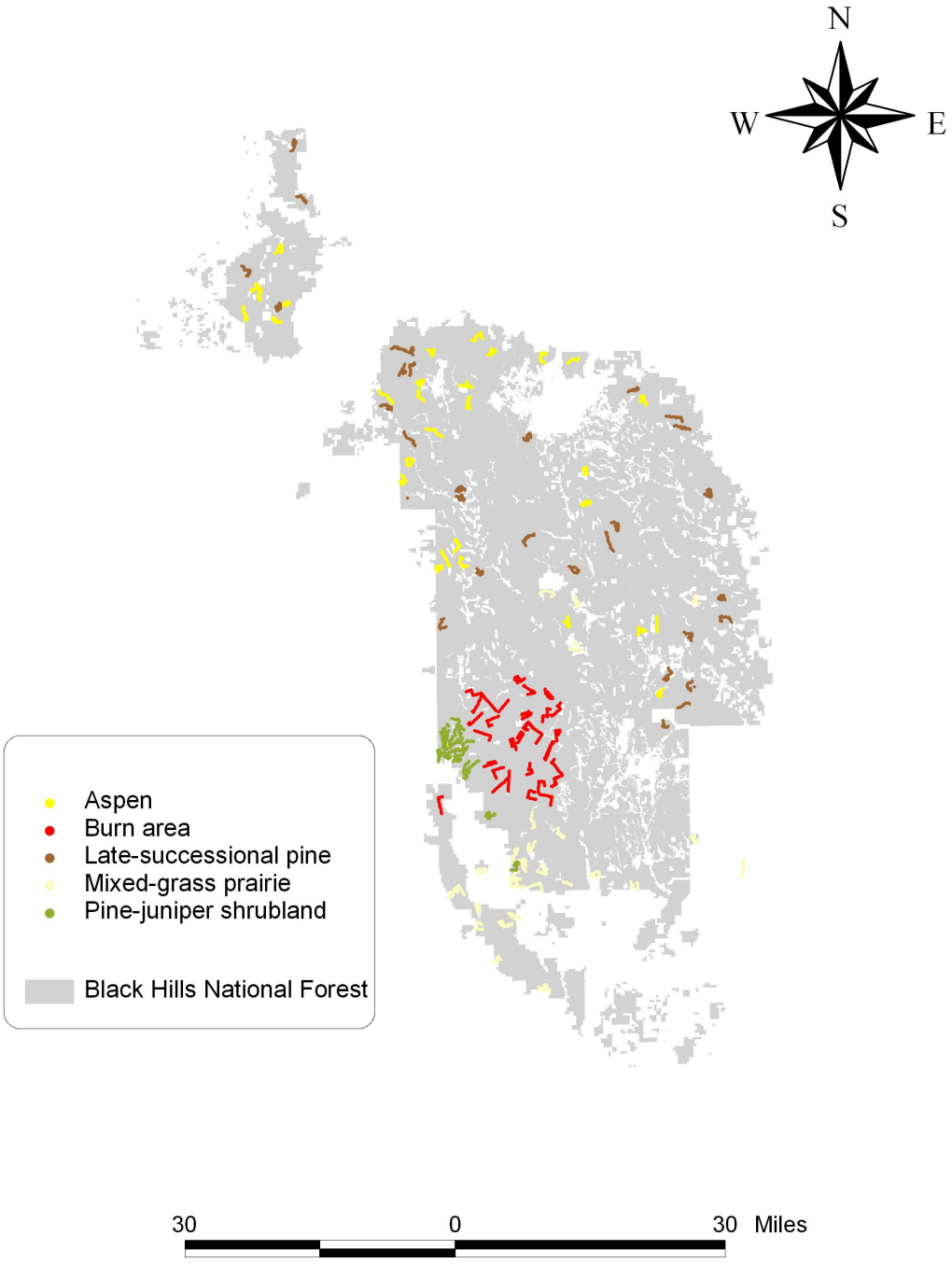


Figure 2. Distribution of habitat-stratified point transects in the Black Hills, 2004.

at the point and transect level, was greatest in pine-juniper shrubland (Table 3). I have provided estimates of avian species richness at both the point-level and the transect (i.e., site) level, as the point-level data are adjusted for effort and are thus best for direct inter-habitat comparisons, while the site-level data, which may be influenced by transect length, provide a more complete picture of the bird community within a given stand of that habitat. Thus, both estimates can be useful from a management perspective.

Table 3. Bird totals and species richness in habitats surveyed in the Black Hills, summer 2004.

Habitat	# birds detected	# species detected	Avg. # birds/point	Avg. # species /point	Avg. # species /transect
Aspen	3,869	64	8.8	6.1	23.1
Burn area	4,816	63	10.5	6.9	25.6
Late-successional pine	3,575	60	8.3	5.7	21.3
Mixed-grass prairie	3,136	85	6.9	4.7	22.9
Pine-juniper shrubland	3,225	71	11.2	7.2	26.3
All habitats	18,621	114	9.0	6.0	24.4

Aspen (AS)

RMBO staff conducted 433 point counts along 30 transects in aspen forests between 15 June and 5 July, 2004 (Table 2). They recorded a total of 3,869 individual birds in this habitat, with an average of 8.8 birds per point count (Table 3). Observers detected 64 species in total and, on average, 6.1 species per point count and 23.1 species per transect in this habitat.

A list of all species and the number of individuals observed in aspen in 2004 can be found in Appendix A. The point transect data from aspen habitat yielded robust density estimates (CV<50%) for 23 species and a moderately robust estimate for one additional species (CV=50-100%; Table 5). MBBH should effectively monitor these 24 species, which represent 38% of all species and 91% of all individual birds recorded from aspen in 2004.

Warbling Vireo, Chipping Sparrow, Ovenbird, MacGillivray's Warbler, Red-naped Sapsucker, and American Robin were among the most abundant species in aspen forests this year. Within the Black Hills, several species reach their maximum densities in aspen forest, including Red-naped Sapsucker, Warbling Vireo, and Ovenbird. They also are an important habitat for Dusky Flycatcher, Black-capped Chickadee, American Robin, Chestnut-sided Warbler, American Redstart, and MacGillivray's Warbler. Aspen stands also appear to be particularly important habitat for forest-dependent raptors. In 2004, more *Accipter* species (Sharp-shinned Hawk, Cooper's Hawk, and Northern Goshawk)

were recorded in aspen forest than in any other habitat (Appendix A). Likewise more Broad-winged Hawks were recorded in aspen than in other habitats surveyed in 2004.

Table 5. Estimated densities of breeding birds in aspen forests in the Black Hills, 2004.

Species	D	LCL	UCL	CV	n
Red-naped Sapsucker	32.88	20.20	53.51	25%	83
Hairy Woodpecker	4.43	2.67	7.35	26%	31
Northern Flicker	0.70	0.44	1.12	24%	37
Dusky Flycatcher	29.00	20.19	41.64	18%	157
Cordilleran Flycatcher	11.06	5.39	22.71	37%	39
Warbling Vireo	93.80	77.32	113.80	10%	628
American Crow	0.50	0.28	0.91	30%	41
Black-capped Chickadee	28.83	20.09	41.38	18%	134
Red-breasted Nuthatch	7.85	5.70	10.82	16%	132
Ruby-crowned Kinglet	3.88	2.24	6.72	28%	107
Townsend's Solitaire	5.91	4.46	7.83	14%	103
Veery	1.60	0.58	4.38	53%	25
Swainson's Thrush	6.33	3.41	11.73	31%	70
American Robin	32.64	23.17	45.96	17%	177
Yellow-rumped Warbler	22.66	16.70	30.74	15%	192
American Redstart	27.27	13.73	54.16	35%	62
Ovenbird	42.29	32.09	55.72	14%	438
MacGillivray's Warbler	34.16	18.15	64.30	32%	55
Common Yellowthroat	2.58	1.01	6.57	49%	22
Western Tanager	5.53	3.80	8.05	19%	61
Chipping Sparrow	56.76	32.40	99.42	29%	181
Dark-eyed Junco	29.91	21.59	41.42	16%	212
Brown-headed Cowbird	12.07	5.71	25.49	39%	51
Red Crossbill	13.30	8.05	21.96	26%	80

D = density estimate in birds/km^2; LCL and UCL = lower and upper 95% confidence limits on D; CV = coefficient of variation of D; n = number of independent observations used to estimate D

Burn area (BU)

RMBO staff surveyed 444 point counts along 30 transects in burn areas between 3 June and 16 June, 2004 (Table 2). They recorded a total of 4,816 birds in this habitat, and an average of 10.5 birds at each count station (Table 3). Observers detected 63 species in total and an average of 6.9 species per point count and 25.6 species per transect in burn areas.

The point transect data from the burn areas yielded robust density estimates for 28 species (CV<50%) (Table 4). MBBH should effectively monitor these 28 species, which represent 44% of all species and 96% of all individual birds recorded from burn areas in 2004.

Chipping Sparrow, Red Crossbill, Dark-eyed Junco, Brown-headed Cowbird Black-capped Chickadee, and Mountain Bluebird were among the most abundant species recorded in the Jasper burn area in 2004. Eleven species (Red-headed Woodpecker, Hairy Woodpecker, Black-backed Woodpecker, Northern Flicker, Western Wood-Pewee, House Wren, Eastern Bluebird, Mountain Bluebird, Dark-eyed Junco, Brown-headed Cowbird and Red Crossbill) had higher estimated densities in the burn area than in any other habitat surveyed in 2004. The positive response of these species to the conditions created by the Jasper Fire highlights the important role of fire in creating optimal habitat for certain species in the Black Hills.

Some forest-dependent birds continue to persist in the Jasper burn area, but after several years of maintaining surprisingly high densities it appears some of them may now be declining. In 2004, densities of at least 5 forest-dependent bird species (Plumbeous Vireo, Gray Jay, Yellow-rumped Warbler, Western Tanager, and Pine Siskin) dropped from 2003 levels. However most other species either maintained similar population levels or increased. Black-backed Woodpecker numbers appear relatively stable, but are still down considerably from their peak in 2002. Hairy Woodpecker and Northern Flicker densities increased significantly from 2003 levels, while Red-headed Woodpeckers increased only slightly, and continue to remain in very low densities (<1 bird/km2). Western Wood-Pewee, a species that was formerly common across the Black Hills (Pettingill and Whitney 1965) but that now exists in only low density in most habitats on the BHNF (Panjabi 2001, 2003a, 2004), continued to show a strong positive population response in the Jasper Burn area. Its density in the Jasper burn area is now roughly 2-3 times that anywhere else in the Black Hills. Mountain and Eastern Bluebirds also continued to increase in density, as did Mourning Doves, Dusky Flycatchers, House Wrens, White-breasted Nuthatches, Chipping and Vesper Sparrows, Dark-eyed Juncos, Brown-headed Cowbirds, and Western Meadowlarks. Most other species appear to have remained relatively stable since 2003.

Table 4. Estimated densities of breeding birds in burn areas (4-years post-fire) in ponderosa pine forest in the Black Hills, 2004.

Species	D	LCL	UCL	CV	n
Mourning Dove	2.03	1.35	3.05	21%	70
Red-headed Woodpecker	0.62	0.37	1.06	27%	29
Hairy Woodpecker	18.03	13.74	23.65	14%	147
Black-backed Woodpecker	3.38	2.03	5.63	26%	38
Northern Flicker	7.04	4.84	10.24	19%	100
Western Wood-Pewee	16.45	12.68	21.35	13%	229
Dusky Flycatcher	14.32	8.91	22.99	24%	99
Plumbeous Vireo	2.37	1.35	4.13	28%	38
Warbling Vireo	6.75	4.04	11.26	26%	93
Gray Jay	2.65	1.15	6.10	43%	21
American Crow	0.20	0.11	0.36	31%	27

Species	D	LCL	UCL	CV	n
Black-capped Chickadee	27.03	17.55	41.64	22%	85
Red-breasted Nuthatch	6.57	3.49	12.35	32%	44
White-breasted Nuthatch	10.15	7.06	14.60	18%	72
Rock Wren	2.02	1.28	3.19	23%	73
House Wren	8.94	6.16	12.97	19%	93
Eastern Bluebird	5.11	2.91	8.97	28%	56
Mountain Bluebird	23.91	18.51	30.87	13%	113
Townsend's Solitaire	7.42	5.75	9.57	13%	161
American Robin	18.36	15.12	22.29	10%	329
Yellow-rumped Warbler	6.91	4.80	9.95	18%	127
Western Tanager	14.77	9.75	22.36	21%	162
Chipping Sparrow	189.94	110.79	325.65	28%	401
Vesper Sparrow	6.23	4.11	9.43	21%	107
Dark-eyed Junco	44.14	35.31	55.17	11%	353
Western Meadowlark	2.13	1.15	3.96	32%	96
Brown-headed Cowbird	30.76	21.81	43.40	17%	181
Red Crossbill	61.23	42.02	89.22	19%	256

D = density estimate in birds/km^2; LCL and UCL = lower and upper 95% confidence limits on D; CV = coefficient of variation of D; n = number of independent observations used to estimate D

Late-successional Ponderosa Pine (LS)

RMBO staff conducted 430 counts along 30 transects in ponderosa pine stands identified in the RIS 2002 database as either structural stage 4c or 5 (i.e., late-successional forest) between 29 May and 4 July, 2003 (Table 2). They recorded a total of 3,575 birds in this habitat, with an average of 8.3 birds at each count station (Table 3). Observers detected a total of 60 species, and on average, 5.7 species per point count and 21.3 species per site in this habitat.

The point transect data from late-successional pine yielded robust density estimates (CV<50%) for 24 species, and a moderately robust estimate for one additional species (CV=50-100%; Table 6). MBBH should effectively monitor these 25 species, which represent 42% of all species and 92% of all individual birds recorded from late-successional pine stands in 2003.

Chipping Sparrow, Dark-eyed Junco, Red-breasted Nuthatch, Black-capped Chickadee, and Yellow-rumped Warbler were among the most abundant species in this habitat this year. Several species had higher estimates of density in this habitat relative to other habitats surveyed this year, but that is not surprising given that it was the only pine forest habitat surveyed in 2004. However, the density of Brown Creepers is higher in late-successional pine stands than in other habitats, with the exception perhaps of white spruce, where it occurs in similar densities.

Although I made a renewed effort in 2004 to remove unrepresentative sites from the sampling scheme and assign new transects to late-successional pine stands (structural stages 4c and 5) using the latest available GIS data (BHNF RIS 2002 database), there continue to be problems with the sampling of this habitat as previously discussed (see Site Selection, in Methods). Only 39% of the point counts in the stands sampled under this category in 2004 were actually in areas where the surrounding forest structure was classified as either 4c or 5. Twenty-nine percent of counts were in stands classified as structural stage 4b, 27% were in stands classified as structural stage 4a, and the remaining 5% were in areas classified as either 3a, b, or c. So while the data used to generate bird densities in this habitat were influenced considerably by conditions in 4c and 5 stands, they do not represent densities solely in such stands, as over half the data were from stands other than the targeted types. This "dilution effect", probably served to weaken differences in species' densities and abundance that were nonetheless apparent (but perhaps not significant) in the late-successional pine stands vs. other forest types. It is therefore not unreasonable to assume that these differences would be even stronger if the sampling of late-successional pine stands could be better restricted to only include such stands.

Table 6. Estimated densities of breeding birds in late-successional ponderosa pine forest in the Black Hills, 2004.

Species	D	LCL	UCL	CV	n
Red-naped Sapsucker	8.45	4.45	16.07	33%	45
Hairy Woodpecker	7.90	4.76	13.13	26%	45
Western Wood-Pewee	3.14	1.61	6.09	34%	27
Dusky Flycatcher	12.28	7.19	20.97	27%	78
Cordilleran Flycatcher	7.14	4.12	12.36	28%	44
Warbling Vireo	28.40	18.76	42.98	21%	262
Gray Jay	6.32	2.93	13.61	40%	23
Black-capped Chickadee	30.71	20.50	46.02	21%	119
Red-breasted Nuthatch	32.89	25.56	42.32	13%	210
White-breasted Nuthatch	12.67	4.50	35.64	55%	26
Brown Creeper	14.06	8.15	24.26	28%	72
Golden-crowned Kinglet	28.58	12.93	63.17	41%	37
Ruby-crowned Kinglet	10.62	5.93	19.03	30%	96
Townsend's Solitaire	11.00	8.08	14.98	15%	174
Swainson's Thrush	7.50	3.92	14.36	33%	73
American Robin	28.75	21.43	38.58	15%	235
Yellow-rumped Warbler	29.26	22.44	38.15	13%	290
American Redstart	3.60	1.43	9.06	48%	30
Ovenbird	26.74	17.14	41.72	22%	283
MacGillivray's Warbler	3.03	1.23	7.45	47%	26
Western Tanager	9.20	5.77	14.67	24%	104
Chipping Sparrow	52.65	36.69	75.56	18%	172
Dark-eyed Junco	36.90	28.39	47.96	13%	238
Brown-headed Cowbird	5.33	2.67	10.65	35%	30
Red Crossbill	25.25	17.46	36.50	19%	119

D = density estimate in birds/km^2; LCL and UCL = lower and upper 95% confidence limits on D; CV = coefficient of variation of D; n = number of independent observations used to estimate D

Mixed-grass Prairie (MG)

RMBO staff conducted 446 point counts along 30 transects in mixed-grass prairies between 23 May and 6 June, 2004 (Table 2). They recorded 3,136 birds in total in this habitat and an average of 6.9 birds at each count station (Table 3). This average number of birds per count was the lowest recorded in any habitat surveyed this year. Interestingly, observers detected 85 species in total at mixed-grass prairie sites, the highest species total of any habitat. Regardless, average species richness was 4.7 species per point count and 22.9 species per transect, the lowest of any habitat. The high species total for this habitat is likely influenced by the high diversity of landscapes occurring adjacent to mixed-grass prairies, including pine forests, riparian areas, shrublands, and burn areas, from which other non-grassland birds were often recorded.

The point transect data from mixed-grass prairies yielded robust density estimates (CV<50%) for 10 grassland species and a moderately robust estimate for one additional species (CV=50-100%; Table 7). I did not estimate densities of non-grassland birds in this habitat, as most such birds were not actually using the habitat, but instead were in adjacent habitats. MBBH should effectively monitor these 10 species in mixed-grass prairie.

Western Meadowlark, Grasshopper Sparrow, Lark Sparrow, Vesper Sparrow, and Mountain Bluebird were among the most abundant species in this habitat this year. Seven species (American Crow, Rock Wren, Vesper Sparrow, Lark Sparrow, Grasshopper Sparrow, Western Meadowlark, and Brewer's Blackbird) had higher estimated densities in mixed-grass prairies than in any other habitat surveyed in 2004.

Several other species recorded in 2004 are primarily restricted to mixed-grass prairies in the Black Hills, including Upland Sandpiper, Sharp-tailed Grouse, Burrowing Owl, Cassin's Kingbird (a new species for BHNF), Horned Lark, and Lark Bunting. Interestingly, staff observed more Pinyon Jays in the mixed-grass prairies than in any other habitat in 2004, even though this species is clearly not a grassland bird. It is unclear why, but their higher observation rate in grasslands could be due to an association with the pine woodland/mixed-grass prairie ecotone, a geographic predilection for the extreme southwestern Black Hills (where mixed grass prairies mostly occur), and/or greater detectability of the species from grasslands.

Table 7. Estimated densities of breeding birds in mixed-grass prairies in the Black Hills, 2004.

Species	D	LCL	UCL	CV	n
Mourning Dove	1.77	1.01	3.11	28%	57

Species	D	LCL	UCL	CV	n
American Crow	0.66	0.47	0.91	16%	75
Rock Wren	2.25	1.30	3.88	28%	79
Mountain Bluebird	8.60	5.86	12.62	19%	88
Vesper Sparrow	22.17	15.50	31.70	18%	250
Lark Sparrow	28.11	15.73	50.23	30%	91
Grasshopper Sparrow	38.38	20.49	71.90	32%	110
Western Meadowlark	57.99	45.72	73.54	12%	692
Brewer's Blackbird	1.81	0.63	5.14	55%	23
Brown-headed Cowbird	7.20	4.06	12.78	29%	49

D = density estimate in birds/km^2; LCL and UCL = lower and upper 95% confidence limits on D; CV = coefficient of variation of D; n = number of independent observations used to estimate D

Pine-juniper Shrubland (SH)

RMBO staff conducted 283 point counts along 20 transects in pine-juniper shrublands between 24 May and 10 June, 2004 (Table 2). They recorded a total of 3,225 birds in this habitat, and on average, 11.2 birds at each count station (Table 3), more than in any other habitat surveyed in 2004. Observers detected 71 species in total and, on average, 7.2 species per point count and 26.3 species per site, making pine-juniper shrublands the most species-rich habitat surveyed in the Black Hills in 2004.

The point transect data from pine-juniper shrublands yielded robust density estimates (CV<50%) for 24 species (Table 8). MBBH should effectively monitor these species, which represent 34% of all species and 92% of all individual birds recorded from pine-juniper shrublands in 2004.

Chipping Sparrow, Spotted Towhee, Dusky Flycatcher, Virginia's Warbler, Violet-green Swallow and Brown-headed Cowbird were among the most abundant species in this habitat this year. Eleven species (Mourning Dove, White-throated Swift, Dusky Flycatcher, Plumbeous Vireo, Violet-green Swallow, Virginia's Warbler, Yellow-breasted Chat, Western Tanager, Chipping Sparrow, Spotted Towhee, and American Goldfinch) had higher estimated densities in pine-juniper shrublands than in other habitats surveyed in 2004. One of these, Virginia's Warbler, is entirely restricted to this habitat type in the Black Hills.

Staff observed considerably more Blue-gray Gnatcatchers (n=15) in the Black Hills in 2004 than in any previous year, a sign of this species' continuing expansion into the Black Hills. Like Virginia's Warbler, this species is entirely restricted to the pine-juniper shrubland habitat, at least at present. If this species continues on its current trend, it should soon join the ranks of the "monitored" species in this habitat.

Table 8. Estimated densities of breeding birds in pine-juniper shrublands in the Black Hills, 2004.

Species	D	LCL	UCL	CV	n
Mourning Dove	11.63	7.33	18.44	23%	90
White-throated Swift	11.63	5.46	24.76	39%	28
Dusky Flycatcher	81.52	63.43	104.77	12%	324
Plumbeous Vireo	12.66	8.92	17.98	17%	84
Warbling Vireo	7.24	3.75	14.01	33%	46
Violet-green Swallow	32.85	18.04	59.80	31%	46
Black-capped Chickadee	17.77	11.09	28.47	24%	71
Red-breasted Nuthatch	3.28	1.37	7.84	45%	31
White-breasted Nuthatch	6.57	3.33	12.95	35%	35
Rock Wren	1.36	0.75	2.48	30%	26
Mountain Bluebird	18.00	9.69	33.43	31%	56
Townsend's Solitaire	10.36	5.88	18.25	29%	55
American Robin	6.00	3.87	9.28	22%	57
Virginia's Warbler	42.45	26.59	67.75	23%	144
Ovenbird	15.51	10.73	22.42	19%	180
Yellow-breasted Chat	1.58	0.64	3.89	46%	25
Western Tanager	15.22	10.72	21.60	18%	108
Spotted Towhee	131.02	89.27	192.30	20%	361
Chipping Sparrow	496.80	315.00	783.54	23%	277
Vesper Sparrow	1.70	0.72	4.00	43%	26
Dark-eyed Junco	16.20	9.39	27.97	27%	33
Brown-headed Cowbird	23.58	17.70	31.39	14%	96
Red Crossbill	19.39	10.46	35.94	32%	52
American Goldfinch	4.44	1.83	10.78	46%	22

D = density estimate in birds/km^2; LCL and UCL = lower and upper 95% confidence limits on D; CV = coefficient of variation of D; n= number of independent observations used to estimate D

SPECIES ACCOUNTS

In this section I present one-page accounts for each bird species detected in 2004 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, or 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, I include designations for BHNF Management Indicator Species (MIS), proposed Species of Local Concern (as per the phase II amendment of the Forest Plan), and Region 2 Sensitive Species (R2SS). For the U.S. Fish and Wildlife Service, I 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, I include designations for State Threatened or Endangered Species. For Partners In Flight I include designations from the Partners In Flight Continental Watch List (Rich et al. 2004), Bird Conservation Region 17, (PIF Species Assessment Database 2001), and the Wyoming Partners In Flight 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).

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 2004. The relative abundance scale used in the maps is based on the average number of birds observed per point count *along each transect* where the species was detected. Therefore, the location of the dots do not necessarily indicate the precise location of the point at which the species was observed, but rather the mid-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. Also, note that the abundance scale has been changed slightly from earlier reports (2001, 2002) to provide greater resolution at the lower end of the abundance scale. The scale is constant among maps, allowing for easy comparisons among species.

In each table I provide two numbers pertaining to the number of observations for each species: *N, the number of individuals observed,* and *n, the number of independent observations for each species*. These numbers may be different as often several individuals are detected in a single observation, as when birds are in a flock. While the number of individuals observed is often of interest, especially for rare species, density estimates are derived using only independent observations.

In a few cases, I provide comparisons with available historical accounts of the avifauna of the Black Hills (Grinnell 1875; Cary 1901; Pettingill and Whitney 1965) to provide a historical perspective in which to interpret the current findings.

Sharp-tailed Grouse

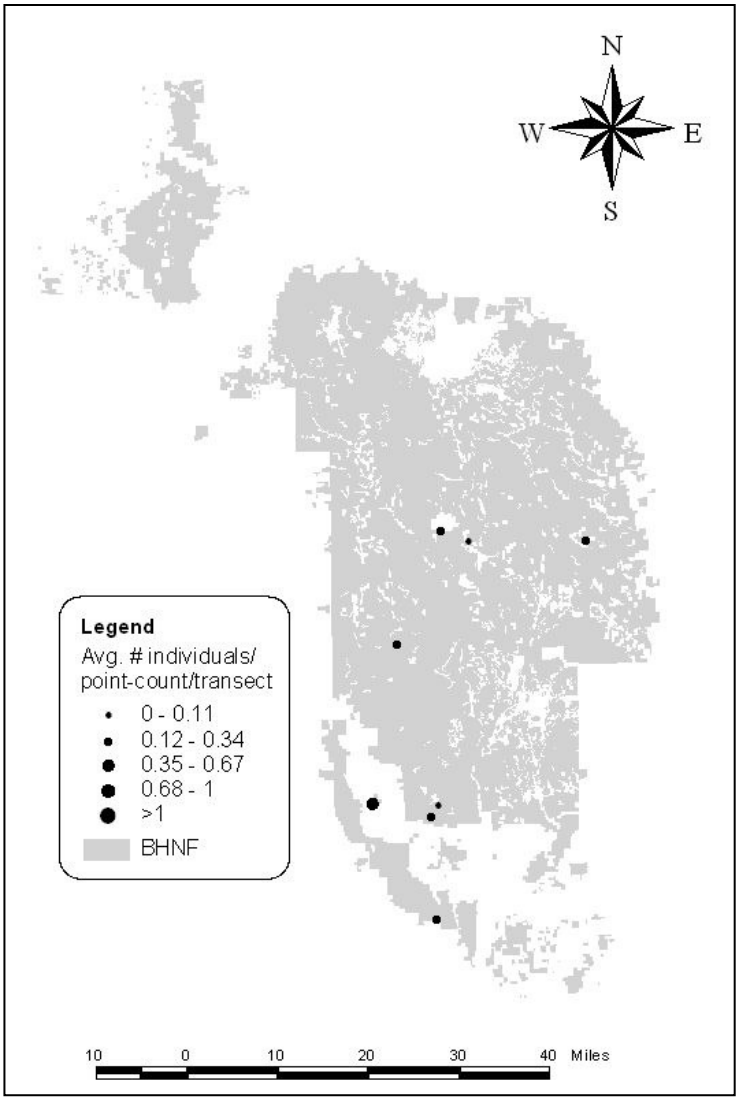
(PIF High Regional Concern BCR17)

Sharp-tailed Grouse occur almost exclusively in areas of native mixed-grass prairie, primarily in the southern Black Hills, Elk Mountains, and also in the large prairies in the central hills. This species may also be starting to colonize the jasper burn area as it starts to revert to grassland. Twenty-five Sharp-tailed Grouse were observed on transects this year, more than in any previous year of MBBH. Twenty-two individuals were observed in mixed-grass prairies and three were observed in the jasper burn. The increase in observations may be partially attributable to the greater number of sites surveyed in mixed-grass prairies this year, and to the removal of unrepresentative sites from this category, but could also be due to better habitat conditions for this species on the BHNF this year.

Although 22 individuals were observed in mixed-grass prairie, many of these were observed in groups, and thus there were insufficient independent observations to generate a density estimate in this habitat.

It is important to realize that the timing of our surveys in MG does not correspond well to the period of peak detectability of Sharp-tailed Grouse, which occurs earlier in spring. Thus the species probably goes undetected on many of our late-spring/early summer surveys. Nonetheless, the observations of this species from point transects could prove sufficient and consistent enough to provide a reliable index for monitoring, although such an assessment is probably premature at this time. Regardless, these data should not be relied upon for density estimates as many individuals are likely missed during our surveys.

Additional survey effort in mixed-grass prairies earlier in the spring would likely yield better information on Sharp-tailed Grouse, although because it is a game species, presumably it is already being monitored through other programs.



Abundance and distribution of Sharp-tailed Grouse observed on point transects in the Black Hills, 2004

Observations of Sharp-tailed Grouse in the Black Hills, 2004.

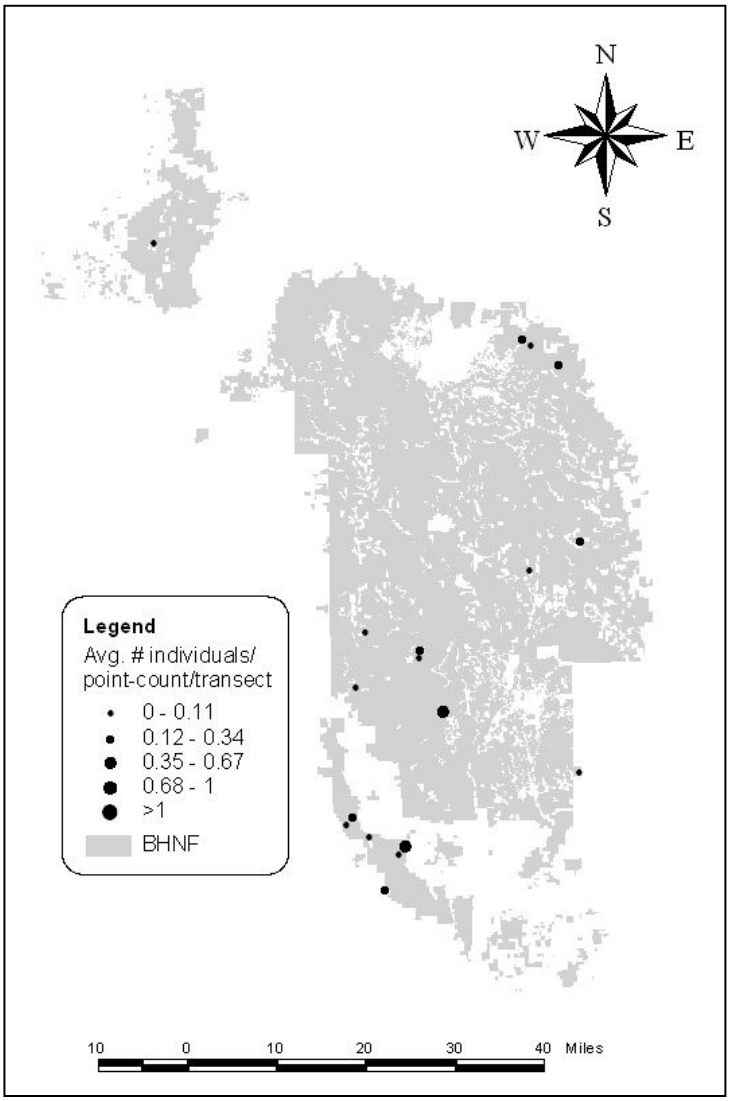
Habitat	D	LCL	UCL	CV(%)	N	(n)
BU	ID	--	--	--	3	1
MG	ID	--	--	--	22	9

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Wild Turkey
(BHNF Management Indicator Species)

Wild Turkey occurs throughout the Black Hills, but because vocalization activity declines sharply by the end of May, the species often goes undetected on our late-spring/early summer surveys. Nonetheless, the observations of turkeys from point transects appear to be sufficient, and should be consistent enough, to provide a reliable index for monitoring the population across habitats. However, these data should not be relied upon for density estimates or to determine habitat relationships as observation rates in each habitat are probably more influenced by the seasonal timing of surveys in the habitat rather than the density of individuals per se.

Additional effort earlier in the spring would likely yield better information on Wild Turkey, although because it is a game species, presumably it is already being monitored through other programs. However, Wild Turkeys should be effectively monitored under *MBBH* through point transects *across all habitat types*.



Abundance and distribution of Wild Turkeys observed on point transects in the Black Hills, 2004

Observations of Wild Turkey in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
AS	ID	--	--	--	3	3
BU	ID	--	--	--	14	7
LS	ID	--	--	--	6	2
MG	ID	--	--	--	23	13
SH	ID	--	--	--	1	1

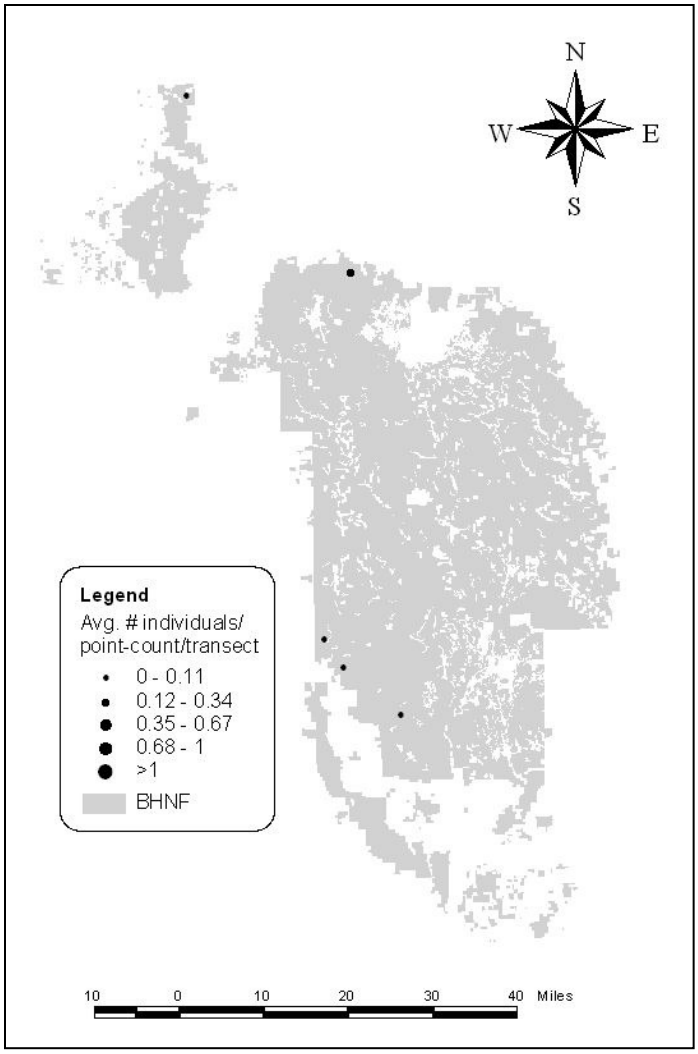
D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Sharp-shinned Hawk
(BHNF Proposed Species of Local Concern)

Sharp-shinned Hawk occurs throughout the Black Hills, but it is perhaps the rarest of the *Accipiters* on the Forest. Six Sharp-shinned Hawks were observed on transects in 2004, more than in any other year. Two were in aspen, one in late-successional pine, one in mixed-grass prairie, and two in pine-juniper shrubland. Too few were observed to estimate density either within or across habitats.

The cumulative observations of Sharp-shinned Hawk across the four years of MBBH suggest that it is the least common of the three Accipiters (Cooper's and Northern Goshawk being the others) in the Black Hills (Appendix A). 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 transects 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. Given interest, such a program could be implemented cost-effectively as part of MBBH, with observers using playback to detect Sharp-shinned Hawks and other forest raptors at count stations after point transect surveys.



Abundance and distribution of Sharp-shinned Hawks observed on point transects in the Black Hills, 2004.

Observations of Sharp-shinned Hawk in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
AS	ID	--	--	--	2	2
LS					1	1
MG	ID	--	--	--	1	1
SH	ID	--	--	--	2	2

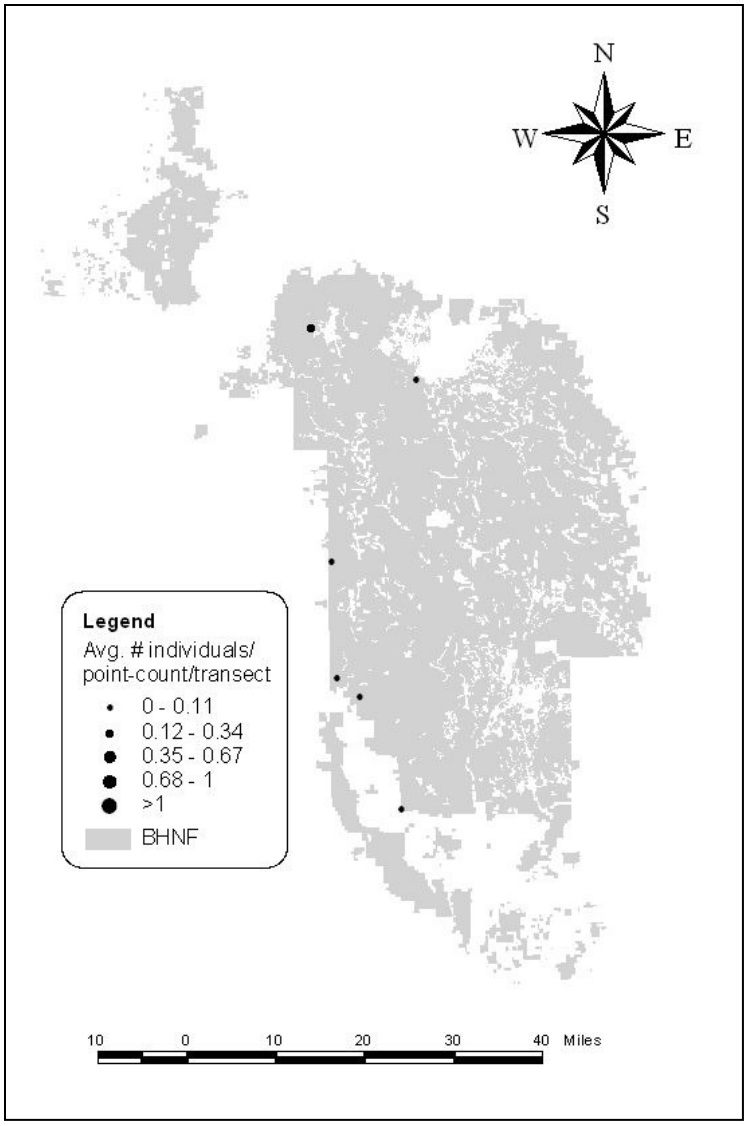
D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Cooper's Hawk

(BHNF Proposed Species of Local Concern)

Cooper's Hawk occurs throughout the Black Hills, but it is rare to uncommon throughout. Seven Cooper's Hawks were observed on transects in 2004. Two were in aspen, two in late-successional pine, one in mixed-grass prairie, and two in pine-juniper shrubland. Too few were observed to estimate density either within or across habitats.

Data from the full spectrum of habitat-based point transects across the Black Hills may provide a means to loosely track the status of Cooper's Hawk over time. Effective monitoring, however, will likely require more intensive and focused efforts, probably involving call-response surveys. 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.



Abundance and distribution of Cooper's Hawks observed on point transects in the Black Hills, 2004.

Observations of Cooper's Hawk in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
AS	ID	--	--	--	2	1
LS	ID	--	--	--	2	2
MG	ID	--	--	--	1	1
SH	ID	--	--	--	2	2

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

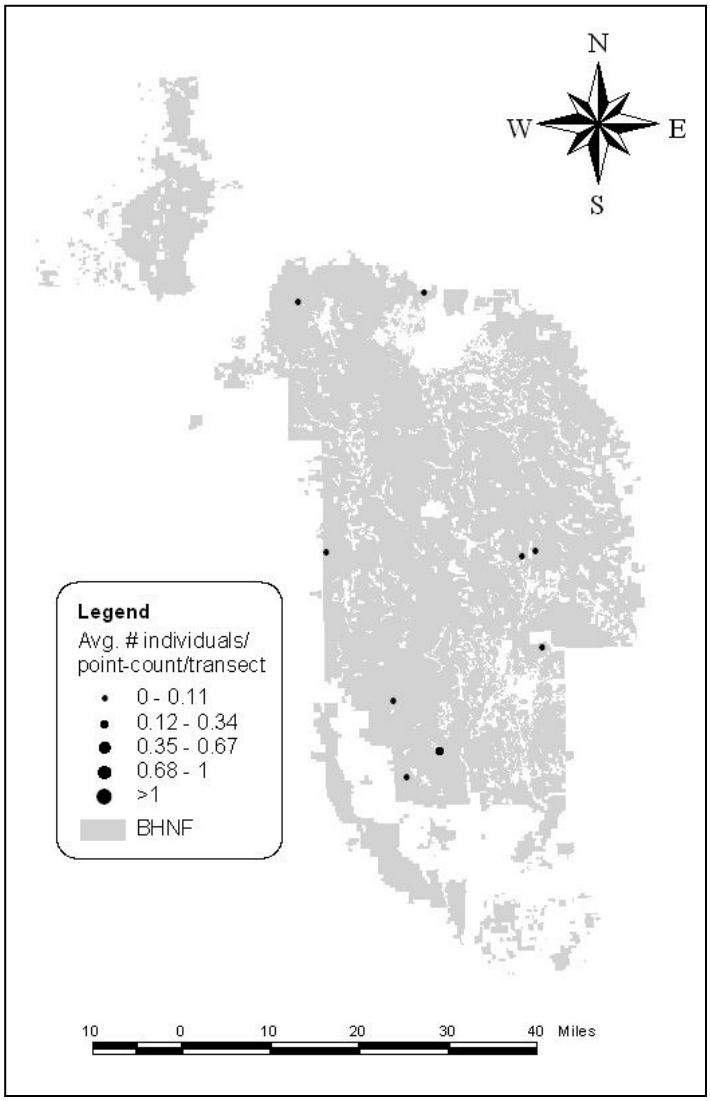
Northern Goshawk

(Region 2 Sensitive Species)
(BHNF Management Indicator Species)
(WY-PIF Level I Priority)

Northern Goshawk occurs widely in the Black Hills but it is rare to uncommon throughout. Ten Northern Goshawks were recorded in 2004: three in aspen, one in the jasper burn, three in late-successional pine forest, and three in mixed-grass prairie. Too few were observed to estimate density either within or across habitats.

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

Data from the full spectrum of habitat-based point transects across the Black Hills may provide a means to loosely track the status of Northern Goshawk over time. Effective monitoring, however, will likely require more intensive and focused efforts, probably involving call-response surveys. Given interest, such a program could be implemented cost-effectively as part of MBBH, with observers using playback to detect goshawks and other forest raptors at count stations after point transect surveys.



Abundance and distribution of Northern Goshawks observed on point transects in the Black Hills, 2004.

Observations of Northern Goshawk in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
AS	ID	--	--	--	3	3
BU	ID	--	--	--	1	1
LS	ID	--	--	--	3	3
MG	ID	--	--	--	3	3

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Broad-winged Hawk

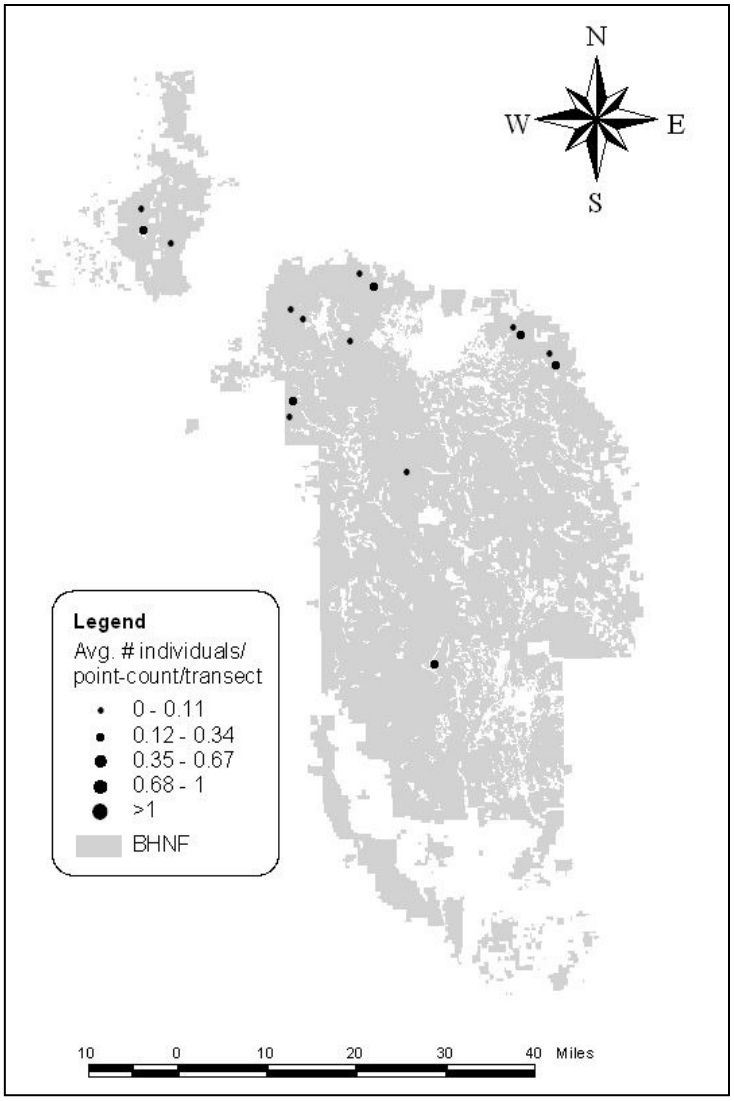
(BHNF Proposed Species of Local Concern)

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. Twenty four Broad-winged Hawks were observed on transects in 2004, more than in any other year. Fourteen of these were in aspen, two in the jasper burn, and eight in late-successional pine forest. Too few were observed to estimate density within any single habitats.

Given that most individuals were observed on transects in aspen, aspen stands probably comprise an important habitat in the Black Hills for this species, which primarily occupies broad-leaved deciduous forests in the core of its range in eastern North America. Late-successional stands of ponderosa pine also appear to be important.

As with most raptors, Broad-winged Hawks are observed too infrequently to be adequately monitored through point transects in any single habitat. However, data from the full spectrum of habitat-based point transects across the Black Hills, particularly in the north, should provide an index consistent enough to monitor the species across all habitats in the Black Hills. However, because of its low density, such an annual index could still be influenced by the vagaries of random sampling.

Alternatively, more intensive and focused efforts, possibly involving call-response surveys, could be used to monitor Broad-winged Hawk and other forest raptors on the Black Hills. 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.



Abundance and distribution of Broad-winged Hawks observed on point transects in the Black Hills, 2004.

Observations of Broad-winged Hawks in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
AS	ID	--	--	--	14	14
BU					2	1
LS	ID	--	--	--	8	8

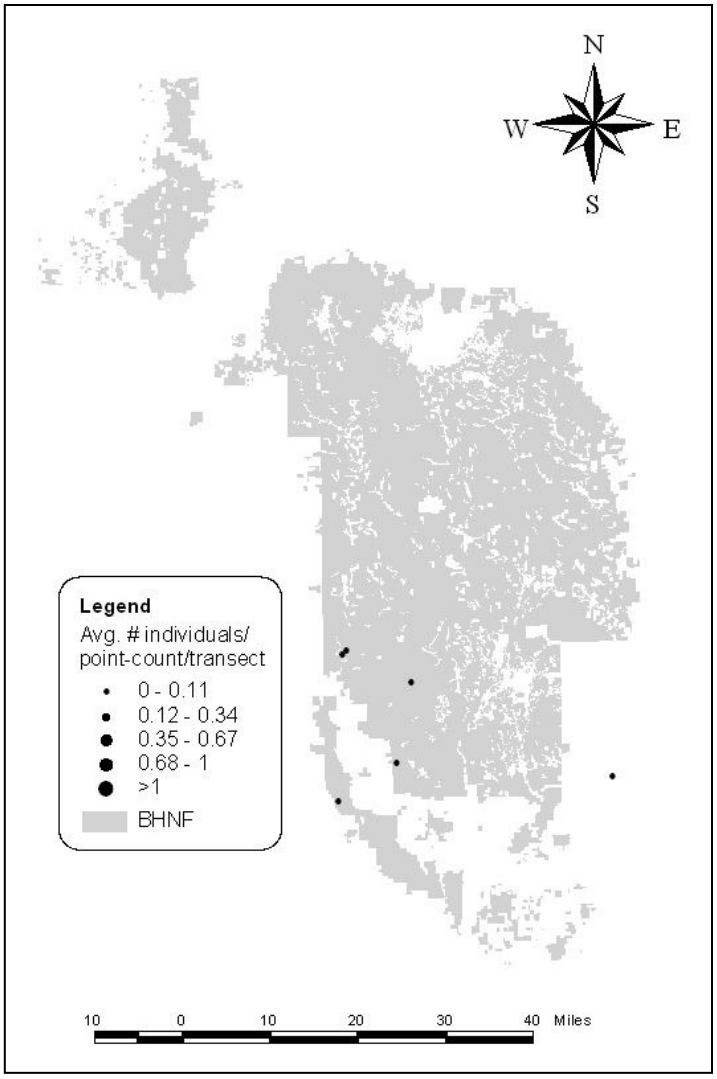
D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Prairie Falcon

(USFWS Bird of Conservation Concern)
(PIF High Overall Priority BCR17)

Prairie Falcon is a rare to locally uncommon species in the Black Hills, occurring primarily where high cliffs provide suitable nesting sites in proximity to open areas for hunting. Six individuals were observed in 2004, one in the Jasper burn, three in mixed-grass prairie, and 2 in pine-juniper shrublands.

Due to the low-density and localized distribution of Prairie Falcons in the Black Hills, habitat-stratified point transects will only provide a means to loosely track the status of this species. Effective monitoring will likely best be accomplished through locating and monitoring as many nests as possible of this species in the Black Hills. Such an effort could be incorporated into MBBH in a cost-effective manner, especially if combined with similar efforts for other cliff-nesting species (e.g., Golden Eagle).



Abundance and distribution of Prairie Falcons observed on point transects in the Black Hills, 2004.

Observations of Prairie Falcon in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
BU	ID	--	--	--	1	1
MG	ID	--	--	--	3	3
SH	ID	--	--	--	2	2

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Upland Sandpiper

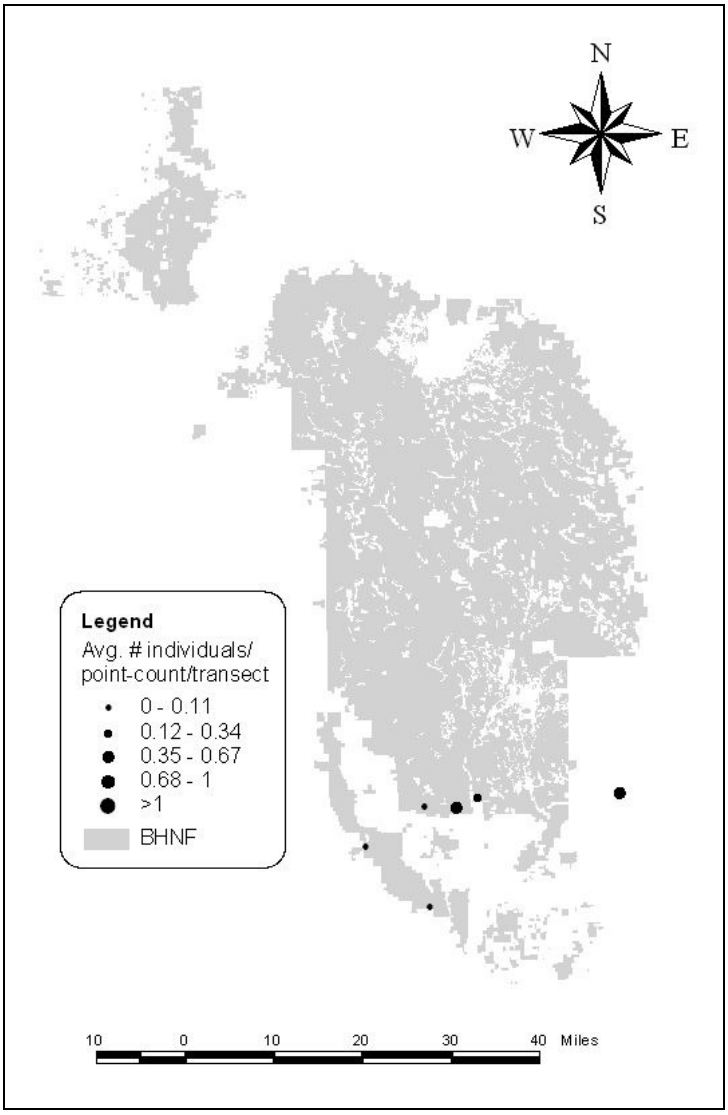
(PIF High Overall Priority BCR17)
(USFWS Bird of Conservation Concern)

Upland Sandpipers occur locally in the Black Hills, primarily in the south, where they are entirely restricted to large expanses of mixed-grass prairie. This year was the first year RMBO staff documented this species on the BHNF, in part due to the increase and refinement of transect allocation in this habitat. A total of 12 individuals was detected on BHNF lands, all in mixed-grass prairies, and an additional 7 individuals were observed on a single MG transect in Wind Cave National Park.

While Upland Sandpipers are generally more abundant on the plains surrounding the BHNF, 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) and no other bird conservation region (BCR) has a higher average density of this species than BCR17.

Upland Sandpipers require short vegetation for foraging, taller vegetation for nesting, and short to medium vegetation for brood cover (Dechant et al. 1999). Thus a mosaic of adjacent grasslands, some grazed and some ungrazed, provides ideal habitat for this species.

Too few independent detections of this species were made to generate a density estimate in the mixed-grass prairie habitat, and the species is too rare at present to be adequately monitored under the current level of effort under MBBH. However, given continued effort in this habitat, it should be possible to loosely track the status of Upland Sandpipers over time on the BHNF through the current array of point-transects in mixed-grass prairie.



Abundance and distribution of Upland Sandpipers observed on point transects in the Black Hills, 2004.

Observations of Upland Sandpiper in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
MG	ID	--	--	--	19	18

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Burrowing Owl

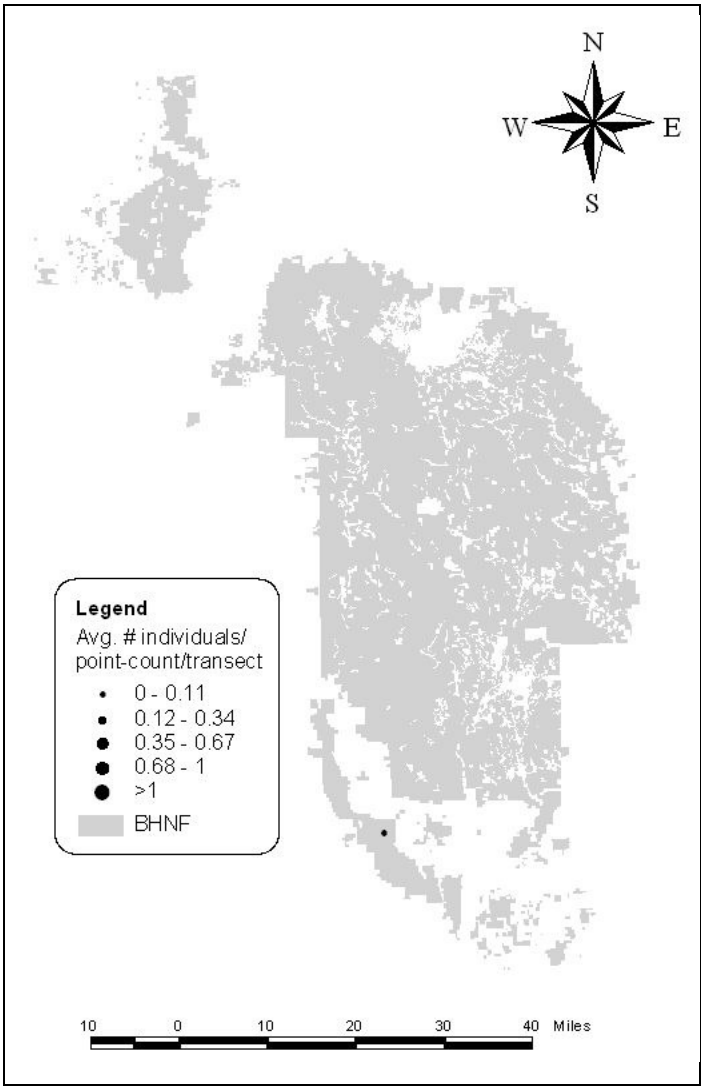
(Region2 Sensitive Species)
(PIF High Regional Priority BCR17)
(USFWS Bird of Conservation Concern)

A single Burrowing Owl was observed in 2004 on a prairie dog town at a mixed-grass prairie site in the Elk Mountains. This was the first observation of Burrowing Owl on the BHNF since the start of MBBH in 2001.

Although only a single bird was observed, this observation confirms the presence of this species on the BHNF during the breeding season. It also signals that the species could occur at other suitable sites on the BHNF, which likely would include prairie dog towns and other grasslands sites where fossorial mammals provide suitable burrows.

Within the Black Hills, Burrowing Owls were previously known only from Wind Cave National Park, although they may also occur in adjacent Custer State Park, as extensive prairie dog towns exist there as well. They are more common, but still highly local, on the plains surrounding the BHNF.

MBBH will not adequately monitor this species, but should serve to track the status of Burrowing Owls at this and other established mixed-grass prairie sites in the Black Hills. If there is interest to better determine the species' status and trends on the BHNF, all potentially suitable sites, particularly prairie dog towns, could be inventoried annually with little cost to determine occupancy and abundance of Burrowing Owls.



Abundance and distribution of Burrowing Owls observed on point transects in the Black Hills, 2004.

Observations of Burrowing Owl in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	n
MG	ID	--	--	--	1

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Northern Saw-whet Owl
(Proposed Species of Local Concern)

Northern Saw-whet Owl occurs throughout the Black Hills in most forest types, especially ponderosa pine, where it is uncommon to fairly common. A single Northern Saw-whet Owl was observed on a point transect in the Jasper burn area in 2004. However, the species' abundance and habitat affiliation as depicted by our diurnal point transects is in no way indicative of the species' abundance across the Forest, as this nocturnal species mostly goes undetected during our surveys.

No map is provided as the single point location of this year's observation would be misleading as the species is much more widespread and common than it would indicate.

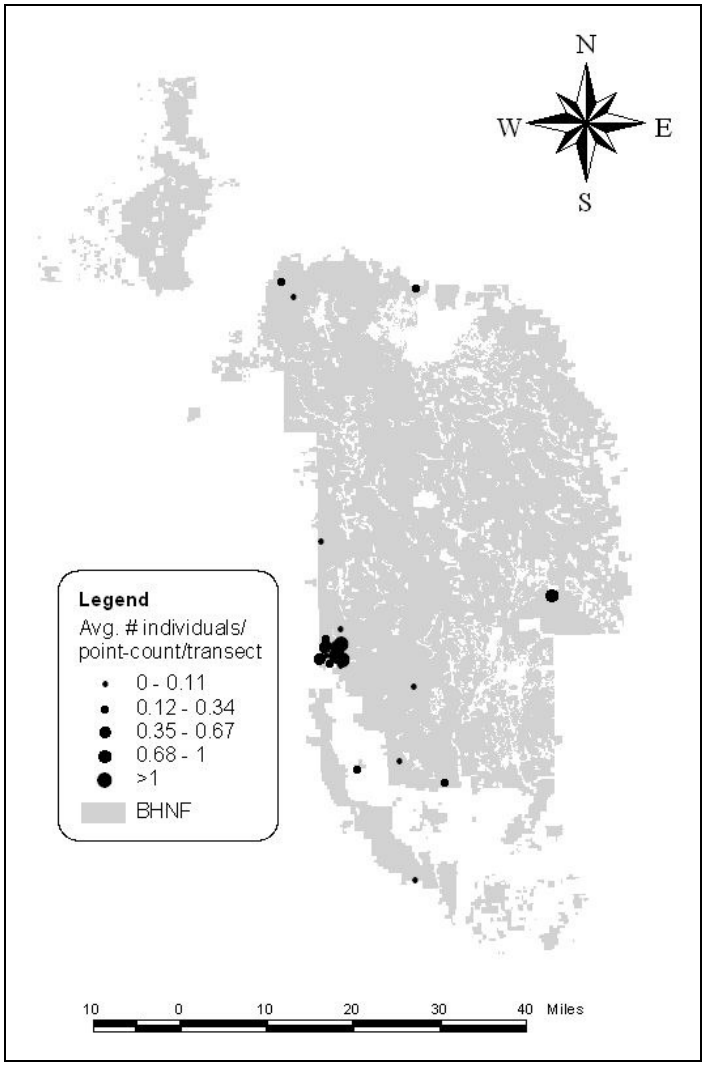
The current sampling scheme of MBBH which targets diurnal species will not serve to adequately monitor Northern Saw-whet Owls or other nocturnal species. However, RMBO has developed and implemented protocols to survey for nocturnal birds such as owls and nightjars, and such an effort could be implemented in the Black Hills, given interest.

White-throated Swift

(PIF Continental Watch List)
(PIF High Regional Priority BCR17)
(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 2004, White-throated Swifts occurred in highest density in pine-juniper shrubland, primarily due to the prevalence of high cliffs there. Previous surveys have shown they also occur in high density in the foothill riparian habitat, again due to the prevalence of high cliffs

Because White-throated Swifts are typically observed in flocks, the number of independent observations of clusters is often considerably lower than the number of individuals recorded. Independently observed clusters in the five habitats surveyed in 2003 were too few to allow for statistically rigorous monitoring, other than in the pine-juniper shrubland habitat. Effective monitoring of White-throated Swifts will best be accomplished through point transects in pine-juniper shrubland and foothill riparian, or through complimentary techniques that specifically target cliff-nesting birds.



Abundance and distribution of White-throated Swifts observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for White-throated Swift in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
AS	ID	--	--	--	4	1
BU	ID	--	--	--	1	1
LS	ID	--	--	--	13	7
MG	ID	--	--	--	9	5
SH	11.6	5.46	24.76	39	115	34

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Lewis's Woodpecker

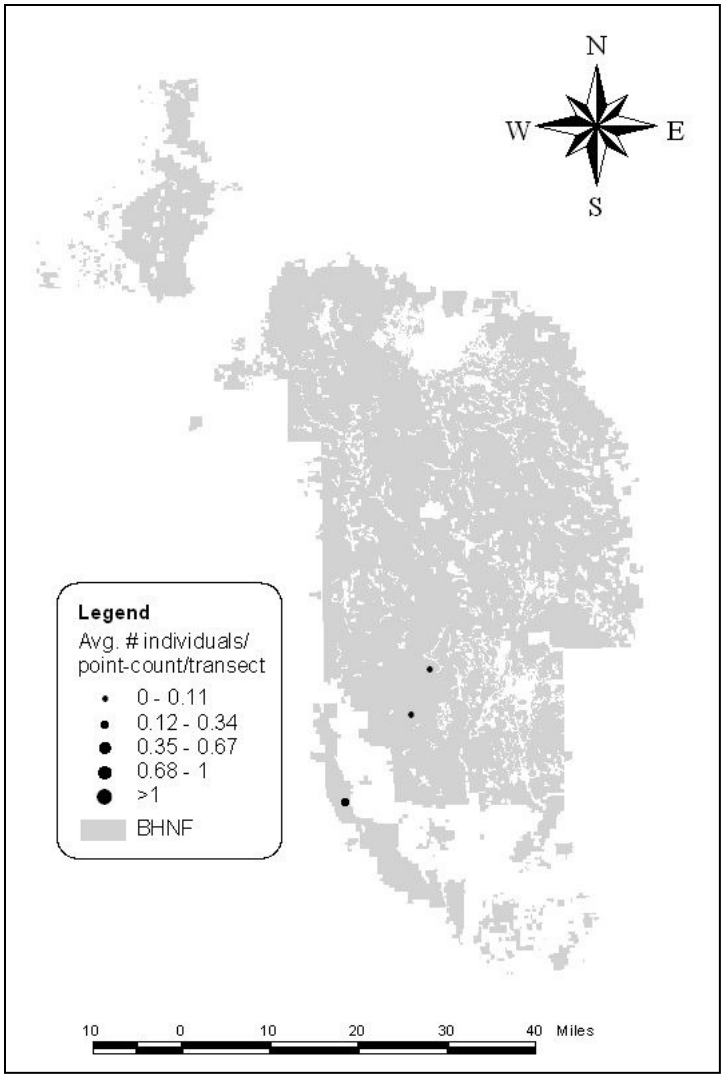
(Region 2 Sensitive Species)
(PIF Continental Watch List)
(PIF High Overall Priority BCR17)
(WY-PIF Level II Priority)
(USFWS Bird of Conservation Concern)

Lewis's Woodpecker reaches the most northeasterly extent of its global distribution in the Black Hills, where it is generally uncommon to rare. In 2004, RMBO staff observed four Lewis's Woodpeckers on the BHNF, two in the jasper burn and two at a mixed-grass prairie site that is located in an old burn area (Dewey Fire, 1996).

Previous accounts of the Lewis's Woodpecker's historical abundance in the Black Hills are somewhat conflicting. Some authors contend it has never been common (Grinnell 1875, Pettingill and Whitney 1965), but at least one author (Cary 1901) stated that it was "common" and "partial to burnt timber on the sides of canyons". Pettingill and Whitney (1965) also stated that it prefers "burned-over areas" and "edges of pine forests and streamside cottonwoods with considerable dead growth". The species has probably always been localized due to its narrow habitat requirements.

Although the Jasper and other recent fires have created new potential habitat for Lewis's Woodpeckers, it does not appear that they are achieving notable population increases there yet, at least in the Jasper burn. Presumably as these burn areas age, their suitability as habitat for this species will increase.

Because still so few Lewis's Woodpeckers are being recorded on point transects in the Jasper burn, it seems that conducting point-transects only in recent burn areas (<5 yrs old) will be inadequate to monitor this species. However, a random sampling scheme that considers all burn areas in the Black Hills (at least up to a certain age, e.g., 20 yrs), and thus includes a greater proportion of older burns, could prove useful to monitoring or tracking the species on the Forest.



Abundance and distribution of Lewis's Woodpeckers observed on point transects in the Black Hills, 2004.

Observations of Lewis's Woodpecker in the Black Hills, 2004.

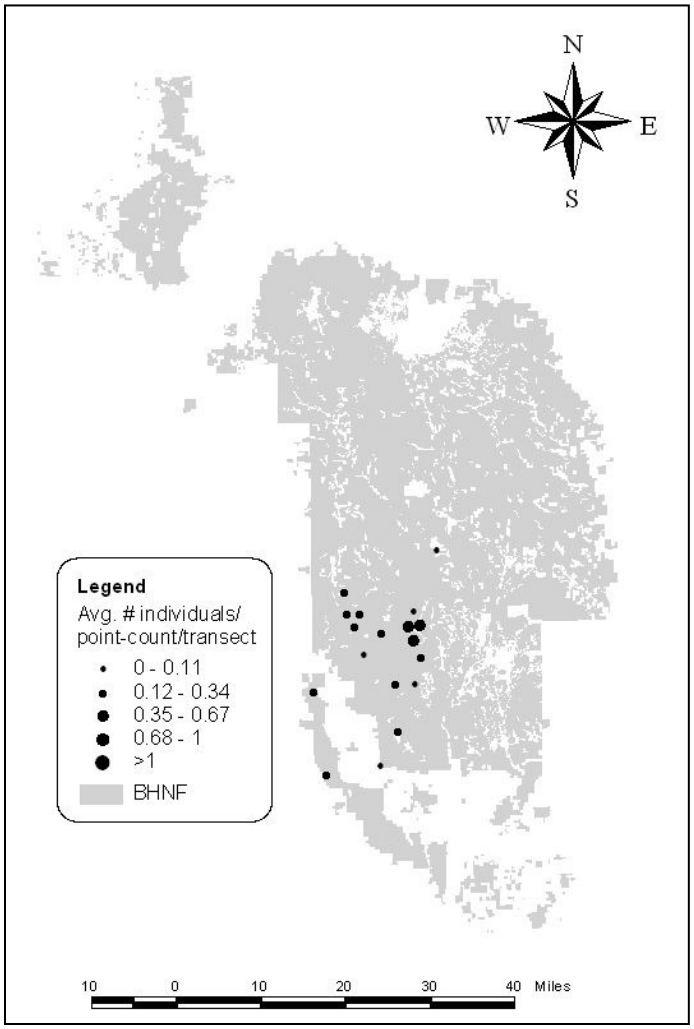
Habitat	D	LCL	UCL	CV(%)	N	(n)
BU	ID	--	--	--	2	2
MG	ID	--	--	--	2	2

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Red-headed Woodpecker

(PIF Continental Watch List)
(PIF High Regional Priority BCR17)

Red-headed Woodpeckers occur locally in the Black Hills, where they are generally uncommon to rare. At present, they occur in very low densities, primarily in burn areas, and less commonly in mixed-grass prairies with scattered trees (pine savannahs). Most individuals recorded in 2004 were in burn areas, and even some of those recorded at mixed-grass prairie sites were actually using burned pine stands in adjacent areas. These observations are consistent with previous evidence (Panjabi 2003a, 2004) that suggests that this species presence in the Black Hills is largely tied to the availability of burned pine forests, and perhaps also open pine savannahs, given sufficient abundance of snags.



Abundance and distribution of Red-headed Woodpeckers observed on point transects in the Black Hills, 2004.

While the density estimate for Red-headed Woodpecker in the burn area is slightly higher than in 2003, the species still occurs in extremely low density in this area. Red-headed Woodpeckers are probably also occupying other recent burn areas in the Black Hills, presumably in similar low densities, although no data exist to document this.

While quantitative data do not exist, Red-headed Woodpeckers were almost certainly more common in the Black Hills previously. Grinnell (1875), who accompanied the Custer Expedition, described it as "especially abundant" in the Black Hills, even calling it "the most common species there". Cary (1901) reported it to be "the most abundant woodpecker in the Hills". This species has declined by over 50% range-wide since 1966 (Sauer et al. 2003), and it appears to have undergone a similar if not greater decline in the Black Hills as well.

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.

Habitat-specific density estimates for Red-headed Woodpecker in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV%	N	(n)
BU	0.62	0.37	1.06	27	47	43
MG	ID	--	--	--	6	5

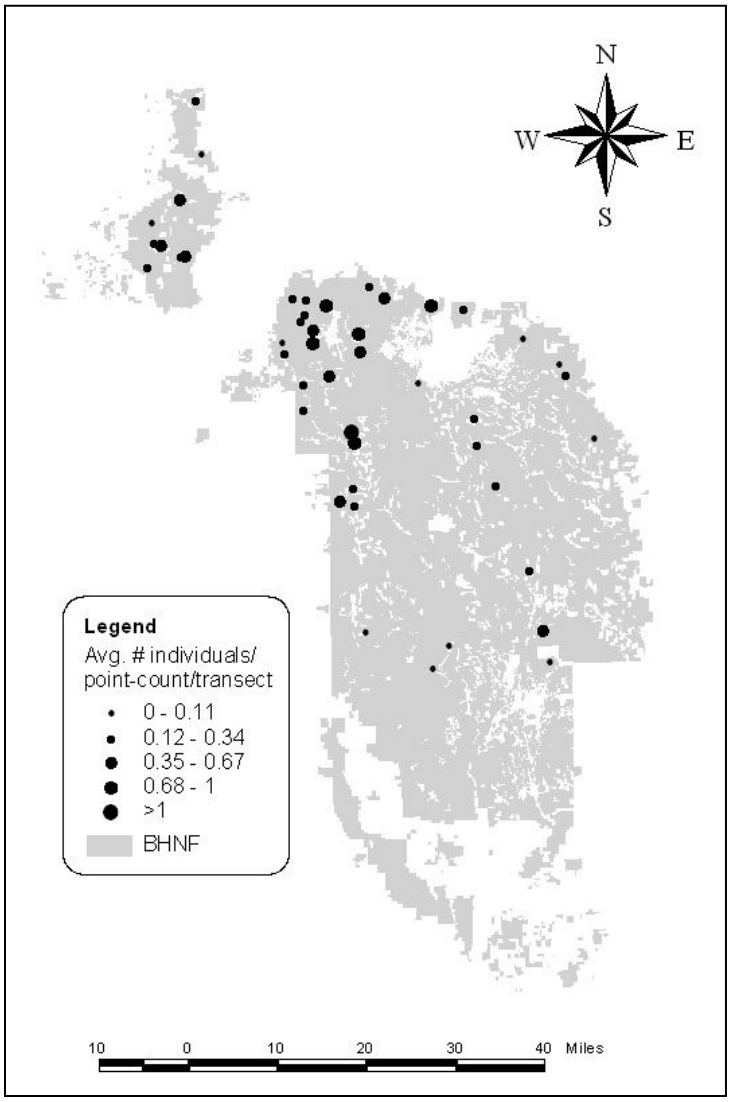
D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Red-naped Sapsucker

(USFWS Bird of Conservation Concern)
(PIF High Overall Priority BCR17)
(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 aspens and willows.

Of the habitats surveyed in 2004, Red-naped Sapsucker occurred in highest density in aspen stands. This species should be effectively monitored under MBBH by point transects in a range of habitats, especially aspen, montane riparian, pine-north, and late-successional pine.

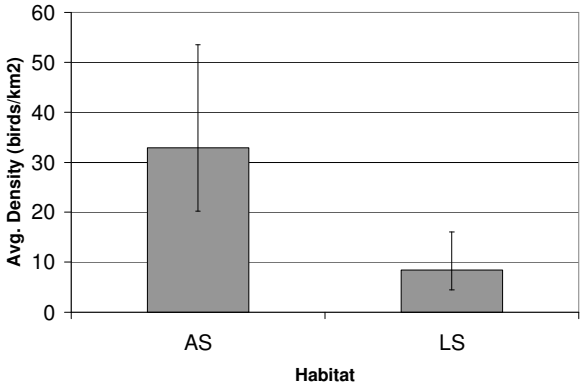


Abundance and distribution of Red-naped Sapsuckers observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Red-naped Sapsucker in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV%	N	(n)
AS	32.9	20.2	53.51	25	133	130
BU	ID	--	--	--	3	3
LS	8.45	4.45	16.07	33	76	74

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data



Relative density of Red-naped Sapsuckers among habitats in the Black Hills, 2003.

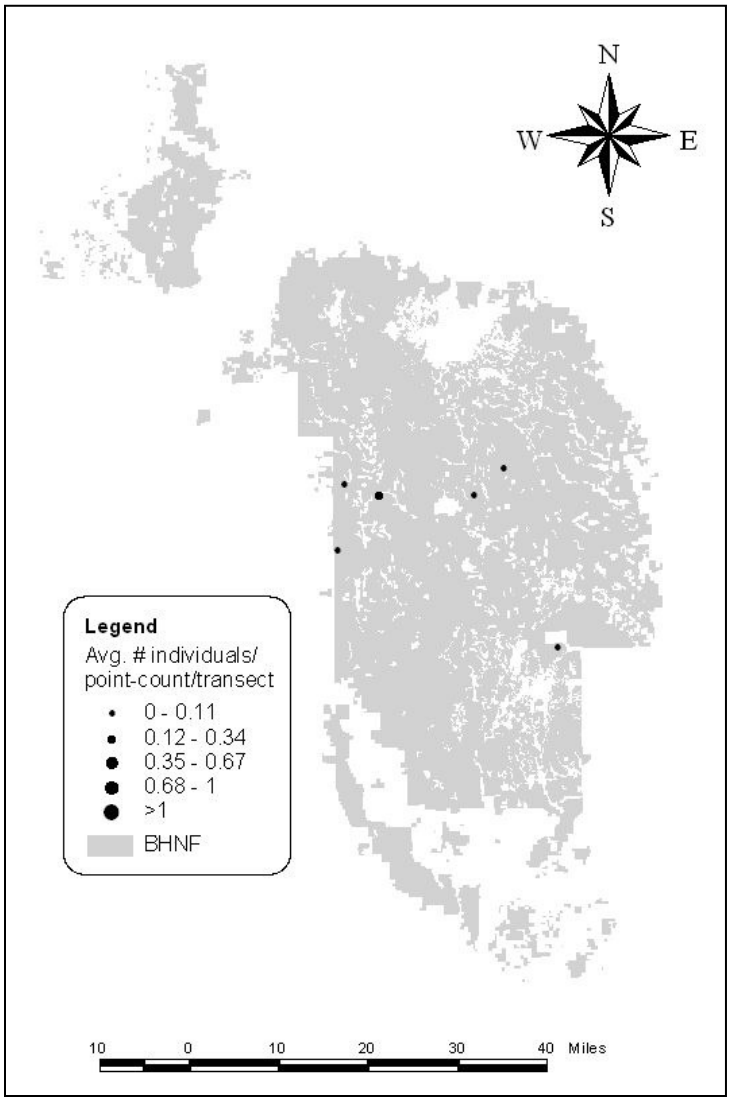
American Three-toed Woodpecker

(Region 2 Sensitive Species)
(BHNF Management Indicator Species)
(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 uncommon to rare. White spruce stands were not surveyed in 2004, but we did record one individual in aspen and seven in late-successional pine stands. However, the areas where these observations occurred supported mature forest (seral stage 4 or 5) of spruce and pine.

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. Thus, its preference for spruce forests likely extends even to burned areas.

Three-toed Woodpecker should be effectively monitored under MBBH through point transects in white spruce.



Abundance and distribution of American Three-toed Woodpecker observed on point transects in the Black Hills, 2004.

Observations of American Three-toed Woodpecker in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV (%)	N	(n)
AS	ID	--	--	--	1	1
LS	ID	--	--	--	7	7

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

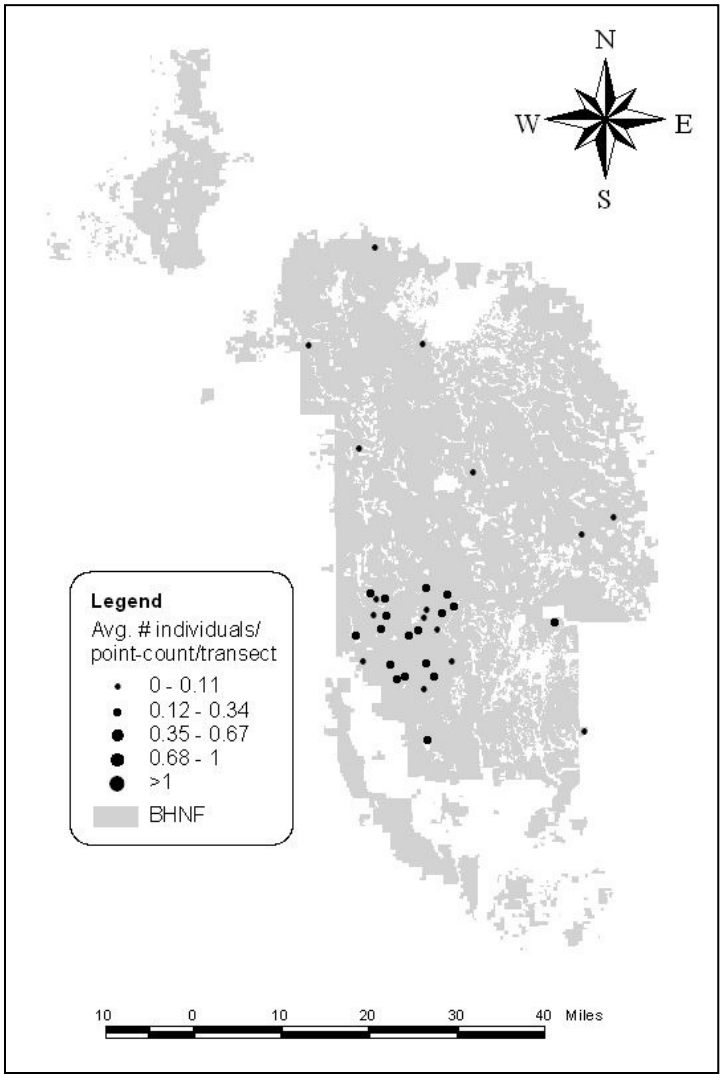
Black-backed Woodpecker

(Region 2 Sensitive Species)
(BHNF Management Indicator Species)
(PIF High Regional Priority BCR17)
(WY-PIF Level II Priority)

Black-backed Woodpeckers occur widely in the Black Hills, but they are rare outside of burns. Black-backed Woodpecker numbers increased significantly in the Jasper burn during the first two years following the fire (Panjabi 2001, 2003a), but it appears the population has since started to decline. Estimated average density of Black-backed Woodpeckers in the Jasper burn was 3.38 birds/ km^2, down from a high of 6.91 birds/km^2 in 2002.

In some parts of the Jasper burn, primarily where high densities of large-diameter burned trees remain, Black-backs are still locally common. Black-backed Woodpeckers in the Jasper burn prefer to nest in large diameter trees and in areas with a higher density of snags (Vierling and Saab 2002). Outside of the Jasper burn, Black-backs were found only in areas with mature forest or in other burn areas (Panjabi unpublished data 2004).

Black-backed Woodpeckers should be effectively monitored under MBBH by point transects in BU, however as conditions change in the Jasper burn it will be necessary to focus effort on other burn areas in order to monitor this species at the Forest-level in the Black Hills. Because Black-backs prefer younger burns, one option could be to switch to rotational sampling in this habitat, so that newer burn areas are continually rotated through the sampling scheme. Alternatively, a greater number of sites randomly selected from the full spectrum of burned areas available on the Forest could provide a means to monitor Black-backed Woodpeckers and other high priority species that also depend on burns, such as Lewis's and Red-headed Woodpecker, in a way that would allow inference to Forest-wide population status and trends.



Abundance and distribution of Black-backed Woodpecker observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Black-backed Woodpecker in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV (%)	N	(n)
AS	ID	--	--	--	2	2
BU	3.38	2.03	5.63	0.26	53	52
LS	ID	--	--	--	7	7
MG	N/A	--	--	--	3	3
SH	ID	--	--	--	3	3

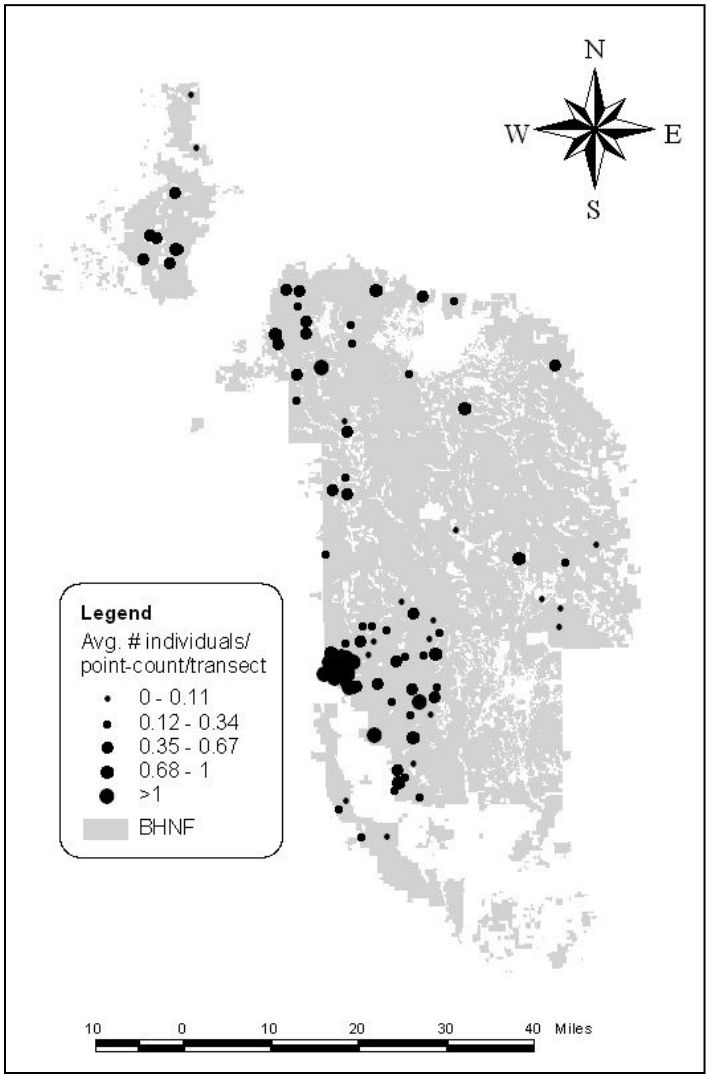
D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Dusky Flycatcher
(WY-PIF Level II Priority)

Dusky Flycatchers occur widely throughout the Black Hills, and are generally fairly common to abundant, although their density varies considerably among habitats. Their abundance appears largely to be tied with the prevalence of broad-leaved, deciduous vegetation of almost any kind.

Of the habitats surveyed in 2004, density was greatest in the pine-juniper shrubland, and this is the habitat in the Black Hills in which this species achieves its greatest density. They also occur in high densities in montane riparian (Panjabi 2003a, 2004) and aspen forests. Dusky Flycatchers are responding positively to the changes caused by the Jasper burn, and have been steadily increasing in density in this area since 2001.

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.

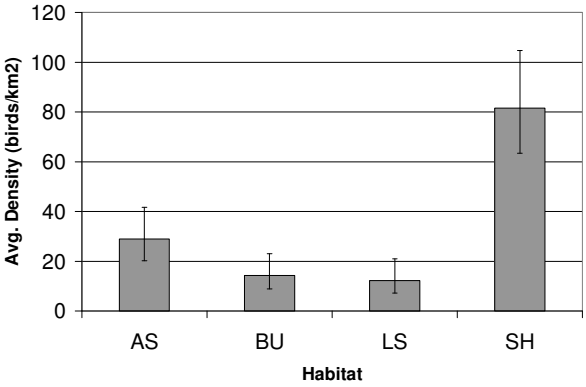


Abundance and distribution of Dusky Flycatchers observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Dusky Flycatcher in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV%	N	(n)
AS	29	20.2	41.64	18	159	158
BU	14.3	8.91	22.99	24	111	110
LS	12.3	7.19	20.97	27	78	78
MG	N/A	--	--	--	42	42
SH	81.5	63.4	104.8	12	325	324

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data



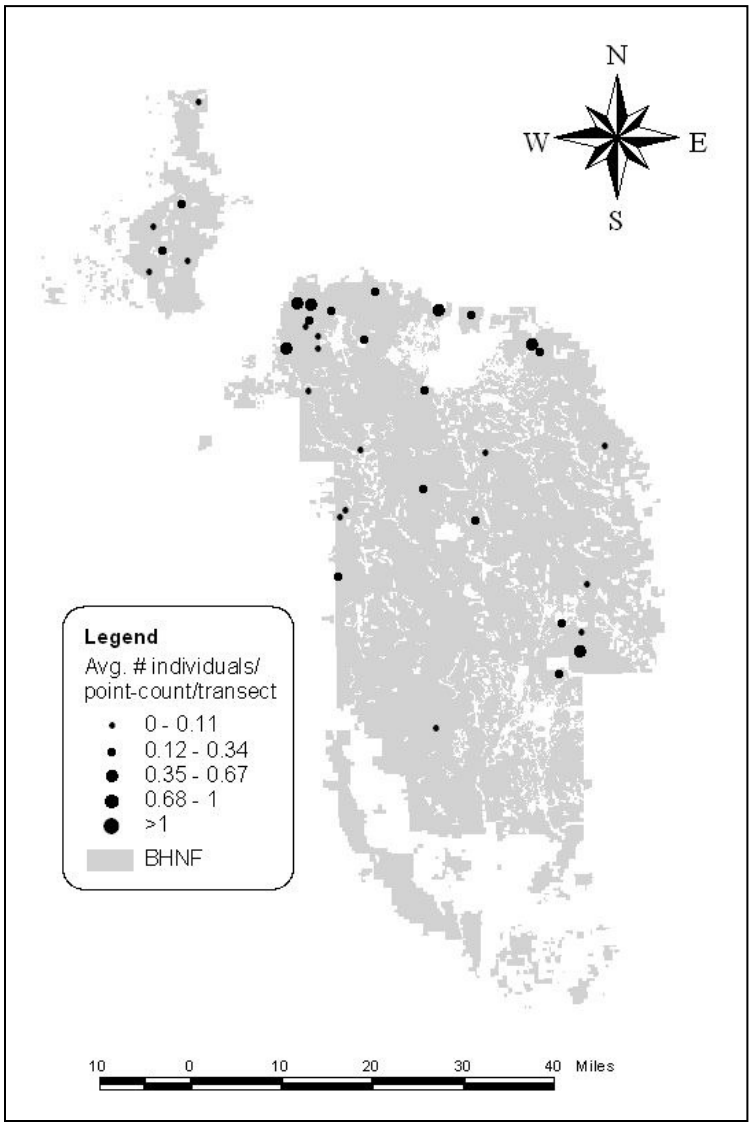
Relative density of Dusky Flycatchers among habitats in the Black Hills, 2004.

Cordilleran Flycatcher
(WY-PIF Level II Priority)

Cordilleran Flycatchers occur widely in the Black Hills, but their 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. They seem to have the strongest preference for moist canyons with abundant broad-leaved, deciduous vegetation.

Of the habitats surveyed in 2004, estimated density was highest in aspen forests, although they occurred in similar, but perhaps slightly lower density in late-successional pine stands. Cordilleran Flycatchers achieve their highest densities in the Black Hills in foothill riparian habitats, with montane riparian habitats running a close second (Panjabi 2003a).

Cordilleran Flycatchers should be effectively monitored under *MBBH* through point-transects in a range of habitats, especially foothill and montane riparian.

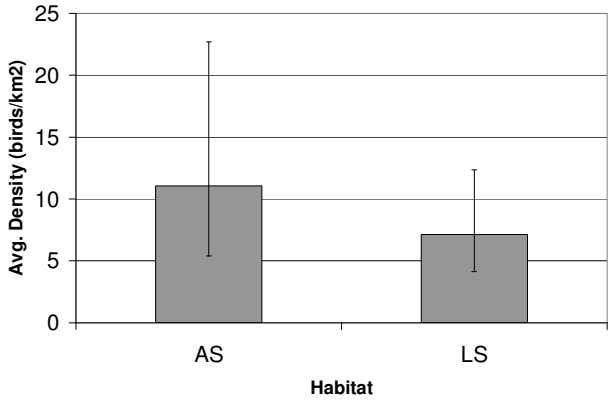


Abundance and distribution of Cordilleran Flycatchers observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Cordilleran Flycatcher in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV%	N	(n)
AS	11.1	5.39	22.71	37	45	45
BU	ID	--	--	--	1	1
LS	7.14	4.12	12.36	28	50	50

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data



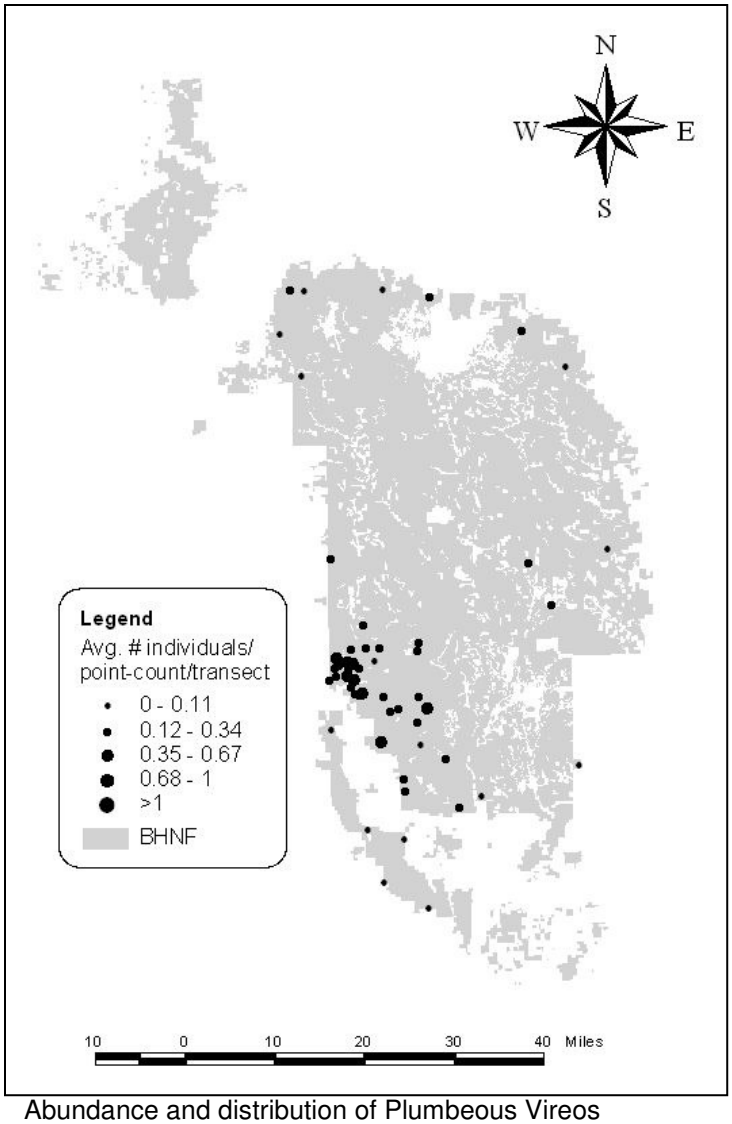
Relative density of Cordilleran Flycatchers among habitats in the Black Hills, 2004.

Plumbeous Vireo
(WY-PIF Level II Priority)

Plumbeous Vireos occur in ponderosa pine forests throughout the Black Hills in low to moderate abundance, but they are most abundant at lower elevations, especially in the southwest, and they seem to have a preference for arid sites. Although they were recorded from all habitats in 2004, their presence is tied to the availability of pine forest.

Plumbeous Vireos achieve their highest density in the Black Hills in the pine-juniper shrublands of the southwestern hills, although they are also fairly common in the southern ponderosa pine forests (Panjabi 2003a, 2004). Plumbeous Vireos forage primarily in foliage and on twigs, but they have been able to persist in the Jasper Burn area, even four years after the fire. However, after a brief spike in 2002, their density in the burn has been steadily declining.

Plumbeous Vireos should be effectively monitored under MBHH through point-transects in a range of habitats, especially in the pine-juniper shrubland and pine-south habitats.

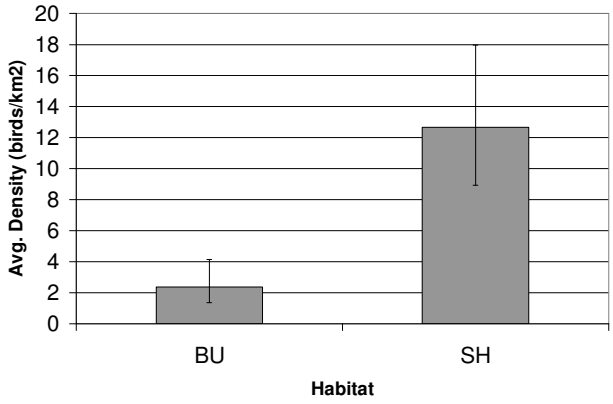


Abundance and distribution of Plumbeous Vireos observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Plumbeous Vireo in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV (%)	N	(n)
AS	ID	--	--	--	6	6
BU	2.37	1.35	4.13	28	40	40
LS	ID	--	--	--	14	14
MG	N/A	--	--	--	16	16
SH	12.7	8.92	17.98	17	90	90

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data



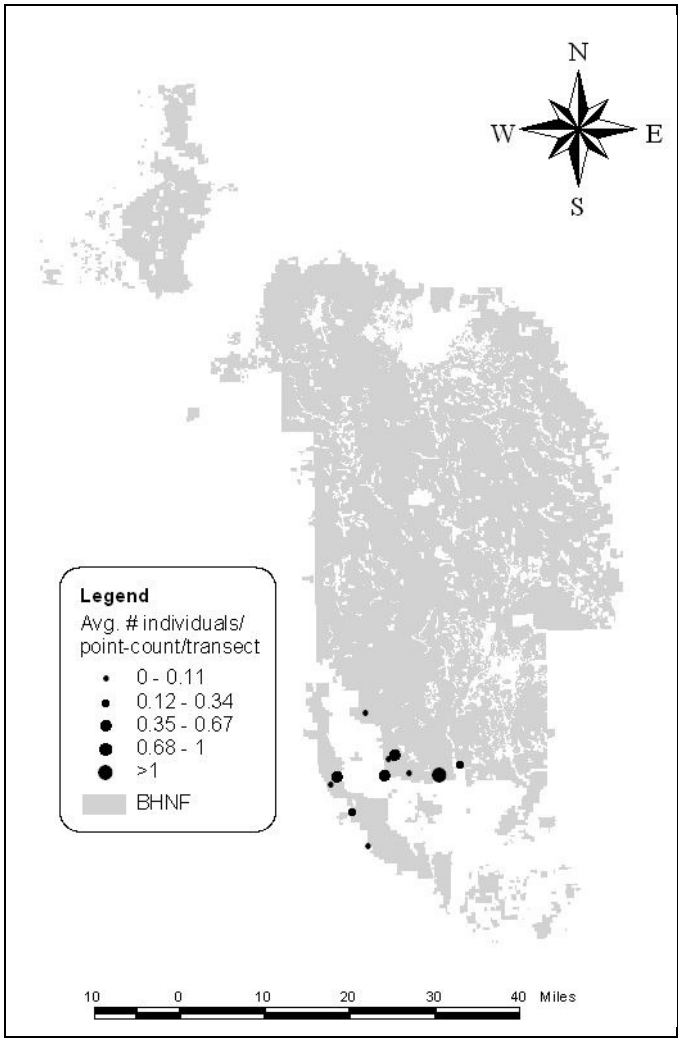
Relative density of Plumbeous Vireos among habitats in the Black Hills, 2004.

Pinyon Jay
(PIF Continental Watch List)

Pinyon Jays are primarily restricted to arid low-elevation habitats in the southwestern Black Hills, although they do occur seasonally in other areas. In 2004, Pinyon Jays were recorded primarily in mixed-grass prairie, with 2 observations from pine-juniper shrublands. However, it is difficult to discern their specific habitat preference from these data, as they are often detected at great distances, and sometimes in flight. Clearly, they are not a grassland species per se, and given their preferences for pine seeds and open woodland habitat, it seems reasonable to surmise that in the Black Hills they prefer the sparse pine woodlands that are interspersed by extensive grasslands, and they probably move about in response to varying abundance of cone crops.

Pinyon Jay is on the Partners In Flight North American Watch List due to a well-documented range-wide population decline of over 50% since the 1960's.

Due to their narrow distribution, small population, and strong propensity for flocking, the probability of encountering Pinyon Jays on point transect surveys is low. Despite a promising number of observations in 2004, Pinyon Jays may not be adequately monitored under MBBH in any single habitat, but they should be reasonably well-monitored across all habitats within their range, given continued effort in mixed-grass prairies, pine-juniper shrublands, and ponderosa pine forests in this area.



Abundance and distribution of Pinyon Jays observed on point transects in the Black Hills, 2004.

Observations of Pinyon Jay in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
MG	ID	--	--	--	54	22
SH	ID	--	--	--	2	2

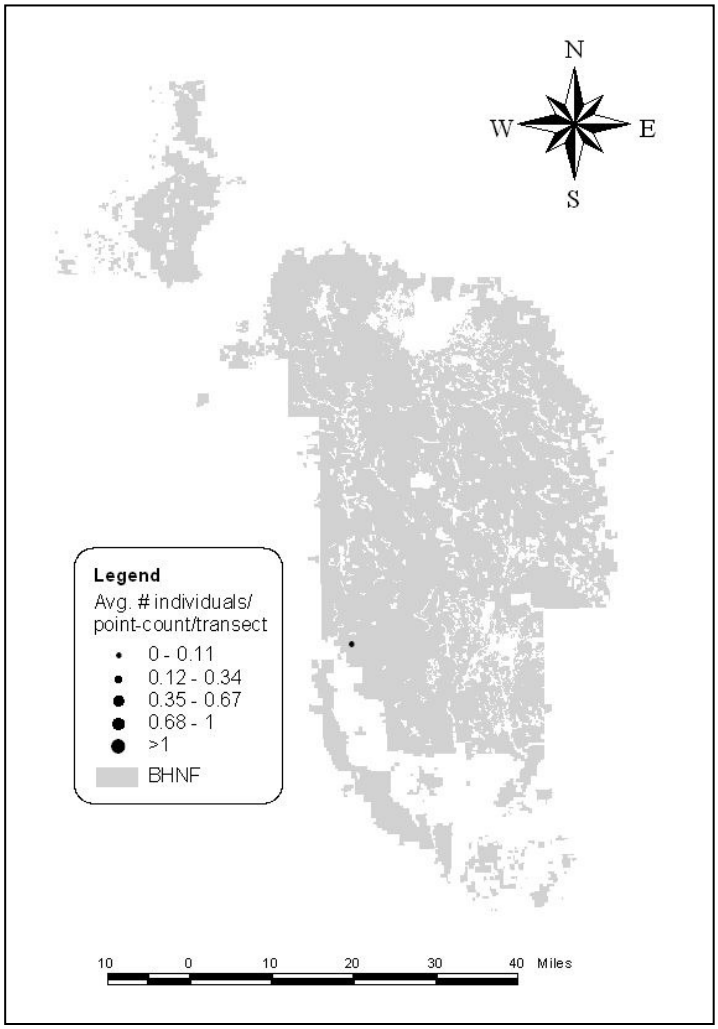
D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Pygmy Nuthatch

(Region 2 Sensitive Species)
(BHNF Proposed Species of Local Concern)

Pygmy Nuthatch is a rare but regular, and apparently widespread, resident in the Black Hills. In 2004, a single Pygmy Nuthatch was observed in the pine-juniper shrublands in the southwestern hills.

Contrary to a recent published accounts (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 start of MBBH in 2001, six Pygmy Nuthatches have been observed in total, two in pine-north (2001), two in pine-juniper shrublands (2001, 2004), one in late-successional pine (2002), and one in white spruce (2002; although this bird was in an area of pine). Thus it is not easy to peg the habitat affinity of this species to any one of these categories.



Abundance and distribution of Pygmy Nuthatches observed on point transects in the Black Hills, 2004.

Due to its rarity, localized nature, and unpredictable distribution, Pygmy Nuthatch will not be rigorously monitored using point transects under MBBH. However, these transects do provide a means to keep tabs on the pulse of this species' population in the Black Hills by providing information on Forest-wide abundance, and by identifying new locations for the species. Alternatively, monitoring pairs or colonies at known nesting sites, which are few in number, could provide information on the persistence of localized populations, but this alone will not provide insight into the species' status and trends at the Forest level. However, more focused research on the demography and habitat requirements of this species in the Black Hills is warranted.

Observations of Pygmy Nuthatch in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
SH	ID	--	--	--	1	1

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

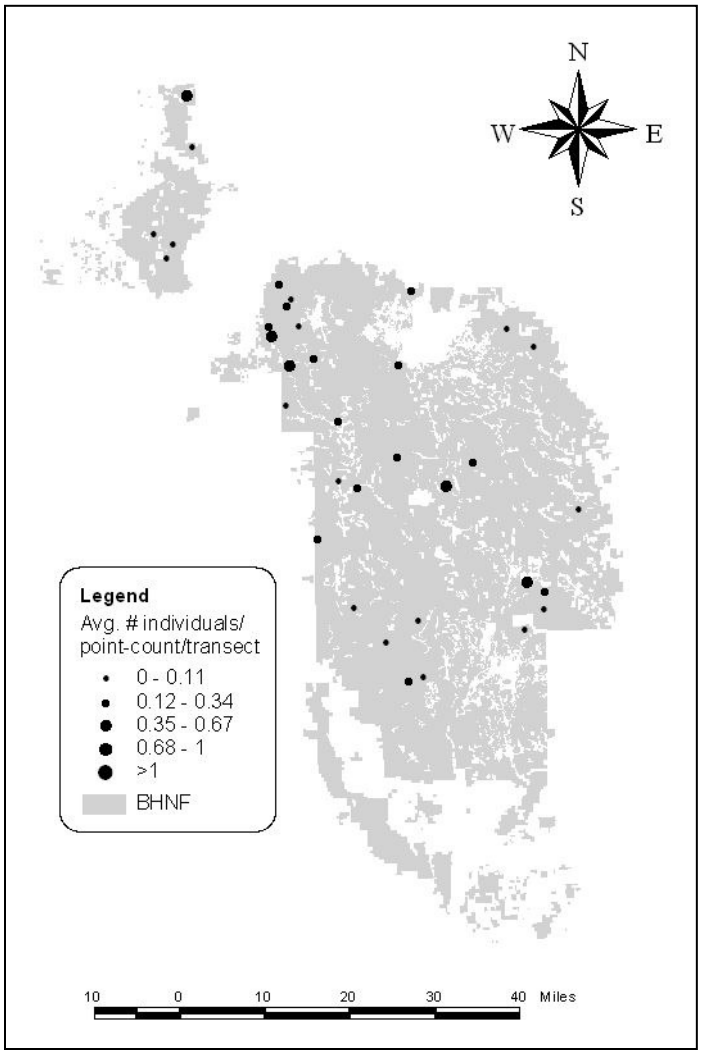
Brown Creeper

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

Brown Creepers occur in low abundance in coniferous forests throughout the Black Hills, but their presence is strongly tied to mature and old-growth forest conditions. Of the habitats surveyed in 2004, Brown Creeper density was highest in late-successional pine stands. Surveys in previous years have shown that they occur in similar densities in white spruce stands, which typically contain a high proportion of mature and old-growth forest conditions (Panjabi 2001, 2003a).

Vegetation data collected at point count stations classifying forest conditions within a 50-m radius suggest a strong relationship between Brown Creeper abundance and the presence of late-successional forest conditions. Of the 44 observations of Brown Creepers in 2004 that were within 50 m radius of a count station, 52% were in areas classified as structural stage 5, 16% were in areas classified as stage 4c, 18% were in areas classified as 4b, and 14% were in areas classified as 4a (Panjabi, unpublished data). Brown Creepers were not observed in forests of any other structural stage in 2004, although certain habitats with a greater proportion of early successional coniferous forest, such as pine-north and pine-south habitats, were not sampled this year.

Brown Creeper should be effectively monitored through point transects under *MBBH,* particularly in late-successional ponderosa pine and



Abundance and distribution of Brown Creepers observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Brown Creeper in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
AS	ID				16	16
BU	ID				7	7
LS	14.1	8.15	24.26	28	73	73

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

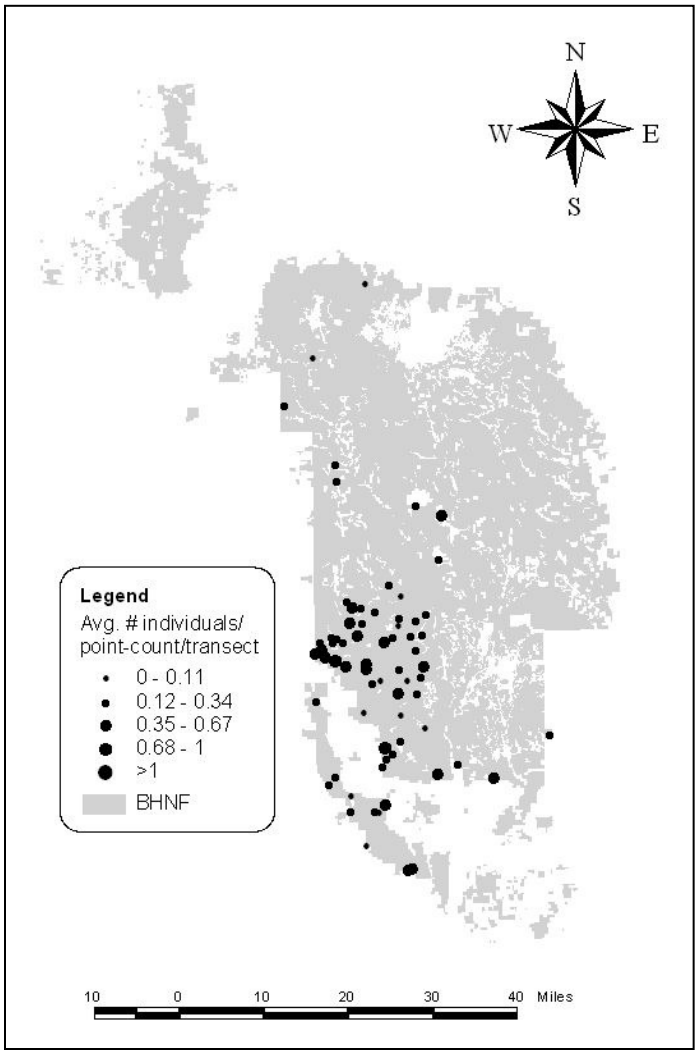
Mountain Bluebird

(PIF High Regional Priority BCR17)

Mountain Bluebirds occur locally throughout the Black Hills, occupying burned areas, grasslands, shrublands, and other open areas. Of the habitats surveyed in 2004, average density was highest in burn areas, a pattern consistent with findings from previous years. Pine-juniper shrublands and mixed-prairie grasslands supported lower densities, but are still important habitats for the species in the Black Hills.

Mountain Bluebirds are secondary cavity nesters that rely largely on woodpeckers to excavate cavities for nest sites. They also require open landscapes for hunting, and thus it is not surprising that they have responded positively to the Jasper burn, and probably also to other recent fires. Density estimates in the Jasper burn have risen steadily each year, from a low of 2.9 birds/km^2 in 2001 to this year's high of 23.9 birds/km^2, an eight-fold increase in density.

Mountain Bluebirds should be effectively monitored under MBBH through point transects in a range of habitats including mixed-grass prairies, pine-juniper shrublands, and especially burn areas.

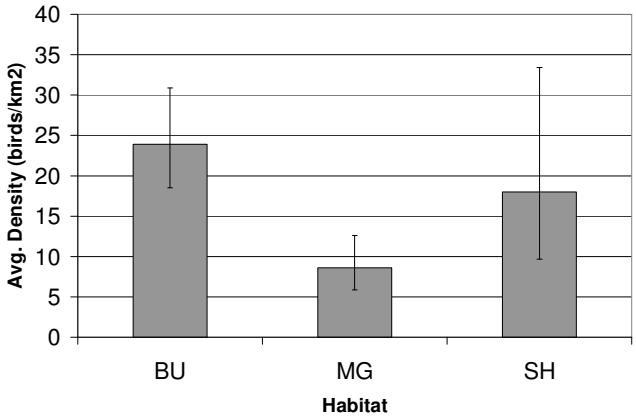


Abundance and distribution of Mountain Bluebirds observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Mountain Bluebird in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
AS					8	7
BU	23.9	18.5	30.87	13	122	113
MG	8.6	5.86	12.62	19	95	88
SH	18.0	9.69	33.43	31	66	58

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data



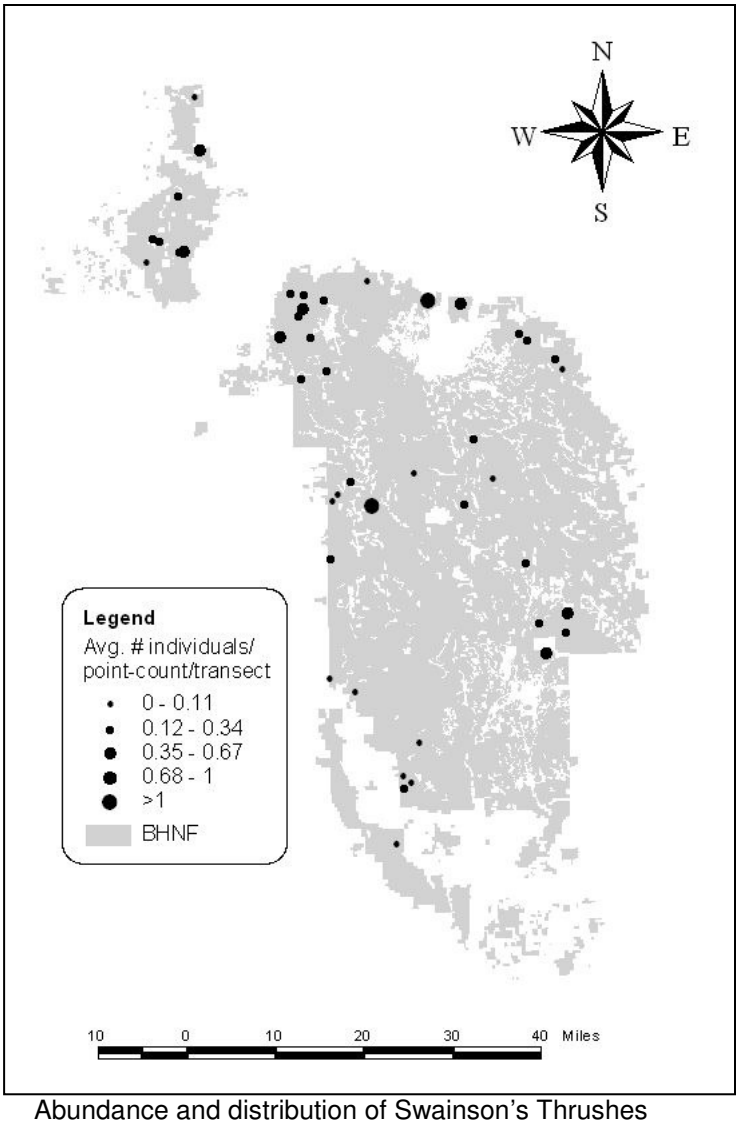
Relative density of Mountain Bluebirds among habitats in the Black Hills, 2004.

Swainson's Thrush
(BHNF Proposed Species of Local Concern)

Swainson's Thrush is a common summer resident at higher elevations in the Black Hills wherever white spruce forests occur. While Swainson's Thrushes do occupy other habitats, their presence in many areas appears to be related to the presence of at least some white spruce in these areas. White spruce stands were not surveyed in 2004, but Swainson's Thrushes were observed in measurable densities in aspen and late-successional pine stands.

Although a few individuals were observed in the grasslands and pine-juniper shrublands of the southern hills, these individuals were almost certainly transient migrants, as there is no suitable breeding habitat for this species in these areas, and it is common to observe migrants of this species in a range of wooded habitats into early June.

Swainson's Thrushes should be effectively monitored through point transects in a range of habitats, especially white spruce.

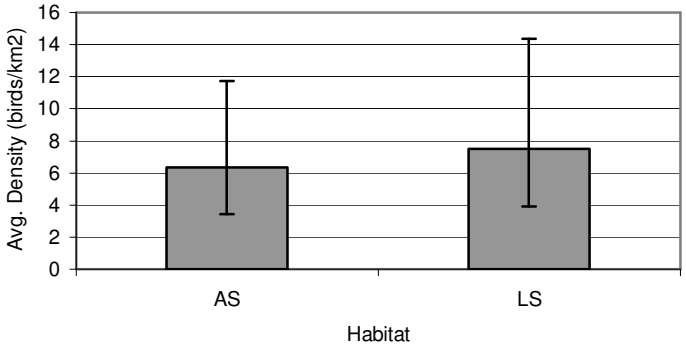


Abundance and distribution of Swainson's Thrushes observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Swainson's Thrush in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV%	N	(n)
AS	6.33	3.41	11.73	31	83	83
LS	7.50	3.92	14.36	33	78	77
MG	N/A	--	--	--	4	4
SH	N/A	--	--	--	4	4

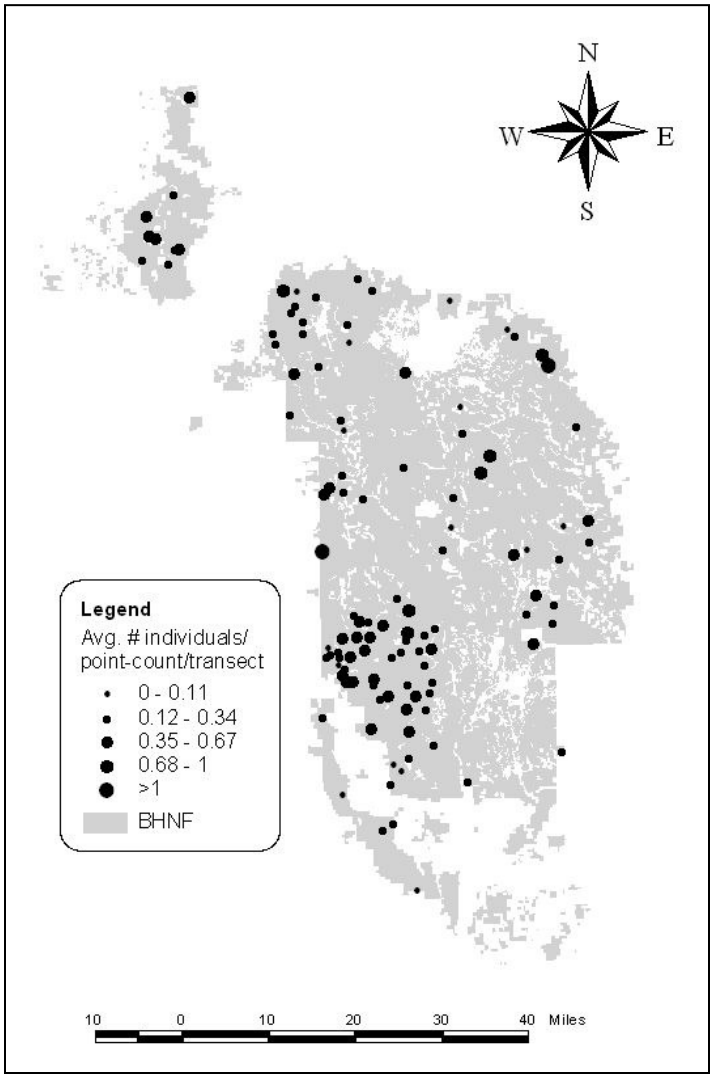
D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data



Relative density of Swainson's Thrushes among habitats in the Black Hills, 2004.

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

Townsend's Solitaire occurs throughout the Black Hills in low to moderate abundance. Of the habitats surveyed in 2004, estimated density was highest in late-successional pine forests, although they occurred in similar densities in most other habitats. This species should be effectively monitored under *MBBH* through point-transects in range of habitats.

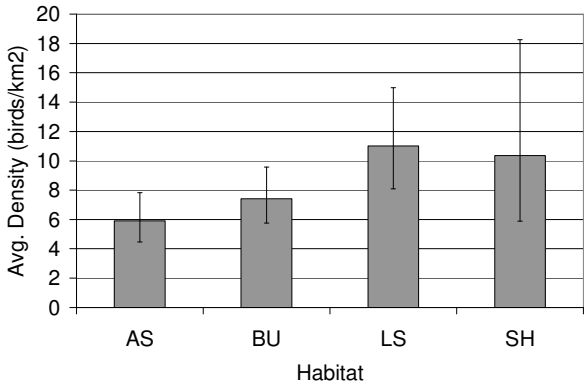


Abundance and distribution of Townsend's Solitaires observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Townsend's Solitaire in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV%	N	(n)
AS	5.91	4.46	7.83	14	104	103
BU	7.42	5.75	9.57	13	165	164
LS	11	8.08	14.98	15	177	174
MG	N/A	--	--	--	30	30
SH	10.4	5.88	18.25	29	61	55

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data



Relative density of Townsend's Solitaires among habitats in the Black Hills, 2004.

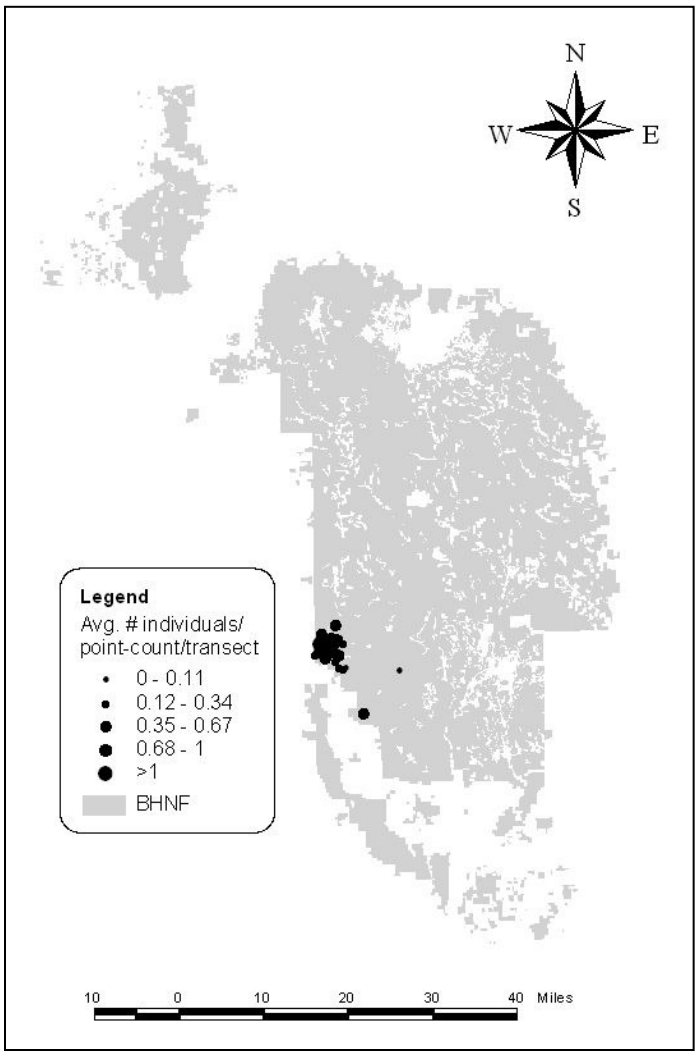
Virginia's Warbler
(PIF Continental Watch List)

Virginia's Warbler reaches the most northeasterly extent of its global breeding range in the Black Hills. It is entirely restricted to the pine-juniper shrubland habitat of the southwest, where it is fairly common to common. 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.

We recorded more Virginia's Warblers in 2004 than in any previous year, in part due to the refinement of transect placement in this habitat and the removal of unrepresentative sites from the sampling scheme.

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.

In 2004, all observations of Virginia's Warbler occurred in the pine-juniper shrubland habitat except for a single observation of a distant, singing bird in the Jasper burn area, which in all likelihood, was actually in an area of pine-juniper shrubland habitat. In the Black Hills, this species does not occur in areas lacking a mountain mahogany and skunkbrush understory.



Abundance and distribution of Virginia's Warblers observed on point transects in the Black Hills, 2004.

Virginia's Warbler should be adequately monitored under MBBH through point transects in pine-juniper shrublands.

Habitat-specific density estimates of Virginia's Warbler in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
BU	N/A	--	--	--	1	1
SH	42.5	26.6	67.75	23	184	184

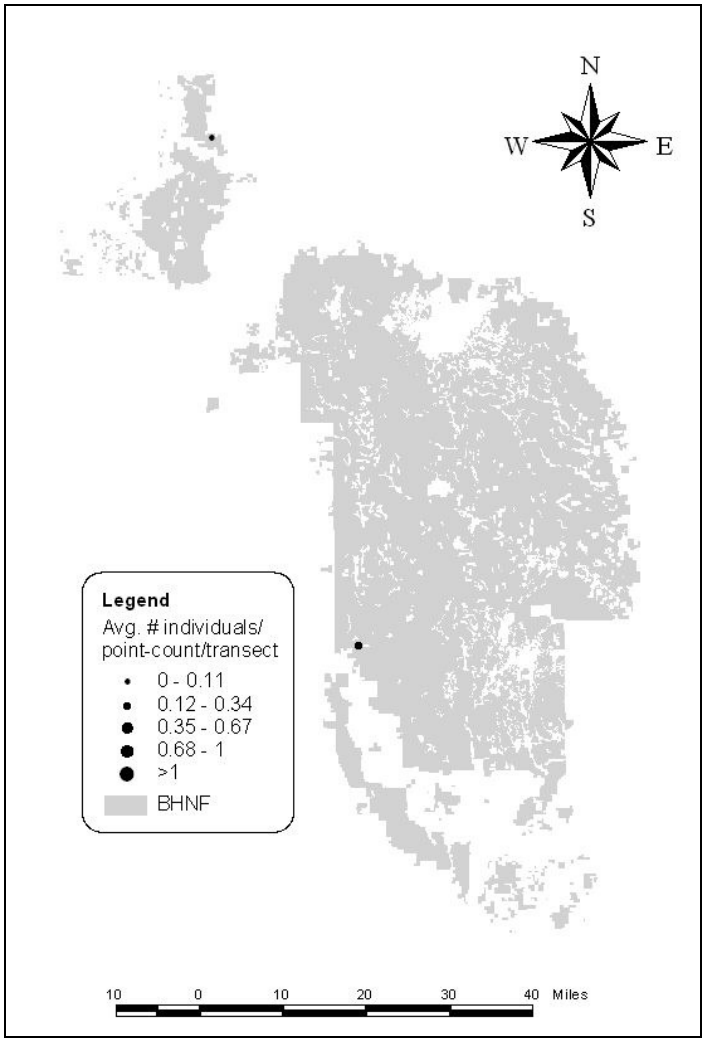
D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

Black-and-white Warbler
(BHNF Proposed Species of Local Concern)

Black-and-white Warbler is a rare and local breeder, mainly at lower elevations in the eastern Black Hills and Bear Lodge Mountains (Panjabi 2001, 2003a, 2004; Tallman et al. 2002). However, observations this year of a pair in the southwestern Black Hills and a singing male in Mt. Rushmore National Memorial (not shown) suggest they may be more widespread, at least in some years.

In the Black Hills, Black-and-white Warblers are found primarily in bur oak woodlands and associated edges. Because these woodlands occur mainly in canyon bottoms at low elevations, much of its habitat in the Black Hills may be on private lands. However, several Black-and-white Warblers have been recorded each year on point transects on BHNF lands.

Black-and-white Warblers are too rare and local on the BHNF to be adequately monitored by point transects in any habitat. However, observations from the range of point transects in ponderosa pine, late-successional forest, aspen, montane riparian, and especially foothill riparian, should provide data to loosely track their status on the BHNF.



Abundance and distribution of Black-and-white Warblers observed on point transects in the Black Hills, 2004.

Observations of Black-and-white Warbler in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	
LS	ID	--	--	--	1	1
SH	ID	--	--	--	2	2

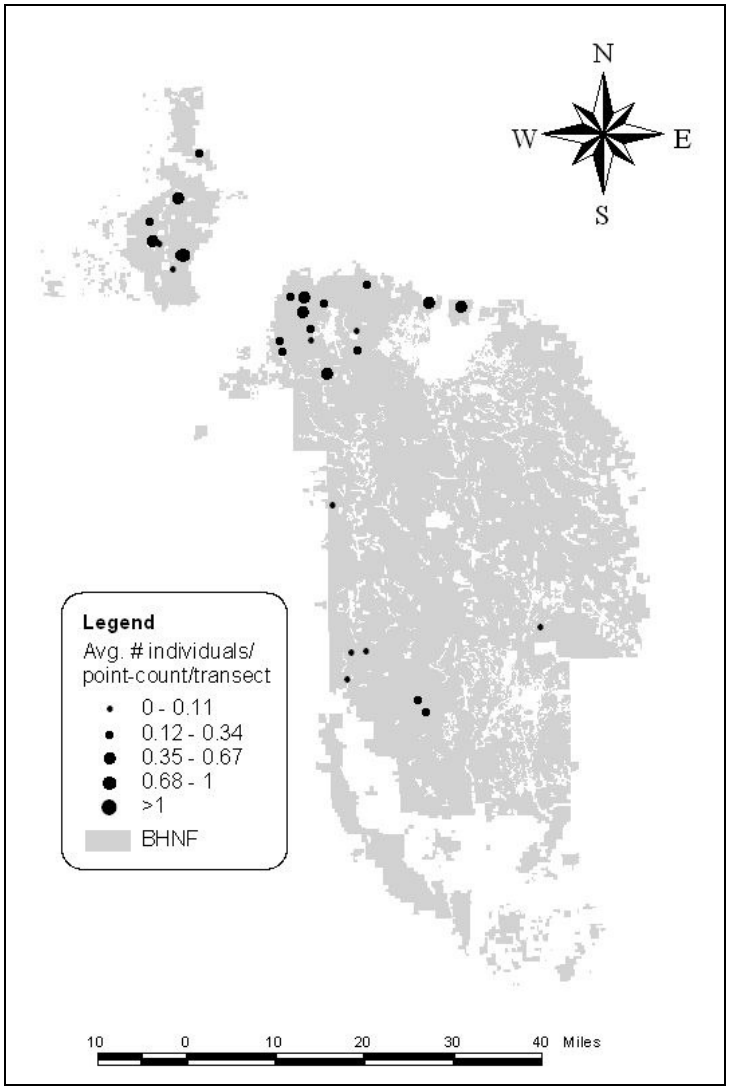
D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

MacGillivray's Warbler
(WY-PIF Level II Priority)

MacGillivray's Warblers range throughout much of the Black Hills, but they are fairly local outside of the northern hills. They are most abundant in the northwestern Black Hills and Bear Lodge Mountains.

MacGillivray's Warblers are found primarily in montane riparian habitats, where they can occur in moderately high density. They also occupy brushy clearings, especially with oaks, both within coniferous and broad-leaved forests. Of the habitats surveyed in 2004, density was highest in aspen.

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

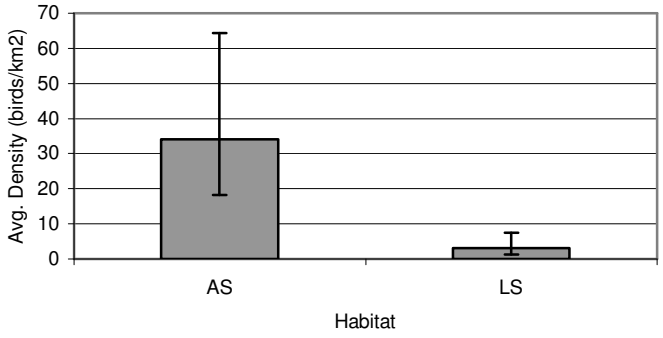


Abundance and distribution of MacGillivray's Warblers observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Macgillivray's Warbler in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
AS	34.2	18.2	64.3	32	68	68
BU	ID	--	--	--	6	6
LS	3.03	1.23	7.45	47	27	27
SH	ID	--	--	--	2	2

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

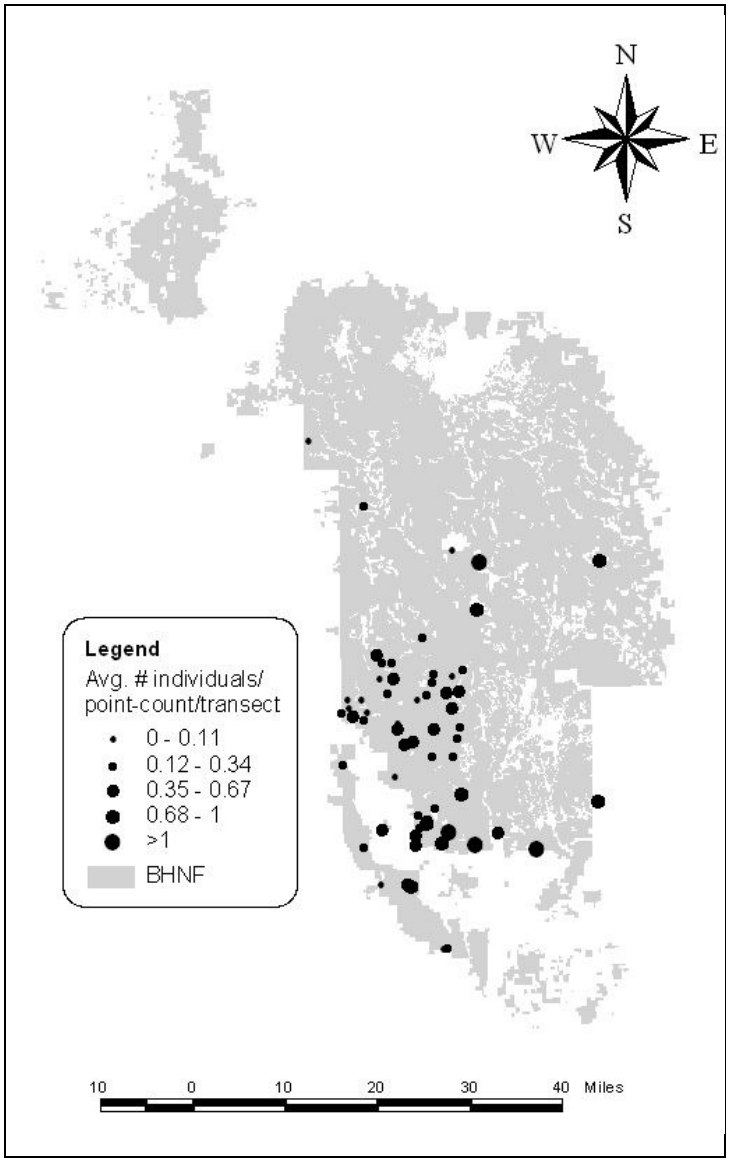


Relative density of MacGillivray's Warblers among habitats in the Black Hills, 2004.

Vesper Sparrow
(WY-PIF Level II Priority)

Vesper Sparrow occurs widely in the Black Hills, primarily in grassy openings, and especially in the 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. Not surprisingly, densities were highest in the mixed-grass prairie habitat in 2004, but the species continues to increase in the Jasper Burn.

Vesper Sparrows should be effectively monitored under *MBBH* through point-transects in mixed-grass prairies, burned areas, and to a lesser extent in pine-juniper shrublands.

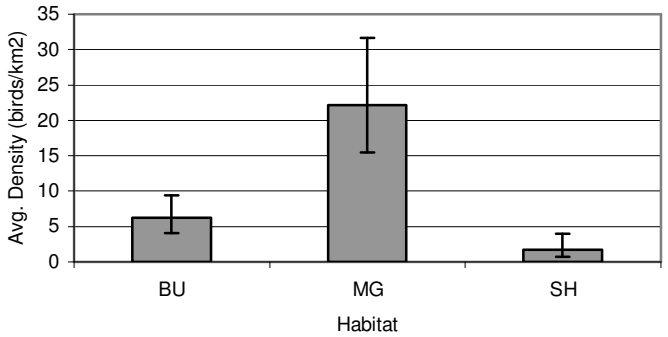


Abundance and distribution of Vesper Sparrows observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Vesper Sparrow in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV(%)	N	(n)
AS					5	4
BU	6.23	4.11	9.43	21	108	107
MG	22.2	15.5	31.7	18	255	255
SH	1.7	0.72	4	43	26	26

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data



Relative density of Vesper Sparrows among habitats in the Black Hills, 2004.

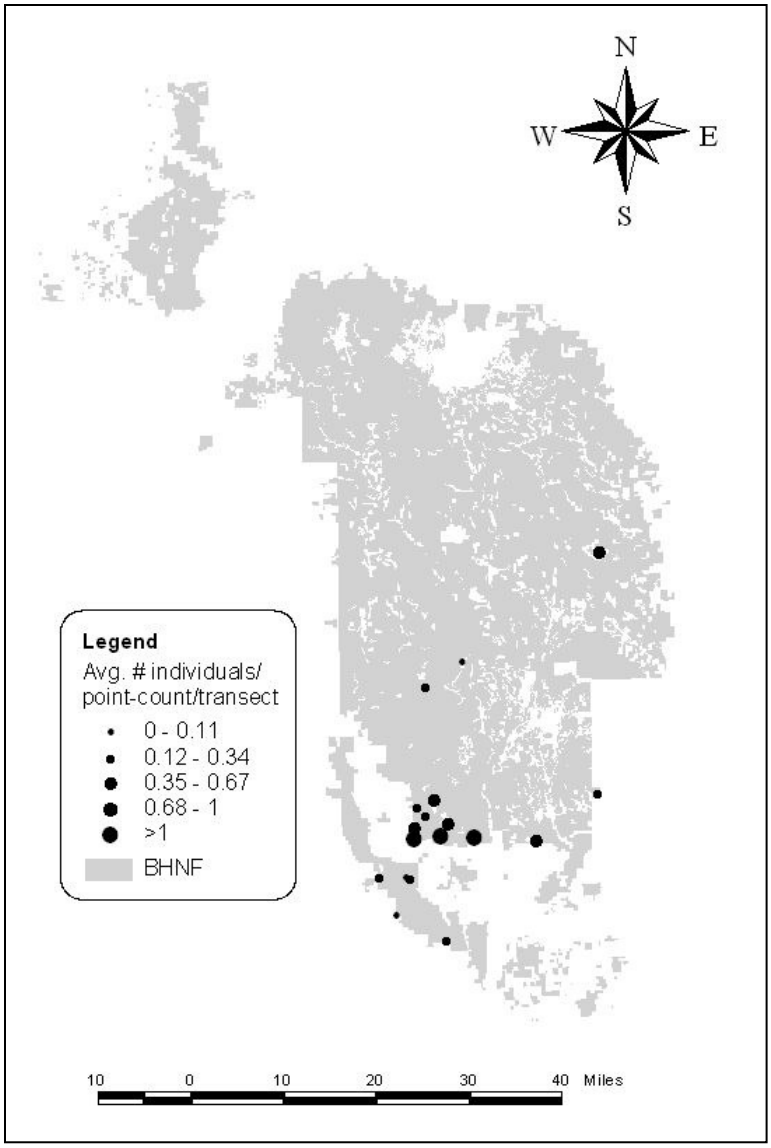
Grasshopper Sparrow

(Region 2 Sensitive Species)
(PIF High Overall Priority BCR17)
(WY-PIF Level II Priority)
(USFWS Bird of Conservation Concern)

Grasshopper Sparrows occur widely in native mixed-grass prairies in the southern Black Hills and Elk Mountains, and locally further north to the central hills. While they may occasionally occur in other types of grasslands (Panjabi 2003a), their presence in these areas appears to be sporadic. Grasshopper Sparrows can be locally abundant in some prairies, particularly where there is a greater proportion of tall grass.

Naturally, densities of Grasshopper Sparrows in 2004 were highest in the mixed-grass prairie category. We recorded more Grasshopper Sparrows in 2004 than in any previous year, in part due to the refined and expanded sampling effort in mixed-grass prairies this year.
Three individuals were observed in the Jasper burn area, a sign that this area is reverting to native prairie grassland.

Grasshopper Sparrow should be effectively monitored under MBBH in mixed-grass prairies.



Abundance and distribution of Grasshopper Sparrows observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Grasshopper Sparrows in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV%	N	(n)
BU					3	3
MG	38.4	20.5	71.9	32	118	118

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data

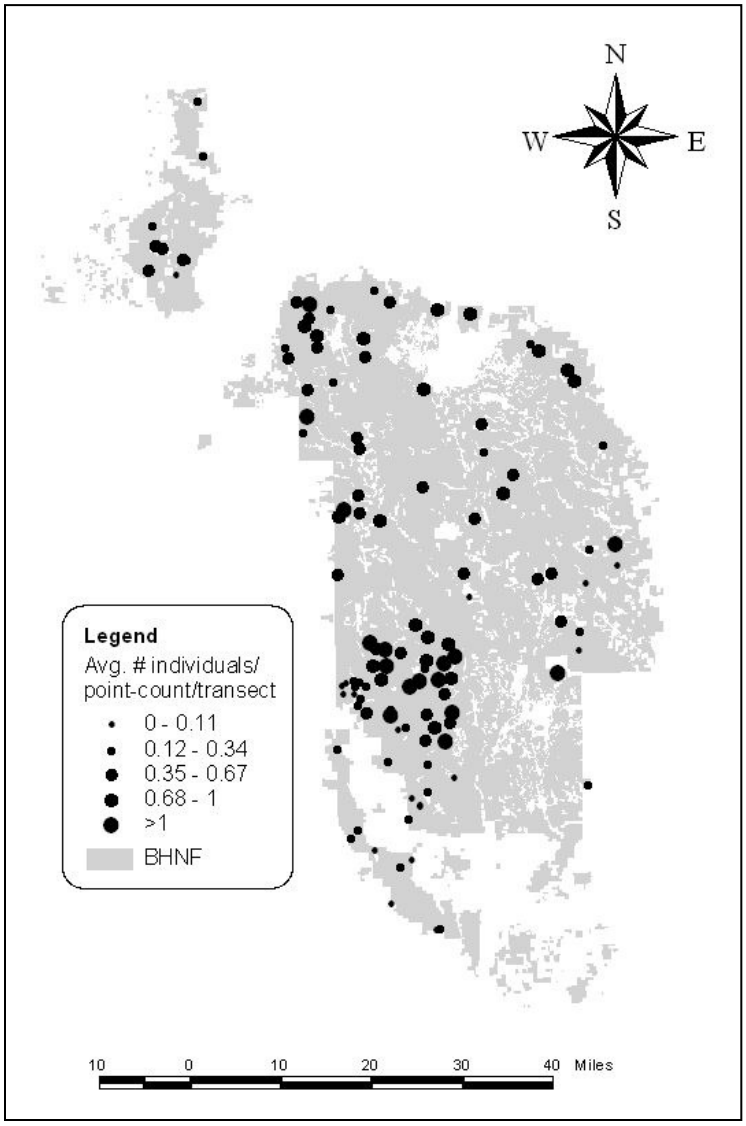
Dark-eyed Junco

Subspecies endemic to the Black Hills

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. Although not currently recognized as a priority for management or conservation, this distinctive endemic subspecies occurs nowhere else except in the Black Hills region, from northwest Nebraska to southeast 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 and current land-use practices within its coniferous forest habitat, the white-winged subspecies of the Dark-eyed Junco is largely secure across its range.

Interestingly, although they are primarily a forest and forest edge species, Dark-eyed Juncos occur in somewhat greater densities in burn areas than in any other habitat.

Dark-eyed Juncos should be effectively monitored under MBBH in a range of habitat types.

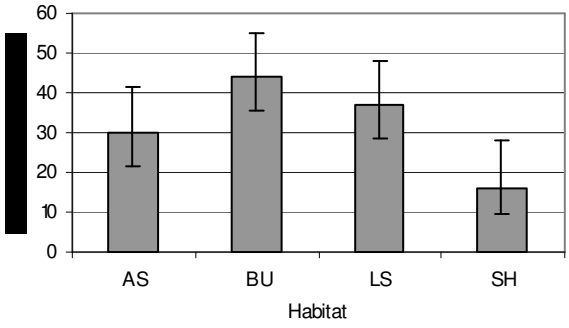


Abundance and distribution of Dark-eyed Juncos observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Dark-eyed Junco in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV%	N	(n)
AS	29.9	21.6	41.4	17	226	213
BU	44.1	35.3	55.2	11	390	368
LS	36.9	28.4	48.0	13	248	238
MG	N/A	--	--	--	32	31
SH	16.2	9.4	28.0	27	36	33

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data



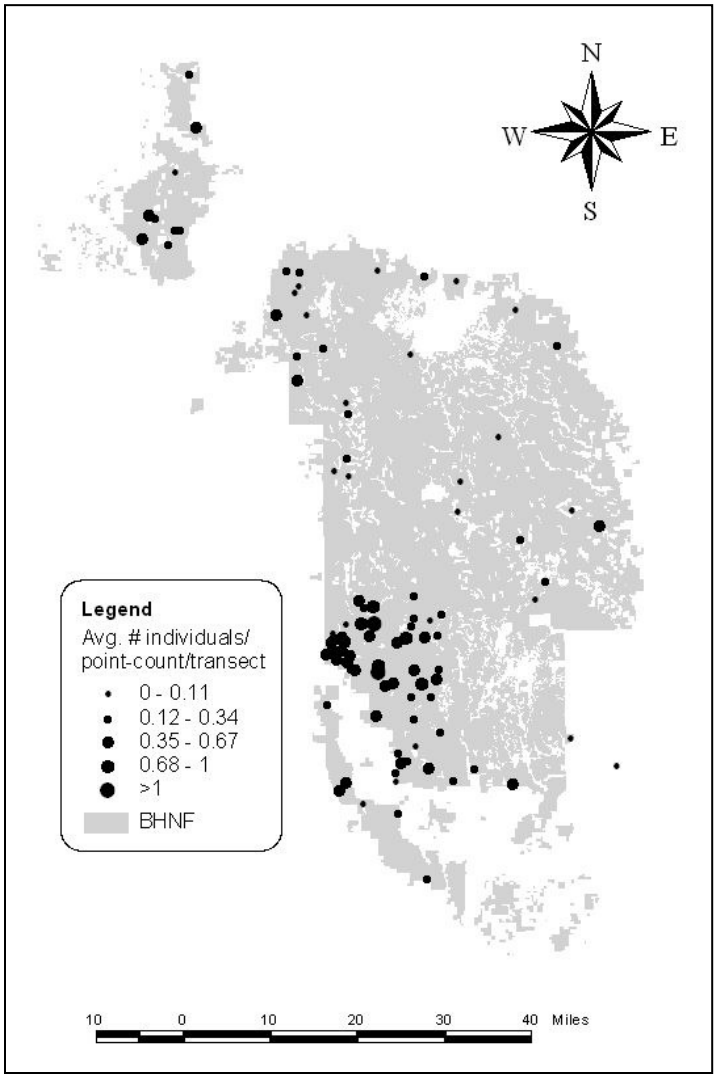
Relative density of Dark-eyed Juncos among habitats in the Black Hills, 2004.

Brown-headed Cowbird

Brood parasite that can impact other bird populations

Brown-headed Cowbirds occur throughout the Black Hills, and they are especially abundant in the Jasper burn area. Of all the habitats surveyed in 2004, the density of Brown-headed Cowbirds was greatest in burn areas. Interestingly, Brown-headed Cowbird density was lowest in late-successional pine stands, suggesting that birds in this habitat may experience lower parasitism pressures and thus enjoy greater reproductive success than birds in many other forest types.

Although Brown-headed Cowbirds are not a species with any special conservation status or other management designation, they are important to monitor as they negatively impact populations of other passerine birds through brood parasitism. In 1965, Pettingill and Whitney described this species as a "rare summer resident at lower elevations." Since then it appears that Brown-headed Cowbirds have increased substantially in the Black Hills as they are now fairly common to abundant in most habitats. Brown-headed Cowbirds should be effectively monitored under *MBBH* through point transects in a wide range of habitats.

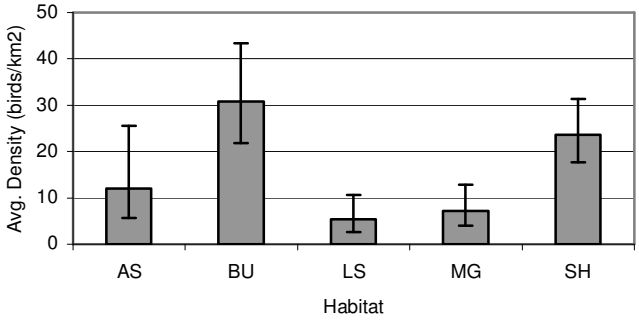


Abundance and distribution of Brown-headed Cowbirds observed on point transects in the Black Hills, 2004.

Habitat-specific density estimates for Brown-headed Cowbird in the Black Hills, 2004.

Habitat	D	LCL	UCL	CV%	N	(n)
AS	12.1	5.7	25.5	39	57	56
BU	30.8	21.8	43.4	17	215	194
LS	5.3	2.7	10.7	35	46	41
MG	7.2	4.1	12.8	29	60	52
SH	23.6	17.7	31.4	14	108	99

D=Density in birds/km2; LCL=lower 95% confidence limit on D; UCL=upper 95% confidence limit on D; coefficient of variation on D; N=number of individuals observed; (n)=number of independent observations; ID=insufficient data



Relative density of Brown-headed Cowbirds among habitats in the Black Hills, 2004.

Discussion and Recommendations

Unique values of habitats

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 2004 follow.

Aspen
Aspen stands support high densities of many species of Neotropical migrant land birds, such as Red-naped Sapsuckers, Dusky and Cordilleran Flycatchers, Ovenbirds, American Redstarts, and others, and are an important breeding habitat for these species in the Black Hills. Mature aspen stands also appear to support higher numbers of many forest raptors, such as Sharp-shinned and Cooper's Hawks, Northern Goshawks, and Broad-winged Hawks, and may comprise an important habitat for these species, for nesting, hunting, or both. Young aspen stands are important habitats too, especially for early-successional songbirds, ruffed grouse, and numerous other birds, as they support very high densities of birds in general.

Burn areas
Although unpopular for obvious reasons, wildfires play an important ecological role in the Black Hills. Stand-replacement wildfires create a unique post-fire habitat on which several native species depend, they increase landscape-level habitat heterogeneity, and they restore and maintain native grasslands and other early-successional habitats. And while burn areas such as the Jasper burn support lower densities of some forest-dependent birds, they support higher densities of several other species, including some, such as Black-backed, Lewis's, and Red-headed Woodpeckers, that are exceedingly rare in other parts of the Black Hills. They also host other charismatic bird species, such as Eastern and Mountain Bluebirds, in higher densities than other areas. And while the Jasper burn may appear bleak to the average visitor, it has ironically become one of the most popular destinations for birdwatchers coming to the Black Hills to see these and other hard to find species. And because bird watching is one of the fastest growing forms of wildlife-based recreation, burned areas should be duly recognized as having significant non-consumptive economic value in addition to ecological value. So while it may be difficult to incorporate wildfire into management plans as a tool for creating certain conditions, a greater emphasis should be placed on managing post-burn areas for wildlife values in order to maintain healthy populations of fire-dependent species, and thus the full spectrum of native birds in the Black Hills.

Late-successional ponderosa pine
Despite the difficulties in locating and surveying late-successional ponderosa pine stands, these forests do provide conditions that appear to be important to

certain birds in the Black Hills, and other wildlife as well. Most notably, Brown Creepers are largely restricted to pine and spruce stands with late-successional characteristics such as large-diameter trees, continuous canopy cover, and large amounts of standing dead, dying, and downed trees. These stands are also important nesting sites for Northern Goshawks (Squires and Reynolds 1997), and perhaps also for Broad-winged Hawks, as a considerable proportion of the observations of this species have come from this habitat. Observations of Black-backed Woodpeckers are also consistently higher in late-successional pine forest than other habitats (other than burn areas), suggesting they may be important reservoirs for the species in years when suitable burns are unavailable. Even red squirrels (*Tamiasciurus hudsonicus*) occur in higher densities in late-successional pine stands than the average pine stand on the BHNF (Panjabi unpublished data). Late-successional forests also support lower densities of Brown-headed Cowbirds, a brood parasite, and thereby may be more productive breeding areas for birds than other forested habitats.

Mixed-grass prairie

The mixed-grass prairies, while comparably depauperate in terms of the total number of species they host, support more unique species that are essentially endemic to this habitat in the Black Hills. Species such as Sharp-tailed Grouse, Upland Sandpiper, Burrowing Owl, Loggerhead Shrike, Horned Lark, Grasshopper Sparrow, Lark Bunting, and Western Meadowlark occur almost exclusively in this habitat in the Black Hills. Mixed-grass prairies are also favored hunting areas for Prairie Falcons and Golden Eagles. The mixed-grass prairie landscape, with its wide open grasslands and scattered pine woodlands, also appears to be favored by Pinyon Jays, which are rare elsewhere in the hills.

Pine-juniper shrubland

Perhaps no other habitat occurring in the Black Hills is more restricted in its extent and distribution than the pine-juniper shrublands. Nonetheless, this distinct and highly fragmented habitat supports not only a higher overall density of breeding birds than any other habitat (Panjabi 2003a), but also several species that occur nowhere else in the Black Hills, including Blue-gray Gnatcatcher and Virginia's Warbler. Other species, such as Dusky Flycatcher and Spotted Towhee, occur in maximum densities in this habitat, and other rare species, such as Sharp-shinned and Cooper's Hawk, Northern Goshawk, and Pygmy Nuthatch, have been observed here as well.

Monitoring post-fire bird communities

Monitoring birds in the Jasper burn area has provided an interesting case study and for the first time has provided quantitative insight into the population dynamics of an entire bird community in a post-fire ponderosa pine forest in the Black Hills. Through this effort, we are learning which bird species respond positively or negatively to stand-replacement fires, in what densities post-fire specialists and non-specialists occupy burns, and how long burned areas provide

suitable habitat for post-fire birds, particularly those of high management or conservation interest.

While it could prove useful to continue monitoring birds in the Jasper burn for many more years, eventually this area will no longer provide the conditions needed by those species we aim to monitor in this habitat, particularly Black-backed Woodpecker. Therefore, as populations of this species shift with the availability of suitable habitat, so should the sampling effort. And because other important species such as Lewis's Woodpecker prefer burns on the opposite end of the successional spectrum (and such areas appear to be used by Black-backs as well, albeit in much lower density), a good strategy would be to broaden the scope of the sampling scheme to include all areas of potentially suitable burn habitat. Because these species are primarily restricted to burns on the BHNF, a monitoring strategy that samples the full spectrum of available sites in this habitat would yield trends that are inferable to the Forest level, rather than being biased to any individual burn, where we know that a species' population trend will rise and eventually fall with the natural succession of changes in that burn. And at some point, individual burns will succeed into young forests that are not suitable for either of these species, at least for the short term. And although the specific optimal time frame for sampling burns in order to target Black-backed and Lewis's Woodpeckers in not yet clear, it will probably best be determined through continued monitoring in the Jasper burn, and perhaps through some pilot investigations in older burns.

Over the long term, monitoring post-fire bird communities will likely require maintaining a floating sampling scheme that in essence targets a shifting habitat type across the Black Hills, as individual burns are suitable for certain species for only relatively short periods of time. In doing so, it may be necessary to sample more than 30 sites in this habitat, or to split the burn areas category into two distinct habitat types, early-successional burn areas (1-6 years post fire) and mid-successional burn areas (5-20 years post fire), as the two target species in this habitat occupy these two different post-fire stages. Although this would require a slight increase in effort and cost, it will still provide a cost-effective means for monitoring these species in the Black Hills.

Prospects for population monitoring

The habitat-stratified point transects produced excellent results with low coefficients of variation (≤ 50%) on 47 bird species in at least one habitat surveyed in 2004. Thus we should be able to detect habitat-specific population trends for these species within our maximum target of 30 years. We obtained sufficient data on an additional 10 species to monitor their populations across habitat types, although in some cases, these species may be better monitored in a habitat that was not surveyed this year. These 57 species represent about 51% of *all species* observed in the five habitats surveyed in 2004, but they

represent almost 92% of all *individual birds* observed. The other 49% of species (~8% of birds observed) fall into one of the following categories below:

1) birds that are currently monitored in one of the other habitats covered by MBBH but not sampled in 2004 (e.g., American Three-toed Woodpecker in white spruce)
2) low-density, highly localized species (e.g., Golden Eagle, Prairie Falcon)
3) low-density, widespread species (e.g., Cooper's Hawk, Northern Goshawk)
4) irregular species (e.g., Dickcissel, Bobolink);
5) casual breeders (e.g., Hooded Warbler, Northern Parula)
6) species that occur mainly outside the Black Hills in the low foothills or on the Great Plains (e.g., Black-billed cuckoo, Brown Thrasher);
7) nocturnal species (e.g., Northern Saw-whet Owl);
8) wetland-restricted species (e.g., Sora); and
9) species that are readily detectable only prior to late May (e.g., sharp-tailed Grouse, Ruffed Grouse).

Species in the aforementioned groups (other than the first category) could 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.

Perhaps the most effective way to monitor the health of bird populations, especially small ones, is to monitor reproductive output at nests. While this method can be more labor intensive than count-based monitoring, depending on the species in question and the detail of information needed, monitoring reproductive output does not necessarily imply high costs.

For species with small populations, such as Golden Eagles and Prairie Falcons, monitoring could be achieved by locating all active nests and visiting each during the spring and summer as necessary to evaluate the outcome of each. Known nests would first be identified 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. Because relatively few nests exist for these species, this type of monitoring would probably require the equivalent effort of what is required for habitat-based monitoring (i.e., one additional person in the field during the spring and early summer).

For some low-density but widespread species, such as Northern Goshawk, a brief call-response survey could be conducted at the end of each point count to detect the presence of this or other similar species across the areas already covered by the habitat-stratified point transects. A high-powered, yet highly portable playback system would be required for each observer, but other than this expense, relatively few additional expenses would be incurred.

Because of the already extensive point transect effort undertaken each year, implementing additional field techniques to target other high-priority species can be done cost-effectively. Rocky Mountain Bird Observatory is open to discussing these options with the Black Hills National Forest in the future.

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APPENDIX A. List of all bird species observed in the Black Hills from 2001-2004, with management designation and species totals.

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2004					Total #individuals observed per year (in all habitats surveyed[5])			
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	AS	BU	LS	MG	SH	2001	2002	2003	2004
Canada Goose					B	0	0	0	2	0	OT	35	2	2
Wood Duck		BCR17			B	0	0	0	0	0	4	13	--	0
Gadwall					PB	0	0	0	0	0	--	1	--	0
Mallard					B	0	0	0	3	0	36	84	5	3
Blue-winged Teal					PB	0	0	0	0	0	OT	--	--	0
Northern Shoveler					PB	0	0	0	0	0	OT	OT	--	0
Ring-necked Duck					PB	0	0	0	0	0	2	--	--	0
Hooded Merganser					TM	0	0	0	0	0	--	1	--	0
Common Merganser					B	0	0	0	0	0	8	9	--	0
Gray Partridge					B	0	0	0	0	0	1	4	--	0
Ring-necked Pheasant					B	0	0	0	0	0	15	2	--	0
Ruffed Grouse					B	1	0	5	0	0	44	62	15	6
Sharp-tailed Grouse		BCR17			B	0	3	0	22	0	--	2	--	25
Wild Turkey	MIS				B	3	14	6	23	1	112	69	45	47
Northern Bobwhite					B	0	0	0	0	0	--	1	--	0
Pied-billed Grebe					PB	0	0	0	0	0	1	--	--	0
Western Grebe					PB	0	0	0	0	0	OT	1	--	0
American White Pelican					TM	0	0	0	20	0	--	--	--	
Double-crested Cormorant					PB	0	0	0	0	0	OT	--	--	0
American Bittern	R2SS				B	0	0	0	0	0	1	1	--	0
Great Blue Heron					B	4	0	0	0	0	9	23	18	4
Turkey Vulture					B	8	7	4	6	18	76	100	17	43
Osprey	MIS				B	0	0	0	0	0	2	OT	--	0
Northern Harrier	R2SS	BCR17			B	0	0	0	0	0	1	OT	--	0
Sharp-shinned Hawk					B	2	0	1	1	2	2	4	3	6

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2004					Total #individuals observed per year (in all habitats surveyed[5])			
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	AS	BU	LS	MG	SH	2001	2002	2003	2004
Cooper's Hawk					B	2	0	2	1	2	8	4	3	7
Northern Goshawk	MIS, R2SS	WY-I			B	3	1	3	3	0	14	5	8	10
Unidentified Accipiter						3	0	0	0	0	4	2	2	3
Broad-winged Hawk					B	14	2	8	0	0	3	6	--	24
Red-tailed Hawk					B	6	15	4	10	8	41	42	32	43
Golden Eagle			BCC-BCR17		B	0	0	0	0	0	1	2	1	0
American Kestrel					B	0	5	0	14	3	8	14	11	22
Merlin		WY-II			B	0	0	0	0	0	--	1	--	OT
Prairie Falcon		BCR17	BCC-BCR17		B	0	1	0	3	2	2	6	2	6
Unidentified Falcon						0	0	0	0	0	1	1	--	0
Unidentified Raptor						0	0	0	0	0	6	4	1	0
Sora					B	0	0	0	0	0	OT	OT	--	0
American Coot					B	0	0	0	0	0	OT	OT	--	0
Killdeer		BCR17			B	4	0	0	5	0	9	19	1	9
Solitary Sandpiper					TM	0	0	0	0	0	--	OT	--	0
Spotted Sandpiper					B	0	0	0	0	0	OT	6	4	OT
Upland Sandpiper		BCR17	BCC-BCR17		B	0	0	0	19	0	4	20	--	19
Pectoral Sandpiper					TM	0	0	0	0	0	25	--	--	0
Wilson's Snipe					B	0	0	0	0	0	13	8	6	0
Franklin's Gull					TM	0	0	0	0	0	--	1	--	0
California Gull					PB	0	0	0	0	0	OT	--	--	0
Rock Pigeon					B	0	0	1	0	0	9	15	7	1
Mourning Dove					B	9	73	12	75	104	212	372	120	273
Black-billed Cuckoo		BCR17, WY-II	BCC-BCR17		B	0	0	0	0	0	2	OT	--	0
Yellow-billed Cuckoo	R2SS	WY-II			B	0	0	0	0	0	--	OT	--	0
Flammulated Owl	R2SS	CWL			B	0	0	0	0	0	--	OT	--	0
Eastern Screech-Owl					B	0	0	0	0	0	--	--	--	0

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2004					Total #individuals observed per year (in all habitats surveyed[5])			
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	AS	BU	LS	MG	SH	2001	2002	2003	2004
Great Horned Owl					B	0	0	0	0	2	3	2	2	2
Burrowing Owl	R2SS	BCR17	BCC-BCR17		B	0	0	0	1	0	--	OT	--	1
Long-eared Owl					B	0	0	0	0	0	1	--	OT	0
Northern Saw-whet Owl					B	0	1	0	0	0	1	OT	OT	1
Unidentified Owl						0	0	0	0	0	1	--	--	0
Common Nighthawk					B	3	21	7	4	1	27	20	8	36
Common Poorwill					B	0	0	0	0	0	OT	OT	OT	0
Chimney Swift					B	0	0	0	0	0	OT	--	--	0
White-throated Swift		BCR17, CWL, WY-II			B	4	1	13	9	115	124	302	166	142
Broad-tailed Hummingbird		WY-II			B	0	0	0	0	0	--	3	2	OT
Belted Kingfisher					B	0	0	0	0	0	29	17	10	OT
Lewis's Woodpecker	R2SS	BCR17, CWL, WY-II	BCC-BCR17		B	0	2	0	2	0	3	4	9	4
Red-headed Woodpecker		BCR17, CWL			B	0	47	0	6	0	25	39	51	53
Red-naped Sapsucker		BCR17, WY-II	BCC-BCR17		B	133	3	76	0	0	389	222	245	212
Downy Woodpecker					B	12	2	2	1	0	31	29	25	17
Hairy Woodpecker					B	50	221	58	21	10	349	469	446	360
American Three-toed Woodpecker	MIS, R2SS	WY-II			B	1	0	7	0	0	12	26	44	8
Black-backed Woodpecker	MIS, R2SS	BCR17, WY-II			B	2	53	7	3	3	24	134	75	68
Black-backed or Three-toed Woodpecker						0	0	0	0	0	--	7	1	0
Northern Flicker					B	46	166	17	28	9	239	238	230	266
Unidentified Woodpecker						11	29	5	7	0	164	96	77	52
Western Wood-Pewee					B	13	235	30	39	22	182	367	379	339

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2004					Total #individuals observed per year (in all habitats surveyed[5])			
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	AS	BU	LS	MG	SH	2001	2002	2003	2004
Alder Flycatcher					TM	0	0	0	0	0	--	2	1	0
Least Flycatcher					B	1	1	0	0	0	5	11	6	2
Dusky Flycatcher		WY-II			B	159	111	78	42	325	1154	1421	723	715
Hammond's Flycatcher					VB								OT	OT
Cordilleran Flycatcher		WY-II			B	45	1	50	0	0	292	364	325	96
Eastern Phoebe					B	0	0	0	0	1	3	1	--	1
Say's Phoebe		BCR17			B	0	0	0	0	1	1	--	--	1
Cassin's Kingbird					B	0	0	0	1	0	OT	OT	--	1
Western Kingbird					B	0	0	0	15	3	6	7	5	18
Eastern Kingbird					B	0	3	0	12	0	37	79	8	15
Unidentified Flycatcher						0	0	1	0	0	5	1	--	1
Loggerhead Shrike	R2SS	WY-II			B	0	0	0	0	0	2	--	--	0
Plumbeous Vireo		WY-II			B	6	40	14	16	90	346	400	236	166
Warbling Vireo					B	649	93	262	8	60	1844	1965	963	1072
Red-eyed Vireo					B	16	0	19	0	0	210	228	102	35
Unidentified Vireo						0	0	0	0	0	1	--	--	0
Gray Jay					B	27	25	63	6	8	270	197	204	129
Blue Jay					B	16	1	4	0	1	96	65	34	22
Pinyon Jay		CWL			B	0	0	0	54	2	13	47	7	56
Clark's Nutcracker					B	0	13	0	13	5	32	65	10	31
Black-billed Magpie					B	0	0	0	24	2	2	1	--	26
American Crow					B	43	33	9	85	11	310	260	194	181
Horned Lark					B	0	0	0	11	0	7	5	--	11
Tree Swallow					B	0	0	0	4	0	14	30	8	4
Violet-green Swallow					B	0	29	6	32	189	240	582	176	256
Northern Rough-winged Swallow		BCR17			B	0	0	0	0	13	1	17	--	13
Bank Swallow					B	0	0	0	1	0	1	1	--	1
Cliff Swallow					B	0	0	0	22	6	21	7	--	28
Barn Swallow					B	0	0	0	8	0	8	26	5	8

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2004					Total #individuals observed per year (in all habitats surveyed[5])			
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	AS	BU	LS	MG	SH	2001	2002	2003	2004
Unknown Swallow						0	0	0	8	0	--	--	--	8
Black-capped Chickadee					B	143	89	120	43	75	943	1126	676	470
Red-breasted Nuthatch					B	137	45	223	29	32	1400	1537	831	466
White-breasted Nuthatch					B	9	72	26	20	35	215	271	337	162
Pygmy Nuthatch	MIS	WY-II			B	0	0	0	0	1	3	2	--	1
Brown Creeper	MIS	WY-II			B	16	7	73	0	0	153	145	136	96
Rock Wren					B	1	73	13	83	26	31	105	47	196
Canyon Wren					B	0	1	1	3	9	17	59	21	14
House Wren					B	10	94	6	6	8	64	148	79	124
Winter Wren					B	0	0	0	0	0	--	2	1	0
American Dipper		WY-II		T	B	0	0	0	0	0	OT	3	4	OT
Golden-crowned Kinglet		WY-II			B	13	0	42	0	0	131	99	224	55
Ruby-crowned Kinglet					B	107	2	105	2	3	581	912	716	219
Blue-gray Gnatcatcher					B	0	0	0	2	13	2	2	1	15
Eastern Bluebird					B	3	58	0	13	0	49	57	57	74
Mountain Bluebird		BCR17			B	8	122	0	95	66	148	171	117	291
Unidentified Bluebird						0	4	0	3	0	5	--	54	7
Townsend's Solitaire		WY-II			B	104	165	177	30	61	727	854	788	537
Veery					B	27	0	1	0	0	64	94	104	28
Swainson's Thrush					B	83	0	78	4	4	510	448	507	169
Hermit Thrush					VB	0	0	4	0	0	2	1	1	4
American Robin					B	217	344	241	121	61	2011	2139	1692	984
Gray Catbird					B	0	0	0	0	0	27	20	27	0
Brown Thrasher					B	0	0	0	2	1	8	3	3	3
European Starling					B	0	7	0	11	0	2	22	--	18
Cedar Waxwing					B	6	0	2	0	35	64	131	61	43
Golden-winged Warbler					VB	0	0	0	0	0	--	OT	--	0
Tennessee Warbler					TM	0	0	0	0	3	--	32	--	3

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2004					Total #individuals observed per year (in all habitats surveyed[5])			
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	AS	BU	LS	MG	SH	2001	2002	2003	2004
Orange-crowned Warbler					VB	0	0	0	0	0	--	1	--	0
Virginia's Warbler		CWL			B	0	1	0	0	184	44	80	2	185
Northern Parula					VB	0	0	0	0	0	2	--	1	0
Yellow Warbler					B	5	0	0	0	3	90	218	35	8
Chestnut-sided Warbler					B	0	0	0	0	0	7	2	2	0
Magnolia Warbler					VB	0	0	0	0	0	1	--	--	0
Black-throated Blue Warbler					VB	0	0	0	0	0	--	1	--	0
Yellow-rumped Warbler					B	193	127	292	94	161	2134	2493	1845	867
Black-and-white Warbler					B	0	0	1	0	2	7	8	2	3
American Redstart					B	65	0	30	0	0	432	407	242	95
Ovenbird					B	460	8	283	15	180	1631	1723	841	946
Mourning Warbler					VB	0	0	0	0	0	OT	--	--	0
MacGillivray's Warbler		WY-II			B	68	6	27	0	2	353	267	206	103
Common Yellowthroat					B	22	0	5	3	0	187	278	219	30
Hooded Warbler					VB	0	0	0	0	0	OT	OT	--	0
Yellow-breasted Chat					B	0	0	0	0	25	24	73	4	25
Western Tanager					B	67	171	110	71	117	819	936	869	536
Spotted Towhee					B	15	4	5	44	363	366	633	152	431
Chipping Sparrow					B	190	421	184	219	326	1247	1652	1536	1340
Clay-colored Sparrow					TM	0	0	0	4	0	OT	2	--	4
Field Sparrow					B	0	0	0	1	4	2	1	1	5
Vesper Sparrow		WY-II			B	5	108	0	255	26	197	371	131	394
Lark Sparrow					B	1	3	0	101	4	25	87	21	109
Lark Bunting		BCR17, WY-II			B	0	0	0	2	0	2	OT	--	2
Grasshopper Sparrow	R2SS	BCR17, WY-II	BCC-BCR17		B	0	3	0	118	0	6	75	--	121
Song Sparrow					B	31	0	0	2	1	205	268	258	34

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2004					Total #individuals observed per year (in all habitats surveyed[5])			
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	AS	BU	LS	MG	SH	2001	2002	2003	2004
White-crowned Sparrow					TM	0	0	0	0	0	--	--	1	0
Dark-eyed Junco					B	226	390	248	32	36	1631	1522	1321	932
Unidentified Sparrow						0	0	0	10	2	1	1	--	12
Northern Cardinal					VB	0	0	0	0	0	--	OT	1	0
Rose-breasted Grosbeak					B	0	0	0	0	0	2	1	1	0
Black-headed Grosbeak					B	20	0	11	1	2	231	326	118	36
Blue Grosbeak					B	0	0	0	0	0	1	--	--	0
Lazuli Bunting					B	0	1	0	4	2	13	50	13	7
Indigo Bunting					B	0	0	0	0	0	4	1	--	0
Dickcissel		BCR17, WY-II	BCC-BCR17		B	0	0	0	0	0	3	11	--	0
Bobolink		WY-II			B	5	0	0	1	0	--	17	10	6
Red-winged Blackbird					B	11	4	0	3	3	204	299	84	21
Western Meadowlark					B	0	96	1	744	31	104	475	44	872
Yellow-headed Blackbird					B	0	0	0	1	0	--	5	--	1
Brewer's Blackbird					B	0	2	0	71	1	23	33	13	74
Common Grackle					B	0	0	0	8	0	59	64	6	8
Brown-headed Cowbird					B	57	215	46	60	108	719	848	607	486
Orchard Oriole					B	0	0	0	0	0	27	18	1	OT
Bullock's Oriole					B	0	0	0	1	0	19	21	--	1
Cassin's Finch					B	0	0	2	0	2	21	7	4	4
House Finch					B	0	0	0	0	0	1	12	--	0
Red Crossbill					B	234	908	429	91	150	2861	5358	1140	1812
White-winged Crossbill					B	0	0	0	0	0	13	12	14	0
Pine Siskin					B	9	4	14	1	10	780	655	173	38
Lesser Goldfinch					B	0	0	0	0	0	--	--	OT	0
American Goldfinch					B	3	5	1	23	28	134	216	76	60
Evening Grosbeak					B	0	0	0	0	0	9	--	--	OT

Common Name[1]	Special Management Designation[2]				status[3]	Total #individuals observed per habitat[4], 2004					Total #individuals observed per year (in all habitats surveyed[5])			
	USFS	PIF	USFWS	SDGFP		AS	BU	LS	MG	SH	2001	2002	2003	2004
Unidentified Finch						0	0	0	0	0	2	--	--	0
House Sparrow					B	0	0	0	0	0	2	1	--	0
Unidentified bird species						0	0	0	0	0	5	6	--	0

[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, MIS=Black Hills National Forest Management Indicator Species, R2 SS=US Forest Service Region 2 Sensitive Species; PIF=Partners In Flight, CWL=Continental Watch List, BCR17=Regional or Overall Priority for Bird Conservation Region 17, WY-I= Wyoming Partners In Flight Level I Priority (Conservation Action), WY-II= Wyoming Partners In Flight Level II Priority (Monitoring); 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, T=State Threatened Species.
[3] Residency status: B=(probably) breeds; VB=vagrant, possibly breeding; TM=transient migrant
[4] Habitats: AS=aspen; BU=burn areas; LS=late-successional ponderosa pine; MG=mixed-grass prairie; SH=pine-juniper shrubland
[5] The number and types of habitats surveyed each year may vary. OT=species detected off transect only, through casual observation.