Monitoring the Birds of the Black Hills: 2005 Field Season Report

March 2006

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In Cooperation With:

ROCKY MOUNTAIN BIRD OBSERVATORY

The mission of the Rocky Mountain Bird Observatory (RMBO) is the conservation of birds of the Rocky Mountains, Great Plains, and Intermountain West, and the habitats on which they depend. *RMBO practices a multi-faceted approach to bird conservation that integrates scientific research and monitoring studies with education and outreach programs to bring bird conservation issues to the public and other conservation partners. RMBO works closely with state and federal natural resource agencies, private landowners, schools, and other nonprofit organizations. RMBO accomplishes its mission by working in four areas:*

***Research**:* *RMBO studies avian responses to habitat conditions, ecological processes, and management actions to provide scientific information that guides bird conservation efforts.*

***Monitoring**:* *RMBO monitors the distribution and abundance of birds through long-term, broad-scale monitoring programs designed to track population trends for birds of the region.*

***Education**:* *RMBO provides active, experiential, education programs for K-12 students in order to create an awareness and appreciation for birds, with a goal of their understanding of the need for bird conservation.*

***Outreach**:* *RMBO shares the latest information in land management and bird conservation practices with private landowners, land managers, and resource professionals at natural resource agencies. RMBO develops voluntary, working partnerships with these individuals and groups for habitat conservation throughout the Great Plains and Rocky Mountains.*

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***Cover Photos**:*

Spotted Towhee, Violet-green Swallow and Hammond's Flycatcher, Tony Leukering, RMBO.

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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 2005, Rocky Mountain Bird Observatory (RMBO), in conjunction with its funding partner, the Black Hills National Forest (BHNF), implemented the fifth 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.

This year, RMBO surveyed six of the ten habitats targeted under the monitoring plan, maintaining a level of effort consistent with funding. RMBO staff conducted 173 point transect surveys (2,480 point counts) in six habitats within the Black Hills (burn area, foothills riparian, montane riparian, northern hills ponderosa pine, southern hills ponderosa pine, and white spruce). RMBO did not survey four habitats covered in 2004 (aspen, late-successional ponderosa pine, mixed-grass prairie, and pine-juniper shrublands). New survey sites were added, while others were dropped or re-established in foothills riparian and montane riparian habitat.

RMBO staff recorded a total of 119 breeding bird species on point transects in the six 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 48 bird species, including three BHNF Management Indicator Species (MIS) and two Region 2 Sensitive Species. The 48 species should be effectively monitored under the current program in at least one of the six habitats surveyed this year, although some of these may be better monitored in other habitats not surveyed this year. We obtained sufficient data on an additional 11 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. The total number of species monitored by MBBH in the habitats sampled this year represents approximately 51% of the total number of breeding species in the Black Hills (Panjabi 2003).

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, contribute 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 2005, Rocky Mountain Bird Observatory (RMBO), in cooperation with its partner, the Black Hills National Forest (BHNF), implemented Year 5 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 fifth 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 2005, 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). In 2005, 6 of 10 habitats targeted for monitoring were sampled: burn areas (BU), foothill riparian (FR), montane riparian (MR), northern hills ponderosa pine (PN), southern hills ponderosa pine (PS), and white spruce (WS) (Figure 2).

Burn areas

Burn areas (BU) consist of previously forested landscapes that have been affected by wildfire. Currently, all BU sites except one are located in the Jasper burn area, which covers approximately 83,000 acres that burned in 2000. The other site is located in the nearby Elk Mountain burn area. The Jasper burn area is a mosaic of patches of charred, heat-killed, and live trees (mostly ponderosa pine, Pinus ponderosa) that ranged in seral stage from 'shrub-seedling' to 'mature' (USDA Forest Service 1998) prior to being burned. By 2004, herbaceous and woody ground cover had resprouted throughout much of the Jasper Burn and, in 2005, continued growth of shrubs and herbaceous plants in this area was noted.

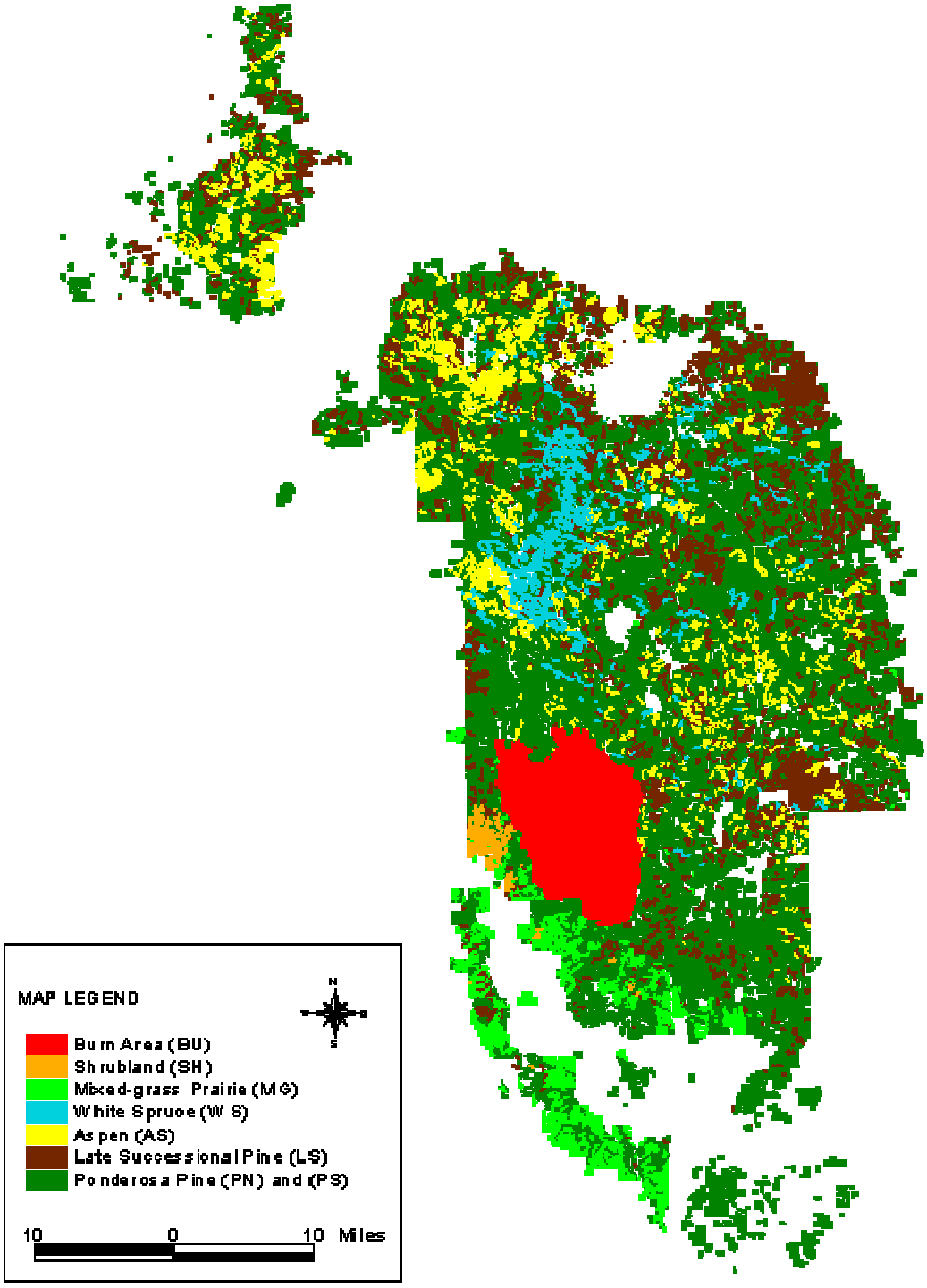


Figure 1. Distribution of habitats targeted for bird monitoring under *Monitoring the Birds of the Black Hills* (note: Foothills Riparian and Montane Riparian habitats not included).

Foothill riparian

Foothill riparian habitat (FR) refers to the wooded corridors along valley bottoms at lower elevations in the Black Hills. These habitats typically occur only in areas with surface water. Dominant tree species vary depending on location, but include plains cottonwood (Populus deltoides), narrow-leaf cottonwood (Populus angustifolia), peachleaf willow (Salix amygdaloides), boxelder (Acer negundo), American elm (Ulmus Americana), green ash (Fraxinus pensylvanica), bur oak (Querces macrocarpa), and Russian Olive (Elaegmus angustifolia). Shrubs may include silver buffaloberry (Sheperdia argentea), western snowberry (Symphoricarpos occidentalis), chokecherry (Prunus virginiana), sandbar willow (Salix exigua), Rocky Mountain juniper (Juniperus scopulorum), silver sagebrush (Artemisia cana) and big sagebrush (A. tridentata), among others. Herbaceous vegetation, especially grasses, is also prevalent.

Montane riparian

Montane riparian (MR) refers to wooded habitats along valley bottoms at mid- to upper-elevations in the Black Hills. These habitats occur almost exclusively along flowing water. Some sites in this category lack an over-story component, while others contain well-developed under- and over-stories. Dominant over-story tree species typically include narrowleaf cottonwood, boxelder, ponderosa pine, bur oak, and/or white spruce. Associated tree species may include aspen, paper birch and ironwood (Ostrya virginiana). Willows (Salix spp.), alders (Alnus sp.) and other shrubs, including snowberry, chokecherry, stinking elderberry (Sambucus racemosa), currant (Ribes spp.), and/or hawthorn (Crataegus chrysocarpa), typically form a fairly continuous shrub layer. The presence of an extensive shrub layer and flowing water are the unifying characteristics among sites in this habitat type. Herbaceous vegetation, especially grasses, is also prevalent.

Ponderosa pine, northern hills

Ponderosa pine, northern hills (PN), or “pine-north,” refers to the mesic forests dominated by ponderosa pine occurring north of the Mystic Ranger District. Although predominantly pine forest, this habitat designation incorporates the natural ecotonal variation in the landscape, such as small groves of aspen (Populus tremuloides) or bur oak (Quercus macrocarpa), drainages with birch (Betula papyrifera) and hazelnut (Corylus cornuta), riparian corridors, and other habitat edges. Nonetheless, transects in this habitat primarily sample pine forest. We separated the northern ponderosa pine habitat from that in the south because of structural and physiognomic differences that contribute to differences in the bird communities in each area. The pine forests in the northern hills receive more rainfall than those in the south, and consequently support an extensive under- and mid-story of bur oak, aspen, paper birch, and other small deciduous trees. This widespread deciduous component contributes to a bird community that is substantially different from that in the south.

Ponderosa pine, southern hills

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

White spruce

White spruce (WS) refers to coniferous forests dominated by white spruce (Picea gluaca), also known as Black Hills spruce. Often there is a significant component of ponderosa pine in this habitat and, to a lesser degree, aspen. White spruce stands typically occur at mid- to high elevations, especially in drainage bottoms and on cool, north-facing slopes. Most of this habitat occurs in a semi-continuous belt extending through the north-central and western Black Hills (Figure 2), although isolated pockets exist in moist, narrow canyons further south and along the eastern edge of the Black Hills.

Methods

Field Personnel

Five experienced biological technicians with excellent aural and visual bird-identification skills comprised the RMBO staff who executed the field component of MBBH in 2005. All technicians, except one, had at least four years of experience conducting RMBO bird monitoring in the Black Hills, bringing with them considerable experience with the protocol and knowledge of the local birds. Each technician also 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). A few additional changes were made to the sampling scheme in 2005, especially in the foothills riparian habitat. Seventeen new sites were added to the foothills riparian habitat (FR78-FR94). Four of these sites were previously labeled as montane riparian transects: MR09, MR10, MR89, and MR98. They were reclassified as foothill riparian transects: FR79, FR81, FR82, and FR80, respectively, as the elevation, vegetation and bird community were more similar to foothill riparian habitat than montane riparian habitat. Also, one foothill riparian transect, FR03, was re-established in a more suitable habitat at the same location. A few other sites (MR03 and PN12) were also re-established in the same areas to better target the existing habitat.

By 2005 we had already reached our goal of establishing 30 long-term monitoring sites in four of the six habitats surveyed: burn areas, northern hills ponderosa pine, southern hills ponderosa pine, and white spruce. We were unable, however, to get to one of the established white spruce transects, WS18, due to time and weather constraints. All of the other transects in these four habitats were surveyed this year as in previous years, except for PN98 and PS95 which are on NPS property. Only one transect on NPS property was surveyed this year, the Jasper burn transect in Jewel Cave National Monument. As for the foothills and montane riparian habitats, we have not met our goal of 30 transects due to difficulties in identifying, locating, and accessing sufficient independent sites in these habitats. We will continue to try to reach our target of 30 transects in each of these habitats in future years.

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 (2005). RMBO technicians 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 change in the bird data collection protocol from previous years was that since 2004, we 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

We 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, density estimates were generated only for species for which there was a minimum of *25 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 2,480 point counts along 173 point transects in 6 different habitats (Figure 3) between 23 May and 9 July, 2005. At least 26 point transects were surveyed in each habitat (Table 1). A total of 26,003 birds of 119 species were recorded on point transects in 2005. Fifty-one probable breeding species were observed in sufficient numbers to estimate density in at least one habitat. In total, RMBO staff have documented 165 species since 2001 that have either bred or summered in the Black Hills (Appendix B).

Table 1. Bird sampling periods and effort in each habitat in the Black Hills, summer 2005.

Habitat	Dates sampled	# point transects	# point counts
Burn area	28 May – 21 June	30	440
Foothills riparian	23 May – 27 June	28	397
Montane riparian	4 June – 6 July	26	372
Pine-north	9 June – 7 July	30	426
Pine-south	23 May – 7 June	30	436
White Spruce	12 June – 9 July	29	409
All habitats	23 May – 9 July	173	2480

The total number of species detected in each habitat in 2005 ranged from 63 in white spruce to 90 in foothill riparian (Table 2). While these totals communicate the magnitude of the spectrum of possible species across a range of sites within a habitat type, it should be understood that some species included in each total were largely peripheral to the habitat in which they were recorded. Thus, species richness measures reflect both the within- and between-habitat diversity of the sites surveyed in each habitat category.

Of the habitats surveyed in 2005, more birds were detected, and average species richness was greatest, in the riparian habitats (Table 2). We have provided estimates of avian species richness at both the point-level (i.e., sub-sample) and the transect (i.e., site) level, as the point-level data are not influenced by stand size (i.e., the number of sub-samples per site), and are therefore best for direct inter-habitat comparisons, while the site-level data, which are influenced by stand size, provide a more complete picture of the bird community within a given stand of habitat. Thus, both estimates are useful from a management perspective.

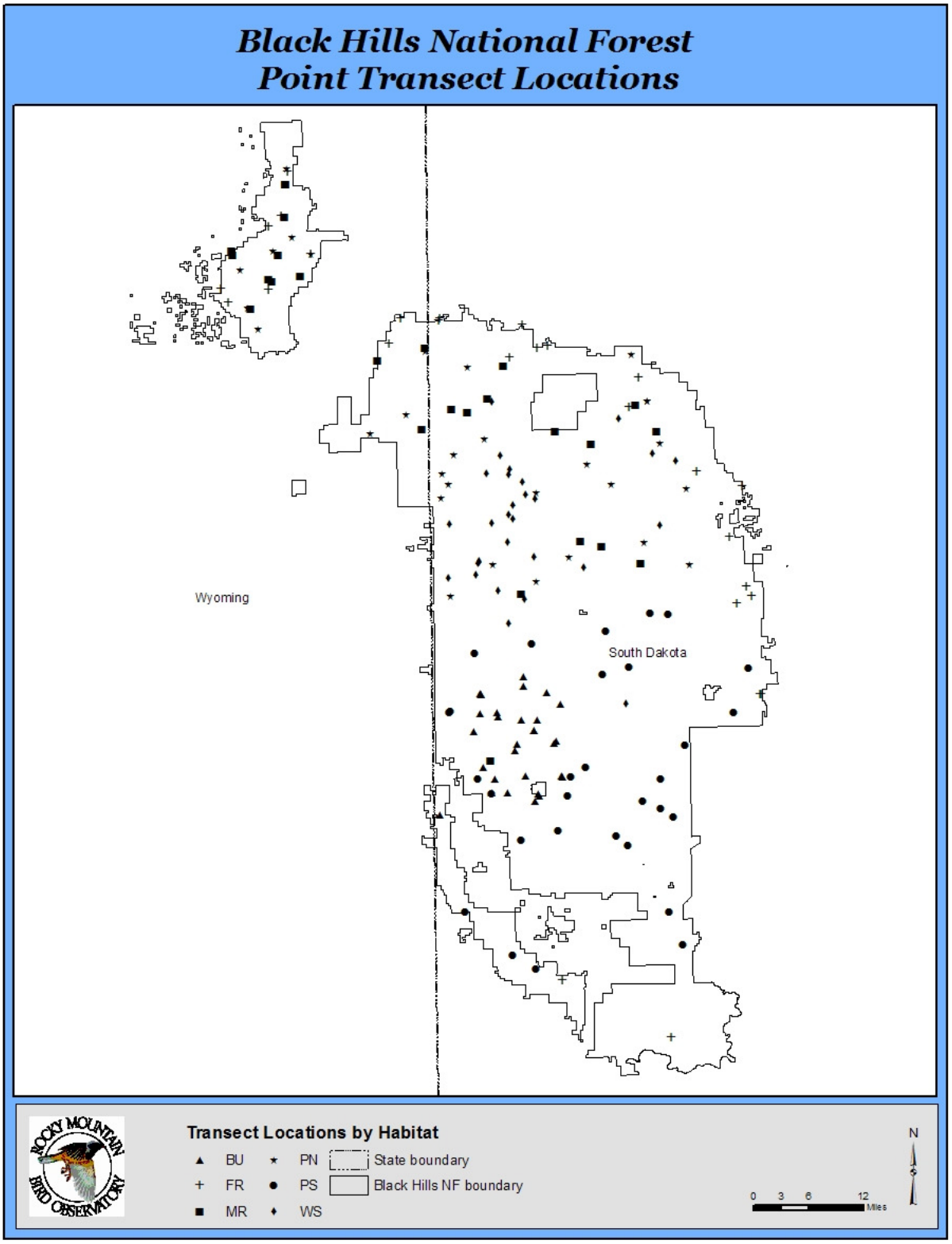


Figure 2. Distribution of habitat-stratified point transects in the Black Hills, 2005.

Table 2. Bird totals and species richness in habitats surveyed in the Black Hills, summer 2005.

Habitat	# birds detected	Avg. # birds/point	# species detected	Avg. species richness/point	Avg. species richness/transect
Burn area	4,255	9.6	63	6.8	25.3
Foothills riparian	5,105	12.9	90	8.6	29.2
Montane riparian	4,794	12.9	87	8.8	29.1
Pine-north	4,340	10.2	69	7.2	23.5
Pine-south	3,998	9.2	77	6.6	23.4
White spruce	3,576	8.7	64	6.2	20.6
All habitats	26,003	10.5	126	7.3	25.1

Burn area (BU)

This was the 5th year RMBO staff surveyed the Jasper burn. We surveyed 440 point counts along 30 transects in burn areas between 28 May and 21 June, 2005 (Table 2). A total of 4,255 birds were recorded in this habitat, with an average of 9.6 birds per count station (Table 2). Observers detected 63 species in total and an average of 6.8 species per point count and 25.3 species per transect (i.e., per site) in burn areas.

The point transect data from burn areas yielded robust density estimates for 28 species (CV<50%) (Table 3). MBBH should effectively monitor these 28 species, which represent 44% of all species recorded from burn areas in 2005, in this habitat.

Chipping Sparrow, Dark-eyed Junco, Mountain Bluebird, Brown-headed Cowbird, and American Robin were the most abundant species in burn areas in 2005. Fourteen species had higher estimated densities in burn areas than in other habitats surveyed in 2005, more species than in any other habitat. These species are: Red-headed Woodpecker, Hairy Woodpecker, Black-backed Woodpecker, Northern Flicker, Western Wood-Pewee, Rock Wren, House Wren, Eastern Bluebird, Mountain Bluebird, Western Tanager, Chipping Sparrow, Vesper Sparrow, Dark-eyed Junco, and Western Meadowlark. If density is assumed to be positively correlated with habitat quality, then burn areas provide optimal habitat for more species than any other habitat surveyed in 2005. A few of the aforementioned species may have had higher densities in habitats that were not surveyed this year (e.g. grassland). A species of conservation interest, Lewis's Woodpecker, was recorded exclusively in this habitat in 2005 (N=6).

Five years after the fire, densities of many species appear to be declining after an initial increase. Hairy Woodpeckers dropped from their highest density of 18.03 birds/km^2 in 2004 to only 6.44 birds/km^2 in 2005. Densities of Black-backed Woodpeckers also declined in 2005. Red-headed Woodpeckers were the only woodpecker that substantially increased in 2005, nearly doubling their density from 2004, and reaching their highest recorded density of 1.24 birds/km^2. Densities of Northern Flickers increased only slightly from 7.04 birds/km^2 in 2004

to 7.18 birds/km^2 in 2005.

Densities of Western Wood-Pewee, a species that was formerly common across the Black Hills (Pettingill and Whitney 1965) dropped markedly in 2005 after reaching a dramatic high density of 16.45 birds/km^2 in 2004. The density of Western Wood-Pewees in burn areas in 2005, around 4 birds/km^2 was similar to densities in other habitats and in other years. The densities of only six other species increased in 2005: Plumbeous Vireo, Rock Wren, Mountain Bluebird, American Robin, Yellow-rumped Warbler, and Vesper Sparrow and these increases were relatively small. Unlike 2004, we were also able to calculate densities for Pine Siskin and American Goldfinch, but we did not have enough detections of Mourning Doves or Gray Jays to calculate densities. The densities of all other species either remained about the same or decreased in 2005.

Table 3. Estimated densities of breeding birds in 5-year post-burn areas in ponderosa pine forest in the Black Hills, summer 2005.

Species	D	LCL	UCL	CV	n	N
Red-headed Woodpecker	1.24	0.70	2.18	28.8%	41	52
Hairy Woodpecker	6.44	4.77	8.70	15.3%	128	142
Black-backed Woodpecker	1.05	0.56	1.97	31.9%	25	32
Northern Flicker	7.18	5.20	9.92	16.5%	204	227
Western Wood-Pewee	3.92	2.64	5.82	19.8%	129	130
Dusky Flycatcher	7.88	5.56	11.16	17.4%	149	156
Plumbeous Vireo	4.26	2.35	7.73	30.1%	54	54
Warbling Vireo	2.91	1.58	5.36	31.1%	51	51
American Crow	0.11	0.06	0.20	32.6%	26	26
Black-capped Chickadee	4.32	3.16	5.92	15.9%	85	86
Red-breasted Nuthatch	3.71	2.36	5.85	22.9%	76	77
White-breasted Nuthatch	5.84	4.32	7.89	15.1%	82	82
Rock Wren	2.49	1.43	4.35	28.1%	91	91
House Wren	6.55	4.19	10.23	22.1%	109	110
Eastern Bluebird	3.97	2.40	6.54	25.5%	51	54
Mountain Bluebird	25.00	19.08	32.75	13.6%	190	211
Townsend's Solitaire	2.42	1.75	3.33	16.2%	98	100
American Robin	21.62	16.97	27.54	12.3%	366	378
Yellow-rumped Warbler	7.76	5.25	11.47	19.6%	155	156
Western Tanager	12.81	8.15	20.13	23.1%	162	168
Chipping Sparrow	120.04	88.17	163.42	15.7%	545	664
Vesper Sparrow	6.55	4.72	9.08	16.4%	149	163
Dark-eyed Junco	41.41	31.99	53.60	13.0%	379	402
Western Meadowlark	1.78	0.77	4.07	42.9%	71	116
Brown-headed Cowbird	22.47	16.56	30.49	15.3%	194	220
Red Crossbill	5.85	3.06	11.18	33.4%	38	94
Pine Siskin	6.24	2.92	13.33	39.4%	38	48
American Goldfinch	2.93	1.30	6.62	42.4%	26	27

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 observations used to estimate; N = number of individuals detected

Foothill riparian (FR)

This was the 2nd year RMBO staff surveyed the foothills riparian habitat. We surveyed 397 point counts along 28 transects in this habitat between 23 May and 27 June, 2005 (Table 1). A total of 5,105 individual birds were recorded, with an average of 12.9 birds per point count (Table 2). Observers detected 90 species in total and, on average, 8.6 species per point count and 29.2 species per transect in this habitat. Overall, more individual birds of a greater number of species were recorded in foothills riparian habitat than in any other single habitat type surveyed this year. However, individuals of some species were often recorded from adjacent habitats.

The point transect data from foothills riparian habitat yielded robust density estimates (CV<50%) for 28 species and a moderately robust estimate for five additional species (CV=50-79%; Table 4). MBBH should effectively monitor these 33 species, which represent 37% of all species recorded from foothills riparian in 2005, in this habitat.

Warbling Vireo, Chipping Sparrow, American Redstart, Cordilleran Flycatcher, and American Robin, Ovenbird, and Black-headed Grosbeak were the most abundant species in foothill riparian this year. Thirteen species (White-throated Swift, Cordilleran Flycatcher, Warbling Vireo, Red-eyed Vireo, Violet-green Swallow, Black-capped Chickadee, American Robin, Yellow Warbler, American Redstart, Ovenbird, Yellow-breasted Chat, Spotted Towhee, and Black-headed Grosbeak), were more abundant in foothills riparian than any other habitat sampled in 2005.

Table 4. Estimated densities of breeding birds in foothill riparian habitat in the Black Hills, summer 2005.

Species	D	LCL	UCL	CV	n	N
Mourning Dove	1.96	0.96	4.03	36.9%	54	59
White-throated Swift	15.80	5.87	42.51	53.0%	41	301
Western Wood-Pewee	2.11	1.19	3.75	29.1%	56	57
Dusky Flycatcher	18.75	11.87	29.63	22.7%	152	152
Cordilleran Flycatcher	49.89	36.32	68.52	15.9%	226	231
Plumbeous Vireo	6.79	3.88	11.86	28.4%	36	36
Warbling Vireo	76.84	60.20	98.06	12.1%	400	412
Red-eyed Vireo	32.67	19.86	53.76	25.4%	139	140
Violet-green Swallow	18.73	9.86	35.58	32.5%	74	206
Black-capped Chickadee	25.92	18.67	35.97	16.7%	167	174
Red-breasted Nuthatch	10.83	7.70	15.23	17.3%	156	165
Golden-crowned Kinglet	8.98	2.87	28.05	61.6%	28	29
Ruby-crowned Kinglet	9.18	4.81	17.54	33.2%	78	78
Townsend's Solitaire	1.93	1.17	3.18	25.5%	58	59
Swainson's Thrush	11.07	6.03	20.35	31.4%	70	70
American Robin	49.60	36.90	66.66	14.9%	316	334
Yellow Warbler	21.61	8.94	52.27	45.7%	68	69
Yellow-rumped Warbler	12.42	8.20	18.82	20.8%	109	114
American Redstart	68.94	43.23	109.97	23.6%	302	311

Table 4 cont. Estimated densities of breeding birds in foothill riparian habitat in the Black Hills, summer 2005.

Species	D	LCL	UCL	CV	n	N
Ovenbird	46.25	35.42	60.39	13.2%	398	409
MacGillivray's Warbler	19.12	10.11	36.17	32.4%	57	62
Common Yellowthroat	24.64	12.06	50.38	36.8%	88	94
Yellow-breasted Chat	1.89	0.52	6.94	70.7%	26	29
Spotted Towhee	13.78	8.19	23.17	26.0%	104	107
Chipping Sparrow	72.74	47.26	111.96	22.0%	157	178
Song Sparrow	24.85	13.54	45.59	30.8%	77	79
Dark-eyed Junco	19.95	12.47	31.91	23.8%	90	96
Black-headed Grosbeak	34.67	22.73	52.90	21.5%	144	147
Red-winged Blackbird	5.32	1.58	17.95	65.6%	37	42
Brown-headed Cowbird	13.48	8.80	20.65	21.5%	88	100
Western Meadowlark	3.10	0.76	12.67	78.7%	25	28
Red Crossbill	4.07	2.22	7.46	30.7%	60	100
Pine Siskin	13.98	8.97	21.80	22.5%	65	76

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 observations used to estimate; N = number of individuals detected

Montane riparian (MR)

This was the 3rd year RMBO staff surveyed montane riparian habitat. We conducted 372 point counts along 26 transects in this habitat between 4 June and 6 July, 2005 (Table 1). A total of 4,794 individual birds were recorded, with an average of 12.9 birds per point count (Table 2). Observers detected 87 species in total and, on average, 8.8 species per point count and 29.1 species per transect in this habitat (Table 2).

The point transect data from montane riparian habitat yielded robust density estimates (CV<50%) for 32 species and a moderately robust estimate for two additional species (CV=50-70%; Table 5). MBBH should effectively monitor these 34 species which represent 39% of all species recorded in montane riparian habitat in 2005.

Common Yellowthroat, American Redstart, Song Sparrow, Pine Siskin, and Warbling Vireo, and were the most abundant species in montane riparian this year. Eight species (Red-naped Sapsucker, Dusky Flycatcher, Veery, MacGillivray's Warbler, Common Yellowthroat, Song Sparrow, and Pine Siskin), had higher estimated densities in montane riparian relative to other habitats surveyed in 2005.

Table 5. Estimated densities of breeding birds in montane riparian habitat in the Black Hills, summer 2005.

Species	D	LCL	UCL	CV	n	N
Red-naped Sapsucker	5.88	3.14	10.99	32.1%	40	49
Northern Flicker	1.11	0.73	1.71	21.2%	50	55
Western Wood-Pewee	1.26	0.64	2.50	34.5%	44	45
Dusky Flycatcher	22.56	17.76	28.66	11.9%	308	308

Table 5 cont. Estimated densities of breeding birds in montane riparian habitat in the Black Hills, summer 2005

Species	D	LCL	UCL	CV	n	N
Cordilleran Flycatcher	16.55	11.25	24.34	19.4%	99	102
Plumbeous Vireo	3.99	1.88	8.47	38.5%	27	27
Warbling Vireo	47.25	34.45	64.80	16.0%	479	484
Red-eyed Vireo	9.05	4.93	16.61	30.3%	51	54
Violet-green Swallow	6.62	3.07	14.26	39.7%	36	130
Black-capped Chickadee	12.29	8.76	17.24	17.1%	122	125
Red-breasted Nuthatch	5.35	3.74	7.66	18.1%	124	126
House Wren	3.25	0.98	10.81	64.4%	29	32
Golden-crowned Kinglet	5.22	2.42	11.27	39.0%	37	38
Ruby-crowned Kinglet	18.63	9.55	36.36	34.8%	193	207
Townsend's Solitaire	0.80	0.46	1.39	28.0%	37	42
Veery	4.82	2.40	9.67	35.7%	49	52
Swainson's Thrush	9.03	4.95	16.47	30.7%	82	82
American Robin	33.62	24.89	45.40	15.1%	326	352
Yellow Warbler	7.10	2.67	18.90	51.9%	37	38
Yellow-rumped Warbler	11.08	7.38	16.65	20.3%	136	141
American Redstart	58.93	38.78	89.54	20.9%	243	244
Ovenbird	25.85	16.81	39.73	21.5%	282	290
MacGillivray's Warbler	23.22	14.50	37.21	24.0%	104	105
Common Yellowthroat	59.12	33.96	102.91	28.5%	163	172
Western Tanager	2.94	1.64	5.27	29.6%	71	72
Spotted Towhee	11.37	5.12	25.24	40.9%	66	67
Chipping Sparrow	45.88	26.24	80.21	28.9%	166	180
Song Sparrow	57.42	35.85	91.95	23.6%	202	229
Dark-eyed Junco	8.46	5.59	12.81	20.8%	101	102
Black-headed Grosbeak	11.58	6.57	20.38	28.5%	75	82
Red-winged Blackbird	6.92	2.84	16.83	46.2%	62	67
Brown-headed Cowbird	6.58	3.90	11.10	26.4%	63	71
Red Crossbill	11.28	5.32	23.89	39.0%	49	75
Pine Siskin	49.91	30.13	82.66	25.8%	115	134

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 observations used to estimate; N = number of individuals detected

Ponderosa pine, northern hills (PN)

This was the 4th year RMBO staff surveyed the northern ponderosa pine habitat. We conducted 426 counts along 30 transects in ponderosa pine forest in the northern Black Hills (pine-north) between 9 June and 7 July, 2005 (Table 1). A total of 4,340 birds were recorded in this habitat, with an average of 10.2 birds at each count station (Table 2). Observers detected a total of 69 species, and on average, 7.2 species per point count and 23.5 species per site in pine-north.

The point transect data from pine-north yielded robust estimates (CV<50%) for all 27 species for which we are able to provide densities (Table 6). MBBH should effectively monitor these 27 species, which represent 39% of all species recorded from pine-north habitat in 2005, in this habitat.

Chipping Sparrow, Yellow-rumped Warbler, Warbling Vireo, American Robin, and Dark-eyed Junco were the most abundant species in this habitat this year. Three species (Gray Jay, Brown Creeper, and Yellow-rumped Warbler) had higher estimated densities in pine-north than in other habitats surveyed in 2005. However, some of these species may have had higher densities in other habitats not surveyed this year.

Because ponderosa pine forests in the northern Black Hills have a significant component of aspen, oak, and other broad-leaved trees, many bird species more often associated with broad-leaved habitats occur here in fairly high density. This fact is reflected by the higher average species richness per point count than in pine-south and by the relatively high densities of species such as Dusky Flycatcher, Warbling Vireo, Ovenbird, and other species that require broad-leaved vegetation. Nonetheless, many of these species occur in even greater densities in other habitats (e.g., aspen, montane riparian) in the Black Hills.

Table 6. Estimated densities of breeding birds in ponderosa pine habitat, northern hills in the Black Hills, summer 2005.

Species	D	LCL	UCL	CV	n	N
Red-naped Sapsucker	3.65	2.40	5.56	21.1%	63	79
Hairy Woodpecker	2.82	1.82	4.37	22.2%	42	64
Northern Flicker	0.83	0.46	1.52	30.7%	48	50
Western Wood-Pewee	3.15	1.73	5.72	30.3%	91	91
Dusky Flycatcher	11.21	6.58	19.11	27.5%	152	156
Cordilleran Flycatcher	5.33	2.83	10.03	32.2%	46	46
Plumbeous Vireo	1.51	0.74	3.07	36.6%	27	27
Warbling Vireo	45.23	34.59	59.13	13.6%	445	458
Gray Jay	1.70	0.83	3.48	37.1%	25	37
Black-capped Chickadee	19.34	14.28	26.21	15.4%	211	221
Red-breasted Nuthatch	14.52	11.61	18.17	11.3%	233	243
Brown Creeper	5.30	3.14	8.95	26.6%	30	30
Golden-crowned Kinglet	19.27	7.59	48.93	48.9%	25	25
Ruby-crowned Kinglet	10.83	6.36	18.43	27.1%	102	108
Townsend's Solitaire	5.19	3.71	7.27	16.9%	144	149
Swainson's Thrush	1.64	0.93	2.89	28.8%	39	39
American Robin	28.90	23.02	36.29	11.5%	265	286
Yellow-rumped Warbler	48.45	39.49	59.45	10.2%	481	488
American Redstart	4.81	2.50	9.25	33.0%	50	50
Ovenbird	23.60	15.38	36.22	21.3%	314	315
MacGillivray's Warbler	4.90	2.52	9.52	33.9%	41	42
Western Tanager	10.03	6.68	15.07	20.4%	155	157
Chipping Sparrow	67.85	49.36	93.27	16.2%	252	309
Dark-eyed Junco	28.89	22.56	36.99	12.4%	255	288
Brown-headed Cowbird	8.39	5.18	13.56	24.5%	77	87
Red Crossbill	14.75	10.59	20.55	16.6%	163	241
Pine Siskin	11.16	7.15	17.42	22.4%	80	99

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 observations used to estimate; N = number of individuals detected

Ponderosa pine, southern hills (PS)

This was the 4th year RMBO staff surveyed the southern ponderosa pine habitat. We conducted 436 point counts along 30 transects in ponderosa pine forest in the southern Black Hills (pine-south) between 23 May and 7 June, 2005 (Table 1). A total of 3,998 birds were recorded in this habitat, with an average of 9.2 birds at each count station. Observers detected 77 species in total in pine-south and an average of 6.6 species per point count and 23.4 species per site in this habitat (Table 2).

The point transect data from pine-south yielded robust density estimates (CV<50%) for 24 species and moderately robust estimates for another three species (CV=50-70%; Table 7). MBBH should effectively monitor these 27 species, which represent 35% of all species recorded from pine-south habitat in 2005, in this habitat.

Chipping Sparrow, Yellow-rumped Warbler, Dark-eyed Junco, Brown-headed Cowbird, and Red Crossbill were the most abundant species in this habitat this year. Eight species (Mourning Dove, Plumbeous Vireo, Red-breasted Nuthatch, White-breasted Nuthatch, Townsend's Solitaire, Brown-headed Cowbird, Red Crossbill, and American Goldfinch) had higher estimated densities in pine-south than in other habitats surveyed in 2005. However, some of these species may have had higher densities in habitats not surveyed this year.

Table 7. Estimated densities of breeding birds in ponderosa pine forest (southern hills) in the Black Hills, summer 2005.

Species	D	LCL	UCL	CV	n	N
Mourning Dove	2.45	1.33	4.51	31.1%	67	76
Hairy Woodpecker	2.46	1.67	3.62	19.5%	55	65
Northern Flicker	0.61	0.37	1.02	26.1%	41	47
Western Wood-Pewee	1.34	0.65	2.77	36.8%	53	53
Dusky Flycatcher	8.66	5.85	12.84	19.7%	123	128
Plumbeous Vireo	9.90	6.72	14.56	19.3%	127	127
Warbling Vireo	9.31	5.54	15.64	26.1%	113	114
American Crow	0.16	0.09	0.29	29.9%	37	42
Black-capped Chickadee	21.14	15.12	29.54	17.0%	140	199
Red-breasted Nuthatch	14.77	10.98	19.87	15.1%	238	247
White-breasted Nuthatch	9.63	6.55	14.16	19.5%	77	89
Rock Wren	0.75	0.36	1.56	37.5%	38	39
Mountain Bluebird	6.02	3.57	10.15	26.5%	80	90
Townsend's Solitaire	5.57	4.13	7.51	15.2%	186	192
American Robin	13.25	9.11	19.28	19.1%	194	198
Yellow-rumped Warbler	40.67	32.32	51.18	11.6%	458	462
Ovenbird	5.23	3.34	8.20	22.8%	141	144
Western Tanager	9.70	6.56	14.35	19.8%	167	169
Spotted Towhee	1.03	0.38	2.78	52.9%	26	26
Chipping Sparrow	96.43	65.31	142.36	19.8%	331	379
Vesper Sparrow	1.28	0.48	3.40	51.1%	28	30
Dark-eyed Junco	26.89	20.49	35.28	13.8%	224	233

Table 7 cont. Estimated densities of breeding birds in ponderosa pine forest (southern hills) in the Black Hills, summer 2005.

Species	D	LCL	UCL	CV	n	N
Western Meadowlark	0.34	0.13	0.90	51.4%	49	49
Brown-headed Cowbird	26.81	18.60	38.64	18.2%	143	191
Red Crossbill	22.06	15.81	30.77	16.8%	167	298
Pine Siskin	6.32	3.30	12.11	32.8%	40	47
American Goldfinch	9.52	5.52	16.39	27.4%	39	57

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 observations used to estimate; N = number of individuals detected

White spruce (WS)

This was the 4th year RMBO staff surveyed the white spruce habitat. We conducted 409 point counts along 29 transects in these stands between 12 June and 9 July, 2005 (Table 1). A total of 3,576 birds were recorded, with an average of 8.7 birds detected at each count station (Table 2). This average number of birds per count was the lowest recorded in any habitat in 2005 (Table 2). Observers detected 64 species in total and, on average, detected 6.2 species per point count and 20.6 species per site.

The point transect data from white spruce habitat yielded robust density estimates (CV<50%) for 20 species and moderately robust estimates for one other species (CV=50-70%; Table 8). MBBH should effectively monitor these 21 species, which represent 33% of all species recorded from white spruce habitat in 2005, in this habitat.

Golden-crowned Kinglet, Chipping Sparrow, Ruby-crowned Kinglet, American Robin, and Yellow-rumped Warbler were among the most abundant species in this habitat this year. Five species (American Three-toed Woodpecker, American Crow, Golden-crowned Kinglet, Ruby-crowned Kinglet, and Swainson's Thrush) had higher estimated densities in white spruce habitat than in other habitats surveyed in 2005.

Table 8. Estimated densities of breeding birds in white spruce stands in the Black Hills, 2005.

Species	D	LCL	UCL	CV	n	N
Hairy Woodpecker	2.08	1.14	3.81	31.0%	43	52
American Three-toed Woodpecker	2.66	1.63	4.34	24.9%	34	44
Dusky Flycatcher	1.55	0.77	3.10	35.5%	32	32
Cordilleran Flycatcher	7.23	4.38	11.95	25.2%	73	73
Warbling Vireo	4.93	3.10	7.84	23.0%	62	67
American Crow	0.32	0.15	0.70	39.9%	29	34
Black-capped Chickadee	9.78	7.20	13.29	15.4%	118	128
Red-breasted Nuthatch	7.00	5.35	9.16	13.6%	152	152
Brown Creeper	5.13	3.12	8.44	25.2%	44	45
Golden-crowned Kinglet	72.67	57.71	91.51	11.7%	237	251
Ruby-crowned Kinglet	49.50	38.85	63.08	12.3%	596	603

Table 8 cont. Estimated densities of breeding birds in white spruce stands in the Black Hills, 2005.

Species	D	LCL	UCL	CV	n	N
Townsend's Solitaire	1.76	1.13	2.74	22.4%	63	66
Swainson's Thrush	16.16	11.98	21.82	15.1%	200	212
American Robin	33.17	25.67	42.86	12.8%	349	379
Yellow-rumped Warbler	25.98	20.89	32.31	10.9%	302	311
Common Yellowthroat	13.12	3.87	44.46	67.1%	41	41
Chipping Sparrow	57.63	38.93	85.31	20.1%	291	313
Song Sparrow	7.69	4.06	14.59	32.2%	80	83
Dark-eyed Junco	21.62	16.38	28.54	13.9%	203	211
Red Crossbill	9.50	6.56	13.76	18.8%	82	127
Pine Siskin	15.22	9.16	25.30	25.6%	92	116

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 observations used to estimate; N = number of individuals detected

SPECIES ACCOUNTS

In this section we present one-page accounts for each bird species detected in 2005 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, South Dakota Comprehensive Wildlife Conservation Plan, 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, we 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, we include designations for Birds of Conservation Concern for Bird Conservation Region 17 (BCR17; USFWS 2002). For the South Dakota Department of Game, Fish, and Parks, we include designations for State Threatened or Endangered Species. For Partners In Flight we include designations from the Partners In Flight Species Assessment Database for Bird Conservation Region 17, (PIF Species Assessment Database 2005), 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 2005. 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. It should also be noted that the location of the dots do not indicate the precise location of the point at which the species was observed, but rather the access point of the transect on which the species was observed. It is important to keep in mind that the maps only reflect the abundance and distribution of the species across the sites we surveyed, and should not necessarily be construed to suggest anything about the areas in between. Also, note that the abundance scale has been changed from earlier reports so that the scale is specific to each species.

In each table we 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. It should also be noted that the number of individuals observed (N) includes flyovers and between point detections. This explains why the total number of birds in Appendix A is greater than the totals in Table 2.

In a few cases, we 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.

Ruffed Grouse

(BHNF Management Indicator Species)

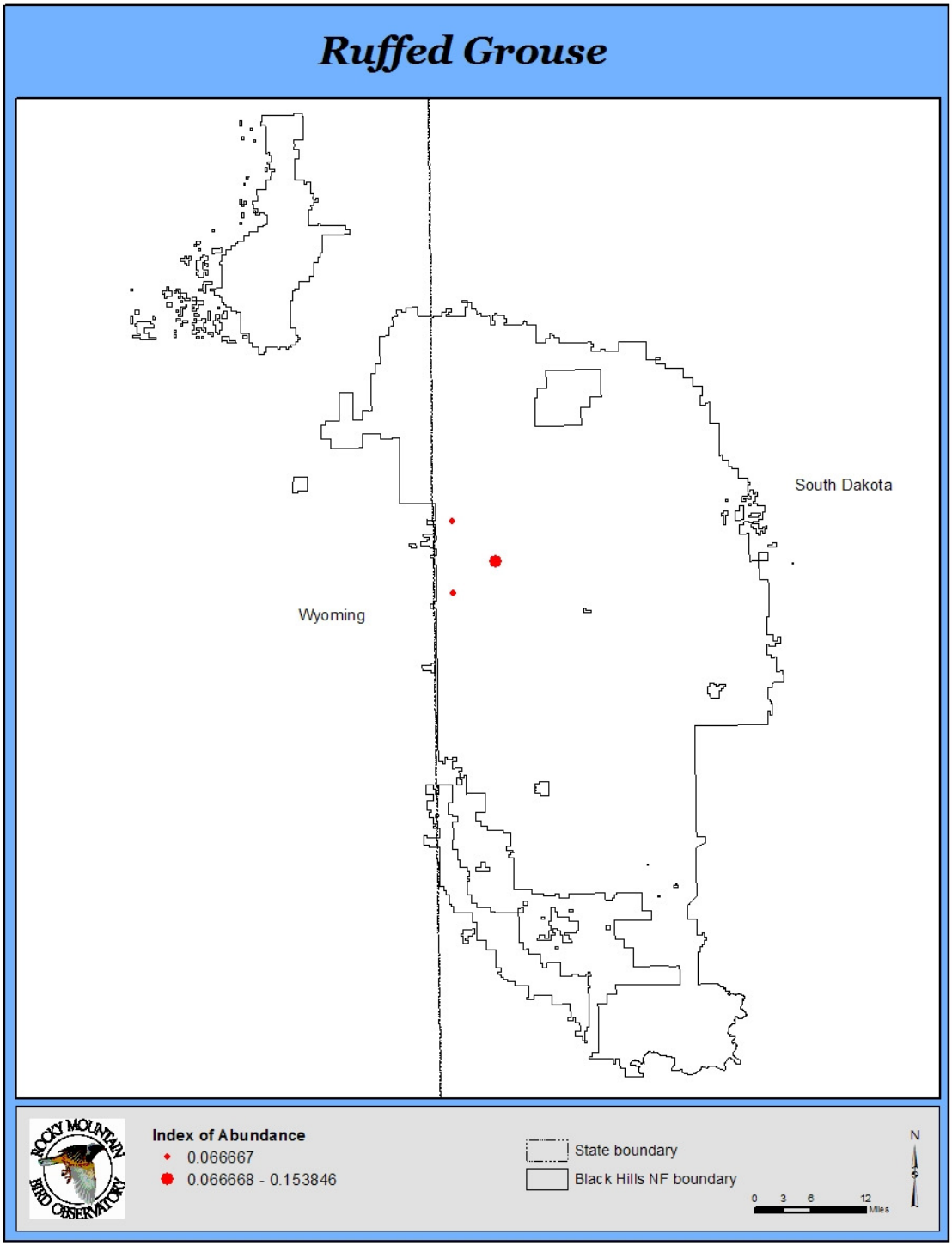
Ruffed Grouse occurs widely throughout much of the northern Black Hills, although in low abundance. We recorded the lowest number of Ruffed Grouse in 2005 since the inception of MBBH. In 2002, we detected 62 birds, the highest number in the history of the program, with 16 in ponderosa pine-north and 11 in white spruce. Although we did not survey aspen and late-successional pine in 2005, these habitats have also supported relatively large numbers of detections of Ruffed Grouse in previous years.

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

Total number of independent detections, number of individuals, and habitat-specific density estimates for Ruffed Grouse for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
PN	ID	--	--	--	3	3
WS	ID	--	--	--	1	1

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Ruffed Grouse
South Dakota
Wyoming
Index of Abundance
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0.066668 - 0.153846
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Sharp-tailed Grouse

(PIF Continental and Regional Stewardship Species)
(WY-PIF Level I Priority)

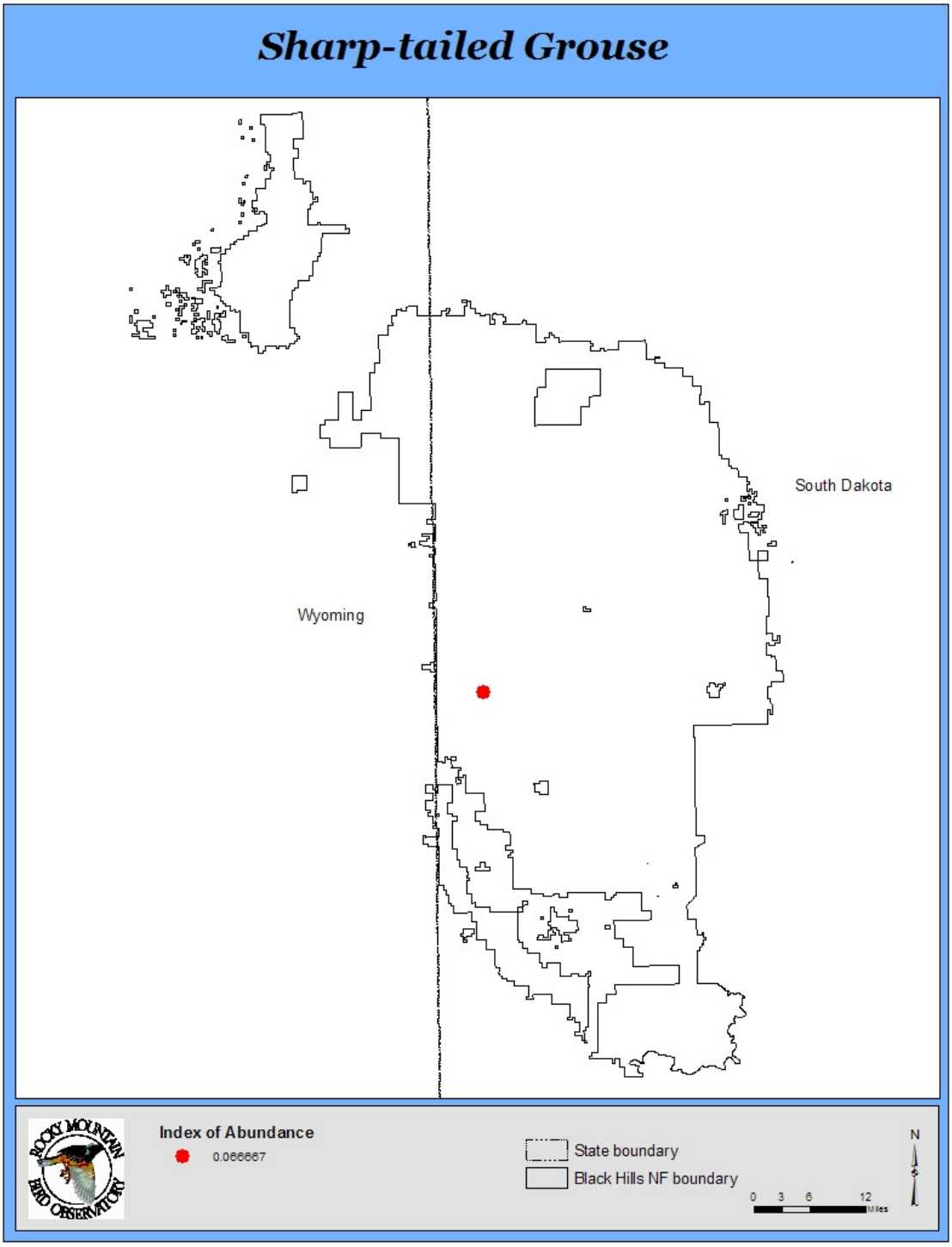
Sharp-tailed Grouse occur almost exclusively in areas of native mixed-grass prairie, primarily in the southern Black Hills, Elk Mountains, and also in the large prairies in the central hills. This species is also starting to colonize the Jasper burn area as it begins to revert to grassland and, in fact, the only Sharp-tailed Grouse detection of 2005 was from the Jasper burn area. Mixed-grass prairie, however, was not surveyed in 2005, and in 2004 we recorded 22 individual Sharp-tailed Grouse in this habitat, more than in any previous year of MBBH.

It is important to realize that the timing of our surveys does not correspond well to the period of peak detectability of Sharp-tailed Grouse, which occurs earlier in the spring. Thus the species probably goes undetected on many of our late-spring/early summer surveys. Therefore, these data should not be relied upon to reflect abundance as many individuals are likely missed during our surveys. Continued surveys in mixed-grass prairie, especially earlier in the spring, would most likely yield better information on Sharp-tailed Grouse.

Total number of detections, number of individuals, and habitat-specific density estimates for Sharp-tailed Grouse on the MBBH monitoring project, 2005.

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

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Sharp-tailed Grouse
South Dakota
Wyoming
Index of Abundance
0.066667
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Osprey

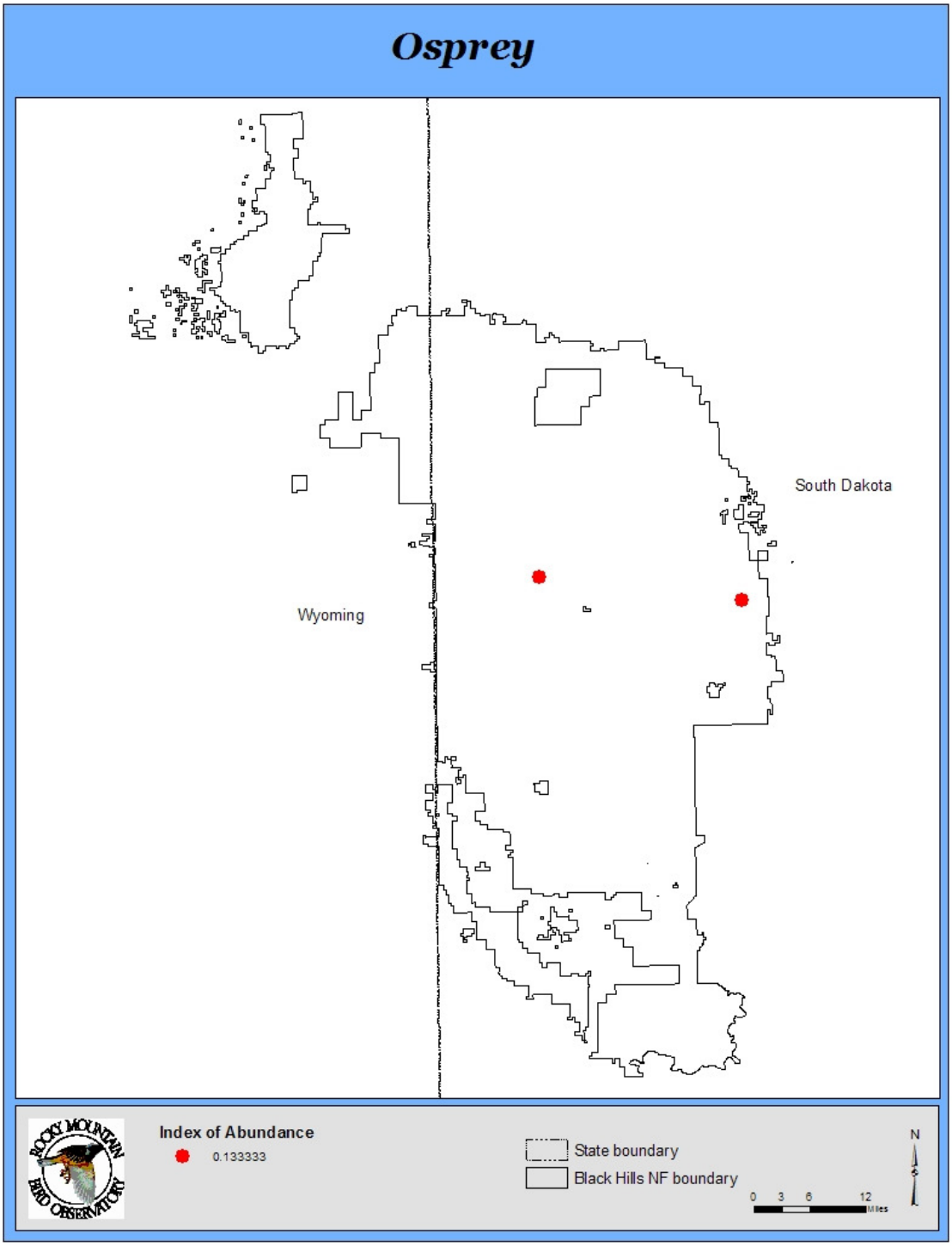
(SDGFP Species of Greatest Conservation Need)

Ospreys nest locally throughout the Black Hills, typically near large bodies of water. Four Osprey were observed on transects in 2005; two were in foothills riparian and two were in ponderosa pine-north. Due to their localized nature and habitat requirements, 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 in the Black Hills. Given interest, such a program could be implemented cost-effectively as part of MBBH, through a volunteer-based special-species program similar to the one RMBO conducts in Colorado.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Osprey for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
FR	ID	--	--	--	1	2
PN	ID	--	--	--	2	2

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Osprey
South Dakota
Wyoming
Index of Abundance
0.133333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Sharp-shinned Hawk

(BHNF Species of Local Concern)

Sharp-shinned Hawk occurs throughout the Black Hills, but it is perhaps the rarest of the Accipiters on the Forest. Three Sharp-shinned Hawks were observed on transects in 2005. In 2004 we recorded six Sharp-shinned Hawks, more than in any other year. Too few were observed to estimate density either within or across habitats.

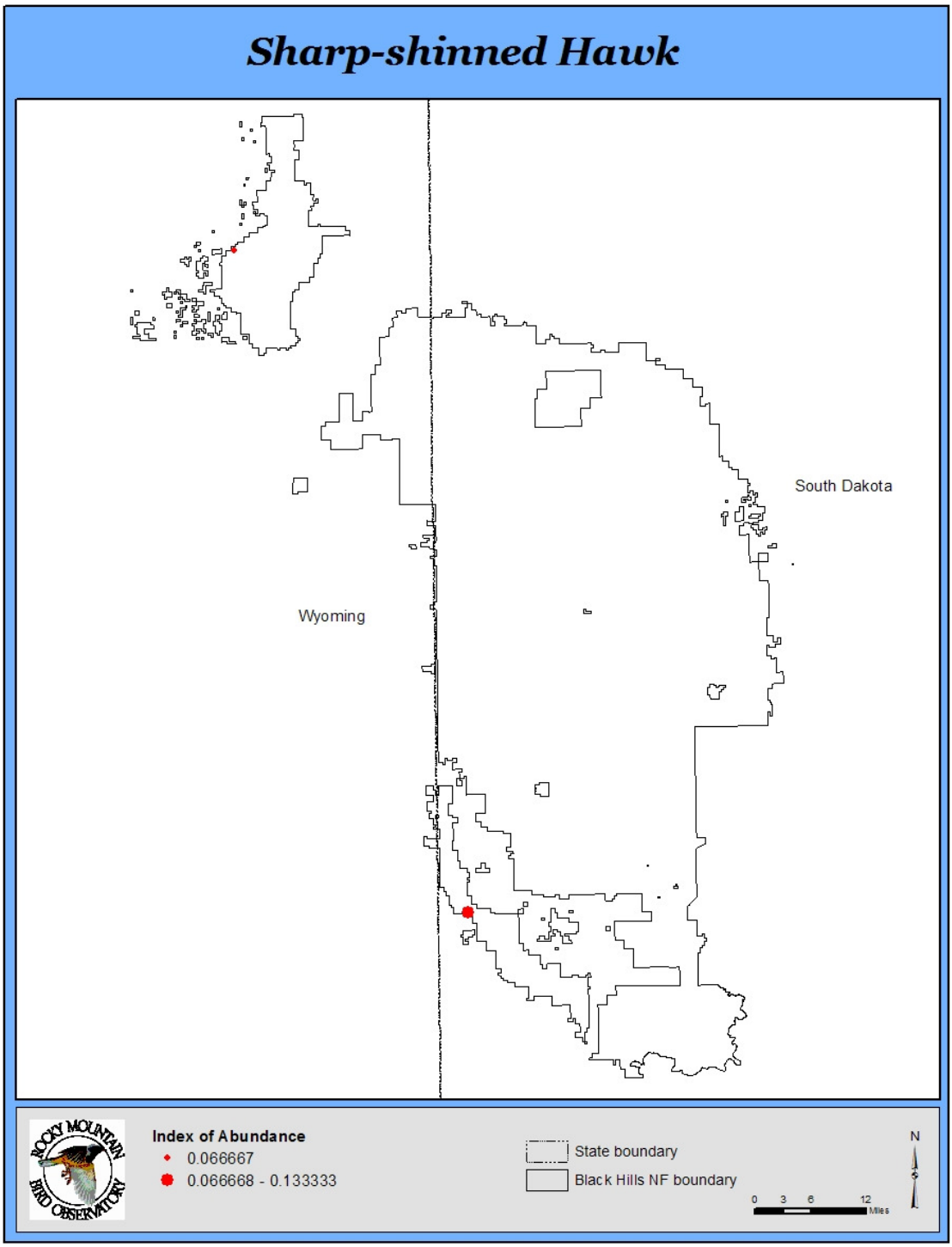
The cumulative observations of Sharp-shinned Hawk across the five years of MBBH, indicates that it is the least common of the three Accipiters (Cooper's and Northern Goshawk being the others) in the Black Hills (Appendix A). Interstingly, earlier accounts of this species suggest it was formerly more 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 this and other forest raptors at count stations after point-transect surveys.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Sharp-shinned Hawk for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
MR	ID	--	--	--	1	1
PS	ID	--	--	--	2	2

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Sharp-shinned Hawk
South Dakota
Wyoming
Index of Abundance
0.066667
0.066668 - 0.133333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Cooper's Hawk

(BHNF Species of Local Concern)

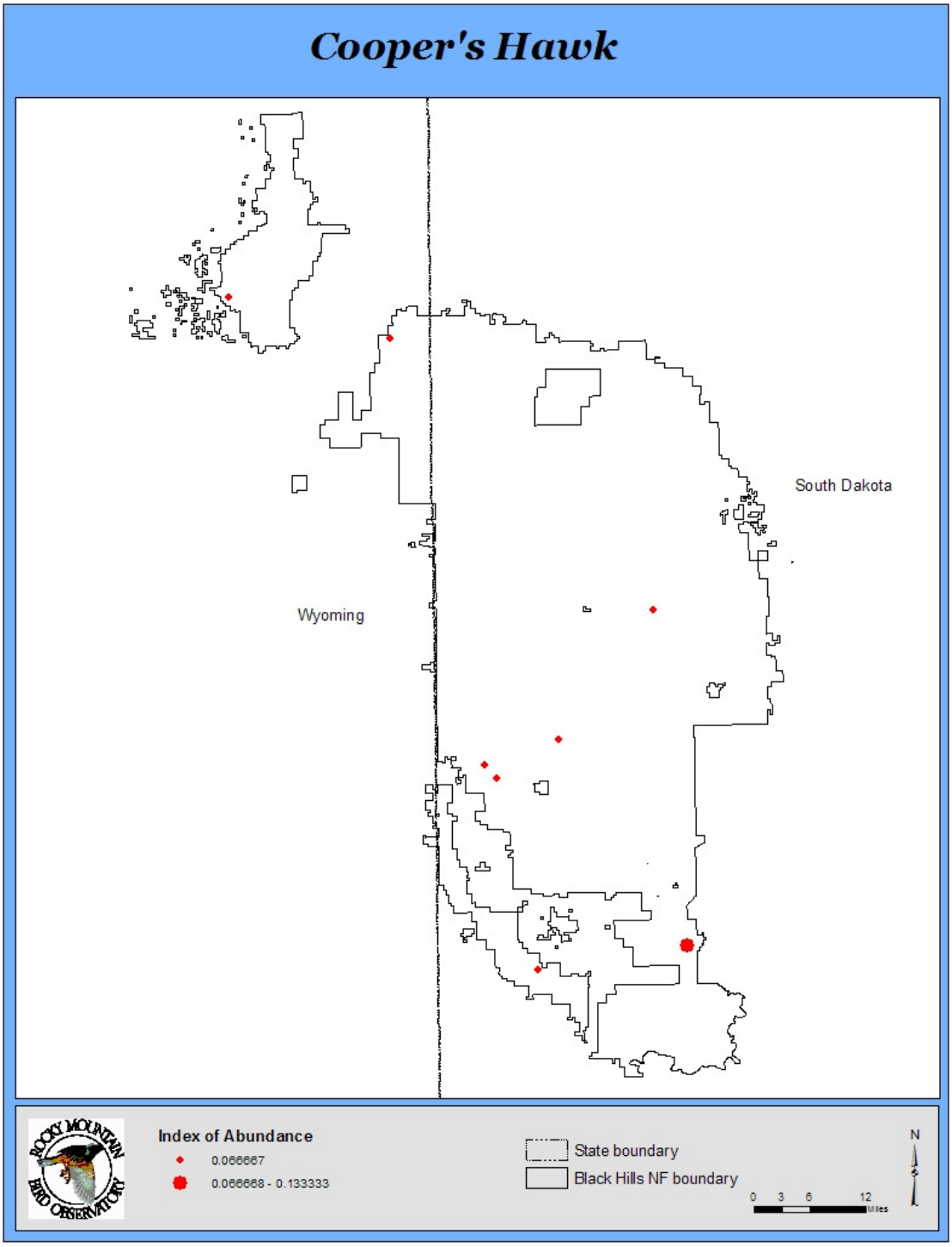
Cooper's Hawk occurs throughout the Black Hills, where it is uncommon. Nine Cooper's Hawks were observed on transects in 2005. Three were in the Jasper burn area, two were in foothills riparian, and four were in ponderosa pine-south. Too few were observed to estimate density either within or across habitats.

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.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Cooper's Hawk for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	3	3
FR	ID	--	--	--	2	2
PS	ID	--	--	--	3	4

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Cooper's Hawk
South Dakota
Wyoming
Index of Abundance
0.066667
0.066668 - 0.133333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Northern Goshawk

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

Northern Goshawk occurs widely in the Black Hills but it is rare to uncommon throughout. Fifteen Northern Goshawks were recorded in 2005: two in foothills riparian, four in montane riparian, four in ponderosa pine-north, four in ponderosa pine-south, and one in white spruce. Too few were observed to estimate density either within or across habitats.

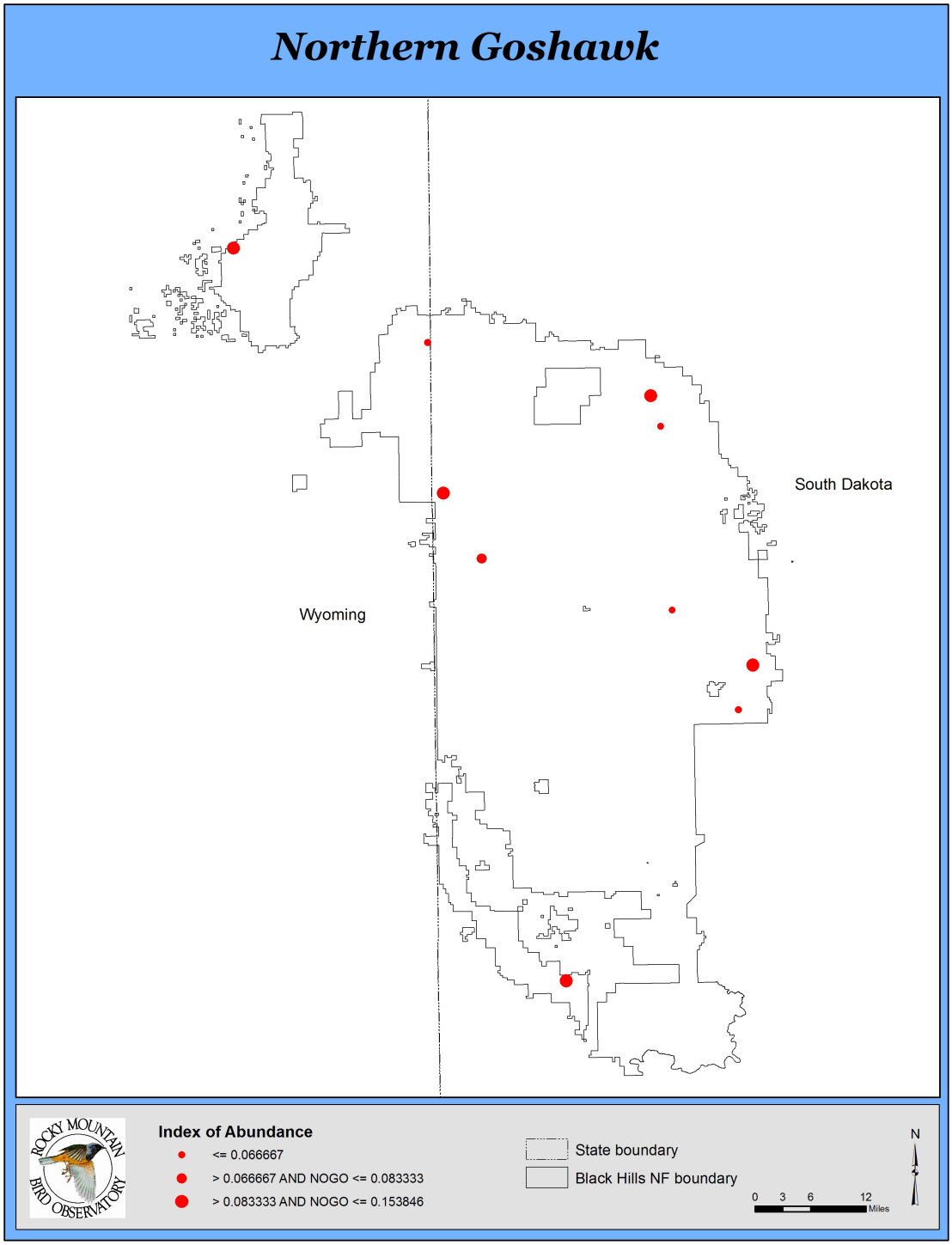
Although uncommon, Northern Goshawk has consistently been the most frequently observed species of the three Accipiter hawks that breed in the Black Hills, and thus may be more abundant than either Cooper's Hawk or Sharp-shinned Hawk.

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. RMBO will implement such a survey in the Black Hills in 2006, as well as in several National Forests in Colorado and Wyoming.

Total number of detections, number of individuals, and habitat-specific density estimates for Northern Goshawk on the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
FR	ID	--	--	--	2	2
MR	ID	--	--	--	1	4
PN	ID	--	--	--	2	4
PS	ID	--	--	--	2	4
WS	ID	--	--	--	1	1

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Northern Goshawk
South Dakota
Wyoming
Index of Abundance
<= 0.066667
> 0.066667 AND NOGO <= 0.083333
> 0.083333 AND NOGO <= 0.153846
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Broad-winged Hawk

(BHNF 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. Nineteen Broad-winged Hawks were observed on transects in 2005; three of these were in foothill riparian, seven in montane riparian, five in ponderosa pine-north, and four in white spruce. Too few were observed to estimate density within any single habitat.

In 2005, montane riparian and ponderosa pine-north had the highest number of detections of Broad-winged Hawk. These habitats have a fairly prominent deciduous component, and at the core of its range in eastern North America, Broad-winged Hawk inhabits deciduous forests. In previous years, however, aspen and late-succesional pine have had higher numbers of Broad-winged Hawks than any of the habitats surveyed in 2005.

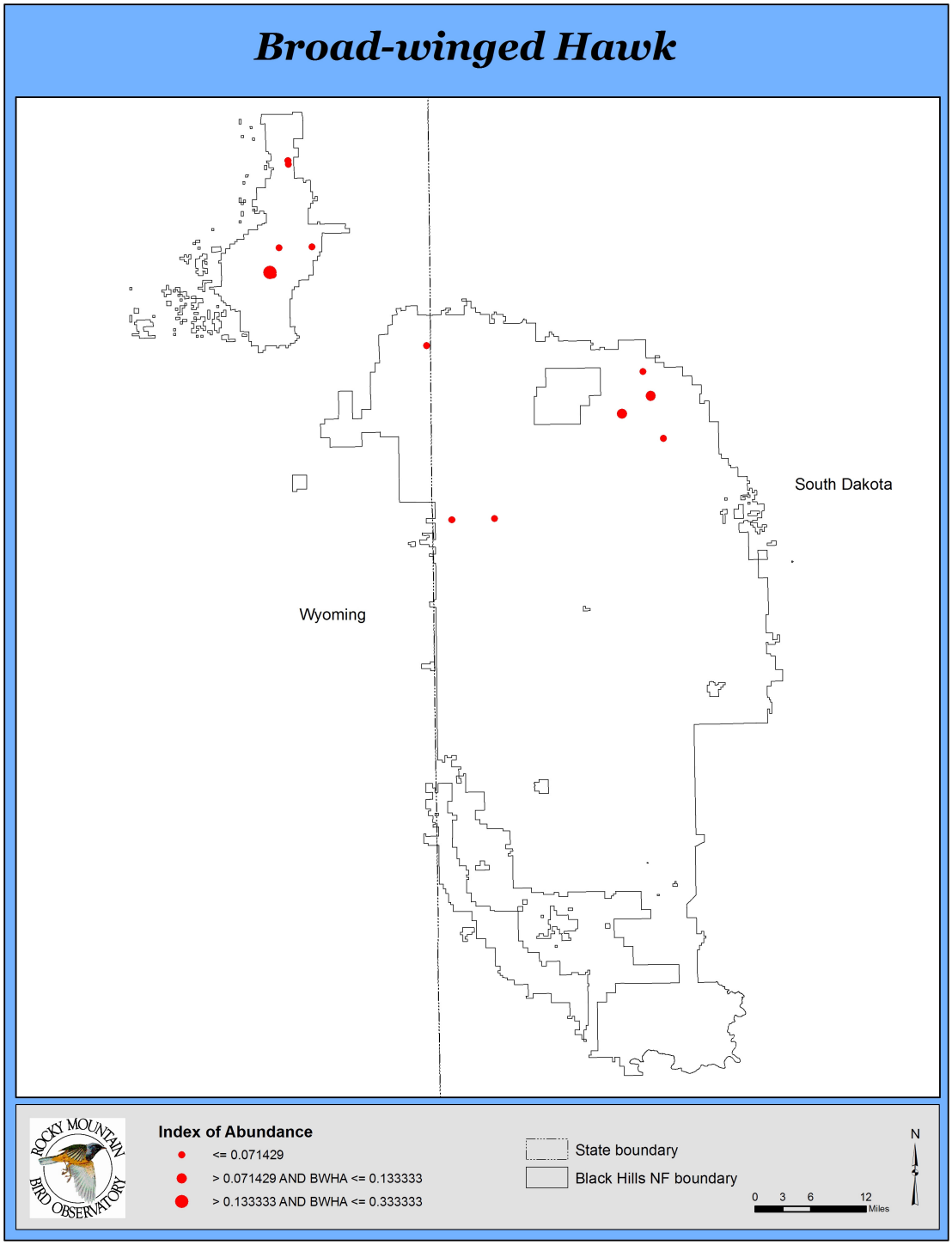
As with most raptors, Broad-winged Hawks are observed too infrequently to be adequately monitored through point transects in any single habitat. However, data from the full spectrum of habitat-based point transects across the Black Hills, particularly in the north, should provide an index consistent enough to monitor the species across all habitats in the Black Hills. Because of its low density though, 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. 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 station after point-transect surveys.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Broad-winged Hawk for MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
FR	ID	--	--	--	3	3
MR	ID	--	--	--	6	7
PN	ID	--	--	--	3	5
WS	ID	--	--	--	2	4

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Broad-winged Hawk
South Dakota
Wyoming
Index of Abundance
<= 0.071429
> 0.071429 AND BWHA <= 0.133333
> 0.133333 AND BWHA <= 0.333333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Golden Eagle

(PIF Species of Regional Concern)
(USFWS Bird of Conservation Concern)

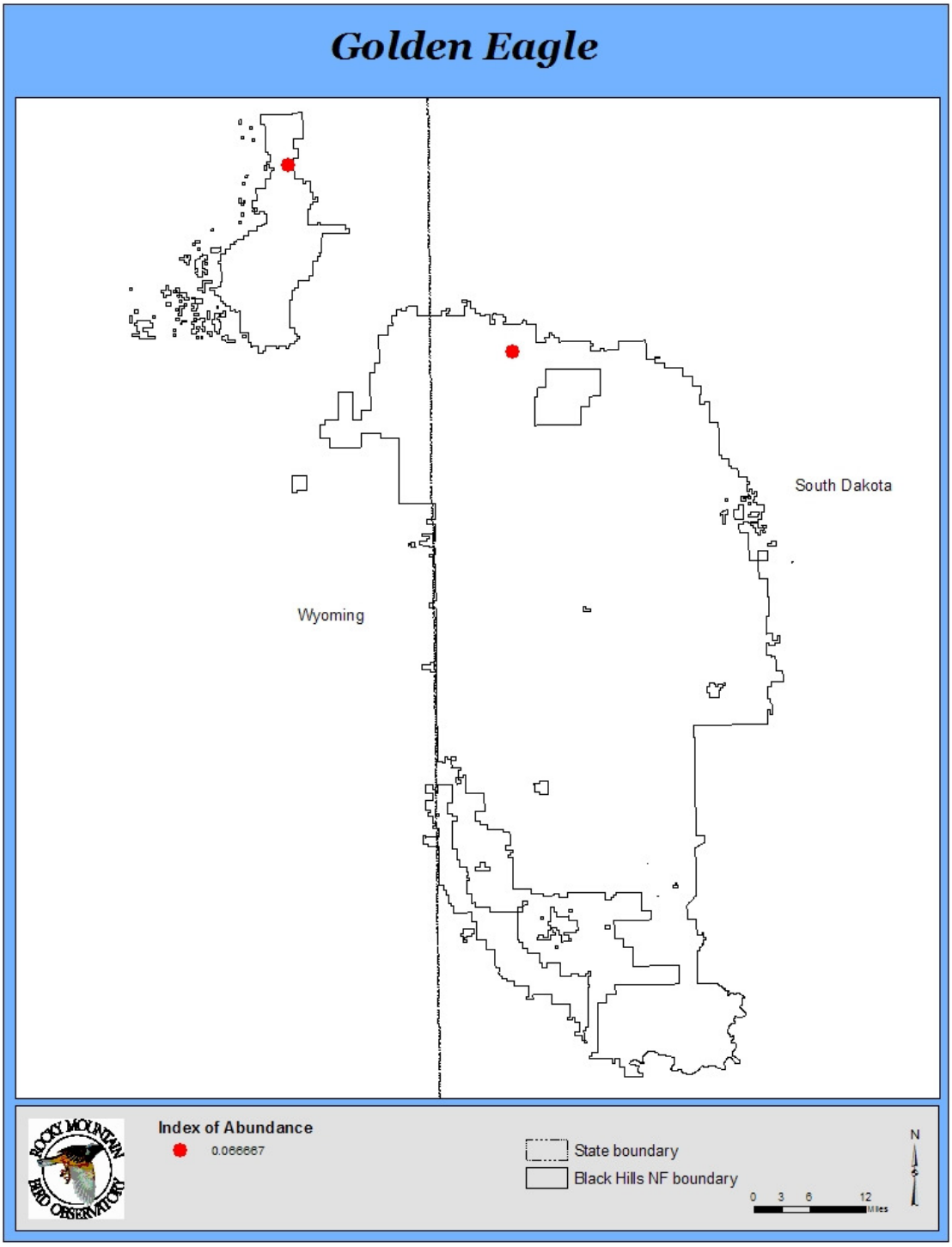
Golden Eagle occurs locally in the Black Hills, especially in areas with remote, high cliffs suitable for nesting. In 2005, two individuals were recorded in foothills riparian habitat.

Because of the scarcity and localized nature of the species, Golden Eagle will not be effectively monitored through habitat-based point transects. Effective monitoring will likely best be accomplished through locating and monitoring as many nests as possible of this species in the Black Hills. Given interest, such a program could be implemented cost-effectively as part of MBBH, with observers recording and cataloguing nest locations and surveying each nest or a random subset of nests for occupancy over time.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Golden Eagle for MBBH monitoring project, 2005.

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

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Golden Eagle
South Dakota
Wyoming
Index of Abundance
0.066667
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Prairie Falcon

(USFWS Bird of Conservation Concern)

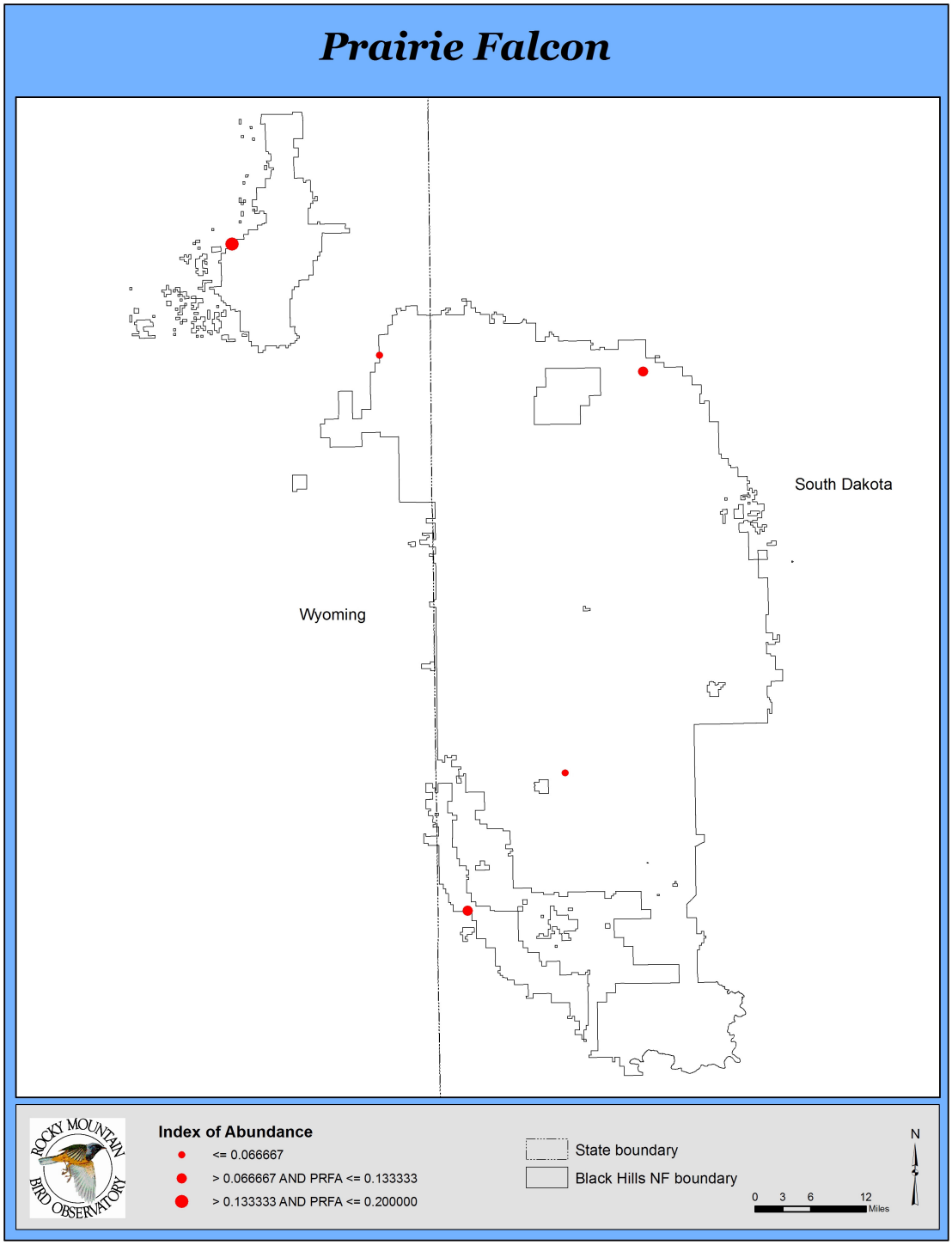
Prairie Falcon is a rare to locally uncommon species in the Black Hills, occurring primarily where high cliffs provide suitable nesting sites in proximity to open areas for hunting. Nine individuals were observed in 2005, one in the Jasper burn, two in foothills riparian, four in montane riparian, and two in ponderosa pine-south.

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).

Total number of independent detections, number of individuals, and habitat-specific density estimates for Prairie Falcon for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	1	1
FR	ID	--	--	--	2	2
MR	ID	--	--	--	4	4
PS	ID	--	--	--	1	2

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Prairie Falcon
South Dakota
Wyoming
Index of Abundance
<= 0.066667
> 0.066667 AND PRFA <= 0.133333
> 0.133333 AND PRFA <= 0.200000
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

White-throated Swift

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

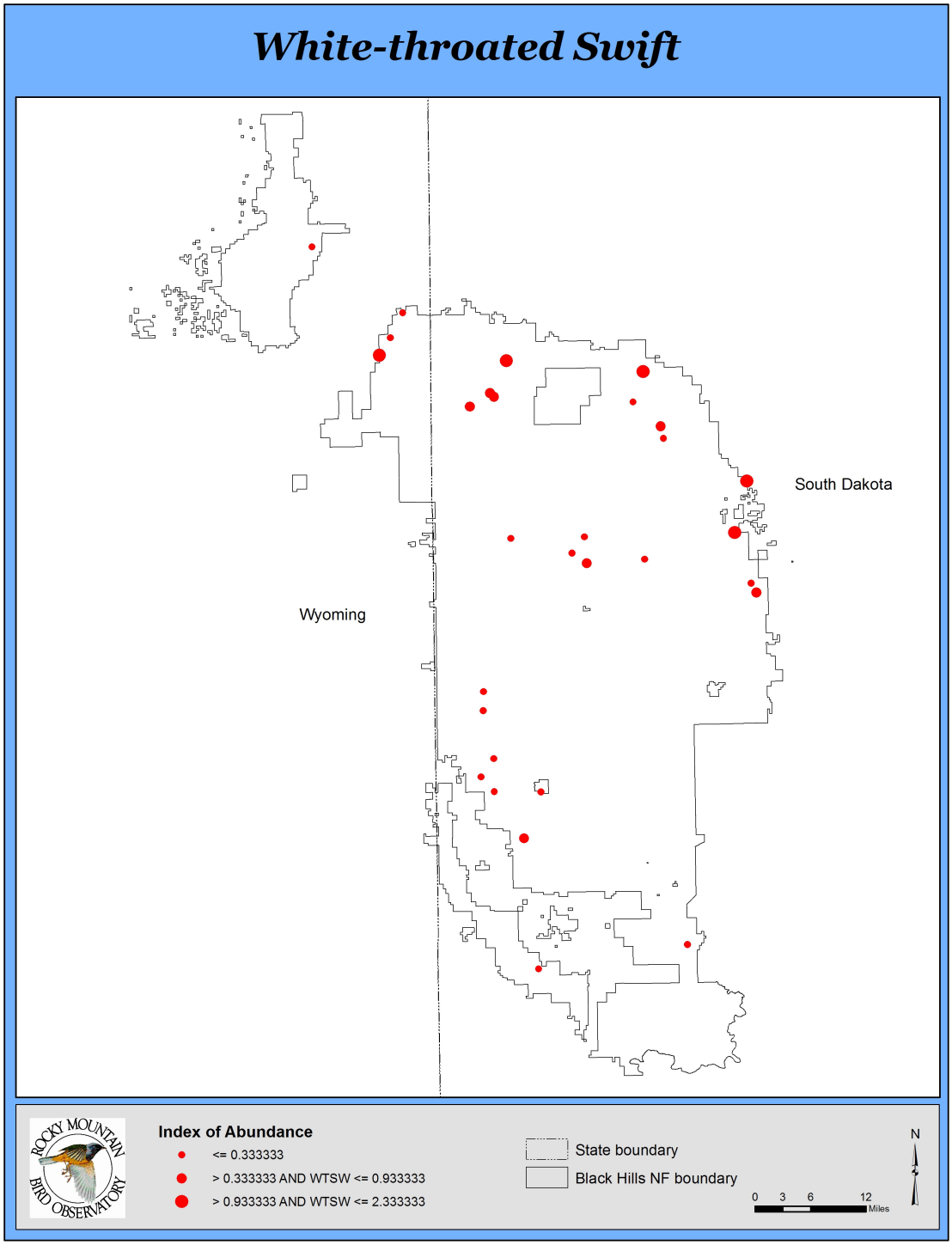
White-throated Swift is locally common in the Black Hills, particularly at lower elevations, where high cliffs provide suitable nesting sites. Of the habitats surveyed in 2005, White-throated Swifts occurred in highest density in foothill riparian, primarily where there was a prevalence of high cliffs. Previous surveys have shown they also occur in high density in the pine-juniper shrubland 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 five habitats surveyed in 2005 were too few to allow for statistically rigorous monitoring, other than in the foothill riparian 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.

Total number of independent detections, number of individuals, and habitat-specific density estimates for White-throated Swift for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	6	6
FR	15.80	5.87	42.51	53.0%	41	301
MR	ID	--	--	--	23	96
PN	ID	--	--	--	3	4
PS	ID	--	--	--	16	16
WS	ID	--	--	--	17	17

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


White-throated Swift
South Dakota
Wyoming
Index of Abundance
<= 0.333333
> 0.333333 AND WTSW <= 0.933333
> 0.933333 AND WTSW <= 2.333333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Broad-tailed Hummingbird

(WY-PIF Level II Priority)

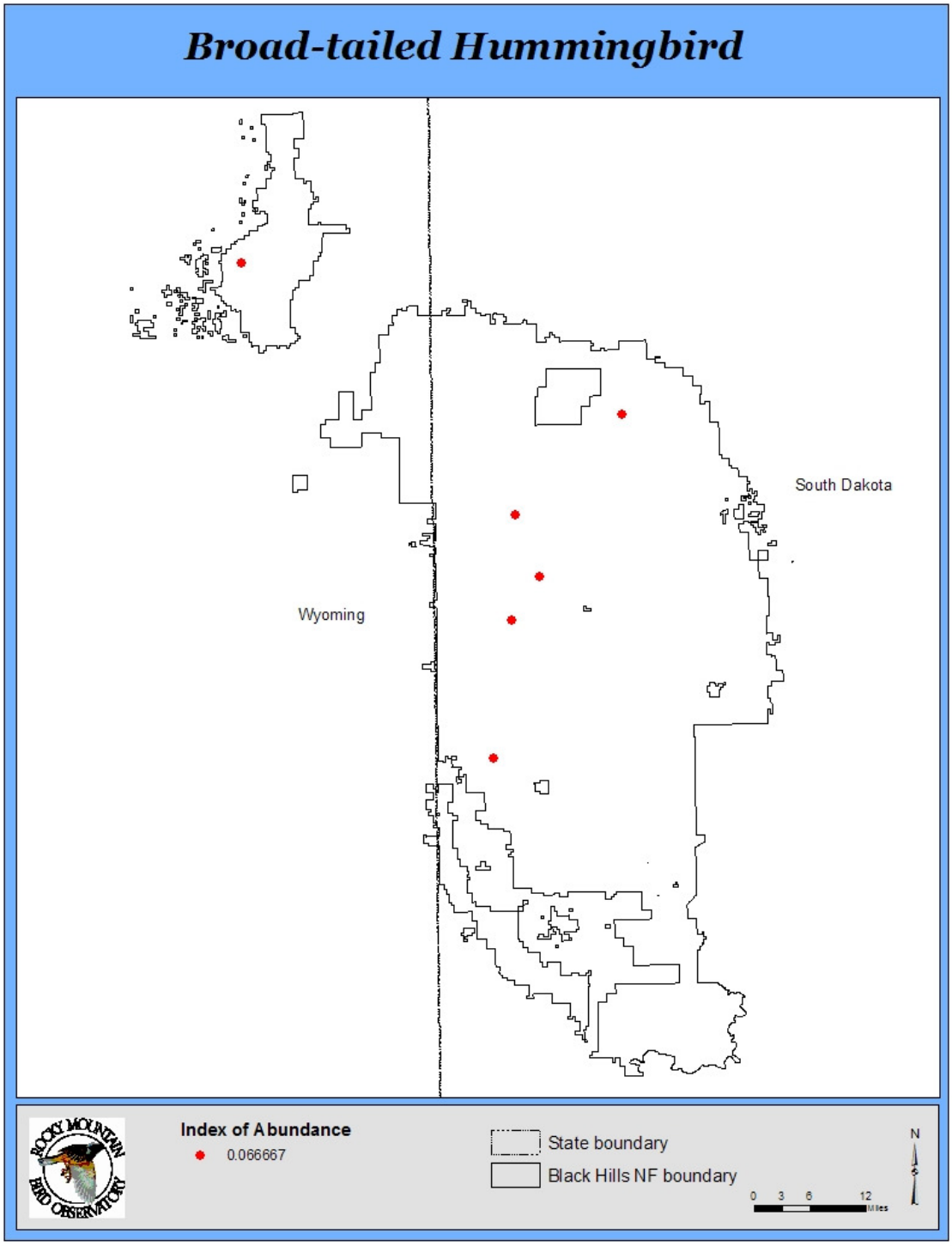
Broad-tailed Hummingbird is considered rare in the Black Hills which represent the extreme northeastern edge of its range. The status of this species in the Black Hills is still not fully clear, but annual sightings of the species during the breeding season, and observations of displaying male birds, suggest a small but regular breeding population exists.

In 2005, RMBO staff recorded one in montane riparian, two in ponderosa pine-north, and three in white spruce. It is not likely that this species will be recorded in sufficient numbers to estimate a density on this project. However, transects may provide a means to loosely track the status of Broad-tailed Hummingbirds in the Black Hills over time.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Broad-tailed Hummingbird for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
MR	ID	--	--	--	1	1
PN	ID	--	--	--	2	2
WS	ID	--	--	--	3	3

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Broad-tailed Hummingbird
South Dakota
Wyoming
Index of Abundance
0.066667
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Lewis's Woodpecker

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

Lewis's Woodpecker reaches the most northeasterly extent of its global distribution in the Black Hills, where it is generally uncommon to rare. In 2005, RMBO staff observed eight Lewis's Woodpeckers on the BHNF, all in the jasper burn.

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.

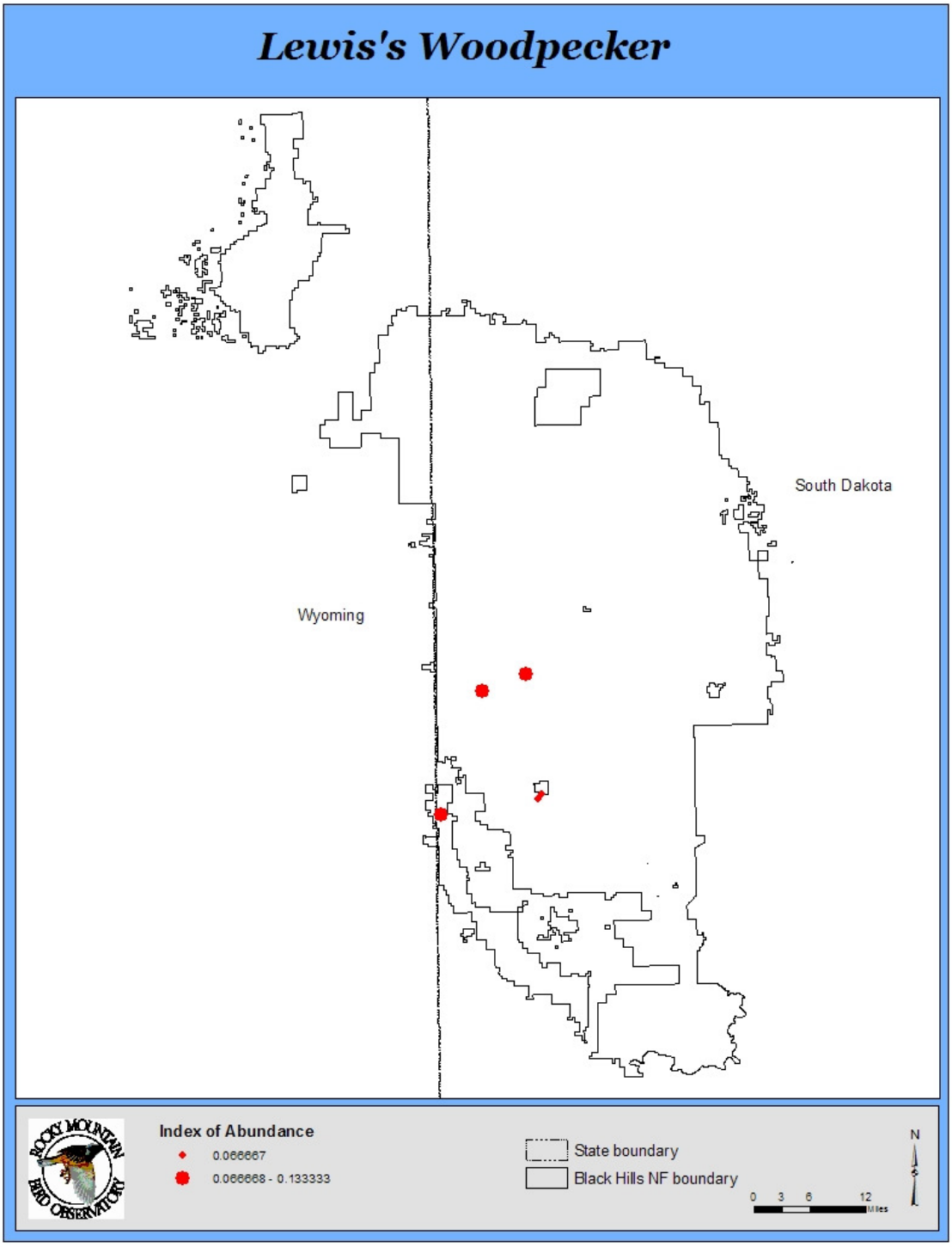
Although the Jasper and other recent fires have created new potential habitat for Lewis's Woodpeckers, it does not appear that they are achieving notably large increases there yet, at least in the Jasper burn. Presumably as these burn areas age, their suitability as habitat for this species will increase.

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), would include a greater proportion of older burns, and could prove useful to monitoring or tracking the species on the Forest.

Number of detections by habitat and habitat-specific density estimates for Lewis's Woodpecker for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	6	8

D=Density(birds/square kilometer); LCL=lower 95% confidence interval of the density; UCL=upper 95% confidence interval of the density; CV(%)=coefficient of variation of the density; n=number of detections; ID=insufficient data.


Lewis's Woodpecker
South Dakota
Wyoming
Index of Abundance
0.066667
0.066668 - 0.133333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Red-headed Woodpecker

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

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. Most individuals recorded in 2005 were in burn areas and 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.

While the density estimate for Red-headed Woodpecker in the burn area is slightly higher than in 2004, 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.

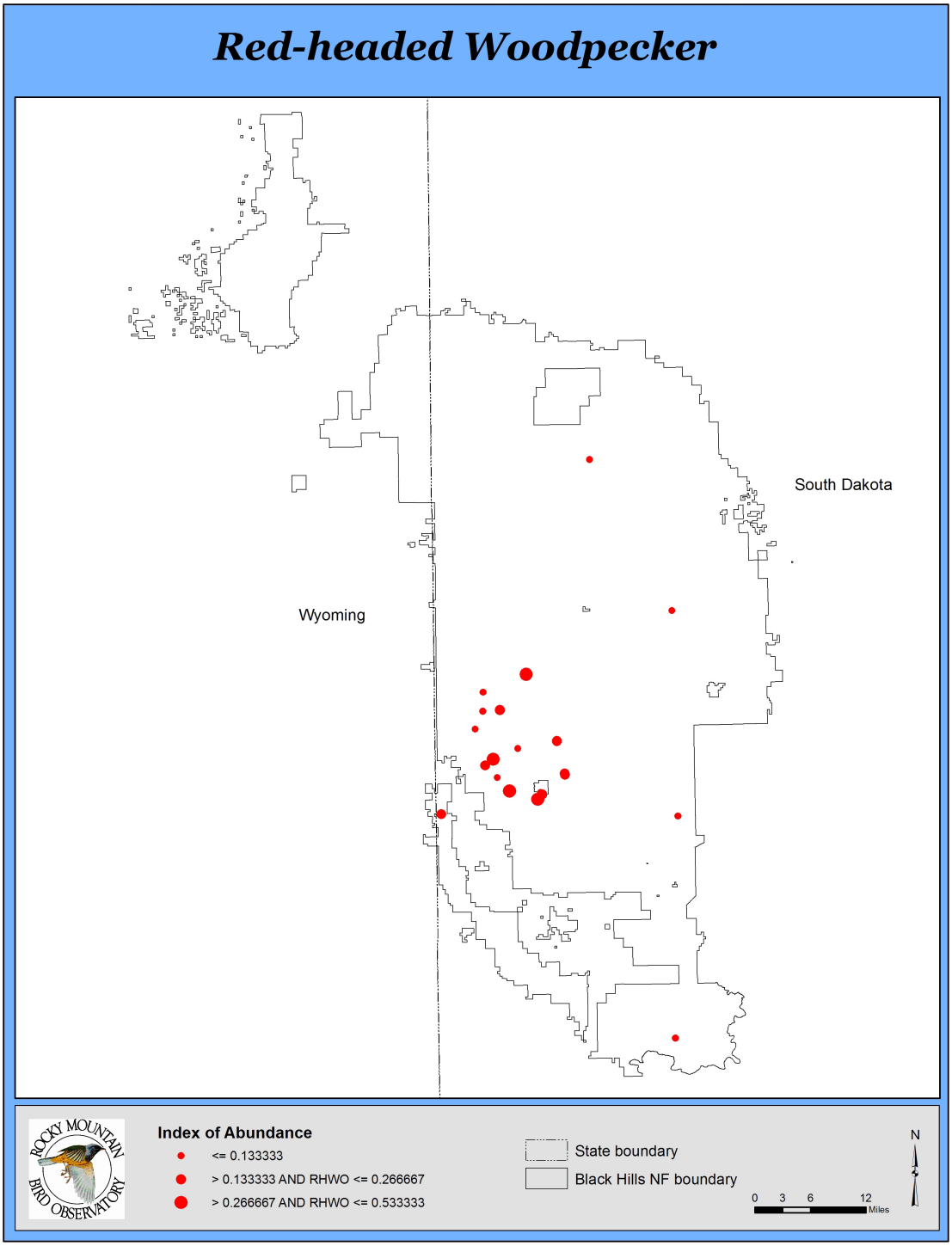
While quantitative data do not exist, Red-headed Woodpeckers were almost certainly more common in the Black Hills previously. Grinnell (1875), who accompanied the Custer Expedition, described it as "especially abundant" in the Black Hills, even calling it "the most common species there". Cary (1901) 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 an even greater decline in the Black Hills.

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) would likely yield a more accurate picture of this species' population status and trend at the Forest level.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Red-headed Woodpecker for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	1.24	0.7	2.18	28.8%	41	52
FR	ID	--	--	--	1	1
MR	ID	--	--	--	8	8
PN	ID	--	--	--	1	1
PS	ID	--	--	--	2	4

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Red-headed Woodpecker
South Dakota
Wyoming
Index of Abundance
<= 0.133333
> 0.133333 AND RHWO <= 0.266667
> 0.266667 AND RHWO <= 0.533333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Red-naped Sapsucker

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

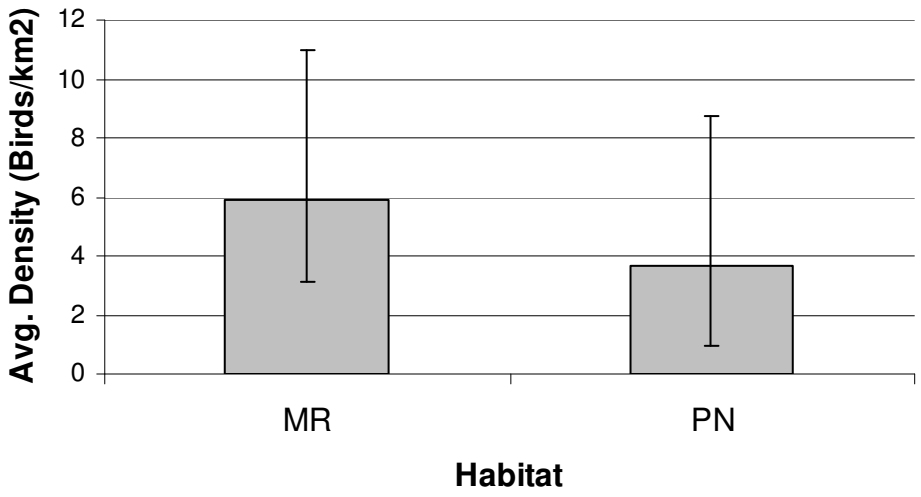
Red-naped Sapsucker occurs in much of the Black Hills, typically in low to moderate density, but it is most abundant and widespread in the north. The abundance and distribution of Red-naped Sapsucker are largely tied to the availability of broad-leaved, woody vegetation, especially aspens and willows.

Of the habitats surveyed in 2005, Red-naped Sapsucker occurred in highest density in montane riparian stands. This species should be effectively monitored under MBBH by point transects in a range of habitats, especially montane riparian and ponderosa pine-north. In previous years, we have also had enough data to monitor Red-naped Sapsuckers in aspen and late-successional pine.

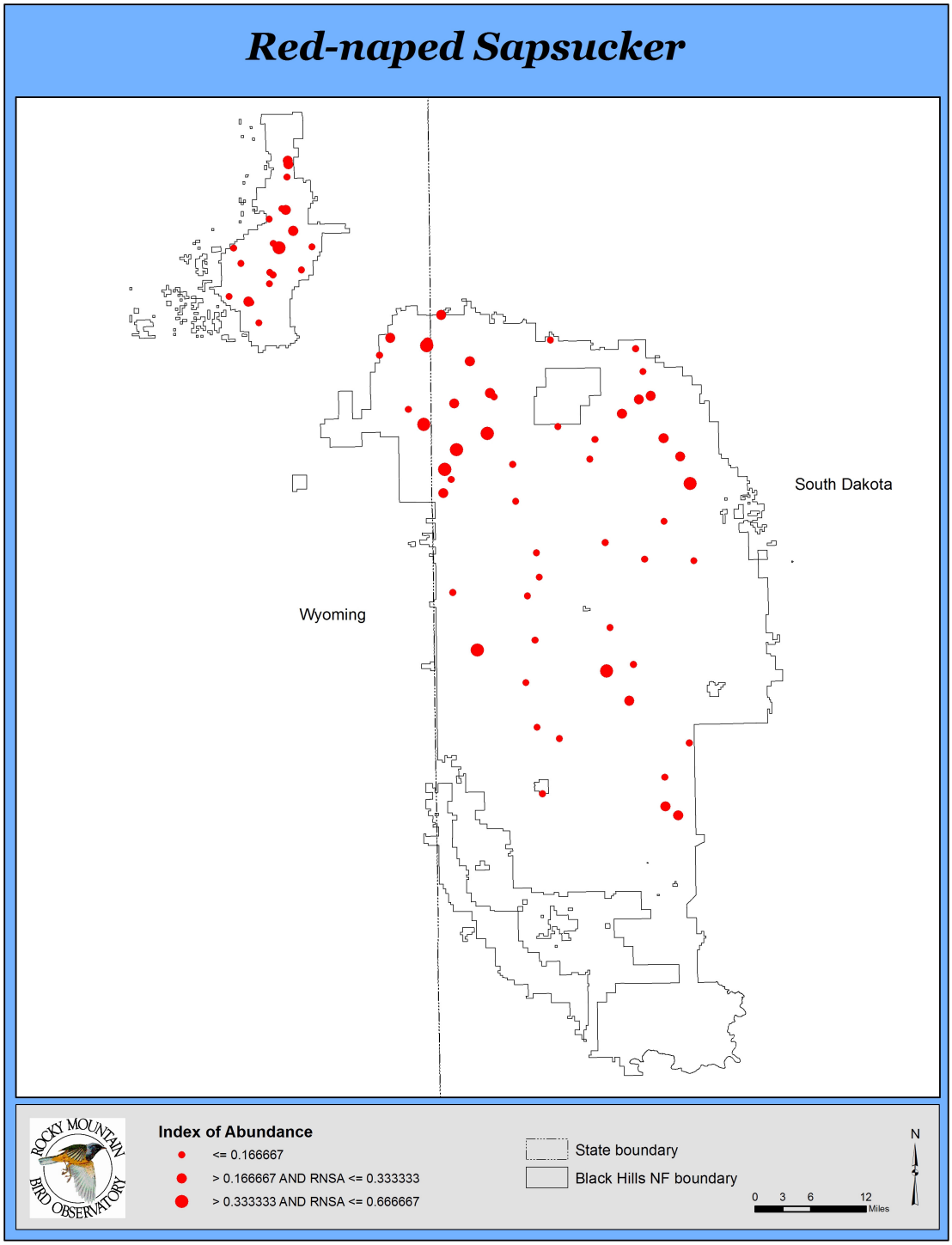
Habitat-specific density estimates for Red-naped Sapsucker for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	7	7
FR	ID	--	--	--	24	24
MR	5.88	3.14	10.99	32.1%	41	41
PN	3.65	2.40	5.56	21.1%	61	61
PS	ID	--	--	--	16	16
WS	ID	--	--	--	14	15

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of detections; ID = insufficient data.



Relative density of Red-naped Sapsucker for the MBBH monitoring project, 2005.


Red-naped Sapsucker
South Dakota
Wyoming
Index of Abundance
<= 0.166667
> 0.166667 AND RNSA <= 0.333333
> 0.333333 AND RNSA <= 0.666667
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

American Three-toed Woodpecker

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

In the Black Hills, American Three-toed Woodpecker occurs almost exclusively in mature stands of white spruce, where it is generally found in low abundance. In 2005, three individuals were also recorded on montane riparian transects.

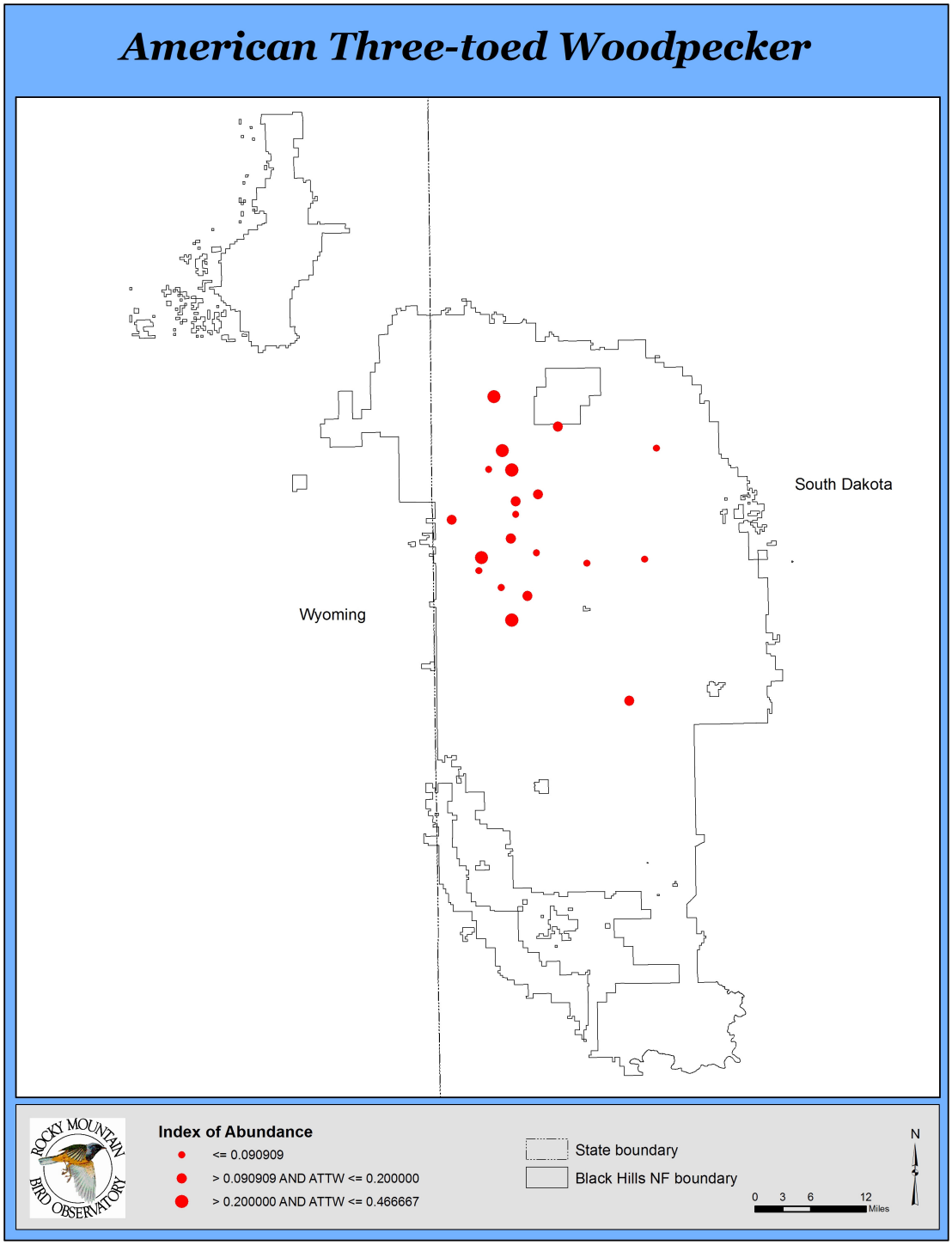
American Three-toed Woodpeckers apparently do not exploit burned ponderosa pine forests in the Black Hills, as none have been recorded to date in the Jasper burn. Thus, its preference for spruce forests likely extends even to burned areas.

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

Total number of independent detections, number of individuals, and habitat-specific density estimates for American Three-toed Woodpecker for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
MR	ID	--	--	--	3	3
WS	2.66	1.63	4.34	24.9%	36	44

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


American Three-toed Woodpecker
South Dakota
Wyoming
Index of Abundance
<= 0.090909
> 0.090909 AND ATTW <= 0.200000
> 0.200000 AND ATTW <= 0.466667
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Black-backed Woodpecker

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

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 1.04 birds/ km^2 in 2005 which is down from 3.38 birds/ km^2 in 2004 and a high of 6.91 birds/km^2 in 2002.

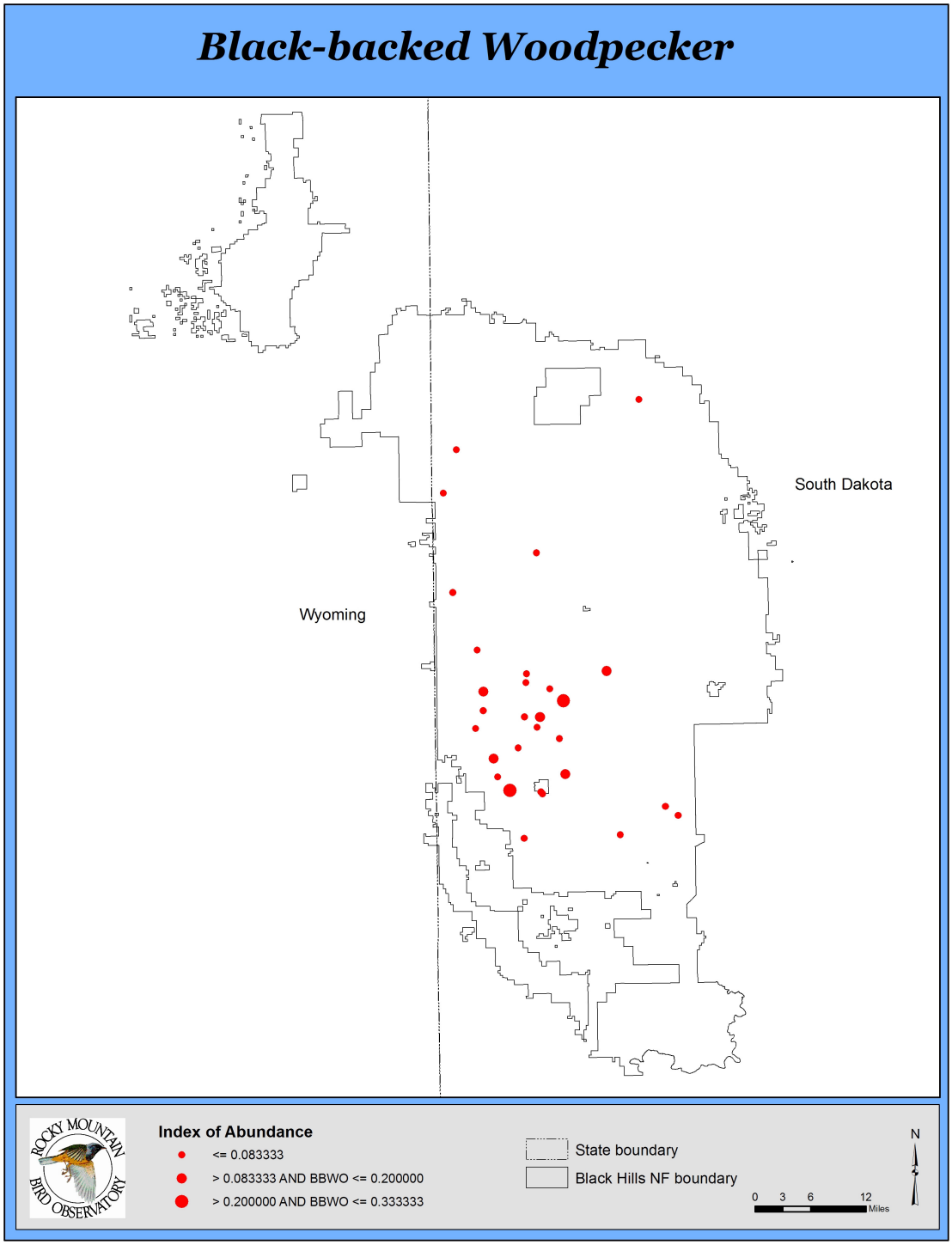
In some parts of the Jasper burn, primarily where high densities of large-diameter burned trees remain, Black-backs are still locally common. Black-backed Woodpeckers in the Jasper burn prefer to nest in large diameter trees and in areas with a higher density of snags (Vierling and Saab 2002). In previous years, Black-backs were found outside the Jasper burn 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 burn areas, 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.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Black-backed Woodpecker for MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	1.05	0.56	1.97	31.9%	25	32
MR	ID	--	--	--	3	3
PN	ID	--	--	--	3	3
PS	ID	--	--	--	5	7
WS	ID	--	--	--	1	1

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Black-backed Woodpecker
South Dakota
Wyoming
Index of Abundance
<= 0.083333
> 0.083333 AND BBWO <= 0.200000
> 0.200000 AND BBWO <= 0.333333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Hammond's Flycatcher

(WY-PIF Level II Priority)

For the first time since the start of MBBH, more than a single individual of this easily overlooked and difficult-to-identify species was recorded on the BHNF, mostly in the Bearlodge Mountains, but also in the northern hills. A single individual has been observed at the same location near the Englewood trailhead in the northern Black Hills since 2003. Although recorded in only foothills and montane riparian habitats, this species habitat preference appears to be similar to elsewhere in its range, occupying mature pine forests on fairly level sites (hence often in valley bottoms), with a moderately open mid-story.

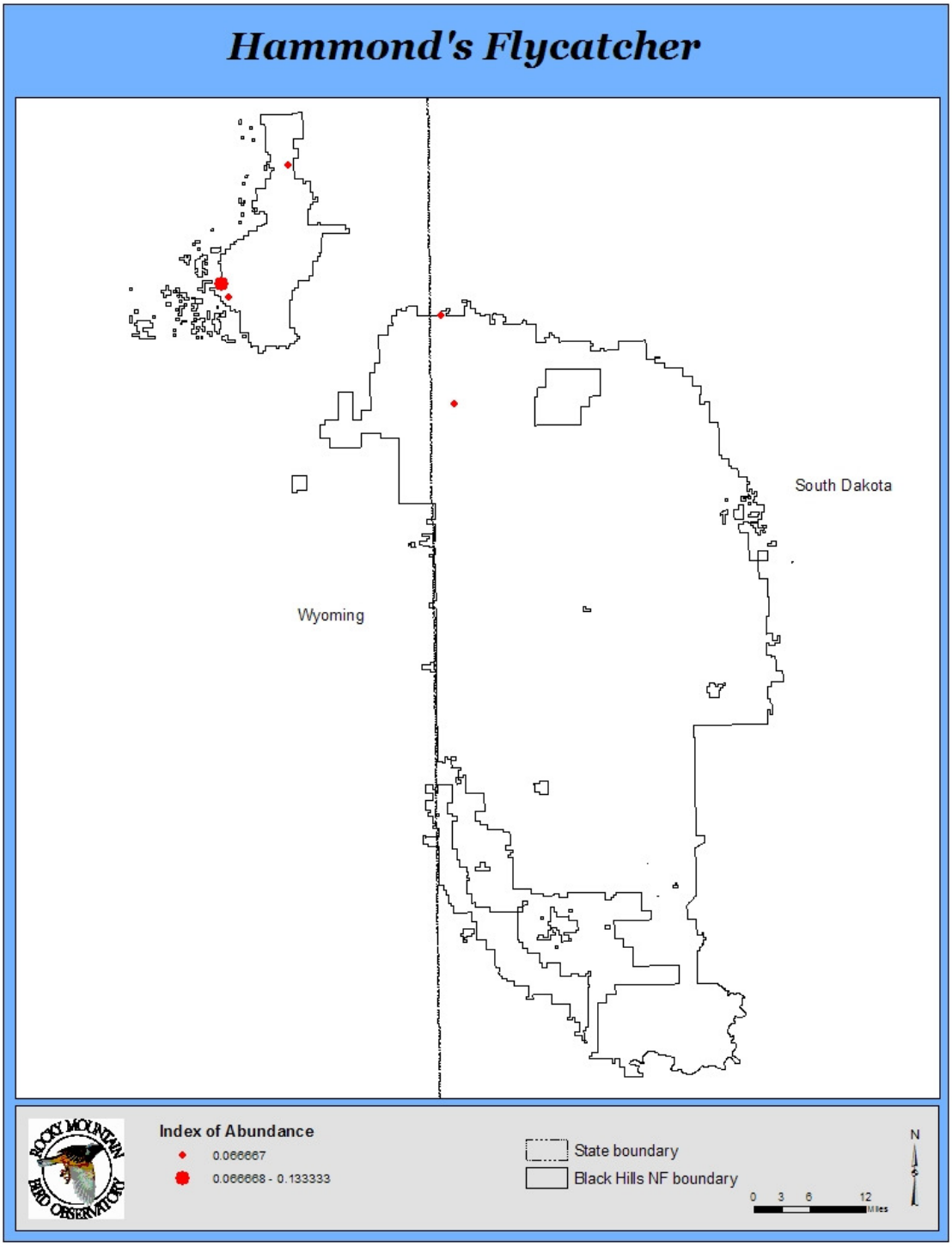
This species is not previously known to breed in this region, but the recent discovery of this species at multiple locations in the Black Hills suggests a breeding population may exist. However, careful identification by observers will be necessary to determine the extent of the species' population in the Black Hills. Because of the similarity of this species to the more common and widespread Dusky Flycatcher, RMBO will heavily emphasize identification of these two species in future training sessions.

At this point in time, it does not appear that Hammond's Flycatcher is sufficiently widespread and abundant to be adequately monitored through point transects under the MBBH program. However, transects may provide a means to loosely track the status of Hammond's Flycatcher in the Black Hills over time.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Dusky Flycatcher for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	N	N
FR	ID	--	--	--	5	5
MR	ID	--	--	--	1	1

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Hammond's Flycatcher
South Dakota
Wyoming
Index of Abundance
0.066667
0.066668 - 0.133333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

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.

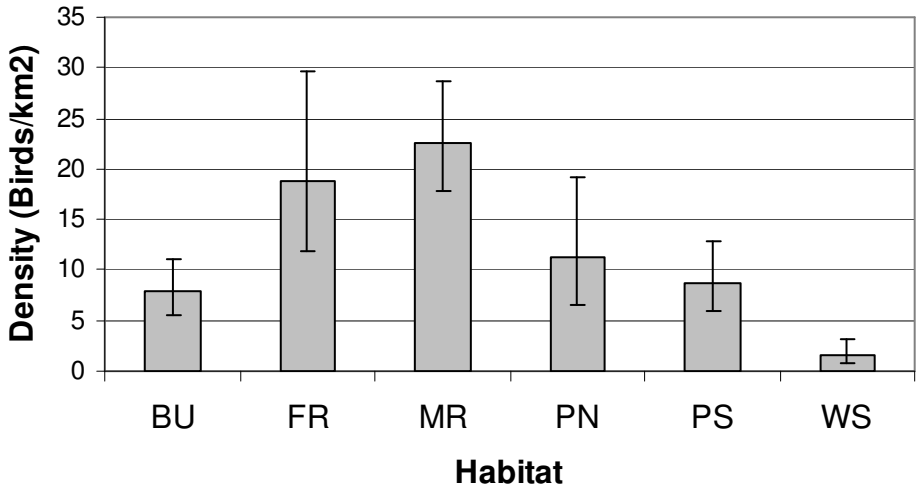
Of the habitats surveyed in 2005, density was greatest in montane riparian, and of those surveyed this year, this is the habitat in the Black Hills in which this species achieves its greatest density. However, they occur in higher densities in pine-juniper shrubland and aspen forests which were not surveyed this year (Panjabi 2003, 2004). We have also seen Dusky Flycatchers respond positively to the changes caused by the Jasper burn, and have been become common in this area since 2001.

Dusky Flycatcher should be effectively monitored through point-transects in a wide range of habitats under MBBH, especially montane and foothill riparian, as well as other habitats not surveyed in 2005.

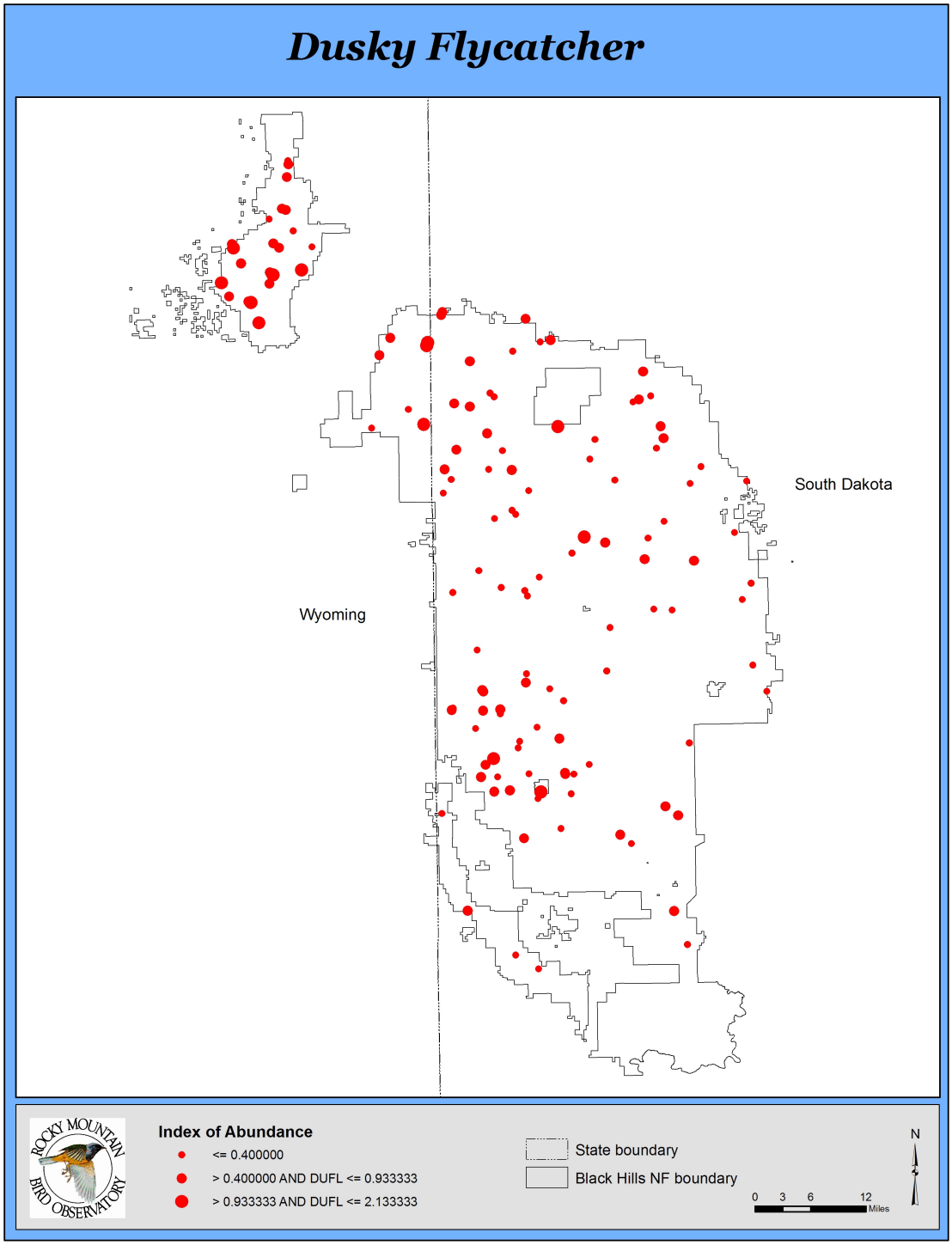
Total number of independent detections, number of individuals, and habitat-specific density estimates for Dusky Flycatcher for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	7.88	5.56	11.16	17.4%	149	156
FR	18.75	11.87	29.63	22.7%	152	152
MR	22.56	17.76	28.66	11.9%	308	308
PN	11.21	6.58	19.11	27.5%	152	156
PS	8.66	5.85	12.84	19.7%	123	128
WS	1.55	0.77	3.10	35.5%	32	32

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.



Relative density of Dusky Flycatcher for the MBBH monitoring project, 2005.


Dusky Flycatcher
South Dakota
Wyoming
Index of Abundance
<= 0.400000
> 0.400000 AND DUFL <= 0.933333
> 0.933333 AND DUFL <= 2.133333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

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.

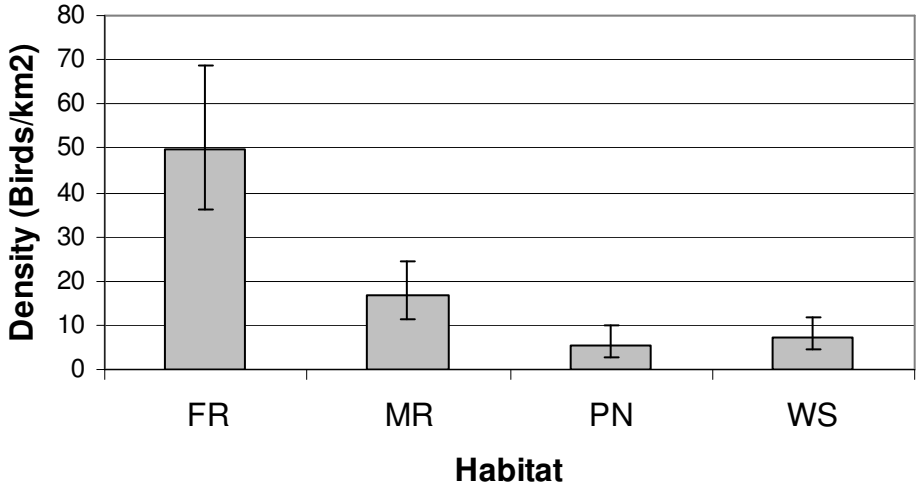
Of the habitats surveyed in 2005, estimated density was highest in foothill riparian, followed by montane riparian but at not even half the density as in foothill riparian. Cordilleran Flycatchers are most abundant along the bottoms of steep canyons which are prevalent in most foothill riparian sites in the Black Hills. This probably explains the extraordinarily high density of Cordilleran Flycatchers in this habitat compared to elsewhere.

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

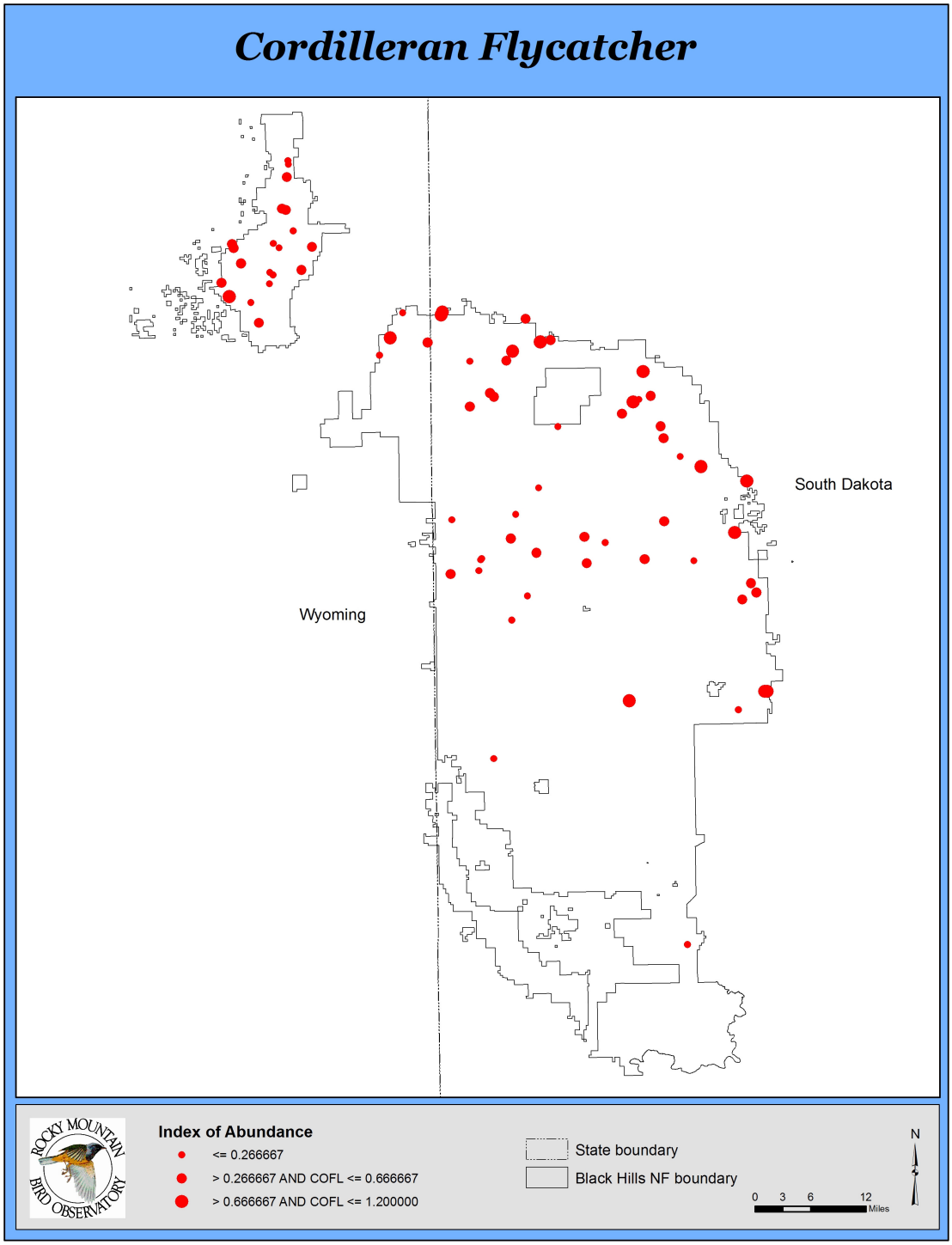
Total number of independent detections, number of individuals, and habitat-specific density estimates for Cordilleran Flycatcher for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
FR	49.89	36.32	68.52	15.9%	227	231
MR	16.55	11.25	24.34	19.4%	101	102
PN	5.33	2.83	10.03	32.2%	46	46
PS	ID	--	--	--	2	2
WS	7.23	4.38	11.95	25.2%	73	73

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.



Relative density of Cordilleran Flycatcher for the MBBH monitoring project, 2005.


Cordilleran Flycatcher
South Dakota
Wyoming
Index of Abundance
<= 0.266667
> 0.266667 AND COFL <= 0.666667
> 0.666667 AND COFL <= 1.200000
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

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 2005, their presence is tied to the availability of pine forests.

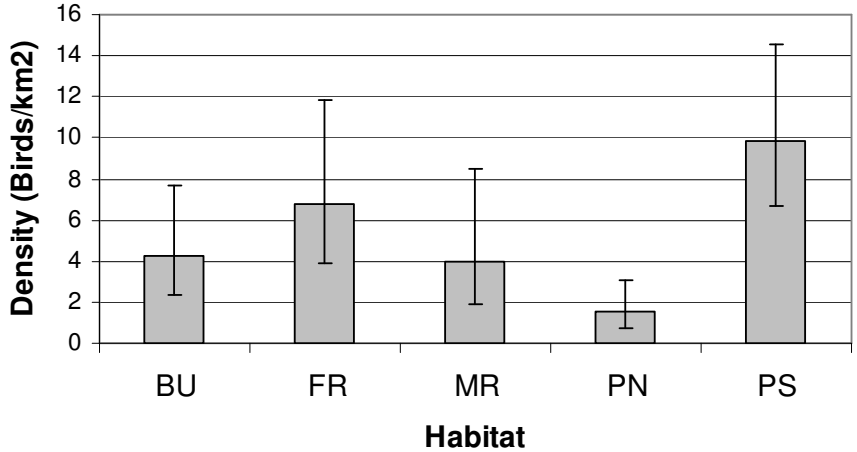
Plumbeous Vireos achieve their highest density in the Black Hills in the pine-juniper shrublands of the southwestern hills, although they are also fairly common in the southern ponderosa pine forests (Panjabi 2003, 2004). The highest estimated densities for Plumbeous Vireos in 2005 were in ponderosa pine-south, foothill riparian, and the burn area. Of note, Plumbeous Vireos showed a slight increase in density in the Jasper burn area after declining for two consecutive years. Also, the densities of Plumbeous Vireo in foothill and montane riparian are probably due to birds recorded from adjacent pine forest.

Plumbeous Vireos should be effectively monitored under MBBH through point-transects in a range of habitats, especially in the burn area and ponderosa pine-south, as well as other habitats not surveyed in 2005 such as pine-juniper shrubland.

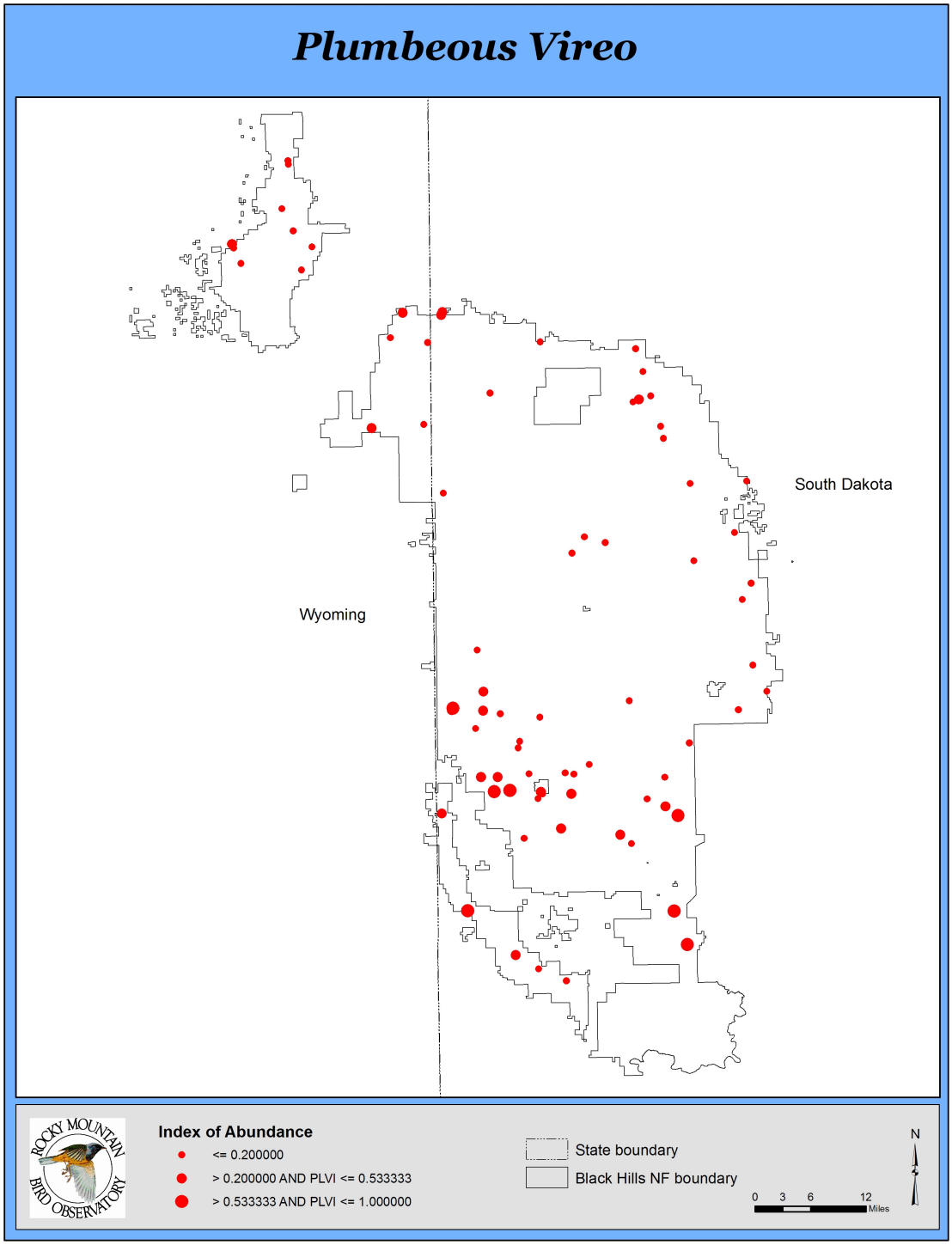
Total number of independent detections, number of individuals, and habitat-specific density estimates for Plumbeous Vireo for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	4.26	2.35	7.73	30.1%	54	54
FR	6.79	3.88	11.86	28.4%	36	36
MR	3.99	1.88	8.47	38.5%	27	27
PN	1.51	0.74	3.07	36.6%	27	27
PS	9.90	6.72	14.56	19.3%	127	127
WS	ID	--	--	--	1	1

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.



Relative density of Plumbeous Vireo for the MBBH monitoring project, 2005.


Plumbeous Vireo
South Dakota
Wyoming
ROCKY MOUNTAIN BIRD OBSERVATORY
Index of Abundance
<= 0.200000
> 0.200000 AND PLVI <= 0.533333
> 0.533333 AND PLVI <= 1.000000
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Pinyon Jay

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

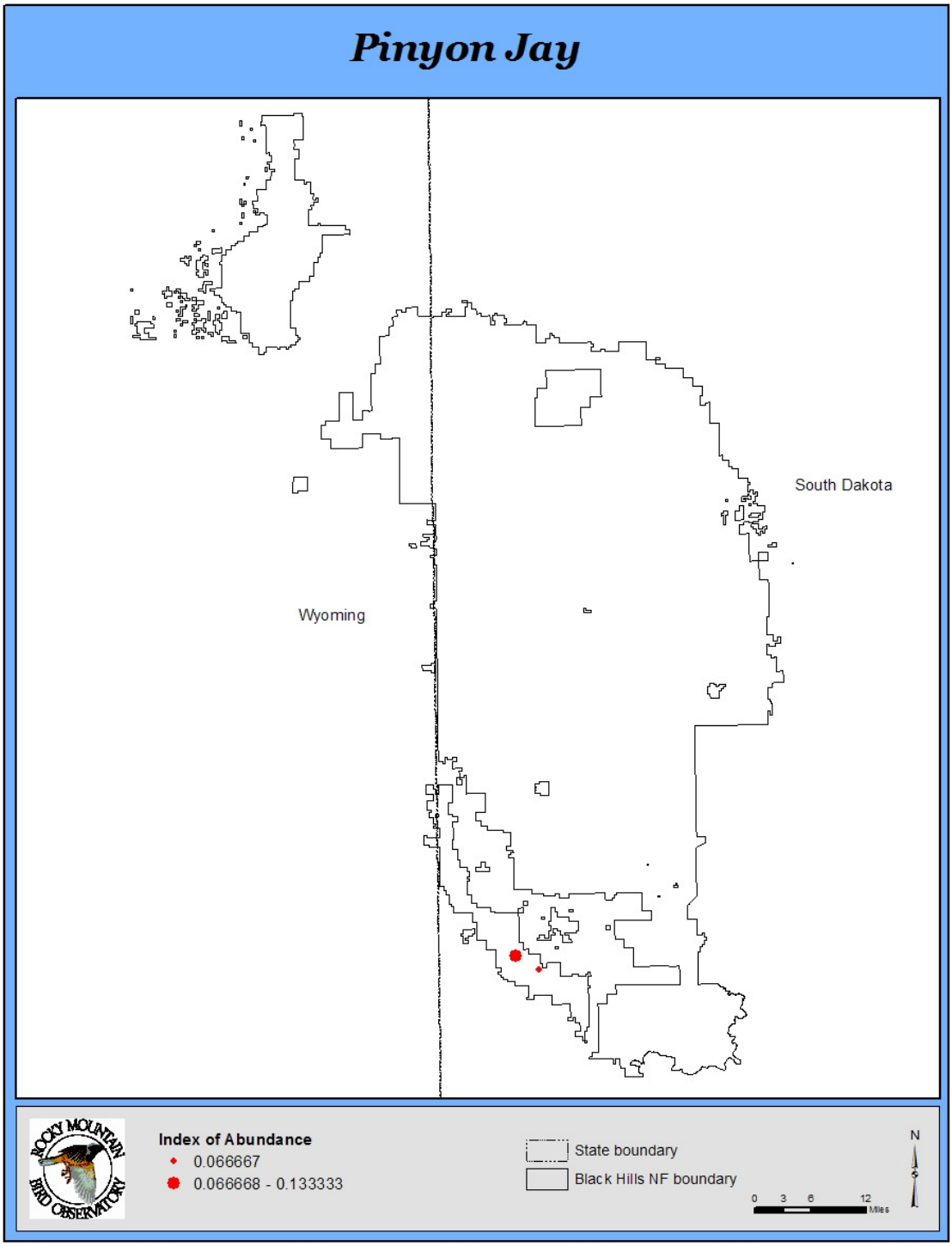
Pinyon Jays are primarily restricted to arid low-elevation habitats in the southwestern Black Hills, although they do occur seasonally in other areas. In 2005, Pinyon Jays were recorded exclusively in ponderosa pine-south. However, it is difficult to discern their specific habitat preference from these data, as they are often detected at great distances, and sometimes in flight. 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, Continental 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 were not detected often in 2005 and may not be adequately monitored under MBBH in any single habitat. They should, however, 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.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Pinyon Jay for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	N	N
PS	ID	--	--	--	3	3

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Pinyon Jay
South Dakota
Wyoming
Index of Abundance
0.066667
0.066668 - 0.133333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Black-billed Magpie

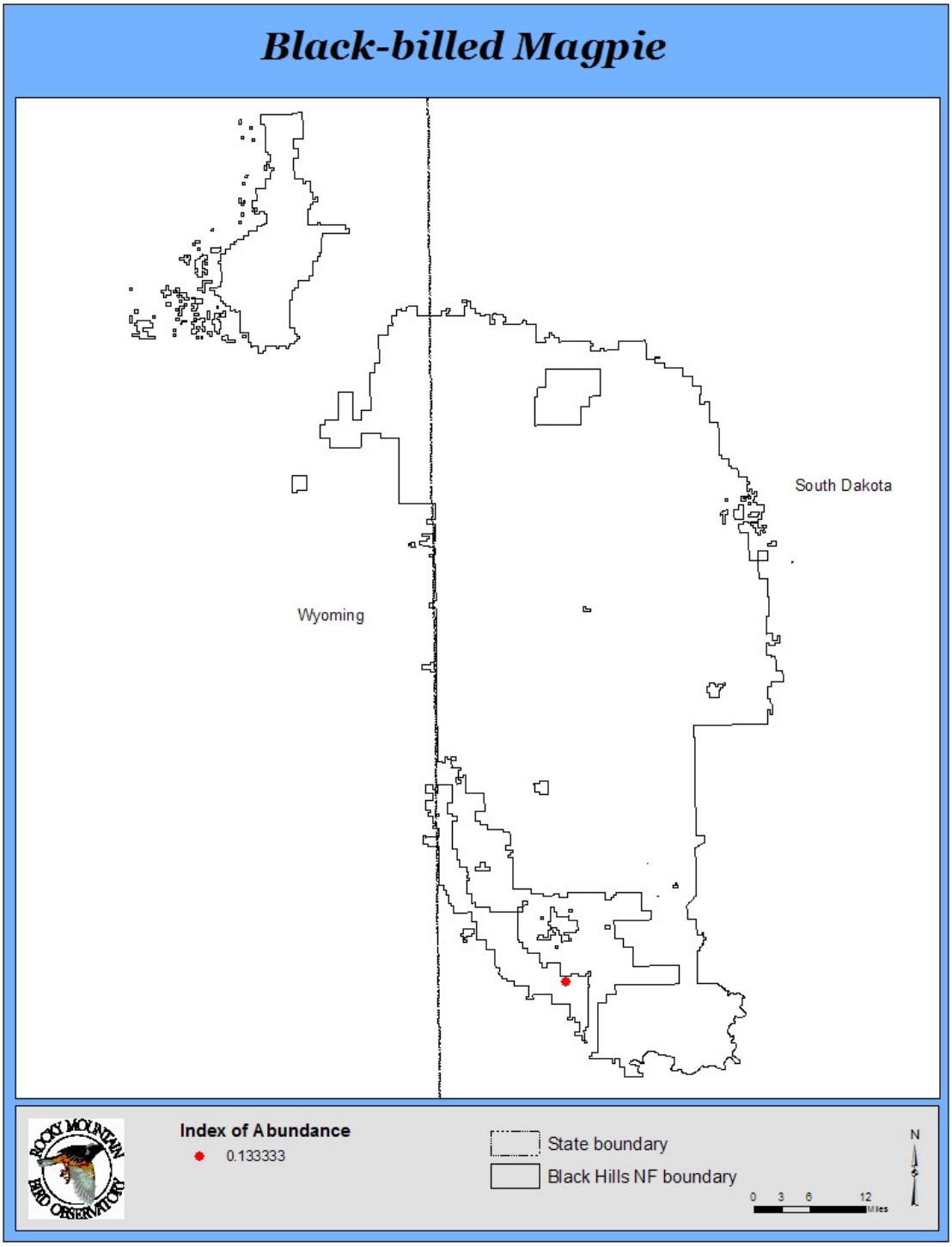
(PIF Species of Regional Concern)

Although once fairly common in the Black Hills, Black-billed Magpie is now rare, especially at mid to higher elevations (Puttingil and Whitney 1964). Throughout the region, the population of Black-billed Magpies appears to be declining, along with the habitat it represents. Of note, Merlin and Lewis's Woodpecker use abandoned Black-billed Magpie nests. It is unlikely that Black-billed Magpie will be monitored under MBBH, without additional effort focused on this species.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Black-billed Magpie for the MBBH monitoring project, 2005.

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

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Black-billed Magpie
South Dakota
Wyoming
Index of Abundance
0.133333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Northern Rough-winged Swallow

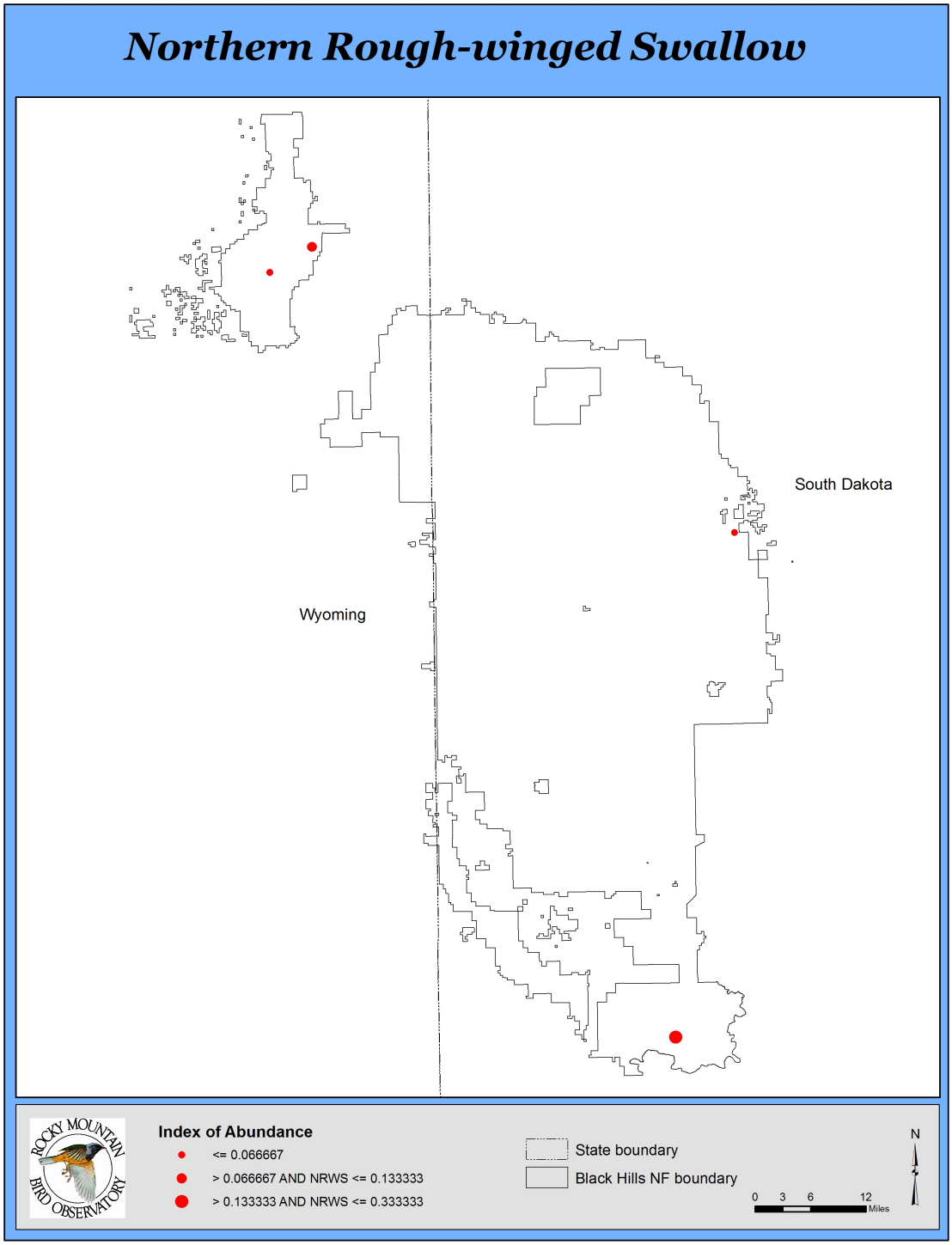
(PIF Species of Regional Concern)

Northern Rough-winged Swallows are uncommon in the Black Hills and this region the species tends to prefer lowland and grassland habitat. In 2005, Northern Rough-winged Swallows were recorded exclusively in riparian habitats. It is unlikely that Northern Rough-winged Swallow will be monitored under MBBH without additional effort focused on this species.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Northern Rough-winged Swallow for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
FR	ID	--	--	--	8	8
MR	ID	--	--	--	1	1

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Northern Rough-winged Swallow
South Dakota
Wyoming
Index of Abundance
<= 0.066667
> 0.066667 AND NRWS <= 0.133333
> 0.133333 AND NRWS <= 0.333333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Pygmy Nuthatch

(BHNF Species of Local Concern)

Pygmy Nuthatch is a rare but regular, and apparently widespread, resident in the Black Hills. In 2005, a total of four Pygmy Nuthatches were observed in the burned and ponderosa pine-south habitats.

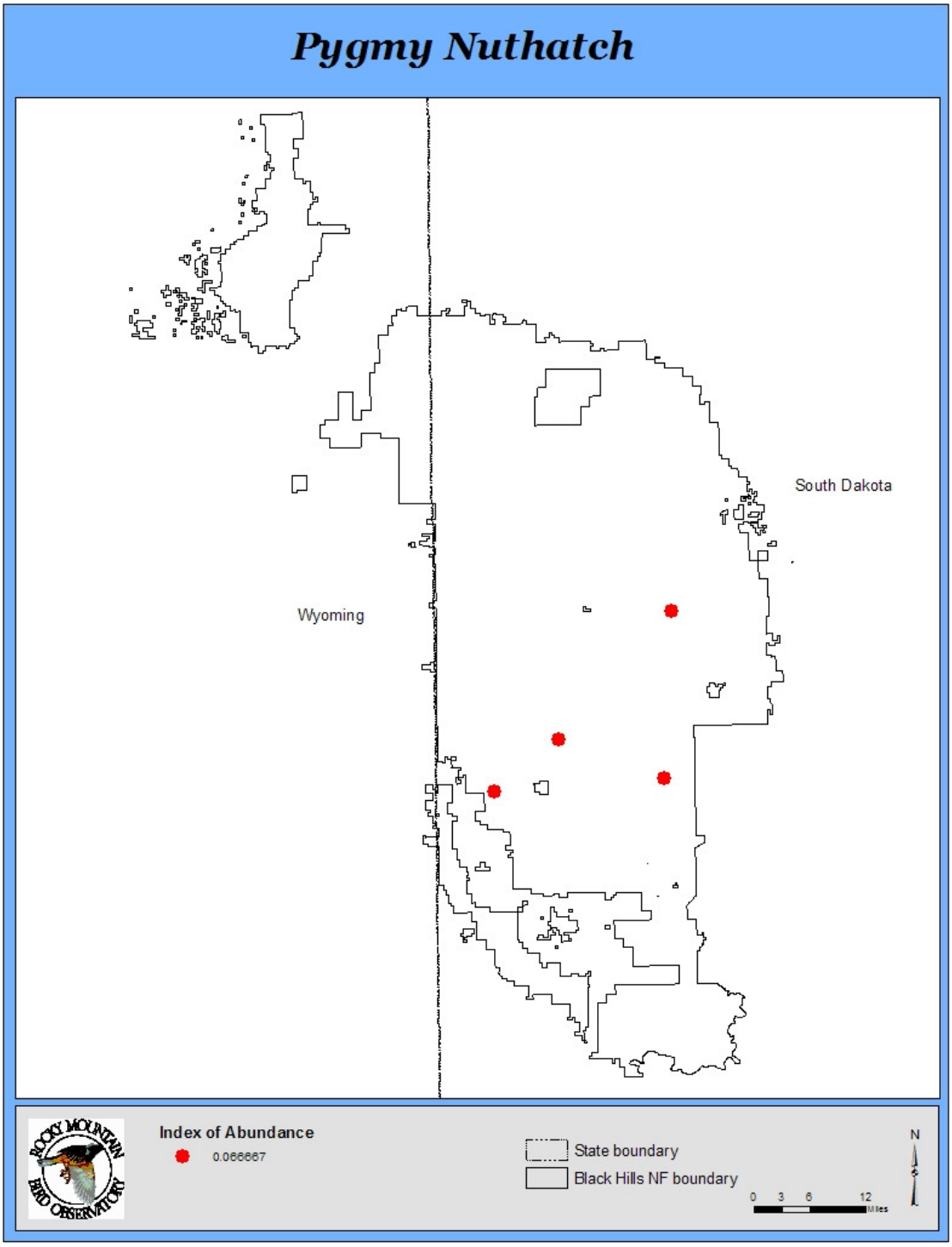
Contrary to a recent published accounts (Tallman et al. 2002), data generated from MBBH (Panjabi 2001, 2003a) suggest this species is not restricted to only the eastern and southern edges of the Black Hills, as it has been recorded on point transects away from these areas in both the central and northwestern hills. Since the inception of MBBH in 2001, eight Pygmy Nuthatches have been observed in total across a range of habitats including pine-north, pine-juniper shrublands, late-successional pine, and white spruce. Thus it is not easy to assign this species to any one of these habitats.

Due to its rarity, localized nature, and unpredictable distribution, Pygmy Nuthatch will not likely 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, especially given its well-documented preference for ponderosa pine in other locations throughout the region.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Pygmy Nuthatch for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	2	2
PS	ID	--	--	--	2	2

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Pygmy Nuthatch
South Dakota
Wyoming
Index of Abundance
0.066667
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Brown Creeper

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

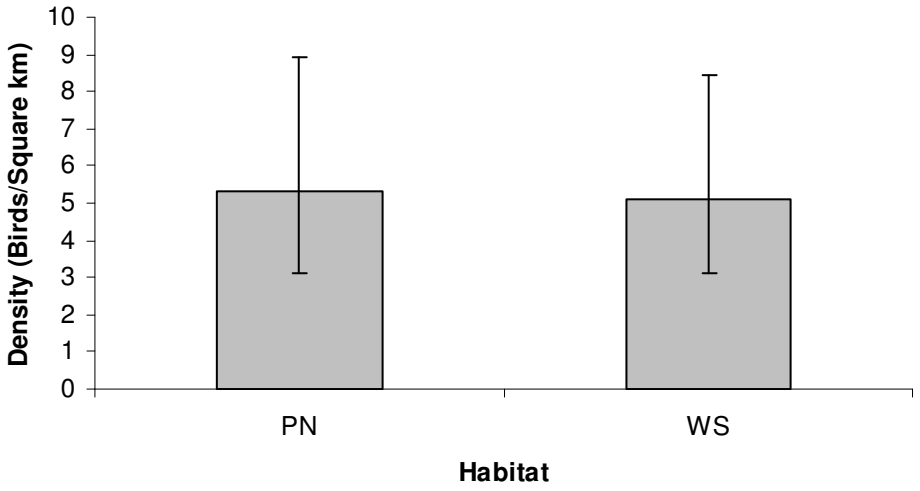
Brown Creepers occur in low abundance in coniferous forests throughout the Black Hills, but their presence is strongly tied to mature and old-growth forest conditions. Of the habitats surveyed in 2005, Brown Creeper density was highest in ponderosa pine-north and white spruce. Surveys in previous years have shown that they occur in higher densities in late-successional pine stands, which typically contain a high proportion of mature and old-growth forest conditions (Panjabi 2001, 2003).

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

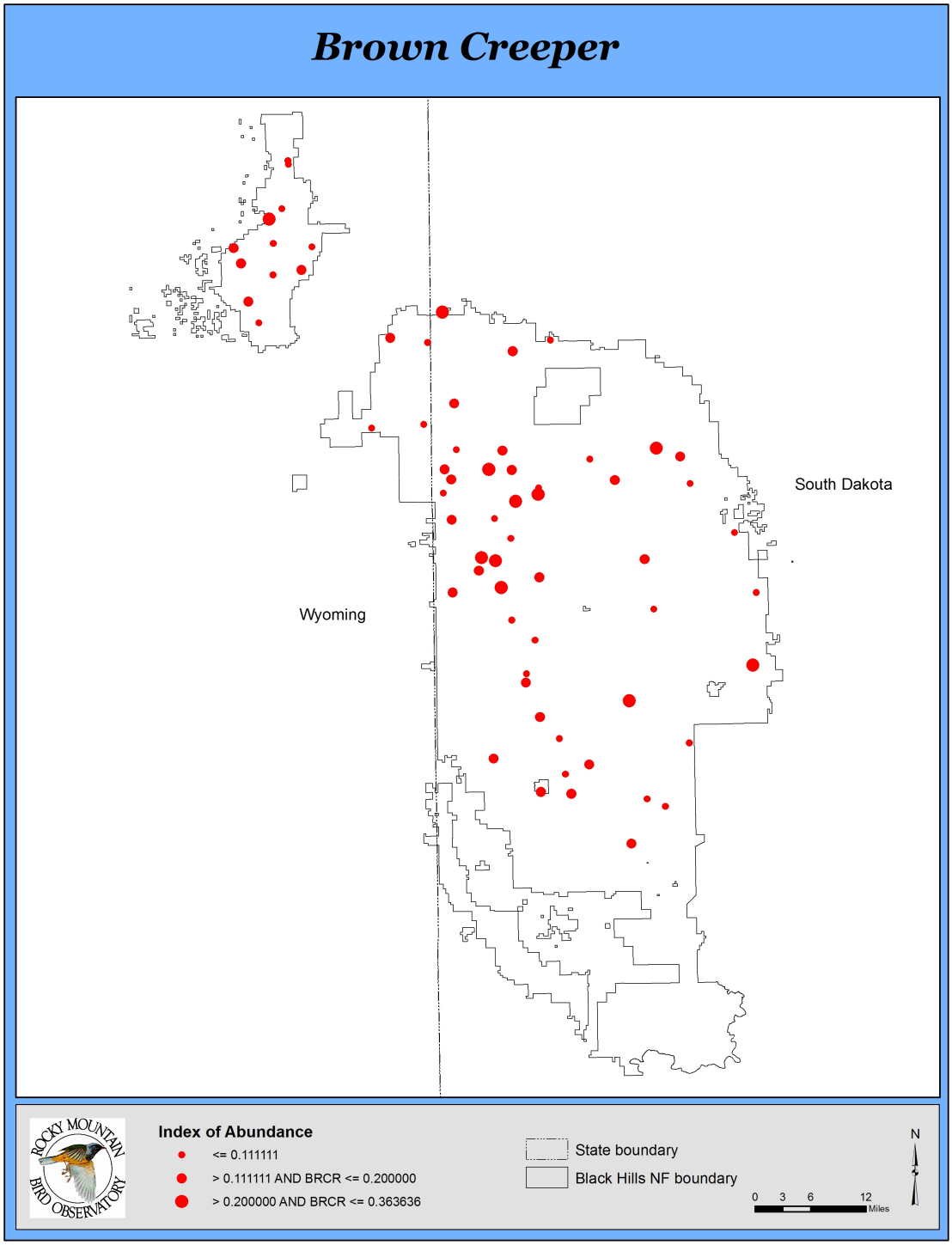
Total number of detections, number of individuals, and habitat-specific density estimates for Brown Creeper on the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	9	9
FR	ID	--	--	--	18	18
MR	ID	--	--	--	15	15
PN	5.30	3.14	8.95	26.6%	30	30
PS	ID	--	--	--	12	13
WS	5.13	3.12	8.44	25.2%	44	45

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.



Relative density of Brown Creeper among habitats on the MBBH project, 2005.


Brown Creeper
South Dakota
Wyoming
Index of Abundance
<= 0.111111
> 0.111111 AND BRCR <= 0.200000
> 0.200000 AND BRCR <= 0.363636
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

American Dipper

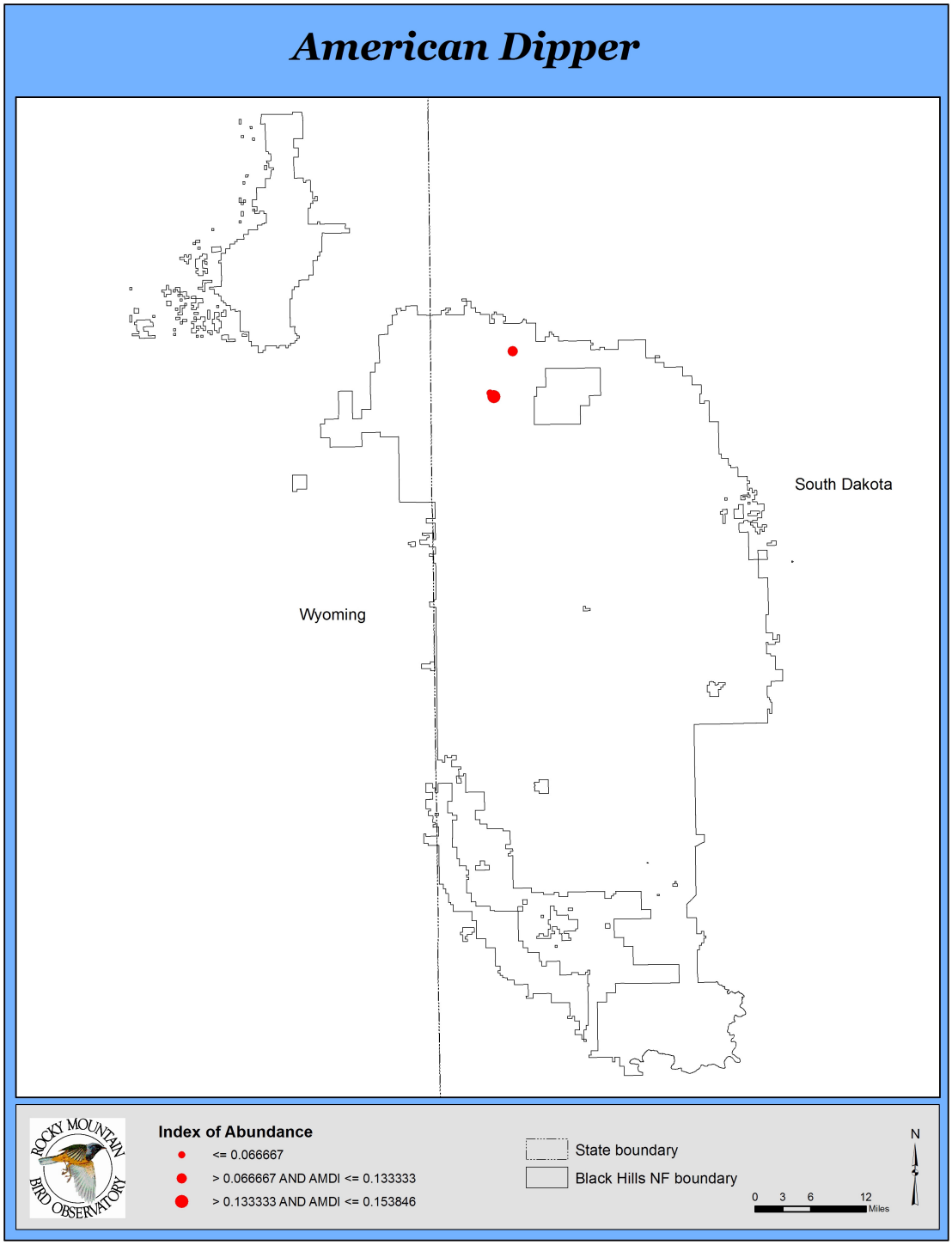
(BHNF Species of Local Concern)
(WY-PIF Level II Priority)
(SDGFP Species of Greatest Conservation Need)

American Dipper occurs primarily along Spearfish creek in the Black Hills, where it relies wholly on aquatic insects (particularly larvae) that are sensitive to water quality. The American Dipper is thus an excellent indicator of overall stream health (Tyler and Ormerod 1994). In 2005, three observations of American Dipper were along Spearfish creek in riparian habitat and two were in white spruce. SDGFP is currently monitoring this species in the Black Hills.

Total number of independent detections, number of individuals, and habitat-specific density estimates for American Dipper for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
FR	ID	--	--	--	2	2
MR	ID	--	--	--	1	1
WS	ID	--	--	--	2	2

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


American Dipper
South Dakota
Wyoming
Index of Abundance
<= 0.066667
> 0.066667 AND AMDI <= 0.133333
> 0.133333 AND AMDI <= 0.153846
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Golden-crowned Kinglet

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

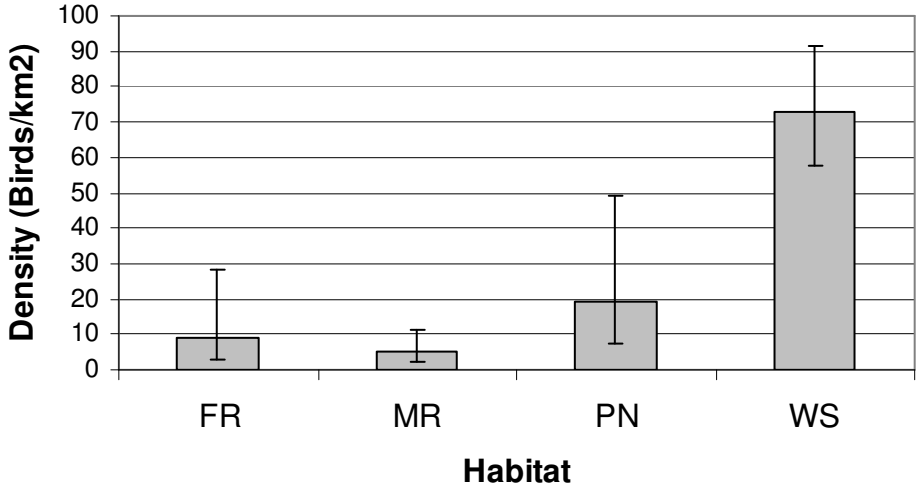
Golden-crowned Kinglet breeds almost exclusively in white spruce forests in the Black Hills. Observations of birds in other habitats reflect the prevalence of white spruce at sites within these habitats.

Golden-crowned Kinglet should be effectively monitored through point transects under MBBH in white spruce and montane riparian habitats, and possibly in ponderosa pine-north and foothills riparian.

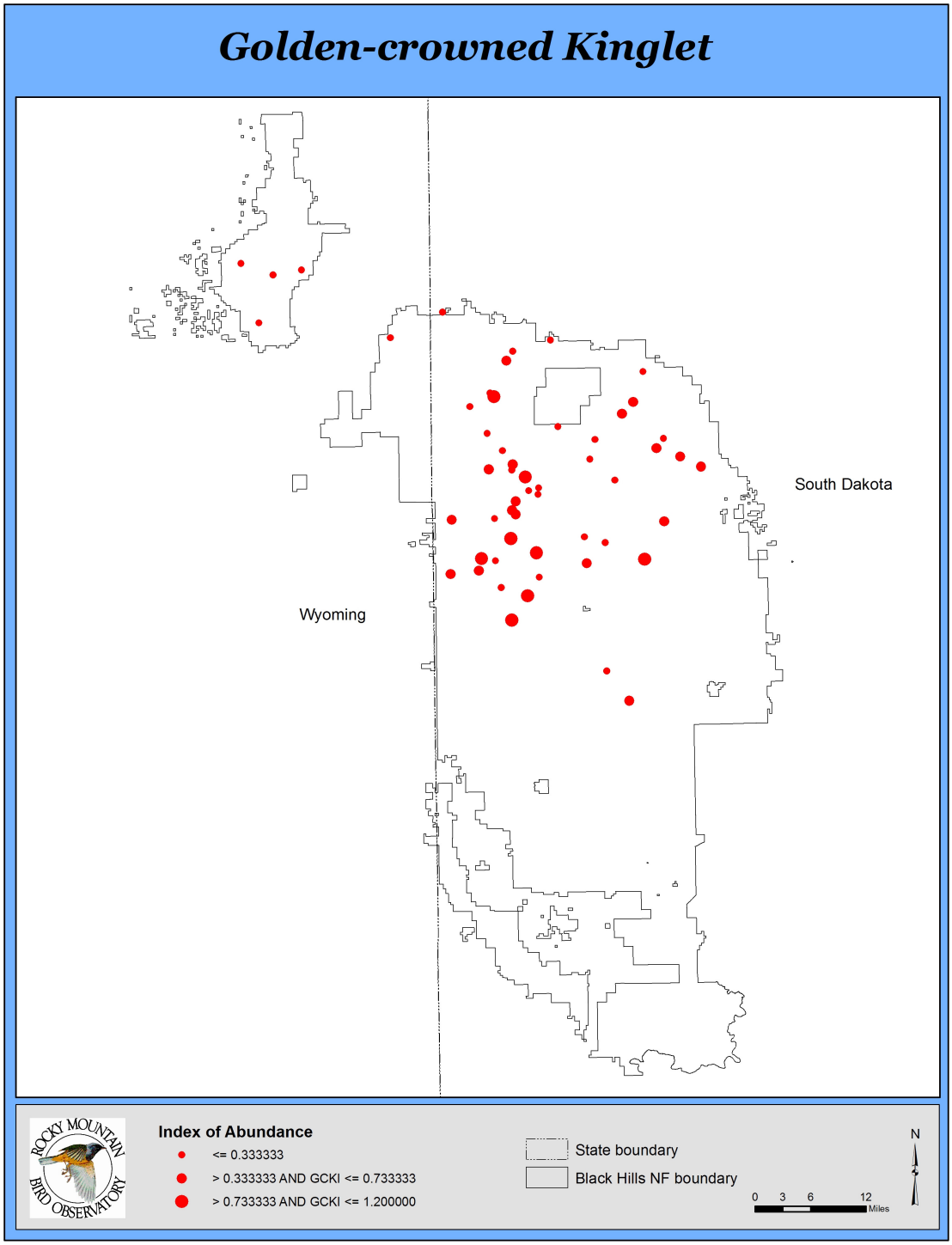
Total number of independent detections, number of individuals, and habitat-specific density estimates for Golden-crowned Kinglet for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
FR	8.98	2.87	28.05	61.6%	28	29
MR	5.22	2.42	11.27	39.0%	37	38
PN	19.27	7.59	48.93	48.9%	25	25
PS	ID	--	--	--	1	1
WS	72.67	57.71	91.51	11.7%	237	251

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.



Relative density of Golden-crowned Kinglet among habitats on the MBBH project, 2005


Golden-crowned Kinglet
South Dakota
Wyoming
Index of Abundance
<= 0.333333
> 0.333333 AND GCKI <= 0.733333
> 0.733333 AND GCKI <= 1.200000
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Mountain Bluebird

(PIF Species of Regional Concern)

Mountain Bluebirds occur locally throughout the Black Hills, occupying burned areas, grasslands, shrublands, and other open areas. Of the habitats surveyed in 2005, average density was highest in burn areas, a pattern consistent with findings from previous years. Ponderosa pine-south supported a higher density of Mountain Bluebirds than in previous years, perhaps because the species has reached its carrying capacity in the Jasper burn, as the species' density has nearly remained stable in the burn since 2004.

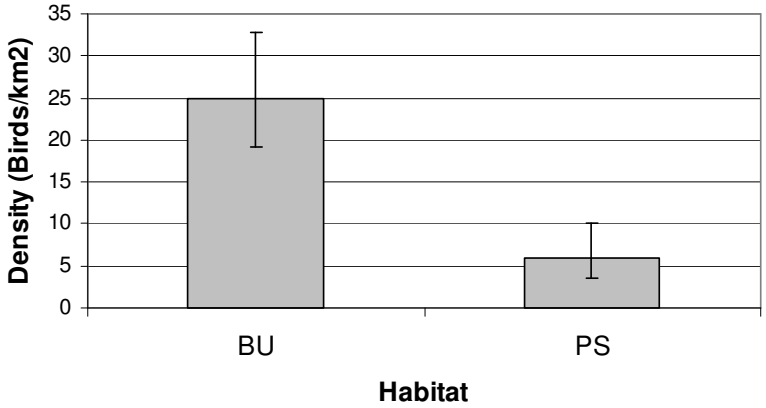
Mountain Bluebirds are secondary cavity nesters that rely largely on woodpeckers to excavate cavities for nest sites. They also require open landscapes for hunting, and thus it is not surprising that they have responded positively to the Jasper burn, and probably also to other recent fires. Density estimates 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 25.0 birds/km^2.

Mountain Bluebirds should be effectively monitored under MBBH through point transects in burn areas and ponderosa pine-south, as well as other habitats not surveyed in 2005.

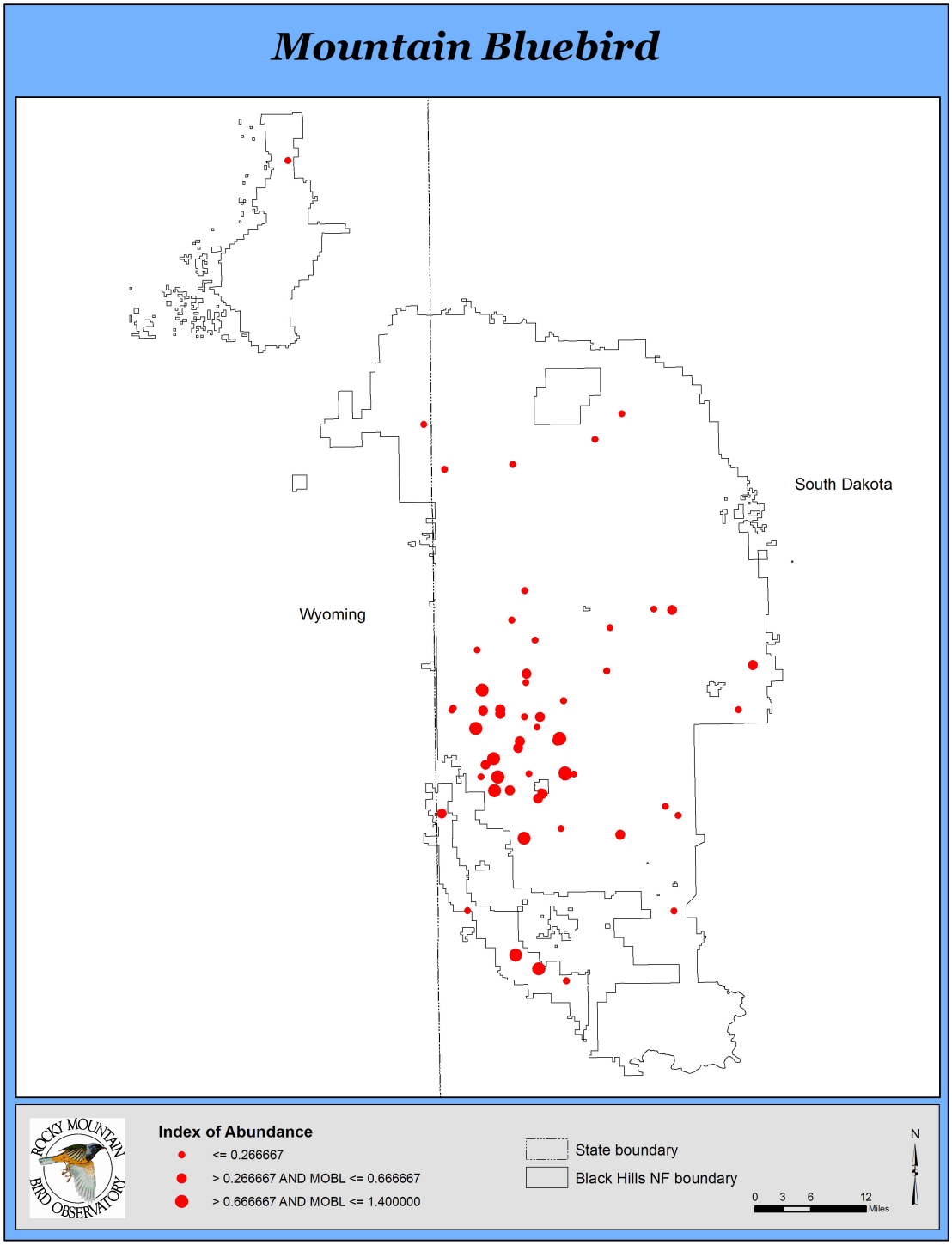
Number of detections by habitat and habitat-specific density estimates for Mountain Bluebird for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	25.00	19.08	32.75	13.6%	190	211
FR	ID	--	--	--	1	1
MR	ID	--	--	--	18	19
PN	ID	--	--	--	2	2
PS	6.02	3.57	10.15	26.5%	80	90
WS	ID	--	--	--	7	7

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.



Relative density of Mountain Bluebird among habitats on the MBBH project, 2005.


Mountain Bluebird
South Dakota
Wyoming
Index of Abundance
<= 0.266667
> 0.266667 AND MOBL <= 0.666667
> 0.666667 AND MOBL <= 1.400000
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Townsend's Solitaire

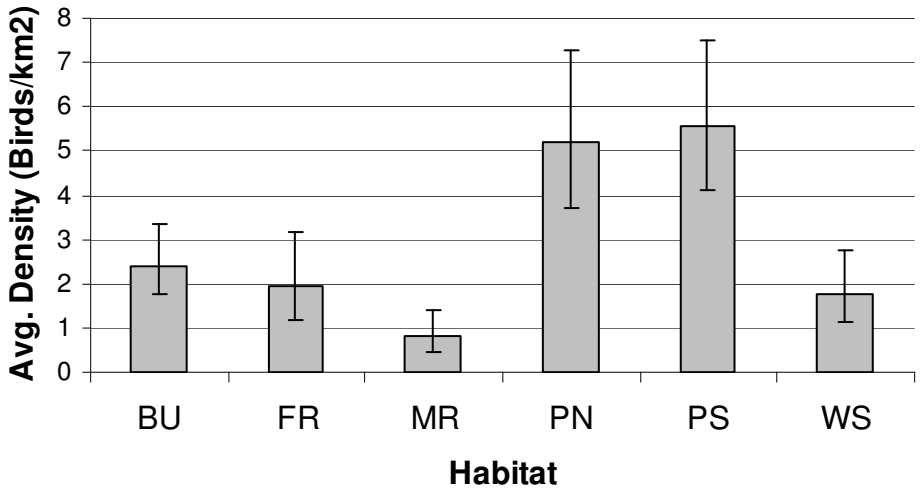
(WY-PIF Level II Priority)

Townsend's Solitaire occurs throughout the Black Hills in low to moderate abundance. Of the habitats surveyed in 2005, estimated density was highest in ponderosa pine forests. This species should be effectively monitored under MBBH through point-transects in range of habitats including some not surveyed in 2005 such as aspen and pin-juniper shrublands.

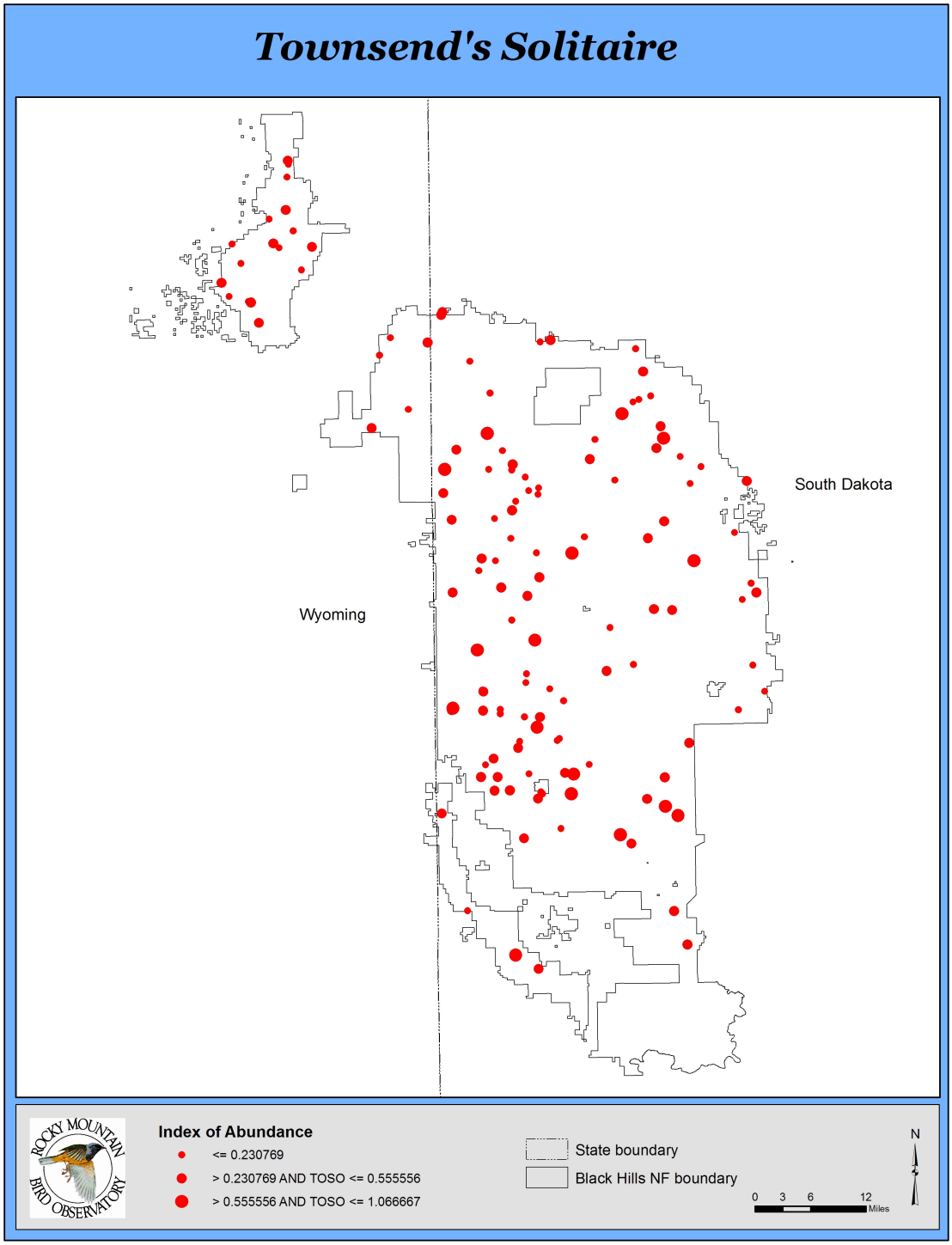
Total number of independent detections, number of individuals, and habitat-specific density estimates for Townsend's Solitaire for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	2.42	1.75	3.33	16.2%	98	100
FR	1.93	1.17	3.18	25.5%	58	59
MR	0.80	0.46	1.39	28.0%	37	42
PN	5.19	3.71	7.27	16.9%	144	149
PS	5.57	4.13	7.51	15.2%	186	192
WS	1.76	1.13	2.74	22.4%	63	66

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.



Relative density of Townsend's Solitaire among habitats on the MBBH project, 2005.


Townsend's Solitaire
South Dakota
Wyoming
Index of Abundance
<= 0.230769
> 0.230769 AND TOSO <= 0.555556
> 0.555556 AND TOSO <= 1.066667
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

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 reaches its highest density in 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.

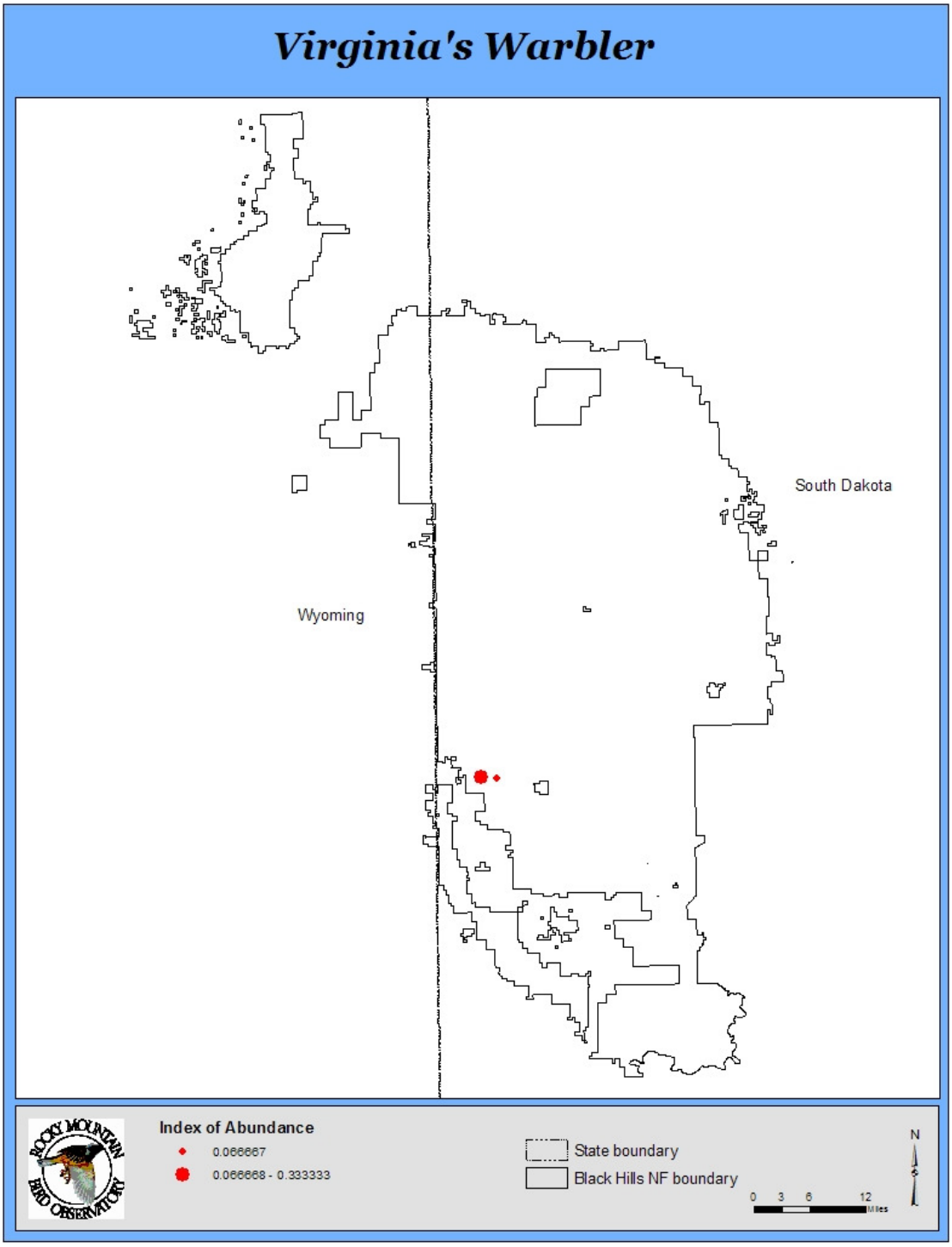
Virginia's Warbler is on the Partners In Flight North American Watch List due to its small population size and restricted distribution. Although it is not presently known to be highly threatened, there is inadequate data to assess its population trend at the continental level.

In 2005, all observations of Virginia's Warbler occurred in the ponderosa pine-south habitat near pine-juniper shrublands. In the Black Hills, this species does not occur in areas lacking a mountain mahogany and skunkbrush understory. Virginia's Warbler should be adequately monitored under MBBH through point transects in pine-juniper shrublands. Although we did not survey this habitat in 2005, we have collected sufficient data to monitor the species in this habitat in previous years.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Virginia's Warbler for the MBBH monitoring project, 2005.

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

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Virginia's Warbler
South Dakota
Wyoming
Index of Abundance
0.066667
0.066668 - 0.333333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Black-and-white Warbler

(BHNF 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, 2003, 2004; Tallman et al. 2002). In 2005, three Black-and-white Warlbers were recorded in foothills riparian and three were recorded in ponderosa pine-north.

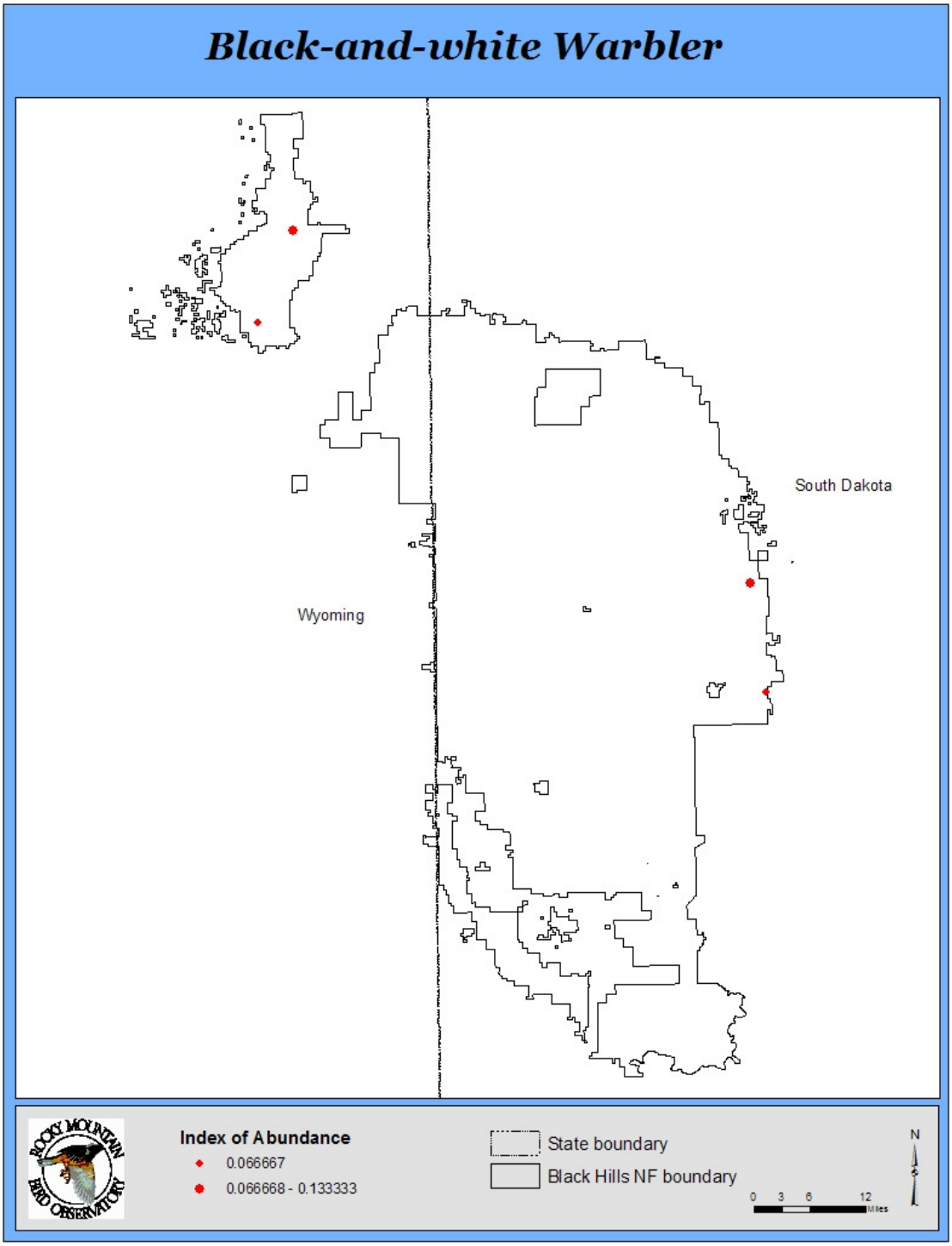
In the Black Hills, Black-and-white Warblers are found primarily in bur oak woodlands and associated edges. Because these woodlands occur mainly in canyon bottoms at low elevations, much of its habitat in the Black Hills may be on private lands. However, several Black-and-white Warblers have been recorded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

Black-and-white Warbler is 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 foothills riparian, should provide data to loosely track its status on the BHNF.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Black-and-white warbler for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
FR	ID	--	--	--	3	3
PN	ID	--	--	--	3	3

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Black-and-white Warbler
South Dakota
Wyoming
Index of Abundance
0.066667
0.066668 - 0.133333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

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.

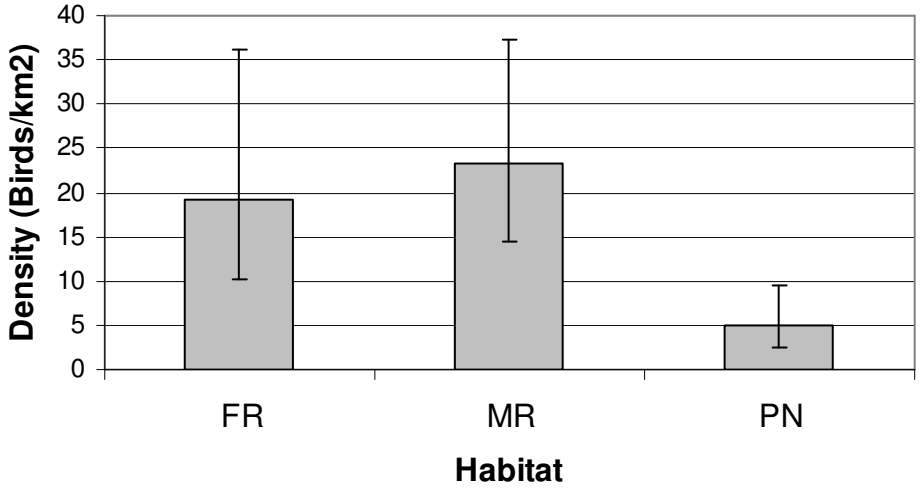
MacGillivray's Warblers are found primarily in riparian habitats, where they can occur in moderately high density. They also occupy brushy clearings, especially with oaks, both within coniferous and broad-leaved forests. Of the habitats surveyed in 2005, density was highest in montane riparian.

MacGillivray's Warblers should be effectively monitored under MBBH through point-transects in a range of habitats, especially montane riparian, foothill riparian, and ponderosa pine-north, as well as some habitats not surveyed in 2005.

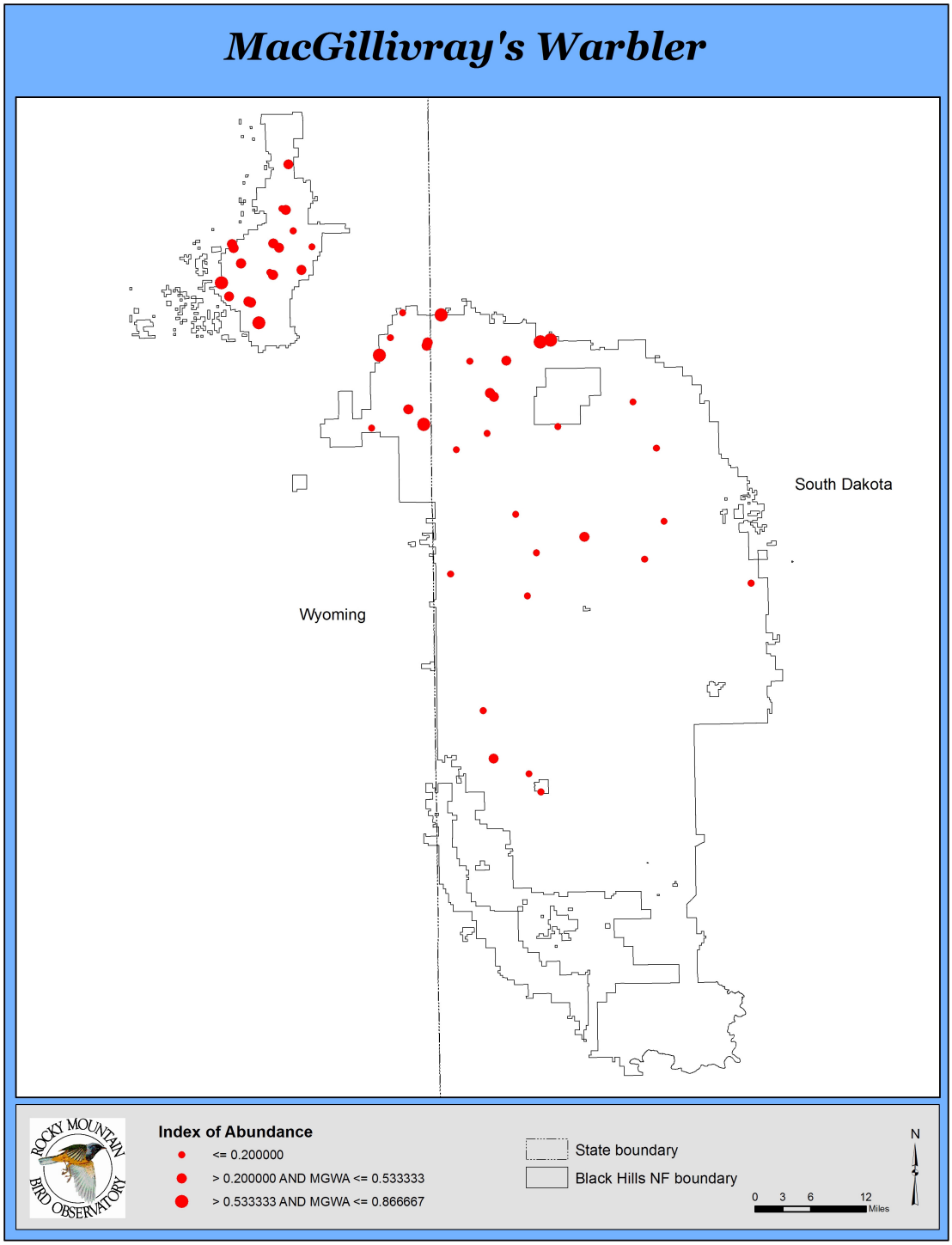
Total number of independent detections, number of individuals, and habitat-specific density estimates for MacGillivray's Warbler for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	3	3
FR	19.12	10.11	36.17	32.4%	57	62
MR	23.22	14.50	37.21	24.0%	104	105
PN	4.90	2.52	9.52	33.9%	41	42
WS	ID	--	--	--	15	15

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.



Relative density of MacGillivray's Warbler among habitats on the MBBH project, 2005.


MacGillivray's Warbler
South Dakota
Wyoming
Index of Abundance
<= 0.200000
> 0.200000 AND MGWA <= 0.533333
> 0.533333 AND MGWA <= 0.866667
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Vesper Sparrow

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

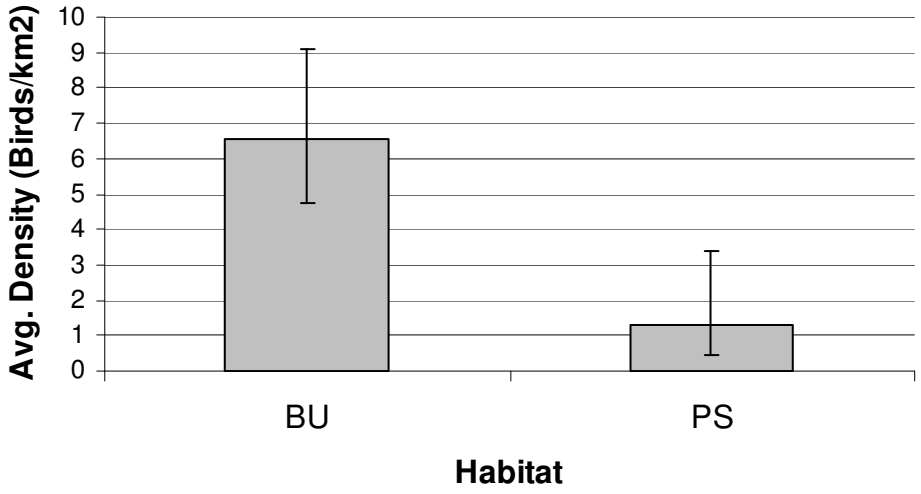
Vesper Sparrow occurs widely in the Black Hills, primarily in grassy openings, and especially in the prairies of the southern and central hills. While the species does require grassland, it seems to be less common in wide-open prairies with no trees than in the prairie-forest ecotone. Densities were highest in the Jasper Burn in 2005, where the species continues to increase.

Vesper Sparrows should be effectively monitored under MBBH through point-transects in burned areas, and to a lesser extent in ponderosa pine-south, as well as habitats not surveyed in 2005, especially mixed-grass prairie.

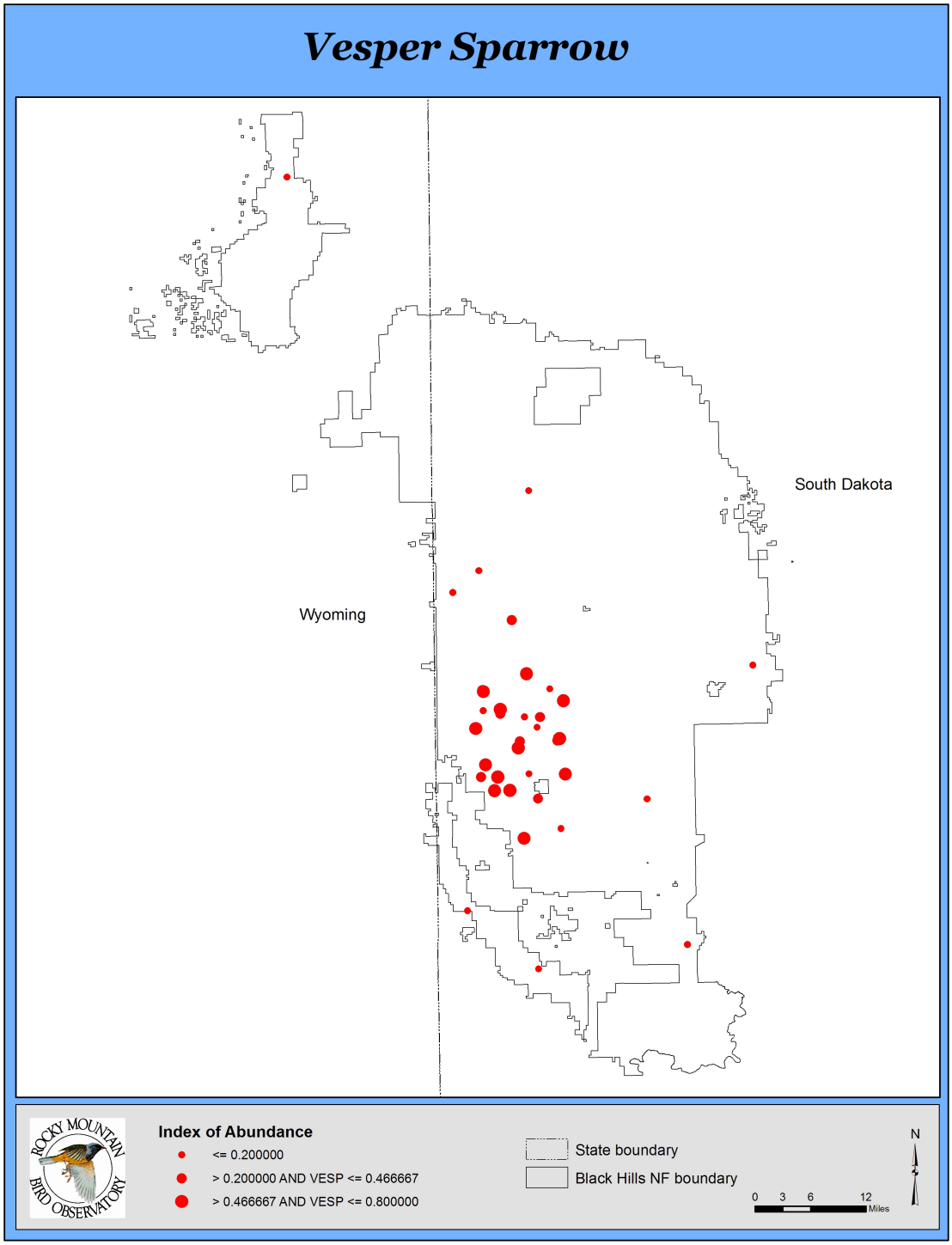
Total number of independent detections, number of individuals, and habitat-specific density estimates for Vesper Sparrow for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	N	N
BU	6.55	4.72	9.08	16.4%	149	163
MR	ID	--	--	--	1	1
PN	ID	--	--	--	1	1
PS	1.28	0.48	3.40	51.1%	28	30
WS	ID	--	--	--	8	9

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.



Relative density of Vesper Sparrow among habitats on the MBBH project, 2005.


Vesper Sparrow
South Dakota
Wyoming
Index of Abundance
<= 0.200000
> 0.200000 AND VESP <= 0.466667
> 0.466667 AND VESP <= 0.800000
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Lark Sparrow

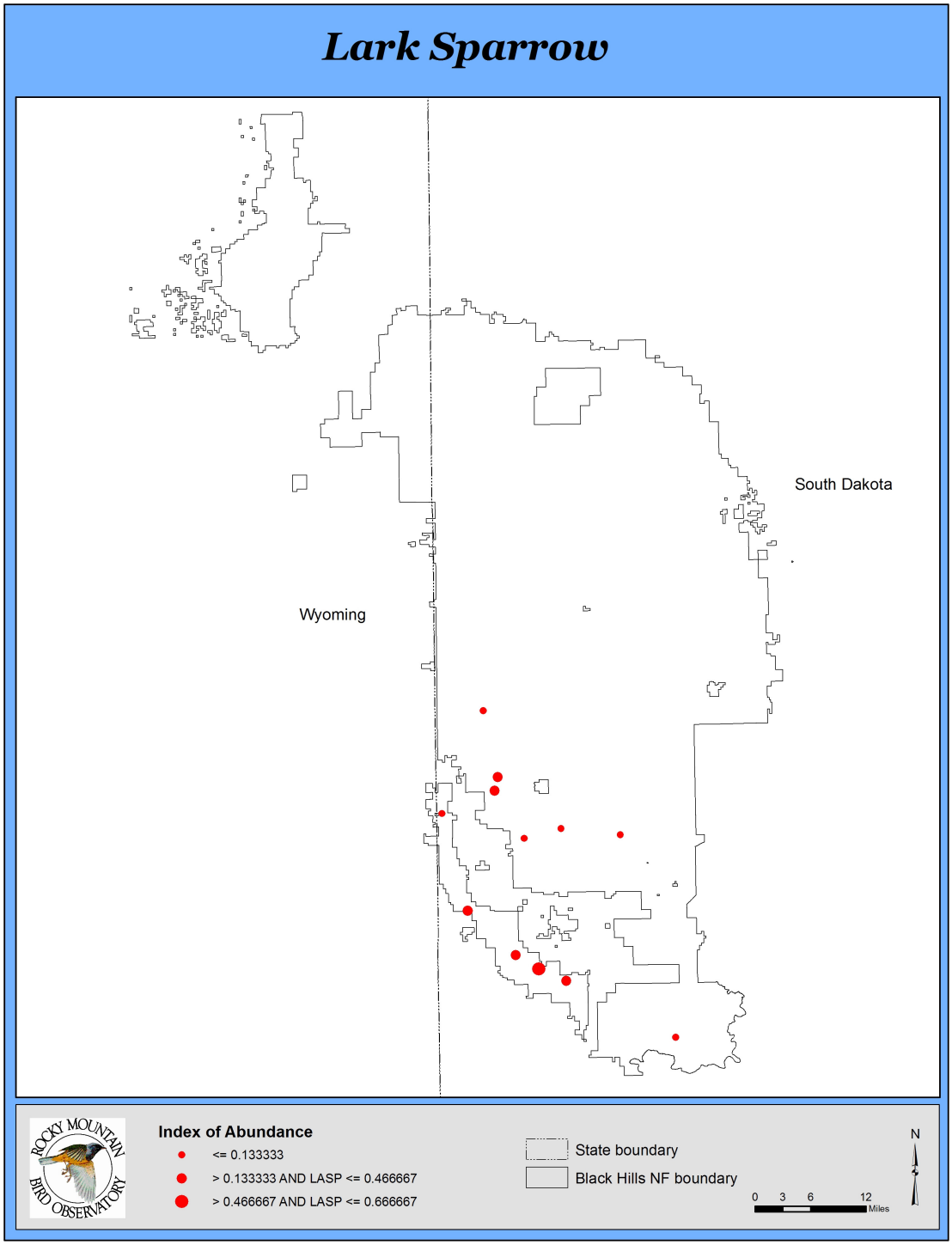
(WY-PIF Level II Priority)

Lark Sparrows can be found in a variety of locations including prairies, roadsides, farms, open woodlands, and mesas. This species is well-monitored under MBBH through point transects in mixed-grass prairie habitat, which was not surveyed in 2005.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Lark Sparrow for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	ID	--	--	--	12	12
FR	ID	--	--	--	9	9
PS	ID	--	--	--	22	25

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Lark Sparrow
South Dakota
Wyoming
Index of Abundance
<= 0.133333
> 0.133333 AND LASP <= 0.466667
> 0.466667 AND LASP <= 0.666667
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Lark Bunting

(PIF Species of Regional Concern)
(PIF Continental and Regional Stewardship Species)
(WY-PIF Level II Priority)
(SDGFP Species of Greatest Conservation Need)

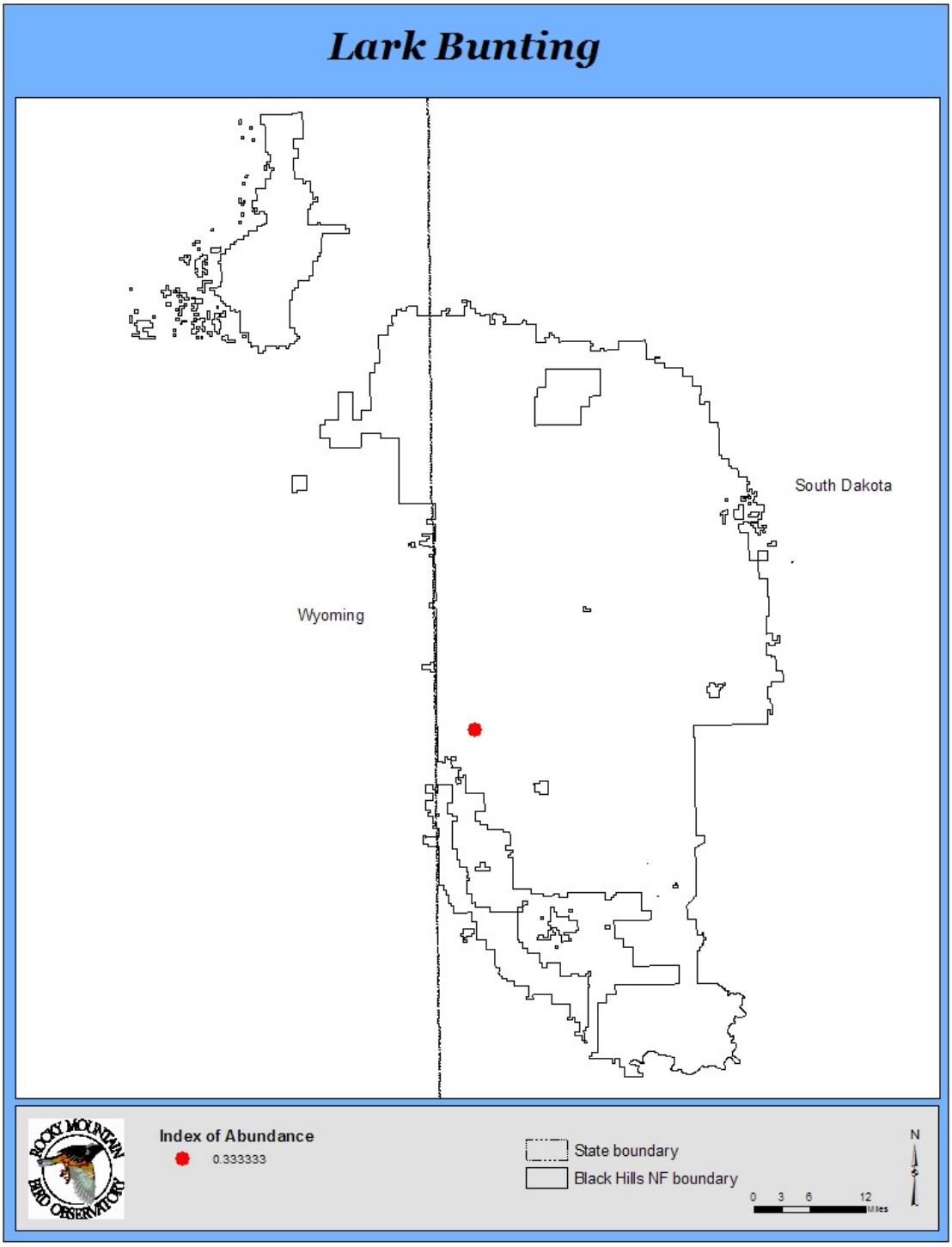
The five Lark Buntings detected in the Jasper burn in 2005 is yet another sign that the fire has restored native grassland conditions in the area. This and other grassland species (e.g., Sharp-tailed Grouse, Grasshopper Sparrow) should further increase in this area as the burn area continues to succeed to grasslands.

Due to its local, uncommon and sporadic nature it is unlikely we will be able to effectively monitor Lark Bunting through point transects under MBBH. Effective monitoring of Lark Buntings would best accomplished under a sampling framework that includes all available native grasslands in the Black Hills surveyed every year.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Lark Bunting for the MBBH monitoring project, 2005.

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

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Lark Bunting
South Dakota
Wyoming
Index of Abundance
0.333333
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Song Sparrow

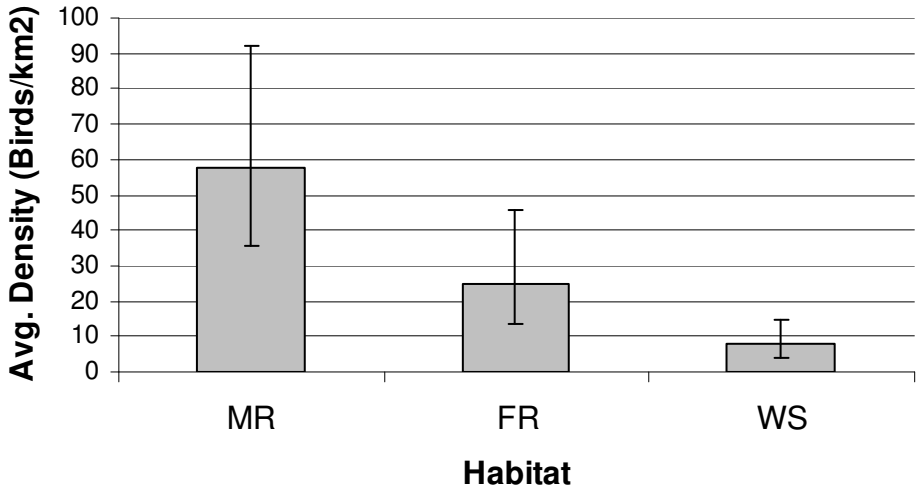
(BHNF Management Indicator Species)

Song Sparrows are found exclusively in dense streamside vegetation in the Black Hills. This sparrow is found in fairly high densities in riparian habitats in the Black Hills and it should be well-monitored under MBBH in montane riparian, foothills riparian, and white spruce, as well as other habitats not surveyed in 2005.

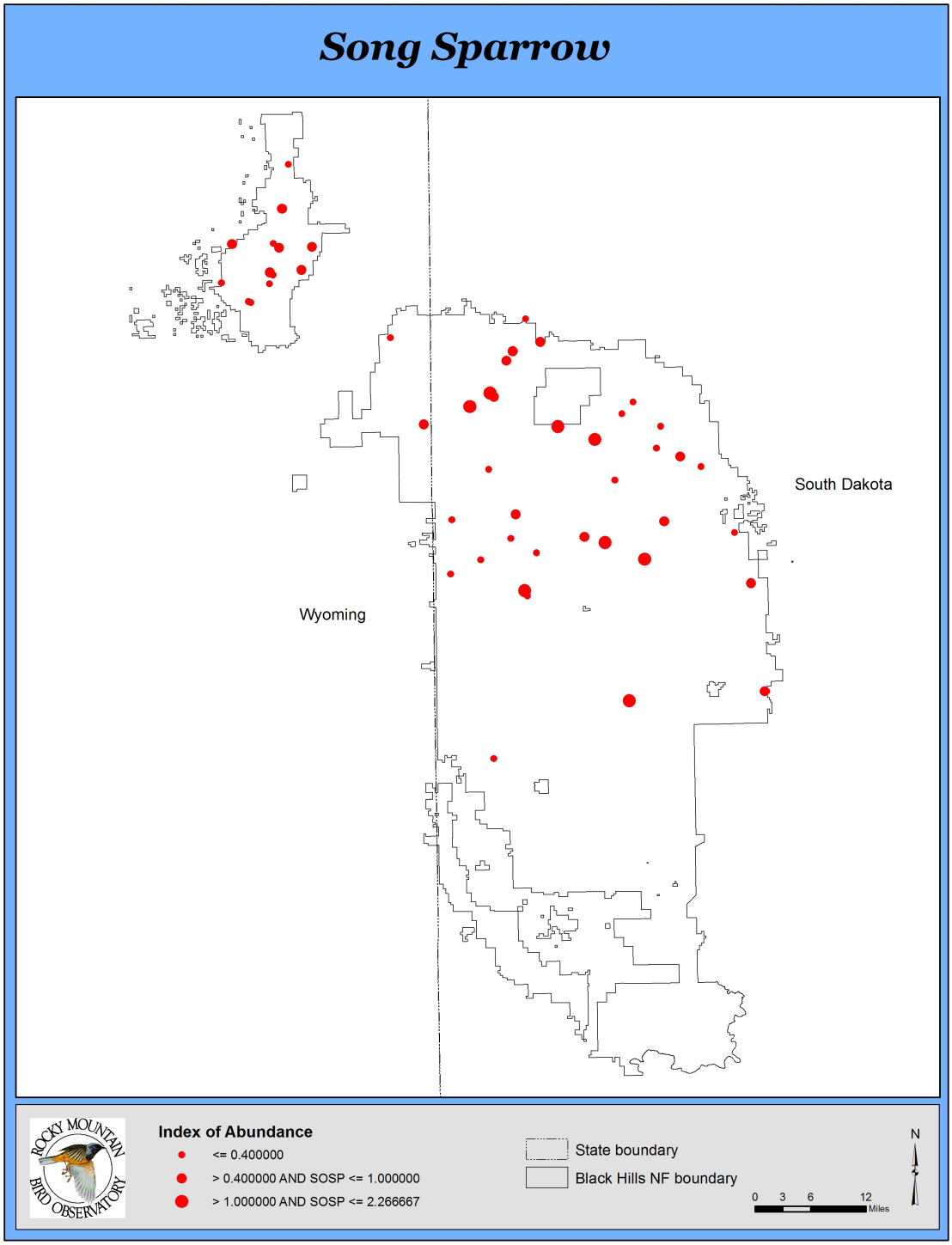
Total number of independent detections, number of individuals, and habitat-specific density estimates for Song Sparrow for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
FR	24.85	13.54	45.59	30.8%	77	79
MR	57.42	35.85	91.95	23.6%	202	229
PN	ID	--	--	--	5	5
WS	7.69	4.06	14.59	32.2%	80	83

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.



Relative density of Song Sparrow among habitats on the MBBH project, 2005.


Song Sparrow
South Dakota
Wyoming
Index of Abundance
<= 0.400000
> 0.400000 AND SOSP <= 1.000000
> 1.000000 AND SOSP <= 2.266667
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Dark-eyed Junco

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

The "white-winged" subspecies of the Dark-eyed Junco, occurs widely in the Black Hills, and it is fairly common to abundant in most wooded habitats. 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 the current land-use practices within its coniferous forest habitat, the white-winged subspecies of the Dark-eyed Junco is largely secure across its range.

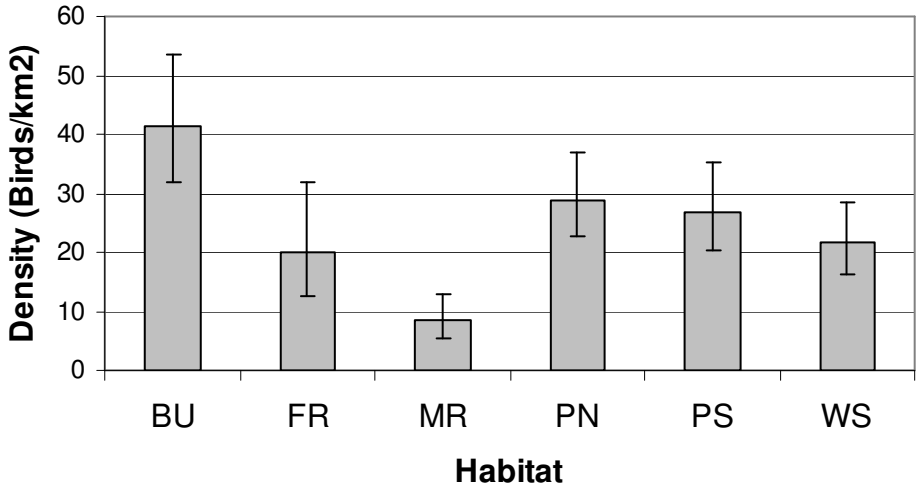
Interestingly, although they are primarily a forest and forest edge species, Dark-eyed Juncos occur in somewhat greater densities in burn areas than in any other habitat.

Dark-eyed Juncos should be effectively monitored under MBBH in a range of habitat types, especially burn areas and ponderosa pine-north, as well as a few habitats not surveyed in 2005.

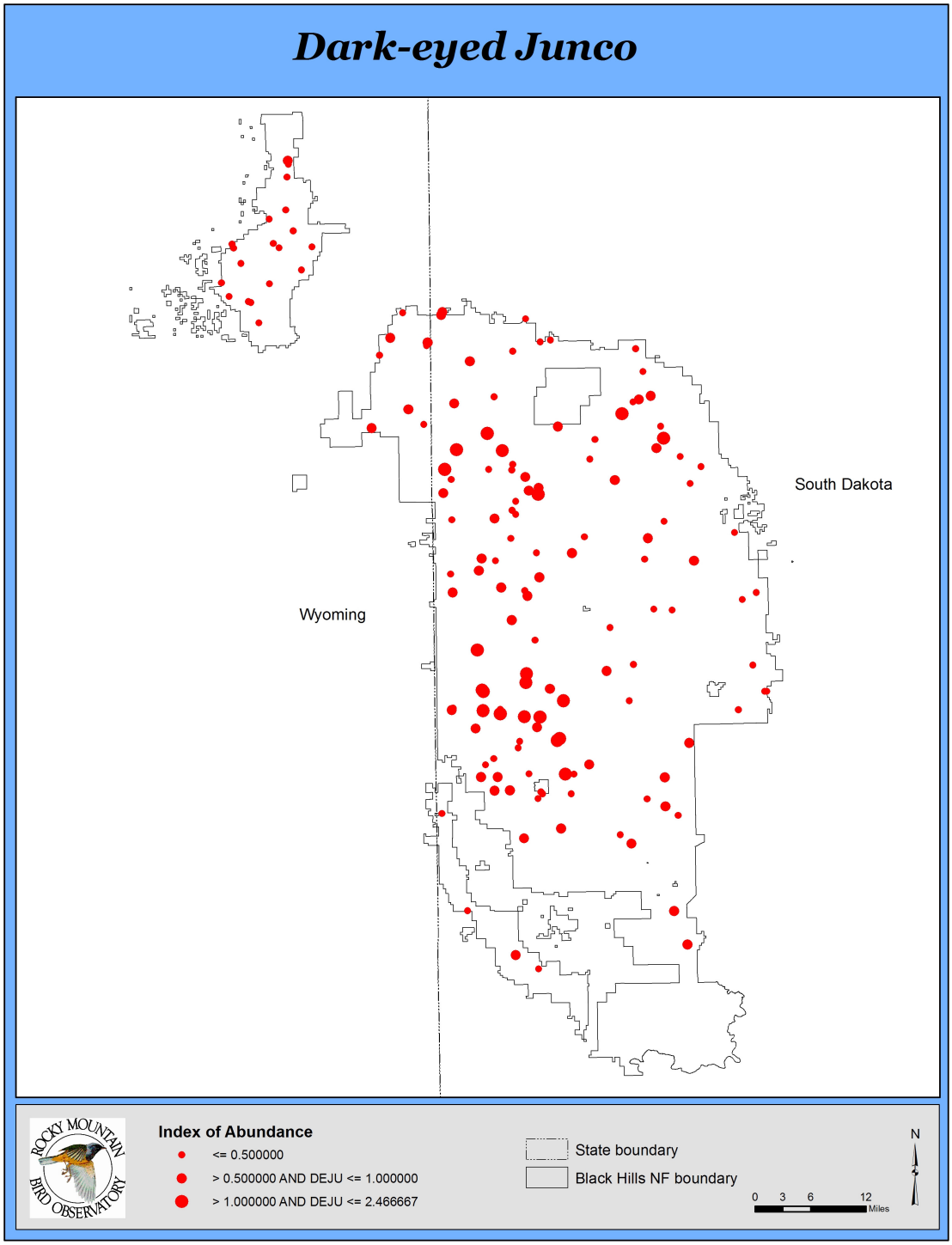
Total number of independent detections, number of individuals, and habitat-specific density estimates for Dark-eyed Junco for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	41.41	31.99	53.60	13.0%	379	402
FR	19.95	12.47	31.91	23.8%	90	96
MR	8.46	5.59	12.81	20.8%	101	102
PN	28.89	22.56	36.99	12.4%	255	288
PS	26.89	20.49	35.28	13.8%	224	233
WS	21.62	16.38	28.54	13.9%	203	211

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.



Relative density of Dark-eyed Junco among habitats on the MBBH project, 2005.


Dark-eyed Junco
South Dakota
Wyoming
Index of Abundance
<= 0.500000
> 0.500000 AND DEJU <= 1.000000
> 1.000000 AND DEJU <= 2.466667
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Bobolink

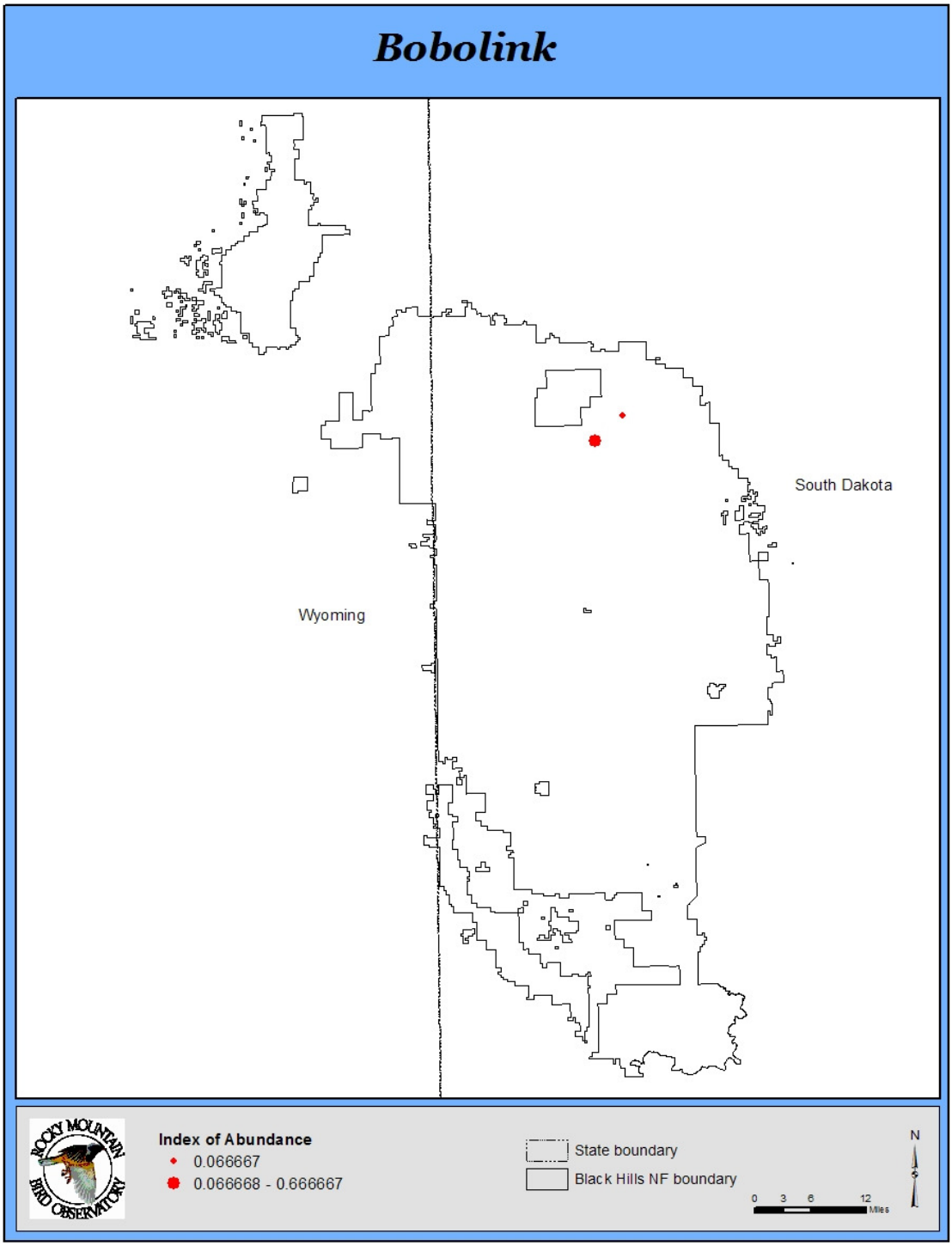
(WY-PIF Level II Priority)

Bobolinks nest primarily in hayfields, tall-grass meadows, and native prairie with tall grasses. The species occurs only locally in the Black Hills and is thus not well monitored through random sampling. In 2005, ten were detected in montane riparian and one in white spruce.

Total number of independent detections, number of individuals, and habitat-specific density estimates for Bobolink for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
MR	ID	--	--	--	10	10
WS	ID	--	--	--	1	1

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.


Bobolink
South Dakota
Wyoming
Index of Abundance
0.066667
0.066668 - 0.666667
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Western Meadowlark

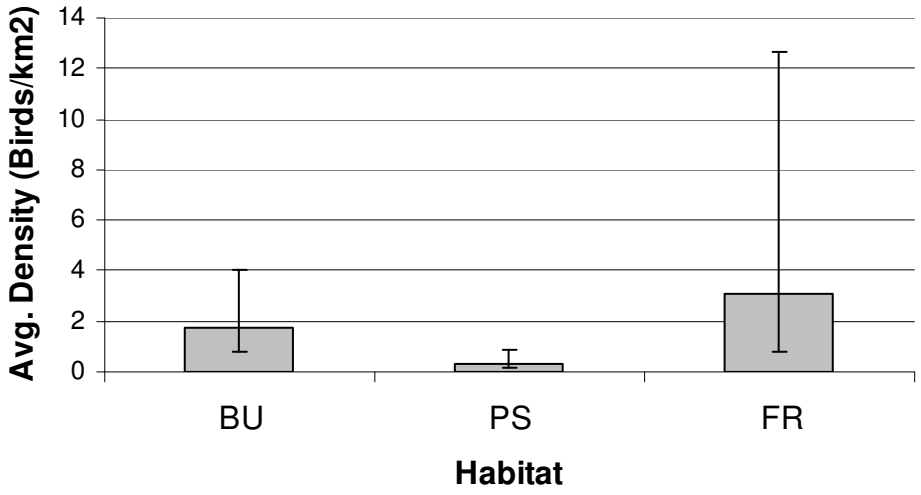
(PIF Regional Stewardship Species)

Western Meadowlarks occur throughout the Black Hills. Of all the habitats surveyed in 2005, the density of Western Meadowlarks was greatest in foothills riparian where this species is presumably occupying inter-mixed or adjacent grasslands. Western Meadowlarks typically breed in native grasslands, semi-desert shrublands and sage shrublands; therefore, densities of this species may be higher in habitats not surveyed in 2005 including mixed-grass prairie and pine-juniper shrublands. Western Meadowlark should be effectively monitored under MBBH through point transects in a range of habitats including burn areas, ponderosa pine-south and foothills riparian.

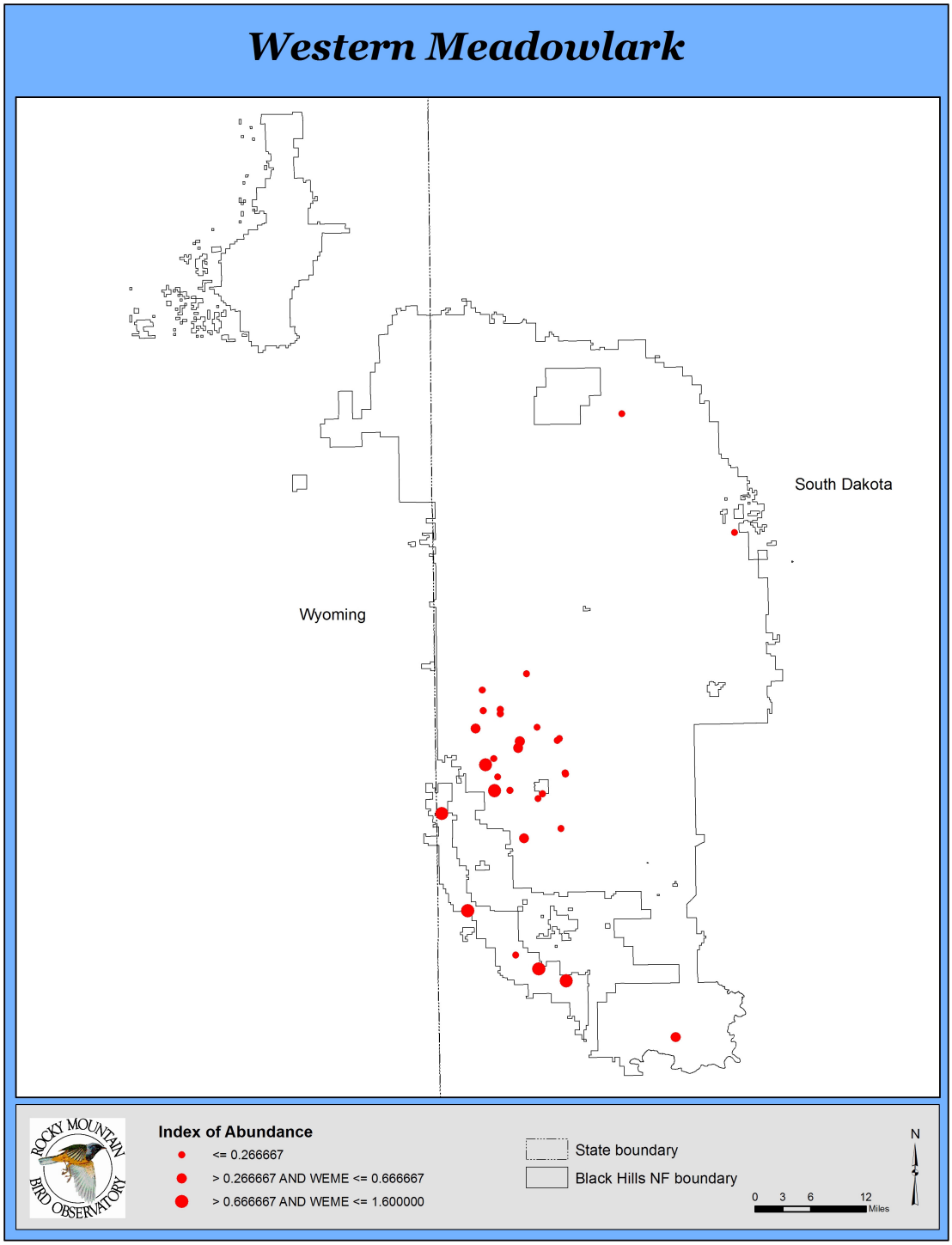
Total number of independent detections, number of individuals, and habitat-specific density estimates for Western Meadowlark for the MBBH monitoring project, 2005.

Habitat	D	LCL	UCL	CV	n	N
BU	1.78	0.77	4.07	42.9%	71	115
FR	3.10	0.76	12.67	78.7%	25	28
MR	ID	--	--	--	3	3
PS	0.34	0.13	0.90	51.4%	49	49
WS	ID	--	--	--	1	1

D = Density (birds/square kilometer); LCL = lower 95% confidence interval of the density; UCL = upper 95% confidence interval of the density; CV(%) = coefficient of variation of the density; n = number of independent detections; N = number of individuals; ID = insufficient data.



Relative density of Western Meadowlark among habitats on the MBBH project, 2005.


Western Meadowlark
South Dakota
Wyoming
Index of Abundance
<= 0.266667
> 0.266667 AND WEME <= 0.666667
> 0.666667 AND WEME <= 1.600000
State boundary
Black Hills NF boundary
0 3 6 12
Miles
N

Discussion and Recommendations

Unique Values of Each Habitat

While the number of species and densities of birds vary across habitats, each habitat supports unique assemblages of birds and other attributes that contribute to the overall biological diversity in the Black Hills. Some highlights pertaining to each habitat surveyed in 2005 follow.

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 is difficult to incorporate wildfire into management plans as a tool for creating certain conditions, it is important for land managers to recognize that many species of birds require post-burn habitat.

Foothills and Montane Riparian

Riparian systems in the western United States support a disproportionate segment of the avifauna, with a greater diversity of breeding birds than all other western habitats combined (Anderson and Ohmart 1977, Johnson et al. 1977, Johnson and Haight 1985). Similarly, riparian habitat in the Black Hills, both the foothills and montane riparian habitats, consistently provide habitat for a greater number and diversity of birds than any other habitat in the Black Hills. Riparian habitat also supports a number of sensitive species and species of conservation concern. In 2005, Osprey, Golden Eagle, and Black-billed Magpie were observed exclusively in foothills riparian habitat, and many other species were most abundant in this habitat including White-throated Swift and Cordilleran Flycatcher. Also in 2005, Alder Flycatcher and Golden-winged Warbler were observed only in montane riparian habitat, and a few species of conservation concern including, Red-naped Sapsucker, Dusky Flycatcher, MacGillivray's Warbler, and Song Sparrow, reached their highest densities in montane riparian habitat.

In the Black Hills many acres of riparian systems have been lost primarily to

agricultural uses, while urban and residential development, and mining and gravel operations have also converted many acres. In addition, the ecological integrity of much of the remaining riparian systems has been reduced by dams, declines in beaver populations, grazing, groundwater pumping and other anthropogenic factors (SDGFP 2005).

Given the importance of riparian habitat to so many species and its overall decline in size and quality, it is especially important to monitor this habitat for species declines, and maintain or restore the habitat whenever possible.

Ponderosa Pine, northern and southern hills

Land conversion of forested ecosystems in the Black Hills has been relatively low at 2% overall, but suppression of natural fire over the last 100 or more years combined with timber harvest has caused significant changes to the ecological processes, structure, and species composition of the ponderosa pine habitat, especially at lower elevations (SDGFP 2005). These factors have resulted in more dense, even-aged stands of ponderosa pine compared to historic forest conditions.

In the Black Hills, ponderosa pine forests support the highest densities of a few sensitive species and species of conservation or local concern, including Brown Creeper, Plumbeous Vireo, and Townsend's Solitaire, as well as many other ecologically important species like Red-breasted Nuthatch and Red Crossbill.

White Spruce

White Spruce habitat in the Black Hills is relatively pristine compared to other habitat types, and has been subject to less human impact from activities such as agriculture, timber production, and fire suppression. Although the number of birds detected and species richness were lower than the other habitats surveyed in 2005, white spruce provides important habitat for a few high-priority species like American Three-toed Woodpecker, Brown Creeper, and Golden-crowned Kinglet.

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. In 2005, the density of Black-backed Woodpeckers declined and will probably continue to do so as the habitat changes and no longer provides the necessary resources. Therefore, as populations of this species shift with the availability of resources, 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 a random sample of all 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 one individual burn area, where we know that a species' population trend will rise and eventually fall with the natural succession of changes in that burn.

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 would likely provide the most cost-effective means for monitoring these specialized species in the Black Hills.

Prospects for Population Monitoring

The habitat-stratified point transects produced excellent results with low coefficients of variation (≤ 50%) on 48 bird species in at least one habitat surveyed in 2005. 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 11 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 59 species represent about 51% of *all species* observed in the six habitats surveyed in 2005, but they represent almost 93% of all *individual birds* observed. The other 49% of species (~7% of birds observed) fall into one of the following categories below:

1) Birds that are adequately monitored in one of the other habitats covered by MBBH (e.g., Grasshopper Sparrow in mixed-grass prairie)
2) Low-density, highly localized species (e.g., Golden Eagle)
3) Low-density, widespread species (e.g., Northern Goshawk)
4) Irregular species (e.g., Bobolink);
5) Vagrant breeders (e.g., Northern Parula)
6) Species that occur mainly outside the Black Hills in the low foothills or on the Great Plains (e.g., Brown Thrasher);

7) Nocturnal species (e.g., Northern Saw-whet Owl);
8) Wetland-obligate species (e.g., Sora); and
9) Species that are readily detectable only prior to late May (e.g., Ruffed Grouse).

Species in 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.

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

For some low-density but widespread species, such as Northern Goshawk, a brief call-response survey could be used 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 easily portable playback system would be required for each observer, but otherwise, relatively few additional expenses would be incurred. RMBO will be implementing a pilot study in 2006 that will use a call-playback technique developed by the USFS for monitoring Northern Goshawk. This study will be conducted in several National Forests throughout Colorado, Wyoming and the Black Hills.

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 our Black Hills partners.

Coordinated Bird Monitoring

Coordinated Bird Monitoring (CBM) is an ongoing effort that began with the Western Working Group of Partners in Flight in 1999, to integrate existing bird monitoring data across the west. Integrating data across the region will enable CBM to estimate trends in population size, describe changes in abundance, and monitor several fitness indicators for priority species in the region. CBM focuses on management issues and, ideally, the integration will be useful at many spatial and administrative levels.

RMBO has been working with the Western Working Group of PIF over the last few years to implement CBM, especially in the Intermountain West. We are in the process of redesigning our web site to enable web-based queries of our data and the display of results by habitat, management unit, ecoregion, and other scales. MBBH data will be used in these queries, along with similar data collected in Wyoming, Colorado, Utah and New Mexico. Some of these data will be available via web crawlers to a larger network of monitoring programs so that data can be queried at a regional level in collaboration with CBM. Currently, several partners are involved in this effort, including the Avian Science Center at the University of Montana, Cornell Lab of Ornithology's Avian Knowledge Network, and the US Geological Survey. Within the next few years, we plan to merge results, broaden our scale of comparison, and provide our collaborators with an easily accessible and more dynamic dataset.

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Appendix A. List of all bird species observed in the Black Hills from 2001-2005, with management designation and species totals.

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2005						Total #individuals observed per year (in all habitats surveyed[5])				
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	BU	FR	MR	PN	PS	WS	2001	2002	2003	2004	2005
Canada Goose					B	0	0	1	0	0	0	OT	35	2	2	1
Wood Duck					B	0	0	0	1	0	0	4	13	--	--	1
Gadwall					PB	0	0	0	0	0	0	--	1	--	--	0
Mallard					B	0	7	12	2	1	0	36	84	5	3	22
Blue-winged Teal					PB	0	0	0	0	0	0	OT	--	--	--	0
Northern Shoveler					PB	0	0	0	0	0	0	OT	OT	--	--	0
Ring-necked Duck					PB	0	0	0	0	0	0	2	--	--	--	0
Hooded Merganser					TM	0	0	0	0	0	0	--	1	--	--	0
Common Merganser					B	0	9	0	0	0	0	8	9	--	--	9
Gray Partridge					B	0	0	0	0	0	0	1	4	--	--	0
Ring-necked Pheasant					B	0	0	0	0	0	0	15	2	--	--	0
Ruffed Grouse	MIS				B	0	0	0	3	0	1	44	62	15	6	4
Sharp-tailed Grouse		CS, RS, WY-1			B	1	0	0	0	0	0	--	2	--	25	1
Wild Turkey					B	1	3	4	7	13	1	112	69	45	47	29
Northern Bobwhite					B	0	0	0	0	0	0	--	1	--	--	0
Pied-billed Grebe					PB	0	0	0	0	0	0	1	--	--	--	0
Western Grebe					PB	0	0	0	0	0	0	OT	1	--	--	0
American White Pelican				SoGCN	TM	0	0	0	0	0	0	--	--	--	--	0
Double-crested Cormorant					PB	0	0	0	0	0	0	OT	--	--	--	0
American Bittern		WY-I			B	0	0	0	0	0	0	1	1	--	--	0
Great Blue Heron					B	0	3	7	1	0	1	9	23	18	4	12
Turkey Vulture					B	2	36	17	11	18	4	76	100	17	43	88
Osprey				SoGCN	B	0	2	0	2	0	0	2	OT	--	--	4
Northern Harrier	R2SS	RC			B	0	0	0	0	0	0	1	OT	--	--	0

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2005						Total #individuals observed per year (in all habitats surveyed[5])				
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	BU	FR	MR	PN	PS	WS	2001	2002	2003	2004	2005
Sharp-shinned Hawk	SOLC				B	0	0	1	0	2	0	2	4	3	6	3
Cooper's Hawk	SOLC				B	3	2	0	0	4	0	8	4	3	7	9
Northern Goshawk	R2SS	RC, WY-I		SoGCN	B	0	2	4	4	4	1	14	5	8	10	15
Unidentified Accipiter						0	0	0	0	0	0	4	2	2	3	0
Broad-winged Hawk	SOLC				B	0	3	7	5	0	4	3	6	--	24	19
Red-tailed Hawk					B	10	12	10	5	14	6	41	42	32	43	57
Golden Eagle		RC	BCC-BCR17		B	0	2	0	0	0	0	1	2	1	--	2
American Kestrel					B	8	1	5	0	6	0	8	14	11	22	20
Merlin		WY-II			B	0	0	0	0	0	0	--	1	--	OT	0
Prairie Falcon			BCC-BCR17		B	1	2	4	0	2	0	2	6	2	6	9
Unidentified Falcon						0	0	0	0	0	0	1	1	--	--	0
Unidentified Raptor						0	0	0	0	0	0	6	4	1	--	0
Sora					B	0	0	0	0	0	0	OT	OT	--	--	0
American Coot					B	0	0	0	0	0	0	OT	OT	--	--	0
Killdeer					B	0	1	0	0	1	2	9	19	1	9	4
Solitary Sandpiper					TM	0	0	0	0	0	0	--	OT	--	--	0
Spotted Sandpiper					B	0	0	0	0	0	0	OT	6	4	OT	0
Upland Sandpiper		WY-I	BCC-BCR17		B	0	0	0	0	0	0	4	20	--	19	0
Pectoral Sandpiper					TM	0	0	0	0	0	0	25	--	--	--	0
Wilson's Snipe					B	0	1	4	0	0	0	13	8	6	--	5
Franklin's Gull		WY-I			TM	0	0	0	0	0	0	--	1	--	--	0
California Gull					PB	0	0	0	0	0	0	OT	--	--	--	0
Rock Pigeon					B	0	7	0	0	1	0	9	15	7	1	8
Mourning Dove					B	19	59	3	8	76	1	212	372	120	273	166
Black-billed Cuckoo		RC, WY-II	BCC-BCR17		B	0	0	0	0	0	0	2	OT	--	--	0

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2005						Total #individuals observed per year (in all habitats surveyed[5])				
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	BU	FR	MR	PN	PS	WS	2001	2002	2003	2004	2005
Yellow-billed Cuckoo	R2SS	WY-II			B	0	0	0	0	0	0	--	OT	--	--	0
Flammulated Owl	R2SS	CWL			B	0	0	0	0	0	0	--	OT	--	--	0
Eastern Screech-Owl		WY-II			B	0	0	0	0	0	0	--	--	--	--	0
Great Horned Owl					B	0	1	0	0	1	0	3	2	2	2	2
Burrowing Owl	R2SS	RC, WY-I	BCC-BCR17	SoGCN	B	0	0	0	0	0	0	--	OT	--	1	0
Long-eared Owl					B	0	0	0	0	0	0	1	--	OT	--	0
Northern Saw-whet Owl	SOLC				B	0	0	0	0	0	0	1	OT	OT	1	0
Unidentified Owl						0	0	0	0	0	0	1	--	--	--	0
Common Nighthawk					B	4	18	4	4	4	0	27	20	8	36	34
Common Poorwill					B	0	0	0	0	0	0	OT	OT	OT	--	0
Chimney Swift					B	0	0	0	0	0	0	OT	--	--	--	0
White-throated Swift		CC, CWL, WY-II			B	6	301	96	4	16	17	124	302	166	142	440
Broad-tailed Hummingbird		WY-II			B	0	0	1	2	0	3	--	3	2	OT	6
Belted Kingfisher					B	0	8	9	1	1	2	29	17	10	OT	21
Lewis's Woodpecker	R2SS	CC, RC, CWL, WY-II	BCC-BCR17	SoGCN	B	8	0	0	0	0	0	3	4	9	4	8
Red-headed Woodpecker		CC, RC, CWL			B	52	1	8	1	4	0	25	39	51	53	66
Unidentified Sapsucker						0	0	0	0	0	0	--	--	--	--	0
Red-naped Sapsucker		WY-II	BCC-BCR17		B	7	26	49	79	27	21	389	222	245	212	209
Downy Woodpecker					B	8	6	17	5	1	1	31	29	25	17	38
Hairy Woodpecker					B	142	29	34	64	65	52	349	469	446	360	386

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2005						Total #individuals observed per year (in all habitats surveyed[5])				
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	BU	FR	MR	PN	PS	WS	2001	2002	2003	2004	2005
American Three-toed Woodpecker	R2SS	WY-II		SoGCN	B	0	0	3	0	0	44	12	26	44	8	47
Black-backed Woodpecker	MIS, R2SS	RC, WY-II		SoGCN	B	32	0	3	3	7	1	24	134	75	68	46
Black-backed or Three-toed Woodpecker						0	0	0	0	0	0	--	7	1	--	0
Northern Flicker					B	227	23	55	50	47	44	239	238	230	266	446
Unidentified Woodpecker						0	0	0	0	0	0	164	96	77	52	0
Western Wood-Pewee					B	130	57	45	91	53	4	182	367	379	339	380
Alder Flycatcher					TM	0	0	0	0	0	0	--	2	1	--	0
Least Flycatcher					B	0	9	2	1	2	0	5	11	6	2	14
Hammond's Flycatcher		WY-II			VB	0	5	1	0	0	0	--	--	OT	OT	6
Dusky Flycatcher		WY-II			B	156	152	308	156	128	32	1154	1421	723	715	932
Cordilleran Flycatcher		WY-II			B	0	231	102	46	2	73	292	364	325	96	454
Eastern Phoebe					B	0	4	0	0	0	0	3	1	--	1	4
Say's Phoebe		RS			B	0	0	0	0	0	0	1	--	--	1	0
Cassin's Kingbird		WY-II			B	0	0	0	0	0	0	OT	OT	--	1	0
Western Kingbird					B	5	4	0	0	0	0	6	7	5	18	9
Eastern Kingbird					B	2	13	1	0	0	0	37	79	8	15	16
Unidentified Flycatcher						0	0	0	0	0	0	5	1	--	1	0
Loggerhead Shrike	R2SS	RC, WYII			B	0	0	0	0	0	0	2	--	--	--	0
Plumbeous Vireo		WY-II			B	54	36	27	27	127	1	346	400	236	166	272
Warbling Vireo					B	51	412	484	458	114	67	1844	1965	963	1072	1586
Red-eyed Vireo					B	0	140	54	22	0	0	210	228	102	35	216
Unidentified Vireo						0	0	0	0	0	0	1	--	--	--	0
Gray Jay					B	15	4	6	37	32	40	270	197	204	129	134
Blue Jay					B	3	22	9	5	0	0	96	65	34	22	39
Pinyon Jay		CC, RC, CWL			B	0	0	0	0	3	0	13	47	7	56	3

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2005						Total #individuals observed per year (in all habitats surveyed[5])				
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	BU	FR	MR	PN	PS	WS	2001	2002	2003	2004	2005
Clark's Nutcracker					B	7	4	0	0	23	0	32	65	10	31	34
Black-billed Magpie		RC			B	0	2	0	0	0	0	2	1	--	26	2
American Crow					B	26	5	23	12	42	34	310	260	194	181	142
Horned Lark					B	0	0	0	0	0	0	7	5	--	11	0
Tree Swallow					B	0	0	5	0	1	1	14	30	8	4	7
Violet-green Swallow					B	18	206	130	3	37	0	240	582	176	256	394
Northern Rough-winged Swallow		RC			B	0	8	1	0	0	0	1	17	--	13	9
Bank Swallow					B	0	0	0	0	0	0	1	1	--	1	0
Cliff Swallow					B	0	0	0	0	3	0	21	7	--	28	3
Barn Swallow					B	0	4	7	0	0	0	8	26	5	8	11
Unknown Swallow						0	0	0	0	0	0	--	--	--	8	0
Black-capped Chickadee					B	86	174	125	221	199	128	943	1126	676	470	933
Red-breasted Nuthatch					B	77	165	126	243	247	152	1400	1537	831	466	1010
White-breasted Nuthatch					B	82	13	21	20	89	6	215	271	337	162	231
Pygmy Nuthatch	SOLC	WY-II			B	2	0	0	0	2	0	3	2	--	1	4
Brown Creeper	MIS	WY-II			B	9	18	15	30	13	45	153	145	136	96	130
Rock Wren					B	91	21	6	2	39	1	31	105	47	196	160
Canyon Wren					B	0	18	6	0	2	1	17	59	21	14	27
House Wren					B	108	10	32	12	16	0	64	148	79	124	178
Winter Wren					B	0	0	0	0	0	3	--	2	1	--	3
American Dipper	SOLC	WY-II		SoGCN	B	0	2	1	0	0	2	OT	3	4	OT	5
Golden-crowned Kinglet	MIS	WY-II			B	0	29	38	25	1	251	131	99	224	55	344
Ruby-crowned Kinglet					B	0	78	207	108	9	603	581	912	716	219	1005
Blue-gray Gnatcatcher					B	0	0	0	0	0	0	2	2	1	15	0
Eastern Bluebird					B	54	0	1	4	4	0	49	57	57	74	63
Mountain Bluebird		RC			B	211	1	19	2	90	8	148	171	117	291	331

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2005						Total #individuals observed per year (in all habitats surveyed[5])				
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	BU	FR	MR	PN	PS	WS	2001	2002	2003	2004	2005
Unidentified Bluebird						0	0	0	0	0	0	5	--	54	7	0
Townsend's Solitaire		WY-II			B	100	59	42	149	192	66	727	854	788	537	608
Veery					B	1	11	52	7	0	2	64	94	104	28	73
Swainson's Thrush					B	1	70	82	39	1	212	510	448	507	169	405
Hermit Thrush					VB	0	0	0	0	0	2	2	1	1	4	2
American Robin					B	378	334	352	286	198	379	2011	2139	1692	984	1927
Gray Catbird					B	0	18	24	1	0	0	27	20	27	--	43
Brown Thrasher					B	0	0	0	0	0	0	8	3	3	3	0
European Starling					B	2	31	6	0	2	2	2	22	--	18	43
Cedar Waxwing					B	0	31	19	2	0	10	64	131	61	43	62
Golden-winged Warbler					VB	0	0	2	0	0	0	--	OT	--	--	2
Tennessee Warbler					TM	0	0	0	0	0	0	--	32	--	3	0
Orange-crowned Warbler					VB	0	0	0	0	0	0	--	1	--	--	0
Virginia's Warbler		CWL			B	1	0	0	0	5	0	44	80	2	185	6
Northern Parula					VB	0	0	0	0	0	0	2	--	1	--	0
Yellow Warbler					B	0	69	38	2	5	0	90	218	35	8	114
Chestnut-sided Warbler					B	0	1	0	2	0	0	7	2	2	--	3
Magnolia Warbler					VB	0	0	0	0	0	0	1	--	--	--	0
Black-throated Blue Warbler					VB	0	0	0	0	0	0	--	1	--	--	0
Yellow-rumped Warbler					B	156	114	141	488	462	311	2134	2493	1845	867	1672
Black-and-white Warbler	SOLC				B	0	3	0	3	0	0	7	8	2	3	6
American Redstart					B	0	311	244	50	1	0	432	407	242	95	606
Ovenbird					B	7	409	290	315	144	21	1631	1723	841	946	1186
Mourning Warbler					VB	0	0	0	0	0	0	OT	--	--	--	0

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2005						Total #individuals observed per year (in all habitats surveyed[5])				
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	BU	FR	MR	PN	PS	WS	2001	2002	2003	2004	2005
MacGillivray's Warbler		WY-II			B	3	62	105	42	0	15	353	267	206	103	227
Common Yellowthroat					B	0	94	172	13	1	41	187	278	219	30	321
Hooded Warbler					VB	0	0	0	0	0	0	OT	OT	--	--	0
Yellow-breasted Chat					B	0	29	0	0	0	0	24	73	4	25	29
Western Tanager					B	168	108	72	157	169	22	819	936	869	536	696
Spotted Towhee					B	13	107	67	7	26	1	366	633	152	431	221
Chipping Sparrow					B	664	178	180	309	379	313	1247	1652	1536	1340	2023
Clay-colored Sparrow					TM	0	0	0	0	0	0	OT	2	--	4	0
Field Sparrow					B	0	0	0	0	0	0	2	1	1	5	0
Vesper Sparrow		RC, RS, WY-II			B	163	0	1	1	30	9	197	371	131	394	204
Lark Sparrow		WY-II			B	12	9	0	0	25	0	25	87	21	109	46
Lark Bunting		RC, CS, RS, WY-II		SoGCN	B	5	0	0	0	0	0	2	OT	--	2	5
Grasshopper Sparrow	MIS, R2SS	RC, CS, RS, CWL WY-II	BCC-BCR17		B	0	0	0	0	0	0	6	75	--	121	0
Song Sparrow	MIS				B	0	79	229	5	0	83	205	268	258	34	396
White-crowned Sparrow					TM	0	0	0	0	0	0	--	--	1	--	0
Dark-eyed Junco				SoGCN	B	402	96	102	288	233	211	1631	1522	1321	932	1332
Unidentified Sparrow						0	0	0	0	0	0	1	1	--	12	0
Northern Cardinal					VB	0	0	0	0	0	0	--	OT	1	--	0
Rose-breasted Grosbeak					B	0	0	0	0	1	0	2	1	1	--	1
Black-headed Grosbeak					B	1	147	82	20	3	6	231	326	118	36	259
Blue Grosbeak					B	0	0	0	0	0	0	1	--	--	--	0
Lazuli Bunting					B	0	10	9	0	0	0	13	50	13	7	19
Indigo Bunting					B	0	0	0	0	0	0	4	1	--	--	0

	Special Management Designation[2]					Total #individuals observed per habitat[4], 2005						Total #individuals observed per year (in all habitats surveyed[5])				
Common Name[1]	USFS	PIF	USFWS	SDGFP	status[3]	BU	FR	MR	PN	PS	WS	2001	2002	2003	2004	2005
Dickcissel		CC, RC, CWL WY-II	BCC-BCR17		B	0	0	0	0	0	0	3	11	--	--	0
Bobolink		WY-II			B	0	0	10	0	0	1	--	17	10	6	11
Red-winged Blackbird					B	8	42	67	4	4	8	204	299	84	21	133
Western Meadowlark		RS			B	116	28	3	0	49	1	104	475	44	872	197
Yellow-headed Blackbird					B	0	0	0	0	0	0	--	5	--	1	0
Brewer's Blackbird					B	0	7	12	1	1	0	23	33	13	74	21
Common Grackle					B	0	3	0	0	1	0	59	64	6	8	4
Brown-headed Cowbird					B	220	100	71	87	191	23	719	848	607	486	692
Orchard Oriole					B	0	6	0	0	0	0	27	18	1	OT	6
Bullock's Oriole					B	0	12	1	1	1	0	19	21	--	1	15
Cassin's Finch					B	4	1	0	0	6	1	21	7	4	4	12
House Finch					B	0	1	0	0	0	0	1	12	--	--	1
Red Crossbill					B	94	100	75	241	298	127	2861	5358	1140	1812	935
White-winged Crossbill					B	0	0	0	3	2	10	13	12	14	--	15
Pine Siskin					B	48	76	134	99	47	116	780	655	173	38	520
Lesser Goldfinch					B	0	0	0	0	0	0	--	--	OT	--	0
American Goldfinch					B	27	26	16	7	57	0	134	216	76	60	133
Evening Grosbeak					B	0	0	0	0	1	0	9	--	--	OT	1
Unidentified Finch						0	0	0	0	0	0	2	--	--	--	0
House Sparrow					B	0	0	0	0	0	0	2	1	--	--	0
Unidentified bird species						0	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, SOLC=Species of Local Concern; PIF=Partners In Flight (from the Species Assessment Database version 2005 found at www.rmbo.org, for BCR17 and in order of priority from highest to lowest) CC=Continental Concern Species,

RC=Regional Concern Species, CS=Continental Stewardship Species, RS = Regional Stewardship Species, CWL = Continental Watch List, WY-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, SoGCN=Species of Greatest Conservation Need (South Dakota Comprehensive Wildlife Conservation Plan 2005).

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

[4] Habitats: BU=burn areas; FR=foothill riparian; MR=mid-elevation riparian; PN=ponderosa pine (north); PS=ponderosa pine (south); WS=white spruce

[5] The number and types of habitats surveyed each year may vary. OT=species detected off transect only, through casual observation.