Monitoring the Birds of the Black Hills: Year 1

Final Report

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Executive Summary

In 2001, Rocky Mountain Bird Observatory, in conjunction with its funding partner, Black Hills National Forest, began implementation of the *Monitoring the Birds of the Black Hills* program, as delineated by Panjabi et al. (2001). The goal of this program is to provide rigorous population trend data on most breeding bird species in the Black Hills. Additionally, it will provide other information helpful in managing bird populations.

We established 261 point transects, consisting of up to 15 point counts each, in 10 habitats within Black Hills National Forest. We sampled bird communities at 3,319 locations along these transects and observed a total of 132 bird species, many of which were recorded on few occasions. The habitat-stratified point transects provided excellent results on 51 bird species (coefficients of variation of ≤50% in at least one habitat), indicating these species should be effectively monitored through this technique. This represents approximately 38% of the total number of species that may breed in the Black Hills region. Modifications to the current plan should increase this percentage.

Because this is only the first year of a long-term monitoring effort, it is too soon to assess, based solely on our results, whether population sizes of birds are changing. However, one species, the American Dipper, stands out as being in need of immediate conservation measures. The American Dipper suffers from excess stream siltation and pollution, and inadequate water flows, especially in winter. It has been extirpated from several watersheds in which it formerly occurred, and the remaining individuals now exist almost entirely in one creek. Immediate efforts must be undertaken to prevent this species from being extirpated from the Black Hills.

Introduction

Long-term population monitoring provides information critical to the effective management and conservation of bird populations. The Black Hills hosts a unique assemblage of birds, and as a region, has a high responsibility for conserving populations of some species. In 2001, Rocky Mountain Bird Observatory (RMBO), in cooperation with its partner Black Hills National Forest (BHNF), began implementation of a habitat-based, bird-monitoring program designed to provide rigorous population trend data on most regularly-occurring breeding species in the Black Hills and informative status data on others (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, will generate a wealth of ancillary data useful in managing birds (e.g., habitat associations and geographic distribution). This report details the findings from the first year of what is the start of a long-term, cooperative effort to monitor bird populations in the Black Hills.

The Habitats

With input from U.S. Forest Service and other biologists, we selected 10 habitats on the Black Hills National Forest in which to initiate our monitoring effort in the Black Hills: Aspen (AS), Burn Area (BU), Ponderosa Pine, northern hills (PN), Ponderosa Pine, southern hills (PS), Late-successional Pine (LS), Mixed-grass Prairie (MG), Riparian (RI), Shrubland (SH), Wet Meadow (WM) and White Spruce (WS) (Figure 1). In order that most bird species are adequately represented in the monitoring scheme, we selected habitats on the basis of the unique components contributed by each habitat to the total breeding avifauna in the Black Hills. Property ownership and level of management interest in the habitat was also a factor in our selection. Because not all habitats were included, we acknowledge that species occurring primarily in other habitats will not be well sampled under the current plan. However, we may allocate effort toward those species and/or habitats in the future. A brief description of each of the selected habitats follows.

Aspen

Aspen habitat (AS) consists of forest stands dominated by quaking aspen (*Populus tremuloides*), ranging in seral stage from 'shrub-seedling' to 'old-growth' (Buttery and Gillam 1983). Aspen stands are not monotypic; other tree species that typically occur within or adjacent to AS include ponderosa pine (*Pinus ponderosa*), white spruce (*Picea glauca*), and paper birch (*Betula papyrifera*). Stands of quaking aspen in the Black Hills are typically small and most not support 15 count stations. Many aspen stands have a woody understory, consisting of a variety of plants including common juniper (*Juniperus communis*), beaked hazelnut (*Corylus cornuta*), gooseberry (*Ribes* spp.), and choke cherry (*Prunus virginiana*). Other stands have only herbaceous understories.

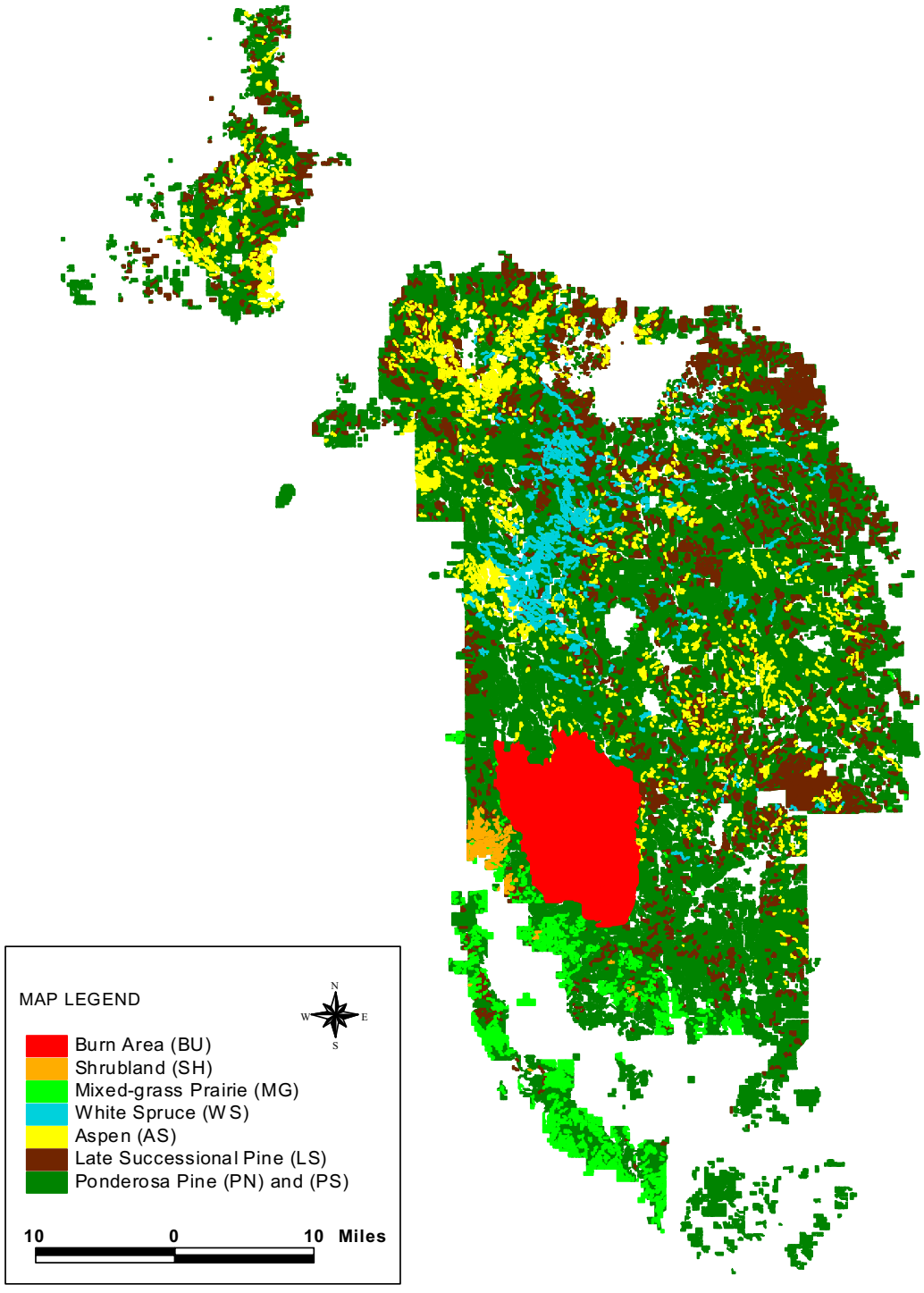


Figure 1. Distribution of habitats selected for bird monitoring under *Monitoring the Birds of the Black Hills*, 2001 (note: Riparian and Wet meadow habitats are not included).

Burn Area

Burn Area habitat (BU) is located within areas affected by the Jasper Fire, which consumed approximately 83,000 acres in 2000 and thus represents a one-year post-burn environment. The Jasper Burn Area is a mosaic of patches of charred, heat-killed, and live trees (mostly ponderosa pine) that ranged in seral stage from 'shrub-seedling' to 'mature' (Buttery and Gillam 1983) prior to being burned. In most places, ground cover or understory vegetation is absent.

Ponderosa Pine, northern hills

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

Ponderosa Pine, southern hills

Ponderosa Pine, southern hills (PS), or "Pine-south," refers to the arid forest dominated by ponderosa pine occurring south of the Northern Hills Ranger District. Similar to Pine-north, this habitat incorporates natural variations in the landscape, such as small groves of aspen or oak, drainages with birch and hazelnut, and riparian corridors. Nonetheless, transects in this habitat primarily sample pine forest. The southern hills receive less rainfall than do the northern hills, and the southern pine forest often has a grassy understory, and lacks any significant woody undergrowth.

Late-successional Pine

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

Mixed-grass Prairie

Mixed-grass Prairie (MG) refers to the expansive, treeless areas of the Black Hills that are dominated by a variety of native, upland grasses, such as blue grama (*Bouteloua gracilis*) western wheatgrass (*Pascopyrum smithii*), and junegrass (*Koeleria macrantha*) (Larson and Johnson 1999). Mixed-grass prairies are fairly common within the Black Hills, especially in the south, although much of this habitat is in private ownership. Some of these grasslands are contiguous with the surrounding prairie of the Great Plains; others are completely surrounded by the forests of the Black Hills, and are isolated from the larger prairie landscape.

Riparian

The term "riparian" refers to narrow strips of lush vegetation that typically occur along streams and rivers that are dominated by tree species such as cottonwoods (*Populus* spp.), willows (*Salix* spp.), bur oak (*Quercus macrocarpa*) and green ash (*Fraxinus pennsylvanica*). These communities can have a substantial coniferous component as well. Riparian habitats (RI) contrast markedly with the drier landscapes they bisect, but the vegetative composition and structure can vary dramatically depending on elevation. Consequently, bird communities can also vary greatly among riparian types. As a first-year effort, we decided to sample riparian habitats as a single category in order to assess whether differences exist among the riparian bird communities in the Black Hills, and if so, whether the habitat should be stratified by elevation in future efforts.

Shrubland

Shrubland (SH) refers primarily to the arid canyon habitats that are limited to the southwestern Black Hills. They are typically dominated by Rocky Mountain juniper (*Juniperus scopulorum*), mountain mahogany (*Cercocarpus montanus*), and skunkbrush (*Rhus trilobata*), often with a sparse component of ponderosa pine. Some sites in this category are dominated by silver sagebrush (*Artimisia cana*) or other low woody shrubs.

Wet Meadow

Wet Meadow (WM) includes a variety of open meadow habitats that are dominated by grasses and sedges, often with a substantial component of snowberry (*Symphoricarpos occidentalis*), and typically occurring in valley bottoms. These meadows are frequently narrow and linear, much like RI, and vary from less than 100 meters to several hundred meters in width. Although these areas were classified as wet meadows in BHNF databases, in reality many of these meadows are not "wet" at all. However, in keeping with the convention of the original classification, we report this habitat as Wet Meadow to avoid possible confusion.

White Spruce

White Spruce (WS) refers to areas dominated by white spruce (*Picea glauca*), also known as Black Hills spruce. This habitat typically occurs at mid- to high elevations, often on cool north-facing slopes and in drainages. Most of this habitat occurs in the north-central and western Black Hills, although some pockets exist in the south near Custer, SD. These stands can be monotypic or mixed with ponderosa pine and aspen.

Methods

Field Personnel

Personnel that executed the field component of *MBBH* consisted of 10 highly skilled field biologists with excellent aural and visual bird-identification skills. Each was trained at the beginning of the season to ensure full understanding of the field protocol and that his/her distance-estimation skills met our requirements (within 10% of true value).

Survey Techniques

We conducted point transects (Buckland et al. 1993) in 10 habitats, as outlined by Panjabi et al. (2001), in order to sample bird populations in the Black Hills. In each habitat, we established transects of up to 15 count stations in each of 30 randomly selected stands (sites). BHNF staff identified potential stands using vegetation data layers from Geographic Information System databases. Potential stands were: 1) located on Black Hills National Forest; 2) representative of the targeted habitat type; 3) a minimum of 80 acres in size; and 4) accessible within 3 miles of a road. Additional stands were randomly selected as back-up sites for stands that had to be replaced after ground-truthing revealed they were inconsistent with other stands in that type or were inaccessible.

One observer surveyed each transect using protocol described by Leukering (2000). All surveys along transects were conducted in the morning, between ½ hour before sunrise and 11 AM, although 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. During this pre-survey visit, observers established an access point for each stand and used a random numbers table to select: 1) a bearing that would take the transect into the selected stand, and 2) a distance (between 0-400 m) at which the first count station would be located from the access point. In the morning, the observer would conduct the survey beginning at the first count station and follow the pre-selected bearing. In many cases, the original bearing would eventually lead the trensect 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 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 linear stands, the narrowness of the stand determined the location and bearing of the transect.

Observers conducted up to 15 five-minute point counts at stations located at 250 m intervals along each transect. All birds detected within the five-minute period were recorded on standardized forms. Fly-overs (birds flying over, but not using the immediate surrounding landscape) were recorded, but excluded from analyses. For each bird observed, we recorded species, sex, how it was detected (e.g., call, song, drumming, etc.), and radial distance (i.e., from observer to bird). Distances were measured using laser rangefinders, whenever possible. The transect intervals between count stations were treated as a line transect, and along these intervals we recorded individuals of a short list of low-density species and estimated the perpendicular distance to each from the transect line. We also recorded perpendicular distances for the same low-density species when they were detected at count stations. Individual birds initially detected on points were not recorded between points.

Observers recorded weather 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. Distances between count stations were measured using hand-held Garmin™ Global Positioning System units. At each count station, observers recorded: UTM coordinates, whether or not the station was within 100m of a road, the two dominant habitat types in the area and the seral stage and canopy closure of each (Buttery and Gillam 1983), and the two dominant understory types and percentage of each within a 50 m radius around the point. These data were recorded prior to performing each bird count.

Data Analysis

We used program DISTANCE (Thomas et al. 1998-99) to analyze the data collected at point counts. In this report, all density estimates (*D*) were generated by program DISTANCE using only data collected at count stations. The notation, concepts, and analysis methods of DISTANCE were developed by Buckland et al. (1993). We performed DISTANCE analyses on each species in each habitat for which there was a minimum of 23 observations (not including outliers), as recorded from count stations on point transects. 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., 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.

Although it was our intention, we do not present the line transect data collected in between count stations in this report. We did not include these data after discovering that line transect and point transect data for the same species, sometimes produced inconsistent results. We believe these inconsistencies resulted from differences in accuracy between measuring (or estimating) radial distances from count stations and estimating perpendicular distances from the transect line either ahead of or behind the

observer. Therefore, for certain low-density species that are of management interest, but for which an insufficient number was observed to estimate density, we present our findings in the form of an abundance index, standardized per unit of effort (i.e., number of birds/100 km of transect).

Results

We conducted a total of 3,319 point counts along 261 point transects (Figure 2) in 10 different habitats (Table 1). The numbers of point transects per habitat varied, ranging from four in Mixed-grass Prairie to 35 in Riparian. We observed a total of 29,468 birds of 132 species on point transects. We observed an additional four species outside of point transects. A complete list of all bird species found in the Black Hills during breeding season in 2001 is provided (Appendix A). The numbers of species observed per habitat varied, ranging from 39 in Mixed-grass Prairie to 107 in Riparian. In most habitats, many of the species observed were peripheral to that habitat and not well represented in the samples. Other species were observed in such low numbers that it was not possible to estimate density. A breakdown of the results, by habitat, follows. In order to make this report more useful, we also present our results at the species level in the section "Species Accounts."

Table 1. Survey effort, cumulative species totals, and average species richness per count in habitats surveyed for *MBBH*, 2001.

Habitat	# point transects	# point counts	# species observed	Avg. species richness/count
Aspen	31	334	53	6.5
Burn Area	32	456	62	5.9
Late-successional Pine	28	359	62	6.3
Mixed-grass Prairie	4	51	39	4.3
Pine-north	31	411	65	7.7
Pine-south	27	389	66	6.3
Riparian	35	433	107	8.1
Shrubland	24	223	59	6.9
Wet Meadow	25	338	67	7.0
White Spruce	24	325	56	7.5
Totals	**261**	**3,319**	**132**	**---**

Aspen (AS)

We established 31 point transects in aspen forest and conducted 334 counts along those transects. We observed a total of 53 species with an average of 6.5 species per count station. We obtained robust density estimates (i.e., CV <50%) for 23 species (Table 2). Warbling Vireo occurred in highest density relative to other species in this habitat. Several species occurred in highest density in Aspen relative to other habitats, including Red-naped Sapsucker, Warbling Vireo, Ovenbird, and Dark-eyed Junco.

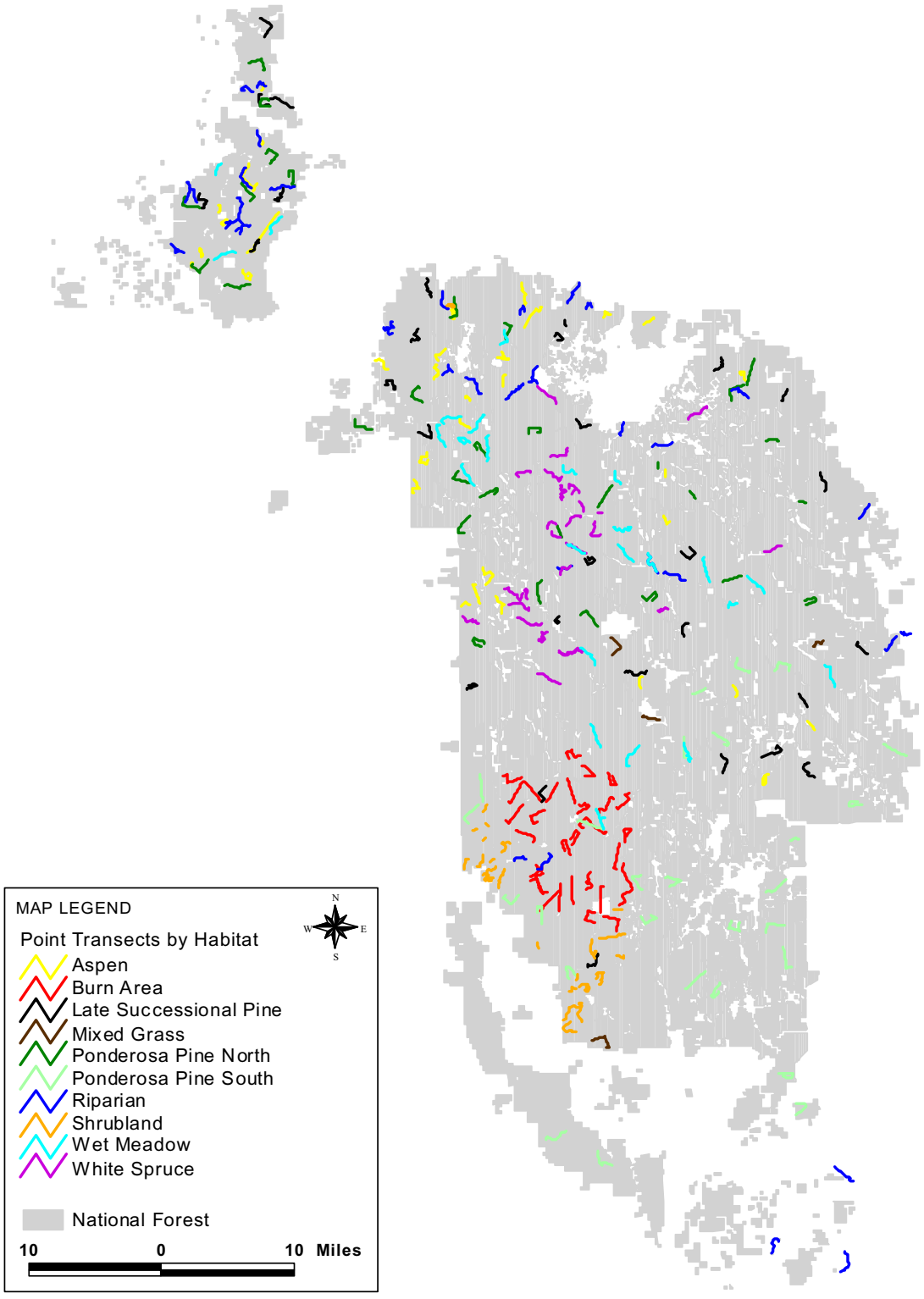


Figure 2. Distribution of habitat-based point transects under *Monitoring the Birds of the Black Hills*, 2001.

Table 2. Estimated densities of breeding birds in Aspen forests on Black Hills National Forest, 2001.

Species	*D*	LCL	UCL	CV (%)	n
Warbling Vireo	77.5	65.6	91.6	9	392
Ovenbird	41.6	34.1	50.7	10	383
Dark-eyed Junco	27.7	21.8	35.3	12	157
Yellow-rumped Warbler	27.5	21.7	34.8	12	138
Red Crossbill	27.1	18.1	40.5	21	193
Pine Siskin	22.7	9.4	54.9	46	41
Chipping Sparrow	19.8	14.0	28.2	18	78
Black-capped Chickadee	19.0	13.6	26.5	17	88
Dusky Flycatcher	18.9	10.5	34.1	30	124
American Robin	18.8	14.1	25.2	15	159
American Redstart	14.3	9.6	21.5	21	59
Red-naped Sapsucker	13.8	8.6	22.1	24	50
Red-breasted Nuthatch	10.9	8.1	14.6	15	128
MacGillivray's Warbler	8.6	5.6	13.1	22	40
Cordilleran Flycatcher	7.9	4.1	15.1	33	27
Brown-headed Cowbird	5.8	3.6	9.4	24	40
Gray Jay	5.6	2.6	12.0	40	25
Black-headed Grosbeak	4.6	2.8	7.8	26	31
Western Tanager	4.3	2.8	6.5	21	58
Townsend's Solitaire	3.7	2.3	5.9	24	34
Swainson's Thrush	3.0	2.0	4.6	21	65
Ruby-crowned Kinglet	2.2	1.3	3.8	27	27
American Crow	0.5	0.3	0.7	21	48

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 *D*

Burn Area (BU)

We established 32 point transects in Burned Areas and conducted 456 counts along those transects. All transects were within the 2000 Jasper Burn Area. We observed a total of 62 species with an average of 5.9 species per count station. We obtained robust density estimates (i.e., CV <50%) for 22 species (Table 3). Red Crossbill occurred in highest density relative to other species in this habitat. At least two species, Townsend's Solitaire and Eastern Bluebird, occurred in highest density in Burn Area relative to other habitats.

Several other species were observed in numbers too small to estimate density but they were recorded from Burn Areas in greater numbers than in any other habitat. Among these were Black-backed Woodpecker (*n*=9), Red-headed Woodpecker (*n*=24), Clark's Nutcracker (*n*=9), Cassin's Finch (*n*=12), and Evening Grosbeak (*n*=6). These observations suggest that Burn Areas may provide important habitat for several low-density species in the Black Hills.

Table 3. Estimated densities of breeding birds in Burn Areas (1 yr post-burn) on Black Hills National Forest, 2001.

Species	*D*	LCL	UCL	CV (%)	*n*
Red Crossbill	53.0	36.7	76.5	19	285
Chipping Sparrow	41.1	28.2	59.8	19	191
Yellow-rumped Warbler	27.9	24.0	32.5	8	387
Dark-eyed Junco	20.4	16.5	25.3	11	261
Pine Siskin	19.3	8.5	44.0	43	60
American Robin	17.1	14.1	20.7	10	320
Western Tanager	9.8	7.8	12.4	12	163
Townsend's Solitaire	8.7	6.7	11.3	13	184
Black-capped Chickadee	8.1	6.0	10.8	15	103
Dusky Flycatcher	6.2	4.5	8.4	16	76
Plumbeous Vireo	4.2	3.0	5.9	17	51
Warbling Vireo	3.2	2.0	5.0	23	50
Mountain Bluebird	2.9	1.8	4.8	26	52
Eastern Bluebird	2.6	1.4	5.1	34	27
Gray Jay	2.4	1.3	4.4	32	27
Red-breasted Nuthatch	2.4	1.6	3.5	19	65
White-breasted Nuthatch	1.8	1.3	2.6	18	37
Hairy Woodpecker	1.7	1.0	3.0	28	26
Vesper Sparrow	1.7	1.1	2.5	20	38
Western Wood-Pewee	1.1	0.6	2.0	32	32
Northern Flicker	1.0	0.5	2.1	39	37
American Crow	0.4	0.2	0.5	20	39

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 *D*

Late-successional Pine (LS)

We established 28 point transects in Late-successional Pine forest and conducted 359 counts along those transects. We detected a total of 62 species with an average of 6.3 species per count station. We obtained robust density estimates (i.e., CV <50%) for 21 species (Table 4). Yellow-rumped Warbler occurred in highest density relative to other species in this habitat. At least two species, Brown Creeper and Yellow-rumped Warbler, occurred in highest density in Late-successional Pine relative to other habitats.

Although great care was taken to stay within the boundaries of the stands (as identified and delineated by BHNF using their GIS database), many of the areas included in these stands were not Late-successional Pine habitat. In fact, only 52% of the count stations within these stands were surrounded by habitat classified as late-successional seral stage (4c or 5, Buttery and Gillam 1983). Despite this shortcoming, some differences in the bird communities between this and other habitats are apparent. Most notable is the high density of Brown Creepers in Late-successional Pine, more than twice that in any other habitat. We did not observe enough Brown Creepers in either the Pine-north or Pine-south habitats to estimate density. However, this is probably an indication that density is

significantly lower in those habitats. Interestingly, Yellow-rumped Warbler, which is common in almost all habitats, also occurred in higher density in Late-successional Pine habitat. One species that showed an opposite pattern is Chipping Sparrow, which occurred in lowest density in Late-successional Pine relative to other forested habitats.

Table 4. Estimated densities of breeding birds in Late-successional Pine forest on Black Hills National Forest, 2001.

Species	*D*	LCL	UCL	CV (%)	*n*
Yellow-rumped Warbler	40.5	33.2	49.5	10	263
Red Crossbill	28.9	22.0	38.0	14	233
Brown Creeper	20.4	12.2	34.1	27	34
Ovenbird	18.8	15.7	22.4	9	307
Red-breasted Nuthatch	17.3	13.7	21.8	12	237
Dark-eyed Junco	16.6	13.2	20.9	12	207
Warbling Vireo	16.5	13.2	20.7	12	196
Pine Siskin	12.9	7.9	20.9	25	48
Chipping Sparrow	11.8	7.9	17.6	20	62
American Robin	9.9	7.4	13.2	15	141
Western Tanager	8.9	6.7	11.6	14	109
Black-capped Chickadee	8.4	6.0	11.7	17	94
Dusky Flycatcher	6.0	3.9	9.2	22	52
Cordilleran Flycatcher	5.8	2.7	12.7	40	30
Townsend's Solitaire	5.3	3.8	7.5	17	103
Gray Jay	5.0	1.6	15.1	59	23
Swainson's Thrush	3.9	2.4	6.3	25	51
Red-naped Sapsucker	3.2	1.8	5.7	30	23
American Redstart	3.0	1.5	5.7	34	24
Brown-headed Cowbird	3.0	1.8	4.8	25	30

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 *D*

Mixed-grass Prairie (MG)

We established 4 point transects in Mixed-grass Prairies and conducted 51 counts along those transects. The low number of sites established in this habitat resulted from a shortage of pre-identified sites prior to the start of the field season, and a shortage in the availability of this habitat on Black Hills National Forest, as much of this habitat in the Black Hills is in private ownership or only accessible through private land. We detected a total of 39 species with an average of 4.3 species per count station. Many of the species recorded from Mixed-grass Prairie occurred in adjacent forested habitats and were not using the Mixed-grass Prairie habitat, although they may have been using the forest/prairie edge. We obtained robust density estimates (i.e., CV <50%) for two species (Table 5). Both species occurred in highest density in Mixed-grass Prairies relative to other habitats. A few other species were recorded in Mixed-grass Prairies that were either rare or absent in other habitats, including Gray Partridge, Killdeer, Black-billed Magpie, Tree Swallow, Horned Lark, and Lark Bunting. Additional effort at more sites should increase our ability to estimate density and detect trends for species in this habitat.

Table 5. Estimated densities of breeding birds in Mixed-grass Prairies on Black Hills National Forest, 2001.

Species	*D*	LCL	UCL	CV (%)	n
Vesper Sparrow	18.8	13.1	26.9	18	49
Western Meadowlark	9.1	5.8	14.3	23	44

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 *D*

Ponderosa Pine, northern hills (PN)

We established 31 point transects in Ponderosa Pine, northern hills (Pine-north) habitat and conducted 411 counts along those transects. We detected a total of 65 species with an average of 7.7 species per count station. We obtained robust density estimates (i.e., CV <50%) for 28 species (Table 6). Pine Siskin occurred in highest density relative to other species in this habitat. A few species occurred in highest density in Pine-north relative to other habitats, including Hairy Woodpecker, American Crow and Pine Siskin.

Because Pine-north habitat has a considerable deciduous component made up of aspen, oak, and other broad-leafed trees, many bird species associated with deciduous habitats were found here in fairly high density. This is reflected in the high species richness at each count station. Although average species richness is higher in Riparian habitat, many of the species recorded there actually occurred in adjacent forests.

Table 6. Estimated densities of breeding birds in Ponderosa Pine (northern hills) on Black Hills National Forest, 2001.

Species	*D*	LCL	UCL	CV (%)	*n*
Pine Siskin	42.5	21.6	83.6	35	130
Yellow-rumped Warbler	34.8	26.3	46.1	14	360
Warbling Vireo	34.3	29.7	39.6	7	425
Chipping Sparrow	28.6	21.5	38.1	15	156
Red Crossbill	27.6	20.5	37.3	15	213
Dark-eyed Junco	26.6	22.7	31.2	8	284
American Robin	23.7	19.5	28.9	10	247
Dusky Flycatcher	20.9	16.6	26.4	12	169
Ovenbird	16.8	14.0	20.2	9	307
Red-breasted Nuthatch	14.2	11.9	17.0	9	258
Brown-headed Cowbird	14.0	10.4	18.9	15	95
American Redstart	9.3	5.4	16.1	28	42
Red-eyed Vireo	7.9	4.4	14.3	30	32
Black-capped Chickadee	7.3	5.5	9.7	15	114
Red-naped Sapsucker	7.2	4.9	10.5	20	54
Townsend's Solitaire	6.6	5.0	8.5	13	116
MacGillivray's Warbler	6.6	4.4	9.9	21	41
Western Tanager	6.4	4.7	8.6	15	113
Hairy Woodpecker	6.3	2.5	16.1	49	33
Gray Jay	5.8	3.3	10.1	29	41
Cordilleran Flycatcher	3.8	2.0	7.0	32	23

Plumbeous Vireo	3.6	2.2	6.1	27	34
Ruby-crowned Kinglet	3.1	2.3	4.1	14	58
Black-headed Grosbeak	2.4	1.5	3.7	23	40
Swainson's Thrush	2.3	1.5	3.6	23	45
Western Wood-Pewee	2.1	1.4	3.3	23	41
White-breasted Nuthatch	1.8	1.0	3.1	28	23
American Crow	0.5	0.3	0.8	24	38

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 *D*

Ponderosa Pine, southern hills (PS)

We established 27 point transects in Ponderosa Pine, southern hills (Pine-south). And conducted 389 counts along those transects. We detected a total of 66 species with an average of 6.3 species per count station. We obtained robust density estimates (i.e., CV <50%) for 20 species (Table 7). Chipping Sparrow occurred in highest density relative to other species in this habitat. Two species occurred in highest density in Pine-south habitat relative to other habitats, including Plumbeous Vireo and Western Tanager.

Table 7. Estimated densities of breeding birds in Ponderosa Pine (southern hills) on Black Hills National Forest, 2001.

Species	***D***	**LCL**	**UCL**	**CV (%)**	***n***
Chipping Sparrow	48.3	33.2	70.3	19	143
Yellow-rumped Warbler	20.6	17.1	24.8	9	270
Dark-eyed Junco	18.5	14.4	23.8	13	221
Brown-headed Cowbird	17.0	12.8	22.5	14	117
Pine Siskin	16.4	10.1	26.8	25	52
Black-capped Chickadee	15.7	12.0	20.5	14	162
Red Crossbill	13.0	9.5	17.6	16	142
Dusky Flycatcher	12.4	9.1	16.7	15	97
Plumbeous Vireo	12.1	9.2	15.8	14	107
Ovenbird	11.9	9.5	14.9	12	183
Western Tanager	11.0	9.0	13.5	10	142
Red-breasted Nuthatch	8.4	6.5	11.0	14	174
Warbling Vireo	6.3	4.6	8.5	16	98
American Robin	6.0	3.7	10.0	26	93
Townsend's Solitaire	4.8	3.6	6.6	15	106
Gray Jay	3.3	1.2	9.1	54	23
Hairy Woodpecker	2.4	1.2	4.8	35	34
White-breasted Nuthatch	1.9	1.3	2.7	19	45
Mourning Dove	0.7	0.4	1.2	27	32
American Crow	0.3	0.1	0.5	34	31
Northern Flicker	0.2	0.1	0.4	28	28

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 *D*

Riparian (RI)

We established 35 point transects in Riparian habitat and conducted 433 counts along those transects. We detected a total of 107 species, more than in any other habitat, with an average 8.1 species per count station, also the highest of any habitat. Several species were restricted to low-elevation sites in the foothills (e.g., Lazuli Bunting and Bullock's Oriole), and thus were not well represented in the habitat across the Black Hills.

Although a high number of species was recorded *from* this habitat, many species occurred primarily in adjacent habitats. On the other hand, some species are riparian obligates and were observed only in this habitat. We obtained robust density estimates (i.e., CV <50%) for 36 species (Table 8). MacGillivray's Warbler occurred in highest density relative to other species in this habitat. Many species occurred in highest density in Riparian habitat relative to other habitats, including Western Wood-Pewee, Cordilleran Flycatcher, Eastern Kingbird, Red-eyed Vireo, Blue Jay, Veery, Cedar Waxwing, Yellow Warbler, MacGillivray's Warbler, Common Yellowthroat, Song Sparrow, Black-headed Grosbeak, Red-winged Blackbird, and Orchard Oriole. The large number of species that occur in highest density in Riparian habitat underscores the importance of this habitat to overall bird diversity in the Black Hills.

Table 8. Estimated densities of breeding birds in Riparian habitat on Black Hills National Forest, 2001.

Species	*D*	LCL	UCL	CV (%)	*n*
MacGillivray's Warbler	66.3	49.1	89.6	15	135
American Redstart	51.1	40.1	65.2	12	212
American Robin	40.0	29.0	55.1	16	300
Dusky Flycatcher	38.5	32.1	46.1	9	224
Warbling Vireo	33.4	28.4	39.2	8	296
Chipping Sparrow	33.0	20.7	52.4	24	87
Song Sparrow	32.5	24.0	43.9	15	118
Pine Siskin	29.4	16.7	51.7	29	49
Black-headed Grosbeak	23.3	17.0	31.9	16	103
Common Yellowthroat	22.0	16.7	29.0	14	113
Brown-headed Cowbird	21.8	14.9	31.9	20	98
Ovenbird	19.9	16.6	23.7	9	294
Cedar Waxwing	14.9	6.7	33.0	42	38
Spotted Towhee	14.7	10.7	20.2	16	106
Dark-eyed Junco	14.4	9.9	21.2	20	85
Yellow-rumped Warbler	13.6	10.3	18.0	14	90
Cordilleran Flycatcher	12.1	8.6	17.0	18	63
Red-eyed Vireo	11.6	8.8	15.2	14	80
Red-winged Blackbird	11.2	7.5	16.7	21	112
Dark-eyed Junco	9.5	7.0	12.9	16	87
Black-capped Chickadee	8.2	6.1	11.1	15	61
Red-naped Sapsucker	7.8	2.9	20.8	51	23
American Goldfinch	7.5	4.4	12.7	28	44
Violet-green Swallow	7.4	4.1	13.6	31	113
Western Tanager	5.8	4.4	7.7	15	74

Red Crossbill	5.7	3.7	9.0	23	61
Veery	5.3	2.7	10.4	35	36
Eastern Kingbird	5.0	2.8	9.1	31	35
Orchard Oriole	4.3	2.2	8.4	35	25
Ruby-crowned Kinglet	3.4	2.2	5.3	23	43
Western Wood-Pewee	2.7	1.6	4.4	25	38
Mourning Dove	2.4	1.5	3.8	24	55
Townsend's Solitaire	2.0	1.2	3.3	25	34
Blue Jay	1.8	1.1	3.1	27	38
Swainson's Thrush	1.3	0.9	2.0	22	32
American Crow	0.4	0.3	0.7	25	40

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 *D*

Shrubland (SH)

We established 24 point transects in Shrubland and conducted 223 counts along those transects. We detected a total of 59 species with and average of 6.9 species per count station. We obtained robust density estimates (i.e., CV <50%) for 21 species, and reasonably robust estimates for two others (Table 8). Chipping Sparrow occurred in highest density relative to other species in this habitat. Many species occurred in higher density in Shrubland relative to other habitats, including Mourning Dove, Dusky Flycatcher, Pinyon Jay, Violet-green Swallow, Virginia's Warbler, Spotted Towhee, Chipping Sparrow, Brown-headed Cowbird, and American Goldfinch. Two of these, Pinyon Jay and Virginia's Warbler, appear to be limited to only this habitat in the Black Hills. Shrubland comprises a unique habitat and supports bird species not found elsewhere, thereby contributing substantially to overall avian diversity in the Black Hills.

Table 8. Estimated densities of breeding birds in Shrublands on Black Hills National Forest, 2001.

Species	***D***	**LCL**	**UCL**	**CV (%)**	***n***
Chipping Sparrow	144.2	100.3	207.5	19	188
Dusky Flycatcher	52.0	40.0	67.6	13	191
American Goldfinch	28.4	7.6	106.1	72	25
Brown-headed Cowbird	26.7	17.0	41.9	23	74
Violet-green Swallow	19.6	11.3	34.0	29	32
Yellow-rumped Warbler	12.8	10.3	15.8	11	136
Vesper Sparrow	11.7	6.8	20.0	28	33
Plumbeous Vireo	11.5	8.6	15.4	15	35
Western Tanager	9.7	7.2	13.2	15	43
Red Crossbill	8.9	3.8	20.8	45	201
Virginia's Warbler	6.5	3.9	11.0	27	33
Black-capped Chickadee	5.7	4.1	7.9	17	72
Warbling Vireo	5.3	2.4	12.1	43	32
Dark-eyed Junco	4.8	1.8	12.8	52	81
Mountain Bluebird	2.7	1.5	4.7	29	26
Mourning Dove	2.5	1.8	3.4	16	84
American Robin	2.5	1.7	3.6	20	53

White-breasted Nuthatch	1.4	0.8	2.3	25	29
Red-breasted Nuthatch	1.3	0.8	2.0	24	28
Townsend's Solitaire	1.2	0.7	2.0	26	71
Western Meadowlark	0.9	0.5	1.7	30	123
American Crow	0.3	0.1	0.6	38	25
Pinyon Jay	0.2	0.1	0.6	48	84

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 *D*

Wet Meadows (WM)

We established 25 point transects in Wet Meadows and conducted 338 counts along those transects. We detected a total of 67 species with an average of 7.0 species per count station. Unfortunately, most sites in this category were not representative of true wet meadow habitat, and therefore did not host many wet meadow birds. A few sites in this category appeared to be somewhat degraded cottonwood-willow riparian habitats, and these sites were analyzed together with other Riparian sites. Most birds recorded in this habitat were forest (particularly forest edge) birds. Therefore, by sampling this habitat we did not contribute much information on birds that were not already represented in other habitats. A few sites in this category were true wet meadows and hosted certain wet meadow bird species such as Common Snipe, but such sites were few and the number of wet meadow birds recorded was low.

We obtained robust density estimates (i.e., CV <50%) for 26 species (Table 7). Chipping Sparrow occurred in highest density relative to other species in this habitat. Two species, Mountain Bluebird and House Wren, occurred in highest density in "wet meadows" relative to other habitats.

Table 9. Estimated densities of breeding birds in Wet Meadows (and forest edge) on Black Hills National Forest.

Species	***D***	**LCL**	**UCL**	**CV (%)**	***n***
Chipping Sparrow	49.8	31.4	78.8	24	171
American Robin	33.9	28.1	41.0	10	292
Yellow-rumped Warbler	29.2	22.9	37.4	13	223
Dusky Flycatcher	28.1	22.7	34.7	11	188
Pine Siskin	21.1	14.6	30.6	19	108
Warbling Vireo	17.0	13.7	21.2	11	233
Common Yellowthroat	15.9	8.1	31.2	35	42
MacGillivray's Warbler	11.0	5.1	23.7	40	37
American Redstart	10.8	4.7	25.1	44	31
Brown-headed Cowbird	8.5	5.5	13.2	23	59
Ruby-crowned Kinglet	8.1	6.0	11.0	16	112
Song Sparrow	7.8	4.1	14.9	33	39
Black-capped Chickadee	6.0	3.9	9.3	23	84
Mountain Bluebird	5.2	1.2	23.5	84	24
Red-breasted Nuthatch	5.2	3.8	7.2	16	147
Red Crossbill	4.1	2.1	8.3	36	48

Townsend's Solitaire	2.5	1.9	3.4	15	60
Hairy Woodpecker	2.2	1.2	3.9	30	23
Ovenbird	2.1	1.1	4.1	35	37
White-breasted Nuthatch	2.1	1.2	3.4	26	30
Red-naped Sapsucker	1.8	1.0	3.2	29	40
Red-winged Blackbird	1.7	0.4	7.4	82	24
Swainson's Thrush	1.6	0.6	4.2	50	29
House Wren	1.2	0.7	2.4	33	24
Northern Flicker	0.4	0.2	0.9	35	27
American Crow	0.2	0.1	0.4	33	24

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 *D*

White Spruce (WS)

We established 24 point transects in White Spruce and conducted a total of 325 counts along those transects. We detected a total of 56 species with an average of 7.5 species per count station. We obtained robust density estimates (i.e., CV <50%) for 19 species (Table 6). Chipping Sparrow occurred in highest density relative to other species in this habitat. Numerous species occurred in highest density in White Spruce relative to other habitats, including Northern Flicker, Gray Jay, Red-breasted Nuthatch, Golden-crowned Kinglet, Ruby-crowned Kinglet, Swainson's Thrush, American Robin, and Red Crossbill. A few species are largely limited in their distribution to White Spruce, including Golden-crowned and Ruby-crowned Kinglets, and Swainson's Thrush. White Spruce contributes substantially to overall bird diversity and supports many bird species at their highest densities in the Black Hills.

Table 10. Estimated densities of breeding birds in White Spruce forests on Black Hills National Forest, 2001.

Species	***D***	**LCL**	**UCL**	**CV (%)**	***n***
Chipping Sparrow	68.9	45.4	104.7	21	151
Red Crossbill	56.2	44.0	71.9	13	468
American Robin	52.3	43.4	62.9	9	295
Ruby-crowned Kinglet	47.0	39.8	55.5	8	303
Gray Jay	44.3	24.2	81.2	31	86
Pine Siskin	38.0	29.5	48.9	13	192
Yellow-rumped Warbler	30.9	25.8	37.1	9	227
Golden-crowned Kinglet	24.6	16.3	37.1	21	66
Dark-eyed Junco	21.3	16.1	28.1	14	192
Red-breasted Nuthatch	19.1	15.9	22.9	9	253
Black-capped Chickadee	14.7	10.9	19.7	15	126
Swainson's Thrush	11.9	9.0	15.9	15	187
Cordilleran Flycatcher	8.7	4.8	15.7	30	44
Brown Creeper	8.6	5.2	14.3	26	26
Red-naped Sapsucker	7.2	3.4	15.0	38	23
Warbling Vireo	6.0	3.9	9.4	23	50
Northern Flicker	5.9	3.7	9.4	24	47
Hairy Woodpecker	5.1	2.3	11.3	42	36

Townsend's Solitaire	2.9	1.9	4.3	21	58

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 *D*

SPECIES ACCOUNTS

In this section we present brief accounts of the geographic distribution and relative density among habitats for each bird species for which we estimated density in the Black Hills. This includes all species for which there were at least 23 observations per habitat (i.e., $n \geq 23$) *as recorded from count stations* on point transects in at least one habitat. For each species we provide: density estimates (D), expressed in #birds/km^2, the coefficient of variation for D (CV, expressed as percentage), and the number of observations (n) used to estimate D. We also provide maps depicting the geographic locations of observations for each species and the relative abundance in which it was observed. When possible, we also provide a graphical comparison of estimated density for each species among habitats, and error bars representing the 95% confidence limits surrounding each estimate.

Although we observed 132 species on point transects in the Black Hills in 2001, many were observed so infrequently that meaningful interpretations of their abundance and distribution are not possible at this time. However, for certain rare species (with $n<23$) that are of management interest (e.g., raptors, woodpeckers), we provide relative abundance indices (in the units of #birds/100 km of transect) for each habitat. We include this information because we believe any information on low-density, localized or rare species is valuable. However, caution should be used in interpreting these indices as they are based on a small number of observations. With additional effort in future years, a more reliable picture of abundance and habitat use should emerge for these species.

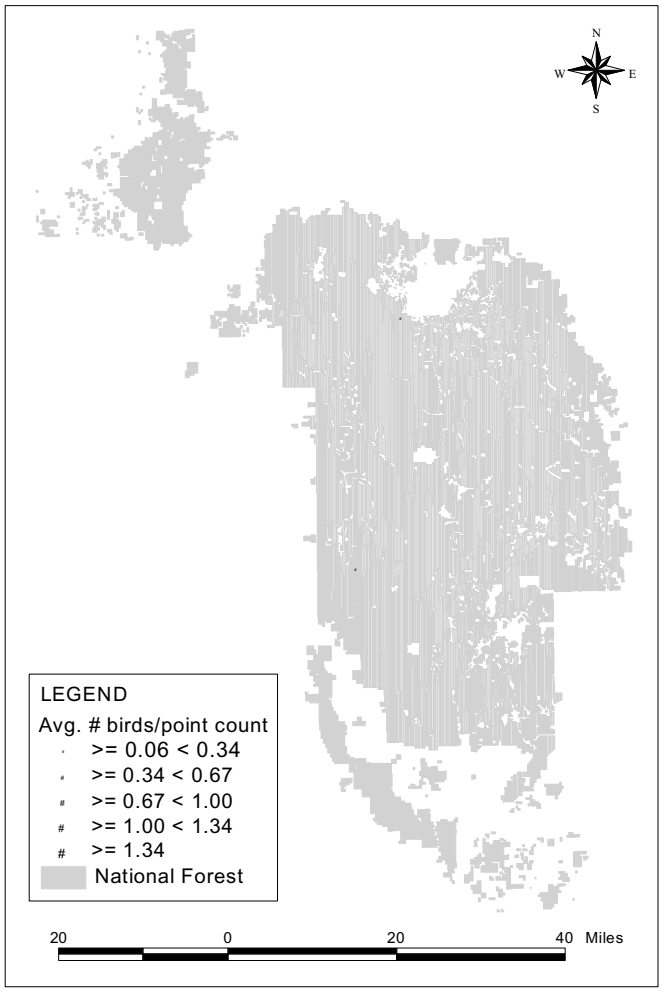
The relative abundance scale used on the distribution maps is based on the average number of birds observed per point count *for each transect*. Therefore, the location of the dots do not necessarily indicate the precise location at which the species was observed, but rather the mid point of the transect on which the species was observed. The abundance scale used on the different maps is constant among species, allowing for easy comparisons.

In a few cases, we provide comparisons with species accounts from Birds of the Black Hills, by Pettingill and Whitney (1965). Prior to *MBBH*, this book provided the most definitive work on the abundance and distribution of bird species in the Black Hills. Although the authors describe bird abundance using qualitative terms such as “rare” or “uncommon,” they apparently standardized the use of those terms for each species, based on the numbers of birds that could be observed per hour, assuming appropriate habitat. Although we cannot compare their data directly with ours, we can compare the interpretations of our data. These comparisons provide a historical perspective in which to interpret our results.

We were not able to collect any data on American Dipper through point transects, perhaps because it occurs so locally and in relatively few numbers. However, a substantial amount of information already exists regarding the past and present status of this species in the Black Hills. In this report, we have summarized and included this information to highlight the need for immediate action to conserve this species.

Sharp-shinned Hawk

Sharp-shinned Hawk appears to be a rare bird in the Black Hills. We observed so few individuals that it is difficult to assess its distribution. Likewise, it is impossible to draw any conclusion regarding habitat use based on two observations, one in BU and one in LS. Pettingill and Whitney (1965) described this species as "probably fairly common," although they cite relatively few observations (including one nest occupied by different pairs in two successive years) to support this statement. Although *Accipiter* hawks often have low detectability, it seems probable that Sharp-shinned Hawk currently exists in very low numbers in the Black Hills, given the level of survey effort in 2001. More focused efforts should be made to determine the status of this species in the Black Hills.

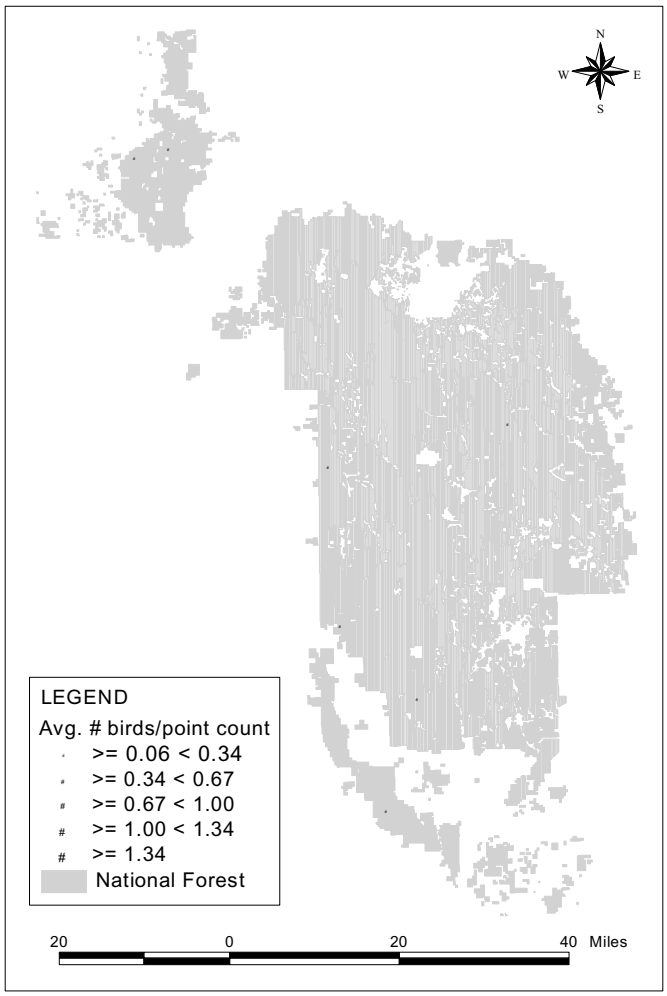


Abundance and breeding distribution of Sharp-shinned Hawk in the Black Hills, 2001.

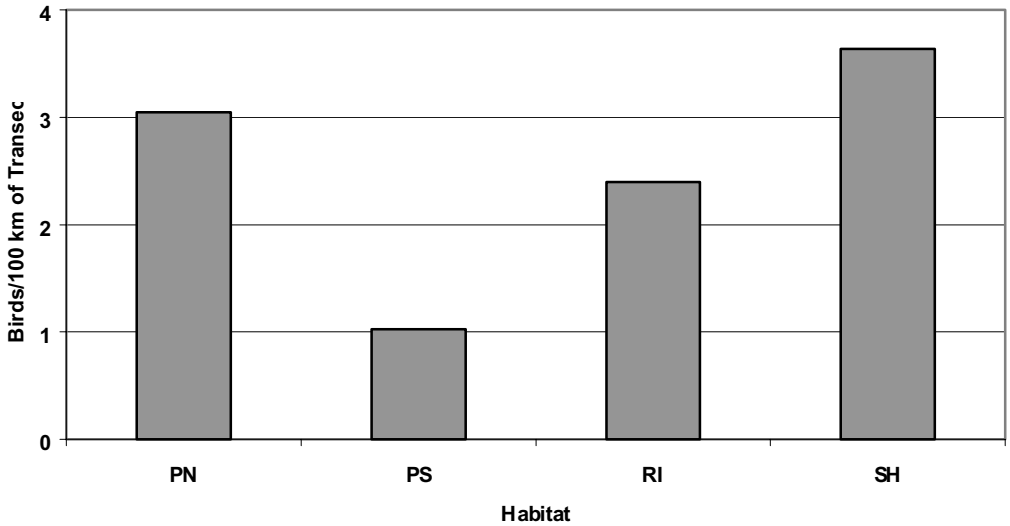
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Cooper's Hawk

Cooper's Hawk appears to occur widely in the Black Hills, although nowhere is it numerous (see map). Too few observations were made to assess habitat use, but it was recorded from PN (*n*=3), PS (*n*=1), RI (*n*=2) and SH (*n*=2). Pettingill and Whitney (1965) described this species as "probably uncommon to rare" in the Black Hills. This probably remains the case today. Point transects may provide a means to track the status of Cooper's Hawk, although additional effort would likely be needed to effectively monitor this species in the Black Hills.



Abundance and breeding distribution of Cooper's Hawk in the Black Hills, 2001.



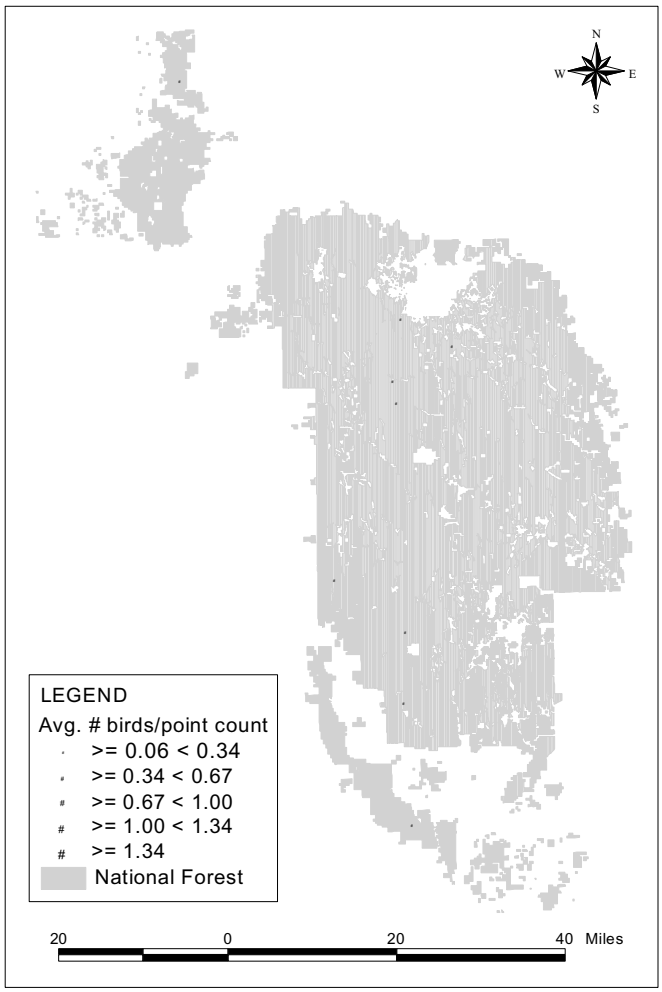
Relative abundance of Cooper's Hawk among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

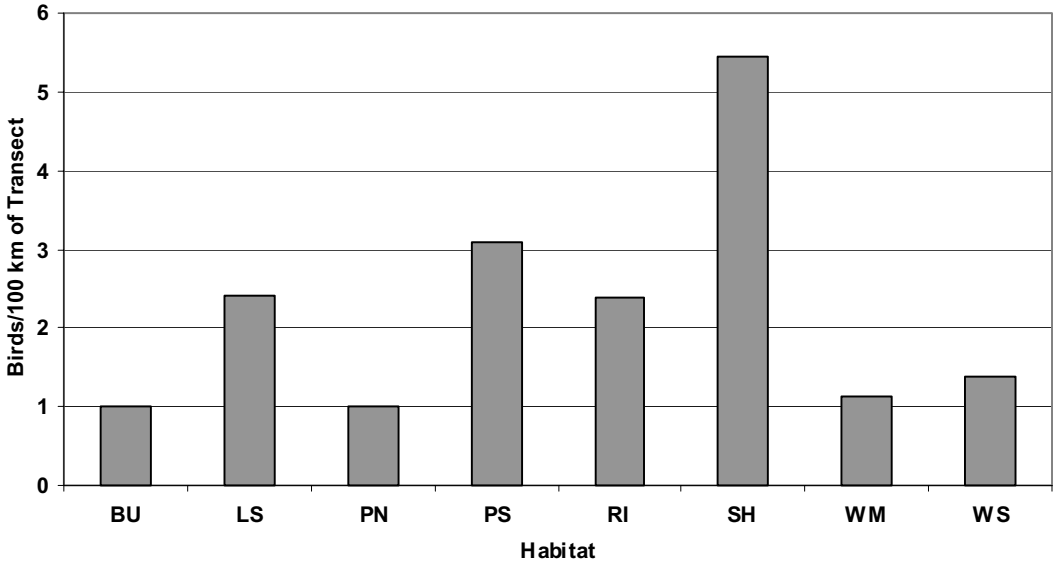
Northern Goshawk

Northern Goshawk appears to occur widely within the Black Hills, although it is rare to uncommon throughout (see map). Northern Goshawks were not observed sufficiently enough in any habitat to estimate density, although a greater number of individuals were observed per unit of effort in SH (*n*=3) (see chart). Goshawks were also recorded from BU (*n*=1), LS (*n*=2), PN (*n*=1), PS (*n*=3), RI (*n*=2), WM (*n*=1), and WS (*n*=1). However, because so few observations of this species were made, it is difficult to ascertain whether it truly occurs in greater abundance in any one habitat.

To put the Goshawk in perspective, it certainly was observed more frequently than many other species of birds that occur regularly in the Black Hills (e.g., Three-toed Woodpecker, Pygmy Nuthatch) and it was observed more often than other *Accipiter* hawsk, such as Sharp-shinned Hawk and Cooper's Hawk. Therefore, the results from this first season are encouraging, in that with several more years of data collection, a true pattern of habitat use and population size may emerge. It appears that point transects may provide a means to track the status of North Goshawk in the Black Hills, although effective monitoring of this species will likely require more intensive efforts.



Abundance and breeding distribution of Northern Goshawk in the Black Hills, 2001.

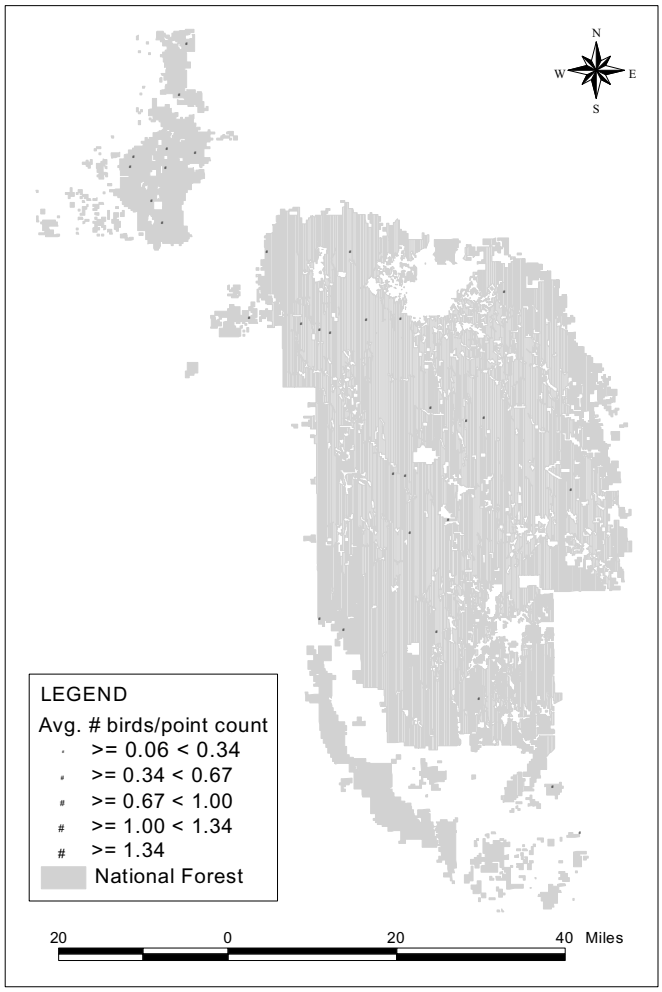


Relative abundance of Northern Goshawk among habitats in the Black Hills.

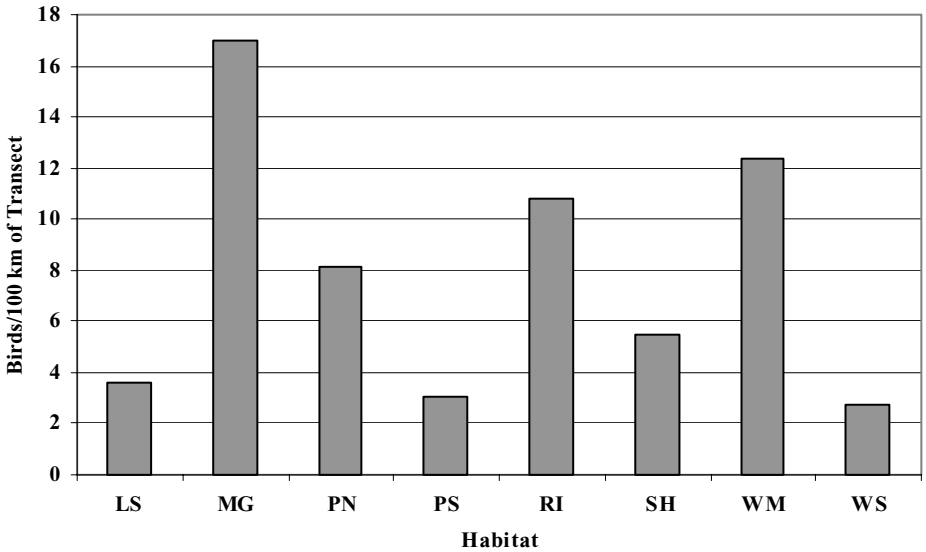
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Red-tailed Hawk

Red-tailed Hawk occurs in low abundance throughout the Black Hills (see map). Although it is generally uncommon, it is probably the most widespread and abundant raptor in the Black Hills. As with most other raptors, Red-tailed Hawk was not observed sufficiently in any single habitat to estimate density, although more individuals per unit of effort were observed in MG (n=2), and in WM (n=11) and RI (n=9) (see chart). However, these results are base on a small number of observations, and they should be interpreted with caution. Additional sites in MG will likely yield better data on Red-tailed Hawk. This species may prove to be effectively monitored under *MBBH* through point transects *across all habitats* in the Black Hills.



Abundance and breeding distribution of Red-tailed Hawk in the Black Hills, 2001.



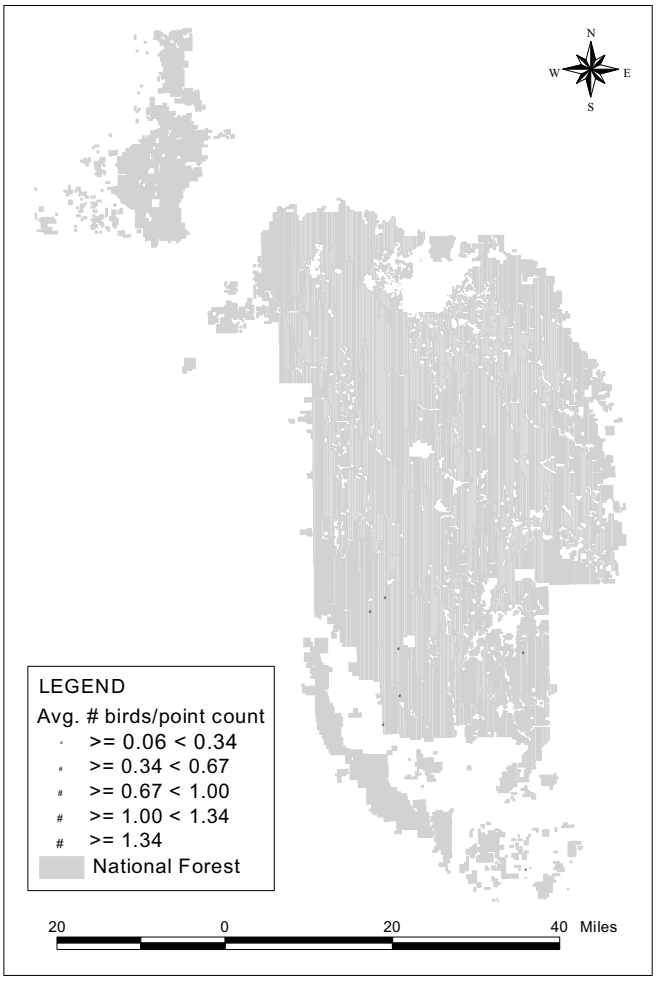
Relative abundance of Red-tailed Hawk among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

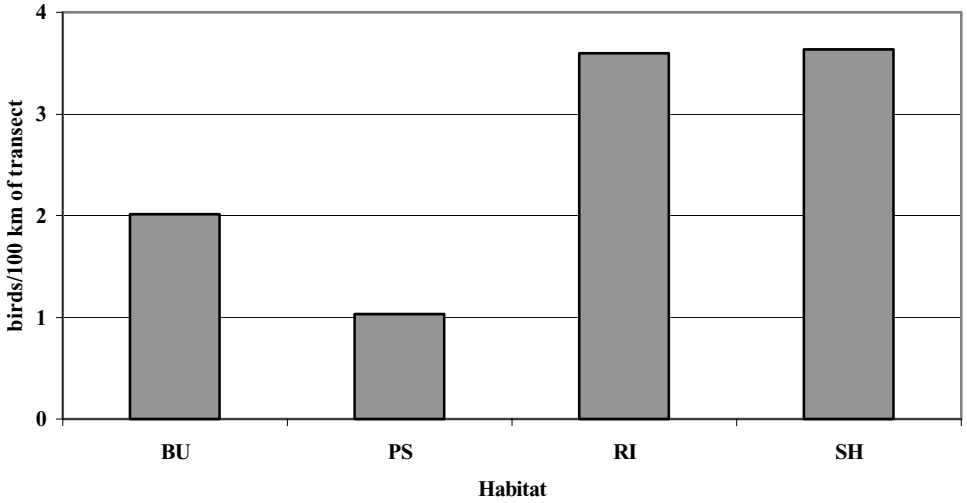
American Kestrel

American Kestrel appears to occur primarily in the southern Black Hills (see map). Nowhere is it abundant. Our findings are inconsistent with observations by Pettingill and Whitney (1965), who described this species as being a "common summer resident at all elevations." This species may have declined significantly in the Black Hills in recent decades. Additional effort should be made to assess the status of this species.

American Kestrel was not detected in sufficient numbers in any habitat to generate a reasonably reliable density estimate. However, density is presumably low. We observed more American Kestrels per unit of effort in SH (*n*=2) and RI (*n*=3) habitats, although these values are based on very few observations. It was also found in BU (*n*=2) and PS (*n*=1). Point transects may provide a means to track the status of this species, but will likely prove insufficient for monitoring.



Abundance and breeding distribution of American Kestrel in the Black Hills, 2001.

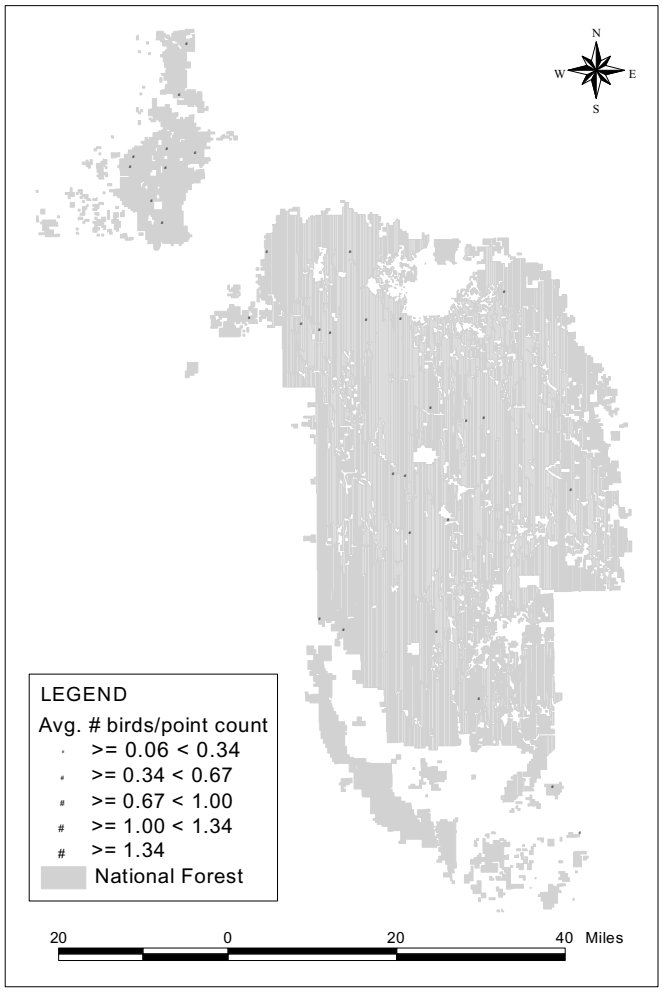


Relative abundance of American Kestrel among habitats in the Black Hills.

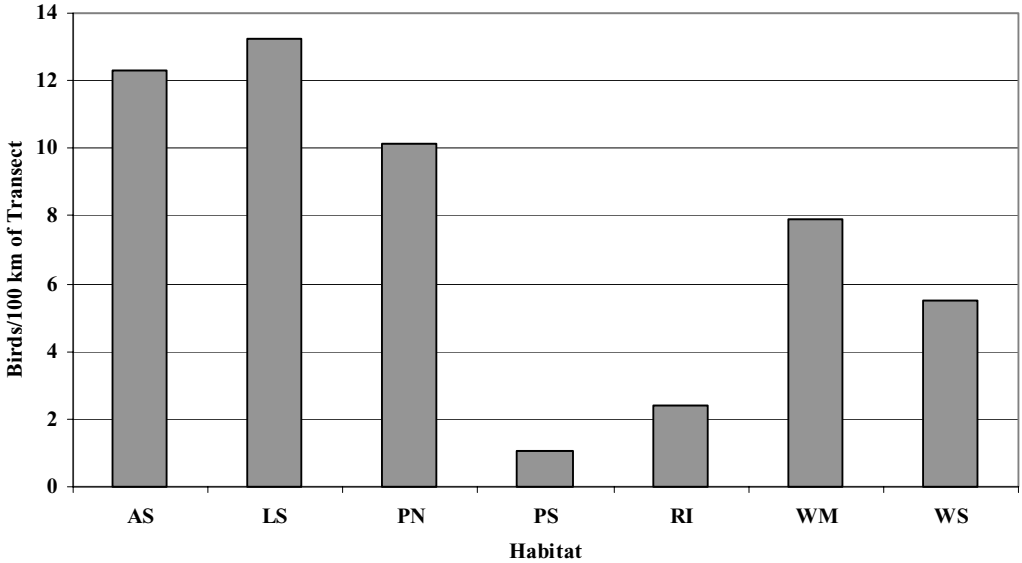
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Ruffed Grouse

Ruffed Grouse occurs widely throughout much of the northern Black Hills, although in low abundance (see map). Ruffed Grouse was not observed in sufficient numbers to estimate density in any one habitat type, although more individuals were observed per unit effort in LS (n=11), AS (n=9), and PN (n=10) (see chart). Lesser numbers were recorded from WM (n=7), WS (n=4), RI (n=2) and PS (n=1). These results are based on relatively few observations, and some caution should be used in interpreting them. This species may prove to be effectively monitored under *MBBH* through point transects *across all habitats* in the Black Hills, although additional efforts may be needed.



Abundance and breeding distribution of Ruffed Grouse in the Black Hills, 2001.

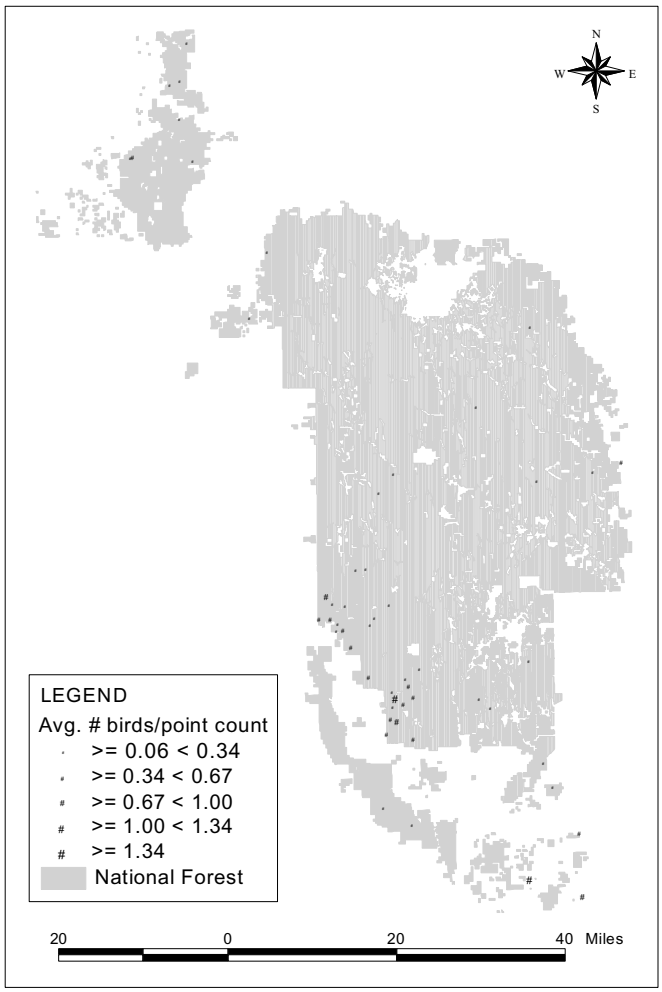


Relative abundance of Ruffed Grouse among habitats in the Black Hills.

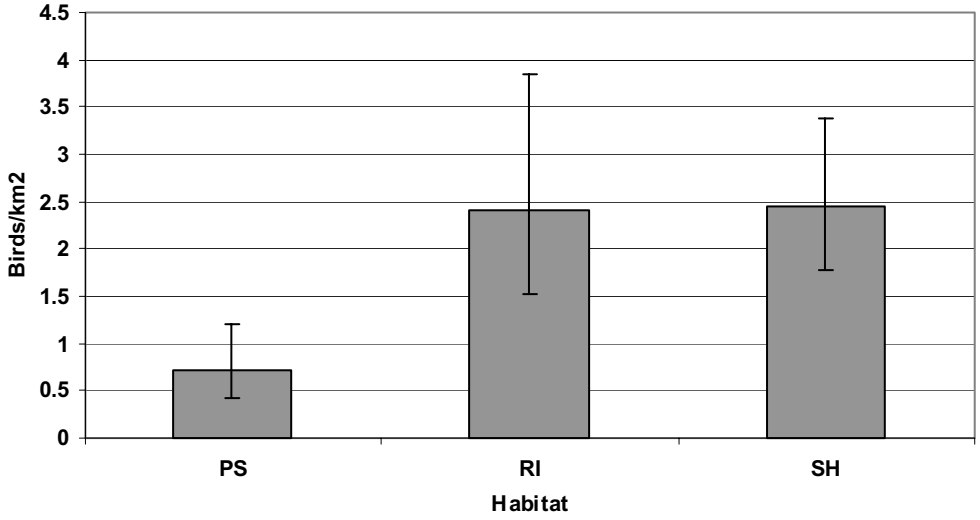
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Mourning Dove

Mourning Dove occurs throughout much of the Black Hills, although the population appears concentrated in the southwest (see map). Mourning Dove density is greatest in SH (*D*=2.6 birds/km^2, CV=16%, *n*=84) and RI (*D*=2.4 birds/km^2, CV=24%, *n*=55) (see chart). In addition to PS (*D*=0.7 birds/km^2, CV=27%, *n*=32), Mourning Dove was recorded in small numbers from AS (*n*=1), BU (*n*=10), LS (*n*=8), MG (*n*=9), PN (*n*=3) and WS (*n*=3). This species should be effectively monitored under *MBBH* through point transects in a range of habitats, especially SH and RI.



Abundance and breeding distribution of Mourning Dove in the Black Hills, 2001.

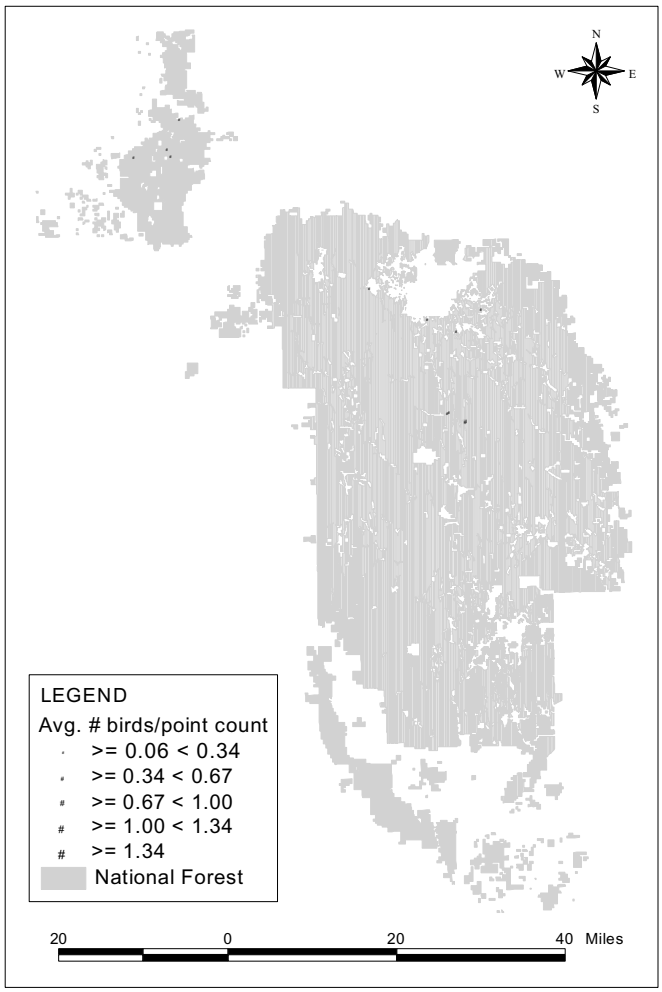


Relative density of Mourning Dove among habitats in the Black Hills.

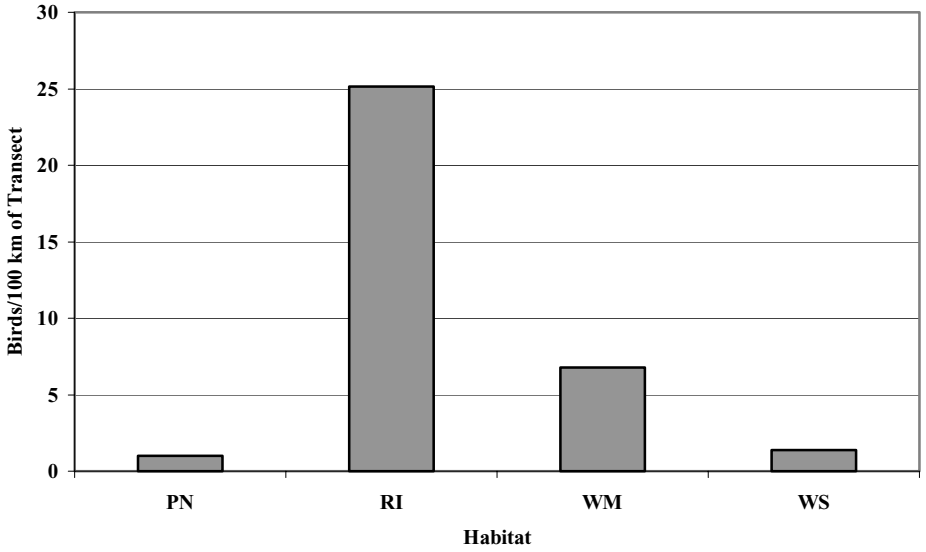
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Belted Kingfisher

Belted Kingfisher occurs locally along streams in the Black Hills, primarily in the north, although it is generally rare to uncommon. We recorded more Belted Kingfisher per unit of effort in RI (*n*=21), although it was also detected from WM (*n*=6), WS (*n*=1) and PN (*n*=1) (see chart). An unusually large number (*n*=9) were recorded along a stretch of Rapid Creek east of Rochford, SD. Belted Kingfishers are probably reasonably good indicators of overall stream condition, as they depend primarily on small fish. The low number of Belted Kingfishers recorded in the Black Hills during 2001 is somewhat alarming, given that Pettingill and Whitney (1965) described the species as a "common permanent resident". It is possible that this species has declined in the Black Hills in recent decades. Point transects may provide an effective means through which to track the status of this species in the Black Hills, although additional effort may be needed for it to be rigorously monitored.



Abundance and breeding distribution of Belted Kingfisher in the Black Hills, 2001.

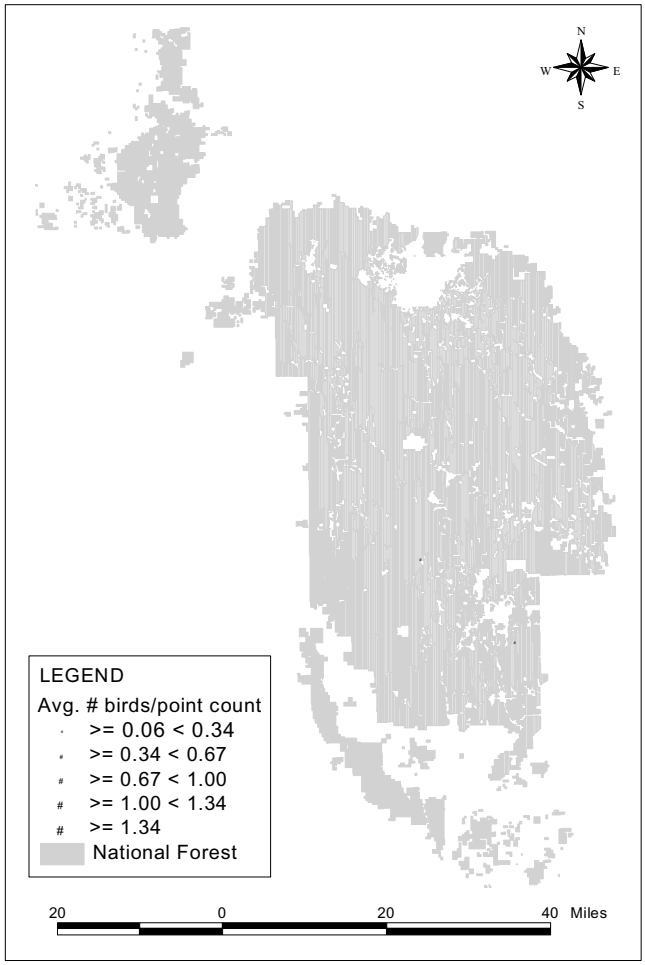


Relative abundance of Belted Kingfisher among habitats in the Black Hills.

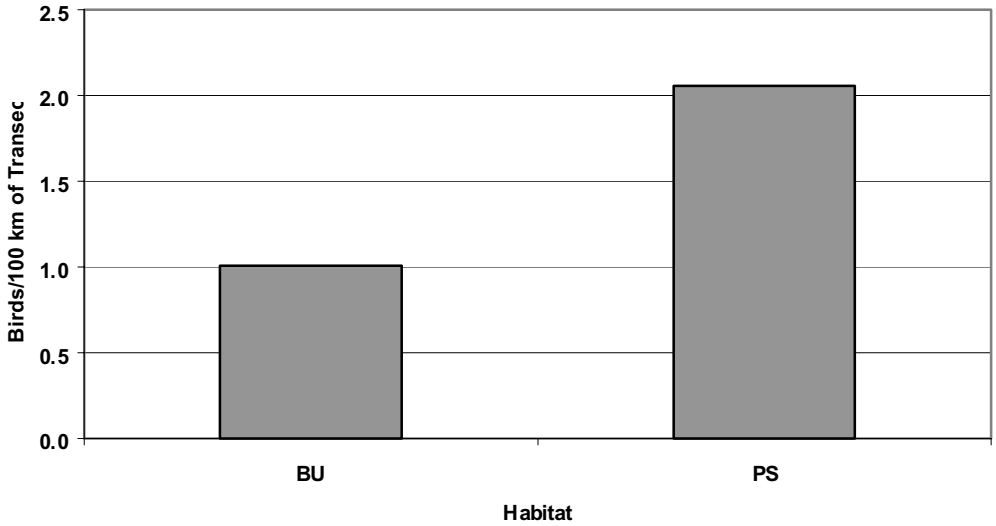
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Lewis's Woodpecker

Lewis's Woodpecker was recorded from only two locations in the Black Hills (see map). The species occurs at the most northeasterly extent of its range in the Black Hills and past records indicate the species was formerly an "uncommon resident" (Pettingill and Whitney, 1965). It seems today that Lewis's Woodpecker is rare in the Black Hills, although it may be somewhat more abundant at lower elevations. According to Pettingill and Whitney (1965), Lewis's Woodpecker prefers "edges of pine forests and streamside cottonwoods with considerable dead growth" and also "burned-over areas". Despite considerable survey effort in these habitats, we recorded only three Lewis's Woodpeckers on Black Hills National Forest in 2001, two in PS and one in BU (see chart). It is possible that the Jasper Burn Area and other recent burn areas may eventually provide suitable habitat that will allow Lewis's Woodpecker populations to expand in the Black Hills in the future. Retention of large diameter snags, especially in burned-over areas and in low-elevation riparian corridors, are likely important factor in maintaining Lewis's Woodpecker populations in the Black Hills.



Abundance and distribution of Lewis's Woodpecker in the Black Hills.

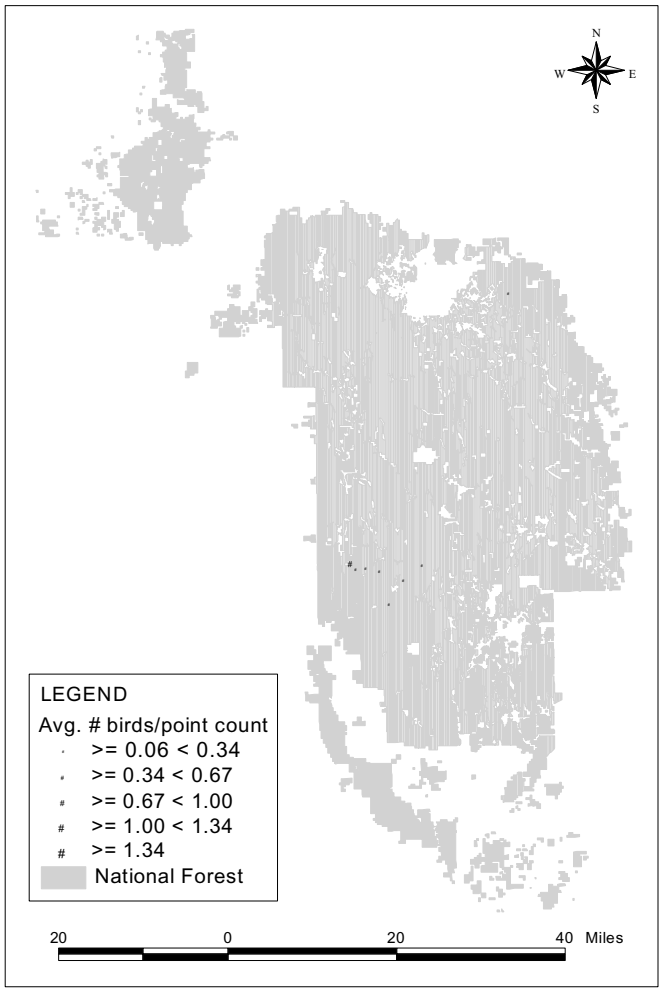


Relative abundance of Lewis's Woodpecker among habitats in the Black Hills.

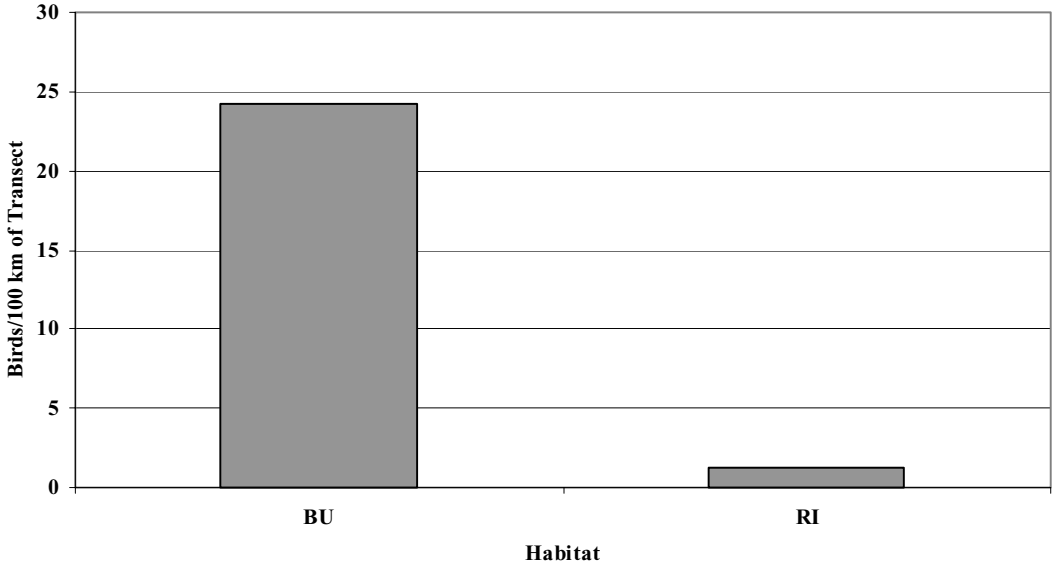
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Red-headed Woodpecker

Red-headed Woodpecker is locally distributed in the Black Hills, where it is generally uncommon (see map). At present, they seem to occur primarily within BU (*n*=24), as nearly all of the individuals observed were recorded from this area. Outside of the Jasper Burn Area, one individual was detected on a point transect in RI habitat. BU appears to provide the most optimal habitat for Red-headed Woodpecker in the Black Hills. Point transects in BU should provide a means to track the status of Red-headed woodpeckers although additional effort may be needed to monitor this species in the Black Hills. Additional point transects in new burns may increase the amount of data gathered on this species.



Abundance and breeding distribution of Red-headed Woodpecker in the Black Hills, 2001.

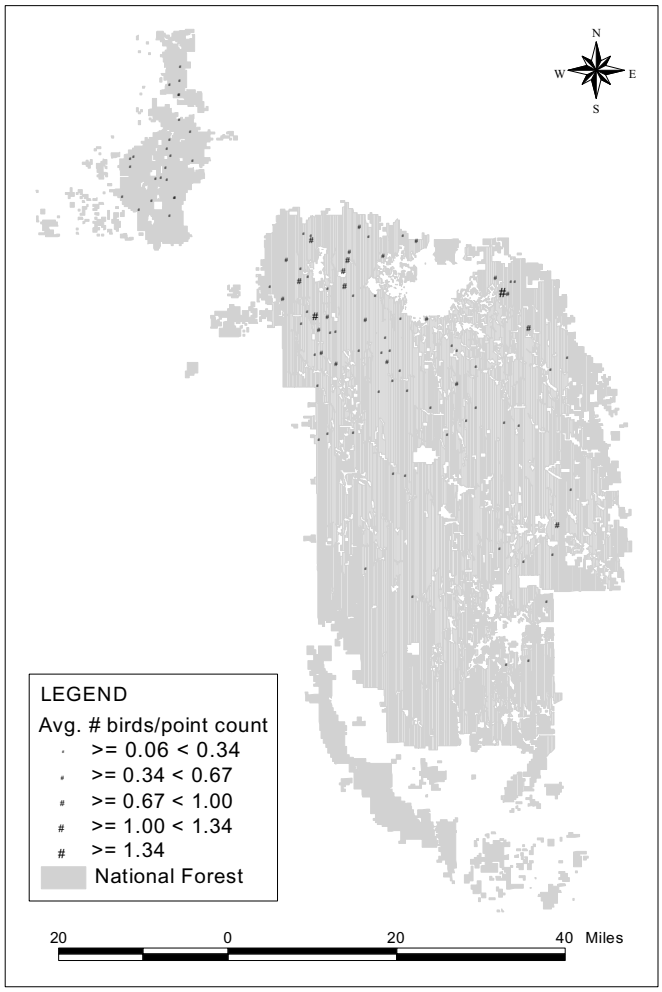


Relative abundance of Red-headed Woodpecker among habitats in the Black Hills.

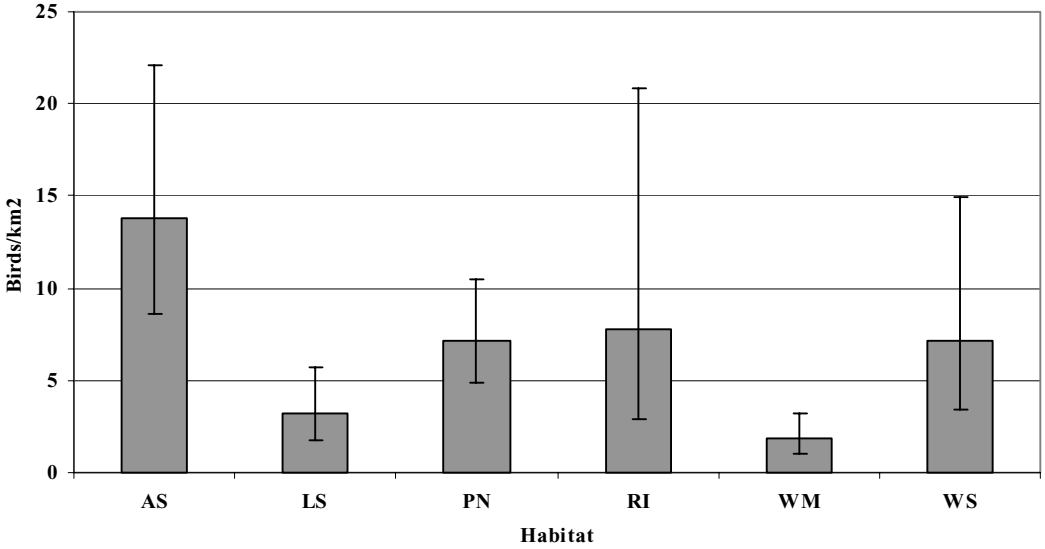
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Red-naped Sapsucker

Red-naped Sapsucker occurs throughout much of the Black Hills, typically in low to moderate abundance, although it is most abundant in the north (see map). Red-naped Sapsucker occurs in greatest density in AS (D=13.8 birds/km^2, CV=24%, n=50), although moderate densities were also observed in PN (D=7.2 birds/km^2, CV=20%, n=54), RI (D=7.8 birds/km^2, CV=51%, n=23) and WS (D=7.2 birds/km^2, CV=38%, n=23), and to a lesser degree in LS (D=3.2 birds/km^2, CV=30%, n=23) and WM (D=1.8 birds/km^2, CV=29%, n=40). Red-naped Sapsucker was also recorded from BU (n=2), PS (n=7) and SH (n=2). This species should be effectively monitored under *MBBH* through point transects in a range of habitats, especially AS.



Abundance and breeding distribution of Red-naped Sapsucker in the Black Hills, 2001.

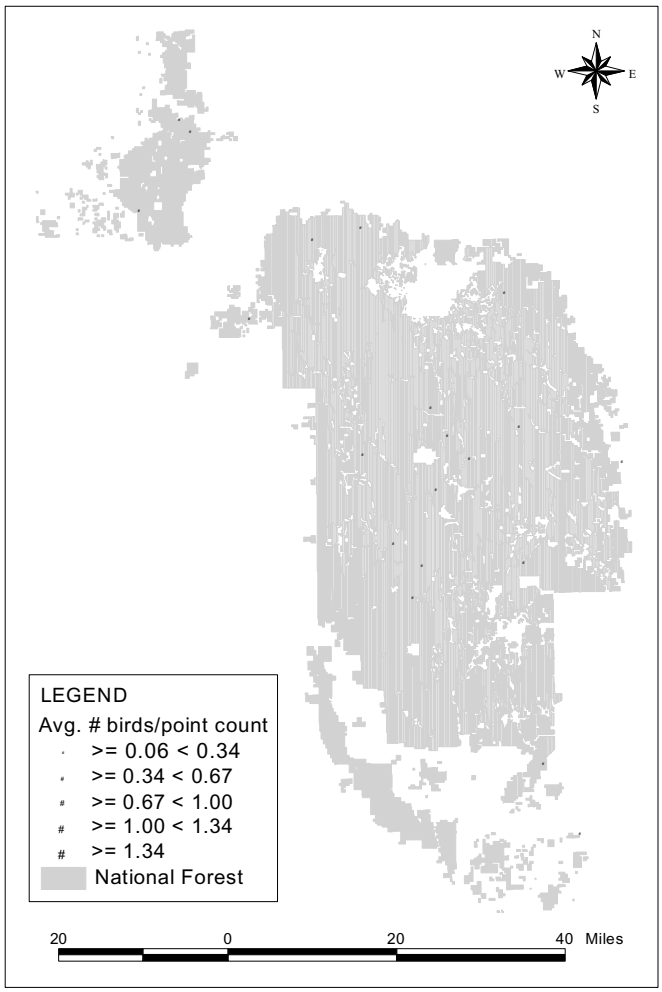


Relative density of Red-naped Sapsucker among habitats in the Black Hills.

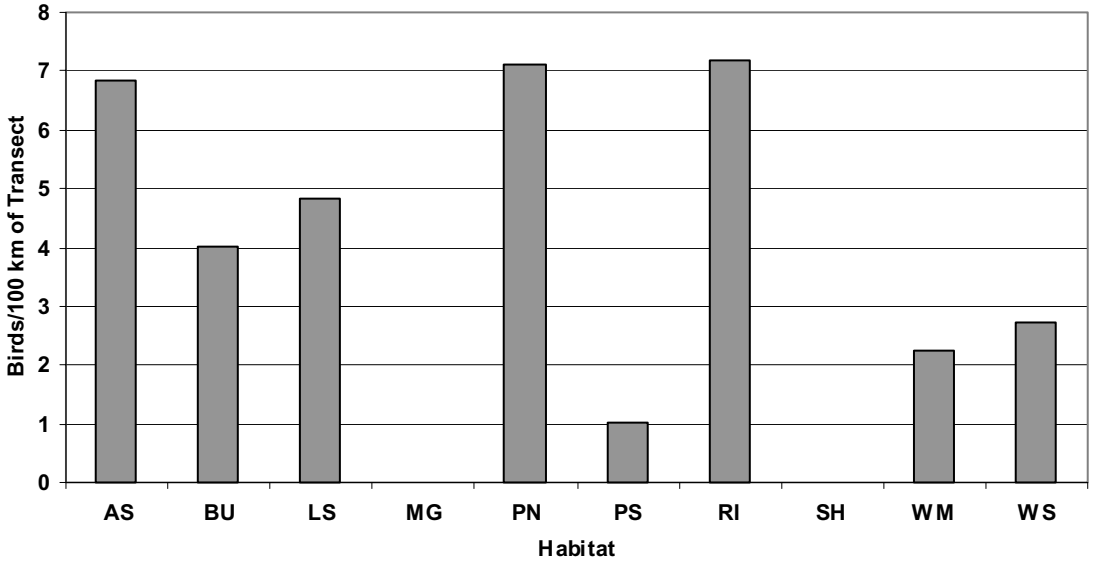
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Downy Woodpecker

Downy Woodpecker occurs in low abundance throughout much of the Black Hills (see map). Based on a small number of observations, Downy Woodpecker appears to occur in a wide range of habitats, and is perhaps most abundant in AS (*n*=5), PN (*n*=7), and RI (*n*=6) (see chart). Pettingill and Whitney (1965) described this species as a "fairly common permanent resident" in the Black Hills. Based on our results, this does not appear to be true, as it was detected in small numbers at less than 8% of our sites. The status of this species may be tracked through point transects, although additional effort would likely be required to effectively monitor this species in the Black Hills.



Abundance and breeding distribution of Downy Woodpecker in the Black Hills, 2001.

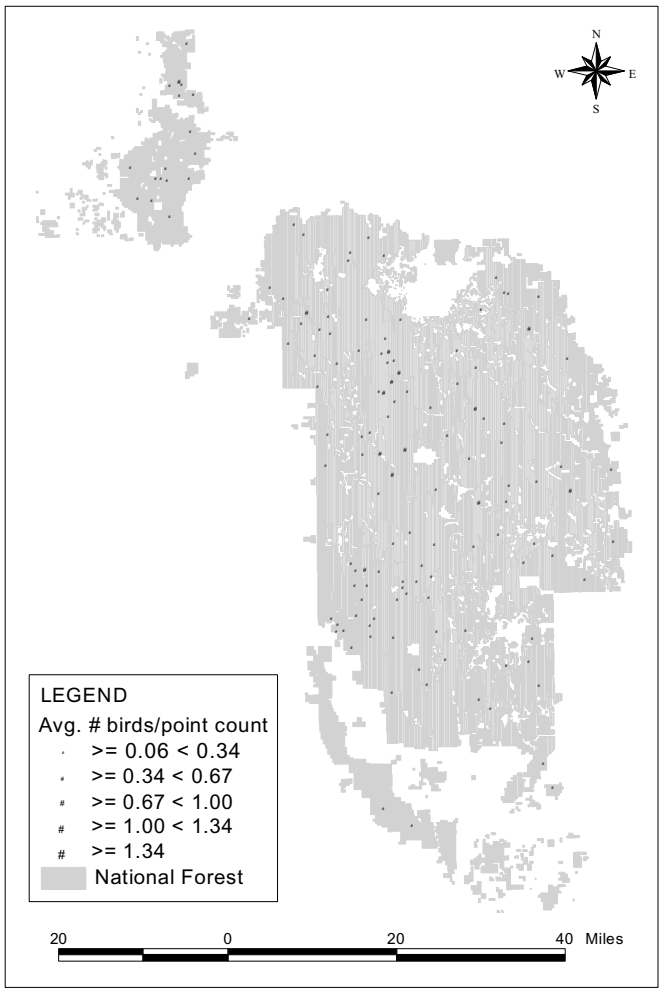


Relative abundance of Downy Woodpecker among habitats in the Black Hills.

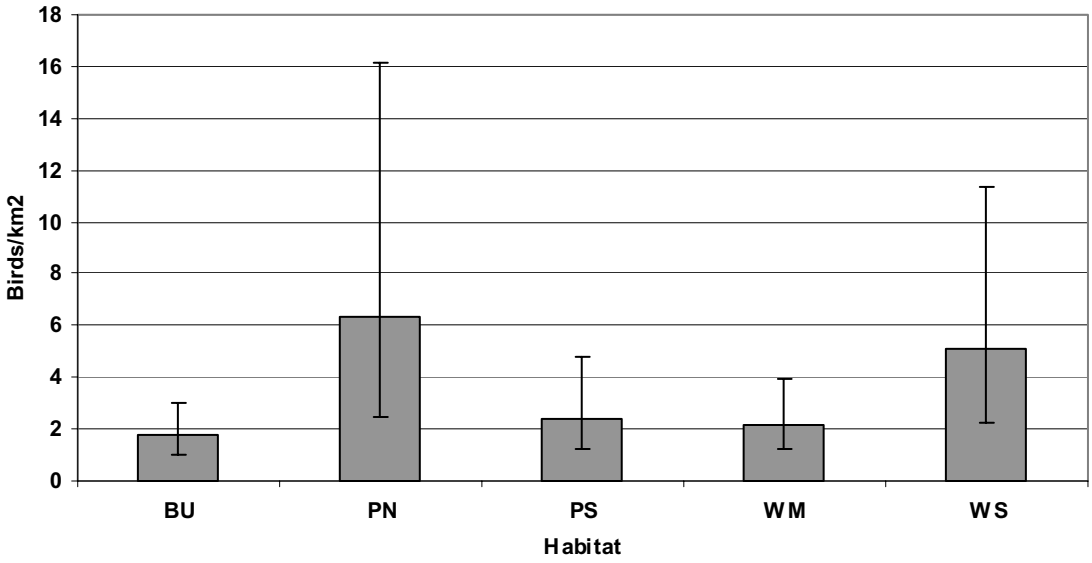
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Hairy Woodpecker

Hairy Woodpecker is widely distributed throughout the Black Hills and occurs in low to moderate abundance (see map). Estimated density of Hairy Woodpecker is greatest in PN (D=6.3 birds/km^2, CV=49%, n=33) and WS (D=5.1 birds/km^2, CV=42%, n=36) habitats (see chart). In addition to the habitats presented in the chart below, Hairy Woodpecker was also recorded in small numbers from AS (n=17), LS (n=41), MG (n=1), RI (n=21), and SH (n=10). This species should be effectively monitored under MBBH through point transects in a wide range of habitats.



Abundance and breeding distribution of Hairy Wood-pecker in the Black Hills, 2001.

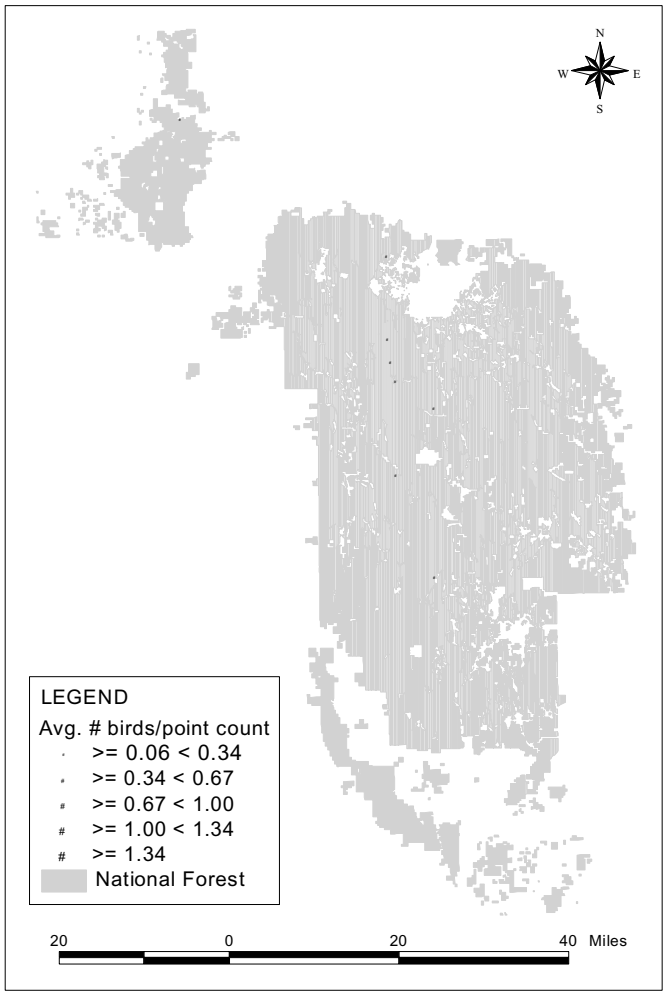


Relative density of Hairy Woodpecker among habitats in the Black Hills.

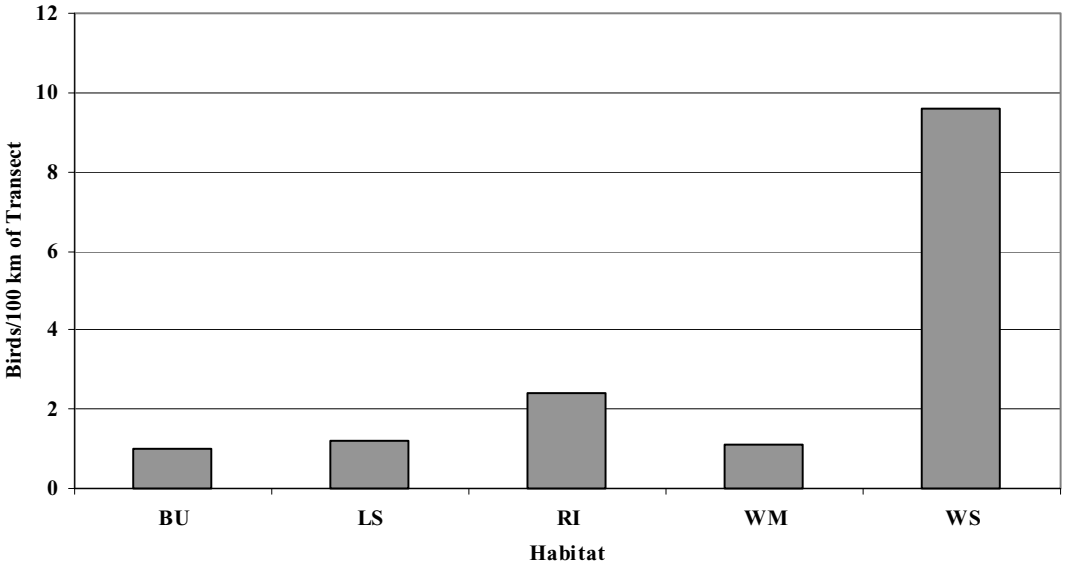
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Three-toed Woodpecker

Three-toed Woodpecker occurs locally in spruce forests in the Black Hills in low abundance (see map). Three-toed Woodpecker was not observed in sufficient numbers to estimate density in any habitat, although a greater number per unit of effort were observed in WS (*n*=7) than in any other habitat (see chart). Three-toed Woodpeckers were also recorded in LS (*n*=1), RI (*n*=2), and WM (*n*=1), but only where white spruce was a prominent feature of the forest surrounding the count station. A single individual was also detected in BU. Point transects should allow us to track Three-toed Woodpeckers in the Black Hills. However, additional efforts may be needed to effectively monitor this species.



Abundance and breeding distribution of Three-toed Woodpecker in the Black Hills, 2001.

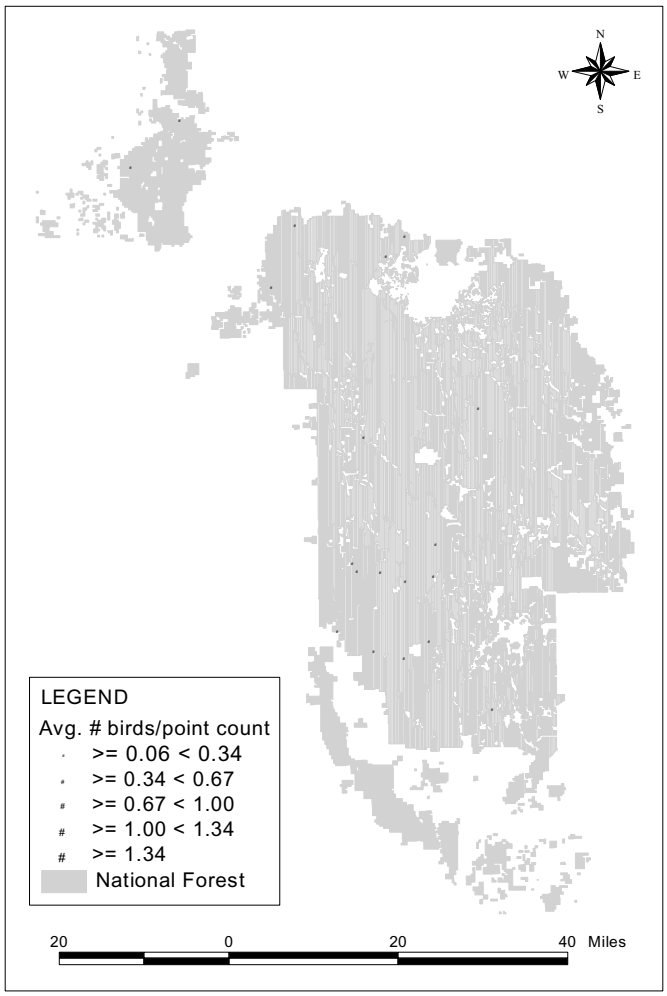


Relative abundance of Three-toed Woodpecker among habitats in the Black Hills.

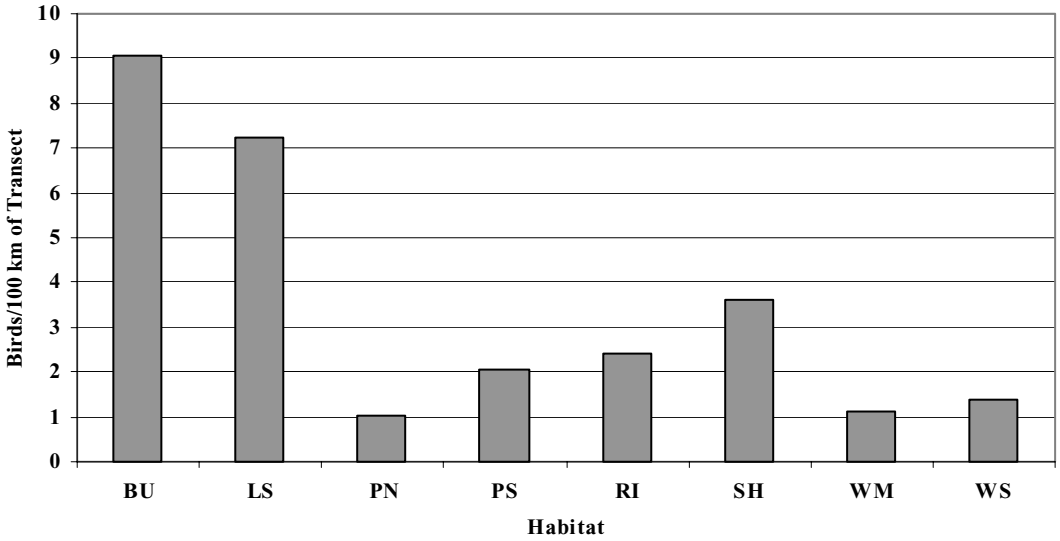
Legend: AS=Aspen, **BU**=Burn, **LS**=Late successional Pine, **MG**=Mixed grass, **PN**=Pine north, **PS**=Pine south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Black-backed Woodpecker

Black-backed Woodpecker is widely distributed in the Black Hills, but it is a relatively rare species throughout (see map). Pettingill and Whitney (1965) described this species as an "uncommon permanent resident at higher elevations," although based on our observations, neither of those descriptions seems wholly correct. We recorded a total of 24 Black-backed Woodpeckers in eight habitats on 763 km of transect in the Black Hills. We observed the most Black-backed Woodpecker per unit of effort in BU (*n*=9) and in LS habitats (*n*=6) (see chart). Because the species was so rarely observed in other habitats (PN, *n*=1; PS *n*=2; RI *n*=2; SH *n*=2; WM *n*=1; WS, *n*=1), BU and LS are important habitats for Black-backed Woodpecker populations in the Black Hills. Because this population is isolated from other populations occurring to the north and west, careful management of Black-backed Woodpecker habitat should be undertaken. Additional efforts in BU and LS may be needed to effectively monitor this species in the Black Hills.



Abundance and breeding distribution of Black-backed Woodpecker in the Black Hills, 2001.

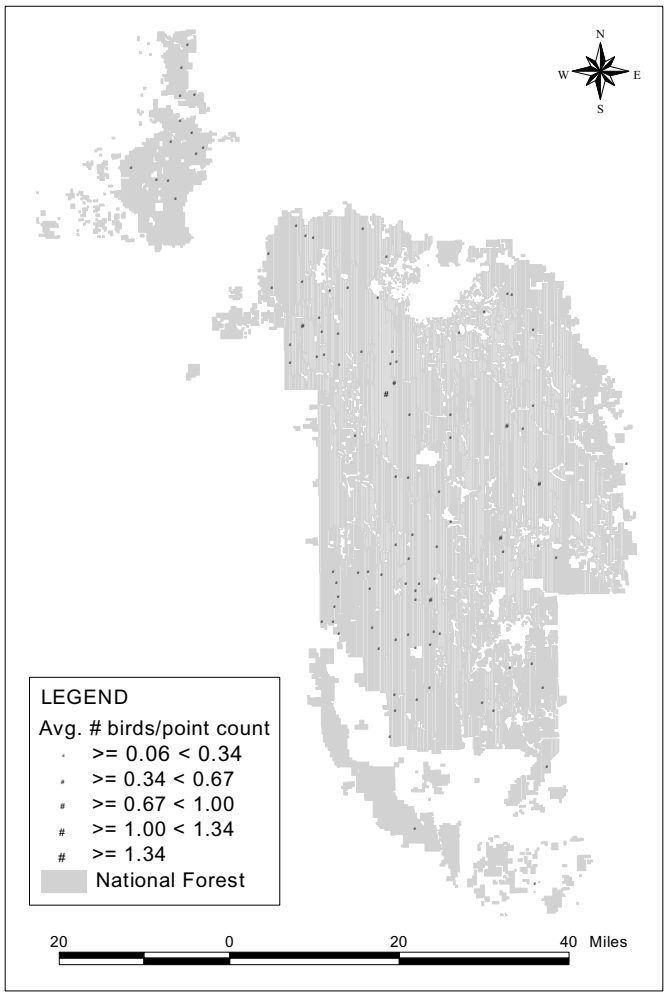


Relative abundance of Black-backed Woodpecker among habitats in the Black Hills.

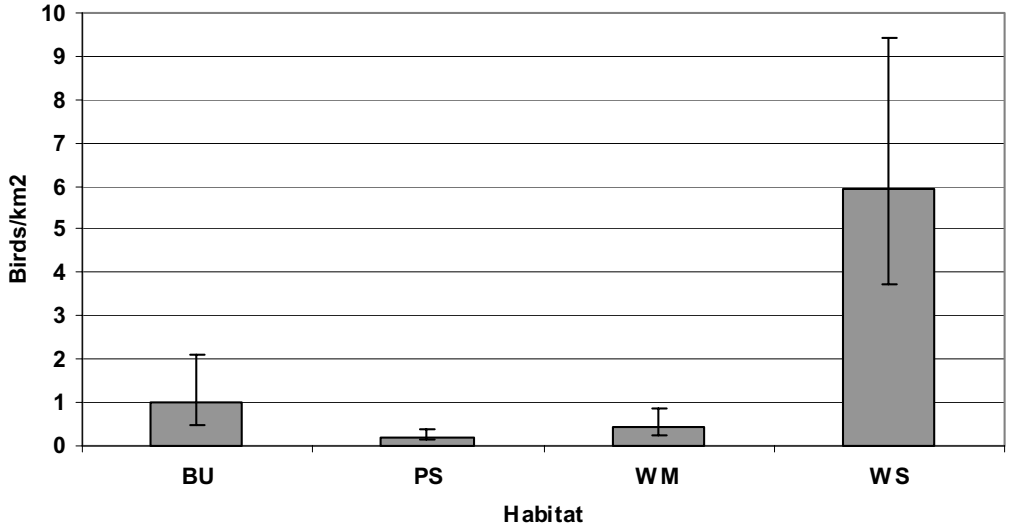
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Northern Flicker

Northern Flicker ranges throughout the Black Hills in low to moderate abundance (see map). Two forms of the Northern Flicker, "Yellow-shafted" and "Red-shafted," occur in the Black Hills; they are treated together here. Density of Northern Flicker is greatest in WS (D=5.9 birds/km^2, CV=24%, n=47). It occurs in low density in BU (D=1.0 birds/km^2, CV=39%, n=37), WM (D=0.4 birds/km^2, CV=35%, n=27) and PS (D=0.2 birds/km^2, CV=28%, n=28), and smaller numbers were recorded from AS (n=13), LS (n=14), MG (n=1), PN (n=22), RI (n=12) and SH (n=11). This species should be effectively monitored under MBBH through point transects in a range of habitats, especially WS.



Abundance and breeding distribution of Northern Flicker in the Black Hills, 2001.



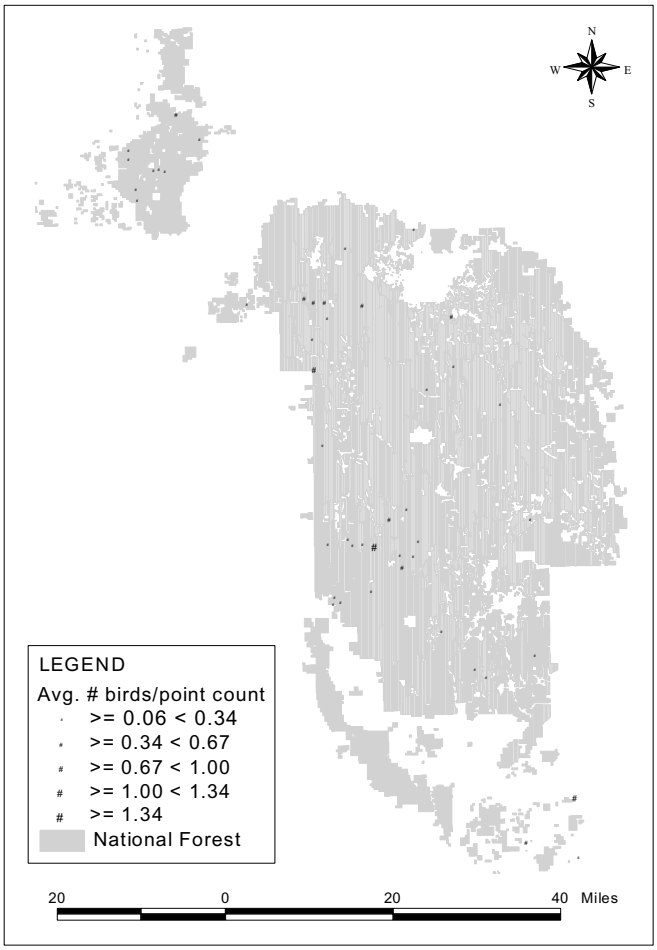
Relative density of Northern Flicker among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

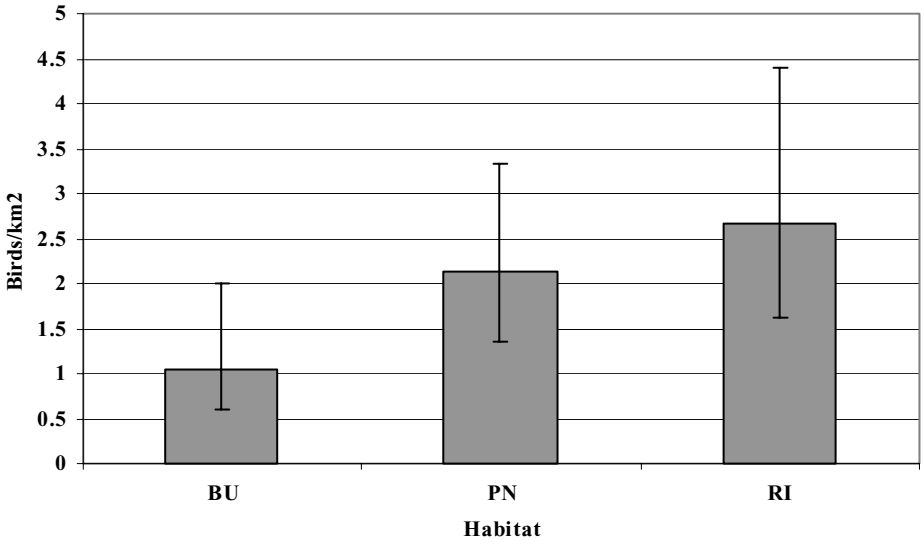
Western Wood-Pewee

Pettingill and Whitney (1965) described Western Wood-Pewee as "common to abundant at all elevations" and "the most numerous flycatcher in the pine forests." However, based on our surveys in 2001, this is no longer the case. We found that Western Wood-Pewee is still fairly widely distributed throughout much of the Black Hills, but in most places it is relatively uncommon or absent (see map). Although comparable data do not exist, it seems certain that Western Wood-Pewee has declined significantly in the Black Hills in recent decades. What is not certain, however, is why.

Presently, Western Wood-Pewee occurs in highest density (although still relatively low compared with other species) in RI (*D*=2.7 birds/km^2, CV=25%, *n*=38), BU (*D*=1.1 birds/km^2, CV=32%, *n*=32) and PN (*D*=2.1 birds/km^2, CV=23%, *n*=41) (see chart). We also found Western Wood-Pewee in small numbers in AS (*n*=11), LS (*n*=15), PS (*n*=16), SH (*n*=3) and WM (*n*=21). This species should be effectively monitored under MBBH through point transects in several habitats, although serious attention should be given toward understanding why this species, that was formerly one of the most abundant summer residents of the Black Hills, is now extremely uncommon.



Abundance and breeding distribution of Western Wood-Pewee in the Black Hills, 2001.

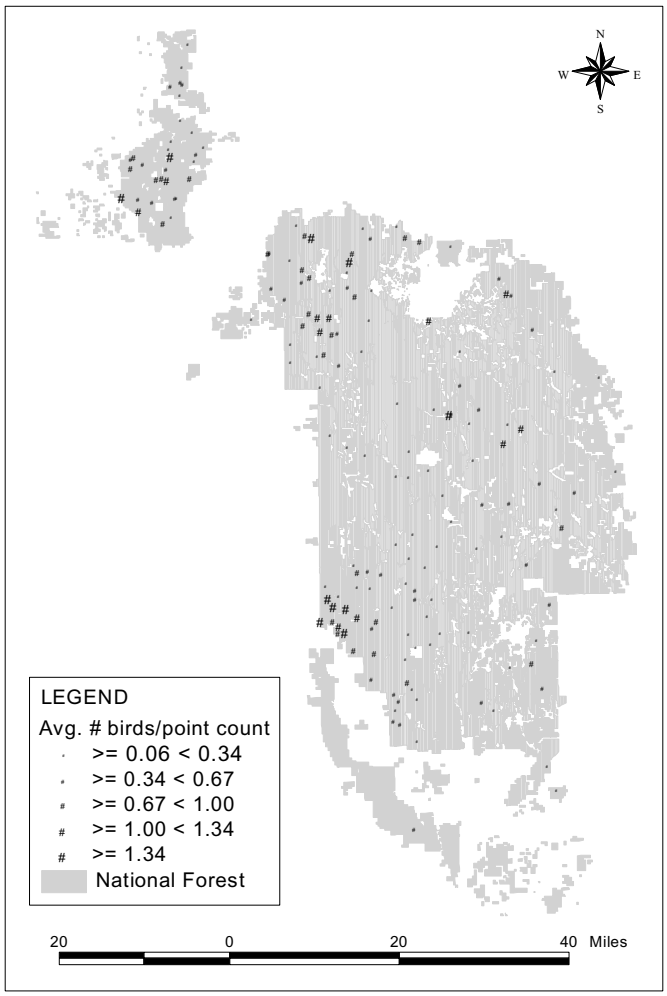


Relative density of Western Wood-Pewee among habitats in the Black Hills.

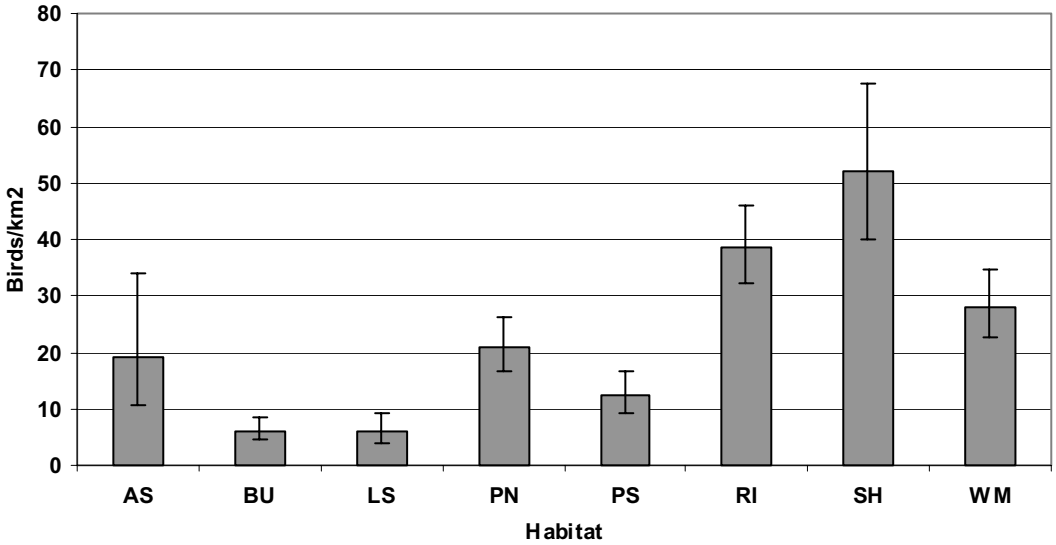
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Dusky Flycatcher

Dusky Flycatcher ranges throughout the Black Hills, but it is more abundant in some areas than in others (see map). Dusky Flycatcher occurs in moderate density in most habitats (see chart), although density is greatest in SH (D=52.0 birds/km^2, CV=13%, n=191), and is considerably high in RI (D=38.5 birds/km^2, CV=9%, n=224) as well. Dusky Flycatcher occurs in lower, but still relatively high density in AS (D=18.9 birds/km^2, CV=30%, n=124), PN (D=20.9 birds/km^2, CV=12%, n=169), PS (D=12.4 birds/km^2, CV=15%, n=97) and WM (D=28.1 birds/km^2, CV=11, n=188). Dusky Flycatcher occurs in relatively low density in BU (D=6.2 birds/km^2, CV=16%, n=76) and LS (D=6.0 birds/km^2, CV=22, n=52), and small numbers were recorded from MG (n=5) and WS (n=9). This species should be effectively monitored through point transects in a wide range of habitats under *MBBH*.



Abundance and breeding distribution of Dusky Flycatcher in the Black Hills, 2001.

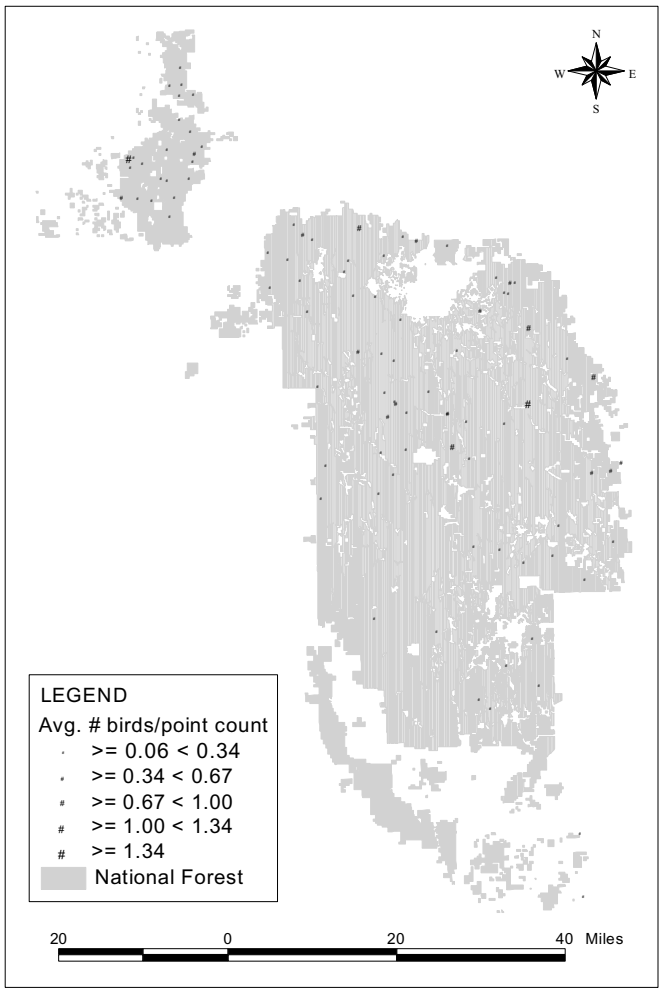


Relative density of Dusky Flycatcher among habitats in the Black Hills.

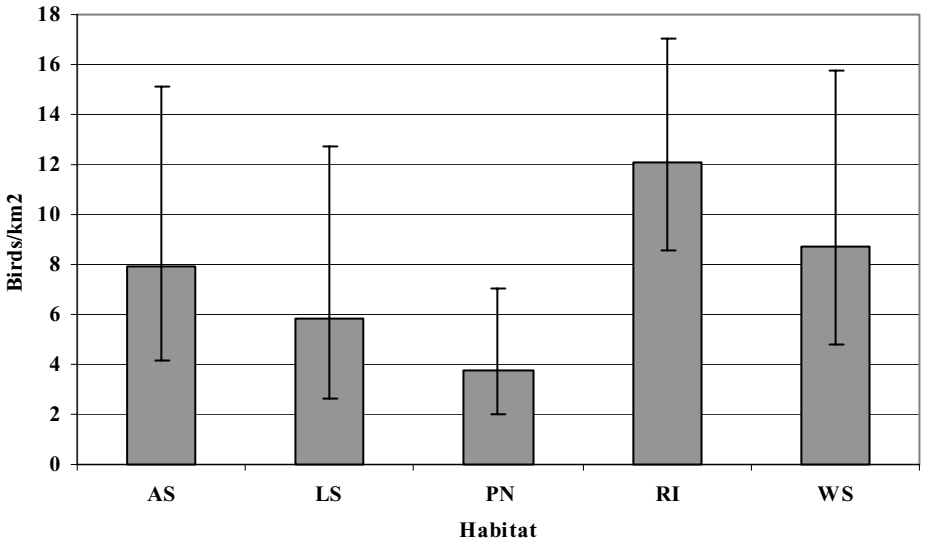
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Cordilleran Flycatcher

Cordilleran Flycatcher occurs throughout much of the Black Hills, but it is more widespread and abundant in the north (see map). The species nests primarily in well-shaded canyons on low cliff ledges, although alternative substrates are sometimes used (Pettingill and Whitney 1965). Cordilleran Flycatcher occurs in greatest density in RI (D=12.1 birds/km^2, CV=18%, n=63), and in somewhat lower density in WS (D=8.7 birds/km^2, CV=30%, n=44), AS (D=7.9 birds/km^2, CV=33%, n=27), LS (D=5.8 birds/km^2, CV=40%, n=30) and PN (D= 3.8 birds/km^2, CV=32%, n=23) (see chart). Cordilleran Flycatcher was also recorded from PS (n=12) and WM (n=19) habitats. This species should be effectively monitored under *MBBH* through point transects in a range of habitats, especially RI.



Abundance and breeding distribution of Cordilleran Flycatcher in the Black Hills, 2001.

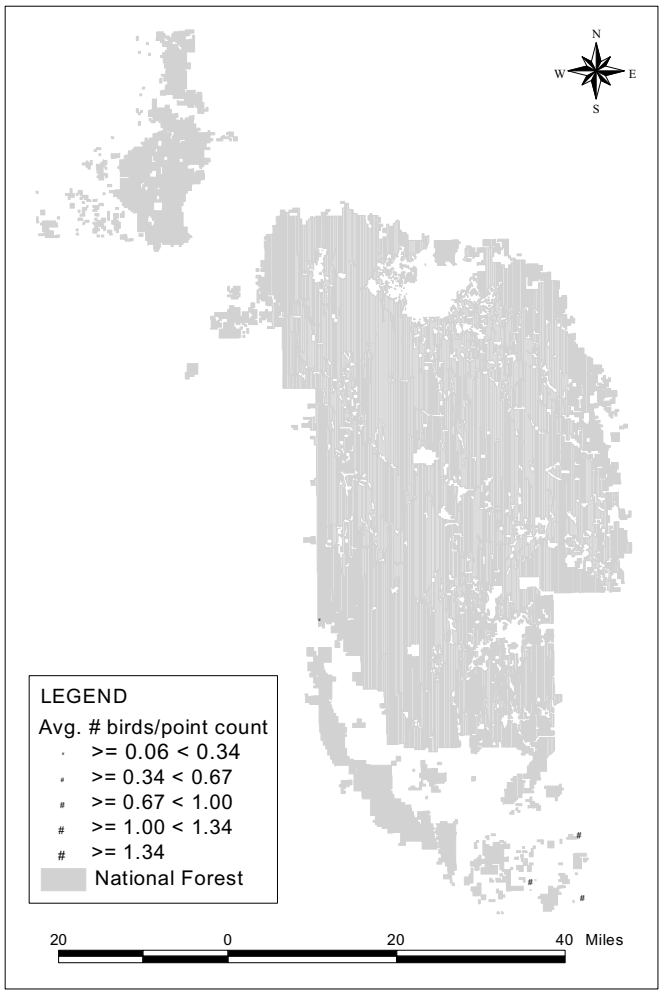


Relative density of Cordilleran Flycatcher among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Eastern Kingbird

Eastern Kingbird occurs in only a few locations within the Black Hills, primarily at low elevations where it can be moderately abundant (see map). However, it is undoubtedly more widespread and abundant outside the Black Hills. Eastern Kingbird was recorded primarily in RI (*D*=4.9 birds/km^2, CV=31%, *n*=35), although this estimate represents the *average* density across all RI habitats in the Black Hills. It was also observed from SH (*n*=2). Because Eastern Kingbird occurs only at lower elevations, density is probably higher at such sites. Nonetheless, this species should be effectively monitored under MBBH through point transects in RI. Additional sites in low-elevation RI would increase power and provide more reliable estimates of density in appropriate habitat.

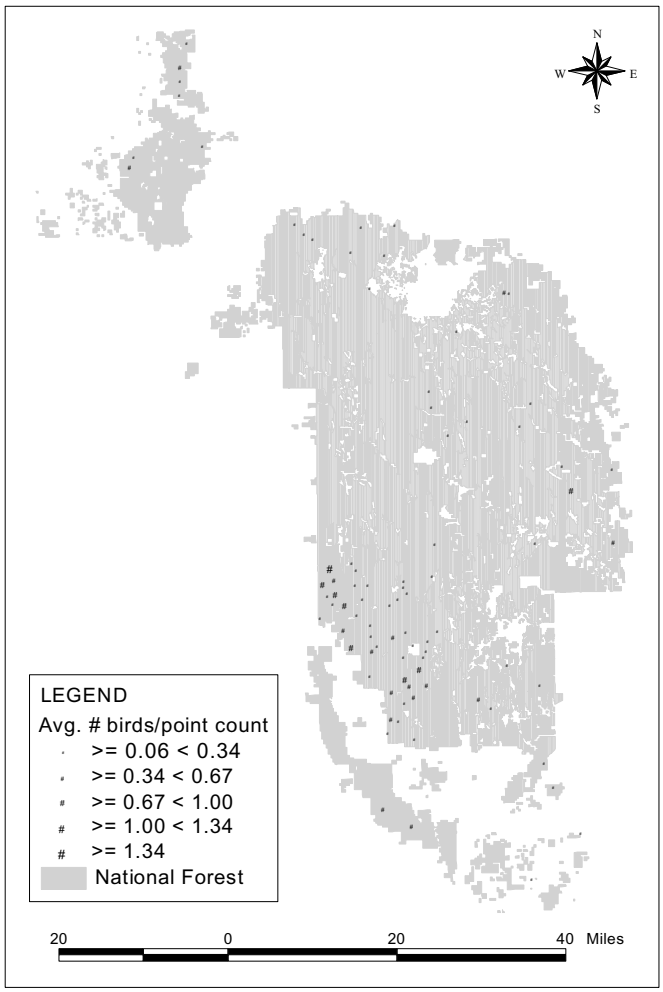


Abundance and breeding distribution of Eastern Kingbird in the Black Hills, 2001.

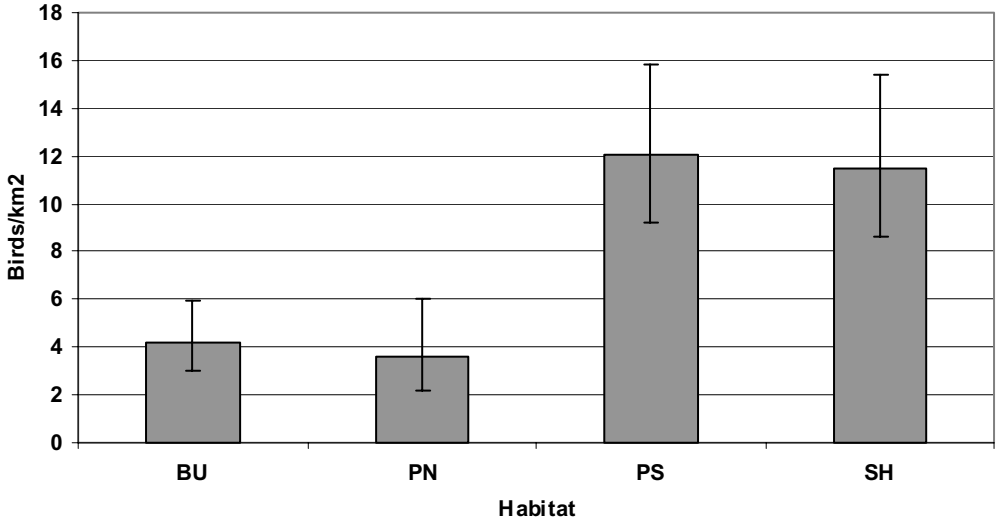
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Plumbeous Vireo

Plumbeous Vireo is distributed widely across the Black Hills in low to moderate abundance, but the population appears to be concentrated in the southwest (see map). Density of Plumbeous Vireo is greatest in PS (D=12.1 birds/km^2, CV=14%, n=107) and SH (D=11.5 birds/km^2, CV=15%, n=35); low densities exist in BU (D=4.2 birds/km^2, CV=17%, n=51) and PN (D=3.6 birds/km^2, CV=27%, n=34). Smaller numbers of Plumbeous Vireos were recorded from other habitats, including AS (n=5), LS (n=14), MG (n=2), RI (n=22), WM (n=23), and WS (n=1). This species should be effectively monitored under MBHH through point transects in a range of habitats, especially in PS and SH.



Abundance and breeding distribution of Plumbeous Vireo in the Black Hills, 2001.

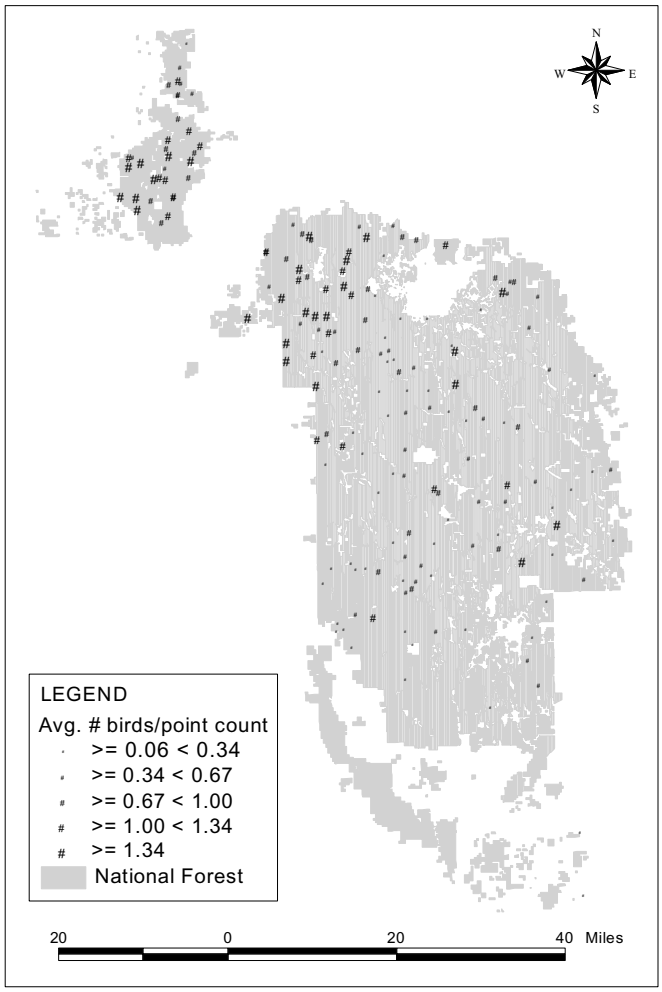


Relative density of Plumbeous Vireo among habitats in the Black Hills.

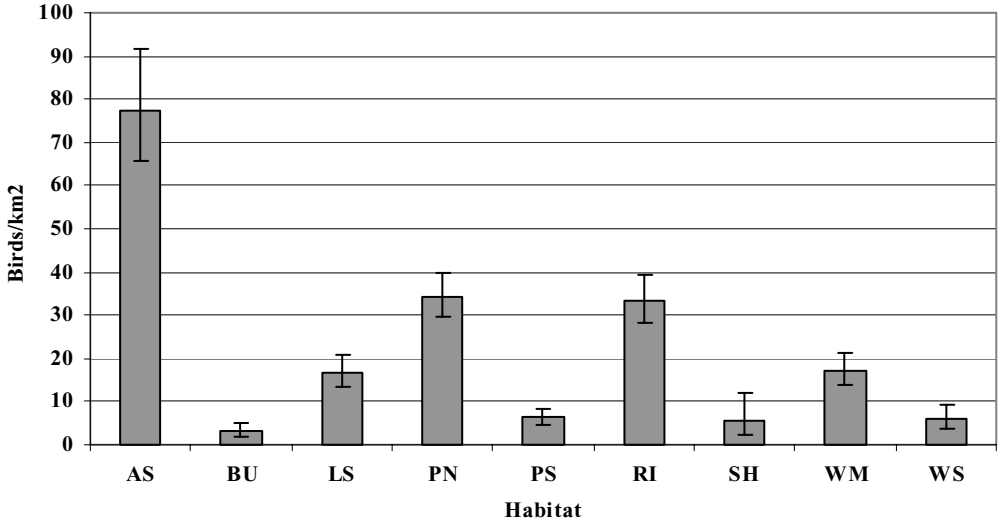
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Warbling Vireo

Warbling Vireo occurs widely throughout the Black Hills, often in high abundance, particularly in the north and in the Bear Lodge Mountains (see map). It invariably occurs in association with deciduous vegetation, especially aspen. Estimated density of Warbling Vireo is greatest in AS (*D*=77.5 birds/km^2, CV=9%, *n*=392), although moderately high densities also occur in PN (*D*=34.3 birds/km^2, CV=7%, *n*=425) and RI (*D*=33.4 birds/km^2, CV=8%, *n*=296) (see chart). Lower densities of Warbling Vireo exist in BU (*D*=3.2 birds/km^2, CV=23%, *n*=50), LS (*D*=16.5 birds/km^2, CV=12%, *n*=96), PS (*D*=6.3 birds/km^2, CV=16%, *n*=98), SH (*D*=5.3 birds/km^2, CV=43%, *n*=32), WM (*D*=17.0 birds/km^2, CV=11%, *n*=233) and WS (*D*=6.0 birds/km^2, CV=23%, *n*=50). Two individuals were also detected from MG. This species should be effectively monitored under *MBBH* through point transects in a range of habitats, especially AS.



Abundance and breeding distribution of Warbling Vireo in the Black Hills, 2001.

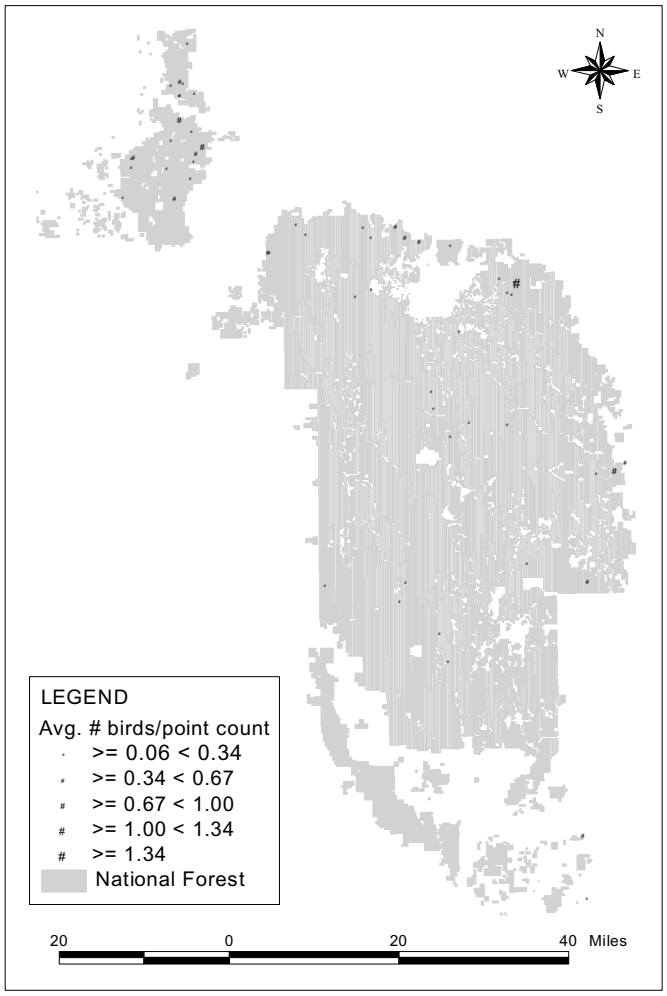


Relative density of Warbling Vireo among habitats in the Black Hills.

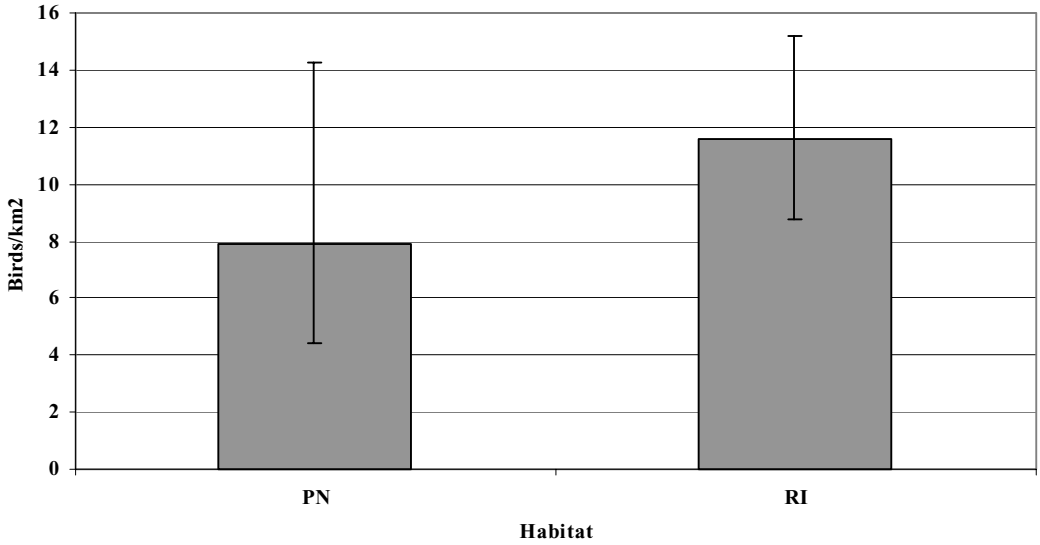
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Red-eyed Vireo

Red-eyed Vireo occurs locally throughout much of the Black Hills in low to moderate abundance (see map). Red-eyed Vireos are found primarily at lower elevations, and usually in association with bur oak or other deciduous trees. Density of Red-eyed Vireos appears to be greatest in RI (D=11.6 birds/km^2, CV=14%, n=80), although they occur regularly in PN (D=7.9 birds/km^2, CV=30%, n=32), primarily where oaks occur. Red-eyed Vireos were recorded in smaller numbers from AS (n=23), BU (n=4), LS (n=16), PS (n=14) and WM (n=6). This species should be effectively monitored under *MBBH* through point transects in RI and PN.



Abundance and breeding distribution of Red-eyed Vireo in the Black Hills, 2001.



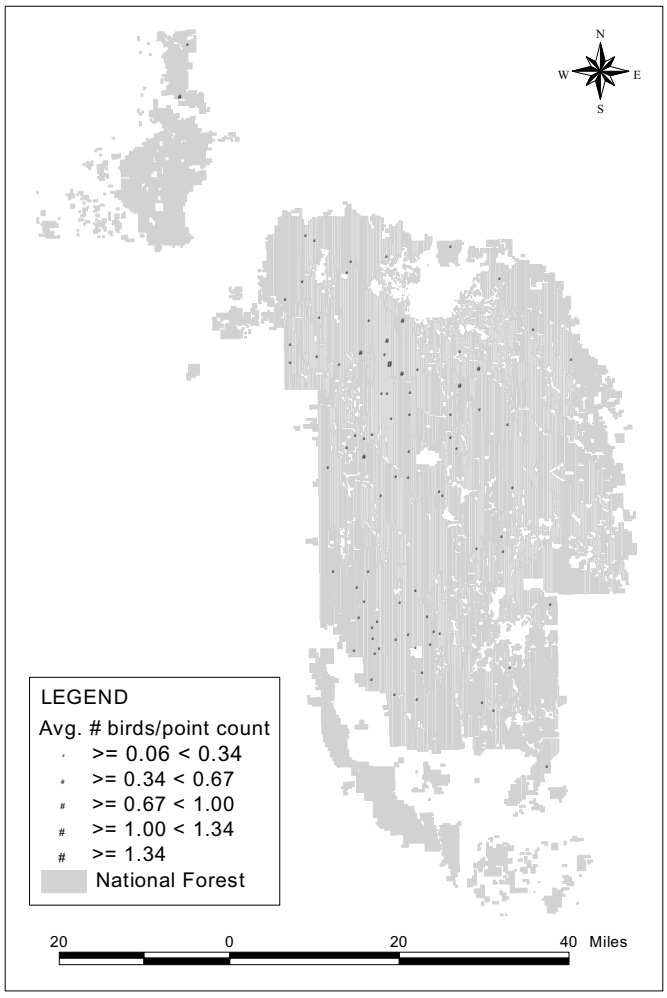
Relative density of Red-eyed Vireo among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

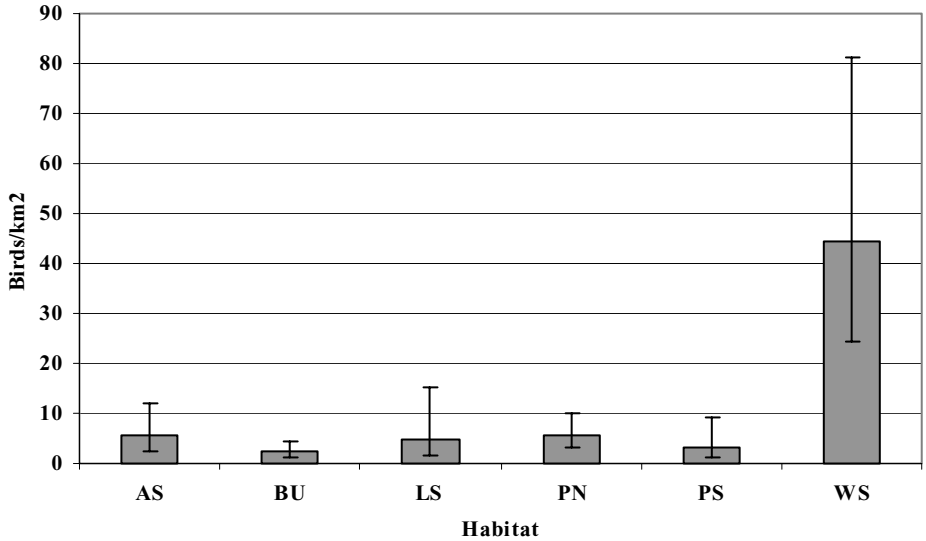
Gray Jay

Gray Jay is found throughout the Black Hills, but is perhaps less abundant in the east (see map). Gray Jays occupy wide range of habitats, but they occur in greatest density in WS (D=44.3 birds/km^2, CV=31%, n=86) (see chart). Gray Jay occurs in lower density in AS (D=5.6 birds/km^2, CV=40%, n=25), BU (D=2.4 birds/km^2, CV=32%, n=27), LS (D=5.0 birds/km^2, CV=60%, n=23), PN (D=5.8 birds/km^2, CV=29%, n=27) and PS (D=3.3 birds/km^2, CV=54%, n=23), and it was recorded in small numbers from RI (n=7), SH (n=3) and WM (n=18).

Gray Jay behavior provides an interesting problem in sampling bird populations that results when birds are attracted to the observer. This behavior can lead to overestimates of population. However, based on our results from this year, Gray Jay should be effectively monitored under MBBH through point transects, especially in WS.



Abundance and breeding distribution of Gray Jay in the Black Hills, 2001.

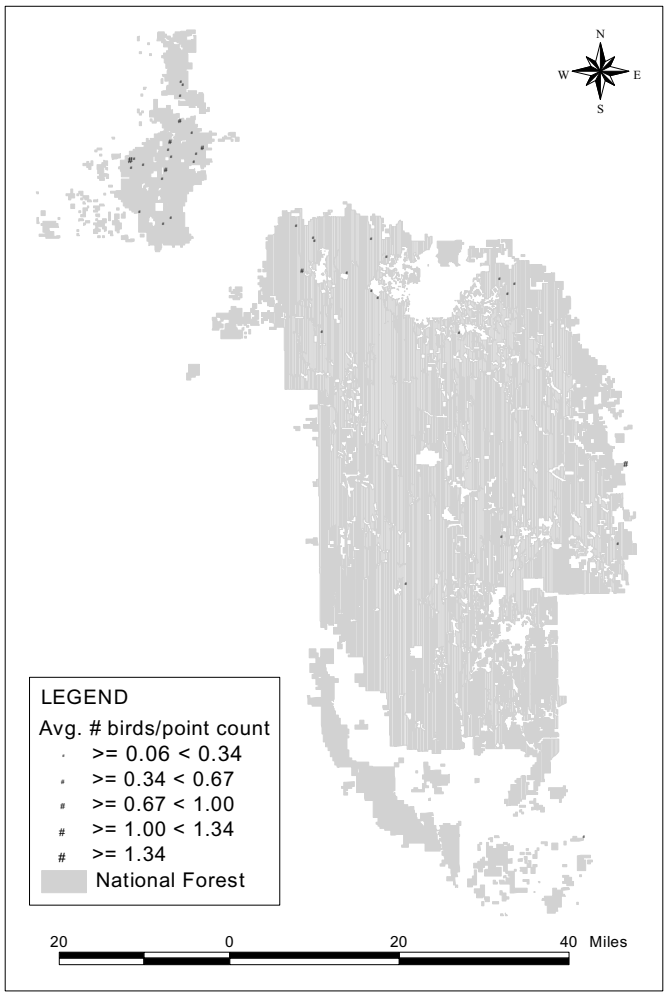


Relative density of Gray Jay among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Blue Jay

Blue Jay occurs mostly in the northern and eastern Black Hills in low to moderate abundance (see map). The species is primarily restricted to RI habitat, where it occurs in relatively low density (D=1.8 birds/km^2, CV=27%, n=38). Blue Jays occur uncommonly in AS (n=19) and PN (n=18), and they were observed in small numbers from most other habitats, including BU (n=1), LS (n=5), PS (n=2), SH (n=2), WM (n=3) and WS (n=3). This species should be effectively monitored through point transects under MBBH in RI habitat.

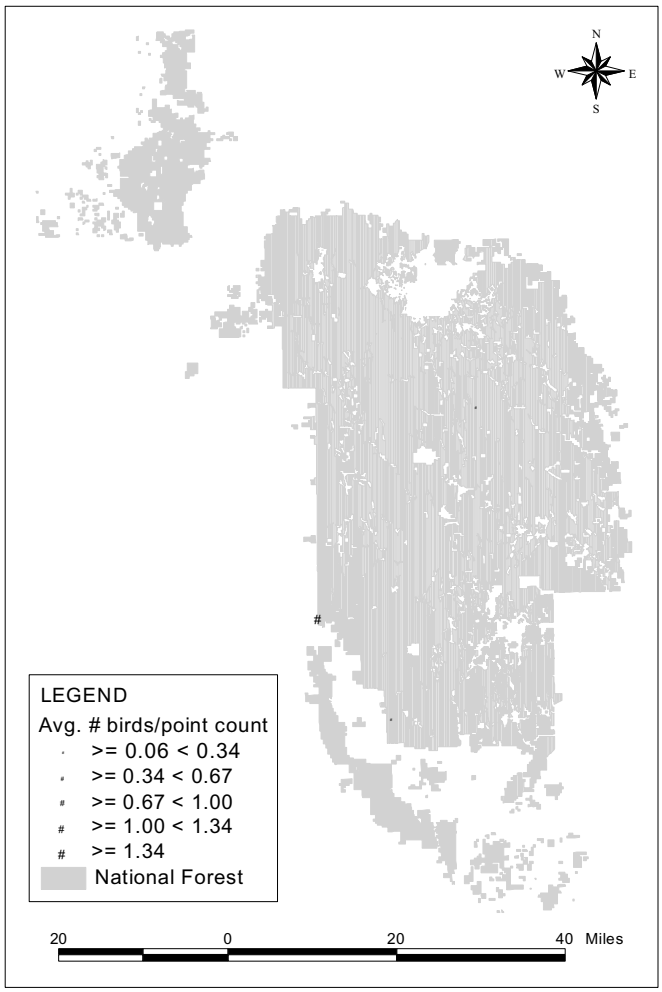


Abundance and breeding distribution of Blue Jay in the Black Hills, 2001.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Pinyon Jay

Pinyon Jay occurs locally at low elevations, primarily within a small area of the southwestern Black Hills (see map). Pinyon Jay occurs almost exlcusively in SH habitat (*D*=0.2 birds/km^2, CV=48%, *n*=84), where it can be observed in large flocks, although it occurs in very low density relative to most other species. One individual was observed in LS. Our results suggest that we should be able to monitor Pinyon Jay under *MBBH* through point transects in SH habitat.

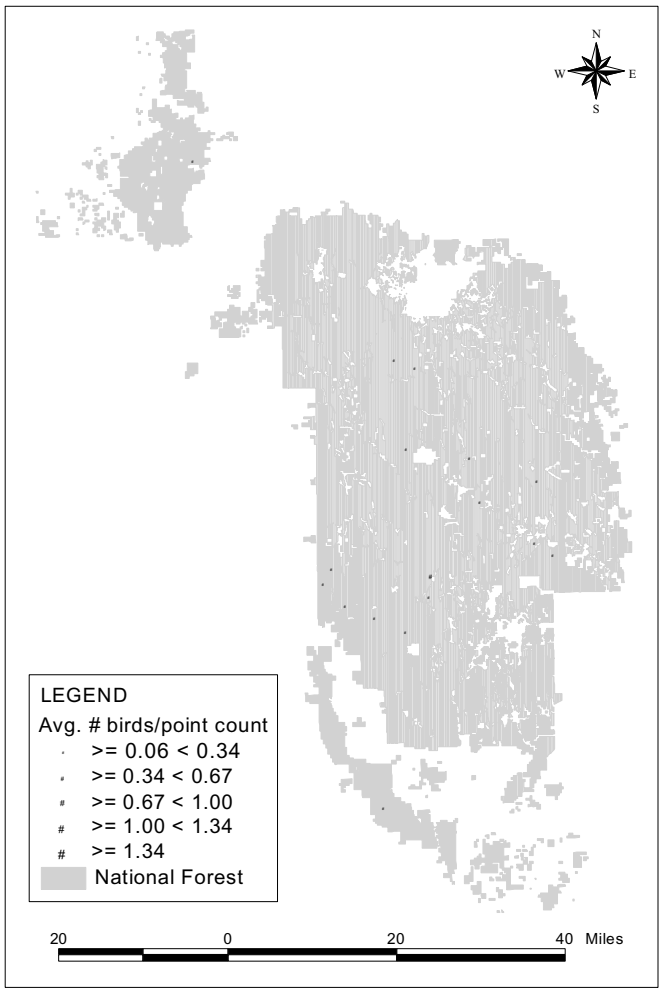


Abundance and breeding distribution of Pinyon Jay in the Black Hills, 2001.

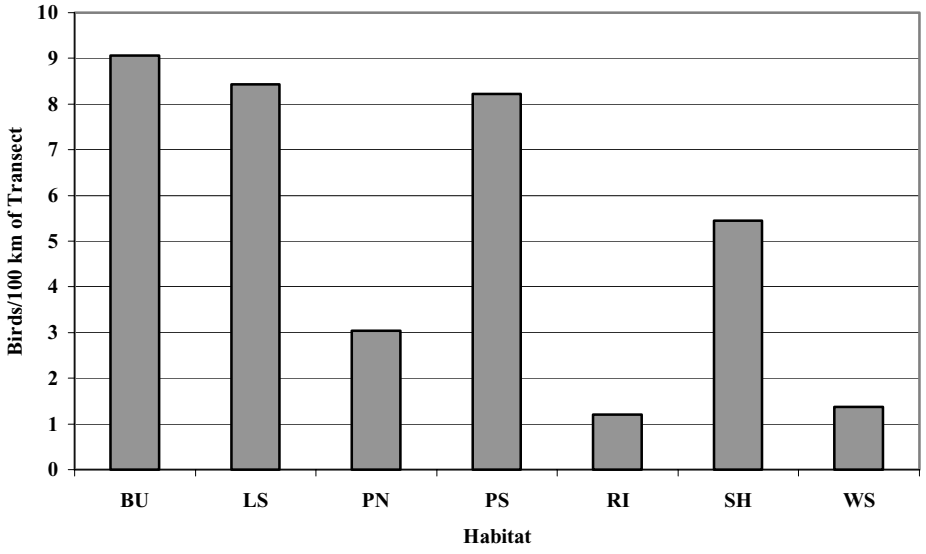
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Clark's Nutcracker

Clark's Nutcracker occurs in many parts of the Black Hills, but nowhere is it abundant (see map). It occurs in a wide range of habitats (see chart), although we recorded more Clark's Nutcracker's per unit of effort in BU (*n*=9), LS (*n*=7), and PS (*n*=8). Pettingill and Whitney (1965) describe this species a "rare or uncommon visitant" in the Black Hills and cite no evidence of breeding. Breeding Bird Atlas data suggest, but do not confirm, breeding in the Black Hills (Peterson 1995). Our breeding season surveys suggest the same, and it is probably not unreasonable to assume that Clark's Nutcracker does in fact breed in the Black Hills. Point transects should provide a means to track its status in the Black Hills. Effective monitoring could require additional effort beyond point transects, and may prove difficult.



Abundance and breeding distribution of Clark's Nutcracker in the Black Hills, 2001.

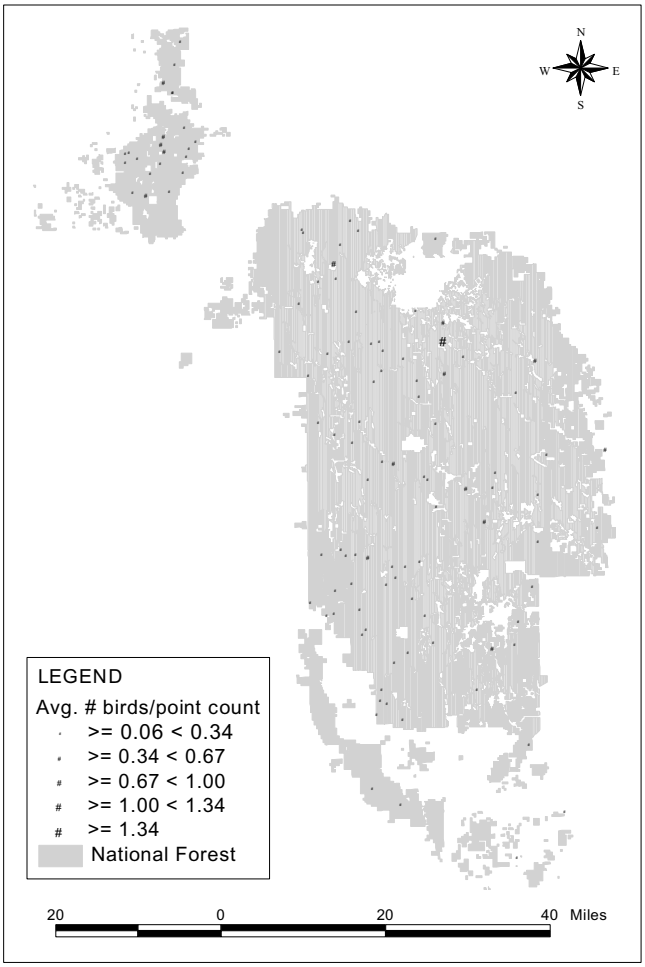


Relative abundance of Clark's Nutcracker among habitats in the Black Hills.

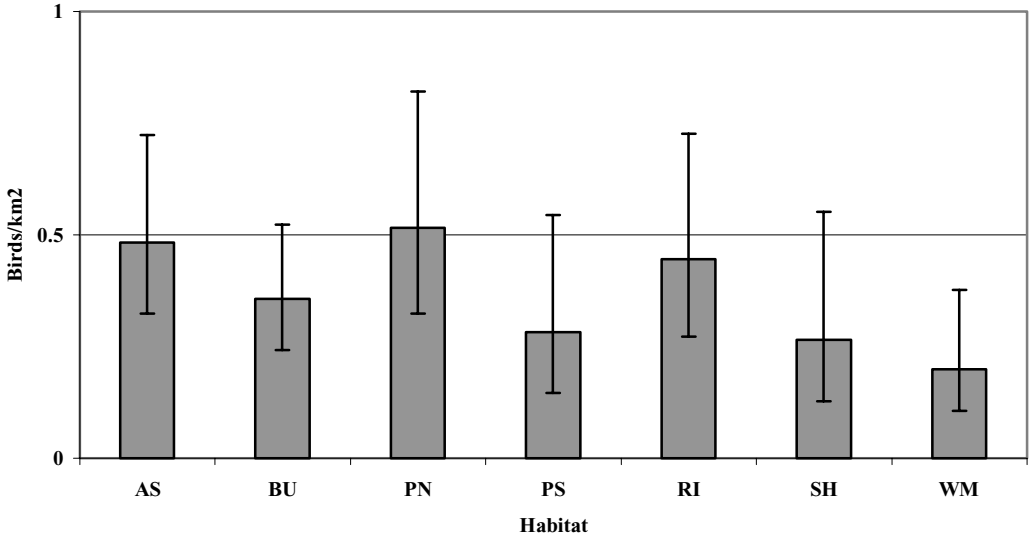
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

American Crow

American Crow occurs in low abundance throughout most of the Black Hills (see map). Estimated density (*D*) of American Crow is relatively low in AS (*D*=0.5 birds/km^2, CV=21%, *n*=48), BU (*D*=0.4 birds/km^2, CV=20%, *n*=39), PN (*D*=0.5 birds/km^2, CV=24%, *n*=38), PS (*D*=0.3 birds/km^2, CV=34%, *n*=31), RI (*D*=0.4 birds/km^2, CV=25%, *n*=40), SH (*D*=0.3 birds/km^2, CV=38%, *n*=25), and WM (*D*=0.2 birds/km^2, CV=33%, *n*=24) (see chart). American Crow was also detected smaller numbers in LS (*n*=20), MG (*n*=6), and WS habitats (*n*=22). This species should be effectively monitored under *MBBH* through point-transects in a wide range of habitats.



Abundance and distribution of American Crow in the Black Hills.

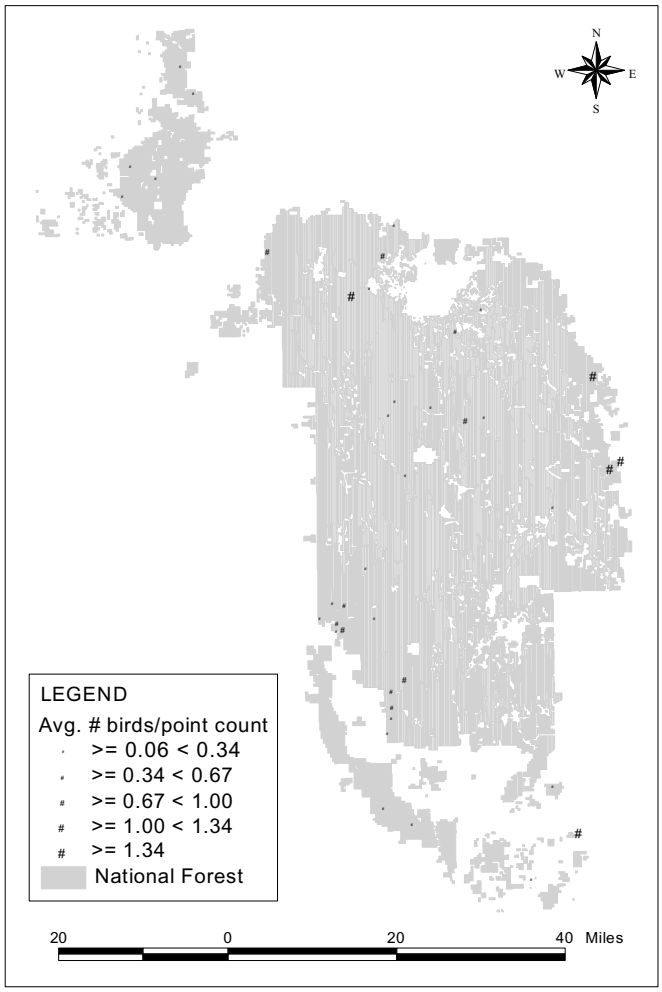


Relative abundance of American Crow among habitats in the Black Hills.

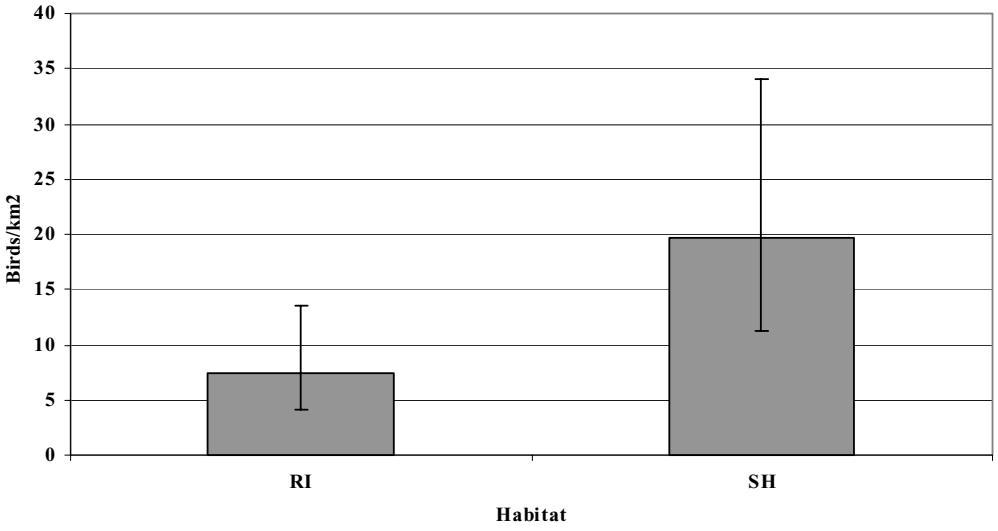
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Violet-green Swallow

Violet-green Swallow occurs locally in the Black Hills, where it can be abundant (see map), particularly in lower reaches of canyons where steep cliffs provide suitable nest sites. Estimated density of Violet-green Swallow is greatest in SH (D=19.6 birds/km^2, CV=29%, n=32), presumably because of the widespread availability of cliffs. Similarly, Violet-green Swallows occur in RI (D=7.4 birds/km^2, CV=31%, n=113), again primarily in the areas around cliffs. Smaller numbers were also recorded from AS (n=4), BU (n=1), LS (n=16), PN (n=2), PS (n=13), WM (n=3) and WS (n=3). This species should be effectively monitored under *MBBH* through point transects in SH and RI habitats.



Abundance and breeding distribution of Violet-green Swallow in the Black Hills, 2001.

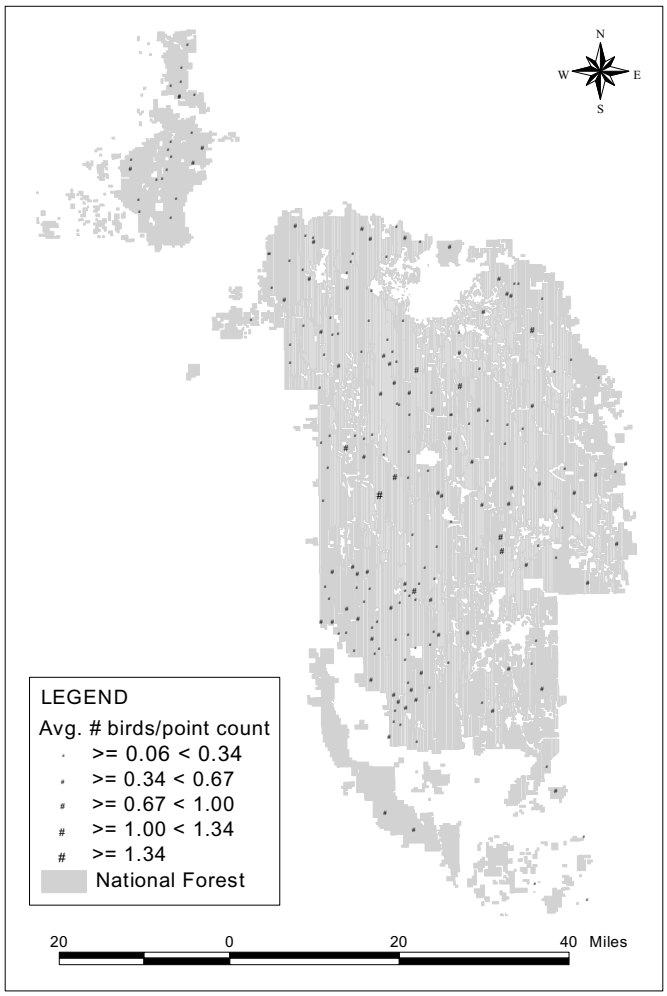


Relative density of Violet-green Swallow among habitats in the Black Hills.

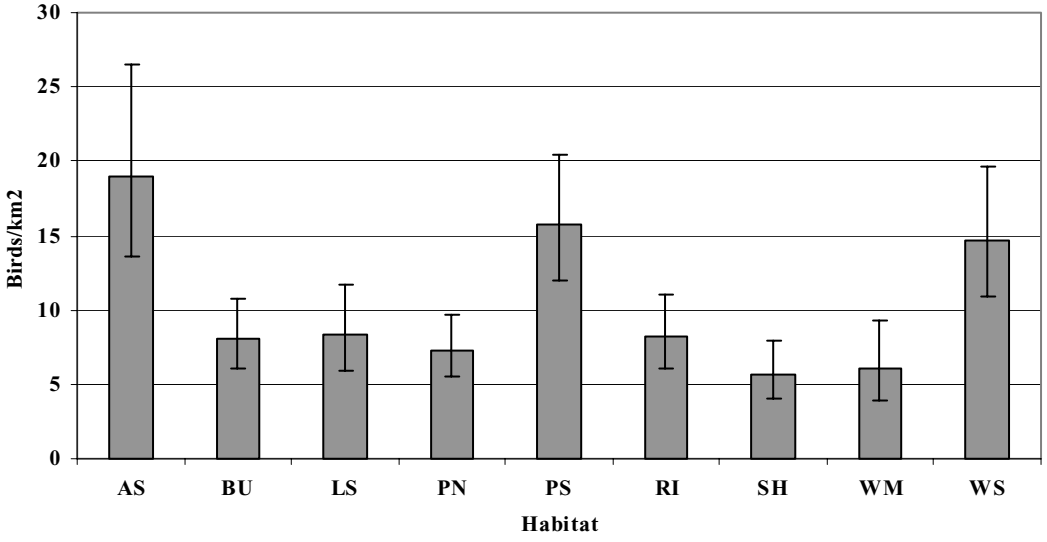
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Black-capped Chickadee

Black-capped Chickadee is a widespread and abundant resident of the Black Hills (see map). It occurs in most habitats, although density is greatest in AS (D=19.0 birds/km^2, CV=17%, n=88), PS (D=15.7 birds/km^2, CV=14%, n=162) and WS (D=14.7 birds/km^2, CV=15%, n=126) (see chart). Black-capped Chickadee occurs in moderate density in BU (D=8.1 birds/km^2, CV=15%, n=103) LS (D=8.4 birds/km^2, CV=17%, n=94), PN (D=7.3 birds/km^2, CV=15%, n=114), RI (D=8.2 birds/km^2, CV=15%, n=61), SH (D=5.7 birds/km^2, CV=17%, n=72), and WM (D=6.0 birds/km^2, CV=23%, n=84). Black-capped Chickadee was also recorded in low numbers from MG (n=6). This species should be effectively monitored through point transects under *MBBH* in a wide range of habitats.



Abundance and breeding distribution of Black-capped Chickadee in the Black Hills, 2001.

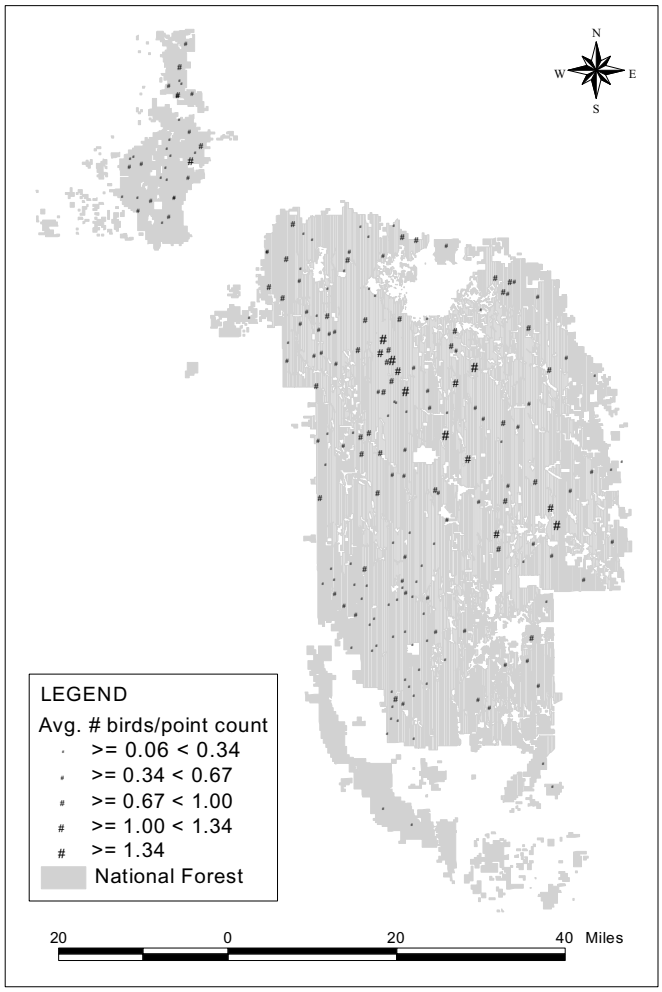


Relative density of Black-capped Chickadee among habitats in the Black Hills.

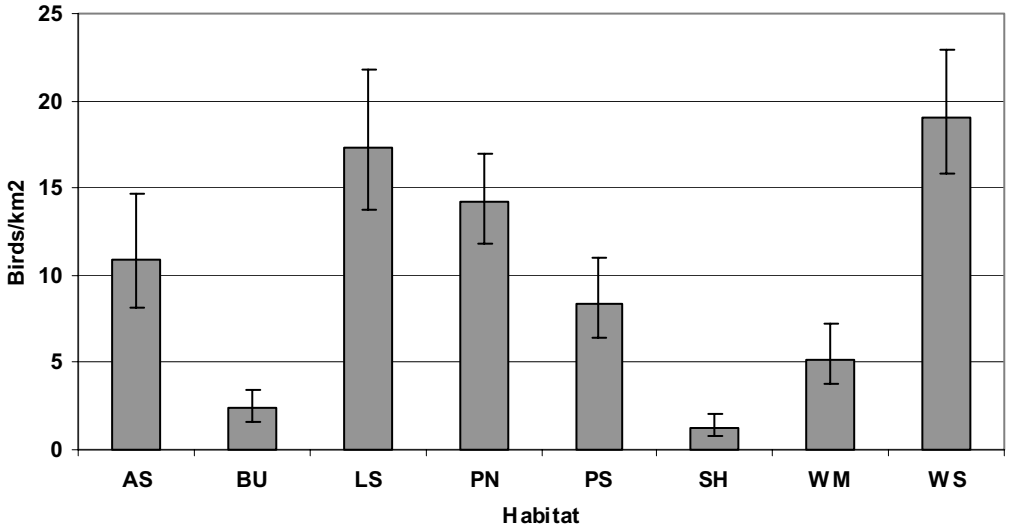
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Red-breasted Nuthatch

Red-breasted Nuthatch occurs throughout the Black Hills but is more abundant in the north (see map). Although found in a wide range of habitats, Red-breasted Nuthatch occurs in greatest density in WS (*D*=19.1 birds/km^2, CV=9%, *n*=253) and LS (*D*=17.3 birds/km^2, CV=12%, *n*=237). Red-breasted Nuthatches also occur in moderately high density in AS (*D*=10.9 birds/km^2, CV=15%, *n*=128), PN (*D*=14.2 birds/km^2, CV=9%, *n*=258), and PS (*D*=8.4 birds/km^2, CV=14%, *n*=174), and in lower density in BU (*D*=2.4 birds/km^2, CV=19%, *n*=65), SH (*D*=1.3 birds/km^2, CV=24%, *n*=28) and WM (*D*=5.2 birds/km^2, CV=16%, *n*=147). Low numbers of Red-breasted Nuthatches were also recorded from MG (*n*=6). This species should be effectively monitored under *MBBH* through point transects in a wide range of habitats.



Abundance and breeding distribution of Red-breasted Nuthatch in the Black Hills, 2001.

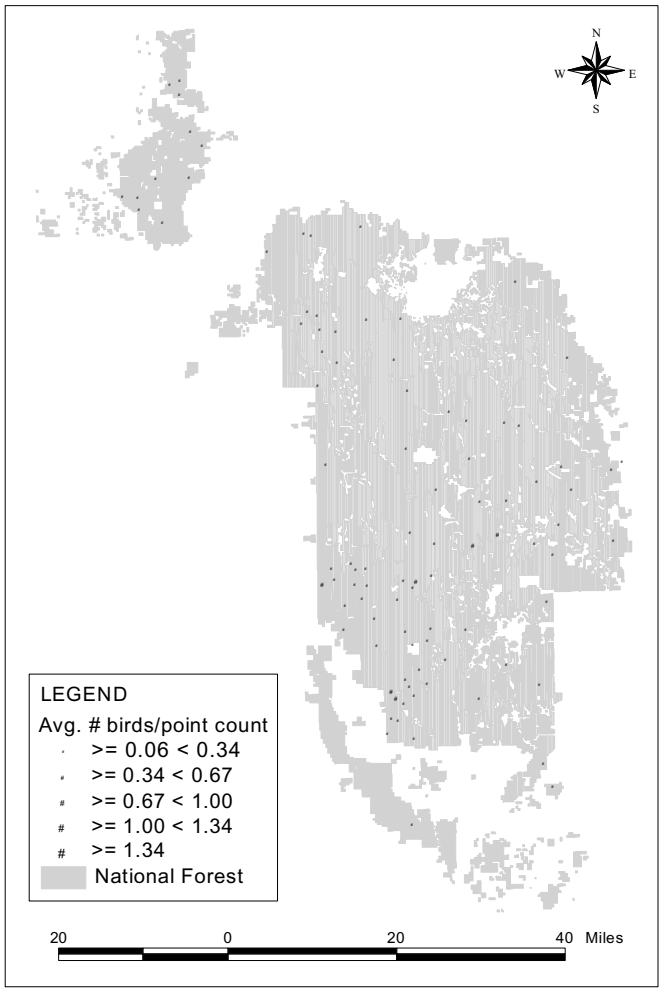


Relative density of Red-breasted Nuthatch among habitats in the Black Hills.

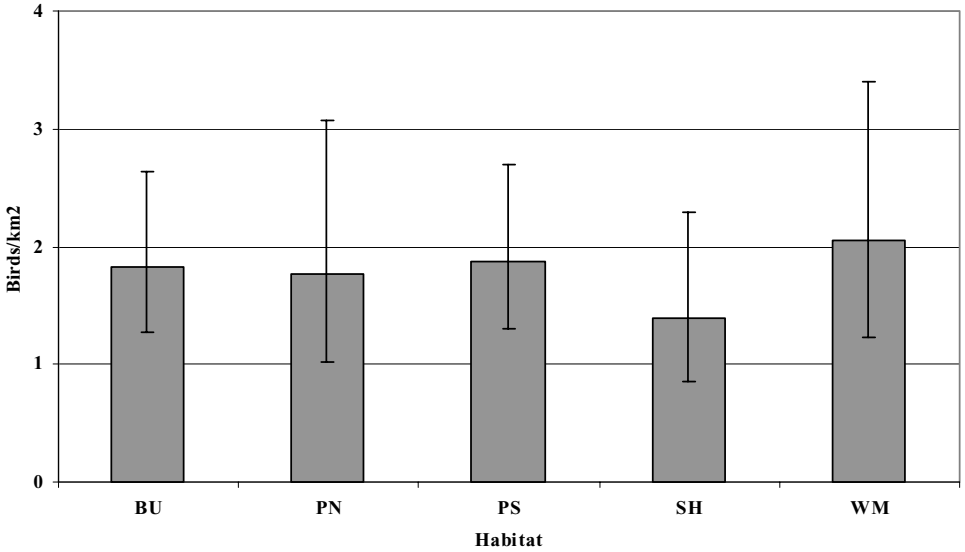
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

White-breasted Nuthatch

White-breasted Nuthatch occurs in low abundance throughout the Black Hills region (see map). Estimated density of White-breasted Nuthatch is remarkably similar among BU (*D*=1.8 birds/km^2, CV=18%, *n*=37), PN (*D*=1.8 birds/km^2, CV=28%, *n*=23), PS (*D*=1.9 birds/km^2, CV=19%, *n*=45), SH (*D*=1.4 birds/km^2, CV=25%, *n*=29) and WM (*D*=2.1 birds/km^2, CV=26%, *n*=30). White-breasted Nuthatch was recorded in smaller numbers from AS (*n*=11), LS (*n*=16), MG (*n*=4), RI (*n*=12), and WS (*n*=2). This species should be effectively monitored under MBBH through point transects in a range of habitats.



Abundance and breeding distribution of White-breasted Nuthatch in the Black Hills, 2001.

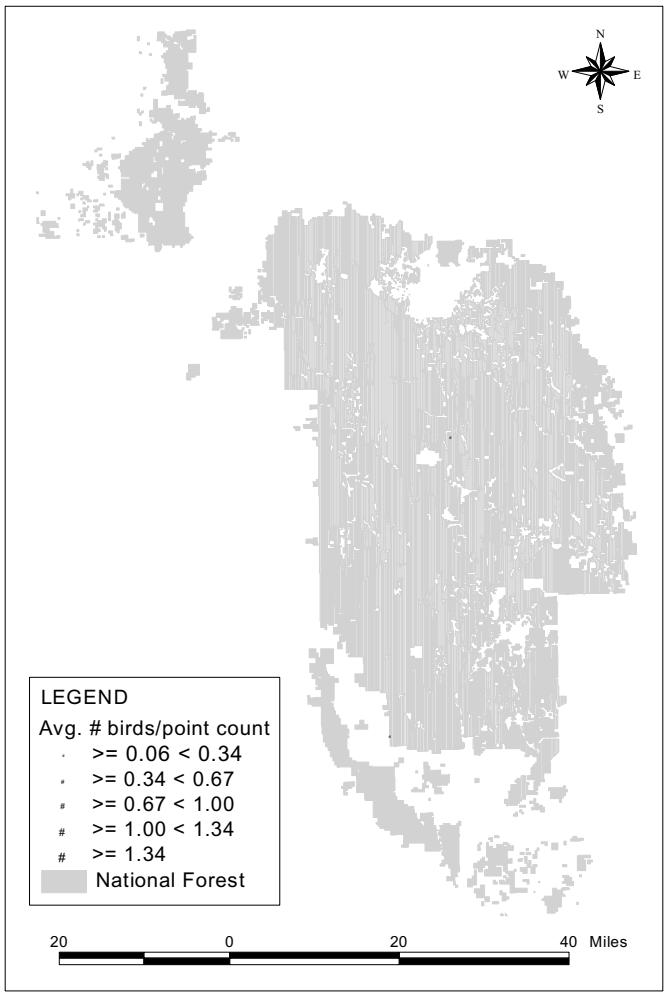


Relative density of White-breasted Nuthatch among habitats in the Black Hills.

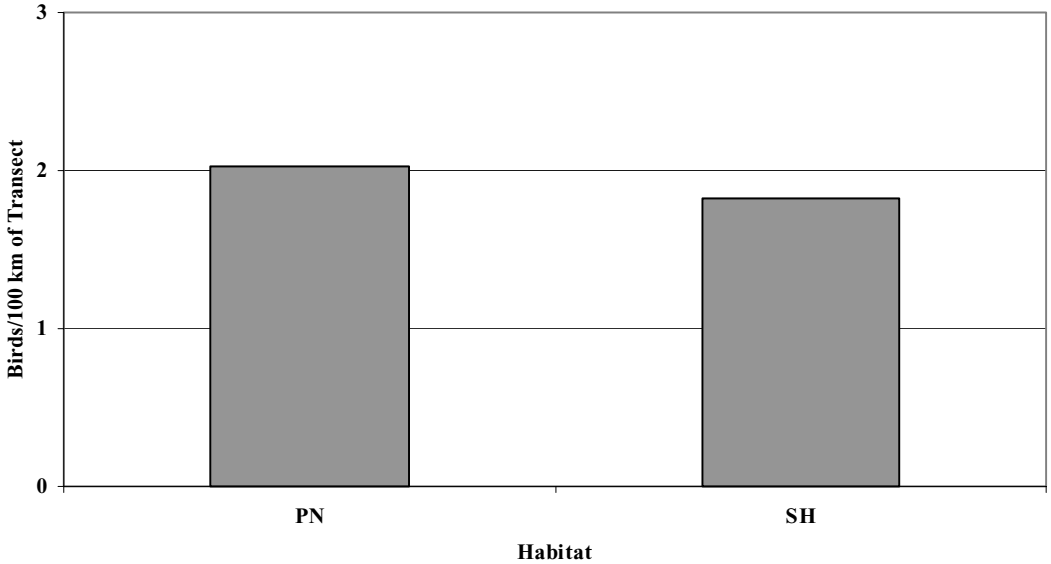
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Pygmy Nuthatch

Pygmy Nuthatch occurs locally within the Black Hills, although it appears to be extremely rare (see map). Our observations (or perhaps more appropriately, our lack thereof) seem to be consistent with available historical information on this species (Pettingill and Whitney, 1965). We detected three Pygmy Nuthatches during 2001, two in PN and one in SH. It seems that point transects will be insufficient to monitor this species in the Black Hills, due to its scarcity and localized distribution. More specific efforts aimed at locating individuals and important breeding areas are needed. Monitoring of reproductive success would likely yield important information about this species' biology in the Black Hills.



Abundance and breeding distribution of Pygmy Nuthatch in the Black Hills, 2001.

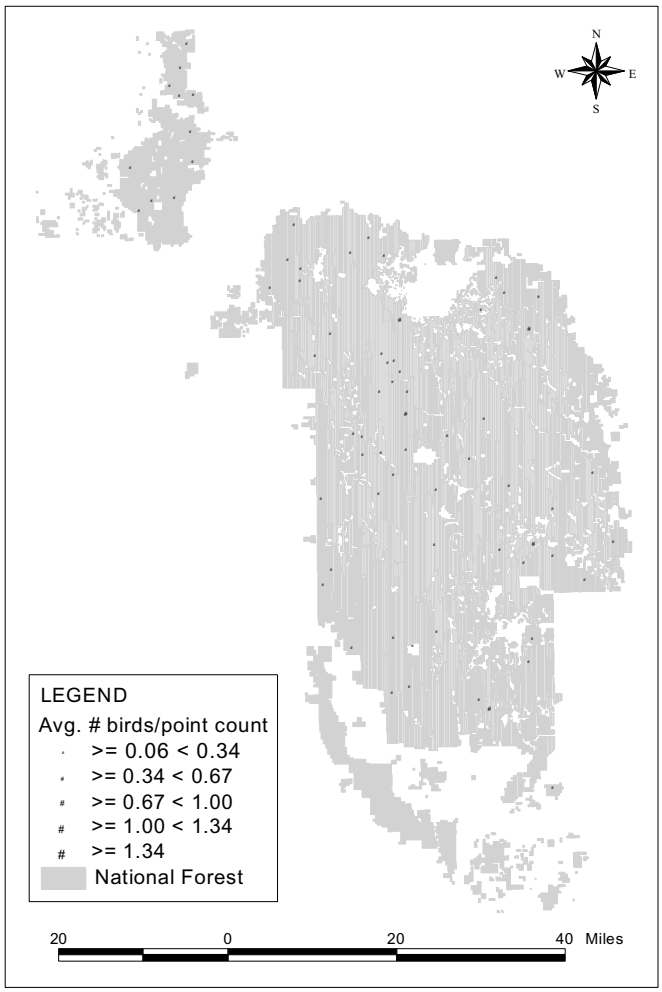


Relative abundance of Pygmy Nuthatch among habitats in the Black Hills.

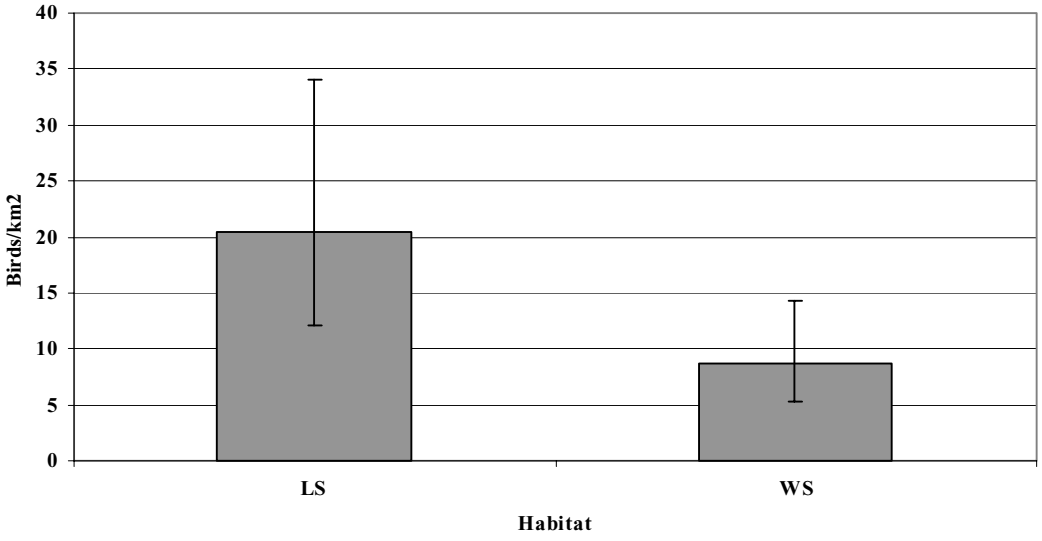
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Brown Creeper

Brown Creeper occurs in low abundance throughout the Black Hills (see map). Brown Creeper occurs in fairly high density in LS (D=20.4 birds/km^2, CV=27%, n=34), although it also occurs in WS (D=8.6 birds/km^2, CV=26%, n=26) in higher density than most other habitats (see chart). Smaller numbers were recorded in AS (n=5), BU (n=4), PN (n=24), PS (n=25), RI (n=1) and WM (n=3). Approximately 92% of all observations of this species, as observed from count stations (n=97), were recorded at sites where the surrounding habitat was classified as mature or old growth (seral stage 4 or 5; Buttery and Gillam 1983). The abundance and distribution of Brown Creeper in the Black Hills appears largely to be tied with mature and old-growth forest stand conditions. This species should be effectively monitored through point transects under *MBBH* in LS and WS.



Abundance and breeding distribution of Brown Creeper in the Black Hills, 2001.

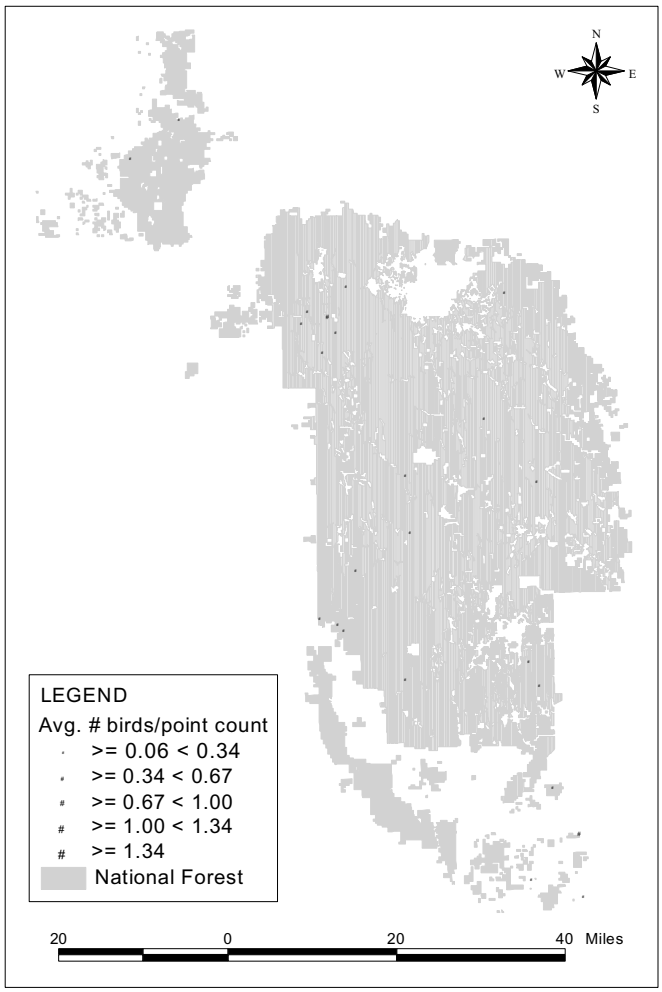


Relative density of Brown Creeper among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

House Wren

House Wren is widespread across the Black Hills, although unlike in many other parts of its range, it is surprisingly uncommon or absent in most places (see map). Pettingill and Whitney (1965) described this species as a "common summer resident at lower elevations." We detected House Wren from most habitats, including AS (*n*=5), BU (*n*=2), LS (*n*=1), PN (*n*=1), PS (*n*=7), RI (*n*=20), SH (*n*=4) and WM, although only in WM could we estimate density (*D*=1.2 birds/km^2, CV=33%, *n*=24). Our results suggest that this species should be effectively monitored under MBBH through point transects in WM, although because of the small number of observations, negative trends could be difficult to detect.



Abundance and breeding distribution of House Wren in the Black Hills, 2001.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

American Dipper

American Dipper occurs at the eastern edge of its global distribution in the Black Hills, where it is a permanent resident along streams. The American Dipper is unique among North American passerines in that it occurs only along fast-flowing, rocky streams and feeds exclusively on aquatic insects by diving into the stream. Because they rely on aquatic insects (particularly larvae) that are sensitive to water quality, American Dippers are excellent indicators of overall stream health (Tyler and Ormerod 1994). Because of their biology and scarcity, dippers were not well represented in our randomized, terrestrial sampling scheme. Fortunately, considerable information exists on the past and present status of the American Dipper in the Black Hills.

American Dippers have declined dramatically in the Black Hills to the point where they now pose a serious conservation problem. Backlund (2001) summarized historical and recent observations from the Black Hills that indicate *the American Dipper is now at high risk of imminent extirpation from the region*. The American Dipper was formerly common on most major watersheds in the Black Hills, including French Creek, Rapid Creek, Box Elder Creek, and Elk Creek, but it has largely been extirpated from these watersheds, and now occurs almost exclusively in the Spearfish Creek drainage (Backlund 2001). Although no studies have carefully examined the causes for the decline, the situation is now at the point where immediate steps must be taken based on what is known to prevent the loss of this species from the Black Hills.

Backlund (2001) points to several factors that are likely to have played a role in the decline of the American Dipper in the Black Hills:

1) ***Excessive siltation of streams***. Many streams in the Black Hills suffer from excess sedimentation (Stewart and Thilnius 1964). High sediment loads reduce or eliminate aquatic insects such as caddisflies and mayflies, the dipper's primary prey and source of food for rearing young (Kingery 1996). Excessive sedimentation in the Black Hills results from cattle grazing in stream bottoms, road building along streams, and excessive logging on steep slopes adjacent to streams (Backlund 2001). *Excess sedimentation is probably the most serious and widespread threat to American Dippers in the Black Hills, and is believed to be currently impacting dipper habitat in French Creek, Box Elder Creek, Elk Creek, Bear Butte Creek, and Spearfish Creek* (Backlund 2001).

2) ***Reduced and erratic water flows.*** Low water flows below dams, especially in winter, can completely eliminate the dipper's foraging habitat and prey base and thus cause severe mortality in dipper populations (Backlund 2001). Low water flows can also result from excess water diversions. Backlund (2001) cites *low and erratic water releases from Pactola Dam as the agent most likely responsible for the near extirpation of the American Dipper on Rapid Creek below the dam*, where habitat otherwise appears suitable. Dippers were formerly common below Pactola Dam, especially in Dark Canyon (Pettingill

and Whitney 1965), where they were recorded on the Rapid City Christmas Bird Count from 1954 to 1984, although none have been recorded since then (Backlund 2001). Despite considerable effort, no dippers were found on Rapid Creek or its tributaries in 2001, although a pair is believed to nest near Thunderhead Falls (Backlund 2001). In addition to Rapid Creek, Backlund (2001) suggests that the construction of Stockade Lake Dam and numerous other small rock dams have contributed to the extirpation of American Dippers in French Creek.

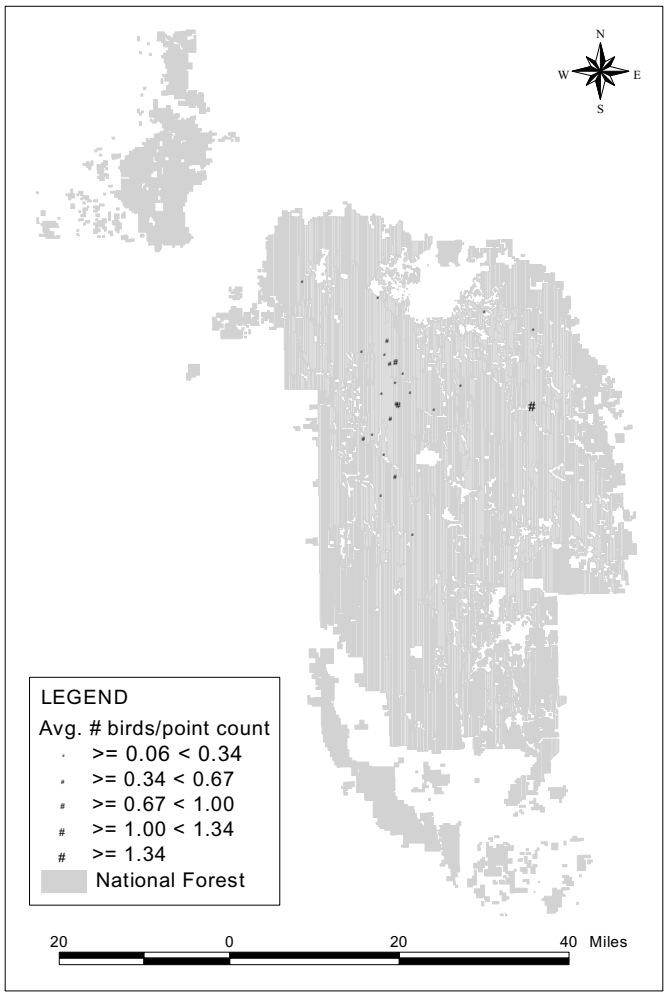
3) ***Pollution from mining, sewage, and roads***. Similar to sedimentation, pollution from various point and non-point sources, especially mines, negatively impacts the aquatic invertebrates upon which the American Dipper depends for food, and could be indirectly poisoning dippers. *Pollution is currently believed to be seriously impacting dipper habitat in French Creek, Bear Butte Creek, and Whitewood Creek* (Backlund 2001).

4) ***Disturbance to nest sites.*** Although apparently not a widespread problem, human disturbance to nesting sites, such as at Roughlock Falls on Little Spearfish Creek, can negatively impact dippers by causing interference with brood-rearing activities and deterioration of streamside habitat (Backlund 2001).

Immediate conservation measures are needed to prevent the further decline and possible extirpation of the American Dipper in the Black Hills. Because the dipper is now largely confined to the Spearfish Creek watershed, a single unpredictable event in this watershed, such as large-scale forest fire, toxic chemical spill, or even a severe winter, could eliminate this last remaining population. Dippers in the Black Hills are isolated from other populations by almost 100 miles of grasslands and probably could not re-colonize the area on their own, were they to be extirpated (Backlund 2001). Until stable Dipper populations are established in streams other than Spearfish Creek, this species cannot be considered secure in the Black Hills. Groups responsible for managing the water and wildlife of the Black Hills, including the U.S. Forest Service, Bureau of Reclamation, and the South Dakota Department of Game and Fish and Parks, must work together and take immediate action to prevent the loss of this unique and charismatic species from the Black Hills avifauna.

Golden-crowned Kinglet

Golden-crowned Kinglet occurs locally in the central and northern Black Hills where it can be moderately abundant in appropriate habitat (see map). It was recorded primarily in WS (*D*=24.6 birds/km^2, CV=21%, *n*=66), and its distribution in the Black Hills seems to be strongly tied to the occurrence of white spruce. Golden-crowned Kinglet was also recorded in low numbers from AS (*n*=2), LS (*n*=1), PN (*n*=5), RI (*n*=6) and WM (*n*=13), presumably where spruce was present. This species should be effectively monitored under *MBBH* through point transects in WS.

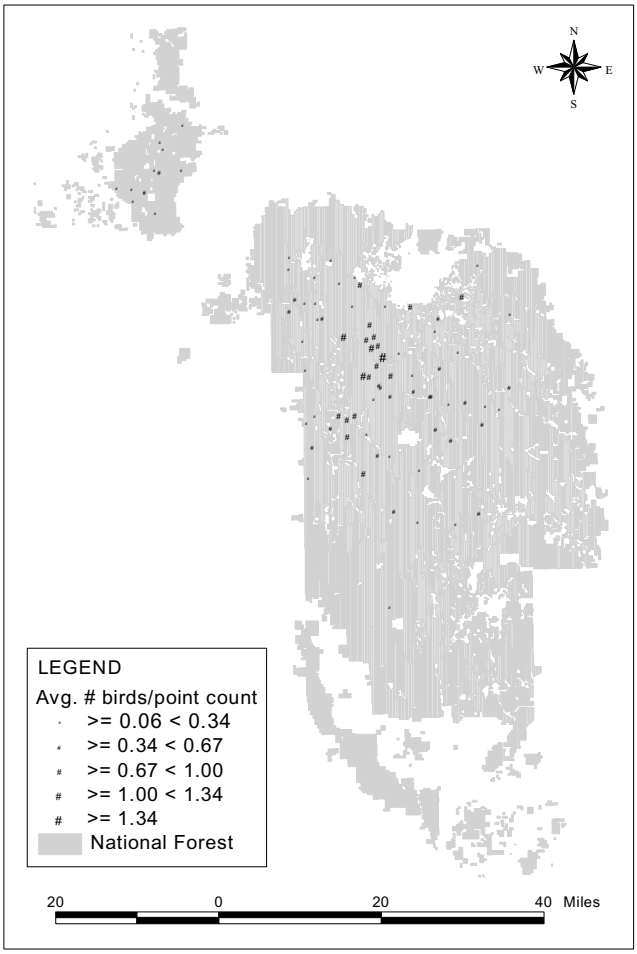


Abundance and breeding distribution of Golden-crowned Kinglet in the Black Hills, 2001.

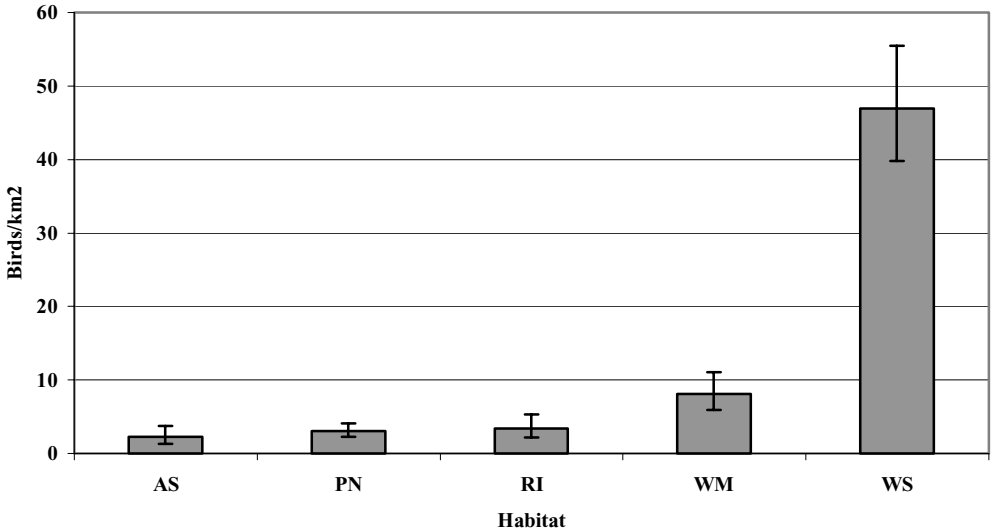
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Ruby-crowned Kinglet

Ruby-crowned Kinglet occurs primarily in the northern Black Hills and Bear Lodge Mountains (see map), typically in association with spruce. Not surprisingly, density is highest in WS (D=47.0 birds/km^2, CV=8%, n=303). Ruby-crowned Kinglet also occurs in low density in AS (D=2.2 birds/km^2, CV=27%, n=27), PN (D=3.1 birds/km^2, CV=14%, n=58), RI (D=3.4 birds/km^2, CV=23%, n=43), and WM (D=8.1 birds/km^2, CV=16%, n=112), generally where there is spruce. Small numbers were also recorded from BU (n=2) and PS (n=7). This species should be effectively monitored under MBBH through point transects in a range of habitats, especially WS.



Abundance and breeding distribution of Ruby-crowned Kinglet in the Black Hills, 2001.

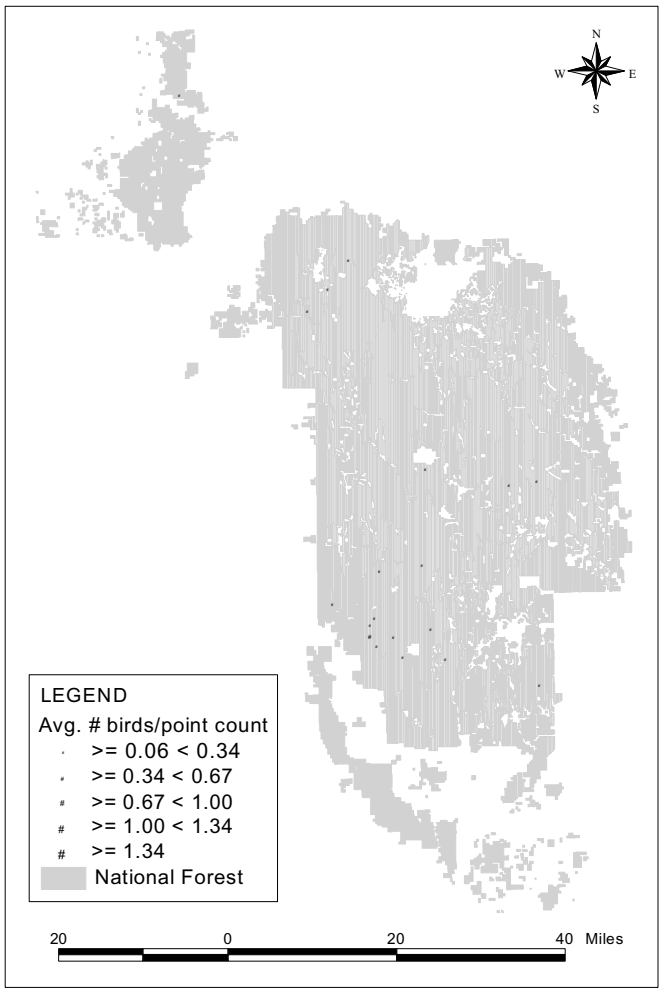


Relative density of Ruby-crowned Kinglet among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Eastern Bluebird

Eastern Bluebird occurs locally throughout the Black Hills, and although it is somewhat more widespread in the southwest, it is not particularly abundant anywhere (see map). Eastern Bluebird occurs primarily in BU (D=2.6 birds/km^2, CV=34%, n=27), although it was also recorded in smaller numbers from MG (n=4), PN (n=3), PS (n=8), RI (n=3), SH (n=1), WM (n=2). Additional sites in MG may provide a more complete picture of the status and distribution of Eastern Bluebird in the Black Hills. However, this species should be effectively monitored under *MBBH* through point transects in BU.

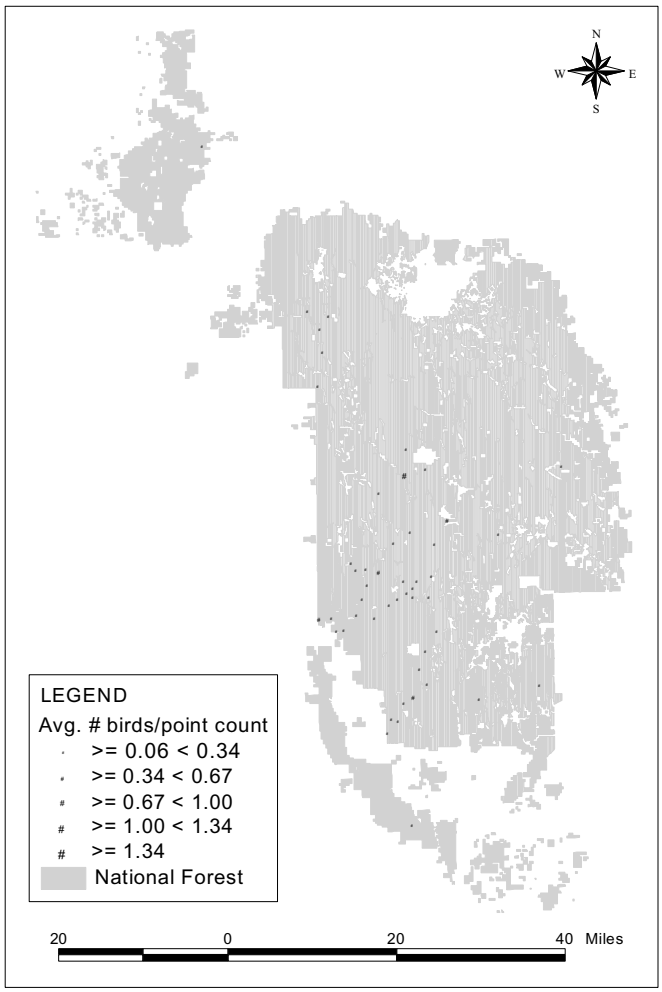


Abundance and breeding distribution of Eastern Bluebird in the Black Hills, 2001.

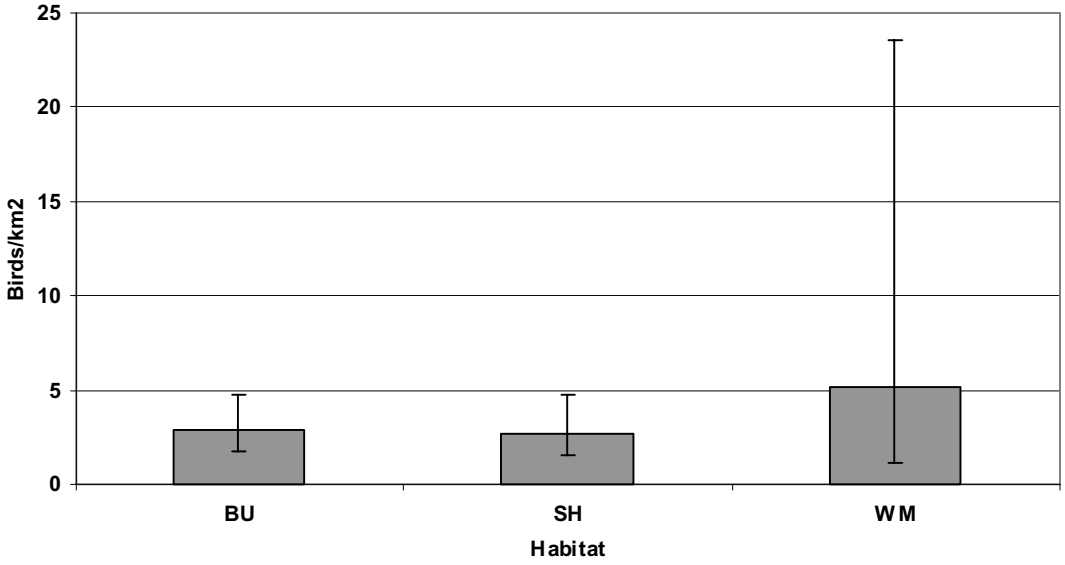
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Mountain Bluebird

Mountain Bluebird occurs in low abundance throughout much of the Black Hills, although it is more widespread in the southwest (see map). Estimated density is greatest in WM (D=5.2 birds/km^2, CV=84%, n=24) (see chart), although the wide confidence interval, high CV, and low number of observations suggest that caution be used in interpreting these result. Mountain Bluebird occurs more widely, although in low density, in BU (D=2.9 birds/km^2, CV=26%, n=52) and in SH (D=2.7 birds/km^2, CV=29%, n=26). Mountain Bluebirds were also recorded in small numbers from most other habitats, including LS (n=1), MG (n=10), PN (n=4), PS (n=11), RI (n=5), and WS (n=2). Additional sites in MG may provide a more complete picture of the status and distribution of Mountain Bluebird in the Black Hills. Given that 10 individuals were recorded from only four sites, density may in fact be greatest in MG, although this is speculative. Nonetheless, our results suggest that Mountain Bluebird should be effectively monitored under MBBH through point transects in a range of habitats, especially in BU and SH.



Abundance and breeding distribution of Mountain Bluebird in the Black Hills, 2001.

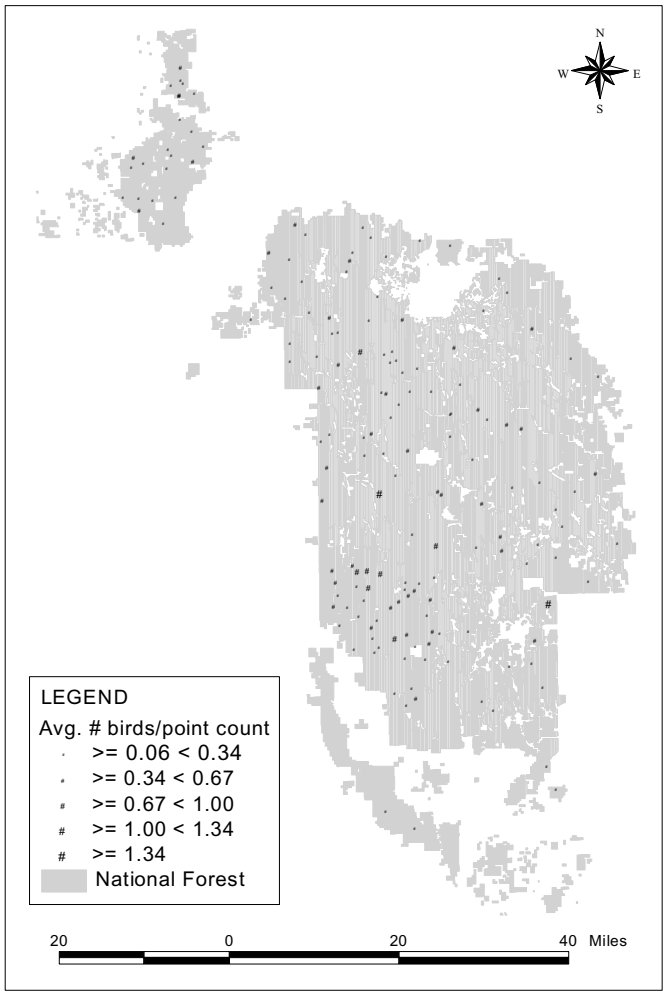


Relative density of Mountain Bluebird among habitats in the Black Hills.

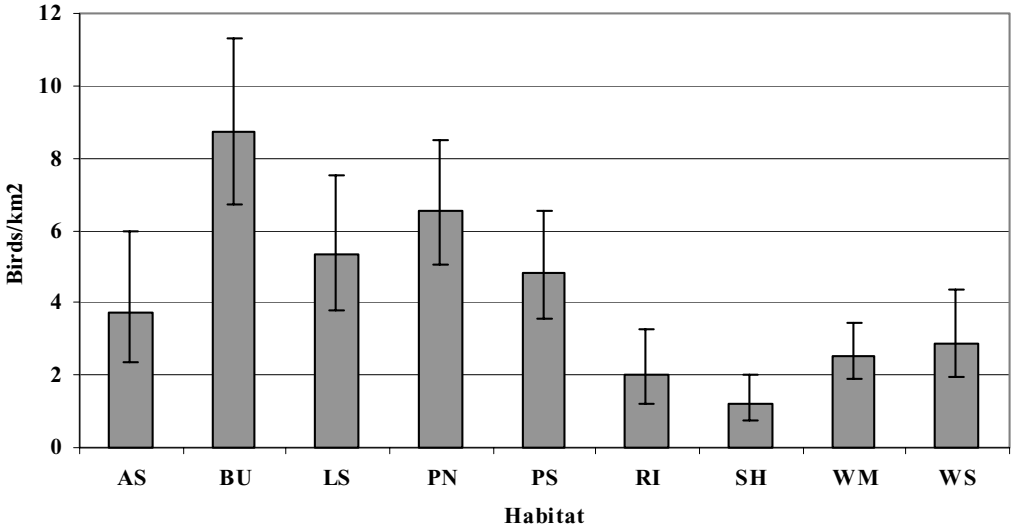
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Townsend's Solitaire

Townsend's Solitaire occurs throughout the Black Hills in low to moderate abundance (see map). Interestingly, estimated density of Townsend's Solitaire is greatest in BU (D=8.7 birds/km^2, CV=13%, n=184), although it also occurs in relatively high density in LS (D=5.3 birds/km^2, CV=17%, n=103), PN (D=6.5 birds/km^2, CV=13, n=116) and PS (D=4.8 birds/km^2, CV=16%, n=106) (see chart). Lower densities of Townsend's Solitaire occur in AS (D=3.7 birds/km^2, CV=24%, n=34), RI (D=2.0 birds/km^2, CV=25%, n=34), SH (D=1.2 birds/km^2, CV=26%, n=71), WM (D=2.5 birds/km^2, CV=15%, n=60) and WS (D=2.9 birds/km^2, CV=21%, n=58). This species should be effectively monitored under *MBBH* through point transects in range of habitats.



Abundance and breeding distribution of Townsend's Solitaire in the Black Hills, 2001.

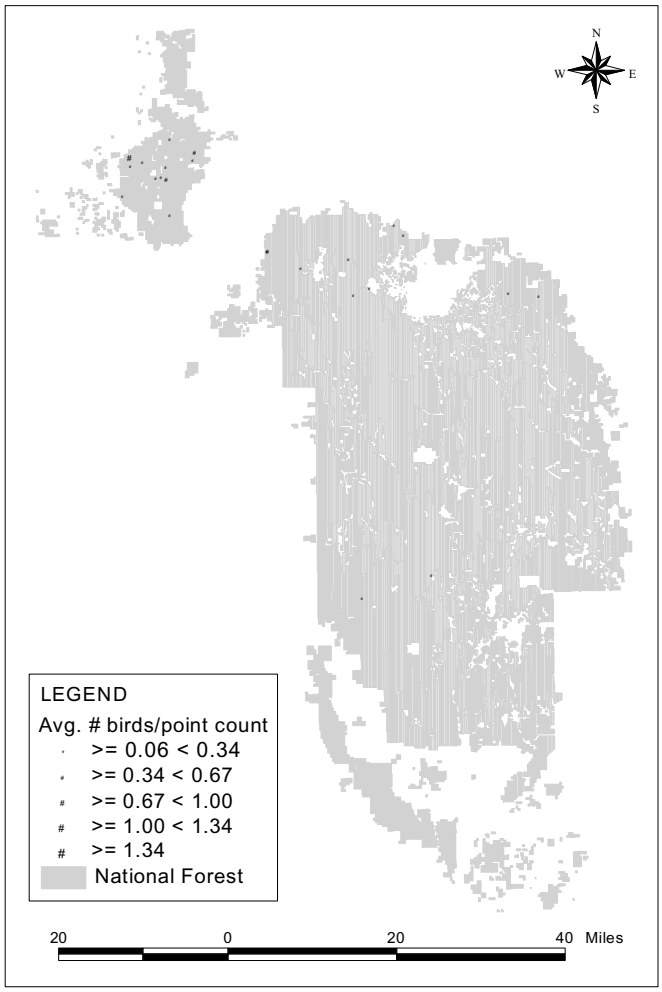


Relative density of Townsend's Solitaire among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Veery

Veery occurs in low to moderate abundance in the northern Black Hills and especially in the Bear Lodge Mountains, although it also occurs locally further south (see map). Veeries occur almost exclusively in RI (*D*=5.3 birds/km^2, CV=35%, *n*=36), although small numbers were also recorded from AS (*n*=6), BU (*n*=2), LS (*n*=3), PN (*n*=4) and WM (*n*=2). This species should be effectively monitored under *MBBH* through point transects in RI habitat.

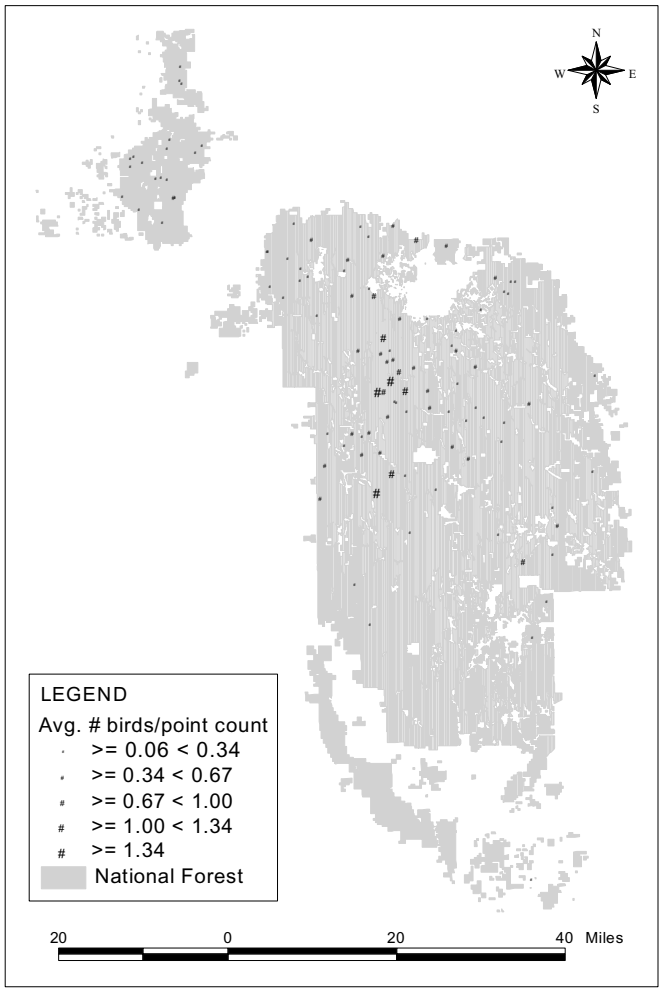


Abundance and breeding distribution of Veery in the Black Hills, 2001.

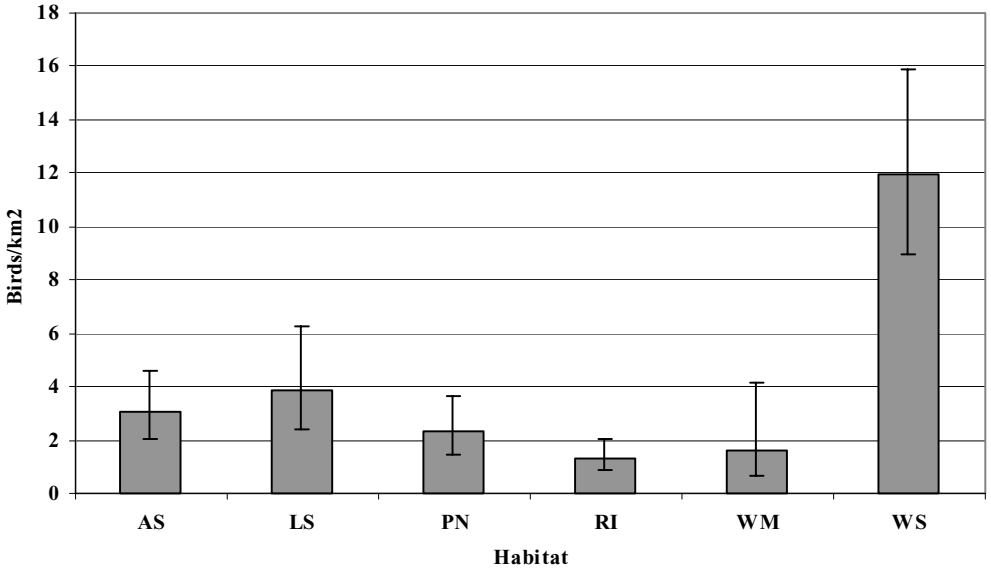
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Swainson's Thrush

Swainson's Thrush occurs primarily in the northern Black Hills, mostly in low to moderate abundance, although in areas with extensive spruce it can be moderately abundant (see map). Swainson's Thrush occurs in highest density in WS (D=11.9 birds/km^2, CV=15%, n=187), although it also occurs in lower density in AS (D=3.0 birds/km^2, CV=21%, n=65), LS (D=3.9 birds/km^2, CV=25%, n=51), PN (D=2.3 birds/km^2, CV=23%, n=45), RI (D=1.3 birds/km^2, CV=22%, n=32) and WM (D=1.6 birds/km^2, CV=50%, n=29) (see chart), generally where some spruce is present. Smaller numbers were recorded from BU (n=2) and PS (n=3). This species should be effectively monitored under *MBBH* through point transects in a range of habitats, especially WS.



Abundance and breeding distribution of Swainson's Thrush in the Black Hills, 2001.

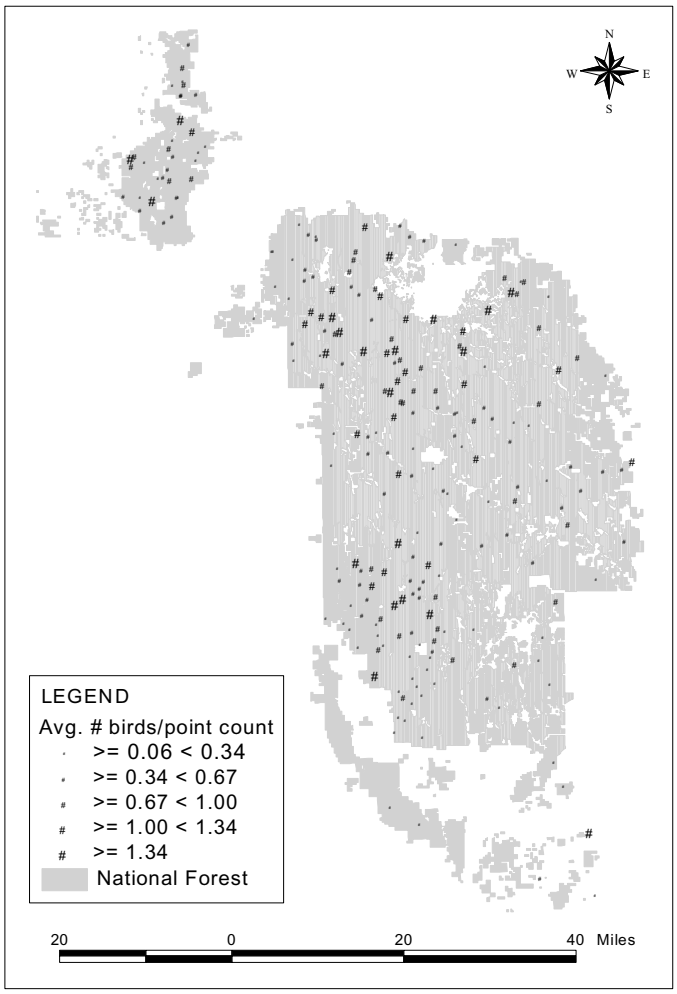


Relative density of Swainson's Thrush among habitats in the Black Hills.

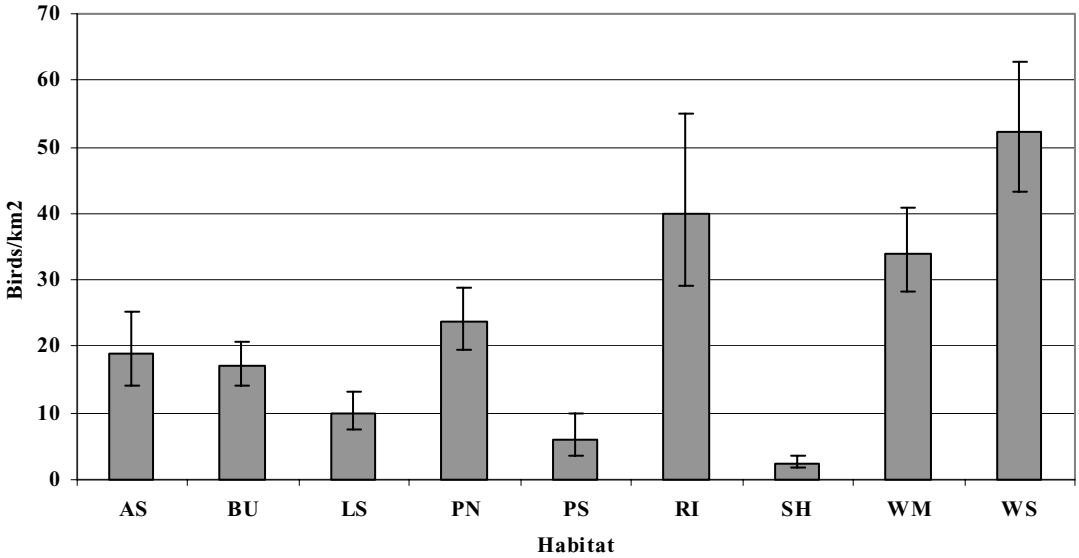
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

American Robin

American Robin is one of the most abundant and widespread birds in the Black Hills (see map). It occurs throughout the region in all habitats, although density appears to be greatest in WS (*D*=52.3 birds/km^2, CV=9%, *n*=295), RI (*D*=40.0 birds/km^2, CV=16%, *n*=300), and WM (*D*=33.9 birds/km^2, CV=10%, *n*=292) (see chart). Lower densities (although still relatively high) occur in AS (D=18.8 birds/km2, CV=15%, *n*=159), BU (D=17.1 birds/km2, CV=10%, *n*=320), LS (D=9.9 birds/km2, CV=15%, *n*=141), and PN (D=23.7 birds/km2, CV=10%, *n*=247). American Robin occurs in relatively low density in PS (D=6.0 birds/km2, CV=26%, *n*=93) and SH (D=2.5 birds/km2, CV=20%, *n*=53), and it was detected in or adjacent to MG (*n*=14). This species should be effectively monitored through point transects under *MBBH* in a wide range of habitats.



Abundance and breeding distribution of American Robin in the Black Hills, 2001.

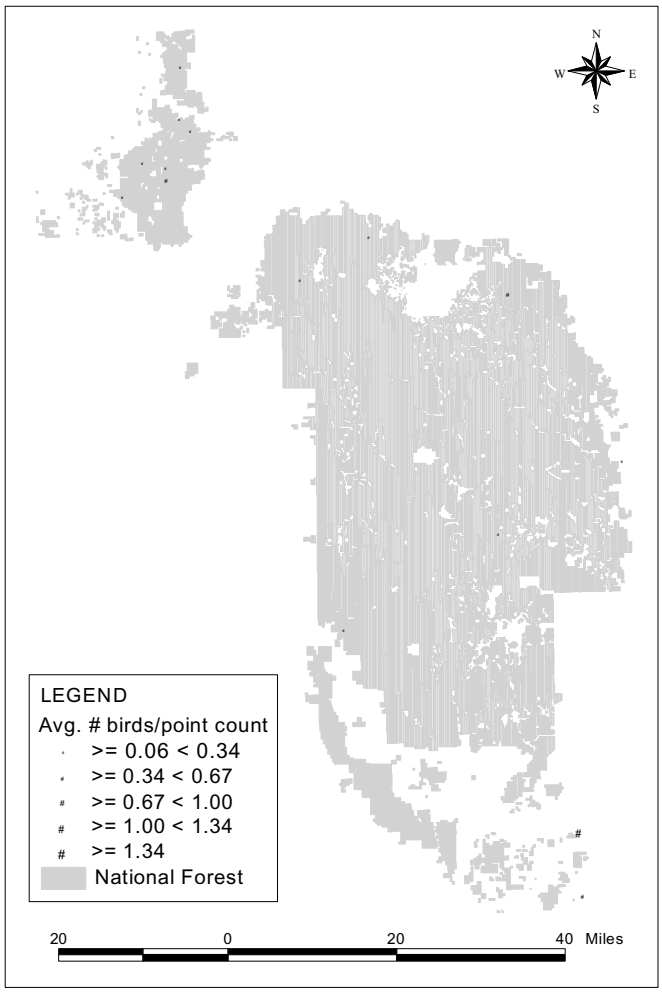


Relative density of American Robin among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Cedar Waxwing

Cedar Waxing occurs in low abundance in many parts of the Black Hills (see map). It occurs primarily at low elevations and is perhaps most widespread in the Bear Lodge Mountains. Cedar Waxwing occurs almost exclusively in RI habitat (D=14.9 birds/km^2, CV=42%, n=38). This species should be effectively monitored through point transects in RI habitat under *MBBH*.

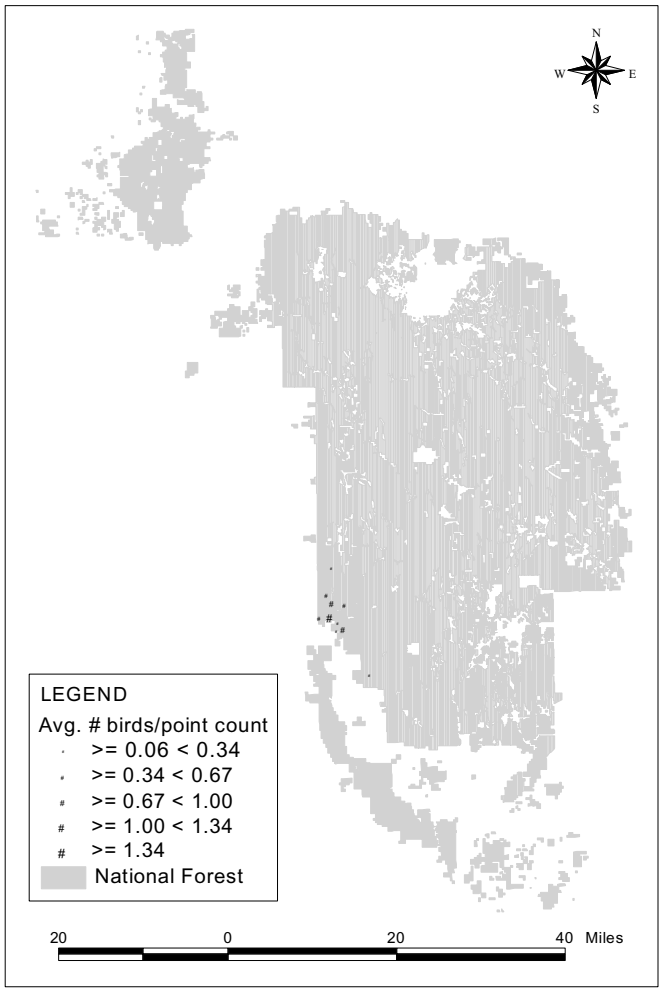


Abundance and breeding distribution of Cedar Waxwing in the Black Hills, 2001.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Virginia's Warbler

Virginia's Warbler is restricted to a small area in the southwestern Black Hills, where it occurs in low to moderately high abundance (see map) in arid canyons with Rocky Mountain juniper, mountain mahogany, skunkbrush and ponderosa pine. We found Virginia's Warbler almost exclusively in SH (D=6.5 birds/km^2, CV=27%, n=33). Only one individual was found outside SH (in PS), but it occurred in an area where mountain mahogany was present in the understory. This species should be effectively monitored under *MBBH* through point transects in SH, although additional sites in this habitat are needed to increase sample size and allow more rigorous interpretations of trends.

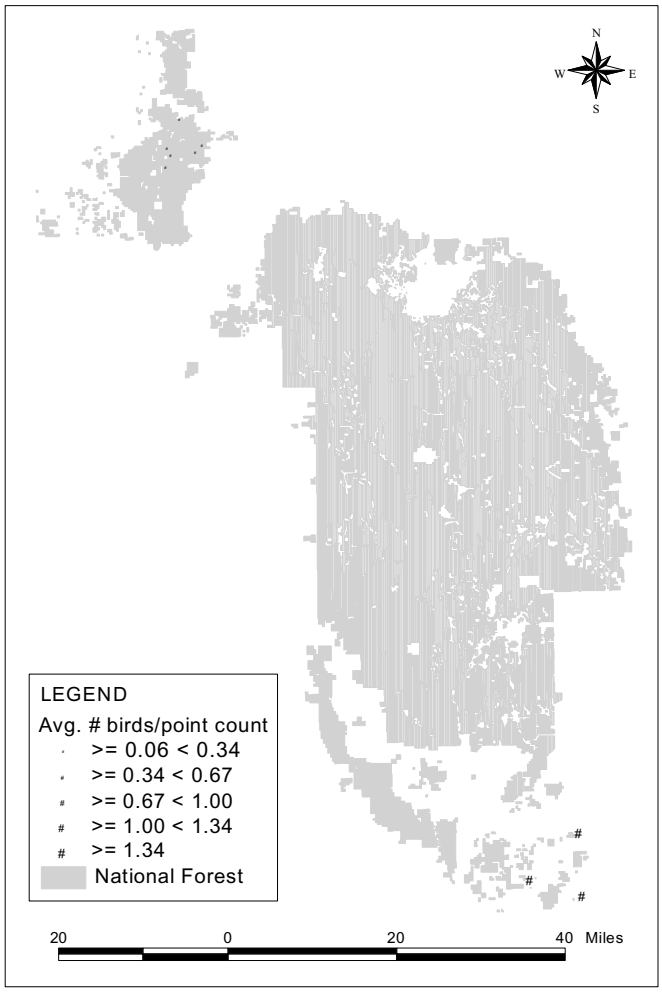


Abundance and breeding distribution of Virginia's Warbler in the Black Hills, 2001.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Yellow Warbler

Yellow Warbler appears to be limited to two general areas in the Black Hills region: in the southeast, where it is abundant (in appropriate habitat), and in the Bear Lodge Mountains, where it is relatively uncommon (see map). Yellow Warblers occur in moderate density in RI habitat (D=14.4 birds/km^2, CV=20%, n=85). This estimate represents the *average* density across all RI habitats in the Black Hills. Because Yellow Warblers occur only at lower elevations, density is probably higher at such sites. Nonetheless, Yellow Warbler should be effectively monitored under MBBH through point transects in RI. Additional sites in low-elevation RI would increase power and provide more reliable habitat-specific information.

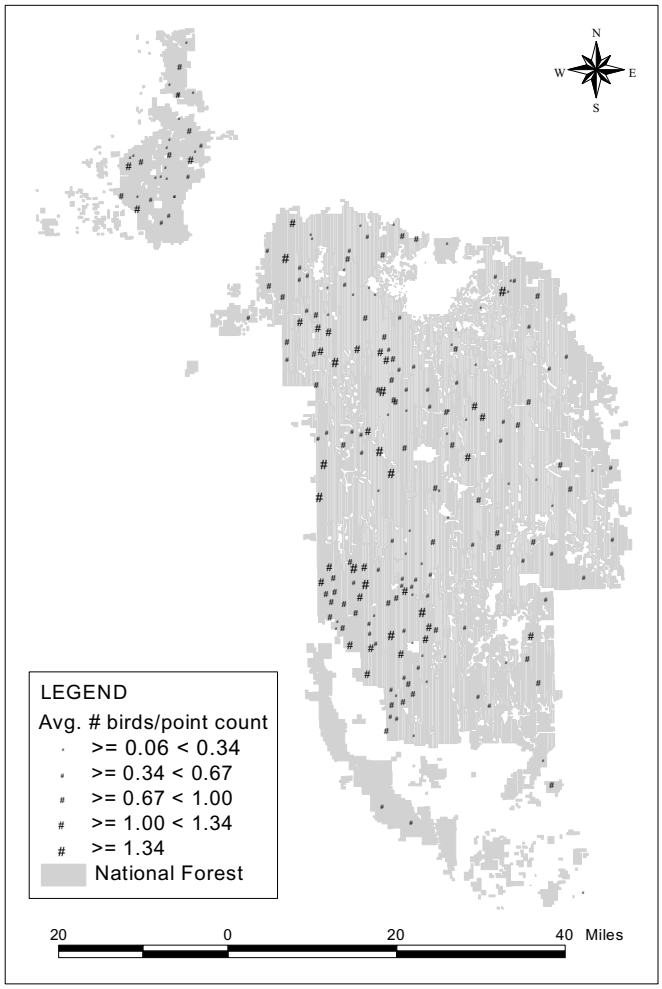


Abundance and breeding distribution of Yellow Warbler in the Black Hills, 2001.

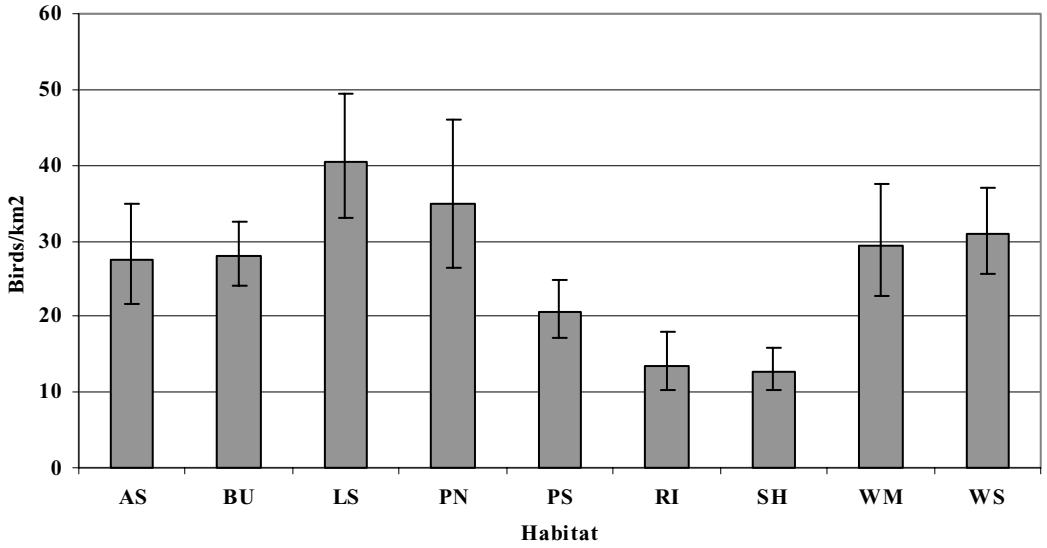
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Yellow-rumped Warbler

Yellow-rumped Warbler (Audubon's race) is one of the most abundant and widespread birds in the Black Hills. It occurs throughout the region in all habitats, although density is greatest in LS (D=40.5 birds/km^2, CV=10%, n=263) and PN (D=34.8 birds/km^2, CV=14%, n=360) (see chart). Yellow-rumped Warbler also occurs in relatively high density in AS (D=27.5 birds/km^2, CV=12%, n=138), BU (D=27.9 birds/km^2, CV=8%, n=387), PS (D=20.6 birds/km^2, CV=9%, n=270), RI (D=13.6 birds/km^2, CV=14%, n=90), SH (D=12.8 birds/km^2, CV=11%, n=136), WM (D=29.2 birds/km^2, CV=13%, n=223) and WS (D=30.9 birds/km^2, CV=9%, n=227). Yellow-rumped Warbler was detected in low numbers in or adjacent to MG (n=10). This species should be effectively monitored through point transects under *MBBH* in a wide range of habitats.



Abundance and breeding distribution of Yellow-rumped Warbler in the Black Hills, 2001.

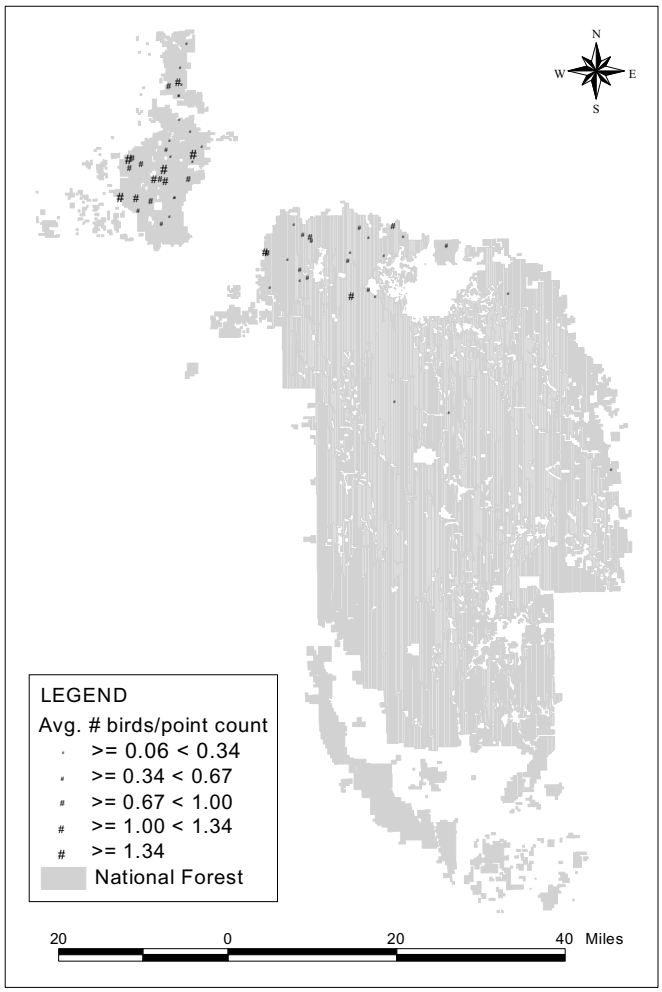


Relative density of Yellow-rumped Warbler among habitats in the Black Hills.

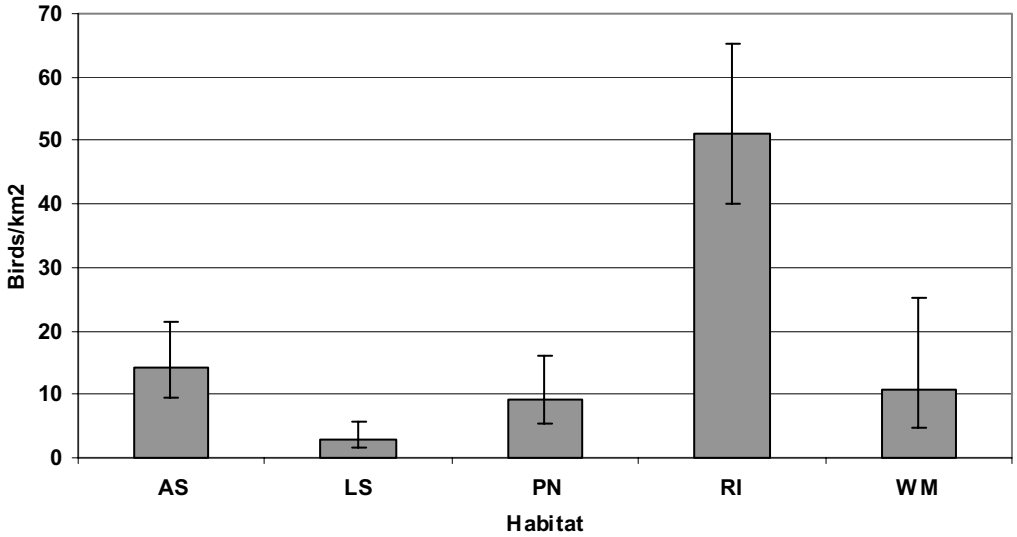
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

American Redstart

The distribution of American Redstart is limited primarily to the northernmost Black Hills, although low numbers occur elsewhere (see map). It is generally common in appropriate habitat, but it is especially abundant in the Bear Lodge Mountains. American Redstart occurs in greatest density in RI (*D*= 51.1 birds/km^2, CV=12%, *n*=212), and it is also fairly common in AS (*D*=14.3, CV=21%, *n*=59), WM (D=10.8 birds/km2, CV=44%, *n*=31), and PN (D=9.3 birds/km2, CV=28%, *n*=42) (see chart). American Redstart occurs in lower density in LS (D=3.0 birds/km2, CV=34%, *n*=24), and in smaller numbers in SH (*n*=9) and WS (*n*=4) habitats. This species should be effectively monitored through point transects under *MBBH* in a range of habitats.



Abundance and breeding distribution of American Redstart in the Black Hills, 2001.

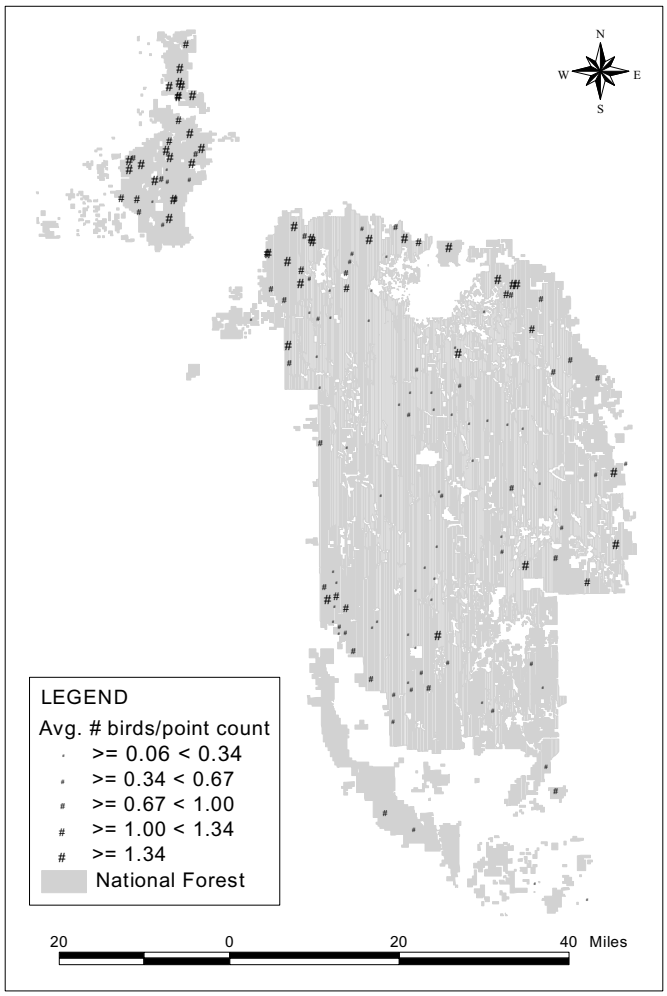


Relative density of American Redstart among habitats in the Black Hills.

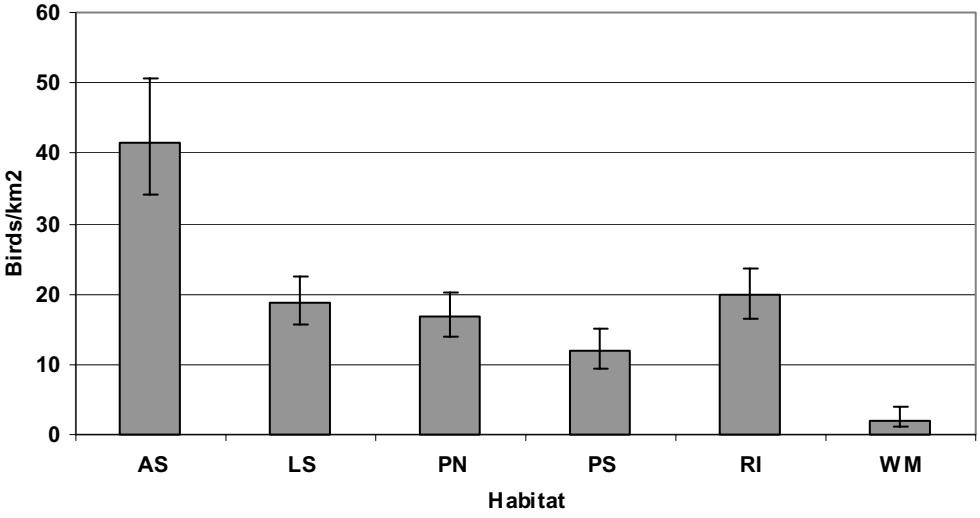
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Ovenbird

Ovenbird occurs throughout the Black Hills in moderate to high abundance, but it appears to be most numerous at low to mid elevations, especially in the north and in the Bear Lodge Mountains (see map). Ovenbird occurs in a wide range of forested habitats (see chart), although density is greatest in AS (*D*=41.6 birds/km^2, CV=10%, *n*=383). Ovenbird occurs in high to moderate density in LS (*D*=18.8 birds/km^2, CV=9%, *n*=307), PN (*D*=16.8 birds/km^2, CV=9%, *n*=307), PS (*D*=11.9 birds/km^2, CV=12%, *n*=183), and RI (*D*=19.9 birds/km^2, CV=9%, *n*=294). In addition to SH (*D*=4.7 birds/km^2, CV=18%, *n*=81) and WM (*D*=2.1 birds/km^2, CV=35%, *n*=37), Ovenbirds were detected in smaller numbers in BU (*n*=7) and WS (*n*=5). This species should be effectively monitored under *MBBH* through point transects in a wide range of habitats.



Abundance and breeding distribution of Ovenbird in the Black Hills, 2001.

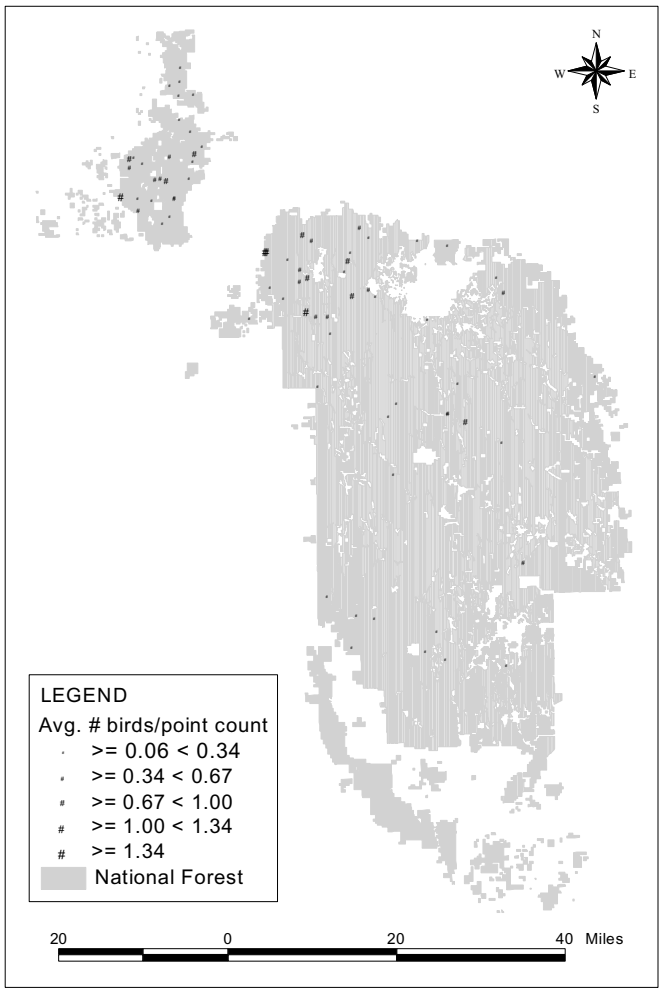


Relative density of Ovenbird among habitats in the Black Hills.

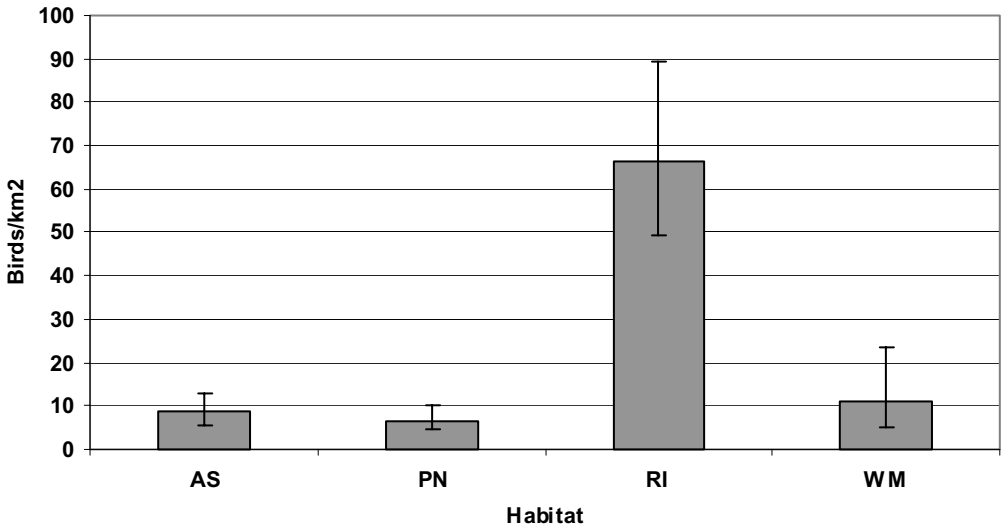
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

MacGillivray's Warbler

MacGillivray's Warbler ranges throughout much of the Black Hills, except perhaps in the extreme south (see map). However, it is undoubtedly most abundant in the far north and Bear Lodge Mountains. It occurs primarily in RI (D=66.3 birds/km^2, CV=15%, n=135), where it is the most densely populated species. MacGillivray's Warbler also occurs regularly in AS (D=8.6 birds/km^2, CV=22%, n=40), PN (D=6.6 birds/km^2, CV=21%, n=41) and WM (D=11.0 birds/km^2, CV=40%, n=37), and in lesser numbers in LS (n=19), PS (n=8), SH (n=2) and WS (n=9). This species should be effectively monitored under *MBBH* through point transects in a range of habitats, especially RI.



Abundance and breeding distribution of MacGillivray's Warbler in the Black Hills, 2001.

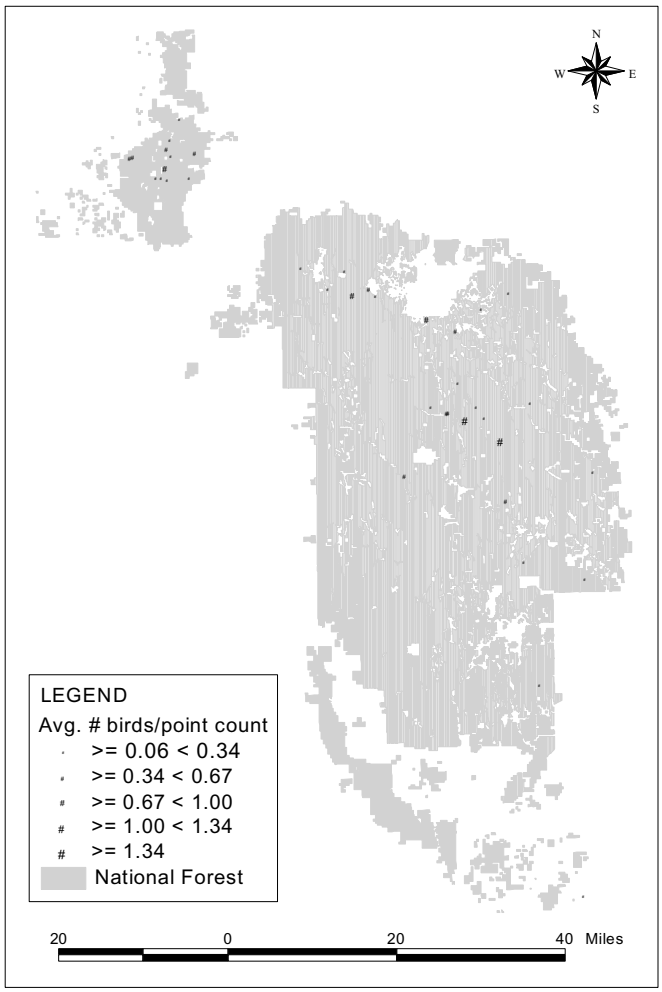


Relative density of MacGillivray's Warbler among habitats in the Black Hills.

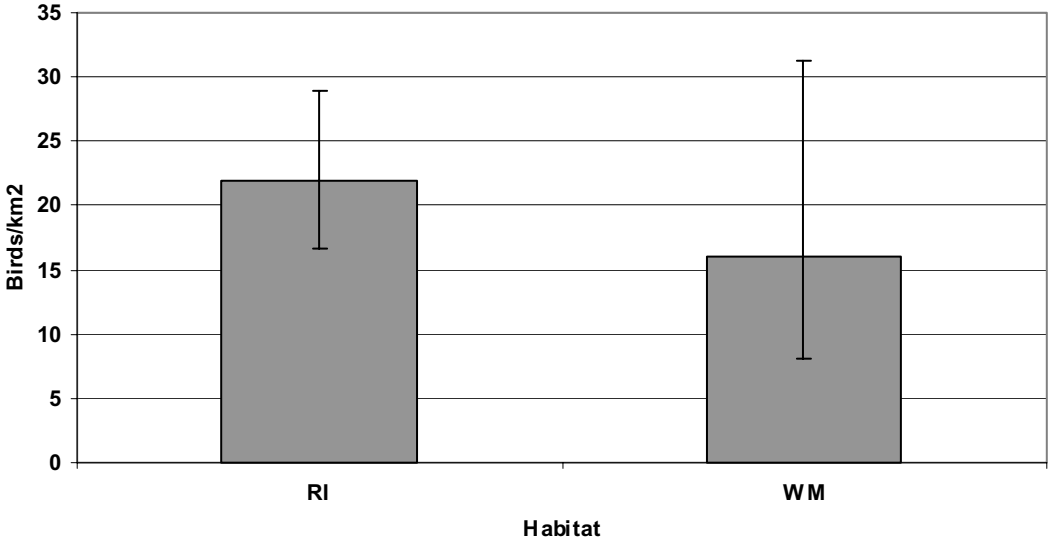
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Common Yellowthroat

Common Yellowthroat occurs locally throughout much of the Black Hills, although it appears to be more widespread and abundant in the north (see map). The species occurs exclusively in riparian and other wetland habitats, although it sometimes wanders into other adjacent habitats (Pettingill and Whitney, 1965). Density is greatest in RI habitat (D=22.0 birds/km^2, CV=14%, n=113), and is somewhat lower in WM (D=15.9 birds/km^2, CV=35%, n=42). Common Yellowthroat was also detected from AS (n=15), LS (n=2), PN (n=1), PS (n=3) and WS (n=6), although these individuals presumably occurred in adjacent wetland habitats. This species should be effectively monitored under *MBBH* through point transects in RI and WM habitats.



Abundance and breeding distribution of Common Yellowthroat in the Black Hills, 2001.

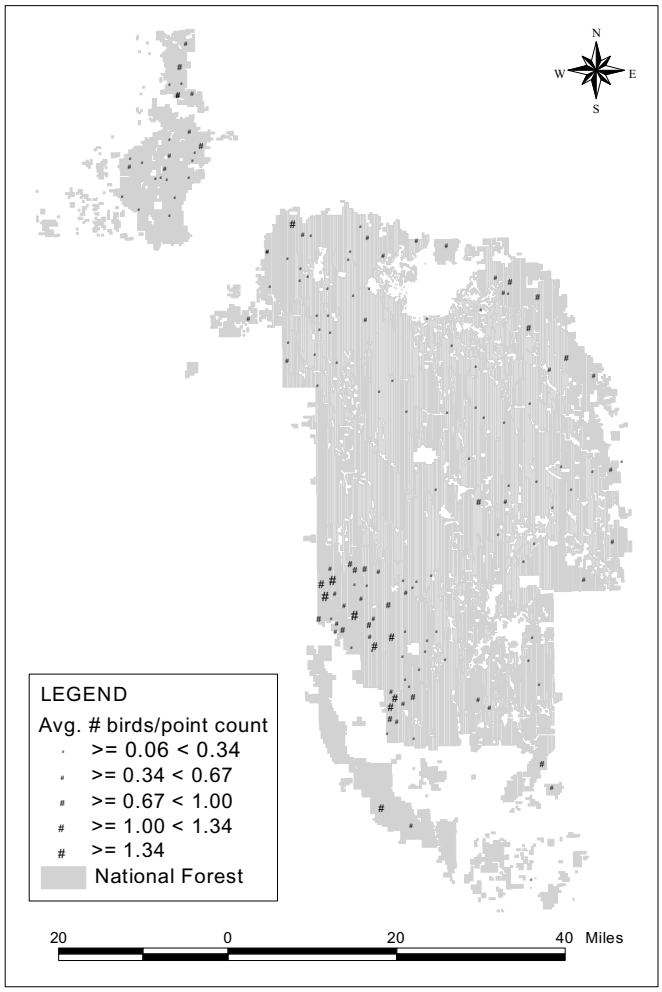


Relative density of Common Yellowthroat among habitats in the Black Hills.

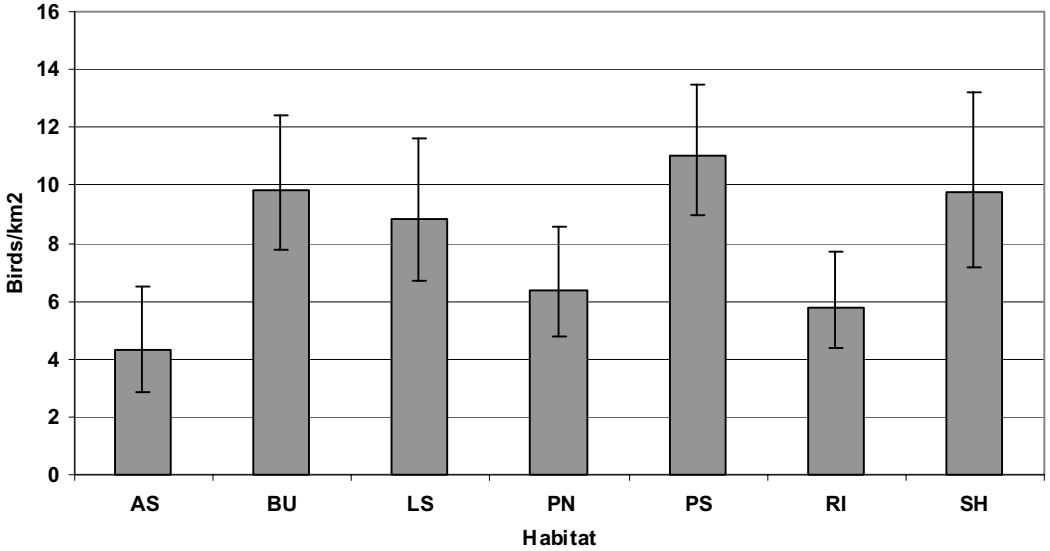
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Western Tanager

Western Tanager occurs throughout much of the Black Hills, particularly at lower elevations, but its distribution and abundance are by no means uniform (see map). Western Tanager is most abundant in the southwest, and to a lesser degree along the northern tier of the Black Hills and in the northern Bear Lodge Mountains. In much of the rest of the Black Hills it is either uncommon or absent. Pettingill and Whitney (1965) described Western Tanager as a "common summer resident at all elevations." We found that Western Tanager occurs in moderate to low density in most habitats, including PS (*D*=11.0 birds/km^2, CV=10%, *n*=142), BU (*D*=9.8 birds/km^2, CV=12%, *n*=163), SH (*D*=9.7 birds/km^2, CV=15%, *n*=43), LS (*D*=8.9 birds/km^2, CV=14%, *n*=109), PN (*D*=6.4 birds/km^2, CV=15%, *n*=113), RI (*D*=5.8 birds/km^2, CV=15%, *n*=74), and AS (*D*=4.3 birds/km^2, CV=21%, *n*=58), but it is only locally common (see chart). Smaller numbers of Western Tanagers were also recorded from MG (*n*=4), WM (*n*=18), and WS (*n*=4). This species should be effectively monitored under *MBBH* through point transects in a wide range of habitats.



Abundance and breeding distribution of Western Tanager in the Black Hills, 2001.

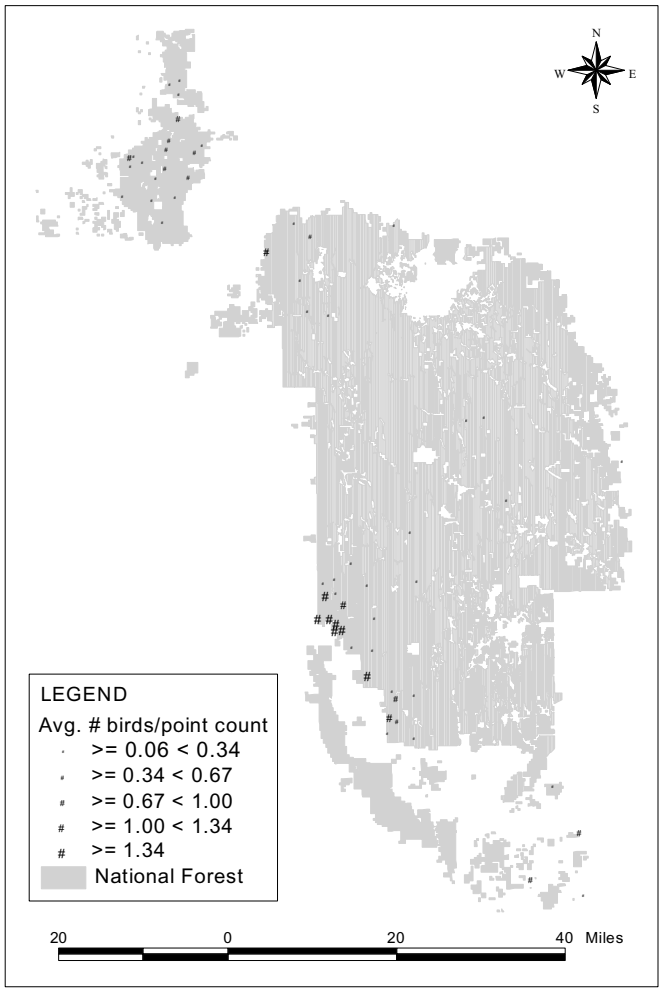


Relative density of Western Tanager among habitats in the Black Hills.

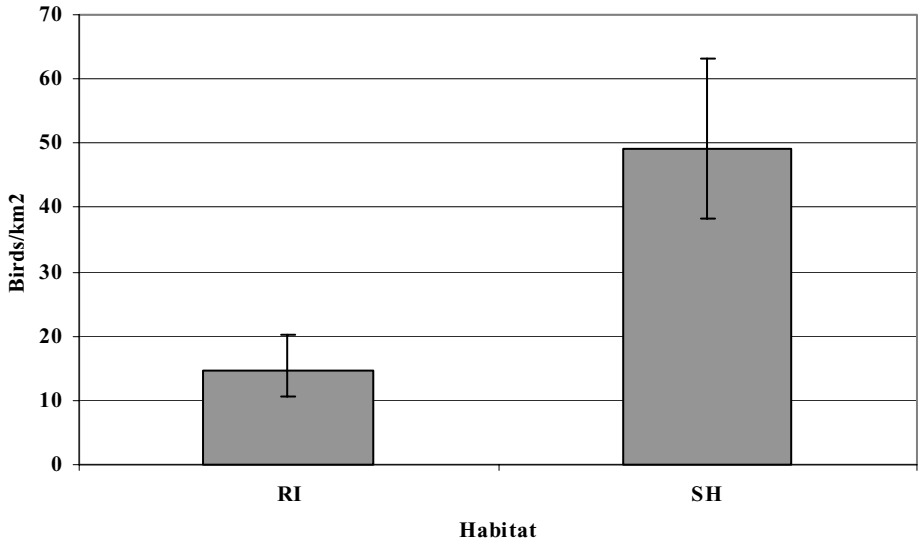
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Spotted Towhee

Spotted Towhee occurs locally within the Black Hills, primarily at lower elevations, and especially in the southwest where it is most abundant (see map). Spotted Towhee occurs in greatest density in SH (D=49.3 birds/km^2, CV=13%, n=201), although it also occurs to a lesser degree in RI (D=14.7 birds/km^2, CV=16%, n=106) (see chart). Spotted Towhee was also recorded in smaller numbers from AS (n=13), BU (n=5), LS (n=5), MG (n=1), PN (n=7), PS (n=10), and WM (n=16). This species should be effectively monitored under *MBBH* through point transects, especially in SH.



Abundance and breeding distribution of Spotted Towhee in the Black Hills, 2001.

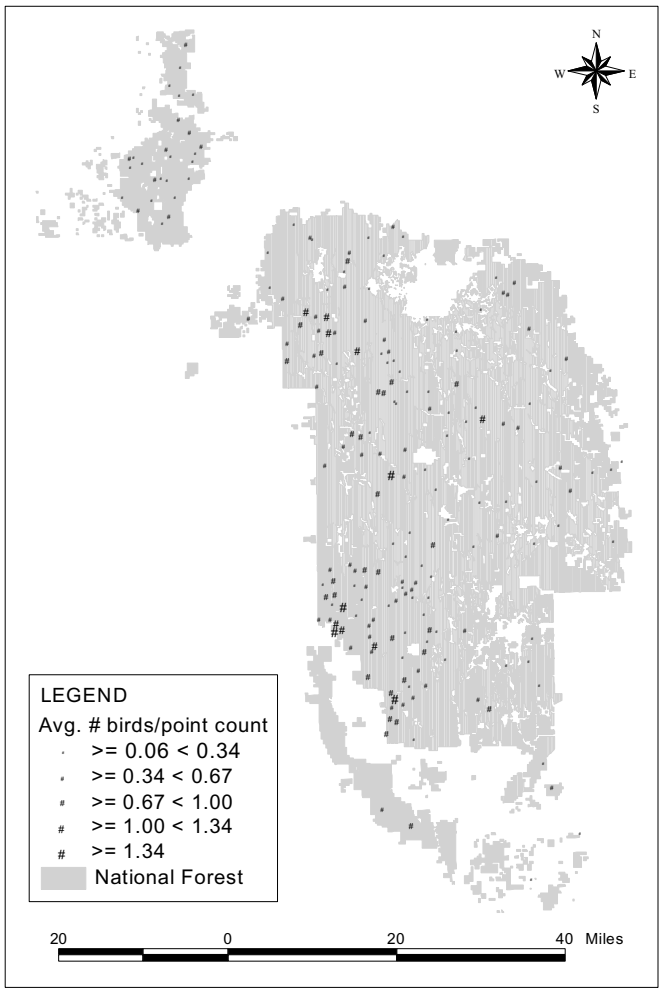


Relative density of Spotted Towhee among habitats in the Black Hills.

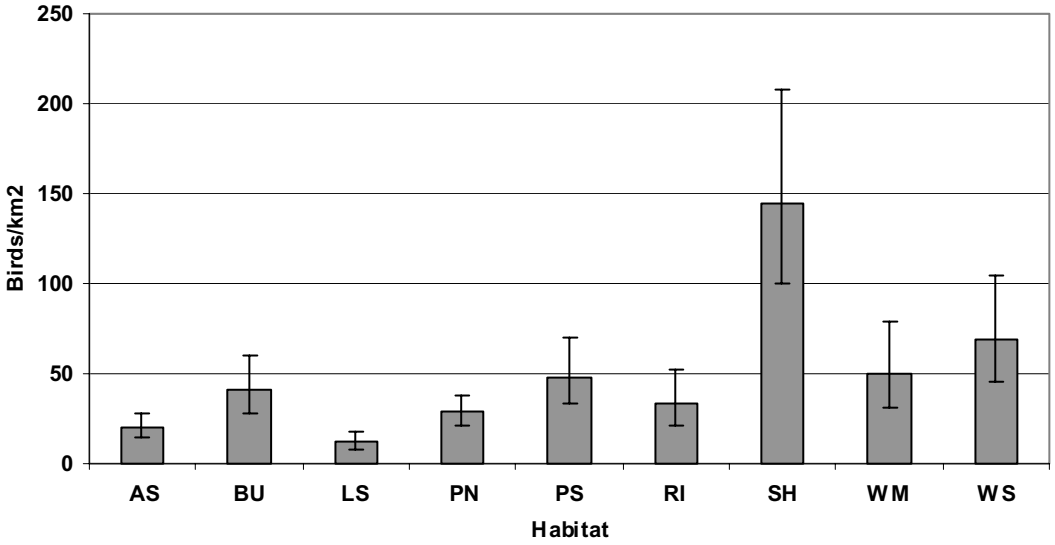
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Chipping Sparrow

Chipping Sparrow is one of the most abundant and widespread species in the Black Hills (see map). Chipping Sparrow occurs in very high density in SH (D=144.2 birds/km^2, CV=19%, n=188) (see chart); no other species occurs in higher density in any habitat in the Black Hills. Chipping Sparrow occurs in very high density in most other habitats as well, including WS (D=68.9 birds/km^2, CV=21%, n=151), WM (D=49.8 birds/km^2, CV=24%, n=171), PS (D=48.3 birds/km^2, CV=19%, n=143), BU (D=41.1 birds/km^2, CV=19%, n=191), RI (D=33.0 birds/km^2, CV=24%, n=87), PN (D=28.6 birds/km^2, CV=15%, n=156) and AS (D=19.8 birds/km^2, CV=18%, n=78). With the exception of MG (n=8), Chipping Sparrow occurs in lowest density in LS (D=11.8, CV=20%, n=62). This species should be effectively monitored under *MBBH* through point transects in a wide range of habitats.



Abundance and breeding distribution of Chipping Sparrow in the Black Hills, 2001.

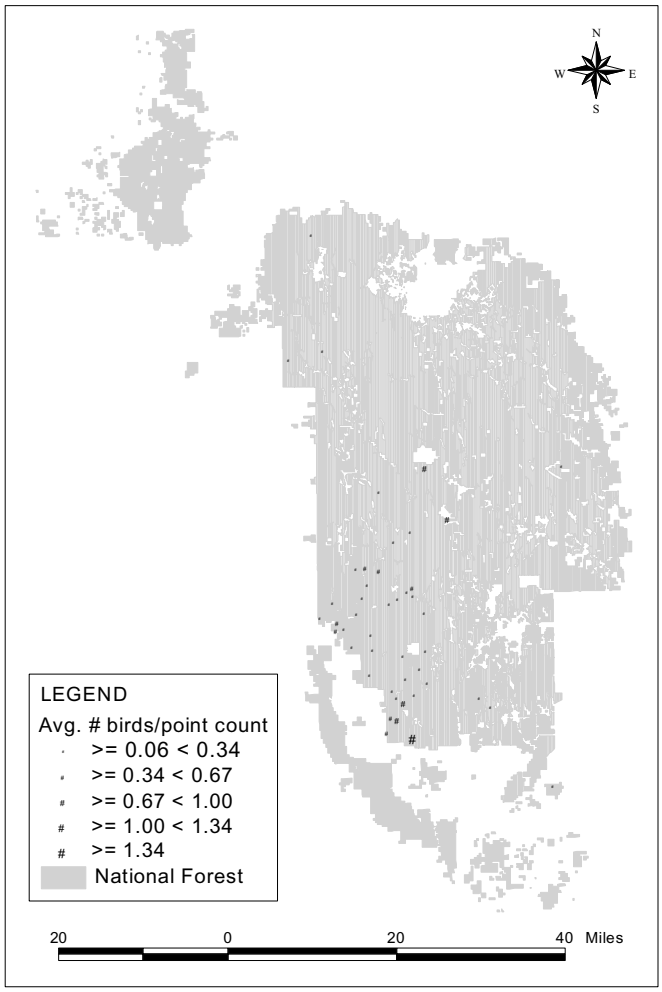


Relative density of Chipping Sparrow among habitats in the Black Hills.

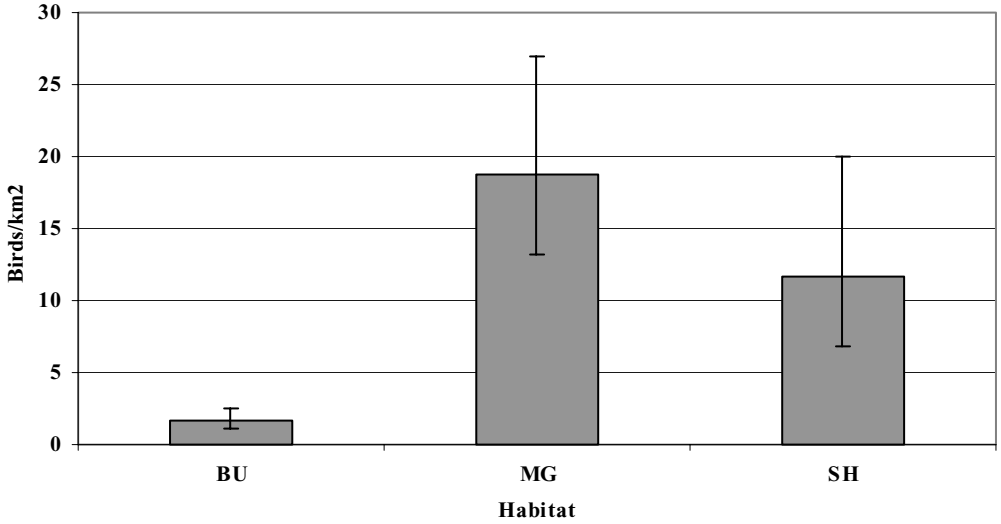
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Vesper Sparrow

Vesper Sparrow occurs primarily in dry, open habitats within the Black Hills, particularly in the southwest, and also locally in the large open prairies of the central hills (see map). Estimated density of Vesper Sparrow is greatest in MG (D=18.8 birds/km^2, CV=18%, n=49), and SH (D=11.7 birds/km^2, CV=28%, n=49) (see chart). Lower densities of Vesper Sparrow occur in BU (D=1.7 birds/km^2, CV=20%, n=38), and small numbers were recorded from AS (n=2), LS (n=2), PS (n=16), RI (n=1), WM (n=12), and WS (n=2). This species should be effectively monitored under MBBH through point transects in SH and MG, although additional sites in MG ar needed to provide a more complete picture its status in the Black Hills.



Abundance and breeding distribution of Vesper Sparrow in the Black Hills, 2001.

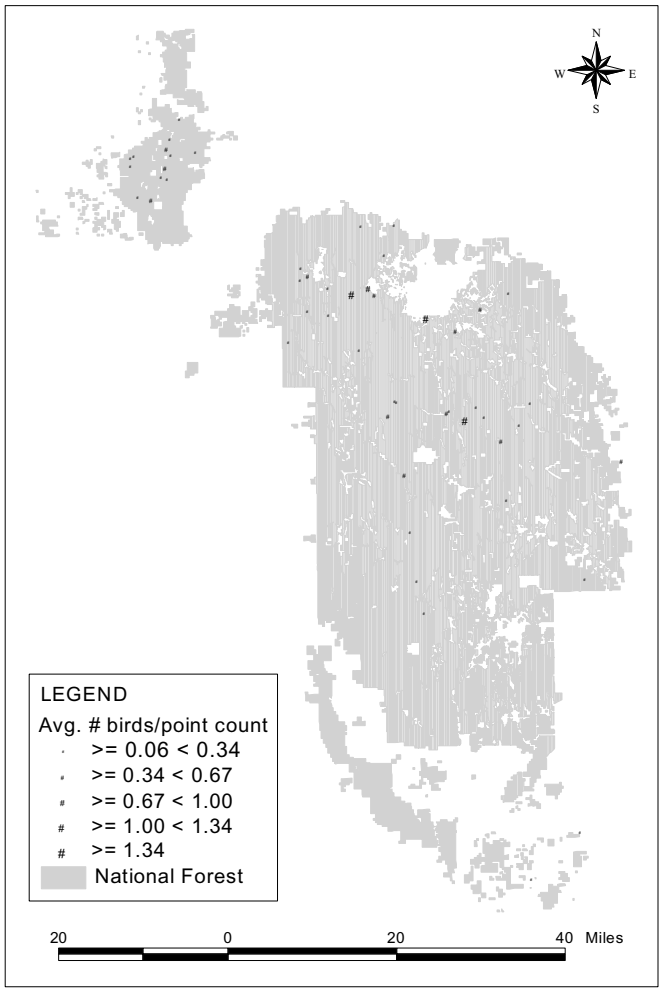


Relative density of Vesper Sparrow among habitats in the Black Hills.

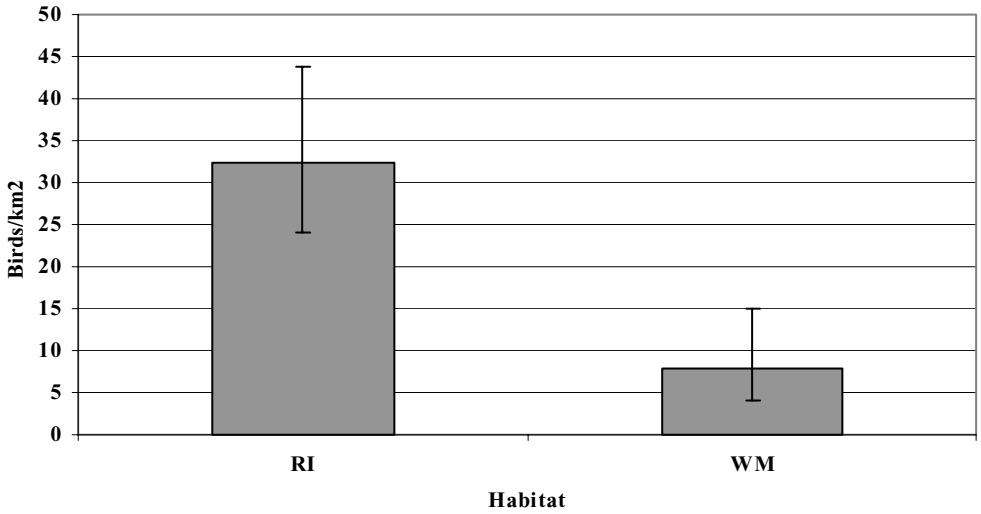
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Song Sparrow

Song Sparrow ranges throughout much of the Black Hills, but it is more abundant and widespread in the north (see map). Song Sparrows occur only in streamside thickets, particularly in willows, and are wholly dependent upon such habitats. Song Sparrows density is highest in RI (*D*=32.5 birds/km^2, CV=15%, *n*=118) although they also occur in lower density in WM (*D*=7.8 birds/km^2, CV=33%, *n*=39) (see chart) where relic riparian vegetation persists. Smaller numbers of Song Sparrows were recorded from AS (*n*=12), BU (*n*=2), LS (*n*=2), PN (*n*=2), PS (*n*=1) and WS (*n*=24), presumably from adjacent riparian areas. This species should be effectively monitored under *MBBH* through point transects in RI.



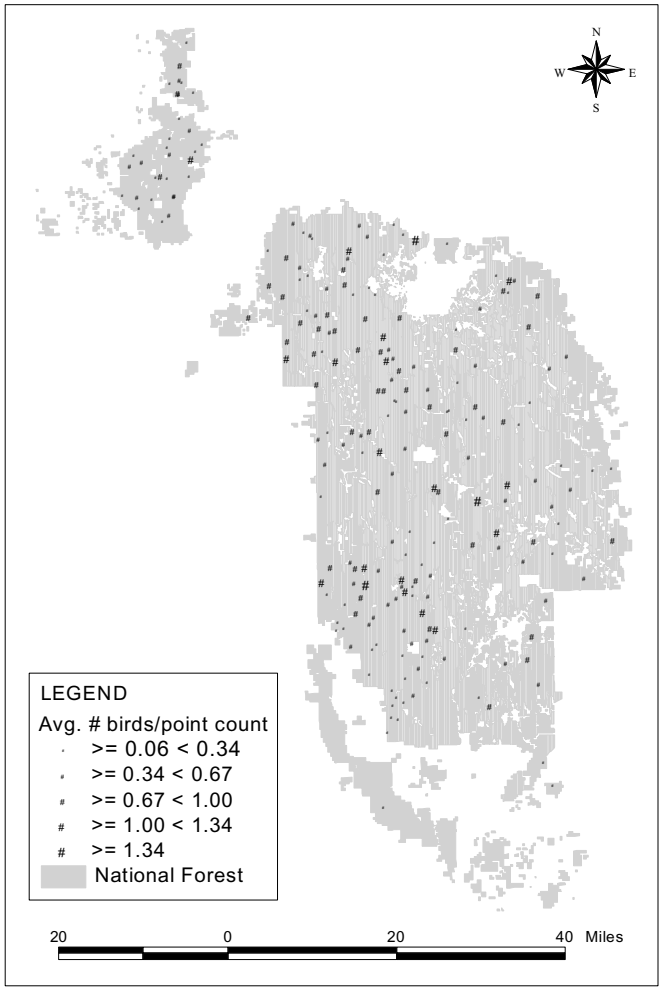
Abundance and breeding distribution of Song Sparrow in the Black Hills, 2001.



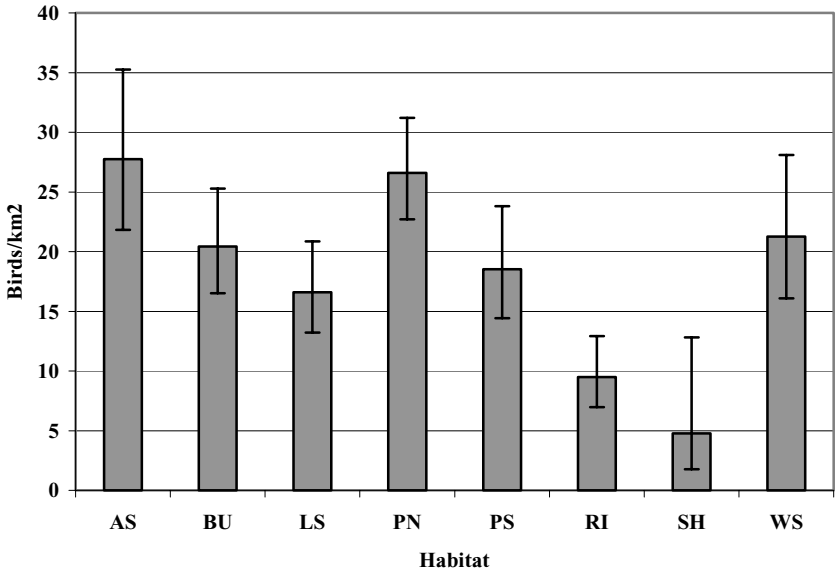
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Dark-eyed Junco

The "white-winged" subspecies of Dark-eyed Junco is endemic to the Black Hills region, where it is widespread and abundant (see map). Dark-eyed Juncos occur in highest density in AS (*D*=27.7 birds/km^2, CV=12%, *n*=157) and PN (*D*=26.6 birds/km^2, CV=8%, *n*=284), although they also occur in relatively high density in BU (*D*=20.4 birds/km^2, CV=11%, *n*=261), LS (*D*=16.6 birds/km^2, CV=12%, *n*=207), PS (*D*=18.5 birds/km^2, CV=13%, *n*=221) and WS (*D*=21.3 birds/km^2, CV=14%, *n*=192) (see chart). Dark-eyed Juncos occur regularly, but in lower density, in RI (*D*=9.5 birds/km^2, CV=16%, *n*=87) and SH (*D*=4.8 birds/km^2, CV=52%, *n*=81). Small numbers were recorded from AS (*n*=12), BU (*n*=2), LS (*n*=2), PN (*n*=2), PS (*n*=1) and WS (*n*=24), presumably from adjacent riparian areas. This species should be effectively monitored under *MBBH* through point transects in RI.



Abundance and distribution of White-winged Junco in the Black Hills.

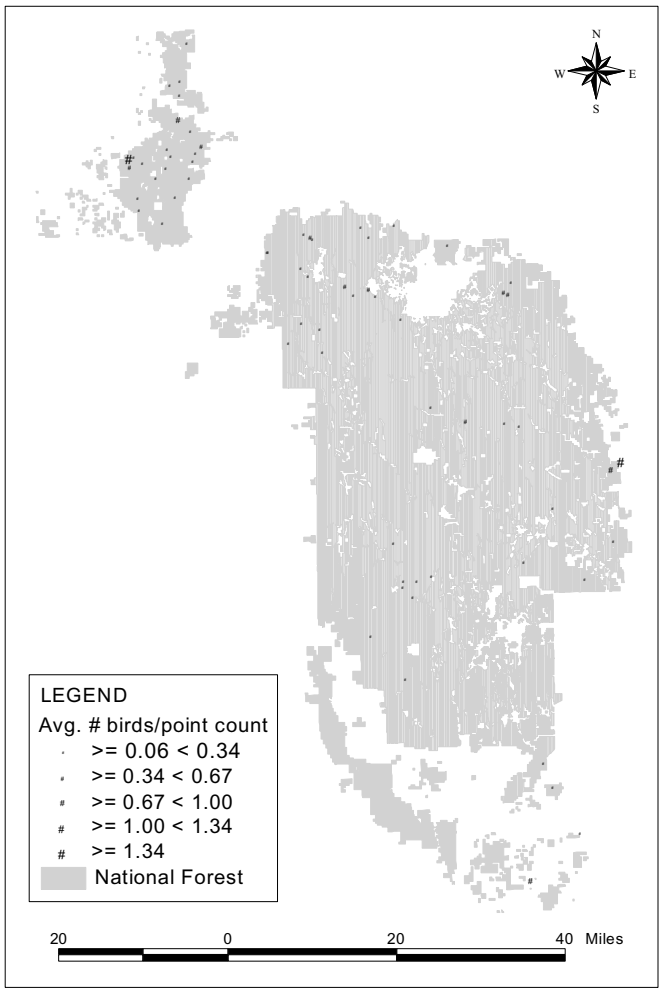


Relative density of Dark-eyed Junco among habitats in the Black Hills.

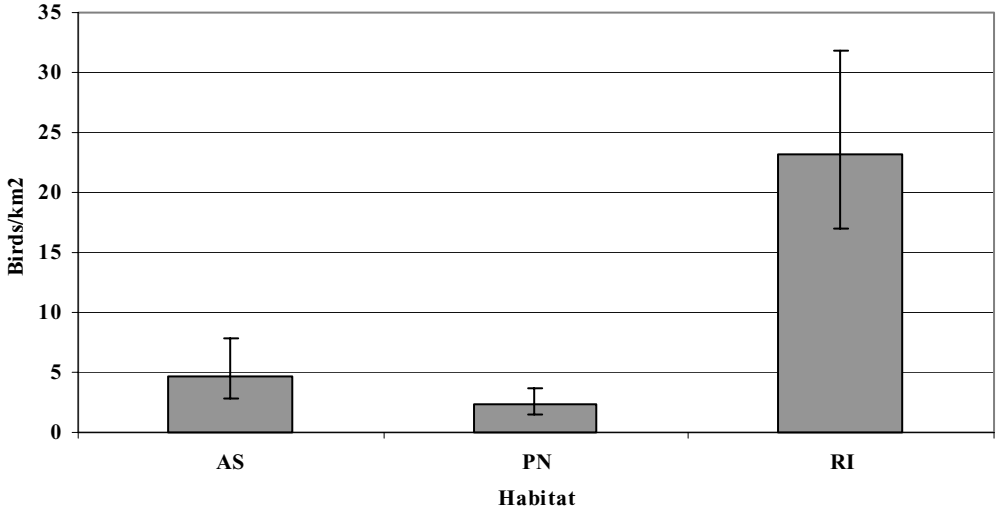
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Black-headed Grosbeak

Black-headed Grosbeak occurs in many parts of the Black Hills, although it is most abundant at lower elevations (see map). Black-headed Grosbeak occurs primarily in RI (*D*= 23.3 birds/km^2, CV=16%, *n*=103), although it also occurs in low density in AS (*D*=4.6 birds/km^2, CV=26%, *n*=31) and PN (*D*=2.4 birds/km^2, CV=23%, *n*=40) (see chart). Black-headed Grosbeak was also recorded in smaller numbers from BU (*n*=8), LS (*n*=13), PS (*n*=9), SH (*n*=5), WM (*n*=13) and WS (*n*=1). This species should be effectively monitored through point transects under *MBBH* in RI, PN and AS habitat.



Abundance and breeding distribution of Black-headed Grosbeak in the Black Hills, 2001.

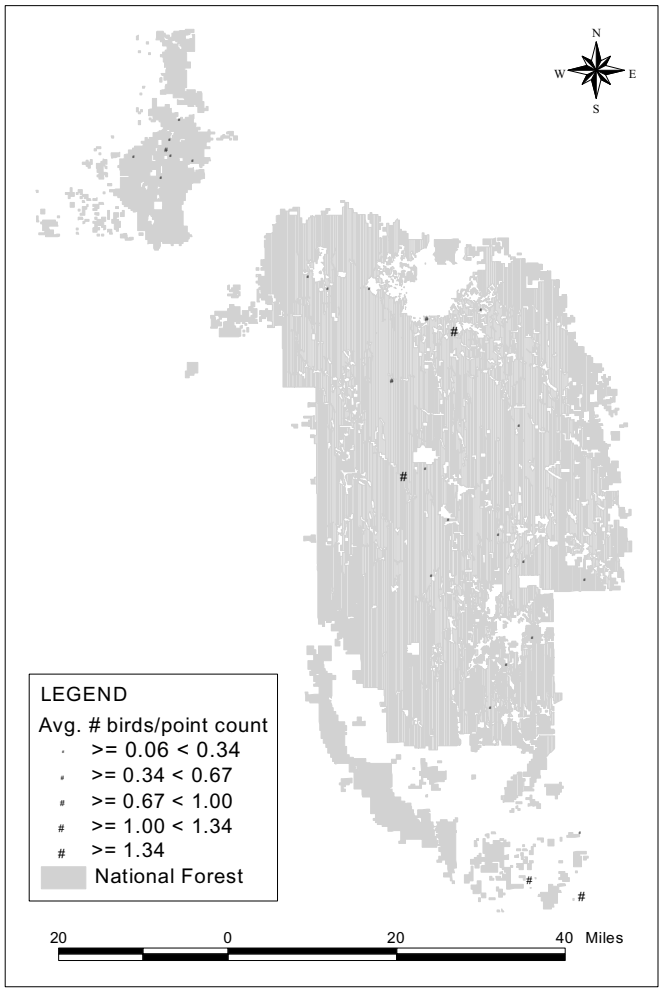


Relative density of Black-headed Grosbeak among habitats in the Black Hills.

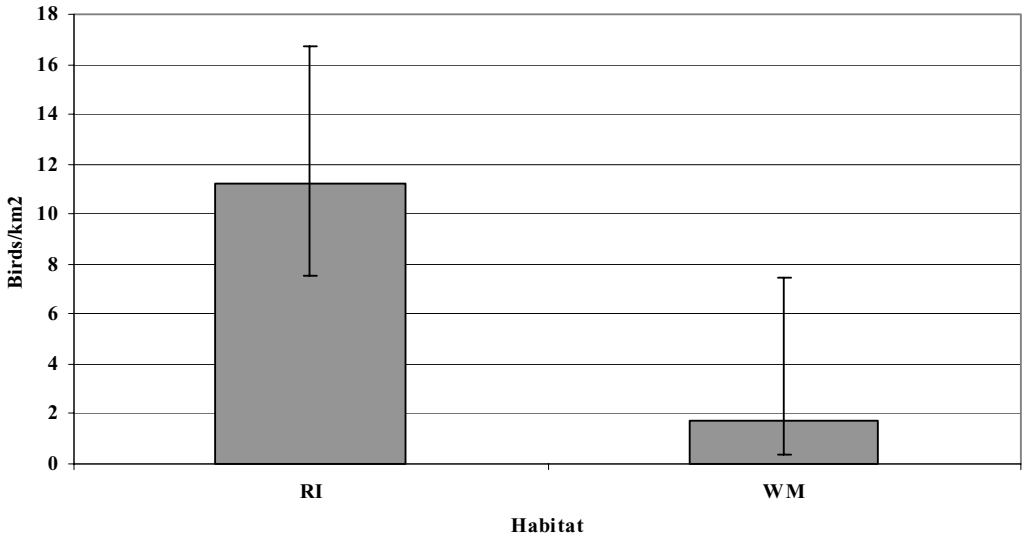
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Red-winged Blackbird

Red-winged Blackbird occurs locally throughout the Black Hills, where it can be abundant (see map). This species occurs primarily in wetland habitats. Not surprisingly Red-winged Blackbird density is greatest in RI (D=11.2 birds/km^2, CV=21%, n=112). Density is lower in WM (D=1.7 birds/km^2, CV=82%, n=24), and Red-winged Blackbird was recorded in small numbers from AS (n=4), BU (n=1), LS (n=1), MG (n=6), PN (n=2), PS (n=8), and WS (n=7). This species should be effectively monitored under *MBBH* through point transects in RI.



Abundance and breeding distribution of Red-winged Blackbird in the Black Hills, 2001.

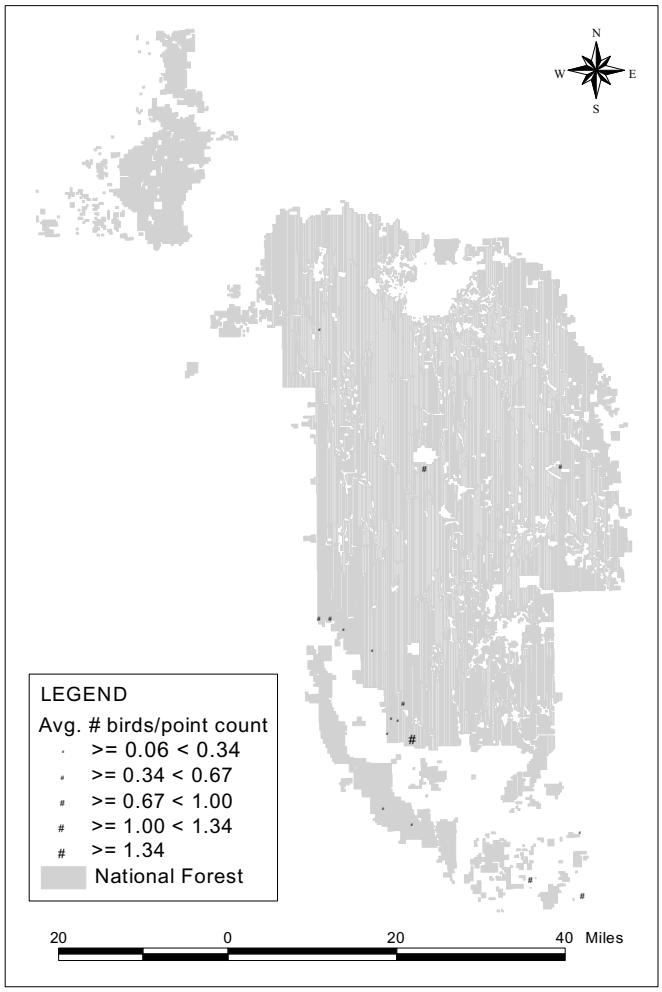


Relative density of Red-winged Blackbird among habitats in the Black Hills.

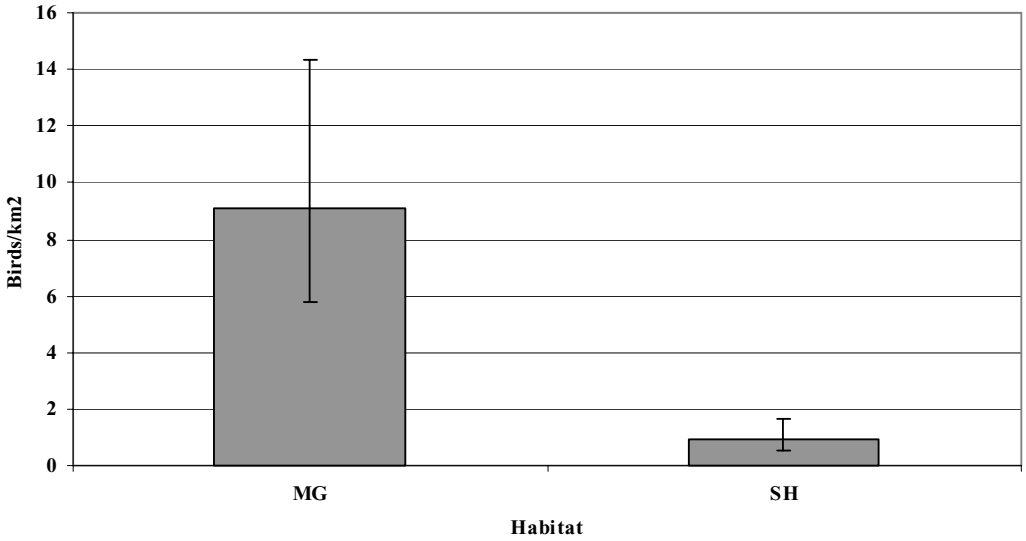
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Western Meadowlark

Western Meadowlark occurs locally in the Black Hills, and is most widespread in the southwest (see map). Western Meadowlark occurs primarily in MG (D=9.1 birds/km^2, CV=23%, n=44), and in low density in SH (D=0.9 birds/km^2, CV=30%, n=123) (see chart). Smaller numbers of Western Meadowlarks were recorded from AS (n=1), PS (n=4), RI (n=25) and WM (n=1), presumably from adjacent open areas. This species should be effectively monitored under *MBBH* through point transects in MG.



Abundance and breeding distribution of Western Meadowlark in the Black Hills, 2001.

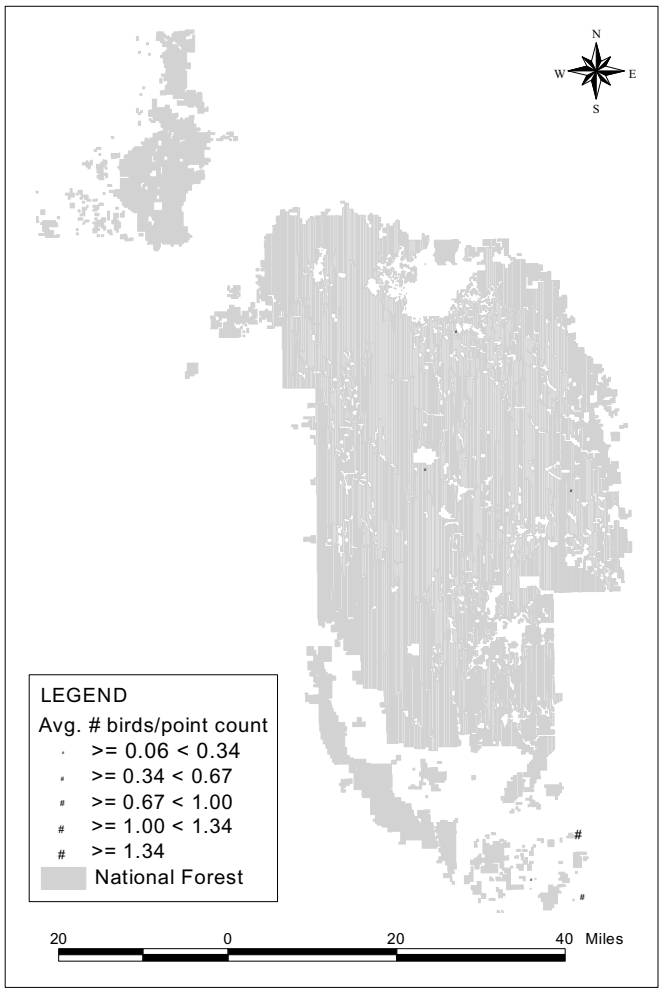


Relative density of Western Meadowlark among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Common Grackle

Common Grackle occurs locally in the Black Hills, mostly at lower elevations (see map). It is a common species outside the Black Hills. Within the Black Hills, it occurs mostly in the southeast in RI habitat (D=5.7 birds/km^2, CV=35%, n=36). Common Grackle was also observed in WM (n=2) and MG (n=4) habitats. This species should be effectively monitored in RI habitat under *MBBH*.

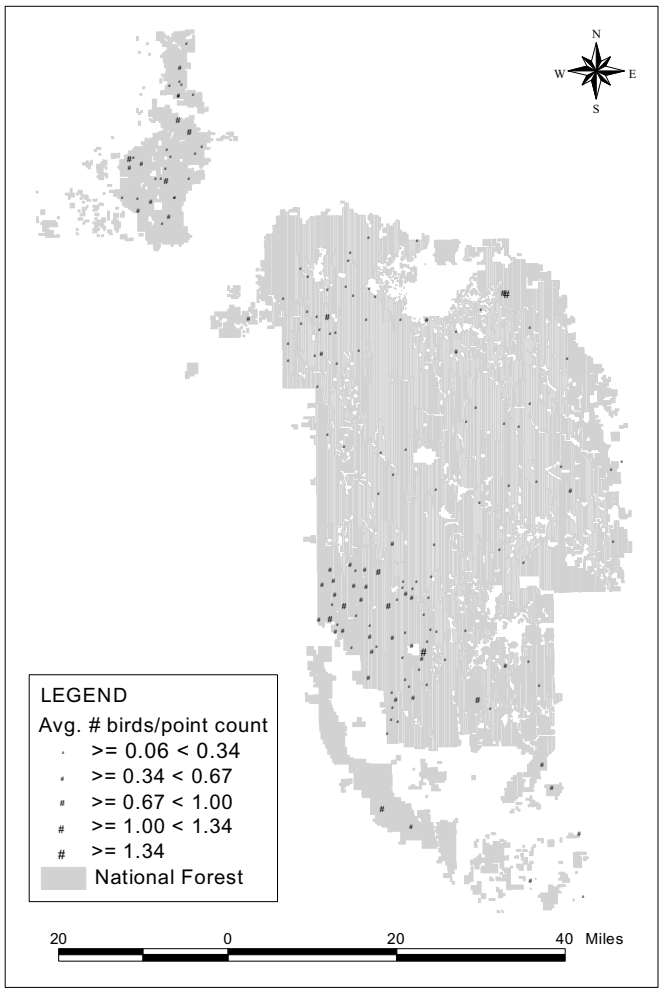


Abundance and breeding distribution of Common Grackle in the Black Hills, 2001.

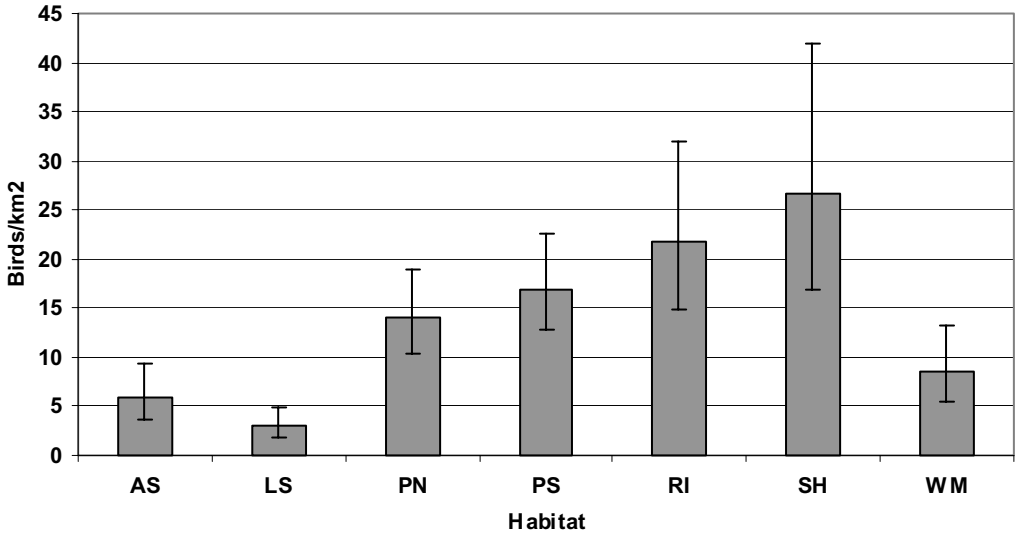
Brown-headed Cowbird

Brown-headed Cowbird occurs throughout the Black Hills, although it appears to be more abundant in the southwest (see map). Brown-headed Cowbirds occur in highest density in SH (*D*=26.7 birds/km^2, CV=23%, *n*=74) and RI habitats (*D*=21.8 birds/km^2, CV=20%, *n*=98) (see chart). They occur in lower, but still relatively high density in PN (*D*=14.0 birds/km^2, CV=15%, *n*=95) and PS (*D*=17.0 birds/km^2, CV=14%, *n*=117), and in moderately low density in WM (*D*=8.4 birds/km^2, CV=23%, *n*=59) and AS (*D*=5.8 birds/km^2, CV=24%, *n*=40). Interestingly, Brown-headed Cowbird density is lowest in LS (*D*=3.0 birds/km^2, CV=25%, *n*=30), and they were not observed in sufficient numbers to estimate density in WS (*n*=10). One individual was observed from MG.

Because Brown-headed Cowbirds can affect populations of other passerine birds through brood parasitism, they are an important species to monitor. Pettingill and Whitney (1965) described this species as a "rare summer resident at lower elevations." It appears that this species has increased substantially in the Black Hills in recent decades. Brown-headed Cowbird should be effectively monitored under *MBBH* through point transects in a wide range of habitats.



Abundance and breeding distribution of Brown-headed Cowbird in the Black Hills, 2001.

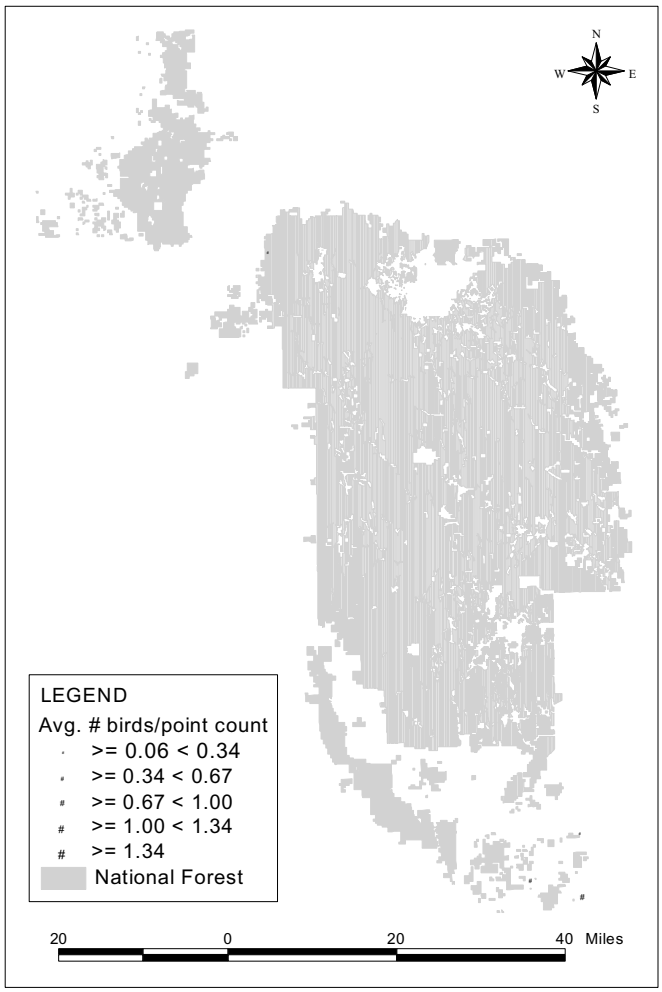


Relative density of Brown-headed Cowbird among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Orchard Oriole

Orchard Oriole occurs locally at lower elevations around the periphery of the Black Hills, particularly in the southeast (see map). We found Orchard Oriole exclusively in RI habitat (D=4.3 birds/km^2, CV=35%, n=27), but only at lower elevations where cottonwood, ash and elm dominate. Because this estimate represents average density in RI habitats across the Black Hills, it probably under estimates their true density in low elevation riparian habitats where they occur. This species should be effectively monitored under *MMBH* through point transects in RI, although negative trends could be difficult to detect due to the low number of observations. Additional sites in RI habitat at lower elevations should increase power to detect trends and provide more accurate habitat-specific information.

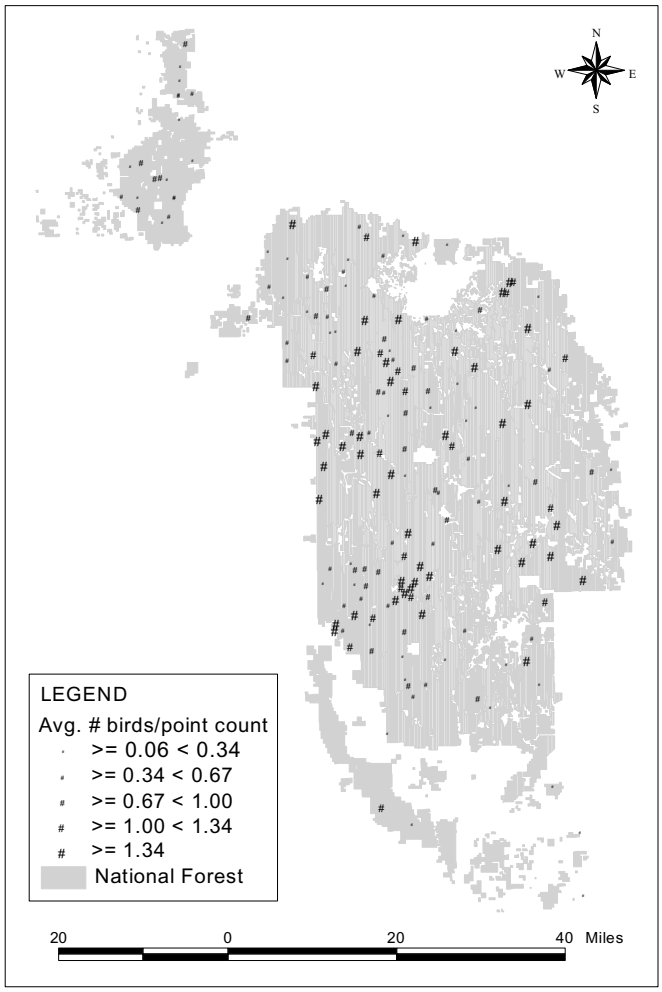


Abundance and breeding distribution of Orchard Oriole in the Black Hills, 2001.

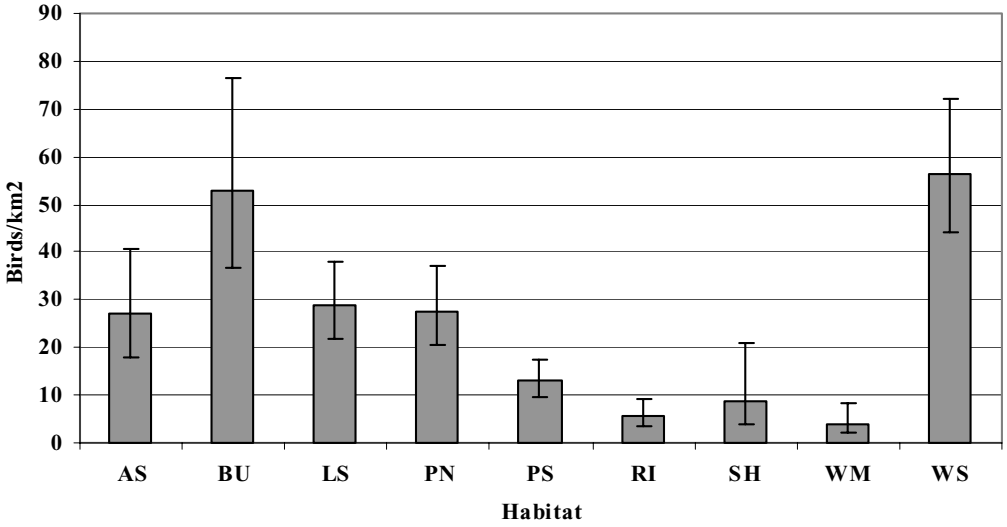
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Red Crossbill

Red Crossbill is an 'irruptive' species in the Black Hills, meaning that in some years, populations from elsewhere may invade the area in great numbers, and then in others years they can withdraw almost entirely. In 2001, Red Crossbills apparently 'irrupted' into the Black Hills and were distributed throughout in high abundance (see map). They occurred in highest density in WS (D=56.2 birds/km^2, CV=13%, n=468) and BU (D=53.0 birds/km^2, CV=19%, n=285), although they also occurred in relatively high density in AS (D=27.1 birds/km^2, CV=21%, n=193), LS (D=28.9 birds/km^2, CV=14%, n=233) and PN (D=27.6 birds/km^2, CV=15%, n=213). Density was lower in PS (D=13.0 birds/km^2, CV=16%, n=142), SH (D=8.9 birds/km^2, CV=45%, n=201), RI (D=5.7 birds/km^2, CV=23%, n=61) and WM (D=4.1 birds/km^2, CV=36%, n=48), and Red Crossbill was also recorded from MG (n=8). While it appears that this species should be effectively monitored through point transects under MBBH, Red Crossbill populations are likely to vary considerably between years.



Abundance and breeding distribution of Red Crossbill in the Black Hills, 2001.

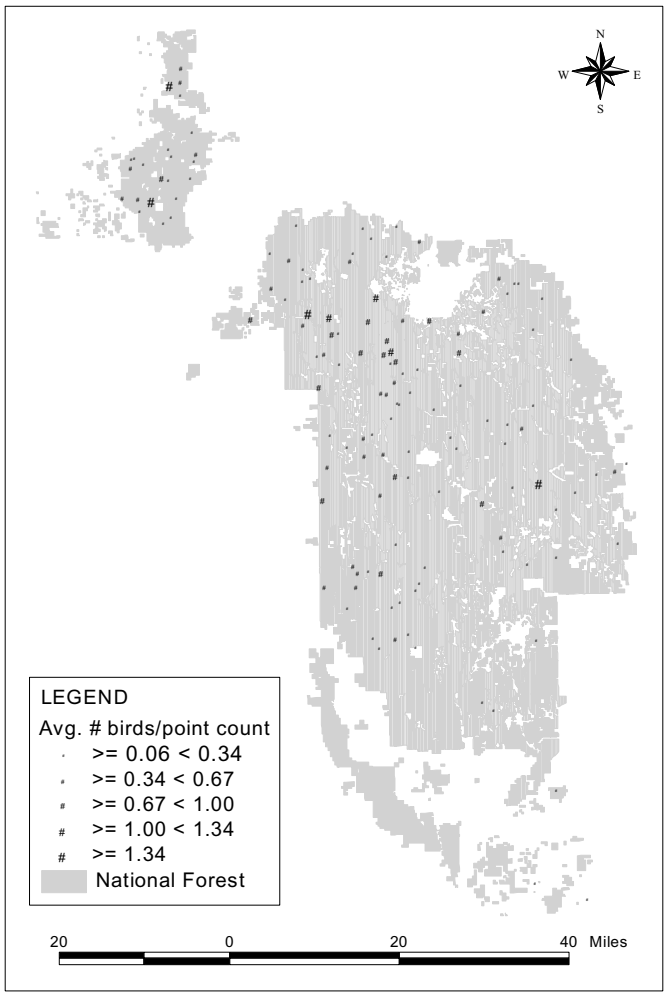


Relative density of Red Crossbill among habitats in the Black Hills.

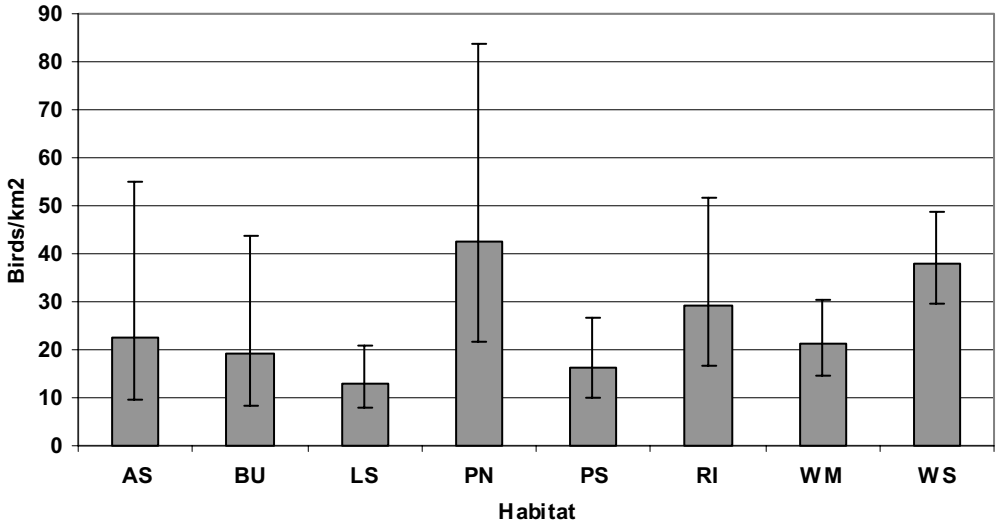
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Pine Siskin

Pine Siskin occurs widely within the Black Hills in moderate to high abundance, although it appears to be less common in the south (see map). Density of Pine Siskins appears to be greatest in PN (D=42.5 birds/km^2, CV=35%, n=130) and WS (D=38.0 birds/km^2, CV=13%, n=108), although it is relatively high in most other habitats as well, including AS (D=22.7 birds/km^2, CV=46%, n=41), BU (D=19.3 birds/km^2, CV=43%, n=60), PS (D=16.4 birds/km^2, CV=25%, n=52), RI (D=29.4 birds/km^2, CV=29%, n=49) and WM (D=21.1 birds/km^2, CV=19%, n=108). In PN and AS, the relatively high CVs and wide confidence limits suggest some caution be used in interpreting the results. Interestingly, density is relatively low in LS (D=12.9 birds/km^2, CV=25%, n=48). Small numbers of Pine Siskins were also recorded from SH (n=3). This species should be effectively monitored under *MBBH* through point transects in a range of habitats.



Abundance and breeding distribution of Pine Siskin in the Black Hills, 2001.

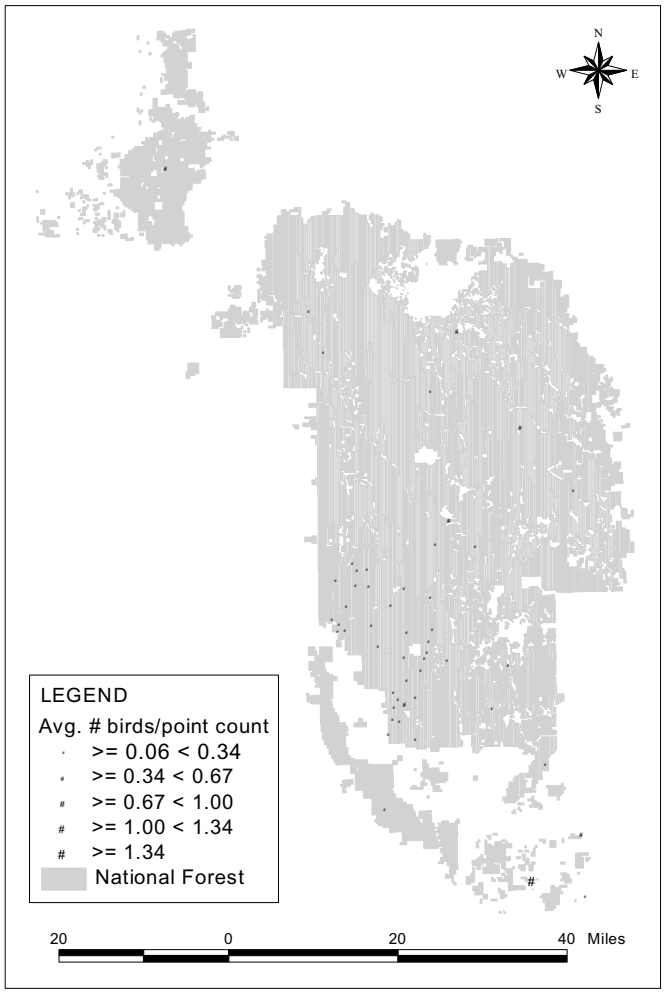


Relative density of Pine Siskin among habitats in the Black Hills.

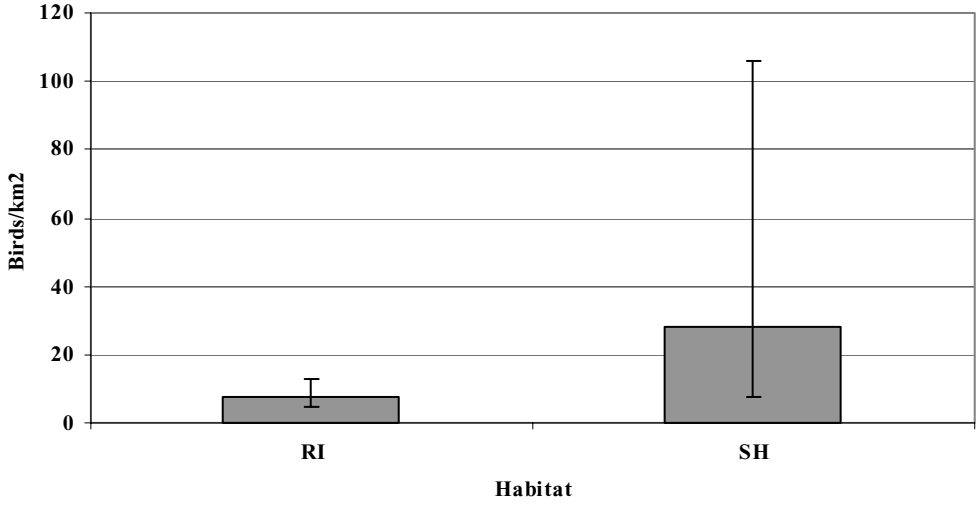
Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

American Goldfinch

American Goldfinch occurs in much of the Black Hills region, more frequently at lower elevations, and especially in the southwest (see map). Estimated density of American Goldfinch is highest in SH habitat (*D*=28.4 birds/km^2, CV=72%, *n*=25) (see chart), although the wide confidence interval and high CV suggest caution be used in interpreting these results. Estimated density of American Goldfinch was lower in RI (*D*=7.5 birds/km^2, CV=28%, *n*=44), although the lower CV suggests the species will be more effectively monitored in this habitat. American Goldfinch was also detected in smaller numbers in BU (*n*=19), MG (*n*=7), PS (*n*=12), and WM (*n*=18). This species should be effectively monitored under *MBBH* through point transects in RI habitat, although additional sites in low-elevation RI habitats would provide a more accurate habitat specific information on density and increase power to detect trends.



Abundance and breeding distribution of American Goldfinch in the Black Hills, 2001.



Relative density of American Goldfinch among habitats in the Black Hills.

Legend: **AS**=Aspen, **BU**=Burn, **LS**=Late-successional Pine, **MG**=Mixed-grass, **PN**=Pine-north, **PS**=Pine-south, **RI**=Riparian, **SH**=Shrubland, **WM**=Wet Meadow, **WS**=White Spruce. *Error bars* denote 95% confidence intervals.

Discussion and Recommendations

One pattern that is apparent in our results is that populations of many species are not evenly distributed across the Black Hills; certain areas and habitats support higher densities of individuals than others. However, these patterns of distribution are not consistent among all species and for many species they are unclear. A thorough assessment of these patterns should be pursued, but it is beyond the scope of this report. However, such area-specific information would prove invaluable in integrating bird conservation with other aspects of forest management in the Black Hills.

Through the habitat-stratified point transects we obtained excellent results with low coefficients of variation (<50%) on 51 bird species, indicating we should be able to detect population trends for these species within a much shorter time period (i.e., 10-15 years) than our maximum target of 30 years. The 51 species in this group are mostly forest and shrubland-dwelling songbirds, many of which, but not all, are fairly widespread across the Hills. This group makes up approximately 38% of all *species* we observed in the Black Hills. While this percentage may seem low, it represents approximately 90% of all *individual birds* we observed. The other 62% of species (10% of observations) fall into one of the following categories below:

1) Species that are locally abundant, or occur widely in low abundance, but for which there were too few observations to generate reliable density estimates;
2) Species that occur widely, but in such low-density that the chance of encountering individuals through a randomized approach is extremely low;
3) Species that occur mainly in the foothills of the Black Hills;
4) Species that occur mainly outside the Black Hills (i.e., on the Great Plains);
5) Localized species that exist in very small numbers (sometimes even single pairs or colonies);
6) Nocturnal species;
7) Wetland-obligate species;
8) Species that are easily detectable only prior to late May.

To effectively monitor this other 62% would require additional effort and a combination of survey techniques, including (but not limited to):

1) additional point transects in existing habitats;
2) sampling additional habitats using point transects;
3) censusing small but localized populations;
4) censusing birds at nesting colonies, eyries, etc;
5) species-specific call-response surveys;
6) nocturnal surveys;
7) wetland surveys;
8) early-season (i.e., winter/spring) surveys.

Perhaps the most effective way to monitor the health of bird populations, especially small ones, is monitor reproductive output at nests. Although somewhat more labor intensive than count-based monitoring, such investigations often yield the most insight into the overall health of bird populations and are not reliant on extensive random sampling. This and many of the other techniques mentioned could be incorporated into *MBBH*, although each will require some level of additional effort. Some techniques, such as censuses of small, localized populations and censuses at known nest sites, will require less additional effort than others and may be incorporated into *MBBH* at little or no additional cost. Others, such as monitoring reproductive success, would require a substantial increase in the level of effort needed to obtain satisfactory results. Rocky Mountain Bird Observatory is open to discussing these issues with Black Hills National Forest in the future.

Bird Conservation Needs in the Black Hills

While it is too soon to assess population change using only the data gathered this year, it is not too soon to assess population status for some species. It is apparent that many, if not most, bird species found in the Black Hills exist in very low numbers across the region. Some species, such as Sharp-shinned Hawk and American Kestrel, were observed so few times that, given our level of survey effort (i.e., roughly equivalent to 10,440 person-hours in the field), the most logical assessment of their status is that few individuals presently breed in the Black Hills. However, more intensive efforts should be made to confirm the status of these and other species that were observed in small numbers on transects. Pettingill and Whitney (1965), who compiled the most thorough treatment of the Black Hills avifauna to date, described Sharp-shinned Hawks as "probably fairly common," and American Kestrels as "common," based on historical records and field surveys from the 1940s through the 1960s. Based on our results, I would not describe their status as such today. Another species that fits a pattern similar to this is the Western Wood-Pewee, which Pettingill and Whitney (1965) described as a "common to abundant summer resident at all elevations" and "the most numerous flycatcher in the pine forests." In 2001 we observed relatively few of these birds. In the few habitats where we observed enough individuals to estimate density, estimates were low (i.e., highest estimated density was in Riparian habitat: 2.7 birds/km^2). Assuming Pettingill and Whitney's assessment were correct, it is only logical to conclude that these species have declined significantly in the Black Hills over the past several decades. The possibility of these declines should be considered seriously and addressed.

That the American Dipper has declined, is less uncertain. The species feeds exclusively on aquatic insects, and especially larvae, that are sensitive to water quality and quantity. In most of its former haunts, it appears that water quality in streams is no longer sufficient to support these organisms, and hence the dipper. Now the American Dipper hangs on tenuously in the Black Hills, primarily in one watershed, and even there it is threatened. The decline is well documented, the reasons for the decline seem clear, and now is the time that conservation measures should be enacted. To effectively conserve the American Dipper in the Black Hills, conservation actions must significantly reduce siltation and pollution in streams, and assure water flow below dams, especially in winter.

Acknowledgements

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APPENDIX A. List of bird species observed in the Black Hills, 2001.

SPECIES	SCIENTIFIC NAME
Pied-billed Grebe	*Podilymbus podiceps*
American Bittern	*Botaurus lentiginosus*
Great Blue Heron	*Ardea herodias*
Turkey Vulture	*Cathartes aura*
Wood Duck	*Aix sponsa*
Mallard	*Anas platyrhynchos*
Ring-necked Duck	*Aythya collaris*
Common Merganser	*Mergus merganser*
Osprey	*Pandion haliaetus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Northern Goshawk	*Accipiter gentilis*
Broad-winged Hawk	*Buteo platypterus*
Red-tailed Hawk	*Buteo jamaicensis*
Golden Eagle	*Aquila chrysaetos*
American Kestrel	*Falco sparverius*
Prairie Falcon	*Falco mexicanus*
Gray Partridge	*Perdix perdix*
Ring-necked Pheasant	*Phasianus colchicus*
Ruffed Grouse	*Bonasa umbellus*
Wild Turkey	*Meleagris gallopavo*
Sora	*Porzana carolina*
Killdeer	*Charadrius vociferus*
Upland Sandpiper	*Bartramia longicauda*
Common Snipe	*Gallinago gallinago*
Rock Dove	*Columba livia*
Mourning Dove	*Zenaida macroura*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Great Horned Owl	*Bubo virginianus*
Long-eared Owl	*Asio otus*
Northern Saw-whet Owl	*Aegolius acadicus*
Common Nighthawk	*Chordeiles minor*
White-throated Swift	*Aeronautes saxatalis*
Belted Kingfisher	*Ceryle alcyon*
Lewis's Woodpecker	*Melanerpes lewis*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Red-naped Sapsucker	*Sphyrapicus nuchalis*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
Three-toed Woodpecker	*Picoides tridactylus*
Black-backed Woodpecker	*Picoides arcticus*
Northern Flicker	*Colaptes auratus*

APPENDIX A. List of bird species observed in the Black Hills, 2001. (cont.)

Western Wood-Pewee	*Contopus sordidulus*
Least Flycatcher	*Empidonax minimus*
Dusky Flycatcher	*Empidonax oberholseri*
Cordilleran Flycatcher	*Empidonax occidentalis*
Eastern Phoebe	*Sayornis phoebe*
Say's Phoebe	*Sayornis saya*
Cassin's Kingbird	*Tyrannus vociferans*
Western Kingbird	*Tyrannus verticalis*
Eastern Kingbird	*Tyrannus tyrannus*
Loggerhead Shrike	*Lanius ludovicianus*
Plumbeous Vireo	*Vireo plumbeous*
Warbling Vireo	*Vireo gilvus*
Red-eyed Vireo	*Vireo olivaceus*
Gray Jay	*Perisoreus canadensis*
Blue Jay	*Cyanocitta cristata*
Pinyon Jay	*Gymnorhinus cyanocephalus*
Clark's Nutcracker	*Nucifraga columbiana*
Black-billed Magpie	*Pica hudsonia*
American Crow	*Corvus brachyrhynchos*
Horned Lark	*Eremophila alpestris*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta thalassina*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Bank Swallow	*Riparia riparia*
Cliff Swallow	*Petrochelidon pyrrhonota*
Barn Swallow	*Hirundo rustica*
Black-capped Chickadee	*Poecile atricapilla*
Red-breasted Nuthatch	*Sitta canadensis*
White-breasted Nuthatch	*Sitta carolinensis*
Pygmy Nuthatch	*Sitta pygmaea*
Brown Creeper	*Certhia americana*
Rock Wren	*Salpinctes obsoletus*
Canyon Wren	*Catherpes mexicanus*
House Wren	*Troglodytes aedon*
American Dipper	*Cinclus mexicanus*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Eastern Bluebird	*Sialia sialis*
Mountain Bluebird	*Sialia currucoides*
Townsend's Solitaire	*Myadestes townsendi*
Veery	*Catharus fuscescens*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*

APPENDIX A. List of bird species observed in the Black Hills, 2001. (cont.)

American Robin	*Turdus migratorius*
Gray Catbird	*Dumetella carolinensis*
Brown Thrasher	*Toxostoma rufum*
European Starling	*Sturnus vulgaris*
Cedar Waxwing	*Bombycilla cedrorum*
Virginia's Warbler	*Vermivora virginiae*
Northern Parula	*Parula americana*
Yellow Warbler	*Dendroica petechia*
Yellow-rumped "Audubon's" Warbler	*Dendroica coronata*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Magnolia Warbler	*Dendroica magnolia*
Black-and-white Warbler	*Mniotilta varia*
American Redstart	*Setophaga ruticilla*
Ovenbird	*Seiurus aurocapillus*
MacGillivray's Warbler	*Oporornis tolmiei*
Common Yellowthroat	*Geothlypis trichas*
Hooded Warbler	*Wilsonia citrina*
Yellow-breasted Chat	*Icteria virens*
Western Tanager	*Piranga ludoviciana*
Spotted Towhee	*Pipilo maculatus*
Chipping Sparrow	*Spizella passerina*
Field Sparrow	*Spizella pusilla*
Vesper Sparrow	*Pooecetes gramineus*
Lark Sparrow	*Chondestes grammacus*
Lark Bunting	*Calamospiza melanocorys*
Grasshopper Sparrow	*Ammodramus savannarum*
Song Sparrow	*Melospiza melodia*
Dark-eyed "White-winged" Junco	*Junco hyemalis*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Blue Grosbeak	*Guiraca caerulea*
Lazuli Bunting	*Passerina amoena*
Indigo Bunting	*Passerina cyanea*
Dickcissel	*Spiza americana*
Red-winged Blackbird	*Agelaius phoeniceus*
Western Meadowlark	*Sturnella neglecta*
Brewer's Blackbird	*Euphagus cyanocephalus*
Common Grackle	*Quiscalus quiscula*
Brown-headed Cowbird	*Molothrus ater*
Orchard Oriole	*Icterus spurius*
Bullock's Oriole	*Icterus bullockii*
Cassin's Finch	*Carpodacus cassinii*
House Finch	*Carpodacus mexicanus*
Red Crossbill	*Loxia curvirostra*

APPENDIX A. List of bird species observed in the Black Hills, 2001. (cont.)

White-winged Crossbill	*Loxia leucoptera*
Pine Siskin	*Carduelis pinus*
American Goldfinch	*Carduelis tristis*
Evening Grosbeak	*Coccothraustes vespertinus*
House Sparrow	*Passer domesticus*