Monitoring the Birds of the Black Hills: 2008 Field Season Report

January 2009

Rocky Mountain Bird Observatory
PO Box 1232
Brighton, CO 80603
303.659.4348
www.rmbo.org
Tech. Report # M-MBBH-USFS08, SDDGF08

In Cooperation With:

Black Hills National Forest

South Dakota Game, Fish, and Parks

ROCKY MOUNTAIN BIRD OBSERVATORY

***Mission**: To conserve birds and their habitats*

***Vision**: Native bird populations are sustained in healthy ecosystems*

***Core Values**: (Our goals for achieving our mission)*

1. ***Science** provides the foundation for effective bird conservation.*
2. ***Education** is critical to the success of bird conservation.*
3. ***Stewardship** of birds and their habitats is a shared responsibility.*

RMBO accomplishes its mission by:

***Partnering** with state and federal natural resource agencies, private landowners, schools, and other nonprofits for conservation.*

***Studying** bird responses to habitat conditions, ecological processes, and management actions to provide scientific information that guides bird conservation efforts.*

***Monitoring** long-term trends in bird populations for our region.*

***Providing** active, experiential, education programs that create an awareness and appreciation for birds.*

***Sharing** the latest information in land management and bird conservation practices.*

***Developing** voluntary, working partnerships with landowners to engage them in conservation.*

***Working** across political and jurisdictional boundaries including, counties, states, regions, and national boundaries. Our conservation work emphasizes the Western United States, including the Great Plains, as well as Latin America.*

***Creating** informed publics and building consensus for bird conservation needs.*

Suggested Citation:

***White, C, Giroir, G.** Monitoring the Birds of the Black Hills, 2008 Field Season Report.* Tech. Rep. M-MBBH-USFS08, SDDGF08. Rocky Mountain Bird Observatory, Brighton, CO, 57 pp.

***Cover Photo**:*

Chipping Sparrow – Dave Herr; Photo obtained from: <https://wwwnotes.fs.fed.us/wo/wfrp/find_a_photo.nsf/findphoto.nsf/photo/38453183551BDF53882571140050725B?OpenDocument>

Contact Information:

Chris White chris.white@rmbo.org
RMBO
PO Box 1232
Brighton, CO 80603
303-659-4348

EXECUTIVE SUMMARY

In 2008, Rocky Mountain Bird Observatory (RMBO), in conjunction with its funding partners, the United States Forest Service (USFS), Black Hills National Forest (BHNF) and South Dakota Game, Fish, and Parks (SDGFP), implemented the eighth year of Monitoring the Birds of the Black Hills (MBBH;) (Panjabi et al. 2001). RMBO has designed the program to provide statistically rigorous long-term trend data for populations of most diurnal, regularly breeding bird species in the Black Hills, including several U.S. Forest Service Region 2 Sensitive Species, BHNF Management Indicator Species, BHNF Species of Local Concern, and SDGFP Species of Greatest Conservation Need. The program provides information such as spatial distribution, abundance, and habitat relationships of bird species needed to effectively manage and conserve bird populations in the Black Hills. This cooperative project supports the BHNF's efforts to comply with requirements set forth in the National Forest Management Act and other statutes and regulations. It also contributes to RMBO's broader landscape-scale breeding bird monitoring program and the goals of state, regional and national bird conservation initiatives.

In 2008, we sampled five of the ten habitats targeted under the monitoring plan: Aspen, Foothills Riparian, Mixed-grass Prairie, Montane Riparian, and Pine-juniper Shrubland. We conducted 136 point-count transects (1,748 point counts) between 24 May and 13 July, 2008. We recorded 16,913 birds of 129 species. The number of species recorded in each habitat ranged from 66 in Aspen to 89 in Montane Riparian. We recorded 58 species in sufficient numbers to estimate density in at least one habitat. We obtained sufficient data on several other species to monitor their populations across habitats, although in some cases, we may better monitor these species with additional transects in specific habitats or with alternative techniques.

This year, as in 2007, we pooled the 2001-2008 point-count data to determine density estimates for each year. This allowed us to calculate density estimates for some low-density species that did not have large enough sample sizes to calculate estimates using only the 2008 data. The pooled 2001-2008 data yielded robust density estimates (CV<50%) for 51 species and moderately robust estimates (CV=50-75%) for seven additional species. We should be able to effectively monitor these 58 species, which represent 45% of all species recorded on point-count transects in the Black Hills during 2001-2008, and 95% of all birds observed during 2001-2008.

ACKNOWLEDGEMENTS

A cooperative agreement with Black Hills National Forest (USFS Region 2), South Dakota Game, Fish, and Parks and Rocky Mountain Bird Observatory funded this project.

We sincerely thank Kerry Burns, Steve Hirtzel and Cara Staab, of the U.S. Forest Service, for their support and involvement in the program as well as for logistical assistance provided during and after the field season. We thank Eileen Dowd-Stukel and Doug Backlund, of the South Dakota Game, Fish, and Parks for their support of this program. We are especially grateful to Bob Paulson and Jeff Symstad of the Nature Conservancy, for the generous use of their comfortable facilities at the Whitney Preserve. We also thank the 2008 field crew: Jennifer Adams, Carl Bullock, Sam Burrell, Thomas Riecke, and Eric Ripma, who spent many weeks in the field, sometimes under difficult conditions, conducting transects. We sincerely appreciate the generosity of Dave Herr for providing the cover photo for this report. We are especially appreciative to Chandman Sambuu of RMBO for his efforts to improve the data entry system and maintain a high quality database.

TABLE OF CONTENTS

INTRODUCTION

Program History

In 2008, RMBO, in cooperation with its partners, the BHNF and SDGFP, implemented year eight of a habitat-based bird monitoring program designed to provide rigorous population trend data on most diurnal, regularly occurring breeding bird species in the Black Hills (Panjabi et al. 2001). Modeled after *Monitoring Colorado's Birds* (Leukering et al. 2000), the program is entitled *Monitoring the Birds of the Black Hills (MBBH).* MBBH is consistent with goals emphasized by the U.S. North American Bird Conservation Initiative (NABCI) Committee (U.S. NABCI Monitoring Subcommittee, 2007). In addition to monitoring bird populations, MBBH generates information useful for managing birds such as habitat associations and spatial distribution. This report details the findings from the eighth year of a long-term, cooperative effort to monitor bird populations in the Black Hills.

Reasons for Monitoring

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

Bird communities reflect an integration of a broad array of ecosystem conditions, including productivity, vegetation structure and composition, water quality, and landscape integrity (Adamus et al. 2001). The response of bird communities to changes in the environment can be examined at a variety of spatial scales, making them a powerful and practical tool for evaluating the broader effects of resource management, conservation and restoration activities, or other environmental changes. And because birds are generally abundant, conspicuous, and relatively easy to identify, they offer tremendous logistical and economic advantages over other taxonomic groups for monitoring their populations.

Population monitoring forms the backbone of avian conservation. Given the declines of many species of North American breeding birds, there is an urgent need for monitoring programs that serve as an "early-warning" system to identify declining species and the causes of declines so that natural resource managers can proactively prevent further declines. Without current monitoring data, conservation efforts may be misguided and inefficient. For these and other reasons, monitoring is mandated by legislation such as the National

Environmental Policy Act (1969), Endangered Species Act (ESA; 1973), and the Forest Management Act (1976), as well as by various state laws, Forest plans, preserve management plans, and other long-range plans (Sauer 1993, Manley et al. 1993). RMBO's monitoring programs are designed to be comparable, repeatable, data rich, long-term, multi-scale, and accessible, so that managers can make informed decisions to effectively conserve birds and their habitats.

Monitoring Objectives

RMBO's bird monitoring programs are designed to provide population trend or status data on all regularly-occurring breeding species within each program area. Initially, we expect to collect data to provide "early-warning" information for all species that we can monitor through a habitat-based approach. After establishing this monitoring framework, we anticipate collecting more demographic information and testing *a priori* hypotheses to determine the possible reasons for known declines and to better inform management decisions. Herein we discuss the initial "early-warning" monitoring framework, monitoring goals, and progress. In the future, with the initial trend information, we hope to develop and establish the second phase of the program to gather demographic and other information to address specific management issues.

The specific objectives of RMBO's monitoring program are:

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

METHODS

Study Area

In January 2001, RMBO, in coordination with biologists from the USFS and other agencies, selected 10 habitats in which to implement the bird monitoring effort - Aspen, Burn Area, Mixed-grass Prairie, Ponderosa Pine - Northern Hills, Ponderosa Pine - Southern Hills, Late-successional Ponderosa Pine, Pine-juniper Shrubland, Riparian, Wet Meadows, and White Spruce (Panjabi et al. 2001). In 2002, we dropped Wet Meadows from the sampling scheme because of poor on-the-ground representation of this habitat, and we split Riparian into two discrete habitats, Montane Riparian and Foothills Riparian, because of differences in bird communities across this elevational gradient (Panjabi 2003). In 2008, we sampled five of the 10 habitats originally targeted for monitoring: Aspen, Foothills Riparian, Mixed-grass Prairie, Montane Riparian, and Pine-juniper Shrubland (Figure 1).

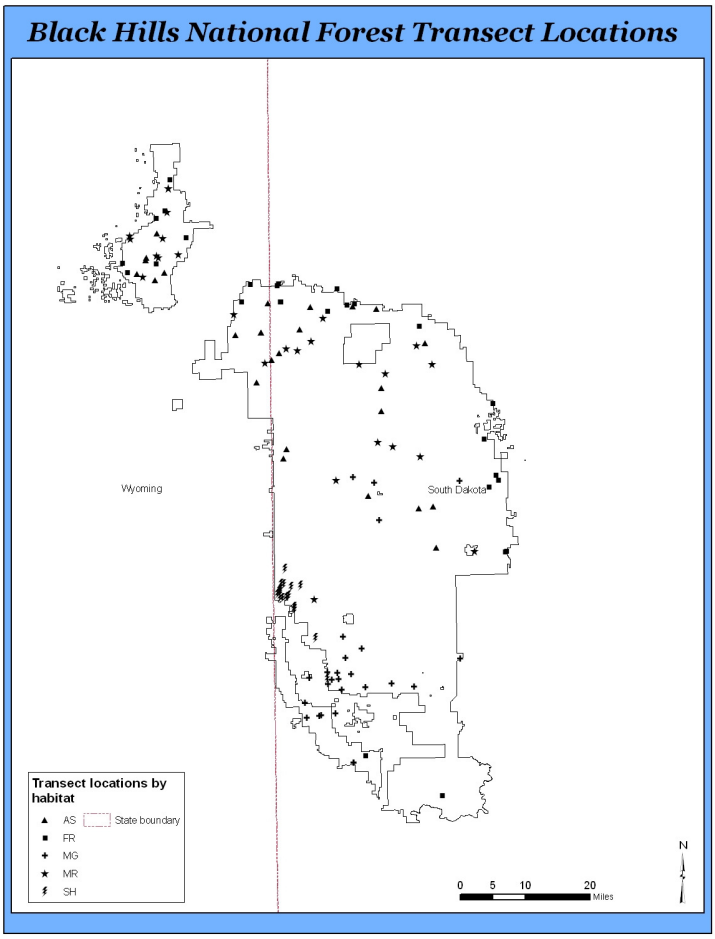

Figure 1. Distribution of habitats targeted for bird monitoring under *Monitoring the Birds of the Black Hills* in 2008.

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

Foothills Riparian
Foothills Riparian (FR) refers to wooded corridors along valley bottoms at lower elevations in the Black Hills, generally below 4,500 ft. These habitats typically occur only in areas with surface water. Dominant tree species vary among locations but include plains cottonwood *(Populus deltoides*), narrow-leaf cottonwood (*Populus angustifolia*), peachleaf willow (*Salix amygdaloides*), boxelder (*Acer negundo*), American elm (*Ulmus americana*), green ash (*Fraxinus pensylvanica*), bur oak (*Querces macrocarpa*), and Russian olive (*Elaegmus angustifolia*). Shrubs may include silver buffaloberry (*Sheperdia argentea*), western snowberry (*Symphoricarpos occidentalis*), chokecherry *(Prunus virginiana*), sandbar willow (*Salix exigua*), Rocky Mountain juniper (*Juniperus scopulorum*), silver sagebrush *(Artemisia cana*) and big sagebrush (*A. tridentata*), among others. Herbaceous vegetation, especially grass, is also prevalent.

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

Montane Riparian
Montane Riparian (MR) refers to wooded habitats along valley bottoms at mid-to-upper elevations in the Black Hills, generally above 4,500 ft. These habitats occur almost exclusively along flowing water. Some sites in this category lack an over-story component, while others contain well-developed under- and over-stories. Dominant over-story tree species typically include narrowleaf

cottonwood, boxelder, ponderosa pine (*Pinus ponderosa*), bur oak, and/or white spruce (*Picea glauca*). Associated tree species may include aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*) and ironwood (*Ostrya virginiana*). Willows (*Salix* spp.), alders (*Alnus* spp.) and other shrubs, including snowberry, chokecherry, stinking elderberry (*Sambucus racemosa*), currant (*Ribes* spp.), and/or hawthorn (*Crataegus chrysocarpa*), typically form a fairly continuous shrub layer. The presence of an extensive shrub layer and flowing water are the unifying characteristics among sites in this habitat. Herbaceous vegetation, especially grasses, is also prevalent.

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

Site Selection

In each of the habitats sampled in BHNF, we aim to have permanent monitoring in 30 randomly selected stands (i.e., sites). USFS personnel identified potential stands using vegetation data layers from BHNF Geographic Information System (GIS) databases. All potential stands conformed to four selection criteria: 1) located within the Black Hills, 2) representative of the targeted habitat, 3) a minimum of 80 acres in size, and 4) accessible to the public within 3 miles of a road. We randomly selected additional stands as back-up sites for stands we would replace if ground-truthing revealed they did not meet one or more of the selection criteria. At each of the chosen sites RMBO staff established a point transect of up to 3.5 km in length.

After the initial site selection in 2001, we added and removed several sites from the sampling scheme. In most cases, we dropped sites because they did not represent the habitat we intended to sample, or because they overlapped with another site. We added new sites to the sampling scheme in order to compensate for sites that we dropped, or to append the current sampling effort in habitats with fewer than 30 sites.

This year, three of the five habitats sampled each contained 30 established sites (Aspen, Foothills Riparian, and Mixed-grass Prairie). Montane Riparian has 27 established sites; field technicians did not establish three new sites in this habitat in 2008 due to time constraints. Pine-juniper Shrubland is relatively limited in BHNF, so the maximum number of sites that we could establish without overlap is 20. In order to increase the sample size in this habitat, we randomly selected 10 of the established sites to sample twice this summer, bringing the number of replicate samples up to 30.

Field Personnel

Experienced biological technicians with excellent aural and visual bird-identification skills comprised the RMBO staff who executed the field component of MBBH in 2008. Each technician completed a 5 day training program at the beginning of the season to ensure full understanding of the field protocols and to practice distance estimation.

Point Transect Protocol

MBBH utilizes point-count transects (Buckland et al. 1993) to sample bird populations in each habitat selected for monitoring. An RMBO field technician conducted each transect following the protocol established by Leukering (2000) and modified by Leukering et al. (2008). RMBO technicians conducted all transects in the morning between ½-hour before sunrise and 11 AM. To maximize efficiency, observers visited the transect prior to the sample date. For new transects, observers used this pre-sample visit to establish an access point for each transect, and a random distance (between 0-400 m) and bearing from the access point at which the first point count station would be located. On the morning of the sample, the observer began the point-count transect at the first count station and then continued along the pre-selected bearing for the fourteen remaining points, if possible. In many cases, the pre-selected bearing eventually would lead out of the target habitat or in to some obstruction (e.g., cliff), forcing the observer to change the transect bearing. When this happened, the observer back-tracked to the last point and randomly turned the transect right or left, at an angle perpendicular to the original bearing, and then alternated right or left if needed. In some small or linear stands (e.g., riparian sites), the size and shape of the stand dictated the location and course of the transect.

Observers conducted five-minute point counts at stations located at 250-m intervals along each point transect, recording all bird detections on standardized forms. Observers noted each one-minute interval of every point count on the datasheet. We recorded birds flying over but not using the immediate surrounding landscape (flyovers), but excluded them from analyses of density. For each bird detected, observers recorded species, sex, how they detected it (visual, calling, singing, flying over the habitat, drumming, or other aural detection), if it sang, and distance from the observation point. Whenever possible, observers measured distances using laser rangefinders. When observers could not directly measure the distance to a bird, they used rangefinders to estimate distance by measuring to an object close to the bird's location.

Observers treated the 250-m intervals between count stations as parts of a line transect and recorded individuals of a list of low-density species (all grouse, raptors, woodpeckers, and a few other rare or uncommon species), measuring the distance and bearing to each from where they detected it along the transect line. They also recorded bearings and distances to individuals on this list when they detected these birds during point counts. We did not record birds we

detected while moving between points if we already recorded them on the previous point. However, if we detected a bird between points and then again during the subsequent point count, we removed the bird from the line-transect data and included only on the point count.

Observers recorded atmospheric data (i.e., temperature in degrees Fahrenheit, cloud cover, precipitation, and wind speed using the Beaufort scale), date, and start and end times of each transect. Field staff used hand-held Global Positioning System (GPS) units to find each point-count station; we uploaded coordinates for each point-count station into the GPS units before the field season using data recorded during previous seasons. Observers recorded all GPS data in Universal Transverse Mercator (UTM) North American Datum 1927. At each count station, observers recorded UTM coordinates (if not already provided), distance to the nearest road (only if the station was within 100m of a road), and a variety of vegetation data within a 50 meter radius of the point count station. Observers recorded structural stage and canopy closure of the forest, mean canopy height, the types and relative proportions of overstory trees, and sub-canopy tree species composition (if present). Observers also recorded the percent coverage, height, and the types and relative proportions of shrubs. Lastly, observers recorded ground cover data, such as the relative proportions of woody, dead and down, herbaceous, bare/litter, and grass cover, and grass height. Other data collected by the observers included the presence of human structures, cliffs or rocks, prairie dog towns/prairie dogs, and the number of dead trees (snags). Observers recorded these data prior to beginning each point count.

Data Analysis

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

This year, as in 2007, we pooled the 2001-2008 point-count transect data to determine density estimates for each year of the MBBH program. This allowed us to calculate density estimates for some low-density species that would not have had large enough sample sizes if we had used only one year of data. As a rule, we only generated density estimates for species which had a minimum of 60 independent detections across all years (2001-2008), or at least 10 detections

per year, as recorded from point count stations in a given habitat, not including flyovers or between-point observations. Because we considered only independent detections in our analyses, the number of independent detections (*n*) used to estimate density for each species may be lower than the number of individuals (*N*) observed. This is especially true for species that tend to associate in groups (e.g., swifts, swallows, crossbills, etc.) Note that (*n*) reflects only the number of independent detections used to estimate density (i.e., after any truncation of outliers), and may be less than the number of independent detections or the number of individuals observed.

RESULTS

In 2008, our eighth year of bird monitoring in the Black Hills, we conducted 1,748 point counts along 136 point-count transects in five different habitats. We conducted transects between 24 May and 13 July (Table 1).

Table 1. Bird sampling periods and effort in the Black Hills, summer 2008.

Habitat	Dates Sampled	# Transects	#Point Counts
Aspen	20 June - 13 July	26	329
Foothills Riparian	5 June - 25 June	28	355
Mixed-grass Prairie	24 May - 19 June	27	377
Montane Riparian	18 June - 13 July	26	348
Pine-Juniper Shrubland	25 May - 18 June	29	339
All Habitats	**24 May – 13 July**	**136**	**1,748**

We recorded 16,913 birds of 129 species on statewide point-count transects (Table 2). We recorded 58 species in sufficient numbers to estimate density in at least one habitat (Tables 3-7).

The number of species recorded in each habitat in 2008 ranged from 66 in Aspen to 89 in Montane Riparian (Table 2). Of the five habitats sampled in 2008, the average number of species per transect was greatest in Montane Riparian and fewest in Aspen (Table 2). While these averages represent the richness of species that we found in each habitat, note that some species were peripheral to the habitat from which we detected them. Thus, species richness as presented in this report does not necessarily indicate that all of the species or individuals actually used the habitat in which we recorded them.

Table 2. Counts of birds recorded by habitat in the Black Hills, summer 2008.

Habitat	# birds recorded	Avg. # birds per transect	# species recorded	Avg. # species per transect
Aspen	2,932	113	66	22
Foothills Riparian	3,155	113	84	24
Mixed-grass Prairie	3,426	127	82	23
Montane Riparian	3,658	141	89	29
Pine-Juniper Shrubland	3,742	129	79	25
All Habitats	**16,913**	**124**	**129**	**25**

Aspen (AS)

We conducted 329 point counts along 26 transects in Aspen between 20 June and 13 July, 2008 (Table 1). We recorded 2,932 birds, with an average of 113 birds per transect (Table 2). We recorded 66 species, with an average of 22 species per transect (Table 2).

The pooled 2001-2008 point-count transect data from Aspen yielded robust density estimates (Coefficient of Variation CV<50%) for 30 species and moderately robust estimates (CV=50-75%) for one additional species (Table 3). These 31 species represent 47% of all species recorded on point-count transects in Aspen in 2008.

Warbling Vireo, Chipping Sparrow, Dark-eyed Junco, Red Crossbill, and American Robin had the highest estimated densities of all species recorded in Aspen (listed in order of highest to lowest density). Eight species – Red-naped Sapsucker, Hairy Woodpecker, Northern Flicker, Warbling Vireo, Gray Jay, Red-breasted Nuthatch, Ovenbird, and Red Crossbill – had higher estimated densities in Aspen relative to the other four habitats sampled. If we assume density positively correlates with habitat quality, then Aspen provides suitable habitat for these species in the Black Hills.

Table 3. Estimated densities of breeding birds in Aspen in BHNF, 2001-2008[1].

Species	Year	D	LCL	UCL	%CV	n
Red-naped Sapsucker	2001	42.8	27.6	66.6	27	79
	2002	28.5	21.5	37.6	17	52
	2004	48.4	36.0	65.0	18	114
	2007	21.3	13.7	33.2	26	35
	2008	41.9	30.4	57.8	19	76
Hairy Woodpecker	2001	--	--	--	--	7
	2002	7.1	4.5	11.3	28	20
	2004	11.6	8.0	16.8	23	44
	2007	7.5	4.7	12.1	29	18
	2008	11.4	7.5	17.3	25	32
Northern Flicker	2001	1.5	0.9	2.4	30	17
	2002	1.1	0.6	1.8	31	12
	2004	2.9	1.9	4.4	25	42
	2007	3.7	2.4	5.6	25	37
	2008	3.6	2.1	6.3	34	43
Western Wood-Pewee	2001	1.4	0.6	3.3	55	10
	2002	1.6	0.7	3.4	49	11
	2004	--	--	--	--	8
	2007	4.9	2.6	9.2	38	31
	2008	4.5	2.8	7.5	30	33
Dusky Flycatcher	2001	20.4	10.4	40.2	43	95
	2002	39.6	28.5	54.9	20	139
	2004	41.0	28.3	59.4	23	136
	2007	41.9	21.2	82.6	43	91
	2008	38.3	28.4	51.7	18	96
Cordilleran Flycatcher	2001	11.3	5.8	22.1	41	34
	2002	6.6	3.0	14.7	50	19
	2004	11.3	6.8	18.8	31	44
	2007	7.7	4.0	14.9	40	20
	2008	6.8	3.6	12.7	39	20
Warbling Vireo	2001	94.1	80.5	110.0	9	383

Species	Year	D	LCL	UCL	%CV	n
Warbling Vireo (cont'd)	2002	73.1	50.0	107.0	23	490
	2004	94.7	80.5	111.4	10	586
	2007	56.8	35.5	90.8	29	350
	2008	116.8	90.2	151.3	16	413
Red-eyed Vireo	2001	6.0	3.0	11.7	42	14
	2002	7.6	3.4	17.0	50	17
	2004	4.6	2.1	10.3	51	13
	2007	--	--	--	--	0
	2008	6.5	2.7	15.6	55	15
Gray Jay	2001	5.5	3.3	9.2	31	24
	2002	2.4	1.2	4.9	44	10
	2004	4.1	2.1	8.0	42	15
	2007	4.0	2.1	7.5	39	12
	2008	3.0	1.5	6.2	43	13
American Crow	2001	0.8	0.5	1.3	29	39
	2002	0.4	0.2	0.6	29	18
	2004	0.6	0.4	1.0	30	36
	2007	1.4	0.9	2.1	27	45
	2008	0.8	0.6	1.2	24	39
Black-capped Chickadee	2001	31.0	20.1	47.6	26	88
	2002	18.9	12.9	27.7	23	105
	2004	24.5	16.8	35.6	23	123
	2007	26.1	19.1	35.7	19	117
	2008	34.2	24.4	48.0	21	109
Red-breasted Nuthatch	2001	10.5	7.4	14.9	21	110
	2002	12.9	9.7	17.0	17	112
	2004	7.9	5.7	10.8	20	113
	2007	37.6	28.8	49.0	16	175
	2008	11.2	8.6	14.5	16	109
White-breasted Nuthatch	2001	--	--	--	--	9
	2002	2.2	1.3	3.7	33	11
	2004	--	--	--	--	7
	2007	5.0	2.9	8.8	34	23
	2008	2.7	1.4	5.2	41	14
Ruby-crowned Kinglet	2001	1.9	1.1	3.3	35	27
	2002	4.6	2.8	7.5	30	63
	2004	4.9	3.2	7.5	25	92
	2007	6.1	4.0	9.5	26	75
	2008	2.5	1.4	4.4	35	35
Townsend's Solitaire	2001	2.1	1.5	3.0	21	33
	2002	2.8	2.0	4.1	21	43
	2004	4.8	3.8	6.0	14	97
	2007	3.8	2.7	5.2	20	51
	2008	2.1	1.3	3.2	27	32
Veery	2001	--	--	--	--	4
	2002	1.6	0.5	4.7	70	12
	2004	2.5	1.1	5.7	53	25
	2007	1.5	0.7	3.3	50	10
	2008	--	--	--	--	7

Species	Year	D	LCL	UCL	%CV	n
Swainson's Thrush	2001	4.1	2.7	6.0	24	57
	2002	2.5	1.3	4.8	39	34
	2004	4.1	2.4	6.9	32	74
	2007	1.6	0.8	3.1	41	19
	2008	3.5	2.2	5.8	29	49
American Robin	2001	24.2	16.4	35.7	24	141
	2002	7.2	5.4	9.7	18	96
	2004	30.3	21.3	43.0	21	171
	2007	47.7	34.3	66.3	20	203
	2008	60.6	48.5	75.7	13	223
Yellow-rumped Warbler	2001	27.2	21.2	34.8	15	138
	2002	19.5	15.5	24.6	14	169
	2004	21.9	17.1	28.1	15	178
	2007	54.4	44.8	66.2	12	236
	2008	31.6	23.2	43.0	19	120
American Redstart	2001	19.7	12.0	32.3	31	51
	2002	15.4	7.9	29.8	41	38
	2004	15.5	8.7	27.7	36	52
	2007	5.8	2.3	14.6	58	13
	2008	14.1	7.8	25.4	36	36
Ovenbird	2001	42.1	33.0	53.7	15	319
	2002	34.7	25.4	47.5	19	276
	2004	36.5	22.1	60.2	31	399
	2007	21.8	14.0	33.9	26	180
	2008	49.4	39.6	61.7	13	361
MacGillivray's Warbler	2001	24.3	14.5	40.8	32	45
	2002	27.7	14.9	51.5	38	49
	2004	25.0	14.5	43.2	34	59
	2007	14.5	6.9	30.2	46	23
	2008	17.6	10.0	30.9	35	32
Common Yellowthroat	2001	2.9	1.5	5.7	41	14
	2002	4.4	2.2	8.8	43	20
	2004	3.4	1.6	7.2	47	21
	2007	--	--	--	--	3
	2008	5.5	2.9	10.5	39	26
Western Tanager	2001	5.0	3.2	7.7	27	56
	2002	3.0	1.9	4.7	27	32
	2004	4.3	3.1	5.8	19	62
	2007	6.4	4.5	9.2	21	62
	2008	5.0	3.5	7.0	20	55
Spotted Towhee	2001	2.5	1.1	5.6	50	11
	2002	4.3	1.7	10.6	57	18
	2004	2.6	1.1	6.1	53	14
	2007	5.0	2.7	9.4	38	19
	2008	7.6	4.0	14.5	39	33
Chipping Sparrow	2001	40.0	21.4	75.0	39	74
	2002	35.1	19.8	62.3	36	62
	2004	59.7	32.4	110.0	38	135
	2007	85.6	48.6	150.6	35	133

Species	Year	D	LCL	UCL	%CV	n
Chipping Sparrow (cont'd)	2008	90.6	52.1	157.7	35	164
Song Sparrow	2001	1.7	0.9	3.2	38	10
	2002	--	--	--	--	6
	2004	3.6	1.8	7.0	42	26
	2007	--	--	--	--	3
	2008	--	--	--	--	9
Dark-eyed Junco	2001	31.4	23.8	41.5	17	141
	2002	14.2	10.3	19.6	20	112
	2004	39.4	28.2	55.2	20	166
	2007	56.2	44.0	71.7	15	211
	2008	64.7	49.9	83.9	16	152
Black-headed Grosbeak	2001	4.9	2.8	8.5	34	28
	2002	9.1	6.0	13.8	25	50
	2004	2.7	1.6	4.6	32	19
	2007	4.2	2.0	9.2	47	21
	2008	2.6	1.5	4.6	33	15
Brown-headed Cowbird	2001	8.6	6.0	12.3	22	39
	2002	11.5	7.9	16.8	23	46
	2004	8.0	5.3	12.0	25	44
	2007	19.9	12.9	30.7	26	70
	2008	18.3	14.2	23.5	15	82
Red Crossbill	2001	22.5	14.4	35.2	27	147
	2002	18.8	10.7	32.9	35	81
	2004	17.1	11.0	26.8	27	79
	2007	61.6	43.3	87.6	22	87
	2008	62.5	44.3	88.2	21	97
Pine Siskin	2001	15.3	9.1	25.7	32	37
	2002	19.9	11.6	34.4	34	38
	2004	--	--	--	--	6
	2007	10.1	5.9	17.5	33	20
	2008	10.7	5.5	21.1	42	20
Red Squirrel	2001	15.6	8.9	27.2	35	22
	2002	16.3	8.6	31.0	40	22
	2004	15.8	8.4	29.7	39	29
	2007	82.4	44.9	151.5	38	100
	2008	43.9	25.1	76.7	35	60

[1]D = estimated density (birds/km^2); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of observations used to estimate D. Note: if n<10, then we omitted the density estimates.

Foothills Riparian (FR)

We conducted 355 point counts along 28 transects in Foothills Riparian between 5 June and 25 June, 2008 (Table 1). We recorded 3,155 birds, with an average of 113 birds per transect (Table 2). We recorded 84 species, with an average of 24 species per transect (Table 2).

The pooled 2001-2008 point-count transect data from Foothills Riparian yielded robust density estimates (CV<50%) for 34 species and moderately robust

estimates (CV=50-75%) for seven additional species (Table 4). These 41 species represent 49% of all species recorded on point-count transects in Foothills Riparian in 2008.

Dark-eyed Junco, American Redstart, American Robin, Yellow Warbler, and Chipping Sparrow had the highest estimated densities of all species recorded in Foothills Riparian (listed in order of highest to lowest density). Thirteen species – Turkey Vulture, Western Wood-Pewee, Cordilleran Flycatcher, Eastern Kingbird, Red-eyed Vireo, Black-capped Chickadee, Gray Catbird, Yellow Warbler, Yellow-breasted Chat, Dark-eyed Junco, Black-headed Grosbeak, Lazuli Bunting, and Orchard Oriole – had higher estimated densities in Foothills Riparian relative to the other four habitats sampled. If we assume density positively correlates with habitat quality, then Foothills Riparian provides suitable habitat for these species in the Black Hills.

Table 4. Estimated densities of breeding birds in Foothills Riparian in BHNF, 2001-2008[1].

Species	Year	D	LCL	UCL	%CV	n
Turkey Vulture	2002	1.2	0.5	2.9	54	25
	2005	1.0	0.6	1.8	34	30
	2006	0.6	0.3	1.1	41	15
	2008	0.7	0.3	1.7	56	14
Mourning Dove	2002	7.5	4.7	11.9	28	66
	2005	4.0	2.3	7.0	34	54
	2006	5.3	3.6	7.7	23	67
	2008	3.1	1.7	5.8	38	35
White-throated Swift	2002	6.0	3.0	12.2	43	32
	2005	20.6	9.6	44.2	48	36
	2006	18.3	8.5	39.4	49	59
	2008	9.3	4.6	18.6	43	25
Red-naped Sapsucker	2002	--	--	--	--	1
	2005	7.0	3.6	13.7	41	20
	2006	10.1	5.7	17.9	35	27
	2008	--	--	--	--	5
Hairy Woodpecker	2002	--	--	--	--	7
	2005	2.7	1.8	4.0	24	26
	2006	3.1	2.1	4.6	24	27
	2008	--	--	--	--	9
Northern Flicker	2002	0.9	0.6	1.5	29	15
	2005	0.9	0.5	1.3	27	21
	2006	1.4	0.9	2.1	25	31
	2008	0.5	0.2	0.9	42	12
Western Wood-Pewee	2002	7.7	4.1	14.5	38	57
	2005	3.7	2.3	5.8	27	41
	2006	5.4	3.3	9.0	31	57
	2008	5.9	4.3	8.1	19	59
Dusky Flycatcher	2002	10.2	6.0	17.2	31	48
	2005	20.1	13.8	29.1	22	146

Species	Year	D	LCL	UCL	%CV	n
Dusky Flycatcher (cont'd)	2006	14.1	8.1	24.5	33	96
	2008	8.6	5.8	12.8	23	56
Cordilleran Flycatcher	2002	29.4	16.8	51.6	34	80
	2005	53.0	40.2	70.0	17	222
	2006	46.6	34.5	63.1	18	182
	2008	28.2	19.6	40.6	22	105
Eastern Kingbird	2002	17.3	9.1	32.6	38	63
	2005	2.3	0.6	8.6	90	11
	2006	2.5	0.7	8.4	82	13
	2008	2.6	1.0	6.6	59	11
Plumbeous Vireo	2002	3.2	1.5	6.8	47	18
	2005	4.0	2.6	6.1	25	35
	2006	4.2	2.7	6.4	26	34
	2008	2.1	1.2	3.6	35	16
Warbling Vireo	2002	24.1	16.1	36.1	24	82
	2005	73.0	59.5	89.5	12	381
	2006	31.5	22.6	43.9	20	154
	2008	42.0	33.0	53.5	14	192
Red-eyed Vireo	2002	36.6	23.3	57.4	27	83
	2005	37.2	25.9	53.3	22	129
	2006	23.8	14.3	39.6	31	78
	2008	25.1	17.5	35.9	22	77
Blue Jay	2002	1.5	0.8	3.0	42	16
	2005	1.0	0.5	1.9	39	15
	2006	1.8	1.0	3.1	35	23
	2008	1.1	0.6	2.0	37	16
American Crow	2002	0.4	0.2	0.7	32	17
	2005	--	--	--	--	4
	2006	0.5	0.3	0.9	34	26
	2008	0.3	0.2	0.6	41	15
Violet-green Swallow	2002	40.0	24.3	65.6	30	99
	2005	23.9	13.9	41.1	33	79
	2006	31.2	20.5	47.4	25	116
	2008	16.9	9.9	29.0	33	44
Black-capped Chickadee	2002	40.1	16.1	99.9	60	50
	2005	85.9	36.6	201.7	56	160
	2006	85.0	35.9	201.3	56	143
	2008	49.7	20.8	118.9	57	83
Red-breasted Nuthatch	2002	4.2	2.6	6.7	29	24
	2005	15.6	12.1	20.1	15	130
	2006	15.3	10.9	21.5	20	126
	2008	5.3	3.4	8.3	27	41
White-breasted Nuthatch	2002	--	--	--	--	9
	2005	0.8	0.4	1.5	38	13
	2006	5.4	3.3	8.8	30	78
	2008	1.2	0.7	2.1	34	17
Rock Wren	2002	1.4	0.5	3.7	62	24
	2005	0.7	0.3	1.5	46	19
	2006	0.5	0.2	1.1	47	13

Species	Year	D	LCL	UCL	%CV	n
Rock Wren (cont'd)	2008	0.9	0.4	1.9	48	21
Canyon Wren	2002	1.8	1.1	2.8	27.8	28
	2005	0.7	0.3	1.4	48	16
	2006	1.3	0.8	2.1	29	30
	2008	--	--	--	--	4
House Wren	2002	18.4	11.0	30.8	30.6	88
	2005	1.6	0.8	3.5	48	12
	2006	1.7	0.8	4.0	51	12
	2008	--	--	--	--	6
Ruby-crowned Kinglet	2002	1.9	0.6	5.5	69	11
	2005	7.8	4.9	12.5	28	71
	2006	3.8	2.1	6.7	35	32
	2008	5.3	2.9	9.8	37	43
Townsend's Solitaire	2002	1.1	0.5	2.4	50	10
	2005	3.2	2.1	4.8	24	46
	2006	2.8	1.6	4.6	32	37
	2008	1.4	0.9	2.3	29	18
Swainson's Thrush	2002	1.7	0.8	3.7	48	13
	2005	5.4	3.7	7.7	22	64
	2006	11.0	7.4	16.2	23	123
	2008	3.1	1.6	6.0	40	33
American Robin	2002	39.4	27.1	57.2	22	95
	2005	75.4	60.9	93.2	13	276
	2006	73.5	56.6	95.5	16	255
	2008	64.7	49.4	84.9	16	206
Gray Catbird	2002	--	--	--	--	7
	2005	11.8	4.8	29.2	58	15
	2006	12.6	4.5	35.5	68	15
	2008	21.3	9.0	50.4	56	23
Cedar Waxwing	2002	86.0	28.0	263.7	76.3	54
	2005	19.3	5.5	67.1	87	10
	2006	15.4	4.2	56.9	92	18
	2008	--	--	--	--	7
Yellow Warbler	2002	77.7	47.3	127.6	30	145
	2005	21.2	10.4	43.5	44	61
	2006	14.5	6.8	30.8	47	39
	2008	52.4	33.3	82.4	27	134
Yellow-rumped Warbler	2002	3.8	2.0	7.3	39	23
	2005	11.8	8.4	16.6	20	109
	2006	13.8	9.8	19.5	21	120
	2008	6.3	4.4	9.1	22	52
American Redstart	2002	29.7	17.9	49.3	30	57
	2005	101.2	70.4	145.5	22	299
	2006	69.0	45.6	104.2	25	191
	2008	79.9	59.8	106.7	17	210
Ovenbird	2002	29.9	17.6	51.0	32	151
	2005	48.6	38.1	62.2	15	378
	2006	29.4	20.2	42.7	22	214
	2008	39.1	30.7	49.8	15	270

Species	Year	D	LCL	UCL	%CV	n
MacGillivray's Warbler	2002	--	--	--	--	8
	2005	29.1	15.3	55.2	40	55
	2006	11.1	5.8	21.3	41	20
	2008	25.1	13.0	48.2	41	43
Common Yellowthroat	2002	43.5	22.9	82.7	39	64
	2005	34.4	19.0	62.4	37	78
	2006	23.6	11.8	47.1	43	47
	2008	17.9	9.0	35.4	43	35
Yellow-breasted Chat	2002	11.2	6.0	21.0	38	61
	2005	2.6	0.9	7.5	68	22
	2006	2.2	0.6	7.6	85	17
	2008	3.0	0.9	9.4	77	22
Western Tanager	2002	3.6	2.2	5.8	28	24
	2005	9.1	6.7	12.3	18	93
	2006	11.9	9.0	15.8	17	113
	2008	8.9	6.8	11.6	16	74
Spotted Towhee	2002	30.2	20.3	44.9	24	92
	2005	21.7	13.6	34.6	28	102
	2006	25.0	14.5	42.9	33	110
	2008	32.5	21.6	49.0	25	136
Chipping Sparrow	2002	29.4	19.2	45.0	25	41
	2005	72.6	53.3	98.9	19	147
	2006	49.6	35.8	68.8	20	100
	2008	51.3	36.6	71.8	20	94
Lark Sparrow	2002	14.7	7.6	28.6	40	48
	2005	--	--	--	--	9
	2006	4.5	1.4	14.1	76	21
	2008	4.3	1.3	14.9	83	20
Song Sparrow	2002	17.4	10.1	30.0	33	35
	2005	24.2	14.9	39.2	29	75
	2006	20.3	13.0	31.7	27	59
	2008	17.4	9.1	33.4	40	48
Dark-eyed Junco	2002	105.0	16.7	661.1	157	18
	2005	295.4	47.7	1830.8	154	75
	2006	202.0	32.1	1273.0	157	49
	2008	212.8	34.1	1327.7	155	49
Black-headed Grosbeak	2002	35.8	25.1	51.0	21	115
	2005	28.3	20.9	38.3	18	138
	2006	23.3	16.0	33.8	22	108
	2008	17.0	11.8	24.5	22	73
Lazuli Bunting	2002	10.1	5.2	19.9	41	38
	2005	1.7	0.7	4.6	63	10
	2006	3.1	1.3	7.8	58	17
	2008	2.9	1.3	6.5	50	15
Red-winged Blackbird	2002	19.9	10.0	39.5	42	122
	2005	4.1	1.6	10.5	59	39
	2006	--	--	--	--	5
	2008	2.5	1.0	6.2	58	23
Western Meadowlark	2002	4.0	2.2	7.3	36.3	57

Species	Year	D	LCL	UCL	%CV	n
Western Meadowlark (cont'd)	2005	1.2	0.4	3.7	74	25
	2006	--	--	--	--	4
	2008	--	--	--	--	7
Common Grackle	2002	18.4	7.3	46.4	58.0	52
	2005	--	--	--	--	3
	2006	--	--	--	--	0
	2008	--	--	--	--	7
Brown-headed Cowbird	2002	20.2	14.4	28.2	20	64
	2005	19.5	13.8	27.5	21	89
	2006	11.6	7.3	18.4	28	53
	2008	23.0	17.0	31.2	18	100
Orchard Oriole	2002	13.5	5.2	34.9	60	15
	2005	--	--	--	--	6
	2006	--	--	--	--	2
	2008	7.9	2.2	27.7	86	11
Bullock's Oriole	2002	4.3	1.8	10.4	55.1	16
	2005	1.7	0.8	3.9	50	10
	2006	--	--	--	--	8
	2008	--	--	--	--	7
Red Crossbill	2002	17.8	5.6	57.1	78	29
	2005	5.8	3.4	10.0	33	51
	2006	3.1	1.8	5.5	35	33
	2008	2.4	1.1	5.5	52	10
Pine Siskin	2002	--	--	--	--	7
	2005	13.1	9.3	18.4	21	67
	2006	7.2	4.4	11.9	30	40
	2008	6.2	3.5	11.1	35	18
American Goldfinch	2002	21.1	12.3	36.2	32	70
	2005	4.9	2.5	9.5	41	22
	2006	7.7	3.7	16.1	45	32
	2008	7.0	3.6	13.7	41	30
Red Squirrel	2002	7.2	2.6	19.8	64	14
	2005	5.0	2.6	9.8	41	14
	2006	13.2	7.4	23.7	36	37
	2008	12.8	7.4	22.2	34	33

[1]D = estimated density (birds/km^2); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of observations used to estimate D. Note: if n<10, then we omitted the density estimates.

Mixed-grass Prairie (MG)

We conducted 377 point counts along 27 transects in Mixed-grass Prairie between 24 May and 19 June, 2008 (Table 1). We recorded 3,426 birds, with an average of 127 birds per transect (Table 5). We recorded 82 species, with an average of 23 species per transect (Table 2).

The pooled 2001-2008 point-count transect data from Mixed-grass Prairie yielded robust density estimates (CV<50%) for 25 species and moderately robust estimates (CV=50-75%) for four additional species (Table 3). These 29 species

represent 35% of all species recorded on point-count transects in Mixed-grass Prairie in 2008.

Chipping Sparrow, Western Meadowlark, Grasshopper Sparrow, Mountain Bluebird, and Vesper Sparrow had the highest estimated densities of all species recorded in Mixed-grass Prairie (listed in order of highest to lowest density). Nine species – Upland Sandpiper, Horned Lark, Rock Wren, Mountain Bluebird, Vesper Sparrow, Lark Sparrow, Grasshopper Sparrow, Western Meadowlark, and Brewer's Blackbird – had higher estimated densities in Mixed-grass Prairie relative to the other four habitats sampled. If we assume density positively correlates with habitat quality, then Mixed-grass Prairie provides suitable habitat for these species in the Black Hills.

Table 5. Estimated densities of breeding birds in Mixed-grass Prairie in BHNF, 2001-2008[1].

Species	Year	D	LCL	UCL	%CV	n
Upland Sandpiper	2001	--	--	--	--	0
	2002	1.2	0.3	4.9	94	18
	2004	0.4	0.2	1.1	60	13
	2006	0.1	0.1	0.3	51	11
	2008	0.8	0.4	1.4	35	20
Mourning Dove	2001	10.6	4.7	23.7	52	39
	2002	7.8	3.5	17.3	51	43
	2004	5.6	2.5	12.7	53	54
	2006	2.2	1.0	4.9	50	68
	2008	7.7	3.5	16.6	49	68
Hairy Woodpecker	2001	--	--	--	--	2
	2002	1.4	0.7	2.7	40	11
	2004	0.8	0.5	1.4	32	14
	2006	0.5	0.3	0.8	30	22
	2008	1.2	0.6	2.5	43	17
Northern Flicker	2001	--	--	--	--	5
	2002	--	--	--	--	9
	2004	0.9	0.6	1.4	29	20
	2006	0.9	0.6	1.6	30	63
	2008	3.0	2.0	4.4	23	57
Western Wood-Pewee	2001	--	--	--	--	0
	2002	--	--	--	--	1
	2004	1.5	0.8	2.9	40	33
	2006	0.4	0.2	0.7	37	26
	2008	1.8	0.9	3.5	42	33
Dusky Flycatcher	2001	9.1	5.0	16.5	35	39
	2002	6.8	3.0	15.7	51	44
	2004	3.2	1.6	6.0	40	42
	2006	0.3	0.1	0.7	57	12
	2008	2.2	1.4	3.6	30	25
Plumbeous Vireo	2001	7.9	4.2	14.9	37	49
	2002	4.3	2.2	8.3	40	40
	2004	0.6	0.3	1.2	42	12

Species	Year	D	LCL	UCL	%CV	n
Plumbeous Vireo (cont'd)	2006	--	--	--	--	8
	2008	1.8	1.0	3.5	40	30
American Crow	2001	0.3	0.2	0.6	36	10
	2002	0.4	0.3	0.7	28	20
	2004	0.7	0.5	0.9	17	69
	2006	0.2	0.1	0.3	26	33
	2008	0.8	0.6	1.1	17	65
Horned Lark	2001	--	--	--	--	7
	2002	--	--	--	--	0
	2004	1.2	0.6	2.2	39	11
	2006	1.2	0.6	2.4	46	30
	2008	4.3	1.6	11.7	64	31
Violet-green Swallow	2001	10.4	4.0	27.3	58	11
	2002	9.4	4.5	19.9	45	15
	2004	8.8	3.7	21.4	56	10
	2006	--	--	--	--	9
	2008	6.1	2.5	15.1	57	14
Black-capped Chickadee	2001	5.8	3.8	8.9	24	32
	2002	3.0	1.4	6.3	44	25
	2004	2.1	1.3	3.4	29	36
	2006	1.5	1.0	2.1	21	76
	2008	4.8	3.4	6.8	20	70
Red-breasted Nuthatch	2001	2.2	1.2	4.1	35	23
	2002	2.7	1.7	4.2	28	41
	2004	0.8	0.5	1.3	29	25
	2006	0.8	0.4	1.3	33	70
	2008	1.3	0.9	2.1	27	36
White-breasted Nuthatch	2001	10.0	4.0	24.7	59	18
	2002	--	--	--	--	6
	2004	3.2	1.2	8.7	66	18
	2006	1.2	0.5	3.2	64	18
	2008	2.1	0.8	5.9	68	10
Rock Wren	2001	--	--	--	--	0
	2002	--	--	--	--	7
	2004	2.5	1.6	3.9	26	80
	2006	0.5	0.3	0.8	28	48
	2008	1.8	1.1	2.9	28	48
Mountain Bluebird	2001	10.9	4.9	24.2	50	20
	2002	9.4	4.9	18.2	41	26
	2004	14.9	8.6	25.8	34	79
	2006	10.7	6.2	18.6	35	153
	2008	36.7	21.9	61.6	32	160
Townsend's Solitaire	2001	--	--	--	--	6
	2002	0.9	0.4	1.9	46.4	15
	2004	0.8	0.5	1.4	31.3	28
	2006	0.1	0.0	0.2	49.5	10
	2008	--	--	--	--	5
American Robin	2001	6.4	4.2	9.7	24	26
	2002	10.2	6.2	16.7	29	62
	2004	8.0	5.7	11.4	21	91
	2006	2.0	1.4	3.0	23	76

Species	Year	D	LCL	UCL	%CV	n
American Robin (cont'd)	2008	13.7	10.0	18.9	19	145
Yellow-rumped Warbler	2001	7.4	4.6	12.0	29	63
	2002	8.0	5.2	12.4	26	88
	2004	8.2	2.8	24.3	73	71
	2006	1.1	0.7	1.9	30	77
	2008	5.5	3.3	9.4	32	60
Ovenbird	2001	1.2	0.5	2.8	52.7	14
	2002	1.2	0.5	2.9	53.5	22
	2004	0.3	0.2	0.6	36.7	13
	2006	0.1	0.1	0.2	46.3	13
	2008	--	--	--	--	5
Western Tanager	2001	5.7	3.3	9.8	32	52
	2002	2.1	1.3	3.5	30	29
	2004	1.9	1.3	2.9	25	53
	2006	0.6	0.4	1.0	31	55
	2008	1.9	1.2	3.1	29	42
Spotted Towhee	2001	6.2	2.2	17.6	63	28
	2002	5.6	2.4	12.9	51	38
	2004	3.1	1.7	5.4	34	43
	2006	0.8	0.4	1.4	36	32
	2008	4.9	3.1	7.7	27	58
Chipping Sparrow	2001	60.7	19.2	192.2	78	51
	2002	46.9	22.1	99.4	48	99
	2004	121.3	58.9	249.8	46	162
	2006	10.1	7.1	14.3	22	212
	2008	73.1	48.5	110.2	25	306
Vesper Sparrow	2001	14.0	6.9	28.5	44	90
	2002	14.6	9.6	22.3	26	182
	2004	96.6	40.0	233.4	57	236
	2006	2.8	2.0	3.9	21	253
	2008	28.0	21.6	36.3	15	265
Lark Sparrow	2001	--	--	--	--	1
	2002	--	--	--	--	7
	2004	12.7	8.6	18.8	24	86
	2006	5.6	3.6	8.8	28	108
	2008	23.6	15.6	35.8	25	142
Grasshopper Sparrow	2001	--	--	--	--	3
	2002	17.3	8.3	36.2	44	47
	2004	18.4	11.2	30.2	30	103
	2006	20.5	14.2	29.7	23	349
	2008	37.8	26.6	53.7	21	179
Dark-eyed Junco	2001	6.1	3.7	9.9	28	20
	2002	4.5	2.5	8.1	36	22
	2004	2.7	1.7	4.1	26	26
	2006	--	--	--	--	4
	2008	4.5	2.7	7.6	31	39
Western Meadowlark	2001	11.7	5.6	24.3	42	56
	2002	44.8	29.1	69.0	25	323
	2004	47.8	39.8	57.4	11	687
	2006	8.9	6.4	12.3	20	396
	2008	51.2	41.9	62.6	12	634

Species	Year	D	LCL	UCL	%CV	n
Brewer's Blackbird	2001	--	--	--	--	0
	2002	3.1	1.0	9.8	76	10
	2004	6.2	2.6	14.6	54	24
	2006	--	--	--	--	7
	2008	5.6	2.2	14.5	61	21
Brown-headed Cowbird	2001	6.7	3.7	12.4	35	19
	2002	12.5	8.0	19.6	26	53
	2004	5.5	3.7	8.1	23	40
	2006	0.8	0.5	1.3	28	20
	2008	12.0	8.3	17.4	22	86
Red Crossbill	2001	--	--	--	--	8
	2002	130.8	67.0	255.2	41	297
	2004	8.8	5.0	15.5	35	39
	2006	2.3	1.3	4.3	38	30
	2008	9.6	5.3	17.4	37	32
American Goldfinch	2001	10.3	5.1	21.0	41	20
	2002	6.5	3.8	11.4	33	19
	2004	2.8	1.7	4.7	31	17
	2006	1.0	0.5	2.0	43	19
	2008	8.5	5.4	13.3	27	37

[1]D = estimated density (birds/km^2); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of observations used to estimate D. Note: if n<10, then we omitted the density estimates.

Montane Riparian (MR)

We conducted 348 point counts along 26 transects in Montane Riparian between 18 June and 13 July, 2008 (Table 1). We recorded 3,658 birds, with an average of 141 birds per transect (Table 2). We recorded 89 species, with an average of 29 species per transect (Table 2).

The pooled 2001-2008 point-count transect data from Montane Riparian yielded robust density estimates (CV<50%) for 42 species and moderately robust estimates (CV=50-75%) for one additional species (Table 6). These 43 species represent 48% of all species recorded on point-count transects in Montane Riparian in 2008.

American Redstart, American Robin, Common Yellowthroat, Song Sparrow, and Dusky Flycatcher had the highest estimated densities of all species recorded in Montane Riparian (listed in order of highest to lowest density). Twelve species – Blue Jay, House Wren, Ruby-crowned Kinglet, Veery, Swainson's Thrush, American Robin, Cedar waxwing, American Redstart, MacGillivray's Warbler, Common Yellowthroat, Song Sparrow, and Red-winged Blackbird – had higher estimated densities in Montane Riparian relative to the other four habitats sampled. If we assume density positively correlates with habitat quality, then Montane Riparian provides suitable habitat for these species in the Black Hills.

Table 6. Estimated densities of breeding birds in Montane Riparian in BHNF, 2001-2008[1].

Species	Year	D	LCL	UCL	%CV	n
Mourning Dove	2001	--	--	--	--	7
	2002	0.9	0.5	1.8	42	20
	2003	0.5	0.2	0.9	42	10
	2005	--	--	--	--	3
	2006	1.2	0.4	3.1	65	21
	2008	0.5	0.3	1.1	44	10
White-throated Swift	2001	--	--	--	--	0
	2002	3.4	1.3	9.0	64	29
	2003	2.4	0.9	6.1	61	36
	2005	6.3	3.0	13.2	46	30
	2006	1.4	0.6	3.2	52	19
	2008	4.9	2.4	10.3	45	20
Red-naped Sapsucker	2001	--	--	--	--	8
	2002	5.7	3.8	8.6	25	37
	2003	8.7	5.8	13.1	25	55
	2005	6.8	4.6	10.2	24	40
	2006	12.8	9.1	17.9	20	75
	2008	6.8	4.4	10.4	26	36
Hairy Woodpecker	2001	--	--	--	--	9
	2002	2.0	1.2	3.1	29	22
	2003	1.6	1.0	2.5	29	17
	2005	3.1	2.0	4.7	25	31
	2006	2.8	2.0	4.1	22	28
	2008	2.0	1.3	3.1	26	19
Northern Flicker	2001	--	--	--	--	5
	2002	0.9	0.6	1.6	32	22
	2003	1.0	0.6	1.7	31	23
	2005	2.4	1.7	3.5	23	51
	2006	3.3	2.1	5.1	26	61
	2008	2.4	1.2	4.8	43	44
Western Wood-Pewee	2001	--	--	--	--	4
	2002	2.7	1.7	4.4	30	49
	2003	2.0	1.2	3.4	32	35
	2005	2.0	1.2	3.2	30	32
	2006	4.9	3.0	8.2	31	81
	2008	4.2	2.5	6.9	30	63
Dusky Flycatcher	2001	34.0	24.2	47.8	19	95
	2002	56.2	45.3	69.7	13	316
	2003	34.3	27.1	43.5	14	233
	2005	37.9	26.9	53.3	21	285
	2006	30.0	22.3	40.2	18	213
	2008	46.1	34.3	62.0	18	147
Cordilleran Flycatcher	2001	12.4	6.5	23.9	39	31
	2002	15.6	10.4	23.5	25	99
	2003	20.3	14.3	28.9	21	125
	2005	16.7	11.7	23.7	21	95
	2006	20.9	14.5	30.2	22	121

Species	Year	D	LCL	UCL	%CV	n
Cordilleran Flycatcher (cont'd)	2008	13.7	9.3	20.2	23	72
Plumbeous Vireo	2001	--	--	--	--	4
	2002	1.8	1.0	3.3	36	17
	2003	--	--	--	--	5
	2005	3.1	1.6	5.8	39	26
	2006	3.0	1.6	5.6	37	26
	2008	--	--	--	--	9
Warbling Vireo	2001	38.5	29.0	51.2	17	138
	2002	50.9	42.6	60.9	11	459
	2003	24.0	18.3	31.6	16	269
	2005	46.1	36.4	58.4	14	452
	2006	15.9	11.6	21.9	19	325
	2008	36.9	28.7	47.3	15	261
Red-eyed Vireo	2001	4.5	1.7	12.4	61	11
	2002	12.2	8.3	17.8	23	75
	2003	12.2	7.4	20.1	30	73
	2005	9.4	5.6	15.6	31	52
	2006	6.0	3.4	10.7	34	34
	2008	7.3	4.3	12.6	33	38
Blue Jay	2001	1.7	0.6	5.0	65	15
	2002	0.8	0.4	1.4	35	17
	2003	0.7	0.3	1.2	39	14
	2005	--	--	--	--	7
	2006	0.9	0.5	1.8	38	19
	2008	1.1	0.7	1.9	32	20
American Crow	2001	1.2	0.6	2.2	39	21
	2002	0.5	0.3	0.9	37	23
	2003	0.9	0.5	1.7	40	41
	2005	0.4	0.2	0.8	35	18
	2006	1.0	0.5	1.8	37	36
	2008	1.0	0.6	1.6	31	34
Violet-green Swallow	2001	--	--	--	--	9
	2002	33.4	15.5	72.0	48	94
	2003	25.1	13.8	45.4	36	76
	2005	37.1	19.7	69.7	39	34
	2006	46.6	26.3	82.8	35	88
	2008	22.5	10.8	47.2	46	29
Black-capped Chickadee	2001	6.5	3.5	12.1	36	14
	2002	20.9	15.5	28.1	18	114
	2003	18.6	13.3	26.2	21	99
	2005	21.0	15.6	28.1	18	100
	2006	25.8	19.1	34.9	18	127
	2008	22.0	16.2	29.9	18	98
Red-breasted Nuthatch	2001	2.7	1.9	3.7	19	23
	2002	5.4	4.2	6.9	15	118
	2003	3.5	2.5	4.9	19	75
	2005	6.0	4.6	7.9	16	119
	2006	6.8	5.0	9.4	19	137
	2008	4.0	2.9	5.6	20	74
White-breasted Nuthatch	2001	--	--	--	--	4
	2002	1.2	0.7	2.1	33	18

Species	Year	D	LCL	UCL	%CV	n
White-breasted Nuthatch (cont'd)	2003	2.7	1.8	3.9	22	39
	2005	1.5	0.8	2.8	39	20
	2006	2.2	1.1	4.4	43	30
	2008	0.8	0.5	1.4	33	10
Rock Wren	2001	--	--	--	--	8
	2002	--	--	--	--	9
	2003	0.6	0.2	1.7	70	10
	2005	--	--	--	--	5
	2006	0.8	0.3	1.8	52	13
	2008	0.9	0.3	3.1	81	14
House Wren	2001	--	--	--	--	2
	2002	3.7	2.1	6.4	35	19
	2003	6.1	2.6	14.8	56	31
	2005	6.2	2.4	16.0	60	29
	2006	4.6	1.7	12.7	65	21
	2008	4.6	1.7	12.5	64	20
Golden-crowned Kinglet	2001	--	--	--	--	0
	2002	--	--	--	--	4
	2003	5.4	1.7	17.0	76	14
	2005	15.1	7.4	30.9	44	36
	2006	--	--	--	--	2
	2008	--	--	--	--	8
Ruby-crowned Kinglet	2001	5.1	2.6	10.0	40	27
	2002	10.1	7.3	13.9	19	137
	2003	10.5	7.7	14.4	19	139
	2005	13.6	9.5	19.5	21	166
	2006	10.2	7.1	14.5	21	126
	2008	6.7	4.4	10.1	25	76
Mountain Bluebird	2001	--	--	--	--	9
	2002	--	--	--	--	5
	2003	1.5	0.6	3.8	59	13
	2005	2.0	0.6	6.6	80	15
	2006	3.7	1.8	7.6	46	23
	2008	2.4	1.1	5.1	47	18
Townsend's Solitaire	2001	1.2	0.6	2.3	39	11
	2002	1.4	0.9	2.2	26	34
	2003	2.8	2.1	3.7	17	63
	2005	1.7	1.1	2.7	27	36
	2006	2.8	2.0	3.9	20	59
	2008	1.1	0.7	1.7	29	20
Veery	2001	5.1	2.5	10.3	41	22
	2002	4.3	2.8	6.6	26	47
	2003	8.1	4.7	14.2	34	87
	2005	4.0	2.4	6.7	30	40
	2006	3.5	1.5	8.2	54	35
	2008	6.3	3.7	10.5	31	58
Swainson's Thrush	2001	1.8	0.8	3.9	45	10
	2002	4.1	2.7	6.4	26	58
	2003	9.0	6.5	12.4	20	122
	2005	6.1	3.9	9.6	27	77
	2006	9.7	6.5	14.5	24	124

Species	Year	D	LCL	UCL	%CV	n
Swainson's Thrush (cont'd)	2008	4.2	2.8	6.3	25	49
American Robin	2001	57.4	39.5	83.5	22	106
	2002	64.2	51.6	80.0	13	301
	2003	64.4	52.3	79.4	13	294
	2005	73.2	57.4	93.3	15	298
	2006	100.0	80.8	123.7	13	418
	2008	72.8	59.4	89.4	12	278
Gray Catbird	2001	--	--	--	--	5
	2002	--	--	--	--	9
	2003	8.9	5.1	15.5	34	23
	2005	9.2	4.2	20.0	48	22
	2006	14.4	6.3	32.6	51	35
	2008	17.0	9.7	29.8	34	37
Cedar Waxwing	2001	7.8	2.4	25.3	74	10
	2002	8.0	4.0	15.7	42	26
	2003	9.8	3.8	25.2	61	30
	2005	5.4	2.5	11.8	48	12
	2006	11.4	6.3	20.7	37	27
	2008	7.3	3.5	15.2	46	13
Yellow Warbler	2001	--	--	--	--	7
	2002	5.6	2.7	11.7	45	20
	2003	8.4	4.2	16.7	42	29
	2005	8.8	4.2	18.1	45	27
	2006	3.4	1.4	8.0	54	11
	2008	21.8	12.0	39.8	37	64
Yellow-rumped Warbler	2001	10.9	6.3	18.8	31	41
	2002	13.1	9.8	17.5	18	125
	2003	16.2	12.4	21.3	17	150
	2005	14.1	9.7	20.3	22	119
	2006	12.6	8.8	18.0	22	110
	2008	7.6	5.5	10.6	20	60
American Redstart	2001	88.8	53.1	148.3	30	113
	2002	72.1	48.0	108.3	25	253
	2003	35.2	23.2	53.3	25	187
	2005	66.5	45.2	98.0	23	231
	2006	65.2	38.9	109.3	32	131
	2008	115.6	84.6	158.1	19	247
Ovenbird	2001	12.5	7.2	21.6	32	68
	2002	22.1	16.3	29.8	18	232
	2003	14.3	8.0	25.4	36	255
	2005	24.1	16.7	34.9	22	250
	2006	43.5	26.0	72.6	31	237
	2008	28.5	17.8	45.8	29	205
MacGillivray's Warbler	2001	73.4	43.9	122.8	31	67
	2002	31.9	22.6	45.0	21	122
	2003	63.1	42.3	94.3	25	140
	2005	33.5	22.2	50.4	25	98
	2006	12.1	7.4	19.9	30	69
	2008	44.5	31.8	62.3	20	82
Common Yellowthroat	2001	38.4	23.7	62.1	28	47
	2002	46.6	32.5	66.9	22	145

Species	Year	D	LCL	UCL	%CV	n
Common Yellowthroat (cont'd)	2003	57.8	42.2	79.2	19	175
	2005	50.3	35.5	71.3	21	140
	2006	48.1	35.4	65.4	18	137
	2008	54.3	37.8	78.1	22	135
Western Tanager	2001	3.6	2.0	6.4	33	27
	2002	3.6	2.4	5.3	24	68
	2003	3.8	2.4	5.9	27	70
	2005	3.7	2.3	5.7	27	63
	2006	4.3	2.7	6.7	27	75
	2008	2.5	1.7	3.8	23	40
Spotted Towhee	2001	18.5	9.0	38.0	42	28
	2002	15.1	8.4	27.1	36	58
	2003	23.0	13.5	39.0	32	86
	2005	15.6	8.4	28.9	38	54
	2006	16.8	8.8	31.8	39	55
	2008	26.6	15.0	47.2	35	86
Chipping Sparrow	2001	19.7	11.9	32.5	29	30
	2002	28.4	22.1	36.5	15	110
	2003	39.2	30.3	50.8	15	148
	2005	42.9	33.3	55.4	15	144
	2006	45.9	32.3	65.3	21	153
	2008	39.9	30.4	52.3	16	128
Song Sparrow	2001	27.6	16.5	46.2	30	39
	2002	45.1	30.6	66.4	23	162
	2003	50.6	37.0	69.1	19	177
	2005	60.2	41.8	86.9	22	193
	2006	57.2	41.7	78.4	19	187
	2008	48.7	33.7	70.3	22	147
Dark-eyed Junco	2001	13.7	8.7	21.4	26	27
	2002	17.7	12.1	26.0	23	89
	2003	15.1	10.3	22.2	23	73
	2005	19.0	13.5	26.7	21	85
	2006	15.7	8.1	30.5	41	71
	2008	10.2	5.8	17.9	34	43
Black-headed Grosbeak	2001	8.2	2.8	24.4	67	25
	2002	12.0	8.3	17.5	22	93
	2003	11.5	8.1	16.5	21	87
	2005	10.9	7.0	17.0	27	76
	2006	7.3	4.9	11.0	24	52
	2008	8.9	6.3	12.6	21	58
Bobolink	2001	--	--	--	--	0
	2002	1.1	0.3	3.7	82	15
	2003	--	--	--	--	8
	2005	--	--	--	--	8
	2006	3.6	1.4	9.1	59	41
	2008	--	--	--	--	7
Red-winged Blackbird	2001	3.1	0.8	12.7	91	14
	2002	5.5	2.8	10.9	42	62
	2003	3.9	1.7	8.7	50	43
	2005	5.2	2.6	10.3	42	53
	2006	7.2	3.7	14.3	42	72

Species	Year	D	LCL	UCL	%CV	n
Red-winged Blackbird (cont'd)	2008	5.3	2.8	9.7	37	49
Brown-headed Cowbird	2001	11.7	6.2	22.0	37	39
	2002	9.3	6.9	12.6	18	79
	2003	10.4	7.7	14.1	18	85
	2005	8.9	5.9	13.5	25	63
	2006	9.9	6.9	14.3	22	74
	2008	12.9	8.1	20.5	28	79
Red Crossbill	2001	7.3	2.6	20.8	63	21
	2002	17.8	9.6	33.0	38	106
	2003	12.6	7.6	21.0	31	64
	2005	10.5	6.3	17.6	31	49
	2006	9.6	6.4	14.6	25	63
	2008	25.1	14.9	42.1	32	51
Pine Siskin	2001	24.5	10.4	58.1	51	34
	2002	36.1	25.0	52.1	22	108
	2003	11.1	6.7	18.4	31	32
	2005	38.2	26.2	55.7	23	111
	2006	33.8	21.6	53.1	27	100
	2008	22.0	14.4	33.5	26	40
American Goldfinch	2001	--	--	--	--	6
	2002	--	--	--	--	4
	2003	3.3	1.3	8.5	61	13
	2005	4.4	2.2	8.6	42	13
	2006	9.2	5.2	16.1	34	28
	2008	5.7	3.6	9.1	28	21
Red Squirrel	2001	17.3	8.9	33.4	39	17
	2002	12.0	6.2	23.1	40	30
	2003	--	--	--	--	6
	2005	--	--	--	--	6
	2006	27.1	16.0	45.8	32	62
	2008	40.9	28.4	59.1	22	83

[1]D = estimated density (birds/km^2); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of observations used to estimate D. Note: if n<10, then we omitted the density estimates.

Pine-juniper Shrubland (SH)

We conducted 339 point counts along 29 transects in Pine-juniper Shrubland between 25 May and 18 June, 2008 (Table 1). We recorded 3,742 birds, with an average of 129 birds per transect (Table 2). We recorded 79 species, with an average of 25 species per transect (Table 2).

The pooled 2001-2008 point-count transect data from Pine-juniper Shrubland yielded robust density estimates (CV<50%) for 29 species and moderately robust estimates (CV=50-75%) for two additional species (Table 7). These 31 species represent 39% of all species recorded on point-count transects in Pine-juniper Shrubland in 2008.

Chipping Sparrow, Spotted Towhee, Brown-headed Cowbird, Dusky Flycatcher, and Dark-eyed Junco had the highest estimated densities of all species recorded

in Pine-juniper Shrubland (listed in order of highest to lowest density). Seventeen species – Mourning Dove, White-throated Swift, Dusky Flycatcher, Plumbeous Vireo, American Crow, Violet-green Swallow, White-breasted Nuthatch, Blue-gray Gnatcatcher, Townsend's Solitaire, Virginia's Warbler, Yellow-rumped Warbler, Western Tanager, Spotted Towhee, Chipping Sparrow, Brown-headed Cowbird, Pine Siskin, and American Goldfinch – had higher estimated densities in Pine-juniper Shrubland relative to the other four habitats sampled. If we assume density positively correlates with habitat quality, then Pine-juniper Shrubland provides suitable habitat for these species in the Black Hills.

Table 7. Estimated densities of breeding birds in Pine-juniper Shrubland in BHNF, 2001-2008[1].

Species	Year	D	LCL	UCL	%CV	n
Mourning Dove	2001	6.8	3.7	12.8	38	35
	2002	9.0	6.0	13.4	24	80
	2004	9.2	6.1	14.0	25	89
	2007	7.2	5.0	10.1	21	57
	2008	8.6	6.6	11.3	16	109
White-throated Swift	2001	--	--	--	--	7
	2002	34.9	15.3	79.4	52	78
	2004	15.8	8.2	30.4	40	27
	2007	11.4	5.9	22.0	40	16
	2008	28.0	13.0	60.6	49	31
Northern Flicker	2001	--	--	--	--	8
	2002	--	--	--	--	8
	2004	--	--	--	--	6
	2007	--	--	--	--	8
	2008	0.4	0.2	0.9	47	12
Western Wood-Pewee	2001	--	--	--	--	2
	2002	--	--	--	--	6
	2004	2.9	1.1	7.2	58	16
	2007	--	--	--	--	7
	2008	2.8	1.4	5.4	41	18
Dusky Flycatcher	2001	82.2	53.4	126.5	26	153
	2002	60.4	46.8	77.9	15	337
	2004	285.3	127.5	638.2	52	294
	2007	144.0	110.8	187.3	16	387
	2008	71.2	57.7	87.9	13	238
Plumbeous Vireo	2001	13.1	8.4	20.3	26	35
	2002	17.2	12.2	24.2	20	80
	2004	13.9	10.7	18.0	15	81
	2007	18.6	13.3	26.0	19	79
	2008	16.3	12.4	21.4	16	111
Warbling Vireo	2001	7.7	2.2	26.9	82	19
	2002	5.4	3.0	9.6	35	23
	2004	8.0	4.7	13.9	33	43
	2007	15.1	6.7	34.0	49	59
	2008	4.8	3.0	7.6	27	30

Species	Year	D	LCL	UCL	%CV	n
American Crow	2001	1.4	0.9	2.2	27	20
	2002	0.5	0.2	1.1	46	13
	2004	0.3	0.1	0.8	53	10
	2007	0.6	0.4	1.0	28	14
	2008	1.2	0.8	1.7	23	43
Violet-green Swallow	2001	19.9	10.3	38.3	39	22
	2002	66.0	47.0	92.6	20	124
	2004	38.9	24.6	61.5	28	47
	2007	42.2	23.0	77.5	37	34
	2008	28.1	17.8	44.4	27	47
Black-capped Chickadee	2001	22.2	15.0	32.8	23	33
	2002	31.7	23.3	43.1	19	82
	2004	21.9	15.4	31.2	21	67
	2007	52.1	36.7	74.1	21	111
	2008	37.3	28.3	49.2	17	135
Red-breasted Nuthatch	2001	2.3	0.9	5.6	55	11
	2002	10.5	7.9	13.8	16	88
	2004	2.9	1.5	5.6	39	30
	2007	14.3	9.9	20.8	21	107
	2008	8.3	6.8	10.1	11	101
White-breasted Nuthatch	2001	3.8	2.1	6.9	35	14
	2002	7.4	4.8	11.5	27	47
	2004	3.7	2.2	6.2	32	29
	2007	8.5	5.6	12.9	25	49
	2008	5.1	3.2	8.0	27	44
Rock Wren	2001	--	--	--	--	3
	2002	2.3	1.3	4.2	36	30
	2004	1.5	0.9	2.6	31	25
	2007	1.6	0.8	3.3	43	19
	2008	0.8	0.5	1.4	31	16
Blue-gray Gnatcatcher	2001	--	--	--	--	2
	2002	--	--	--	--	2
	2004	15.8	4.8	52.4	82	11
	2007	25.4	6.8	94.6	91	14
	2008	30.6	11.0	85.1	68	22
Mountain Bluebird	2001	8.7	4.3	17.5	43	11
	2002	5.9	2.9	11.9	43	13
	2004	22.6	13.0	39.4	34	53
	2007	21.5	11.0	42.1	41	39
	2008	17.5	10.2	29.9	33	52
Townsend's Solitaire	2001	2.4	1.0	5.7	52	11
	2002	3.3	1.9	5.8	34	26
	2004	6.1	3.9	9.6	28	54
	2007	6.8	4.0	11.6	32	48
	2008	2.4	1.6	3.8	26	28
American Robin	2001	8.0	4.2	15.4	39	29
	2002	6.1	3.8	9.7	28	38
	2004	6.1	4.4	8.5	20	44
	2007	18.7	12.7	27.5	23	105
	2008	8.0	5.3	12.0	24	73
Virginia's Warbler	2001	19.4	10.7	35.2	35	32

Species	Year	D	LCL	UCL	%CV	n
Virginia's Warbler (cont'd)	2002	25.9	15.9	42.1	29	74
	2004	36.0	24.8	52.2	22	127
	2007	29.1	19.7	43.1	23	76
	2008	14.4	10.7	19.4	18	60
Yellow-rumped Warbler	2001	15.6	11.0	22.1	21	68
	2002	32.9	24.6	43.9	17	168
	2004	25.0	17.6	35.7	21	143
	2007	28.6	22.4	36.5	14	171
	2008	43.0	33.7	54.9	15	194
Ovenbird	2001	7.8	3.6	17.0	49	54
	2002	14.2	10.1	19.8	20	136
	2004	12.9	9.7	17.1	17	146
	2007	9.2	4.8	17.5	41	112
	2008	24.6	18.6	32.5	17	211
Yellow-breasted Chat	2001	--	--	--	--	0
	2002	--	--	--	--	2
	2004	2.1	1.1	4.3	42	21
	2007	2.2	1.2	4.1	36	16
	2008	1.8	0.9	3.8	44	21
Western Tanager	2001	11.6	7.4	18.2	27	60
	2002	14.6	10.6	20.1	19	126
	2004	50.0	11.7	213.3	107	86
	2007	12.6	8.5	18.6	23	96
	2008	26.3	18.8	36.9	20	102
Spotted Towhee	2001	81.8	56.9	117.6	21	170
	2002	66.4	50.6	87.0	16	340
	2004	146.7	112.4	191.5	16	330
	2007	77.3	62.0	96.3	13	330
	2008	126.1	110.6	143.8	8	465
Chipping Sparrow	2001	188.5	134.9	263.4	20	108
	2002	214.4	129.3	355.4	31	215
	2004	490.1	329.8	728.4	24	223
	2007	252.4	171.6	371.0	24	239
	2008	301.9	238.1	382.7	14	452
Vesper Sparrow	2001	4.8	3.0	7.7	28	24
	2002	3.3	2.0	5.5	30	29
	2004	2.2	1.1	4.5	43	24
	2007	3.8	1.6	8.8	51	30
	2008	2.2	1.2	4.2	38	26
Dark-eyed Junco	2001	15.7	7.3	33.5	47	12
	2002	30.8	17.0	56.0	37	41
	2004	19.8	11.2	35.0	35	30
	2007	127.8	79.6	205.2	29	145
	2008	43.7	25.3	75.6	34	82
Western Meadowlark	2001	2.6	1.2	5.6	48	11
	2002	4.4	2.2	8.7	42	33
	2004	3.0	1.4	6.3	46	28
	2007	--	--	--	--	7
	2008	3.0	1.2	7.4	57	33
Brown-headed Cowbird	2001	281.7	57.5	1380.2	121	54
	2002	27.2	13.3	55.5	45	74

Species	Year	D	LCL	UCL	%CV	n
Brown-headed Cowbird (cont'd)	2004	67.8	33.2	138.4	45	77
	2007	39.2	25.5	60.3	26	100
	2008	71.9	55.1	93.9	16	191
Red Crossbill	2001	8.5	4.5	16.2	39	26
	2002	71.2	33.2	152.6	47	290
	2004	20.0	12.0	33.3	31	47
	2007	21.9	15.0	32.1	23	67
	2008	10.5	6.0	18.6	35	21
Pine Siskin	2001	--	--	--	--	3
	2002	7.0	3.8	12.9	37	12
	2004	--	--	--	--	6
	2007	--	--	--	--	6
	2008	23.3	12.9	41.9	36	35
American Goldfinch	2001	--	--	--	--	8
	2002	19.8	9.9	39.6	42	34
	2004	11.2	5.5	22.9	44	18
	2007	17.9	10.5	30.4	32	18
	2008	34.3	21.9	53.8	27	67

[1]D = estimated density (birds/km^2); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of observations used to estimate D.
Note: if n<10, then we omitted the density estimates.

DISCUSSION AND RECOMMENDATIONS

Unique Values of Each Habitat

Birds comprise a diverse group of niche specialists, occupy a broad range of habitats, are sensitive to both physical and chemical impacts on the environment, and often reflect the abundance and diversity of other organisms with which they coexist. While some bird species can inhabit many different habitats, the number of species and bird densities tend to vary across habitats. Each habitat supports unique assemblages of birds and other attributes that contribute to the overall biological diversity in BHNF. Highlights pertaining to each habitat sampled in 2008 follow. Please note that the following information pertains only to habitats we sampled and does not take into account other habitats that may be present in BHNF.

Aspen

In 2008, we recorded Ruffed Grouse and Pine Grosbeak only in Aspen. Historically, we recorded more Ruffed Grouse in Ponderosa Pine North than in Aspen (RMBO sampled both habitats for five seasons). We recorded a cluster of three Pine Grosbeaks as flyovers, meaning the observer saw them flying over Aspen and not actually using the habitat. Pine Grosbeak is generally associated with coniferous forests. This is the first time since the start of MBBH that we recorded this species.

We recorded nine other species, including Red-naped Sapsucker, Hairy Woodpecker, Warbling Vireo, Gray Jay, Red-breasted Nuthatch, Townsend's Solitaire, Ovenbird, Dark-eyed Junco, and Red Crossbill, more in this habitat than any other sampled this year. Historically, we recorded more Red-naped Sapsuckers in Aspen than any other habitat sampled in Black Hills. Historically, we recorded more Townsend's Solitaires in five habitats not sampled this year (Burn Area, Late-successional Pine, Ponderosa Pine North, Ponderosa Pine South, and White Spruce). Historically, we recorded more Dark-eyed Juncos in four habitats not sampled this year (Burn Area, Ponderosa Pine North, Ponderosa Pine South, and White Spruce).

Aspen stands are rarely monotypic; many other tree species generally occur within or adjacent to Aspen. These stands tend to be small and in close proximity to other forested habitats. Some of the species we calculated density estimates for in Aspen were probably detected in other habitats within or near Aspen stands. These species include Cordilleran Flycatcher, Gray Jay, Ruby-crowned Kinglet, Townsend's Solitaire, Common Yellowthroat, Song Sparrow, and Red Crossbill. Of the eight species that reached their highest densities in Aspen (see Results), five have historically occurred in even higher densities in habitats not sampled in 2008. Hairy Woodpecker and Northern Flicker historically reached their highest densities in Burn Area, Gray Jay and Red Crossbill historically reached their highest densities in Ponderosa Pine North,

and Red-breasted Nuthatch historically reached its highest density in Late-successional Pine.

Foothills Riparian
In 2008, we recorded Eastern Phoebe and Indigo Bunting only in Foothills Riparian. We have only recorded 16 Eastern Phoebes since 2001 and 13 of these have been in Foothills Riparian. We have only recorded eight Indigo Buntings since 2001, and five have occurred in Foothills Riparian.

We recorded 11 other species, including Turkey Vulture, Cordilleran Flycatcher, Red-eyed Vireo, Violet-green Swallow, Cliff Swallow, Yellow Warbler, Black-headed Grosbeak, Lazuli Bunting, Common Grackle, Orchard Oriole, and Bullock's Oriole, more in this habitat than any other sampled this year. Historically, we recorded more Cordilleran Flycatchers in Foothills Riparian than any other habitat sampled in Black Hills.

It is important to note that Foothills Riparian refers to wooded habitats along valley bottoms at lower elevations that occur almost exclusively in areas with surface water. This habitat is linear, following rivers and streams and closely borders other habitat. During point counts, observers frequently detect species that use habitats peripheral to Montane Riparian. Many of the species we calculated density estimates for in Montane Riparian were probably detected in surrounding habitats. These species include Red-naped Sapsucker, Rock Wren, Ruby-crowned Kinglet, Western Tanager, Western Meadowlark, and Red Crossbill. Of the 17 species that reached their highest densities in Foothills Riparian this year (see Results), all have historically reached their highest densities in this habitat.

Mixed-grass Prairie
In 2008, we recorded Sharp-tailed Grouse, Merlin, Long-billed Curlew, Eurasian Collared-Dove, Lewis's Woodpecker, Say's Phoebe, Cassin's Kingbird, Horned Lark, Brewer's Sparrow, and Lark Bunting only in Mixed-grass Prairie. We recorded more Sharp-tailed Grouse in this habitat than any other sampled since 2001. We recorded one Merlin this year, which is only the second Merlin recorded since 2001. Historically, we have only recorded Long-billed Curlew and Horned Lark in Mixed-grass Prairie. This is the first year we recorded Eurasian Collared-Dove in the Black Hills. We only recorded one individual. Historically, we recorded more Lewis's Woodpecker in Burn Area than any other habitat we sampled since 2001. Most likely, the observer detected this species in a habitat peripheral to Mixed-grass Prairie. We recorded only four Say's Phoebes since 2001. This year we recorded three Brewer's Sparrows. We have only recorded four Brewer's Sparrows since 2001. Most likely, the observer detected these individuals in a habitat peripheral to Mixed-grass Prairie. This year we recorded 111 Lark Buntings in this habitat. We recorded 99 of these individuals in large flocks early in the breeding season, on 24 May. Observers recorded them as

flyovers, meaning they flew overhead but did not use the habitat. Most likely, these birds were migrating through to other areas.

We recorded 21 other species, including Wild Turkey, American Kestrel, Upland Sandpiper, Northern Flicker, Western Kingbird, Eastern Kingbird, Pinyon Jay, Black-billed Magpie, American Crow, Common Raven, Rock Wren, Eastern Bluebird, Mountain Bluebird, European Starling, Clay-colored Sparrow, Vesper Sparrow, Lark Sparrow, Grasshopper Sparrow, Western Meadowlark, Brewer's Blackbird, and Cassin's Finch more in this habitat than any other sampled this year. Historically, we recorded more Northern Flickers in one habitat sampled this year (Montane Riparian), and two habitats not sampled this year (Burn Area and White Spruce). Observers probably detected this species in forested areas surrounding the Mixed-grass Prairie. Historically, we recorded more Eastern Kingbirds in Foothills Riparian than any other habitat we sampled. We recorded more Pinyon Jays, Black-billed Magpies, Vesper Sparrows, Grasshopper Sparrows, and Western Meadowlarks in Mixed-grass Prairie than any other habitat since 2001. Most likely, observers detected Pinyon Jays in another habitat bordering the Mixed-grass prairie. This is the first year we recorded Common Ravens in the Black Hills. We recorded three in Mixed-grass Prairie and one in Pine-juniper Shrubland. Historically, we recorded more Eastern Bluebirds, Mountain Bluebirds, and Cassin's Finches in Burn Area than any other habitat sampled since 2001. We did not sample this habitat in 2008. Observers probably detected Cassin's Finches in wooded areas surrounding Mixed-grass Prairie.

It is important to note that some of the Mixed-grass Prairie we sample is contiguous with the surrounding prairie of the Great Plains; others border the shrublands and forests of the Black Hills and are isolated from the larger prairie landscape. Bird communities in contiguous areas more accurately reflect the diversity of species found within this habitat, while grasslands surrounded by forest contain a mixture of grassland, shrubland, and forest species. Many of the species we calculated density estimates for in Mixed-grass Prairie were probably detected in grassland surrounded by forest or shrub habitat. These species include Hairy Woodpecker, Northern Flicker, Western Wood-Pewee, Dusky Flycatcher, Plumbeous Vireo, Black-capped Chickadee, Red-breasted Nuthatch, White-breasted Nuthatch, Townsend's Solitaire, Yellow-rumped Warbler, Ovenbird, Western Tanager, Spotted Towhee, Chipping Sparrow, Dark-eyed Junco, and Red Crossbill. Mountain Bluebird historically reached its highest density in Burn Area, which we did not sample in 2008.

Montane Riparian

In 2008, we recorded Sharp-shinned Hawk, Spotted Sandpiper, Wilson's Snipe, Marsh Wren, Tennessee Warbler, Black-and-white Warbler, and Bobolink only in Montane Riparian. We recorded only one Sharp-shinned Hawk this year. We recorded one Marsh Wren this year for the first time since 2001. We recorded only one Tennessee Warbler this year, and we have not recorded this species

since 2004. We recorded only one Black-and-white Warbler this year. Historically, we recorded this species more in Foothills Riparian than in any other habitat.

We recorded 23 other species, including Great Blue Heron, Sora, Belted Kingfisher, Downy Woodpecker, Black-backed Woodpecker, Western Wood-Pewee, Blue Jay, Barn Swallow, House Wren, American Dipper, Golden-crowned Kinglet, Ruby-crowned Kinglet, Veery, American Robin, Gray Catbird, Cedar Waxwing, Chestnut-sided Warbler, American Redstart, MacGillivray's Warbler, Common Yellowthroat, Song Sparrow, Red-winged Blackbird, and Pine Siskin more in this habitat than any other sampled this year. Historically, we recorded more Black-backed Woodpeckers in three habitats not sampled this year (Burn Area, Late-successional Pine, and Ponderosa Pine South). Observers probably detected this species in forested areas surrounding Montane Riparian. Historically, we recorded more Western Wood-Pewees in two habitats not sampled this year (Burn Area and Ponderosa Pine North). Since 2001, we recorded more House Wrens in Burn Area, which we did not sample this year. We recorded more American Dippers, MacGillivray's Warblers and Song Sparrows in Montane Riparian than in any other habitat sampled since 2001. Historically, we recorded more Golden-crowned Kinglets and Ruby-crowned Kinglets in White Spruce, which we did not sample this year. Observers probably detected these species in habitats surrounding Montane Riparian. We recorded more Chestnut-sided Warblers in Aspen than any other habitat since 2001. Observers probably detected this species in a habitat peripheral to Montane Riparian. Historically, we recorded more Pine Siskins in White Spruce, which we did not sample this year. Observers probably detected this species in habitats peripheral to Montane Riparian.

It is important to note that Montane Riparian refers to wooded areas along valley bottoms at mid-to- upper elevations that occur almost exclusively along flowing water. This habitat is linear, following rivers and streams and closely borders other habitats. During point counts, observers frequently detect species that use habitats peripheral to Montane Riparian. Many of the species we calculated density estimates for in Montane Riparian were probably detected in surrounding habitats. These species include White-throated Swift, Red-naped Sapsucker, Hairy Woodpecker, Northern Flicker, Dusky Flycatcher, Plumbeous Vireo, Black-capped Chickadee, Red-breasted Nuthatch, White-breasted Nuthatch, Rock Wren, House Wren, Golden-crowned Kinglet, Ruby-crowned Kinglet, Mountain Bluebird, Townsend's Solitaire, Spotted Towhee, Chipping Sparrow, Dark-eyed Junco, Brown-headed Cowbird, Red Crossbill, and Pine Siskin. Of the 14 species that reached their highest densities in Montane Riparian (see Results), three have historically occurred in even higher densities in habitats not sampled in 2008. Golden-crowned kinglet, Ruby-crowned Kinglet, and Swainson's Thrush reached their highest densities in White Spruce.

Pine-juniper Shrubland

In 2008, we recorded Ferruginous Hawk, Brown Thrasher, White-crowned Sparrow, House Finch, and Lesser Goldfinch only in Pine-Juniper Shrubland. This is the first year we recorded a Ferruginous Hawk in the Black Hills. We only recorded one Brown Thrasher this year. The two White-crowned Sparrows we observed were probably migrants passing through the area. Historically, we recorded more House Finches in Foothills Riparian than any other habitat since 2001. This is the first year we recorded this species in Pine-juniper Shrubland. This is the first year we recorded Lesser Goldfinch in Pine-juniper Shrubland.

We recorded 17 other species, including Mourning Dove, White-throated Swift, Broad-tailed Hummingbird, Dusky Flycatcher, Plumbeous Vireo, Clark's Nutcracker, Black-capped Chickadee, White-breasted Nuthatch, Canyon Wren, Blue-gray Gnatcatcher, Virginia's Warbler, Yellow-rumped Warbler, Western Tanager, Spotted Towhee, Chipping Sparrow, Brown-headed Cowbird, and American Goldfinch more in this habitat than any other sampled this year. This is the second year we recorded Broad-tailed Hummingbird in the Black Hills since 2001. Historically, we recorded more Dusky Flycatchers and Virginia's Warblers in Pine-juniper Shrubland than any other habitat since 2001. We recorded more Plumbeous Vireos, Clark's Nutcracker, and Black-capped Chickadee in Ponderosa Pine South than any other habitat since 2001. We did not sample this habitat in 2008. Historically, we recorded more White-breasted Nuthatches and Brown-headed Cowbirds in Burn Area and Ponderosa Pine South, which we did not sample this year. Since 2001, we recorded more Canyon Wrens and American Goldfinch in Foothills Riparian than in Pine-juniper Shrubland. Historically, we recorded more Yellow-rumped Warblers in five habitats not sampled this year (Burn Area, Late-successional Pine, Ponderosa Pine North, Ponderosa Pine South, and White Spruce). We recorded more Western Tanagers in three habitats not sampled this year (Burn Area, Ponderosa Pine North, and Ponderosa Pine South) than in Pine-juniper shrubland. Historically, we recorded more Chipping Sparrows in Burn Area, which we did not sample this year.

Pine-Juniper Shrubland stands are found on canyon slopes and mesa tops in the southernmost Black Hills. These stands tend to be small and in close proximity to other habitats. Some of the species we calculated density estimates for in Pine-juniper Shrubland were probably detected in other habitats nearby. These species include Western Wood-Pewee, Warbling Vireo, Ovenbird, Yellow-breasted Chat, and Western Meadowlark. Of the seventeen species that reached their highest densities in Pine-juniper Shrubland (see Results), three have historically occurred in even higher densities in habitats not sampled in 2008. White-breasted Nuthatch historically reached its highest density in Burn Area, Townsend's Solitaire and Yellow-rumped Warbler historically reached their highest densities in Ponderosa Pine North.

Prospects for Population Monitoring

This year we combined point-count transect data from 2001 through 2008 in order to more accurately determine density estimates for each year. This allowed us to calculate density estimates for some species that would not have had large enough sample sizes if we had used only the 2008 data. As a result, we were able to calculate density estimates for 58 species in 2008. Had we only used the data collected during the 2008 field season, we would have only been able to calculate density estimates for 37 species.

The habitat-stratified point transects produced estimates with low coefficients of variation (< 50%) for 51 bird species, and moderate coefficients of variation (CV=50-75%) for another seven species in at least one habitat sampled in 2008. We should be able to detect habitat-specific population trends for these species within our maximum target of 30 years. These 58 species represent 45% of all species observed in the five habitats sampled in 2008, but represent 95% of all birds observed. The other 55% of species (5% of all birds observed) fall into one of the following categories:

1) Species that are adequately monitored in other habitats covered by MBBH that were not sampled in 2008;
2) Low-density, highly localized species (e.g., Golden Eagle);
3) Low-density, widespread species (e.g., Northern Goshawk);
4) Irregular species (e.g., Bobolink);
5) Vagrant breeders (e.g., Northern Parula);
6) Species that occur mainly outside the Black Hills in the low foothills or on the Great Plains (e.g., Long-billed Curlew);
7) Nocturnal species (e.g., Northern Saw-whet Owl);
8) Wetland-obligate species (e.g., Sora); and
9) Species that are readily detectable only prior to late May (e.g., Ruffed Grouse).

We could possibly monitor species in these groups (other than the first category) through additional effort using one or more of the following sample techniques:

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

Accomplishments

During the 2008 field season, RMBO attempted to complete 150 MBBH point-count transects among five habitats (2,250 point counts). Field staff completed

1,748 point counts along 136 point transects. A description of our accomplishments in each habitat is as follows:

Aspen
RMBO has 30 established Aspen transects in BHNF. In 2008, RMBO staff completed 26 transects. Because of weather delays, field technicians did not complete AS13, AS23, and AS32 within the optimal sample dates for Aspen. We did not complete AS30 because of a closed access road. It is unknown whether this was a temporary or permanent closure; this transect may need to be reestablished at another location in the future.

Foothills Riparian
RMBO has 30 established Foothills Riparian transects in BHNF. In 2008, RMBO staff completed 28 transects. Because of weather delays, field technicians did not complete FR10 and FR94 within the optimal sample dates for this habitat.

Mixed-grass Prairie
RMBO has 30 established Mixed-grass Prairie transects in BHNF. In 2008, RMBO staff completed 27 transects. We did not complete MG20 and MG21 because field technicians were unable to locate them based on written directions. RMBO staff will review the directions to these transects prior to the next field season and make sure that they are correct. We did not complete MG14 because the access road was undrivable and we did not have enough time to return within the optimal sample timeframe.

Montane Riparian
RMBO has 27 established Montane Riparian transects in BHNF. In 2008, RMBO staff completed 26 transects. Because of weather delays, field technicians did not complete MR12 within the optimal sample dates for this habitat. We need to establish three more transects in this habitat in order to bring the total to 30.

Pine-juniper Shrubland
RMBO has 20 established Pine-juniper Shrubland transects in BHNF. The amount of Pine-juniper Shrubland is relatively limited in BHNF, so the maximum number of transects that we could establish without overlap is 20. In order to increase our sample size in this habitat, we randomly selected 10 of the established transects to be sampled twice this summer, bringing the number of transects up to 30. Because of weather delays, field technicians did not complete SH26 within the optimal sample dates for this habitat. We randomly selected this transect to be sampled twice this year but we only sampled it once.

Meeting Our Goals in the Future

RMBO staff did not complete all scheduled point count transects in 2008 for one of the following reasons:

1) Poor weather conditions;

2) Optimal dates for sample missed;
3) Access issues;
4) Transect needs to be reestablished.

While there will always be unforeseeable events such as bad weather or closed roads, RMBO staff will work towards eliminating other problems that are avoidable.

First, three Montane Riparian transects need to be reestablished so they can be conducted properly. This can be time-consuming during an already busy field season, and if not done properly, we may need to reestablish it again the following season. In order to avoid these issues, RMBO staff can set up transects prior to the field season. This can be done by experienced, non-seasonal staff who know how to set up point count transect that can be run year after year in the same location.

Most transects that we did not complete in 2008 were the result of missing optimal sample dates for their respective habitats, mostly because of weather delays. According to our protocol, we cannot conduct a transect on a rainy or windy day because these conditions greatly affect the detectability of birds. While these transects could have been conducted outside of the sample window, the data collected probably would have been skewed. Point count transects should be performed after all migratory species have returned to the area and as early in the season as possible. Also, transects within a given habitat should all be sampled in as short a period as possible--within three weeks; less time, if possible. By limiting the period in which transects in each habitat are sampled, we reduce the amount of seasonal variability in singing rates, and hence detections, that are captured in our data. The only way to address this issue is to increase the number of field technicians working in the Black Hills so that field crew can conduct more transects in a shorter period of time.

RMBO staff will take these issues into consideration when planning for the 2008 field season.

Data Dissemination Website

We are currently in the process of redesigning our web site so that one can query data and view results displayed on a variety of scales (i.e. management unit, county, state). Access to the raw data, distribution maps and habitat relationships will allow managers to apply the data to local management issues. In addition, we are working with Cornell Lab of Ornithology's Avian Knowledge Network and the U.S. Geological Survey to compile and merge results from a variety of sources. This effort will identify monitoring programs, integrate information, and conduct analyses on regional datasets that can help inform management decisions.

SPECIES ACCOUNTS

This section presents links to online accounts and maps for each bird species recorded in 2008 that is of management interest, as designated by the South Dakota Dept. of Game, Fish, and Parks, the Black Hills National Forest, the U.S. Forest Service, Partners in Flight, and Wyoming Partners in Flight (Table 8). Each of these organizations has a stake in maintaining healthy populations of birds in the Black Hills. For the South Dakota Department of Game, Fish, and Parks, we include designations for State Threatened or Endangered Species and Species of Greatest Conservation Need (SDGFP 2006, SDGFP 2008). For the Black Hills National Forest we include designations for Management Indicator Species and Species of Local Concern (BHNF 2006). For the U.S. Forest Service, we include designations for Region 2 Sensitive Species (USFS 2008). For Partners in Flight we include designations from the Partners in Flight Species Assessment Database for Bird Conservation Region 17, (PIF 2005). For Wyoming Partners in Flight we included designations from the Bird Conservation Plan (2003; this designation included only for Level I and II priority species recorded in the Wyoming portion of the Black Hills). For accounts of these species visit www.rmbo.org/public/monitoring.

Table 8. Species of Management Concern recorded in BHNF, summer 2008.

Species[1]	
Ruffed Grouse	Plumbeous Vireo
Sharp-tailed Grouse	Pinyon Jay
Osprey	Black-billed Magpie
Sharp-shinned Hawk	Northern Rough-winged Swallow
Cooper's Hawk	Brown Creeper
Broad-winged Hawk	American Dipper
Swainson's Hawk	Golden-crowned Kinglet
Ferruginous Hawk	Mountain Bluebird
Golden Eagle	Townsend's Solitaire
Long-billed Curlew	Virginia's Warbler
White-throated Swift	Black-and-white Warbler
Broad-tailed Hummingbird	MacGillivray's Warbler
Lewis's Woodpecker	Brewer's Sparrow
Red-headed Woodpecker	Vesper Sparrow
Red-naped Sapsucker	Lark Bunting
Black-backed Woodpecker	Grasshopper Sparrow
Hammond's Flycatcher	Song Sparrow
Dusky Flycatcher	Dark-eyed Junco (White-winged)
Cordilleran Flycatcher	Western Meadowlark
Say's Phoebe	

[1] Species names are from the A.O.U. Check-list of North American Birds, Seventh Edition (2008).

LITERATURE CITED

Adamus, P. R, T. J. Danielson, and A. Gonyaw. 2001. Indicators for monitoring biological integrity of inland, freshwater wetlands: A survey of North American technical literature (1990-2000). U.S. Environmental Protection Agency, Office of Water, Wetlands Division. Washington, D.C. EPA 843-R-01.

The American Ornithological Union. 2008. Check-list of North American Birds, Seventh Edition. http://www.aou.org/checklist/index.php3

Birdlife International. 2003. Biodiversity indicator for Europe: population trends of wild birds. <http://www.birdlife.net/action/science/indicators/eu_briefing_bird_indicator.pdf>

Black Hills National Forest. 2006. Management Indicator Species. <http://www.fs.fed.us/r2/blackhills/projects/planning/97Revision/fp/23_3_mis_sg.pdf>

Buckland, S.T., D.R. Anderson, K.P. Burnham, and J.L. Laake. 1993. *Distance Sampling: Estimating Abundance of Biological Populations.* Chapman and Hall, London, reprinted 1999 by RUWPA, University of St. Andrews, Scotland. 446pp.

Bureau of Land Management. 1998. Birds as indicators of riparian vegetation condition in the western U.S. Bureau of Land Management, Partners in Flight, Boise, Idaho. BLM/ID/PT-98/004+6635. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. <http://www.npwrc.usgs.gov/resource/1998/ripveg/ripveg.htm>

Buttery, R.F. and B.C. Gillam. 1983. Ecosystem descriptions. Pages 43-71 in R.L. Hoover and D.L. Wills, ed., Managing Forested Lands for Wildlife. Colo. Div. of Wildl. In cooperation with USDA For. Ser., Rocky Mount. Reg., Denver, Colo.Cary, Merritt. 1901. Birds of the Black Hills. Auk 18:231-238.

Croonquist, M., and R. Brooks. 1991. Use of avian and mammalian guilds as indicators of cumulative impacts in riparian wetland areas. Environmental Management 15(5):701-714.

Hutto, R. L. 1998. Using landbirds as an indicator species group. Pp. 75-92 in Marzluff, J. M., and R. Sallabanks (eds.), Avian conservation: Research and Management. Island Press, Washington, DC.

Larson, G.E. and J.R. Johnson. 1999. Plants of the Black Hills and Bearlodge Mountains. South Dakota State University, Brookings, S.D.

Leukering, T. 2000. Point transect protocol for *Monitoring Colorado's Birds*. Unpubl. document, Rocky Mountain Bird Observatory, Brighton, CO. 16 pp.

Leukering, T., M. Carter, A. Panjabi, D. Faulkner, and R. Levad. 2000. Monitoring Colorado's Birds: The Plan for Count-based Monitoring. Unpubl. document. Rocky Mountain Bird Observatory, Brighton, CO. 25 pp.

Leukering, T., M. Carter, A. Panjabi, D. Faulkner, and R. Levad. Modified April 2008. Rocky Mountain Bird Observatory Point Transect Protocol. Unpubl. document. Rocky Mountain Bird Observatory, Brighton, CO. 42 pp. <http://www.rmbo.org/public/monitoring/downloads.aspx>

Manley, P.N., W.M. Block, F.R. Thompson, G.S. Butcher, C. Paige, L.H. Suring, D.S. Winn, D. Roth, C.J. Ralph, E. Morris, C.H. Flather, and K. Byford. 1993. Guidelines for Monitoring Populations of Neotropical Migratory Birds on National Forest System Lands. USDA Forest Service, Washington. 35 pp.

Morrison, M. 1986. Bird populations as indicators of environmental change. Curr. Ornithology 3:429-451.

O'Connell, T.J., L.E. Jackson, and R.P. Brooks. 2000. Bird Guilds as indictors of ecological condition in the central Appalachians. Ecological Applications 10:1706-1721.

Panjabi, A., M. Carter, T. Leukering, and D. Faulkner. 2001. Monitoring the Birds of the Black Hills: The Plan for Count-based Monitoring. Unpubl. Document, Rocky Mountain Bird Observatory, Brighton, CO. 14 pp.

Panjabi, A. 2003. Monitoring the birds of the Black Hills: Year 2. Final Report submitted to Black Hills National Forest. Rocky Mountain Bird Observatory, Brighton, Colorado. 125 pp.

Partners In Flight. 2005. Species Assessment Database. <http://www.rmbo.org/pif/pifdb.html>

Rich, T. 2002. Using breeding land birds in the assessment of western riparian systems. Wildlife Society Bulletin. 30(4):1128-1139.

Sauer, J.R. 1993. Monitoring Goals and Programs of the U.S. Fish and Wildlife Service. In Finch, D.M. and P.W. Stangel (eds.) Status and Management of Neotropical Migratory Birds; 1992 Set. 21-25; Estes Park, Co. Gen. Tech. Rep. RM-229. Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 422 pp.

South Dakota Department of Game, Fish and Parks. 2006. South Dakota Comprehensive Wildlife Conservation Plan. South Dakota Dept. of Game, Fish and Parks, Pierre, Wildlife Division Report 2006-2008.

South Dakota Department of Game, Fish and Parks. 2008**.** Threatened, Endangered, and Candidate Species of South Dakota. <http://www.sdgfp.info/Wildlife/Diversity/TES.htm>

Thomas, L., Laake, J.L., Strindberg, S., Marques, F.F.C., Buckland, S.T., Borchers, D.L., Anderson, D.R., Burnham, K.P., Hedley, S.L., Pollard, J.H., Bishop, J.R.B. and Marques, T.A. 2006. Distance 5.0. Release 2. Research Unit for Wildlife Population Assessment, University of St. Andrews, UK. <http://www.ruwpa.st-and.ac.uk/distance/>

U.S. Environmental Protection Agency. 2002. Methods for evaluating wetland condition: biological assessment methods for birds. Office of Water, U.S. Environmental Protection Agency, Washington. D.C. EPA-822-R-02-023.

U.S. Fish and Wildlife Service. 2002. Birds of Conservation Concern 2002. Division of Migratory Bird Management, Arlington, VA. 99 pp. <http://migratorybirds.fws.gov/reports/bcc2002.pdf>

U.S. Forest Service. 2008. Region 2 Regional Forester's Sensitive Species. <http://www.fs.fed.us/r2/projects/scp/sensitivespecies/index.shtml>

U.S. North American Bird Conservation Initiative Monitoring Subcommittee. 2007. Opportunities for Improving Avian Monitoring. U.S. North American Bird Conservation Initiative Report. 50 pp. Available from the Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Arlington, VA; <http://www.nabci-us.org/>

Wyoming Partners In Flight. 2003. Wyoming Bird Conservation Plan, version 2.0. compiled by Sharon Nicholoff. <http://www.blm.gov/wildlife/plan/WY/menu.htm>

APPENDIX A.

List of special species observed on point-count transects in BHNF from 2001-2008 and their management designations.

Species[1]	Species Management Designation						
		USFS[3]		USFWS[4]		PIF[5]	
	SDGFP[2]	BHNF	Region 2	BCR17	Region 6	BCR17	WY-PIF
Ruffed Grouse		MIS					
Sharp-tailed Grouse						CS,RS	
American White Pelican	SGCN						WY-II
American Bittern			R2SS				WY-I
Osprey	SGCN, ST						
Bald Eagle	SGCN, ST						WY-I
Northern Harrier			R2SS		BCC	RC	
Sharp-shinned Hawk		SOLC					
Cooper's Hawk		SOLC					
Northern Goshawk	SGCN		R2SS			RC	WY-I
Broad-winged Hawk		SOLC					
Swainson's Hawk					BCC	CC	WY-I
Ferruginous Hawk	SGCN		R2SS	BCC	BCC	RC,RS	WY-I
Golden Eagle				BCC	BCC	RC	
Merlin							WY-II
Prairie Falcon				BCC	BCC		
Upland Sandpiper				BCC	BCC		WY-I
Long-billed Curlew	SGCN			BCC	BCC		WY-I
Franklin's Gull							WY-I
Black-billed Cuckoo				BCC	BCC	RC	WY-II
Burrowing Owl	SGCN		R2SS	BCC	BCC	RC	WY-I
Northern Saw-whet Owl		SOLC					
White-throated Swift						CC	WY-II
Broad-tailed Hummingbird							WY-II
Lewis's Woodpecker	SGCN		R2SS	BCC	BCC	CC,RC	WY-II
Red-headed Woodpecker					BCC	CC,RC	
Red-naped Sapsucker				BCC	BCC		WY-II
American Three-toed Woodpecker	SGCN		R2SS				WY-II
Black-backed Woodpecker	SGCN	MIS	R2SS			RC	WY-II
Hammond's Flycatcher							WY-II
Dusky Flycatcher							WY-II
Cordilleran Flycatcher							WY-II
Say's Phoebe						RS	
Cassin's Kingbird							WY-II
Loggerhead Shrike			R2SS		BCC	RC	WY-II
Bell's Vireo					BCC		
Plumbeous Vireo							WY-II
Pinyon Jay						CC,RC	

Species[1]	Species Management Designation						
	SDGFP[2]	USFS[3]		USFWS[4]		PIF[5]	
		BHNF	Region 2	BCR17	Region 6	BCR17	WY-PIF
Black-billed Magpie						RC	
Northern Rough-winged Swallow						RC	
Pygmy Nuthatch		SOLC					WY-II
Brown Creeper		MIS					WY-II
Marsh Wren							WY-II
American Dipper	SGCN, ST	SOLC					WY-II
Golden-crowned Kinglet		MIS					WY-II
Mountain Bluebird						RC	
Townsend's Solitaire							WY-II
Virginia's Warbler					BCC		
Black-and-white Warbler		SOLC					
MacGillivray's Warbler							WY-II
Brewer's Sparrow			R2SS	BCC	BCC	CC,RC	WY-I
Vesper Sparrow						RC	WY-II
Lark Sparrow							WY-II
Lark Bunting	SGCN					RC,CS,RS	WY-II
Grasshopper Sparrow		MIS	R2SS	BCC	BCC	RC,CS,RS	WY-II
Song Sparrow		MIS					
Dark-eyed Junco (White-winged)	SGCN						
Dickcissel				BCC	BCC	CC,RC	WY-II
Bobolink					BCC		WY-II
Western Meadowlark						RS	

[1] Species names are from the A.O.U. Check-list of North American Birds, Seventh Edition (2008).
[2] SDGFP=South Dakota Dept. of Game, Fish, and Parks, SGCN=Species of Greatest Conservation Need, ST=State Threatened Species (SDGFP 2006, SDGFP 2008).
[3] USFS=United States Forest Service, BHNF=Black Hills National Forest, MIS=Black Hills National Forest Management Indicator Species, SOLC=Species of Local Concern, Region 2= USFS Region 2, R2SS=US Forest Service Region 2 Sensitive Species (BHNF 2006, USFS 2008).
[4] USFWS=U.S. Fish and Wildlife Service, BCR=Bird Conservation Region, Region 6=USFWS Region 6 (Mountain-Prairie Region), BCC=Bird of Conservation Concern (USFWS 2002).
[5] PIF=Partners In Flight, BCR17=Bird Conservation Region 17, CC=Continental Concern Species, RC=Regional Concern Species, CS=Continental Stewardship Species, RS = Regional Stewardship Species, WY-PIF=Wyoming Partners in Flight, WY-PIF=Wyoming Partners in Flight, WY-I=WY-PIF Level I Priority (Conservation Action), WY-II=WY-PIF Level II Priority (Monitoring) (PIF 2005, WY PIF 2003).

APPENDIX B.

List of all bird species observed during point-count transects in BHNF, with species totals by habitat in 2008, and yearly species totals from 2001-2008.

Species[1]	Number of individuals observed per habitat[2], 2008					Number of individuals observed per year (in all habitats sampleed[3])							
	AS	FR	MG	MR	SH	2001	2002	2003	2004	2005	2006	2007	2008
Canada Goose							35	1	2	1		4	
Wood Duck						6	13			1			
Gadwall							1						
Mallard		2	2	3		42	84	5	8	22	10	3	7
Blue-winged Teal									1				
Ring-necked Duck						2							
Hooded Merganser							1						
Common Merganser						8	9			9	1		
Gray Partridge						1	4						
Ring-necked Pheasant						15	2						
Common Peafowl				2									2
Ruffed Grouse	2					44	62	15	6	4	1	2	2
Sharp-tailed Grouse			5				2		25	1	4		5
Wild Turkey	7	7	22	5	8	118	67	43	47	29	53	25	49
Northern Bobwhite							1				1		
Pied-billed Grebe						1							
Western Grebe							1						
American White Pelican									20				
American Bittern						1	1						
Great Blue Heron	2	5	1	10		14	23	18	4	12	13	4	18
Turkey Vulture	8	22	8	7	14	84	98	15	44	88	48	53	59
Osprey		1		1		2				4			2
Bald Eagle										2			
Northern Harrier						1					1		
Sharp-shinned Hawk				1		2	4	3	7	3		1	1
Cooper's Hawk	1	1	1		2	10	4	3	9	9	2	3	5
Northern Goshawk						14	5	8	10	15	3	7	
Broad-winged Hawk	4			1		4	6		24	19	3	2	5
Swainson's Hawk			1		1					1	1		2
Red-tailed Hawk		8	10	11	3	47	42	32	44	57	38	23	32
Ferruginous Hawk					1								1
Golden Eagle		4			6	1	2	1		2	6		10
American Kestrel	1	1	14	3		8	14	11	23	20	12	8	19
Merlin			1				1						1
Prairie Falcon			1	1	3	2	6	2	6	9	6		5
Sora	1			3							2		4
American Coot										1			
Killdeer			6	6		9	19	1	10	4	2	6	12
Spotted Sandpiper				5			6	4			1		5
Upland Sandpiper			20		1	4	20		19		12	1	21
Long-billed Curlew			3								7		3
Pectoral Sandpiper						25							
Wilson's Snipe				10		15	8	6		5	8		10
Franklin's Gull							1						
Rock Pigeon		15	3	3	15	9	9	4	1	8	10		36

Species[1]	Number of individuals observed per habitat[2], 2008					Number of individuals observed per year (in all habitats sampleed[3])							
	AS	FR	MG	MR	SH	2001	2002	2003	2004	2005	2006	2007	2008
Eurasian Collared-Dove			1										1
Mourning Dove	6	40	76	10	116	217	365	118	278	166	195	250	248
Black-billed Cuckoo						2					1		
Great Horned Owl	2	1	1	1		3	2	2	2	2	4	3	5
Burrowing Owl									1				
Long-eared Owl						1							
Northern Saw-whet Owl						1			1				
Common Nighthawk	2	6	2	4	6	27	20	8	36	34	42	24	20
Common Poorwill												1	
Chimney Swift										1			
White-throated Swift	2	84	8	65	143	124	261	93	157	460	203	83	302
Broad-tailed Hummingbird	1				4		3	3		6	1	3	5
Belted Kingfisher		2		6		33	17	10	1	21	15	1	8
Lewis's Woodpecker			1			3	4	9	4	8	6	9	1
Red-headed Woodpecker			3	3		25	38	50	54	66	8	48	6
Red-naped Sapsucker	80	5		37		402	222	245	210	210	118	118	122
Downy Woodpecker	5		1	9		34	29	25	21	38	26	17	15
Hairy Woodpecker	35	9	17	20	4	351	468	440	362	386	93	361	85
American Three-toed Woodpecker						12	27	44	8	47		11	
Black-backed Woodpecker	1		1	5		24	132	75	70	46	3	38	7
Northern Flicker	45	14	58	47	12	240	235	226	267	447	180	225	176
Western Wood-Pewee	35	60	34	64	18	182	360	373	361	379	195	468	211
Alder Flycatcher							1	1		1	2		
Least Flycatcher		3		3	1	5	11	6	6	14	10	2	7
Hammond's Flycatcher		1		1						6	3	2	2
Dusky Flycatcher	97	56	25	147	240	1186	1407	723	720	933	359	980	565
Cordilleran Flycatcher	20	105		73	10	297	364	325	100	454	342	151	208
Eastern Phoebe		4				3	1		3	4		1	4
Say's Phoebe			2			1			1		3	2	2
Cassin's Kingbird			2						1				2
Western Kingbird		1	6		1	6	7	5	21	9	4	5	8
Eastern Kingbird		13	16	1	1	37	79	8	35	16	32	6	31
Loggerhead Shrike						2							
Bell's Vireo												1	
Plumbeous Vireo	8	16	31	9	111	347	385	230	167	273	82	244	175
Warbling Vireo	422	198	10	262	30	1888	1960	960	1076	1591	576	1187	922
Red-eyed Vireo	15	78		39		217	228	102	35	216	122	12	132
Gray Jay	13	4	8	9	7	273	197	204	129	135	16	114	41
Blue Jay	14	16		21	1	109	65	34	22	39	52	13	52
Pinyon Jay		9	60			13	47	7	56	3	24		69
Clark's Nutcracker	1		1		6	33	65	10	31	34	4	14	8
Black-billed Magpie	3	4	7			2	1		26	2	18	1	14
American Crow	40	19	70	37	43	333	258	194	184	142	141	185	209
Common Raven			3		1								4
Horned Lark			34			7	4		11		38		34
Tree Swallow		3	12	12	3	14	30	8	6	7	22	10	30
Violet-green Swallow		164	31	71	86	241	568	162	269	394	406	125	352
Northern Rough-winged Swallow		4		2	1	1	17		13	9	13	3	7
Bank Swallow						2	1		10		2		
Cliff Swallow		20			10	21	7		28	3	23	5	30
Barn Swallow		1	12	16	5	11	26	5	11	11	29	11	34
Black-capped Chickadee	111	86	74	102	142	949	1120	672	483	941	403	746	515
Red-breasted Nuthatch	121	50	36	75	105	1418	1519	817	469	1013	361	1268	387

Species[1]	Number of individuals observed per habitat[2], 2008					Number of individuals observed per year (in all habitats sampleed[3])							
	AS	FR	MG	MR	SH	2001	2002	2003	2004	2005	2006	2007	2008
White-breasted Nuthatch	14	17	10	11	47	215	263	335	162	232	147	339	99
Pygmy Nuthatch						3	2		1	4	3	6	
Brown Creeper		1		1		155	143	135	97	131	7	35	2
Rock Wren	2	21	50	14	16	31	102	44	197	160	79	51	103
Canyon Wren	2	4	2	8	12	17	59	21	18	27	43	18	28
House Wren	18	6	10	20	10	65	147	74	135	183	65	155	64
Winter Wren							2	1		3			
Marsh Wren				1									1
American Dipper		2		4			3	4		5	3		6
Golden-crowned Kinglet	2			8		131	99	224	55	346	7	21	10
Ruby-crowned Kinglet	36	43		77	8	595	912	716	219	1005	198	529	164
Blue-gray Gnatcatcher			6		28	2	2	1	15			20	34
Eastern Bluebird			4		1	49	57	57	74	63	3	28	5
Mountain Bluebird	3	10	183	18	64	159	169	116	292	333	255	265	278
Townsend's Solitaire	33	18	6	21	28	739	850	783	544	610	119	492	106
Veery	7	17		59		66	94	104	28	73	63	32	83
Swainson's Thrush	49	33		50	2	514	448	507	170	405	276	311	134
Hermit Thrush						2	1	1	4	2	15	1	
American Robin	231	216	148	295	74	2064	2129	1670	1006	1926	900	1322	964
Gray Catbird	2	24		42		38	20	27	2	43	60	3	68
Brown Thrasher					1	8	3	3	5		1	1	1
European Starling		4	15	2		2	22		21	43	9	3	21
American Pipit									1				
Cedar Waxwing	5	11		20	1	65	131	61	51	62	73	40	37
Golden-winged Warbler										3			
Tennessee Warbler				1			32		3				1
Orange-crowned Warbler							1						
Virginia's Warbler		2	2		60	44	80	2	185	6		79	64
Northern Parula						2		1		1			
Yellow Warbler	1	134		67	6	97	218	35	61	114	76	58	208
Chestnut-sided Warbler	1			3		8	2	2		3		2	4
Black-throated Blue Warbler							1						
Yellow-rumped Warbler	120	52	62	62	201	2150	2471	1831	872	1675	355	1577	497
Black-and-white Warbler				1		8	8	2	4	6	7		1
American Redstart	40	211		249		485	407	242	97	609	396	63	500
Ovenbird	363	271	6	209	221	1675	1719	838	952	1192	563	802	1070
MacGillivray's Warbler	34	44		83	3	362	267	206	103	227	105	87	164
Common Yellowthroat	26	36	2	143	1	217	277	219	45	321	228	47	208
Yellow-breasted Chat		22			21	24	73	4	62	29	23	49	43
Western Tanager	55	81	46	41	113	827	921	856	545	697	262	651	336
Spotted Towhee	33	136	59	87	470	385	632	152	452	221	219	459	785
Chipping Sparrow	168	99	336	134	528	1264	1626	1523	1345	2028	616	1697	1265
Clay-colored Sparrow			5		1		2		4	1			6
Brewer's Sparrow			3								1		3
Field Sparrow		1	5		5	2	1	1	5			1	11
Vesper Sparrow			275		28	197	362	131	394	204	264	289	303
Lark Sparrow	2	21	151		21	25	86	21	114	46	162	28	195
Lark Bunting			111			2			2	5	9		111
Grasshopper Sparrow		2	193		3	6	75		121		382		198
Song Sparrow	10	48		147	1	237	268	258	38	396	292	67	206
White-crowned Sparrow					2			1					2
Dark-eyed Junco	156	50	40	44	86	1639	1500	1320	936	1335	196	1884	376
Northern Cardinal								1					

Species[1]	Number of individuals observed per habitat[2], 2008					Number of individuals observed per year (in all habitats sampleed[3])							
	AS	FR	MG	MR	SH	2001	2002	2003	2004	2005	2006	2007	2008
Rose-breasted Grosbeak						2	1	1		1			
Black-headed Grosbeak	16	76	2	62	7	240	326	116	53	262	190	65	163
Blue Grosbeak						1							
Lazuli Bunting	1	16		5	9	13	50	13	20	19	30	25	31
Indigo Bunting		1				4	1				1	1	1
Dickcissel						3	11				31		
Bobolink				10			17	10	6	11	64		10
Red-winged Blackbird	6	23	5	52		234	299	84	34	138	106	44	86
Western Meadowlark		7	645	1	34	104	475	44	892	197	461	83	687
Yellow-headed Blackbird							5		1				
Brewer's Blackbird	3		47	16	1	26	33	13	74	21	38		67
Common Grackle		25	1	3		59	64	6	12	4	5	4	29
Brown-headed Cowbird	82	100	96	93	203	731	831	591	496	694	177	684	574
Orchard Oriole		12		1		27	18	1	25	6	4	8	13
Bullock's Oriole		7	1	1	1	19	21		7	15	9	7	10
Pine Grosbeak	3												3
Cassin's Finch			4		1	21	7	4	4	12	1	8	5
House Finch					7	1	12		1	1	2	1	7
Red Crossbill	253	31	80	156	82	2865	5300	1138	1823	935	228	1829	602
White-winged Crossbill						13	12	14		15		11	
Pine Siskin	32	31	15	67	58	803	654	165	38	520	231	261	203
Lesser Goldfinch					1						2	3	1
American Goldfinch	7	32	48	29	89	140	212	76	66	132	119	137	205
Evening Grosbeak						9				1	2		
House Sparrow						2	1						
Abert's Squirrel	1												1
Red Squirrel	71	35	4	86	25	458	315	271	123	89	128	787	221

[1] Species names are from the A.O.U. Check-list of North American Birds, Seventh Edition (2008)
[2] Habitats: AS=aspen; FR=foothills riparian; MG=mixed-grass prairie; MR=montane riparian; SH=pine-juniper shrubland
[3] The number and types of habitats sampled each year may vary.