

**Bird Inventories and Monitoring on National
Park Service Units in the Northern Great
Plains, 2002-2004
FINAL REPORT**



By:

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Cover photo:

A view of the Missouri River and the North Woods at Knife River Indian Villages National Historic Site, North Dakota. By Arvind Panjabi

Table of Contents

Introduction	2
Methods	4
Results and Discussion	7
Fort Laramie National Historic Site	7
Devil’s Tower National Monument.....	18
Fort Union Trading Post National Historic Site	27
Jewel Cave National Monument	33
Knife River Indian Villages National Historic Site	39
Mount Rushmore National Memorial.....	54
Wind Cave National Park.....	60
Acknowledgements	67
Literature Cited	67

Introduction

National Park Service (NPS) lands (including National Parks, Monuments, Historic Sites, and Memorials) often support high-quality biological communities and may have significant natural resource conservation values. In particular, birds are a natural resource for which many parks are highly valued, even if they were not established, and are not managed, with birds in mind. NPS lands have been, and continue to be, subject to a variety of internal and external pressures that can affect the integrity of ecosystems within a park. These pressures may include historical and/or current land use within the park, public visitation/recreation and associated development, management emphasis of other resources, air and water pollution, and changes in the surrounding landscape.

Although park management plans do not always address birds directly, birds are a valuable resource that should be managed carefully in national parks to ensure their enjoyment by future generations. Birding is an increasingly popular activity, as evidenced by the fact that in 2001, 46 million birdwatchers in America spent more than \$32 billion on birding and related activities (USFWS 2003). Thus, the maintenance of healthy bird communities in national parks can have positive impacts on the experience of park visitors and on local economies.

Inventory and long-term monitoring of bird populations provides information that is essential for the effective management and conservation of birds in national parks. However, bird monitoring can also serve other purposes. Because bird communities in a given landscape 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), birds are increasingly being recognized as indicators of biological integrity and environmental change (Morrison 1986, Croonquist and Brooks 1991, Bureau of Land Management 1998, O'Connell et al. 2000, U.S. EPA 2002, Birdlife International 2003). Thus, monitoring birds also provides a means to monitor the broader effects of human activities on the ecosystem and to gauge the sustainability of those activities.

Between 2002 and 2004, Rocky Mountain Bird Observatory (RMBO) implemented a three-year cooperative effort with the NPS Inventory and Monitoring (I&M) Program in the Northern Great Plains Network (NGPN) to conduct bird inventories and monitoring in seven NPS units ("parks"). The parks, located in Wyoming, South Dakota, and North Dakota, include Devil's Tower National Monument, Jewel Cave National Monument, Wind Cave National Park, Mount Rushmore National Memorial, Fort Laramie National Historic Site, Fort Union Trading Post National Historic Site, and Knife River Indian Villages National Historic Site. This report details the final results of this three year effort to inventory and begin monitoring bird population trends in national parks in the northern Great Plains.

Inventories

The primary goal of the bird inventories was to record the presence of breeding bird species at the parks, so that by the end of this effort, at least 90% of the expected breeding species at each park will have been documented. The inventories also provide an update on the status of previously documented species in each park. *Documented* and *expected* species in each park were determined by the NGPN I&M Program. Because bird communities are dynamic, and not all species present will be detected on any single visit, the inventories were carried out annually over a three-year period, after which time we expect a fairly complete assessment of the breeding avifauna within each park should be possible. No specific effort was made to document nesting by any species however, other than incidental observations, so the presence of any species in a park does not necessarily imply that it is nesting there, particularly with wide-ranging birds such as shorebirds, waterbirds, and raptors. However, most species, particularly passerines, were likely breeding in the vicinity of where they were detected.

Monitoring

The goal of the bird monitoring is to detect trends in bird populations over time so that interpretations of the health of those populations can be made with confidence. RMBO has designed a landscape-level, habitat-based bird monitoring program that can detect a 3% or greater annual change in population size (with 80% power and 90% certainty) over a period of no more than 30 years for most common species (Leukering et al. 2000). Declines of greater than 3% annually will be detectable within a shorter timeframe for many species.

Monitoring vs. tracking

In the strictest sense, *monitoring* implies that levels of change can be interpreted with high statistical certainty; *tracking* does not imply that high statistical certainty can be inferred. For most common species, monitoring can be accomplished through random sampling if a sufficient number of samples contain target individuals so that a reasonably precise estimate of density or abundance can be derived each year. Monitoring can also be accomplished through censuses, where all individuals in a population are counted periodically over time.

While it would be preferable to monitor all bird species within each park, the level of effort that would be required to yield meaningful results would be high, as would be the cost. Under the current plan, monitoring at the scale of individual parks will be possible only for the most common species. Concurrent bird monitoring efforts by RMBO in the Black Hills and other parts of the Rocky Mountains and Great Plains will allow most parks to be incorporated into a broader regional bird-monitoring network designed to provide landscape-level, habitat-specific population trends for most land bird species in this region (see

Panjabi et al. 2001). Thus, parks will gain specific information on their bird communities, including trends of the most common species, and some will also be able to examine landscape-level trends for many more species the parks support.

Methods

RMBO staff conducted inventories and/or monitoring surveys at each of the seven parks over a 1-4 day period each year between 24 May and 2 July. This period corresponds well to the period of peak detectability of most breeding birds in each park. Experienced field biologists trained in bird identification and RMBO's point count protocol conducted all field work.

Inventory

RMBO staff generally conducted inventories on the first day of each park visit, as this allowed observers to gain familiarity with the park and communicate with park staff regarding access, locations of habitats, and other logistics. Although observers documented all birds detected at any time during their visit, they devoted this one full day, from sunrise to sunset, entirely to the inventory effort. Observers used a checklist provided by the NGPN I&M Program (heretofore, the "I&M list") to compile a complete list of all bird species detected during the visit.

In general, field observers attempted to visit and thoroughly search every habitat in the park that could potentially yield a new species for each inventory. While they attempted to cover all areas of the parks, particularly those not covered by the monitoring effort, this was not always possible due to the size of some parks and time constraints. Because the primary goal of the inventories was to determine the status of expected species that were not yet documented, observers focused first and foremost on searching habitats where such species would most likely be found. Staff also emphasized searching restricted habitats such as wetlands, rivers, creeks, and prairie dog towns. Although they made no special effort to locate nests, RMBO staff documented active nests found and in cases of rare or otherwise important species, they recorded their locations using GPS.

In each park, observers attempted to document nocturnal species on one or more nights of the visit through passive listening in targeted habitats, as well as by using tape-recorded vocalizations of targeted species (including all likely owls and nightjars) in these areas. They generally conducted these nocturnal surveys along roadways and trails within three hours after sunset. Recorded vocalizations were also used in some parks to detect diurnal species like rails, accipters, and woodpeckers.

Most birds observed during the inventory, particularly small passerines, were generally assumed to be breeding in the park or surrounding vicinity, except for wide-ranging species with specific nesting needs that were not likely met in the park (e.g., cliff-nesting swifts or raptors in a park with no cliffs, or colonial waterbirds in a park with no obvious colonies or colony sites). Unless specifically noted in the results, it can be assumed that most birds documented were nesting in the parks.

It should be kept in mind that the inventories were conducted as one to three day visits during a breeding season that lasts from late April through July. By no means are the lists all conclusive, nor can they necessarily reflect what may have nested in the park in the past, or what will nest there in the future. And while the dates chosen for the inventories generally correspond well to the peak period of detectability among most breeding birds, some species' peak detectability periods did not overlap with our visits. This is particularly true for birds like turkey and grouse that mate earlier in the year. Nonetheless, the lists should represent fairly well the core avifauna of each park, including some of the more rare species. But bird communities are dynamic systems and they should be expected to change in some regards over time. With additional years of searching each park, we would certainly continue to add more species to each park's list of possible breeding birds.

Monitoring

RMBO staff conducted point transects (Buckland et al. 1993) in order to sample bird populations at each site selected for monitoring and assist with the inventory. Each transect was surveyed by one observer following protocol delineated by Leukering (2000) and modified by Panjabi (2003). Observers conducted up to 17 (generally 15) five-minute point counts at stations located at 250-m intervals along each point transect. The first station was located in a randomly chosen direction, and at a randomly chosen distance between 0-400 meters from an access point. In small or linear stands, the size and shape of the stand often determined the placement and course of the transect. All transect surveys were conducted in the mornings, between ½-hour before sunrise and 11 AM. Most surveys were completed before 10 AM.

Observers recorded all bird detections on standardized forms, including fly-overs (birds flying over, but not using the immediate surrounding landscape), which were later excluded from analyses of density. For each bird detected, observers recorded the species, sex, how it was detected (e.g., call, song, drumming, etc.), and distance from the observation point. Whenever possible, they measured distances using Bushnell® Yardage Pro 500™ laser rangefinders. When it was not possible to measure the distance to a bird, staff used rangefinders to gauge distance estimates by measuring to some closer object. Observers treated the 250-m intervals between count stations as parts of a line transect, and recorded individuals of a short list of low-density species (all grouse, raptors,

woodpeckers, and a few species from other taxonomic groups) and measured the distance and bearing to each from where it was detected along the transect line. They also recorded bearings and distances to individuals of the same low-density species when they were detected at count stations. Birds initially detected on points were not recorded between points.

Starting in 2004, individual birds that were detected as a result of detecting another bird first, such as birds in a flock, were treated as non-independent detections. Such detections were recorded as part of a 'cluster' together with the first independently observed bird, rather than as separate independent observations of those individuals. In previous years, all individual birds recorded were treated as independent observations. For the final density analyses in this report, successive observations of birds of the same species detected at the same distance on the same point count station in a given year were lumped into independent clusters rather than treated as individuals in order to conform to the revised protocol.

Observers recorded atmospheric data (i.e., temperature in degrees Fahrenheit, cloud cover, precipitation, and wind--Beaufort scale) and the time at the start and end of each transect. They measured distances between count stations using hand-held Garmin® E-trex™ Global Positioning System units. All GPS data were logged in Universal Transverse Mercator (UTM) North American Datum 1927. At each count station, observers recorded UTM coordinates, whether or not the station was within 100m of a road, the primary and secondary habitat types in the area, the seral stage and canopy closure of each habitat (Buttery and Gillam 1983, USDA Forest Service 1998), and the primary and secondary understory types (and percent coverage of each) within a 50 m radius of the point. Observers recorded these data prior to beginning each bird count.

Data Analysis

All density estimates in this report were generated using program DISTANCE (Thomas et al. 1998-99). Program DISTANCE utilizes distance data associated with observations to generate a unique detection function for each species in each situation that is analyzed. Detection functions are based on one of four polynomial models (uniform/cosine, half-normal/cosine, half-normal/hermite, hazard-rate/simple) that is selected primarily on the basis of the Akaike Information Criterion, a measure that reflects how well the data fits the model. The model selected for a given species could change between years due to the distribution of observations in a given year. The data presented here have been re-analyzed from previous interim reports, using data from each transect that has been pooled across years in order to generate a single detection function for the species that can be applied to each year's data. Using a single model to assess population density should reduce spurious changes in density estimates over years that could result from varying model selection in different years. However, using a single model to estimate density across years relies on the assumption

that the detectability of a species has not changed along individual transects over the three years, which is probably true in most cases.

Despite optimistic results from much of the point transect data, species density estimates in individual parks are based on very few samples and are thus especially prone to sampling error as a result of weather, observer variability, timing of the surveys, or even chance. Careful consideration of these variables should be made when interpreting the results from point count analyses and results should not be extrapolated beyond the sampling area.

Repeated surveys along each transect over the course of the breeding season would enhance the precision and robustness of these estimates, and could also allow additional species to be monitored along each transect. In the future, particularly in the larger parks, adding additional transects in similar habitats would greatly enhance the monitoring effort in each park. This would increase the number of observations of most species, increase the number of samples from which estimates are based, and allow for between-site comparisons of similar habitats within a given park.

Results and Discussion

Fort Laramie National Historic Site

Inventory

Fort Laramie was listed as having 72 *documented* breeding bird species, with another 99 species *expected* (National Park Service 2002). Subsequent review of this list by the author found that the number of *expected* species was actually 98.

RMBO staff detected a total of 67 bird species at Fort Laramie NHS (Table 1.1) during three visits to the park (15-17 June, 2002; 4-5 June, 2003; 1-2 July, 2004). RMBO confirmed the presence of 24 (24%) of the 98 *expected* species, reconfirmed the presence of 42 (58%) of the 72 *documented* species, and confirmed the likely breeding of one additional species not listed as either *documented* or *expected*. While these percentages may seem low, many of the *documented* species were either documented outside of the breeding season or were otherwise documented in error and many of the *expected* species should not have been expected to breed in or near the park.

Of the 74 *expected* species that were not documented during the inventory, 21 species (Osprey, Bald Eagle, Northern Harrier, Swainson's Hawk, Ferruginous Hawk, Prairie Falcon, Virginia Rail, Sora, Upland Sandpiper, Ring-billed Gull, California Gull, Forster's Tern, Barn Owl, White-throated Swift, Lewis's Woodpecker, Least Flycatcher, Pinyon Jay, Horned Lark, Bank Swallow,

Grasshopper Sparrow, and Dickcissel) could possibly summer in or near the park in the future, although they probably do not at present and should not necessarily be expected to occur in the future. The other 53 *expected* species on this list are not likely to summer in or near the park for reasons ranging from lack of suitable habitat to the park lying outside of the species' normal breeding range (Table 1.1). Some of these species may occur as transients during migration.

Of the 30 *documented* species that were not observed during the inventories, only one, Great Horned Owl, probably does occur regularly in the park during breeding. Four other *documented* species (Golden Eagle, Violet-green Swallow, Rock Wren, Chipping Sparrow) were observed outside the park on the nearby Bedlam Trail Ruts unit, but not within the park. Two of these, Golden Eagle and Violet Green Swallow, are wide-ranging species that could possibly be observed from the park on occasion, but the other two are not likely to occur in the park due to their small home range size and lack of suitable habitat in the park. Five other *documented* species (Canada Goose, Black-crowned Night-Heron, Northern Mockingbird, Brewer's Blackbird, House Finch) could possibly breed nearby, or might have in the past, but they probably did not breed in the park during the 3 years of the inventory, as they are fairly conspicuous species. The remaining 20 *documented* species do not breed in the region and were likely documented at Fort Laramie during some time other than during the breeding season (Table 1.1). Only one species was found in the park that was not listed as either *expected* or *documented*, the Eurasian Collared-Dove. This is an exotic species that has recently begun colonizing the western Great Plains and could be expected to increase in abundance in the park, especially in light of the surrounding agricultural landscape. Records of all *documented* species on the I&M list that were not observed during the inventory warrant further verification by experts before inclusion of these species on the updated list of breeding bird species at Fort Laramie NHS.

Areas searched during the inventory included the entire riparian woodland along the North Platte and Laramie Rivers, the native grasslands in the northwest corner of the park, the large pastures in the center of the park, the picnic area, the fort, the wetlands in the southwest corner of the park, and the area around the seasonal staff camping area. Weather conditions during visits to the park were generally favorable for detecting birds, although some light rain did occur during the inventory in 2004.

The Bedlam Trails Ruts unit that had been included in inventories in 2003 and 2004 was not surveyed in 2004, and species observed only at this site have been removed from the park list as per recommendations of the NGPN I&M coordinator (Dan Licht, pers. com.). The Bedlam Trail Ruts unit contains habitats such as ponderosa pine woodland and limestone cliffs that are not found elsewhere in the park, and thus contributed several species to the park list that are absent from the park proper.

Table 1.1. Results of breeding bird inventories at Fort Laramie National Historic Site, Wyoming, 2002-2004.

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Wood Duck	expected	X	X	X	confirmed	uncommon; river
Mallard	documented	X	X	X	confirmed	fairly common, river
Common Merganser	documented	X		X	confirmed	fairly common; river
Ring-necked Pheasant	expected	X	X		confirmed	fairly common; grasslands, riparian
Wild Turkey	documented	X			confirmed	uncommon; riparian
Double-crested Cormorant	expected	X		X	confirmed	uncommon; river
Great Blue Heron	documented	X	X	X	confirmed	uncommon; river
Turkey Vulture	expected	X	X		confirmed	fairly common; generalist
Cooper's Hawk	documented	X			confirmed	uncommon; riparian woodland
Red-tailed Hawk	documented		X	X	confirmed	uncommon; riparian woodlands, grasslands
American Kestrel	documented	X	X		confirmed	uncommon; riparian woodland, grasslands
Killdeer	documented	X	X	X	confirmed	fairly common; river, grasslands
Spotted Sandpiper	documented	X	X	X	confirmed	fairly common; river
Wilson's Snipe	expected	X			confirmed	rare; wetlands
Rock Pigeon	expected	X	X	X	confirmed	common; around building structures
Eurasian Collared-Dove	not listed		X	X	confirmed	uncommon; agricultural areas, woodlands
Mourning Dove	documented	X	X	X	confirmed	common; riparian woodland
Eastern Screech-Owl	documented	X	X		confirmed	fairly common; riparian woodland
Common Nighthawk	documented	X	X	X	confirmed	fairly common; generalist
Belted Kingfisher	documented		X		confirmed	uncommon; river
Red-headed Woodpecker	documented	X	X	X	confirmed	fairly common; riparian woodlands
Downy Woodpecker	documented	X	X	X	confirmed	common; riparian woodlands
Hairy Woodpecker	documented	X	X		confirmed	fairly common; riparian woodlands
Northern Flicker	documented	X	X	X	confirmed	fairly common; riparian woodland
Western Wood-Pewee	expected	X	X	X	confirmed	common; riparian woodlands
Eastern Phoebe	expected		X		confirmed	rare; riparian woodlands and edge
Say's Phoebe	documented	X	X	X	confirmed	uncommon; grasslands
Western Kingbird	documented	X	X	X	confirmed	common; grasslands
Eastern Kingbird	documented	X	X	X	confirmed	common; riparian woodlands
Loggerhead Shrike	documented	X	X		confirmed	uncommon; grasslands
Warbling Vireo	expected	X	X	X	confirmed	fairly common; riparian woodlands
Red-eyed Vireo	expected	X			confirmed	rare; riparian woodlands
Blue Jay	documented	X	X	X	confirmed	common; riparian woodlands
Black-billed Magpie	documented	X	X	X	confirmed	common; generalist
American Crow	documented	X	X	X	confirmed	fairly common; generalist
Tree Swallow	expected		X	X	confirmed	uncommon; riparian woodlands
Northern Rough-winged Swallow	expected			X	confirmed	uncommon; river
Cliff Swallow	documented	X	X	X	confirmed	common; river
Barn Swallow	documented	X	X	X	confirmed	common; around structures, grasslands, riparian
Black-capped Chickadee	expected	X	X	X	confirmed	fairly common; riparian woodland
White-breasted Nuthatch	expected	X		X	confirmed	uncommon; riparian woodland
House Wren	documented	X	X	X	confirmed	common; riparian woodlands
Marsh Wren	expected		X		confirmed	rare; wetlands
Eastern Bluebird	expected	X	X		confirmed	rare; riparian woodlands and edge
American Robin	documented	X	X	X	confirmed	common; riparian woodlands
Brown Thrasher	documented	X	X	X	confirmed	fairly common; riparian woodland

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
European Starling	documented	X	X	X	confirmed	fairly common; riparian woodlands, near structures, agricultural areas
Cedar Waxwing	expected	X	X	X	confirmed	fairly common; riparian woodlands
Yellow Warbler	documented	X	X	X	confirmed	common; riparian woodlands
Common Yellowthroat	expected	X	X	X	confirmed	fairly common; riparian woodlands, wetlands
Yellow-breasted Chat	documented	X	X	X	confirmed	fairly common; riparian woodlands, wetlands
Spotted Towhee	documented	X	X	X	confirmed	fairly common; riparian woodlands
Lark Sparrow	documented	X	X	X	confirmed	common; riparian woodlands and edge, grasslands
Lark Bunting	expected	X	X		confirmed	uncommon; grasslands
Song Sparrow	documented	X	X	X	confirmed	fairly common; riparian woodlands
Black-headed Grosbeak	expected	X	X	X	confirmed	fairly common; riparian woodlands
Blue Grosbeak	expected	X	X	X	confirmed	fairly common; riparian woodlands
Lazuli Bunting	expected	X		X	confirmed	uncommon; riparian woodlands
Red-winged Blackbird	documented	X	X	X	confirmed	common; riparian woodlands, wetlands
Western Meadowlark	documented	X	X	X	confirmed	common; grasslands
Common Grackle	documented	X	X	X	confirmed	common; generalist
Brown-headed Cowbird	documented	X	X	X	confirmed	common; riparian woodlands
Orchard Oriole	expected	X	X	X	confirmed	common; riparian woodlands
Bullock's Oriole	documented	X	X	X	confirmed	common; riparian woodlands
American Goldfinch	documented	X	X	X	confirmed	common; riparian woodlands
House Sparrow	documented		X	X	confirmed	uncommon; near structures, agricultural areas
Canada Goose	documented				possible	could potentially breed near small ponds or rivers
Osprey	expected				possible	may breed regionally
Bald Eagle	expected				possible	not likely to breed in park, but may breed regionally
Northern Harrier	expected				possible	not likely to breed in park, but may breed regionally
Swainson's Hawk	expected				possible	breeds regionally
Ferruginous Hawk	expected				possible	inadequate or unsuitable breeding habitat in park, but breed regionally; observed near Bedlam Trail Ruts unit in 2003.
Golden Eagle	documented				possible	not likely to nest in park, but breeds nearby (nest on cliffs on Bedlam Trail Ruts unit)
Prairie Falcon	expected				possible	not likely to breed in park, but may breed regionally
Virginia Rail	expected				possible	somewhat sporadic, may breed in some years
Sora	expected				possible	somewhat sporadic, may breed in some years
American Coot	documented				possible	not likely to breed in park, but may breed regionally
Upland Sandpiper	expected				possible	inadequate or unsuitable breeding habitat in park
Ring-billed Gull	expected				possible	peripheral in region; inadequate or unsuitable breeding habitat in park
California Gull	expected				possible	peripheral in region; inadequate or unsuitable breeding habitat in park
Forster's Tern	expected				possible	not likely to breed in park, but may breed regionally
Barn Owl	expected				possible	possible, rare in region

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Great Horned Owl	documented				possible	probably breeds in area
White-throated Swift	expected				possible	breeds regionally, but no suitable breeding habitat in park
Lewis's Woodpecker	expected				possible	very rare in region
Least Flycatcher	expected				possible	rare breeder in region
Pinyon Jay	expected				possible	not likely to breed in park, but may breed regionally; observed on Bedlam Trail Ruts unit in 2003
Horned Lark	expected				possible	prefers open grasslands
Violet-green Swallow	documented				possible	breeds nearby (Bedlam Trail Ruts unit); could be observed from park, but breeding within park is doubtful
Bank Swallow	expected				possible	may breed regionally; nests in colonies in cut-banks
Grasshopper Sparrow	expected				possible	prefers areas with taller grass; may occur in some years
Dickcissel	expected				possible	peripheral in region; could occur in some years
House Finch	documented				possible	unlikely to breed in park, but may breed regionally
Gray Partridge	expected				unlikely	peripheral in region
Sharp-tailed Grouse	expected				unlikely	peripheral in region; habitat in park marginal
Pied-billed Grebe	expected				unlikely	Inadequate or unsuitable breeding habitat in park
Black-crowned Night-Heron	documented				unlikely	rare in region
Merlin	expected				unlikely	Inadequate or unsuitable breeding habitat in park, peripheral in region
Long-billed Curlew	expected				unlikely	inadequate or unsuitable breeding habitat in park
Wilson's Phalarope	expected				unlikely	inadequate or unsuitable breeding habitat in park
Caspian Tern	expected				unlikely	peripheral in region; inadequate or unsuitable breeding habitat in park
Black-billed Cuckoo	expected				unlikely	inadequate or unsuitable breeding habitat in park, peripheral in region
Yellow-billed Cuckoo	expected				unlikely	inadequate or unsuitable breeding habitat in park, very rare in region
Burrowing Owl	expected				unlikely	inadequate or unsuitable breeding habitat in park
Long-eared Owl	expected				unlikely	inadequate or unsuitable breeding habitat in park
Short-eared Owl	expected				unlikely	Inadequate or unsuitable breeding habitat in park, peripheral in region
Cassin's Kingbird	expected				unlikely	inadequate or unsuitable breeding habitat in park
Common Raven	documented				unlikely	peripheral in region; not likely to nest in park due to lack of suitable sites (cliffs)
Gray Catbird	expected				unlikely	inadequate or unsuitable breeding habitat in park
Northern Mockingbird	documented				unlikely	peripheral in region
Chipping Sparrow	documented				unlikely	not likely to breed in park (generally requires pines), but likely breeds nearby (observed at Bedlam Trail Ruts unit 2003)

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Vesper Sparrow	documented				unlikely	unlikely as a breeder in the park (habitat unsuitable), may breed nearby
McCown's Longspur	expected				unlikely	habitat in park is marginal; prefers shortgrass prairie; does not appear to be breeding in vicinity
Bobolink	expected				unlikely	peripheral in region; could occur in some years
Yellow-headed Blackbird	documented				unlikely	unlikely to breed in park, but may breed regionally
Brewer's Blackbird	documented				unlikely	unlikely to breed in park, but may breed regionally
Gadwall	expected				does not breed	Inadequate or unsuitable breeding habitat
American Wigeon	documented				does not breed	Inadequate or unsuitable breeding habitat
Blue-winged Teal	expected				does not breed	Inadequate or unsuitable breeding habitat
Northern Shoveler	expected				does not breed	Inadequate or unsuitable breeding habitat
Northern Pintail	documented				does not breed	Inadequate or unsuitable breeding habitat
Green-winged Teal	documented				does not breed	Inadequate or unsuitable breeding habitat
Ruddy Duck	expected				does not breed	Inadequate or unsuitable breeding habitat
Greater Sage-Grouse	expected				does not breed	extirpated from region
Eared Grebe	expected				does not breed	Inadequate or unsuitable breeding habitat
Western Grebe	expected				does not breed	Inadequate or unsuitable breeding habitat
American White Pelican	expected				does not breed	Inadequate or unsuitable breeding habitat
American Bittern	expected				does not breed	Inadequate or unsuitable breeding habitat
Snowy Egret	expected				does not breed	peripheral in region
Green Heron	documented				does not breed	does not breed in region
White-faced Ibis	expected				does not breed	habitat in park unsuitable for breeding; no known colonies in area
Sharp-shinned Hawk	expected				does not breed	generally requires coniferous forest for nesting; park lies outside of breeding range
Semipalmated Plover	documented				does not breed	park lies outside of breeding range
Black-necked Stilt	documented				does not breed	peripheral in region; not likely to breed; no suitable habitat in park
American Avocet	expected				does not breed	not likely to breed in park, inadequate or unsuitable breeding habitat; peripheral in region
Willet	expected				does not breed	not likely to breed in park, inadequate or unsuitable breeding habitat; peripheral in region
Western Screech-Owl	documented				does not breed	park lies outside of breeding range
Common Poorwill	expected				does not breed	Inadequate or unsuitable breeding habitat in park
Olive-sided Flycatcher	documented				does not breed	requires montane forest
Plumbeous Vireo	expected				does not breed	park lies outside of breeding range
Gray Jay	expected				does not breed	park lies outside of breeding range
Steller's Jay	documented				does not breed	park lies outside of breeding range
Mountain Chickadee	expected				does not breed	park lies outside of breeding range
Juniper Titmouse	documented				does not breed	park lies outside of breeding range
Red-breasted Nuthatch	expected				does not breed	park lies outside of breeding range

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Pygmy Nuthatch	expected				does not breed	park lies outside of breeding range
Brown Creeper	documented				does not breed	park lies outside of breeding range
Rock Wren	documented				does not breed	breeds nearby (Bedlam Trail Ruts unit); not likely to breed in park due to lack of habitat (rocky slopes)
Canyon Wren	expected				does not breed	inadequate or unsuitable breeding habitat in park
Blue-gray Gnatcatcher	expected				does not breed	breeds regionally, but inadequate or unsuitable breeding habitat in park
Western Bluebird	expected				does not breed	park lies outside of breeding range
Mountain Bluebird	expected				does not breed	prefers higher elevations
Townsend's Solitaire	expected				does not breed	park lies outside of breeding range
Veery	expected				does not breed	park lies outside of breeding range
Swainson's Thrush	expected				does not breed	park lies outside of breeding range
Sage Thrasher	documented				does not breed	inadequate or unsuitable habitat in park
Yellow-rumped Warbler	expected				does not breed	park lies outside of breeding range
American Redstart	expected				does not breed	inadequate or unsuitable habitat in park, peripheral in region
Ovenbird	expected				does not breed	inadequate or unsuitable habitat in park, peripheral in region
MacGillivray's Warbler	documented				does not breed	park lies outside of breeding range
Scarlet Tanager	expected				does not breed	park lies outside of breeding range
Western Tanager	documented				does not breed	inadequate or unsuitable breeding habitat in park
Green-tailed Towhee	expected				does not breed	inadequate or unsuitable breeding habitat in park
Clay-colored Sparrow	expected				does not breed	park lies outside of breeding range
Field Sparrow	expected				does not breed	peripheral in region
Fox Sparrow	expected				does not breed	park lies outside of breeding range
Lincoln's Sparrow	expected				does not breed	park lies outside of breeding range
Harris's Sparrow	expected				does not breed	park lies outside of breeding range
White-crowned Sparrow	documented				does not breed	park lies outside of breeding range
Dark-eyed Junco	documented				does not breed	park lies outside of breeding range
Red Crossbill	expected	X			does not breed	observed at Bedlam Trail Ruts unit, probably as a post-breeder; not likely to breed in the park; no suitable habitat
Pine Siskin				X	does not breed	probably a post-breeder; not likely to breed in park; no suitable habitat

Monitoring

A transect with 15 point counts was established in 2002 in low-elevation riparian forest, starting near the old iron bridge in the northeast corner of the park and heading south along the west side of the North Platte River, and then west along the north side of the Laramie River. In 2003, this transect was modified slightly to better sample the riparian habitat by crossing the bridge over the Laramie River and finishing the transect on the south side of the river, west of the county road (Figure 1). Each year, all 15 counts along the transect were conducted on the second day of each park visit.

RMBO staff recorded between 268 and 499 birds annually of 55 species on the point transect over the three years (Table 1.2). The large fluctuation in total

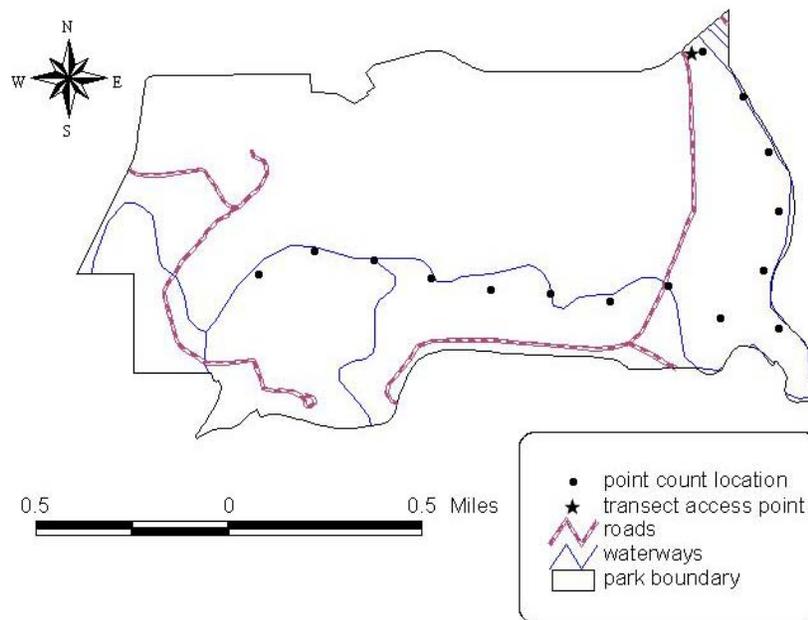


Figure 1. Location of bird monitoring point transect in riparian forest at Fort Laramie National Historic Site, Wyoming.

number of birds observed is due in part to large numbers of Cliff Swallows detected in some years.

Of the 55 species detected, seven were observed frequently enough to generate density estimates for trend monitoring (Table 1.3). Coefficients of variation for each annual estimate for all seven species were within acceptable limits (<59%) for meeting the stated monitoring targets assuming annual sampling (Hanni and Panjabi 2004), and thus these seven species should be effectively monitored using the current point transect. While no species have statistically discernible trends at this time, estimated densities of some species changed unidirectionally over the three years. House Wrens decreased from a high of 3.42 birds/ha in 2002 to 1.64 birds/ha in 2004. Yellow Warblers increased from a low of .47 birds/ha in 2002 to .83 birds/ha in 2004.

A promising index for monitoring the overall health of the avifauna at Fort Laramie is the average annual density of all species combined. This estimate had a coefficient of less than 10% each year, suggesting that trends should be discernable within 10 years (Hanni and Panjabi 2004). Average densities of all birds in the riparian woodland at Fort Union ranged from 8.96 to 9.44 birds per hectare, suggesting relative stability in the overall size of the riparian bird community at Fort Laramie.

Table 1.2. Abundance of breeding bird species recorded on a point transect in riparian forest at Fort Laramie National Historic Site, Wyoming, 2002-2004.

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Wood Duck	1	1		2	0.07	0.07		0.04
Mallard		1		1		0.07		0.02
Common Merganser	4		2	6	0.27		0.13	0.13
Ring-necked Pheasant	2	1		3	0.13	0.07		0.07
Wild Turkey	2			2	0.13			0.04
Double-crested Cormorant	1		1	2	0.07		0.07	0.04
Great Blue Heron		3	1	4		0.20	0.07	0.09
Red-tailed Hawk		3	2	5		0.20	0.13	0.11
American Kestrel	3			3	0.20			0.07
Killdeer	1	2	6	9	0.07	0.13	0.40	0.20
Spotted Sandpiper	1	4	3	8	0.07	0.27	0.20	0.18
Rock Pigeon	1	8	24	33	0.07	0.53	1.60	0.73
Eurasian Collared-Dove		1		1		0.07		0.02
Mourning Dove	22	13	20	55	1.47	0.87	1.33	1.22
Common Nighthawk	2		2	4	0.13		0.13	0.09
Belted Kingfisher	1	1	2	4	0.07	0.07	0.13	0.09
Red-headed Woodpecker	1	10	5	16	0.07	0.67	0.33	0.36
Downy Woodpecker	4	3	6	13	0.27	0.20	0.40	0.29
Hairy Woodpecker		1		1		0.07		0.02
Northern Flicker	4	1	8	13	0.27	0.07	0.53	0.29
Unidentified Woopecker	1			1	0.07			0.02
Western Wood-Pewee	8	12	13	33	0.53	0.80	0.87	0.73
Western Kingbird	7	4	8	19	0.47	0.27	0.53	0.42
Eastern Kingbird	13	16	9	38	0.87	1.07	0.60	0.84
Warbling Vireo	3	11	6	20	0.20	0.73	0.40	0.44
Blue Jay	3	7	8	18	0.20	0.47	0.53	0.40
Black-billed Magpie	1		1	2	0.07		0.07	0.04
American Crow	1	3	1	5	0.07	0.20	0.07	0.11
Northern Rough-winged Swallow			3	3			0.20	0.07
Cliff Swallow	4	221	110	335	0.27	14.73	7.33	7.44
Barn Swallow	2			2	0.13			0.04
Black-capped Chickadee	3	3		6	0.20	0.20		0.13
White-breasted Nuthatch	2		2	4	0.13		0.13	0.09
Rock Wren	1			1	0.07			0.02
House Wren	46	41	22	109	3.07	2.73	1.47	2.42
Eastern Bluebird		1		1		0.07		0.02
American Robin		4	5	9		0.27	0.33	0.20
Brown Thrasher	3		3	6	0.20		0.20	0.13
European Starling	15	2	5	22	1.00	0.13	0.33	0.49
Cedar Waxwing	2	4	2	8	0.13	0.27	0.13	0.18

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Yellow Warbler	17	22	30	69	1.13	1.47	2.00	1.53
Common Yellowthroat	3	5	11	19	0.20	0.33	0.73	0.42
Yellow-breasted Chat	4	4	8	16	0.27	0.27	0.53	0.36
Spotted Towhee	2		1	3	0.13		0.07	0.07
Lark Sparrow	4	1	7	12	0.27	0.07	0.47	0.27
Song Sparrow	1	2	1	4	0.07	0.13	0.07	0.09
Black-headed Grosbeak	1	8	5	14	0.07	0.53	0.33	0.31
Blue Grosbeak	2	4	4	10	0.13	0.27	0.27	0.22
Lazuli Bunting			4	4			0.27	0.09
Red-winged Blackbird	9	11	6	26	0.60	0.73	0.40	0.58
Western Meadowlark	13	14	7	34	0.87	0.93	0.47	0.76
Common Grackle	11	12	25	48	0.73	0.80	1.67	1.07
Brown-headed Cowbird	1	5	1	7	0.07	0.33	0.07	0.16
Orchard Oriole	21	10	15	46	1.40	0.67	1.00	1.02
Bullock's Oriole	9	17	8	34	0.60	1.13	0.53	0.76
American Goldfinch	5	2	7	14	0.33	0.13	0.47	0.31
All birds	268	499	420	1187	17.87	33.27	28.00	26.38

Table 1.3. Estimated annual densities of breeding birds in a riparian woodland at Fort Laramie National Historic Site, Wyoming, 2002-2004.

Common Name	Year	D	LCL	UCL	%CV	df
Mourning Dove	2002	0.62	0.37	1.05	27	51
	2003	0.36	0.19	0.67	33	51
	2004	0.59	0.35	1.01	27	51
Eastern Kingbird	2002	0.40	0.22	0.73	30	36
	2003	0.53	0.32	0.90	26	36
	2004	0.30	0.15	0.59	34	36
House Wren	2002	3.42	2.20	5.32	23	105
	2003	2.97	1.89	4.69	23	105
	2004	1.64	0.96	2.79	27	105
Yellow Warbler	2002	0.47	0.28	0.79	26	67
	2003	0.61	0.38	0.97	24	67
	2004	0.83	0.55	1.25	21	67
Common Grackle	2002	1.07	0.51	2.24	38	47
	2003	0.95	0.44	2.06	40	47
	2004	1.43	0.73	2.79	34	47
Orchard Oriole	2002	0.52	0.32	0.84	24	44
	2003	0.26	0.13	0.49	33	44
	2004	0.39	0.22	0.67	28	44
Bullock's Oriole	2002	0.50	0.24	1.07	38	29
	2003	0.78	0.41	1.49	32	29
	2004	0.45	0.20	0.98	40	29

Common Name	Year	D	LCL	UCL	%CV	df
All birds	2002	8.96	7.57	10.60	9	842
	2003	9.40	7.96	11.10	8	842
	2004	9.44	8.00	11.14	8	842

D=Estimated density (birds/ha); LCL=Lower 95% confidence limit; UCL=Upper 95% confidence limit; %CV=Coefficient of variation; df= degrees of freedom

Discussion and recommendations

Despite the small size of Fort Laramie NHS, a high number of probable breeding bird species was recorded, largely due to the extensive and generally good condition of the riparian habitats within the park. The riparian corridor, with its variety of vegetation types and other habitats, including willow shrublands, early- to late-successional cottonwood-willow forest, emergent wetlands, shores and sandbars, and the open river, should be recognized as the primary habitat component in the park that supports the greatest variety and abundance of birds and other wildlife. Careful management and monitoring of this area should allow for the continued maintenance of the habitats and species found within.

A few potential management issues are worth noting. In a few areas of the riparian woodland, understory vegetation is notably absent, probably due to a lack of periodic flooding which would normally scour and soak the ground, providing conditions needed for regeneration of cottonwoods and other woody riparian plants. However, ensuring proper regeneration of cottonwoods and willows through alternative techniques in the absence of flooding will be essential to maintaining a diverse and healthy riparian system, and avifauna, at Fort Laramie over time. Another issue that could be problematic for birds, ironically, is the removal of non-native woody vegetation from the riparian corridor, particularly Russian olive (*Eleagnus angustifolia*). In some places, Russian olive provides the dominant understory vegetative structure and is thus used by many bird species for nesting, foraging, perching, and protective cover. While the removal of non-native vegetation is commendable, and should continue, it should also be kept in mind that Russian olive currently supports many of the riparian songbirds. When removed, the habitat for these species is eliminated, and populations will diminish. In order to maintain songbird populations during riparian restoration, Russian olive removal should be done slowly over time, so as to allow for regeneration of desirable native vegetation in its place, and not create a significant net loss of habitat in the short term.

Fort Laramie National Historic Site hosts some noteworthy species of birds in the area. A local concentration of Red-headed Woodpeckers breeds in the park, especially in the areas of mature and dying cottonwoods. This species has lost more than 50% of its global population over the last 30 years and is included on the list of Birds of Conservation Concern (USFWS 2002) and the Partners In Flight (PIF) Continental Watch List (Rich et al. 2004.). The species is presently fairly common in the park, but management activities that affect the availability

and recruitment of large snags could impact this species. The park has also hosted Eastern Bluebirds, a fairly rare species in southeast Wyoming. Red-tailed Hawks and American Kestrels also nest within the park.

Devil's Tower National Monument

Inventory

Devil's Tower was listed as having 83 *documented* breeding bird species, with another 26 species *expected* (National Park Service 2002). Subsequent review of this list by the author found that 4 species were listed as both expected and documented.

RMBO staff detected a total of 65 bird species at Devil's Tower (Table 2.1) during three visits to the park (15-16 June, 2002; 28-29 May, 2003; 26-27 May, 2004). RMBO confirmed the presence of 6 (23%) of the 26 *expected* species, reconfirmed the presence of 61 (73%) of the 83 *documented* species, and documented the presence of 2 additional species that were not listed as either *expected* or *documented*. While these percentages may seem low, some of the previously documented species, such as Osprey and Great Blue Heron, among others, are rare and local breeders in the region that probably use the park only occasionally, while others such as Blackpoll Warbler, Rose-breasted Grosbeak, and Clay-colored Sparrow were likely documented outside of the breeding season. It is also possible that some of the previously documented species, such as Wood Duck and Common Merganser, may have formerly bred in or near the park, but no longer do so today.

Similarly, some of the *expected* species probably should not be expected to breed in or near the park, as they are either very rare breeders in the region, or the park lacks appropriate habitat for these species (Table 2.1). Nonetheless, it is possible that some of these species could occur in the park on occasion during the breeding season, although they are highly unlikely to breed there. Of the 20 *expected* species that were not documented during the inventory, 10 species (Sharp-tailed Grouse, Sharp-shinned Hawk, Golden Eagle, Long-eared Owl, Lewis's Woodpecker, Loggerhead Shrike, Clark's Nutcracker, Eastern Bluebird, Cassin's Finch, and House Finch) could possibly summer in or near the park in the future, although this possibility should not necessarily be expected. The other 10 *expected* species on this list (Blue-winged Teal, Spotted Sandpiper, Black-billed Cuckoo, Horned Lark, Swainson's Thrush, American Redstart, MacGillivray's Warbler, Common Yellowthroat, Yellow-breasted Chat, and Grasshopper Sparrow) are highly unlikely to summer in or near the park, primarily because they are riparian or grassland habitat specialists, and the those habitats in the park are not presently suitable for these species. However, some could occur as transients during migration.

Of the 22 *documented* species that were not observed during the inventories, one, Great Horned Owl, almost certainly does occur regularly in the park during breeding. Fifteen others (Great Blue Heron, Osprey, Cooper's Hawk, Eastern Screech-Owl, Belted Kingfisher, Black-backed Woodpecker, Say's Phoebe, Gray Jay, Black-billed Magpie, Tree Swallow, Northern Rough-winged Swallow, Lazuli Bunting, Indigo Bunting, Brewer's Blackbird, and House Sparrow) may have occurred in the past and are possible in the future, but they were not observed during any of the inventories over the three-year period, and are therefore probably not breeding in or near the park at present. Four species (Wood Duck, Common Merganser, Common Raven, and Rose-breasted Grosbeak) are unlikely to occur at present for either habitat- or distribution-related reasons, although if adequate documentation of past breeding exists, this designation could be reconsidered. Two species, Blackpoll Warbler and Clay-colored Sparrow do not breed in the region, and were probably documented during migration rather than during the breeding season.

Most areas in the park were searched for the inventory, including the burned and unburned pine forests and forest openings surrounding the tower, the rock face of the tower itself, the oak woodlands in the southwest and western portions of the park, the riparian area from north of the entrance road to where it exits the park in the southwest, the grasslands and prairie dog town in the southeast, and the upland meadows in the northwest corner of the park. Good weather provided favorable conditions during all site visits.

Table 2.1. Results of breeding bird inventories at Devil's Tower National Monument, Wyoming, 2002-2004.

Common Name	NPS I&M status	Year Documented			RMBO status	comments
		2002	2003	2004		
Canada Goose	documented		X	X	confirmed	uncommon; riparian
Mallard	documented		X		confirmed	uncommon; may breed along river in some years
Wild Turkey	documented		X	X	confirmed	uncommon; pine forest and clearings
Turkey Vulture	documented	X	X	X	confirmed	common; generalist
Northern Goshawk	documented		X		confirmed	uncommon; pine forest
Red-tailed Hawk	documented		X	X	confirmed	uncommon; generalist
American Kestrel	documented		X	X	confirmed	uncommon; meadows and grasslands
Prairie Falcon	documented			X	confirmed	uncommon; tower, grasslands
Killdeer	documented		X		confirmed	uncommon; meadows and grasslands, river
Rock Pigeon	documented	X	X	X	confirmed	common; tower
Mourning Dove	documented	X	X	X	confirmed	common; generalist
Northern Saw-whet Owl	expected	X			confirmed	uncommon; pine forest
Common Nighthawk	documented	X		X	confirmed	fairly common; generalist
Common Poorwill	expected		X		confirmed	uncommon; pine forest and shrublands
White-throated Swift	documented	X	X	X	confirmed	common; tower
Red-headed Woodpecker	documented	X	X		confirmed	fairly common (usually), but could not be found in 2004

Common Name	NPS I&M status	Year Documented			RMBO status	comments
		2002	2003	2004		
Downy Woodpecker	documented		X	X	confirmed	uncommon; oak woodlands, cottonwood riparian
Hairy Woodpecker	documented	X	X	X	confirmed	uncommon; pine forest, cottonwood riparian, oak woodland
Northern Flicker	documented	X	X	X	confirmed	fairly common; generalist
Western Wood-Pewee	documented	X	X	X	confirmed	common; pine forest
Least Flycatcher	not listed			X	confirmed	uncommon; oak woodlands
Dusky Flycatcher	expected			X	confirmed	rare; aspen groves in pine forest
Western Kingbird	documented	X	X	X	confirmed	fairly common; cottonwood riparian, meadows and grasslands
Eastern Kingbird	documented		X	X	confirmed	common; riparian, meadows and grassland
Plumbeous Vireo	documented	X	X	X	confirmed	common, pine forest
Warbling Vireo	documented	X	X	X	confirmed	fairly common; aspen groves, cottonwood riparian
Red-eyed Vireo	documented	X		X	confirmed	fairly common; oak woodlands
Blue Jay	documented	X	X	X	confirmed	uncommon; generalist
Pinyon Jay	documented			X	confirmed	uncommon and sporadic; pine forest
American Crow	documented	X	X	X	confirmed	uncommon; generalist
Violet-green Swallow	documented		X	X	confirmed	common; pine forest and meadows, esp. around cliffs
Cliff Swallow	documented	X	X	X	confirmed	common; river, meadows, and around cliffs
Barn Swallow	documented	X	X	X	confirmed	uncommon; meadows and grasslands
Black-capped Chickadee	documented	X	X	X	confirmed	common; pine forest, oak woodlands, riparian
Red-breasted Nuthatch	documented	X	X	X	confirmed	common; pine forest
White-breasted Nuthatch	documented		X	X	confirmed	common; pine forest
Brown Creeper	documented	X	X	X	confirmed	uncommon; pine forest
Rock Wren	documented	X	X	X	confirmed	common; rocky hillsides
Canyon Wren	documented			X	confirmed	fairly common; tower, cliffs
House Wren	documented	X	X	X	confirmed	common; oak woodlands, woody draws, open areas
Mountain Bluebird	documented		X	X	confirmed	fairly common; meadows and grasslands
Townsend's Solitaire	documented	X	X	X	confirmed	fairly common; pine forest
American Robin	documented	X	X	X	confirmed	common; generalist
Gray Catbird	not listed		X		confirmed	rare, occasional; oak woodlands, woody draws
Brown Thrasher	documented	X			confirmed	rare; oak woodlands, woody draws
European Starling	documented	X	X	X	confirmed	common; cottonwood riparian
Cedar Waxwing	documented	X	X	X	confirmed	uncommon; oak woodlands
Yellow Warbler	documented	X	X	X	confirmed	common; cottonwood riparian and oak woodlands
Yellow-rumped Warbler	documented	X	X	X	confirmed	common; pine forest
Ovenbird	documented		X	X	confirmed	uncommon; oak woodlands
Western Tanager	documented		X	X	confirmed	common; pine forest
Spotted Towhee	documented	X	X	X	confirmed	fairly common; woody draws
Chipping Sparrow	documented	X	X	X	confirmed	common; pine forest
Vesper Sparrow	expected			X	confirmed	uncommon; meadows and grasslands
Lark Sparrow	expected	X	X	X	confirmed	common; meadows and grasslands,

Common Name	NPS I&M status	Year Documented			RMBO status	comments
		2002	2003	2004		
						woody draws, pine forest edge
Dark-eyed Junco	documented	X	X	X	confirmed	fairly common; pine forest
Black-headed Grosbeak	documented	X	X	X	confirmed	fairly common; oak woodlands
Red-winged Blackbird	expected	X	X	X	confirmed	uncommon; riparian
Western Meadowlark	documented	X	X	X	confirmed	fairly common; meadows and grasslands
Common Grackle	documented	X	X	X	confirmed	common; generalist
Brown-headed Cowbird	documented	X	X	X	confirmed	common; generalist
Bullock's Oriole	documented	X	X	X	confirmed	common; cottonwood riparian
Red Crossbill	documented		X	X	confirmed	fairly common, seasonally; pine forest
Pine Siskin	documented	X	X		confirmed	fairly common, but sporadic; pine forest
American Goldfinch	documented	X	X	X	confirmed	common; oak woodlands, woody draws, cottonwood riparian, pine forest
Sharp-tailed Grouse	expected				possible	possible occasional visitor in upland grasslands
Great Blue Heron	documented				possible	breeds regionally; colonial
Osprey	documented				possible	breeds regionally
Sharp-shinned Hawk	expected				possible	rare in region
Cooper's Hawk	documented				possible	rare breeder in region
Golden Eagle	expected				possible	breeds regionally
Wilson's Snipe	not listed				possible	habitat along river seems adequate, could be present in some years
Eurasian Collared-Dove	not listed				possible	invading species; likely in future
Eastern Screech-Owl	documented				possible	possible in oak woodlands, cottonwood riparian
Great Horned Owl	documented				possible	probably breeds, esp. among large cottonwoods
Long-eared Owl	expected				possible	rare in region
Belted Kingfisher	documented				possible	fairly common breeder in region
Lewis's Woodpecker	expected				possible	rare in region
Black-backed Woodpecker	documented				possible	occasional; likely present after forest fires
Say's Phoebe	documented				possible	rare breeder in region
Loggerhead Shrike	expected				possible	prefers more open landscapes
Gray Jay	documented				possible	uncommon breeder in region
Clark's Nutcracker	expected				possible	rare in region
Black-billed Magpie	documented				possible	rare resident in region
Tree Swallow	documented				possible	uncommon breeder in region
Northern Rough-winged Swallow	documented				possible	fairly common breeder in region
Eastern Bluebird	expected				possible	possible sporadic breeder, especially in burns
Lazuli Bunting	documented				possible	fairly common breeder in region
Indigo Bunting	documented				possible	rare breeder in region
Brewer's Blackbird	documented				possible	breeds in region, especially in surrounding grasslands
Cassin's Finch	expected				possible	rare in region
House Finch	expected				possible	rare in region
House Sparrow	documented				possible	fairly common breeder around human settlements in region

Common Name	NPS I&M status	Year Documented			RMBO status	comments
		2002	2003	2004		
Wood Duck	documented				unlikely	riparian habitat too degraded
Blue-winged Teal	expected				unlikely	riverine habitat marginal for nesting
Common Merganser	documented				unlikely	riparian habitat too degraded
Spotted Sandpiper	expected				unlikely	riparian habitat too degraded
Black-billed Cuckoo	expected				unlikely	rare breeder in region; riparian habitat too degraded
Common Raven	documented				unlikely	park lies outside of breeding range
Horned Lark	expected				unlikely	extent and condition of grasslands inadequate
Swainson's Thrush	expected				unlikely	generally requires spruce or dense riparian habitat for nesting
American Redstart	expected				unlikely	riparian habitat too degraded, but could be expected if restored
MacGillivray's Warbler	expected				unlikely	occurs mainly at higher elevations
Common Yellowthroat	expected				unlikely	riparian habitat too degraded, but could be expected if restored
Yellow-breasted Chat	expected				unlikely	riparian habitat too degraded, but could be expected if restored; also possible in wooded/shrubby draws
Grasshopper Sparrow	expected				unlikely	grasslands too limited and disturbed
Rose-breasted Grosbeak	documented				unlikely	very rare (accidental) breeder in region
Blackpoll Warbler	documented				does not breed	park lies outside of breeding range
Clay-colored Sparrow	documented				does not breed	park lies outside of breeding range

Monitoring

In 2002, RMBO staff established a six-point transect in ponderosa pine forest along the Tower trail. In 2003, this transect was reestablished so as to survey the pine forest at random, irrespective of roads and trails, and to extend it to 15 points. This transect starts at the northwest corner of the park and systematically covers the pine forest habitat, making frequent turns (Figure 1).

RMBO staff recorded between 104 and 209 individual birds of 42 species on the point transects during the three annual surveys (Table 2.2). The large fluctuation in the number of birds observed is a result of the reestablishment of this transect in 2003, changing it from a six-point transect to a 15-point transect.

Of the 42 species detected, three were observed frequently enough to generate density estimates for trend monitoring (Table 2.3). Coefficients of variation for each annual estimate for the three species were mostly within acceptable limits (<59%) for meeting the stated monitoring targets with annual sampling (Hanni and Panjabi 2004), although CVs fluctuated considerably between years in some species. Nonetheless, these three species will likely be effectively monitored using the current point transect. While no species have statistically discernible

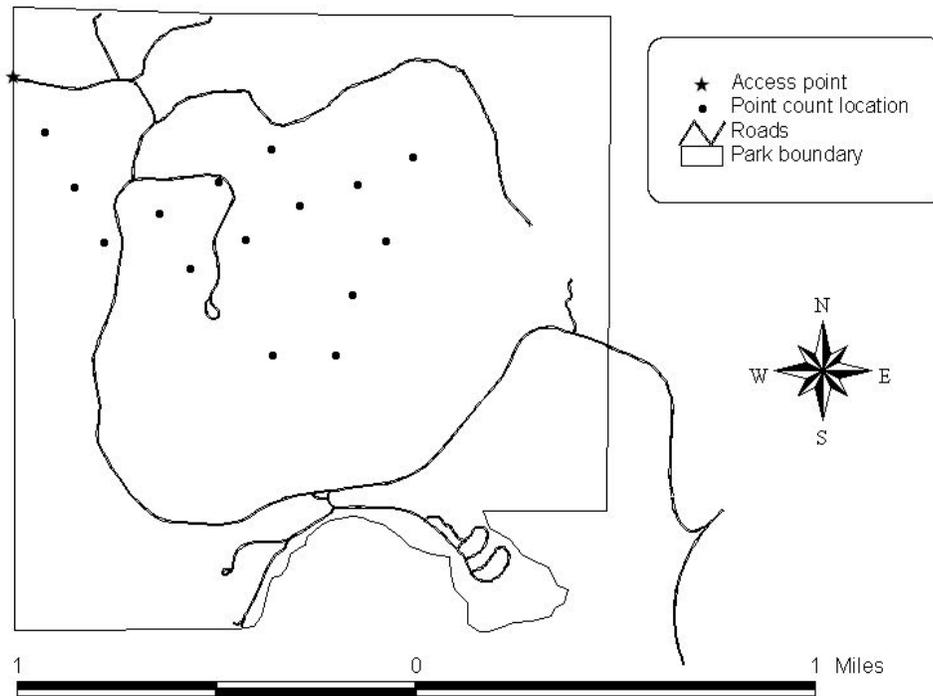


Figure 2. Location of bird monitoring point transect in ponderosa pine forest at Devil's Tower National Monument, Wyoming.

trends at this time, estimated densities for all three species increased slightly over the three years.

The average annual density of all breeding birds combined provides a promising index for monitoring the overall health of the avifauna in the ponderosa pine forest at Devil's Tower. This estimate had a coefficient 13 to 16% each year, suggesting that trends should be discernable within 12-14 years with annual sampling (Hanni and Panjabi 2004). Average densities of all birds in the ponderosa pine forest at Devil's Tower ranged from 6.48 to 8.48 birds per hectare over the three-year period.

Table 2.2. Abundance of breeding bird species recorded in ponderosa pine forest at Devil's Tower National Monument, Wyoming, 2002-2004.

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Wild Turkey		2		2		0.13		0.06
Turkey Vulture	2	2	6	10	0.33	0.13	0.40	0.28
American Kestrel			1	1			0.07	0.03
Rock Pigeon	6	3	1	10	1.00	0.20	0.07	0.28
Mourning Dove		2	4	6		0.13	0.27	0.17
White-throated Swift	35	73	7	115	5.83	4.87	0.47	3.19

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Red-headed Woodpecker		1		1		0.07		0.03
Hairy Woodpecker	1	2		3	0.17	0.13		0.08
Northern Flicker		3	3	6		0.20	0.20	0.17
Unidentified Woopecker	1			1	0.17			0.03
Western Wood-Pewee	7	6	6	19	1.17	0.40	0.40	0.53
Dusky Flycatcher			1	1			0.07	0.03
Plumbeous Vireo	2	6	12	20	0.33	0.40	0.80	0.56
Warbling Vireo	5	3	8	16	0.83	0.20	0.53	0.44
Blue Jay			4	4			0.27	0.11
Pinyon Jay			11	11			0.73	0.31
Violet-green Swallow	9	14	7	30	1.50	0.93	0.47	0.83
Black-capped Chickadee	1	4	3	8	0.17	0.27	0.20	0.22
Red-breasted Nuthatch	2	14	7	23	0.33	0.93	0.47	0.64
White-breasted Nuthatch	1	2	4	7	0.17	0.13	0.27	0.19
Brown Creeper	2	1	4	7	0.33	0.07	0.27	0.19
Rock Wren	2	3	8	13	0.33	0.20	0.53	0.36
Canyon Wren			2	2			0.13	0.06
House Wren	1	5	4	10	0.17	0.33	0.27	0.28
Mountain Bluebird		1	3	4		0.07	0.20	0.11
Townsend's Solitaire	1	5	5	11	0.17	0.33	0.33	0.31
American Robin	7	22	23	52	1.17	1.47	1.53	1.44
Yellow-rumped Warbler	4	14	16	34	0.67	0.93	1.07	0.94
Ovenbird		3	3	6		0.20	0.20	0.17
Hooded Warbler			1	1			0.07	0.03
Western Tanager	4	13	5	22	0.67	0.87	0.33	0.61
Spotted Towhee			1	1			0.07	0.03
Chipping Sparrow	2	13	14	29	0.33	0.87	0.93	0.81
Lark Sparrow			3	3			0.20	0.08
Dark-eyed Junco	5	1	3	9	0.83	0.07	0.20	0.25
Black-headed Grosbeak		2	5	7		0.13	0.33	0.19
Western Meadowlark			4	4			0.27	0.11
Brown-headed Cowbird	2	16	9	27	0.33	1.07	0.60	0.75
Bullock's Oriole			1	1			0.07	0.03
Red Crossbill			8	8			0.53	0.22
Pine Siskin	1	8		9	0.17	0.53		0.25
American Goldfinch	1		2	3	0.17		0.13	0.08
All birds	104	244	209	557	17.33	16.27	13.93	15.47

Table 2.3. Estimated annual densities of breeding birds in ponderosa pine forest at Devil's Tower National Monument, WY, 2002-2004.

Common Name	Year	D	LCL	UCL	%CV	df
American Robin	2002	1.00	0.44	2.27	43	48
	2003	1.14	0.63	2.05	30	48
	2004	1.31	0.75	2.31	29	48
Yellow-rumped Warbler	2002	0.34	0.12	0.93	53	33
	2003	0.47	0.25	0.90	32	33
	2004	0.54	0.29	1.00	31	33
Chipping Sparrow	2002	0.23	0.06	0.87	73	28
	2003	0.59	0.30	1.16	34	28
	2004	0.55	0.28	1.09	35	28
All Birds	2002	7.98	5.83	10.92	16	384
	2003	6.48	4.99	8.42	13	384
	2004	8.48	6.62	10.86	13	384

D=Estimated density (birds/ha); LCL=Lower 95% confidence limit; UCL=Upper 95% confidence limit; %CV=Coefficient of variation; df= degrees of freedom

Discussion and recommendations

The diversity of habitats at Devil's Tower, including the riparian woodlands, native grasslands, ponderosa pine forests, burned forests, rocky slopes, and steep cliffs contribute to the variety of breeding bird species in the park. One important habitat feature for birds in the park is the tower itself, which hosts large colonies of White-throated Swifts, a species on the Partners In Flight Continental Watch List (Rich et al., in prep.), and in some years, Prairie Falcons, a PIF high regional priority. However, the latter species has not been observed breeding in the park since the start of the inventory effort. The park also supports a local concentration of Red-headed Woodpeckers, a species that has lost more than half of its population in the last 30 years and is included on the Birds of Conservation Concern List (USFWS 2002) and the Partners In Flight Continental Watch List (Rich et al. 2004). This species was fairly common in the park in 2002 and 2003, but for reasons unknown, it could not be found in 2004.

Several management challenges exist at Devil's Tower that have implications for birds. Perhaps most serious is the degraded condition and lack of any regeneration in the riparian area along the Belle Fourche River. Almost no woody vegetation exists in this riparian area except for some decadent cottonwoods and a few aging box elders. A still vigorous but mature and even-aged stand of cottonwoods also exists in the campground, but it is compromised considerably by the presence of the campground within it. With the continued aging of the few remaining cottonwoods, this last vestige of riparian habitat will soon be gone from the park, and no regeneration is occurring to take its place. Restoration of riparian vegetation along the Belle Fourche is probably the single most likely management action that could increase the biodiversity at Devil's Tower, and while it will likely be a complex process, it should be feasible.

Restoration of this habitat in the park would allow for many of the *expected* species to occur at Devil's Tower that currently do not, mainly due to the lack of riparian habitat. Restoration of bottomland grasslands on the upper floodplain of the Bell Fourche would also restore a missing component of the biodiversity of the park, and could allow for the return of species such as Grasshopper Sparrow to the park.

Management of recreational climbing on the tower, and its potential impacts to nesting birds, is another major issue that deserves, and apparently receives, high management attention. However, it is troubling that despite this effort, the Prairie Falcons that nested here historically have not nested on the tower in recent years, even though it is probably one of the most attractive nest sites for this species in the area. Management consideration in regards to potential impacts from climbing should also be given to White-throated Swifts, a species that is declining range-wide and has recently been designated a high conservation priority for North America (Rich et al. 2004). Little is known about this species' sensitivity to human intrusion during the nesting period. Careful evaluation of decisions, and the decision-making process in relation to recreational climbing and nesting birds is warranted.

Ongoing management of the ponderosa pine forest at Devil's Tower also poses potential problems for some birds. The pine forest in general is in good condition, and supports high numbers of Brown Creepers, as well as a nesting pair of Northern Goshawks, both species that depend on late-successional forest conditions. Management emphasis should focus on maintaining these conditions, which are rare or uncommon across much of the rest of the Black Hills. Thinning and burning in order to reduce the risk of large-scale fires should proceed cautiously, if at all. Understory and mid-levels pines are an important habitat component for many pine forest birds, and maintenance of these features should be considered when conducting these activities. Also, it appears that the burning is providing favorable conditions for the spread of invasive noxious weeds into the forest, away from roads and trails. Leafy spurge and Canada thistle were common in burned areas, even under a continuous forest canopy. Removal of these invasive species is problematic and costly. It should also be kept in mind that the clearing of dead wood, either standing or fallen, will have negative consequences for biodiversity in the park and this practice is strongly discouraged. Dead wood stabilizes soils, sustains forest productivity, retains moisture, stores carbon, and provides nesting and foraging habitat for many species (Dudley and Vallauri 2004). Although the desire to prevent a large-scale fire is understandable, allowing natural dynamics in protected forest areas is a precondition to the conservation of biodiversity.

Fort Union Trading Post National Historic Site

Inventory

Fort Union was listed as having 102 *documented* breeding bird species, with another 47 species *expected* (National Park Service 2002). Subsequent review of this list by the author found that the number of *expected* species was actually 42, as five species were listed as both *expected* and *documented*.

RMBO staff detected a total of 90 bird species at Fort Union (Table 3.1) during three visits to the park (10-11 June, 2002; 3-4 June, 2003; 14-15 June, 2004). RMBO confirmed the presence of 21 (50%) of the 42 *expected* species, reconfirmed the presence of 65 (64%) of the 102 previously *documented* species, and confirmed the presence of four additional species not listed as either *documented* or *expected*. Although these percentages are low, some of the *documented* species were likely documented in error or were otherwise documented outside of the breeding season, and many of the *expected* species should probably not have been expected to breed in or near the park.

Of the 21 *expected* species that were not documented during the inventory, 17 species (Northern Pintail, Sharp-tailed Grouse, Black-crowned Night-Heron, Cooper's Hawk, Swainson's Hawk, Wilson's Snipe, Black Tern, Black-billed Cuckoo, Short-eared Owl, Willow Flycatcher, Say's Phoebe, Purple Martin, Marsh Wren, Eastern Bluebird, Chestnut-collared Longspur, Rose-breasted Grosbeak, and Dickcissel) are reasonably likely to summer in or near the park in the future, although they should not necessarily be expected. The other 4 *expected* species (Sharp-shinned Hawk, Common Poorwill, Baird's Sparrow, and McCown's Longspur) are not likely to summer in or near the park, primarily due to inappropriate habitat conditions. However, these species may occur as transients during migration.

Of the 37 *documented* species that were not observed during the inventories, 24 species (American Wigeon, Green-winged Teal, Gray Partridge, Greater Sage-Grouse, Pied-billed Grebe, Eared Grebe, Bald Eagle, Ferruginous Hawk, Golden Eagle, Merlin, American Coot, American Avocet, Willet, Upland Sandpiper, Long-billed Curlew, Eastern Phoebe, Loggerhead Shrike, Horned Lark, Mountain Bluebird, Brewer's Sparrow, Lark Bunting, Savannah Sparrow, Grasshopper Sparrow, and House Sparrow) conceivably could have summered in or near the park in the past, and may possibly do so again in the future. Eight other *documented* species (Canvasback, Redhead, Lesser Scaup, Ruddy Duck, American Bittern, Burrowing Owl, Rock Wren, and Sprague's Pipit) are highly unlikely to ever breed in or near the park due to lack of appropriate habitat. Five other *documented* species (Common Goldeneye, Solitary Sandpiper, Boreal Owl, Common Raven, and Bohemian Waxwing) do not breed in this region and were likely documented at some other time of year or were otherwise documented in error. Records of all *documented* species on the I&M list that were not observed

during the inventory warrant further verification by an expert before inclusion of these species on the updated list of documented breeding bird species at Fort Union Trading Post NHS.

RMBO staff searched all areas of the park, including most of the riparian woodlands and wetlands along the north side of the Missouri River, the meadows around the housing area, the mature cottonwood stand and associated shrublands on the south side of the river, the restored grassland south of the highway, and the non-native grasslands north of the highway along the trail to the Bodmer Overlook. Weather was favorable during most sites visits, but in 2002, wind and rain provided less than ideal conditions for detecting birds. Nonetheless, a large number of birds species were found during each visit, and the poor weather in 2002 probably had little effect if any, on the overall outcome of the inventory.

Table 3.1. Results of breeding bird inventories at Fort Union Trading Post National Historic Site, North Dakota, between 2002-2004.

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Canada Goose	documented	X	X		confirmed	fairly common; wetlands
Wood Duck	not listed	X	X	X	confirmed	uncommon; wetlands, river
Gadwall	documented	X	X		confirmed	uncommon; wetlands
Mallard	documented	X	X	X	confirmed	common; wetlands, river
Blue-winged Teal	documented	X	X		confirmed	common; wetlands
Northern Shoveler	documented	X			confirmed	uncommon; wetlands
Ring-necked Pheasant	documented	X	X	X	confirmed	common; grasslands, riparian woodlands
Wild Turkey	expected	X	X		confirmed	uncommon; riparian woodlands
Western Grebe	documented	X			confirmed	rare; not likely to breed in park, but may breed regionally; river
American White Pelican	documented	X	X	X	confirmed	fairly common; not likely to breed in park, but may breed regionally; wetlands, river
Double-crested Cormorant	documented	X	X		confirmed	uncommon; not likely to breed in park, but may regionally; wetlands, river
Great Blue Heron	documented		X		confirmed	uncommon; not likely to breed in park, but may regionally; wetlands, river
Turkey Vulture	documented	X	X	X	confirmed	uncommon; not likely to breed in park, but may regionally; all habitats
Northern Harrier	documented	X	X		confirmed	uncommon; not likely to breed in park, but may regionally; grasslands, wetlands
Red-tailed Hawk	documented	X	X	X	confirmed	fairly common; all habitats, esp. riparian woodlands
American Kestrel	documented	X	X	X	confirmed	fairly common; grassland, riparian woodlands
Prairie Falcon	documented	X			confirmed	uncommon; does not breed in park, but may regionally; all habitats, esp. grasslands
Sora	documented	X			confirmed	uncommon, sporadic; probably nests in park in some years; wetlands
Killdeer	documented	X	X	X	confirmed	uncommon; shores, meadows
Spotted Sandpiper	documented	X	X	X	confirmed	fairly common; shores, esp. along river
Marbled Godwit	expected		X		confirmed	rare; not likely to breed in park, but may regionally; wetlands, river
Wilson's Phalarope	expected		X		confirmed	rare; may breed in some years;

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
						wetlands, river
Franklin's Gull	expected	X		X	confirmed	uncommon; not likely to breed in park, but may regionally; wetlands, grasslands
Ring-billed Gull	documented	X			confirmed	uncommon; not likely to breed in park, but may regionally; river, wetlands
California Gull	documented	X			confirmed	uncommon; not likely to breed in park, but may regionally; river, wetlands
Caspian Tern	not listed		X		confirmed	rare, not likely to breed in park, but may regionally; river
Common Tern	expected			X	confirmed	uncommon; not likely to breed in park, but may regionally; river
Forster's Tern	expected	X		X	confirmed	uncommon; not likely to breed in park, but may regionally; river
Least Tern	expected		X	X	confirmed	uncommon; not likely to breed in park, but may regionally; river
Rock Pigeon	documented	X			confirmed	uncommon, likely breeds in surrounding area; agricultural fields
Mourning Dove	documented	X	X	X	confirmed	common; all habitats, esp. riparian woodlands
Eastern Screech-Owl	expected		X		confirmed	uncommon; riparian woodlands
Great Horned Owl	documented	X			confirmed	uncommon; riparian woodlands
Common Nighthawk	documented	X		X	confirmed	fairly common; all habitats, esp. grasslands
Belted Kingfisher	expected		X		confirmed	uncommon; river, wetlands
Red-headed Woodpecker	documented		X	X	confirmed	uncommon; riparian woodlands
Downy Woodpecker	documented	X	X	X	confirmed	uncommon; riparian woodlands
Hairy Woodpecker	documented		X		confirmed	uncommon; riparian woodlands
Northern Flicker	documented	X	X	X	confirmed	common; riparian woodlands
Western Wood-Pewee	documented			X	confirmed	rare; riparian woodlands
Least Flycatcher	documented	X	X	X	confirmed	fairly common; riparian woodlands
Western Kingbird	documented	X	X		confirmed	uncommon; grasslands, shrublands, woodland edge
Eastern Kingbird	documented	X	X	X	confirmed	common; grasslands, riparian woodlands
Warbling Vireo	documented	X	X	X	confirmed	uncommon; riparian woodlands
Red-eyed Vireo	documented	X	X	X	confirmed	common; riparian woodlands
Blue Jay	expected			X	confirmed	uncommon; riparian woodlands
Black-billed Magpie	documented	X	X	X	confirmed	fairly common; all habitats,
American Crow	documented	X	X	X	confirmed	common; all habitats
Tree Swallow	expected		X	X	confirmed	common; all habitats, esp. over river
Northern Rough-winged Swallow	expected	X			confirmed	uncommon; all habitats, esp. over river
Bank Swallow	documented		X	X	confirmed	common; all habitats, esp. over river
Cliff Swallow	documented	X	X	X	confirmed	common; all habitats, esp. over river
Barn Swallow	documented	X	X	X	confirmed	fairly common; all habitats, esp. grasslands, river
Black-capped Chickadee	documented	X	X	X	confirmed	uncommon; riparian woodlands
White-breasted Nuthatch	expected		X	X	confirmed	uncommon; riparian woodlands
House Wren	documented	X	X	X	confirmed	common; riparian woodlands
Veery	expected	X	X	X	confirmed	fairly common; riparian woodlands
American Robin	documented	X	X	X	confirmed	common; riparian woodlands
Gray Catbird	documented	X	X	X	confirmed	common; riparian woodlands
Brown Thrasher	expected		X	X	confirmed	uncommon; riparian woodlands
European Starling	documented	X	X		confirmed	fairly common; agricultural fields, grasslands, riparian woodlands
Cedar Waxwing	documented		X	X	confirmed	fairly common; riparian woodlands

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Yellow Warbler	documented	X	X	X	confirmed	common; riparian woodlands
Black-and-white Warbler	not listed	X	X	X	confirmed	fairly common; riparian woodlands
American Redstart	documented	X	X	X	confirmed	fairly common; riparian woodlands
Ovenbird	expected	X	X	X	confirmed	uncommon; riparian woodlands
Northern Waterthrush	not listed			X	confirmed	rare; riparian woodlands
Common Yellowthroat	documented	X	X	X	confirmed	common; riparian woodlands
Yellow-breasted Chat	documented	X	X	X	confirmed	fairly common; riparian woodlands
Spotted Towhee	documented	X	X	X	confirmed	fairly common; riparian woodlands
Chipping Sparrow	documented	X	X	X	confirmed	uncommon; woodland edge
Clay-colored Sparrow	documented	X	X	X	confirmed	fairly common; shrublands, grasslands
Field Sparrow	expected			X	confirmed	uncommon; woodland edge
Vesper Sparrow	documented	X	X	X	confirmed	common; grasslands, woodland edge
Lark Sparrow	documented	X	X	X	confirmed	common; shrublands, grasslands, woodland edge
Song Sparrow	documented	X	X	X	confirmed	common; riparian woodlands
Black-headed Grosbeak	expected	X	X	X	confirmed	fairly common; riparian woodlands
Lazuli Bunting	documented	X	X	X	confirmed	common; riparian woodlands
Indigo Bunting	expected			X	confirmed	rare; riparian woodlands
Bobolink	documented	X	X	X	confirmed	uncommon; grasslands
Red-winged Blackbird	documented	X	X	X	confirmed	common; wetlands
Western Meadowlark	documented	X	X	X	confirmed	common; grasslands, shrublands
Yellow-headed Blackbird	documented	X	X		confirmed	uncommon; wetlands
Brewer's Blackbird	documented	X	X	X	confirmed	uncommon; grasslands, wetlands
Common Grackle	documented	X	X	X	confirmed	common; all habitats
Brown-headed Cowbird	documented	X	X	X	confirmed	common; riparian woodlands
Orchard Oriole	expected	X		X	confirmed	uncommon; riparian woodlands
Bullock's Oriole	expected	X			confirmed	rare; riparian woodlands
Baltimore Oriole	documented		X		confirmed	rare; riparian woodlands
American Goldfinch	documented	X	X	X	confirmed	common; riparian woodlands
American Wigeon	documented				possible	possible in some years
Northern Pintail	expected				possible	possible in some years
Green-winged Teal	documented				possible	possible in some years
Gray Partridge	documented				possible	grasslands
Greater Sage-Grouse	documented				possible	extirpated from region, but possible historically; should not be considered part of the present day avifauna
Sharp-tailed Grouse	expected				possible	prefers native prairie
Pied-billed Grebe	documented				possible	possible in some years
Eared Grebe	documented				possible	possible in some years
Black-crowned Night-Heron	expected				possible	habitat in park appears suitable; likely breeds in region, but uncommon
Bald Eagle	documented				possible	unlikely to breed in park, but may breed regionally
Cooper's Hawk	expected				possible	habitat in park appears suitable; likely breeds in region, but uncommon
Swainson's Hawk	expected				possible	habitat in park appears suitable; likely breeds in region, but uncommon
Ferruginous Hawk	documented				possible	inadequate breeding habitat in park, but may breed regionally
Golden Eagle	documented				possible	unlikely to breed in park, but may breed regionally
Merlin	documented				possible	unlikely to breed in park, but may breed regionally
American Coot	documented				possible	possible in some years
American Avocet	documented				possible	inadequate or unsuitable breeding habitat

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Willet	documented				possible	inadequate or unsuitable breeding habitat
Upland Sandpiper	documented				possible	habitat marginal, prefers extensive native grasslands
Long-billed Curlew	documented				possible	breeds regionally, but habitat in park marginal
Wilson's Snipe	expected				possible	habitat in park appears suitable; likely breeds in region
Black Tern	expected				possible	not likely to breed in park, but likely breeds in region; colonial
Black-billed Cuckoo	expected				possible	habitat in park appears suitable; likely breeds in region, but uncommon
Short-eared Owl	expected				possible	habitat in park appears suitable; likely breeds in region, but uncommon to rare
Willow Flycatcher	expected				possible	habitat in park appears suitable; likely breeds in region, but uncommon
Eastern Phoebe	documented				possible	rare in region
Say's Phoebe	expected				possible	habitat in park appears suitable; likely breeds in region, but uncommon
Loggerhead Shrike	documented				possible	habitat marginal, prefers native prairie
Horned Lark	documented				possible	possible in some years
Purple Martin	expected				possible	rare in region; should not be expected
Marsh Wren	expected				possible	habitat in park is marginal; breeds in region
Eastern Bluebird	expected				possible	habitat in park appears suitable; likely breeds in region, but uncommon
Mountain Bluebird	documented				possible	possible in some years
Brewer's Sparrow	documented				possible	requires sage shrublands; could return with restoration
Lark Bunting	documented				possible	prefers shrubby grasslands; could return with restoration
Savannah Sparrow	documented				possible	grasslands
Grasshopper Sparrow	documented				possible	prefers taller grasslands
Chestnut-collared Longspur	expected				possible	prefers native prairie; could be expected around Bodmer Overlook
Rose-breasted Grosbeak	expected				possible	extremely rare in region; should not be expected
Dickcissel	expected				possible	may occur in some years
House Sparrow	documented				possible	possible around structures, could be expected
Canvasback	documented				unlikely	inadequate or unsuitable breeding habitat in park
Redhead	documented				unlikely	inadequate or unsuitable breeding habitat in park
Lesser Scaup	documented				unlikely	breeds regionally, but habitat in park marginal
Ruddy Duck	documented				unlikely	inadequate or unsuitable breeding habitat in park
American Bittern	documented				unlikely	habitat marginal, prefers more extensive marshes
Burrowing Owl	documented				unlikely	possible, but would likely require prairie dogs or other fossorial mammals to colonize first
Rock Wren	documented				unlikely	inadequate or unsuitable in the park, but likely breeds in area
Sprague's Pipit	documented				unlikely	inadequate or unsuitable breeding habitat
Baird's Sparrow	expected				unlikely	inadequate or unsuitable breeding habitat; breeds in region

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
McCown's Longspur	expected				unlikely	prefers native shortgrass prairie
Common Goldeneye	documented				does not breed	peripheral in region, habitat in park marginal
Sharp-shinned Hawk	expected				does not breed	not likely to breed in area; generally requires conifer forest
Solitary Sandpiper	documented				does not breed	park lies outside breeding range
Boreal Owl	documented				does not breed	park lies outside breeding range
Common Poorwill	expected				does not breed	inadequate or unsuitable breeding habitat in park; may breed in region
Common Raven	documented				does not breed	park lies outside breeding range
Bohemian Waxwing	documented				does not breed	park lies outside breeding range

Monitoring

A 13 point transect was established in error in the riparian woodland along the north side of the Missouri River in 2002, but later discontinued. Due to the relatively small size of this park, it was not possible to establish enough independent sampling points in this habitat to yield statistically meaningful results on individual species. However, other options do exist for monitoring birds in this small area. For example, a line transect could be conducted in this area, and could provide enough detections of some species to allow them to be monitored. Alternatively, spot mapping could be used to provide a census of all birds in the riparian woodland, or even the entire park. As a last resort, a point or line transect could be used to loosely track the status of birds over time without using statistical targets or parameters. Such data could still be useful to detect major changes in bird populations.

Discussion and recommendations

The unusually high number of breeding birds found in this small park is attributable to the high diversity and generally good condition of habitats present, including scrubby and mature willow riparian thickets, mixed riparian woodland, young and mature cottonwood stands, emergent wetlands, seasonal ponds, grasslands, meadows, and remnant sage brush shrublands. In particular, the diverse riparian vegetation types and other wetland habitats account for the presence of at least 90% of the bird species found in the park. Maintenance of these habitats should be considered the top priority for wildlife in the park, and careful management should be applied to ensure the persistence of each of these habitats and their associated species.

The Missouri River itself provides feeding habitat and a travel corridor for some unique species not found elsewhere in the park (e.g., Western Grebe, various terns, Spotted Sandpiper). However, none of the colonial waterbirds detected in the park appear to be breeding there at present.

The grasslands in the park, which include both non-native and restored grasslands, support relatively few birds at present, primarily Western Meadowlarks, and an occasional Bobolink, Vesper Sparrow, or Eastern Kingbird. Even the restored grassland area hosted only Western Meadowlarks and a Bobolink in 2004. Nonetheless, these grasslands may be important for some low-density species that use this area as part of their home range (e.g. raptors, shrikes, grouse). The quality of the restored grassland could be improved for birds, small mammals and other wildlife by also restoring the shrub component to this area. On the slope below this grassland are small remnants of sage brush shrubland, and it is likely that this shrubland extended up onto the broader floodplain prior to human settlement. If the documentation of Greater Sage-Grouse at this site in the past is indeed accurate, then this area had to support extensive sage brush, as this species is tied exclusively to this habitat. Restoration of this area to native grasses and 1-10% shrub cover will increase its attractiveness to other grassland birds such as Lark Buntings, Clay-colored Sparrows, and others, while still maintaining its suitability for the species currently found there. However, in order to restore the sage brush component to this grassland, burning as a management technique can not be applied, as sage brush does not tolerate fire.

Jewel Cave National Monument

Inventory

Jewel Cave was listed as having 41 *documented* breeding bird species, with another 20 species *expected* (National Park Service 2002).

RMBO staff detected a total of 59 bird species in Jewel Cave (Table 4.1) during three visits (24 May and July 7-8 2002; 25-26 May, 2003; 3-4 June, 2004). RMBO confirmed the presence of 12 (60%) of the 20 *expected* species, reconfirmed the presence of 33 (80%) of the 41 previously *documented* species, and confirmed the presence of 14 additional species not previously listed as either *documented* or *expected* (Table 4.1).

Of the eight *expected* species that were not documented during the inventory, three of them, Barn Swallow, Pygmy Nuthatch, and European Starling, could possibly summer in or near the park in the future, although they probably do not at present and should not necessarily be expected (Table 4.1). At present, these species are all quite rare in the surrounding forest, if present at all. The remaining five species (Ruffed Grouse, Bald Eagle, Cliff Swallow, Common Yellowthroat, and House Finch) are unlikely to occur, due either to a lack of suitable habitat in the park, or to their extreme rarity in the vicinity as breeders. However, some of these species may occur as transients during migration.

Of the 8 *documented* species that were not observed during the inventories, only one, Great Horned Owl, probably occurs regularly in the park. The other seven species (Killdeer, Lewis's Woodpecker, Clark's Nutcracker, Ruby-crowned Kinglet, Swainson's Thrush, American Redstart, and Cassin's Finch) either lack suitable habitat in the park or they are rare regional breeders that may formerly have used the park, either regularly or occasionally (Table 4.1). As a measure of prudence, records of all *documented* species on the I&M list that were not observed during the inventory warrant further verification by an expert before inclusion of these species on the updated list of documented breeding bird species at Jewel Cave National Monument.

RMBO staff searched most areas of the park, including Lithograph and Hell canyons, the visitor center area and surrounding pine forest, the burned forest north and south of Highway 16, and the sewage ponds. Snow hampered point count efforts in 2002, otherwise, weather conditions were generally favorable for detecting birds during visits to the park.

Table 4.1. Results of breeding bird inventories at Jewel Cave National Monument, South Dakota, 2002-2004.

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Mallard	not listed		X	X	confirmed	uncommon; sewage lagoon
Wild Turkey	expected			X	confirmed	fairly common; all habitats
Turkey Vulture	documented	X	X	X	confirmed	uncommon; all habitats
Sharp-shinned Hawk	expected		X		confirmed	rare; all habitats
Cooper's Hawk	expected			X	confirmed	rare; all habitats
Northern Goshawk	expected	X			confirmed	rare; all habitats
Red-tailed Hawk	documented		X		confirmed	uncommon; all habitats
American Kestrel	expected		X	X	confirmed	uncommon; all habitats
Mourning Dove	documented	X	X	X	confirmed	fairly common; all habitats
Northern Saw-whet Owl	expected	X	X	X	confirmed	fairly common; pine forest
Common Nighthawk	documented	X	X	X	confirmed	uncommon; all habitats
Common Poorwill	documented	X	X	X	confirmed	uncommon; pine forest, shrublands
White-throated Swift	documented	X	X	X	confirmed	uncommon; all habitats, esp. around cliffs
Red-headed Woodpecker	expected		X	X	confirmed	uncommon; burns
Downy Woodpecker	documented		X		confirmed	uncommon; pine forest, woody draws, burns
Hairy Woodpecker	documented	X	X	X	confirmed	common; pine forest, burns
Black-backed Woodpecker	expected	X	X	X	confirmed	uncommon; occurs primarily in recent burns, less in mature pine forest
Northern Flicker	documented	X	X	X	confirmed	common; all habitats
Western Wood-Pewee	expected	X	X	X	confirmed	common; burns, pine forest
Dusky Flycatcher	documented	X	X	X	confirmed	common; pine forest, woody draws, burns
Cordilleran Flycatcher	documented		X	X	confirmed	uncommon; woody draws
Western Kingbird	not listed		X	X	confirmed	uncommon; grasslands, forest edge
Plumbeous Vireo	documented	X	X	X	confirmed	common; pine forest, burns
Warbling Vireo	documented	X	X	X	confirmed	common; pine forest, woody draws, aspen
Gray Jay	expected			X	confirmed	uncommon; pine forest
American Crow	documented	X	X	X	confirmed	uncommon; all habitats
Violet-green Swallow	documented	X	X	X	confirmed	fairly common; all habitats

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Black-capped Chickadee	documented	X	X	X	confirmed	fairly common; pine forest, woody draws, burns
Red-breasted Nuthatch	documented	X	X	X	confirmed	common; pine forest, burns
White-breasted Nuthatch	documented	X	X	X	confirmed	uncommon; pine forest, burns
Brown Creeper	documented	X	X	X	confirmed	uncommon; pine forest
Rock Wren	not listed		X	X	confirmed	uncommon; rocky slopes
Canyon Wren	expected	X			confirmed	rare; cliffs
House Wren	documented	X	X	X	confirmed	uncommon; woody draws, burns
Eastern Bluebird	expected	X	X	X	confirmed	uncommon; burns, grasslands
Mountain Bluebird	documented	X	X	X	confirmed	fairly common; burns, grasslands
Townsend's Solitaire	documented	X	X	X	confirmed	common; pine forest, burns
American Robin	documented	X	X	X	confirmed	common; all habitats
Cedar Waxwing	not listed		X		confirmed	uncommon; woody draws
Yellow-rumped Warbler	documented	X	X	X	confirmed	common; pine forest, burns
Ovenbird	documented	X	X	X	confirmed	uncommon; pine forest, woody draws
MacGillivray's Warbler	documented	X	X	X	confirmed	uncommon; woody draws
Yellow-breasted Chat	not listed			X	confirmed	rare; woody draws
Western Tanager	documented	X	X	X	confirmed	fairly common; pine forest, burns
Spotted Towhee	not listed		X	X	confirmed	uncommon; woody draws, shrublands
Chipping Sparrow	documented	X	X	X	confirmed	common; all habitats
Field Sparrow	not listed	X			confirmed	rare; burns, grasslands
Vesper Sparrow	not listed	X	X	X	confirmed	uncommon; grasslands, forest edge, burns
Lark Sparrow	not listed	X			confirmed	uncommon; shrublands, forest edge
Dark-eyed Junco	documented	X	X	X	confirmed	common; all habitats
Lazuli Bunting	not listed			X	confirmed	uncommon; burns, woody draws, shrublands
Indigo Bunting	not listed	X			confirmed	rare, sporadic; burns, woody draws
Red-winged Blackbird	documented		X		confirmed	uncommon; sewage lagoon
Western Meadowlark	not listed			X	confirmed	uncommon; grasslands, burns
Brewer's Blackbird	not listed	X			confirmed	uncommon; grasslands
Brown-headed Cowbird	documented	X	X	X	confirmed	common; all habitats
Red Crossbill	documented	X		X	confirmed	sporadic, abundant in some years, uncommon in others; pine forest, burns
Pine Siskin	documented	X	X	X	confirmed	fairly common, somewhat sporadic; pine forest, burns
American Goldfinch	not listed	X	X	X	confirmed	fairly common; all habitats
Killdeer	documented				possible	breeding habitat marginal; prefers wetlands
Great Horned Owl	documented				possible	probably breeds in area
Lewis's Woodpecker	documented				possible	may occur occasionally; could be expected in as Jasper Burn ages
Clark's Nutcracker	documented				possible	may occur occasionally, but likely doesn't breed in park; presumably breeds in area
Barn Swallow	expected				possible	could breed in future years
Pygmy Nuthatch	expected				possible	very rare in Black Hills
European Starling	expected				possible	could be expected in future years
Cassin's Finch	documented				possible	may occur occasionally, but likely doesn't breed in park at present; breeds in surrounding area
Ruffed Grouse	expected				unlikely	generally requires significant aspen stands
Bald Eagle	expected				unlikely	does not breed in Black Hills; rare and local breeder on plains
Cliff Swallow	expected				unlikely	colonial; prefers lower elevations in Black Hills

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Ruby-crowned Kinglet	documented				unlikely	inadequate or unsuitable breeding habitat; generally requires spruce
Swainson's Thrush	documented	X			unlikely	inadequate or unsuitable breeding habitat; generally requires spruce; observed as migrant only
American Redstart	documented				unlikely	rare in southern Black Hills; generally requires dense riparian habitat
Common Yellowthroat	expected				unlikely	generally requires riparian or wetland habitats
House Finch	expected				unlikely	rare throughout Black Hills except at low elevations

Monitoring

A point transect was established in burned ponderosa pine forest in 2002, but was terminated early after only 10 point counts due to snow. In 2003, this transect was extended to the present 15 points, which were repeated in 2004. The transect starts near the south entrance to the park on Lithograph Canyon Road (278 Rd) and heads northward, crosses Highway 16, turns east just before the northern boundary, and then turns south just before the eastern boundary and again crosses Highway 16 (Figure 3).

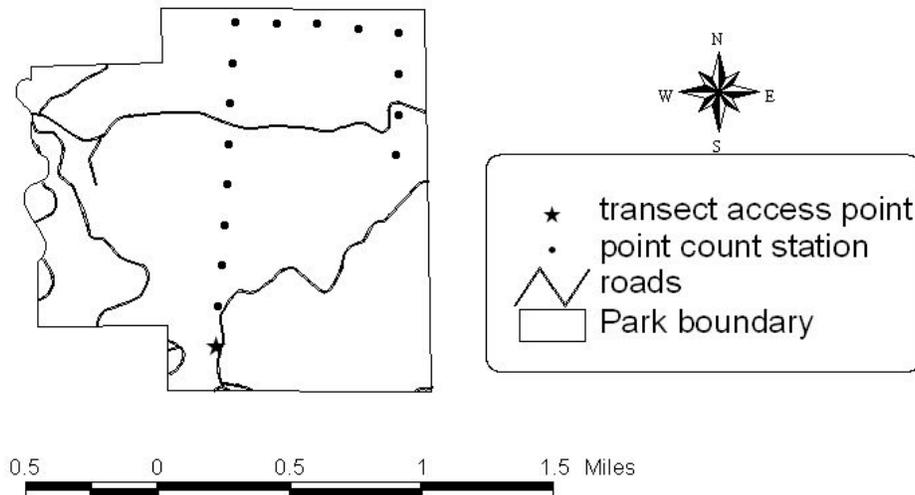


Figure 3. Location of bird monitoring point transect in burned ponderosa pine forest in Jewel Cave National Monument, South Dakota.

RMBO staff recorded between 127 and 204 individual birds of 36 species on the point transects during the three annual surveys (Table 4.2). The considerable variation in the total number of birds observed is due at least in part to the early

termination of the transect in 2002 and its subsequent extension to a 15-point transect in 2003.

Of the 36 species detected, four species, Dusky Flycatcher, American Robin, Yellow-rumped Warbler, and Chipping Sparrow, were observed frequently enough to generate density estimates for trend monitoring (Table 4.3). Coefficients of variation for each annual estimate for the four species were mostly within acceptable limits (<59%) for meeting the stated monitoring targets with annual sampling (Hanni and Panjabi 2004), although CVs fluctuated considerably between years in some species. Nonetheless, these four species will likely be effectively monitored using the current point transect. While no species have statistically discernible trends at this time, estimated densities for two species, Dusky Flycatcher and Chipping Sparrow, increased considerably over the three years, suggesting probable population increases in these species. Such trends would be consistent with these species current trends elsewhere in the Jasper burn area (Panjabi 2005).

The average annual density of all breeding birds combined provides a promising index for monitoring the overall health of the avifauna in the burned ponderosa pine forest at Jewel Cave. This estimate had a coefficient 8 to 12% each year, suggesting that trends should be discernable within approximately 10 years, given annual sampling (Hanni and Panjabi 2004). Average densities of all birds in the burned forest at Jewel Cave ranged from 3.67 to 6.17 birds/ha over the three year period, suggesting a considerable increase in the overall bird community in this part of Jewel Cave. It is worthwhile to note that the combined density of birds in this burned ponderosa pine forest in Jewel Cave is equal to or greater than that in similar unburned forests in other parks in the Black Hills.

Table 4.2. Abundance of breeding bird species recorded in burned ponderosa pine forest at Jewel Cave National Monument, South Dakota, 2002-2004.

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Turkey Vulture		2		2		0.13		0.05
Mourning Dove		2	3	5		0.13	0.20	0.13
White-throated Swift			1	1			0.07	0.03
Hairy Woodpecker	2	9	9	20	0.20	0.60	0.60	0.50
Black-backed Woodpecker	2	12	4	18	0.20	0.80	0.27	0.45
Northern Flicker		2	2	4		0.13	0.13	0.10
Western Wood-Pewee		5	10	15		0.33	0.67	0.38
Dusky Flycatcher	4	15	19	38	0.40	1.00	1.27	0.95
Cordilleran Flycatcher		1	1	2		0.07	0.07	0.05
Plumbeous Vireo	2	11	9	22	0.20	0.73	0.60	0.55
Warbling Vireo		8	8	16		0.53	0.53	0.40
Gray Jay			2	2			0.13	0.05
American Crow		2	2	4		0.13	0.13	0.10
Violet-green Swallow		4	4	8		0.27	0.27	0.20

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Black-capped Chickadee	4	2	4	10	0.40	0.13	0.27	0.25
Red-breasted Nuthatch	10	7	6	23	1.00	0.47	0.40	0.58
White-breasted Nuthatch	4		3	7	0.40		0.20	0.18
Brown Creeper		1	3	4		0.07	0.20	0.10
Rock Wren			1	1			0.07	0.03
Mountain Bluebird		1	1	2		0.07	0.07	0.05
Townsend's Solitaire		1	10	11		0.07	0.67	0.28
Swainson's Thrush	1			1	0.10			0.03
American Robin	9	22	9	40	0.90	1.47	0.60	1.00
Cedar Waxwing		1		1		0.07		0.03
Yellow-rumped Warbler	8	18	10	36	0.80	1.20	0.67	0.90
Ovenbird	4	8	6	18	0.40	0.53	0.40	0.45
MacGillivray's Warbler		2	2	4		0.13	0.13	0.10
Western Tanager		13	11	24		0.87	0.73	0.60
Spotted Towhee			1	1			0.07	0.03
Chipping Sparrow	3	22	22	47	0.30	1.47	1.47	1.18
Dark-eyed Junco	3	9	13	25	0.30	0.60	0.87	0.63
Red-winged Blackbird		1		1		0.07		0.03
Brown-headed Cowbird	3	15	11	29	0.30	1.00	0.73	0.73
Red Crossbill	68		13	81	6.80		0.87	2.03
Pine Siskin		4		4		0.27		0.10
American Goldfinch		4	1	5		0.27	0.07	0.13
All birds	127	204	201	532	12.7	13.6	13.4	13.3

Table 4.3. Estimated annual densities of breeding birds in burned ponderosa pine forest at Jewel Cave National Monument, South Dakota, 2002-2004.

Common Name	Year	D	LCL	UCL	%CV	df
Dusky Flycatcher	2002	0.18	0.07	0.48	51	37
	2003	0.46	0.27	0.79	27	37
	2004	0.58	0.35	0.95	25	37
American Robin	2002	0.31	0.16	0.63	36	38
	2003	0.51	0.31	0.84	25	38
	2004	0.21	0.10	0.42	36	38
Yellow-rumped Warbler	2002	0.27	0.13	0.57	39	34
	2003	0.46	0.28	0.76	25	34
	2004	0.26	0.13	0.49	33	34
Chipping Sparrow	2002	0.29	0.08	1.10	73	39
	2003	1.86	1.04	3.33	29	39
	2004	1.76	0.97	3.18	30	39
All birds	2002	3.67	2.88	4.67	12	553
	2003	6.17	5.23	7.27	8	553
	2004	6.13	5.20	7.23	8	553

D=Estimated density (birds/ha); LCL=Lower 95% confidence limit; UCL=Upper 95% confidence limit; %CV=Coefficient of variation; df= degrees of freedom

Discussion and recommendations

Jewel Cave supports a rich and varied avifauna that is surprisingly diverse given the relatively few habitat types present in the park. The current dominant habitat (as of the fall of 2000 when the Jasper Fire burned almost 85,000 acres in the Black Hills) is burned ponderosa pine forest. However, this burned area is interspersed with patches of unburned pine, open meadows, woody draws, and cliffs. Broad-leaved, deciduous vegetation is limited, and occurs primarily in a short stretch of Lithograph Canyon, and locally in Hell Canyon and some smaller canyons. The sewage ponds are the only source of permanent water in the park. The patchwork of burned and unburned ponderosa pine forest has created habitat for a suite of species that probably were less common or absent in the park prior to the fire. These include birds such as the Black-backed Woodpecker, Red-headed Woodpecker, Eastern Bluebird and Mountain Bluebird, as well as other open-country birds such as Indigo Bunting, Vesper Sparrow and Field Sparrow.

It is important to note that some of the species that depend on post-fire habitats, such as Black-backed and Red-headed Woodpeckers, and Mountain Bluebirds, are high priorities for conservation in this region (Partners In Flight Species Assessment Database 2001). Since the Jasper Fire, Jewel Cave has consistently supported a higher density of breeding woodpeckers, especially Black-backed Woodpeckers, relative to surrounding National Forest lands in the Jasper burn area. The higher density of woodpeckers in Jewel Cave is likely due to the greater maturity of the pine forest there prior to the fire, and to the lack of commercial salvage logging after the fire, which removes much of the preferred habitat for post-fire dependent woodpeckers. As a best management practice for the birds in Jewel Cave, the Jasper burn area should be allowed to exist as-is; little can be done to improve the quality of the habitat, and the natural post-fire dynamics of this area in Jewel Cave will be important to the conservation of biodiversity in this region.

Knife River Indian Villages National Historic Site

Inventory

Knife River Indian Villages was listed as having 109 *documented* breeding bird species, with another 20 species *expected* (National Park Service 2002).

RMBO staff detected a total of 92 bird species at Knife River Indian Villages (Table 1) during three visits to the park (12-15 June, 2002; 5-8 June, 2003; 15-17 June, 2004). RMBO confirmed the presence of 6 (30%) of the 20 *expected* species, reconfirmed the presence of 80 (73%) of the 109 previously

documented species, and confirmed the presence of six additional species not listed as either *documented* or *expected* (Table 5.1). Although these percentages are low, some of the *documented* species that were not reconfirmed during the inventories were likely documented in error or were otherwise documented outside of the breeding season, and some of the *expected* species should probably not have been expected to breed in or near the park.

Of the 14 *expected* species that were not documented during the inventory, one species, Rose-breasted Grosbeak, probably does occur as a rare breeder in the park or surrounding areas. In 2004, a male hybrid Rose-breasted x Black-headed Grosbeak was observed in the park, suggesting the presence of pure Rose-breasted Grosbeaks in the area. Nine of the undocumented *expected* species (Ferruginous Hawk, Piping Plover, Bell's Vireo, Veery, Sprague's Pipit, Scarlet Tanager, Baird's Sparrow, Chestnut-collared Longspur, and Dickcissel) could possibly summer in or near the park in the future, although they are mostly rare regional breeders and should not necessarily be expected (Table 5.1). One *expected* species, Burrowing Owl, is highly unlikely to breed in or near the park due to a lack of suitable habitat, namely prairie dog towns or others areas where suitable burrows exist. The three remaining *expected* species that were not documented (McCown's Longspur, Red Crossbill, and Pine Siskin) do not breed in this region and thus should not be expected to occur as breeders. Although I can say with reasonable certainty that the aforementioned *expected* species did not occur in the park as breeders in 2002-2004, it is possible that some of these species may have occurred in the past, and could possibly occur in the future, as bird communities are often dynamic. Also, some of these species may occur in the park as transients or winter residents.

Of the 29 *documented* species that were not observed during the inventories, 12 species (Gray Partridge, Sharp-tailed Grouse, Osprey, Swainson's Hawk, Golden Eagle, Merlin, Prairie Falcon, Long-eared Owl, Short-eared Owl, Purple Martin, Lark Bunting, and House Sparrow) could possibly have summered in or near the park in the past, and could possibly do so again in the future. Three other species (Gadwall, American Wigeon, Blue-winged Teal) are highly unlikely to have nested in or near the park due to lack of suitable habitat (shallow wetlands and ponds). The remaining 14 *documented* species (Common Goldeneye, Common Merganser, Sharp-shinned Hawk, Northern Goshawk, Herring Gull, Snowy Owl, Olive-sided Flycatcher, Northern Shrike, Red-breasted Nuthatch, Brown Creeper, Bohemian Waxwing, Orange-crowned Warbler, Yellow-rumped Warbler, and Palm Warbler) do not breed in this region and were likely documented at some other time of year or were otherwise documented in error. Records of all *documented* species on the I&M list that were not observed during the inventory warrant further verification by an expert before inclusion of these species on the updated list of documented breeding bird species at Knife River Indian Villages NHS.

RMBO staff searched most areas of the park, including the North Woods, the grasslands and woody draws north of the Big Hidatsa Village Road, the

grasslands north, south and east of the visitor center, the riparian woodlands along both sides of the Knife River, the riparian woodlands around the confluence of the Knife and Missouri rivers, the sandbars and open water on the Missouri River (using a spotting scope), and the riparian woodlands north of the Stanley town campground. Weather conditions were generally favorable for detecting birds, but wind and rain did occur on three out of nine days spent at Knife River. However, the effects of this inclement weather on the overall outcome of the inventory were probably negligible.

Table 5.1. Results of breeding bird inventories from 2002 to 2003 at Knife River Indian Villages National Historic Site, North Dakota.

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Canada Goose	documented	X	X	X	confirmed	fairly common; rivers
Wood Duck	documented		X		confirmed	uncommon; rivers
Mallard	documented	X	X	X	confirmed	fairly common; rivers
Ring-necked Pheasant	documented	X	X	X	confirmed	common; grasslands, open riparian woodlands
Wild Turkey	documented	X	X	X	confirmed	fairly common; riparian woodlands, meadows, agricultural fields
American White Pelican	documented	X	X	X	confirmed	uncommon; rivers
Double-crested Cormorant	documented		X		confirmed	fairly common; rivers
Great Blue Heron	documented	X	X		confirmed	uncommon; rivers
Turkey Vulture	documented	X	X	X	confirmed	uncommon; all habitats
Bald Eagle	documented	X	X	X	confirmed	fairly common; riparian woodlands, rivers
Northern Harrier	documented	X	X	X	confirmed	uncommon; grasslands
Cooper's Hawk	documented	X	X	X	confirmed	uncommon; riparian woodlands
Red-tailed Hawk	documented	X	X	X	confirmed	fairly common; riparian woodlands, grasslands
American Kestrel	documented	X	X	X	confirmed	fairly common; grasslands, riparian woodlands
Killdeer	documented	X	X	X	confirmed	fairly common; rivers, grasslands
Willet	not listed	X			confirmed	rare; river
Spotted Sandpiper	documented		X	X	confirmed	fairly common; rivers
Upland Sandpiper	documented	X	X	X	confirmed	uncommon; grasslands
Marbled Godwit	not listed	X			confirmed	rare; grasslands, wetlands
Ring-billed Gull	documented		X	X	confirmed	uncommon; rivers, grasslands
California Gull	documented	X	X	X	confirmed	fairly common; rivers, grasslands
Forster's Tern	not listed	X		X	confirmed	uncommon; rivers
Least Tern	documented			X	confirmed	uncommon; rivers
Rock Pigeon	documented		X	X	confirmed	uncommon; agricultural and urban areas
Mourning Dove	documented	X	X	X	confirmed	common; all habitats
Black-billed Cuckoo	documented	X			confirmed	rare; riparian woodlands
Eastern Screech-Owl	documented	X	X		confirmed	uncommon; riparian woodlands
Great Horned Owl	documented	X	X	X	confirmed	fairly common; all habitats
Common Nighthawk	documented	X	X	X	confirmed	fairly common; all habitats
Chimney Swift	expected	X		X	confirmed	uncommon; all habitats
Belted Kingfisher	expected			X	confirmed	uncommon; rivers
Red-headed Woodpecker	documented		X	X	confirmed	uncommon; riparian woodlands
Yellow-bellied Sapsucker	not listed			X	confirmed	rare; riparian woodlands
Downy Woodpecker	documented		X	X	confirmed	fairly common; riparian woodlands
Hairy Woodpecker	documented	X	X	X	confirmed	uncommon; riparian woodlands

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Northern Flicker	documented	X	X	X	confirmed	common; riparian woodlands
Eastern Wood-Pewee	expected			X	confirmed	rare; riparian woodlands
Willow Flycatcher	documented			X	confirmed	uncommon, sporadic breeder
Least Flycatcher	documented	X	X	X	confirmed	common; riparian woodlands
Say's Phoebe	documented		X	X	confirmed	uncommon; grasslands, woody draws
Great Crested Flycatcher	documented	X	X	X	confirmed	uncommon; riparian woodlands
Western Kingbird	documented	X	X	X	confirmed	fairly common; riparian woodlands and edge, grasslands
Eastern Kingbird	documented	X	X	X	confirmed	common; riparian woodlands and edge, grasslands
Loggerhead Shrike	expected			X	confirmed	uncommon; grasslands
Warbling Vireo	documented	X	X	X	confirmed	fairly common; riparian woodlands
Red-eyed Vireo	documented	X	X	X	confirmed	common; riparian woodlands
Blue Jay	documented	X	X	X	confirmed	fairly common; riparian woodlands
Black-billed Magpie	documented	X	X	X	confirmed	uncommon; all habitats
American Crow	documented	X	X	X	confirmed	uncommon; all habitats
Horned Lark	documented		X	X	confirmed	uncommon; grasslands
Tree Swallow	documented	X	X	X	confirmed	fairly common; river, grasslands, riparian woodlands
Northern Rough-winged Swallow	documented	X	X	X	confirmed	fairly common; river, grasslands
Bank Swallow	documented		X	X	confirmed	common; river, grasslands
Cliff Swallow	documented	X	X	X	confirmed	fairly common; river, grasslands
Barn Swallow	documented		X	X	confirmed	fairly common; river, grasslands
Black-capped Chickadee	documented	X	X	X	confirmed	fairly common; riparian woodlands
White-breasted Nuthatch	documented	X	X	X	confirmed	fairly common; riparian woodlands
House Wren	documented	X	X	X	confirmed	common; riparian woodlands
Sedge Wren	not listed			X	confirmed	rare, possibly sporadic breeder; wetlands
Eastern Bluebird	documented		X	X	confirmed	uncommon; woodland edge, grasslands
American Robin	documented	X	X	X	confirmed	common; riparian woodlands
Gray Catbird	documented	X	X	X	confirmed	fairly common; woody draws, riparian woodlands
Brown Thrasher	documented	X	X	X	confirmed	fairly common; woody draws, riparian woodlands
European Starling	documented	X	X	X	confirmed	uncommon; riparian woodlands, agricultural areas
Cedar Waxwing	documented	X	X	X	confirmed	fairly common
Yellow Warbler	documented	X	X	X	confirmed	common; riparian woodlands
Black-and-white Warbler	documented	X	X	X	confirmed	uncommon; riparian woodlands
American Redstart	documented	X	X	X	confirmed	common; riparian woodlands
Ovenbird	documented	X	X	X	confirmed	fairly common; riparian woodlands
Common Yellowthroat	documented	X	X	X	confirmed	common; riparian woodlands, woody draws, wetland
Yellow-breasted Chat	documented	X	X	X	confirmed	fairly common; woody draws, riparian woodlands
Spotted Towhee	documented	X	X	X	confirmed	fairly common; woody draws, riparian woodlands
Chipping Sparrow	documented		X	X	confirmed	uncommon; riparian woodlands
Clay-colored Sparrow	documented	X	X	X	confirmed	common; woody draws, grasslands
Field Sparrow	documented	X	X	X	confirmed	common; woody draws, riparian woods, grasslands
Vesper Sparrow	documented	X	X	X	confirmed	uncommon; woody draws, grasslands
Lark Sparrow	documented	X	X	X	confirmed	fairly common; woody draws, grasslands
Savannah Sparrow	expected	X	X	X	confirmed	uncommon; grasslands

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Grasshopper Sparrow	documented	X	X	X	confirmed	common in native prairie, does not use hayfields
Song Sparrow	documented	X	X	X	confirmed	fairly common; riparian woodlands
Rose-breasted Grosbeak	expected			X	probable	status unclear, but observation of hybrid Black-headed x Rose-breasted Grosbeak male in 2004 suggests presence of pure Rose-breasted Grosbeaks in area; riparian woodlands
Black-headed Grosbeak	documented	X	X	X	confirmed	fairly common; riparian woodlands
Lazuli Bunting	documented	X	X	X	confirmed	fairly common; riparian woodlands
Indigo Bunting	expected			X	confirmed	rare, occasional breeder; riparian woodlands
Bobolink	documented	X	X	X	confirmed	common; grasslands
Red-winged Blackbird	documented	X	X	X	confirmed	common; riparian woodlands
Western Meadowlark	documented	X	X	X	confirmed	common; grasslands
Brewer's Blackbird	documented	X			confirmed	uncommon; grasslands
Common Grackle	not listed	X	X	X	confirmed	common; all habitats
Brown-headed Cowbird	documented	X	X	X	confirmed	common; riparian woodlands
Orchard Oriole	documented	X		X	confirmed	uncommon; riparian woodlands
Baltimore Oriole	documented	X	X	X	confirmed	uncommon; riparian woodlands
American Goldfinch	documented	X	X	X	confirmed	common; riparian woodlands
Gray Partridge	documented				possible	breeds regionally, but apparently not in park
Sharp-tailed Grouse	documented				possible	breeds regionally, but apparently not in park
Osprey	documented				possible	probably breeds in region, but not in park; may be observed using park
Broad-winged Hawk	not listed	X			possible	rare, breeding status uncertain; not known to breed in region, but pair observed near north woods in 2002
Swainson's Hawk	documented				possible	does not breed in park, apparently rare in area
Ferruginous Hawk	expected				possible	probably breeds in region; not likely to breed in park but may be observed using park
Golden Eagle	documented				possible	probably breeds in region, but not in park; may be observed using park
Merlin	documented				possible	probably breeds in region, but not in park; may be observed using park
Prairie Falcon	documented				possible	probably breeds in region, but not in park; may be observed using park
Piping Plover	expected				possible	should continue to be expected on sandbars in Missouri River; more thorough effort to survey sandbars warranted
Long-eared Owl	documented				possible	possible, could be expected
Short-eared Owl	documented				possible	breeds regionally, although not in park
Bell's Vireo	expected				possible	possible, but peripheral in region
Purple Martin	documented				possible	breeds regionally, but not in park
Veery	expected				possible	possible; breeds in region but apparently absent from park
Sprague's Pipit	expected				possible	possible, but unlikely; uncommon breeder in region
Scarlet Tanager	expected				possible	possible, but peripheral and rare in region
Lark Bunting	documented				possible	may have bred, but probably sporadic; breeds regionally

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Baird's Sparrow	expected				possible	possible, but unlikely; uncommon breeder in region
Chestnut-collared Longspur	expected				possible	possible, but apparently absent from park
Dickcissel	expected				possible	could be expected in some years
House Sparrow	documented				possible	breeds locally (Stanton), but not in park
Gadwall	documented				unlikely	breeds regionally, but no suitable nesting habitat in park
American Wigeon	documented				unlikely	breeds regionally, but no suitable nesting habitat in park
Blue-winged Teal	documented				unlikely	breeds regionally, but no suitable nesting habitat in park
Burrowing Owl	expected				unlikely	inadequate or unsuitable breeding habitat
Common Goldeneye	documented				does not breed	park lies outside of breeding range
Common Merganser	documented				does not breed	park lies outside of breeding range
Sharp-shinned Hawk	documented				does not breed	park lies outside of breeding range
Northern Goshawk	documented				does not breed	park lies outside of breeding range
Herring Gull	documented				does not breed	park lies outside of breeding range
Snowy Owl	documented				does not breed	park lies outside of breeding range
Olive-sided Flycatcher	documented				does not breed	park lies outside of breeding range
Alder Flycatcher	not listed		X		does not breed	park lies outside of breeding range; late migrant
Northern Shrike	documented				does not breed	park lies outside of breeding range
Red-breasted Nuthatch	documented				does not breed	park lies outside of breeding range
Brown Creeper	documented				does not breed	park lies outside of breeding range
Swainson's Thrush	not listed		X		does not breed	park lies outside of breeding range; late migrant
Bohemian Waxwing	documented				does not breed	park lies outside of breeding range
Orange-crowned Warbler	documented				does not breed	park lies outside of breeding range
Yellow-rumped Warbler	documented				does not breed	park lies outside of breeding range
Palm Warbler	documented				does not breed	park lies outside of breeding range
McCown's Longspur	expected				does not breed	does not breed in region
Red Crossbill	expected				does not breed	park lies outside of breeding range
Pine Siskin	expected				does not breed	park lies outside of breeding range

Monitoring

Two 15-point transects were established at Knife River in 2002, and each was resurveyed in its entirety in 2003 and 2004 (Figure 4). One transect is in dense riparian woodland (as distinguished from the more open riparian woodlands also present at Knife River) and the other is in a mostly native mixed-grass prairie.

Grasslands

The grassland transect starts at the junction of Highway 200 and the Big Hidatsa Village road and heads northeast. The first part of this transect crosses non-native brome grass before entering into native mixed-grass prairie and eventually terminating near the northern border of the park. While it would have been preferable to keep the entire transect within one type of grassland, neither type was extensive enough to support a 15-point transect. However, in 2004, this area of brome grass had been sprayed with an herbicide as part of a restoration effort, leaving mostly dead grass and bare ground in this area.

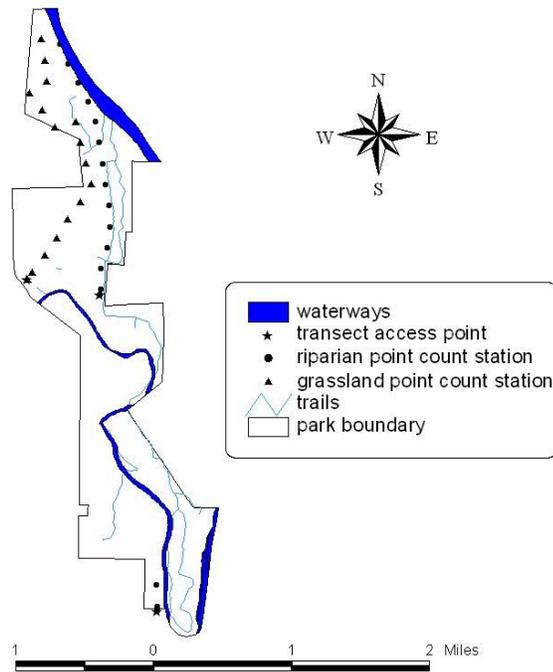


Figure 4. Locations of point transects for bird monitoring in Knife River Indian Villages National Historic Site, North Dakota.

RMBO staff recorded between 177 and 249 individual birds of 50 species on the point transects during the three annual surveys (Table 5.2). The considerable variation in the total number of birds observed is due at least in part to the elimination of grassland habitat from part of the transect due to herbicide spraying in 2004. This brome grass field had previously supported an extraordinarily dense concentration of breeding Bobolinks, but in 2004, only a few common grackles were observed in this area. Whereas 20 Bobolinks were counted on the two point counts in this area in 2003, only one was recorded on these counts in 2004.

Of the 50 species detected, five species, Ring-necked Pheasant, Clay-colored Sparrow, Grasshopper Sparrow, Bobolink, and Western Meadowlark, were observed frequently enough to generate density estimates for trend monitoring (Table 5.3). Coefficients of variation for each annual estimate for the four species were within acceptable limits (<59%) for meeting the stated monitoring targets with annual sampling (Hanni and Panjabi 2004), and thus these five species should be effectively monitored through the current point transect. While no species have statistically discernible trends at this time, estimated densities for all five species decreased over the three years. The change in density for Bobolink is particularly troubling, suggesting that roughly half of this population was lost between 2003 and 2004.

Although prospects for monitoring many of the individual species appear good, the average annual density of all breeding birds combined provides a more sensitive index for monitoring the overall health of the avifauna in the grasslands at Knife River. This estimate had a coefficient 9 to 10% each year, suggesting a high level of precision in the estimate. The low CV also implies that trends should be discernable within 10 years, given annual sampling (Hanni and Panjabi 2004). Average densities of all birds in the grasslands at Knife River declined significantly from 4.15 birds/ha in 2003 to 2.81 birds/ha in 2004. This decrease in bird density raises concerns about ongoing management in the grasslands, and warrants continued monitoring.

Table 5.2. Abundance of breeding bird species recorded in grasslands at Knife River Indian Villages National Historic Site, North Dakota, 2002-2004.

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Canada Goose		7		7		0.47		0.16
Northern Pintail	2			2	0.13			0.04
Ring-necked Pheasant	13	10	11	34	0.87	0.67	0.73	0.76
Great Blue Heron		1		1		0.07		0.02
Northern Harrier	1		2	3	0.07		0.13	0.07
Cooper's Hawk			1	1			0.07	0.02
Red-tailed Hawk	1	1	1	3	0.07	0.07	0.07	0.07
Willet	1			1	0.07			0.02
Upland Sandpiper	8	2	5	15	0.53	0.13	0.33	0.33
Ring-billed Gull			1	1			0.07	0.02
California Gull		1		1		0.07		0.02
Mourning Dove	7	5	1	13	0.47	0.33	0.07	0.29
Great Horned Owl	1		1	2	0.07		0.07	0.04
Common Nighthawk	2	1		3	0.13	0.07		0.07
Downy Woodpecker		1		1		0.07		0.02
Northern Flicker	6	2	1	9	0.40	0.13	0.07	0.20
Willow Flycatcher			3	3			0.20	0.07
Least Flycatcher	3		1	4	0.20		0.07	0.09
Say's Phoebe		1		1		0.07		0.02
Eastern Kingbird	8	6	1	15	0.53	0.40	0.07	0.33
Black-billed Magpie	1	1	1	3	0.07	0.07	0.07	0.07
American Crow	1	3	2	6	0.07	0.20	0.13	0.13
Horned Lark			1	1			0.07	0.02
Bank Swallow	2		6	8	0.13		0.40	0.18
House Wren	5	3	2	10	0.33	0.20	0.13	0.22
Sedge Wren			1	1			0.07	0.02
American Robin		3		3		0.20		0.07
Gray Catbird	2	3	1	6	0.13	0.20	0.07	0.13
Brown Thrasher	1		1	2	0.07		0.07	0.04

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
European Starling	1			1	0.07			0.02
Cedar Waxwing		2		2		0.13		0.04
Yellow Warbler	4	6	3	13	0.27	0.40	0.20	0.29
Ovenbird		2		2		0.13		0.04
Common Yellowthroat	5	9	6	20	0.33	0.60	0.40	0.44
Yellow-breasted Chat	1		2	3	0.07		0.13	0.07
Spotted Towhee	5	4	2	11	0.33	0.27	0.13	0.24
Clay-colored Sparrow	10	12	8	30	0.67	0.80	0.53	0.67
Field Sparrow	8	4	4	16	0.53	0.27	0.27	0.36
Vesper Sparrow		1	3	4		0.07	0.20	0.09
Lark Sparrow	1	1		2	0.07	0.07		0.04
Grasshopper Sparrow	35	32	26	93	2.33	2.13	1.73	2.07
Song Sparrow	1	4	1	6	0.07	0.27	0.07	0.13
Black-headed Grosbeak		1		1		0.07		0.02
Bobolink	72	75	41	188	4.80	5.00	2.73	4.18
Red-winged Blackbird	3	10	3	16	0.20	0.67	0.20	0.36
Western Meadowlark	19	25	17	61	1.27	1.67	1.13	1.36
Brewer's Blackbird	3	1		4	0.20	0.07		0.09
Common Grackle			11	11			0.73	0.24
Brown-headed Cowbird		6	6	12		0.40	0.40	0.27
American Goldfinch	5	3		8	0.33	0.20		0.18
All birds	238	249	177	664	15.87	16.6	11.8	14.76

Table 5.3. Estimated annual densities of breeding birds in grasslands at Knife River Indian Villages National Historic Site, North Dakota, 2002-2004.

Common Name	Year	D	LCL	UCL	%CV	df
Ring-necked Pheasant	2002	0.31	0.17	0.57	31	32
	2003	0.24	0.12	0.47	34	32
	2004	0.24	0.12	0.47	34	32
Clay-colored Sparrow	2002	0.18	0.09	0.36	35	28
	2003	0.21	0.11	0.41	33	28
	2004	0.13	0.06	0.28	41	28
Grasshopper Sparrow	2002	1.13	0.57	2.23	36	88
	2003	1.09	0.55	2.17	36	88
	2004	0.89	0.44	1.80	37	88
Bobolink	2002	1.61	1.21	2.15	15	173
	2003	1.56	1.17	2.09	15	173
	2004	0.84	0.58	1.21	19	173
Western Meadowlark	2002	0.12	0.07	0.19	25	62
	2003	0.16	0.10	0.24	22	62
	2004	0.09	0.05	0.16	27	62

Common Name	Year	D	LCL	UCL	%CV	df
All birds	2002	4.09	3.41	4.91	9	568
	2003	4.15	3.46	4.97	9	568
	2004	2.81	2.30	3.45	10	568

D=Estimated density (birds/ha); LCL=Lower 95% confidence limit; UCL=Upper 95% confidence limit; %CV=Coefficient of variation; df= degrees of freedom

Riparian woodland

The riparian woodland transect was split into two parts in order to maintain similar habitat along the entire transect (Figure 4). The transects starts at the northeast corner of the Stanton town campground at the NPS boundary. The transect continues northward through dense riparian woodland for two points, before this area of habitat terminates. The transect resumes at the trailhead for the North Woods, along the Big Hidatsa Village Road, for points three to 15.

RMBO staff recorded between 384 and 276 individual birds of 62 species on the point transect during the three annual surveys (Table 5.4). The annual decrease in the total number of birds observed may be the result of an actual decline in the density of birds breeding in riparian habitats at Knife River.

Of the 62 species detected, ten species, Least Flycatcher, Red-eyed Vireo, House Wren, Yellow Warbler, American Redstart, Ovenbird, Common Yellowthroat, Spotted Towhee, Brown-headed Cowbird, and American Goldfinch, were observed frequently enough to generate density estimates for trend monitoring (Table 5.5). Coefficients of variation for each annual estimate for the four species were within acceptable limits (<59%) for meeting the stated monitoring targets with annual sampling (Hanni and Panjabi 2004), and thus these ten species should be effectively monitored through the current point transect. While no species have statistically discernible trends at this time, estimated densities for six individual species decreased over the three years. Densities for the remaining four species show no unidirectional changes.

Although prospects for monitoring many of the individual species appear good, the average annual density of all breeding birds combined provides a more sensitive index for monitoring the overall health of the avifauna in the riparian woodlands at Knife River. This estimate had a coefficient 8% each year, suggesting a high level of precision. The low CV also implies that trends should be discernable within 10 years, given annual sampling (Hanni and Panjabi 2004). Average densities of all birds in the dense riparian woodlands at Knife River declined from 32.38 birds/ha in 2002 to 27.2 birds/ha in 2003 to 24.61 birds/ha in 2004, a roughly 25% decrease that raises concerns about ongoing management in the North Woods and other riparian woodlands, and warrants continued monitoring.

The very high density of breeding birds in the North Woods and other similar woodlands, in spite of apparent declines, underscores the extreme importance

and value of this environment to birds and other wildlife at Knife River. The density of birds in the North Woods is more than triple that found in other parks. Any management that alters the structure or composition of this habitat should be weighed carefully.

Table 5.4. Abundance of breeding bird species recorded in dense riparian woodland at Knife River Indian Villages National Historic Site, North Dakota, summer 2002-2004.

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Canada Goose		16		16		1.07		0.36
Mallard		3		3		0.20		0.07
Ring-necked Pheasant	9	10	10	29	0.60	0.67	0.67	0.64
Wild Turkey	1	3		4	0.07	0.20		0.09
American White Pelican			1	1			0.07	0.02
Great Blue Heron	1	1		2	0.07	0.07		0.04
Bald Eagle			1	1			0.07	0.02
Northern Harrier			1	1			0.07	0.02
Cooper's Hawk			1	1			0.07	0.02
Broad-winged Hawk	2			2	0.13			0.04
Red-tailed Hawk	2		1	3	0.13		0.07	0.07
Killdeer		1		1		0.07		0.02
Upland Sandpiper		2		2		0.13		0.04
Ring-billed Gull		2		2		0.13		0.04
California Gull	1			1	0.07			0.02
Mourning Dove	6	13	8	27	0.40	0.87	0.53	0.60
Black-billed Cuckoo	1			1	0.07			0.02
Great Horned Owl	2			2	0.13			0.04
Chimney Swift	2			2	0.13			0.04
Red-headed Woodpecker		1		1		0.07		0.02
Hairy Woodpecker	5	3	1	9	0.33	0.20	0.07	0.20
Northern Flicker	2	1	2	5	0.13	0.07	0.13	0.11
Unidentified Woopecker	1			1	0.07			0.02
Alder Flycatcher		2		2		0.13		0.04
Least Flycatcher	20	17	14	51	1.33	1.13	0.93	1.13
Say's Phoebe			1	1			0.07	0.02
Great Crested Flycatcher	4	1		5	0.27	0.07		0.11
Eastern Kingbird	2		1	3	0.13		0.07	0.07
Warbling Vireo		1		1		0.07		0.02
Red-eyed Vireo	35	21	22	78	2.33	1.40	1.47	1.73
Blue Jay	1	1		2	0.07	0.07		0.04
American Crow	5	8	2	15	0.33	0.53	0.13	0.33
Horned Lark			1	1			0.07	0.02
Northern Rough-winged Swallow	1			1	0.07			0.02
Bank Swallow	6	32	2	40	0.40	2.13	0.13	0.89

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Black-capped Chickadee	6	3	2	11	0.40	0.20	0.13	0.24
White-breasted Nuthatch	3	2	1	6	0.20	0.13	0.07	0.13
House Wren	29	24	20	73	1.93	1.60	1.33	1.62
Swainson's Thrush		1		1		0.07		0.02
American Robin	13	7	5	25	0.87	0.47	0.33	0.56
Gray Catbird	3	4	1	8	0.20	0.27	0.07	0.18
Brown Thrasher		3	3	6		0.20	0.20	0.13
Cedar Waxwing	13	3	2	18	0.87	0.20	0.13	0.40
Yellow Warbler	31	27	30	88	2.07	1.80	2.00	1.96
Black-and-white Warbler	10	1	6	17	0.67	0.07	0.40	0.38
American Redstart	32	46	30	108	2.13	3.07	2.00	2.40
Ovenbird	20	17	16	53	1.33	1.13	1.07	1.18
Common Yellowthroat	12	18	11	41	0.80	1.20	0.73	0.91
Yellow-breasted Chat	6	2	1	9	0.40	0.13	0.07	0.20
Spotted Towhee	13	9	9	31	0.87	0.60	0.60	0.69
Clay-colored Sparrow	7	9	6	22	0.47	0.60	0.40	0.49
Field Sparrow	5	7	7	19	0.33	0.47	0.47	0.42
Lark Sparrow	1		1	2	0.07		0.07	0.04
Song Sparrow	11	10	8	29	0.73	0.67	0.53	0.64
Black-headed Grosbeak	7	3	2	12	0.47	0.20	0.13	0.27
Lazuli Bunting	1	2	4	7	0.07	0.13	0.27	0.16
Bobolink	1	2	1	4	0.07	0.13	0.07	0.09
Red-winged Blackbird		9	2	11		0.60	0.13	0.24
Western Meadowlark	5	4	5	14	0.33	0.27	0.33	0.31
Brewer's Blackbird	1			1	0.07			0.02
Common Grackle	3		3	6	0.20		0.20	0.13
Brown-headed Cowbird	13	14	8	35	0.87	0.93	0.53	0.78
American Goldfinch	8	18	23	49	0.53	1.20	1.53	1.09
All birds	363	384	276	1023	24.2	25.6	18.4	22.73

Table 5.5. Estimated annual densities of breeding birds in dense riparian woodland at Knife River Indian Villages National Historic Site, North Dakota, 2002-2004.

Common Name	Year	D	LCL	UCL	%CV	df
Least Flycatcher	2002	1.27	0.80	2.00	23	50
	2003	1.08	0.66	1.76	25	50
	2004	0.89	0.52	1.52	27	50
Red-eyed Vireo	2002	3.78	2.35	6.07	24	75
	2003	2.16	1.24	3.75	28	75
	2004	2.37	1.39	4.06	27	75
House Wren	2002	2.18	1.42	3.33	22	71
	2003	1.80	1.14	2.84	23	71
	2004	1.50	0.92	2.45	25	71

Common Name	Year	D	LCL	UCL	%CV	df
Yellow Warbler	2002	2.62	1.75	3.92	21	86
	2003	2.19	1.42	3.38	22	86
	2004	2.53	1.68	3.81	21	86
American Redstart	2002	4.67	3.13	6.96	20	105
	2003	6.42	4.50	9.17	18	105
	2004	4.38	2.91	6.59	21	105
Ovenbird	2002	0.91	0.56	1.49	25	52
	2003	0.77	0.46	1.31	27	52
	2004	0.73	0.43	1.25	27	52
Common Yellowthroat	2002	0.36	0.19	0.66	31	40
	2003	0.54	0.32	0.90	26	40
	2004	0.33	0.17	0.62	32	40
Spotted Towhee	2002	0.80	0.41	1.56	34	30
	2003	0.55	0.26	1.18	39	30
	2004	0.55	0.26	1.18	39	30
Brown-headed Cowbird	2002	1.61	0.86	3.03	32	32
	2003	1.61	0.86	3.03	32	32
	2004	0.99	0.46	2.12	39	32
American Goldfinch	2002	1.15	0.47	2.79	46	35
	2003	3.05	1.60	5.84	33	35
	2004	2.48	1.25	4.94	35	35
All birds	2002	32.38	27.79	37.72	8	845
	2003	27.20	23.18	31.91	8	845
	2004	24.61	20.88	29.00	8	845

D=Estimated density (birds/ha); LCL=Lower 95% confidence limit; UCL=Upper 95% confidence limit; %CV=Coefficient of variation; df= degrees of freedom

Discussion and recommendations

The high number of bird species observed in the park is due largely to the great extent and condition of the diverse habitats found here, including the riparian woodlands, shrublands, wetlands, the rivers and sandbars, the native grasslands, and hay fields. By far, the greatest number of bird species was found in the North Woods area. This area consists of an exceptionally dense and structurally complex mature riparian forest, with an abundance of dead, dying and downed wood, small clearings, shrublands and wetlands. An area with similar diversity and abundance of birds as the North Woods is located at the south end of the park, just north of the Stanley town park campground. However, this area is much smaller than the North Woods, and it consequently supports fewer birds overall.

The diversity and abundance of birds in the North Woods contrast markedly with those in the woodlands that appear to have been treated with fire and/or thinning. Many of the riparian forest birds found in the North Woods, including rare species such as Cooper's Hawk, Eastern Screech Owl, Black-billed Cuckoo, Black-and-

white Warbler, and Ovenbird, are entirely absent from these open woodlands. Many other common riparian forest birds, such as Least Flycatcher, Red-eyed Vireo, Yellow Warbler, and American Redstart, are also either entirely absent or in considerably lower densities in these burned woodlands. In contrast, birds that were more abundant in these burned woodlands included Western Kingbird and Lark Sparrow, both open-country species.

Several ongoing management practices in the riparian forests of Knife River Indian Villages NHS raise serious concerns about the maintenance of biodiversity in this park. In particular, the misguided practice of burning these forests, presumably to promote regeneration, has likely had a devastating effect on the birds of Knife River, and most probably other wildlife as well. It is unlikely that fire plays any natural regulatory role in maintaining the health of these riparian forests along the Missouri River, or that species in this environment have adapted to the effects of fire, as fire risk in these riparian systems is generally low by their very nature. Of all the woody riparian plant species that occur at Knife River, only one, choke cherry (*Prunus virginiana*), has regenerated at all in response to this burning. Many trees of other species, including dominant species like peachleaf willow (*Salix amygdaloides*), eastern cottonwood (*Populus deltoides*), and green ash (*Fraxinus pennsylvanica*), were severely damaged or killed by these prescribed fires and do not show any signs of regenerating. This effort to promote regeneration of riparian vegetation through burning has resulted in a net loss of habitat and wildlife, and it likely will have lasting negative consequences for the biodiversity at Knife River. Perhaps a better approach to encouraging regeneration of riparian vegetation in the absence of flooding (the natural disturbance mechanism that would otherwise promote regeneration in these systems) might be to try to mimic the scouring effects of floods, perhaps using mechanical means to disturb the upper soil layer and knock out competitors in advance of the summer rains. As with all experimental restoration techniques, such practices should be applied to only small areas at first to determine effects and assess results. I strongly urge that the practice of burning riparian vegetation ceases immediately, and that this technique not be applied to other areas of the park that have not yet been impacted by this practice, particularly the North Woods.

A second ongoing practice in riparian woodlands that has negative consequences for birds and other wildlife, and again raises serious concerns about habitat management in the park, is the systematic removal of downed woody debris from the forest floor and understory. This practice is currently ongoing in the North Woods, where in some places, particularly in the southern end of this woodland, live understory vegetation is sparse or absent, and downed branches provide the only understory habitat structure. Understory structure is a critical habitat component in riparian forests that is required by many species of birds, small mammals, and invertebrates. In the absence of live understory vegetation, downed branches fill this role to a limited extent. Removal of this resource eliminates that last remnants of any understory structure, and thus

reduces the diversity and abundance of birds and other wildlife in the area. Dead wood also plays a critical role in maintaining forest productivity, replenishing soil nutrients, retaining moisture, storing carbon, providing microclimatic conditions for certain plants and animals, and providing nesting and foraging habitat for a wide diversity of wildlife (Dudley and Vallauri 2004).

The rationale for removing dead wood, presumably to reduce fire risk, seems unfounded, as this riparian woodland is at low risk of natural fire and the immediate negative consequences for biodiversity far outweigh the relatively small risk that a large scale fire could severely impact the area. As with the prescribed burning of riparian vegetation, I strongly urge that this unnecessary practice be stopped immediately. It is possible that the removal of dead wood from the understory is responsible, at least in part, for the observed decline in bird density in this area since 2002, particularly for species like Least Flycatcher, House Wren, and Ovenbird, that occupy the forest understory.

An apparently perceived threat to the North Woods and other forests in the park is the prevalence of a shelf fungus indicative of heart rot in green ash trees. While this may result in the death of many individual trees, this threat is not serious in my view, as the fungus is a native species responding to natural conditions. I recommend against taking steps such as removing infected trees, as the snags and small forest openings created by this fungus will likely contribute to an increase in the biodiversity at this site.

Because the North Woods has such exceptional value for birds and wildlife, and given that current management techniques appear to do more harm than good, I strongly recommend a hands-off approach in managing this area. Allowing for the natural dynamics of ecological succession in these woods will likely preserve the diversity and abundance of species over time more effectively than narrowly focused management activities.

One threat that does warrant attention, however, is the invasion of Dame's Rocket (*Hesperus matronalis*), a non-native invasive plant. In 2002, this plant was not very prevalent in the park, but by 2004, this species had taken over much of the understory herbaceous cover in the North Woods and other riparian areas. The impact this species will have on other plants and wildlife, and whether this invasion represents a temporary or permanent change to the flora of the park, is unclear, but careful monitoring of this situation is warranted. It will likely prove very difficult, if at all possible, to remove this species from the park.

The grasslands at Knife River host extraordinary densities of Bobolinks and Grasshopper Sparrows, two species that are exhibiting long-term, range-wide population declines (PIF Species Assessment Database 2001). While the goal to restore hay fields back to native grasslands is admirable, caution should be used when implementing restoration. Hay fields that are not mowed during the breeding season, such as those at Knife River, provide optimal habitat for

Bobolinks, although not for many other native grassland birds. However, elimination of this habitat during restoration results in a net loss of habitat and birds from the park, at least in the short term. Whether or not Bobolinks and other native birds return to occupy these grasslands after the native grasses have been planted is not yet known, but it should not necessarily be assumed that they will, especially for species that are declining in this region. I strongly recommend monitoring the effects and success of the grassland areas treated thus far before extending this practice to other non-native grasslands. Hopefully, this practice will allow native grasses to become established and for native wildlife communities to flourish in these areas. In the meantime, the importance of undisturbed hay fields to some native birds should not be discounted or overlooked.

Mount Rushmore National Memorial

Inventory

Mount Rushmore was listed as having 32 *documented* breeding bird species, with another 22 species *expected* (National Park Service 2002). Subsequent review of this list by the author found that the number of *expected* species was actually 21.

RMBO staff detected a total of 48 bird species at Mount Rushmore (Table 6.1) during three visits to the park (5-6 June, 2002; 11-12 June, 2003; 16 June and 1 July, 2004). RMBO confirmed the presence of 9 (43%) of the 21 *expected* species, reconfirmed the presence of 29 (91%) of the 32 previously *documented* species, and confirmed the presence of eight additional species not listed as either *documented* or *expected*. As with some of the other park lists, some *documented* species were likely documented in error or were otherwise documented outside of the breeding season, and some of the *expected* species should probably not have been expected to breed in or near the park.

Of the 12 *expected* species that were not documented during the inventory, nine species (Cooper's Hawk, Northern Goshawk, Black-backed Woodpecker, Clark's Nutcracker, House Wren, Eastern Bluebird, Mountain Bluebird, European Starling, Red-winged Blackbird) are reasonably likely to summer in or near the park in the future, although they should not necessarily be expected. Some, such as Black-backed Woodpecker, House Wren, and Eastern and Mountain Bluebird, would likely require a large-scale fire in order to create suitable habitat. The other 3 *expected* species that were not documented (Killdeer, Long-eared Owl, Common Poorwill) are not likely to summer in or near the park, primarily due to inappropriate habitat conditions.

The three *documented* species that were not observed during the inventories (Downy Woodpecker, Gray Jay, and Barn Swallow) could possibly have

summered in or near the park in the past, and may again do so in the future. All of these are quite rare at this elevation in the Black Hills, and Gray Jay is perhaps most likely to reoccur regularly. Downy Woodpeckers are surprisingly rare in the Black Hills and are most common in low elevation riparian settings. Barn Swallows are also rare or uncommon breeders in the Black Hills, especially away from wet meadows and pastures. These types of habitats do not exist at Mount Rushmore, and it is possible that Barn Swallows were instead documented during migration, when their use of habitats is less specific. Records of all *documented* species on the I&M list that were not observed during the inventory warrant further verification by an expert before inclusion of these species on the updated list of documented breeding bird species at Mount Rushmore National Memorial.

RMBO staff searched most areas of the park, including Starling Basin west and south from highway 244 to the park boundary, the rock spires around Mount Rushmore, the visitor parking area, the area along the road to the offices and maintenance shop, and the pine forests south of highway 244 across from the parking area and along both sides of highway 244 heading towards Keystone. Weather conditions were generally favorable for detecting birds, although on one of the 6 days spent at Mount Rushmore, strong afternoon winds reduced detectability of birds for part of the day. However, the impact of these strong winds on this single day probably had little effect on the overall outcome of the inventory.

Table 6.1. Results of breeding bird inventories at Mount Rushmore National Memorial, South Dakota, 2002-2004.

Common Name	NPS I&M status	Year documented			RMBO status	comments
		2002	2003	2004		
Ruffed Grouse	expected			X	confirmed	rare; aspen/spruce, riparian
Wild Turkey	documented	X			confirmed	uncommon; all habitats
Turkey Vulture	documented	X	X		confirmed	uncommon; all habitats
Sharp-shinned Hawk	expected	X			confirmed	rare; all habitats
Red-tailed Hawk	expected			X	confirmed	uncommon; all habitats
Rock Pigeon	expected	X		X	confirmed	common; cliffs
Mourning Dove	expected			X	confirmed	uncommon; pine forest
Great Horned Owl	documented			X	confirmed	uncommon; cliffs, pine forest
Northern Saw-whet Owl	expected	X		X	confirmed	fairly common; all forested habitats
Common Nighthawk	expected	X	X	X	confirmed	uncommon; all habitats
White-throated Swift	documented	X	X	X	confirmed	common; cliffs
Red-naped Sapsucker	not listed			X	confirmed	uncommon; aspen, mixed woods
Hairy Woodpecker	documented	X	X	X	confirmed	fairly common; all forested habitats
Northern Flicker	documented	X	X	X	confirmed	fairly common; all forested habitats
Western Wood-Pewee	documented			X	confirmed	uncommon; pine forest, aspen
Dusky Flycatcher	expected	X	X	X	confirmed	common; pine forest, aspen
Cordilleran Flycatcher	documented	X	X	X	confirmed	fairly common; all forested habitats, esp. near cliffs
Plumbeous Vireo	documented		X		confirmed	uncommon; pine forest
Warbling Vireo	documented	X	X	X	confirmed	uncommon; pine forest, aspen
Blue Jay	not listed		X		confirmed	uncommon; documented within 1/2 mile of park; likely wanders into park on occasion
American Crow	documented	X		X	confirmed	uncommon; all habitats

Violet-green Swallow	documented	X	X	X	confirmed	common; all habitats, esp. near cliffs
Black-capped Chickadee	documented	X	X	X	confirmed	fairly common; all forested habitats
Red-breasted Nuthatch	documented	X	X	X	confirmed	common; all forested habitats
White-breasted Nuthatch	documented	X	X	X	confirmed	fairly common; all forested habitats
Brown Creeper	documented	X	X	X	confirmed	uncommon; all forested habitats
Rock Wren	not listed	X	X	X	confirmed	uncommon; rocky slopes
Canyon Wren	documented		X	X	confirmed	uncommon; cliffs
Golden-crowned Kinglet	not listed			X	confirmed	uncommon; spruce
Ruby-crowned Kinglet	documented	X	X	X	confirmed	uncommon; spruce
Townsend's Solitaire	documented	X	X	X	confirmed	common; pine forest, spruce
Swainson's Thrush	documented	X	X	X	confirmed	uncommon; spruce, mixed woods
American Robin	documented	X	X	X	confirmed	common; all forested habitats
Yellow-rumped Warbler	documented	X	X	X	confirmed	common; pine forest, spruce
Ovenbird	documented	X	X	X	confirmed	uncommon; all forested habitats
MacGillivray's Warbler	not listed		X	X	confirmed	uncommon; riparian, aspen
Common Yellowthroat	not listed	X	X	X	confirmed	uncommon; wetland, riparian
Western Tanager	documented	X	X	X	confirmed	common; pine forest
Chipping Sparrow	documented	X	X	X	confirmed	common; all forest habitats
Song Sparrow	not listed		X		confirmed	rare; riparian
Dark-eyed Junco	documented	X	X	X	confirmed	common; all forested habitats
Black-headed Grosbeak	not listed	X			confirmed	rare; aspen, riparian
Brown-headed Cowbird	documented	X	X	X	confirmed	common; all forested habitats
Cassin's Finch	expected		X		confirmed	rare, sporadic; pine forest
Red Crossbill	documented	X	X	X	confirmed	common, sporadic; pine forest, spruce
Pine Siskin	documented	X	X	X	confirmed	common; pine forest, spruce
Cooper's Hawk	expected				possible	probably occurs in surrounding area; should be expected
Northern Goshawk	expected				possible	probably occurs in surrounding area, should be expected
Killdeer	expected				possible	possible, but habitat in park is generally unsuitable
Downy Woodpecker	documented				possible	probably does occur occasionally, but is likely sporadic and rare
Black-backed Woodpecker	expected				possible	most likely to occur after a forest fire, or in old-growth pine stands; should continue to be expected
Gray Jay	documented				possible	probably does occur in area
Clark's Nutcracker	expected				possible	occurs in region, probably wanders into park occasionally
Barn Swallow	documented				possible	habitat in park is marginal; documented status during breeding season requires verification
House Wren	expected				possible	possible, but prefers lower elevation sites with less forest cover, burns
Eastern Bluebird	expected				possible	most likely to occur after a forest fire; possibly in meadows; should continue to be expected
Mountain Bluebird	expected				possible	most likely to occur after a forest fire; possibly in meadows; should continue to be expected
European Starling	expected				possible	possible, but rare away from towns; probably doesn't occur at present, but could continue to be expected
Red-winged Blackbird	expected				possible	breeds in area, but inadequate or unsuitable breeding habitat in park; could be observed flying over park
Long-eared Owl	expected				unlikely	Inadequate habitat; prefers dense vegetation adjacent to open meadows

Common Poorwill	expected				unlikely	unsuitable habitat in park; probably too high in elevation
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Monitoring

A 15-point transect was established in ponderosa pine forest in 2002, and was resurveyed in its entirety in 2003 and 2004 (Figure 5). This transect starts at the western park boundary on Highway 244, and heads roughly southeast, traversing Starling Basin, before turning to the northeast and then again to the northwest before ending near Highway 244, east of the parking area.

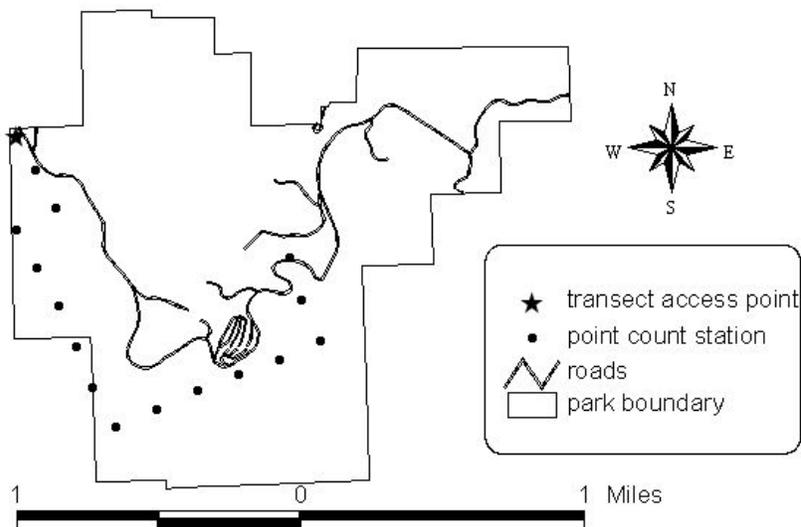


Figure 5. Location of point transect for bird monitoring in Mount Rushmore National Memorial, South Dakota.

RMBO staff recorded between 196 and 41 individual birds of 33 species on the point transect during the three annual surveys (Table 6.2). The considerable variation in the total number of birds observed is unfortunately due at least in part to observer error in 2004.

Of the 33 species detected, three species, Red-breasted Nuthatch, American Robin, and Yellow-rumped Warbler, were observed frequently enough to generate density estimates for trend monitoring (Table 6.3). Coefficients of variation for each annual estimate for the four species were generally within acceptable limits (<59%) for meeting the stated monitoring targets with annual sampling (Hanni and Panjabi 2004), although CVs varied considerably among some years, and were particularly high in 2004, again probably due to observer error. Nonetheless, these three species should be effectively monitored through

the current point transect. No species have statistically discernible trends at this time, and no species show any unidirectional changes in density that could suggest any significant increases or decreases in population size.

Although prospects for monitoring a few of the individual species appear reasonably good, the average annual density of all breeding birds combined provides a more sensitive index for monitoring the overall health of the avifauna in the ponderosa pine forest at Mount Rushmore. This estimate had a CV between 11 and 18% each year, suggesting that trends should be discernable within 12-15 years, given annual sampling (Hanni and Panjabi 2004). Average densities of all birds in the ponderosa pine forest at Mount Rushmore ranged from 3.79 birds/ha in 2002, to 5.09 birds/ha in 2003, to 1.18 birds/ha in 2004. Again, the low density estimate in 2004 is probably more a result of observer error than an actual decrease in birds in the park.

Table 6.2. Abundance of breeding bird species recorded in ponderosa pine forest at Mount Rushmore National Memorial, South Dakota, 2002-2003.

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Wild Turkey	1			1	0.07			0.02
Turkey Vulture		1		1		0.07		0.02
Red-tailed Hawk			1	1			0.07	0.02
White-throated Swift	3	18		21	0.20	1.20		0.47
Belted Kingfisher			1	1			0.07	0.02
Hairy Woodpecker	3	5	3	11	0.20	0.33	0.20	0.24
Northern Flicker	1	3	1	5	0.07	0.20	0.07	0.11
Unidentified Woopecker	1	1		2	0.07	.07		0.04
Dusky Flycatcher		1		1		0.07		0.02
Cordilleran Flycatcher	2	7		9	0.13	0.47		0.20
Plumbeous Vireo		1		1		0.07		0.02
Warbling Vireo	9	14	1	24	0.60	0.93	0.07	0.53
Violet-green Swallow	1	8		9	0.07	0.53		0.20
Black-capped Chickadee	5	5	2	12	0.33	0.33	0.13	0.27
Red-breasted Nuthatch	13	16	2	31	0.87	1.07	0.13	0.69
White-breasted Nuthatch	1			1	0.07			0.02
Brown Creeper	1	4	1	6	0.07	0.27	0.07	0.13
Rock Wren	1	2		3	0.07	0.13		0.07
Canyon Wren	1	3		4	0.07	0.20		0.09
Ruby-crowned Kinglet	2	2		4	0.13	0.13		0.09
Townsend's Solitaire	4	4	5	13	0.27	0.27	0.33	0.29
Swainson's Thrush	1	7	1	9	0.07	0.47	0.07	0.20
American Robin	9	28	13	50	0.60	1.87	0.87	1.11
Yellow-rumped Warbler	26	21	4	51	1.73	1.40	0.27	1.13
Black-and-white Warbler			1	1			0.07	0.02
Ovenbird	9	8	2	19	0.60	0.53	0.13	0.42

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
MacGillivray's Warbler		2		2		0.13		0.04
Common Yellowthroat	1	1		2	0.07	0.07		0.04
Western Tanager	3	7	1	11	0.20	0.47	0.07	0.24
Chipping Sparrow	8	10	2	20	0.53	0.67	0.13	0.44
Dark-eyed Junco	8	7		15	0.53	0.47		0.33
Black-headed Grosbeak	1			1	0.07			0.02
Red Crossbill	6	6		12	0.40	0.40		0.27
Pine Siskin	7	4		11	0.47	0.27		0.24
All birds	128	196	41	365	8.60	13.00	2.73	8.09

Table 6.3. Estimated annual densities of breeding birds in ponderosa pine forest at Mount Rushmore National Memorial, South Dakota, 2002-2004.

Common Name	Year	D	LCL	UCL	%CV	df
Red-breasted Nuthatch	2002	0.39	0.19	0.81	37	27
	2003	0.42	0.20	0.86	36	27
	2004	0.60	0.15	0.23	75	27
American Robin	2002	0.31	0.15	0.62	36	44
	2003	0.82	0.50	1.35	25	44
	2004	0.44	0.24	0.82	31	44
Yellow-rumped Warbler	2002	0.72	0.45	1.15	24	50
	2003	0.58	0.35	0.96	26	50
	2004	0.11	0.04	0.29	52	50
All Birds	2002	3.79	3.02	4.75	12	340
	2003	5.09	4.14	6.27	11	340
	2004	1.18	0.84	1.67	18	340

D=Estimated density (birds/ha); LCL=Lower 95% confidence limit; UCL=Upper 95% confidence limit; %CV=Coefficient of variation; df= degrees of freedom

Discussion and recommendations

The habitat at Mount Rushmore consists primarily of ponderosa pine forest, although a number of vegetative, hydrologic and geologic features contribute to a more diverse landscape. The pine forest is comprised of a range of age classes, but is mostly mature or old-growth. In a few places, small stands of aspen provide habitat for species that require broad-leaved vegetation, such as Dusky Flycatcher, Warbling Vireo and Black-headed Grosbeak. A small stand of white spruce along the bottom of Starling Basin provides habitat for Swainson's Thrush and Ruby-crowned Kinglet. A wetland in the bottom of Starling Basin also adds to the diversity of habitats within the park. A mixed spruce-aspen-pine stand in a drainage with flowing water heading north from the road to the maintenance shops provides unique habitat in the park for Ruffed Grouse, Red-naped Sapsucker, and Golden-crowned Kinglet, among other species. The tall rock

spires around Mount Rushmore provide habitat for cliff nesting species, such as White-throated Swift, Canyon Wren and Violet-green Swallow, in addition to non-native Rock Pigeons, and could potentially provide nesting sites for other cliff nesting birds such as Prairie Falcons as well.

It does not appear that any active management of habitats is ongoing at Mount Rushmore. Maintenance of old growth pine stands should be considered the top priority for bird management in the park, as such stands are generally rare throughout the Black Hills. Although these stands may have a low overall density and diversity of breeding birds, they are important for other reasons. They provide habitat for several rare or uncommon species in the Black Hills, such as Northern Goshawks, Brown Creepers, Black-backed Woodpeckers, and others. Data from the Black Hills National Forest indicates that old-growth pine stands have low densities of Brown-headed Cowbirds (Panjabi 2005), a parasitic species that can lower reproductive rates among songbirds. Thus old-growth stands may serve as population sources for forest birds that disperse to other areas.

Wind Cave National Park

Monitoring

Two point transects were conducted at Wind Cave to initiate bird monitoring, one in foothill riparian habitat, and the other in mixed-grass prairie. The transect in the riparian habitat was surveyed on 3 June, 2002, 19 June, 2003, and 2 June 2004. The prairie transect was surveyed on 29 May, 2003, 20 June, 2003, and 27 May, 2004. Weather conditions were ideal during all transect surveys, except in 2003, when moderate winds may have affected the numbers of birds detected on both transects. However, conditions were within acceptable limits of the protocol, and surveys were conducted as normal. No additional effort was made to inventory birds at Wind Cave, as inventories have already been completed in this park.

Foothill riparian

A 17-point transect was established in foothill riparian habitat in Wind Cave in 2002 (Figure 6). All 17 points were repeated in 2003, but only 16 were completed in 2004 due to a herd of Bison occupying the area around one of the point count stations that year. This transect starts at the west entrance to the park on Highway 385 and follows Spring Creek downstream to its confluence with Beaver Creek, and then continues downstream along Beaver Creek.

Although this transect follows the creek closely, not all count stations fall in similar vegetation types. The vegetation along the creek varies from dense riparian brush, to light woodland, to open wet meadows and grasslands. Stands

of live and burned ponderosa pine are present on hillsides adjacent to much of the creek. In some places, the creek runs through canyons with steep cliffs. The

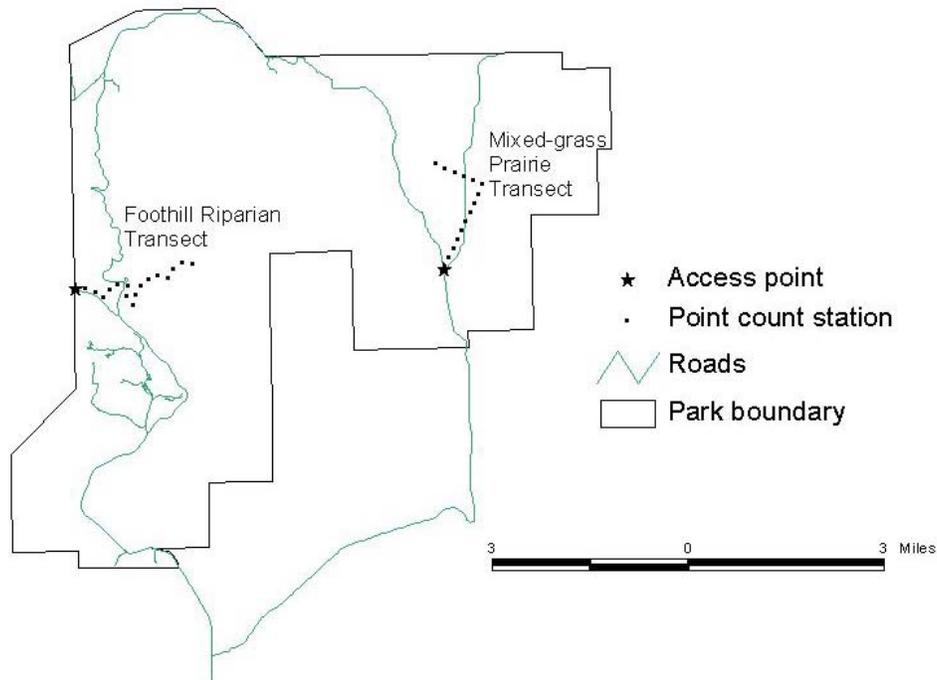


Figure 6. Locations of point transects for bird monitoring in Wind Cave National Park, South Dakota.

greater number of count stations along this transect helps compensate for the heterogeneity of the riparian habitat along it.

RMBO staff recorded between 294 and 195 individual birds of 59 species on the foothill riparian transect over the three years (Table 7.1). The 30% decrease in the total number of birds observed is not easily attributable to factors such as weather, observer error, or varying effort (although only 16 of the 17 point counts were surveyed in 2004), and may represent an actual decline in bird density at this site. Whether this decrease is short-term or part of a long-term trend is not known.

Of the 59 species detected, five species, Western Wood-Pewee, House Wren, Yellow Warbler, Common Yellowthroat, and Spotted Towhee, were observed frequently enough to generate density estimates for trend monitoring (Table 7.2). Coefficients of variation for each annual estimate for the four species were within acceptable limits (<59%) for meeting the stated monitoring targets with annual sampling (Hanni and Panjabi 2004). Thus these five species should be effectively monitored through the current point transect. While no species have statistically discernible trends at this time, density estimates for four out of the

five species decreased during each of the three years. Continued monitoring of birds at this site is warranted to determine whether or not this trend continues.

Although prospects for monitoring many of the individual species appear good, the average annual density of all breeding birds combined provides an even more sensitive index for monitoring the overall health of the avifauna in the riparian woodlands at Knife River. This estimate had a coefficient of variation between 10 and 11% each year, suggesting a reasonably high level of precision. The low CV also implies that trends should be discernable within 10 years, given annual sampling (Hanni and Panjabi 2004). Average densities of all birds at this foothill riparian site in Wind Cave decreased steadily from 8.52 birds/ha in 2002 to 7.42 birds/ha in 2003 to 6.46 birds/ha in 2004. Although not statistically significant at this early stage in monitoring, this roughly 25% decrease in the overall estimated size of the bird community is alarming, and continued and perhaps intensified monitoring is warranted. This same trend is reflected among some of the most common species at this site.

As stated earlier, this decrease is not easily attributable to sampling error. Only continued monitoring can determine whether or not these changes in density represent a short-term dip in bird densities or are symptoms of a long-term decline. I strongly recommend adding at least one other point transect within the park in similar riparian habitat to enhance the monitoring effort. This should increase the number of observations of most species, increase the number of samples upon which estimates are based, and allow for between-site comparisons of foothill riparian habitat within the park to assess whether similar trends are occurring elsewhere.

Table 7.1. Abundance of breeding bird species recorded in foothill riparian habitat at Wind Cave National Park, South Dakota, 2002-2004.

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Mallard	3			3	0.18			0.06
Blue-winged Teal			1	1			0.06	0.02
Red-tailed Hawk			1	1			0.06	0.02
Upland Sandpiper	1	3		4	0.06	0.18		0.08
Mourning Dove	3	1	2	6	0.18	0.06	0.13	0.12
White-throated Swift	1	13	15	29	0.06	0.76	0.94	0.58
Belted Kingfisher		1		1		0.06		0.02
Red-headed Woodpecker	1		2	3	0.06		0.13	0.06
Downy Woodpecker		1	1	2		0.06	0.06	0.04
Hairy Woodpecker	1			1	0.06			0.02
Northern Flicker	3	4	1	8	0.18	0.24	0.06	0.16
Unidentified Woopecker	1			1	0.06			0.02
Western Wood-Pewee	18	16	11	45	1.06	0.94	0.69	0.90
Alder Flycatcher	1			1	0.06			0.02
Dusky Flycatcher	4	1	5	10	0.24	0.06	0.31	0.20

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Cordilleran Flycatcher	3	9	4	16	0.18	0.53	0.25	0.32
Eastern Phoebe	1	1	1	3	0.06	0.06	0.06	0.06
Eastern Kingbird		3	5	8		0.18	0.31	0.16
Plumbeous Vireo	3	4		7	0.18	0.24		0.14
Warbling Vireo	7	1	1	9	0.41	0.06	0.06	0.18
Red-eyed Vireo	2			2	0.12			0.04
American Crow	2	12	2	16	0.12	0.71	0.13	0.32
Violet-green Swallow	27	4	9	40	1.59	0.24	0.56	0.80
Bank Swallow			9	9			0.56	0.18
Cliff Swallow	4			4	0.24			0.08
Barn Swallow	3	2		5	0.18	0.12		0.10
Black-capped Chickadee	2	5	5	12	0.12	0.29	0.31	0.24
Red-breasted Nuthatch	2	7	1	10	0.12	0.41	0.06	0.20
White-breasted Nuthatch	1			1	0.06			0.02
Rock Wren		1		1		0.06		0.02
Canyon Wren	2	2	4	8	0.12	0.12	0.25	0.16
House Wren	18	14	10	42	1.06	0.82	0.63	0.84
Mountain Bluebird			1	1			0.06	0.02
Townsend's Solitaire		1	2	3		0.06	0.13	0.06
American Robin	11	16	4	31	0.65	0.94	0.25	0.62
Gray Catbird	1			1	0.06			0.02
Cedar Waxwing	18	14	3	35	1.06	0.82	0.19	0.70
Yellow Warbler	21	16	9	46	1.24	0.94	0.56	0.92
Yellow-rumped Warbler	1	1	1	3	0.06	0.06	0.06	0.06
American Redstart	3	3	2	8	0.18	0.18	0.13	0.16
Ovenbird	3		3	6	0.18		0.19	0.12
Common Yellowthroat	28	16	12	56	1.65	0.94	0.75	1.12
Yellow-breasted Chat	5	7	12	24	0.29	0.41	0.75	0.48
Western Tanager	4	8	3	15	0.24	0.47	0.19	0.30
Spotted Towhee	10	15	12	37	0.59	0.88	0.75	0.74
Chipping Sparrow		2	3	5		0.12	0.19	0.10
Vesper Sparrow		3		3		0.18		0.06
Lark Sparrow	1			1	0.06			0.02
Song Sparrow	2		1	3	0.12		0.06	0.06
Dark-eyed Junco	1		3	4	0.06		0.19	0.08
Black-headed Grosbeak	14	3	4	21	0.82	0.18	0.25	0.42
Lazuli Bunting		7	1	8		0.41	0.06	0.16
Red-winged Blackbird	1			1	0.06			0.02
Western Meadowlark	14	8	10	32	0.82	0.47	0.63	0.64
Brewer's Blackbird	11	5		16	0.65	0.29		0.32
Common Grackle	6		2	8	0.35		0.13	0.16
Brown-headed Cowbird	6	1	4	11	0.35	0.06	0.25	0.22

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Red Crossbill	14	5	11	30	0.82	0.29	0.69	0.60
Pine Siskin	1			1	0.06			0.02
American Goldfinch	1	6	2	9	0.06	0.35	0.13	0.18
All birds	291	242	195	728	17.12	14.24	12.19	14.56

Table 14. Estimated annual densities of breeding bird species in a foothill riparian site at Wind Cave National Park, South Dakota, 2002-2004.

Common Name	Year	D	LCL	UCL	%CV	df
Western Wood-Pewee	2002	0.23	0.12	0.42	31	42
	2003	0.19	0.10	0.36	33	42
	2004	0.15	0.07	0.30	36	42
House Wren	2002	0.43	0.25	0.73	27	40
	2003	0.33	0.19	0.60	30	40
	2004	0.25	0.13	0.49	34	40
Yellow Warbler	2002	0.98	0.59	1.64	26	44
	2003	0.70	0.39	1.25	29	44
	2004	0.45	0.22	0.91	36	44
Common Yellowthroat	2002	1.75	1.02	2.99	27	44
	2003	1.08	0.58	2.03	32	44
	2004	0.88	0.44	1.77	36	44
Spotted Towhee	2002	0.65	0.27	1.54	45	32
	2003	0.91	0.41	2.04	41	32
	2004	0.83	0.36	1.90	43	32
All birds	2002	8.52	7.01	10.35	10	585
	2003	7.42	6.07	9.08	10	585
	2004	6.46	5.22	8.00	11	585

D=Estimated density (birds/ha); LCL=Lower 95% confidence limit; UCL=Upper 95% confidence limit; %CV=Coefficient of variation; df= degrees of freedom

Mixed-grass prairie

A 15-point transect was established in mixed-grass prairie in 2002, and was repeated in full in 2003 and 2004. In 2003, the observer had to make a minor adjustment to the course of this transect to avoid a group of bison. This transect begins at the intersection of NPS 5 and NPS 6 roads, in the northern end of the park, and heads northeast for the first ten counts, and then turns to the northwest for the last 5 counts (Figure 6). Although this transect primarily samples mixed-prairie grassland, it crosses a sparse riparian woodland at two points, and therefore a few riparian species were recorded along this route.

RMBO staff recorded between 191 and 87 individual birds of 26 species on the mixed-grass prairie transect over the three years (Table 7.1). The large

decrease in the total number of birds observed in 2004 is probably due at least in part to observer error (this observer had trouble detecting birds aurally at greater distances) and is thus may not be indicative of a negative population trend.

Of the 26 species detected, three species, Upland Sandpiper, Grasshopper Sparrow, and Western Meadowlark, were observed frequently enough to generate density estimates for trend monitoring (Table 7.2). Coefficients of variation for each annual estimate for the four species were generally within acceptable limits (<59%) for meeting the stated monitoring targets with annual sampling (Hanni and Panjabi 2004), although some estimates from 2004 have high CVs, again likely due to observer error. Nonetheless, these five species will probably be effectively monitored through the current point transect. No species have statistically discernible trends at this time, and given the possible sampling error in 2004, no preliminary assessments of trends can be made at this time.

Although prospects for monitoring a few of the individual species on this transect appear reasonably good, the average annual density of all breeding birds combined provides a more sensitive index for monitoring the overall health of the avifauna in this mixed-grass prairies at Wind Cave. This estimate had a coefficient of variation between 11 and 15% each year, suggesting that trends should be discernable within 12-13 years, given annual sampling (Hanni and Panjabi 2004). Average densities of all birds at this mixed-grass prairie site in Wind Cave ranged from 1.53 birds/ha in 2002 to 1.85 birds/ha in 2003 to .69 birds/ha in 2004. Again, the drop in density in 2004 may be a result of observer error, but continued monitoring may be warranted.

As with the riparian transect, repeated surveys along this mixed-grass prairie transect over the course of the breeding season would enhance the precision and robustness of the density estimates, and could allow additional species to be monitored as well. I also recommend adding at least one other point transect in similar grassland habitat in the park to enhance the monitoring effort. This would increase the number of observations of most species, and the number of samples upon which estimates are based, and should allow for between-site comparisons among different areas of the park.

Table 15. Abundance of breeding bird species recorded in mixed-grass prairie at Wind Cave National Park, South Dakota, 2002-2004.

Common Name	# individuals observed				average # birds/point count			
	2002	2003	2004	all years	2002	2003	2004	all years
Sharp-tailed Grouse	2			2	0.13			0.04
Great Blue Heron		1		1		0.07		0.02
American Kestrel		1	2	3		0.07	0.13	0.07
Prairie Falcon			1	1			0.07	0.02
Killdeer	3	3	1	7	0.20	0.20	0.07	0.16
Upland Sandpiper	19	12	7	38	1.27	0.80	0.47	0.84
Mourning Dove	4	1		5	0.27	0.07		0.11

Northern Flicker		1	1	2		0.07	0.07	0.04
Unknown Woodpecker			1	1			0.07	0.02
Eastern Kingbird	3	1	3	7	0.20	0.07	0.20	0.16
American Crow	2	7	4	13	0.13	0.47	0.27	0.29
Northern Rough-winged Swallow	2	1		3	0.13	0.07		0.07
Barn Swallow	3	2		5	0.20	0.13		0.11
Unknown Swallow			1	1			0.07	0.02
Rock Wren	2			2	0.13			0.04
Brown Thrasher			1	1			0.07	0.02
European Starling	2	6	4	12	0.13	0.40	0.27	0.27
Common Yellowthroat	1			1	0.07			0.02
Spotted Towhee	2			2	0.13			0.04
Clay-colored Sparrow	1			1	0.07			0.02
Vesper Sparrow	4	1		5	0.27	0.07		0.11
Grasshopper Sparrow	6	28		34	0.40	1.87		0.76
Red-winged Blackbird	10	1		11	0.67	0.07		0.24
Western Meadowlark	78	115	33	226	5.20	7.67	2.20	5.02
Brewer's Blackbird		7	27	34		0.47	1.80	0.76
Brown-headed Cowbird		3	1	4		0.20	0.07	0.09
Orchard Oriole	1			1	0.07			0.02
American Goldfinch	4			4	0.27			0.09
All birds	149	191	87	427	9.93	12.73	5.80	9.49

Table 16. Estimated annual densities of breeding birds in mixed-grass prairie at Wind Cave National Park, South Dakota, 2002-2004.

Common Name	Year	D	LCL	UCL	%CV	df
Upland Sandpiper	2002	0.16	0.08	0.33	36	27
	2003	0.07	0.03	0.16	45	27
	2004	0.17	0.04	0.67	76	27
Grasshopper Sparrow	2002	0.24	0.10	0.57	45	33
	2003	1.11	0.66	1.88	26	33
	2004	0.00				
Western Meadowlark	2002	0.64	0.49	0.83	13	221
	2003	0.93	0.73	1.17	12	221
	2004	0.27	0.19	0.39	19	221
All birds	2002	1.53	1.21	1.92	12	370
	2003	1.85	1.49	2.30	11	370
	2004	0.69	0.52	0.93	15	370

D=Estimated density (birds/ha); LCL=Lower 95% confidence limit; UCL=Upper 95% confidence limit; %CV=Coefficient of variation; df= degrees of freedom

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