

SOUTH DAKOTA ALL BIRD CONSERVATION PLAN



**BY KRISTEL K. BAKKER, PH.D. FOR
SOUTH DAKOTA DEPARTMENT OF GAME, FISH AND PARKS
PIERRE, SOUTH DAKOTA
2005**

WILDLIFE DIVISION REPORT 2005-09

Photos of Greater Sage-Grouse and Long-billed Curlew by Doug Backlund

South Dakota All Bird Conservation Plan
Kristel Bakker, Dakota State University
Kristel.bakker@dsu.edu
(605) 256-5182

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List of Acronyms:

BBS-Breeding Bird Survey
 BCR-Bird Conservation Region
 CBC-Christmas Bird Count
 CRP-Conservation Reserve Program
 EWP-Emergency Watershed Program
 EWRP-Emergency Wetland Reserve Program
 FWP-Federal Wetlands Protection
 NAWCA-North American Wetlands Protection Act
 NAWCP-North American Waterbird Conservation Plan
 NAWMP-North American Waterfowl Management Plan
 NGPJV-Northern Great Plains Joint Venture
 NRCS-Natural Resources Conservation Service
 PIF-Partners in Flight
 PPJV-Prairie Pothole Joint Venture
 SDGFP-South Dakota Department of Game, Fish and Parks
 USFWS-United States Fish and Wildlife Service
 USSCP-United States Shorebird Conservation Plan

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Executive Summary

State conservation plans were identified as necessary for the management of nongame landbirds. Ecological management requires determining which species and habitats are most in need of conservation. The objectives of this plan are to identify the priority species of concern in South Dakota, present their habitat requirements, and identify possible habitat management options. Conservation issues and research needs for each habitat are identified. An additional goal of the plan is to identify gaps in our knowledge of South Dakota birds so research efforts and money can be directed to those areas. This plan is organized by general habitat type with references to regions incorporated within habitat description and species accounts. Management recommendations for individual priority species follow each account, when available. Primarily literature from South Dakota (Bakker 2003a) or nearby areas with similar vegetation and climatic conditions are incorporated into species accounts because habitat requirements can vary greatly across regions (Flather and Sauer 1996, Hochachka et al. 1999, Johnson and Igl 2001, Bakker et al. 2002). For each habitat type, overall management objectives, conservation issues, and research needs follow species accounts. Priority bird species are summarized in Table 1. Of the 30 level I priority species, 26 require wetland, grassland, or a combination of these habitats during the breeding season. Of the remaining species three use riparian woodlands extensively and one is a sagebrush obligate. The biggest threat to these species is drainage of wetlands and tillage of native habitats for agriculture. Preventing further loss is a much more efficient means of providing habitat for birds than restoration or management of other land use activities. Therefore, conservation of native habitats across the landscape is the most important factor in maintaining populations of priority birds in South Dakota. It is clear that in order to achieve these goals, partnerships between state, local, tribal, and federal government agencies, conservation groups and private landowners are critical.

Introduction

Partners in Flight (PIF) was formed in 1990 with the intent to conserve North American landbirds. The PIF mission is based on the premises of helping species at risk, keeping common birds common, and forming voluntary partnerships that benefit birds, habitat, and people. The long-term PIF vision is that, “Populations of native birds will occur in their natural numbers, natural habitats, and natural geographic ranges, through coordinated efforts by scientists, government, and private citizens” (Rich et al. 2004). The foundation of PIF’s conservation strategy is based on bird conservation plans. These encompass continental, regional and state plans. The common goal of these plans is to identify avian species and habitats most in need of conservation, and to establish objectives to meet identified conservation goals. These objectives are based on sound science and consensus among land managers, interested groups, and knowledgeable individuals.

Partners in Flight assesses species status and vulnerability based on six factors: population size, breeding distribution, non-breeding distribution, threats to breeding range (habitat destruction/loss, competition from exotic species, etc.), threats to non-breeding range, and population trends. PIF then assigns responsibility to avifaunal biomes critical to each species (Rich et al. 2004). Avifaunal biomes are further broken down into Bird Conservation Regions (BCRs). South Dakota is located primarily in BCRs 11 and 17 (Figure 1). BCR 11 is termed the prairie potholes and includes mixed and tallgrass prairie and covers the area from the eastern border of the state to the Missouri River. BCR 17 is referred to as the Badlands and Prairies and contains the land area defined as west river South Dakota.

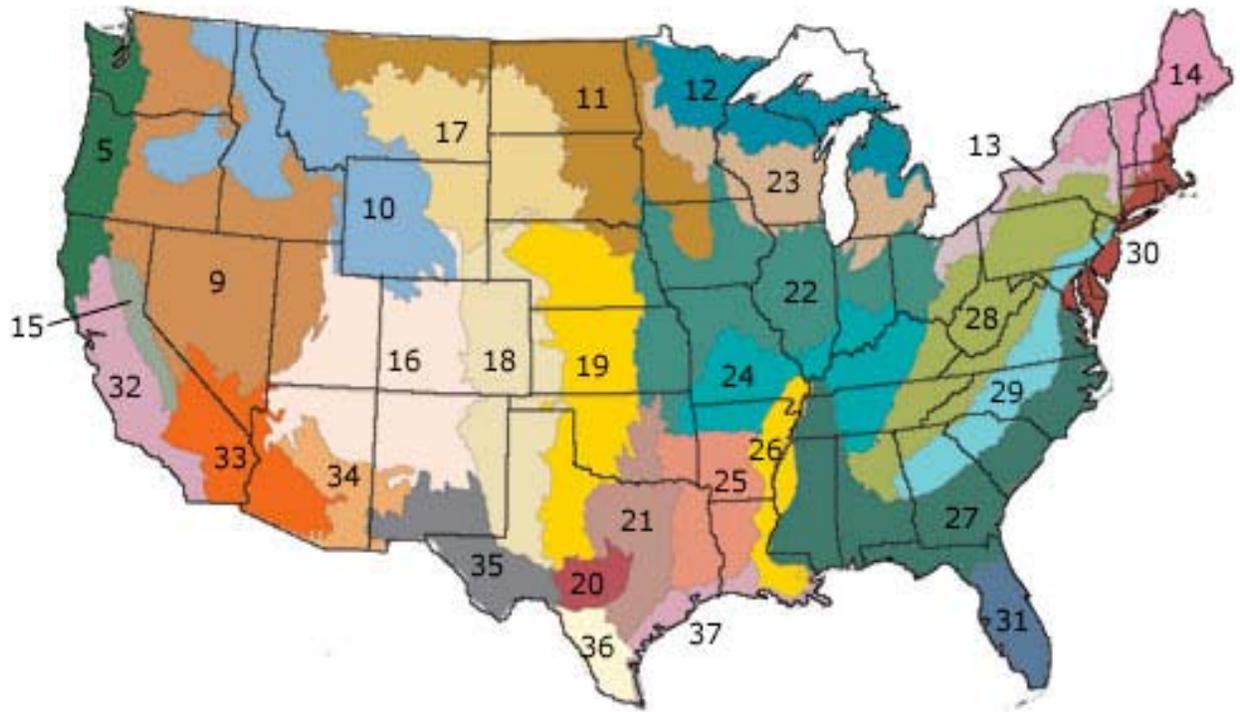


Figure 1. Bird Conservation Regions (BCRs) of the United States. Eastern South Dakota lies in BCR 11, the Prairie Pothole conservation region while western South Dakota lies within BCR 17, the Badlands and Prairies conservation region. Map courtesy of <http://www.abcbirds.org/nabci/bcrs.htm>.

North American Bird Conservation Plans

Currently there are 4 major bird plans, the North American Waterfowl Management Plan (NAWMP), Partners in Flight North American Landbird Conservation Plan, North American Waterbird Conservation Plan (NAWCWCP) and United States Shorebird Conservation Plan (USSCP). The NAWMP is a joint effort between the Canadian and United States governments and is implemented regionally in joint ventures (<http://northamerican.fws.gov/NAWMP/nawmphp.htm>). It was crafted in response to record low numbers of waterfowl species in the 1980s. Joint ventures involve partnerships with federal, state, provincial, tribal and local governments, businesses, conservation organizations, and individual citizens. Implementation plans are developed regionally to protect wetland resources. Actions include protection, restoration, and enhancement of wetland and upland habitats (<http://northamerican.fws.gov/NAWMP/nawmphp.htm>). The mission of the NAWCWP is to create a partnership dedicated to the conservation and management of waterbirds, including seabirds, colonial wading birds, coastal waterbirds and marshbirds, and their habitats in North America (<http://www.nacwcp.org/>). The PIF North American Landbird Conservation Plan summarizes the conservation status of landbirds across North America, identifies species most in need of attention at the continental scale, emphasizes species in need of attention in specific biomes, promotes conservation of species throughout the seasonal cycles, presents population objectives for species at risk, demonstrates the need for greater resources for landbird conservation, and promotes a coordinated approach to landbird conservation among nations and regions of North America (Rich et al. 2004). The USSCP was completed in 2000 and is committed to the conservation of shorebirds and their habitats (<http://www.manomet.org/USSCP.htm>). The plan was developed in response to the substantial declines in 26 shorebird species and predicted declines of up to 25% of 5 of these over the next

10 years. The USSCP has 3 objectives; 1) development of a standardized, scientifically sound system for monitoring shorebird populations to provide information to researchers and land managers, 2) identify principles and practices that can integrate shorebird habitat conservation into local, regional, and national multiple species management plans, and 3) to design a strategy to increase public awareness and education about shorebirds and their habitats

(<http://www.manomet.org/USSCP.htm>). All of these plans are incorporated to some extent into South Dakota's All Bird Conservation Plan.

Priority Bird Species of South Dakota

The priority bird species list developed for South Dakota includes birds on the PIF watch list with distributions in South Dakota, birds with a high proportion of their total population breeding or wintering in South Dakota (e.g., area importance, South Dakota therefore has a greater responsibility and more conservation opportunities for these species), federal endangered or threatened species, American Bird Conservancy green list species, waterbirds classified as “moderate” and “high concern” by the Northern Prairie and Parkland Waterbird Conservation Plan (Beyersbergen et al. 2004), USSCP, NAWCP, or NAWMP and those designated as species of concern by wildlife managers and scientists in South Dakota (Table 1). These priorities are presented as guidelines for management direction, but ultimately, conservation partner activities will be determined by their respective missions and other management goals.

Priority species were ranked based on continental and state declines and state abundance scores into conservation priority levels. Level I species have the highest conservation priority due to high maximum abundance of the species within its range in South Dakota, South Dakota constitutes the core of the species breeding range, and/or the species is showing population declines in South Dakota or across its range. Level II species are those with moderate

conservation priority due to medium abundance scores in South Dakota or management plans are already in place (e.g., Federally listed, game species). Level III species include birds with moderate conservation priority due to low abundance scores in South Dakota or South Dakota is on the periphery of the species' range, the species is unique to some habitats (i.e., Black Hills) in South Dakota, or wintering species. Even though Level III species may not be declining nationally they are considered important to the biodiversity in the state.

Table 1. South Dakota's priority species, population trends, status, area importance scores, major habitat association, and priority level.

Species	^a BBS National	South Dakota BBS		^b State Status	AI ^c BCR		Habitat	Priority Level ^d
		1966-2003	1980-2003		11	17		
Horned Grebe	0.3	---	---	B	3		Wetland	I
Red-necked Grebe	-1.4	---	---	B	2		Wetland	III
Eared Grebe	7.5*	-3.9	-20.2*	B	4	2	Wetland	II
Western Grebe	0.9*	7.2	-2.3	B	2	2	Wetland	III
American White Pelican	3.5*	14.1	14.9*	B	4	4	Wetland	II
American Bittern	-0.1*	-4.2	1.3	B	5	2	Wetland	I
Least Bittern	-2.1	---	---	B	2		Wetland	III
Great Blue Heron	2.8*	3.7	2.0	B	3	2	Wetland	II
Black-crowned Night Heron	4.9*	-7.6	-4.4	B	4	2	Wetland	I
Northern Pintail	0.1	-3.3*	-2.3	B	5	3	Wetland	II
Canvasback	8.1*	22.4	22.7*	B	5	2	Wetland	II
Redhead	4.2*	12.1	14.6	B	5	2	Wetland	II
Bald Eagle	11.2*	---	---	B	1	1	Riparian	II
Northern Harrier	-0.6	-4.1	-5.3	B	5	5	Grassland	I
Northern Goshawk	-2.8	-6.8	-6.8	Y		4	Black Hills	III
Swainson's Hawk	0.0	2.1	-3.6	B	5	4	Woodland /Grassland	I
Ferruginous Hawk	2.6*	10.3	6.5	B	5	5	Grassland	I
Golden Eagle	1.5	-1.6	-6.3*	B		5	Grassland	I
Gyr Falcon	---	---	---	W			Grassland	III
Ring-necked Pheasant	-1.0*	1.5	2.6	Y	4	5	Grassland	III
Sharp-tailed Grouse	-0.6	-0.7	-12.3	Y	5	5	Grassland	I
Greater Sage-Grouse	0.1	---	---	Y		5	Sagebrush	I
Greater Prairie Chicken	-4.1*	---	---	Y	2	2	Grassland	I
Ruffed Grouse	-1.6	---	---	Y		2	Black Hills	III
Virginia Rail	0.2	-15.1*	---	B	5	5	Wetland	I
Whooping Crane	---	---	---	M			Wetland	III
Piping Plover	---	---	---	B	2	3	Riverine	II
American Avocet	0.6	12.3*	7.9*	B	3	2	Wetland	II
Willet	0.8	5.8	7.2	B	5	2	Wetland/ Grassland	I
Upland Sandpiper	0.9*	1.0	-0.9	B	5	5	Grassland	I
Long-billed Curlew	-1.9*	-3.1*	-3.8	B	5	4	Grassland	I
Marbled Godwit	1.2	6.5	6.9	B	5	2	Wetland/ Grassland	I
Wilson's Phalarope	0.1	-4.5*	-2.5*	B	5	5	Wetland/ Grassland	I
Franklin's Gull	0.2	-14.2*	-20.6*	B	5	1	Wetland	I
Common Tern	-7.3*	---	---	B	5	3	Wetland	III
Least Tern	-0.7	---	---	B	3	2	Riverine	II
Black Tern	2.6	-3.3	5.7	B	5	1	Wetland	I
Mourning Dove	-0.2*	0.6	-1.9*	B	4	4	Grassland, Woodland	III
Black-billed Cuckoo	-2.2*	-2.8	-1.8	B	5	5	Woodland	I
Burrowing Owl	-1.2	-9.3*	-12.7*	B	2	3	Grassland	I
Short-eared Owl	-1.9	9.9	-11.5*	Y	3	4	Grassland	I

Species	^a BBS National	SD BBS		^b State Status	AI ^c BCR		Habitat	Priority Level ^d
		1966-2003	1980-2003		11	17		
Whip-poor-will	-2.3*	---	---	B	1		Woodland	III
White-throated Swift	-1.5	-1.9	-6.6	B		4	Open areas near rocky cliffs	II
Ruby-throated Hummingbird	2.2*	---	---	B,M	2	1	Woodland residential	III
Lewis's Woodpecker	-3.2*	---	---	B		3	Black Hills	III
Red-headed Woodpecker	-2.6*	-0.7	-1.9	B	4	2	Woodland	II
Yellow-bellied Sapsucker	3.7*	---	---	B	2		Woodland	III
Red-naped Sapsucker	3.3*	8.2*	6.8	B		3	Black Hills	III
American Three-toed Woodpecker	-2.7	---	---	Y		2	Black Hills	III
Black-backed Woodpecker	3.2	---	---	Y		2	Black Hills	III
Eastern Wood-Pewee	-1.5*	-30.8	---	B	2		Woodland	III
Willow Flycatcher	-0.9*	2.9	1.7	B	2	3	Woodland	II
Bell's Vireo	-2.9*	-6.4	46.8	B	1	1	Woodland	III
Yellow-throated Vireo	1.1*	---	---	B	2		Woodland	III
Pinyon Jay	-4.6*	-12.9	-27.9	Y		2	Black Hills	III
Clark's Nutcracker	1.5	123.0	122.9	Y		2	Black Hills	III
Red-breasted Nuthatch	0.2	1.1	-0.5	Y		3	Woodland	III
Pygmy Nuthatch	0.4	---	---	Y		1	Black Hills	III
Blue-gray Gnatcatcher	0.7*	---	---	B			Woodland	III
American Dipper	1.0	---	---	Y		1	Black Hills	III
Townsend's Solitaire	2.0*	-0.7	-2.3	Y		4	Black Hills	III
Veery	-1.4*	---	---	B		2	Black Hills, Woodland	III
Wood Thrush	-1.7*	---	---	B,M			Woodland	III
Sage Thrasher	-0.8*	---	---	B		2	Sagebrush	III
Sprague's Pipit	-2.1	-2.8	15.3	B	5	3	Grassland	III
Virginia's Warbler	-0.7	---	---	B			Black Hills	III
Black-and-White Warbler	-1.2*	---	---	B	1		Black Hills	III
Scarlet Tanager	-0.1	---	---	B	1		Woodland	III
Western Tanager	0.9*	0.6	2.1	B		2	Woodland	III
Eastern Towhee	-1.8*	-1.1	0.0	B	1	1	Woodland	III
American Tree Sparrow	---	---	---	W			Grassland	III
Brewer's Sparrow	-2.8*	1.6	-1.6	B	1	3	Sagebrush	II
Lark Bunting	-1.3*	-3.4*	-5.2*	B	2	5	Grassland	I
Savannah Sparrow	-0.8*	1.3	12.1*	B	4	2	Grassland	I
Grasshopper Sparrow	-3.8*	-4.7*	-4.4*	B	4	5	Grassland	I

Species	^a BBS National	SD BBS		^b State Status	AI ^c BCR		Habitat	Priority Level ^d
		1966-2003	1980-2003		11	17		
Baird's Sparrow	-4.2*	-1.8	0.4	B	5	4	Grassland	I
Henslow's Sparrow	-8.6*	---	---	B	3		Grassland	II
Le Conte's Sparrow	3.7*	---	---	B	4	2	Grassland	I
Nelson's Sharp-tailed Sparrow	7.9*	---	---	B	5		Wetland	I
Harris's Sparrow	---	---	---	W			Woodland	III
Dark-eyed Junco	-0.8*	2.6*	2.0	Y-BH W	1	2	B-BH, W-widesprd	III
McCown's Longspur	1.9	---	---	B	5	5	Grassland	III
Lapland Longspur	---	---	---	W	1	1	Fields, prairie, roadsides	III
Chestnut-collared Longspur	-2.5*	-6.7*	-11.2*	B	5	5	Grassland	I
Rose-breasted Grosbeak	0.0	-17.9	-54.9	B	3	1	Woodland	III
Dickcissel	-1.2*	-2.9	0.5	B	2	2	Grassland	II
Bobolink	-0.9*	2.5	2.3	B	4	2	Grassland	II
Western Meadowlark	-0.8*	0.2	-0.3	B	4	5	Grassland	I
Orchard Oriole	-0.8*	1.8*	-0.5	B	3	2	Woodland	I
Cassin's Finch	-3.4*	---	---	B		1	Black Hills	III
Lesser Goldfinch	-0.8	---	---	B			Black Hills	III
Pine Siskin	-3.1*	1.2	-1.4	B, W	2	3	Black Hills, W-widesprd	III

^aUSFWS Breeding Bird Survey results indicating the average percent (%) population change per year.

*statistically significant ($p \leq 0.10$)

^bB=breeding, W=wintering, M=migratory, Y=year round, BH=Black Hills

^cBird Conservation Region (BCR) Area Importance (AI). 5=Maximum abundance of the species within its range as compared to all other states or BCRs (50-100% of maximum abundance value), 4=25-49.9% of maximum abundance, 3=6-24.9% of maximum abundance, 2=0-5.9% of maximum abundance, 1=Not detected by BBS or does not breed regularly within state or BCR.

^dLevel I: Species with the highest conservation priority due to high maximum abundance of the species within its range or South Dakota constitutes the core of the species breeding range and the species is showing population declines in South Dakota or across its range.

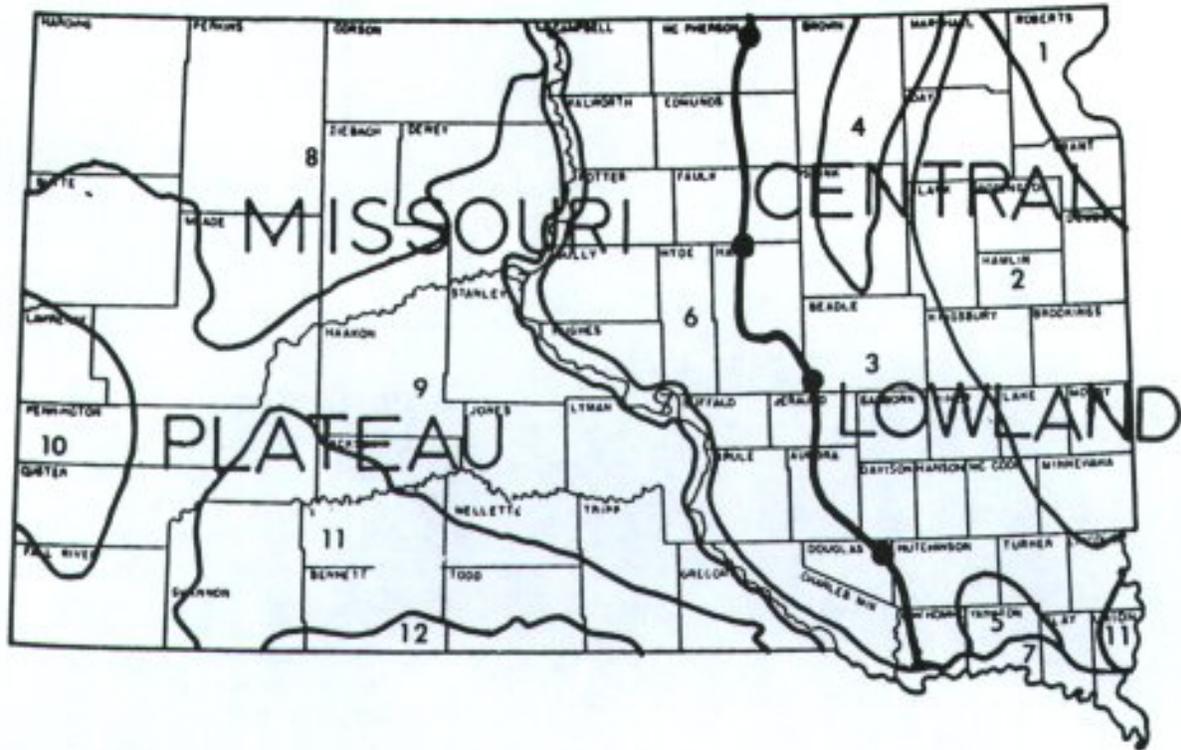
Level II: Species with a moderate conservation priority due to medium abundance scores or management plans are already in place (e.g., Federally listed, game species).

Level III: Species with a moderate conservation priority but have low abundance scores in South Dakota or South Dakota is on the periphery of the species' range, species unique to some habitats (Black Hills) in South Dakota which may not be declining nationally but are considered important to the biodiversity in the state, and wintering species.

Geography and Land Use of South Dakota

South Dakota lies in the prairie biome of North America. The state consists of 199,730 km² nearly equally divided by the Missouri River, which flows north to south through the center of the state. Eastern South Dakota is divided into 8 physiographic regions, the 3 major ones being the Missouri Coteau, the Central Lowland (James River Lowland) and the Prairie Coteau (Figure 2, divisions 6, 3, and 2, respectively). Eastern South Dakota is part of the Prairie Pothole Region as landforms are the result of the movement and deposition of continental glaciers during the Pleistocene (Peterson 1995). Elevations range from 253 to 528 m above sea level. Eastern South Dakota consists mainly of mixed grass prairie but moderate amounts of tallgrass prairie occur in the Prairie Coteau (Figure 2). The James River Lowland and the Missouri Coteau comprise the mixed grass prairie. Total surface area (upland and wetland) of public lands in eastern South Dakota is 132,438 ha and grassland easements protect another 74,143 ha of upland habitat (Estey 1998). The percent of total county surface area within protected tracts ranges from 0.8% (255 ha) to 48.7% (145,205 ha) in eastern South Dakota (Estey 1998). Native grasslands constitute from <10 to 80% of the land area in various eastern South Dakota counties (Figure 3). Grassland abundance is highest throughout the Missouri Coteau, central James River Lowland and northern Prairie Coteau. Agricultural activity is intensive in the remaining area of eastern South Dakota with wheat (*Triticum aestivum*), soybeans (*Glycine max*) and corn (*Zea mays*) being the primary crops. Wetlands are a prominent feature of the glaciated prairie pothole region of eastern South Dakota, accounting for 2,222,113 ac (899,277 ha) or 9.8% of the eastern South Dakota landscape (Johnson and Higgins 1997).

Western South Dakota lies within the northwestern Great Plains ecoregion (Bryce et al. 1998) between 42 and 46 latitude and 98 and 104 longitude. It is delineated into 5 physiographic



Legend:

- Division 1: Minnesota River-Red River Lowland
- Division 2: Coteau des Prairies
- Division 3: James River Lowland
- Division 4: Lake Dakota Plain
- Division 5: James River Highlands
- Division 6: Coteau du Missouri
- Division 7: Missouri River Trench
- Division 8: Northern Plateaus
- Division 9: Pierre Hills
- Division 10: Black Hills
- Division 11: Southern Plateaus
- Division 12: Sand Hills

Figure 2. Physical Divisions of South Dakota.
<http://www.northern.edu/natsource/EARTH/Physio1.htm>

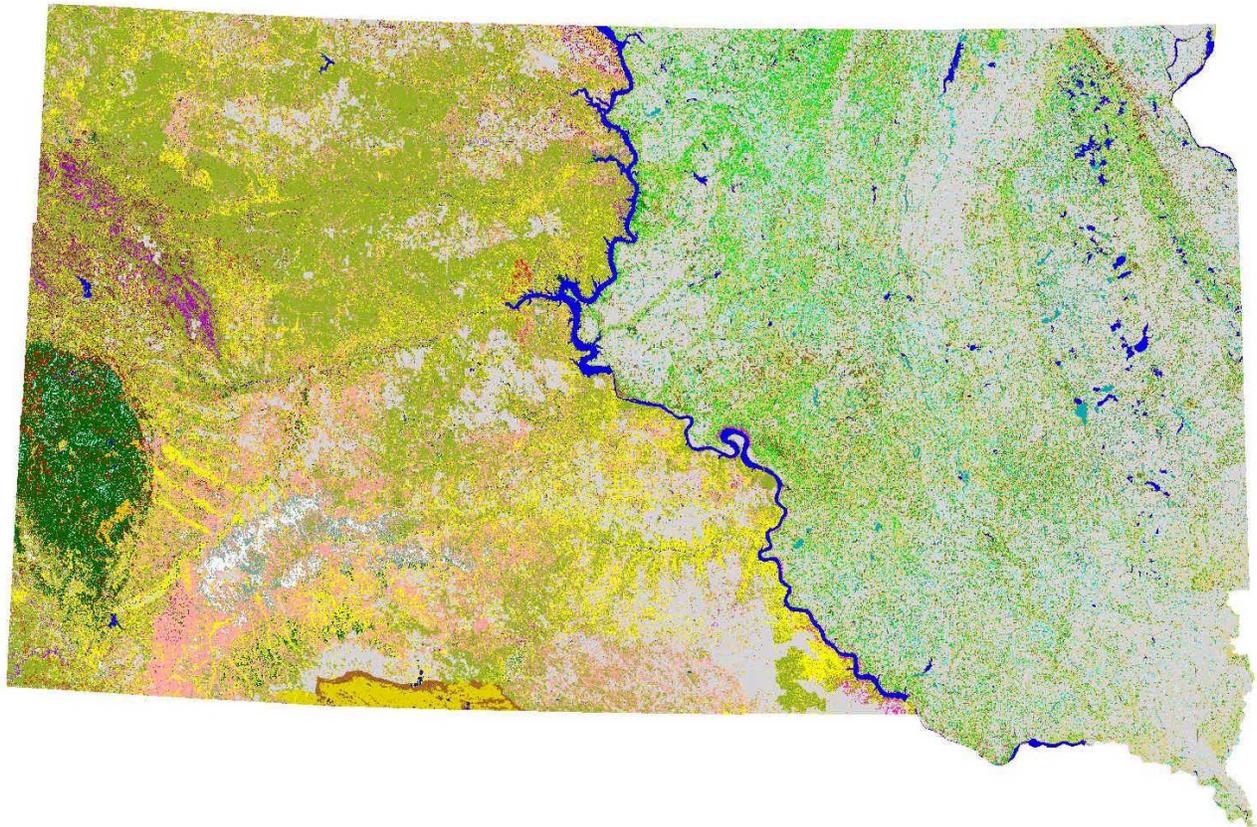


Figure 3. South Dakota land cover classification. Courtesy of South Dakota GAP <http://wfs.sdstate.edu/sdgap/land.html>.

regions and includes the Badlands and Black Hills (Figure 2). Landscapes in western South Dakota are nonglaciaded, erosional landforms produced by ancient geological processes.

Western South Dakota is characterized by broad, rolling open plains dotted with broad buttes and deep river breaks. The Grand, Moreau, Cheyenne, Bad and White rivers flow east from the Black Hills and Great Plains regions and drain into the Missouri River. Soils are derived from shale, siltstone and sandstone. Elevations range from 443 m in the river breaks, to over 1,128 m in some plains areas (Bryce et al. 1998). Mean annual precipitation varies from 33-55.8 cm per year and mean min./max. July temperatures are 13/33 C. Extreme temperatures, low precipitation and relatively low humidity limit agricultural expansion and explain why the northern mixed grass prairie of western South Dakota remains one of the largest intact grassland landscapes in North America. Surface water covers 2.4% of the 10,810,700 ha of land area in western South Dakota (Rieger 2004). Palustrine systems account for 50.2%, lacustrine systems account for 41.8%, and riverine systems account for 8.1% of the surface water area (Rieger 2004). Western South Dakota has 30% fewer hectares of National Wetlands Inventory delineated wetlands as eastern South Dakota (Rieger 2004). Trees comprise <1% of the landscape and are primarily riparian and wooded draws with some planted shelterbelts and windbreaks. The major land use of the region is pasture/rangeland (<http://wfs.sdstate.edu/sdgap/land.html>).

History of Avifauna

South Dakota bird life is highly diversified due to varied habitats consisting of rivers, potholes, lakes, ponds, riparian woodlands, man-made woodlands, sagebrush, shrublands, croplands, haylands, Conservation Reserve Program (CRP) planted cover, virgin mixed and tallgrass prairies and the Black Hills. South Dakota's midcontinental geographic position

constitutes a transition zone where both western and eastern species occur (Tallman et al. 2002). In addition, thousands of migrating waterfowl, shorebirds, and songbirds pass through South Dakota in the spring and fall.

In 1916, South Dakota's bird list consisted of 320 species (Over and Thoms 1932). When additional records were added in 1932 the list included 349 species and subspecies of birds for the state. In 1991, due in part to taxonomic changes as well as additional species in the state, the list contained 395 species (SDOU 1991), 219 of which were known to breed in South Dakota (Peterson 1995). Today, the list has grown to 414 species (Tallman et al. 2002), mainly due to the addition of non-breeding individuals during migration or winter and the documentation of new breeding species, such as Great-tailed Grackles (*Quiscalus mexicanus*) (Swanson and Liknes 2001), Virginia's Warblers (*Vermivora virginiae*) (Swanson et al. 2000) and Whip-poor-wills (*Caprimulgus vociferus*) (Dean et al. 1995). Two exotic species that were rarely seen historically, the Rock Dove (*Columbia livia*) and the European Starling (*Sturnus vulgaris*) are now common throughout South Dakota, and a third, the Eurasian Collared-Dove (*Streptopelia decaocto*) is increasing in the state (Tallman et al. 2002).

Conservation Opportunities

South Dakota has a number of entities, both public and private, with the ability to purchase or protect lands for wildlife management and conservation purposes. This section highlights some existing efforts.

The eastern half of South Dakota is in the core of waterfowl production in the United States. Prairie potholes and the surrounding grasslands provide ideal breeding habitat for many species, including waterfowl. Other species that require grassland/wetland mosaics for breeding,

such as Marbled Godwits and Black Terns, occur in abundance in South Dakota. High populations of many rare and declining grassland species breed throughout South Dakota. Additionally, many migrating shorebirds and songbirds pass through South Dakota in the spring and fall.

The U.S. Fish and Wildlife Service (USFWS) and the Canadian Wildlife Service have coordinated and implemented the North American Waterbird Plan, of which the Prairie Pothole Joint Venture (PPJV) is a component. These entities have supported the development and implementation of the Northern Prairie and Parkland Waterbird Conservation Plan (Beyersbergen et al. 2004). Implementation of the North American Waterfowl Management Plan is dependent on the prairie pothole region, including South Dakota. The PPJV is also committed to conservation of wetland-associated non-game birds and with the U.S. Geological Survey's Biological Division helped fund an in-depth literature synthesis on grassland birds. "Effects of Management Practices on Grassland Birds" provides information on the effects of management on 32 North American grassland birds and can be found at www.npwrc.usgs.gov/resource/literatr/grasbird/grasbird.htm. The PPJV has also coordinated the delineation of grassland bird conservation areas.

The Northern Great Plains Joint Venture (NGPJV) covers the area west of the PPJV which is arid to semi-arid and mostly unglaciated with relatively few natural wetlands. The NGPJV includes the western portion of South Dakota. Maintaining and protecting existing wetlands and grasslands, as well as creation and enhancement of wetlands is a major focus for the NGPJV (<http://mountain-prairie.fws.gov/nawm/ngpjbv.htm>). NGPJV partners include the USFWS, U.S. Bureau of Reclamation, U.S. Forest Service, The Nature Conservancy, and others.

The USFWS Habitat and Population Evaluation Team office in Bismarck, North Dakota, has produced a series of maps which depict areas of highest breeding waterfowl concentrations and link them with wetland abundances. They have also delineated possible areas that could function as Grassland Bird Conservation Areas. South Dakota can use a combination of these maps to target areas for conservation that would meet the greatest number of population objectives and, therefore, benefit the highest number of species of concern.

Conservation and restoration of grassland habitats are supported by the U.S. Department of Agriculture, USFWS and the SDGFP. South Dakota currently has 1,463,754 acres of land enrolled in the Conservation Reserve Program (CRP) (Bill Smith, SDGFP, pers. comm.). These acres depend on future Farm Bills, and the lack of reauthorization has the potential to cause significant population declines for several avian species. If no additional acres are enrolled and current contracts allowed to expire, by 2009 only 295,117 acres of CRP will remain in South Dakota (Bill Smith, SDGFP, pers. comm.).

The South Dakota Department of Game, Fish and Parks (SDGFP) and the USFWS conserve lands through purchase for public hunting, easements, and walk-in areas. Conservation easements are offered by the USFWS and Ducks Unlimited and are one of the few ways to offer monetary support to landowners for the preservation of native prairies. Currently in South Dakota, 430,000 acres of grasslands and 470,000 acres of wetlands are protected by easements. Total surface area (upland and wetland) of public lands in eastern South Dakota is 132,438 ha (327,261 acres) (Estey 1998). The percent of total surface area within protected tracts ranges from 0.8% (255 ha, 630 acres) to 48.7% (145,205 ha, 358,809 acres) in eastern South Dakota counties (Estey 1998). There are 4 national wildlife refuges in South Dakota; Sand Lake, Lake Andes, Waubay and LaCreek. Sand Lake is comprised of 21,498 acres, approximately half

upland and half wetland habitat. Sand Lake is managed primarily for overwater nesting birds and migrating shorebirds. South Dakota is separated into 5 USFWS wetland management districts which manage waterfowl production areas and secure wetland and grassland easements. Waterfowl production areas are fee title lands purchased with duck stamp dollars.

Walk-In Areas are privately owned grasslands the SDGFP pays owners to allow public hunting. The program places an emphasis on grasslands because they provide the best nesting, winter cover, and hunting lands for Ring-necked Pheasants. Much land leased for public hunting is also enrolled in the Conservation Reserve Program. Other cover types such as pasture land and cropland may be accepted into the program as long as a reasonable opportunity for hunting is provided. Highest rates are paid for high quality habitats. As of 2004, there were 935,000 acres of walk-in areas in South Dakota (Bill Smith, SDGFP, pers. comm.).

The SDGFP cost shares with private landowners on wetland restoration in CRP/FWP lands, wetland creation, grazing systems, and native seedings of marginal croplands. They also provide incentives to prevent conversion of native prairie, to shift away from season-long grazing and to restore grassland cover. The United States Fish and Wildlife Service (USFWS) and SDGFP form partnerships with NAWCA, Ducks Unlimited, and Pheasants Forever to provide similar incentives. These relationships are considered key as 80% of South Dakota is privately owned.

There are 3 national grasslands in South Dakota, the Fort Pierre (116,000 ac), Buffalo Gap (595,000 ac), and Grand River (151,000 ac) National Grasslands. National grasslands are managed by the US Forest Service for multiple uses. The focus is on maintaining diversity of seral stages and vegetation structure, halting the encroachment of woody vegetation and noxious weed control. During the years 2000-2004, approximately 50% of wildlife funds have been

invested to inventory and monitor species on the Grand River National Grassland (Dan Svingen, pers. comm.).

The Badlands National Park is located in southwestern South Dakota. The Badlands National Park consists of 244,000 acres of sharply eroded buttes and the largest, protected mixed grass prairie in the United States (<http://www.blackhillsbadlands.com/>). Wind Cave National Park is located in the Black Hills and is 28,295 acres in size. Much of the area of the Black Hills in South Dakota is administered as public land by Black Hills National Forest, which was established in 1897 by President Grover Cleveland (<http://www.blackhillsbadlands.com/go.asp?ID=321>). The USDA Forest Service manages these 1.2 million acres of public lands for a diversity of wildlife and fish, recreation, water production, livestock grazing, timber harvest, wilderness and other uses (<http://www.blackhillsbadlands.com/go.asp?ID=321>).

There are 17 state parks and nature areas in South Dakota (<http://www.sdgfp.info/parks/Regions/LocatorMap.htm>). The largest is Custer State Park. Located in the Black Hills, it encompasses 71,000 acres. State parks and nature areas preserve natural habitats for wildlife and public recreation.

The Nature Conservancy (TNC) has purchased 13 preserves in South Dakota which encompass nearly 50,000 acres, 40,000 acres of which is located in the Black Hills. TNC preserves include native prairies and potholes, oak savanna, fen, river canyons, and other habitats. The Nature Conservancy often partners with other entities such as the U.S. Forest Service and private landowners to protect and manage larger areas than the preserves alone encompass (<http://nature.org/wherewework/fieldguide/projectprofiles/crc.html>). The largest

preserve, Samuel H. Ordway, Jr. Memorial Prairie, is located in McPherson County and covers 7,800 acres of native prairie and potholes.

The South Dakota Conservation Alliance includes The Nature Conservancy, Northern Prairies Land Trust, South Dakota Parks and Wildlife Foundation, Ducks Unlimited, Izaak Walton League, South Dakota Wildlife Federation, Rocky Mountain Elk Foundation, Spearfish Canyon Foundation, and the South Dakota Chapter of the Wildlife Society. These entities are working together to educate South Dakotans about the public and private benefits of perpetual conservation easements (TNC 2004). Conservation easements protect land for future generations while allowing the land owner to retain many private property rights but protect the natural resources. To date, The Nature Conservancy has protected 24,000 acres in South Dakota with conservation easements. South Dakota has a total of 1.3 million acres of conservation easements (TNC 2004). Organizations such as Ducks Unlimited and the Rocky Mountain Elk Foundation also purchase land and conservation easements to benefit wildlife.

Ducks Unlimited's Grasslands for Tomorrow program has a goal of protecting 1.85 million acres of grasslands in the Missouri Coteau region of the United States and Canada (Ducks Unlimited 2005). Currently, a total of 570,000 acres are permanently protected. During the fiscal year ending in June 2005, Ducks Unlimited purchased 5,678 acres of wetland easements and 37,674 acres of grassland easements in the Missouri Coteau Focus Area of North and South Dakota (Ducks Unlimited 2005).

The Natural Resources Conservation Service (NRCS) has purchased easements in perpetuity on 77,871 acres under the Wetland Reserve Program (WRP), Emergency Wetland Reserve Program (EWRP), and Emergency Watershed Protection (EWP) - Floodplain

easements, and 30-year WRP easements on 5,522 acres. These easements cover wetlands and associated uplands.

The Bureau of Land Management administers approximately 279,000 acres of land in South Dakota for multiple uses, including wildlife food and cover and outdoor recreation. The South Dakota Office of School and Public Lands administers approximately 800,000 acres of trust land, with the interest on the trust fund used for education. Hunting and fishing are allowed on these lands.

Many of South Dakota's species of concern will thrive in the extensive wetland/grassland complexes promoted by these entities. Virtually all landscape-level, ecosystem-based habitat strategies that benefit waterfowl also benefit many grassland and wetland non-game bird suites. However, species with specific habitat requirements may not be accommodated by waterfowl management strategies. The current switch in focus by many of these agencies and groups to all bird conservation is crucial to bird conservation planning.

Bird Monitoring Programs in South Dakota

North American Breeding Bird Survey (BBS)

The BBS monitors bird populations over large geographic areas and tracks the status and trends of North American bird populations. The USGS Patuxent Wildlife Research Center, the Canadian Wildlife Service and National Wildlife Research Center coordinate the BBS program, which was initiated in 1966. The BBS informs researchers and wildlife managers of significant changes in bird population levels. Each year during the avian breeding season participants collect bird population data along roadside survey routes. Each survey route is 24.5 miles long with stops at 0.5-mile intervals. At each stop, a 3-minute point count is conducted. During the count, every bird seen or heard within a 0.25-mile radius is recorded. Surveys start one-half hour

before local sunrise. Over 4100 survey routes are located across the continental U.S. and Canada. There are 65 routes located throughout South Dakota. BBS data provide an index of population abundance that can be used to estimate population trends and relative abundances at various geographic scales. Trend estimates for more than 420 bird species are currently available via the BBS web site and can be estimated by state, route, and species. <http://www.mbr-pwrc.usgs.gov/bbs/bbs2001.html>

Christmas Bird Count (CBC)

This survey is coordinated by the National Audubon Society and is the oldest continuous wildlife survey in North America. Groups of people count birds over large areas during a single day. The CBC is based on count circles of 15 miles in diameter. The area covered should not change from year to year except when snow (especially in northern latitudes) makes certain roads inaccessible. Counts must occur during between Dec 14 – Jan 5 but may vary from year to year. Coverage, i.e. how many people are doing the count each year, in count areas may also vary. While these differences prevent meaningful comparisons of the results between CBCs, the data from single CBCs can still provide useful information on the status and trends of populations within each area.

May Breeding Waterfowl and Habitat Survey

The Canadian Wildlife Service and the U.S. Fish and Wildlife Service survey breeding waterfowl from the north-central U.S. throughout Canada and Alaska each May and June. Survey biologists estimate numbers and species from airplanes flown along transects. A portion of the transects is also surveyed from the ground by biologists who census all waterfowl to correct for birds not counted by the aerial team. This is the most extensive wildlife survey in the world, and the results are a major factor used in setting annual duck-hunting regulations. There

are survey data for Mallards, Gadwall, American Wigeon, Green-winged Teal, Blue-winged Teal, Northern Shoveler, Northern Pintail, Redhead, Canvasback, and Lesser Scaup. Breeding population and habitat survey abundance maps can be viewed at <http://birdmaps.fws.gov/>.

Project FeederWatch

Project FeederWatch is operated by the Cornell Lab of Ornithology in partnership with the National Audubon Society, Bird Studies Canada, and Canadian Nature Federation. Project FeederWatch is a winter-long survey of birds that visit feeders at backyards, nature centers, community areas, and other locales in North America. FeederWatchers periodically count the highest numbers of each species they see at their feeders from November through early April. FeederWatch helps scientists track broadscale movements of winter bird populations and long-term trends in bird distribution and abundance. Anyone with an interest in birds can participate. FeederWatch is being conducted by people of all skill levels and backgrounds, including children, families, individuals, classrooms, youth groups, nature centers, and bird clubs.

Monitoring Avian Productivity and Survivorship (MAPS) Program

The Monitoring Avian Productivity and Survivorship (MAPS) Program was created by The Institute for Bird Populations in 1989 to assess and monitor the vital rates and population dynamics of over 120 species of North American land birds. MAPS provides critical conservation and management information on bird populations. The MAPS Program utilizes constant-effort mist netting and banding at a continent-wide network of monitoring stations staffed by both professional biologists and highly trained volunteers.

Colonial Waterbird Inventory and Monitoring Program

The USFWS, USGS National Biological Survey, and state agencies are collaborating to create a system of periodic inventories of colonial waterbirds in the U.S. An effort will be made

to complete a thorough census of colonial waterbirds in each state on a 5-10 year rotating basis. Data from all states are being stored in a standardized and consolidated database. Data collection has begun on the East Coast and will move westward.

The North America Raptor Monitoring Strategy

The USGS Forest and Rangeland Ecosystem Science Center, Snake River Field Station, Boise State University, Raptor Research Center, and many collaborators are developing a strategy for monitoring diurnal raptors throughout North America. Development of species accounts involves: 1) evaluation of the literature and existing databases for methods and data useful for monitoring each species; 2) identification of weaknesses in existing monitoring programs (with respect to methodology, geographic coverage, and seasonal coverage); 3) description of existing procedures for overcoming weaknesses; and 4) recommendation of new procedures and approaches where needed. The result of this effort will be a North American Raptor Monitoring Strategy consisting of individual species accounts and a synthesis identifying the best techniques and most efficient approaches for long-term monitoring.

Midwinter Bald Eagle Survey

In cooperation with the national Midwinter Bald Eagle Survey, SDGFP surveys the Missouri River along four standardized routes annually each January. Results can be viewed at this website: <http://www.sdgfp.info/Wildlife/Diversity/BEAD/midwinter.htm>

Monitoring Activities Unique to South Dakota

Bald Eagle Nest Surveys

Beginning in 2004, SDGFP coordinated a statewide survey of Bald Eagle nests, resulting in the confirmation of 20 nests that fledged 34 birds. This effort included SDGFP, NPS, and USFWS staff and additional private and tribal cooperators. SDGFP will continue to monitor

Bald Eagle nests for occupancy and success, with flights to locate nests planned for every 3-4 years, as needed. This monitoring effort will continue for 10 years following federal delisting.

SDGFP Duck Banding

SDGFP generally bands about 2,000 ducks, 1,000 Canada geese, and 600-800 mourning doves per year in South Dakota. Banding is done for several reasons:

- 1) Distribution (where do they come from and where do they go).
- 2) Compute reporting rate (number of hunters who bag and report a band to BBL).
- 3) Compute annual survival rates.
- 4) Compute harvest rate (percentage of population being harvested).

Canada goose banding takes place in early July, when 3-5 people spend 3-5 days banding geese. Duck banding runs from August 1st to about mid-September. SDGFP pre-baits prior to August 1st and makes sure that all the bait is gone 10 days before the duck hunting season opens. Mourning doves are banded in Brookings, Sioux Falls, Watertown, Aberdeen, Huron, and Pierre, with a specific quota to be met at each site (Spencer Vaa, SDGFP, pers. comm.).

Bird Monitoring in the Black Hills

Black Hills Habitat Based Surveys

With funding and direction from Black Hills National Forest and the National Park Service, the Rocky Mountain Bird Observatory (RMBO) currently monitors birds in the Black Hills of South Dakota. Habitat based surveys are conducted in 10 different habitat types found in the Black Hills. Fifteen point counts are conducted along a transect at each of 30 randomly selected sites in each habitat type and habitat assessments are conducted at each point. The goal of these surveys is to monitor population trends within habitat types and provide other management oriented information for bird species (Arvind Panjabi, RMBO, pers. comm.).

American Dippers Banding in Spearfish Canyon, Lawrence County, South Dakota

South Dakota lists the American Dipper as a state threatened species. Banding of American Dippers in Spearfish Canyon was initiated in 2002 by Doug Backlund, SDGFP. Findings indicate that Spearfish and Whitewood creeks are home to the only permanent nesting populations of American Dippers in the Black Hills (Doug Backlund, SDGFP, pers. comm.).

Goshawk Monitoring

Goshawk monitoring is being conducted by SDGFP and BHNH personnel on national forest lands.

The South Dakota Breeding Bird Atlas Project

From 1988-1993, 71 volunteers collected 19,905 records of 219 species of breeding birds from 124-3 mile by 3 mile blocks. Blocks were stratified randomly within 17 ecological regions within South Dakota. In addition to random blocks, “special blocks,” thought to be representative of native habitats, were surveyed, as well as managed areas, which included a variety of public lands. All habitats available in the blocks were surveyed and most blocks were surveyed 3 separate times. This information is summarized in the South Dakota Breeding Bird Atlas (Peterson 1995).

Bird Banding in Aberdeen, South Dakota

Dan Tallman, Northern State University, has banded birds at 2 different residences in Aberdeen since 1979. During that time, Tallman has banded 58,360 individual birds of 124 species. A recent article contains a comprehensive summary of results and the author’s interpretations related to bird population increases and declines (Tallman 2005).

Bird Banding on Farm Island, Hughes County, South Dakota

Farm Island is located about 3 miles east of Pierre in Hughes County. Birds were first banded on Farm Island in the 1960s and into the 1980s. Since 1993, birds have been banded each spring (24 April-3 June) and fall (27 August-14 October) (Backlund et al.

<http://www.sdgifp.info/Wildlife/Diversity/birdbanding/index.htm>). Species not captured since 1993 or captured in low numbers relative to their relative capture frequency in earlier years are assumed to be declining or may no longer occur on Farm Island. Trend data can be directly compared for recent years to determine future trends of bird species on Farm Island.

Grazing System Bird Monitoring

Beginning in 2002, six privately owned, management intensive grassland grazing systems were selected to be monitored yearly. Dr. Kristel Bakker of Dakota State University is organizing a cooperative monitoring effort with the Natural Resources Conservation Service, private landowners, South Dakota Grassland Coalition and volunteer bird surveyors. The main objective is to determine the effect of management intensive grazing systems on grassland birds. “Management intensive” is defined as intensive management aimed at providing optimal forage for cattle while maintaining grassland health.

Ring-necked Pheasant Brood Survey

During summer brood surveys for Ring-necked Pheasants, broods are counted along survey routes throughout the state by SDGFP wildlife conservation officers. Information is used to predict population abundance during the fall hunting season.

Greater Sage-Grouse Lek Surveys

Sage Grouse leks are surveyed in western South Dakota. In 2004, 112 males were detected on 6 active leks in Butte County. A total of 9 leks were found. Twelve leks, 9 of which

were active, and a total of 115 males were detected in Harding County and 9 males on 1 lek were detected in Fall River County (John Wrede, SDGFP, pers. comm.).

Prairie Grouse Lek Surveys

Breeding ground counts are conducted yearly for Greater Prairie-Chickens and Sharp-tailed Grouse. Results of these counts as well as hunting and harvest statistics can be found at <http://www.sdgfp.info/Wildlife/hunting/grouse/Statistics.htm>.

Mourning Dove Call-Count Survey

The Mourning Dove Call-Count Survey was developed to provide an index to population size and to detect annual changes in mourning dove breeding populations in the U.S. The survey consists of numerous routes throughout the U.S. which are surveyed in late May and early June. The resulting estimates of relative abundance and population trends are used in the annual setting of mourning dove hunting seasons.

GRASSLAND HABITATS

South Dakota's grassland habitats consist of both tall and mixed grass prairies. Prior to European settlement, this region was a vast complex of grassland and wetlands, with a woody component on some riparian stretches. Prairie condition was maintained by fire, herbivory (particularly by bison), and periodic drought. Ecosystems of the northern Great Plains have been transformed from vast mosaics of grasslands into highly fragmented landscapes characterized by large blocks of croplands interspersed with smaller, more isolated grassland patches. Land use in most eastern South Dakota counties is dominated by croplands. Rangeland constitutes 40-80% of the westernmost counties of eastern South Dakota.

Most grassland habitat in western South Dakota is part of the northern wheatgrass – needlegrass plains (Johnson and Larson 1999). Vegetation consists primarily of mixed-grass prairie species such as western wheatgrass (*Pascopyrum smithii*), gramas (*Bouteloua* spp.), green needlegrass (*Stipa viridula*), and needleandthread (*Stipa comata*) and low densities of forbs and shrubs such as western snowberry (*Symphoricarpos occidentalis*), leadplant (*Amorpha canescens*), prickly pear (*Opuntia* spp.) and purple coneflower (*Echinacea angustifolia*) (Johnson and Larson 1999). Some areas have been planted to, or invaded by, exotic species, such as crested wheatgrass (*Agropyron cristatum*), Kentucky bluegrass (*Poa* spp.) or alfalfa (*Medicago sativa*, *M. falcata*). However, in just 20 years (1977-1997), 14% of rangeland area (1.4 million ha) in South Dakota has been converted to cropland (Higgins et al. 2002). Conversion of rangeland continues today as land operators replace native grasslands with soybeans (*Glycine max*), winter wheat (*Triticum aestivum*) and corn (*Zea mays*).

Level I Priority Grassland Species (Table 2)

Table 2. Grassland Species of Concern in South Dakota.

Species	PIF Continental Population Objective	Habitat Association	Occurrence in South Dakota
Northern Harrier	*	Grasslands, open fields	All
Ferruginous Hawk	*	Grasslands, prairie dog colonies	All but Southeast
Golden Eagle	*	Grasslands, open areas, prairie dog colonies	West
Sharp-tailed Grouse	Maintain	Grasslands	All but SE
Greater Prairie-Chicken	Increase by 100%	Grasslands	Central
Upland Sandpiper	Increase by 50%**	Grasslands	All
Long-billed Curlew	Increase by 50%**	Mixed grass prairie	Western
Burrowing Owl	*	Short prairie, prairie dog colonies	Western
Short-eared Owl	Increase by 100%	Open grasslands	All
Sprague's Pipit	Increase by 100%	Mixed grass prairie	Northwest
Lark Bunting	Maintain	Dry grasslands	All, esp. western
Savannah Sparrow	*	Grasslands	All
Grasshopper Sparrow	Maintain	Grasslands	All
Baird's Sparrow	Increase by 100%	Native grasslands	Northcentral and west
Henslow's Sparrow	Increase by 100%	Weedy fields, prairie	Northeast
Le Conte's Sparrow	*	Weedy fields, grasslands	Northeast
Chestnut-collared Longspur	Maintain	Native mixed grass	All, esp. western
McCown's Longspur	Maintain	Short prairie, prairie dog towns	Extreme Northwest
Dickcissel	Increase by 50%	Dense grasslands, weedy fields	All
Bobolink	*	Grasslands	All
Western Meadowlark	*	Grasslands	All

*Not on PIF species of continental importance for the U.S. and Canada list (Rich et al. 2004).

**Estimated from U.S. Shorebird Conservation Plan population targets (Brown et al. 2001).

Northern Harrier

Northern Harriers occur in relatively high abundance throughout South Dakota. They require large blocks of grassland habitat (Herkert et al. 1999). Most Northern Harrier nests were found in undisturbed wetlands and grasslands dominated by tall, dense grass with abundant residual vegetation (Kantrud and Higgins 1992, Duebbert and Lokemoen 1977). Few nests were found in areas grazed, hayed, burned or tilled annually (Duebbert and Lokemoen 1977). Herkert et al. (1999) found harriers nesting in small grasslands (<45 ha) but hypothesized this was due to high amounts of overall grassland habitat in the surrounding landscape in Illinois. Northern Harriers preferred idle to mowed grasslands for foraging in South Dakota (Luttschwager and Higgins 1992).

General Management Recommendations:

- Apply management treatments (mowing, burning) only once in every 3-5 years in tallgrass and mixed grass habitats east of the Missouri River and once in every 5-10 years west of the Missouri River to maintain Northern Harrier nesting and foraging habitat in South Dakota
- Preserve large blocks of grassland habitat
- Extend CRP contracts to provide tall, dense habitat
- do not till through dry wetland habitats
- Do not mow or burn grasslands during the breeding season
- Lightly graze pastureland

Ferruginous Hawk

Populations are declining due to destruction and alteration of breeding and wintering habitats. Individual pairs of Ferruginous Hawks have been observed covering areas >2000 ha while hunting (Wakeley 1978). Schmutz (1987) found nest densities were inversely proportional to the area of cultivated landscape. Ferruginous Hawks preferred lightly grazed pasture or idle

areas for nesting in studies completed in South Dakota (Lokemoen and Duebbert 1976, Blair 1978, Blair and Schitoskey 1982). Prairie dogs are a relatively stable prey source, available year round for Ferruginous Hawks and other raptors (Phillips and Beske 1990). Ferruginous Hawks are highly dependent on prairie dogs, especially so in winter (VerCauteren and Gillihan 2004). VerCauteren and Gillihan (2004) recommend maintaining prairie dogs and other burrowing prey items at a level that is compatible with other uses of a piece of property. Jackrabbits are also an important prey item (Bechard and Schmutz 1995).

General Management Recommendations:

- preserve/restore large blocks of grassland habitat
- preserve prairie dog colonies

Golden Eagle

Golden Eagles are uncommon permanent residents in western South Dakota, where they occupy open areas (Tallman et al. 2002). They nest on sandstone and limestone cliffs in the Black Hills (Pettingill and Whitney 1965). Pulkrabek and O'Brien (1974) found Golden Eagles nesting on rocky outcrops, mud buttes, creek banks, and in trees along streams in Harding County. Golden Eagles prefer to prey on small to medium-sized mammals, such as jackrabbits, rabbits, ground squirrels, and prairie dogs (Kochert et al. 2002). Other foods may include carrion, waterfowl, sage grouse, and larger prey, such as deer or turkeys, which may be taken through cooperative hunting with other golden eagles (Kochert et al. 2002).

Sharp-tailed Grouse

The PIF objective for the Sharp-tailed Grouse is to maintain its continental population. Hanowski et al. (2000) determined that grouse were sensitive to even small increases (1-2%) in the amount of woody vegetation in their home range and successful management should include

an assessment of planted conifers within the lek vicinity in Minnesota. In North Dakota, Sharp-tailed Grouse used and nested in brushy grasslands (Ken Higgins, SDSU, pers. comm.).

General Management Recommendations:

- maintain large continuous blocks of habitat (>2000 ac)
- manage grasslands with livestock grazing and fire to increase the amount of diverse, high-structure grasslands, regenerate native shrubs and halt the encroachment of exotic grasses
- do not plant exotic grass species
- do not plant shelterbelts or trees near lek sites

Greater Prairie-Chicken

Greater Prairie-Chickens are negatively associated with woody vegetation within the grassland patch, adjacent to a grassland patch, and within the surrounding landscape (Bakker 2003b). In central Wisconsin, active Greater Prairie-Chicken leks had higher percentages of grassland, shrub and wetland cover and lower percentages of row crop, hay and forest cover compared to random points (Niemuth 2000). Forest cover was lower at active sites at the 400 and 800 m scales. A positive association with shrub cover was attributed to the degradation of grassland habitat and strong site fidelity to leks, not a preference for shrub cover during the nesting season (Niemuth 2000). From 1986-1996, 389 unique Greater Prairie-Chicken leks were observed and classified as either traditional (males displayed in lek ≥ 6 of 11 years) or temporary (leks used < 5 of 11 years) in northwestern Minnesota (Merrill et al. 1999). Lek points had significantly less forest and residential land and more Conservation Reserve Program grasslands within 810 ha than did non-lek points. Temporary leks had significantly greater percentages of forest and cropland within 810 ha than did traditional leks (Merrill et al. 1999). Ryan et al. (1998) concluded that in Missouri landscapes with less than 15% grassland, contiguous prairie tracts of at least 65 ha in size provided the greatest potential for Greater Prairie-Chicken

productivity. Nesting success of Greater Prairie-Chickens declined with increasing woody cover and litter (McKee et al. 1998). Only 3 of 17 nests hatched when woody cover within the grassland was >5%.

General Management Recommendations:

- maintain large continuous blocks of habitat (>2000 ac)
- manage grasslands with livestock grazing and periodic fire to halt the encroachment of woody vegetation
- livestock/buffalo grazing should be used at light stocking rates and with periodic rest from annual grazing
- do not plant shelterbelts near lek sites

Upland Sandpiper

Upland Sandpipers were classified as area sensitive east of the Missouri River in South Dakota and preferred grasslands with relatively low height-density of vegetation (Bakker 2000). Upland Sandpipers preferred large patches in eastern South Dakota where mean patch size of occupied grasslands was 159 ha, mean litter depth was 64 cm, and mean vegetation height-density measured with a Robel pole was 2.2 dm (Bakker 2000). Upland Sandpipers occurred in 14% of 125 grasslands averaging 1,016 ha in size west of the Missouri River in South Dakota (DeJong 2001). Grasslands that have been grazed, burned or mowed are used for feeding, loafing and brood rearing. Some blocks of grassland should be left undisturbed to serve as nesting cover (Bowen and Kruse 1993). Periodic burning and mowing should be avoided during the nesting season.

On the Fort Pierre National Grassland, habitats classified as low and low-intermediate seral stage were determined to be important to Upland Sandpipers for feeding and high seral stages were important for nesting (Fritcher 1998). Upland Sandpipers did not use vegetation

taller than 60 cm for nesting on 29 waterfowl production areas within the Lake Andes Wetland Management District in South Dakota (Kaiser 1979). All nests were located in native prairie grasslands. No nests were detected in tame grass, tame-grass legume seedlings or alfalfa (Kaiser 1979). Kirsch and Higgins (1976) reported low productivity for Upland Sandpipers on seeded grass-legume grasslands in North Dakota. Hatching success in their study ranged from 48% on annually grazed areas to 71% on both undisturbed and 3-year interval burned areas. Upland Sandpipers used recently burned areas more than unburned ones on the Ordway Prairie near Leola, South Dakota (Huber and Steuter 1984). Higgins et al. (1969) found 38 of 41 nests in undisturbed grasslands in the Missouri Coteau of North and South Dakota. Upland Sandpipers nested in areas with grasses ranging from 15 to 61 cm, medium density, abundant ground litter in a study completed in North and South Dakota (Higgins et al. 1969). Grazing during the nesting season reduced Upland Sandpiper nest density in southcentral North Dakota (Bowen and Kruse 1993). Nests in South Dakota, North Dakota, Montana and Manitoba were located in sites with 30-99% litter cover in both tame and native grasslands (Kantrud and Higgins 1992).

Grant et al. (2004) found Upland Sandpiper occurrence was negatively associated with percent woodland within 500 m of the survey plots.

General Management Recommendations:

- Preserve large grasslands (>160 ha) with abundant litter for nesting
- Grasslands should be part of a continuous matrix of idle, burned, mowed and grazed patches for nesting, feeding and brood rearing
- Grasslands should not be annually burned or mowed to retain litter
- Grasslands should not be burned or mowed during the nesting season
- do not plant shelterbelts near grasslands inhabited by Upland Sandpipers

Long-billed Curlew

Long-billed Curlews nest in irregular clumps of native short and mixed grass prairie primarily in western South Dakota. Once eggs have hatched, curlews seem to prefer taller, denser grass, probably for camouflage for the young and to reduce heat stress (http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=52).

General Management Recommendations:

-preserve large, contiguous blocks of grassland habitat

Burrowing Owl

Burrowing Owls occur mainly in western South Dakota and are often associated with prairie dog towns. In fact, Burrowing Owl declines have been attributed primarily to declines in the number and extent of prairie dog towns. Burrowing Owls have been shown to prefer active prairie dog towns. In 2002, biologists surveyed 178 prairie dog colonies on the U.S. Forest Service Buffalo Gap National Grasslands in southwestern South Dakota. A total of 229 adult Burrowing Owl adults were detected on 101 prairie dog colonies (<http://www.prairiewildlife.org/otherwild.htm>). Prairie dog colony size was positively correlated to number of owls and negatively to owl density, i.e., more owls were found on large colonies while smaller colonies supported more owls per unit area. Their results suggested that large colonies are needed to maintain Burrowing Owl populations (<http://www.prairiewildlife.org/otherwild.htm>). Other research has indicated higher nest site fidelity, lower rates of nest predation and higher nest success in large, well-populated prairie dog colonies as compared to Burrowing Owls in small or low density colonies (Butts 1973, Desmond and Savidge 1996, Toombs 1997). Griebel (2000) studied the effects of nest and colony level factors on Burrowing Owl reproductive performance in Buffalo Gap National Grassland in western South Dakota. He determined that burrowing owls using colonies that had enough

desirable habitat to allow for greater spacing of nests had higher reproductive success. On the Buffalo Gap National Grassland, Burrowing Owls' top prey items included insects, spiders, small mammals and vegetation (MacCracken et al. 1985). Small mammals were most frequently consumed during spring and early summer. Any threats to prairie dogs colonies will impact Burrowing Owls in South Dakota (Klute et al. 2003).

General Management Recommendations:

- encourage maintenance of large prairie dog colonies within landscapes dominated by grassland
- provide areas of short, sparse vegetation
- maintain populations of prey items and burrowing mammals, specifically prairie dogs
- educate the public on the benefits of prairie dogs to other species
- maintain large, expansive areas of native prairie, especially areas with prairie dog colonies
- identify and protect Burrowing Owl nesting sites on public lands

Short-eared Owl

Short-eared Owls occur throughout South Dakota. They prefer large, open grasslands and nest primarily on the ground. However, Herkert et al. (1999) found them nesting in small grasslands (28 ha) with high amounts of grassland habitat in the surrounding landscape in Illinois. In a study conducted in Manitoba, Montana, North Dakota and South Dakota, Kantrud and Higgins (1992) hypothesized that Short-eared Owls avoided areas with livestock present. Short-eared Owls were found nesting in cover >60 cm tall surrounded by standing vegetation in planted fields idled for 2-8 years in North and South Dakota (Duebbert and Lokemoen 1977).

General Management Recommendations:

- Preserve large blocks of grassland habitat
- Do not burn, mow or graze grasslands during the breeding season

Lark Bunting

Lark Buntings are found primarily in western South Dakota. They prefer habitat with an average litter depth of 7 mm and forbs with an average height of 5 dm in western South Dakota pastures (DeJong 2001). Lark Buntings respond positively to moderate grazing in taller grasslands but negatively to heavier grazing in short grasslands (Bock et al. 1993). It is recommended to eliminate heavy summer grazing where Lark Buntings occupy arid, short grass areas (Casey 2000), such as in western South Dakota.

General Management Recommendations:

-eliminate heavy summer grazing where Lark Buntings breed

Savannah Sparrow

Savannah Sparrows occur primarily in the eastern part of the state. Population trends are stable in South Dakota but decreasing nationwide. With just a 2% increase in the proportion of trees within 400 meters of a grassland patch in the mixed grass region of eastern South Dakota, occurrence of Savannah Sparrows was halved (Bakker et al. 2002, Bakker 2000). Grant et al. (2004) determined that Savannah Sparrow occurrence was negatively associated with percent woodland within 500m of the survey plot and shrub cover >1m within a 100 meter radius in North Dakota. Nest predation rates were lower for Savannah Sparrows in large fragments and in fragments ≥ 45 meters from woody vegetation while brood parasitism was also lower far (≥ 45) from wooded edges in western Minnesota (Johnson and Temple 1986, 1990). Savannah Sparrow occurrence increased in larger patches in the tallgrass region. Savannah Sparrows prefer intermediate vegetation height and litter depth with some tall forbs and grasses for perching (Bakker 2000). They are most abundant in moderately grazed pasture as compared to heavily grazed or idle areas (personal observation). Savannah Sparrows rarely occurred west of the Missouri River (DeJong 2001).

General Management Recommendations:

- preserve large grassland patches
- do not plant woody vegetation in or near grasslands
- periodically burn to remove within patch woody vegetation
- moderate grazing appears beneficial

Grasshopper Sparrow

Grasshopper Sparrows can be found in most types of grasslands throughout South Dakota. Studies in South Dakota (Bakker et al. 2002, DeJong 2001) and throughout their range (Renfrew 2002, Johnson and Igl 2001, Herkert 1994a) have indicated Grasshopper Sparrows are area sensitive, i.e., they are present more often and in higher densities in larger grassland patches. DeJong (2001) found Grasshopper Sparrows in 99% of 125 pastures surveyed in western South Dakota. They were termed area sensitive because their density increased with increasing patch size. Nest predation rates were lower for Grasshopper Sparrows in large habitat fragments and in fragments ≥ 45 meters from woody vegetation. Brood parasitism was also lower farther (≥ 45) from wooded edges in western Minnesota (Johnson and Temple 1986, 1990). Grant et al. (2004) determined that Grasshopper Sparrow occurrence was negatively associated with percent woodland within 500m of the survey plot and shrub cover $> 1m$ within a 100 meter radius in North Dakota. In a study comparing bird densities in warm and cool season monotypes, warm- and cool- season grass mixtures and native prairies, Grasshopper Sparrows had significantly higher densities in warm season mixtures and in native prairies (Bakker and Higgins 2005). Blankespoor (1980) found them in grasslands with intermediate height. Grasshopper Sparrows are most often associated with clumped vegetation interspersed with patches of bare ground, little woody vegetation within or around grasslands, and moderately deep litter (Wiens 1969, Arnold and Higgins 1986, Bakker 2000, DeJong 2001, Bakker et al. 2002, Bakker 2003b).

General Management Recommendations:

- preserve and restore large, contiguous grasslands
- preserve native grassland habitats
- moderate grazing maintains preferred vegetation structure
- do not plant trees within or adjacent to grasslands

Baird's Sparrow

Baird's Sparrows have been declining significantly nation-wide (Table 1) largely due to the conversion and overgrazing of prairie habitats. In South Dakota, they breed primarily in native prairies in the northcentral and northwestern portions of the state (Tallman et al. 2002). Baird's Sparrows prefer ungrazed to lightly grazed native prairie with moderate to dense litter. Several studies have indicated a negative association with the encroachment of woody vegetation (Bakker 2003b). Burning is beneficial to the removal of woody vegetation but Baird's Sparrow populations will decline in recently burned areas (Herkert 1994b).

General Management Recommendations:

- preserve native prairie habitats
- manage habitats to maintain litter
- only light grazing is recommended
- periodically burn native areas to stop the encroachment of woody vegetation

Le Conte's Sparrow

During short term studies, Le Conte's Sparrow populations have exhibited highs and lows depending on local moisture conditions (Stewart 1975, Igl and Johnson 1995, Madden 1996). Le Conte's Sparrows show a preference for tall, dense vegetation in wet meadows and wetland edges but tend to avoid areas with permanent standing water (Tallman et al. 2002). Le Conte's Sparrows regularly breed in native prairie as well as other upland grass areas, including pasture,

hayland, and planted grasslands (Stewart 1975, Renken and Dinsmore 1987, Igl and Johnson 1995, Madden 1996, Prescott and Murphy 1999, Horn and Koford 2000). However, due to their preference for dense ground litter they are often absent on annually mowed hayland (Kantrud 1981). Horn and Koford (2000) found Le Conte's Sparrows were slightly more abundant in idled CRP compared to CRP mowed the previous year. Madden (1996) found they were more abundant in fields with repeated fires and absent from fields that were unburned for extended periods of time in North Dakota mixed grass prairie.

General Management Recommendations:

- to provide areas with dense litter, do not mow or graze annually
- manage grasslands periodically

Chestnut-collared Longspur

Chestnut-collared Longspurs are declining both nationally and in South Dakota due to degradation and conversion of native prairie to cropland. Chestnut-collared Longspurs prefer native mixed grass prairie over tame grasslands and avoid thick, dense grasslands and cropland (Bakker, unpublished data). They have higher nest densities in moderately grazed native pastures with little to no litter than in pastures with higher amounts of litter in northcentral South Dakota (Bakker, unpublished data). The majority of nests in northcentral South Dakota were found in or next to forbs approximately 5 dm tall (Bakker, unpublished data). Chestnut-collared Longspurs occurred in approximately 50% of 125 native pastures in western South Dakota (DeJong 2001). Grasslands where they occurred had an average Robel reading of 0.93 dm, litter depth of 5.0 mm, tall forb height of 4.47 dm and tall grass height of 5.27 dm. Grant et al. (2004) determined that Chestnut-collared Longspur occurrence was negatively associated with percent woodland within 500m of the survey plot in North Dakota.

General Management Recommendations:

- preserve native prairies
- avoid long-term idling of pastures
- moderate grazing to maintain preferred vegetation structure
- periodic burning to remove litter accumulation
- do not plant trees near grasslands

Western Meadowlark

The Western Meadowlark is a common summer resident throughout South Dakota (Tallman et al. 2002). They occupy native grasslands, Conservation Reserve Program grasslands, haylands, and smooth brome-dominated grasslands in South Dakota (Bakker 2000, DeJong 2001, Eggebo 2001, Bakker et al. 2002, Bakker et al. *in press*, DeJong et al. *in press*). In eastern South Dakota, they were negatively associated with dense vegetation and the perimeter of grasslands comprised of trees (Bakker et al. 2002). Grant et al. (2004) determined that Western Meadowlark occurrence was negatively associated with percent woodland within 500m of the survey plot in North Dakota. They occurred more frequently in grasslands with thick litter and density increased in larger grassland patches in eastern South Dakota (Bakker et al. 2002). Western Meadowlark nest density was greater in large versus small (<100 ha) native mixed grass prairies of northeastern South Dakota (Bakker, unpublished data). In a study comparing bird densities in warm- and cool- season monotypes, warm and cool season grass mixtures and native prairies, Western Meadowlarks had significantly higher densities in warm season mixtures and native prairies (Bakker and Higgins 2005). In western South Dakota, Western Meadowlarks occurred in 120 of 125 moderately grazed native prairies (DeJong 2001).

Management Recommendations:

- preserve native prairie habitats
- preserve and restore large grassland tracts

- do not plant trees in or around grassland patches
- use native warm season mixtures in CRP plantings
- use moderate grazing to maintain preferred vegetation structure
- do not mow or burn nesting areas until the cessation of breeding (July 15-August 1)

Level II Priority Grassland Species

Henslow's Sparrow

Henslow's Sparrows are one of the fastest declining North American songbirds.

Henslow's Sparrows typically nest in moist, undisturbed grasslands, with little or no woody vegetation and prefer areas with tall, dense grass cover, a high density of standing dead vegetation, an accumulation of vegetative litter, and scattered song perches (Wiens 1969, Herkert 1994c). Rotenberry and Wiens (1980) found Henslow's Sparrow abundance was directly correlated with the percent litter cover. Igl (2002) found the species nesting in weedy old fields, idle pastures, unmowed hayfields and CRP lands.

General Management Recommendations:

- manage grasslands to remove woody vegetation
- avoid burning, mowing or grazing during the breeding season
- idle lands for 3-5 years to provide habitat and litter

Dickcissel

Dickcissels have been declining throughout their range. Reasons for their decline include conversion of native tall and mixed grass prairies into farmland, nest parasitism by Brown-headed Cowbirds and nest predation (Zimmerman 1983, 1984) in their breeding range. Massive poisoning campaigns on the wintering grounds also likely impacts population levels of Dickcissels.

Dickcissels prefer habitats with dense, moderate to tall vegetation (particularly with some tall forbs) and moderately deep litter (Rotenberry and Wiens 1980, Sample 1989, Delisle and Savidge 1997, Winter 1998). Suitable habitats are found in old fields, hayfields, fencerows, hedgerows, road rights-of-way, planted cover (e.g., CRP and dense nesting cover), and moderately grazed and idle prairie (Blankespoor 1980, Delisle and Savidge 1997, Winter 1998, Bakker 2000, Bakker et al. *in press*). Dickcissels preferred large grasslands in the mixed grass region of eastern South Dakota (Bakker et al. 2002).

In a study of CRP grasslands of differing age and cover type in eastern South Dakota, Dickcissels attained their highest densities in old (>10 yrs) fields (Bakker et al. *in press*). No Dickcissels were detected in several moderately grazed pastures in the northwestern portion of eastern South Dakota (Bakker, unpublished data). Dickcissels prefer tall, dense vegetation with tall forbs for perching (Bakker 2000). Dickcissel nests were most often found elevated in grasses, forbs, and shrubs (Winter 1998).

General Management Recommendations:

- conserve and restore large tracts of grassland habitat
- extend CRP contracts
- mowing and burning should not be completed during the breeding season
- idle CRP lands for extended periods of time (10-13 years)
- grasslands with some cool season mixtures may attract Dickcissels

Bobolink

Bobolinks breed throughout South Dakota with highest abundances in the east (Tallman et al. 2002). Bobolinks are declining nationally but have exhibited positive trends in South Dakota. Bobolinks prefer thick, dense vegetation (Bakker 2000). Bobolinks were not determined to be area sensitive in eastern South Dakota (Bakker et al. 2002), but have been in

other areas (Herkert 1994a). Loss and overgrazing of grassland habitats is the major threat to Bobolink populations. They also have an affinity for nesting in hayland. Mowing during the nesting period leads to loss of nests. No Bobolink nests were found in moderately grazed pastureland in northwestern portion of eastern South Dakota (Bakker, unpublished data). Nest predation rates were lower for Bobolinks in large fragments and in fragments ≥ 45 meters from woody vegetation while brood parasitism was also lower far (≥ 45) from wooded edges in western Minnesota (Johnson and Temple 1986, 1990). Grant et al. (2004) determined that Bobolink occurrence was negatively associated with percent woodland within 500m of the survey plot in North Dakota. In a study comparing cover types and age classes of CRP in eastern South Dakota, Bobolinks had significantly higher occurrence and density in fields ≥ 10 years of age compared to fields ≤ 3 years (Bakker et al. *in press*). There were no significant differences in occurrence or density between warm and cool season plantings.

General Management Recommendations:

- postpone mowing until after the cessation of breeding (at least July 15, preferably Aug. 1). This is particularly important for Bobolinks due to their affinity for hayland.
- manage habitats to provide the thick, dense vegetation preferred by Bobolinks
- extend CRP contracts
- do not plant trees near grasslands

Level III Priority Grassland Species

Sprague's Pipit

Sprague's Pipits are uncommon breeders in mixed grass prairies of northcentral and northwestern South Dakota. They are exhibiting negative population trends both nationwide and in South Dakota (Table 1). Sprague's Pipits display a strong preference for native prairie with low amounts of litter. Studies have indicated they are negatively associated with woody

vegetation within and surrounding grassland patches (Bakker 2003b). Grant et al. (2004) determined that Sprague's Pipit occurrence was negatively associated with shrub cover >1m within a 100 meter radius in North Dakota. Little research has been conducted on this species in South Dakota. In Canada and North Dakota, Sprague's Pipits were significantly more abundant in native versus tame pasture land and they preferred areas with intermediate vegetation density and grass height (Dale 1983, Dale 1984, Madden 1996). Sprague's Pipits avoided idle grasslands with deep litter in North Dakota (Madden 1996). Lightly to moderately grazed grasslands are preferred by this species (Kantrud and Kologiski 1982).

General Management Recommendations:

- preserve native prairie
- manage grasslands to remove woody vegetation
- implement light to moderate grazing to maintain preferred vegetation structure
- mowing or burning during the nesting season is detrimental

McCown's Longspur

McCown's Longspurs are found in short grass or heavily grazed mixed grass prairies, prairie dog towns, stubble fields, and areas with bare ground in South Dakota (Tallman et al. 2002). South Dakota is on the eastern edge of their major breeding grounds (Tallman et al. 2002), although this species historically nested across most of western South Dakota. They require low amounts of litter (Felske 1971) and little vegetation cover (DuBois 1935, Creighton 1974). Heavily grazed mixed grass prairies in the extreme western counties of South Dakota may attract McCown's Longspurs.

General Management Recommendations:

- moderate to heavy grazing
- preserve mixed grass prairies

Overall Population and Management Objectives for Grassland Bird Species

Population objectives should revolve around reversing negative population trends exhibited by the majority of grassland bird species. All grassland species of concern will benefit from preserving and restoring large blocks of habitat required by large bodied species such as Greater Prairie-Chickens, Northern Harriers and Short-eared Owls. Therefore, grassland bird conservation objectives should focus on preserving large blocks of grassland habitat and restoring grasslands in less fragmented areas. Studies suggest that grasslands should be large enough (65-250 ha) to support the greatest diversity of passerine grassland species (Bakker et al. 2002, DeJong 2001). Small grassland patches can provide habitat for some grassland obligates if they are embedded in landscapes with abundant grass (>40% within 1600m buffers) (Bakker et al. 2002, Bakker 2000, Herkert et al. 1999). Guidelines used to develop grassland bird conservation areas (GBCAs) delineate tier 1 GBCAs as a 640 acre core with a minimum of 40% grassland habitat within a 1600 m buffer of the core. There is research ongoing, but it is believed that such areas should support populations of Greater Prairie-Chickens and all other grassland birds. The mixed grass prairie region of central South Dakota has enough remaining grassland habitat to support several GBCAs (Bismarck HAPET office). Due to more rugged topography and lower and less predictable precipitation, the Missouri Coteau did not undergo as much conversion to agriculture as occurred in tallgrass prairie regions. A great deal of the land on the Missouri Coteau remains in native grass and is used as rangeland for cattle. However, especially during drought years, these grasslands are predisposed to excessive grazing pressure. Additionally, grassland habitat in the mixed grass region is currently being converted to cropland at an alarming rate, particularly on gentler terrain (Higgins et al. 2002). High priority should be placed on conserving as much native prairie as possible through purchase and easements because

several birds of concern require native prairie habitats (i.e., Baird's Sparrow, Chestnut-collared Longspur). Managers should focus first on lands delineated as possible GBCAs. To aid our ability to preserve native grasslands, future farm bills should contain subsidies and benefits for ranchers who maintain their land in native prairie as well as the continuation of the Conservation Reserve Program. Efforts to protect native prairie with perennial easements should be supported. In the tallgrass region of eastern South Dakota, conservation should be focused in the northeast where much of the wetland and grassland habitat is still intact. In the remaining area, conservation and restoration efforts will involve piecing together grasslands by purchasing, using conservation easements and leases and the Conservation Reserve Program to form larger, contiguous landscapes.

After grasslands are preserved, management should focus on maintaining grasslands for birds through grazing, mowing and burning, which will provide a matrix of vegetation structure for the suite of grassland birds and control nonnative grasses and woody vegetation. Mowing should not occur until after the breeding season has been completed due to destruction of nests. Generally, mowing and burning should take place every 3-5 years in the tallgrass prairie (Naugle et al. 2000a). Grassland species can be classified by the vegetation structure they prefer (e.g., tall and dense, mid, short and sparse). Land managers can maintain a mosaic of vegetation structure to focus on individual species and suites of species. Both old and newly planted CRP grasslands can provide habitat for grassland bird species (Bakker et al. *in press*). Planting shelterbelts in or near grasslands should be avoided and those already present should be removed if possible, as most grassland species are negatively associated with woody vegetation (Bakker 2003b, Table 3). Instead of planting woodlands within or adjacent to grasslands they should be

placed alongside croplands where they can be beneficial for both erosion control and thermal cover for wildlife species.

Landscape Level Management Recommendations:

- Protect remaining native tracts
- Preserve large grassland habitats (>65 ha)
- In fragmented areas, restore or preserve >40% grasslands habitats
- Remove woody vegetation within, adjacent, and within 400m of grassland patches

Table 3. The number of studies in which a species was positively/negatively associated with a measure of woody vegetation. Categories of wood include woody vegetation within the grassland patch, the percentage of the patch encompassed by woody vegetation, distance from a point (survey point, nest, etc.) to woodland habitat, and a measure of the proportion or increase of woodland habitat in the landscape surrounding a grassland patch. The number in parentheses is the total number of studies conducted on a species in each category (remaining studies indicated no effect of woody vegetation). Table adapted from Bakker (2003b).

Species	Within	% Woody	Distance to	
	Patch	Perimeter	Woody	Landscape
	+/-	+/-	+/-	+/-
Artificial nests	0/1 (1)	0/1 (1)	1/2 (4)	0/1(1)
Duck spp.	0	0/2 (2)	0/1 (1)	0/2 (2)
Northern Harrier	1/0 (1)	0	0	0
Ring-necked Pheasant	0	0	0/3 (4)	0
Greater Prairie-Chicken	0/2 (2)	0	0/0 (1)	0/3 (3)
Lesser Prairie-Chicken	0	0	0	0/2 (2)
Sharp-tailed Grouse	0	0	0	0/2 (2)
Burrowing Owl	0/1 (1)	0	0	0
Upland Sandpiper	0/1 (3)	0/0 (2)	0	0/0 (1)
Loggerhead Shrike	0/0 (1)	0	0	1/0 (1)
Horned Lark	0/4 (4)	0/1 (2)	0	0
Sedge Wren	0/0 (1)	0/1 (3)	0	0/0 (1)
Sprague's Pipit	0/2 (2)	0/1 (1)	0	0
Clay-colored Sparrow	3/0 (3)	0/0 (2)	0/2 (2)	0/0 (1)
Grasshopper Sparrow	0/8 (11)	0/4 (6)	0/4 (5)	0/1 (3)
Baird's Sparrow	0/3 (3)	0/1 (1)	0	0
Henslow's Sparrow	0/4 (7)	0/1 (2)	0/3 (3)	0
Le Conte's Sparrow	0/0 (1)	0/0 (1)	0	0
Lark Bunting	0/1 (2)	0/1 (1)	0	0
Savannah Sparrow	0/5 (7)	0/6 (7)	0/3 (6)	0/2 (3)
Vesper Sparrow	0/2 (3)	1/0 (2)	0/1 (1)	0/0 (1)
Chestnut-collared Longspur	0/1 (3)	0/1 (1)	0	0
McCown's Longspur	0/1 (1)	0	0	0
Dickcissel	2/1 (6)	0/1 (2)	0/1 (1)	0/1 (2)
Bobolink	0/3 (6)	0/2 (5)	0/3 (3)	0/2 (2)
Eastern Meadowlark	0/4 (6)	0/1 (4)	0/1 (1)	0/1 (2)
Western Meadowlark	0/3 (4)	0/2 (3)	0/3 (3)	0/2 (2)
Grassland Bird Group	0	0/1 (1)	0/3 (3)	0/1 (2)

Patch Level Management Recommendations (Table 4):

- Avoid burning and haying during the breeding season (May 15-August 1)
- Grazing can provide habitat for several different grassland species, depending on intensity
- Use prairie dog management as a tool to enhance habitat for species that depend on short-statured grasses

Table 4. Recommended management practices for grassland nesting priority wetland and grassland species.

Species	Grazing	Fire	Mowing	Woody Vegetation
Northern Pintail	Moderate to heavy	Periodic*	Annual to periodic*, before March 1 or after Aug. 1	Duck spp. response is negative to woody vegetation at all levels, no studies specific to pintails
Northern Harrier	Idle to light	Periodic, not during breeding season	Periodic, after Aug. 1	Positive response to within patch woody cover, i.e., snowberry
Ferruginous Hawk	Moderate to heavy	Periodic, not during breeding season	Periodic	Prefer open areas, isolated tree for nesting
Golden Eagle	Moderate to heavy	unknown	unknown	unknown
Sharp-tailed Grouse	Light to moderate, use of grazing system, idle lek sites	Periodic, not during breeding season	Periodic, after Aug. 1	Negative response to trees around nesting and lek sites
Greater Prairie-Chicken	Light to moderate, use of grazing system, idle lek sites	Periodic, not during breeding season	Periodic, after Aug. 1	Negative response to trees around nesting and lek sites
Upland Sandpiper	Light grazing west river, light to moderate east, grazing systems can provide a mosaic of vegetation heights	Periodic, not during breeding season	Periodic, after Aug. 1	Prefer open areas with isolated perches, e.g., fence posts, negative response to landscape woody veg.
Willet	Moderate to heavy, before March 1 or after nesting	Periodic, fall burn	Periodic to annual, after Aug. 1	unknown
Marbled Godwit	Moderate to heavy, rotational, delay grazing until late May to late June	Periodic, fall burn	Periodic to annual, after Aug. 1	unknown
Wilson's Phalarope	Defer until after July 15	Periodic, after Aug. 1	Periodic to annual, after Aug. 1	unknown
Long-billed Curlew	Moderate grazing systems, defer until late June	periodic	Before March 1 or after Aug. 1	Negative response to shrub and tree cover
Burrowing Owl	Heavy for nesting, rotational grazing for prey base	periodic	Periodic	Prefer open areas with little shrub cover within patch
Short-eared Owl	Light to moderate	periodic	Periodic, after Aug. 1	Unknown
Sprague's Pipit	Idle to light, rotational	Negative for 2+ years postburn	Periodic, after Aug. 1	Negative response to woody veg. within and around grasslands
Lark Bunting	Light to moderate, grazing systems	Negative for 2+ years	After Aug. 1	Negative response to woody veg. within and around grasslands
Savannah Sparrow	Moderate east river, light to moderate west river	periodic	After Aug. 1	Negative response to within patch, perimeter and landscape woody veg.
Grasshopper Sparrow	Light to moderate east river, light west river	Periodic, negative for 1-2 years	After Aug. 1	Negative response to within patch, perimeter and landscape woody veg.
Baird's Sparrow	Idle to light	Negative for 3+ years	Periodic in wet areas, negative response in drier areas, after Aug. 1	Negative response within and around patch, may tolerate low levels of shrubby cover

Species	Grazing	Fire	Mowing	Woody Vegetation
Henslow's Sparrow	Light periodically, not during breeding season	Periodically to remove woody vegetation, after Aug. 1	Periodically to remove woody vegetation, after Aug. 1	Negative response to perimeter and landscape woody veg.
Le Conte's Sparrow	Idle to light	Periodic, negative 1-2 years	Negative to annual mowing	Neutral response to patch and perimeter
Chestnut-collared Longspur	Moderate to heavy east, moderate west	Periodically to remove litter	Does not use hayland, annually to native prairie if not grazing	Negative response to within, perimeter, and landscape woody veg.
McCown's Longspur	Moderate to heavy	Periodically to remove woody vegetation	Does not use haylands	Negative within patch
Dickcissel	Idle	Periodic	Readily nests in hayland, periodic to annual, after Aug. 1	Positive to some within patch woody veg., negative to perimeter and landscape trees
Bobolink	Idle to light with a short duration grazing system	Periodic	Readily nests in hayland, periodic to annual, after Aug. 1	Negative to perimeter and landscape trees
Western Meadowlark	Light to moderate	Periodic	Periodic to annual, after Aug. 1	Negative to perimeter and landscape trees

*Periodic means burning or mowing every 3 to 5 years east river (east of the Missouri River) and every 5-10 years west river (west of the Missouri River) unless otherwise stated

-Burning, haying, and grazing are essential to maintaining prairie health by discouraging woody encroachment and invasion by exotic species

-Restored grasslands and plantings should incorporate a variety of native grasses and native forbs

Conservation Issues

Eastern South Dakota

-Loss of grassland habitat

-Altered hydrology due to wetland drainage

-Invasion of nonnative grasses and woody vegetation resulting from fire suppression and grazing regimes

-overgrazing

-planted woodlands in and adjacent to grasslands

-wind power

-increased cowbird parasitism

-conservation easement legislation

Western South Dakota

-overgrazing

-drought

-genetically engineered crops

-cultivation of grassland habitats

-degradation by exotic species

-wind power

-conservation easement legislation

Conversion rates from native grassland to farm land in eastern South Dakota counties range from 20% to over 90% (Peterson 1995). In 2001 alone, 40,054 acres of previously untilled land were converted to agricultural uses in South Dakota with many grassland-dominated counties converting more than 1,000 acres (K. Forman, USFWS, pers. comm.). Many of the remaining grasslands are overgrazed or degraded by exotic plant species. Higgins et al. (2002a) determined privately owned tallgrass prairie remnants suffer from lack of litter and near absence of height-density structure while many publicly owned remnants have an overabundance of litter and are invaded with Eurasian grasses.

The expansion of tillage agriculture has increased concern for wetland and grassland species (Higgins et al. 2002). Grassland bird populations are declining faster and more consistently than any other group of North American birds (Samson and Knopf 1994, Herkert 1995). Linked to the declines have been the loss and degradation of grassland habitats. Nine species of birds are considered narrow endemic prairie species in the Great Plains and 20 others are considered secondary (more widespread) prairie species (Samson and Knopf 1996). Six of the 9 endemic species are declining nationwide (Samson and Knopf 1996). Thirteen grassland bird species associated with the Great Plains region are declining at significant rates. According to data from the Breeding Bird Survey (BBS), 9 grassland species are declining in abundance in South Dakota (Sauer et al. 1997). The lack of knowledge on grassland bird demographics and winter ecology makes it difficult to understand which factors are most limiting to grassland birds. However, much of the decline of grassland birds has been attributed to the conversion of grassland to intensive row crop farming (Herkert et al. 1996).

Habitat fragmentation leads to increased edge habitat, which in turn contributes to increased rates of nest parasitism and predation (Herkert et al. 1993, Suarez et al. 1997). Edges act as travel corridors for mammalian predators including red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*) and opossum (*Didelphis virginiana*) (Herkert et al. 1993). Red fox predation is a major source of upland nesting duck mortality throughout the Prairie Pothole Region of the northern Great Plains (Sargeant et al. 1984). In addition, parasitism rates by Brown-headed Cowbirds (*Molothrus ater*) on passerine species are enhanced along habitat edges (Herkert et al. 1993, Winter et al. 2000). Several grassland nesting species experience increased predation and parasitism rates associated with woody vegetation (Bakker 2003b). Lack of fire and planted woodlands exacerbate these problems.

Although research indicates that native grassland birds require large, uninterrupted tracts of treeless grasslands (Herkert 1994a, Vickery et al. 1994, Winter and Faaborg 1999, Bakker et al. 2002), planting trees in prairie landscapes is still regarded by many as a universally positive land management practice for wildlife. Yet a growing body of literature (Bakker 2003b) indicates that trees in prairie landscapes often are associated with negative consequences to numerous avian taxa including ducks (Rumble and Flake 1983, Gazda et al. 2002), wetland birds other than ducks (Naugle et al. 1999c), prairie grouse (Hanowski et al. 2000, Niemuth 2000), grassland passerines (Johnson and Temple 1990, Winter et al. 2000, Bakker et al. 2002) and ring-necked pheasants (Trautman 1982, Olson and Flake 1975, Snyder 1984) (see Table 3). Grassland birds either avoid otherwise suitable grassland habitat near trees (Winter et al. 2000, Bakker et al. 2002) or have nests predated by mid-sized carnivores that use wooded edges as travel lanes (Johnson and Temple 1990, Winter et al. 2000, Herkert et al. 2003).

Wind Turbines. Grassland bird densities were significantly lower up to 180 m from wind turbines in CRP fields in southwestern Minnesota (Leddy et al. 1999). Management recommendations included installing wind turbines in croplands instead of grassland habitats. Bird mortalities were associated with direct contact with wind turbines but it does not appear they cause more mortality than other man-made structures (Osborn et al. 2000). Wind turbines placed in South Dakota should take into consideration the avian populations in those areas. Preferably, they should only be placed in already fragmented areas.

Research needs

While the delineation and preservation of grassland bird conservation areas is a major step forward, no studies have been published on how these areas function as nesting habitat. Nesting studies focusing on how well birds reproduce in different landscapes are critical to the

implementation of the GGCA concept. Little is known about the habitat requirements of many grassland species of concern in South Dakota (e.g., Short-eared Owl, Chestnut-collared Longspur, Baird's Sparrow, Le Conte's Sparrow) because they have limited ranges or are difficult to study. Habitat requirement information for most grassland species in western South Dakota is lacking (but see DeJong 2001). This is especially true for non-passerine species such as Long-billed Curlews, Upland Sandpipers, Marbled Godwits, Northern Harriers, and Ferruginous Hawks. Research focusing on these species would enhance our ability to manage for the entire suite of grassland species.

WETLAND HABITATS

Prairie Potholes and Lakes (natural and manmade)

The northern Great Plains region of North America provides the primary breeding habitat for waterbirds. Eastern South Dakota is part of the prairie pothole region, where waterfowl densities are particularly high. This area has often been termed the “duck factory”. Waterfowl are attracted to the numerous small wetlands formed by glacial activity 10,000 years ago (Higgins et al. 2002). Thirteen species of shorebirds breed in the Northern Plains/Prairie Pothole Region of the United States (Brown et al. 2001). South Dakota is one of the few prairie states that has the majority of its wetland basins (approx. 65%) intact (Johnson and Higgins 1997).

Surface water (depressional and riverine wetlands) covers approximately 9.8% or 899,277 ha of eastern South Dakota (Johnson and Higgins 1997). Of this, 80.1% is classified as palustrine wetlands, 16.8% as lacustrine and deepwater habitats, and 3.1% as riverine (Johnson and Higgins 1997). Water travels by superficial flow into insular basins formed from melting ice blocks and deposited in glacial till over most of eastern South Dakota. There are a total of 932,829 wetland basins (potholes or lakes) in eastern South Dakota, of which 55.7% are temporary, 35.9% are seasonal, 8.1% are semipermanent and 0.2% are permanent (Johnson and Higgins 1997). Temporary basins comprise 18.3%, seasonal 26.0%, semipermanent 34.0%, and permanent 21.7% of the total wetland area in eastern South Dakota. Temporary and seasonal basins are most abundant in the James River Lowland and Minnesota-Red River Lowland physiographic regions, whereas natural semipermanent and permanent basins are most abundant on the Prairie Coteau physiographic region (Johnson and Higgins 1997).

Surface water covers 2.4% of the 10,810,700 ha of land area in western South Dakota (Rieger 2004). Of the total surface water area, palustrine systems account for 50.2%, lacustrine systems account for 41.8%, and riverine systems account for 8.1% (Rieger 2004). Western

South Dakota has 30% fewer hectares of National Wetlands Inventory delineated wetlands as eastern South Dakota (Rieger 2004). A total of 172,867 basins (5 times fewer than eastern South Dakota) exist in western South Dakota, 86,927 (50.3%) of which are created. Of the created basins, 72,562 are impounded basins, 14,054 are dugouts, and 311 were created by beaver (*Castor canadensis*) (Rieger 2004). Much of western South Dakota is characterized by steeply rolling terrain, which is conducive to grazing, but makes tillage impractical. In areas with flatter topography, naturally occurring seasonal and temporary wetlands are more abundant, as is tillage. Of the natural basins, 61,757 are classified as temporary, 50,447 as seasonal, 59,340 as semipermanent, and 1,323 as permanent (Rieger 2004).

The prairie pothole region of the Northern Great Plains is known for its importance to an impressive assemblage of breeding waterfowl, shorebirds and other water dependent birds as well as high numbers of nesting passerines. A high number of species has been observed using temporary, seasonal, semi-permanent and permanent wetlands and wetlands complexes throughout South Dakota and the northern Great Plains (Weber et al. 1982, Kantrud and Stewart 1984, Naugle 1997). For example, a total of 98 species was documented nesting on the LaCreek National Wildlife Refuge and an additional 20 were present during the breeding season but were not confirmed nesting (Lohofener and Ely 1978). Meeks and Higgins (1998) observed 32 species in semi-permanent wetlands and 41 in seasonal wetlands during breeding season surveys on the Sand Lake National Wildlife Refuge. A total of 147 species were detected using wetland and uplands habitats of the Oak Lake Field Station in Brookings County (Bakker and Troelstrup 1998). In unglaciated western South Dakota, May (2001) detected 52 nongame bird species in a survey of 196 stock ponds and an average of 5 wetland bird species was detected using 168 semi-permanent and seasonal wetlands of various sizes (Naugle et al. 1999a).

Wetlands can also provide habitat for species not generally associated with wetland habitat. For example, several bird species use dry wetlands as nesting habitat (Hubbard 1982), and Ring-necked Pheasants use large wetlands with cattails or shrub growth as winter habitat (Sather-Blair and Linder 1980). Pheasant use of food plots was best predicted by the percent of the peripheral area comprised of dense wetland emergents and willow patches (Crookston 1991). Gabbert et al. (1999) concluded cattail wetlands, grassland habitats and food plots are crucial for winter survival of pheasants. Prairie Chickens and Sharp-tailed Grouse leks are often located near wetlands (Johnsgard 1973).

Level I Priority Wetland Species (Table 5)

Horned Grebe

Horned Grebes breed in shallow wetlands with emergent vegetation (Beyersbergen et al. 2004) and in seasonally flooded wetlands and small ponds (Duebbert and Lokemoen 1973). Due to fluctuation in nesting numbers, Horned Grebe breeding status in South Dakota is poorly understood (Tallman et al. 2002). While Horned Grebes appear to be declining throughout BCR 11, current population estimates and distributions are unknown (Beyersbergen et al. 2004).

Wetland drainage has negatively affected populations of Horned Grebes. Preservation of wetlands will benefit this species. Additionally, it is imperative to know which habitats and landscapes require conservation action in South Dakota.

American Bittern

American Bitterns prefer wetlands with tall emergent vegetation where they forage along the edges (Beyersbergen et al. 2004). Naugle (1997) determined American Bittern occurrence was positively associated with emergent cover in eastern South Dakota. Nests are placed over water in emergent vegetation or in tall, dense herbaceous cover in grasslands (Beyersbergen et al.

2004). Loss and destruction of wetland and grassland habitats have negatively affected American Bitterns. Habitat and area requirements need to be determined for this species.

Table 5. Wetland species of concern in South Dakota.

Species	Population Objective	Habitat Association^a	South Dakota Distribution
Horned Grebe	*	Wetland C	Northcentral
Red-necked Grebe	*	C	Northeastern
Eared Grebe	*	C	All
Western Grebe	*	C	All
American White Pelican	*	E	Northeastern
American Bittern	*	A	All
Least Bittern	*	A	Extreme Eastern
Great Blue Heron	*	D	All
Black-crowned Night-Heron	*	A	All but extreme west
Northern Pintail	Increase by 100% ^b	A	All
Canvasback	Maintain ^b	B	All
Redhead	Maintain ^b	B	All
Virginia Rail	*	A	Eastern
Whooping Crane	*		Central
Piping Plover	Increase by 100% ^c	E	Riverine
American Avocet	Maintain ^c	Alkaline lakes, shallow ponds	All
Willet	Maintain ^c	Mudflats, wet meadows	All but southeastern
Marbled Godwit	Maintain ^c	Wet fields, mudflats, grasslands	All but southeastern
Wilson's Phalarope	Increase by 100% ^c	Wet meadows, shallow ponds	All but southeastern
Franklin's Gull	*	B	Northern
Common Tern	*	E	Central Eastern
Least Tern	*	E	Missouri River
Black Tern	*	B	All
Nelson's Sharp-tailed Sparrow	Increase 100% ^d	Marshes	Northeastern

^aWetland types based on amount of emergent vegetation, open water, and nesting habitat formulated by Beyersbergen et al. (2004). Wetlands with A=substantial emergent vegetation and variable open water, B=emergent vegetation and partial open water, C=emergent vegetation and extensive open water, D=emergent vegetation, open water, nesting trees, E=lake or river with open water, barren ground, islands.

^bEstimated from the North American Waterfowl Management Plan 1998 Update.

^cEstimated from U.S. Shorebird Conservation Plan population targets (Brown et al. 2001).

^dPIF population objective.

*Not on PIF species of continental importance for the U.S. and Canada list (Rich et al. 2004).

NOTE: SDGFP has contracted with the Rocky Mountain Bird Observatory to conduct a statewide colonial waterbird inventory of South Dakota. This effort will produce baseline data upon which a long-term monitoring program will be developed. The initial inventory project will be completed by December 31, 2007.

Black-crowned Night-Heron

Black-crowned Night-Herons breed in eastern South Dakota and at LaCreek National Wildlife Refuge in western South Dakota (Tallman et al. 2002). They use rivers, streams, lakes and sloughs for feeding and nest in trees and in large cattail and bulrush marshes (Tallman et al. 2002). Threats include pesticides that result in indirect adult mortality and direct mortality of eggs and young and wetland loss and degradation (Beyersbergen et al. 2004). Research needs to be conducted to determine habitat and landscapes for conservation.

Virginia Rail

Virginia Rails were positively associated with the presence of thick stemmed emergent vegetation in eastern South Dakota (Naugle 1997). Virginia Rails prefer wetlands with 40-70% emergent vegetation and may be negatively affected by cattail encroachment (Beyersbergen et al. 2004). Research needs to be conducted to determine population size and trends and habitat preferences so high priority habitats and landscapes can be targeted for conservation (Beyersbergen et al. 2004).

Willet (see Table 4)

Willetts forage in wetlands and use short, sparse grasslands for nesting (Stewart 1975, Kantrud and Higgins 1992). Willetts prefer native grasses to tame (Stewart 1975, Ryan and Renken 1987, Kantrud and Higgins 1992). Willetts preferred pastures that were idle during the nesting season, followed by actively grazed pasture, over other land-use types (Higgins et al. 1979, Ryan and Renken 1987, Kantrud and Higgins 1992). However, Willetts preferred previously grazed areas that are idle during the current breeding season over idle grasslands (Kantrud and Higgins 1992). Willetts occurred most often in grasslands with heavy to extreme grazing intensity in mixed grass prairies of southcentral North Dakota (Higgins et al. 2004). In northcentral South Dakota, they were observed in moderately grazed grasslands near

semipermanent wetlands, however, no nests were found during intensive searching (Bakker, unpublished data). Ryan and Renken (1987) recommended burning, mowing, or grazing of both upland and wetland habitat to maintain the short, sparse vegetation and thin litter layer preferred by Willets.

Marbled Godwit (see Table 4)

Marbled Godwits depend on both wetland and grassland habitats typical of the prairie pothole region of South Dakota. Marbled Godwits require large, sparse to moderately vegetated grasslands for nesting and foraging, and wetland complexes for foraging (Stewart 1975, Ryan et al. 1984, Kantrud and Higgins 1992). Marbled Godwits nest in semi-colonial groups without territories (Tallman et al. 2002). Nests have been located in grasslands as far as 230 meters from water (Casey 2000). Livestock grazing provides the sparser vegetation preferred by Marbled Godwits for nesting. Marbled Godwits did not occur in grasslands until they reached heavy to extreme grazing intensity in southern North Dakota mixed grass prairie (Higgins et al. 2004). Marbled Godwits prefer previously grazed areas that are idle during the current breeding season in North Dakota (Kantrud and Higgins 1992). Sedivec (1994) recommended using rotational grazing instead of season-long grazing and to delay grazing until late May to late June to provide more optimal habitat for marbled Godwits (Sedivec 1994). If using season-long grazing, it is recommended to delay grazing until mid-June (Sedivec 1994). Fall burning or mowing of upland sites and wetland edges can produce suitable cover for the following spring (Ryan et al. 1984). Regrowth in burned areas may be too dense for nesting, but can provide the denser, taller cover used by Marbled Godwit broods (Ryan et al. 1984). When managing croplands, to provide the most benefit for Marbled Godwits, use no-tillage and minimum-tillage practices (Kantrud and Higgins 1992).

Wilson's Phalarope (see Table 4)

Wilson's Phalaropes nest in sparse to dense vegetation in grasslands and marshes. Wilson's Phalaropes were found nesting in idle, hayed, and grazed grasslands adjacent to wetlands (Kantrud and Higgins 1992). Idle and previously grazed grasslands provided habitat for nesting, but grasslands with cattle present during the breeding season were not as suitable (Renken and Dinsmore 1987, Kantrud and Higgins 1992). Kantrud and Higgins (1992) recommended no mowing, burning, or heavy grazing in nesting areas during the breeding season, which generally extends from early May to late July (Kantrud and Higgins 1992). May et al. (2002) reported 3.5 times higher Wilson Phalarope densities in grassland versus cropland landscapes in western South Dakota stock dams. In eastern South Dakota, Wilson's Phalaropes were more likely to inhabit wetlands when less than 50% of the surrounding upland had been tilled (Naugle et al. 2001).

Franklin's Gull

In the mid-1990s, Sand Lake National Wildlife Refuge in northeastern South Dakota boasted the largest breeding population of Franklin's Gulls in North America with at least 127,140 nests present in 1995 (Schultze 1996). After several years of high water, breeding numbers have been reduced. During breeding, Franklin's Gulls concentrate their activities near the nesting colony. During migration they often feed on agricultural lands (Beyersbergen et al. 2004). Threats to this species include high mortality from botulism outbreaks and possible negative effects from agricultural pesticides (Beyersbergen et al. 2004).

Black Tern

In eastern South Dakota, Black Terns were more likely to inhabit wetlands when less than 50% of the surrounding upland had been tilled (Naugle et al. 2001). Suitable Black Tern nest sites in eastern South Dakota occurred within regenerating or degenerating wetlands where vegetation structure was more important than type of vegetation present (Naugle et al. 2000b).

At the time of Naugle et al. 2000b's study, 44% of suitable wetlands for Black Terns had been protected. The decline in Black Terns is likely due to loss of wetland habitats. Other issues facing Black Terns include maintenance of stable water levels on recreational wetlands, cattail encroachment in prairie wetlands, and contaminants relating to their insectivorous diet (Beyersbergen et al. 2004). Research needs include determining the role of wetland complexes, effective strategies to reduce cattail encroachment, and how site fidelity is influenced by water conditions (Beyersbergen et al. 2004).

Level II Priority Wetland Species

Eared Grebe

Eared Grebe habitat includes shallow lakes and ponds with emergent vegetation and high macroinvertebrate numbers (Beyersbergen et al. 2004). Eared Grebes were positively associated with the occurrence of thin stemmed emergent vegetation in eastern South Dakota (Naugle 1997). Specific nesting wetlands are hard to identify due to seasonal and annual changes in water levels. Population numbers are not well known but may be negatively affected by habitat loss and fragmentation from lakefront development, human disturbance from watercrafts, water level fluctuations, cattail encroachment in prairie wetlands, and botulism outbreaks (Beyersbergen et al. 2004).

Management recommendations include monitoring, opening cattail choked wetlands to create open water, preventing woody encroachment, limiting residential development, maintaining wetland complexes and water levels, and educating the public (Beyersbergen et al. 2004).

American White Pelican

American White Pelicans were observed nesting on islands throughout South Dakota during the 1970s (Greichus and Greichus 1973, McCrow 1974). Nest failure was due in most

cases to severe weather, deterioration of nesting sites and high water levels (Greichus and Greichus 1973). Presently, well established breeding colonies are restricted to Day, Marshall, Codington, Roberts and Bennett counties (Tallman et al. 2002). American White Pelicans use a variety of wetland habitats for foraging including rivers, streams, lakes, ponds and marshes.

Threats include perceived competition for fish resources and periodic loss of large numbers due to diseases, including West Nile virus, Newcastle's disease and avian botulism (Beyersbergen et al. 2004).

Great Blue Heron

Great Blue Herons nest in large trees by water and feed in slow-moving to calm shallow waters (Beyersbergen et al. 2004). They are assumed to be declining but population numbers are not known. Actions needed include monitoring to determine population size, distribution and potential habitats (Beyersbergen et al. 2004).

Northern Pintail (see Table 4)

Northern Pintails nest primarily east of the Missouri River in South Dakota. They use a variety of wetlands types and nest in upland habitats. They prefer sparse upland vegetation for nesting. Long-term waterfowl surveys indicate significant declines in pintail populations with recent trends indicating no change in the mid-continent region (NAWMP 1998, <http://northamerican.fws.gov/NAWMP/nawmphp.htm>).

Canvasback

Surveys of Canvasback populations have shown increasing trends since 1985 in the mid-continent region (NAWMP). They are found in semipermanent wetlands and deep waters and nest over water in dense stands of emergent vegetation.

Redhead

Redhead populations have been increasing since 1985 in the mid-continent region (NAWMP). This species prefers semipermanent and other deep wetlands. It is an overwater nester and will parasitize nests of other diving ducks.

American Avocet

American Avocets are common summer residents in northeast and western South Dakota (Tallman et al. 2002). Their major habitat association is alkaline lakes and shallow ponds.

Least Tern

Least Terns nest on sand bars, beaches, dry mudflats and unvegetated islands along the Missouri and Cheyenne rivers in South Dakota (Tallman et al. 2002). The interior population of the Least Tern is listed as federal and state endangered in South Dakota. From 1989-2001, counts along Lake Oahe ranged from 166-438 adults (Tallman et al. 2002). South Dakota has developed a statewide management plan for Least Terns and Piping Plovers (Aron 2005a).

Piping Plover

The Piping Plover is listed as a federal and state threatened species. In South Dakota they breed mainly on sandbars and shores of the Missouri River. Piping Plovers will also nest on sandy, gravelly shores of semipermanent wetlands (Kantrud and Higgins 1992). South Dakota has developed a statewide management plan for Least Terns and Piping Plovers (Aron 2005a).

Level III Priority Wetland Species

Red-necked Grebe

Red-necked Grebes breed primarily in shallow, freshwater lakes with approximately 60-80% open water and some emergent vegetation (Beyersbergen et al. 2004). Their nests can potentially be deserted or destroyed due to watercraft wave action. Removal of shoreline vegetation also reduces habitat quality (Beyersbergen et al. 2004).

Conservation actions include identifying and protecting existing colonies as well as public education on the results of shoreline developments and recreation (Beyersbergen et al. 2004).

Western Grebe

Western Grebes require lakes deep enough for diving and maintenance of fish populations (Beyersbergen et al. 2004). Nests are placed in stands of emergent vegetation. Population numbers are not well known but may be negatively affected by habitat loss and fragmentation from lakefront development, human disturbance from watercrafts, water level fluctuations, and botulism outbreaks (Beyersbergen et al. 2004).

Least Bittern

Least Bitterns build nests over water and near open water in wetlands in the hemimars stage (equal open water and emergent vegetation) (Beyersbergen et al. 2004). Their population numbers and trends are relatively unknown (Beyersbergen et al. 2004).

Whooping Crane

Whooping Cranes are listed as a federal and state endangered species. They migrate through South Dakota en route to breeding grounds in the Northwest Territories and Alberta. They use a variety of upland and wetlands sites during migration including fields and shallow ponds. Staging areas and stopover sites used during migration are critical to successful migration (Beyersbergen et al. 2004). South Dakota counties frequented by Whooping Cranes during migration include Hughes, Potter and Sully counties in central South Dakota (Beyersbergen et al. 2004), although they have been spotted in many additional South Dakota counties (Tallman et al. 2002).

Common Tern

In the Great Plains, sparsely vegetated islands in large lakes or reservoirs are used for nesting (Johnsgard 1979). They nest on bare rock, sand, bare ground or short grass on islands

and sand bars and avoid areas with tall vegetation (Beyersbergen et al. 2004). Issues include water level management for islands, susceptibility to predation and competition from gulls, and recreational activities that may lead to nest abandonment (Beyersbergen et al. 2004).

Nelson's Sharp-tailed Sparrow

Nelson's Sharp-tailed Sparrow populations in South Dakota are thought to fluctuate with wet and dry conditions (Tallman et al. 2002). It is a rare summer breeder in South Dakota with 3 or more nesting reports from 1996-2001. The biggest threat to their population is the loss of wetland habitat. They nest in grassland, marsh edges and wetlands, generally using bulrush and cattails as nesting substrates. Sharp-tailed Sparrows respond negatively to any amount of grazing in their nesting habitat (Casey 2000). This species will benefit from management that targets grassland/wetland complexes.

Overall Population and Management Objectives

Management plans for the majority of waterbirds in South Dakota are found in the North American Waterfowl Management Plan, the Northern Prairie and Parkland Waterbird Conservation Plan or the United States Shorebird Conservation Plan. The biggest threat to wetland species is the loss and degradation of wetland and upland habitats. Several wetland species utilize the surrounding grasslands for nesting. Management priorities should focus on wetland complexes embedded in contiguous tracts of grassland habitat to attract the greatest diversity of wetland species. However, the importance of wetlands in agricultural matrixes should not be devalued as they also provide habitat for several avian species, including migrating shorebirds. Waterfowl brood production in the James River Lowlands, one of the most intensively farmed regions in eastern South Dakota, is higher than that of the Missouri or Prairie Coteau Regions during wet years when seasonal wetlands retain their water through the breeding

season (Ken Higgins, SDSU, pers. comm.). Grazing can create plant diversity in the shoreline and emergent zone and should be used to manage for these conditions.

Conservation Issues

Conservation issues facing waterbirds in the Northern Great Plains and South Dakota include wetland loss/deterioration, upland habitat management/loss/degradation, water management, contaminants, disturbance/recreation/eco-tourism, climate change, abundant species and nuisance congregation sites, aquaculture and fisheries, disease/toxicity/parasites, exotic and invasive species, wildlife depredation, harvest management, collisions, predators, creation of artificial islands, and prescribed fire (Beyersbergen et al. 2004). In South Dakota, the impact of grazing on wetlands and the associated uplands is a conservation issue, particularly west river.

Wetland ecosystems provide the principal breeding and foraging habitats for about one-third of North America's avifauna, most of which are nongame species (Kroodsma 1978). In a little over a century, the prairie pothole region of the northern Great Plains has been transformed from a contiguous expanse of wetlands and grasslands into a highly fragmented, agricultural landscape that is less conducive to wetland bird production.

Wetland and upland loss and degradation are the most important issues to waterbird populations. Two-thirds of breeding wetland species in the mixed grass region use grassland-wetland mosaics. Waterfowl use wetland complexes for nesting, feeding, and brood rearing. High wetland drainage rates (Dahl 1990) jeopardize the capability of the PPR to maintain its historical annual production of 50-80% of North America's waterfowl populations. Species such as Black Terns require large proportions (50%) of grassland habitat around wetland complexes. Waterfowl productivity is higher in areas with unfragmented grasslands (May 2001). Most

dabbling ducks nest in the surrounding grassland habitat. Loss and degradation of grasslands negatively affects nesting success.

Creating wetland habitat in the largely unfragmented grasslands of western South Dakota provides habitat for Canada Geese, ducks, shorebirds and many nongame bird species (Bultsma 1976, Evans and Kerbs 1977, Flake et al. 1977, Bultsma et al. 1979, Rumble and Flake 1983, May 2001). Ruwaldt et al. (1979) concluded that semipermanent wetlands and stock ponds contained proportionately more waterfowl pairs than other wetland classes. May (2001) detected 11 waterfowl and 52 nongame species using stock ponds. Mallard, Blue-winged Teal and Gadwall were the most common, and overall productivity averaged 50 broods/100 pairs.

Research needs

Population sampling methods for assessing the status of several species need to be developed and tested. Sound conservation planning will require information on breeding biology, demography, life history, breeding site philopatry, colony dynamics, factors affecting productivity and survival, impacts of diseases, and local and landscape level habitat requirements of waterbirds (Beyersbergen et al. 2004). Many of these areas are poorly understood for many waterbird species, such as the impact of the invasive narrowleaf cattail (*Typha angustifolia*) and its hybrid (*Typha X glauca*). Little research has examined the importance of these habitats to migrating birds in South Dakota. It is important to determine what constitutes a quality stopover site for wetland migrants (waterfowl and shorebirds) and how migrants are distributed among natural and man-made or managed wetlands. This is particularly important for fall migrants, as seasonal, temporary and even semi-permanent wetlands tend to dry out over the summer, making this habitat much less available to fall migrants than to spring migrants or breeders (Dave

Swanson, USD, pers. comm.). Additionally, for many species, a high percentage of annual mortality may occur during migration (Dave Swanson, USD, pers. comm.).

WOODLAND HABITATS

Natural woodlands. Natural prairie woodlands consist of isolated habitats of various dimensions found in the upper reaches of grassland drainages and water courses, upland deciduous forests, and riparian patches. These woodlands were a natural part of the prairie landscape since before settlement (Rumble et al. 1998). Natural woodland patches in South Dakota include naturally occurring habitats found in the upper reaches of grassland drainages and water courses and upland deciduous forests. Natural woodland patches are dominated by green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), cottonwood (*Populus deltoides*), willow (*Salix* spp.), hackberry (*Celtis occidentalis*), chokecherry (*Prunus virginiana*), and American plum. A considerable number of acres of natural woodland have been converted to agricultural lands (Emmerich and Vohs 1982, Hodorff et al. 1988, Peterson 1995, Swanson 1999) while the number and acres of planted woodlands have increased (Emmerich and Vohs 1982). Early successional riparian habitat, comprised mainly of willow, dogwood and young cottonwood (*Populus* spp.), is becoming increasingly rare due to the construction of dams (Johnson 1992).

In western South Dakota, trees comprise <1% of the landscape, excluding the Black Hills (<http://wfs.sdstate.edu/sdgap/land.html>). Native woodland vegetation in western South Dakota consists primarily of riparian woodland along rivers and streams, with woody draws common in many areas. Woody vegetation associated with native riparian areas includes: cottonwood, American elm, boxelder (*Acer negundo*), peachleaf willow (*Salix amygdaloides*), green ash, chokecherry, western snowberry (*Symphoricarpos occidentalis*) and silver buffaloberry (*Shepherdia argentea*) (Johnson and Larson 1999). The rolling topography of western South Dakota promotes the establishment of wooded draws. Rocky Mountain Juniper stands can be

found scattered along river banks of major rivers (Sieg 1991). Rocky Mountain Juniper is limited to areas with steep topography in western South Dakota (Sieg 1991).

Man-made Woodlands. Since 1935, 176.6 million trees have been planted in South Dakota, covering 123,600 ha or approximately 1.1% of the total land area (Rumble et al. 1998, Martin 1978). Planted woodlands are predominantly linear habitats used as windbreaks around crops and homesteads, or as wildlife habitat. These wooded habitats may be viewed as small habitat islands with areas that are usually less than one hectare (Martin 1980, Yahner 1982). Shelterbelts and windbreaks have straight linear edges and are generally smaller than the irregularly shaped riparian zones. Woodlots around farmsteads comprise a substantial fraction of human-planted woodlands in eastern South Dakota. Woodlots typically aren't as linear as shelterbelts. The majority of planted woodlands consist of a tree layer, shrubs along the outside and a grassy understory. In general, individual planted woodlands consist of rows of native and exotic trees and/or shrubs of the same species and age class and exhibit little variation in structure throughout. Local conservation districts offer over 75 species of trees and shrubs to landowners for tree plantings. Dominant tree species include, but are not limited to, cedar (*Juniperus* spp.), green ash, American Elm, and Russian-olive (*Elaeagnus angustifolia*). The most common shrub species include Siberian peashrub (*Caragana arborescens*), lilac (*Syringa vulgaris*), and American plum (*Prunus americana*). Farmstead woodlots are dominated by American elm, mulberry, boxelder, hackberry, and green ash (Swanson et al. 2003).

Level I Priority Woodland Species (Table 6)

Swainson's Hawk

Gaines and Kohn (1982) found that wooded islands surrounded by native prairie were important habitat for nesting Red-tailed and Swainson's Hawks. Norelius (1984) observed 5 raptor species (American Kestrel, Swainson's Hawk, Red-tailed Hawk, Great Horned Owl and

Eastern Screech-Owl) using shelterbelts in Brookings County, South Dakota. Others have found that Swainson's Hawks prefer open grassland areas with scattered trees or with small clumps of trees or shrubs. They use native grasslands, pastures, riparian areas, isolated trees, shelterbelts, prairie dog colonies, haylands and cropland for foraging, nesting and perching (Dechant et al. 2003). They nest in isolated trees and shrubs and shelterbelts. Nests have been found from 0 to 18 meters off the ground in woody vegetation with heights from 2 to 22 meters (Dechant et al. 2003). Nests have been reported on the crossbars of telephone poles and on railway signal gantries, but rarely on nest platforms (Dechant et al. 2003).

Black-billed Cuckoo

Very little research has been completed on the Black-billed Cuckoo in South Dakota or elsewhere, thus, little is known about its habitat requirements. Black-billed Cuckoos prefer woodlands with a shrubby understory for nesting (Baicich and Harrison 1997). Populations of cuckoos are declining in response to continuing loss and degradation of riparian woodlands.

Level II Priority Woodland Species

Bald Eagle

South Dakota's Bald Eagle Management Plan (Aron 2005b) should be referred to when managing for this species.

Red-headed Woodpecker

Red-headed woodpeckers nest in snags in riparian woodlands and shelterbelts near open habitat. Population declines may be associated with unsuccessful competition with European Starlings and House Sparrows, loss of riparian habitat and removal of snags. In South Dakota,

Table 6. Woodland species of concern in South Dakota.

Species	PIF Continental Population Objective	Habitat Association	Occurrence in South Dakota
Bald Eagle	*	Riparian woodlands	All
Swainson's Hawk	Maintain/increase	Woodlands and prairie	All
Black-billed Cuckoo	*	Woodlands	All
Whip-poor-will	*	Mature riparian woodlands	Extreme southeastern
Ruby-throated Hummingbird	*	Woodlands, residential	Northeastern
Red-headed Woodpecker	Increase by 100%	Woodlands and open areas with dead trees	All
Yellow-bellied Sapsucker	Maintain	Woodlands	Extreme eastern
Eastern Wood-Pewee	*	Woodlands	Eastern
Willow Flycatcher	Increase by 50%	Shrubs and small trees	All
Yellow-throated Vireo	Maintain	Mature deciduous woodlands	Northeastern and southeastern
Bell's Vireo	Increase by 100%	Shrubby riparian thickets	Southern and central
Warbling Vireo	*	Woodlands, riparian	All
Blue-gray Gnatcatcher	*	Deciduous woodlands and thickets	Southeastern
Veery	*	Woodlands, riparian thickets	Black Hills, extreme northeastern
Wood Thrush	Increase 50% *	Mature woodlands	Southeastern, Sica Hollow, Roberts Co.
Black-and-white Warbler	*	Deciduous woodlands, groves	Southwestern
Scarlet Tanager	*	Deciduous woodlands, groves	Northeastern and southeastern
Western Tanager	*	Pine forests	Black Hills, Western
Eastern Towhee	Maintain	Shrubby vegetation, woodlands with brush	Extreme southeastern
Rose-breasted Grosbeak	*	Woodlands	All
Orchard Oriole	*	Woodland edge	All

*Not on PIF species of continental importance for the U.S. and Canada list (Rich et al. 2004)

Red-headed Woodpeckers were negatively associated with woodlands dominated by coniferous vegetation and occurred more frequently in naturally occurring versus planted woodlands (Bakker 2000, Bakker and Higgins 2003). Red-headed Woodpeckers preferred native woodlands with herbaceous understories and mature trees (Bakker 2000). Red-headed Woodpeckers nested primarily in American elm snag stands with an open canopy along the Big Sioux River in South Dakota (Parrish 1981). Gentry et al. (in preparation) determined that Red-headed Woodpeckers used farmstead woodlots and woodlands along the river corridors in southeastern South Dakota. Management recommendations include preserving naturally occurring woodlands and their associated snags. Planted woodlands with mature, native tree species also attract Red-headed Woodpeckers.

Willow Flycatcher

Willow Flycatchers were observed in shelterbelts, thickets, wooded draws, riparian woodlands, and wooded drainages in large scale studies throughout South Dakota (Bakker 2000, Kelsey 2001). Willow Flycatchers using planted woodlands in eastern South Dakota preferred shrub dominated shelterbelts over tree dominated ones (Bakker 2000).

Level III Priority Woodland Species

Whip-poor-will

Whip-poor-wills commonly summer, and likely breed, in mature riparian forests in extreme southeastern South Dakota (Tallman et al. 2002). There are only 2 confirmed nesting records in South Dakota, one in Roberts County and one in Lincoln County (Tallman et al. 2002).

Ruby-throated Hummingbird

Ruby-throated Hummingbirds occupy woodlands and residential areas in South Dakota (Tallman et al. 2002). The only confirmed nesting location is in northeastern South Dakota (Tallman et al. 2002).

Yellow-bellied Sapsucker

Yellow-bellied Sapsuckers are rare summer residents in extreme eastern South Dakota (Tallman et al. 2002). Parrish (1981) found Yellow-bellied Sapsuckers nesting only in live green ash in a riparian area along the Big Sioux River.

Eastern Wood-Pewee

The Eastern Wood-Pewee is a common summer resident of woodlands in eastern South Dakota (Tallman et al. 2002).

Bell's Vireo

Bell's Vireos are common breeders in the Missouri River Valley and its tributaries and LaCreek National Wildlife area (Tallman et al. 2002). They nest in shrubby riparian thickets and are closely associated with early successional habitats (willows, dogwoods, and plum thickets) (Tallman et al. 2002). Bell's Vireos selected relatively open, low, dense, shrubby breeding habitats in both eastern and western South Dakota (Martin 1996). Wild plum was the dominant shrub chosen for nest sites in western South Dakota. In eastern South Dakota, Bell's Vireos nested in early successional habitats and placed nests mainly in dogwood (*Cornus* spp.). Early successional riparian habitat, comprised mainly of willow, dogwood and young cottonwood (*Populus* spp.), is becoming increasingly rare due to the construction of dams which reduce flooding (Johnson 1992). This may be the cause of population declines of Bell's Vireos in South Dakota (Tallman et al. 2002).

Yellow-throated Vireo

Yellow-throated Vireos nest in mature deciduous woodlands in southeastern and northeastern South Dakota (Tallman et al. 2002).

Warbling Vireo

In eastern South Dakota, Warbling Vireos were negatively associated with planted woodlands containing high densities of coniferous trees (Bakker 2000). They occurred more frequently in native woodlands with a shrub component (Bakker 2000). Hutto and Young (1999)

found Warbling Vireos were strongly associated with deciduous shrubs. Gentry et al. (in preparation) found Warbling Vireos at higher densities in Missouri River habitats than in either Big Sioux River riparian woodlands or farmstead woodlots. This is probably due to their association with cottonwoods. Rumble and Gobeille (2004) also determined they were associated with cottonwood habitats.

Blue-gray Gnatcatcher

The only nesting records in South Dakota were documented in the southeastern counties of Lincoln and Minnehaha (Tallman et al. 2002).

Veery

In South Dakota, the Veery breeds only in Spearfish Canyon in the Black Hills and Sica Hollow State Park in extreme northeastern South Dakota (Tallman et al. 2002). Saab (1996) found the probability of detecting a Veery increased with increasing size of cottonwood riparian forests in Idaho. Veerys nest on the ground and have been found to be common cowbird hosts. Heavy grazing may have a negative effect on Veerys (Masconi and Hutto 1982).

Wood Thrush

The Wood Thrush breeds in mature woodlands with dense underbrush in the southeast, along the Missouri River from the extreme southeast through Charles Mix County, and in the northeastern South Dakota county of Roberts (Tallman et al. 2002). Wood Thrush range in South Dakota has retracted with dam construction along the Missouri (Tallman et al. 2002). Dam construction flooded the bottomland forest habitat used by Wood Thrushes.

Black-and-white Warbler

Black-and-white Warblers have been documented nesting in deciduous woodlands and groves in Pennington and Meade counties of southwestern South Dakota (Tallman et al. 2002).

Scarlet Tanager

Scarlet Tanagers are uncommon and local summer residents of mature deciduous woodlands and groves of extreme northeast and southeast South Dakota (Tallman et al. 2002).

Western Tanager (see also the Black Hills section)

Western Tanagers breed in ponderosa pine forests and associated riparian woodlands of far western South Dakota and the Black Hills (Tallman et al. 2002). Preferred habitat in the state is mature ponderosa pine forests of the Black Hills (Peterson 1990).

Eastern Towhee

Eastern Towhees nest in shrubby vegetation and woodlands with brushy undergrowth (Tallman et al. 2002). Previously, the Eastern Towhee and Spotted Towhee were classified as the same species, called the Rufous-sided Towhee. Tallman et al. (2002) recommend additional study to document nesting and winter records now that the species are split. Rufous-sided Towhees were observed infrequently in a study of 525 woodlands in eastern South Dakota (Bakker 2000). Woodlands where they did occur had little herbaceous undergrowth.

Rose-breasted Grosbeak

National BBS trends indicate a stable population but South Dakota trends are indicating a steep negative trend, though not significant. More research on this species is necessary to determine if the South Dakota trend is a result of management or BBS sampling (e.g., low occurrence on routes and degradation or removal of habitat on routes). Bakker and Higgins (2003) found more Rose-breasted Grosbeaks in naturally occurring versus planted woodlands. They preferred larger natural woodlands dominated by mature trees and few shrubs (Bakker 2000). Rose-breasted Grosbeaks were more common in both Missouri and Big Sioux riparian corridors than in farmstead woodlots in southeastern South Dakota (Gentry et al., in preparation).

Orchard Oriole

Orchard Orioles regularly occurred in planted woodlands dominated by mature deciduous trees in eastern South Dakota (Bakker 2000). They were negatively associated with planted woodlands dominated by coniferous trees (Bakker 2000). Gentry et al. (in preparation) found that Orchard Orioles used farmstead woodlots and Missouri River riparian woodlands more than

Big Sioux River riparian woodlands. In addition, they found nesting success of Orchard Orioles did not differ significantly between corridors and woodlots.

Overall Population and Management Objectives

The conservation of riparian woodlands is a priority management objective for many of South Dakota's priority woodland birds. Naturally occurring non-riparian woodlands should also be a top conservation priority. Many priority species occurred more frequently in natural versus man-made woodlands (Kelsey 2001, Bakker and Higgins 2003). However, mature planted woodlands can provide habitat for nesting and migratory woodland birds (Bakker 2000, Swanson et al. 2003, Swanson et al. *in press*, Gentry et al. *in preparation*). Recommendations for planting woodlands include making the perimeter to area ratio as small as possible, planting a variety of native deciduous trees and shrubs of differing age classes, and limiting coniferous species (Bakker 2000, Kelsey 2001, Bakker and Higgins 2003). Maintenance of snags and the understory of riparian and deciduous woodlands as well as the natural processes leading to regeneration of riparian woodlands also provide important habitat for several woodland bird species.

Conservation Issues

- Loss of riparian and floodplain woodlands to agriculture
- Riparian habitats are being damaged by intensive cattle grazing
- The tradeoffs that exist for woodland and grassland species related to planted woodlands (see grassland section)

The preservation and maintenance of natural woodland patches of all sizes is recommended to provide maximum benefits for woodland species of concern. Historically, woodlands on the Great Plains existed only in riparian areas and areas where there was sufficient ground water or the topography afforded protection from fire (Higgins 1986). Several priority

species use trees and shrubs in riparian areas. Incentives to encourage landowners to keep cattle from overgrazing these areas should be continued and expanded.

Early successional riparian habitat, comprised mainly of willow, dogwood and young cottonwood (*Populus* spp.), is becoming increasingly rare due to the construction of dams (Johnson 1992). This habitat was found to support a diverse assemblage of birds including uncommon and localized breeders in South Dakota (e.g., Bell's Vireo, American Redstart and Ovenbird) (Swanson 1999). A total of 44 species were identified as potential breeders in early successional riparian habitat including Neotropical and temperate-zone migrants and permanent South Dakota residents. Surveys of mature deciduous and scrub cottonwood/willow riparian areas found no significant differences in avian diversity (Liknes et al. 1994). However, of the 40 species detected, 15 were found only in the scrub cottonwood/willow riparian areas and 9 were detected only in the mature riparian habitat. Five of the species detected only in mature habitats were cavity nesters while the majority of species found only in scrub habitat nest primarily in open habitats. Other studies found lower avian density and species richness in early successional than in later successional habitats along the Missouri River (Rumble and Gobeille 1998, Rumble and Gobeille 2004).

Swanson et al. (2003) determined that several Neotropical migrants utilize farmstead woodlots as stopover sites and hypothesized that they supplement available riparian woodlands. Additionally, when spring and fall use of riparian corridor woodlands and farmstead woodlots by Neotropical migrants were compared, overall abundance, species richness and diversity were similar (Swanson et al. *in press*). They also determined that Neotropical migrants that were recaptured gained mass in woodlots. This suggests that farmstead woodlots can effectively supplement riparian woodlands as habitat for migrating birds, which is important due to the

marked decline in riparian woodlands during the last century (Swanson et al. *in press*). However, Bakker and Higgins (2003) reported the majority of breeding birds using planted woodlands were generalist and edge species, including the Brown-headed Cowbird, while several woodland obligates (including South Dakota priority species such as Red-headed Woodpeckers and Rose-breasted Grosbeaks) were detected significantly more in naturally occurring woodlands. Similarly, Yahner (1982) indicated that wooded islands were capable of sustaining high densities of several different species of nesting birds. However, the most abundant nesting species in shelterbelts were edge-generalists (e.g., Common Grackle, Mourning Dove and American Robin, which also occur in several other habitat types).

Nesting success was similar between farmstead woodlots and riparian corridors in southeastern South Dakota (Gentry et al. *in preparation*). The major distinction between corridors and woodlots was the low density or complete absence of some Neotropical migrant species from the woodlot habitats that were present in higher numbers in river corridors. These included Warbling Vireo, Red-eyed Vireo, Eastern Wood-Pewee, Wood Thrush, American Redstart, Yellow Warbler, Rose-breasted Grosbeak, and Eastern Towhee. Among Neotropical migrants, only Baltimore and Orchard orioles, House Wrens, Common Yellowthroats, and Eastern Kingbirds were observed more often in woodlots than in at least one river corridor during at least one year of the study (Gentry et al. *in preparation*).

Woodlands associated with other larger landscape habitats increase edge and/or generalist avian species, which may compete with forest interior and grassland species for nests, food, and territory (Thompson 1996). Planted woodlands provide habitat mainly for edge and generalist bird species, many of which thrive without the aid of management and frequently occur in natural woodlands. However, these planted woodlands don't support most species of woodland

obligates to the same extent as natural woodlands (Bakker and Higgins 2003, Swanson et al. *in press*, Gentry et al. *in preparation*). Because planted woodlands attract mammalian and avian predators and Brown-headed Cowbirds, these habitats may negatively affect the avian communities nesting within the patches as well as in the adjacent patches of grassland. Many grassland nesting species are negatively affected by the presence of woody vegetation (Bakker 2003b). Thus, managers must weigh the value of planting woodlands with their potential detrimental effects.

Research needs

Several species are lacking information on local and landscape level habitat requirements. Further research into how riparian areas, shelterbelts and woodlots function as habitat for species of concern is needed. Studies comparing nesting success between natural and man-made woodlands are needed to determine if the birds that do use man-made woodlands are producing young and therefore if they can serve as an adequate replacement for naturally occurring woodlands. Setting a standard method to evaluate habitat quality (perhaps by nesting success during the nesting season, and rates of mass gain during migratory stopover) and then looking at relative habitat quality between natural and planted woodlands would help inform conservation decisions regarding these habitats. This research would also help determine how riparian restoration should proceed to provide the most benefits to birds of concern.

BIG SAGEBRUSH STEPPE HABITATS

Big sagebrush (*Artemisia tridentata*) in South Dakota occurs only in the west river physiographic region, predominantly along the western edge of the state in Fall River, Butte and Harding counties. Big sagebrush in western South Dakota is part of an ecotone between the mixed-grass prairie to the east and the sagebrush prairie to the west. Big sagebrush scrub reaches its eastern limit in these three counties (Visher 1918). This area is classified as wheatgrass-big sagebrush plains, containing scattered to fairly dense dwarf shrubs, western wheatgrass, big sagebrush, Junegrass (*Koeleria macrantha*), Sandberg’s bluegrass (*Poa secunda*), and needleandthread (*Stipa comata*) (Johnson and Larson 1999).

Table 7. Species of Concern in Big Sagebrush Habitats in South Dakota

Species	PIF Continental Population Objective	Habitat Association	South Dakota Distribution
Greater Sage-Grouse	Increase by 100%	Big Sagebrush	Extreme northwestern and southwestern
Sage Thrasher	Maintain	Big Sagebrush	Extreme northwestern and southwestern
Brewer’s Sparrow	Increase 100%	Big Sagebrush	Extreme northwestern and southwestern

Level I Priority Sagebrush Species

Greater Sage-Grouse

Sage Grouse depend on big sagebrush for forage and cover during all stages of their life cycle. Lek and nesting sites are completely tied to the presence of sagebrush habitat. Additionally, sagebrush dominates the winter diet. Sparse vegetative cover with few to no shrubs is preferred on lek sites and 15-40% shrub cover and 3-30% residual grass cover is preferred on nesting sites (VerCauteren and Gillihan 2004). Nesting habitat should also include adequate canopy cover of grasses \geq 18cm and shrubs 40-80 cm tall (Crawford et al. 2004). Nests are typically located about 2-5 miles from lek sites (VerCauteren and Gillihan 2004). Abundant

forbs and insects are critical in brood rearing habitat and availability of herbaceous riparian species for late growing season foraging is necessary (Crawford et al. 2004). During winter, Sage Grouse use medium height (25-80 cm) and taller sagebrush with southern and western exposure (Crawford et al. 2004) with 5-45% shrub cover (VerCauteren and Gillihan 2004).

Recent guidelines for managing Greater Sage-Grouse were published in 2000 (Connelly et al. 2000). These guidelines recommend maintaining diverse habitats for Sage Grouse during differing stages of their life cycle (e.g., breeding, brood rearing, and wintering). Connelly et al. (2000) recommend canopy cover of sagebrush in both arid and mesic sites should be maintained at 15 to 25% in breeding habitat, 10 to 25% in brood-rearing habitat, and 10 to 30% in wintering habitat. Canopy cover in winter refers to the portion of sagebrush exposed above snow (Connelly et al. 2000). Grass-forb cover is recommended to be $\geq 15\%$ in arid sites and $\geq 25\%$ in mesic sites during breeding. During brood rearing, grass-forb cover should exceed 15% in both mesic and arid sites. Sagebrush height during breeding and brood rearing is recommended to be 40 to 80 cm (mesic sites) or 30 to 80 cm (arid) and in winter, sagebrush should be 25 to 35 cm above snow level (Connelly et al. 2000). Connelly et al. (2000) recommend height of grasses and forbs in both mesic and arid sites be >18 cm for breeding habitat. Grass and forb heights in brood-rearing habitat can be variable (Connelly et al. 2000). To be effective, at least 80% of breeding and winter habitats and 40% of brood-rearing habitats should be maintained as prescribed (Connelly et al. 2000). Sage Grouse respond negatively to grazing pressure that does not leave 3-30% residual grass cover or 15-38% sagebrush cover for nesting and wintering habitat (VerCauteren and Gillihan 2004). Light to moderate rotational grazing can stimulate bunch grasses necessary in nesting and brood rearing habitats (VerCauteren and Gillihan 2004).

In a study comparing current and historic sage grouse lek sites in North and South Dakota, Smith (2003) detected no difference in microhabitat characteristics between active and abandoned lek sites. However, he determined that tillage prior to 1972 may have led to lek abandonment. Additionally, sagebrush density had a positive effect on lek size in North Dakota. In 2001, 160 males were observed on 11 active leks and in 2002, 142 males were found on 12 active leks (J. Smith, SDSU, pers. comm.).

Level II Priority Sagebrush Species

Brewer's Sparrow

Brewer's Sparrows only occur in areas with big sagebrush in western South Dakota. Brewer's Sparrows were detected in areas that averaged 10.6% shrub cover, 10.4% sagebrush cover and 0.93 shrubs per m² in a study completed in South and North Dakota (Lewis 2004). In Butte County, South Dakota, Igl and Murphy (1996) documented territorial pairs in Conservation Reserve Program grasslands with <0.1% vegetative coverage of sagebrush plants. Fragmentation of sagebrush habitat and altered grazing regimes increase vulnerability of Brewer's Sparrows to Brown-headed Cowbird parasitism.

Level III Priority Sagebrush Species

Sage Thrasher

In an extensive study of sagebrush habitats in South Dakota and North Dakota, one Sage Thrasher was detected in 200 surveys (Lewis 2004). Sage Thrashers were detected on several surveys in Wyoming in the same study. Sage Thrashers are a sagebrush obligate species and South Dakota is on the periphery of their range.

Overall Population and Management Objectives

Provide large areas of intact sagebrush habitats with a healthy understory of native plants and forbs. Preserve, maintain, restore and enhance sagebrush habitats through replanting,

livestock grazing management, and control of exotic and invasive species. Manage habitats to encompass habitat requirements of Sage Grouse during different stages of their life cycle and throughout the year. Restore degraded sagebrush habitats through replanting. In areas where sagebrush has increased beyond the required cover guidelines, the use of burning and/or grazing or mechanical removal may be warranted. Avoid the use of herbicides and pesticides during nesting and brood rearing when insects are crucial to adults and chicks (Connelly et al. 2000).

Conservation Issues

- loss of sagebrush habitat
- overgrazing
- fire timing and frequency
- invasion by exotics and woody vegetation

The loss and degradation of sagebrush habitat has occurred with conversion to agriculture, invasion by exotic species, drought and overgrazing (Lewis 2004). Sage Grouse distribution and densities have been greatly reduced due to loss and degradation of sagebrush habitats to cultivation, improperly timed or reduced fire frequency, sagebrush removal by herbicides, and overgrazing (VerCauteren and Gillihan 2004). Plowed sagebrush is unlikely to return to a native shrub community and in dry areas sagebrush can't reinvade (Vander Haegen et al. 2000, Tweit 2000). Overgrazing and herbicides have reduced sagebrush land (SDOU 1991). Invasion by downy brome (*Bromus tectorum*) makes sagebrush regrowth difficult (Vander Haegen et al. 2000). Additionally, downy brome is prone to fires. Sagebrush can take 25-30 years to recover from fire (Connelly et al. 2000) or become completely eradicated.

Research needs

Due to differing habitat use during their life cycle and throughout the year, Sage Grouse likely require large, contiguous areas of different habitat types, but studies have not been

completed to determine how much and in what proportions. Specific landscape requirements (i.e., size of sagebrush patch, proportion of sagebrush in the landscape, etc.) for the Greater Sage-Grouse and Brewer's Sparrow are needed. Additionally, no nesting studies on these species have been conducted in sagebrush habitats of South Dakota. Microhabitat characteristics necessary for nesting, brood rearing and over-wintering will be necessary to further manage Sage Grouse. Further population studies to determine if the Sage Thrasher nests in South Dakota.

BLACK HILLS HABITATS

Forests of the Black Hills are predominantly comprised of ponderosa pine (*Pinus ponderosa*) with white spruce occurring in the higher elevations. Aspen groves are interspersed with conifers throughout the Black Hills, but are diminishing. The northern hills receive more precipitation than the southern hills. Several canyons containing steep cliffs, deciduous woodlands and mountain streams are interspersed throughout the Hills. Historically, many of the fast flowing mountain streams were lined with lush riparian vegetation, but such areas are becoming more limited. Pine-juniper-shrub habitat is found in southwestern South Dakota on rocky hillsides and canyon breaks. Forest fires leave behind snags and restart succession of the forest vegetation. Burned areas succeed to aspen stands but some will remain open for several years or succeed directly to pine. Burn areas can be very important habitats for Black Hills birds. Panjabi (2005) found that pine-juniper shrublands and burn areas support the highest number of species per transect as compared to 8 other habitat types. Lakes found in the Hills are the result of dam construction. The forests of the Black Hills are managed by timber harvest and burning. Cutting is used to rejuvenate quaking aspen/paper birch forest stands to help discourage invasion by ponderosa pine. Mountain pine beetle infestations are a natural part of the disturbance regime in the Black Hills.

The Black Hills of South Dakota provide unique habitat for several species of birds with both eastern and western distributions that are not present anywhere else in South Dakota (see Tallman et al. 2002). For example, the northern Black Hills is the only area American Dippers have been documented in South Dakota (Backlund 1994).

Level I Priority Species

None

Level II Priority Species

None

Level III Priority Species (Table 8)

Ruffed Grouse

In the Black Hills, young to medium age aspen stands, hardwoods, and open pine forests comprise major habitat for Ruffed Grouse (Tallman et al. 2002). Fire suppression has resulted in a loss of Ruffed Grouse habitat (Tallman et al. 2002).

Northern Goshawk

It is not clear if the Black Hills population of breeding goshawks is migratory (Tallman et al. 2002). Goshawks were observed in February of 2005 near their nest sites, implying at least some of the population stays during winter to defend their territories (Cara Staab, BHNF, pers. comm.). Nearly all Goshawk nests in the Black Hills are located in ponderosa pine (Cara Staab, BHNF, pers. comm.). Goshawks hunt in cover types ranging from open steppe to dense forests (USFWS 1998). Goshawks forage in old growth forest as well as early successional habitats in the Black Hills (Cara Staab, BHNF, pers. comm.).

Goshawk habitat management should focus on retaining mature coniferous stands with high canopy closure (Casey 2000) for nesting habitat. Timber harvest which reduces canopy closure in mature forests will likely reduce use by goshawks for nesting. Management prescriptions that reduce understory but maintain canopy cover should not adversely affect goshawk nesting in those stands (Casey 2000). To produce and maintain desired forest conditions for Northern Goshawks, Reynolds et al. (1992) recommended thinning understory trees and prescribed burning to create small openings in the forest. Abundant snags, large downed logs, woody debris, interspersed of different tree sizes across the landscape and the majority of the goshawk's home range in old growth forest are also critical habitat elements for maintaining both goshawk and prey populations (Reynolds et al. 1992).

Table 8. Species of concern in the Black Hills of South Dakota.

Species	PIF Continental Population Objective	Habitat Association
Ruffed Grouse	*	Aspen, open pine
Northern Goshawk	*	Conifer, mixed forests
Lewis's Woodpecker	Maintain/increase	Dead trees in burned forest, stream bottoms
Red-naped Sapsucker	Maintain	Aspen groves, mixed pine/aspen
American Three-toed Woodpecker	*	Spruce forests
Black-backed Woodpecker	Maintain	Recent burns, conifer forests
Cordilleran Flycatcher	*	Mature woodland, foothill riparian areas
Veery		Riparian, aspen
Pinyon Jay	Increase 100%	Open pine forests
Clark's Nutcracker	Maintain	Conifer forests
Pygmy Nuthatch	*	Pine forests
American Dipper	*	Mountain streams
Virginia's Warbler	Maintain/increase	Pine-juniper-shrub
Black-and-white Warbler	*	Oak woodlands
Western Tanager	*	Ponderosa pine forests
Dark-eyed Junco	*	Coniferous and mixed forest
Cassin's Finch	Maintain	Woodlands, residential
Lesser Goldfinch	*	Woodlands, weedy fields
Pine Siskin	*	Woodlands

*Not on PIF species of continental importance for the U.S. and Canada list (Rich et al. 2004)

Lewis's Woodpecker

In South Dakota, Lewis's Woodpecker occurs only in the Black Hills (Tallman et al. 2002). Lewis's Woodpeckers are experiencing significant declines nation-wide. Habitat requirements include an open forest canopy, a dense shrub understory, and large snags for nesting (Vierling 1997, K. Vierling, SDSMT, pers. comm.). In Colorado riparian woodland and foothill sites, Vierling (1997) found all nests were in dead and decaying cottonwoods. Nest sites were located in open cottonwood stands adjacent to light or moderately grazed fields. Ponderosa pine habitat was not occupied during the breeding season (Vierling 1997). It was hypothesized this was a result of dense forest structure due to a lack of fire. In 2004, RMBO staff observed 4 Lewis's Woodpeckers in the Black Hills, 2 in burned areas and 2 in a mixed grass prairie site located near an old burn area (Panjabi 2005).

Red-naped Sapsucker

Aspen and mixed pine/aspen habitat is used by Red-naped Sapsuckers in the Black Hills (Tallman et al. 2002). Panjabi (2003, 2005) determined that the abundance and distribution was directly related to the availability and abundance of broad-leaved, deciduous woody vegetation, particularly aspen and willows. Red-naped Sapsuckers were found in low to moderate abundance throughout the Black Hills, occurring at the highest abundance in the north. Densities were highest in aspen habitat followed by pine in the north, likely due to the presence of aspen and birch within it (Panjabi 2003, 2005).

Mills et al. (2000) categorized the Red-naped Sapsuckers as aspen/birch obligates and determined the use of fire was critical to maintaining these habitat types.

American Three-toed Woodpecker

In the Black Hills of South Dakota, Three-toed Woodpeckers occur primarily in spruce forests (Tallman et al. 2002). Panjabi (2003) found their distribution was tied almost exclusively

to mature stands of white spruce. In Yellowstone National Park, Three-toed and Black-backed Woodpeckers increased in numbers the first 3 years post burn (Taylor and Barmore 1980). In the Black Hills, no American Three-toed Woodpeckers have been recorded in the Jasper burn of 2000 in 4 years post burn (Panjabi 2005). Intense logging practices had adverse effects on nesting abundance in Montana (Caton 1996).

Black-backed Woodpecker

In South Dakota, Black-backed Woodpecker habitat is described as coniferous forests and recently burned areas (Tallman et al. 2002). Burned areas were determined to be critical habitat for this species in the Black Hills (Panjabi 2003). Black-backed Woodpeckers were also found in lower densities in late successional pine habitats. However, long term viability of Black-backed Woodpeckers may be dependent on stand replacement fires, especially in areas with high snag density (Panjabi 2003). Black-backed Woodpeckers increased in density the first 2 years postburn and declined in years 3 and 4 postburn (Panjabi 2005). In studies conducted in Montana, Wyoming and Idaho, Black-backed Woodpeckers also showed strong preferences for burned areas (Hutto 1995). In Yellowstone National Park, Three-toed and Black-backed Woodpeckers increased in number the first 3 years post burn (Taylor and Barmore 1980). Twelve Black-backed Woodpecker nests were found in areas of mountain pine beetle infestations in the Black Hills during 2004 (Bonnot 2004). This ongoing study will estimate Black-backed Woodpecker nest survival and fledging success and quantify nest site selection at the landscape, territory and micro-site scales (Bonnot 2004).

Pinyon Jay

Pinyon Jays are uncommon, permanent residents of open pine forests in far western South Dakota (Tallman et al. 2002). Panjabi (2003) found Pinyon Jays uncommonly at low elevations in the southwestern Black Hills. He hypothesized they used pine-juniper shrublands

and sparse pine woodlands interspersed with grasslands where their presence is highly dependent on cone crops (Panjabi 2003, 2005).

Clark's Nutcracker

Nutcrackers are closely linked to areas of high conifer seed production and use a variety of structural stages of forest (Hutto 1995). Pine seeds are the major food source for Clark's Nutcrackers in the Black Hills (Tallman et al. 2002).

Pygmy Nuthatch

Pygmy Nuthatches are rare permanent residents of pine forests in the lower elevations (<5,500 feet) of the Black Hills. Breeding locations in the southern and eastern Black Hills are not consistent from year to year, possibly due to the social nature and small recruitment pool of the species (Tallman et al. 2002). Panjabi (2005) recorded Pygmy Nuthatches in the central and northwestern Black Hills and determined that the species is rare but widespread.

American Dipper

The American Dipper is found in the Black Hills using swift, clear streams (Tallman et al. 2002). Nest sites are typically over water, protected from predators and flooding, and feature a supportive horizontal ledge or crevice. American Dippers are currently found only on Spearfish and Whitewood creeks in the Black Hills (Backlund 2001, Panjabi 2003). American Dippers were formerly more widespread occurring on French Creek, Box Elder Creek, Elk Creek and Rapid Creek (Backlund 2001). Human activities, including dam building, pollution from road building and mining, cattle grazing and other activities that increase sedimentation, likely have led to the absence of American Dippers from these creeks (Backlund 2001). Timber harvest along creeks in the Black Hills could increase sedimentation and change pH and clarity of streams (Anderson 2002). Management recommendations include maintaining uncut buffer strips along streams and restoring the health of watersheds in the Black Hills. American Dippers have strong nest site fidelity (Kingery 1996), so the protection of existing nest sites is critical.

Cordilleran Flycatcher

The Cordilleran Flycatcher is found in the Black Hills in well-shaded woodlands, often near exposed rock and water (Tallman et al. 2002). The Cordilleran Flycatcher nests in cavities of dead or live trees, on stream banks, and on rock ledges (Ehrlich et al. 1988). In the Black Hills, they nest primarily on low cliffs and rock outcrops in moist canyons with abundant deciduous vegetation (Panjabi 2003) and also use bridges and buildings (Doug Backlund, SDGFP, pers. comm.) Highest densities were recorded in foothill and montane riparian habitats (Panjabi 2003, 2005). Best management options are to maintain snags and dense understory of well-shaded woodlands and conserve riparian habitats.

Veery

The western subspecies of the Veery is found in the Black Hills. Veerys are found in low to moderate abundance in the northern Black Hills, with highest abundance in the Bear Lodge Mountains. However, Veerys are found in relatively high densities in the Black Hills and it is likely an important breeding area for this subspecies (Arvind Panjabi, RMBO, pers. comm.). They are found only in the northern Black Hills in montane riparian habitat and to a lesser degree in the understory of mature, mesic aspen stands (Panjabi 2003, Arvind Panjabi, RMBO, pers. comm.). They are highly vulnerable to activities that affect the extent and quality of riparian habitat, especially grazing.

Virginia's Warbler

The only documented breeding area for the Virginia's Warbler in South Dakota is located in the southwestern Black Hills (Swanson et al. 2000). A small area of pine-juniper-shrub habitat is present here on rocky hillsides and canyon breaks at elevations of 1,350-1,700 m. The overstory in these habitats consists of scattered ponderosa pine and Rocky Mountain Juniper and a shrubby understory of skunkbush sumac (*Rhus aromatica*) and mountain mahogany (*Cercocarpus montanus*). In South Dakota, dense shrub cover, steep slopes, and medium to

large ponderosa pines (ca. 8 m minimum) were present wherever breeding warblers were documented (Swanson et al. 2000). Swanson et al. (2000) recommend that future research address nesting success, nest site characteristics, and source-sink analyses of population dynamics. Once these factors have been determined, population objectives for the Virginia's Warbler in South Dakota can be determined. In 2004, more Virginia's Warblers were recorded than any other year since surveys began in 2000 by the RMBO (Panjabi 2004). All birds were detected in pine-juniper shrubland only in areas with mountain mahogany and skunkbrush understory (Panjabi 2005).

Black-and-white Warbler

Black-and-white Warblers are found primarily in low-elevation oak woodlands, particularly in valley bottoms, along the northern and eastern slope of the Black Hills (Panjabi 2003, 2005). They are especially vulnerable to increasing development in the Black Hills because the majority of their habitat is located on privately owned lands (Arvind Panjabi, RMBO, pers. comm., Panjabi 2005).

Western Tanager

Bock and Bock (1983) compared breeding birds in burned and unburned ponderosa pine stands and pine-savannah habitats. Western Tanagers were significantly more abundant in the burned areas the first year post-burn. Western Tanagers selected mature and multi-storied ponderosa pine with moderate to high canopy cover in a study comparing bird use of quaking aspen/paper birch stands and ponderosa pine stands in the central Black Hills (Mills et al. 2000).

Dark-eyed Junco

The white-winged subspecies of the Dark-eyed Junco is endemic to the Black Hills region from northwest Nebraska to southeast Montana (Panjabi 2005). The Black Hills supports almost the entire global population of this subspecies (Panjabi 2005). Dark-eyed Juncos are widespread and abundant throughout the Black Hills with highest densities in late successional

pine, aspen, and white spruce habitats (Panjabi 2003). Panjabi (2005) reported them in the highest densities in burn areas. Bock and Bock (1983) compared breeding birds in burned and unburned ponderosa pine stands and pine-savannah habitats. Dark-eyed Juncos were significantly more abundant in the burned areas the first year postburn.

Cassin's Finch

Cassin's Finch used habitats predominately within open ponderosa pine forests and Douglas-fir/mixed coniferous forests (Hutto and Young 1999). Post-fire and selectively logged sites are used extensively by Cassin's Finches.

Pine Siskin

Pine Siskins are a common permanent resident of the Black Hills (Tallman et al. 2002). They winter throughout South Dakota in woodland groves and residential areas (Tallman et al. 2002). Highest densities of Pine Siskins are found in montane riparian; pine in the north and white spruce habitats of the Black Hills (Panjabi 2003).

Lesser Goldfinch

Lesser Goldfinches can be found regularly from May to September in Hot Brook Canyon, near Hot Springs in Fall River County, South Dakota (Tallman et al. 2002). Two confirmed nesting records, an occupied nest and fledged young, were reported in Hot Springs during 2004. Studies to determine distribution and habitat requirements in South Dakota must be completed before management recommendations can be instituted.

Overall Population and Management Objectives

Priority species for the Black Hills have varied habitat requirements. Management prescriptions must be tailored to each habitat guild of management concern. However, no published research exists on the habitat requirements of several of these species. The first step then must be research into these species and their habitat requirements. The most effective way to monitor health of these bird populations is by studying reproductive success.

Management may include harvesting and fire prescriptions to maintain desired habitats. Bock and Bock (1983) compared breeding birds in burned and unburned ponderosa pine stands and pine-savannah habitats. Birds were significantly more abundant in the burned areas the first year post-burn. American Robins, Mountain Bluebirds, Solitary Vireos, Yellow-rumped Warblers, Western Tanagers, Dark-eyed Juncos and Chipping Sparrows were all significantly more abundant in burned areas. No species was significantly more abundant in unburned areas. There was no difference in breeding bird abundance between treatments in the second year post-burn. Red-breasted Nuthatches and American Robins were more abundant in unburned areas in year 2.

Bird species richness was greater in quaking aspen/paper birch stands than in ponderosa pine stands in the central Black Hills (Mills et al. 2000). Recommendations for increasing bird use included maintaining within and between stand diversity, managing at the stand level first, inclusion of subdominant tree species that may be necessary for some species and leaving snags, non-merchantable timber and deciduous trees within cutting units (Mills et al. 2000).

Conservation Issues

- alteration of fire regimes
- increased development
- timber harvest
- health of Spearfish Creek and all other watersheds

The forests of the Black Hills are managed by timber harvest, grazing, and burning. Prescribed fire and timber harvest are important for maintaining early successional stages in the Black Hills forest ecosystem. Forest fires leave behind snags and restart succession of the forest vegetation. Most burned areas succeed to aspen stands but some will remain open for several years or succeed directly to pine. Alteration of fire regimes has resulted in thick growth of young trees in many areas. Fires also leave behind many snags for cavity nesting birds. Since

2000, wildfires have burned over 10% of the Black Hills National Forest (Cara Staab, BHNF, pers. comm.). Cutting is used to rejuvenate quaking aspen/paper birch forest stands and to help discourage invasion by ponderosa pine. The implementation and timing of these management techniques are important for providing habitat for different bird species. Increased home building threatens habitat and the use of fire as a management technique. Approximately 20% of lands within the Black Hills National Forest boundary are in private ownership (Cara Staab, BHNF, pers. comm.). Maintaining the health of Spearfish Creek is critical to preventing the extirpation of the American Dipper from the Black Hills (Arvind Panjabi, RMBO, pers. comm.). Restoration of other watersheds so they can support healthy populations of dippers will be critical to sustaining the population over the long term.

Research needs

- increased population monitoring of priority species, in addition to the yearly monitoring conducted by the Rocky Mountain Bird Observatory
- studies on the effects of development
- nesting studies
- many species have little to no research conducted on specific habitat requirements in the Black Hills of South Dakota

CLIFF AND BADLAND HABITATS

The White River Badlands are located in southwestern South Dakota. Much of this area is part of Badlands National Park. The badlands consist of steep, eroded cliffs that provide nesting sites for species such as the white-throated swift. Juniper groves line the draws where some water accumulates.

Table 9. Cliff and Badlands Species of Concern in South Dakota .

Species	PIF Continental Population Objective	Habitat Association	South Dakota Distribution
White-throated Swift	Increase 100%	Open areas near rocky cliffs	Black Hills, Badlands

Level II Priority Species

White-throated Swift

White-throated Swifts are most abundant in the Black Hills, the buttes of Harding County and the Badlands in South Dakota (Tallman et al. 2002). They are locally common at lower elevations around the perimeter of the Black Hills, where high cliffs provide suitable nesting sites (Panjabi 2003). White-throated Swifts were found in the greatest density in foothill riparian and pine-juniper shrub habitat with cliffs nearby during surveys of Black Hills habitats (Panjabi 2003, 2005).

Research needs

No studies have been conducted on White-throated Swifts in South Dakota. To propose effective management options for this species, estimates of population size and habitat requirements are necessary. The first step, currently being completed by the Rocky Mountain Bird Observatory in the Black Hills, is to locate and monitor populations.

ARTIFICIAL TERRESTRIAL HABITATS (ag. fields, urban landscapes, bridges, etc.)

Agriculture is the dominant land use in South Dakota

(<http://wfs.sdstate.edu/sdgap/land.html>). Agricultural practices have shifted to include more row crops and less planting of small grains and hay (Higgins et al. 2002). South Dakota is predominately a rural state with only 2 major cities (Sioux Falls and Rapid City, SD).

Table 10. Species of concern using artificial terrestrial habitats.

Species	PIF Continental Population Objective	Habitat Association	South Dakota Distribution
Ring-necked Pheasant	*	Cropland for feeding	All

***Not on PIF species of continental importance for the U.S. and Canada list (Rich et al. 2004)**

Ring-necked Pheasant

The Ring-necked Pheasant is an exotic species that contributes significantly to South Dakota's economy. Many management plans implemented by state and federal agencies focus on Ring-necked Pheasant populations.

Ring-necked Pheasants nest in grassland habitats. Eggebo et al. (2003) recorded more crowing pheasants in old cool-season CRP fields than in young cool- or old or young warm-season CRP fields. More broods were recorded in cool- versus warm-season CRP fields, regardless of age. Schmitz and Clark (1999) concluded that grassland fragmentation increases mortality of hen pheasants during the spring breeding season.

Nest predation was greater on or near (<0.6 km) an area with extensive tree plantings than at more distant locations (33 vs. 14%) in northeast Colorado (Snyder 1984). Near this area, both avian and mammalian predators decreased nesting success, whereas mammals were the major source of predation far (> 0.6 km) from the tree plantings. Woody cover characterized as having a high stem density near ground level was a preferred habitat of breeding male pheasants in east central South Dakota (Leif 2003). While tree plantings appear to have a negative effect

on pheasant nesting success (Trautman 1982, Olson and Flake 1975, Snyder 1984), woody cover comprised of shrubby vegetation has been found to be attractive for breeding male pheasants (Robertson 1996, Leif 2003) and for nest placement by hens in Utah (Robertson 1998). Little research has been conducted on the effects of shrubby vegetation on other grassland nesting species.

Bogenschutz et al. (1995) postulated that wild female Ring-necked Pheasants that fed within food plots had larger lipid reserves due to a higher quality diet than females not feeding in food plots during the winter months in eastern South Dakota. However, in a study taking place during mild winters, females with food plots within their home range did not have larger body or lipid masses than females without food plots (Purvis et al. 1999). Hen pheasants were found to expand their winter home ranges to include food plots and hens residing <300m from food plots did have higher survival rates (Gabbert 1997). Gabbert et al. (1999) determined that shelterbelts and food plots were critical to survival of pheasants during extreme winters (1 every 15-20 years).

Management Recommendations:

- preserve, plant, restore large grassland tracts
- Extend existing CRP contracts
- if planting trees for winter survival, do not plant them near grasslands; instead, plant them in highly agricultural areas adjacent to food plots where they could provide winter benefits and not negatively affect nesting pheasants or other grassland birds
- do not fragment existing grasslands, especially native tracts, by planting trees or shrubs in or adjacent to grassland habitats

-planting of shrubby vegetation to benefit pheasants on large grassland tracts should not take place until the effects on other priority species nesting in grasslands is known

WINTERING SPECIES

Table 11. Wintering species of concern in South Dakota.

Species	PIF Population Objective	Habitat	Distribution
Gyr Falcon	Maintain	Grassland	All
American Tree Sparrow	Maintain	Shrub/successional	All except Black Hills
Harris's Sparrow	Increase 100%	Shrub/successional	All except Black Hills
Lapland Longspur	Maintain	Grassland	All except Black Hills

Gyr Falcon

Gyr Falcons winter throughout South Dakota (Tallman et al. 2002). Habitats near Pierre, South Dakota appear to be one of the best wintering spots for Gyr Falcons in the nation (David Swanson, USD, personal communication). They feed primarily on waterfowl prior to winter freeze and Sharp-tailed Grouse after winter freeze in the Pierre area (Sanchez, personal communication in Tallman et al. 2002). Sanchez (1993) followed 5 immature and 3 adult female Gyr Falcons wintering in central South Dakota. He learned that immature birds did not establish winter home ranges in this area, as did the monitored adults. He found the birds to be closely associated with Lake Oahe and with large feeding waterfowl flocks and intolerant of human approach.

Harris's Sparrow

Ninety-seven percent of the global population of Harris's Sparrows winter in the PIF Prairie Avifaunal Biome (BCRs11, 17-19, 21-23) (Rich et al. 2004). In South Dakota, the species uses woodlands, groves, thickets and weedy fields during the winter, although this is a relatively uncommon winter species in the state (Tallman et al. 2002). South Dakota provides important habitats for this species during migration (David Swanson, USD, pers. comm.).

American Tree Sparrow

Eighty-six percent of the global population of American Tree Sparrows winter in the PIF Prairie Avifaunal Biome (BCRs11, 17-19, 21-23) (Rich et al. 2004). American Tree Sparrows

use weedy fields, thickets, marshes, and residential feeding stations during the winter months in South Dakota (Tallman et al. 2002).

Lapland Longspur

The Lapland Longspur is a wintering species found statewide using fields, prairies and road edges (Tallman et al. 2002). They are often found wintering in large mixed flocks of Horned Larks and Snow Buntings (Tallman et al. 2002). Ninety-nine percent of the western hemisphere population winters in the PIF Prairie Avifaunal Biome (BCRs11, 17-19, 21-23) (Rich et al. 2004).

Research needs

Research into wintering habits and habitat requirements of these species is necessary before population and management objectives and conservation issues can be established. No studies on wintering characteristics were found for any of these species in South Dakota or nearby habitats.

SUMMARY

Priority Habitats

Of the 30 level I priority species, 26 require wetland, grassland, or a combination of these habitats during the breeding season. Of the remaining species three use riparian woodlands extensively and one is a sagebrush obligate. Therefore, conservation, maintenance and restoration of native habitats, including grassland/wetland complexes, sagebrush and riparian woodlands, across the landscape are the most important factors to maintaining healthy populations of priority species in South Dakota. These efforts will benefit waterfowl, migratory shorebirds, waterbirds, woodland birds and grassland nesting birds. Conservation of existing native habitats is a far more efficient means of providing habitat and should be the top priority. Conservation priorities should be focused in areas with the highest amounts of native lands still intact because many priority species require large tracts of habitat (e.g., Northern Harrier, Long-billed Curlew, Grasshopper Sparrow, Greater Sage-Grouse, Willet, Marbled Godwit, Black Tern, etc.). Once habitat is protected, management of vegetation to benefit priority species can take place. To conserve and restore large amounts of habitat, partnerships between state, local, tribal, and federal government agencies, conservation groups and private landowners are critical.

Research Priorities

Many studies have looked at local and landscape requirements for birds in different habitats throughout South Dakota (Lewis 2004, Kelsey 2001, May 2001, DeJong 2001, Bakker 2000, Naugle 1997). While the data suggest that some species may use only unfragmented habitats while others use both fragmented and unfragmented landscapes, their nesting success in these environments is largely unknown. Likewise, some studies have looked at the use of native versus restored habitats, but few have analyzed nesting success in these habitats. Nesting studies

comparing success in fragmented and unfragmented landscapes as well as natural and man-made/restored habitats (woodlands, wetlands, grasslands) would enhance our ability to manage avian species across the landscape. These data would allow managers and conservationists to focus their efforts in areas that would provide the most benefits to priority species. Increased research effort needs to be focused on Level I and II priority species. Many of these species, especially large-bodied and uncommon birds, have had little research completed on their habitat requirements in South Dakota. In general, long-term avian studies are sorely needed in South Dakota.

Acknowledgements:

Eileen Dowd Stukel, South Dakota Game, Fish and Parks, organized the South Dakota All Bird Workshop and reviewed all drafts of this plan. Thanks to David Swanson and KC (Kent) Jensen for reviewing the priority bird list for South Dakota. David Swanson, Tony Leif, Cara Staab, Arvind Panjabi, Doug Backlund, Bill Smith, Chad Switzer, Laura Hubers, Mark Rumble, Greg Schenbeck, Kenneth Higgins, Dan Svingen, Connie Vicuna, Carol Aron, Dan Foster, Nancy Hilding, and Eddie Childers provided thorough reviews of the final draft. Several individuals participated in the South Dakota All Bird Workshop, which was sponsored by the International Association of Fish and Wildlife Agencies and SDGFP, and provided valuable information and expertise for inclusion in this plan. Funding for this publication was provided by the South Dakota Department of Game, Fish and Parks and the Wildlife Conservation and Restoration Program Grant SD R-2, administered by the U.S. Fish and Wildlife Service.

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