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## U.S. Shorebird Conservation Plan

# Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan

**Version 1.0**

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# **U.S. Shorebird Conservation Plan**

## **Northern Plains/Prairie Pothole Regional Shorebird Plan**

### **Executive Summary**

The Northern Plains/Prairie Pothole Region (NP/PPR) encompasses two Bird Conservation Regions, the Prairie Potholes and the Badlands and Prairies, and all or parts of seven states, including eastern Montana, northeastern Wyoming, North Dakota, South Dakota, western Minnesota, north-central Iowa, and northeastern Nebraska. The landscape is characterized by rolling hills of prairie grasses, millions of depressional wetlands ranging in size from shallow temporary or seasonal wetlands to deeper semi-permanent wetlands, and agriculture.

Thirteen species of shorebirds breed within the NP/PPR and require a landscape of grassland and wetland habitats for nesting and brood rearing. One of the major migration routes for western hemispheric shorebirds, especially long-distance migrants, traverses the NP/PPR. Because long-distance migrations are energetically expensive, the availability of abundant habitat and food resources at migration stopovers within the NP/PPR is critical. Shorebirds use a wide range of habitat types within the NP/PPR, including dry grasslands, sand and gravel beaches, natural freshwater and alkaline wetlands, lake margins, and shallowly-flooded agricultural fields. During migration, the unvegetated shallow waters and moist mudflats of freshwater or alkaline wetlands are especially important. Dramatic fluctuations in water levels are commonplace in the NP/PPR, and shallow water and mudflat habitats are highly unpredictable in space and time. Due to the dynamic nature of wetlands in this region, many shorebirds are opportunistic and dispersed across the changing landscape.

Three major shorebird issues have been identified for the NP/PPR. These are:

1) conservation of endangered and threatened species, declining species, and species of special concern; 2) habitat loss, including fragmentation and degradation; and 3) the need for additional information to evaluate potential threats, such as contaminants, predation, and invasion of exotic plants, to migrating and breeding shorebirds.

Regional goals within the NP/PPR are to:

- 1) maintain biotic integrity and persistence of breeding shorebird populations in the NP/PPR;
- 2) ensure that adequate stopover resources exist to support populations of migrating shorebirds;
- 3) identify and fill information gaps, including the development of tools to use within the context of dynamic ecosystem processes; and
- 4) coordinate with other conservation efforts in a cross-border landscape.

A series of habitat goals and objectives and research goals aligning with the regional goals have been delineated.

Managing for shorebirds in the NP/PPR is challenging because of the dynamic nature of wetland conditions in time and space and because of the need to provide diverse wetland habitats for waterfowl and other wetland-dependent birds. An identified management and monitoring need is to

enhance the landscape perspective on shorebird use of the plains, to acquire critical information on whether, when, and where ‘ecological hurdles’ (i.e., lack of suitable stopover habitat across large regions) exist, and to create avenues for focused, coordinated management activities. To fill this need, we propose an internet-based regional communication network apprising land managers and biologists of habitat availability and generalized shorebird movements within the U.S. interior.

## **Description of the Northern Plains/Prairie Pothole Region**

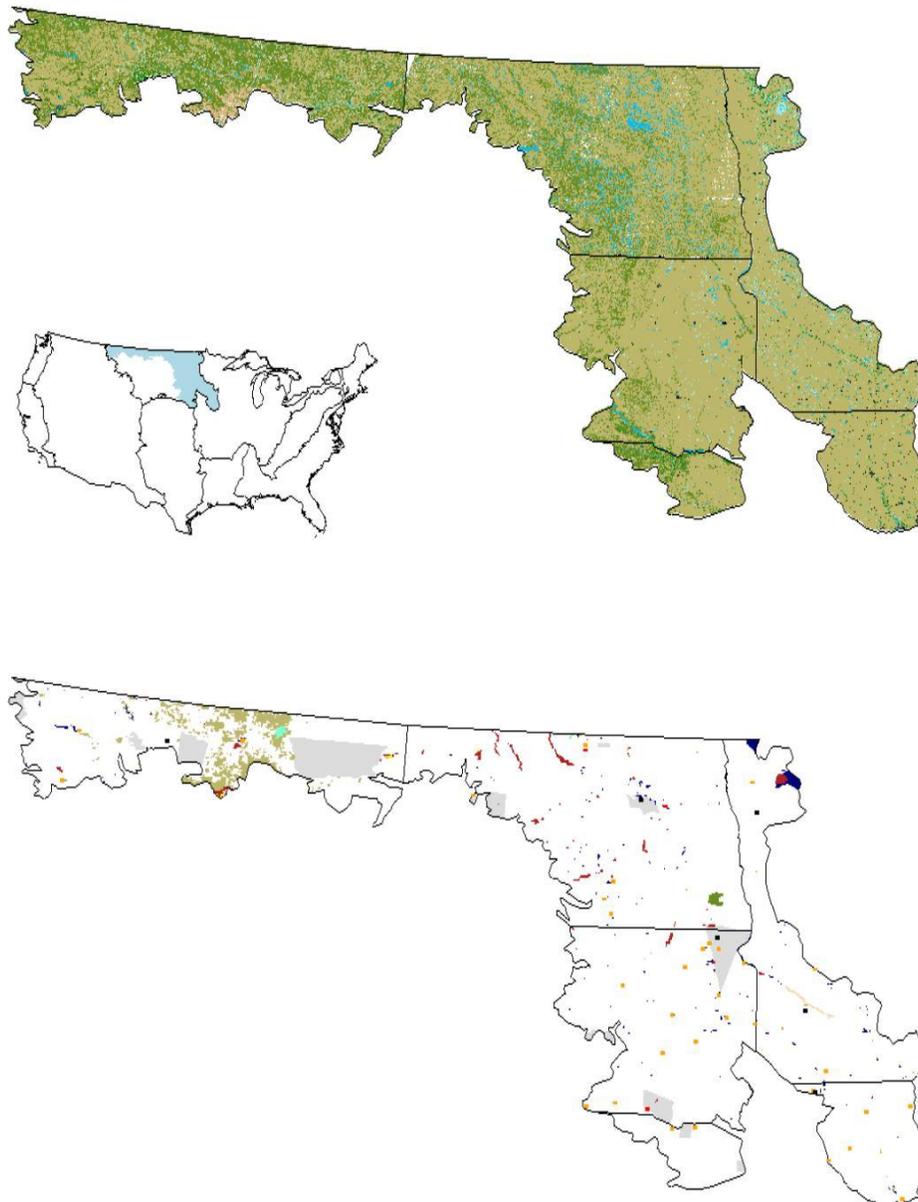
The Northern Plains/Prairie Pothole Region (NP/PPR) encompasses over 313,000 square miles in all or parts of seven states, which include eastern Montana, northeastern Wyoming, North Dakota, South Dakota, western Minnesota, north-central Iowa, and a small portion of northeast Nebraska. It encompasses two Bird Conservation Regions (BCR): 11, the Prairie Potholes, and 17, the Badlands and Prairies. The BCR maps for these regions are included in Figure 1 (Prairie Potholes-BCR 11) and Figure 2 (Badlands and Prairies-BCR 17). In addition, these maps are available in both .jpg and .tif format on the Manomet website at <http://www.Manomet.org/USSCP/bcrmaps.htm>.

The topography of this region was formed by the advance and retreat of glaciers across central North America, which left a gently rolling land surface with millions of depressions ranging in size from less than 1 acre to more than 10,000 acres. Most are shallow temporary or seasonal wetlands with deeper semi-permanent wetlands and lakes scattered throughout the area. Rolling hills of prairie grasses and cropland characterize the landscape today. The predominant land use is agriculture, consisting primarily of cattle and small grain production. Several major landforms or areas comprise this region, including the Missouri Coteau (French for “hills of the prairie”), the Prairie Coteau, the Coteau Slope, the Drift Prairie, the James River lowland, and the Red River Valley. Within the Badlands and Prairies (BCR 17), the predominant land cover types are grasslands and dryland-scrub (10.73 million hectares), followed by agricultural lands (2.91 million hectares) and coniferous forest (0.96 million hectares). Wetland and grassland habitats are greatly influenced by the landforms in which they occur.

One of the major North American migration routes for shorebirds, especially long-distance migrants, traverses the NP/PPR, where shorebirds make extensive use of wetlands for resting and feeding during their annual migrations. Because long-distance migration is energetically expensive, the availability of adequate habitat and food resources at migration stopovers is critical. The NP/PPR also provides important breeding habitat for several shorebird species.

**Shorebird habitat types within the region.** As a group, shorebirds are morphologically diverse and use a wide range of habitat types within the NP/PPR, including dry grasslands, riverine beaches and sandbars, natural freshwater and alkaline wetlands, lake margins, and flooded agricultural fields. Thirteen species of shorebirds breed within the NP/PPR and use a variety of habitat for nesting and brood rearing. Piping Plovers nest mainly along semi-permanent and permanent prairie alkali lakes associated with the Missouri Coteau landform from central North Dakota to northeastern Montana (roughly 65% of breeding pairs of the U.S. Great Plains); many pairs also nest on sandbars along the Missouri River. Mountain Plovers are terrestrial shorebirds within the NP/PPR that are generally restricted to prairie sites modified by prairie dogs in northern Montana.

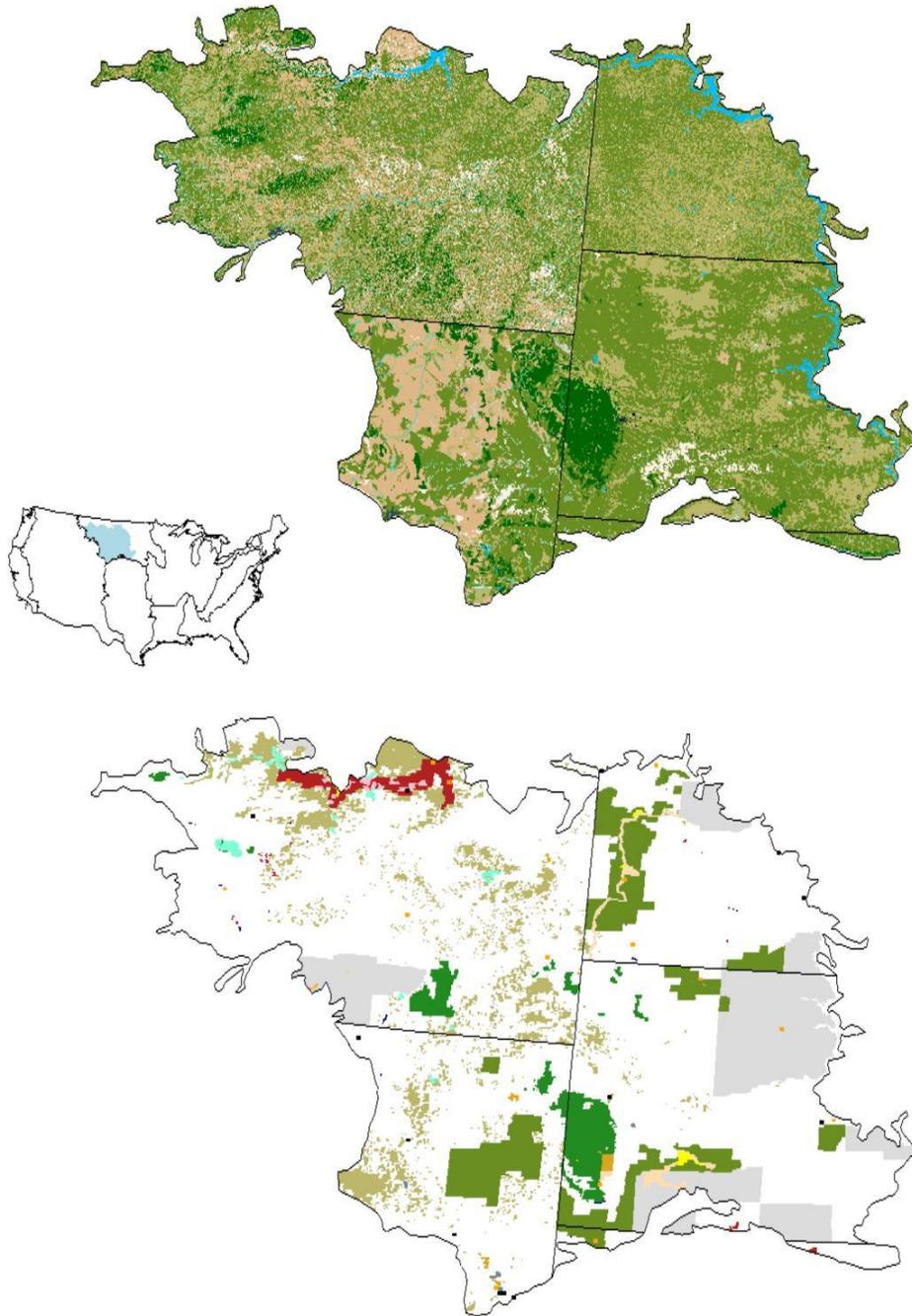
**Figure 1: Bird Conservation Region 11: Prairie Potholes<sup>1</sup>**



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<sup>1</sup> These maps, and the information on which they are based, were compiled by the Adaptive Management and Assessment Team of the North American Waterfowl and Wetlands Office. Available in .jpg and .tif format on the Manomet website: <http://www.Manomet.org/USSCP/bcrmaps.htm>.

**Figure 2: Bird Conservation Region 17: Badlands and Prairies**



# Bird Conservation Region Key

## Land Cover Classification

-  Agricultural Lands/Pasture/Hay
-  Orchards/Cultivated Trees
-  Coniferous Forest
-  Mixed Forest
-  Deciduous Forest
-  Disturbed/Transitional Forest
-  Dryland Scrub-Shrub
-  Grassland
-  Open Water/Aquatic Bed
-  Emergent Wetlands
-  Forested Wetlands
-  Cultivated Urban/Suburban Grasslands
-  Urban Residential
-  Low Intensity Residential
-  Commercial/Industrial/Transportation
-  Mining/Landfill
-  Bare Sediment
-  Snow/Ice
-  Clouds

## Other Features

-  Lakes and Reservoirs
-  States

## Managed Lands

-  Indian Reservation
-  Military Reservation
-  National Forest
-  National Grassland
-  National Monument
-  National Park
-  National Recreation Area
-  National Seashore
-  National Wildlife Refuge
-  State Forest
-  State Park
-  State Recreation Area
-  Wild and Scenic River
-  Wilderness
-  Wilderness Study Area
-  Other BLM Lands
-  Other Managed Areas

## Small Managed Tracts

-  Indian Reservation
-  Military Reservation
-  National Monument
-  National Recreation Area
-  National Wildlife Refuge
-  State Park
-  State Recreation Area
-  Wild and Scenic River
-  Wilderness
-  Other Managed Areas

The remaining eleven breeding species are more widely distributed within the NP/PPR and nest in a broad range of wetland and upland habitats, such as gravel substrates, edges of freshwater and alkaline wetlands, and moderately vegetated mid-grass prairie (Table 1).

**Table 1. Habitat Needs for Breeding Shorebirds** (after Ehrlich et al. 1988; Fitzgerald et al. 1999).

Species:	Breeding Habitat:
Piping Plover	Sand or gravel beaches and open beaches of alkaline wetlands, river sandbars, reservoir beaches.
Killdeer	A wide variety of upland habitats including pastures, fields, and wetland margins.
Mountain Plover	Disturbed shortgrass prairie with extensive bare ground.
Black-necked Stilt, American Avocet	Shallow marshes, ponds, and alkaline wetlands.
Willet, Spotted Sandpiper, Marbled Godwit, Common Snipe	Uplands with short, sparse to dense vegetation adjacent to Wetlands.
Wilson's Phalarope	Uplands with short to tall dense vegetation adjacent to wetlands.
Upland Sandpiper	Uplands with mid- to high vegetation.
Long-billed Curlew	Uplands with short, dense vegetation, sometimes near wetlands.
American Woodcock	Open woodlands, brushy areas, or uplands, usually near water.

During migration through the NP/PPR, shorebirds are associated primarily with shallow water and moist mudflats of freshwater or alkaline wetlands. More than 70% of the species require water depths of less than 10 cm, and many are restricted to water depths of less than 5 cm; phalaropes generally forage in deeper water. Species also vary in their use of foraging habitat relative to vegetation structure and distribution. Although shorebird foraging substrates range from bare (no vegetative cover) to vegetative cover exceeding 75%, most species use sites with less than 25% cover. Many shorebirds prefer vegetation height to be less than half of their body height, although some species forage in taller vegetation.

Dramatic fluctuations in water levels are characteristic of the NP/PPR, and shallow water and mudflat habitats are highly variable geographically and temporally. Due to the dynamic nature of wetlands in this region, many shorebirds are opportunistic, and population distribution varies with temporal changes in wetland conditions in contrast to their use of more stable staging areas along the Atlantic and Pacific coasts. Historically, the highly dynamic and diverse complexes of prairie wetlands and rivers probably provided nearly ideal habitat options for migrating shorebirds. Wetland complexes provided a variety of options that virtually assured availability of suitable foraging habitat under any climatic conditions (Skagen and Knopf 1993, 1994). Wetland complexes facilitate food searching by en-route migrants (Farmer and Parent 1997). However, since European settlement, changes in land use with high impacts on seasonal and ephemeral wetlands have probably impaired the ability of the ecosystem to consistently provide for the needs of this diverse group of wetland-dependent birds.

Historically, biotic and abiotic disturbances resulted in the short vegetation and mudflat habitats that are optimal foraging sites for shorebirds. Herbivore species, such as bison, elk, deer, antelope, prairie dogs, grasshoppers and invertebrates, created widespread disturbances to the landscape of the Great Plains (Samson 1996), and drought and fire were important factors in maintaining the grassland conditions in the Great Plains (Collins 1990). Today, most grazing mammals have been extirpated from considerable portions of their range. Once numerous, prairie dogs now only represent < 2% of their historic range (Clippinger 1989) and are currently being petitioned to be listed under provisions of the Endangered Species Act. Many invertebrate populations such as grasshoppers are annually controlled with pesticide applications. The loss of these herbivores contributes to robust wetland vegetation, making many sites unsuitable as foraging areas for waterbirds.

Although the historic forces that shaped the Great Plains have been impacted, some current factors mimic the net effect on the landscape. Prescribed fire is used to maintain the vigor of managed grasslands, and agricultural practices such as tillage for row crops and haying pastureland appear to provide suitable habitat for shorebirds (Fredrickson 1998).

**Major shorebird issues in the Northern Plains/Prairie Pothole Region.** The major identified issues fall into the following three categories.

**Issue 1.** The conservation of endangered and threatened species, declining species, and species of special concern. Two species that breed in the NP/PPR merit special attention. The Piping Plover is listed as threatened in the NP/PPR by the U.S. Endangered Species Act (ESA) because of a steady population decline, potentially due to low reproductive success and loss of breeding and/or wintering habitat. The Mountain Plover has recently been proposed for listing under the ESA. Breeding populations in eastern Montana appear stable at present. In addition, population declines are suspected for several species that migrate through the plains, including Black-bellied Plovers, Sanderlings, Semipalmated Sandpipers, and Stilt Sandpipers.

**Issue 2.** Habitat loss is pervasive throughout the region and occurs as a result of habitat degradation, habitat fragmentation, wetland loss (especially ephemeral wetlands), and grassland loss. Wetlands throughout the Great Plains have undergone considerable changes in the last 50 years due to drainage of wetland basins for agriculture and urban development. An estimated 35% of the area of South Dakota wetlands have been lost (Dahl 1990). Approximately 860,000 ha of wetlands currently remain in eastern South Dakota, of which temporary and seasonal comprise 91.6% of the total number of wetlands, and constitute 43% of the total wetland area (Johnson 1997). Of these remaining temporary wetlands, approximately 77% occur in croplands; the suitability of wetlands in these environments is unknown.

**Issue 3.** There is a need for information to facilitate shorebird conservation and to evaluate the following potential threats to migrating and breeding birds in the NP/PPR:

Contaminants, especially on agricultural and commercial lands (sod farms, sewage and water treatment lagoons) that are important to migrating shorebirds;

**a.** Impacts of predation, including the impacts of nonnative predators; and  
Invasion by exotic plants into grassland and wetland habitats.

## **Shorebird Species Occurrence and Regional Species Priorities**

Thirteen species of shorebirds breed within the NP/PPR, and collectively 36 species breed and/or migrate through this region. Some species travel as far as 21,000 km annually during their round trip between arctic breeding grounds in Canada and Alaska and wintering areas in Central and South America.

Shorebird distributions in midcontinental North America (an area which includes the NP/PPR) during spring and fall are illustrated in Figure 3. During spring migration, the majority of shorebirds pass through the NP/PPR from early April to early June, although the timing varies among species. Nearly 27% of the small shorebirds (total body length of less than 190mm) in the midcontinent pass through the NP/PPR in their spring migration, (Appendix 1); the region is especially important to long-distance migrants such as American Golden-plover, Hudsonian Godwit, and White-rumped Sandpiper. During fall migration, from early July through September, the region is important to medium-sized long-distance migrants such as American Golden-plover, Pectoral Sandpiper, and Stilt Sandpiper; more than 22% of medium-sized shorebirds crossing the midcontinent in the fall occur in the NP/PPR (Appendix 2). Further information on distribution and timing of shorebird migration in the midcontinental United States can be viewed on the Internet at <http://www.mesc.usgs.gov/shorebirds>.

Figure 3. Distribution of all shorebirds in the midcontinent region of North America, including the Northern Plains/Prairie Pothole Region, during spring and fall migrations (from Skagen et al. 1999).

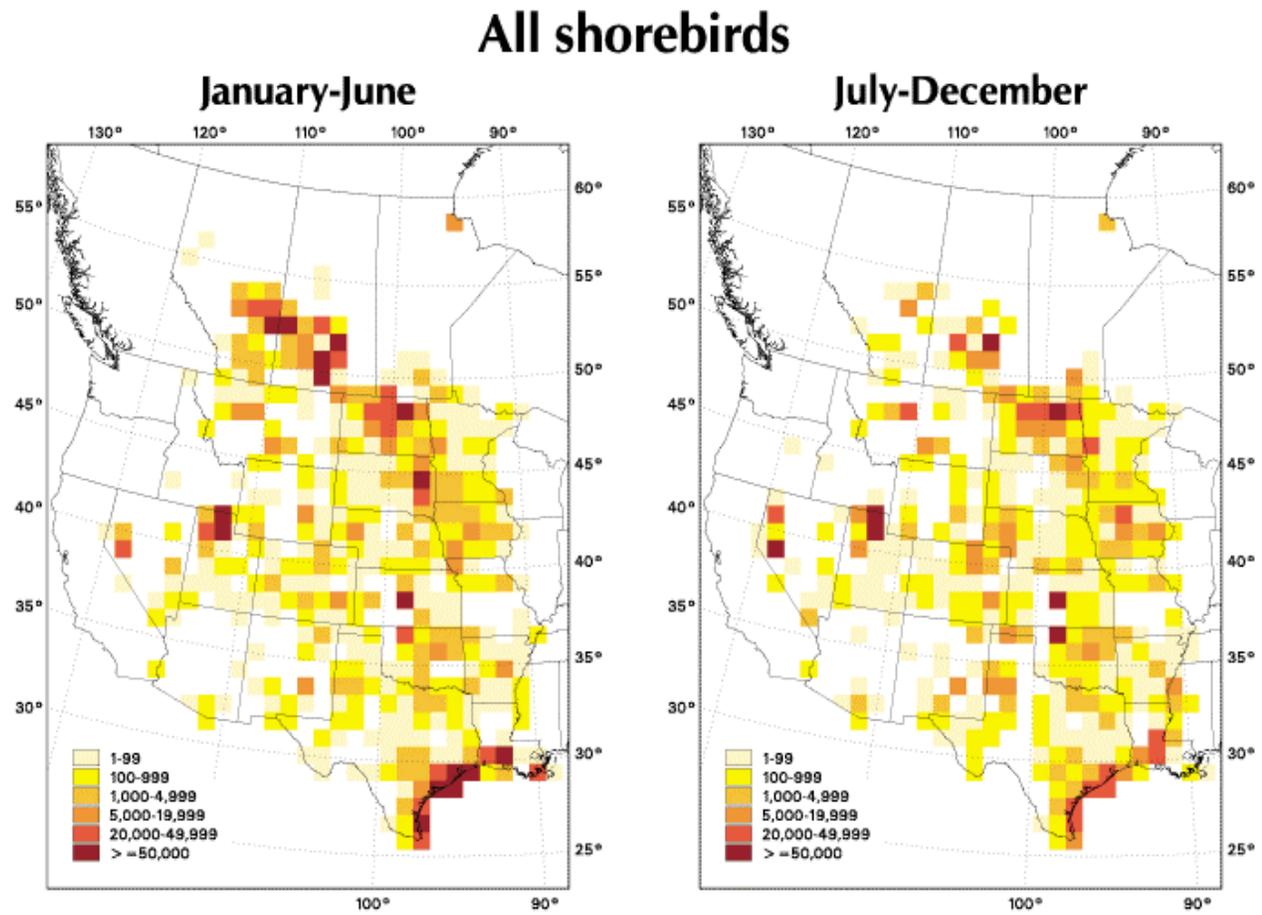


Table 2 summarizes the occurrence and prioritization scores, both regional and national, of shorebirds of the NP/PPR. The regional priority scores are derived and modified from the national scores. Nine species identified within the NP/PPR as species of concern<sup>1</sup> have regional scores that reflect this concern and thus are greater or equal to the national scores. These nine species are Piping Plover, Mountain Plover, American Avocet, Upland Sandpiper, Long-billed Curlew, Hudsonian Godwit, Marbled Godwit, American Woodcock, and Wilson's Phalarope.

This region is especially important to ten migrating species (see Table 2). The provision of adequate stopover habitat is a regional priority; regional scores may be higher than national scores for some of these species. Four species that are uncommon or rare in the region have lower regional than national scores.

**Shorebird guilds.** Three useful habitat guilds can assist in the identification of some management strategies in the NP/PPR:

- 1) Shorebirds that are closely tied to grassland habitats during their residency in the NP/PPR. Ten of the 13 breeding species nest in uplands, mostly grasslands. This guild includes Marbled Godwits, Willets, Upland Sandpipers, and Wilson's Phalarope.
- 2) Shorebirds that exclusively or primarily use unvegetated wet mud/shallow water (< 5 cm) habitats. This guild is comprised primarily of the small transient sandpipers such as Semipalmated Sandpipers and White-rumped Sandpipers.
- 3) Shorebirds that are associated with agricultural lands and meadows, including American Golden-plovers, Buff-breasted Sandpipers, and Pectoral Sandpipers.

## Regional Goals

**Goal 1.** Maintain the biotic integrity and persistence of breeding shorebird populations in the NP/PPR. This entails a multi-step process of identifying the extent and distribution of important habitat types throughout the region, and identifying the concerns, problems, and limitations associated with these habitats. The integration of applicable information and implementation

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<sup>1</sup> Based on a combination of species of concern identified by the U.S. Fish and Wildlife Service (FWS) Region 3 and the Mississippi Headwaters/Tallgrass Prairie Ecosystem; the Minnesota Department of Natural Resources; the South Dakota Department of Game, Fish, and Parks; and the Partners in Flight (PIF) Physiographic Area 40-Northern Tallgrass Prairie and Physiographic Area 37-Northern Mixed-grass Prairie.

**Table 2. Conservation priority of regularly occurring shorebird species in the Northern Plains/Prairie Potholes Region.** Regional priority scores reflect several factors, including population status, abundance, and comparative importance of the region during migration.

Species	Status <sup>2</sup>	Abundance <sup>1</sup>		Priority		Comments
		Spring	Fall	National	Regional	
Black-bellied Plover	M	U	U	3	3	
American Golden-Plover	M	C	C	4	4	Area esp. important to migrants
Semipalmated Plover	M	C	C	2	3	Area esp. important to migrants
Piping Plover	B/M	R	R	5	5	Identified as species of concern
Killdeer	B/M	C	C	3	3	
Mountain Plover	B/M	R	R	5	5	Identified as species of concern
Black-necked Stilt	b/m	R	R	2	2	
American Avocet	B/M	U	U	3	4	Identified as species of concern
Greater Yellowlegs	M	C	C	3	3	
Lesser Yellowlegs	M	C	C	2	3	Area esp. important to migrants
Solitary Sandpiper	M	C	C	3	3	
Willet	B/M	C	U	3	3	
Spotted Sandpiper	B/M	C	C	3	3	
Upland Sandpiper	<b>B/M</b>	C	C	2	4	Identified as species of concern
Whimbrel	m	R	R	4	4	
Long-billed Curlew	B/M	U	U	5	2	Uncommon in region
Hudsonian Godwit	M	C	R	4	4	Identified as species of concern
Marbled Godwit	B/M	U	U	4	4	Identified as species of concern
Ruddy Turnstone	M	U	R	4	4	
Red Knot	m	R	R	4	2	Uncommon in region
Sanderling S: Uncommon, F: Uncommon	m	U	U	4	2	Uncommon in region
Semipalmated Sandpiper	M	C	C	3	4	Area esp. important to migrants
Western Sandpiper	m	R	R	3	2	Uncommon in region
Least Sandpiper	M	C	C	3	3	
White-rumped Sandpiper	M	C	R	2	4	Area esp. important to migrants
Baird's Sandpiper	M	C	C	2	3	Area esp. important to migrants

Species	Status <sup>2</sup>	Abundance <sup>1</sup>		Priority		Comments
		Spring	Fall	National	Regional	
Pectoral Sandpiper	M	C	C	2	3	Area esp. important to migrants
Dunlin	M	C	U	3	4	Area esp. important to migrants
Stilt Sandpiper	M	C	C	3	3	Area esp. important to migrants
Buff-breasted Sandpiper	M	U	U	4	4	
Short-billed Dowitcher	M	C	C	3	3	
Long-billed Dowitcher	M	C	C	2	3	Area esp. important to migrants
Common Snipe	b/M	C	C	3	3	
American Woodcock	<b>B</b> /m	U	U	4	4	Identified as species of concern
Wilson's Phalarope	B/M	C	C	4	4	Identified as species of concern
Red-necked Phalarope	M	U	U	3	3	

<sup>1</sup>Common: very likely to be seen in the appropriate habitat; Uncommon: present, but likely to be seen only in small numbers; Rare: not likely to be seen, and then only in small numbers.

<sup>2</sup>B: breeding, M: migration; bold indicates that region is highly important to population; lower case indicates that region is less important.

strategies from other landscape level plans for waterfowl and grassland birds is recommended. For example, Koford and Stallman (1996) recommend that unaltered natural wetlands and upland habitats be emphasized in conservation planning.

**Goal 2.** Ensure the existence and quality of stopover habitats for migrating birds. The NP/PPR is especially critical to the successful migration of long-distance migrants, which need several “stepping stones” of stopover sites along their migratory routes.

**Goal 3.** Identify and fill information gaps, including the development of tools to facilitate monitoring and conservation of breeding and migrating shorebird habitat within the context of dynamic ecosystems. Within the NP/PPR, this necessitates the development of data collection systems that are spatially explicit. For example, there is a need for better models that link habitat and landscape characteristics to breeding shorebird population parameters. The requisite tools for this endeavor are currently being used and/or tested for waterfowl management applications in the NP/PPR under the auspices of the USFWS Habitat and Population Evaluation Team (HAPET). These include Landsat-based landcover classification maps and the application of Geographical Information Systems (GIS) to identify and test the spatial distribution of various habitat configurations for prescribing management treatments. In addition, the use of interactive, web-based monitoring programs (i.e., Birdsource at Cornell University) can contribute data to determine shorebird populations, ranges, migration pathways, and habitat use.

**Goal 4.** Coordinate conservation efforts within the context of landscapes, regions, national, and international approaches for migratory birds.

**Regional contributions to meeting national goals.** The goals presented herein will contribute greatly to the USSCP National Goal of “stabilizing populations of all shorebird species known or suspected of being in decline due to limiting factors occurring within the U.S., while ensuring that common species remain common”. The NP/PPR efforts will result in a “regionally-based, biologically driven, landscape-oriented, integrated migratory bird management program” that will guide conservation actions for shorebirds. Although stated differently and in a fashion more specific to the NP/PPR, the goals stated here are consistent with and enhance the common regional goals outlined in the U.S. Shorebird Conservation Plan.

## **Habitat Management Options**

Six major shorebird habitat types are important within the NP/PPR:

- 1) grasslands;
- 2) grassland/wetland matrices;
- 3) freshwater wetlands including lake margins and impoundments;
- 4) alkaline wetlands;
- 5) riverine beaches; and
- 6) agricultural lands.

Ongoing management activities include the use of conservation easements to protect grasslands for migratory and breeding shorebirds. The combination of private and public grassland can provide the mosaic of short-, mid-, and dense cover for different breeding requirements of shorebirds.

Recent studies have shown that several grassland nesting birds such as Willets and Marbled Godwits prefer and have higher nest success in the shorter cover of grazed grassland easements than in dense cover typical of waterfowl production areas (R. Murphy, personal communication).

At the landscape level throughout most of the NP/PPR, resource managers have limited water management capabilities. Wetland conditions are dependent almost entirely on climatic events. However, because of the great diversity of wetlands, suitable habitat is generally available under virtually any set of conditions. Resource managers can monitor these conditions and report them in real time via the communication network described below in “Management Coordination and Monitoring Needs.” For the wetlands with on-site management capabilities, timing is essential; knowledge of the approximate shorebird migration chronology can be used to determine when to draw down or reflood a wetland.

**Habitat Goal 1.** Compile information on the extent, status and condition, ownership, and management capabilities of the six habitat types listed above. Some information already exists, for example, habitat used by Piping Plovers (Appendix 3). Alkali lakes present promise for the Piping Plover recovery because they are relatively intact and generally support relatively high reproductive success among piping plovers. However, recent data suggest that the integrity of grassland landscapes surrounding alkali lakes probably influences local reproductive success, as has been demonstrated for other prairie bird species (Murphy & Knetter, unpubl. data). Ephemeral and temporary freshwater wetlands, highly important to migrating shorebirds, are the most vulnerable of all wetland types to drainage and filling.

**Habitat Goal 2.** Describe known shorebird habitat requirements and identify and fill information gaps. Habitat requirements of some breeding species, e.g., Piping Plover (Appendix 1), are known in detail, whereas less is known for other breeding and migrating species. An important information gap for many species is how landscape attributes (patch size, surrounding land uses, isolation/connectivity) influence population parameters such as reproductive success.

**Habitat Goal 3.** Determine habitat objectives for each of the six habitat types, based on knowledge of critical habitat requirements, landscape character, and population objectives for each species. Population objectives should be set in coordination with the national monitoring section of the USSCP and within the Central Flyway overall. A dynamic process that includes the analysis of long-term weather patterns could be used to assess the need for integrated active management across a species’ range. A primary management objective should be to ensure a minimum acreage of available habitat during certain seasons.

**Priority conservation projects listed by state.** Implementation of the Shorebird Conservation Plan within the Northern Plains/Prairie Pothole region will include an assessment of existing projects together with the formulation of new priority conservation efforts, through coordinated input from state, federal and non-governmental natural resource agencies in conjunction with private landowners. This expertise and collaboration will be essential for identifying site-specific management strategies for shorebirds, and for generating matching funds. The development of priority conservation projects will benefit from the evolving all bird conservation initiatives of the Prairie Pothole Joint Venture (under the North American Waterfowl Management Plan), and from regular meetings of non-game biologists (i.e., Minnesota). Project focus areas include shorebird habitat requirements and priority area identification; together with coordinated shorebird habitat

management strategies that provide a complex of wetland types for breeding and migrating shorebirds. The following conservation projects illustrate priority focus areas.

**Conservation Project 1. Piping Plover, North Dakota and Montana.** The current recommendations of the Piping Plover Recovery Plan clarify potential project elements, and include:

Implement short-term, stop-gap measures to preserve the opportunity to recover Piping Plovers. Manage plovers intensively on alkali lake breeding habitats by boosting fledging rates above threshold levels needed for population stability.

Long-term, sustainable measures are to:

enhance plover breeding habitat locally by gravel, salt applications, or prescribed burning; manage livestock appropriately to avoid damage to important spring feeding sites along alkali lakeshores, and delay grazing (where practical) on plover nesting beaches until late summer; identify landscape-scale factors that influence plover reproductive success and incorporate solutions into integrated landscape plans for conserving native prairie and indigenous wildlife species; through modeling, analyze feasibility of plover recovery and cost-benefits of recovery actions on prairie alkali lakes (analysis underway); and purchase grassland easements around major breeding sites under private ownership.

**Conservation Project 2. Mountain Plover, Montana.** Project elements aim to: determine the population status and habitat security of Mountain Plovers (reference research findings of Stephen Dinsmore and Fritz Knopf re: the stability of plover population in Blaine and Phillips counties); determine the current distribution of black-tailed prairie dogs in those counties; monitor the effects of plague on prairie dogs to determine current-year habitat availability; encourage practices that favor prairie dogs (eliminate poisoning, reduce recreational shooting); begin a program of experimental burning in areas adjacent to prairie dog “towns” to encourage expansion of those towns and to attract plovers to a vicinity, encourage intensive cattle grazing on and around prairie dog towns to encourage both prairie dogs and plovers.

## **Management Coordination and Monitoring Needs**

**Need 1. Monitoring populations of breeding shorebirds.** Breeding populations of shorebirds in the NP/PPR are currently monitored by the Breeding Bird Survey (BBS), by various state agencies, and state Natural Heritage Programs. The Missouri River Environmental Assessment Program is a long-term monitoring plan that includes monitoring “species composition, abundance, distribution, and habitat use of shorebirds” as well as other bird species. In coordination with the national monitoring section of the USSCP, the extent and effectiveness of current and proposed monitoring activities needs to be evaluated. All new and existing monitoring efforts should be spatially-explicit and incorporate habitat information. Coordination with federal and state governmental and private entities is essential.

The USFWS Piping Plover Recovery Teams (Great Plains, Great Lakes, and Atlantic Coast) demonstrate shorebird monitoring and management through their program for Piping Plovers in the U.S. State and tribal agencies, the US Army Corps of Engineers, and nongovernmental organizations such as The Nature Conservancy provide annual survey information to the recovery team leaders for each population, who then compile the information for the International Piping

Plover Recovery Group. This team combines the monitoring of piping plover populations in the US with information from Canada and Mexico. The international team also currently coordinates the Piping Plover International Census every five years.

No current monitoring effort is conducted, or appears feasible, for the Mountain Plover because it is widely scattered across the western Great Plains. Some federal lands are predictably used by plovers, and a current annual survey is conducted on the Pawnee National Grasslands in Colorado by USGS and on BLM lands in Phillips County, Montana, by FWS/USGS. Annual monitoring of plover populations may better be conducted on the wintering grounds when the birds are (slightly) more concentrated. Such a survey was conducted by the Point Reyes Bird Observatory in the Imperial Valley of California in December 1999; five mountain Plovers banded in Montana were seen on that survey.

**Need 2. Monitoring of migrating shorebirds.** An estimation of population sizes and trends of en-route migrants will be undertaken at the national level by the national monitoring section. A regional effort to monitor en route migrants is needed to provide insights on whether adequate stopover habitat exists and on the effectiveness of management activities, even though it will be difficult due to the shifting nature of wetland habitats and migrant distribution. This monitoring could be undertaken via two approaches, within the context of a national effort to monitor “important areas,” and in conjunction with the “migration habitat monitoring” effort described below. The use of interactive, web-based monitoring programs such as *Birdsource*<sup>2</sup> can contribute data to determine shorebird ranges, migration pathways, and habitat needs.

**Need 3. Migration habitat monitoring within the context of dynamic ecosystems.** Managing for shorebirds in the NP/PPR is challenging because of the dynamic nature of wetland conditions in time and space and because of the need to provide diverse wetland habitats for waterfowl and other wetland-dependent birds (Table 3). There is a need to enhance the landscape perspective on shorebird use of the plains, to acquire critical information on whether, when, and where ‘ecological hurdles’ (i.e., lack of suitable stopover habitat across large regions) exist, and to create avenues for focused, coordinated management activities.

A *regional communication network* that can apprise land managers and biologists of habitat availability and generalized shorebird movements within the U.S. interior is proposed. This internet-based network will provide information on the necessity, timing, and extent of habitat management actions, and will enable land managers to prioritize and coordinate management activities on a landscape basis. The management planning process will make possible the detection of potential effects on other wetland-dependent species. Participants will be trained (via in-person training workshops, site visits, and web-based training) to ensure that efforts are coordinated and that standardized procedures are used. Information will be summarized weekly and potential ‘hurdles’ could be identified and targeted for management.

This regional communication network will serve several purposes:

- (1) To assess the status of migratory stopover habitat for shorebirds and to determine if, where, and when critical habitat shortages occur. This would provide agencies with another tool for prioritizing land acquisition within areas lacking suitable shorebird habitat;

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<sup>2</sup> Birdsource is an interactive website designed and managed by Cornell Laboratory of Ornithology and the National Audubon Society that enables the tracking and display of species-specific bird density and movement in real time.

Table 3. The challenge, constraints, and proposed approach for shorebird management in the Northern Plains/Prairie Potholes Region (modified from Dinsmore et al. 1999).

<p style="text-align: center;"><b>THE CHALLENGE</b></p> <p>To provide breeding and stopover resources for shorebirds.</p>
<p style="text-align: center;"><b>CONSTRAINTS</b></p> <p>Wetland conditions are dynamic and unpredictable in time and space. Need to consider requirements of a diverse wetland bird community. Lack of water management capabilities in most wetlands. Most wetland habitats are on private lands. Habitat changes are not easily monitored using remote-sensing.</p>
<p style="text-align: center;"><b>APPROACH</b></p> <p>Development of tools to use in dynamic ecosystem context. Internet-based communication system to monitor shorebird habitat during migration. Assess if, when, and where habitat shortages (i.e., 'ecological hurdles') occur. When 'ecological hurdle' is detected, actively manage wetlands with water control capabilities. Apply habitat and water management tools when necessary. Identify areas for habitat acquisition and restoration. Regional, national, and international coordination with other bird conservation efforts.</p>

- (2) To identify ecological hurdles and target these areas for adaptive management;
- (3) To provide instantaneous interpretation of the habitat data so that managers can choose management actions immediately;
- (4) To provide current information on habitat condition and distribution, to be used by concurrent population monitoring programs to stratify survey effort;
- (5) To assist in building, testing, and refining models that predict habitat availability for shorebirds based on remote sensing technology and climate information;
- (6) To provide information that land managers and the general public can use to further our understanding of shorebird migration in this region. The internet site will provide links to shorebird management documents and will facilitate the acquisition of new shorebird distribution information. It could also provide an electronic forum for resource professionals to solicit information and recommendations regarding management, monitoring, and research; to update others on the success of efforts; and to hold valuable “dialogues” or “virtual conferences.”

**Need 4. Continued coordination of conservation activities within the context of landscapes, regions, national, and international approaches for all migratory birds.** There are several exciting initiatives at present that are working to integrate all-bird management and programming, both across the NP/PPR and at the national level. The Prairie Pothole Joint Venture, under the auspices of the North American Waterfowl Management Plan (NAWCA), is continuing to work on an integrated migratory bird approach in the Prairie Pothole Region, that includes shorebird and grassland bird planning efforts with multiple partners. In addition, some Joint Ventures are utilizing Bird Conservation Region (BCR) boundaries as an opportunity to improve landscape management.

Partnership efforts to implement migratory bird initiatives on a broad scale are focused in part on increasing the resource base. This is exemplified by the North American Bird Conservation Initiative (NABCI) Plan , which is being developed to provide significantly increased funding for bird conservation, and to foster cooperative implementation of bird conservation among the various bird initiatives, nationally and internationally. The shorebird plan partnership has participated in the development of NABCI, and this collaboration should contribute significantly to bird conservation for all birds in the US and throughout the continent.

## **Research Information Needs**

The following topics need further research in the NP/PPR to effectively manage for shorebirds (Dinsmore et al. 1999) and to contribute to the regional and national goals of the U.S. Shorebird Conservation Plan. The USSCP Regional Goals are, in part, to provide high quality habitat to ensure that shorebirds are not limited by lack of habitat and to ensure that efforts are integrated into multiple species habitat management initiatives.

**Research Goal 1.** Synthesize and acquire information that will facilitate the conservation of breeding shorebird populations and habitats in a landscape context.

**Objective 1a.** Develop spatially explicit models to help determine availability of suitable breeding habitats (e.g., grassland/wetland complexes in close juxtaposition; prairie dog distribution regarding Mountain Plovers). Determine habitat relationships of the major breeding species of concern. Determine the degree to which floristics (invasive plants) and landscape attributes affect habitat suitability.

**Objective 1b.** Identify and assess the status of suitable breeding habitats using Geographic Information Systems.

**Objective 1c.** Determine effects of contaminants on shorebird food availability, shorebird survival, and reproductive health. Many temporary and ephemeral wetlands that shorebirds prefer occur on private agricultural land, and are therefore vulnerable to pesticide and herbicide contamination, in addition to the effects of siltation and runoff. This may be exacerbated at present with the increase in both crop diversification and required chemical inputs brought about by the present “Freedom to Farm” policy.

**Objective 1d.** Determine the predator species that threaten reproductive success and recruitment of shorebirds.

**Research Goal 2.** Determine the location of suitable/critical stopover habitat and develop a strategy to conserve these areas.

**Objective 2a.** Understand the scale of shorebird distribution within the NP/PPR during migration. Specifically, do shorebirds concentrate at particular sites, and, if so, does this vary seasonally? Compare the level at which isolated wetlands versus complexes provide requirements for shorebirds.

**Objective 2b.** Determine the significance of agricultural fields as foraging areas for migrating shorebirds. Assess the status, abundance, and availability of invertebrate food resources within agricultural fields, including the timing of recolonization of these sites by chironomids.

**Objective 2c.** Delineate species-specific flexibility in microhabitat use during migration. This information will help identify the vulnerability of species to loss of certain habitat types during migration.

**Objective 2d.** Assess migrant body condition (trends through time and variation) relative to availability and distribution of food resources. Is body condition a useful indicator of overall habitat quality at a regional scale?

**Objective 2e.** Determine if there are genetically distinct shorebird subpopulations within the midcontinent region.

**Research Goal 3.** Develop tools that would be useful in monitoring shorebirds and habitats in a dynamic ecosystem. This approach would incorporate the frequent movements and broad dispersion patterns that characterize migration through the northern plains.

**Objective 3a.** Develop models to predict and define important migration habitats. This entails modeling of wetland condition, availability, and shorebird habitat use under various weather and

climate regimes using remote sensing information, real-time habitat information from the regional communication network described above, and shorebird distribution data.

**Objective 3b.** Determine residency times and turnover rates at stopover sites.

## **Education and Outreach Objectives**

Ultimately, the long-term success at maintaining or enhancing shorebird populations and their habitat in the NP/PPR will require cooperation between a large number of organizations, interest groups, government agencies, and individuals. A key element to fostering and maintaining effective cooperation and collaboration between public and private landowners will be a good understanding about the importance of the lands and habitats within the region for shorebirds and other migratory wildlife. Creating and sustaining an effective education/outreach program will be critical to the overall success of this plan. The following are important education/outreach goals for the region.

**Objective 1. Promote further involvement of private landowners in shorebird conservation initiatives.** Private landowners in the NP/PPR are essential partners to achieve management goals for shorebirds because a significant portion of shorebird habitat is on private land. This goal can be approached by providing technical information and assistance through the development and distribution of educational and outreach materials. A variety of media and educational materials, such as brochures, pamphlets, and the Internet, can familiarize landowners with wetland-dependent wildlife, including shorebirds, and provide general information on species requirements and wetland enhancement techniques. In addition to developing new materials, we need to identify existing educational materials and promote their use and distribution. This will also involve innovate means of outreach to formulate private landowner partnerships that can benefit both shorebirds and farmers.

**Objective 2. Enhance/improve communication with public land managers.** Technical information can be conveyed through workshops, the internet and the dissemination of educational materials. There is a need to convey the potential for wetland and upland management techniques to achieve a diversity of wildlife without compromising the original intent of NAWMP.

**Objective 3. Enhance the overall effectiveness of education/outreach efforts by promoting cooperation between state and federal agencies and private organizations.** There are numerous opportunities to achieve this goal, such as formalizing partnerships with Memorandums of Understanding or Cooperative Agreements, and sponsoring demonstration projects and workshops to help reduce barriers to better integrating shorebird management into traditional waterfowl management programs. There is a need to take the active and personal approach, to solicit input early in the process, and to have a “bottom up” as well as “top down” approach. Additionally, current Internet access in remote areas may not be sufficient to include all stakeholders; we need to assess the availability of Internet access and to remedy impediments .

**Objective 4. Develop regional educational/outreach plan with State-specific action items identified.** Due to the size of the NP/PPR, there will undoubtedly be a number of education/outreach strategies that will not be applicable in every one of the 7 affected States. A

regional education plan should be customized to fit individual state issues and capabilities to implement within their existing delivery systems.

**Objective 5. Integrate shorebird conservation into existing appropriate environmental education initiatives and programs.** Since Arctic-nesting shorebirds migrate from Central/South America, Australia, and southeast Asia to Alaska, Canada, and the Russian Far East, participation in the *Shorebirds Sister Schools Program* provides an excellent opportunity for students to track shorebird migration and to communicate with “sister schools” worldwide. Students can participate on the E-mail list serve, and thus view and share field research, migration observations, field trip experiences, program/project information, and inter-classroom communication. Visit <http://www.fws.gov/r7enved/sssp.html> to experience the “Super Shorebird Flyway. In addition, copies of the *Arctic Nesting Shorebird Curriculum* ([wizard@xyz.net](mailto:wizard@xyz.net)) are also available.

There are also many opportunities to integrate shorebird conservation into existing environmental education programs and outreach centers, as well as into nationally recognized programs such as Project WILD and WET.

### **Funding Needs for Regional Actions**

Development of habitat monitoring communication network.	\$40K/yr	(1 yr)
Development of spatially-explicit habitat models for breeding shorebirds	\$40 K/yr	(4 yrs)
Development of predictive models for migrating shorebirds.	\$40 K/yr	(4 yrs)
Habitat Acquisition/Conservation easements:	\$750K/yr	(5 yrs)
Mapping/Habitat Assessment	\$300K/yr	(5 yrs)
Habitat Improvement/Restoration (project work)	\$750K/yr	
Education/Outreach	\$ 75K/yr	
Research efforts	\$3-500K/yr	

In addition, a Shorebird Coordinator is proposed, to be shared regionally across the Plains and Playa Lakes Regions. This Coordinator would have oversight responsibility for development of the habitat monitoring and communication network, together with subsequent implementation and monitoring.

### **Individuals and organizations that contributed to the regional report**

- Susan K. Skagen, USGS/Biological Resources Division, Fort Collins, CO
- Genevieve Thompson, National Audubon Society, Fargo, ND
- Carol Lively, North American Waterfowl Management Plan/PPJV, Denver, CO
- Bridget Olson, Big Stone National Wildlife Refuge, Odessa, MN
- Lisa A. Gelvin-Innvaer, Minnesota DNR Nongame Program, New Ulm, MN
- Eileen Dowd Stukel, South Dakota Dept. Game, Fish and Parks, Pierre, SD
- Stephen J. Dinsmore, Colorado State University and USFWS, Fort Collins, CO
- Charles Pelizza, Lake Andes National Wildlife Refuge, Lake Andes, SD
- Beth Madden, Medicine Lake National Wildlife Refuge, Medicine Lake, MT
- Bob Murphy, Des Lacs National Wildlife Complex, Kenmare, ND
- Bill Schultze , Sand Lake National Wildlife Refuge, Columbia, SD
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## **Proposed WHSRN sites**

The following have been preliminarily identified as possible WHSRN sites under the current WHSRN criteria. There is a need for a new designation for interior sites that reflects the dynamic nature of wetlands in the midcontinent of North America.

- 1) Big Stone National Wildlife Refuge, Odessa, MN;
- 2) Salt Lake, Marietta, MN;
- 3) Black Rush Lake, southcentral MN
- 4) Agassiz National Wildlife Refuge, northwestern MN
- 5) Kelly's Slough National Wildlife Refuge, northeastern ND
- 6) Dry Lake, Clark County, SD
- 7) Bowdoin National Wildlife Refuge, Great Falls, MT
- 8) Union Slough National Wildlife Refuge, IA
- 9) Lake Mason National Wildlife Refuge, MT
- 10) Minnewaukan Flats, Devil's Lake, ND
- 11) Dry Lake, Clark County, SD

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**Appendix 1.** Maximum numbers of shorebirds reported at important spring stopover sites in the Northern Great Plains/Prairie Potholes Region. Percentages are based on the sums of maximum counts reported within midcontinental North America (from Skagen et al. 1999).

<b>All Shorebirds</b>	
Location	Count
1. Minnewaukan Flats, Devil's Lake, Benson Co., ND	82,789
2. Dry Lake, Clark Co., SD	53,979
3. Lake Thompson, Kingsbury Co., SD	20,675
4. Minot sewage lagoons, Ward Co., ND	18,063
5. Milwaukee Lake, Lake Co., SD	16,661
6. Lake County, SD	12,822
7. Blue Lake, McLean Co., ND	12,620
8. Devil's Lake sewage ponds, Ramsey Co., ND	11,244
9. Benton Lake NWR, Cascade Co., MT	10,266
10. Kingsbury County, SD	9,010
Total of all shorebirds in the region	456,087
Percentage of all shorebirds in midcontinent region	15.6%

<b>Medium Shorebirds</b>	
1. Minnewaukan Flats, Devil's Lake, Benson Co., ND	36,300
2. Dry Lake, Clark Co., SD	12,267
3. Lake Thompson, Kingsbury Co., SD	10,281
4. Minot sewage lagoons, Ward Co., ND	9,032
5. Casper, WY	8,287
6. Kingsbury County, SD	8,107
7. Freezeout Lake, Teton Co., MT	7,559
8. Milwaukee Lake, Lake Co., SD	7,210

<b>Large Shorebirds</b>	
Location	Count
1. Benton Lake NWR, Cascade Co., MT	3,127
2. Lake Thompson, Kingsbury Co., SD	1,083
3. Ponds near Billings, MT	750
4. Minot sewage lagoons, Ward Co., ND	720
5. Minnewaukan Flats, Devil's Lake, Benson Co., ND	710
6. Kingsbury County, SD	692
7. West of Horsehead Lake, Kidder Co., ND	687
8. Granville, McHenry Co., ND	650
9. Northwest of Billings, MT	530
10. Northwest of Medina, Kidder Co., ND	444
Total of all large shorebirds in the region	22,196
Percentage of large shorebirds in midcontinent region	5.9%

<b>Small Shorebirds</b>	
1. Minnewaukan Flats, Devil's Lake, Benson Co., ND	45,779
2. Dry Lake, Clark Co., SD	41,247
3. Blue Lake, McLean Co., ND	11,529
4. Milwaukee Lake, Lake Co., SD	9,375
5. Lake Thompson, Kingsbury Co., SD	9,311
6. Minot sewage lagoons, Ward Co., ND	8,311
7. Devil's Lake sewage ponds, Ramsey Co., ND	6,949
8. Lake County, SD	6,304

9. Benton Lake NWR, Cascade Co., MT	6,832
10. Lake County SD	6,503
11. Medicine Lake NWR, Sheridan Co., MT	5,458
Total of all medium shorebirds in the region	216,007
Percentage of medium shorebirds in midcontinent region	14.5%

9. Sheyenne Lake, Eddy Co., ND	5,665
10. Kcorn wetland, T17N R56W S22-23, Clark Co., SD	5,653
Total of all small shorebirds in the region	217,725
Percentage of small shorebirds in midcontinent region	26.7%

**Appendix 2.** Maximum numbers of shorebirds reported at important fall stopover sites in the Northern Great Plains/Prairie Potholes Region. Percentages are based on the sums of maximum counts reported within midcontinental North America (from Skagen et al. 1999).

<b>All Shorebirds</b>	
Location	Count
1. Minnewaukan Flats, Devil's Lake, Benson Co., ND	63,889
2. Devil's Lake, Ramsey Co., ND	23,800
3. North Dakota State University, Fargo, Cass Co., ND	22,146
4. Benton Lake NWR, Cascade Co., MT	17,748
5. Union Slough NWR, Kossuth Co., IA	14,960
6. Minot Sewage Lagoons, Ward Co., ND	11,227
7. J.C. Salyer NWR, McHenry/Bottineau Cos., ND	9,975
8. North of Grand Forks Lagoons, Grand Forks Co., ND	8,081
9. Benson Co., ND	5,770
10. Wells Co., ND	5,703
Total of all shorebirds in the region	322,146
Percentage of all shorebirds in midcontinent region	15.4%

<b>Medium Shorebirds</b>	
1. Minnewaukan Flats, Devil's Lake, Benson Co., ND	54,816
2. Devil's Lake, Ramsey Co., ND	21,125
3. North Dakota State University, Fargo, Cass Co., ND	19,769
4. Benton Lake NWR, Cascade Co., MT	15,673

<b>Large Shorebirds</b>	
Location	Count
1. Long Lake NWR, Burleigh/Kidder Co.'s, ND	2,220
2. Minnewaukan Flats, Devils Lake, Benson Co., ND	2,020
3. Benton Lake NWR, Cascade Co., MT	1,533
4. Devil's Lake, Ramsey Co., ND	1,019
5. Arrowwood NWR, Stutsman Co., ND	554
6. Lisbon, Ransom Co., ND	426
7. Minot Sewage Lagoons, Ward Co., ND	348
8. Halfbreed NWR, MT	325
9. Casper, WY	268
10. Veseth Wetlands, Phillips Co., MT	250
Total of all large shorebirds in the region	12,684
Percentage of large shorebirds in midcontinent region	2.7%

<b>Small Shorebirds</b>	
1. Minnewaukan Flats, Devil's Lake, Benson Co., ND	7,053
2. McHenry and Wells Cos., ND	3,000
3. Union Slough NWR, Kossuth Co., IA	2,533
4. North Dakota State University, Fargo, Cass	2,363

5. Union Slough NWR, Kossuth Co., IA	12,426
6. J.C. Salyer NWR, McHenry/Bottineau Cos., ND	9,715
7. Minot Sewage Lagoons, Ward Co., ND	9,312
8. North of Grand Forks Lagoons, Grand Forks Co.,ND	6,099
9. Wells Co., ND	5,703
10. Benson Co., ND	5,491
Total of all medium shorebirds in the region	265,743
Percentage of medium shorebirds in midcontinent region	22.8

Co.,ND	
5. North of Grand Forks Lagoons, Grand Forks Co.,ND	1,884
6. Orwell WMA, Otter Tail Co., MN	1,753
7. Denbigh, McHenry Co., ND	1,690
8. Devils Lake, Ramsey Co., ND	1,656
9. Minot Sewage Lagoons, Ward Co., ND	1,567
10. Halfbreed NWR, MT	1,475
Total of all small shorebirds in the region	217,725
Percentage of small shorebirds in midcontinent region	26.7%

### **Appendix 3.** Critical shorebird habitat requirements: Piping Plover.

In the Great Plains region, Piping Plovers can be found on riverine sandbars and shorelines, reservoir islands, sandbars, and shores, and semi-permanent and permanent prairie alkali lakes. About 65% of the U.S. Great Plains population of Piping Plover nests these alkali lakes associated with the Missouri Coteau landform. Within this area, about 25% of the pairs nest on lands under USFWS ownership, 25% nest on The Nature Conservancy's Williams Preserve in central North Dakota, and nearly all of the remainder nest on privately owned lands. Alkali lakes present promise for the species recovery because they are relatively intact habitats and generally support relatively high reproductive success among Piping Plovers. However, recent data suggest that the integrity of grassland landscapes surrounding alkali lakes probably influences local reproductive success, as has been demonstrated for other prairie bird species (Murphy & Knetter, unpubl. data). Also, we cannot dismiss the value of riverine systems for Piping Plovers, as we do not completely understand the relationship between the two habitats for the species.

On prairie alkali lakes, Piping Plovers require salt-encrusted, gravelly clay substrates that are relatively flat and nearly devoid of vegetation (Prindiville Gaines and Ryan 1988). On rivers, Piping Plovers nest on unvegetated to sparsely vegetated sandbars and beaches with sandy to gravelly substrate (Schwalbach 1988). Nests are generally a simple, shallow scrape lined with tiny pebbles, typically in the mid-beach area away from dense vegetation or heavy cobbles or rubble. Piping plovers are strongly territorial during breeding season. Area of breeding territories varies depending on nesting density; it ranges from 500 m<sup>2</sup> for densely packed pairs in high quality habitat (B. Root, unpubl. data) to >40,000 m<sup>2</sup> for isolated pairs in what appears to be marginal habitat (Whyte 1985). Normally, breeding pairs defend about 50-200 m of beach and may travel with their 2- to 3-wk old chicks up to 200-400 m from nests. Dense vegetation usually impedes movement of chicks. Beach width is an important factor in site selection; some evidence suggests that nests of plovers on relatively narrow beaches (< 10 m) are more vulnerable to predation than nests on wider beaches. Piping Plovers on alkali lakes forage primarily for terrestrial arthropods that typically are wind-borne and washed ashore. Adjacent vegetation may influence food availability, but this is unstudied. Cattle may sometimes trample nests and leave hoof prints along shorelines, but this varies with substrate type; however, the highest productivity among breeding pairs along the Missouri Coteau appears to occur in landscapes where rangeland is the prevalent land use (R. Murphy and M. Rabenberg, unpubl. data).

#### Appendix 4. Shorebird Habitat Management Questionnaire for Land Managers

##### U.S. Shorebird Conservation Plan QUESTIONNAIRE FOR LAND MANAGERS

(Available in electronic format upon request. Contact: [Lisa.Gelvin-Innvaer@dnr.state.mn.us](mailto:Lisa.Gelvin-Innvaer@dnr.state.mn.us))  
(Note: formatting has been changed to a condensed format)

Land Agency and Contact Person:

\_\_\_\_\_

address: \_\_\_\_\_ phone: \_\_\_\_\_ email: \_\_\_\_\_  
Person completing questionnaire: \_\_\_\_\_

Date completed: \_\_\_\_\_

1. Name and location of wetland area.
2. Approximately how many acres of wetland habitat are found in your area?
3. How many of those acres would you consider to be "manageable" for shorebird habitat (shallow water)?
4. What are the primary management objectives for the wetland habitats in your area?
5. Are shorebirds one of the species groups you manage for? If so, please answer questions 6-8. If not, proceed to 9.
6. Do you manage for any particular species? \_\_\_\_\_ If so, please list them.
7. Describe the management goals (e.g., increase population of a species, provide specific habitat types) and how you evaluate the effects of your management (e.g., monitoring). Are the goals being achieved?
8. What specific management strategies are being used to provide shorebird habitat in your area (e.g. water level management, habitat manipulation, protection from predators).
9. Are there reports that document shorebird use and/or abundance for your area? \_\_\_\_\_  
If so, what are the titles, years written, and addresses where they may be obtained?
10. Do you feel management for shorebirds conflicts with other management goals? \_\_\_\_\_  
How so?
11. As best as possible, estimate the approximate resource requirements to manage for shorebirds in your area? Purchase of additional wetland habitat for shorebirds? \_\_\_\_\_  
Personnel days per year? \_\_\_\_\_ Other \_\_\_\_\_
12. Briefly outline management programs that may potentially benefit shorebirds in your area and estimate how much additional resources would be required to implement those programs.

13. Do you use any written management plans to manage your wetland areas? \_\_\_\_\_  
Written waterbird plans? \_\_\_\_\_ Written shorebird plans? \_\_\_\_\_

14. Briefly describe these management plans (e.g., what management methods are discussed; are they general in nature, or specific to your area; etc.)

15. Are you aware of any targeted shorebird management taking place on public or private lands in your vicinity? \_\_\_\_\_ Who?

If yes above, do you cooperate or coordinate with nearby land managers to provide habitat beneficial to shorebirds? \_\_\_\_\_ How?

### MN DNR- Questionnaire Supplement

In order to better integrate effective management for shorebirds and to promote and enhance responsible viewing, what forms of assistance would be most useful concerning the areas that you manage as well as adjacent private lands?

Please rank the following **1-4** with:

**1**-not useful **2**-slightly useful **3**-moderately useful **4**-highly useful

#### **Information/Education/Coordination** (within state and within Prairie Pothole Region)

\_\_\_\_ training workshops

\_\_\_\_ manuals & other printed technical materials

\_\_\_\_ technical assistance/consultation (e.g., including site visits)

\_\_\_\_ interactive website (e.g., listserv for discussions & fielding questions, distributing information, networking, real time tracking of shorebird migrations and water level/habitat conditions, etc.)

\_\_\_\_ state coordination meetings (annual?)

\_\_\_\_ conference calls      \_\_\_\_ in-person meetings (*Check all that apply*)

\_\_\_\_ Northern Great Plains/Prairie Pothole Region coordination meetings (annual?)

\_\_\_\_ conference calls      \_\_\_\_ in-person meetings (*Check all that apply*)

Funding for:

\_\_\_\_ Equipment/capital improvements (Give examples, e.g., heavy equipment, water control structures, etc.): \_\_\_\_\_

\_\_\_\_ Vegetation Management/Control (burning, chemicals, mechanical)

\_\_\_\_ Land acquisition/easements

\_\_\_\_ Incentives for private landowners

\_\_\_\_ land set-aside programs

\_\_\_\_ other? (*Explain:* \_\_\_\_\_)

\_\_\_\_ Staff (DNR, contractual or some other cooperative agreement)

\_\_\_\_ Research/monitoring (e.g., shorebirds, habitat, invertebrate food base, effects of management practices or chemicals on shorebirds/invertebrate foods, control of undesirable vegetation, etc.) *Please specify*

- On-site management activities
  - Recreation/Interpretive
  - Signs (administrative &/or interpretive)
  - Viewing platforms &/or blinds
  - Printed materials (e.g., brochures) for distribution to the public
  - Travel to meetings/training workshops
  - Other \_\_\_\_\_
- 

To help jump start this effort, we are seeking involvement at various levels. Please check any of the following that apply:

- willing to attend training workshop(s) and wish to be on notification list
- potentially interested in having the site that I manage be a management demonstration area
- potentially interested in having the site that I manage be a research study area
- willing to participate in state coordination meetings (or assign staff to attend)
  - conference calls     in-person meetings *(Check all that apply)*
- willing to participate in state coordination meetings (or assign staff to attend)
  - conference calls     in-person meetings *(Check all that apply)*

Other suggestions? \_\_\_\_\_

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Integrating shorebird management may require innovative approaches to augment efforts on state and federal wildlife areas. Example areas to explore have included sewage treatment areas and special flood/water control units. If you have additional ideas or know of specific opportunities to explore, please describe them below:

To make this effort a success, diverse involvement and input is necessary. Besides Wildlife contacts within the DNR, are there other key individuals whom we should contact? *(Please fill in below any information you have):*

Name	Affiliation	Address	Phone No.	Fax No.


Lastly, we appreciate your time and consideration in completing this questionnaire. We welcome and encourage any additional comments you may have:

Please return completed questionnaires to:  
Lisa Gelvin-Innvaer, Nongame Program, MN DNR-Reg. 4, 261 Hwy 15 South, New Ulm, MN  
56073