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U.S. Shorebird Conservation Plan

Upper Mississippi Valley/ Great Lakes Regional Shorebird Conservation Plan

Version 1.0

Prepared by¹:

Ferenc de Szalay, Department of Biological Sciences, Kent State University, Kent, Ohio

Doug Helmers, USDA Natural Resources Conservation Service, Columbia, Missouri

Dale Humburg, Missouri Department of Conservation, Columbia, Missouri

Stephen J. Lewis, U. S. Fish and Wildlife Service, Fort Snelling, Minnesota

Barbara Pardo, U. S. Fish and Wildlife Service, Fort Snelling, Minnesota

Mark Shieldcastle, Ohio Division of Wildlife, Oak Harbor, Ohio

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¹ Authors are listed alphabetically.

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EXECUTIVE SUMMARY

The Upper Mississippi Valley/Great Lakes (UMVGL) region is a diverse area that includes five Bird Conservation Regions and provides important habitat for shorebirds, especially migrants. Thirty-two shorebird species occur in the region, with 25 being common or abundant. Twenty-three species are of moderate or higher concern in the region. High-priority species include: greater yellowlegs, whimbrel, buff-breasted sandpiper, short-billed dowitcher, marbled godwit, Wilson's phalarope, upland sandpiper, American woodcock, and the Federally-listed piping plover; the latter five species breed in the region. Various habitats within the region, including natural and managed wetlands, river floodplains, lake shoreline, sand and gravel bars, reservoirs, and flooded agricultural fields, provide the shallow water and sparsely-vegetated conditions required by foraging shorebirds. However, interior areas like the UMVGL region experience dynamic climatic conditions, making habitat conditions for shorebirds unpredictable compared to coastal regions. Furthermore, loss of wetlands from urban development, river dredging and diking, and agriculture has reduced the amount of habitat in the region. A primary goal of this plan is to ensure the availability of shorebird foraging and nesting sites over a range of climatic conditions by protecting, restoring, and managing a variety of habitat types throughout the UMVGL region. At many intensively managed sites, water level manipulation and other management activities (e. g., burning or discing) can be used to provide habitat for shorebirds, usually without compromising other wildlife objectives. Ultimately, an integrated management approach should be adopted that combines region-specific information on wetland dynamics and life history strategies of a variety of wildlife species. The North American Waterfowl Management Plan's Upper Mississippi River and Great Lakes Region Joint Venture established waterfowl habitat conservation objectives that focus on providing complexes of ephemeral and permanent wetlands and associated upland habitats. Objectives include providing 3.6 million hectares (9.1 million acres) of wetlands and associated uplands in Joint Venture waterfowl production counties (northern latitudes), and 213,000 hectares (533,000 acres) of wetlands in waterfowl migration counties (mid-latitudes). Since most of these areas will also provide good shorebird habitat, the Joint Venture's habitat objectives have been adopted for this plan. The infrastructure and partnerships in place to implement the Joint Venture will be expanded to address shorebird habitat needs, although the type of habitat provided for shorebirds (especially shallow water) may at times differ from what is optimal for some waterfowl species. Information is needed on the following to accomplish this plan: regional abundance, distribution, chronology, and population trends of shorebirds; responses of shorebirds and their invertebrate food base to management activities; wetland distribution and habitat conditions during a variety of climatic patterns; and effects of human disturbance on shorebirds. Providing this and other information to land managers and private landowners will help ensure the conservation of shorebirds throughout the region. Regional needs for shorebird population monitoring, research, and education and outreach activities in the UMVGL region are identified in this plan.

INTRODUCTION

The U. S. Shorebird Conservation Plan (USSCP) was developed to stabilize populations of declining shorebird species and ensure that common species remain so. This will be accomplished, in part, through implementation of 11 regional conservation plans that outline strategies to provide sufficient high-quality shorebird habitat and to overcome other shorebird limiting factors. This plan addresses shorebird conservation in the Upper Mississippi Valley/Great Lakes (UMVGL) planning region, which is a large, diverse area that provides important habitat for a variety of shorebirds, especially migrants. The purpose of the plan is to conserve shorebirds in the UMGVL region through a combination of habitat protection, restoration, and management, population monitoring, research, and education/outreach. These actions will reverse wetland losses, preserve and enhance existing shorebird habitats, provide needed data on populations and limiting factors, and disseminate information on shorebird needs and values. While the ultimate result will be the maintenance or increase of shorebird populations, many other wetland species with similar habitat needs will also benefit. As a component of the North American Bird Conservation Initiative, the USSCP is aimed at promoting partnerships at a landscape level that emphasize integrated management for multiple bird species.

DESCRIPTION OF THE UMGVL REGION

Physical Description

The UMGVL shorebird planning region encompasses 1.4 million square kilometers (535,000 square miles) in the north-central United States, including all or most of Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio, New York, and Wisconsin, plus portions of nine other adjacent states (Figure 1). Parts of the UMGVL region are heavily forested or have rugged terrain with few wetlands, and these support little shorebird use except for the American woodcock (see Table 1 for scientific names).

Bird Conservation Regions

The UMGVL planning region includes five Bird Conservation Regions (BCRs) that were established by the North American Bird Conservation Initiative to delineate areas with similar bird communities, habitats, and resource management issues (Commission on Environmental Cooperation 1998). These BCRs are, from north to south: the Boreal-Hardwood Transition, Lower Great Lakes/St. Lawrence Plain, Prairie-Hardwood Transition, Eastern Tallgrass Prairie, and Central Hardwoods (Figure 1). Land use coverage and public land ownership data for the BCRs can be found at: <http://www.manomet.org/USSCP/bcrmaps.htm>.

The Boreal-Hardwood Transition BCR (comprising 16% of the UMGVL region) is characterized

by coniferous and northern hardwood forests, nutrient-poor soils, shallow lakes, Great Lakes coastal estuaries, and riparian habitat. The Lower Great Lakes/St. Lawrence Plain BCR (7% of the UMVGL region) is a low-lying area with important lakeshore habitats and associated wetlands. Although it was once covered by oak-hickory, northern hardwood, and mixed-coniferous forests, most forests have been cleared and cropland and early successional habitats now predominate. The Prairie-Hardwood Transition BCR (16% of the UMVGL region) contains important lakeshore marshes and links the Prairie Pothole Region to the eastern forests. The Eastern Tallgrass Prairie BCR (39% of the UMVGL region) was once vast prairie and savannah, but is now dominated by agriculture; glaciation resulted in numerous pothole-type wetlands, shallow lakes, and rivers. The Central Hardwoods BCR (22% of the UMVGL region) includes oak-hickory forests in the hilly regions of the Ozark Plateau in Missouri and Arkansas, which are separated from the Interior Low Plateaus of Kentucky and Tennessee by the floodplains of the Mississippi River and its larger tributaries.

Shorebird Habitats in the UMVGL

Most shorebirds using the UMVGL region are long-distance migrants that require suitable wetlands where they can periodically stop to replenish their fat reserves. These staging areas must have shallow water (<20 cm or 8 in deep) and/or mud flat habitats with sparse vegetation (<25 % cover), undisturbed resting areas, and abundant invertebrate food resources to meet the high energetic demands of migration (Burger et al. 1977, Cowell and Oring 1988, Hands 1988, Helmers 1991 and 1992). The region has a wide variety of habitats that provide, or have the potential to provide, these requirements, including natural and managed wetlands, lake shorelines, river floodplains (especially along the Mississippi, Illinois, Missouri, Ohio Rivers), reservoirs, and flooded agricultural fields. Several species of shorebirds in the UMVGL region forage and nest in upland habitats (e. g., grasslands, wet meadows, pastures, haylands, croplands, sparsely-vegetated beaches, and sand and gravel bars), many of which are associated with wetland complexes .

Only recently has the importance of interior U. S. habitats to shorebirds become more widely understood (Dinsmore et al. 1999, Skagen et al. 1999). Unlike coastal areas where habitat and food resources are fairly predictable and abundant, resource availability in inland areas is highly dependent on precipitation and hydrology patterns and varies in time and space (Fredrickson and Reid 1990, Skagen and Knopf 1993 and 1994, Skagen 1997). While many natural wetlands in inland regions can potentially provide excellent shorebird habitat, precipitation directly influences wetland conditions and corresponding use by shorebirds. During dry years, naturally-receding semipermanent or permanent wetlands may provide the only unmanaged shorebird habitat available. In extremely wet years, such areas are generally flooded, sometimes with water levels well into the wet meadow zone, and these sites will not be utilized by most shorebird species. Therefore, seasonal or temporary habitats may be the only wetlands with ideal conditions in wet years. Wet and dry cycles make it difficult to predict the location, available food resources, and duration of suitable wetland conditions of prime shorebird habitats. The dynamics of climatic cycles and the changing availability of basins cause shorebirds migrating through interior regions like the UMVGL to be scattered over larger areas and in small numbers

at numerous sites, rather than concentrated at a few major staging sites, as is common along the Atlantic and Pacific coasts (Skagen and Knopf 1993 and 1994, Dinsmore et al. 1999, Skagen et al. 1999).

Important shorebird habitats in the Great Lakes include coastal marshes and deposited sandy beaches. Great Lakes coastal wetlands are usually dominated by herbaceous vegetation and have a fringe of woody vegetation in shallower areas. Many have a bare zone at the water's edge from scouring by waves and winter ice. Lake Michigan has the most coastal marshes and Lake Erie the least (Maynard and Wilcox 1997). The amount of beach habitats along the Great Lakes has not been estimated. The large size of the Great Lakes creates some physical factors that are more similar to marine coastal environments than inland habitats. For example, waves from storms erode vegetation and sediments along shorelines, and most coastal marshes occur in sheltered areas (e. g., embayments; behind barrier beaches or sandbars) (Maynard and Wilcox 1997).

A key characteristic of Great Lakes beach habitats and undiked coastal marshes is that they are affected by changes in Great Lakes water levels (Bedford 1992). Lake water levels typically vary 25-75 cm (10-30 in) during the year, with levels the lowest in mid-winter and highest in mid-summer. Furthermore, long-term changes in precipitation patterns affect lake water levels, and differences of 1-2 m (3-6 ft) between all-time high and low water levels have been recorded in the Great Lakes. Short-term changes are also common. For example, wind-driven seiches cause lake-basin water levels to rock back and forth, which can cause water levels to oscillate 20-60 cm (8-24 in) for several days. These fluctuations may have important consequences for feeding shorebirds because they expose areas of the shoreline (and associated invertebrate food resources) that would otherwise be submerged. However, little research has been done to determine how natural water-level changes affect shorebird use of these habitats.

Human Impacts on Shorebird habitat in the UMVGL Region

Much of the northern and central portions of the UMVGL region historically had abundant inland wetlands and Great Lakes coastal marshes, and probably supported large numbers of shorebirds. Unfortunately, shorebird habitats in the UMVGL region have been dramatically reduced and degraded by human activities. The abundance and diversity of wetlands have declined, largely due to drainage for agriculture, roads, and urban development. States within the region have lost 50-90% of their wetlands (Dahl and Johnson 1991). Rivers have been dredged and diked for navigation, flood control, and agriculture, which has reduced shallow floodplain areas that previously attracted shorebirds. Before the Missouri, Mississippi, and Ohio Rivers were extensively altered, their floodplains and tributaries provided numerous sandbars, mudflats, and oxbows that were ideal habitat for shorebirds, including breeding areas for piping plover and killdeer. After forested riparian areas were cleared and converted to agricultural fields and pastures, many temporary and seasonal wetlands remained, but increased emphasis on flood control and crop production has resulted in drainage of many of these marginal agricultural lands, which has decreased their availability to waterbirds.

In many ways, environmental problems in Great Lakes coastal marshes are similar to those in

inland wetlands. Many wetlands have been destroyed for agriculture or urban development (Maynard and Wilcox 1997). Wetlands that receive water from rivers are often affected by nearby agricultural practices and may have high levels of nutrients, herbicides, and sediments from farm runoff. Industrial effluents have also been found to input toxic compounds throughout the Great Lakes. Near urban areas, beaches are commonly replaced by breakwalls to prevent shoreline erosion. Finally, many exotic species (e. g., zebra mussel, spiny water flea, carp, purple loosestrife) have been introduced into these habitats (Mills et al. 1993). Little is known about the effects of most of these factors on shorebirds that migrate through and breed in the Great Lakes.

Some human actions have created shorebird habitat in the UMVGL region. Reservoirs and stock ponds, sewage lagoons, flooded agricultural fields, and sand and gravel excavation pits that have shallow water margins are all used by shorebirds. In coastal areas along the Great Lakes, dredged material is deposited in Confined Disposal Facilities (CDFs), such as in Saginaw Bay, Michigan, and along Lake Erie, and these are sometimes used heavily by foraging shorebirds. However, the sediments in CDFs often have high contaminant levels. Dikes and water control structures have provided shorebird habitat in some Great Lakes coastal marshes that otherwise would have been inundated by high lake levels. Wetland restoration programs have provided additional shorebird habitat, and at least one species, the upland sandpiper, has benefitted from grassland restoration programs such as the Conservation Reserve Program (Dechant et al. 2000).

SHOREBIRD SPECIES OCCURRENCE AND REGIONAL PRIORITIES

Species Occurrence and Abundance

Thirty-two of the 50 shorebird species being considered in the USSCP occur regularly in the UMVGL region. Twenty-five of these species occur in high concentrations, or are common or locally abundant in the region (Table 1). Survey data (as noted below, only limited data are available) and expert opinion were used to determine the relative abundance of species within each Bird Conservation Region, and these values were then used to derive an overall occurrence/abundance value for each species in the entire UMVGL region. Because the UMVGL region is large and diverse, the occurrence and relative abundance of most species vary among the five BCRs within the region; only about 2/3 of the region's species occur in all five BCRs. The Central Hardwoods BCR is used by the fewest species - only 20. Four species - the snowy plover (*Charadrius alexandrinus*), long-billed curlew (*Numenius americanus*), black-necked stilt (*Himantopus mexicanus*), and American avocet (*Recurvirostra americana*) - are very peripheral to the UMVGL region, and are not included in Table 1 because regional management activities would not provide significant benefits to these species.

Nine of the species listed in Table 1 breed in the UMVGL region, and four of these (piping plover, killdeer, spotted sandpiper, and American woodcock) have significant breeding populations. Twenty-five species, including seven of the nine breeding species, make significant

use of the region during migration (Table 1). Skagen et al. (1999) summarized information on numbers, distribution, and chronology of migrating shorebirds in the midcontinent, including the western portion of the UMVGL region (Iowa, Kansas, Minnesota, Missouri, and Nebraska).

Species Priorities

The USSCP species prioritization system (see <http://www.manomet.org/USSCP.htm>) was used to identify species of concern within the UMVGL region by considering:

(1) global values for Relative Abundance and Breeding and Nonbreeding Distribution, (2) global or, where appropriate, UMVGL-specific values for Population Trend and Breeding and Nonbreeding Threats, and (3) Area Importance values derived from the occurrence/abundance information in Table 1. Table 2 shows the resulting regional priorities, as well as national priorities, for each UMVGL species. Twenty-three species are of moderate or higher concern in the region. (Note: a general lack of data on species' abundances and population trends in the UMVGL region made prioritization difficult because those variables in the prioritization scheme sometimes had a high degree of uncertainty. Available population data are restricted to well-known (mostly public) areas and may not reflect shorebird use in the variety of habitats occurring throughout the UMVGL region. For these reasons, the species priorities identified in this plan are subject to change as better population data become available in the future.)

The UMVGL region has one highly-imperiled shorebird species and eight species of high concern (Table 2). Populations of these species are known or believed to be small and/or declining, and they are experiencing other known or potential threats. Five of the species - **piping plover (Great Lakes population)**, **American woodcock**, **upland sandpiper**, **marbled godwit**, and **Wilson's phalarope** - breed in the region; the first two species are major breeders and the last three are minor breeders. The piping plover, American woodcock, Wilson's phalarope, **greater yellowlegs**, **buff-breasted sandpiper**, and **short-billed dowitcher** are major migrants in the region. The **whimbrel** is the other high-concern species; while it is a minor migrant in the UMVGL region, its small and declining global population elevated its regional priority score. The least sandpiper is a major migrant in the UMVGL region, and its global population trend is declining significantly. However, because of low values for the other prioritization criteria, it only ranked as being of moderate concern in the region. Nevertheless, it is clearly a species in need of attention, and one that can benefit greatly from conservation actions undertaken in the UMVGL region.

The piping plover is the region's only highly-imperiled species. The Great Lakes population has been Federally listed as endangered since 1986, and is the smallest of the species' three populations. (The other two populations - the Northern Great Plains and the Atlantic Coast - are classified as threatened.) The Recovery Plan for this population (U. S. Fish and Wildlife Service 1988) is currently being revised and has a recovery goal of ≥ 150 nesting pairs, with a five-year average fecundity of ≥ 2.0 fledglings per pair (Mark Hodgkins, personal communication). In 1999, a record high of 32 pairs nested along cobble beaches of the U. S. Great Lakes shores in northern Michigan, rearing 49 young to fledging (1.5 fledglings per pair). Recent population trends indicate a slow increase. Historical sites that were previously unoccupied on Lakes

Superior and Michigan have been reinhabited and consistent breeding season use by non-breeding birds has occurred along Lake Huron. Among the threats to this population are beach disturbance by people and pets, predation on eggs and chicks, and habitat loss. Strategies for population recovery include protecting individual nests and essential breeding habitat along the Great Lakes shoreline. The reader is referred to the Recovery Plan and Matteson (1996) for further details on the life history, limiting factors, and conservation needs of the Great Lakes piping plover.

The American woodcock is a highly sought-after game species that has declined substantially in recent years (Bruggink 1999). Breeding densities are highest in the Upper Midwest, and the species occurs throughout the UMVGL region during migration. The woodcock has very different habitat requirements than most shorebird species in the UMVGL region; it breeds in early successional habitats in the northern parts of the region, including brushy fields, abandoned farmland, and small forest openings. Changing land uses and forest management practices, together with advancing forest succession, have caused the loss and degradation of woodcock habitat, and this is the major management problem for the species. A national management plan for the American woodcock (U. S. Fish and Wildlife Service 1990) outlines general strategies for the species' conservation. These include regulation of hunter harvest and management of habitat (Sepik et al. 1992). Regional woodcock management plans are also being developed. Therefore, the woodcock will not be covered in detail in the UMVGL plan except to acknowledge that it is among the priority shorebird species in the region.

The upland sandpiper is designated low concern nationally in the USSCP, and it is an uncommon to fairly common breeder and migrant in the UMVGL region. However, its regional population trend and relative abundance scores elevated it to high concern in the region. Upland sandpipers use native and tame grasslands, wet meadows, old fields, hayland, pastures, planted cover (e. g., Conservation Reserve Program), cropland, highway and railroad rights-of-way, and grassy areas of airports. Generally, they forage in short vegetation and nest and rear broods in taller vegetation. Like many grassland birds, the upland sandpiper has experienced population declines in recent years, and it is on the U. S. Fish and Wildlife Service's list of nongame bird species of management concern (U. S. Fish and Wildlife Service 1995) as well as several state agency lists.

Dechant et al. (2000) provide a comprehensive treatment of the species' habitat requirements and management needs.

The marbled godwit is a minor breeder and migrant in the UMVGL region. It prefers short, sparse to moderately vegetated uplands for nesting and foraging, and wetland complexes for foraging (Johnson et al. 1998). The Wilson's phalarope is a minor breeder and major migrant in the region. It nests in wetlands, wet meadows, and upland grasslands, and forages in wetlands with open water, emergent vegetation, and open shoreline (Dechant et al. 1999).

With the above exceptions, the primary importance of the UMVGL region to shorebirds is in providing resources for migrants as they journey between their breeding and wintering grounds. All 32 shorebird species occurring regularly in the UMVGL region are classified as migrants. Therefore, the remainder of this plan will emphasize conservation strategies for meeting the

needs of migrant shorebirds.

REGIONAL SHOREBIRD HABITAT CONSERVATION STRATEGIES

A primary goal of this plan is to ensure the availability of shorebird foraging and nesting sites by protecting, restoring, and enhancing a diversity of habitat types throughout the UMVGL region. Because shorebirds in the interior United States use a variety of wetland basins within a landscape as climatic conditions change (Skagen 1997, Dinsmore et al. 1999, Skagen et al. 1999), conservation of shorebirds in areas like the UMVGL region will require management actions across wetland classes (from ephemeral to permanent) on both public and private lands. Cooperative partnerships among Federal and state agencies, conservation organizations, and private landowners will be crucial to accomplishing shorebird habitat conservation on a landscape scale in the UMVGL region.

Habitat Protection and Restoration

Wetland complexes and associated uplands that are consistently used by large numbers of shorebirds in the UMVGL region, especially high-concern species, should be identified. Where such sites are subject to conversion, degradation, or other threats, they should receive long-term protection by Federal and state agencies and conservation organizations (Ducks Unlimited, The Nature Conservancy, etc.) through fee-title acquisition, easements, or landowner agreements.

Many of the wetland/upland complexes that have been identified as priority areas for waterfowl in the UMVGL region are also important to shorebirds, and the North American Waterfowl Management Plan (NAWMP) can be a major facilitator in shorebird habitat conservation in the region. The NAWMP is comprised of partnerships, called Joint Ventures, that are focused on regional waterfowl habitat areas of concern. The activities of each Joint Venture are overseen by a Joint Venture Coordinator and a Management Board. The Management Board is comprised of high-level representatives of each of the partner groups involved in Joint Venture activities, e. g., Federal and state agencies and nongovernmental organizations like Ducks Unlimited and The Nature Conservancy. Joint Venture Management Boards set general direction, outline strategies, and prioritize projects for grant funding consideration from the North American Wetlands Conservation Act. At the local level, most states have a steering committee that works at the state level to put partners and projects together.

When the Upper Mississippi River and Great Lakes Region Joint Venture Implementation Plan was updated in 1998, a nongame bird objective was added (Upper Mississippi River and Great Lakes Region Joint Venture Management Board 1998). The geographic boundaries and habitat conservation priorities of this Joint Venture are very similar to those of the UMVGL shorebird planning unit. Therefore, the UMVGL shorebird plan is adopting the Joint Venture's habitat conservation objectives. These objectives include providing 3.6 million hectares (9.1 million acres) of wetlands and associated uplands in Joint Venture waterfowl production counties

(northern latitudes), and 213,000 hectares (533,000 acres) of wetlands in waterfowl migration counties (mid-latitudes), focusing on complexes of ephemeral and permanent wetlands and associated upland habitats. Most of these areas will provide good shorebird habitat, although the type of habitat needed for shorebirds (especially shallow water) may at times differ from what is optimal for some waterfowl species.

The infrastructure and partnerships in place to implement the Joint Venture will be expanded to address shorebird habitat needs. A shorebird expert will be proposed for addition to the Joint Venture Management Board. At the State Steering Committee level, shorebird advocates will become involved with projects that offer particular benefits to shorebirds, and shorebird partners will seek funds that can be used for Joint Venture projects. See Streeter et al. (1993) for a broader discussion of the benefits that the NAWMP can provide to shorebirds.

Restoration of drained wetlands through alteration or elimination of drainage systems and/or installation of water control structures provides important habitat for shorebirds. The U. S. Fish and Wildlife Service and state agencies have active wetland restoration programs on public and private lands. Several priority shorebird species in the UMVGL region nest in grasslands and related habitats, and can benefit from upland restoration programs such as the USDA's Conservation Reserve Program.

Agricultural programs that protect and restore wetlands on private lands, especially ephemeral, temporary, and seasonal sites, are crucial to the conservation of shorebirds and other wetland-dependent species. These programs include: (1) the U. S. Department of Agriculture's Wetland Reserve Program, in which permanent conservation easements are purchased on restored wetlands, (2) the USDA's Conservation Reserve Enhancement Program, which provides restoration and long-term protection of habitat on agricultural lands in riverine floodplains in a number of states, and (3) the Farm Service Agency's Inventory Property Easement Program, which protects lands containing significant wildlife habitat. Preservation of existing wetlands through the enforcement of Federal and state wetland protection laws and permits is another important tool in conserving shorebird habitats.

The piping plover, the only highly-imperiled shorebird species in the UMVGL region, nests on broad, barren, undisturbed sand beaches with scattered areas of cobble along the shoreline and islands of the Great Lakes. Conservation strategies for this population include protecting nesting areas and individual nests (U. S. Fish and Wildlife Service 1988). Under the Endangered Species Act, the U. S. Fish and Wildlife Service will be designating Critical Habitat for this population and it will be a high priority to ensure the preservation of this habitat.

Habitat Management

Managed wetlands are valuable because they can provide optimal habitat for shorebirds when natural wetlands are affected by drought or flooding (Eldridge 1992). Thus, the management of emergent and seasonal wetlands, agricultural fields, and other important habitats for migrant shorebirds is a high priority in the UMVGL region. Although this document is primarily a

strategic planning tool, an overview of key management techniques for migrating shorebirds in the UMVGL region is provided in Appendix 1 (see also Rundle and Fredrickson 1981, Fredrickson and Taylor 1982, Eldridge 1992, Helmers 1992 and 1993, Laubhan and Fredrickson 1993, and Dinsmore et al. 1999). Helmers (1992) provides comprehensive information on shorebird ecology, habitat use, and management options.

A survey of managers and biologists on wildlife areas in the UMVGL region was conducted (Appendix 2) and indicated that many wildlife refuges and management areas with potential shorebird habitat are not being managed specifically for shorebirds; while they incidentally provide some benefits to shorebirds, their full potential is not being realized. A few of the managers surveyed felt that shorebird management caused biological conflicts (e. g., encouraged invasive species or botulism, or had adverse impacts on other priority wildlife species), but most felt that shorebird conservation could be accomplished without compromising other wildlife goals. One limiting factor noted by a number of managers was a lack of water control structures due to funding constraints. Installation of water control structures, pumping systems, and dikes on developed sites should be a priority within the region to increase management capabilities and options for individual basins or wetland complexes.

Dinsmore et al. (1999) proposed the establishment of a Shorebird Habitat Monitoring Network to enhance shorebird management on a landscape scale. This network would encourage managers to use the Internet and other means to communicate with each other in real time about habitat availability and generalized shorebird movements during migration to determine if, when, and where there are critical habitat shortages. Managers within a region would then work in a coordinated manner to overcome these ecological hurdles by adjusting the timing and extent of their habitat management activities.

Whenever possible, an integrated wetland management approach should be adopted that combines region-specific information on wetland dynamics and life history requirements of a variety of wildlife species. Wetland use among different waterbird guilds varies both temporally and spatially, although considerable overlap does occur. Wetland managers should understand that a single wetland may support different shorebird species at different times of the year, and that each species or guild requires different water depths, vegetative characteristics, and invertebrate food resources (Fredrickson and Reid 1986). By diversifying the timing, depth, and duration of drawdowns or flooding within a wetland complex, managers can provide habitats for migrant shorebirds without decreasing their value to other avian groups with different needs.

Several high-concern shorebird species in the UMVGL region nest in upland habitats that can be enhanced through management. The American woodcock uses brushy fields and small forest openings for nesting, rearing, daytime feeding, roosting, and singing grounds. Clear-cutting and burning can be used to create and maintain such early successional habitats (see Sepik et al. 1992). Grasslands, wet meadows, haylands, pastures, croplands, and similar habitats provide important breeding sites for the upland sandpiper, marbled godwit, and Wilson's phalarope. Management techniques include seeding, burning, grazing, and mowing on a rotational basis (see Fitzgerald et al. 1998, Johnson et al. 1998, Dechant et al. 1999, Dechant et al. 2000).

Western Hemisphere Shorebird Reserve Network

The Western Hemisphere Shorebird Reserve Network (WHSRN) was formed to protect and manage critical sites where large numbers of shorebirds concentrate during migration. As mentioned previously, the UMVGL region has relatively few sites that attract large numbers of shorebirds on a regular basis. However, congregations of birds have been found at several wildlife refuges in the region, and these have been designated as WHSRN sites. They include Chautauqua National Wildlife Refuge (NWR), Illinois, and Swan Lake NWR, Missouri. The Lake Erie marsh region, from the mouth of the Detroit River in Michigan, to Huron, Ohio, has been nominated for WHSRN designation. This area includes Ottawa NWR and Magee Marsh and Pickerel Creek State Wildlife Areas in Ohio, as well as several private hunting clubs.

POPULATION MONITORING ACTIVITIES AND NEEDS

Most shorebird habitat in the UMVGL region is dispersed and ephemeral. Thus, shorebirds using interior areas of the continent tend to exploit available habitat opportunistically across the landscape rather than consistently concentrating at a few sites (Skagen and Knopf 1994), and this makes population monitoring a challenge. Furthermore, much of the prime shorebird habitat is located on private lands where monitoring rarely occurs. Available population data are restricted to well-known areas (e. g., Federal and state wildlife refuges; Missouri River aerial surveys by Helmers and Humburg; see Skagen et al. 1999) and may not reflect shorebird use in the variety of habitats occurring throughout the UMVGL region.

A major need exists for data on shorebird abundance, distribution, chronology, and population trends in the UMVGL region. Population objectives cannot be set for most species without such information. One of the most important issues consistently identified by wildlife managers surveyed in the UMVGL region (see Appendix 2) was the need for basic information on shorebird use of their areas. Less than half the areas surveyed actively monitor shorebird use, and only 10 conduct quantitative surveys to estimate seasonal patterns of shorebird abundance.

The only large-scale survey for tracking numbers and distribution of migrating shorebirds that currently covers the UMVGL region is the International Shorebird Survey (ISS). Based at the Manomet Center for Conservation Sciences, the ISS uses a network of ~800 cooperators to census shorebirds at over 500 locations. ISS data are useful in providing information on use, peak numbers, timing of migration, and responses to management activities at individual survey sites. However, because ISS sites are not randomly selected, coverage varies within and among years, observer bias is large, and the accuracy of large counts is unknown, the ISS has limited utility for estimating population trends. Nevertheless, along the Atlantic coast, the ISS has shown a 50-80% decrease in several species of shorebirds (Howe et al. 1989).

ISS coverage within the UMVGL is limited. The following numbers of ISS sites have been

surveyed in the major states comprising the UMVGL region (Brian Harrington, personal communication): Illinois, 11 sites; Indiana, 6; Iowa, 12; Kentucky, 5; Michigan, 23; Minnesota, 7; Missouri, 4; Ohio, 54; New York (Great Lakes portion), 12; and Wisconsin, 4 (see Table 3 for a partial list of ISS sites in the region). The most important shorebird population assessment need in the UMVGL region is to increase participation in, and geographic coverage of, the ISS. Both public and private lands need to be surveyed.

Other, more specialized monitoring programs provide population trend data on several shorebird species in the UMVGL region. The North American Breeding Bird Survey (BBS) is a statistically-based, roadside survey that uses point counts done along ~4,100 routes in the U. S. and Canada to monitor avian population trends (but not population size). In the UMVGL region, the BBS provides adequate trend data on breeding populations of the killdeer and upland sandpiper, but problems with species detectability and route locations limit the BBS's usefulness for other shorebird species.

Species-specific surveys monitor populations of two high-concern shorebird species in the UMVGL. The U. S. Fish and Wildlife Service and the Canadian Wildlife Service coordinate an annual Woodcock Singing-ground Survey, which provides a statistically sound population index for this species. Singing males are counted along randomly selected routes throughout the species' northern breeding range (Bruggink 1999). Harvest surveys are also done for woodcock, and provide information on age and sex composition of populations as well as harvest size and distribution and hunter success. Breeding populations and productivity of piping plovers are monitored intensely by researchers, volunteers, and Federal and state agencies in the Great Lakes. In addition, a coordinated, international survey of breeding and wintering piping plovers is conducted every five years.

This plan will strive to support and expand the above shorebird monitoring programs in the UMVGL region and, to the extent possible, adopt any additional single- or multi-species monitoring protocols that are developed for the USSCP.

RESEARCH AND INFORMATION NEEDS

The research and information needs listed below have to be addressed to further shorebird conservation in the UMVGL region. This is neither an exhaustive, nor a prioritized list but it provides an initial focus for shorebird information-gathering efforts in the region. Information is needed on:

- 1) Shorebird distribution and abundance, and factors affecting them (e. g., habitat availability and management). It is especially important to better understand the distribution of shorebirds on public vs. private lands as this has implications for habitat conservation and population monitoring activities.
- 2) The chronology and peaks of shorebird movements, temporal composition of migrants,

and factors affecting turnover rates at stopover sites. These factors also have implications for habitat conservation and population monitoring.

- 3) The distribution, abundance, conditions, and ownership of wetlands and other important shorebird habitats, how they are affected by climatic patterns and human activities, and where there is potential to restore and enhance additional shorebird habitat in the region. Existing and potential habitats should be mapped with Geographic Information Systems to determine where conservation efforts can be most effective. The Shorebird Habitat Monitoring Network proposed by Dinsmore et al. (1999) should be considered for the UMVGL region as a means of assessing habitat availability for migrant shorebirds, determining if, when, and where there are critical habitat shortages, and enhancing coordinated management efforts to overcome these ecological hurdles.
- 4) Shorebird nutritional requirements and food preferences, and how their invertebrate food resources respond to wetland dynamics and management activities.
- 5) How human disturbance affects shorebird foraging and breeding, and ways to reduce these impacts.
- 6) The effects of contaminants on shorebirds, especially at Confined Disposal Facilities that are used by foraging birds.

EDUCATION AND OUTREACH NEEDS

A number of wildlife area managers surveyed in the UMVGL region (see Appendix 2) mentioned the need for literature and training on shorebird identification, life histories, habitat requirements, and management techniques. These are necessary to facilitate the incorporation of shorebird management into larger resource management programs. A number of excellent shorebird management workshops have been held in the UMVGL region by the Manomet Center for Conservation Sciences in the past and these should continue. Regional management manuals should be developed to assist managers.

Because a large portion of shorebird habitat is on private lands, outreach information on the values and needs of shorebirds should be developed and made available to private landowners. Technical assistance is also needed, for those landowners with specific interests in managing their land for shorebirds. This can be provided by biologists with the U. S. Fish and Wildlife Service, Natural Resources Conservation Service, Farm Services Agency, and state wildlife agencies if additional funding is available.

Educational programs are needed to inform the public about the ecology and importance of shorebirds, and threats facing them (especially human disturbance). The Shorebird Sister Schools Program is an excellent educational tool whose use should be expanded in the UMVGL

region. It includes a K-12 curriculum, World Wide Web site, and listserv that track migrating shorebirds, educate students and teachers about these species and overall wetland conservation, and facilitate the formation of international pen pals who are linked to one another as the birds span the globe in their migrations.

FUNDING NEEDS

Previous sections of this plan have identified actions that are needed to better conserve shorebirds in the UMVGL region. Some of these are regionwide in scope, while others are site-specific. At present, detailed funding needs for shorebird conservation in the region cannot be specified, but support is needed for the following general activities (not listed in priority order) :

- 1) Habitat protection through fee-title acquisition, easements, and agreements.
- 2) Restoration of wetlands and grasslands.
- 3) Habitat management activities and infrastructure, including water control structures, pumping systems, dikes, impoundments, and farming equipment.
- 4) Population monitoring and development of Geographic Information Systems and other databases to house region-specific information on shorebird numbers, distribution, chronology, population trends, and habitats.
- 5) Research to address information needs related to shorebird conservation, as outlined above in the section on research and information needs.
- 6) Education and outreach activities and materials, including training workshops, publications, and educational programs.
- 7) Technical assistance to private landowners.
- 8) Additional biologists and resource managers to accomplish the above tasks.

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APPENDIX 1: MANAGEMENT TECHNIQUES FOR MIGRATING SHOREBIRDS IN THE UMOVGL REGION

This section focuses on management techniques that can be used to benefit migrating shorebirds in UMOVGL region (see Rundle and Fredrickson 1981, Eldridge 1992, Fredrickson and Taylor 1982, Helmers 1992 and 1993, Laubhan and Fredrickson 1993, and Dinsmore et al. 1999 for more details). These techniques are designed to mimic natural fluctuations in water levels and vegetation that result in high quality habitat for shorebirds. Such management involves timed drawdowns or re-flooding to ensure the availability of mud flats and shallow water (<10 cm; 4 in) where abundant invertebrates are readily available to foraging birds. Ideal feeding depths vary between shorebird guilds because of differences in size and foraging strategy, and range from drying and wet mudflats to water depths of 18 cm (6 in) (Helmers 1992). Shorebirds generally prefer areas with <25% vegetative cover. Other management activities (e. g., burning or discing) can also be adjusted to provide habitat for shorebirds.

For management purposes, foraging shorebirds can be grouped into several habitat guilds based on water depth or soil moisture (Helmers 1992, Mark Shieldcastle personal communication). In general, the water depth in which a bird forages is correlated with its body size (Eldridge 1992). By recognizing which habitats are available, or could be made available through management, in a given wetland or wetland complex, the variety of shorebirds potentially using an area can be predicted. **Beach** shorebirds prefer sandy or gravel beaches, tend to be specialists, and include

the sanderling, ruddy turnstone, and piping plover. **Dry-mudflat** specialists in the region include the Baird's, buff-breasted, and upland sandpipers, the large plovers, and killdeer. **Moist-mudflat** species prefer areas with no surface water and include the pectoral, solitary, spotted, semipalmated, and least sandpipers, semipalmated plover, red knot, and common snipe. **Shallow-water** shorebirds prefer mostly open water (up to 5 cm (2 in) deep) with some mixed emergent vegetation, and include the greater and lesser yellowlegs, willet, pectoral and stilt sandpipers, dunlin, and short- and long-billed dowitchers. **Deep-water** species prefer mostly open water at depths of 5-20 cm (2-8 in) with some mixed emergent vegetation, and include the whimbrel, Hudsonian and marbled godwits, and Wilson's and red-necked phalaropes.

The types of wetland used by shorebirds range from temporary basins in agricultural fields and pastures, to permanent lakes. When considering the management of shorebird habitats in conjunction with other wildlife management activities in the UMVGL region, several factors should be taken into account. These include the current land-use (such as row crops or pasture), water management capabilities, and land ownership (whether public or private). Three major land ownership/management categories are found in the UMVGL region: 1) intensively-managed public lands, such as national wildlife refuges or state wildlife management areas, many of which have water level management capabilities, 2) unmanaged public lands, which do not have water level management capabilities, such as state natural areas, and 3) private lands, which are largely unmanaged.

In the UMVGL region, the major focus of many managed wetlands with water control structures has been to grow natural foods and row crops for waterfowl, especially fall migrants. Additional emphasis has recently been placed on providing high energy foods and increasing invertebrate availability in areas used by waterfowl during their spring migration (Fredrickson and Reid 1986). The timing, water depth, and duration of drawdowns and flooding are important in creating habitats for all waterbirds. Integrated management strategies should include adjusting the timing and spatial distribution of manipulations to optimize habitats for shorebirds and other waterbirds. For example, a certain sites could be drawn down for both late-migrating ducks and shorebirds, or discing and burning schedules could be timed to provide mudflats and sparsely vegetated areas when shorebirds are migrating.

Included below are management guidelines in the three most common habitat types in the UMVGL region, seasonally-flooded impoundments, semi-permanent and permanent wetlands, and flooded agricultural fields. It is important to note that the following recommendations are generalized and will require fine-tuning at each site as the optimal timing and type of water level and vegetation manipulations vary within the region. When assessing the potential management capabilities of an area, wetland managers must ultimately make site-specific management decisions based on such factors as water availability, drawdown and flooding capabilities, and time since disturbance.

Seasonally-flooded Impoundments (Moist-soil Units)

Moist-soil management is a term applied to drawing down or irrigating a wetland to create

mudflat conditions that promote the germination of annual plants. This management approach is applied throughout the UMVGL region. Drawing down marshes during open water stages encourages the regeneration of vegetation. Generalized strategies and techniques for the management of moist-soil units have been summarized by Fredrickson and Taylor (1982), Reinecke et al. (1989), and Fredrickson (1991).

Spring shorebird migration in the UMVGL region occurs between mid-March and late May, depending on latitude (Helmert 1992, Humburg and Helmert unpublished data). Moist-soil units suitable for spring shorebird management require fall flooding approximately one month before the first heavy freeze and maintenance of flooded conditions to enable chironomid midges (*Chironomus* spp.) and other invertebrates to re-populate, as well as to assure survival of larvae over winter. During the spring migratory period, units should be drawn down slowly (2-3 cm (1 in)/week) to provide a continuous supply of invertebrates (Hands et al. 1991, Rundle and Fredrickson 1981). Units managed for spring shorebird use should have extensive areas of open water with generally less than 50% dense emergent vegetation. This will allow shorebirds to forage in open shallow water and mudflats as drawdowns appear (Rundle and Fredrickson 1981, Hands et al. 1991, Helmert 1991). If more than one unit is being drawn down for shorebirds, staggering the initial drawdown dates will extend the availability of habitat and provide resources throughout the migratory period. For example, at Ted Shanks Wildlife Management Area, Missouri, peak spring migration dates for lesser yellowlegs occur in late April, whereas semipalmated sandpipers peak in late May (Hands 1988). Slow and staggered drawdown of moist-soil units provide resources for shorebirds and other species, and will also promote a diversity of vegetation communities (Fredrickson 1991).

Summer/fall shorebird migration in the UMVGL region occurs between mid-July and late September. Management of moist soil units for summer/fall shorebird habitats includes two different strategies: moist soil-units that remained flooded through spring and early summer can be drawn down, or units that are dry can be reflooded. If units were flooded through spring and early summer to provide habitats for breeding herons and rails, then natural evaporation or slow drawdowns in late summer/fall make invertebrates available to shorebirds and concentrate prey for other waterbirds.

If dry units will be flooded for shorebirds, they should be shallowly flooded 10-15 cm (4-6 in) 2-3 weeks before summer/fall migration begins. This allows time for invertebrates to re-populate the newly-created habitats (Rundle and Fredrickson 1981, Hands et al. 1991, Helmert 1991). If possible, some of the vegetation should be disced before re-flooding to promote shorebird response. It is important to use shallow discing because this helps convert plant biomass to a detrital food source that is available to benthic invertebrates, whereas deep discing buries the cut plant material and makes it unavailable to invertebrates (Fredrickson and Reid 1986).

Moist-soil units may need reconditioning every several years to remove undesirable vegetation. Reconditioning units through shallow disking and reflooding provides excellent opportunities for shorebird management during the summer. As with spring management, staggering the

manipulations within several units extends the availability of habitats.

Semipermanent and Permanent Wetlands

Semipermanent and permanent wetlands without water control capabilities can offer excellent foraging sites for shorebirds. Short, sparse vegetation that is shallowly flooded during early spring, can provide foraging habitats within wet meadow zones (Colwell and Oring 1988, Eldridge 1992). Summer/fall drawdowns from natural evaporation of permanent wetlands and ponds provide habitats for south-migrating shorebirds (Hands et. al. 1991). Removing dense vegetation from wetlands by burning or mowing after basins have dried in late summer or fall will produce additional foraging areas for migrant shorebirds the following spring. When basins are reflooded from precipitation or winter snow melt, shallowly-flooded habitats will be available at wetland edges the following spring.

Semipermanent and permanent wetlands with water control can be drawn down in a fashion similar to those described for moist-soil units. However, complete drawdowns are not always feasible if wetlands are large (>20 ha; 50 ac) or deep (>1 m; 3 ft) because abilities to re-flood may be limited.

Flooded Agricultural Fields

Agricultural lands in many areas, such as the Lower Mississippi Valley (Reinecke et al. 1989, Ringleman 1990), are managed for waterfowl and may have the potential to provide resources for shorebirds. Managed agricultural fields can be highly effective in providing shorebird habitat, especially in areas where managed wetlands are unavailable or where natural wetlands have been lost or degraded (Hands et. al 1991). If optimal water depths are available, shorebird use of agricultural fields can be extensive, especially during spring migration.

Managed agricultural fields flooded for waterfowl over winter are generally drawn down quickly in early spring to prepare fields for planting. These fields, planted in long- season crops, such as corn or rice, can be drawn down slowly beginning in late March through April so that early migrant shorebirds, ibis, and late migrating waterfowl are provided with invertebrates. Fields planned for crops with a shorter growing season, such as soybeans and milo, can be drawn down slowly in late March or early April to provide habitats for late-migrating shorebirds and waders. During the spring, drawdowns of some fallow fields flooded for winter waterfowl should be delayed until late May to ensure that habitat remains for late-migrating shorebirds. Water should also be held as long as possible before preparing fields for later crops such as cover crops or millet.

Agricultural fields are harvested from July to November, depending on the number of crops, the planting date, and the type of crop. Between late July and September, shallowly-flooded fields (from <1-15 cm (1-6 in)) will provide foraging opportunities for south-migrating shorebirds such as the semipalmated and pectoral sandpipers, as well as early migrating blue-winged teal (*Anas discors*) and northern pintail (*Anas acuta*). Opportunities to create shorebird habitat may exist in

the UMVGL region by shallowly disking and re-flooding wheat fields during July and August. During the summer, staggering the flooding dates between fields, and water depths within fields, can have a dual benefit. First, it will continuously provide new foraging habitat for migrant shorebirds and waders. Second, early-flooded fields that are naturally drawn down from evaporation stimulate the germination of annual plants and in turn provide browse for wintering geese and possibly seeds for dabbling ducks (Helmert 1992).

APPENDIX 2: CURRENT SHOREBIRD MANAGEMENT ACTIVITIES IN THE UMVGL REGION

Managers and biologists on wildlife areas in 11 states throughout the UMVGL region were surveyed to identify factors that affect shorebird use on managed lands. The survey was aimed at determining habitat goals for these areas, ongoing management practices that affect shorebird use, and the potential for additional efforts to enhance shorebird habitat in the future. Telephone interviews and written questionnaires were used, and responses were received from 66 wildlife areas (Table 3). It is important to note that the survey was not sent to all possible wildlife areas. For example, most national wildlife refuges and tribal areas within the region were surveyed, but relatively few State or privately managed wildlife areas were contacted. Nevertheless, these results provide useful insight into current shorebird management practices throughout the UMVGL region.

As expected, the survey found that most wildlife areas are managed for a diverse array of habitat goals. The three most common primary goals of the areas surveyed are to: 1) provide waterfowl habitat (n = 38); 2) provide waterfowl and nongame habitat (n = 13); and 3) protect, enhance or restore natural habitats and processes (n = 6). However, slightly less than half of the areas surveyed (n = 31) intentionally provide shorebird habitat (Table 3), and only three manage for specific shorebird species (e. g., woodcock, snipe, and piping plover). Although about half (n = 35) have water management plans that sometimes include wildlife management strategies, only five areas have plans specifically for shorebird habitat management.

While few areas are actively managed for shorebirds, ongoing management practices on many areas can affect shorebird habitat. For example, wildlife areas commonly use techniques that can enhance habitats for shorebirds such as burning, disking, and/or mowing (n = 13), and spring and/or fall drawdowns (n = 9). Furthermore, some mentioned other potentially important factors such as benefits from waterfowl management techniques (n = 3), and restoration of degraded habitats (n = 3).

Respondents were also asked to list potential problems with providing shorebird habitat. Some respondents mentioned that shorebird management may conflict with waterfowl management goals (n = 4) or other interests such as fisheries, agriculture, or commercial use (n = 5). Some felt that drawdowns timed during shorebird migratory periods sometimes are not compatible with current management goals (n = 9), or can increase problems from invasive species (e. g., purple loosestrife, cocklebur or willow) (n = 3) or botulism (n = 2), and some areas lack water control structures and cannot manipulate drawdown schedules (n = 3). However, it is important to note

that most respondents (n = 48) felt that they can incorporate shorebird management practices without compromising well-established goals.

Finally, additional resources are necessary to implement new management strategies for shorebirds. One of the most important needs is basic information on shorebird populations and life histories. For example, less than half the wildlife areas (n = 30) actively survey shorebird use of their areas, and only nine conduct quantitative surveys to estimate seasonal patterns of shorebird abundance. Clearly, accurate information on the timing and abundance of migratory shorebirds is needed in the UMVGL region. Many respondents (n = 22) also mentioned needing materials and opportunities such as literature and workshops on shorebird identification and management strategies. Other needed resources for increasing shorebird management capabilities are additional personnel (n = 16), funding to acquire habitat (n = 7), and water control structures (n = 5).

Table 1. Seasonal occurrence and relative abundance of shorebirds in the Upper Mississippi Valley /Great Lakes shorebird planning region and the Bird Conservation Regions (BCRs) that comprise the planning region.

Species	Entire Planning Region	Boreal Hardwood Transition (BCR 12)	Lower Great Lakes/St. Lawrence Plain (BCR 13)	Eastern Tall Grass Prairie (BCR 22)	Prairie Hardwood Transition (BCR 23)	Central Hardwoods (BCR 24)
Black-bellied Plover <i>Pluvialis squatarola</i>	M	M	M	M	M	
American Golden-Plover <i>Pluvialis dominicus</i>	M	m	M	M	M	m
Semipalmated Plover <i>Charadrius semipalmatus</i>	M	m	M	M	M	m
Piping Plover (Great Lakes Population) <i>Charadrius melodus</i>	M, B	m, B	M	M	M	
Killdeer <i>Charadrius vociferus</i>	M, B	M, B	M, B	M, B	M, B	M, B
Greater Yellowlegs <i>Tringa melanoleuca</i>	M	M	M	M	M	M
Lesser Yellowlegs <i>Tringa flavipes</i>	M	M	M	M	M	M
Solitary Sandpiper <i>Tringa solitaria</i>	M, b	M, b	M	M	M	
Willet <i>Catoptrophorus semipalmatus</i>	m	m	m	m	m	
Spotted Sandpiper <i>Actitis macularia</i>	M, B	M, B	M, B	M, B	M, B	M, b

Species	Entire Planning Region	Boreal Hardwood Transition (BCR 12)	Lower Great Lakes/St. Lawrence Plain (BCR 13)	Eastern Tall Grass Prairie (BCR 22)	Prairie Hardwood Transition (BCR 23)	Central Hardwoods (BCR 24)
Upland Sandpiper <i>Bartramia longicauda</i>	m, b	m, b	m, b	m, b	m, b	m
Whimbrel <i>Numenius phaeopus</i>	m	m	m	m	m	m
Hudsonian Godwit <i>Limosa haemastica</i>	M	M	m	M	M	
Marbled Godwit <i>Limosa fedoa</i>	m, b	m, b	m	M	m	
Ruddy Turnstone <i>Arenaria interpres</i>	M, w	M	M, w	M	M	
Red Knot <i>Calidris canutus</i>	m	m	m	m	m	
Sanderling <i>Calidris alba</i>	M	M	m	M	M	
Semipalmated Sandpiper <i>Calidris pusilla</i>	M	M	M	M	M	M
Western Sandpiper <i>Calidris mauri</i>	m	m	m	m	m	
Least Sandpiper <i>Calidris minutilla</i>	M	M	M	M	M	M
White-rumped Sandpiper <i>Calidris fuscicollis</i>	M	M	m	M	M	m
Baird's Sandpiper <i>Calidris bairdii</i>	M	M	m	M	M	m

Species	Entire Planning Region	Boreal Hardwood Transition (BCR 12)	Lower Great Lakes/St. Lawrence Plain (BCR 13)	Eastern Tall Grass Prairie (BCR 22)	Prairie Hardwood Transition (BCR 23)	Central Hardwoods (BCR 24)
Pectoral Sandpiper <i>Calidris melanotos</i>	M	M	M	M	M	m
Dunlin <i>Calidris alpina</i>	M	m	M	M	M	m
Stilt Sandpiper <i>Calidris himantopus</i>	M	m	M	M	M	m
Buff-breasted Sandpiper <i>Tryngites subruficollis</i>	M	m	M	M	M	m
Short-billed Dowitcher <i>Limnodromus griseus</i>	M	m	M	M	M	m
Long-billed Dowitcher <i>Limnodromus scolopaceus</i>	M	m	M	M	M	m
Common Snipe <i>Gallinago gallinago</i>	M, b	m, B	M, b	M, b	M, b	m
American Woodcock <i>Scolopax minor</i>	M, B	M, B	M, B	M, B	M, B	M, B
Wilson's Phalarope <i>Phalaropus tricolor</i>	M, b	M, b	m, b	M	M	
Red-necked Phalarope <i>Phalaropus lobatus</i>	m		m	m	m	

Codes: B = Breeding, M = Migration, and W = Wintering. **B, M, W** = high concentrations known to occur; region is extremely important to the species relative to the majority of other regions. B, M, W = common or locally abundant, with large numbers known or suspected to occur; region is important to the species. b, m, w = uncommon to fairly common; region is within the species' range and occurs regularly, but is present in low abundance relative to other regions. Blank = does not occur in the region, or only unpredictable, irregular occurrence as a vagrant.

Table 2. Shorebird species priorities in the Upper Mississippi Valley/Great Lakes Region¹.

SPECIES	REGIONAL SCORES ²						AREA IMPORTANCE ³	REGIONAL (NATIONAL) PRIORITY ⁴
	PT	RA	TB	TN	BD	ND		
Highly Imperiled								
Piping Plover (Great Lakes Population)	5	5	5	4	5	5	5	5 (5)
High Concern								
Whimbrel	5	4	2	3*	3	2	3	4 (4)
Marbled Godwit	4	3	4	3*	3	3	3	4 (4)
Buff-breasted Sandpiper	4	5	3	3*	3	4	4	4 (4)
Short-billed Dowitcher	5	2	2	4	3	2	4	4 (4)
American Woodcock	5	1	4	3*	2	3	4	4 (4)
Wilson's Phalarope	4	1	3	4	2	5	4	4 (4)
Greater Yellowlegs	3	4	2	3*	2	1	5	4 (3)
Upland Sandpiper	4*	2	4*	3*	2	3	3	4 (2)
Moderate Concern								
American Golden-Plover	4	3	2	3*	2	3	4	3 (4)
Solitary Sandpiper	3	4	4	3*	3	2	4	3 (4)
Hudsonian Godwit	3	4	3	3*	4	4	4	3 (4)
Ruddy Turnstone	4	3	2	3*	2	2	4	3 (4)

SPECIES	REGIONAL SCORES ²						AREA	REGIONAL
	PT	RA	TB	TN	BD	ND	IMPORTANCE ³	(NATIONAL) PRIORITY ⁴
Red Knot	5	2	2	3*	3	3	3	3 (4)
Sanderling	5	2	2	3*	2	1	4	3 (4)
Black-bellied Plover	5	3	2	3*	2	1	4	3 (3)
Killdeer	5	1	3	3	1	2	4	3 (3)
Semipalmated Sandpiper	5	1	2	3	3	3	4	3 (3)
Western Sandpiper	3	1	2	3*	4	2	3	3 (3)
Least Sandpiper	5	2	2	3*	2	2	5	3 (3)
Dunlin	5	2	2	3	2	3	4	3 (3)
Common Snipe	5	1	2*	3*	1	2	4	3 (3)
Red-necked Phalarope	4	1	2	3	1	3	3	3 (3)
Low Concern								
Willet	3	3	3	3	3	3	3	2 (3)
Stilt Sandpiper	3	3	3	3*	3	3	4	2 (3)
Semipalmated Plover	3	3	2	3*	1	1	4	2 (2)
Lesser Yellowlegs	3	2	2	3	2	1	4	2 (2)
Spotted Sandpiper	3	3	3*	3*	1	1	4	2 (2)
White-rumped Sandpiper	3	2	2	3*	3	3	4	2 (2)
Baird's Sandpiper	3	2	2	3*	3	3	4	2 (2)

SPECIES	REGIONAL SCORES ²						AREA IMPORTANCE ³	REGIONAL (NATIONAL) PRIORITY ⁴
	PT	RA	TB	TN	BD	ND		
Pectoral Sandpiper	3	2	2	3*	2	3	4	2 (2)
Long-billed Dowitcher	2	2	2	3	4	3	4	2 (2)

¹ Species with an Area Importance score < 3 (rarely occur in the region) were not included in the priority list.

² The USSCP species prioritization scheme was used to score, on a scale of 1 to 5 (1 being the lowest concern and 5 being the highest concern), the following variables for each species: Population Trend (PT), Relative Abundance (RA), Threats on the Breeding grounds (TB), Threats on the Nonbreeding grounds (TN), Breeding Distribution (BD), and Nonbreeding Distribution (ND). PT, TB and TN were, in some cases, modified to reflect Regional differences from national scores, and modifications are noted by *.

³ These scores were determined using information in Table 1 and procedures established in the USSCP species prioritization scheme. Details are available in the National Shorebird Conservation Assessment, at <http://www.manomet.org/USSCP/files.htm>.

⁴ These scores were determined using the information in the previous columns of this table and procedures established in the USSCP species prioritization scheme. Priority 5 = highly imperiled species; 4 = species of high concern; 3 = species of moderate concern; 2 = species of low concern; 1 = species not at risk.

Table 3. Land manager responses to a questionnaire on shorebird management in the Upper Mississippi Valley/Great Lakes Region.

Location	State	Managing for shorebirds?	Written management plans for shorebirds?	Monitoring for shorebird presence? ¹	Quantitative surveys for shorebirds? ²
Agassiz National Wildlife Refuge (NWR)	MN	Y	N	Y	N
Andalusia State Refuge	IL	N	N	N	N
Anderson Lake Fish and Wildlife Area	IL	N	N	N	N
Bad River Indian Reservation	WI	Y	Y	Y	N
Bay Mills Indian Reservation	MI	N	N	N	N
Big Muddy National Wildlife Refuge	MO	N	N	N	N
BK Leach & Quiver Island Conservation Area	MO	N	N	N	N
Bois Forte Indian Reservation	MN	N	N	N	N
Carlyle Lake Wildlife Management Area	IL	Y	N	Y	N
Chain O' Lakes State Park/Redwing Slough	IL	Y	N	Y	N
Chautauqua National Wildlife Refuge	IL	Y	N	Y	Y
Crab Orchard National Wildlife Refuge	IL	Y	N	Y	N
Donnelley Wildlife Management Area	IL	N	N	N	N
Driftless Area National Wildlife Refuge	IA	N	N	N	N
Eagles Bluffs Conservation Area	MO	Y	N	Y	N
Erie National Wildlife Refuge	PA	Y	N	Y	N
Horicon National Wildlife Refuge	WI	Y	N	Y	Y
Horseshoe Lake Conservation Area	IL	N	N	N	N
Iroquois National Wildlife Refuge	NY	N	N	N	N
Jasper Pulaski Fish and Wildlife Area	IN	N	N	N	N
Kankakee Fish and Wildlife Area	IN	N	N	N	N
Kaskaskia Fish and Wildlife Area	IL	N	N	N	N
Kingsbury Fish and Wildlife Area	IN	N	N	N	N
L'Anse Indian Reservation	MI	N	N	N	N
Lac Courte Oreilles Indian Reservation	WI	N	N	N	N
Lac Vieux Desert Indian Reservation	MI	N	N	N	N
LaSalle Fish and Wildlife Area	IN	Y	Y ³	Y	N
Leech Lake Indian Reservation	MN	N	N	N	N
Marias Tempe Claire Conservation Area	MO	Y	N	Y	N
Marshall Fish and Wildlife Area	IL	N	N	N	N
Mark Twain NWR, Annada District	MO	Y	N	Y	N
Mark Twain NWR, Brussels District	IL	N	N	Y	N
Mark Twain NWR, Wapello District	IA	N	N	N	N

Location	State	Managing for shorebirds?	Written management plans for shorebirds?	Monitoring for shorebird presence? ¹	Quantitative surveys for shorebirds? ²
Mermet Lake Conservation Area	IL	N	N	Y	N
Mille Lacs Lake Indian Reservation	MN	Y	N	N	N
Mingo National Wildlife Refuge	MO	Y	Y ³	Y	N
Mississquoi National Wildlife Refuge	VT	N	N	N	N
Montezuma National Wildlife Refuge	NY	Y	N	Y	N
Necedah National Wildlife Refuge	WI	N	N	N	N
Oneida Indian Reservation	WI	N	N	N	N
Ottawa National Wildlife Refuge	OH	Y	N	Y	Y
Pigeon River Fish and Wildlife Area	IN	Y	N	N	N
Pine Creek Gamebird Area	IN	Y	N	Y	N
Presque Isle State Park	PA	Y	Y	Y	Y
Red Cliff Indian Reservation	WI	N	N	N	N
Red Lake Indian Reservation	MN	N	N	Y	N
Rend Lake Fish and Wildlife Area	IL	N	N	Y	N
Rice Lake National Wildlife Refuge	MN	N	N	Y	Y
Sanganois Conservation Area	IL	N	N	N	N
Seney National Wildlife Refuge	MI	Y	N	Y	N
Sherburne National Wildlife Refuge	MN	Y	N	Y	N
Shiawassee National Wildlife Refuge	MI	Y	N	Y	Y
Squaw Creek National Wildlife Refuge	MO	Y	Y	Y	Y
St. Croix National Scenic Riverway	WI	N	N	N	N
Swan Lake National Wildlife Refuge	MO	Y	N	Y	Y
Ted Shanks Conservation Area	MO	Y	N	N	Y
Trempealeau National Wildlife Refuge	WI	N	N	Y	N
Tri-County Fish and Wildlife Area	IN	Y	N	N	N
Upper Mississippi River Conservation Area	MO	N	N	N	N
Upper Mississippi NW & FR, Lacrosse District	WI	Y	N	N	N
Upper Mississippi NW & FR, McGregor District	IA	Y	N	N	N
Upper Mississippi NW & FR, Savanna District	IL	Y	N	Y	N
Upper Mississippi NW & FR, Winona District	MN	Y	N	Y	N
Upper and Lower Sioux Indian Reservations	MN	N	N	N	N
White Earth Indian Reservation	MN	N	N	N	N
Willow Slough Fish and Wildlife Area	IN	Y	N	N	N

¹ Includes informal monitoring and incidental records of shorebird occurrence from waterfowl surveys conducted on the area.

² Includes data from quantitative surveys that are sent to the International Shorebird Survey.

³ Strategies for shorebird management are incorporated into written water management plans.

Note: Additional responses that could not be summarized as yes / no answers are given in the text.



