

Shorebirds

July 2000

Fish and Wildlife Habitat Management Leaflet

Number 17



American avocet.

General Information

Shorebirds belong to the diverse avian Order Charadriiformes, suborder Charadrii, and members occupy a wide range of environments. Habitats include coastal, saline, and freshwater wetlands, flooded agricultural fields, interior grasslands, and arctic tundra. Most shorebirds have small bodies with long, thin legs for wading. Three unwebbed toes point forward and the hind toe is reduced or absent (except in the partially webbed-toed American Avocet and lobed-toed phalaropes). Beaks come in a variety of shapes and sizes, and each is designed for a specific foraging substrate. Shorebirds such as oystercatchers and sandpipers exhibit countershading, where dark colors on the back balance the shaded light-colors on the underside. Killdeer and Semipalmated plovers display disruptive coloration bold patterns break up the bird's outline to help avoid detection by predators. If juvenile birds survive their first year, life spans greater than ten years are not uncommon for some shorebird species.

Shorebirds are champion migrators, travelling thousands of miles between Arctic nesting grounds and wintering grounds in Central and South America. Migration routes typically follow coastlines or interior water sources. Staging areas and stopover sites in North America provide abundant food resources crucial for supplying the energy needed to complete migration. About 51 species migrate through North America each year. However, declining numbers have been observed at many staging grounds.

Wetland habitat alterations have contributed to significant decreases in populations of Eskimo curlews, buff-breasted sandpipers, whimbrels, and sanderlings. Nearly all *Charadrius* plover species including mountain plovers, piping plovers, killdeer, and snowy plovers have experienced population declines and have serious status concerns. In the lower 48 states, more than 50% of original wetland habitat suitable for shorebirds has been destroyed or degraded since the late 1700s. Coastal and wetland developments have limited foraging and staging areas along migration routes. Inland fresh and salt water habitats continue to be threatened by industrial and agricultural land use, agricultural runoff, and chemical pollution. Human use of

Family name	Species representatives
Haematopodidae	Oystercatchers
Recurvirostridae	Stilts and avocets
Charadriidae	Lapwings and plovers
Scolopacidae	Sandpipers, godwits, curlews, willet, yellowlegs, phalaropes, dunlin, red knot, turnstones, dowitchers, and whimbrel
Jacaniidae	Jacanas

shorebird habitats (e.g., hiking, fishing, motor vehicle use, and walking unleashed dogs) also disturbs nesting shorebirds and can cause them to abandon nest sites, eggs, or young.

This leaflet provides an introduction to the habitat requirements of shorebirds and is intended to assist landowners and managers in developing comprehensive shorebird management plans. The success of any management plan depends on targeting the specific needs of the species in question and analyzing and managing habitats to maximize its quality. Practical habitat management activities that attract shorebirds and help maintain existing populations are included. This leaflet encourages landowners to engage experienced wildlife professionals to identify and achieve shorebird management objectives.

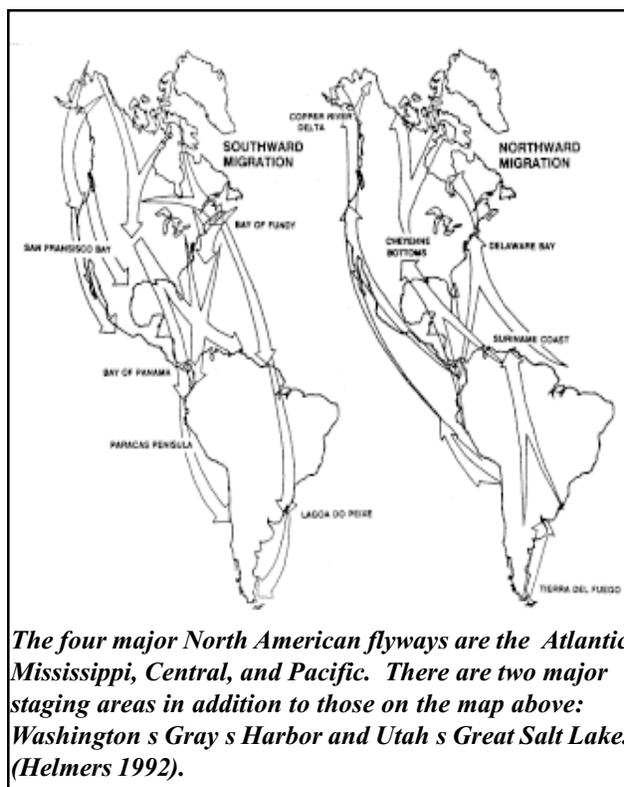
Range

The ranges of some shorebird species span entire continents and oceans. Species of plovers, sandpipers, and phalaropes have breeding ranges throughout the U.S. and Canada. Winter ranges for many shorebirds extend from the southern United States to the Caribbean, Mexico, and Central and South America. Breeding ranges of some oystercatchers, plovers, and killdeer stretch from southern Canada down to southern Atlantic and Gulf Coast shorelines. Populations of killdeer, American avocets, marbled godwits, upland sandpipers, snowy plovers, and piping plovers occupy breeding ranges in grasslands of the Great



Snowy plover.

U.S. Fish and Wildlife Service



Plains. The Great Basin region of North America supports breeding groups of long-billed curlews, mountain plovers, snowy plovers, and black-necked stilts.

Migration

Migration routes are largely determined by food availability. Superabundant food resources drive migrating shorebirds to build fat reserves needed to complete migration routes. For example, the white-rumped sandpiper travels about 13,000 miles to complete one round-trip migration cycle. An enormous amount of energy is needed to complete such a journey. Shorebirds that follow coastlines to wintering grounds have relatively stable foraging opportunities. Predictable tides and seasonal food sources coincide with migration patterns. These birds usually travel in large groups and exhibit a jumping migration strategy (long distance travel over large expanses of water with few stops). If food sources have been depleted at stopover sites, then those shorebirds might not survive migration. Transcontinental (inland) migrants typically travel in small numbers and may hop between stopover sites to reach wintering grounds. This strategy involves flying short distances between stops to replenish fat reserves. Wetland degradation and land-

use conversion have modified many interior stopover sites, reducing the potential of frequent stops. Unpredictable weather and fluctuating water levels in areas like the Great Basin and Prairie Pothole Regions can also negatively affect food supplies.

About two-thirds of all western hemispheric shorebird species leave Arctic breeding grounds in the fall and move south via North American flyways to wintering grounds. The four main migration routes follow the Atlantic coast, Pacific coast, Mississippi, and Central flyways. Most shorebirds winter in the temperate regions of South America and sub-tropical areas of the U.S. and Mexico, and return to northern breeding grounds in the spring. Peak migrations occur from March through May (spring) and from July through September (fall). On the west coast of North America, peak migration times occur later than those in the adjacent plains region. There are seven super staging sites for migrating shorebirds in North America, (along with dozens of other major sites), and each location provides rich foraging opportunities: Alaska's Copper

River Delta, Washington's Gray's Harbor, Canada's Bay of Fundy, Kansas' Cheyenne Bottoms, the Great Salt Lake of Utah, San Francisco Bay, California, and beaches of Delaware Bay in New Jersey, Maryland, and Delaware. For example, 500,000 to 1.5 million shorebirds arrive on and depart from Delaware Bay beaches within a three to four-week period in the spring. This stopover is synchronized with the annual breeding cycle of horseshoe crabs, which come ashore to lay eggs on the beach. Birds gorge themselves on crab eggs to store fat needed to fuel their journey to northern breeding grounds. Effective shorebird management plans could help protect these and other important habitats for migrating shorebirds.

Conservation of wintering and staging areas for migrating shorebirds is a growing concern. Increasing harvest of horseshoe crabs by fishermen may threaten populations of common species like red knots, sand-erlings, ruddy turnstones, and semipalmated sandpipers. Loss of Central and South American wintering sites presents an additional challenge for shorebirds.

Common shorebird food items.

Aquatic insects:

¥ Water boatmen, backswimmers, water scorpions, giant water bugs, diving beetles, dragonfly nymphs, caddis flies, mayfly nymphs, pillbugs, and larvae of mosquitos, flies, midges, crane flies, soldier flies, dance flies, snipe flies, horseflies, brine flies, flower flies, and water beetles.

Crustaceans and other aquatic invertebrates

¥ Crayfish, fiddler crabs, horseshoe crab eggs, shrimp, squid, clams, mussels, oysters, snails, polychaete and oligochaete marine worms, amphipods, and copepods.

Terrestrial invertebrates

¥ Grasshoppers, flies, gnats, wasps, crickets, beetles, caterpillars, cutworms, earthworms, bloodworms, spiders, ants, weevils, mites, and ticks.

Fishes

¥ Very small herring, smelt, minnows, dace, killifishes, and other small fish.

Reptiles and amphibians

¥ Skinks, small frogs, tadpoles, and salamander larvae.

Plants (minor part of diet)

¥ Grasses, sedges, tender shoots, wild berries, roots and tubers of aquatic and marsh plants, pondweeds, wigeon grass, and seeds of bulrushes and smartweeds.



More than 30 shorebird species take advantage of the interior wetlands in the great Plains and Prairie Pothole Regions. The Prairie Pothole Region includes portions of Alberta, Saskatchewan, Manitoba, Montana, North Dakota, South Dakota, Minnesota, and Iowa. Large numbers of breeding birds gather in the Prairie Pothole Region including Wilson's phalarope, killdeer, marbled godwits, American avocets, and piping plovers. These upland areas are typically grassland and agricultural lands interspersed with shallow depressions filled with water. Seasonal changes in water levels and severe weather (droughts or floods) can destroy food and cover. Prescribed burns, mowing, and grazing should be excluded during the nesting season. Integrated wetland management helps maintain the upland and aquatic habitats required by shorebirds. (Figure courtesy of Prairie Pothole Joint Venture.)

Habitat Requirements

Comprehensive shorebird management should focus on habitat improvements for local migrant species. Landowners should consider the length of nesting seasons when coordinating shorebird management planning with other land uses. The majority of shorebird species nest between late April and early July, but courtship and territory establishment activities usually start in March. Most chicks fledge by mid-August. It is beyond the scope of this leaflet to identify detailed habitat requirements for each individual species, but broad guidelines for the general habitat needs of most species are provided.

Food and foraging sites

Interior grasslands, beaches, natural wetlands, and flooded agricultural fields provide foraging areas for a wide variety of shorebirds. Most shorebirds forage in water less than four inches deep, although some forage in upland sites (e.g., curlews, upland sandpiper, woodcock) and in deeper water by swimming (e.g., phalaropes). Most shorebird diets consist of insects, aquatic invertebrates, mollusks and small fish. Through resource partitioning, several different species may forage together in suitable habitats. Each species seeks its preferred foods by using distinct feeding methods, which helps prevent direct competition among species for food. Some members of one species may assist the foraging efforts of another species without significant costs or benefits. For example, beaters stir up prey while attendants follow and forage in the disturbed substrate. Coastal shorebirds usually sort themselves into preferred feeding habitats as the high tide recedes. Least sandpipers feed on insects in drier marsh mud while dowitchers probe the substrate in shallow water for mollusks. Sanderlings search for crustaceans in wet sands, while greater yellowlegs feed in deeper water, snatching small fish from the surface.

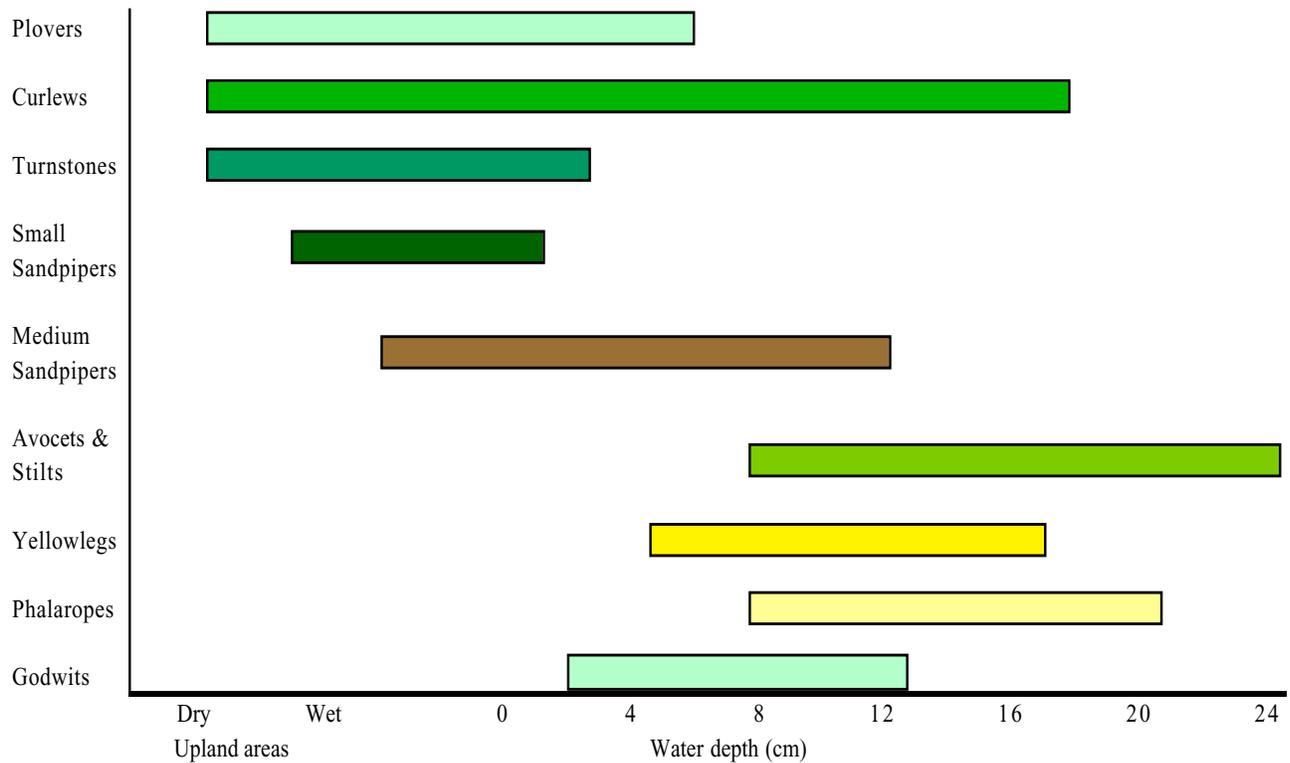
Waste grain in harvested agricultural fields is a minor food item (if present, about 5% of the total diet). However, flooded agricultural fields can be a rich source of invertebrate foods for wintering shorebirds.

Maintaining viable invertebrate populations is the most important aspect of shorebird food management, particularly where water levels change frequently. Comprehensive wetland management that enhances invertebrate populations can help compensate for loss of more natural shorebird feeding sites associated with loss and degradation of wetland habitats.

Natural nesting cover

Most shorebird species prefer open, sparsely vegetated nesting cover near shallow water. These areas include lowland arctic tundra, wide sloping beaches, and wetlands edges. Shorelines of inland aquatic habitats also support local breeding popu-

Typical foraging depths of various shorebirds (from Helmers 1992).



lations. Some shorebirds favor natural nesting substrates, such as broken bits of shells and pebbles, on sandy beaches. Preferred vegetation types include morning glory vine, sea oats, and wrack (dead organic material) washed up by the tide. Nest sites are selected near feeding sites and where a source of fresh water for adults and chicks

is available. Shorebird chicks can not metabolize salt for the first few weeks of life, so adult birds need to nest close to a freshwater source. Later, the birds can move to more saline wetlands to take advantage of their ample invertebrate food resources. Shorebird nesting habitats are most productive when free from human disturbance.



Spotted sandpiper

Artificial nesting cover

Spoil islands (composed of mixtures of sand, silt, and clay) formed by disposal of dredged material are becoming important nesting habitats for shorebirds, as natural coastal nesting habitats have been lost or degraded in many areas. Shorebirds usually favor nesting on sandy substrates on spoil islands than on finer textured dredged material. Killdeer have adapted to nesting sites on gravel covered roof tops, especially in the southeastern United States. These sites are frequently selected for nesting, even where feeding sites are as much as two miles away.



Long-billed dowitcher.

U.S. Fish and Wildlife Service

Wintering and migration staging areas

Wintering shorebirds usually gather in large flocks on estuarine mudflats, inland shorelines, and other open wetland areas. The spacing of wintering birds depends on location, time of day, and density of food resources. Some migrating birds feed along the margins of inland lakes and rivers. Spotted sandpipers, Wilson's plovers, and wandering tattlers defend individual feeding territories that have well-defined boundaries. Winter territories may be occupied for several weeks or months. Stilt sandpipers, red knots, and short-billed dowitchers move in large foraging flocks.

Migrating shorebirds need suitable staging areas to complete migration. Inland stopover sites for migrating birds are just as important as coastal habitats. Fluctuating water levels in inland wetlands provide mudflat and shallow water sites used by feeding shorebirds. Upland areas interspersed with wetlands are also important, making the Prairie Pothole Region a major stopover area. Most shorebirds favor foraging areas with less than 25 percent vegetative cover, whether it is sandy beaches or shortgrass prairies.

The future of many migrating shorebirds depends on the suitability of wintering and staging sites. Winter habitats in Central and South America are quickly disappearing because of increased human land development activity. Chemical or oil spills at super staging sites could significantly reduce food resources and negatively affect migrating shorebird populations. Ensuring adequate quantity and quality of migrating and winter habitats is important, as most shorebirds spend nine or ten months of the year in these areas.

Interspersion of habitat types

Shorebird habitat management should emphasize maintaining a variety of wetland types to support the needs of various species. A mixture of aquatic and upland habitats maximizes habitat quality for some shorebirds. Optimal habitat requirements depend on whether the

Shorebird habitat requirements summary table.

Habitat component	Habitat requirement
Food	Aquatic insects and other invertebrates including crustaceans, and mollusks, terrestrial insects, small fish and amphibians.
Water	Adult food contain sufficient water; chicks need fresh water source during the first few weeks of life.
Nesting habitat	Most prefer open, sparsely vegetated sandy habitats along coastal and inland waterways and wetlands; arctic lowland tundra. Human disturbance reduces nesting habitat potential.
Wintering and migrating habitats	Wide variety of coastal and inland waterways and wetlands, including natural and artificially managed wetlands and flooding agricultural lands.
Habitat interspersion	Prefer feeding and nesting sites in close proximity.

Factors affecting local shorebird habitat quality

Habitat component	Availability/Quality			
	High	Medium	Low	Absent
Food and foraging habitat				
Nesting habitat				
Winter and roosting habitat (May not apply to areas in which shorebirds do not winter.)				
Interspersion of habitat components				

species is nesting, feeding, or migrating. Most shorebirds nest or roost in close proximity to foraging habitats.

Minimum habitat area

Most shorebirds do not have a minimum area requirement, but plovers, oystercatchers, and others are known to defend nesting territories. Migrating flocks and individual pairs may have well-defined foraging boundaries for a few weeks or months.

Limiting Factors

For planning purposes, use the table above to subjectively rate the availability and quality of shorebird habitat within a planning area, based on the above habitat requirement descriptions. Habitat components that are absent or rated low are probably limiting shorebird habitat quality.

Shorebird Management

It is important to consider landowner objectives, local landscape features, and population goals for species of concern when planning management actions for shorebirds. In general, there are two strategies for improving shorebird habitat: 1) protect existing sites by restricting human activities to limit disturbance when shorebirds are present, and 2) improve the habitat with increased food availability (water depth management) and nesting or roosting areas (vegetation management). Prohibiting all human disturbance is not always possible, but

landowners should attempt to limit human activity in shorebird nesting areas at least during the nesting season. Since shorebirds occupy a wide range of habitats, management plans should focus on supporting both suitable wetland and upland habitats.

Managing coastal habitats

Many preferred coastal habitats on open, sandy beaches are eroding from natural and man-made causes. Natural succession of primary dunes into secondary dune and scrub-shrub habitats produces thicker vegetation not favored by nesting shorebirds. Human disturbance often hastens natural beach eroding processes and reduces the amount of available nesting habitat. Naturally occurring plants like sea oats and morning glory vines stabilize dunes and provide more suitable nesting cover. Shell and gravel debris can be deposited to help control thick vegetation, creating additional nesting areas for shorebirds. Spoil islands and eroded shorelines can be enlarged by depositing clean dredge materials.

Managing wetlands for shorebirds

Integrated wetland management, management that maximizes benefits for wetland wildlife, also supports shorebirds as well as waterfowl and wading birds. Natural wetlands should be preserved whenever possible. In more artificial wetland settings, water control structures are commonly used to regulate water levels to stimulate the growth of wetland plants whose seeds and tubers are consumed



Short-billed dowitchers

by waterfowl (ducks and geese). Shorebirds take advantage of the rich invertebrate populations found in the saturated and flooded substrates of wetlands managed for moist soil plants.

Seasonal flooding and sequential draw down of moist soil wetland water levels provide productive shorebird foraging substrates. In the late summer or early fall, dry areas can be reflooded (four to six inches) for the fall migration. Flooding in the early fall, before the first major freeze, also allows invertebrate food resources to survive the winter. Water levels can be drawn down in the spring by systematically draining areas that are regulated by flashboard risers or other water control structures. Landowners can start drawdown of fall-flooded areas at the rate of one inch per week, just before spring migration starts. Most foraging shorebirds prefer water depths that vary from one to six inches.

Shallow disking of moist soil areas every two to three years removes thick, emergent vegetation that is not favored by shorebirds. Emergent plants grow along shorelines and extend above the surface of the water. Disking removes this vegetation and reconditions the wet soil by incorporating organic plant material, which attracts invertebrates. Draining and flooding practices should be planned, with the help of local wildlife professionals, to mimic natural flooding cycles as much as possible to benefit shorebirds and other wetland wildlife. NRCS

personnel can help landowners determine the best locations for water control structures, as well as with installation.

Where water level management is not feasible, such as in natural wetlands and wetlands restored without water control structures that manipulate water levels, and where wetlands are restored to function as natural systems, natural hydrologic cycles periodically provide high-quality shorebird habitat.

Managing agricultural lands for shorebirds

Flooded agricultural lands can make productive wintering and migrating shorebird foraging habitats. Where water control structures and levees provide water management opportunities on crop fields, water management can greatly improve shorebird habitat. Agricultural fields flooded during winter can be dewatered at a rate of one inch per week beginning in late February or early March to benefit early migrants. The types of crops, planting dates, and harvest dates determine draw down rates and how long fields are flooded.

Insects and other invertebrates found in cultivated and wild rice fields on the Gulf Coastal Plain, Mississippi Alluvial Valley, and California's Central Valley provide food resources for shorebirds and other wildlife.



Flooded agricultural fields provide productive foraging sites for migrating and wintering shorebirds due to their potentially high invertebrate production.

Human disturbance and effects on shorebirds

Studies show human disturbance (e.g., walking, dog walking, sunbathing, birdwatching, fishing, and driving on the beach) negatively impacts populations of nesting, migrating, and foraging shorebirds. Disturbed migrating shorebirds cannot build adequate fat stores and may be forced to fly underweight. Consequently, these birds may not survive to reach their next staging site thousands of miles away. Nesting shorebirds may abandon eggs or chicks if they are flushed repeatedly. During high tide, shorebirds and humans compete for space on thin bands of beach and tips

of coastal barrier islands. Permanent or seasonal closure of areas used by shorebirds may be required to sustain local nesting populations.

Driving and walking buffer zones limit human use at high tide. Prohibiting human activity above the average high tide line helps keep shorebirds separated from human activities. If area closure is not an option, signs that describe local species should be posted (by authorized persons) in areas of high shorebird concentrations. Leaflets and educational materials about regional shorebird species and habitat conservation should be made available at public beach access sites.

Habitat component	Management options for increasing habitat quality or availability	Cons. Practices and assistance programs
Food	Protect coastal and freshwater wetlands, marshes, lakes, and ponds from siltation and non-point source pollution by fencing off livestock. Plant riparian vegetation to stabilize banks and shorelines.	390, 643, 657 WRP, WHIP, EQIP, PFW, CRP
	Reduce pesticide use, especially near water, where applications reduce invertebrates.	
	Permanent or seasonal closures for areas with high shorebird concentrations (nesting, wintering, or foraging) to limit human disturbance establish tidal walking/driving buffer zones (50m).	
Nesting and migrating habitats	Promote protection of natural shorebird nesting areas: barrier islands, shorelines, wetlands.	327, 390, 643, 657 WHIP
	Enhance artificial nesting sites with natural substrates or sparse vegetation.	
	Control thick vegetation in grasslands and conduct appropriate grassland mgmt. practices.	338, 528a, 645 PFW, WRP, WHIP
	Reduce herbicide use when application results in loss of nesting, foraging, or loafing cover.	
	Maintain appropriate water levels in wintering and migration habitats.	
Water	Provide freshwater source for chicks	657 WRP
Interspersion of habitat components	Maintain mosaic of quality habitat through combination of management actions.	

(Right) NRCS Conservation Practices that may be useful in undertaking shorebird management actions.

Code	Conservation Practice
327	Conservation Cover
647	Early Successional Habitat Development
338	Prescribed Burning
528a	Prescribed Grazing
390	Riparian Herbaceous Cover
643	Restoration of Declining Habitats
645	Upland Wildlife Management
657	Wetland Restoration

Programs that provide technical and financial assistance to develop fish and wildlife habitat on private lands.

Program	Land eligibility	Type of assistance	Contact
Conservation Reserve Program (CRP)	Highly erodible land, wetland and certain other lands with cropping history. Stream-side areas in pasture land.	50% cost-share for est. permanent cover and conservation practices, and annual rental payments for land enrolled in 10 to 15 year contracts. Additional financial incentives available for some practices.	NRCS or FSA state or county office
Environmental Quality Incentives Program (EQIP)	Cropland, range, grazing land and other agricultural land in need of treatment.	Up to 75% cost-share for conservation practices in accordance with 10 to 15 year contracts. Incentive payments for certain management practices.	NRCS state or county office
Partners for Fish and Wildlife Program (PFW)	Most degraded fish and/ or wildlife habitat.	Up to 100% financial and technical assistance to restored wildlife habitat under a minimum 10 year cooperative agreement.	Local office of the U.S. Fish and Wildlife Service
Waterways for Wildlife	Private lands.	Technical and program development assistance to coalesce habitat efforts of corporations and private landowners to meet common watershed level goals.	Wildlife Habitat Council
Wetlands Reserve Program (WRP)	Previously degraded wetland and adjacent upland buffer, with limited amount of natural wetland and existing or restorable riparian areas.	75% cost-share for wetland restoration under 10 year contracts and 30 year easements, and 100% cost-share on restoration under permanent easements. Payments for purchase of 30 year or permanent conservation easements.	NRCS state or county office
Wildlife at Work	Corporate lands.	Technical assistance on developing habitat projects into programs that allow companies to involve employees and the community.	Wildlife Habitat Council
Wildlife Habitat Incentives Program (WHIP)	High-priority fish and wildlife habitats.	Up to 75% cost-share for conservation practices under 5 to 10 year contracts.	NRCS state or county office

State fish and wildlife agencies and private groups, such as local Audubon chapters, may have assistance programs or other useful tools in your area.

Management Practices

Management treatments should address the habitat components that are determined to be limiting shorebird habitat potential. For planning purposes, select among the possible action items listed on Page 9 to raise the quality or availability of each habitat component considered limiting. NRCS Conservation Practices and various programs that may provide financial or technical assistance to carry out specific management practices are listed on Page 10.

Available Assistance

Landowners interested in making their individual efforts more valuable to the community can work with the Wildlife Habitat Council and NRCS to involve school, scout, and community groups, as well as state and federal fish and wildlife agency personnel, in habitat projects when possible. On-site education programs demonstrating the necessity of shorebird management can greatly increase the value of a shorebird management project. Corporate landowners should encourage interested employees to start a habitat management team. Involving federal, state and nonprofit conservation agencies and organizations in the planning and operation of a shorebird management plan can greatly improve the project's success. Assistance programs available through various sources are listed for shorebird conservation.

Shorebird Conservation Plans and Programs

Additional information on shorebird conservation is available on the world wide web and elsewhere. Websites listed below contain useful links to find information about shorebirds and wetland habitat conservation. The *Shorebird Management Manual* was designed to coordinate shorebird and nongame species into wetland management efforts. Nesting ecology, habitat requirements, disturbance factors, and management issues for shorebirds in fresh water and coastal wetlands are also included. Other scientific, habitat management, and educational re-

sources are found on the Western Hemisphere Shorebird Reserve Network website at <http://www.manomet.org/WHSRN.htm>.

U.S. Shorebird Conservation Plan

Increasing recognition of conservation opportunities has prompted many public and private landholders, researchers, educators, and policy makers to integrate wildlife management into land use activities. The U.S. Shorebird Conservation Plan focuses on managing shorebird populations while promoting conservation of biodiversity and habitat of common and abundant species. The three major goals of the plan are:

1. Develop a standardized, scientifically-sound system for monitoring and studying shorebird populations that will provide practical information to researchers and land managers for shorebird conservation;
2. Identify the principles and practices upon which local, regional, and national management plans can effectively integrate shorebird habitat conservation with multiple species strategies; and
3. Design an integrated strategy for increasing public awareness and information concerning wetlands and shorebirds.

North American Waterfowl Management Plan Joint Ventures and Partners in Flight professionals work closely with those developing the U.S. Shorebird Conservation Plan to improve management recommendations for other species in prime shorebird habitat. The U.S. Shorebird Conservation Plan website is <http://www.manomet.org/USSCP.htm>.

International Shorebird Survey (ISS)

The Manomet Center for Conservation Science organized the International Shorebird Survey in 1974 to collect information on shorebirds and wetland use. This is now the largest single database on

shorebird migration. Results of ISS surveys show populations of 16 out of 26 shorebirds species in North America have declined since 1972, some by as much as 80 percent. ISS researchers hope to assist management initiatives by monitoring strategic staging sites and learning how different species depend on certain wetlands and flyways. In cooperation with the U.S. Forest Service, Department of Defense, U.S. Fish and Wildlife Service and state agencies, ISS monitoring practices have been successful.

Western Hemisphere Shorebird Reserve Network (WHSRN)

Manomet is also the vehicle for the Western Hemisphere Shorebird Reserve Network. Composed of 145 private and public organizations responsible for over 20 million acres of habitat in seven countries, the primary objective of WHSRN is to study shorebirds and gain international support to protect and conserve important habitat sites. Efforts concentrate on protecting wetlands that international migrants depend on for food and rest, especially in areas where commercial and agricultural land use seems incompatible with shorebird management. WHSRN works to monitor threatened shorebird populations, improve management techniques, and educate local communities to increase awareness of shorebird conservation. WHSRN provides on-site technical assistance to habitat enhancement projects and conducts regular training workshops for wildlife biologists and land managers throughout North America. Contact: Manomet Center for Conservation Sciences, P.O. Box 1770, Manomet, Massachusetts 02345. Tel: (508) 224-6521 or email: whsrn@manomet.org.

Shorebird Sister Schools Program (SSSP)

The Shorebird Sister Schools Program was established by the U.S. Fish and Wildlife Service in Alaska as an educational and public outreach tool to help students, schools, and educators track migrations of shorebirds from their nesting grounds in the Arctic to tropical wintering sites. The interactive, on-line program covers all major flyways in North America and includes an email listserve, workshop listings, and K-12 curriculum. Since

1994, SSSP has offered non-governmental organizations, schools and researchers opportunities to work with state and federal wildlife agencies and protect wetlands while monitoring migrating shorebirds. See www.fws.gov/r7enved/sssp.html.

North American Waterfowl Management Plan (NAWMP)

The primary objective of the NAWMP focuses on reducing wetland loss while enhancing existing habitat for wetland wildlife. Although management of waterfowl populations has been its primary goal, shorebirds and other wetland-dependent wildlife species are also targeted in the plan's management efforts.

Prairie Pothole Joint Venture (PPJV)

The Prairie Pothole Joint Venture focuses on providing quality wetland habitats to waterfowl and migratory nongame species, including shorebirds. In 1987, PPJV was developed under NAWMP and includes portions of Montana, North Dakota, South Dakota, Minnesota, and Iowa. The Prairie Habitat Joint Venture (PHJV) includes the Canadian provinces of the Prairie Pothole Region: Alberta, Saskatchewan, and Manitoba. The PPJV hopes to protect 2 million acres of wetland and associated upland habitats, and restore or enhance up to 5 million additional acres for waterfowl and nongame migratory bird species.

Conclusion

Effective shorebird management plans include techniques that sustain and improve regional habitats, food sources, and migration staging sites. Landowners can provide quality habitat for shorebirds if they incorporate the needs of local shorebird species with habitat management strategies. Most importantly, landowners and managers must develop (or supplement) a reliable food source free from human disturbance. Staging sites are important areas for migrating and wintering shorebirds, so they should be preserved to protect habitat quality and support a wide variety of foraging opportunities. Managing coastal and interior wetlands for shorebirds also benefits waterfowl, wading birds, and other wetland-associated wildlife.

The key to successful, long-term shorebird management is clear communication between landowners and natural resource professionals. Economic and social objectives must be defined before management actions take place. Biologists can supply technical information, and landowners learn about environmental stewardship and habitat management on their property.

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100 Webster Circle, Suite 3
Madison, Mississippi 39110
(601) 607-3131

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Wildlife Habitat Council

1010 Wayne Avenue, Suite 920
Silver Spring, Maryland 20910
(301) 588-8994

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