13.2.14. Management of Habitat for Breeding and Migrating Shorebirds in the Midwest

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Shorebirds have always relied on the extensive network of natural wetlands from Texas to North Dakota. This network has now been fractured by wetland drainage and agriculture to the point where suitable wetlands are absent in much of the Midwest. Habitat loss and the resulting risk of population decline highlight the importance of management of shorebirds on refuges, hunting clubs, and preserves for both breeding and migrating species.

Because shorebirds, like waterfowl, depend on wetlands throughout the year, the loss of natural wetlands in the Midwest poses a real threat. Unfortunately, shorebirds are slow to recover from population declines caused by human disturbance; for example, the Eskimo curlew has never recovered from being overhunted at the turn of the century. Many species, particularly those that nest in the lower 48 states, have declined in this century because of habitat loss. Arctic nesting species are relatively safe in remote breeding grounds, but are vulnerable to degradation of habitats critical to migration through the Midwest.

This chapter provides guidance for wetland managers in midwestern states for attracting migrating and breeding shorebirds. These suggestions will benefit most of the 40 species that migrate or breed in 12 states of the mid-continent region: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin (Table). Emphasis is on migrating species because they can benefit the most from the kind of managed wetland habitat usually available on mid-continent refuges. The unique value of managed wetlands is their capacity to buffer the effects of both drought and flooding in surrounding wetland habitat.

Management of Breeding Shorebirds

Management of grassland can create essential upland habitat for breeding shorebirds through grazing, mowing, or prescribed burning. Before European settlement, breeding shorebirds specialized in exploiting the grassland mosaics left in the path of roaming buffalo herds or created by prairie fires. Today the appropriate habitat is becoming increasingly rare because native rangeland is converted to cropland throughout the Midwest. Breeding shorebirds nest in a wide range of habitat from unvegetated wetland beaches to moderately tall, dense grass in the uplands. Long-billed curlews, marbled godwits, willets, killdeer, and mountain plovers forage and nest in the short (<15 cm; <6 inches) sparse vegetation of open grasslands and often nest hundreds of yards from wetlands. Wilson's phalaropes and upland sandpipers use somewhat taller (10–30 cm;

Table. *Shorebirds that breed, migrate, or winter in twelve midwestern states.*

Species	Breeding	Migrating	Wintering
Snowy plover	X	X[a]	
Piping plover	X	X	
Mountain plover	X	X	
Semipalmated plover		X	
Killdeer	X	X	X
Lesser golden-plover		X	
Black-bellied plover		X	
Black-necked stilt	X	X	
American avocet	X	X	
Spotted sandpiper	X	X	
Ruddy turnstone		X	
Upland sandpiper	X	X	
Sanderling		X	
Dunlin		X	
Baird's sandpiper		X	
Red knot		X	
White-rumped sandpiper		X	
Stilt sandpiper		X	
Western sandpiper		X	
Pectoral sandpiper		X	
Least sandpiper		X	
Semipalmated sandpiper		X	
Willet	X	X	
Common snipe	X	X	X
Short-billed dowitcher		X	
Long-billed dowitcher		X	
Marbled godwit	X	X	
Hudsonian godwit		X	
Long-billed curlew	X	X	X
Eskimo curlew		X	
Whimbrel		X	
Ruff		X	
American woodcock	X	X	X
Lesser yellowlegs		X	
Greater yellowlegs		X	
Solitary sandpiper	X	X	
Buff-breasted sandpiper		X	
Red phalarope		X	
Red-necked phalarope		X	
Wilson's phalarope	X	X	

[a] An X indicates presence in at least one of the states of the mid-continent region during the indicated time. More detailed accounts of breeding and wintering range can be found in Hayman et al. 1986.

4–12 inches) vegetation for nesting. Phalaropes are often in wet meadows adjacent to permanent or semi-permanent wetlands, but upland sandpipers occupy drier grassland sites not associated with wetlands. American avocets and endangered piping plovers nest on bare to sparsely vegetated beaches of saline wetlands.

Nesting shorebirds avoid tilled fields and prefer native grassland to planted grass. Timely management on native grasslands can increase diversity and provide habitat for many species of breeding shorebirds. Prescribed burning benefits all nesting shorebirds. Moderate to heavy grazing or mowing, especially on wetter sites, may benefit nesting habitat for long-billed curlews, killdeer, mountain plovers, willets, and marbled godwits. Upland sandpipers benefit from light grazing or mowing in the wetter, eastern half of the Midwest. To the west, on drier sites, such management may be unnecessary. Grazing and associated trampling can be effective at controlling vegetation on wetlands managed for godwits and willets; but piping plovers abandon beaches grazed by livestock.

For many breeding shorebirds, landscape context or juxtaposition of habitats is important. During the breeding season, long-billed curlews, killdeer, mountain plovers, and upland sandpipers forage and nest in the same type of upland habitats; but Wilson's phalaropes, American avocets, piping plovers, marbled godwits, and willets depend on the invertebrates in surrounding wetlands. American avocets and piping plovers require shallow, saline basins for feeding and brood rearing. Wilson's phalaropes feed in open water to depths of 30 cm (12 inches) in seasonal to permanent wetlands. Marbled godwits and willets are most abundant in areas with a variety of wetland types; they feed at or near shorelines with minimal vegetation. Ephemeral and temporary ponds are important feeding sites early in reproduction, whereas seasonal, semi-permanent, and saline wetlands provide foraging habitat throughout nesting and brood rearing.

Management of Migrating Shorebirds

In the spring, shorebirds that nest in the Arctic usually migrate through the Midwest after the breeding species have already arrived. The migrating shorebirds stop opportunistically to feed. They accumulate fat reserves that are necessary for continued migration and possibly for reproduction. During migration, many species look for a specific combination of habitat elements that include:

- a wetland in partial drawdown,
- invertebrate abundance of at least 100 individuals per square meter,

- a combination of open mudflat and shallow water (3 to 5 cm; 1 to 2 inches) in a wetland basin with gradually sloping sides, and
- very little vegetation.

Any one of these elements may be available, but without invertebrates, the birds do not stay.

The key to managing habitat for migrating shorebirds is to encourage invertebrate production and then make the invertebrates available to the birds. Aquatic invertebrates increase when wetlands are fertilized by mowing and grazing, but water control in the impoundment makes the job easier. The proper regime of drawdown and flooding can stimulate plant growth and decomposition and create a detrital food source for invertebrates. When the water is drawn down slowly (2 to 4 cm per week) during the appropriate times of the year, shorebirds are attracted to the available invertebrates. In general, water depth in which birds forage and body size of the birds correlate; larger birds tend to forage in deeper water. Some species may be attracted by shallow water, others, by mudflats. Some forage at the edge of the receding water line. If the interface between mud and water remains constant, they can deplete the invertebrates available to them. A slow, continuous drawdown provides the birds with new habitat and invertebrates. Each individual shorebird may only stay for a few days, but over several weeks, thousands of individuals of many species may benefit.

Timing of Migration

Shorebirds migrate through the Midwest over a wide span of time in the spring and an even wider span in fall. Because the timing of migration varies with latitude, managers should link drawdowns to the local migration phenology. The following dates are offered only for general guidance. Spring drawdowns should be scheduled for early to mid-April and through May, depending on the latitude of the refuge. Refuges in Missouri, for example, should begin drawdowns in early to mid-April and continue slowly for several weeks. Refuges in Minnesota and Michigan should begin drawdowns in late April to early May and continue until early June. In late summer, drawdowns can be scheduled from July to October throughout the region. If the wildlife area has more than one impoundment, managers should draw them down asynchronously (see *Fish and Wildlife Leaflet* 13.4.6).

In terms of shorebird conservation, spring drawdowns may be particularly important in northern refuges because wetlands in drawdown are usually rare at this time of the year (droughts are an exception). In southern refuges, drawdowns may be especially important in fall when shorebird habitat is rare in the surrounding unprotected land.

Food Preferences

Shorebirds feed primarily on Chironomidae (midge) larvae during migration through the Midwest. Whether shorebirds prefer midges or simply eat whatever is most abundant in a wetland during a drawdown is not clear. Shorebirds probably pick the largest and easiest to catch aquatic larval form. For example, a study at the Shiawassee National Wildlife Refuge in Michigan demonstrated that shorebirds preferred slow-moving beetle larvae (Haliplidae) to the much smaller midge larvae.

Several studies revealed that, irrespective of wetland type, midge larvae are often the most abundant invertebrate. This is primarily because midges have solved several basic problems in the wetland environment. They adapted to the enormous variation in conditions that are typical of the average wetland; they can cope with freezing, drying, high temperatures, high salinity, and low oxygen. In a word, they are flexible and, as a result, adaptively radiated into a variety of niches in the wetland basin.

Chironomidae Life History

Midges have four life stages: egg, larva, pupa, and adult. The larvae progress through four instar stages during which they grow from 2 mm to as large as 24 mm. Because development is temperature dependent, four to five generations may be present in a single season in warm southern wetlands, whereas in the Arctic, one generation may take 7 years to pass through all stages. Irrespective of length of development, midges spend most of their life as larvae. The egg, pupa, and adult stages pass quickly, each in a matter of days.

Because midges are such a major component of the wetland environment, it should not be surprising that they follow the general rules of most aquatic invertebrates:

- species diversity increases with structural diversity of vegetation,
- species diversity increases with water permanence.

However, species diversity may not be the best goal of water management designed specifically for shorebirds. For shorebird management, midge biomass, not diversity, should be the primary goal.

The most important midges for migrating shorebirds are the Chironominae species known as bloodworms, which are usually in the genus *Chironomus*. The larva are bright red because they contain hemoglobin and can withstand water with low levels of dissolved oxygen. They grow to be as long as 24 mm and are often among the earliest colonizers in newly available habitat. They function in a wetland by burrowing throughout the detritus, and they consume algae, primarily diatoms, that flourish in the detrital layer. Their burrowing churns and aerates the bottom, accelerating decomposition and microbial activity. They are often most abundant in areas of shallow, open water unshaded by submergent and emergent vegetation, thus promoting algal growth. They form tubes of detritus and usually feed from these tubes. Because they flourish in warm, shallow water and are bright red, they are prime targets for foraging shorebirds.

Management of Habitat for Midge Larvae

During spring, shorebirds congregate where large bloodworms have overwintered and are exposed in the shallows of gradually receding wetlands. The purpose of management specifically for shorebirds should be to imitate these conditions. Because many waterfowl hens and broods also consume midge larvae, management of habitat for shorebirds is also beneficial for waterfowl. Early colonizing midges, such as *Chironomus tentans*, flourish in wetlands maintained in an early successional stage typical of moist-soil-unit management. This keeps the plant and midge community simple and can lead to a large population (and biomass) of detrivorous midge larvae. The community remains simple when water fluctuates annually or biannually. Disking in the moist-soil units also keeps the community of plants in early succession. Wetland managers should try a variety of approaches because the success of any approach varies with location and climate. Although management in spring is stressed, each management regime can be used in late summer by simply delaying the drawdown until the peak of the southbound shorebird migration. On refuges with more than one managed wetland, water regimes should be manipulated asynchronously so that in any given year some shorebird habitat is available during both spring and fall.

No management is complete without some level of evaluation to determine whether midge larvae and shorebirds have responded as expected to the water management. An attempt should be made to census shorebird populations on the managed wetlands and to sample midge larvae in the wetland sediment. Censuses of shorebirds can be conducted as part of a routine wildlife inventory for the refuge, and core samples can easily be taken for the midge larvae. Cores should be taken with a simple core sampler (a graduated cylinder with a diameter of approximately 7 to 10 cm is an excellent core sampler). The core should be taken to a depth of approximately 3 cm in the mud and should be washed through a screen. The midges can be most accurately counted while they are alive and colorful. The number of midge larvae per square meter of mud flat can be extrapolated from the simple count of larvae in the core sample. This number should be at least 100 midge larvae per square meter to successfully attract and hold shorebirds.

Management Regimes for Shorebirds

Temporary Wetland (Moist Soil Unit) —Winter Drawdown

Begin a slow drawdown in early to mid-July. The slow drawdown allows midge larvae to form cocoons and prepare for desiccation. Leave the wetland moist throughout the summer to encourage production of moist soil (annual) plants. The wetland can remain dry throughout the winter because vegetation decomposes more rapidly if exposed than if inundated. Return water slowly to the basin early the following spring to inundate the decomposing vegetation. Flooding the basin rapidly may float unthawed soil, causing increased turbidity later. The newly flooded wetland has a flush of nutrients and the overwintering larvae grow rapidly. Keep the water shallow and warm to encourage algal growth and nutrients for midge production. At the appropriate time of shorebird

migration, start a gradual drawdown, always maintaining at least 3 to 5 cm of water in the wetland basin.

Temporary Wetland (Moist Soil Unit)—Summer Drawdown

Repeat the described steps for a spring drawdown to allow annuals to grow on moist mudflats. Return water to the basin in late summer after substantial annual plant biomass develops. Because midge larvae may die when conditions are too severe, inundate the basin during the winter in areas of late summer drought and hard winter freeze. Larvae continue to grow until late fall and overwinter as larger, older forms, providing spring migrants with a better food resource.

Temporary Wetland (Moist Soil Unit)—Disking and Flooding

Disk the moist soil unit in late summer and flood shallowly so the basin contains an interspersion of mudflat, shallow water, and deeper water to provide habitat as the wetland dries. When the manipulation coincides with fall migration, the shorebirds respond almost immediately.

Semipermanent Wetland—Upland Flooding

Flood the uplands surrounding the emergent vegetation zone in the early spring. This kills the wet meadow plants, and midges rapidly colonize the detritus. Maintain the water high and then slowly lower it to expose the decomposing vegetation during the peak of shorebird migration. Gradually lower the level to normal in the late summer for the southbound migration or draw it down the following spring.

Semipermanent Wetland—Periodic Drawdown

Semipermanent wetlands managed for vegetation and invertebrate diversity undergo drawdown once every 3 to 10 years depending on the size of the basin. This type of management can be coordinated with shorebird migration by drawing the wetland down slowly during the spring or late summer migration. In a complex of wetlands, the drawdowns can be conducted asynchronously so at least one basin is available to shorebirds each year.

Cautions

The recommendations outlined here are based on the assumption that the wetland does not have a history of problems, such as invasion of perennial plants (purple loosestrife, willow, or woolgrass) or outbreaks of avian disease such as botulism.

Conclusions

The management regimes outlined in this report need extensive trial, but, given what is known about shorebird and midge biology, they should prove helpful in attracting shorebirds to refuges. The key to success is to keep upland vegetation grazed or mowed and to time the drawdowns so they coincide with migration in the area of the refuge. Finally, conduct all water manipulations slowly so the invertebrates can adjust to the changes.

Suggested Reading

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Appendix. Common and Scientific Names of the Birds Named in Text.

Spotted sandpiper	*Actitis macularia*
Ruddy turnstone	*Arenaria interpres*
Upland sandpiper	*Bartramia longicauda*
Sanderling	*Calidris alba*
Dunlin	*Calidris alpina*
Baird's sandpiper	*Calidris bairdii*
Red knot	*Calidris canutus*
White-rumped sandpiper	*Calidris fuscicollis*
Stilt sandpiper	*Calidris himantopus*
Western sandpiper	*Calidris mauri*
Pectoral sandpiper	*Calidris melanotos*
Least sandpiper	*Calidris minutilla*
Semipalmated sandpiper	*Calidris pusilla*
Willet	*Catoptrophorus semipalmatus*
Snowy plover	*Charadrius alexandrinus*
Piping plover	*Charadrius melodus*
Mountain plover	*Charadrius montanus*
Semipalmated plover	*Charadrius semipalmatus*
Killdeer	*Charadrius vociferus*
Common snipe	*Gallinago gallinago*
Black-necked stilt	*Himantopus mexicanus*
Short-billed dowitcher	*Limnodromus griseus*
Long-billed dowitcher	*Limnodromus scolopaceus*
Marbled godwit	*Limosa fedoa*
Hudsonian godwit	*Limosa haemastica*
Long-billed curlew	*Numenius americanus*
Eskimo curlew	*Numenius borealis*
Whimbrel	*Numenius phaeopus*
Red phalarope	*Phalaropus fulicarius*
Red-necked phalarope	*Phalaropus lobatus*
Wilson's phalarope	*Phalaropus tricolor*
Ruff	*Philomachus pugnax*
Lesser golden-plover	*Pluvialis dominica*
Black-bellied plover	*Pluvialis squatarola*
American avocet	*Recurvirostra americana*
American woodcock	*Scolopax minor*
Lesser yellowlegs	*Tringa flavipes*
Greater yellowlegs	*Tringa melanoleuca*
Solitary sandpiper	*Tringa solitaria*
Buff-breasted sandpiper	*Tryngites subruficollis*

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