Sharing Your Land with Prairie Wildlife

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Introduction

About the Rocky Mountain Bird Observatory (RMBO): Our mission is to conserve Rocky Mountain, Great Plains, and Intermountain West birds and their habitats through research, monitoring, education, and outreach. We conduct on-the-ground conservation in cooperation with other private organizations and government agencies responsible for managing areas and programs important for birds. We also work with private landowners and managers to encourage practices that foster good land stewardship. Much of our work is designed to increase understanding of birds and their habitats by educating children, teachers, natural resource managers, and the general public. Because birds do not recognize political boundaries, and may even spend most of their lives outside of the United States, RMBO works to bring a unified approach to conservation among states and countries, and many of our projects focus on issues associated with winter grounds, especially those in Mexico. At the core of our conservation work is bird population monitoring. Only through long-term monitoring can we identify which species are in need of help, and evaluate our success at protecting or recovering them.

About this manual: This third edition of this manual (formerly entitled Sharing Your Land With Shortgrass Prairie Birds) is about how to help birds and other wildlife make a living from the land while you do the same. Prairie wildlife species have gone about their business of reproducing, feeding, mating, and dying for thousands and thousands of years. They continue to live out their lives all around you, on land you provide. However, the populations of some birds and other wildlife species are declining, for reasons that are not clear. A little assistance from you can help keep declining wildlife populations on the land, along with maintaining the more common species. This manual offers information about what these species need and how you can provide for those needs on your land.

Although the focus of this third edition is still the shortgrass prairie, it includes information on species found in other parts of the Great Plains, and most of the concepts presented are applicable to grasslands beyond the shortgrass prairie. Also, while we have added discussions of five species that are not birds, we have retained the introductory material from previous editions when birds were the focus. The manual begins with some basic information about the shortgrass prairie and about bird biology. It goes on to present general management guidelines, followed by more specific guidelines for some prairie birds and other wildlife in need of conservation. This is followed by information about agencies and organizations that can help you with technical and financial assistance. Finally, three appendices provide information on simple structures, techniques, and equipment modifications that can benefit birds and other wildlife.

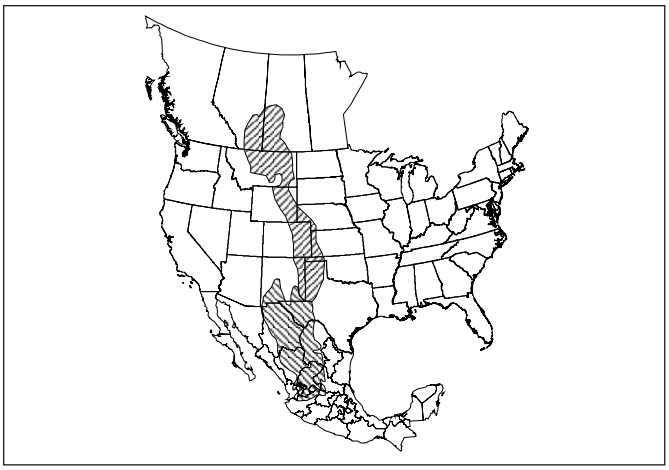
We hope you'll find this information useful. Please contact us with questions or comments about the manual.

A Short History of Shortgrass

Ecology—

The shortgrass prairie lies along the eastern edge of the Rocky Mountains, from New Mexico north to Alberta, Canada. Storm fronts traveling east across the continent from the Pacific Ocean lose their moisture as they climb over the Rockies, and the resulting rain shadow creates the driest conditions found on the Great Plains. These semi-arid conditions support only limited plant growth, and the ankle-high vegetation of the shortgrass prairie is the result. Traveling east, precipitation increases, and shortgrass gives way to the taller mixed-grass and tallgrass prairies. Shortgrass prairie is dominated by two low-growing warm-season grasses, blue grama and buffalograss; western wheatgrass is also present, along with prickly-pear, yucca, winterfat, and cholla. Sandsage prairie is found where sandy soils occur, and is dominated by sand sagebrush and grasses such as sand bluestem and prairie sand-reed. Pockets of mixed-grass prairie (including needle-and-thread and side-oats grama) and tallgrass prairie (including big bluestem, little bluestem, and switchgrass) are found where moisture is adequate, typically in low-lying areas.

The shortgrass prairie landscape has been shaped over time by the forces of climate, grazing, and fire. Precipitation, for example, is lower and more unpredictable than in either the mixed-grass or tallgrass prairies. Droughts are not uncommon, and vegetation growth is variable from year to year. Before widespread settlement by European-Americans, a major grazing force came from the expanding, contracting, and shifting prairie dog colonies. Herds of bison, pronghorn, and elk wandered widely but at times concentrated in small areas, so the impact of their grazing and trampling was spread unevenly over the landscape. The result of such animal activities was that, at any given time, some areas were grazed intensively and others not at all, creating a diversity of habitat conditions across the landscape. Little is known about the ecological role of fire in shortgrass, although fires were probably never very frequent because of the lack of dense grass as fuel. Humans have used fire as a management tool in shortgrass to improve grazing conditions for livestock by removing woody vegetation, cacti, and accumulated litter. However, the grasses recover slowly, requiring 2–3 years.



Shortgrass prairie birds breed and winter throughout the cross-hatched areas

Because of the forces of fire, grazing, and climate, shortgrass prairie birds historically had access to a patchwork of vegetation in a variety of growth stages and conditions. Each bird species could move about the prairie until it found the habitats most suitable for its nesting and foraging. Ideally, modern prairie management would continue to create this patchwork of vegetation by duplicating the timing, intensity, and landscape distribution of the natural forces that shaped the prairie. However, the primary management activity on native shortgrass prairie today, livestock grazing, tends to spread out its effects evenly, resulting in a landscape that varies little from one area to another. The patches of habitat are very similar in vegetative growth and condition. Shortgrass birds no longer have access to the variety of habitats that they had historically, and it is increasingly difficult for some species to find the particular habitat conditions that meet their needs.

A tradition of stewardship—

During the 1800s, the U.S. government gave much of the Great Plains grasslands to homesteaders and the railroads (who eventually sold much of it to individuals) to encourage westward expansion. Those landowners plowed, planted, and ran cattle on the prairie. Today, about 70% of the shortgrass prairie remains in private

ownership. Landowners in the shortgrass region have a long tradition of careful and effective management of the land (*stewardship*), a necessity in a dry region where so little vegetation grows. Careful stewardship includes maintaining healthy ecosystems upon which livestock, wildlife, and humans depend. As a landowner, you live close to the land, and recognize that abusing it reduces its productivity. Land that is less productive is less profitable. And because abused land affects not only the current owners but future generations, you nurture it to leave a lasting legacy of healthy land.

Because of the semi-arid climate and low human population density, less of the shortgrass prairie has been altered than either the mixed-grass or tallgrass prairies. Less than 50% of the original shortgrass prairie has been converted to other land-cover types. By comparison, cropland and other land-cover types now cover about 98% of the original tallgrass prairie. As prairie is lost, so are the plants and animals that are adapted to it. Prominent among the animals that are declining are some species of prairie birds.

Bird conservation—

Together, the shortgrass, mixed-grass, and tallgrass prairies cover about one-fifth of North America. In spite of their large size, the prairies support a bird community with few members. Only nine bird species are restricted to the Great Plains (eight of the nine are covered in this publication), and only 20 others are closely linked with it. These 29 species are a small fraction of the approximately 650 bird species that breed in North America north of Mexico. Such a small group of birds is easily overlooked, especially in comparison with the more numerous and colorful species of forested lands.

As a result, population declines among shortgrass bird species have been largely overlooked until recently. Part of this neglect was due to widespread concern about well-publicized population declines among birds of eastern forests. However, grassland birds are now the highest conservation priority—among North American birds, they have shown the steepest population declines of any group. With 70% of shortgrass prairie habitat in private ownership, assistance from landowners is critical to prairie bird conservation.

Basic Bird Biology

Food—

Some birds eat fruits, some eat seeds, and some eat animals, but most birds eat insects. Even some species that rarely consume insects will eat them during the breeding season for the protein and calcium they provide. Both nutrients are necessary for producing eggs. Some young birds are fed only insects to help them grow and develop. Even hummingbirds eat spiders and insects, contrary to the common belief that they eat only nectar. The number of insects that a bird can eat is impressive. A biologist once found a Swainson's Hawk in Kansas with 98 crickets in its crop and another 132 in its stomach. Other Swainson's Hawks have been found with 40–50 grasshoppers in their stomachs. Although birds usually cannot control large insect outbreaks after they have begun, under normal conditions they can suppress the numbers of insects, keeping them below the outbreak levels that require more active control by landowners.

Birds of prey (raptors) take their toll on rodents—a large hawk or owl can eat over a thousand mice and voles per year, adding up to many thousands over the course of its lifetime. A pair of Ferruginous Hawks will kill about 500 ground squirrels, prairie dogs, and other rodents each summer to feed themselves and their young. Such natural controls on insect and rodent populations are of great economic value to landowners.

Breeding—

One of the things that separates birds from mammals is the fact that birds lay eggs. Bird eggs exhibit tremendous variation in size, shape, and color, depending on the species and where it lives. They range in size from the pea-sized eggs of hummingbirds to the apple-sized eggs of cranes. Egg shape varies greatly, too. For example, birds that make their nests in tree cavities usually lay eggs that are nearly spherical, while those that nest on narrow cliff ledges lay eggs that are very pointed on one end. For cavity-nesting species, easy-rolling spherical eggs are not a problem, since the cavity

is deep and the eggs cannot roll out. The pointed eggs of ledge-nesting species, however, roll around in a tight circle, so they are less likely to roll off the ledge. Egg color varies, too, with cavity-nesting birds producing all-white eggs while birds that nest in the open, such as shorebirds, lay eggs that are heavily streaked and spotted with various shades of brown, black, purple, or green creating excellent camouflage.

Bird nests are quite variable, too. Some species simply scrape out a shallow bowl on the ground. Other species build elaborate structures each year, such as the hanging pouch nests of orioles. Others just keep adding material to the same nest year after year, such as many hawks and eagles. One eagle nest used for many years was 10 feet across and weighed 2000 pounds! The purpose of the nest is to hold the eggs during incubation. Incubating adults keep the eggs warm and roll them over occasionally, to ensure proper development of the embryos. Once hatched, the young birds stay in the nest until they grow and develop to where they can move about on their own. For some birds that hatch in a highly developed form, the stay in the nest lasts only a day or so. As soon as these birds dry off and their feathers fluff, they are ready to follow their parents around on the ground (learning to fly comes later). This is common for shorebirds and other species that nest in exposed areas, where squirming, helpless nestlings would make easy prey for predators. For other species, the nestling stage lasts for weeks. The young of these species hatch in a very undeveloped form, with unopened eyes and few feathers. They are completely dependent on their parents adult for warmth and food.

Migration—

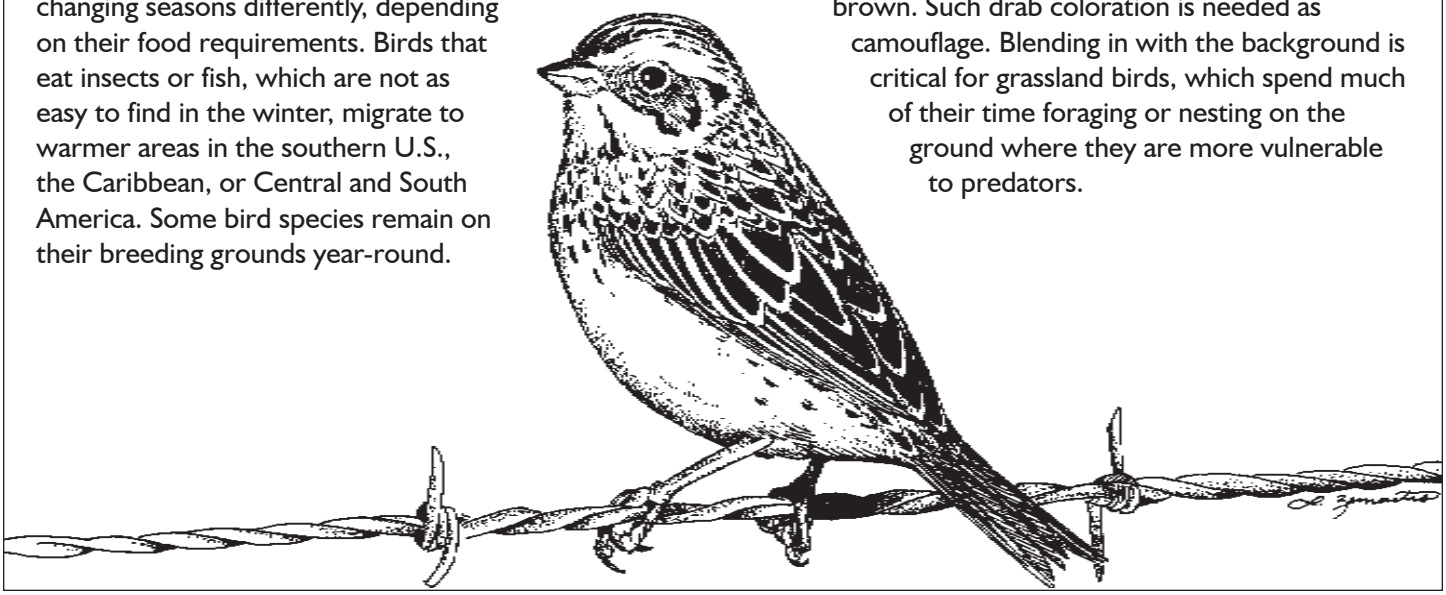
Different bird species respond to the changing seasons differently, depending on their food requirements. Birds that eat insects or fish, which are not as easy to find in the winter, migrate to warmer areas in the southern U.S., the Caribbean, or Central and South America. Some bird species remain on their breeding grounds year-round. These resident birds are usually those that eat seeds, which are still available during the winter. Some birds that eat other birds or small mammals migrate south for the winter, but they may travel shorter distances than the insect-eaters. Some birds of mountainous areas may move down to lower elevations, including the prairie, to spend the winter.

For many years, scientists believed that North American birds flew south for the winter to avoid the cold and snow. However, recent research has suggested that many North American birds actually originated in the tropics, in Central and South America. They fly north to take advantage of abundant food and nest sites during the breeding season, then return to their southern homes to spend the rest of the year. Many species that we think of as "our" birds actually spend the greater part of each year elsewhere.

While migrating, some birds get blown off-course, or wander outside of their normal range in search of new areas. As a result, individual birds may show up hundreds or even thousands of miles from the species' usual breeding or wintering areas. Sometimes these individuals find that the new areas suit their needs, and they may colonize these areas. One example is the Cattle Egret. This species was originally found only in Africa, but some wandering individuals managed to cross the Atlantic Ocean and colonize South America in the late 1800s. From that original foothold, the species has spread into most of North America, including the Great Plains.

Coloration—

Unlike the colorful reds, yellows, and blues worn by many forest birds, grassland birds are mostly brown. Such drab coloration is needed as camouflage. Blending in with the background is critical for grassland birds, which spend much of their time foraging or nesting on the ground where they are more vulnerable to predators.



Habitat—

An animal's habitat is the place that provides all that the animal needs to survive and reproduce. For a bird, this means food, water, and nest area (during the breeding season):

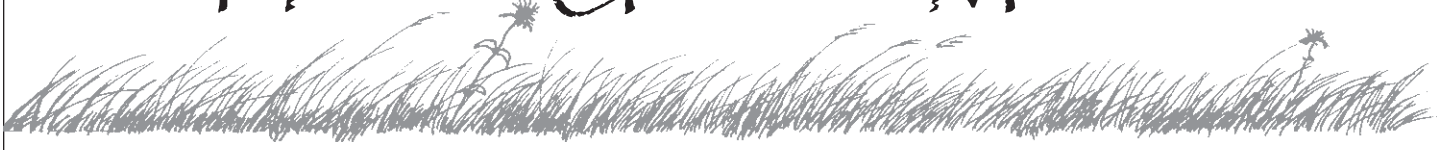
- *Food* is an obvious need, essential for the survival of all organisms. What is not so obvious is that birds may require large areas in which to find enough food. This is especially true for hawks and other large birds with widely scattered food supplies.
- *Water* is also an obvious need, although many birds of the shortgrass prairie do not need access to open water for drinking or bathing. They eat moisture-rich foods and "bathe" in fine prairie dust that absorbs excess oils from their feathers.
- *Nest area* is the nest site itself (for example, a clump of grass) and the area around the nest site. This is the area needed by the bird for gathering nest materials and enough food to feed itself and its growing family.

Each species is adapted to a particular habitat, and to the features of that habitat, such as the climate, foods, vegetation, and so on. Birds choose a particular site to breed or spend the winter based on the suitability of the habitat. They judge the habitat at several geographic scales. First, at the widest scale, the site must be within a broad geographic area that has the proper climate—a bird of cool, rainy coastal areas of the Northwest might have a difficult time adjusting to the hot, dry Great Plains. Second, at a smaller geographic scale, the site must contain the proper vegetation type—a bird accustomed to finding food and nest sites in dense, mature pine forests of the Rocky Mountains might not survive long among the low grasses and sparse shrubs of the shortgrass prairie. Third, at an even smaller geographic scale, the site must contain habitat elements in the particular arrangement that suits the species' needs—for example, some species require large pastures of closely cropped grasses, while others require a mix of tall grasses and wetlands. Finally, the site must include the specific features that the species requires at a very fine scale—for example, a dry hilltop with patchy grasses for a nest site. Birds will only settle in an area if it meets their habitat needs at all of these geographic scales.

Birds and a healthy environment—

Aldo Leopold, considered to be the father of modern wildlife management, said, "To keep every cog and wheel is the first precaution of intelligent tinkering." Birds are integral parts of the prairie mechanism, and they are essential for its proper function. They help control insects and rodents, disperse seeds, eat carrion (dead animals), and serve as food for other animals. Scientists are continually gaining new information about how birds fit into their habitats and how they affect the lives of other organisms. When a species is missing because its habitat needs are not met, its function as a cog or wheel in the prairie mechanism is missing. But when all the parts are present, the prairie "machine" hums along smoothly. Because of their importance in smooth system operations, healthy populations of birds indicate a healthy environment. Also, because bird habitat overlaps with habitat for other wildlife species, preserving bird habitat ensures the preservation of homes for many other animals, all of which are essential for a healthy prairie. Finally, healthy wildlife habitat is also a good indicator of good range conditions.

How to Use this Manual



Not all of these birds will be on your land. The first step is to determine which species are present or *could* be present if the right habitat conditions were available. Compile a list of the birds present with the help of a local birdwatcher, biologist, or Prairie Partners representative. Or look over the maps in the following pages and decide which species could *potentially* be on your land, based on their distributions. Then, for each of those species, read through the habitat information to find out which ones might be able to find suitable homes on your land, given the kind of habitat they need and the kind of habitat your land can provide. Follow the guidelines and manage the land to provide the necessary habitat conditions. In some cases, the management recommendations for one species contradict the recommendations for another species. If both species are on your land, follow both sets of recommendations but in different areas, or consult with local bird experts to determine which species is a higher conservation priority in your area, and follow the recommendations for that species.

General management recommendations—

Here are some general guidelines for enhancing bird habitat on your land. Keep in mind that these are just *recommendations*—they are not rules or regulations, just suggestions. Feel free to follow as few or as many as you like. The more you follow, the more birds your land will support.

• Conserve native prairie and the native flora and fauna. Once native prairie is plowed, it requires decades for a similar plant community to return. Controlled livestock grazing in planned regions is one of the most sustainable uses of native prairie. Other options are available that preserve native prairie while diversifying your ranching business (Prairie Partners can help you with this).

• Manage grazing so that your pastures reflect various intensities of grazing, ranging from light to heavy. This will leave a variety of amounts of residual cover and create habitat for a greater diversity of birds. For bird species that require taller grass cover for nesting, try to have some pastures lightly grazed or ungrazed through the winter so that when birds return in spring, they have taller cover for nesting. This pasture can then be grazed again after the birds have completed their nesting cycle, usually by August.

• Manage pastures and other grassland parcels as large units, rather than as many small units. Many bird species are more attracted to large grassland patches than small isolated ones. Some scientists consider 125 acres to be the minimum parcel size needed by a breeding pair of grassland birds, thus the larger the tract provided the greater the number of birds it will support.

• Schedule any haying, plowing, burning, or heavy grazing in the spring *before* the nesting season (April to late July), or *after* the nesting season (after at least mid-July) — such activities during the nesting season can disrupt breeding activities, destroy nests, or expose nests and birds to predators.

• Use a flush bar, flush chain, or similar device attached to the swather of the mowing machine if you must mow while birds are nesting, usually before mid-July. These tools will cause a bird to "flush" in front of the mower and are most effective when operating at less than top speed (Appendix A).

• Do not mow at night, when birds are on their nests.

• Burn shortgrass prairie every 8–10 years, an interval that is approximately equal to the historic interval.

• Mow or burn uncultivated areas in rotation, leaving some areas uncut and unburned each year.

• Install escape ladders in watering troughs so that birds and other small animals can climb out (Appendix B).

• Manage croplands under a conservation tillage system (no-till or minimum tillage), which can provide crop residue that acts as cover for birds, their nests, and their prey, resulting in higher nest success than in either conventional or organic farms. Delay first tillage until at least late June (mid-July would be even better) to avoid destroying nests.

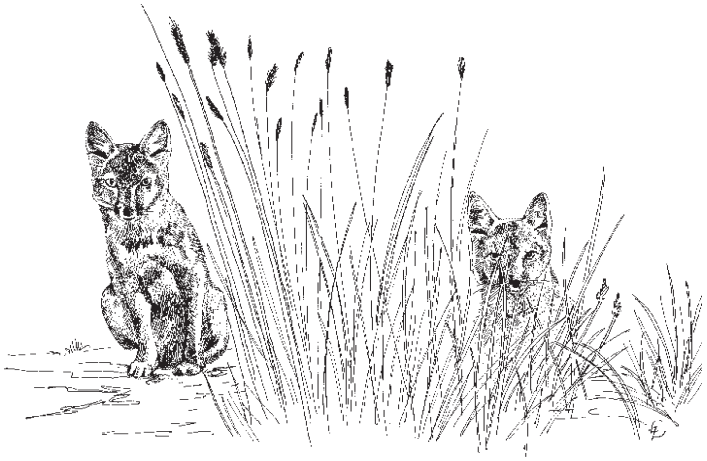
• Apply Integrated Pest Management practices (IPM), including alternatives to chemical control of insects, to preserve the food supply for insect-eating birds. If chemical controls are necessary, use pesticides that degrade rapidly. Contact your extension service for more information about IPM.

• Protect agricultural land from grasshopper damage by using a bait line only along the boundary between agricultural and range land.

• Reseed with native species—if you have land enrolled in CRP (Conservation Reserve Program), use native shortgrass species. Birds have a long history with specific plants and plant communities and are more likely to breed successfully and overwinter where the plants are natives.

• Control non-native plant species, emphasizing early detection, controlling spread, and facilitating re-colonization by native plants.

• If you plan to change your management scheme, please refer to our Assistance Programs section in this manual to identify programs that are available to provide technical and financial assistance.



Plains Topminnow

Plains Topminnow (Fundulus sciadicus)

Identification: A small fish, about 2.5" long, the Plains Topminnow has rounded anal and dorsal (back) fins set far back on the relatively long body and a distinct snout that tapers upward. The male's thin white to yellow stripe along the top edge of the powder blue body is distinctive, as is the variably-red edgings to the fins. Females are olive-colored or grayish above with a cream-colored belly, with some sporting a red spot between the gills and the caudal (side) fin.

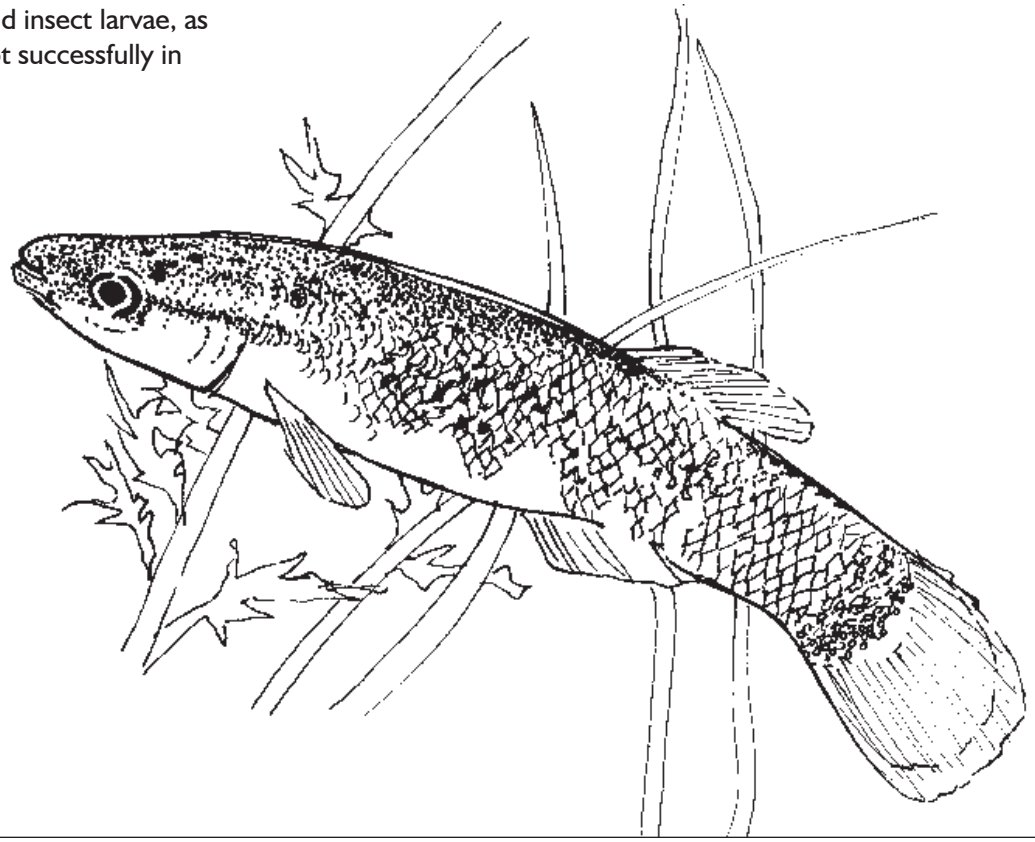
Habitat: Plains Topminnow prefers areas of clear, slow water with abundant filament-like algae growth, specifically, quiet pools of small perennial creeks and backwaters of larger streams. Individuals have also been found in ponds unconnected to streams, probably as a result of human introduction.

Natural history: This species typically occurs singly or in small groups near the surface or in shallower, near-shore waters, presumably to avoid predation by larger fishes. Little is known of the natural feeding habits of Plains Topminnow, though it is assumed to be omnivorous, eating insects and insect larvae, as well as algae. It has been kept successfully in aquaria on a diet of mass-market Tetra food and brine shrimp.

Eggs: Females lay their small (about 1 mm) clear eggs as singles or chains on fine-leaved plants or algae, and are most successful in waters of 71-75°F (22-24°C).

Did you know? The courtship of the Plains Topminnow is an involved ritual, with tandem swimming and S-shaped movements and with the red areas on the male's fins intensifying in color.

Conservation need: The historic alteration of Great Plains stream flows, particularly with the channelization of larger streams and rivers, has caused a decline in the availability of habitat for Plains Topminnow. Coincident with habitat decline has been a decline in the fish's populations, with many local extinctions. Runoff from urban areas and agriculture negatively impact populations due to the excessive particle loads that cloud normally clear water.



Management recommendations:

• Minimize livestock access to backwaters and slow stretches of creeks and streams, particularly May-July before eggs hatch, by providing alternate water sources for livestock. Livestock use of these areas alters Plains Topminnow habitat by muddying the water and removing plants that shade the water and regulate its temperature.

• Create or enhance backwaters.

• Remove or control the non-native Bullfrog (*Rana catesbiana*), which preys on small native fishes.

• Avoid introducing mosquitofish (sometimes introduced to control mosquitoes) into waters containing Plains Topminnow.

• Avoid applying herbicides or pesticides upstream of, or in the drainage areas hosting, backwaters and slow-moving stretches of streams.

Associated species:

Other species that may benefit from habitat management for Plains Topminnow include Northern Leopard Frog, Killdeer, Spotted Sandpiper, Belted Kingfisher, and Common Yellowthroat.

Plains Topminnow Distribution

Plains Topminnow Habitat

Plains Topminnow Diet

Invertebrates (crustaceans, snails, insect larvae) 75%

Algae 25%

Great Plains Toad

Great Plains Toad (*Bufo cognatus*)

Identification: This medium-sized toad (up to 4" long) is identified by the white or cream borders to the large dark patches on the back. The belly lacks dark spots. The ridges between the eyes (cranial crests) extend from behind the eyes to meet near the snout (the crests on the similar-appearing Canadian Toad (*Bufo hemiophrys*) do not extend behind the eyes).

Habitat: Great Plains toads typically occupy grasslands in sandy or loose-soil areas. They breed in temporary, clear, shallow pools, usually with considerable vegetation emerging from the water. Such sites are often created by spring runoff or heavy rain and include flooded fields, ditches, and playas (which are depressions that fill with water after rainfall). Some permanent or semi-permanent water bodies are used and these may be critical to the species in times of drought. Clear water is also critical, as Great Plains Toads will apparently not breed in muddy or cloudy waters.

Natural history: The species is primarily nocturnal (active at night), spending summer days camouflaged on the ground surface or holed up in burrows, particularly during periods of high heat or cold. Individuals hibernate winter away in burrows dug to below the frost line. Great Plains Toads subsist almost wholly on insects (particularly beetles and ants) and other arthropods (such as spiders). Few species prey on these toads—like many toad species, they have glands that produce substances distasteful to birds and mammals (though Raccoons and skunks can avoid those glands). Hognose Snakes, however, seem to have a particular affinity for these toads. The unusually long life (at least 10 and up to, perhaps, 20 years) is probably an adaptation to allow the species to survive multi-year droughts when appropriate breeding pools are scarce.

Eggs: about 9,400 (range of 1,300 to 45,000), laid in long strings by a single female, attached to debris at bottom of pools of water

Did you know? When threatened by predators, individuals will, with a deep breath, puff themselves up, lower their heads, and extend all four legs, apparently to make themselves difficult to handle.

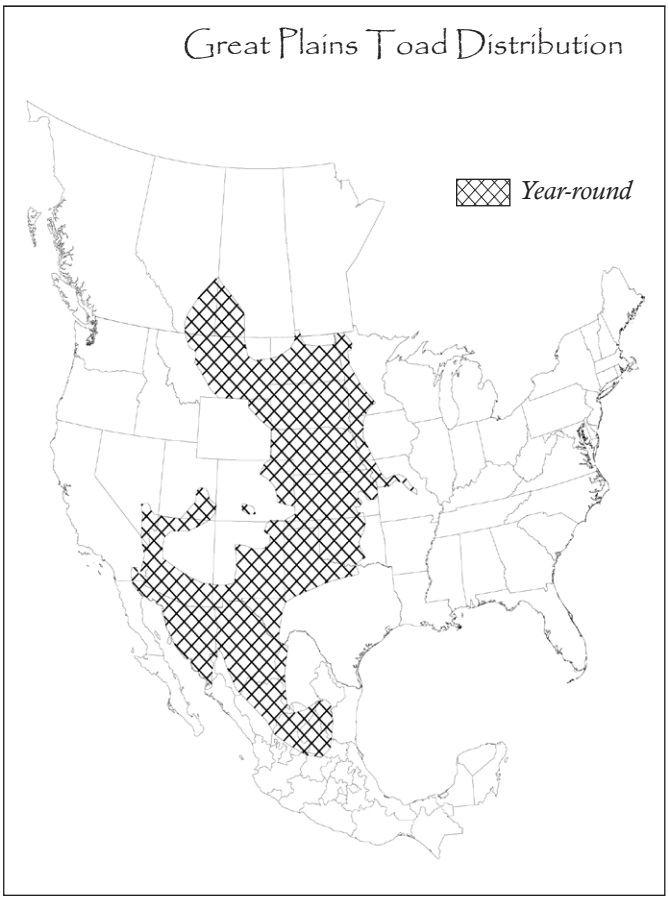
Conservation need: Great Plains Toad populations have declined since European settlement, probably due, at least in part, to conversion of grasslands to agriculture. Filling, draining, and alteration of temporary pools of water, including playa wetlands, have probably also contributed to the decline.

Management recommendations:

- Preserve low-lying areas that catch rain or runoff and that form pools of water.
- Avoid pitting (or deepening) playas or other low-lying wetlands—deep pools are less beneficial to toads and other shallow-water wetland-dependent species.
- Fill pitted playas and restore native wetlands.
- Fence off all or part of playas or other wetlands with emergent vegetation to protect eggs, tadpoles, and adults from trampling by livestock, and to maintain water clarity.
- Avoid applying herbicides or pesticides upstream of, or in the drainage areas hosting ephemeral pools.

Associated species:

Other species that depend on areas occupied by Great Plains Toad include Ferruginous Hawk, Burrowing Owl, Lark Bunting, Baird's Sparrow, McCown's and Chestnut-collared longspurs, and Ord's Kangaroo-Rat.



Great Plains Toad Habitat

Great Plains Toad Summer Diet

Insects, spiders, other arthropods 100%

Greater Short-horned Lizard

Greater Short-horned Lizard
(Phrynosoma hernandezi)

Identification: A medium-sized horned lizard, Greater Short-horned Lizard is around 4" in length (snout to tail tip), but can grow to about 6". It has very short "horns" on the back of its head. The animal's sides are each adorned by a single row of spines. In the southern Great Plains and southern Rockies, the large, dark spots on the back are edged with white or pale, while in the northern and central Great Plains, these spots are typically not so edged.

Habitat: The species occupies a large array of habitats in its relatively expansive range, from grasslands and sage shrublands to open Ponderosa Pine forest, ranging uphill to 9000 feet in places. It prefers areas with at least some loose or sandy soil.

Natural history: Horned lizards are specialist ant predators, though they do take other insects (such as beetles) and arthropods, like spiders and sowbugs. Greater Short-horned Lizards hibernate during winter under the soil or in rodent burrows and can spend the hotter summer periods dormant in similar situations. Individuals fall prey to a large number of other predators, such as other lizards, snakes, hawks, Greater Roadrunners, and Burrowing Owls.

Litters: Unlike most lizards (even some other horned lizard species), Greater Short-horned Lizards bear live young (3-36 per litter).

Did you know? When threatened by predators, horned lizards can squirt a stream of blood from the corners of their eyes at the eyes and mouth of the predator, though this is probably a last-ditch effort to avoid being eaten.

Conservation need: The species is highly susceptible to habitat loss and degradation, particularly that of urbanization, intensive agriculture, and, in places, intensive off-road vehicle use. Cattle grazing is generally compatible with Greater Short-horned Lizards.

Management recommendations:

- Conserve native grassland.
- In southern areas where fire ant control is necessary, use spot treatments rather than broadcast application of insecticides to avoid eliminating other species of ants.
- Avoid prolonged, high-impact use of off-road vehicles.
- Control non-native plants, including cheatgrass, which may restrict the movements of the lizards.
- In areas where substantial amounts of ground litter accumulate, remove the litter by burning pastures on a rotational basis.

Associated species:

Other species that depend on areas occupied by Greater Short-horned Lizard include Swainson's and Ferruginous Hawks, Burrowing Owl, Loggerhead Shrike, Lark Bunting, McCown's and Chestnut-collared Longspurs, Ord's Kangaroo-Rat, and Swift Fox.

Greater Short-horned Lizard Distribution

Greater Short-horned Lizard Habitat

Greater Short-horned Lizard Diet

Insects, spiders, other arthropods 100%

Greater Prairie-Chicken

GREATER PRAIRIE-CHICKEN (Tympanuchus cupido)

Identification: A medium-sized grouse, the Greater Prairie-Chicken has whitish underparts strongly barred with dark brown. Males are larger than females, have all-dark tails, sport long tufts of feathers that are erected in display but trail behind the head otherwise, and have orange air sacs on the sides of their necks that they inflate during display and which amplify their distinctive low booming. Females' tails are paler with dark bars and their crowns are barred.

Habitat: The species originally used native grassland with a mixture of shrubs and/or low-stature trees, particularly oaks. Currently, much of the species' population utilizes grassland without the woody component and, at times, interspersed with agriculture. In the western reaches of the range (historic and current), sage, particularly Sand-sage (Artemesia latifolia), provided the woody habitat aspect. Currently, Greater Prairie-Chickens seem to do best in tallgrass prairies with a mix of 75% grassland and 25% cropland. Hens and chicks need taller vegetation for concealment but not so tall or dense that their movements are restricted. Preferred height of vegetation in nesting areas is about 15 inches (38 cm), but nests have been found in grass heights of 4-38 inches (10-97 cm). Successful brood-rearing habitats generally have areas of both dense and sparse cover and a high diversity of forbs (broad-leaved annual plants), providing a diversity of insects as food for chicks. High forb number and diversity also support adults by producing seed crops that are their primary food.

Natural history: Greater Prairie-Chicken males gather in early spring on booming grounds (leks) and display to attract females. Leks are comprised of from a few males to more than 30 at times. Females visit leks to assess male quality and to solicit matings, most of which are performed by the one or two dominant males on the lek, even in large leks. Females will often visit multiple leks, sometimes multiple times, before mating. The species forages on seeds, leaves, and insects on the ground, but occasionally in trees, with most feeding occurring in morning and evening.

Nest: Females construct nests that are bowl-shaped depressions (7" wide, 3" deep) in the ground that they line with feathers and dried grass and leaves, sometimes with twigs.

Eggs: Typically 10-12 (ranging from 7 to 17), olive to pale buff with dark brown speckling

Did you know? The Lesser Prairie-Chicken of southeast Colorado, southwest Kansas, western Oklahoma, and panhandle Texas is quite similar with similar habitat needs. In the northern part of the species' range, they prefer high-structure grasslands; in Texas, areas of grass and shinnery oak provide the birds habitat.

Conservation need: Loss and/or degradation of habitat, primarily through extensive conversion of native grassland to cropland but also through over-grazing, is the primary threat to prairie-chicken populations. Some success has been achieved in enlarging some populations, but most are still declining and are becoming more and more isolated from each other, which can create genetic problems.

Management recommendations:

• Maintain a patchwork of pastures containing short grass, taller grass, and scattered shrubs for lekking, foraging, nesting, brood-rearing, and wintering. This mosaic can be produced by light to moderate grazing or by burning at intervals of 3-4 years. However, in the southwestern part of the range (Colorado, Kansas, western Nebraska), burn intervals should be longer, as the shortgrass prairie does not recover from burning as quickly as does tallgrass prairie.

• Conserve native grassland, particularly on a large scale.

• Avoid or minimize sheep grazing in shortgrass habitat occupied by Greater Prairie-Chickens as sheep graze an area more completely and to a shorter height, and their habit of traveling in tight herds results more often in nest destruction.

• Control non-native plants, including cheatgrass, leafy spurge, and knapweed, which replace the grasslands favored by prairie-chickens.

• Encourage native forbs including sunflowers, compassplant, and wild indigo.

Greater Prairie-Chicken Distribution

Greater Prairie-Chicken Habitat

Associated species:

Other species that may benefit from habitat management for Greater (and Lesser) Prairie-Chickens include Sharp-tailed Grouse, Northern Harrier, Swainson's Hawk, Ferruginous Hawk, Short-eared Owl, Loggerhead Shrike, Cassin's Sparrow, Grasshopper Sparrow, and Eastern Meadowlark.

Greater Prairie-Chicken Diet

Seeds, grains 55% | Leaves, buds 25% | Insects 20%

Sharp-tailed Grouse

SHARP-TAILED GROUSE (Tympanuchus phasianellus)

Identification: The Sharp-tail is a medium-sized grouse, somewhat intermediate in appearance between Greater Prairie-Chicken and female Ring-necked Pheasant. Its underparts are mottled dark and light; in the southern parts of its range it has a pale belly. Sharp-tailed Grouse has a medium-length, pale, pointed tail, and feathered legs (pheasants have unfeathered legs). Males and females have similar plumage, but males are larger, with a yellow comb over each eye that enlarges and brightens during display season. Males also have pinkish-violet air sacs on the sides of their necks that they inflate during display and which amplify their low cooing. Though Greater (and Lesser) Prairie-Chickens can be similar, that species is easily differentiated by the extensive horizontal barring underneath.

Habitat: Sharp-tailed Grouse primarily uses prairie or prairie-like habitats in a mosaic of shrubland and forest, such as aspen, birch, oak, and willow. In many parts of its range, the species switches from more open grasslands in summer to shrubby or wooded habitats in winter. However, in parts of the range (particularly eastern Wyoming and western Nebraska), the species can readily be found in mosaics of native grassland and agriculture with some woody component. This last is the typical habitat of the species in the Shortgrass Prairie region, where windbreaks and Sand-sage provide the woody component.

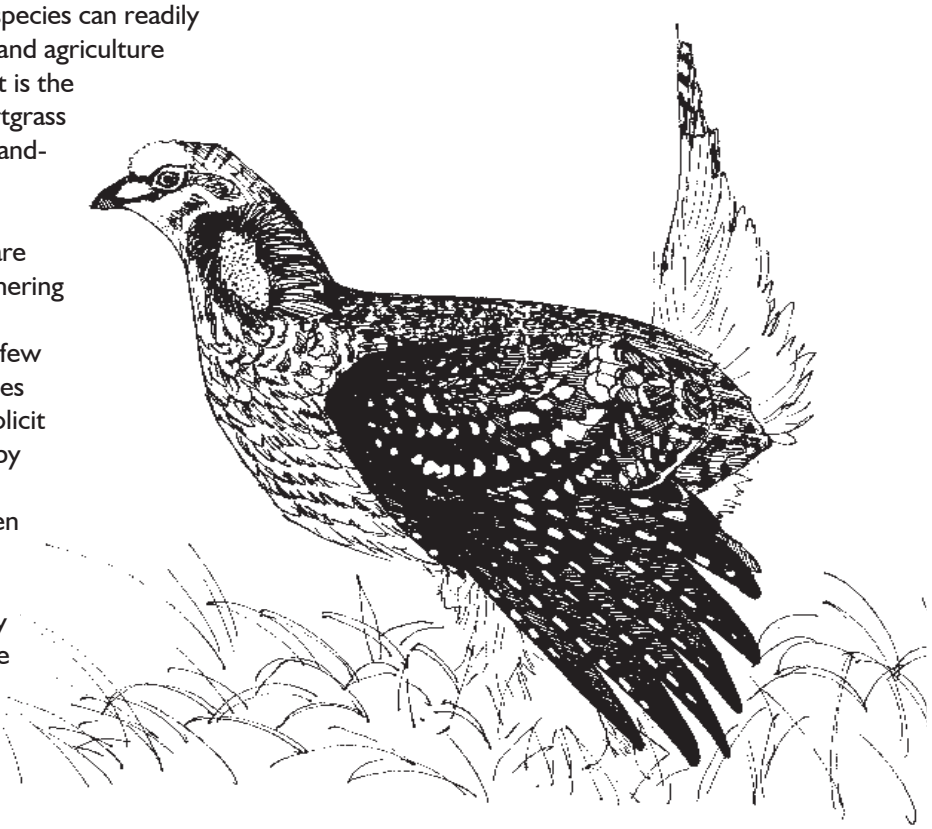
Natural history: Sharp-tailed Grouse are typical of lekking grouse with males gathering in early spring and displaying to attract females. Leks are comprised of from a few to 25 males (occasionally more). Females visit leks to assess male quality and to solicit matings, most of which are performed by the one or two dominant males on the lek, even in large leks. Females will often visit multiple leks, sometimes multiple times, before mating. The grouse forage on seeds, leaves, and buds. They commonly feed in trees eating buds (like Ruffed Grouse), much more so than do prairie-chickens, particularly in winter when snow covers other food supplies.

Nest: Females construct nests in dense vegetation, often under or near a shrub or small tree. The oval nest is placed in a depression in the ground composed of various materials, including moss, grasses, and leaves and lined with sedges and some of her own breast feathers.

Eggs: Usually about 12 (up to 14), about 1¾" long, olive-buff to pale brown with various brown speckling

Did you know? Sharp-tailed Grouse may migrate short distances (often <3 mi., but up to 40 mi.) to spend the winter away from breeding grounds, at that time being found in some areas in which the species does not breed (e.g., northeast Colorado). This species and Greater Prairie-Chicken have been known to hybridize where their ranges overlap.

Conservation need: Loss of habitat is the main source of population decline, primarily through conversion of native grassland to cropland but also due to development and urbanization (particularly near the Denver metropolitan area).



Management recommendations:

• Maintain a patchwork of pastures containing short grass, taller grass, and scattered shrubs for lekking, foraging, nesting, brood-rearing, and wintering. This mosaic can be produced by light to moderate grazing or by burning at intervals of 3-4 years. However, in the south-central part of the range (eastern Wyoming, western Nebraska), burn intervals should be longer, as the shortgrass prairie does not recover from burning as quickly as does tallgrass prairie.

• Conserve native grassland, particularly on a large scale.

• Avoid or minimize sheep grazing in shortgrass habitat occupied by Sharp-tailed Grouse as sheep graze an area more completely and to a shorter height, and their habit of traveling in tight herds results more often in nest destruction.

• Control non-native plants, including cheatgrass, leafy spurge, and knapweed, which replace the grasslands favored by these grouse.

• Encourage native forbs (broad-leafed plants) including sunflowers, compassplant, and wild indigo.

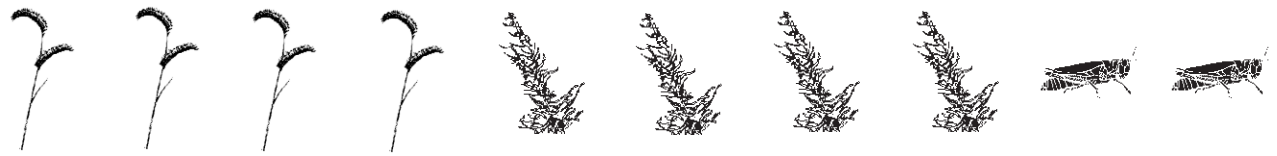
Sharp-tailed Grouse Distribution

Sharp-tailed Grouse Habitat

Associated species:

Other species that may benefit from habitat management for Sharp-tailed Grouse include Greater Prairie-Chicken, Swainson's Hawk, Lark Bunting, and Western Meadowlark,.

Sharp-tailed Grouse Diet



Swainson's Hawk

Swainson's Hawk (Buteo swainsoni)

Identification: These birds are identified by a dark brown head and bib (female) or gray head and reddish bib (male), contrasting with white chin and belly. Some individuals are dark brown underneath rather than white. The tail has several dark, narrow bands with a wider one near the tip. The wingspan is 52".

Habitat: Nesting habitat includes open grasslands with scattered trees or large shrubs, river bottoms, shelterbelts, and farmyards. The hawks hunt in open habitats such as grasslands, hay fields, open shrublands, or croplands. Their wintering habitat is grasslands and croplands.

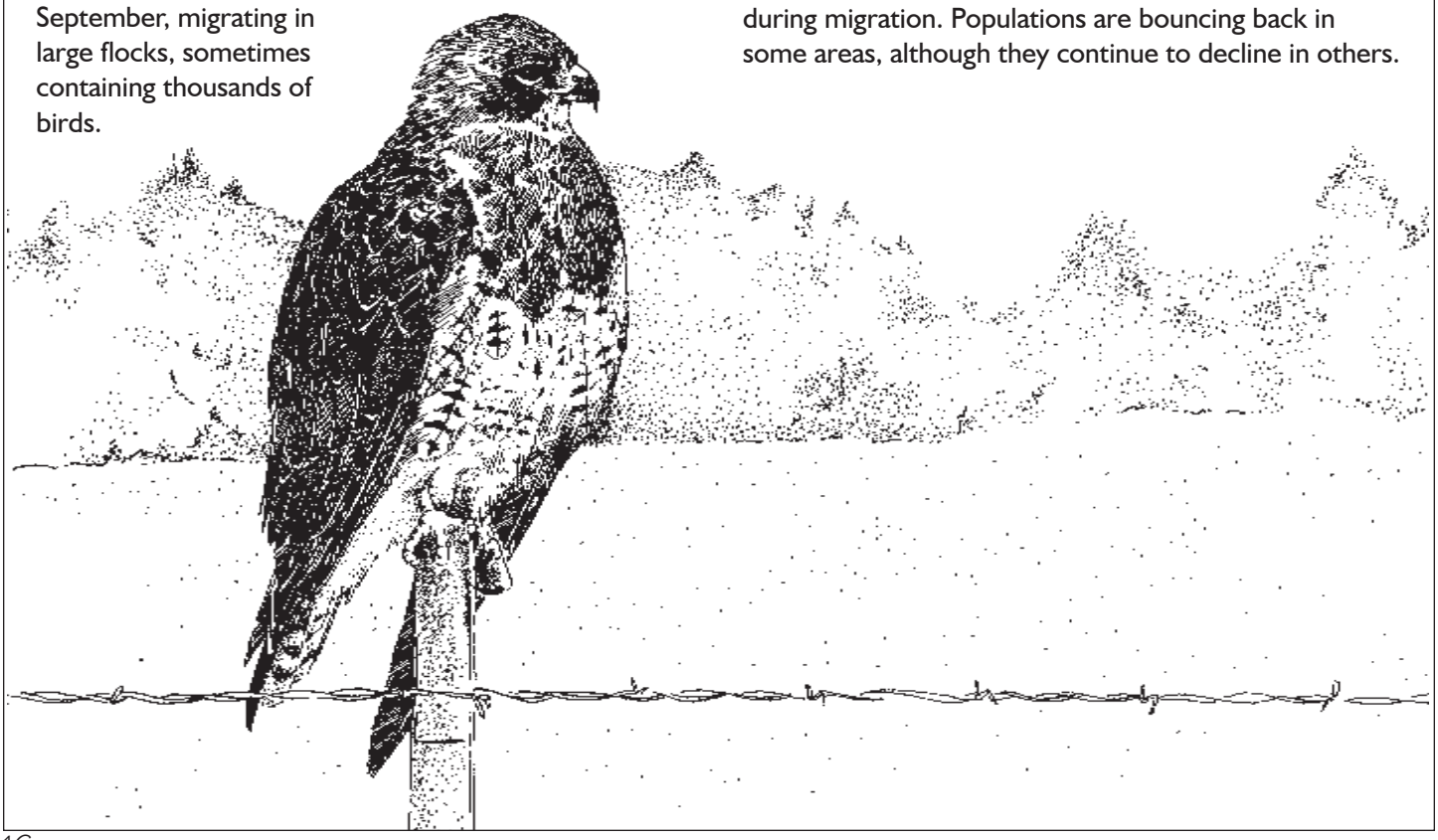
Natural history: Swainson's Hawks begin to leave their wintering grounds in February, and arrive on the breeding grounds in March and April. They begin nesting in April and May, with young birds usually out of the nest by June or July. Many ranchers and farmers are familiar with this species' habit of following farm equipment through the fields to pick up injured rodents and insects. The birds leave for the wintering grounds in September, migrating in large flocks, sometimes containing thousands of birds.

Nest: A large stick nest, 2–4' across and about 1' tall, is usually placed high in a live tree but sometimes in a large bush or on a rock outcrop. Swainson's Hawks often reuse the same nest each year, or use old nests of other birds, especially magpies, as the base for their nest.

Eggs: 2 (sometimes 3 or 4), 2 1/4 " long, white with dark brown blotches.

Did you know? Swainson's Hawks are long-distance migrants—the trip between their breeding grounds and South American wintering grounds covers 5,000–8,000 miles and lasts 15–35 days each way.

Conservation need: California populations have declined an estimated 91% since the early 1900s and their breeding range across the continent has diminished considerably. Causes include habitat loss (loss of native grasslands, loss of nest trees, conversion of suitable agricultural land by urbanization), pesticide use (especially on the wintering grounds), and shooting during migration. Populations are bouncing back in some areas, although they continue to decline in others.



Swainson's Hawk Distribution

Management recommendations:

• Preserve trees in shelterbelts, windbreaks, and around old homesteads, as those trees provide nest sites. However, many of the trees are lost through natural aging and dying, and through active removal as small farms are consolidated into larger farms and old homesteads are removed. As the trees are lost, suitable nest sites become more scarce.

• Preserve trees that already contain nests, since pairs often use the same nest year after year.

• Protect nest trees from livestock rubbing by using fences or other barriers, and from destruction by fire, herbicides, or other causes (Appendix C).

• Control rather than eradicate the primary prey species (including rodents and grasshoppers), at levels compatible with economic activities on the land. Controlling those animals may be harmful to Swainson's Hawk populations—less food means fewer hawks.

• Leave unused utility poles for use as hunting perches.

Associated species:

Other species that may benefit from habitat management for Swainson's Hawk include Red-tailed Hawk, Ferruginous Hawk, Rough-legged Hawk, Golden Eagle, American Kestrel, Mourning Dove, Great Horned Owl, Western and Eastern Kingbird, and Loggerhead Shrike.

Swainson's Hawk Habitat

Swainson's Hawk Summer Diet

Small mammals (including ground squirrels, rabbits, prairie dogs) 67%

Birds 25%

Snakes, frogs, and insects 8%

Ferruginous Hawk

Ferruginous Hawk (Buteo regalis)

Identification: Often seen while soaring, these hawks are rust-colored on the back and shoulders, mostly white under the wings and on the breast, belly, and tail (which lacks the dark bands of other hawks). The rust-colored legs contrast with the white body and look like a dark "V" when the bird is flying overhead. Some individuals are all dark. This is the largest hawk in North America, with a 53" wingspan. It gets its name, Ferruginous (fer-OO-jin-us) from the red coloration, like rusty iron (ferrous).

Habitat: Habitat, summer and winter, includes grasslands, deserts, and other open areas with isolated shrubs or trees where less than 50% of the land is under cultivation. During winter, Ferruginous Hawks are often found around colonies of prairie dogs, which make up much of their winter diet.

Natural history: These birds arrive in the northern part of the breeding grounds in March and April. Nesting begins as early as mid-March in Colorado and Kansas, but in most other prairie states nesting does not start until May. Young leave the nest during late June and July.

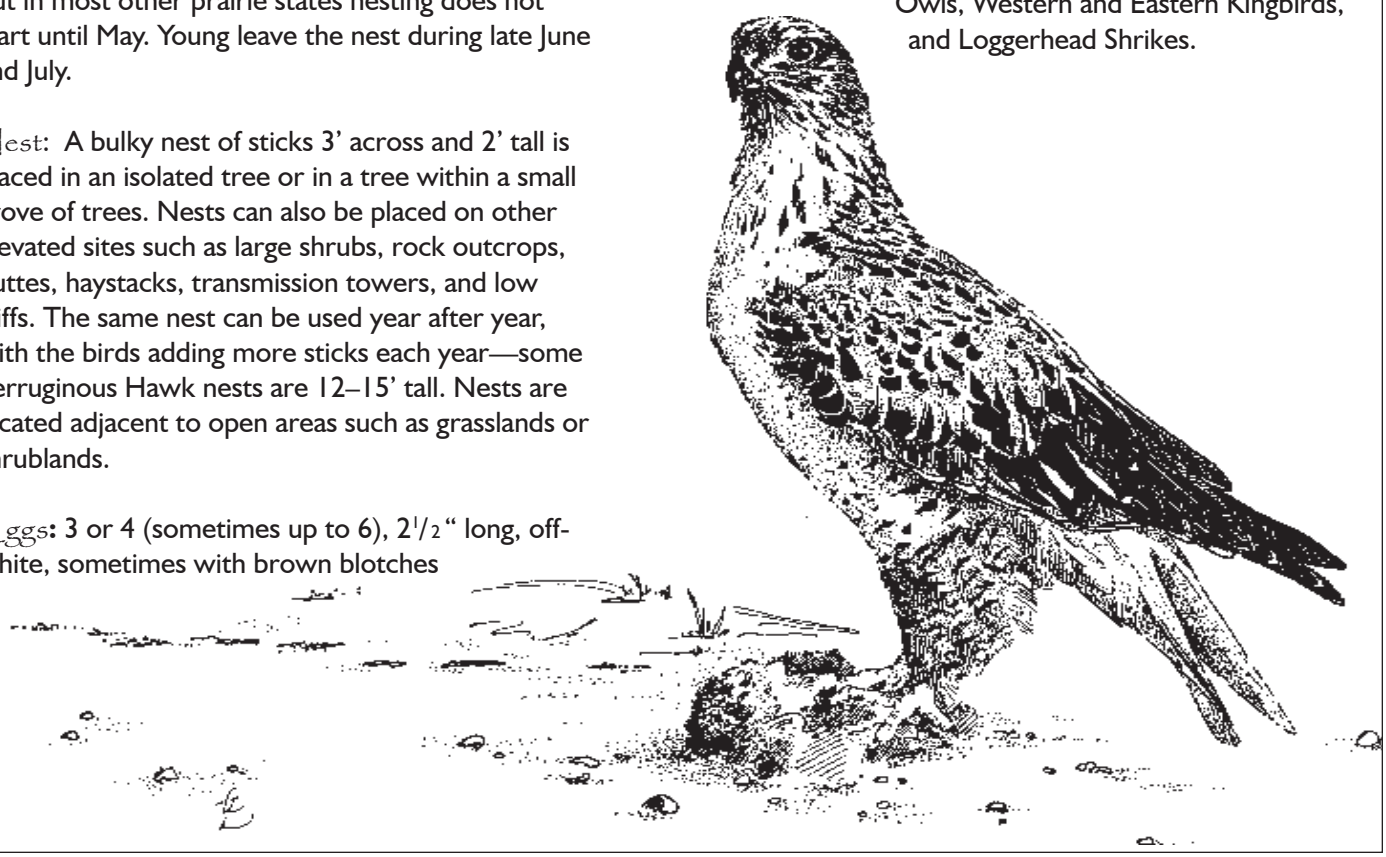
Nest: A bulky nest of sticks 3' across and 2' tall is placed in an isolated tree or in a tree within a small grove of trees. Nests can also be placed on other elevated sites such as large shrubs, rock outcrops, buttes, haystacks, transmission towers, and low cliffs. The same nest can be used year after year, with the birds adding more sticks each year—some Ferruginous Hawk nests are 12–15' tall. Nests are located adjacent to open areas such as grasslands or shrublands.

Eggs: 3 or 4 (sometimes up to 6), 2 1/2" long, off-white, sometimes with brown blotches

Did you know? In the Old West, Ferruginous Hawks used not only sticks but also bison bones to build nests, and used bison wool and manure to line the nests.

Conservation need: Ferruginous Hawk numbers are low—a 1993 estimate placed the population as low as 12,000 birds. The populations are stable in some areas but declining in others. Causes for declines include loss of habitat (by conversion of native prairie to cropland or other uses, conversion of suitable habitat by urbanization, and conversion of native vegetation to non-native) and disturbance of nesting birds. This species is very sensitive to human disturbance around the nest.

Associated species:
Other wildlife that may benefit from habitat management for Ferruginous Hawk include Swainson's Hawks, Red-tailed Hawks, Rough-legged Hawks, Golden Eagles, American Kestrels, Mountain Plovers, Mourning Doves, Great Horned Owls, Burrowing Owls, Western and Eastern Kingbirds, and Loggerhead Shrikes.



Management recommendations:

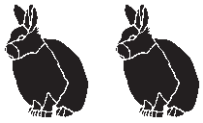
- Preserve native grassland, as its conversion to cropland is considered the main factor in population declines.
- Control rather than eradicate the primary prey species (ground squirrels, prairie dogs, and jackrabbits). Retain populations at levels compatible with economic activities on the land.
- Deferred grazing in mixed-grass prairie may help control prairie dogs. With adequate moisture, the vegetation may grow faster than the prairie dogs can clip it in the spring, impacting their abilities to settle in or expand in these areas.
- Poison only active prairie dog burrows if you use chemical controls.
- Avoid the use of strychnine to poison rodents. Hawks can die from eating the poisoned animals.
- Avoid disturbances near Ferruginous Hawk nests during the nesting season, such as visits by humans, mineral extraction, or pipeline construction. Such activities result in fewer young birds produced, or even nest abandonment by the adults. Limit brief disturbances to no closer than 1/2 mile, prolonged disturbances no closer than 1 mile, and long-term disturbances (such as construction) no closer than 1 1/2 miles.
- Preserve trees planted as windbreaks and around abandoned homesteads. As with Swainson's Hawks, some nest sites are in those areas, and as those trees are lost, nest sites become more scarce.
- Preserve trees that already contain nests, since pairs often use the same nest year after year.
- Protect nest trees from livestock rubbing by using fences or other barriers (Appendix C), and from destruction by fire, herbicides, or other causes.

Ferruginous Hawk Distribution

Ferruginous Hawk Habitat

Ferruginous Hawk Summer Diet

Rodents (mostly ground squirrels and prairie dogs) 64%



Rabbits 20%

Birds and snakes 16%

Mountain Plover

Mountain Plover (Charadrius montanus)

Identification: In summer, the Mountain Plover is mostly light brown with a white throat and breast, and white under the wings. It has a white forehead and white line over the eye, which contrast with a dark brown cap. Plovers blend in extremely well with the background, making them very difficult to spot, especially when they hunker down on their nests. The winter plumage is similar to the summer plumage, but the brown colors are paler. Plovers lack the black bands across the chest found on their more common (and noisier) relative, the Killdeer. They are a little smaller than Killdeer—about 8" tall. This species was originally called "Rocky Mountain Plover," but the name was shortened.

Habitat: Despite the name, Mountain Plovers breed in shortgrass prairie where the land is fairly flat or gently sloped. They favor areas where vegetation is sparse (at least 30% bare ground) and very short (2" or less). Dry alkaline lakes are attractive to plovers, as are areas where grazing livestock or prairie dogs have reduced vegetation height and density. They will also nest in areas with low, widely scattered shrubs. Plovers will forage and nest in agricultural fields that are bare or contain short vegetation, but will abandon nests in such habitats when the vegetation grows taller than about 2". Winter habitat includes alkali flats, plowed or burned fields, fallow fields, heavily grazed grasslands, sod farms, prairie dog colonies, or other areas with low, sparse vegetation.

Natural history: These birds leave their wintering grounds (primarily in California) in mid-February or March, and begin to arrive on the breeding grounds in March. Southern birds lay their eggs in April, northern birds in June. Their young are on their own by June or July. In hot weather, young birds can die within 15 minutes if not protected from the sun by an adult. Adults protect their nests from trampling by flying up into the face of cattle that get too close. Mountain Plovers don't need access to water for drinking, as they get enough from their diet. Although they are often found near water sources such as stock ponds, it may be the low, sparse vegetation that attracts them. The adults usually begin leaving for the wintering grounds as early as July, arriving during mid-September to November. During migration, they sometimes form flocks of hundreds of birds.

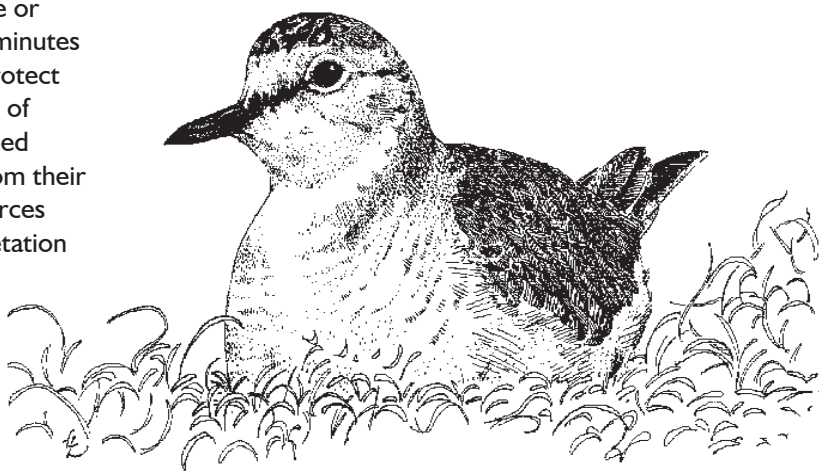
Nest: A shallow bowl on the ground, the nest is sometimes lined with dried grasses. Unlike some other ground-nesting prairie birds, Mountain Plovers do not place their nests next to tall vegetation, although they often place them next to dried manure.

Eggs: usually 3 (sometimes 2 or 4), 1 1/2" long, buffy or olive-colored, with small dark brown splotches; well-camouflaged and extremely difficult to find.

Did you know? Female Mountain Plovers will sometimes lay eggs in one nest and leave it in the male's care while she lays eggs in a second nest, which she tends.

Conservation need: The Mountain Plover's population and distribution are declining at an alarming rate, faster than any other grassland bird. Between 1966 and 1991, the population dropped by an estimated 63%. The current total population is estimated at less than 9,000 birds, which is a very low number compared to most other bird species. Causes for the decline include conversion of native shortgrass prairie to cropland, urbanization (especially on the wintering grounds), removal of prairie dogs, oil and gas development, and plowing and planting on the nesting grounds (the bare ground of fallow and plowed fields is very attractive to plovers, but many nests are destroyed when the fields are planted or tilled, or are abandoned when the crops grow taller than 2").

Associated species:
Other species that may benefit from habitat management for Mountain Plovers include Greater Short-horned Lizard, Long-billed Curlew, Burrowing Owl, Horned Lark, and McCown's Longspur.



Management recommendations:

- Graze shortgrass prairie at moderate to heavy levels in summer, late winter, or early spring to create the short, sparse vegetation profile preferred by Mountain Plovers.
- Burn shortgrass prairie outside of the nesting season to create favorable vegetation conditions.
- *Control* rather than *eradicate* prairie dogs. Retain populations of prairie dogs at levels compatible with economic activities on the land. Efforts to control prairie dogs may be detrimental to plovers, as prairie dogs provide the low, sparse vegetation structure favored by plovers.
- Poison only active prairie dog burrows if you use chemical controls.
- Deferred grazing in mixed-grass prairie may help control prairie dogs. With adequate moisture, the vegetation may grow faster than the prairie dogs can clip it in the spring, impacting their abilities to settle in or expand in these areas.
- Preserve native shortgrass prairie, because plovers usually cannot nest successfully in croplands.
- Delay discing croplands until June, to allow plovers to complete their nesting.
- Plant native shortgrass species (blue grama and buffalograss) rather than taller, non-native species. Plovers will not use areas with tall grasses.
- Control non-native plants, including cheatgrass, leafy spurge, and knapweed, which displace native shortgrass prairie plants and do not provide the structure favored by plovers.
- Avoid disturbance to nesting plovers by restricting activities such as oil and gas exploration, water well development, and other similar activities during the nesting season. Such activities are restricted at certain sites from April through June in Colorado, Wyoming, and Utah to protect plovers.
- Protect the area around known nest sites as some plovers will reuse nest sites in subsequent years, and their offspring will return to nest near where they hatched.
- Maintain wintering sites as native rangeland, and protect from uses that are harmful to plovers, such as use of off-road vehicles.

Mountain Plover Distribution

Mountain Plover Habitat

Mountain Plover Summer Diet

Invertebrates (mostly grasshoppers, beetles, crickets, ants) 99%

Seeds 1%

Upland Sandpiper

Upland Sandpiper (Bartramia longicauda)

Identification: Brown on the back and wings, but lighter on the breast, belly, and underwings. Long neck, and eyes that look like they're too large for the small head. Just under 1' tall. Upland Sandpipers are often seen perched on fenceposts. Adults sometimes feign injury to draw humans and predators away from nests.

Habitat: In shortgrass prairies, Upland Sandpipers are usually found near water and other areas with tall grasses, up to 24", although they sometimes nest in grass as short as 4". Their typical nesting habitat is the tall, dense vegetation found in mixed-grass and tallgrass prairies, with up to 50% forbs, few shrubs, and little bare ground. They also nest in wet meadows and hayfields, and sometimes in weedy fallow fields, roadsides, Conservation Reserve Program lands, and row crops. Litter cover is usually moderate to dense, 1 1/2–3 1/2" deep. Their nesting territory usually includes rock piles, stumps, or fenceposts for displaying. They forage in areas where the vegetation is up to10" tall, such as grazed pastures, plowed fields, stubble, and croplands. Brooding areas contain vegetation 4–8" tall.

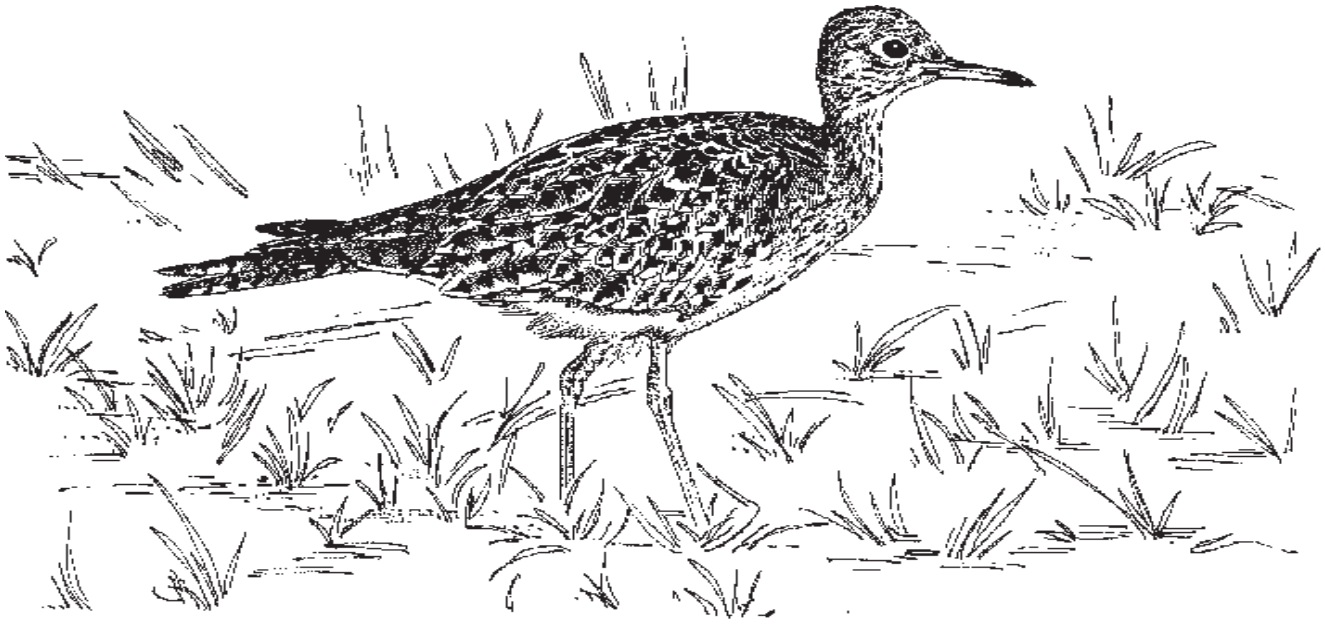
Natural history: Upland Sandpipers leave their wintering grounds in mid-February, arriving on the southern breeding grounds in April, and in the north in May. Nesting in the southern part of their range begins in late April and May, and in the northern areas in late May and June. Most young birds leave the nest in June and July. They depart for the wintering grounds by late July.

Nest: A depression in the ground, the nest is 2–3" deep, lined with grasses, inside diameter 4–5", usually covered by overhanging vegetation.

Eggs: usually 4 (sometimes 3 or 5), 1 3/4" long, buff-colored with brown speckles and blotches concentrated on the large end of the egg

Did you know? Upland Sandpiper numbers dropped substantially during the 1880s as market hunters ran out of Passenger Pigeons and switched their aim to the sandpipers.

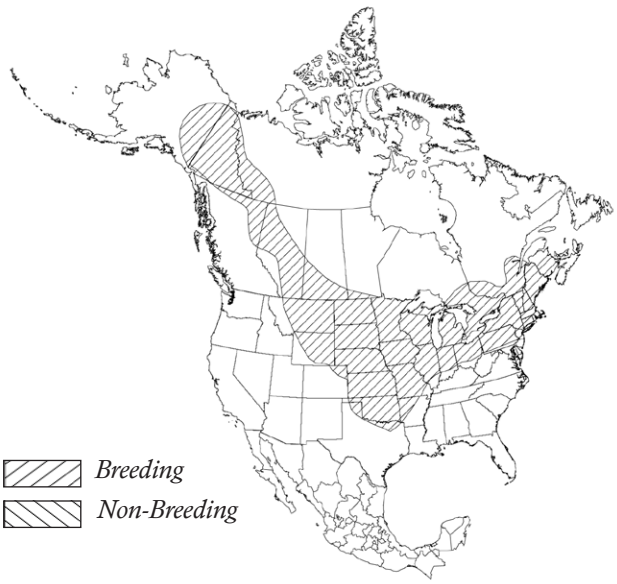
Conservation need: Populations are increasing on the Great Plains, but declining in other areas, such as the Upper Midwest and New England. They are most common in the mixed-grass and tallgrass prairies, and have never been very common in the shortgrass prairie.



Management recommendations:

- Maintain a patchwork of shortgrass and other grasses of different heights and densities to provide habitat for foraging, nesting, and brood-rearing.
- Avoid grazing in areas known or suspected to be used for nesting sites, which removes the taller grasses preferred by Upland Sandpipers for nesting.
- Protect taller grasses around water, which may be the only suitable habitat for Upland Sandpipers in the shortgrass prairie.
- Delay mowing or pesticide applications until late July, to allow the birds to complete their nesting cycle.
- Leave small pockets of uncut hay as refuges for young birds if hayfields must be cut before late July.
- Use a flush bar or similar device if you must mow earlier than mid-July (Appendix A).
- Use a back-and-forth mowing pattern (illustrated in Appendix A).

Upland Sandpiper Distribution



Upland Sandpiper Habitat

Associated species:

Other wildlife that may benefit from habitat management for Upland Sandpipers include Ring-necked Pheasants, Sharp-tailed Grouse, Greater Prairie-Chicken, Baird's Sparrows, Grasshopper Sparrows, and Western Meadowlarks.

Upland Sandpiper Summer Diet

Invertebrates (mostly grasshoppers, crickets, weevils; also beetles, grubs) 97%

Seeds 3%

Long-billed Curlew

Long-billed Curlew (Numenius americanus)

Identification: This is North America's largest shorebird, standing about 16" tall. The overall color is cinnamon brown, lighter on the breast and belly, with brown markings. But the most striking feature of these birds is the extremely long, downward-curving bill: 5–6" long for the male, and 6 1/2–8" for the female. Their long bills are used to probe for food deep in mud and soft soil. Their "cur-lee" calls can be heard for long distances across the prairie.

Habitat: Curlews nest in shortgrass and mixed-grass prairie, with or without scattered shrubs, and occasionally in idle cropland such as wheat stubble. They prefer short vegetation, and nest where vegetation is less than 12" and often where it is less than 4" tall. Total vegetation cover should be 50–95%. After hatching, the adults move the chicks to areas of taller grasses and scattered forbs and shrubs, apparently for protection from predators and weather extremes, although they avoid areas of dense vegetation, possibly due to low visibility and difficulty of travel for chicks.

Curlews are often found within 1/4 mile of standing water, and often much closer, although the birds are rarely seen actually using the water. The water is often from human sources (stock tank overflow, stock ponds, etc.). As with Mountain Plovers, curlews may be attracted to the short vegetation created by livestock near such water sources, rather than being attracted to the water itself. They often search for food in wet meadows or areas of moist soil, which may also explain the attraction to water sources. Winter habitat is open fields, grasslands, and shores of oceans, bays, and freshwater lakes.

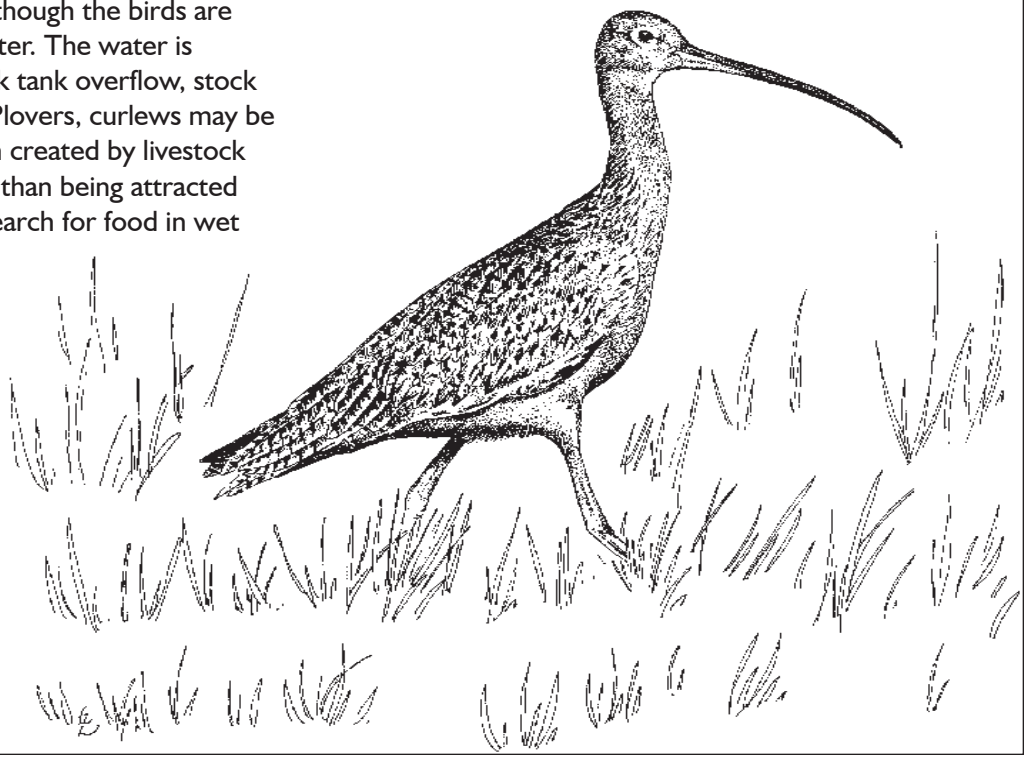
Natural history: Nesting usually takes place in May and June, with most young birds leaving their nests during June and July. Most birds leave their breeding grounds by the end of August. Territories, which range from 15–35 acres in size, are often reused in subsequent years. Curlews will not re-nest if their nest is destroyed by predators or other causes, but instead will wait until the following year to try again.

Nest: A depression in the ground about 2" deep, lined with grass or weeds, inside diameter about 8".

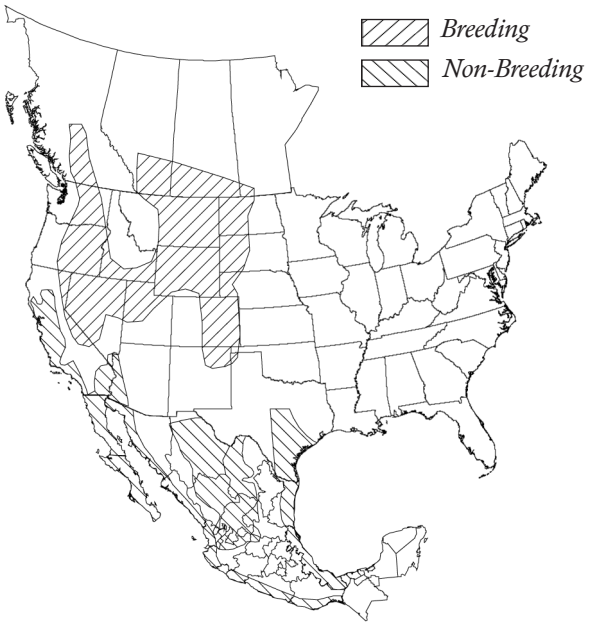
Eggs: usually 4 (sometimes 5), 2 1/2" long, pale green or buff-colored, heavily marked with dark brown blotches

Did you Know? The nest is often placed next to dried manure, probably to help hide the nest from predators, or to mask its scent.

Conservation need: Long-billed Curlews are one of the highest conservation priorities on the Great Plains. Their populations in the shortgrass prairie have declined 10% per year for several decades, probably because of the loss of suitable breeding habitat as prairie is converted to cropland or urban developments. Other possible causes include loss of habitat and pesticide use on the wintering grounds.



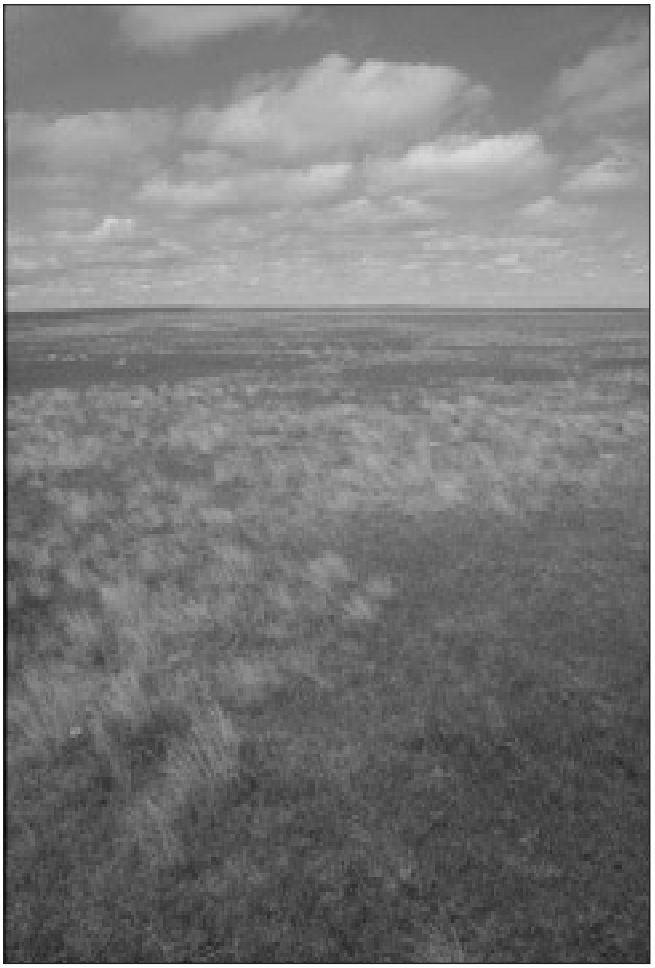
Long-billed Curlew Distribution



Associated species:

Other species that may benefit from habitat management for Long-billed Curlew include Greater Short-horned Lizard, Mountain Plover, Horned Lark, and Swift Fox.

Long-billed Curlew Habitat



Management recommendations:

- Maintain a patchwork of pastures containing shortgrass, taller grasses, and scattered shrubs for foraging, nesting, and brood-rearing.
- Preserve native shortgrass prairie, as its conversion to cropland often renders it unacceptable to curlews.
- Avoid grazing sheep in shortgrass habitat occupied by nesting curlews. Sheep grazing may be more detrimental than cattle grazing, as sheep graze an area more completely and to a shorter height, and their habit of traveling in tight herds results more often in nest destruction.
- Plant native shortgrass species (blue grama and buffalograss), forbs, and legumes rather than taller, non-native species. Curlews will not nest in areas with tall grasses.
- Control non-native plants, including cheatgrass, leafy spurge, and knapweed, which do not provide the structure favored by curlews, and displace native shortgrass prairie plants.
- Avoid disturbance to curlews at known nesting sites by restricting activities such as oil and gas exploration, water well development, and other similar activities during the nesting season.
- Protect the area around known nest sites because some curlews will reuse nest sites in subsequent years and their offspring will return to nest near where they hatched.

Long-billed Curlew Summer Diet

Invertebrates (insects, worms, burrow-dwelling crustaceans, mollusks) 90%

Toads, eggs, nestlings 10%

Burrowing Owl

Burrowing Owl (Athene cunicularia)

Identification: These are small, long-legged owls, 8–10" tall, brown with white spots on the back and wings, and dark brown barring on the light brown breast and belly. They are often seen in the daytime perched on fenceposts or on the ground in or near prairie dog colonies. They have the peculiar habit of bobbing up and down while looking at prey or other animals.

Habitat: Burrowing Owls nest in treeless areas with short vegetation (less than 4" tall), usually where there are prairie dogs. The owls nest underground in burrows dug by prairie dogs, badgers, or foxes. They successfully raise more young where there is a high density of prairie dogs, probably because the owls are less conspicuous to predators in areas with many prairie dogs, or because prairie dogs are good at spotting predators and barking to alert all residents of the colony including the owls. Burrowing Owls benefit from some areas of tall, dense vegetation (at least 12" tall), which provides habitat for insect and small mammal prey.

Natural history: Northern birds leave their wintering grounds in March and April, arriving on the breeding grounds as late as May. They begin laying eggs in late March in the southern part of the range, and mid-May in the north. Burrowing Owls nest in loose colonies, with nest burrows about 100 yards apart. The adults and young birds move around and use "satellite" burrows in addition to the nest burrow. Northern birds leave for their wintering grounds by mid-October, while more southern birds remain year-round. Unlike many other owls, Burrowing Owls will hunt during the day. This is when they capture insects near the nest burrow and in other areas of short vegetation. They also hunt at night, capturing small mammals in areas of taller vegetation. Contrary to popular belief, they do not share their burrows with prairie dogs or rattlesnakes.

Burrowing Owls rely on prairie dogs to maintain the burrows that they use for nesting and resting. Without prairie dogs, burrows remain usable to owls for only 1–3 years, depending on the soil type. Although they will do minor excavating, the owls are unable to dig new burrows or clear out collapsed burrows.

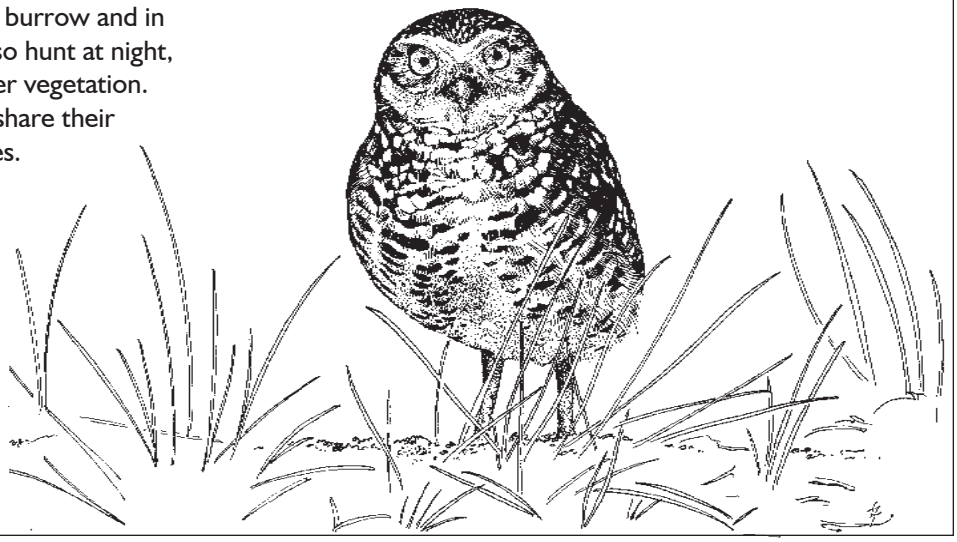
Nest: The nest is located underground at the end of a burrow 4–12' long. The nest is usually lined with plants or dried manure, probably either to disguise its scent or to help absorb water.

Eggs: usually 5–7 (sometimes as few as 3 or as many as 10), 1 1/4 " long, white, almost round

Did you know? Zuni Indians called the Burrowing Owl the "Priest of the Prairie Dogs."

Conservation need: Significant range contractions and population declines have occurred in some areas, especially Canada and California, where 60% of the breeding birds disappeared in the 1980s and 1990s. Over the past 100 years, Burrowing Owl populations in British Columbia, Alberta, California, Nevada, Colorado, and New Mexico have dropped by more than 50%. In Saskatchewan, the population declined 88% between 1988 and 1997. Causes include loss of habitat (due to urbanization and conversion of native grasslands to croplands or to taller, non-native grasslands), and removal of ground squirrels (in California) and prairie dogs.

Associated species:
Other wildlife that may benefit from habitat management for Burrowing Owls include Swainson's Hawks, Red-tailed Hawks, Ferruginous Hawks, Rough-legged Hawks, Golden Eagles, Mountain Plovers, and Horned Larks.



Management recommendations:

• Retain populations of the principal insect prey species (grasshoppers, crickets, beetles) at levels compatible with economic activities on the land. Insecticides have direct (poisoning) and indirect (loss of prey) effects on the birds. If insecticides are necessary, postpone their use until after the young owls have left the care of their parents (i.e., after the end of July).

• Control rather than eradicate prairie dogs. Retain populations of prairie dogs at levels compatible with economic activities on the land because Burrowing Owls are heavily dependent on prairie dogs for nest burrows. Consider the use of barrier fences to control the distribution of prairie dogs.

• Poison only active prairie dog burrows if you use chemical controls.

• Don't poison burrows used by Burrowing Owls. These burrows can often be identified by the presence of feathers and white droppings around the burrow entrance, or livestock manure lining the burrow. However, these signs are not always present, especially when the young hatch and start using different burrows than the nest burrow. A safer alternative is to fumigate burrows in the spring before the owls arrive, or bait in the fall after the owls have left.

• Leave inactive burrows open to provide roosting sites and future nesting sites for owls.

• Educate varmint hunters about the owls, and instruct them to be sure of their targets. Given the owls' habit of perching on the ground outside a burrow entrance, some owls could be mistaken for prairie dogs or ground squirrels.

• Protect known nest burrows because the owls will often reuse the same burrow in subsequent years.

• Maintain a buffer zone of 100–300 yards (up to 1/2 mile, if possible) around owl nest burrows; limit insecticide applications, rodent control, and other human disturbances in this area.

• Graze areas of shortgrass prairie used by owls, to maintain a low vegetation profile and provide manure for owl nests.

Burrowing Owl Distribution

• Maintain areas of taller vegetation, such as weedy fallow fields or fencerows, within 1 1/2 miles of known owl nest burrows, to provide habitat for the owls' prey species.

• Drive slowly by colonies to avoid collisions with owls—vehicles often hit owls when they fly low over roads in search of prey.

Burrowing Owl Habitat

Burrowing Owl Summer Diet

Invertebrates (mostly grasshoppers) 88%

Small mammals and birds 12%

Loggerhead Shrike

LOGGERHEAD SHRIKE (Lanius ludovicianus)

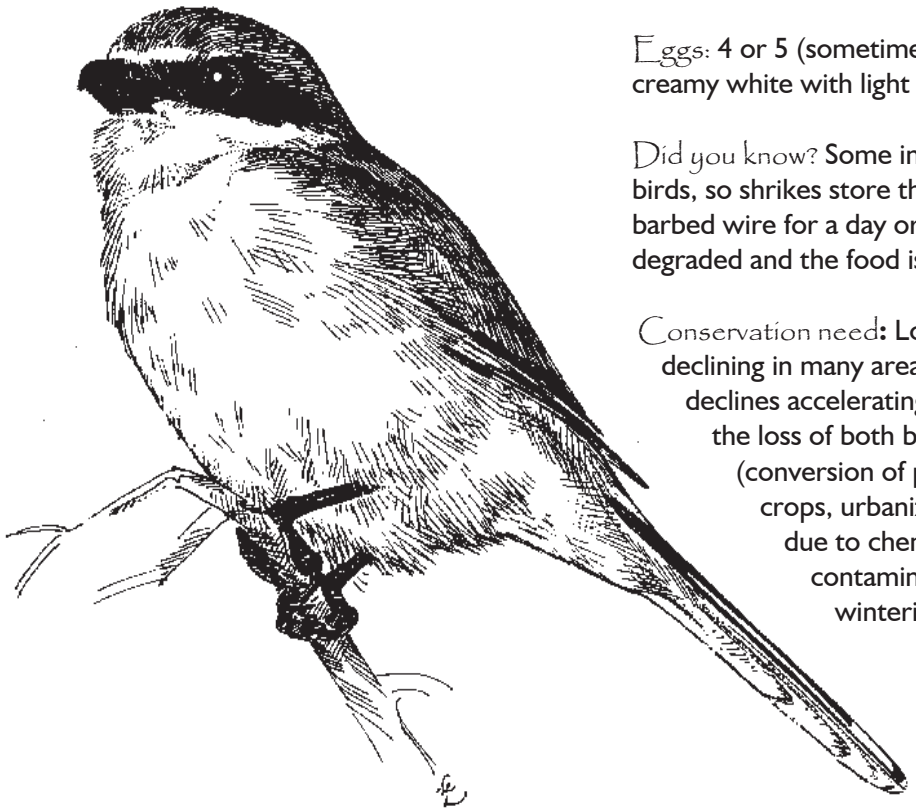
Identification**:** Slightly smaller than a robin, gray with black wings and tail, white throat and breast, white patches on the wings (especially visible when the bird is flying), and a black mask across the eyes. At close range, the hooked beak can be seen.

Habitat: Loggerhead Shrikes require areas with scattered or clustered trees and shrubs in open country, with a mix of short (less than 4") and tall (more than 8") grasses. They avoid large expanses of very short grass, such as heavily grazed pastures—probably because there is less food there. On the plains, suitable nesting sites include fencerows, shelterbelts, stream bottoms, and abandoned farmsteads. Popular shrubs for nesting include greasewood, saltbush, and sagebrush; popular trees include hackberries, hawthorns, and red cedar.

Shrikes hunt from elevated perches, such as utility lines and poles, fences, trees, shrubs, even tall weeds. They sometimes impale their prey on barbed wire or large thorns to store it for later consumption, or to hold it while they eat.

Natural history: Loggerhead Shrikes that breed in the north leave their wintering grounds in early April and May; other birds remain in the south year-round. They are early nesters, beginning their nesting activities as early as February in the south and late April in the north. Young birds usually leave the care of their parents in June. Northern birds leave for their wintering grounds by October. An almost identical species, the Northern Shrike, moves into the shortgrass prairie from northern Canada each winter.

Nest**:** A bulky nest of small twigs and bark strips, placed in tall shrubs or small trees (especially those with thorns) in open country.



Eggs: 4 or 5 (sometimes as many as 7), 1" long, creamy white with light brown and gray blotches

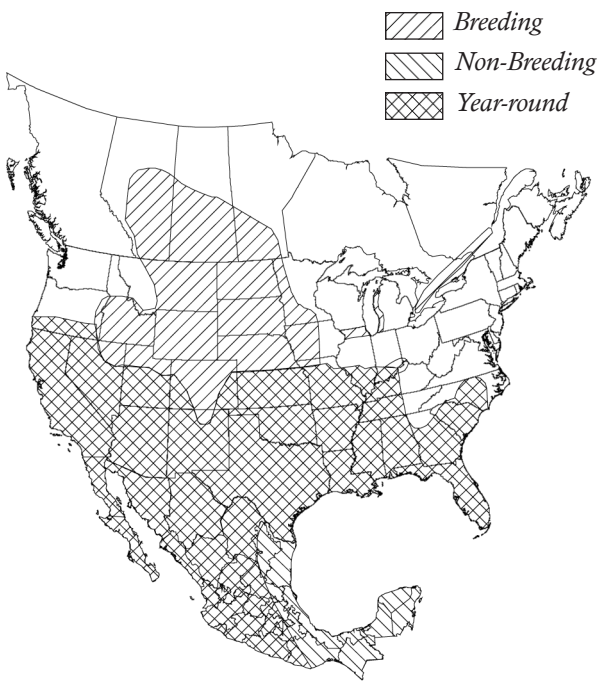
Did you know? Some insects are naturally toxic to birds, so shrikes store these toxic bugs on thorns or barbed wire for a day or two until the toxins have degraded and the food is safe to eat.

Conservation need**:** Loggerhead Shrikes are declining in many areas of the U.S., with the declines accelerating recently. Causes include the loss of both breeding and wintering habitat (conversion of pastures and hayfields to row crops, urbanization), loss of insect prey due to chemical controls, and pesticide contamination (especially on the wintering grounds).

Associated species:

Other species that may benefit from habitat management for Loggerhead Shrikes include Swainson's Hawk, American Kestrel, Burrowing Owl, Long-eared Owl, Northern Shrike, and Northern Mockingbird.

Loggerhead Shrike Distribution



Loggerhead Shrike Habitat

Management recommendations:

- Avoid heavy grazing (especially in areas where grass is naturally short or sparse)—tall vegetation, more than 8", provides habitat for prey.
- *Control* rather than *eradicate* populations of the principal insect prey species (grasshoppers, crickets, beetles), at levels compatible with economic activities on the land. Insecticides have direct (poisoning) and indirect (loss of prey) effects on shrikes.
- Protect known nest trees and shrubs from browsing or rubbing by livestock and from destruction by fire, herbicides, or other causes.
- Preserve tall grasses, shrubs, and other vegetation along fencelines and other areas within 200 yards of known nest trees because they provide habitat for prey.
- Preserve hedgerows and windbreaks because they provide nesting sites, hunting perches, and habitat for prey species. Where appropriate, establish new thickets with thorns.

Loggerhead Shrike Summer Diet

Invertebrates (mostly grasshoppers) 72%

Small mammals 14%

Birds 14%

Cassin's Sparrow

Cassin's Sparrow (Aimophila cassinii)

Identification: The Cassin's Sparrow measures 5–6" from beak to tail, with brown and gray streaking on the back, a pale gray throat and breast, and a white belly. The face is light gray. The brownish-gray central tail feathers have conspicuous dark brown bands; white corners on the tail are obvious when the bird is flying. The male frequently flies up about 20' above his territory, then sets his wings and glides down while singing.

Habitat: Cassin's Sparrows inhabit shortgrass prairie with scattered shrubs or other vegetation (including bunchgrasses, sagebrush, yucca, rabbitbrush, mesquite, oaks, and cactus). In some areas, they are found in fairly dense shrublands with scattered grassy openings. The taller plants are used as song perches and for nest cover. Their territories typically contain 20–35% bare ground, 40–80% total cover of shortgrass and mixed-grass, and at least 5% shrub cover. They will accept a wide range of shrub cover densities as long as some grass is also present. The winter habitat is similar to that of summer.

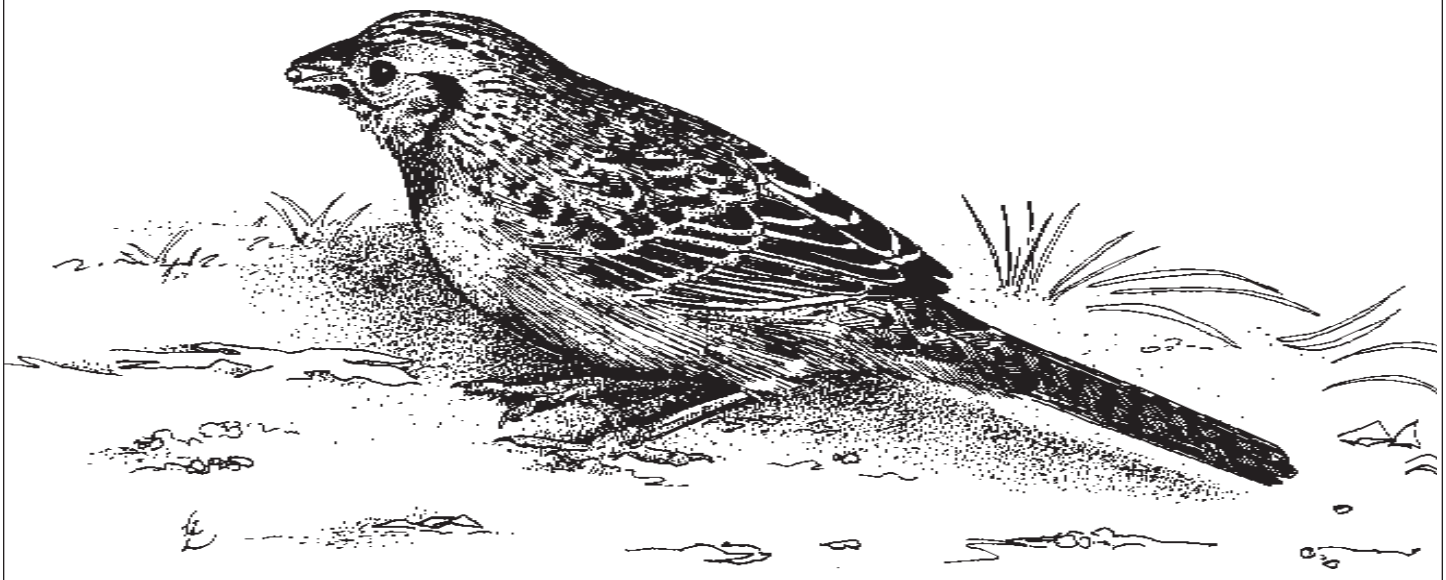
Natural history: Nesting begins as early as March (in Texas) and continues as late as early September (in Arizona). Nesting begins in the latter half of May in Kansas, Colorado, and Oklahoma. Clusters of breeding pairs often nest close to each other. Most birds have left for their wintering grounds by late September.

Nest: A deep cup made of weeds and grasses, lined with fine grasses or hair, placed on the ground in bunchgrass or near the base of a shrub or cactus, or a few inches off the ground in a shrub or cactus.

Eggs: usually 4 (sometimes 3 or 5), 3/4" long, plain white

Did you know? Although all male Cassin's Sparrows sing the same basic song, each male's song is slightly different from his neighbors' songs. The difference is strong enough that individual birds can be identified by careful study of their songs.

Conservation need: Cassin's Sparrow populations have been declining nationwide for decades, probably a result of habitat loss due to conversion of native prairie to cropland, urbanization, planting of non-native grasses, fire exclusion leading to overly dense woody vegetation, and brush control on the breeding and wintering grounds.



Cassin's Sparrow Distribution

Management recommendations:

- Avoid grazing in areas where the vegetation is already sparse, such as sparse shortgrass and desert grasslands. Cassin's Sparrows usually respond negatively to grazing in such areas, probably because of their need for some tall vegetation for nest protection and as song perches, and because of the habitat needs of their insect prey.
- Provide a patchwork of grassland parcels of different heights and densities. Cassin's Sparrows change nest sites from year to year, probably in response to changes in plant growth, grass seed production, and insect populations. Providing a diversity of habitat types provides Cassin's Sparrows options for establishing breeding sites each year.
- Preserve suitable shrub/grass habitat (grassland with at least 5% shrub cover).
- Avoid disturbance of nesting birds, as the adults are easily disturbed at the nest, and visits by humans often result in nest failure.

Cassin's Sparrow Habitat

Associated species:

Other wildlife that may benefit from habitat management for Cassin's Sparrows include Lesser Prairie-Chickens, Scaled Quail, Loggerhead Shrikes, Lark Buntings, and Western Meadowlarks.

Cassin's Sparrow Summer Diet

Invertebrates (mostly beetles, grasshoppers, crickets, caterpillars) 80%

Seeds 20%

Lark Bunting

LARK BUNTING (Calamospiza melanocorys)

Identification: These birds are 6 1/2" from the tip of the beak to the end of the tail. In summer, the males are black with bold white wing patches, while the females are mostly brown, with white wing patches, dark brown streaks on a white breast and cream-colored corners on the tail. During winter, males resemble females, but are darker, with a black throat. Beginning in early spring, males fly up above their breeding territory, then slowly glide down across it while singing an exuberant song of whistles and trills. This handsome species is Colorado's state bird.

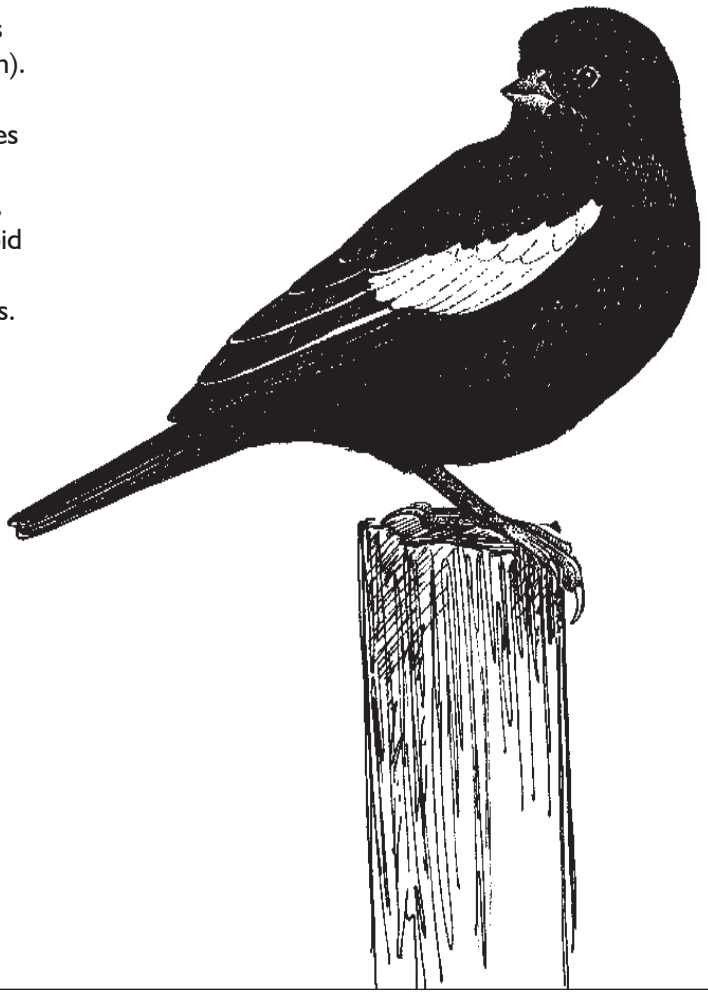
Habitat: Lark Buntings nest in open grasslands with a mixture of short and tall grasses and scattered shrubs, and in sagebrush shrublands with grassy openings. They prefer to nest in areas with 60–70% low grass cover and 10–15% bare ground. Also important is 10–30% cover of shrubs, tall grasses, or other plants taller than the blue grama and buffalograss (tall vegetation is necessary for protecting nests from the hot prairie sun). They will not nest in areas with less than 30% grass cover or more than 60% bare ground. Other nest sites include fallow fields with weeds and residual stubble, Conservation Reserve Program lands with tall grasses, and unmowed alfalfa and other hayfields, but they avoid mowed hayfields. Winter habitat is similar to summer habitat, although they will inhabit areas without shrubs.

Natural history: Birds leave the wintering grounds in early March, arrive on their breeding grounds in April and May, and begin nesting in May and June. Young birds leave the nest during June and July. Migration to the winter grounds occurs by late September, although some birds may stay over the winter in the southern parts of their range. The birds are most common in Mexico from August to April. During migration, large flocks of Lark Buntings are often seen in weedy roadsides. During migration and in winter, flocks may contain many hundreds of birds. Most of their food is picked off the ground, although they sometimes catch insects in flight.

Nest: A cup of fine grasses placed on the ground, inside diameter about 2 1/2", with the rim at ground level, usually partially concealed with grasses or other vegetation. It is often placed next to a shrub or other tall vegetation. Neighboring nests are sometimes just 10–15 yards away.

Eggs: usually 4 or 5 (but as few as 3 or as many as 7), 3/4–1" long, pale blue or greenish-blue, sometimes with reddish-brown spots

Did you know? In the 1800s and early 1900s, some farmers waited for the arrival of Lark Buntings each spring before planting, as the arrival of the birds generally coincided with more settled and favorable spring weather.



Conservation need: Ornithologists first began reporting a steady shrinkage of the breeding range and population declines in the 1800s, and the situation has not changed since. Lark Bunting populations are declining significantly across their range.

Associated species:
Other species that may benefit from habitat management for Lark Buntings include Chestnut-collared Longspur, Western Meadowlark, and Swift Fox.

Management recommendations:

- Avoid heavy summer grazing of shortgrass on the breeding grounds. This removes grass and forb cover needed by prey (especially grasshoppers) and taller vegetation needed to shade nests.
- Graze shortgrass lightly in summer or heavily in winter.
- Graze at moderate to heavy intensity in the northern and eastern parts of the species' range where grasses are taller (12" or more) to improve Lark Bunting habitat by reducing vegetation height and density.
- Use short-term rotational grazing rather than long-term grazing in shortgrass prairie to maintain the tall vegetation these birds need.
- Delay mowing until mid-July, when young birds should be out of their nests.
- Use a flush bar or similar device if you must mow earlier than mid-July (Appendix B).
- Retain shrubs, cacti, and other tall vegetation, which are needed by Lark Buntings for perching and for shading nests.
- Preserve the taller, weedy vegetation found along fencerows as habitat for migrating buntings.

Lark Bunting Distribution

Lark Bunting Habitat

Lark Bunting Summer Diet

Invertebrates (mostly grasshoppers) 75%

Seeds 25%

Grasshopper Sparrow

GRASSHOPPER SPARROW (Ammodramus savannarum)

Identification: Grasshopper Sparrows are 4–5" long. The back is chestnut and gray with some dark brown markings. The throat is white or off-white. There is a buffy tinge on the breast and sides with faint brown streaking, and a plain white belly. The males sing an insect-like buzz—the origin of the bird's name. When approached by a human, Grasshopper Sparrows often run along the ground rather than fly.

Habitat: Grasshopper Sparrows are found in most types of grassland, especially tallgrass and mixed-grass prairies, but also shortgrass, especially where scattered shrubs, trees, or other tall plants are present, and in Conservation Reserve Program lands, which provide the only suitable habitat in some parts of the shortgrass prairie. In addition to native grasslands, they will nest in fallow fields with tall weeds. Grasshopper Sparrows require some areas of bare ground, up to 35% of their territory, since they forage on the ground. In general, they prefer sites where much of the vegetation is at least 4" tall. These birds are highly territorial and prefer areas with tall forbs or scattered trees or shrubs to use as singing perches. However, they avoid areas with more than 35% shrub cover. During winter, they can be found in areas of dense grass with scattered low shrubs, and in weedy fields.

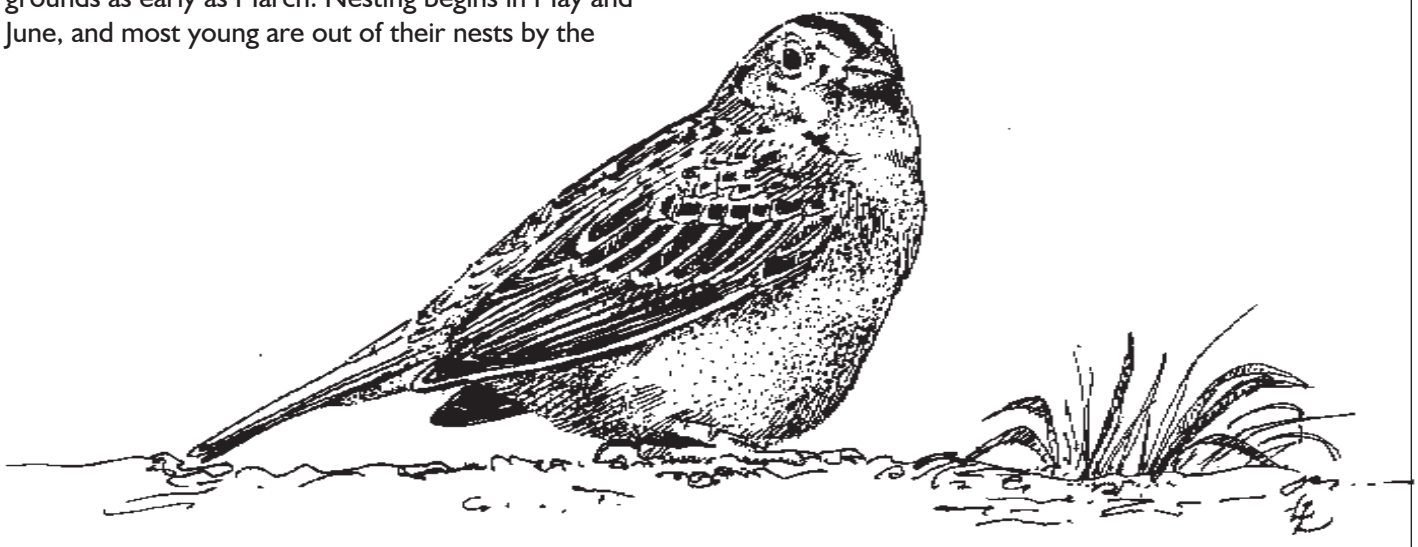
Natural history: Birds start leaving the wintering grounds as early as March. Nesting begins in May and June, and most young are out of their nests by the end of July. Most birds have migrated off the breeding grounds by late September. Grasshopper Sparrows sometimes nest close together, and populations in a particular location can vary widely from year to year, as the birds move around in response to changes in their habitat.

Nest: A simple cup on the ground, made of grasses, often at the base of grass clumps or other dense vegetation. The nest is concealed by overhanging vegetation.

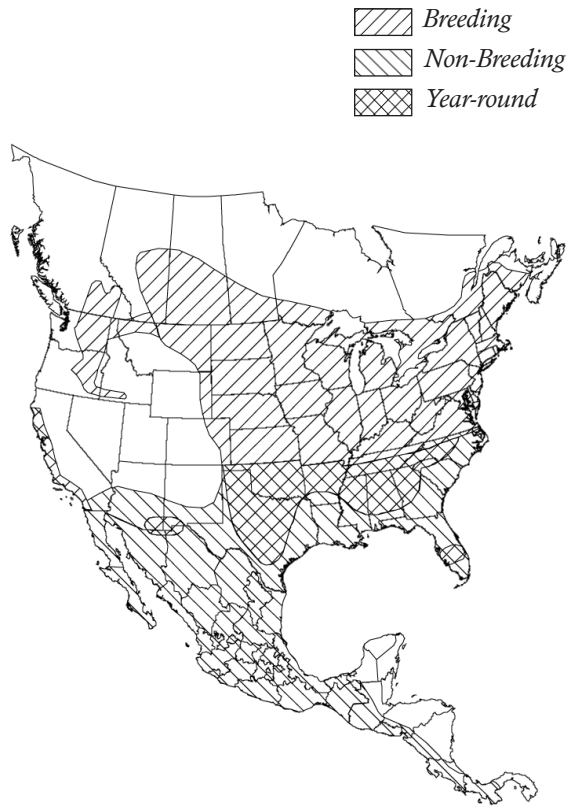
Eggs: usually 4 or 5 (sometimes 3 or 6), 3/4" long, white with reddish-brown blotches heaviest on the large end

Did you know? Grasshopper Sparrow singing is unusual in the bird world: the males sing two completely different songs (one is the insect-like buzz, the other more musical), and the females sing a trill to attract males.

Conservation need: Like several other grassland bird species, Grasshopper Sparrow populations are declining wherever they are found. Causes include loss of habitat by urbanization, conversion of native grassland to cropland, and overgrazing.



Grasshopper Sparrow Distribution



Management recommendations:

- Provide pastures and grassland parcels of at least 30 acres because Grasshopper Sparrows prefer large tracts of suitable habitat. Nests in smaller tracts are more likely to be found and destroyed by predators.
- Avoid grazing shortgrass, or delay grazing until after the end of nesting (the end of July), because the grazed vegetation often becomes too short and sparse to suit Grasshopper Sparrows.
- Delay mowing until after nesting, i.e., usually the end of July (mowing operations often destroy nests placed in hayfields, or expose them to predators).
- Use a flush bar or similar device if you must mow before mid-July (Appendix B).
- If pastures of shortgrass prairie are burned, they should be burned at relatively long intervals (>8 years), as the tall vegetation and shrubs needed by Grasshopper Sparrows take several years to reach heights suitable for the birds.

Grasshopper Sparrow Habitat

Associated species:

Other wildlife that may benefit from habitat management for Grasshopper Sparrows include Ring-necked Pheasants, Greater and Lesser Prairie-Chickens, Upland Sandpipers, Vesper Sparrows, and Western Meadowlarks.

Grasshopper Sparrow Summer Diet

Invertebrates 61% (mostly grasshoppers)

Seeds 39%

McCown's Longspur

McCown's Longspur (Calcarius mccownii)

Identification: These birds are 5–6" long from beak to tail. The male in summer has a gray face with black crown and "moustache," gray back with black streaking, white throat, black across the breast, and white belly. Chestnut-colored "shoulders" are especially noticeable in flight. An inverted "T" can be seen in the tail in flight, formed by a black band across the end of the tail, black central tail feathers, and white outer tail feathers. The female is similar to the male, but the colors are muted. In winter, the black on the male's head is brown, and the black on the breast is not as noticeable, while the female looks like she does in summer. The male displays by flying up above his territory, then floating down on outstretched wings while singing his territorial song.

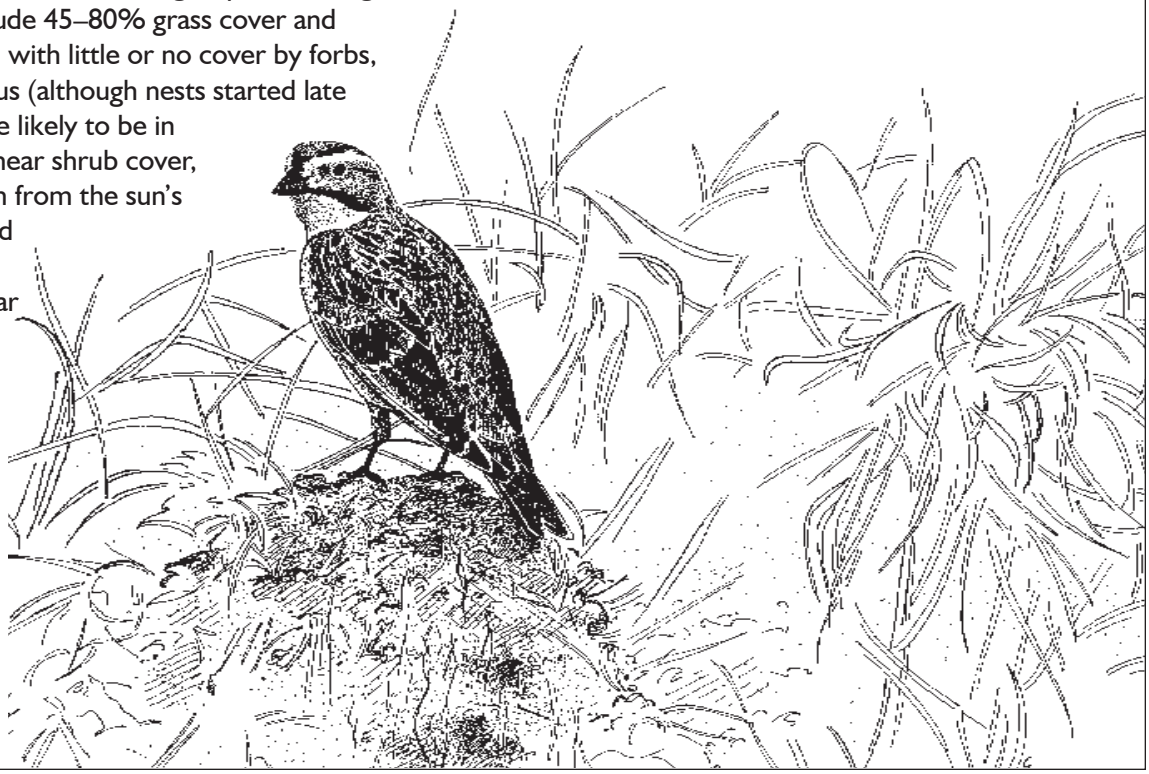
Habitat: McCown's Longspurs breed in shortgrass, especially where vegetation cover is sparse due to soil moisture or grazing, or is interspersed with shrubs or taller grasses. They are also found in grazed mixed-grass prairies and stubblefields. Individuals often use sparsely vegetated hilltops for displaying and nesting. They require areas of bare soil, and nest sites are often on barren hillsides. Early in the breeding season, nests are often placed on south-facing slopes. Nesting territories usually include 45–80% grass cover and 15–25% bare ground, with little or no cover by forbs, woody plants, or cactus (although nests started late in the season are more likely to be in denser vegetation or near shrub cover, perhaps for protection from the sun's heat). Longspurs breed in loose colonies. Winter habitat is similar to that of summer, with the addition of freshly plowed and bare fields.

Natural history: Longspurs leave the wintering grounds in late February and March, arrive on the breeding grounds in late March and April, and often linger into November. Nesting begins by mid- to late May, with most young out of the nest by mid-July. Paired birds are strongly attached to each other and stay close together, even walking side by side when foraging.

Nest: A simple grass structure, the rim level with the ground, placed next to a grass tuft, cactus, or small shrub, in an area of very sparse plant cover.

Eggs: 3–4 (sometimes as many as 6), 3/4" long, buff-colored with faint brown blotches

Did you know? The nests are difficult for predators (and humans) to find because the female sits tightly on her nest until practically stepped upon, relying on her superb camouflage to avoid detection. Females also have a strong instinct to protect the eggs: one researcher who wanted to count eggs in the nest of a particularly protective mother had to first lift her off the nest because she refused to abandon her eggs even momentarily.

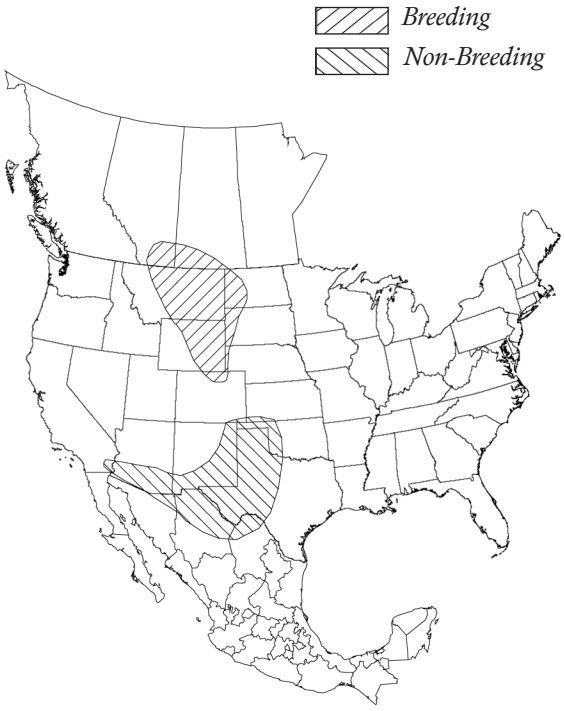


Conservation need**:** The population is down and the range has contracted since at least the early 1900s, probably because of loss of breeding and wintering habitat through fire exclusion, conversion of native prairie to cropland, and urbanization.

Management recommendations:

- Retain populations of the principal insect prey species (especially grasshoppers) at levels compatible with economic activities on the land.
- Graze at moderate to heavy intensity to improve McCown's Longspur habitat by reducing vegetation height and density.
- Graze in summer, rather than winter.
- Preserve or create native shortgrass prairie because longspurs cannot nest successfully in croplands or in tall non-native grasses.
- Control non-native plants, including cheatgrass, leafy spurge, and knapweed, which do not provide the vegetation structure preferred by longspurs, and displace native shortgrass prairie plants.
- Protect the area around known nest sites because some longspurs will return to nest in subsequent years.

McCown's Longspur Distribution



McCown's Longspur Habitat

Associated species:
Other wildlife that may benefit from habitat management for McCown's Longspurs include Greater Short-horned Lizards, Mountain Plovers, Long-billed Curlews, Burrowing Owls, and Horned Larks.

McCown's Longspur Summer Diet

Seeds 70%

Invertebrates (mostly grasshoppers) 30%

Chestnut-collared Longspur

Chestnut-collared Longspur (Calcarius ornatus)

Identification: Chestnut-collared Longspurs are 4 1/2–6" long. The male in summer is dark brown overall with some lighter brown streaking on the back. He has a black crown with black and white on the face and pale yellow on the throat and face up to the eye. The nape of the neck is chestnut. The female in summer has brown streaks on the back and crown, a white throat, a brown "necklace," white belly with faint brown streaks on the sides. In winter males, brown replaces the black on the head and breast, and the chestnut on the back of the neck. The female doesn't change much from summer to winter, although her overall coloration in winter is paler. Like the male McCown's Longspur, the male Chestnut-collared Longspur sings while flying over his territory.

Habitat: Chestnut-collared Longspurs prefer shortgrass or grazed mixed-grass prairie with scattered shrubs. In dry areas with sparse vegetation, they seek out wet meadows and other low, moist areas where the vegetation is taller and denser. They appear to prefer a mix of short and tall grasses, especially bunchgrasses, and usually avoid the tall dense cover common to some Conservation Reserve Program lands. They will nest in mowed hayfields and grazed pastures, provided some vegetation is 8–12" tall, but they avoid cultivated fields for nesting. They prefer native pasture over planted grasses or hayfields, and they avoid areas with dense litter. The territory is usually centered on a large rock, fencepost, or shrub, which is used as a singing post. Some research has shown them to nest most successfully in grassland patches of at least 140 acres. Winter habitat is similar to that of summer—grasslands with vegetation less than 20" tall, also croplands and mowed hayfields.

Natural history: Birds arrive in mid-April and begin nesting in May, with most young out of their nests by mid-June. However, because some pairs nest a second time, young can be found in nests as late as mid-August. After the end of the nesting season, the birds forage in large flocks. Most birds migrate south by September or October. The male vigorously attacks and drives away other birds and ground squirrels that get too close to the nest.

Nest: A nest of fine grasses placed in an area of sparse vegetation, the rim below or level with the ground, placed under grass tufts.

Eggs: 3–5 (sometimes 6), 3/4" long, white with dark brown speckles and blotches

Did you know? Unlike many songbirds that live in forests, Chestnut-collared Longspurs and other grassland birds do not hop on the ground, but walk or run. The elongated claw of the backward-facing toe may aid in this—it is this elongated claw that gives the bird its name, "longspur."

Conservation need**:** The breeding range has contracted, and the population has declined. For example, Chestnut-collared Longspurs were common breeders in western Kansas in the late 1800s, but they no longer nest there. Significant declines have also been recorded in Minnesota and Saskatchewan. Causes for the declines include loss of native prairie due to urbanization and through conversion to cropland.

Management recommendations:

- Protect known nesting sites because the birds will nest in the same areas year after year.
- Graze lightly or moderately in shortgrass prairie, leaving some areas of vegetation at least 6" tall—longspurs are more abundant in properly grazed grassland than in ungrazed grassland.
- Use a twice-over rotation system, which creates more suitable habitat than either season-long or short-duration grazing.
- Preserve native prairie because longspurs will not nest in croplands.

Chestnut-collared Longspur Distribution

Chestnut-collared Longspur Habitat

Associated species:
Other wildlife that may benefit from habitat management for Chestnut-collared Longspurs include Greater Short-horned Lizards, Lark Buntings, Western Meadowlarks, and Swift Foxes.

Chestnut-collared Longspur Summer Diet

Invertebrates (mainly beetles, grasshoppers, spiders) 72%

Seeds 28%

Ord's Kangaroo-Rat

Ord's Kangaroo-Rat (Dipodomys ordii)

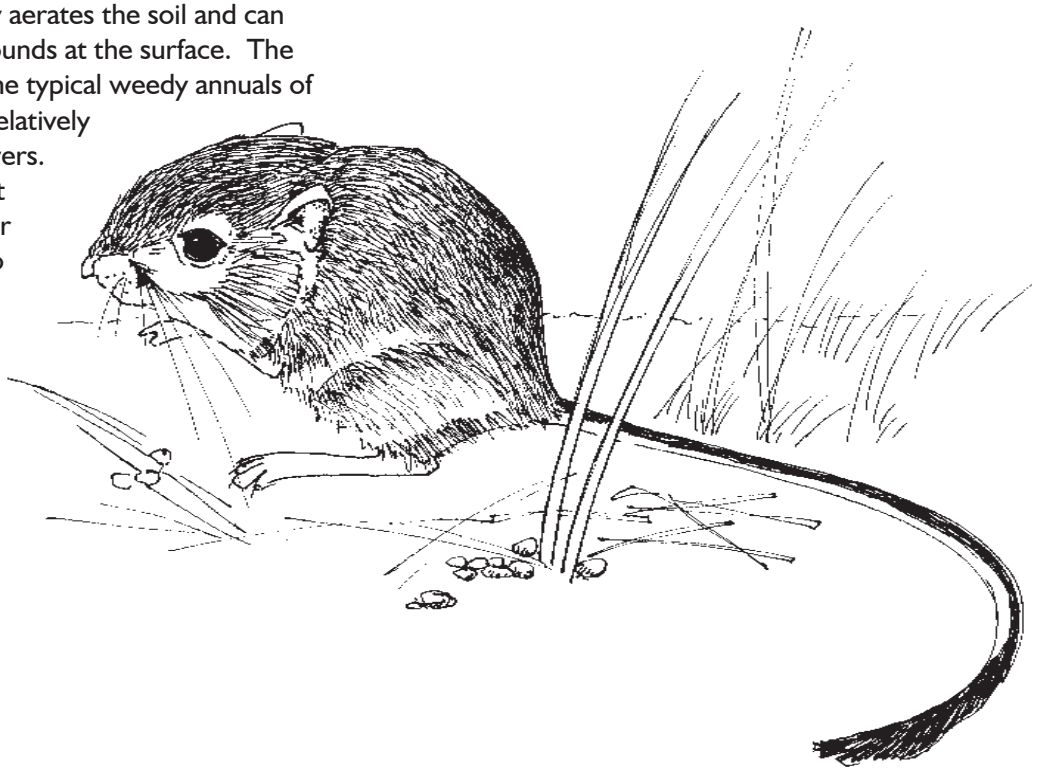
Identification: Ord's Kangaroo-Rat is a medium-sized kangaroo-rat with five toes per foot. It has a relatively long tail (even for a "k-rat") accounting for about 60% of the species' average 10" length. The tail is only rarely white-tipped. The fur is pale cinnamon-buff (with some darker color) on the upperparts with distinct dark facial markings. There are usually distinct white patches at the bases of the ears and above the eyes.

Habitat: This species is resident in a wide variety of habitats (e.g., grassland, semi-desert shrubland, piñon-juniper woodland) on the Great Plains and in the Intermountain West from southernmost Canada well into Mexico where sandy soils predominate. It readily colonizes newly-disturbed areas with little ground cover and where shifting sands are a conspicuous component of the habitat.

Natural history: Ord's Kangaroo-Rats dig deep burrows in which they spend their days safe from predators and high summer and low winter temperatures typical of the species' range. These burrows often have multiple entrances and the rats' extensive burrowing greatly aerates the soil and can create "soft" patches or mounds at the surface. The primary food supplies are the typical weedy annuals of arid country that produce relatively large seeds, such as sunflowers. Ord's Kangaroo-Rats collect seeds that they store in their expansive cheek pouches to take back to their burrows and eat in relative safety. They do not hibernate, so can be found during the winter foraging on the snow for their daily seed haul, though the species is strictly nocturnal (active at night). Their primary predators are Swift Foxes, Badgers (which can dig them out of their burrows), rattlesnakes, and open-country owls (such as Barn Owl).

Litter: Typical litters consist of three young, ranging from two to six. The breeding season occupies a large portion of the year, from early spring to late summer or early fall, dependent on latitude and other factors. However, during drought and other conditions during which food resources are poor, breeding is limited with fewer litters and fewer young per litter.

Did you know? Ord's Kangaroo-Rats have no particular need for surface water as they metabolize all their water needs from the dry seeds (mostly weed seeds) that they eat. So unimportant is available water to the species that they do not even know how to swim.



Conservation need: Though the species' populations are susceptible to conversion of native habitats, as are virtually all species detailed in this booklet, Ord's Kangaroo-Rat is fairly resilient and can be found in fairly disturbed and altered habitats. There is no strong concern for the species' populations currently, though urbanization in some areas certainly has a strong negative effect. Additionally, the historic alteration of prairie stream flows, particularly the channelization of the larger water courses may have erected barriers to dispersal to an animal without the ability to swim.

Ord's Kangaroo-Rat Distribution

Management recommendations:

- Conserve native grasslands, especially on a large scale.
- Avoid filling in burrows.
- Encourage native forbs, including sunflowers.
- Control non-native plants, such as leafy spurge and cheatgrass, which do not provide the vegetation structure nor food resources that this species prefers.

Ord's Kangaroo-Rat Habitat

Associated species:
Ord's Kangaroo-Rat shares its habitat with many other prairie species, particularly Swift Fox, Burrowing Owl, Lark Bunting, and McCown's and Chestnut-collared Longspurs.

Ord's Kangaroo-Rat Diet

Seeds 90%

Insects 10%

Swift Fox

Swift Fox (Vulpes velox)

Identification: This, one of the smallest native dogs of North America, is about the size of a house cat, weighing only around 4-5 lbs. The black-tipped tail is distinctive, as are black marks on the muzzle. The winter fur is primarily buffy-gray on the head and upperparts (including the upper side of the tail), orangish-tan on the sides, legs, and underside of the tail, and pale buff on the throat, chest, and belly. In summer, Swift Foxes are overall more reddish-gray.

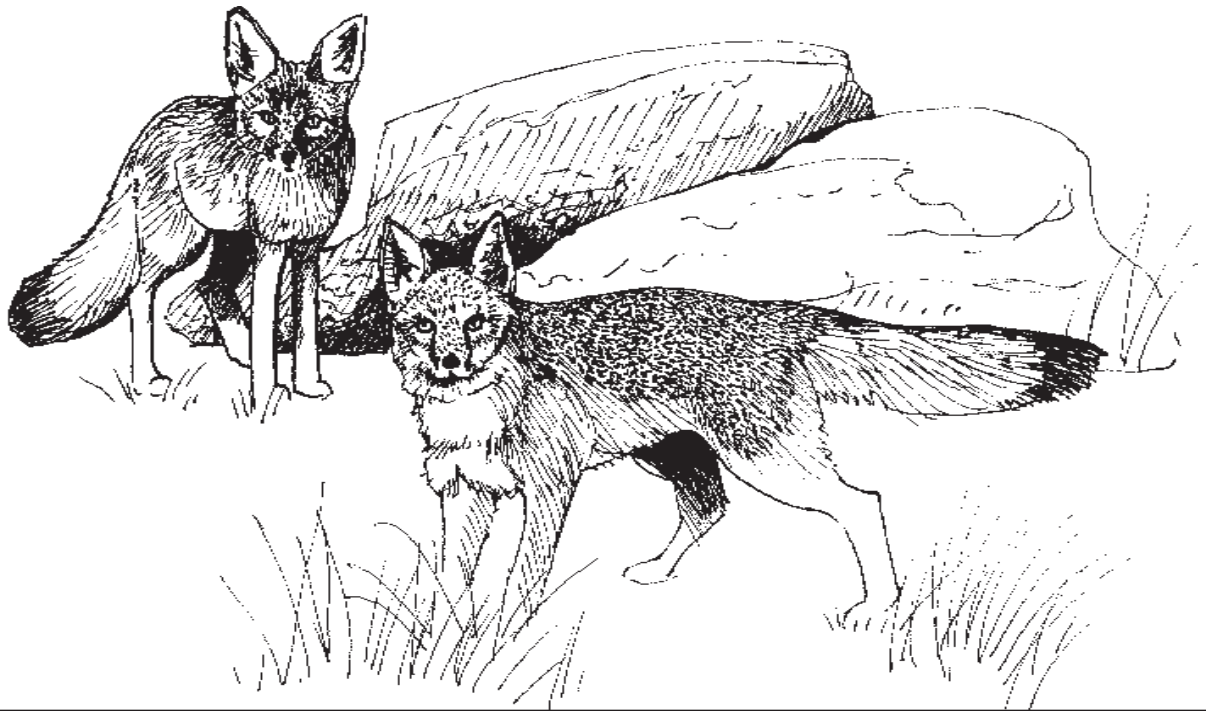
Habitat: Swift Foxes prefer open or sparsely-vegetated shortgrass and mixed-grass prairie with high visibility. In some parts of the range, particularly more southerly areas (e.g., southeast Colorado), habitat preference is a bit wider with shrubbier habitats being utilized. The conversion of native prairie to cropland and other uses is detrimental to the species. Den sites, which are used year-round (unlike in other North American canids), are typically burrows excavated by the foxes themselves, or modifications they make to existing badger or prairie-dog burrows, on well-drained slopes or hilltops near water. Those used solely for protection (from weather and predators) typically have a single entrance. Those used for birthing are often mazes of burrows and tunnels with multiple entrances.

Natural history: This species eats primarily smaller mammals (e.g., mice and rabbits), but also scavenges carcasses killed by other causes (e.g., disease or other predators). Swift Foxes are opportunistic predators and will kill and eat nearly anything that they can catch (e.g., birds). The breeding season of Swift Fox runs from January into summer, with pups born in April or May. Pups leave the parents' territory sometime in fall.

Litter: Typical litters consist of four or five pups, but range from as few as one to as many as eight pups.

Did you know? Swift Foxes have a low tolerance for wind and are rarely seen above-ground on windy days. Also, adults are very fast runners, reaching speeds of 25 miles per hour, hence the species' name.

Conservation need: During the latter 1800s and early 1900s, the Swift Fox suffered drastic reduction in both range and numbers and disappeared entirely from the Canadian part of its range. Primary causes of this decline were conversion of prairie and harvesting for furs. The Canadian government has reintroduced



the species in parts of its historic range with success. Other reintroduction efforts have been successful in South Dakota and elsewhere in the United States. These efforts have been part of the cause behind a resurgence of range and population size in many areas. Even parts of the species' range that have not hosted reintroduction efforts have seen a rebound in Swift Fox numbers, particularly Colorado, Wyoming, and western Kansas. Swift Fox have been trapped in Colorado and released elsewhere in the Great Plains to enhance smaller populations. This species was proposed for listing under the Endangered Species Act but was removed from "candidate" status partly due to the willingness of private landowners to allow access for surveys and restoration efforts.

Swift Fox Distribution

Associated species:

Most other native, terrestrial prairie animals also depend on areas that support Swift Fox, particularly Ferruginous Hawk, Mountain Plover, Burrowing Owl, Lark Bunting, and McCown's and Chestnut-collared Longspurs.

Swift Fox Habitat

Management recommendations:

- Return cropland to native prairie; incentives and cost-share programs are available through state and federal agences for this purpose.
- If controlling coyote populations, avoid killing Swift Foxes.
- Avoid disturbing burrows, particularly birthing dens during the breeding season.
- Control rather than eradicate the primary prey species (mice, ground squirrels, and rabbits). Retain populations at levels compatible with your economic activities on the land.

Swift Fox Diet

Assistance Programs

A number of programs are available from government agencies and private organizations to assist landowners and land managers in protecting, creating, and enhancing habitat for birds in the shortgrass prairie. Please see our website for a more complete list of assistance programs (www.rmbo.org), or call 303-659-4348.

Conservation Easement

- Conservation easements are often used to keep agricultural land in production, giving landowners financial support for not developing their land.
- Landowner voluntarily transfers (by donation or sale) certain development and land-use rights for all or part of their land to a qualifying conservation organization or government agency, while retaining title and all other rights to the land. Both parties agree to the details of the contract, which can include continued operations on the land, such as farming or ranching.
- Conservation easement donors may be eligible for income tax deductions. Property with a conservation easement in place may also be eligible for reduced property and estate taxes. See IRS Guidelines for specific details.
- Some organizations that accept donated easements and/or purchase easements on the plains are: Colorado Cattleman's Association Land Trust, The Nature Conservancy, Colorado Division of Wildlife, Montana Land Reliance, American Farmland Trust, and Centennial Land Trust.
- For more information, contact the Land Trust Alliance, 1319 F Street NW, Suite 501, Washington, DC 20004-1106; phone 202-638-4725 (www.LTA.org).

Natural Resources Conservation Service (NRCS)

- NRCS administers the Farm Bill which includes about 20 agricultural conservation programs nationwide. There are about 3,000 local districts across the country.
- NRCS provides educational, technical, and financial assistance to landowners who wish to protect and enhance wildlife habitat through enrollment in a Farm Bill program.
- Programs that involve wildlife habitat components include: Conservation of Private Grazing Land (CPGL), Conservation Reserve Program (CRP), Environmental Quality Incentives Program (EQIP), Wetlands Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP).
- Projects included under these programs involve retirement of cropland, establishment of grass cover, retirement of wetlands from grazing, wetland enhancement and restoration, and grassland renovation and management.
- Depending upon the program, the landowner may provide cost-share, in-kind contributions, or in some instances, receive incentive payments for enrollment.
- Contact your local NRCS office for more information (www.nrcs.usda.gov).

Partners for Fish and Wildlife

- Private lands program of the U.S. Fish and Wildlife Service
- Provides technical and financial assistance for wetland and riparian restoration, nest structures or nesting islands, grazing plans that benefit wildlife, food and shelter for wildlife, native plant restoration, water level management, and more.
- The landowner's part of the cost-share can be cash or in-kind (i.e., labor, equipment use, etc..)
- Work is accomplished by an active coalition of willing landowners, non-governmental organizations, tribes, and state and federal agencies.
- The emphasis is on landowner choice and blending profitable agriculture with wildlife conservation.
- Contact Bill Noonan (Colorado) at 303-275-2435, or for more information check the website at www.r6.fws.gov/pfw.

Pheasants Forever

- Provides up to 100% of the cost to establish or maintain habitat
- Emphaisis is on pheasants and other upland game birds, but managing their habitat benefits other birds with similar habitat needs, such as Upland Sandpipers
- Contact your local Pheasants Forever chapter, or check their website (www.pheasantsforever.org).

Candidate Conservation Agreement with Assurances (CCAA)

• Agreement for landowner to provide habitat for species that are candidates for listing under the Endangered Species Act (ESA).
• The landowner agrees to enhance habitat and, in return, receives cost-share funding to implement management practices. Landowner also receives assurances that if the species becomes listed under the ESA, his/her lands will not be subject to restrictions imposed by the ESA.
• Contact the nearest U.S. Fish and Wildlife Service office for more information (www.fws.gov). Region 6 (CO, KS, NE, WY, SD): 303-236-7920, and Region 2 (OK, NM, TX): 505-248-6282.

High Plains Partnership

•A Branch of Partners for Fish and Wildlife (USFWS) that focuses on rare and declining species on the plains, such as those outlined in this manual.
• Uses CCAAs as a conservation tool. This is a mutually drafted agreement between the landowner and High Plains Partnership designed to improve habitat for rare species.
• The USFWS provides cost-share for habitat improvements on private lands. The landowner contribution may be "in-kind."
• Participating landowners receive the "assurance" that should any of the species managed for on their lands be listed under the ESA, they would be exempt from any land-use restrictions under the ESA.
• Contact Steve Arey, USFWS, 918-581-7458, ext. 239.

WILD Nebraska—Partnerships for Wildlife Habitat

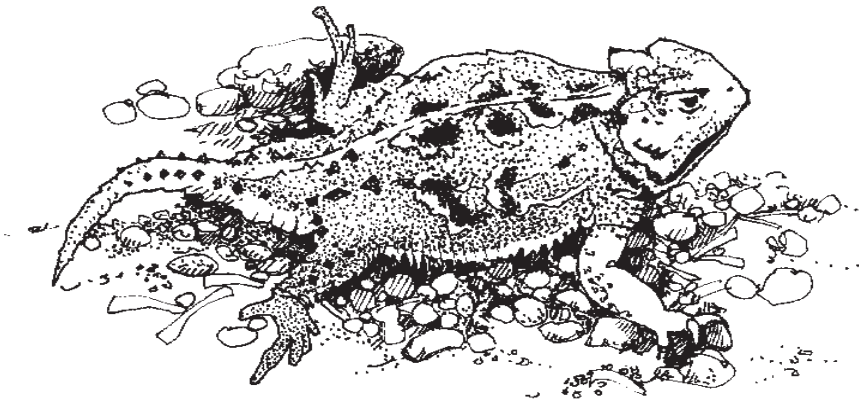
• Private lands program of the Nebraska Game and Parks Commision (NGPC)
• Provides technical and financial assistance
• Wildlife habitat development and management activities
• Transition land-use payments
• Public access option
• Contact your local NGPC office for more information, or check the website at www.ngpc.state.ne.us

Prairie Partners

• Provides technical assistance for the management of species in this manual.
• Provides inventory for shortgrass prairie birds.
• Provides cost-share assistance for habitat enhancement projects on private lands, through cooperative agreements.
• Contact Rocky Mountain Bird Observatory, 14500 Lark Bunting Lane, Brighton, CO 80603; phone 303-659-4348 (www.rmbo.org).

Cooperative Habitat Improvement Program (CHIP)

• Designed to assist landowners wishing to develop or improve wildlife habitat.
• Offered statewide by the Colorado Division of Wildlife (CDOW).
• CDOW will provide technical assistance and as much as $4,000.00 per landowner in financial assistance.
• CDOW will also provide assistance to landowners regarding other cost-share programs.
• Can be used as a stand-alone program for small projects, however many projects can be supplemented and improved by partnering with other habitat programs such as the Conservation Programs within Farm Bill and Partners for Fish and Wildlife.
• A flexible program offering landowners several options to create habitat for a specific species. A few examples of habitat projects eligible for this program are small woody plantings, grass plantings, wetland enhancements, and stream improvements. Match: 15% landowner cash or in-kind, $4,000 cap.
• Deadline: On-going
• Contact your local CDOW office.



Colorado Species Conservation Partnership

• A far-reaching species protection program developed with the U.S. Department of the Interior by The Great Outdoors Colorado Trust Fund (GOCO), in partnership with the Colorado Division of Wildlife (DOW), private landowners and non-governmental organizations throughout Colorado.
• Goals are to prevent further decline of Colorado's wildlife species, meet species conservation goals that secure recovery of declining species in the state, reduce the necessity of further listing of new species under the Endangered Species Act (ESA), and down-list and delist species listed as threatened or endangered under ESA.
• Brings together species protection and land conservation tools and incentives not available without the partnership.
• Protection strategy entails use of habitat conservation easements providing incentives to private landowners to actively assist with management and protection of Colorado's declining species.
• Conservation easements used to guarantee that landscapes will remain intact to provide fundamental wildlife resources on a long-term basis.
• Private landowners have the opportunity to choose either term or perpetual conservation easements.
• All conservation easements within the program will have an accompanying management plan that will be agreed upon by the landowner and CDOW.
• Landowner preference and biological concerns drive these options.
• Species conservation goals of CSCP over the long-term will recognize that habitat protection efforts should not undermine the financial viability of an agricultural operation.
• For more information regarding CSCP or other landowner programs offered through the Division of Wildlife, please contact:

Ken Morgan
Private Lands Habitat Specialist
ken.morgan@state.co.us
(303) 291-7404

In Canada...

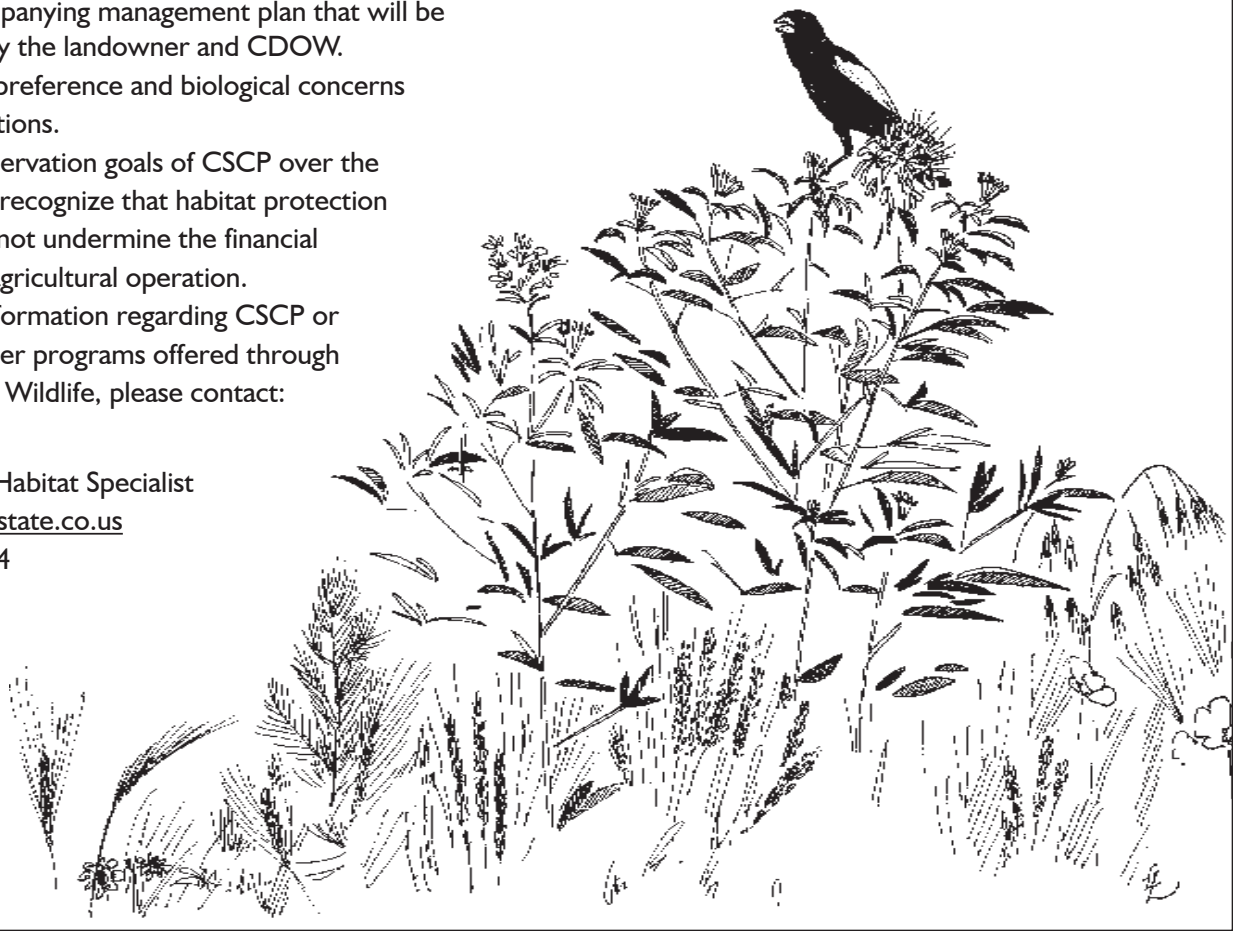
Native Prairie Stewardship Program

• Voluntary stewardship agreements with landowners.
• Provides educational materials and technical assistance.
• Contact Saskatchewan Wetland Conservation Corporation, 2022 Cornwall St., Room 101, Regina, SK S4P 2K5; phone 306-787-0726 (www.wetland.sk.ca).

Operation Grassland Community

• Provides educational materials and technical assistance.
• Incorporates Operation Burrowing Owl.
• Special focus on Burrowing Owls, Loggerhead Shrikes, and other uncommon or declining grassland species.
• Contact Operation Grassland Community, Box 1644, Brooks, AB T1R 1C5 (www.eidnet.org/local/ogc).

Additional information on programs in the U.S. is available from your state wildlife agency, Soil and Water Conservation District offices, extension service, and state lands offices.



Prairie Partners

Prairie Partners is an RMBO program that works with private landowners and asks their voluntary cooperation to conserve shortgrass prairie wildlife. Because most of the shortgrass prairie is privately owned, landowners are the key to conservation. Landowners choose their level of involvement, ranging from allowing us to inventory their land, to implementing management practices described in this manual, to enrolling in one of the programs outlined in the *Assistance Programs* section. Prairie Partners encourages conservation on private lands through:

Inventory-

An survey of shortgrass prairie birds, other wildlife, and their habitats.

Outreach-

We involve private landowners in prairie conservation through personal one-on-one conversations, workshops, and presentations to landowner groups.

Incentives-

For landowners interested in habitat enhancement projects, we provide technical advice and help landowners identify other sources of technical and financial assistance. We develop projects that provide win-win solutions by helping landowners with their operations while simultaneously enhancing habitat. Please see the *Assistance Programs* section for further details.

Mountain Plover-

We conduct Mountain Plover nest marking on cultivated land during the nesting season. The equipment need only miss nests by inches. Call toll-free 1-888-575-6837 during Mountain Plover nesting season (mid-April through July 4th) and an RMBO biologist will survey your land, mark nests, and provide a map. This is a voluntary opportunity to help a species of conservation concern. This program is available in eastern Colorado and western Nebraska.

Publications-

We provide publications to help raise awareness for prairie wildlife conservation needs including this manual, the *Pocket Guide to Prairie Birds*, and the *Stewardship Resource Guide* for private lands.

Colorado Birding Trail-

We also encourage economic diversification on private land through opportunities including the Colorado Birding Trail. To nominate your land for the birding trail, please contact RMBO or visit the web site www.birdingtrail.org. This is a free opportunity to diversify your economic base by attracting nature enthusiasts to your property.

Nebraska Shortgrass Prairie Partnership (NSPP)

This is a partnership between the Nebraska Game & Parks Commission and RMBO. The NSPP provides technical and financial assistance to landowners for at-risk prairie species' habitat conservation and enhancement in the panhandle of Nebraska. Assistance can be used for:

- Grazing management (cross-fence, pipeline, tanks, wells);
- Grassland restoration (tillage, cover crop, reseeding of native plant species);
- Prescribed fire (to enhance native plant communities);
- Tree clearing and thinning (to remove trees encroaching on grasslands); and
- Mountain Plover nest marking.

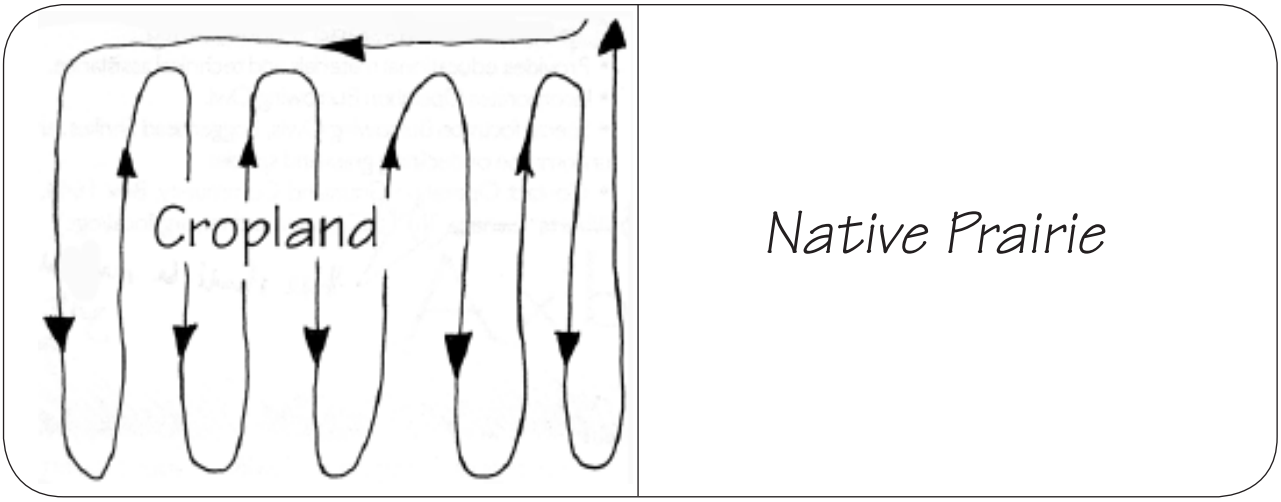
In Summary-

Our goal is to engage you in the conservation of birds and other wildlife, build partnerships, and work collaboratively to create win-win solutions in shortgrass prairie conservation.

Private lands, as a whole, make a tremendous contribution to shortgrass prairie habitat conservation, but this is largely unrecognized. The Prairie Partners program is eliminating the gap in information that exists on private lands by asking permission to inventory private range. We can document the number of acres supporting prairie bird species, numbers of birds, and provide better scientific information. We work in Wyoming, Colorado, New Mexico, Texas, Oklahoma, Kansas, Nebraska, and South Dakota, thus covering the breeding range of many of the shortgrass prairie bird species. Information collected on private lands is summarized and given to representative natural resource agencies; *individual landowners are not identified*. Information collected on private lands is a powerful tool that can help keep common species common, and less abundant species from becoming listed as threatened or endangered. This is an effective way to keep management on a local level, in your hands.

Appendix A

Mowing Technique



At the time of harvest, reduce the speed of your machine and use a cutting pattern that will give the birds a chance to escape from the cutting device. The most effective technique is to start from the edge of the plot and use a back-and-forth pattern to push birds toward uncut areas, such as native prairie. The birds will use the standing cover for concealment until they reach the native prairie.

Flush Bar Construction

Flushing bars mounted on the front of mowing devices can reduce the number of birds killed when harvesting a field. The pictures here show how a flushing bar is connected to a self-propelled hay mower. To obtain specific information on how to build and mount a flushing bar on your tractor, please contact: Ducks Unlimited Canada / Alberta Prairie CARE office in Brooks at 403-362-4827 (http://www.ducks.ca). Photos courtesy Ducks Unlimited Canada.

Appendix B

Stock Tank Escape Ladder for Wildlife

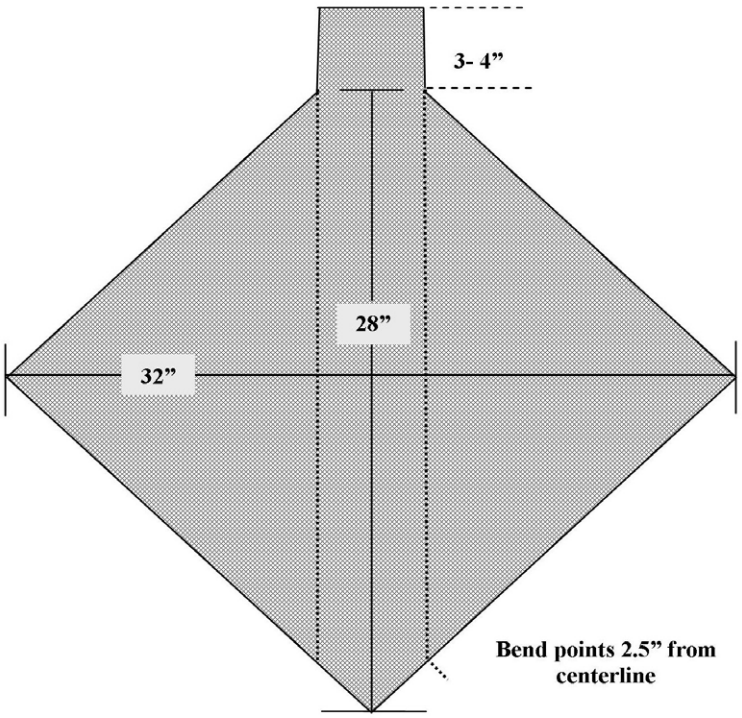
The design is somewhat like a diamond, where the ramp length is 28" and the "wings" to be bent down are 32" across. The ramp is made of 14-gauge expanded metal with 3/4" mesh. A pattern can be made from sheet metal, which is clamped on the expanded metal and used as a template for cutting. One 4'x10' sheet of expanded metal will yield six ladders.

After cutting out the design with a cutting torch, the metal is bent with a metal brake 4" between bends to make the sloped side or "wings" for the ramp. A 3/16" rod can be used to form the hangers for round rim and rimless tanks or use a bolt, washer, and nut to secure the ladder to the tank.

Another option for hanging is to leave a 3-4" tail on your diamond-shaped cutout making it more kite-shaped (see diagram below). After bending the wings, bend the tail in a half-circle and use it as a hanger. The ladders can be painted or dipped with a neutral color farm implement paint to prevent rusting.

If interested in ordering fabricated ladders contact Horse Creek Fabrications of Karval, Colorado, at rainbowvalley@plains.net

Dead Red-tailed Hawk in stock tank.



Appendix C

Ferruginous Hawk Nest Platform and Tree Crib

It is important to recognize that historically the Ferruginous Hawk has preferred to nest on the ground using bison bones and large sticks to construct a nest. Now, however, about half of all Ferruginous Hawk nests are located in trees and shrubs. Most of these trees were planted during the homesteading days and are now old and dying. We recognize that trees were not as prominent in the past on the shortgrass prairie but are important today for nesting Ferruginous Hawks. Discretion must be used when constructing a nest platform for the Ferruginous Hawk in the prairie. Nest platforms alone will not bring Ferruginous Hawks to your property. You should evaluate several factors before constructing a nest platform:

1. Records of Ferruginous Hawks on your property. Historical and current records of nesting Ferruginous Hawks are a good indicator that you have suitable habitat.

2. Disturbance near the nest platform. Ferruginous Hawks are sensitive to disturbance and have been known to abandon nests when a prolonged disturbance (e.g., construction) is within a mile.

3. Availability of prey. Small mammals are the primary prey items of the Ferruginous Hawk. Habitat to maintain populations of these animals must be available to provide a food supply during the breeding season.

4. Condition of current nest tree. Ferruginous Hawks reuse nests and if the nest tree is old and dying the nest will be lost with the tree.

The nest platform and nest tree crib (pictured below) are tools that can be used to assist in Ferruginous Hawk conservation. The nest platform will provide the hawk with additional nesting opportunities if nest sites are limited. The nest tree crib provides protection from livestock rubbing up against the tree, hence prolonging the life of the nest site. Contact the Rocky Mountain Bird Observatory for more detailed information or to assist in Ferruginous Hawk conservation on your land.

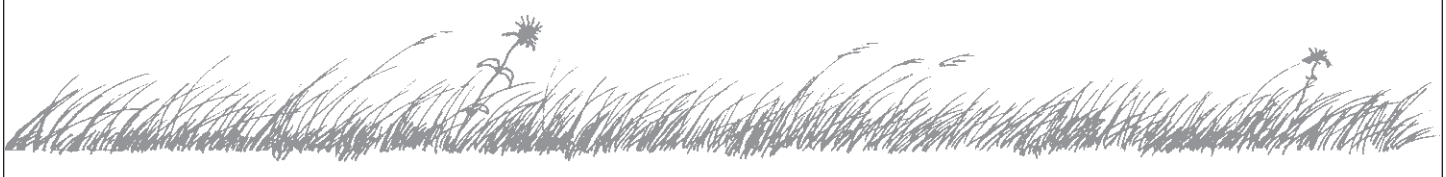
Ferruginous Hawk Nest Platform

Ferruginous Hawk Nest Tree Crib

Photos courtesy of Dan Garcia

Pictures of some other species mentioned in the text.

Notes:



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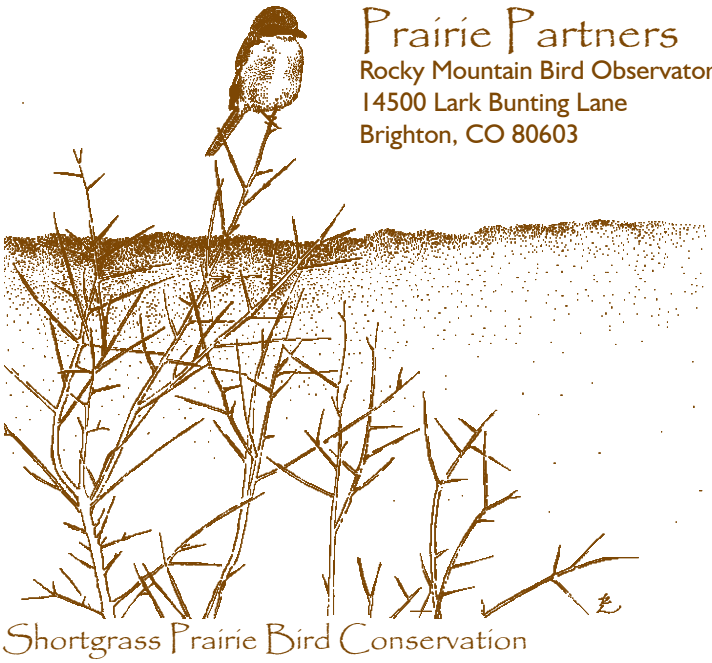
Third Edition Edits: Tony Leukering



Prairie Partners
Rocky Mountain Bird Observatory
14500 Lark Bunting Lane
Brighton, CO 80603

Shortgrass Prairie Bird Conservation