Integrating Bird Conservation into Range Management

Tammy VerCauteren and Scott W. Gillihan
Rocky Mountain Bird Observatory
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Tammy VerCauteren and Scott W. Gillihan
Rocky Mountain Bird Observatory
14500 Lark Bunting Lane
Brighton, CO 80603
www.rmbo.org

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Cover photos courtesy Lacy Anderson (cattle) and Tony Leukering (birds).

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Summary

This manual is designed to assist resource professionals with integrating birds and their habitat needs into range management and monitoring, and to train landowners and land managers to do the same. The Rocky Mountain Bird Observatory's "Pocket Guide to Prairie Birds" and "North American Bird Reference Book" CD-ROM are designed to accompany the manual and help the user with bird identification both by sight and sound. Birds play critical ecological roles including helping control insects, dispersing seeds, and serving as prey for a diversity of wildlife species. Birds also play an increasing economic role as a third of all Americans participate in bird watching, an activity that generates millions of dollars for local economies. Since birds are closely tied to the available habitat structure (height and density of vegetation), they can serve as indicators of habitat change, which in turn can reflect changes in land management strategies. This manual will help landowners document their lands' contribution to birds, showing how wildlife habitat and grazing management are complementary. Such documentation may help landowners rank higher when applying for financial or technical assistance programs such as EQIP. Many prairie bird species are of high conservation concern but through voluntary, proactive efforts we hope to keep common birds common, reverse declining population trends, and keep management strategies within the hands of the owners and operators.

Who we are

The Rocky Mountain Bird Observatory (RMBO) is a nonprofit 501(c)(3) organization governed by a Board of Directors and dedicated to the conservation of birds and their habitats throughout the Rocky Mountains and Great Plains. We accomplish our conservation goals through research, monitoring, education, and outreach and conduct on-the-ground conservation in cooperation with other private, state, and federal agencies responsible for managing areas and programs important for birds. We also partner with private landowners and managers to promote land stewardship that benefits birds. Much of our work is designed to increase the public's understanding of birds and their habitats by educating children, teachers, natural-resource managers, and the general public. Because birds do not recognize political boundaries, RMBO works to bring a unified approach to conservation among states and countries.

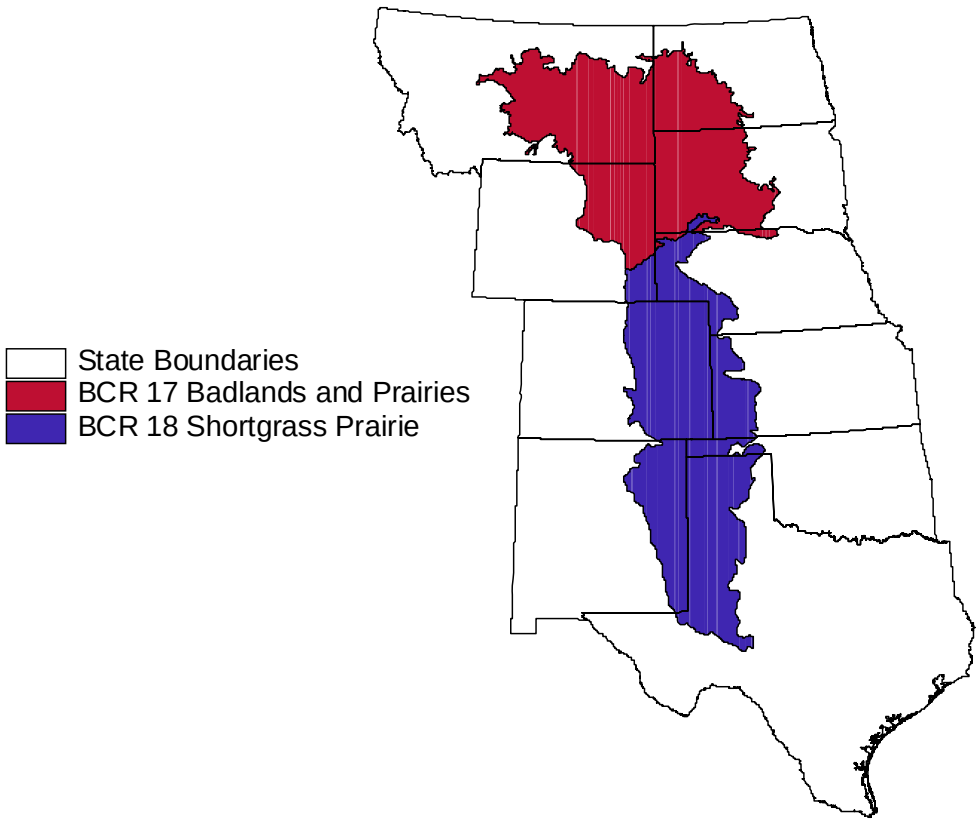
Prairie Partners is a program within RMBO established to conserve prairie birds and the habitats upon which they depend. Our ultimate goal is to build a coalition of landowners and land managers actively involved in the conservation of lands important to prairie birds. We achieve this goal by monitoring prairie birds and their habitats, conducting outreach to increase awareness and understanding of prairie birds and their habitat requirements, providing technical assistance to landowners on how to incorporate birds into management, and working with interested landowners and other partners to design projects to enhance bird habitat on their lands.

Prairie Partners works within the frameworks of both Partners In Flight (PIF) and the North American Bird Conservation Initiative (NABCI) to achieve its goals. PIF is an international effort that also works at a regional level to draw together the many groups and individuals working on bird conservation in North America. It was launched in response to the growing

concerns about population declines of many land bird species. The goals of PIF are to 1) prevent rare species from going extinct; 2) prevent uncommon species from becoming threatened; and 3) keep common birds common. We use the PIF assessment database to determine priority species for the landscapes in which we work.. Visit the PIF web site (http://www.partnersinflight.org) for more information.

The role of NABCI is to facilitate the conservation of native North American birds by increasing the effectiveness of existing initiatives, enhancing coordination, and fostering greater cooperation among the nations and peoples of the continent. Please visit their web site (http://www.nabci.org/) for more information. *Prairie Partners* is committed to the NABCI model of integrated bird conservation by "delivering the full spectrum of bird conservation through regionally based, biologically driven, landscape-oriented partnerships," carried out within ecologically determined landscapes called Bird Conservation Regions (BCR). Our work is carried out mostly within BCR 17 (which we refer to in this manual as the **Northern Plains**) and BCR 18 (which we refer to as the **Central Plains**) (Fig. 1). These are the most important regions to shortgrass prairie birds breeding within the U.S.

Figure 1. Boundaries of Bird Conservation Regions 17 (**Northern Plains**) and 18 (**Central Plains**).



USDA SARE Grant

As part of RMBO's ongoing outreach work on the Great Plains, we visited with hundreds of landowners over several years. Some wanted to document how their land contributes to bird conservation. We started formulating plans for a simple field survey protocol that would allow landowners to track changes in bird populations on their land. We felt that, because birds can be good indicators of changes in the land, they can be tied into range management.

To further pursue those ideas, RMBO's *Prairie Partners* program received a grant from the USDA Sustainable Agriculture Research and Education (SARE) Program in 2002. The overall goal of this two-year project was to heighten the awareness of birds with resource professionals and private landowners, increase their understanding of grassland bird habitat requirements and associations, and help them integrate birds into range management prescriptions. The objectives used to achieve these goals were:

1) Develop a manual for landowners and resource professionals that integrates bird conservation into range management and monitoring. This manual will complement Colorado State University's Cooperative Extension project on "Coached Land Planning and Care," also funded by SARE. The manual includes information on bird identification, distribution, habitat requirements, and conservation status in two geographic regions (**Central Plains** and **Northern Plains**) of the Great Plains.
2) Develop a protocol for bird population surveys as part of the manual, which will help resource professionals and landowners tie range habitat types and structure to the bird community. These surveys are a way to encourage resource professionals and private landowners to become more aware of the birds their lands support. With time, the surveys will help generate enthusiasm for birds and encourage stewardship.
3) Create, print, and distribute an easy-to-use, illustrated "Pocket Guide to Prairie Birds," a guide that resource professionals and private landowners can use to help them identify common bird species and those of conservation concern.
4) Develop an interactive CD-ROM to accompany the training manual and pocket guide. The CD-ROM will help with bird identification by sight and sound. It will serve as a tool to aid in the field and office or home setting to prepare users for the bird community they are likely to encounter while working or managing the land.

Introduction

Birds are ecologically and economically important. Because of their essential role in the prairie community, healthy populations of birds are indicative of a healthy environment. Birds eat dead animals, distribute seeds, serve as food for other wildlife, and help control insects and rodents. Most grassland birds, even seed-eaters, eat insects during the breeding season and most young birds are fed only insects and other invertebrates. Birds can eat impressive numbers of insects: a Swainson's Hawk will eat approximately 230 crickets in one day, and Baird's Sparrows collect an estimated 135 insects (mostly grasshoppers) per day to feed their young. Some grassland birds specialize in mammal prey. To feed themselves and their young during a single breeding season, a pair of Ferruginous Hawks will kill roughly 500 ground squirrels, gophers, and prairie dogs, as well as jackrabbits and cottontails. Although birds may not control large insect and rodent outbreaks after they have begun, they can suppress populations, keeping them below outbreak levels that require more active control by landowners and managers.

Birds are also important to the U.S. economy. In 2001, over 80 million Americans participated in some form of recreational activity related to fish and wildlife. One-third of all adults, 69 million people, consider themselves birdwatchers. This growing activity results in $85 billion in overall economic output and $13 billion in state and federal taxes, and supports more than 800,000 jobs. According to a 2001 survey by the U.S. Fish and Wildlife Service (USFWS 2002), Colorado had 1,127,000 residents and 838,000 non-residents who watched wildlife; in Montana the figures were 341,000 residents and 511,000 non-residents; in Wyoming, 154,000 and 416,000; in New Mexico, 449,000 and 387,000. Dollars spent while watching wildlife amounted to $621,043,000 in Colorado, $392,076,000 in Montana, $391,528,000 in Wyoming, and $555,616,000 in New Mexico (USFWS 2002). Nature-based tourism is the fastest-growing segment of the tourism industry in the United States. Birders are considered "low impact" because they are careful to avoid adversely impacting the environment and tend to spend freely on their hobby, traveling extensively to find rare species.

Land Management and Birds

Land management influences habitat by altering its structure (both height and density of the vegetation). Resource professionals commonly measure habitat structure (percent bare ground, vegetation cover, etc.) to monitor changes. In the same way, birds can be used as indicators of habitat change since they are closely tied to the available structure.

During the breeding season, birds are very conspicuous as they sing or perform aerial displays to attract mates and define territories. Since birds are conspicuous and the number of species using the prairie is low, they can easily be incorporated into monitoring plans to help serve as indicators of change. For instance, if you are managing to decrease the shrub component within a management unit, the birds dependent on shrubs will decrease in this management unit over time and those more heavily dependent on grassland habitats should increase. If the bare ground component within your management unit is increasing, then those species that are dependent on heavy disturbance like the Horned Lark and Mountain Plover will likely occupy or increase in numbers on the management unit. This manual will provide tools for you to assess changes in the bird community that reflect changes in structure and management.

The grasslands and shrublands of the Great Plains harbor unique bird species found nowhere else in the world. Unfortunately, according the U.S. Geological Survey's annual Breeding Bird Survey, which has tracked North American bird populations since 1965, many of these species have been exhibiting population declines (Knopf 1996a). The precise causes of these declines remain poorly understood and vary from species to species. Most evidence suggests that the conversion of grassland to cropland, changes in historic disturbance regimes including grazing and fire, invasion by non-native species, and pesticide use are the primary causes. Although the migration patterns of grassland birds are poorly understood, additional forces causing the population declines probably include management practices and habitat loss on the birds' wintering grounds in the southern U.S., Mexico, and Central and South America.

Purpose of this Manual

Recognition of the ecological and economic importance of grassland birds and their continuing population declines has led to increased attention being placed on their conservation within state and federal agencies, bird conservation initiatives (such as Partners in Flight and Joint Ventures), and non-profit organizations such as RMBO. Several grassland species have been listed by state agencies as threatened or sensitive, and others have been petitioned for the federal Endangered Species List. It is important for the resource agencies and conservation groups involved to work proactively and cooperatively to preclude listing of more species in the future and to conserve grassland birds for future generations.

Private landowners own over 80% of the Great Plains (USFS 2002). Therefore, it is imperative that the agencies and organizations working on bird conservation issues provide the technical and financial tools to assist landowners in conserving grassland birds. The USDA Farm Bill Conservation Provisions and state landowner incentive programs to improve habitat have had positive impacts on habitat for grassland birds, and the potential for increased conservation under new programs and increased funding is enormous. Aside from these programs, landowners have expressed interest in documenting their contribution to bird conservation. Landowners want to show that they are working proactively to conserve species and that regulatory action is not needed.

Resource professionals at the USDA Natural Resources Conservation Service (NRCS), U.S. Fish and Wildlife Service Partners For Fish and Wildlife (USFWS PFW), state wildlife agencies, and others are working directly with private landowners on a daily basis. Therefore, it is important for these professionals to become more aware of the grassland bird communities in their area. The purpose of this training module is to provide information on how to identify these birds and information on their distribution, habitat requirements, and conservation status, so that on-the-ground biologists can have a greater positive impact by:

1) helping landowners to identify grassland birds;
2) instilling a sense of pride in landowners for providing habitat for birds;
3) increasing landowners' awareness of the habitat requirements of grassland birds and how they can help provide habitat on their farm or ranch;
4) helping landowners document their contribution to bird conservation;
5) encouraging landowners to integrate bird conservation measures into their management actions and priorities; and
6) increasing the level of technical and financial assistance available to landowners through State and Federal programs to help enhance habitat.

How To Use This Manual

This manual is designed to increase awareness of grassland birds among resource professionals and landowners and help them gain a better understanding of the birds: key identification characteristics, habitat requirements, distribution, and conservation status. The manual and accompanying materials are also designed for use by professionals, to allow them to pass along information to landowners through workshops or direct one-on-one contact. We have organized the manual into four main sections to address the following goals:

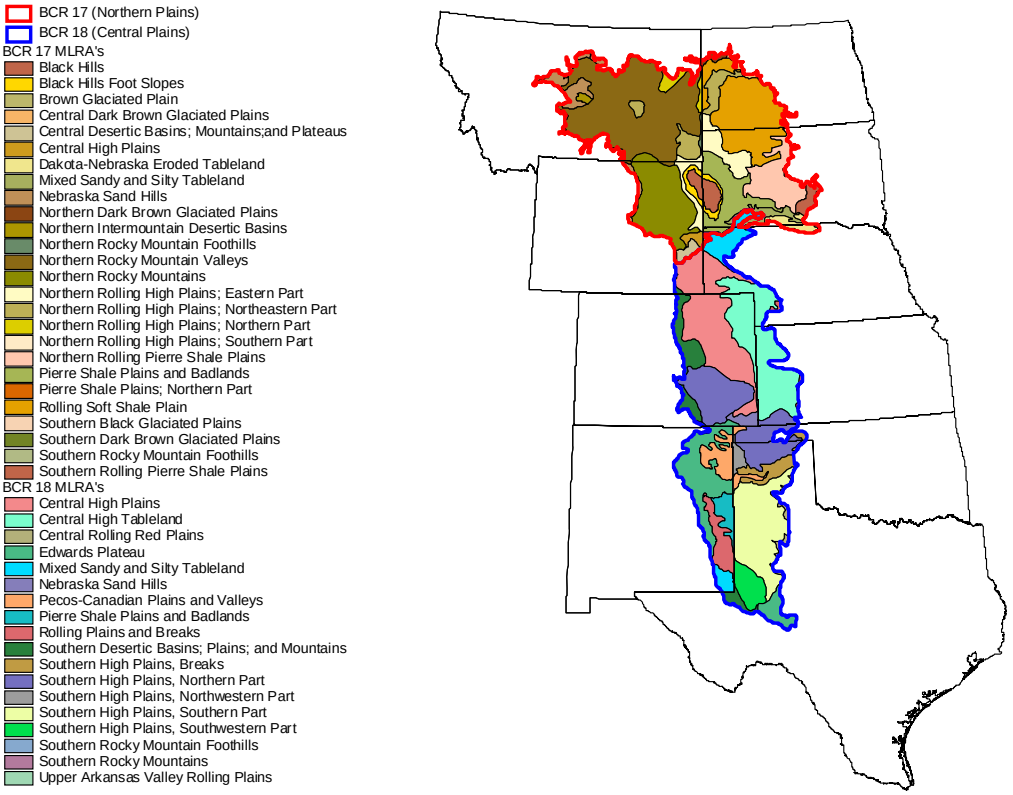
1) highlight the important influence of habitat structure on birds and how the bird community can change in response to changes in this structure;
2) provide information on the general habitat requirements of these species;
3) provide a simple protocol that helps resource professionals and landowners inventory birds on their land, and thereby integrate birds into their range monitoring efforts and management plans; and
4) assist resource professionals and landowners in the identification of birds of conservation concern in two geographic regions of the Great Plains (**Central Plains** and **Northern Plains**).

Manual Sections

Section 1. *The Importance of Habitat Structure to Grassland Birds.* In this section we briefly introduce the important influence of habitat structure on the bird community. We also discuss the influence of management practices on habitat structure and reference a table that provides more information about how specific management practices affect selected grassland birds. We have included this section to emphasize the greater importance of habitat structure over specific plant species.

Section 2. *Grassland Bird Habitat Descriptions and Indicator Species.* This section includes a general description of the grassland-shrubland habitats, and information on indicator species associated with habitat structural components. Since birds generally respond more to habitat structure than to plant type, we have not described the plant communities in detail. Since the birds within this region differ from north to south, we have divided the grasslands into **Northern Plains** and **Central Plains** (Fig. 2). Please refer to the appropriate section of the manual for bird and habitat information relevant to your area.

Figure 2. Central Plains and Northern Plains Regions covered in this module overlaid with USDA NRCS Major Land Resource Areas.



Also included are tables that enable the user to identify indicator birds that are associated with habitat structural components. For simplicity, we break the habitat into its most basic structural components — shrub cover and herbaceous cover (grass and broad-leaf plants) — and identify birds that may be used as indicator species of different combinations of structural components. The additional habitat information (Tables 1 and 2) provides further detail on habitat features used by grassland and shrubland birds in this region. Use the species lists provided, the "Pocket Guide to Prairie Birds," and the "North American Bird Reference Book" CD-ROM, to identify birds that are associated with other habitats such as marshes, riparian zones, and wooded areas. We have also included a list of birds of conservation concern for each region (**Central Plains**: Table 3 and **Northern Plains**: Table 6) and their status with Partners in Flight and the United States Shorebird Conservation Plan.

The indicator species identified in this section should be used in conjunction with the Bird Survey Protocol (Appendix A) to document which species correspond to various habitat structures. The land manager can use these tables to assess changes in the bird community and see how these changes relate to changes in habitat structure and management. We intend this section to be used by the resource professional or landowner to help them gain a basic understanding of the response of the bird community to changes in the structure of the habitat on their land. It is not meant as a scientific protocol for monitoring populations over time.

Land managers and landowners interested in more rigorous protocols for bird monitoring on their land may contact RMBO and/or other trained resource professionals for further details.

Section 3. Appendix A: Bird Survey Protocol. This is a simple technique that resource professionals and landowners can use in conjunction with the previous section to inventory birds. It was designed to be integrated with range monitoring efforts so that both can be conducted simultaneously. Even if a standardized range monitoring protocol is not in place, our simple bird survey protocol can be easily implemented. The survey can document which indicator species, as identified in the previous section, are using a particular parcel of land. Landowners can use also this protocol to document their contribution to prairie bird conservation. Most importantly, it is a way for resource managers and private landowners to familiarize themselves with the birds using the lands they own or manage, and recognize the importance of particular habitat components.

Section 4. Appendix B: Identification, Habitat Preferences, and Management of Grassland Birds of Conservation Concern. This section includes a list of some of the most important birds within the two regions and how to identify them. Use this list in conjunction with the "Pocket Guide to Prairie Birds" and "North American Bird Reference Book" CD-ROM to help with identification. With the list, we have included general habitat descriptions, interesting facts about the species, and management suggestions.

In addition, we provide supplemental information to assist with completing the bird survey data sheets: shrub cover photos (Appendix C) and bare ground cover photos (Appendix D).

Section 1. The Importance of Habitat Structure to Grassland Birds

As mentioned previously, grassland bird communities are generally more indicative of the habitat structure than the particular species of plants in the habitat. In this section we define what we mean by habitat structure, describe its importance to birds, and provide sources of information that can give insight into how particular management practices influence different species of birds.

Bird communities reflect the structural complexity of their habitats. Habitat structure consists of many factors, including height and density of vegetation, topographic features, ground cover, and man-made structures. Structure is important in providing nesting substrates and opportunities for feeding, resting, and perching. Generally, the more structurally diverse a habitat is, the more species-rich the bird community found there. For example, a tropical rainforest has a very complex structure, with many places for birds to find food or build nests on the forest floor, understory, and canopy. Therefore, there are many opportunities for different species to co-exist in this habitat. In contrast, grasslands are one of the least structurally diverse habitats, and support a correspondingly simple bird community. Still, within any given grassland, more structurally diverse habitats will generally provide habitat for a greater variety of birds. However, habitats that may look simple and flat to our eye may be complex from a bird's perspective.

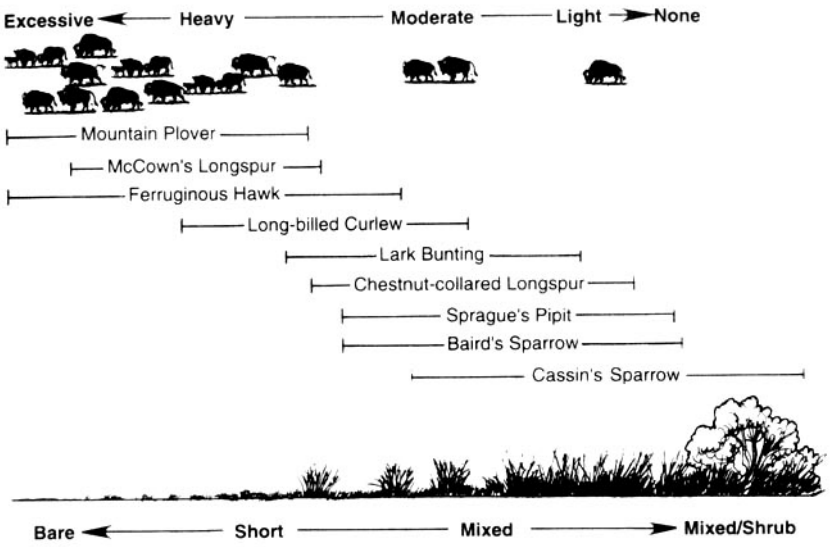
This does not mean that plant species composition is not important—in the case of sage grouse, for example, not just any shrub species will provide the habitat needs—these birds need sagebrush. But most bird species are more flexible in their habitat choices and will focus on plant structure more than plant species.

There are several factors in grassland habitats that influence their structure. These factors can be grouped into five categories: herbaceous vegetation (grass and broad-leaf plants) and ground cover, shrubs, burrowing mammals, special features, and man-made structures.

The height and density of the vegetation and the amount of ground cover in grasslands are important factors in determining the structure of the habitat and what bird species will be present (Figure 3). For example, some species require taller, denser vegetation for nesting while others require short vegetation. Grasslands with a patchy structure will generally provide opportunities for both sets of species to co-exist. Ground cover, including the amount of bare ground and plant litter, is also an important nesting requirement for many birds. Climate, soil type, the grass-to-forb ratio, the ratio of cool-season grasses to warm-season grasses, and management influence this factor.

Grasslands with shrubs are more structurally complex than those lacking shrubs. The presence and density of shrubs greatly influence the bird community. Shrubs create opportunities for nesting, perching, and foraging in addition to that provided by the herbaceous layer. Generally, grasslands with a shrub component are home to more bird species than those without. However, this should not be interpreted to mean that more shrubs means a better grassland bird community — some species of conservation concern (such as Mountain Plover) require virtually shrub-free grasslands.

Figure 3. Grassland habitat used by prairie bird species in relation to habitat structure and grazing pressure (reproduced with permission from Knopf 1996b).



Burrowing mammals play an important role in generating grassland habitat structure. Grazing and/or disturbance by pocket gophers, prairie dogs, ground squirrels, and badgers contribute to the maintenance of grassland ecosystems by decreasing woody vegetation, aerating soil, and reducing the dominance of perennial grasses. These disturbances create habitat for annual forbs and grasses, thereby increasing plant and animal diversity by creating unique microhabitats and enhancing grasslands. These burrowing mammals also serve as important prey for raptors (birds of prey) such as Swainson's Hawk, Red-tailed Hawk, and Ferruginous Hawk. Also, burrows dug by prairie dogs, badgers, coyotes, and foxes serve as nest sites for Burrowing Owls.

Special habitat features are those created by topography. These features, such as rock outcrops and cliffs, provide additional nest-site and perching opportunities for many birds, particularly raptors and ravens.

Man-made features also increase grassland structure. Although some of these features have positive impacts on some species (e.g., providing nest sites), many can be viewed as negative. Structures such as power lines and fences can effectively reduce the size of a habitat parcel and negatively influence species that require large, unfragmented grasslands. Collisions with fences are a major cause of mortality for Lesser Prairie-Chickens, accounting for about 32% of all deaths in Oklahoma (Wolfe et al. 2003). Tree and shrub plantings on grassland can have the same effect and can also increase breeding opportunities for the Brown-headed Cowbird, a brood parasite (it lays its eggs in the nests of other birds, leaving the host birds to care for the young cowbirds at the expense of the host bird's young).

Management actions can increase or decrease structure in the habitat available to birds. Livestock grazing is the most common and widespread use of grasslands in this region, and under proper management is a sustainable use of the grasslands. Various grassland bird species are adapted to differing vegetation conditions, which are influenced by the intensity, timing, and duration of grazing. The best way to create a structurally complex grassland with

grazing is to vary grazing patterns both spatially and temporally. Grazing a particular pasture during the same months year after year can cause a decline in particular grass components. For example, heavy spring grazing year after year may reduce cool-season grasses in a pasture and eventually eliminate these species, which is detrimental to early-season nesting birds that require a cool-season grass component. Through a prescribed grazing plan, livestock can be used as an effective tool to improve grassland bird habitat.

Similarly, other management factors can influence the available habitat structure for birds including the use or non-use of fire, haying and mowing of grasslands, invasive species management, and others. The table in Appendix B outlines some of the management practices that influence grassland birds of conservation concern.

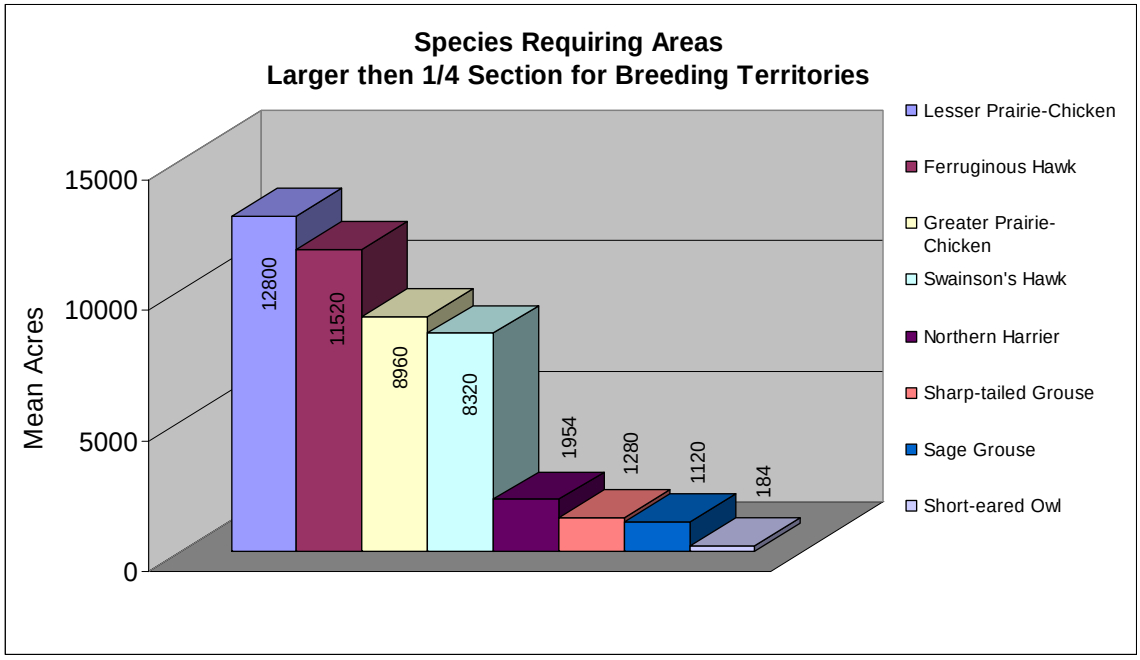
Factors to consider when integrating birds into your grazing plan

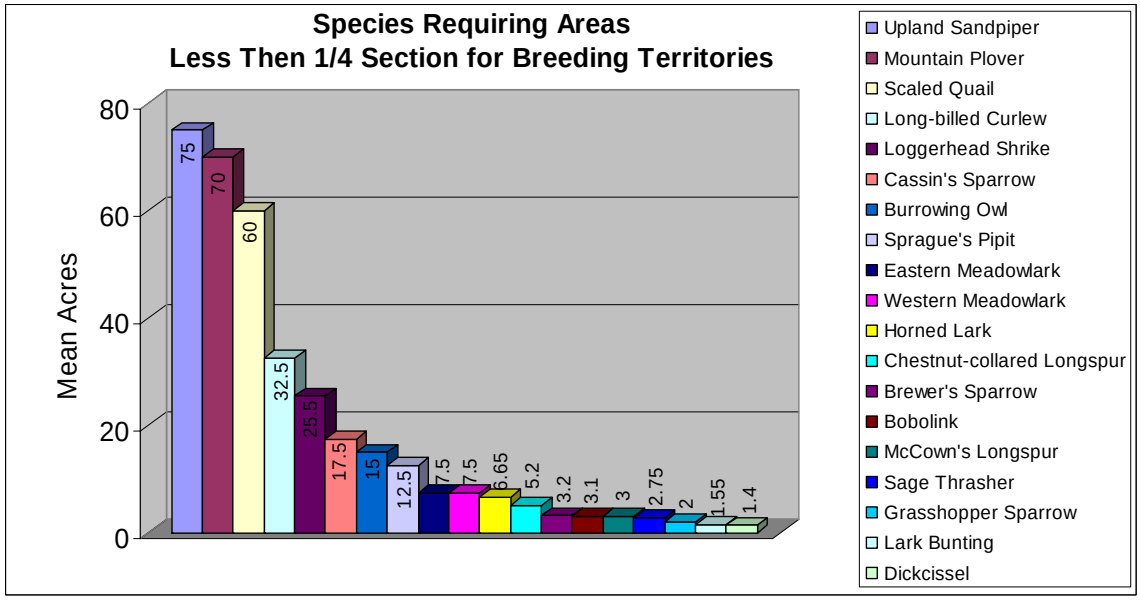
1. Determine the potential bird community your ranch could support. Consult with a Rocky Mountain Bird Observatory biologist, NRCS Private Lands Wildlife Biologist, local Audubon Chapter, or refer to this manual and the distribution information provided for the *Indicator species* (pages 17 and 25) and *typical bird species* of other habitats pages (18 and 26). Also see Tables 1 and 2 on pages 20 and 21 or Tables 4 and 5 on pages 28 and 29.
2. Consider the size of the land you have available. Territories for birds vary from <1 acre (for Chestnut-collared Longspur and Grasshopper Sparrow) to 28–35 square miles (for Lesser Prairie-Chicken and Ferruginous Hawk). Information on species' territory requirements is included below. Each territory contains multiple habitats, which must provide all the necessary resources for the species' growth, survival, and reproduction including food, water, cover, roosting, and nesting sites. Entire or partial territories may be defended, particularly areas for attracting mates and/or nesting sites.

Territory requirements for birds discussed in this manual

Northern Harrier	68 acres - 6 mi^2
Swainson's Hawk	2.4 – 10.5 mi^2
Ferruginous Hawk	1.2 – 34.9 mi^2
Sage Grouse	1 – 2.5 mi^2 (summer) – annual as large as 577 mi^2
Sharp-tailed Grouse	2 mi^2 minimum area needed
Lesser Prairie-Chicken	28 mi^2 minimum area needed 12.3 mi^2
Greater Prairie-Chicken	4 – 24 mi^2
Scaled Quail	40 - 80 acres
Long-billed Curlew	15 - 50 acres
Mountain Plover	40 acres (70 acres needed to raise a brood)
Upland Sandpiper	2.5 - 30 acre (75 acres nesting area)
Burrowing Owl	0.1 – 15 acres
Short-eared Owl	57 - 311 acres
Logger-headed Shrike	11 – 40 acres (average 15 – 22 acres)
Horned Lark	0.7 – 12.6 acres
Sage Thrasher	1 – 4.5 acres
Sprague's Pipit	2.5 - 10 acres
Cassin's Sparrow	15 – 20 acres
Brewer's Sparrow	3.2 acres

Grasshopper Sparrow	0.8 – 3.5 acres (average 2 acres)
Lark Bunting	1.2 – 1.9 acres
McCown's Longspur	3 acres
Chestnut-collared Longspur	0.2 – 10 acres
Dickcissel	0.7 – 2.7 acres
Bobolink	1.2 – 5 acres
Eastern Meadowlark	3 – 12 acres
Western Meadowlark	3 – 32 acres (average 7 – 8 acres)





3. Consider the habitat types you have available including your neighbors

    a. Shortgrass prairie
    b. Cultivated Land
    c. Shrub communities
    d. Prairie Dog towns
    e. Sandhills
    f. Tame rangeland
    g. Riparian
    h. Playas/Lagoons
    i. Wet meadows
    j. Other wetlands

    Refer to Appendix B in the manual to gain a better understanding of the habitat types and response of different birds to management including grazing, haying, and burning.

4. Different bird species require different habitat features (bare ground vs. tall grass vs. shrubs etc.)—some require multiple habitat features for nesting, foraging, and brood rearing. Providing habitat with multiple heights of structural diversity will help meet the diverse needs of grassland birds. Also, even though territory requirements may be small, birds that require less than 1 acre typically key in on several acres of similar habitat to choose where to nest and establish territories. With this in mind, try to keep management units to 200 acres or more. Smaller units can create fragmentation and make areas less suitable.
    a. Example: With 640 acres of grassland habitat and a three-pasture system, the following species may benefit with varied grazing rotations (varies geographically):
        i. Graze cell one March – May
            a. Mountain Plover
            b. McCown's Longspur
            c. Horned Lark
        ii. Grace cell two June – August
            a. Lark Bunting
            b. Chestnut-collared Longspur
            c. Western Meadowlark
        iii. Graze cell three dormant season
            a. Prairie-Chicken
            b. Cassin's Sparrow
            c. Grasshopper Sparrow

    You can see from the above example if your entire grazing system was implemented at the same time the diversity of birds would decrease. If all pastures were grazed in spring, you could lose species that need more structural diversity like Lark Bunting and Prairie Chicken.

5. When developing your grazing plan, take into consideration rangeland health as well as habitat needs for birds. Do not graze the same pasture at the same time year after year otherwise you can decrease plant diversity, leading to decreased insect and seed diversity, reducing the quality of habitat you are providing, and limiting natural ecological processes including nutrient cycling. Structural diversity of vegetation will

also vary with stocking rate—grazing above recommended stocking rates may decrease structure while stocking below recommended rates may help increase structure. Please refer to Figure 3, page 10 of the manual, to see how the structure of vegetation influences the presence of different grassland bird species. Providing a mosaic or diversity of vegetation structure will help meet the diverse needs of a broader group of grassland birds.

6. When developing or implementing a rotational grazing scheme consider alternate methods of moving cattle. Fences are effective, however they can cause loss of wildlife through collisions. Less-permanent fences are an option as well as using water sources, salt blocks, and fire as methods to help move and distribute cattle.

7. Encourage native species on your land including grasses and forbs or broad-leafed plants. Providing a greater diversity of vegetation will likely lead to greater diversity of wildlife species on your land. Some native Great Plains forbs include coneflower, clover, sunflower, and scurf-pea.

8. Trees are an important tool for protecting against soil erosion, increasing energy efficiency around buildings, etc. However, they can fragment habitat for native birds and increase occurrences of nest predators including American Crow, Blue Jay, Black-billed Magpie, Great Horned Owl, red fox, raccoon, skunk, and coyote. Some species including Lesser Prairie-Chicken will avoid hundreds of acres of otherwise suitable habitat if trees are present. Cautiously consider where you place trees and take into account the landscape surrounding your plantings. Some riparian systems on the plains historically had trees and could benefit from practices to encourage native trees within the system. Planting trees in uplands considerable distances from riparian areas should be avoided if possible.

9. This guide focuses mainly on the importance of breeding habitat for grassland birds; however private lands are also important to a variety of migrating and wintering songbirds, shorebirds, and waterfowl. Migration is a crucial component to the lifecycle of many birds and is often a hazardous undertaking given the uncertainty of resource availability. To aid in providing sufficient migratory corridors, a diversity of native habitats should be maintained including: shallow playa lakes or lagoons, riparian areas providing canopy (cottonwoods) and sub-canopy (willows) cover, any permanent water features, and grasslands containing a mosaic of vegetative structure.

Section 2. Grassland Bird Habitat Descriptions and Indicator Species

Central Plains

The Central Plains region extends from the eastern boundary of the Rocky Mountains in Wyoming through the panhandle of Nebraska into western Kansas and south into the panhandles of Oklahoma and Texas and into eastern New Mexico. This region is sometimes referred to as the "Central Shortgrass Prairie" or "High Plains." This region is a subset of NABCI's BCR 18 (Shortgrass Prairie), which is an important region for breeding and wintering grassland birds (Figure 4).

The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) has designated Major Land Resource Areas (MLRA) throughout the U.S. Within these MLRAs they have further defined Ecological Site Descriptions corresponding to soil types. The Ecological Site Descriptions contain information on the plant and animal communities associated with the MLRAs. This training module covers most Ecological Sites within the MLRAs shown in Figure 4.

This region includes a variety of plant communities and associated bird communities. The Central Plains Region covers two of the communities with the greatest land coverage: grassland associations and sandsage-bluestem. The most common grasslands in this region are those dominated by blue grama (*Bouteloua gracilis*) and buffalo grass (*Buchloe dactyloides*). Other grasses that characterize the prairie include needle-and-thread (*Stipa comata*), western wheatgrass (*Pascopyrum smithii*), sand dropseed (*Sporobolus cryptandrus*), and sideoats grama (*Bouteloua curtipendula*). These grasslands often contain variable amounts of several species of shrubs including four-wing saltbush (*Atriplex canescens*), winterfat (*Krascheninnikovia lanata*), rabbitbrush (*Chrysothamnus* spp.), cacti (*Opuntia* spp.), yucca (*Yucca glauca*), and sagebrush (*Artemesia* spp.). Sandsage-bluestem plant communites are dominated by sandsage (*Artemesia filifolia*) and many mid to tall species of grass including sand bluestem (*Andropogon hallii*).

Central Plains Indicator Species

The following page shows the different structural components for habitat and the birds indicative of these components. We start with three main habitat categories based on shrub cover, then step down to two secondary habitat categories based on herbaceous cover. As the habitats change, the bird communities change, with subtle differences noticed in the shift from no shrub cover to low shrub cover and more pronounced changes noted when comparing minimal shrub cover to high shrub cover. Photographs of example shrub cover categories are provided in Appendix C, and photographs of example bare ground cover categories are provided in Appendix D. Some species, like Western Meadowlark and Grasshopper Sparrow, are dependent on herbaceous cover but can also be found in habitats with some shrub cover. In areas of minimal to no shrub cover on the Central Plains, these species are more likely to be present when moderate to high herbaceous cover is available. If the herbaceous cover within a management unit is increasing over time, then those species should start showing up during bird surveys. Thus, these species will help signal a change in the habitat that may reflect a change in the management. If the shrub component within the management unit starts to increase, the bird species present should change as well.

We have selected habitats in which particular species are most common, as this can help identify changes in habitat structure over time. Although birds are mobile and will use a variety of habitats, they will be found most often in the habitats that offer the features they most prefer.

Central Plains Indicator Species

1. Minimal or no shrub cover available (< 1%)

Herbaceous Cover*	Indicator Birds	Central Plains Distribution
Low-Moderate (Grass and Forb height < 6 inches)	Mountain Plover** Horned Lark** McCown's Longspur	Throughout Throughout Throughout
Moderate-High (Grass and Forb height > 6 inches)	Western Meadowlark Chestnut-collared Longspur Grasshopper Sparrow	Throughout Northern CO & SE WY Throughout

* Herbaceous cover takes into account height of grasses and forbs (broad-leaf plants like clover, alfalfa, and flowers). Bare ground is another important habitat feature. Species that are indicative of bare ground can be located in Tables 1 and 2. The presence of these species can be used to identify changes in this habitat feature over time. For example, if the presence of Horned Larks is increasing within a pasture it is likely that bare ground is increasing.

** Mountain Plover and Horned Lark need a bare ground component; Mountain Plover prefer more than 30% bare ground within their brood-rearing habitat.

2. Low shrub cover available (1–5%)

Herbaceous Cover	Indicator Birds	Central Plains Distribution
Low-Moderate (Grass and Forb height < 6 inches)	Mountain Plover* Horned Lark* Lark Sparrow	Throughout Throughout Throughout
Moderate-High (Grass and Forb height > 6 inches)	Grasshopper Sparrow Lark Bunting Western Meadowlark	Throughout Throughout Throughout

* Mountain Plover and Horned Lark need a bare ground component; Mountain Plover prefer more than 30% bare ground within their brood-rearing habitat.

3. High shrub cover available (> 5%)

Herbaceous Cover	Indicator Birds	Central Plains Distribution
Low-Moderate (Grass and Forb height < 6 inches)	Loggerhead Shrike Sage Thrasher Brewer's Sparrow Lark Sparrow	Throughout Scattered CO & SE WY Northern CO & SE WY Throughout
Moderate-High (Grass and Forb height > 6 inches)	Greater Prairie-Chicken Lesser Prairie-Chicken Sharp-tailed Grouse Cassin's Sparrow	Northeast CO Southeast CO & NE NM Northeast CO Throughout

Typical bird species of other habitats within the Central Plains

In addition to the indicator species, many other species are present in the Central Plains. The following list includes species that may be found in other habitats of the region.

Marshes

Great Blue Heron	*Ardea herodias*	
American Avocet	*Recurvirostra americana*	
Wilson's Phalarope	*Phalaropus tricolor*	(range = northeast CO and SE WY)
Red-winged Blackbird	*Agelaius phoeniceus*	
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	
Great-tailed Grackle	*Quiscalus mexicanus*	

Riparian

Bald Eagle	*Haliaeetus leucocephalus*	
Great Blue Heron	*Ardea herodias*	
Northern Bobwhite	*Colinus virginianus*	
Great Horned Owl	*Bubo virginianus*	
Lewis's Woodpecker	*Melanerpes lewis*	(range = southeast CO and NM)
Downy Woodpecker	*Picoides pubescens*	
Northern Flicker	*Colaptes auratus*	
Western Wood-Pewee	*Contopus sordidulus*	
Western Kingbird	*Tyrannus verticalis*	
Eastern Kingbird	*Tyrannus tyrannus*	
House Wren	*Troglodytes aedon*	
Eastern Bluebird	*Sialia sialis*	(range = easternmost part of Central Plains)
American Robin	*Turdus migratorius*	
Brown Thrasher	*Toxostoma rufum*	
Yellow Warbler	*Dendroica petechia*	
Yellow-breasted Chat	*Icteria virens*	
Spotted Towhee	*Pipilo maculatus*	
Song Sparrow	*Melospiza melodia*	(range = N half of Central Plains)
Lazuli Bunting	*Passerina amoena*	
Common Grackle	*Quiscalus quiscula*	
Orchard Oriole	*Icterus spurius*	
Bullock's Oriole	*Icterus bullockii*	
Baltimore Oriole	*Icterus galbula*	(range = eastern part of Central Plains)
American Goldfinch	*Carduelis tristis*	

Wooded Habitats (e.g., shelterbelts, homesteads, towns)

(This category includes virtually all those species found in the Riparian list, with these additional species):

Red-tailed Hawk	*Buteo jamaicensis*	
Greater Roadrunner	*Geococcyx californianus*	(range = southern third of Central Plains)
Say's Phoebe	*Sayornis saya*	
Northern Mockingbird	*Mimus polyglottos*	
European Starling	*Sturnus vulgaris*	
Great-tailed Grackle	*Quiscalus mexicanus*	

House Finch	*Carpodacus mexicanus*	
House Sparrow	*Passer domesticus*	

Habitat Generalists

Golden Eagle	*Aquila chrysaetos*	
American Kestrel	*Falco sparverius*	
Killdeer	*Charadrius vociferus*	
Mourning Dove	*Zenaida macroura*	
Barn Owl	*Tyto alba*	
Common Nighthawk	*Chordeiles minor*	
Chihuahuan Raven	*Corvus cryptoleucus*	(range = southeast CO and New Mexico)
Cliff Swallow	*Petrochelidon pyrrhonota*	
Barn Swallow	*Hirundo rustica*	
Rock Wren	*Salpinctes obsoletus*	
Brewer's Blackbird	*Euphagus cyanocephalus*	
Brown-headed Cowbird	*Molothrus ater*	

Habitat features used by species of conservation concern

Many species breeding within the prairie require multiple habitats to meet their breeding requirements. For example, prairie-chickens and grouse require areas with minimal herbaceous cover for display grounds but females also need sites that contain ample cover for nests. Managing for a mosaic of native habitats will help ensure all required habitat components are available for the breeding season. Tables 1 and 2 cover the different habitat components used and/or required by Central Plains indicator birds (described above) and some additional species of conservation concern.

Table 1. Habitat features used by indicator species and species of conservation concern in **GRASSLAND** habitats within the Central Plains.

	Herbaceous Cover (includes height of grasses and forbs)			**Shrub Cover** (percent cover)			**Other Habitat Features**								
Bird Species	Low Herb. Cover (<2 in)	Mod Herb. Cover (2-6 in)	High Herb. Cover (>6 in)	Low Shrub Cover < 1%	Mod. Shrub Cover 1-5%	High Shrub Cover >5%	Bare Ground	Litter Layer	Forbs	Wetlands including Wet Meadow	Burrowing Mammals	Trees	Rocky outcrops, including cliffs	Crop	Central Plains Distribution
Northern Harrier	U	U	R	U						R				U	
Swainson's Hawk	U	U	U	U	U							R		U	
Ferruginous Hawk	U	U	U	U	U						R	U	R		
Prairie Falcon	U	U	U	U	U								R		
Mountain Plover	**I/R**	U		U			**I/R**	U			U			U	
Upland Sandpiper	R	R	R	U	U		U	R	R						ne CO
Long-billed Curlew	R	R	U	U			U		U	R	U			U	
Burrowing Owl	R	U	U	U			**I/R**				R				
Short-eared Owl		R	U	U	U					U				U	
Horned Lark	**I/R**	U		U	U		**I/R**	U						U	
McCown's Longspur	**I/R**	U		U			**I/R**	U							ne CO
Chestnut-collared Longspur	U	**I/R**	U	U			R	U		U					ne CO
Bobolink		R	R					R	R	R				U	ne CO/ se WY
Dickcissel		R	R	U				R	R					U	ne CO

I/R = Indicator species for habitat feature, habitat feature is also required
R = Required habitat feature
U = Used but not required habitat feature
Note that the requirement for bare ground is typically related to foraging habitat; however, Mountain Plovers nest on bare ground

Table 2. Habitat features used by indicator species and species of conservation concern in **GRASSLAND-SHRUBLAND** habitats within the Central Plains.

	Herbaceous Cover (includes height of grasses and forbs)			**Shrub Cover** (percent cover)			**Other Habitat Features**									
Bird Species	Low Herb. Cover (<2 in)	Mod Herb. Cover (2-6 in)	High Herb. Cover (>6 in)	Low Shrub Cover <1%	Mod Shrub Cover 1-5%	High Shrub Cover >5%	Bare Ground	Litter Layer	Forbs	Wetlands including Wet Meadow	Burrowing Mammals	Trees	Rocky outcrops including cliffs	Build-ings	Crop	Central Plains Distribution
Greater Prairie-Chicken	R lek <6"	**I/R 6-18"**	**I/R 18-20+"**	U	**I/R 5% <6"**	U <20%	R	R	**I/R**			U			U	ne CO
Lesser Prairie-Chicken	R lek <4"	**I/R 4-18"**	**I/R 18-20+"**	U	**I/R**	**I/R 20% <31"**	**I/R**	R	R						U	se CO/ east NM
Sharp-tailed Grouse	R lek	R	R >12"	U	U	U 10% 12"	R	R	**I/R**	R		U			U	north CO WY
Scaled Quail	U	R 4-6"	R 6-16"	U	R 5% 4-16"	R <15%	R		R					U	U	se CO/ NM
Loggerhead Shrike	R	U	U	U	U	R	R	R	R			R				
Sage Thrasher	R	R			U	R	R									scattered CO/WY
Cassin's Sparrow		**I/R**	**I/R**	U	U	**I/R**			R			U				
Brewer's Sparrow	**I/R**	U			U	**I/R**	R									Northern CO & SE WY
Lark Sparrow	**I/R**	U	U		**I/R**	U	**I/R**	U	**I/R**			U				
Lark Bunting		**I/R**	U	**I/R**	**I/R**	U	R		R							
Grasshopper Sparrow		U	**I/R**	R	U		U	R	R	U						
Western Meadowlark		**I/R**	R	R	U		R	R	R							

I/R = Indicator species for habitat feature, habitat feature is also required
R = Required habitat feature
U = Used but not required habitat feature
Note that the requirement for bare ground is typically related to foraging habitat; however, Mountain Plovers nest on bare ground

Table 3. Conservation status scores of grassland-associated bird species identified as conservation priority species in the Central Plains by Partners in Flight and the United States Shorebird Conservation Plan.

SPECIES	Global Score*	Central Plains Score
Mississippi Kite	3	3
Bald Eagle	1	3
Northern Harrier	4	4
Swainson's Hawk	3	2
Ferruginous Hawk	1	3
Prairie Falcon	2	1
Greater Prairie-Chicken	5	3
Lesser Prairie-Chicken	5	3
Sharp-tailed Grouse	3	3
Scaled Quail	4	5
Mountain Plover	5	3
American Avocet	3	3
Upland Sandpiper	4	4
Long-billed Curlew	5	4
Wilson's Phalarope	4	3
Burrowing Owl	4	3
Short-eared Owl	5	3
Say's Phoebe	2	3
Western Kingbird	2	2
Chihuahuan Raven	4	4
Horned Lark	4	4
Cassin's Sparrow	4	4
Brewer's Sparrow	5	4
Lark Sparrow	5	4
Lark Bunting	4	4
Grasshopper Sparrow	5	4
McCown's Longspur	3	3
Chestnut-collared Longspur	4	3
Dickcissel	4	2
Bobolink	4	3
Western Meadowlark	4	2
Yellow-headed Blackbird	1	4

* "Global Score" reflects the species' status throughout its range

Explanation of Scores

1 = Low Vulnerability: population has increased by >50% over the past 30 years
2 = Population is stable or is showing a slight increase
3 = Unknown, uncertain, or highly variable population trend
4 = Moderate Vulnerability: population has decreased 15-50% over the past 30 years
5 = High Vulnerability: population has decreased by >50% over the past 30 years

Partners in Flight database available online at http://www.rmbo.org/pif/pifdb.html for landbirds and http://www.manomet.org/usscp/files.htm for shorebirds

Northern Plains Region

The Northern Great Plains region includes western North and South Dakota, central and eastern Montana, and eastern Wyoming. This region is a subset of NABCI's BCR 17 (Badlands and Prairies), designated as an important region to breeding and wintering grassland birds. The information contained within this manual is only applicable to the region defined in Figure 5.

The U.S. Department of Agriculture Natural Resources Conservation Service has designated Major Land Resource Areas (MLRA) throughout the U.S. Within these MLRAs they have further defined Ecological Site Descriptions corresponding to soil types. The Ecological Site Descriptions contain information on the plant and animal communities associated with the MLRAs. This manual covers most Ecological Sites within the Central High Plains, Northern Rolling Plains (North Part), and Northern Rolling Plains (South Part) MLRAs, as shown in Figure 5.

The region is characterized by mixed and shortgrass prairies with some woodlands and forest communities at higher elevations. The Northern Plains is bounded by tallgrass prairie to the east, the Rocky Mountains with conifer to the west, and the blue grama (*Bouteloua gracilis*) and buffalo grass (*Buchloe dactyloides*) dominated shortgrass prairie to the south. The grasslands extend into Canada to the north. Although mixed-grass prairie is characteristic of the eastern half of this region, tallgrass prairie species dominate in areas with sufficient moisture and shortgrass prairie species dominate where it is drier. Because mixed-grass prairies occur as the transition zone between the short and tallgrass types they support a diverse mix of species. The transitional nature of mixed prairies makes them the most floristically rich of all the grasslands. Scattered needle-leaf evergreen shrubs and trees are present within the grasslands along with big sagebrush (*Artemisia tridentata*) and other sagebrush species, rabbitbrush (*Chrysothamnus* spp.), and yucca (*Yucca glauca*). Plant communities of focus include sagebrush steppe (sagebrush-wheatgrass association) and northern mixed grass prairie (grama-needlegrass-wheatgrass association).

Birds respond to the structure these shrubs provide and are not particularly influenced by the shrub species type. Birds occupy habitats along a continuum from no shrub cover to high shrub cover. Photos in Appendix C characterize the different shrub cover levels. Shrubs and residual cover are key habitat factors influencing the presence of breeding birds in the Northern Plains.

Northern Plains Indicator Species

The tables on the following pages show the different structural components for habitat and the bird species indicative of these components. We start with three main habitat categories based on shrub cover, then step down to two secondary habitat categories based on herbaceous cover. As the habitats change, the bird communities change, with subtle differences noticed in the shift from no shrub cover to low shrub cover and more pronounced changes noted when comparing minimal shrub cover to high shrub cover. Some species, like Western Meadowlark and Grasshopper Sparrow, are dependent on herbaceous cover but can also be found in habitats with some shrub cover. In areas of minimal to no shrub cover on the Northern Plains, these species are more likely to be present when moderate to high herbaceous cover is available. If the herbaceous cover within a management unit is increasing over time, those species should start showing up during bird surveys. Thus, these species will help signal a change in the habitat that may reflect a change in management. If the shrub component within the management unit starts to increase, changes in bird species present should start to become noticable.

We have selected habitats in which particular species are most common, as this can help identify changes in habitat structure over time. Although birds are mobile and will use a variety of habitats, they will be found most often in the habitats that offer the features they most prefer.

Northern Plains Indicator Species

1. Minimal or no shrub cover available (< 1%)

Herbaceous Cover*	Indicator Birds	Northern Plains Distribution
Low-Moderate (Grass and Forb height < 6 inches)	Mountain Plover** Long-billed Curlew Horned Lark** McCown's Longspur	Throughout Throughout Throughout Throughout
Moderate-High (Grass and Forb height > 6 inches)	Short-eared Owl Baird's Sparrow Chestnut-collared Longspur Dickcissel Bobolink Upland Sandpiper	Throughout Northeastern Montana Throughout Eastern Throughout Throughout

* Herbaceous cover takes into account height of grasses and forbs (broad-leaf plants like clover, alfalfa, and flowers). Bare ground is another important habitat feature. Tables 5 and 6 identify bird species that are indicative of bare ground. The presence of these species can be used to identify changes in this habitat feature over time. For example, if the presence of Horned Larks is increasing within a pasture it is likely that bare ground is increasing.

** Mountain Plover and Horned Lark need a bare ground component; Mountain Plover prefer more than 30% bare ground within their brood rearing habitat.

2. Low shrub cover available (1–5%)

Herbaceous Cover	Indicator Birds	Northern Plains Distribution
Low-Moderate (Grass and Forb height < 6 inches)	Horned Lark* Lark Sparrow	Throughout Throughout
Moderate-High (Grass and Forb height > 6 inches)	Lark Bunting Upland Sandpiper	Throughout Throughout

* Horned Lark need a bare ground component

3. High shrub cover available (> 5%)

Herbaceous Cover	Indicator Birds	Northern Plains Distribution
Low-Moderate (Grass and Forb height < 6 inches)	Sage Thrasher Sage Sparrow Brewer's Sparrow Lark Sparrow	Throughout Wyoming Throughout Throughout
Moderate-High (Grass and Forb height > 6 inches)	Sharp-tailed Grouse Greater Sage-Grouse	Throughout Throughout

Typical bird species of other habitats within the Northern Plains

In addition to the indicator species, many other species are present in the Northern Plains. The following list includes species that may be found in other habitats of the region.

Marshes

Great Blue Heron	*Ardea herodias*	
American Avocet	*Recurvirostra americana*	
Marbled Godwit	*Limosa fedoa*	
Wilson's Phalarope	*Phalaropus tricolor*	
Franklin's Gull	*Larus pipixcan*	
Red-winged Blackbird	*Agelaius phoeniceus*	
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	

Riparian

Bald Eagle	*Haliaeetus leucocephalus*	
Great Blue Heron	*Ardea herodias*	
Great Horned Owl	*Bubo virginianus*	
Lewis's Woodpecker	*Melanerpes lewis*	
Downy Woodpecker	*Picoides pubescens*	
Northern Flicker	*Colaptes auratus*	
Western Wood-Pewee	*Contopus sordidulus*	
Western Kingbird	*Tyrannus verticalis*	
Eastern Kingbird	*Tyrannus tyrannus*	
House Wren	*Troglodytes aedon*	
Eastern Bluebird	*Sialia sialis*	(range = easternmost part of Northern Plains)
American Robin	*Turdus migratorius*	
Brown Thrasher	*Toxostoma rufum*	
Yellow Warbler	*Dendroica petechia*	
Yellow-breasted Chat	*Icteria virens*	
Spotted Towhee	*Pipilo maculatus*	
Song Sparrow	*Melospiza melodia*	(range = northern half of Northern Plains)
Common Grackle	*Quiscalus quiscula*	
Orchard Oriole	*Icterus spurious*	(range = eastern part of Northern Plains)
Bullock's Oriole	*Icterus bullockii*	
Baltimore Oriole	*Icterus galbula*	(range = eastern part of Northern Plains)
American Goldfinch	*Carduelis tristis*	

Wooded Habitats (e.g., shelterbelts, homesteads, towns)

(This category includes virtually all those species found in the Riparian list, with these additional species):

Say's Phoebe	*Sayornis saya*
Northern Mockingbird	*Mimus polyglottos*
European Starling	*Sturnus vulgaris*
House Finch	*Carpodacus mexicanus*
House Sparrow	*Passer domesticus*

Habitat Generalists

Golden Eagle	*Aquila chrysaetos*
American Kestrel	*Falco sparverius*
Killdeer	*Charadrius vociferus*
Mourning Dove	*Zenaida macroura*
Barn Owl	*Tyto alba*
Common Nighthawk	*Chordeiles minor*
Cliff Swallow	*Petrochelidon pyrrhonota*
Barn Swallow	*Hirundo rustica*
Rock Wren	*Salpinctes obsoletus*
Brewer's Blackbird	*Euphagus cyanocephalus*
Brown-headed Cowbird	*Molothrus ater*

Habitat features used by species of conservation concern

Many species breeding within the prairie require multiple habitats to meet their breeding requirements. For example, grouse require areas with minimal herbaceous cover for display grounds but females also need sites that contain ample cover for nests. Managing for a mosaic of native habitats will help ensure all required habitat components are available for the breeding season. Tables 4 and 5 cover the different habitat components used and/or required by the Northern Plains indicator birds (described above) and some additional species of conservation concern.

Table 4. Habitat features used by indicator species and species of conservation concern in **GRASSLAND** habitats within the Northern Plains.

	Herbaceous Cover (includes height of grasses and forbs)			**Shrub Cover** (percent cover)			**Other Habitat Features**								
Bird Species	Low Herb. Cover (<4 in)	Mod Herb. Cover (4-6 in)	High Herb. Cover (>6 in)	Low Shrub Cover <1%	Mod. Shrub Cover 1-5%	High Shrub Cover >5%	Bare Ground	Litter Layer	Forbs	Wetlands, including Wet Meadow	Burrowing Mammals	Trees	Rocky outcrops including cliffs	Crop	Northern Plains Distribution
Northern Harrier	U	U	R	U						R				U	
Swainson's Hawk	U	U	U	U	U							R		U	
Ferruginous Hawk	U	U	U	U	U						R	U	R		
Prairie Falcon	U	U	U	U	U								R		
Mountain Plover	**I/R**	U		U	U		**I/R**	U			U			U	
Upland Sandpiper	R	R	R	U	U		U	R	R	U					
Long-billed Curlew	R	R	U	U			U		U	R	U			U	
Burrowing Owl	R	U	U	U			**I/R**				R				
Short-eared Owl		R	U	U	U					U				U	
Horned Lark	**I/R**	U		U	U		**I/R**	U						U	
Sprague's Pipit	R	R		R			R	R	**I/R**	U					northern MT
Baird's Sparrow		R	**I/R**	U	U		U	R	**I/R**						eastern MT
McCown's Longspur	**I/R**			U			**I/R**	U							
Chestnut-collared Longspur	U	**I/R**	U	U			R	U		U					
Bobolink		R	R					R	R	R				U	
Dickcissel		R	R	U				R	R					U	

I/R = Indicator species for habitat feature, habitat feature also required
R = Required habitat feature
U = Used but not required habitat feature
Note the requirement for bare ground is typically related to foraging habitat; however, Mountain Plovers nest on bare ground

Table 5. Habitat features used by indicator species and species of conservation concern in **GRASSLAND-SHRUBLAND** habitats within the Northern Plains.

	Herbaceous Cover (includes height of grasses and forbs)			**Shrub Cover** (percent cover)			**Other Habitat Features**									
Bird Species	Low Herb. Cover (<4 in)	Mod Herb. Cover (4-6 in)	High Herb. Cover (>6 in)	Low Shrub Cover <1%	Mod Shrub Cover 1-5%	High Shrub Cover >5%	Bare ground	Litter Layer	Forbs	Wetlands, including Wet Meadow	Burrowing Mammals	Trees	Rocky outcrops including cliffs	Build-ings	Crop	Northern Plains Distribution
Greater Sage-Grouse	R lek	**I/R**	**I/R**	R	R	**I/R 15-40% 1-3'**	R	R	**I/R**	R		U			U	
Sharp-tailed Grouse	R lek	R	R >12"	U	U	U 10% 12"	R	R	**I/R**	R		U			U	
Loggerhead Shrike	R	U			R	U	R	R	R			R				
Sage Thrasher	R	R			U	R	R									
Brewer's Sparrow	**I/R**				U	**I/R**	R									
Vesper Sparrow	R	R	U	R	R	U	U		R			U			U	
Lark Sparrow	**I/R**	U	U	U	**I/R**	U	**I/R**	U	**I/R**			U				
Sage Sparrow	**I/R**				U	**I/R**	R									central WY
Lark Bunting		**I/R**	U	**I/R**	**I/R**	U	R		R							
Grasshopper Sparrow		U	**I/R**	R	U		U	R	R							
Western Meadowlark		**I/R**	R	R	U		R	R	R							

I/R = Indicator species for habitat feature, habitat feature is also required
R = Required habitat feature
U = Used but not required habitat feature
Note the requirement for bare ground is typically related to foraging habitat; however, Mountain Plovers nest on bare ground

Table 6. Conservation status scores of grassland-associated bird species identified as conservation priority species in the Northern Plains by Partners in Flight and the United States Shorebird Conservation Plan.

SPECIES	Global Score*	Northern Plains Score
Northern Harrier	4	3
Swainson's Hawk	3	1
Ferruginous Hawk	1	2
Prairie Falcon	2	3
Greater Sage Grouse	5	3
Sharp-tailed Grouse	3	3
Killdeer	3	5
Mountain Plover	5	3
Upland Sandpiper	4	2
Long-billed Curlew	5	5
Wilson's Phalarope	4	5
Burrowing Owl	4	3
Short-eared Owl	5	3
Say's Phoebe	2	3
Mountain Bluebird	1	4
Sprague's Pipit	5	2
Brewer's Sparrow	5	5
Lark Bunting	4	2
Baird's Sparrow	5	3
Grasshopper Sparrow	5	5
McCown's Longspur	3	3
Chestnut-collared Longspur	4	5
Dickcissel	4	5
Bobolink	4	2
Western Meadowlark	4	2

* "Global Score" reflects the species' status throughout its range

Explanation of Scores

1 = Low Vulnerability: population has increased by >50% over the past 30 years
2 = Population is stable or is showing a slight increase
3 = Unknown, uncertain, or highly variable population trend
4 = Moderate Vulnerability: population has decreased 15-50% over the past 30 years
5 = High Vulnerability: population has decreased by >50% over the past 30 years

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Appendix A: Bird Survey Protocol

This protocol may be integrated into existing range monitoring efforts designed by NRCS and/or private landowners. Whether range monitoring is done at a point or along a transect, bird surveys can be incorporated.

Defining the Habitat

When defining a habitat type, look at the pasture as a whole — much of it may be a single habitat type, but there may be some unique habitats nested within the pasture. Woodlots, marshes, other wetlands, or homesteads will support a different bird community — one that may not respond to changes in grassland management. Recognize this to avoid placing survey points closer than 250 yards (230 m) to these unique patches so you do not record bird species using a different habitat type. You may survey the birds within these unique patches, but keep this survey separate from the principal habitat you have defined within your pasture.

To define the habitat:

1) Determine the level of shrub cover: minimal (< 1%), low (1–5%), or high (> 5%). Use the photos in Appendix C as a guide.
2) Determine the level of herbaceous cover: low–moderate (< 6 inches tall [15 cm]) or moderate–high (> 6 inches tall [15 cm]).
3) Determine the percent of bare ground. Use the photos in Appendix D as a guide.

Conducting the Surveys

Once you have determined habitat structure (i.e., available herbaceous and shrub cover), identify the indicator birds for that habitat (refer to the Table of Contents to find the list of indicator species for your region). Refer to the "Pocket Guide to Prairie Birds" and the "North American Bird Reference Book" CD-ROM for physical characteristics and songs of these indicator birds.

Bird surveying can be easily incorporated into normal range monitoring efforts. Whether you conduct a point assessment or a transect for vegetation analyses, simply record the indicator birds observed. Before conducting your vegetation point assessment or transect select one of the following options for the bird survey.

Types of Bird Surveys:

1) Timed area search

   Walk through the habitat you are monitoring for 5 minutes and record the names and numbers of all indicator birds heard and/or seen within the area. Estimate the amount of area covered during the 5-minute period in order to quantify your effort and allow for consistency over time.

2) Point transect method

   If vegetation monitoring follows a transect, depending on the length of the transect, you can conduct one or more bird counts along the transect. When more than one count is done along a transect, maintain a minimum distance of 250 yards (230 m) between count locations to avoid double-counting individual birds. If the transect is less than 250 yards (230 m), conduct a single bird count at the mid-point of the transect so it maximizes the overlap of the vegetation and bird data. Record all indicator bird

species heard and/or seen during a 5-minute period. Avoid recording birds that are located beyond 250 yards (230 m) from your bird survey point.

3) Point-count method

   If an area search or transect method is not feasible, select a location within a management unit, and stand at that point for 5 minutes recording all indicator birds heard and seen.

   Note: When recording birds, try to be aware of their locations and movements to avoid counting individuals more than once.

4) Other options

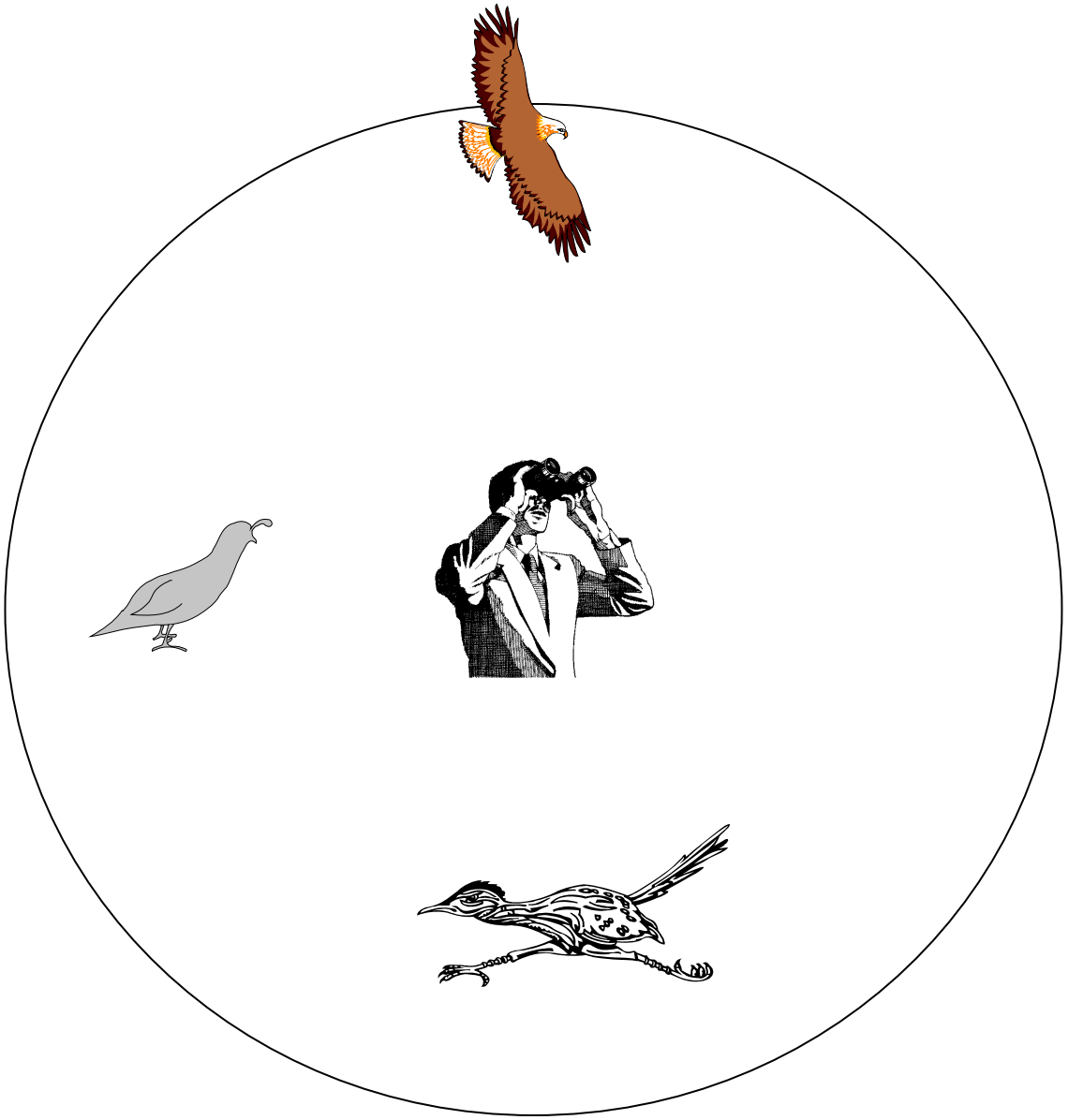
   If you have a normal driving route for checking cattle, fences, etc., stop for 5 minutes and record indicator birds for your pasture(s). Select an area that falls within a single pasture. Avoid stopping next to windmills since some of the birds using stock tanks may not actually be nesting in your nearby pasture.

Suggestions for Conducting Bird Surveys:

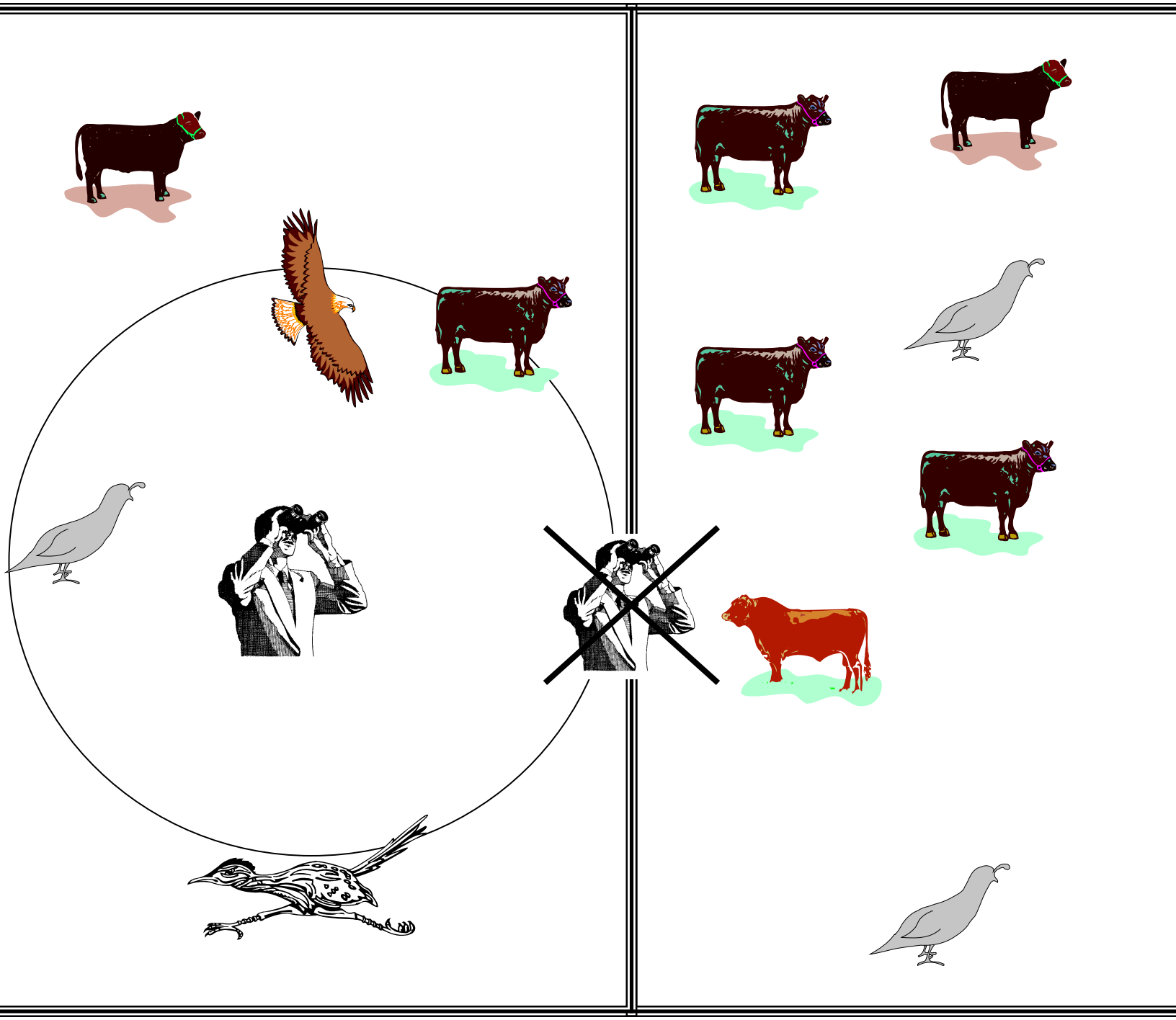
1) Establish survey points at least 250 yards (230 m) apart to avoid double-counting individual birds.
2) The best time of year to survey breeding birds is from mid-May until the end of June. The best time of day to survey birds is from dawn until 10:00 a.m. because bird activity diminishes as the day progresses.
3) Record birds on at least one transect, point, or area search per habitat type as defined by the manual.
4) Record structural features near the bird survey area, including fences, stock tanks, trees, abandoned buildings, power lines, etc.
5) Keep written notes or mark bird survey locations with flags and/or GPS units to ensure repeatability of counts in future years.
6) Bird survey location(s) should correspond to discrete management units, such as summer-grazed versus winter-grazed pastures.
7) If possible, do a survey two or three times during the breeding season, using the same methodology, to get an average number of indicator birds on the land. If multiple surveys are conducted, note any changes in the habitat including increases or decreases in the available residual cover.
8) Record other bird species heard and seen while conducting the surveys.

This protocol should provide an idea of bird trends, within surveyed areas, over time. For example, if Horned Larks increase and Lark Buntings and Meadowlarks decrease, this could be an indication that the residual cover within the management unit is decreasing.

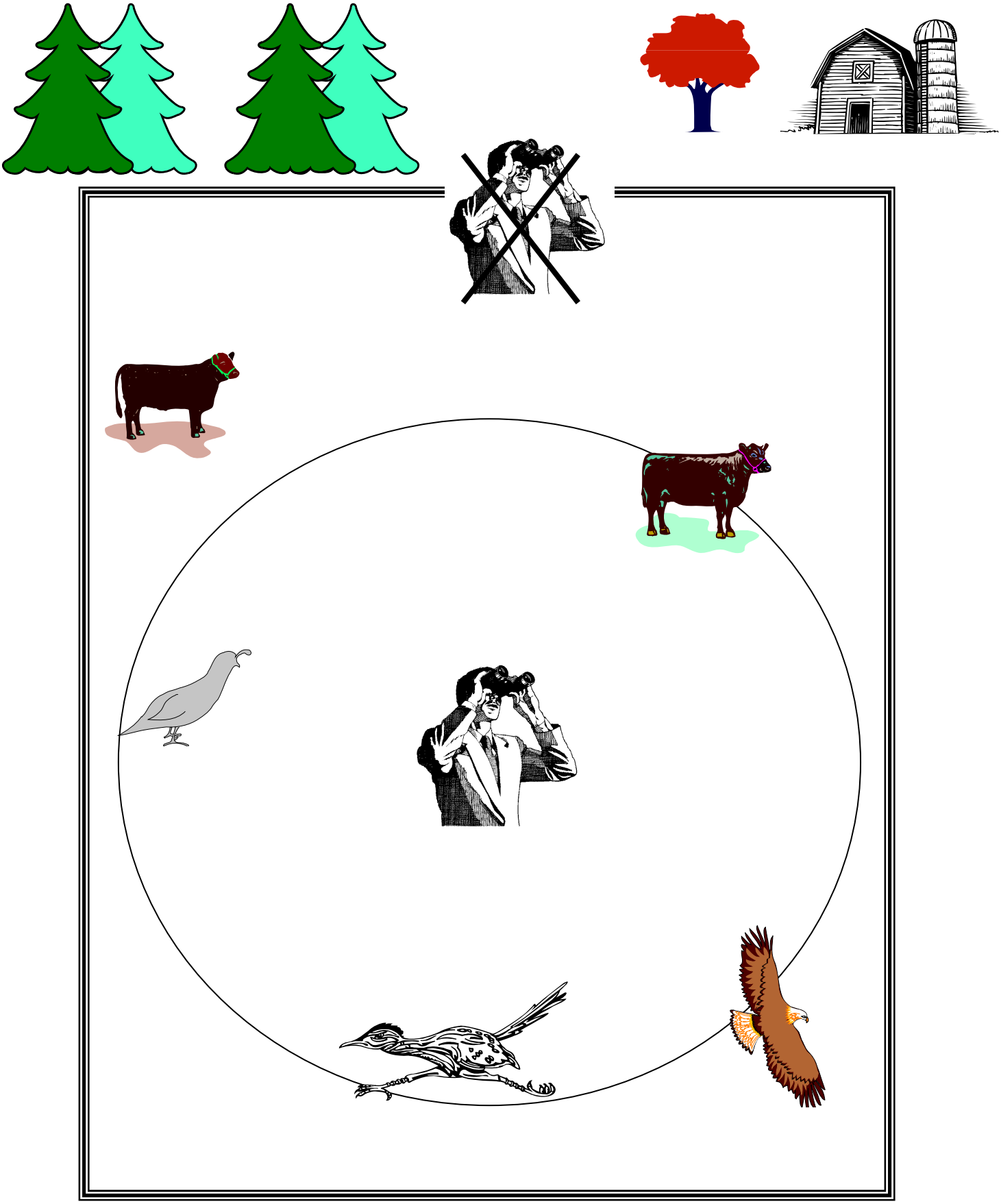
While this survey method can provide general information about bird habitat on the land, this is not a statistically rigorous method. For quantitative and statistically sound data, please contact Rocky Mountain Bird Observatory and we set up a monitoring protocol that is specific to the needs of the land.



When surveying for birds, be sure to look behind you as well as above you. Record birds out to the distance you are comfortable identifying them by sight and/or sound. If you conduct multiple surveys along a transect, make sure you space them 250 yards apart to avoid double-counting individual birds. Remember to look with and without your binoculars so you don't miss birds that may be flying around within the pasture you are surveying.



When conducting a bird survey, be sure your survey is conducted within one management unit or pasture, like the observer shown above within the survey circle. Do not survey like the observer in the middle of the diagram who is straddling two different pastures. The stocking rate is different in the pasture on the right thus the available habitat structure is different. Also, surveying along a fenceline will inflate your bird numbers since they tend to perch on fence posts and wires but may not be breeding or using the adjacent pastures. The best solution here would be to conduct a separate survey in each pasture.



If you have different habitat types within or adjacent to the pasture you are surveying, be sure to buffer yourself from them since they will attract different species. Feel free to conduct a survey in these unique habitats separately. The observer in the middle is focused within one habitat type where the observer at the top is surveying several habitats at once.

Bird Survey Data Sheet (make copies of this sheet, front and back, for your use)

- Use **Appendix A** and the table of **Indicator Species** for your region.
- Using the example data sheet as a guide, record:
  (1) your name (**2)** start/stop time of survey (**3)** weather conditions and (**4)** survey location
- Determine survey method:
  (5) (area search, transect, or point count)
- Record the habitat:
  (6) Take into account shrub and herbaceous cover. The habitat you record should be representative of the survey area, i.e., look at the entire **250-yard** area being surveyed.
- Estimate the bare ground component within the survey area (use the photographs in Appendix D as a guide):
  (7) This will influence the presence or absence of some bird species.
- Survey identification number:
  (8) Assign a unique identifier (e.g., paddock 1A).
- Record all species seen and heard using the habitat (don't record birds flying over unless they seem to be hunting or displaying to attract mates).
- Record any features such as power lines or cross fences that may be nearby. Record how the pasture is managed, e.g summer grazed (May-Sept) and stocking rate.
- If more than one survey is conducted in the area during the breeding season, record any changes in habitat in the last column of the data sheet.

Observer: **(1)** Tammy VerCauteren			Weather: **(3)** sunny, 75, no wind			
Start time: **(2)** 0800	Stop time: **(2)** 0805		Survey Location: **(4)** Butler Ranch		Survey Method: **(5)** (Circle one) Area Search Transect Point	
Habitat **(6)**	Shrub Cover	< 1% Minimal or no shrubs 1-5% Low shrubs > 5% High shrubs	Herbaceous Cover (height of grass and forbs)	< 6 inches > 6 inches	Low-Moderate Moderate-High	Percent Bare Ground **(7)** 15%

Survey identification number **(8)**	Habitat including shrub cover, herbaceous cover, and bare ground	Indicator bird species and presence of other species of interest	Other features nearby, e.g, powerlines, fences, etc.	Management	Habitat changes (if you survey more than once during the breeding season)
Pasture 3	See above info	Brewer's Sparrow 1 1 1 1	lone cottonwood	grazed May - July	
		Lark Sparrow 1 1 1		40 cow/calf pairs	
		Western Meadowlark 1 1			
		Loggerhead Shrike 1			

Bird Survey Data Sheet example

Bird Survey Data Sheet (make copies of this sheet, front and back, for your use)

- Use **Appendix A** and the table of **Indicator Species** for your region.
- Using the example data sheet as a guide, record:
  (1) your name (**2)** start/stop time of survey (**3)** weather conditions and (**4)** survey location
- Determine survey method:
  (5) (area search, transect, or point count)
- Record the habitat:
  (6) Take into account shrub and herbaceous cover. The habitat you record should be representative of the survey area, i.e., look at the entire **250-yard** area being surveyed.
- Estimate the bare ground component within the survey area (use the photographs in Appendix D as a guide):
  (7) This will influence the presence or absence of some bird species.
- Survey identification number:
  (8) Assign a unique identifier (e.g., paddock 1A).
- Record all species seen and heard using the habitat (don't record birds flying over unless they seem to be hunting or displaying to attract mates).
- Record any features such as power lines or cross fences that may be nearby. Record how the pasture is managed, e.g. summer grazed (May-Sept) and stocking rate.
- If more than one survey is conducted in the area during the breeding season, record any changes in habitat in the last column of the data sheet.

Observer: **(1)**			Weather: **(3)**			
Start time: **(2)**		Stop time: **(2)**	Survey Location: **(4)**		Survey Method: **(5)** (Circle one) Area Search Transect Point	
Habitat **(6)**	Shrub Cover	< 1% Minimal or no shrubs 1-5% Low shrubs > 5% High shrubs	Herbaceous Cover (height of grass and forbs)	< 6 inches > 6 inches	Low-Moderate Moderate-High	Percent Bare Ground **(7)**

Survey identification number **(8)**	Habitat including shrub cover, herbaceous cover, and bare ground	Indicator bird species and presence of other species of interest	Other features nearby, e.g, powerlines, fences, etc.	Management	Habitat changes (if you survey more than once during the breeding season)

Survey identification number	Habitat including shrub and herbaceous cover and bare ground	Indicator bird species and presence of other species of interest	Other features nearby, e.g., powerlines, fences, etc.	Management	Habitat changes (if you survey more than once during the breeding season)

Appendix B: Identification, Habitat Preferences, and Management of Grassland Birds of Conservation Concern

Please refer to the "Pocket Guide to Prairie Birds", the "North American Bird Reference Book" CD-ROM, or other bird field guides for additional assistance with species identification. What follows are tips on identification of the bird species presented in the training module and for those grassland species on which the *Prairie Partners* program focuses. We also present general information on those species' habitat associations and responses to management.

The **Northern Harrier** (*Circus cyaneus*) has an owl-like face. Individuals are typically observed flying low over fields or marshes searching for prey. Long wings, a long tail, and a white rump typify this species. The female is brown above with brown streaks on the white underparts. The male is mostly gray above and white below with black wing tips.

- This species is a long-distance migrant in much of its range. Its sexual dimorphism (differences) in plumage and its common behavior of polygyny (males having more than one mate) make it unique among North American birds of prey.
- Breeding habitat includes open wetlands, marshy meadows, lightly grazed wet pastures, and old fields. The Harrier forages over open habitats and females typically hunt over taller and denser vegetation than do males. Defended territories average about 68 acres (28 ha), but a mated pair may range over a much larger area, up to 6 square miles (15.7 sq km).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting: Grasses and wetland veg average 9–12 inches (23–30 cm) tall, but will nest where veg is >24 inches (60 cm); typically about 100% veg cover, >15% residual litter **Foraging**: Grasses and wetland veg <18 inches (46 cm) tall	None or light grazing to provide tall, dense vegetation and abundant residual cover Uses both dry and wet open, grassy pastures Reduce or remove winter livestock grazing from wetland and grasslands to improve winter habitat	3+ years post-burn Burn every 3–5 years to maintain nesting and prey habitat in late summer/ fall to avoid breeding period (April – July) In wetlands, reducing cattails through burning or herbicides could eliminate nesting cover	Delay mowing until after July 15 Maintain dense cover in idle haylands by mowing fields rotationally or alternately every 3–5 years	Will nest and forage in CRP greater than 250 acres (100 ha)	Prefers large pastures with patches of woody plants, such as western snowberry, rose, and other low shrubs for nesting; 1–3% total shrub cover	Wintering habitat is structurally similar to breeding habitat Absent from Montana in winter	Where water levels are artificially maintained, do not allow levels to rise above 6 inches (15 cm) from April – August to prevent nests in wetlands from becoming submerged Avoid using pesticides in areas used by harriers Avoid tilling wetlands Maintain a mosaic of undisturbed grasslands and wetlands so that while some areas are being treated to stop succession, others are available for nesting and foraging Try to limit treated areas to 250–500 acres (100–200 ha) to minimize the number of displaced nesting harriers Decline in numbers of harriers thought to be due in part to loss of habitat through wetland draining and conversion of grassland for monotypic farming

The **Swainson's Hawk** (*Buteo swainsoni*) typically has a dark brown head and bib (female) or gray head and rufous (dark red to red brown) bib (male) contrasting with a white chin and belly. However, some individuals are all dark. The tail has several narrow, dark bands with a wider one near the tip. In flight, one can see that the dark flight feathers contrast with the paler wing linings, that is, the outer and trailing parts of the wing are dark and the rest of the wing is light (though dark birds typically have darker underwings).

- These birds are long-distance migrants, wintering in southern South America. Individuals may migrate 5,000 to 8,000 miles (8,000–12,900 km) between breeding and wintering grounds. Large groups of Swainson's Hawks often gather in locations of plentiful food (mainly small rodents and large insects, such as grasshoppers), often following tractors that are tilling fields.
- Nesting habitat includes open grasslands with scattered trees or large shrubs, river bottoms, shelterbelts, and farmyards. The species hunts in open habitats, such as grasslands, hay fields, open shrublands, and cropland. The home range may be 2.4–10.5 square miles (6.2–27.3 sq km).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting: Nest placed in a solitary tree or bush, or within a windbreak or homestead **Foraging**: Open grassland, shrub steppe, cropland	Moderate to heavy grazing reduces vegetative cover & makes prey more visible	May increase habitat suitability in shrub-dominated areas	Tolerates extensive cultivation around nest sites as long as 10% remained in native grassland	Will forage in CRP	Open grasslands with scattered shrubs (1–3% cover) that contain patches of trees for nesting/ perching & that are near cultivation	Winters outside the four-state focus area	Maintain trees in shelterbelts, windbreaks, & around homesteads, especially those that already have nests May favor nest sites near low amounts of cropland (greater prey density) or high amounts of cropland (ease with which prey can be captured in harvested fields) Preserve remaining nest trees by installing nest cribs which protect tree from excessive trampling/ rubbing by cattle

The **Ferruginous Hawk** (*Buteo regalis*) is rust-colored on the back and shoulders and mainly white on the breast, belly, and tail. The leg feathers are also rust-colored and, in flight, form a brown V against the white belly. However, some individuals are all dark. When they bank in flight, look for white patches near the tips of the wings.

- This species is the largest of North America's hawks. Individuals often congregate around prairie dog towns in the winter, as these large rodents are a winter staple of the species.
- Breeding and wintering habitat includes grasslands, deserts, and other open areas with isolated shrubs or trees where less than 50% of the land is under cultivation. Pairs often nest on rocky outcrops but nest in lone trees on the prairie that are far from disturbances, where these are available. Estimates of home range vary widely, from 1.2 to 34.9 square miles (3.1–90.3 sq km).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting: Nest usually placed in a solitary tree or grove isolated from disturbance, or on a rocky outcrop; area around nest <50% hay and crops; grass usually <6 inches (15 cm) tall but up to 24 inches (60 cm) may be acceptable **Foraging**: Similar to nesting habitat: grasslands, deserts, open areas	Moderate to heavy grazing reduces vegetative cover & makes prey more visible Encourage rest rotation or deferred rotation to create islands of habitat for prey species, especially in pastures where they are nesting, until incubation is completed	May increase habitat suitability in shrub-dominated areas For disturbance purposes, avoid treatment between March 1st and August 1st	Creates open habitat for prey visibility	May provide cover for prey	Prefers open grasslands (<30% shrub cover) In a Colorado study, preferred 1–10% cover	Winter habitat is similar to breeding habitat; closely tied to prairie dog colonies in winter	Disturbances near the nest result in lower nest success or abandonment Restrict activities within ½ mile (0.8 km) of active nests from March 1st to August 1st Commonly nests on rocky outcrops, but will use trees – typically lone trees Preserve remaining nest trees by installing nest cribs, which protect tree from excessive trampling/ rubbing by cattle Greatly dependent on prairie dog colonies as prey source, especially in winter — retain populations of prairie dogs & other burrowing mammals at highest level compatible with economic uses of your land

The **Greater Sage-Grouse** (*Centrocercus urophasianus*) is very large (a male may stand over 2 feet tall [60 cm]) with a long, spiky, pointed tail. The belly and throat is black and the chest is white. The male has yellow air sacs on the chests that inflate and plumes on the back of the head that are raised during breeding displays. The female is drab gray and speckled overall, with a pointed tail and black belly. Females do not sport the white chests or black throats of the males.

- This is North America's largest grouse species and is known for its spectacular breeding displays. During the winter, it consumes large amounts of sagebrush, a nutritious food, but one that contains oils that can kill micro-organisms in the digestive tract of most other animals. During the breeding season it consumes leaves, buds, stems, flowers, fruit, and insects. The diet of chicks is at least 80% insects during the first couple weeks after hatching.
- This species is adapted to a variety of sagebrush habitats, including those mixed with riparian meadows, willow, juniper, ponderosa pine, or aspen. In Wyoming, Big Sagebrush and Mountain Big Sagebrush are preferred. Areas with common dandelion and yellow salsify may also be preferred. The display grounds where males attract females (called leks) are often on ridgetops, in grassy swales, or on dry lakebeds; these areas often have less herbaceous and shrub cover than adjacent areas. Leks are often associated with disturbed areas, such as burned sites, cultivated fields, airstrips, and roads. Males display on leks from mid-March to mid-May. Hens typically place their nests 2–5 miles (3.2–8 km) from a lek in thick vegetative cover, usually dominated by sagebrush, but occasionally in habitats dominated by grasses or by other species of shrubs, such as three-tip sagebrush, rabbitbrush, greasewood, or antelope bitterbrush. Sites with vegetative diversity may provide the best nest concealment. See Paige and Ritter (1999) for additional information on this and other sagebrush bird species.

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Lek: Sparse veg cover, few or no shrubs **Nesting**: 15–40% shrub cover, 3–30% residual grass cover. The nest is placed under a shrub 14–31 inches (36–79 cm) tall **Foraging**: Similar to nesting habitat, but with only scattered shrubs **Winter**: 5–45% shrub cover	Light to moderate rotational grazing maintains tall bunch grasses that are good for nesting and brood-rearing cover Responds negatively to grazing management that does not leave adequate residual grass cover (3–30%) or sagebrush cover (15–38%) for nesting and wintering habitat	0–2 years post-burn for lek maintenance/ creation; 3+ years post-burn for nesting, brooding, & foraging cover 3–7 year burn cycle promotes new bunchgrass/ shrub growth and can promote the preferred mix of shrubs and grasses Burn parcels in rotation so that unburned habitat in varying successional stages is always available	Does not readily use grass-dominated habitats Although sage grouse have adjusted to altered habitats, including alfalfa, wheat, and crested wheatgrass, usefulness of these areas is dependent on their location and size in relation to preferred native sagebrush habitats	Use of CRP not known	Moderate to high sagebrush cover, especially big sagebrush, between 15–38% and average height of 1–3 feet Adapted to and rely heavily on a mosaic of sagebrush habitats throughout their range for nest sites Sagebrush is essential for survival of this species, as it dominates their winter diet	May stay in nesting area, but some birds may move as far as 45 mi Males and females flock separately Forages in drainages and on southern or western slopes where snow does not accumulate — needs access to sagebrush above the snow (10–12 inches exposed)	Distribution and population densities have been greatly reduced because of loss of quality sagebrush habitat to widespread cultivation, improperly timed and/or reduced frequency of fire, sagebrush removal by herbicides, and intense grazing pressure Occasionally hybridizes with Blue or Sharp-tailed grouse There is no evidence that availability of lek habitat is limiting sage grouse success Pesticides reduce insect and forb availability, which has significant impacts on nesting females and chicks during breeding season (April – July) In general, water developments have not been shown to improve quality of habitat Although healthy populations clearly require large, contiguous areas of habitat, precise area requirements by region are not known

The **Sharp-tailed Grouse** (*Tympanuchus phasianellus*) is similar in size and shape to the Greater Prairie-Chicken, but with white spotting on the wings and a sharply pointed tail that is tan above and white below. Males have purplish-red air sacs that they inflate during courtship displays.

- This species occasional hybridizes with the Greater Prairie-Chicken where the two species overlap. Males gather at leks from March through June to strut and boom to attract females. Some Native American dances mimic the courtship displays.
- This species inhabits a range of plant communities dominated by grasses and shrubs. Common grasses on breeding grounds include bluestem, bluegrass, and needlegrass; common shrubs include rose, cherry, serviceberry, snowberry, sagebrush, and hawthorn. Leks are usually on elevated areas, are sometimes associated with disturbed sites, and are often on sites with less vegetation than the surrounding area. The nest is typically located about 0.6 miles (1 km) from a lek but may be up to 2 miles (3.2 km) away. Sharp-tailed Grouse generally require a structurally diverse landscape, including stands of grasses, forbs, and shrubs. Broods depend on areas with abundant forbs and insects. The distance between leks and winter grounds is usually less than 3 miles (5 km); the minimum area needed by this species is believed to be about 2 square miles (5.3 km^2).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting: About 90% veg cover, >12 inches (30 cm) tall **Foraging**: 30% grass and 30% forb cover found in an Idaho study; dense forb cover is needed by broods	Light to moderate rest-rotational grazing maintains preferred nesting cover of dense residual grass >12 inches tall Pastures should be rested more often then grazed or, at most, grazed in alternating years Some areas may need to be rested initially to allow vegetation to recover Range seeding may improve land that has been heavily grazed Keep cattle off active lek areas April–June to prevent breeding site abandonment	Fire preferred over mowing or grazing to maintain vigorous stands of grasses and forbs Manage brush adjacent to leks prior to May 15 through periodic prescribed burning or mowing every 5–10 years once brush exceeds 7–8 feet	Fire is more effective than mowing for creating and maintaining suitable habitat Revegetation of cropland should include seeding with a high proportion (40–50%) of forbs and perennial grasses Encourage use of conservation tillage systems, which leave waste grain available over winter Retain standing row crops and small grain over winter adjacent to, or within ¼ mile of, winter cover Delay mowing of roadsides and hayfields until after August 1	CRP responsible for providing tens of thousands of acres of nesting and brood-rearing habitat, thereby increasing otherwise declining populations in the 1980s–1990s	Less than 30% cover and < 40 inches (1 m) tall in breeding areas 5–50% in foraging areas; avg of 9% in an Idaho study, 35% in a Montana study (brood habitat)	Tree and shrub cover especially important in riparian areas for wintering, namely aspen, chokecherry, & serviceberry 2-acre clumps of winter habitat should be established at short intervals along streams, draws, and springs	Distribution and population densities have been reduced because of loss and decline of quality of habitat to conversion of grassland to cropland and pine plantations, improperly timed and/or reduced frequency of fire, and intense grazing pressure Woodcutting, tree clearing, herbicide drift, and grazing during the growing season result in a loss of important riparian winter habitat Cheatgrass and knapweed are two of the most important noxious weed threats to more desirable and important vegetation The minimum size of habitat blocks should be ½ square mile and preferably, 2 square miles. The larger the open area, the better for sharptails and other bird species dependent on open lands Don't plant conifers within ½ mile of lek sites; remove tall trees near food plots and leks The Plains Sharp-tailed Grouse is listed as Endangered in Colorado

The **Lesser Prairie-Chicken** (*Tympanuchus pallidicinctus*) is stocky with a weakly barred belly, yellow-orange feathers on its head, and a short, rounded tail. It is paler and grayer than the Greater Prairie-Chicken, and males have reddish air sacs.

- The Lesser Prairie-Chicken is closely related to the Greater Prairie-Chicken. This species prefers arid prairie habitats and is also well-known for its elaborate breeding displays on leks. Lesser and Greater Prairie-Chicken ranges do overlap and the two species occasionally hybridize.
- Breeding habitat includes sandsage-bluestem and shinnery oak-bluestem vegetation types, in addition to shortgrass and mixed-grass prairies on loamy or clay soils. In Colorado and Kansas, the Lesser uses sandsage communities dominated by sand dropseed and sideoats grama. In Oklahoma, Texas, and New Mexico, it prefers shinnery oak-bluestem habitats. Males display on leks to attract females from March through May. Leks are typically sparsely vegetated and located on knolls or ridges. The nest is located 0.75–2.1 miles (1.2–3.4 km) from a lek, in shinnery oak or sand sagebrush grasslands with high canopy cover and moderate vertical and horizontal cover, specifically in residual cover with vegetative height above the nest bowl of 17–32 inches (43–81 cm). The Lesser Prairie-Chicken forages on the ground in native rangeland or grain fields. An ideal area for this species would contain all the habitat features needed (lek and nesting, foraging, brood-rearing, and wintering habitat) and would be at least 7900 acres (3200 ha, or 12.3 square miles), although at least 17,800 acres (7200 ha, or 28 square miles) would be better.

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Lek: Veg <4 inches (10 cm), no shrubs, extensive bare ground **Nesting**: 3–35% cover of grass and other veg 12–32 inches (30–81 cm) tall; landscape for 3 miles (4.8 km) around should be >60% native prairie **Foraging**: Veg 10–31 inches (25–80 cm) tall, with roughly equal amounts of grass, shrubs, and bare ground	Light to moderate rotational grazing maintains residual vegetation and tall bunch grasses that are good for nesting and brood-rearing cover Rest pastures 1 year out of every 2–5, depending on precipitation and range condition Excluding cattle from nesting/ brood-rearing areas (minimum of 160 acres) may improve these areas	Will sometimes use burned areas as leks in the first year Areas burned in the last 3 years are usually unsuitable for nesting, brooding, and foraging cover, but do contribute to the desired habitat mosaic 3–7 year burn rotation timed in early spring (March) promotes new shrub/ bunchgrass growth; burning 100–300 acre blocks (or 20–33%) can produce desired mosaic effect	Does not readily use grass-dominated habitats Use no-till or minimum tillage techniques for corn, oats, wheat, rye, sorghum, and other small grain crops to leave some waste grains available after harvest	Will use CRP, but prefers grasslands with some shrub cover	Requires high percentage of forbs and low-growing shrubs (<31 inches [80 cm] tall) exceeding 30% cover over majority of habitat	Veg >31 inches (80 cm) tall Foraging sites averaged 46% litter, 44% bare ground, 10% live plants in one study	Eliminate herbicide use to reduce brush during nesting/brooding months of mid-April through July Herbicides should not be applied if perennial grasses are not present Food plots not recommended Clearing overgrown vegetation on leks through grazing or fire enhances their value and use Short areas around stock tanks, oil pads, or prairie dog towns can be used for lek grounds, especially in shrub-dominated habitat

The **Greater Prairie-Chicken** (*Tympanuchus cupido*) is very similar to the Lesser Prairie-Chicken, but is slightly darker, browner, and larger. It has a short, rounded tail, barred underparts, pale throat, dark eye-lines, and yellow-orange feathers on the head. During breeding displays, males inflate yellowish-orange air sacs.

- This species is known for its elaborate breeding display, in which males attract females by booming and strutting on leks from March through May. There are three subspecies of Greater Prairie-Chicken, one of which, the Heath Hen (of the East Coast), is extinct and another, Attwater's Prairie-Chicken (of Texas), is Endangered.
- Breeding habitats include prairie openings interspersed with oak woodlands, oak savannah, and riparian "oak fingers." Nest sites are usually in mid- or tallgrass prairie. Excessive litter (residual vegetation) in nesting habitat creates favorable conditions for small mammals and beetles, which may attract foxes and skunks, two predators of Prairie-Chicken eggs and young. The species requires grasslands for roosting, loafing, and nesting. Leks are often located on rises or hilltops where short grasses provide clear views of the surrounding landscape. Occupied habitat in northeast Colorado is sandhills characterized by taller grasses, often with sandsage. All components of the habitat (leks, and habitat for nesting, foraging, brood-rearing, and wintering) should be contained within 5 miles (8 km), and preferably within 2–3 miles (3–5 km), of the center of the territory. This is an area-sensitive species — it requires large tracts of habitat: 4–24 sq mi (10–62 sq km).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Leks: Veg <6 inches (15 cm) tall with extensive bare ground **Nesting**: Veg 5–28 inches (13–70 cm) tall with at least 20% cover of veg 18–20 inches (45 cm) tall; 70–80% grass, 10–20% forbs is optimal **Foraging**: Veg <8 inches (20 cm) tall; otherwise similar to nesting habitat	Light to moderate rotational grazing of mid and tallgrass prairie maintains tall bunch grasses that are good for **nesting** and **brood-rearing** cover Leave 4–6 inches of vegetation at the end of the growing season to provide residual cover for nesting birds the following spring	Burn before March 15 or after July 31 Burn fields on a 3–5 year rotation if needed to control heavy litter accumulation or brush invasion **Foraging:** Fall- and spring- burned sites can be utilized in spring and early summer **Nesting**: Can be burned every 3 years **Brood-rearing**: Can be burned annually Spring burning (through May) can enhance residual	Grassland habitat is often mixed with cropland — cultivated grain, such as corn and sorghum, now makes up a significant portion of diet Hay or mow after July 31 and leave 4–6 inches of vegetation to give late-nesting birds a chance to rear young. Plant tall perennial grasses in center-pivot corners in areas with Greater Prairie-Chickens	CRP fields within 2 miles of lek grounds provide nesting, brooding, and roosting cover CRP fields could be burned in 20–80-acre units on a 4-year rotation using disked firebreaks Unmanaged CRP fields decline in nesting value 4–5 years after establishment	**Leks**: None **Nesting and foraging**: <5% preferred, but up to 20% acceptable; <6 inches (15 cm) tall	Grasses and other veg >10 inches (25 cm) tall; 20% cover of 18 inches (45 cm) tall **Roosting:** Shrubs 20 inches (50 cm) or taller, <20% cover. The shrubs capture snow, into which the birds burrow at night Optimal mix is 25% cover of cereal grains (or sunflowers or corn), with waste grain available, and 75% cover of native prairie	Leks are typically at least 50 yards in diameter In areas of cattle grazing, leks are usually not a limiting factor. Therefore, special efforts to create or expand leks are usually not necessary. Pesticides reduce insect availability, which has significant impacts on nesting females and chicks during breeding season (April – September). Whenever possible, postpone the use of insecticides until after mid-July. Although birds may drink from stock tanks when available, in general, water developments have not been shown to improve abundance or distribution The species' range has diminished as prairie and woodland habitats have been converted to cropland or fescue. Although habitat alteration is the primary cause of the decline, habitat fragmentation increases predation by mammals and birds and competition between prairie-chickens and Ring-necked Pheasants, which further decimate populations Greater Prairie-Chickens need large (>160 acres) tracts of prairie or suitable grasslands for nesting, brood rearing, and roosting cover. Most experts recommend that tracts of 2,000 acres are necessary

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
		cover by shifting cool-season dominated pastures to warm-season grasses					for sustainable populations Optimum management of large tracts should be approximately 70% grassland and 30% cropland in the vicinity of lek areas **Nesting and winter**: Prairies or open fields adjacent to or near cropland should not be converted, as they provide nesting habitat; dense grassland patches near cropland provide winter cover **Nesting, brood-rearing, roosting**: Manage lowlands by burning or mowing; burn in July when they are dry to get better control of brush **Nesting**: Coyote-dominated landscapes have double the rate of nesting success, as coyotes help to control red foxes (a common predator of ground-nesting birds)

The **Scaled Quail** (*Callipepla squamata*) is a stocky and short-tailed bird with short, white tufts on the tops of their heads, and gray tails. It is pale gray on the back and face and the feathers form a distinct scaled pattern on the chest.

- Like other New World quail, Scaled Quail (colloquially known as "Cottontops" or "Scalies" or "Blue Quail") use sideways scratching to expose seeds and insects. It is typically found in pairs, families, and small groups, called coveys.
- Breeding habitat includes brushy gullies, juniper foothills, cactus flats, and sagebrush or mesquite plains. The species is common around homesteads, often nesting under brush piles or old machinery. Scaled Quail prefer habitats with a diversity of grasses and forbs, along with scattered shrubs. Common shrubs used include yucca, four-wing saltbush, littleleaf, skunkbrush sumac, beargrass, sandsage, and a variety of cacti. Roosting cover is also important and consists of shrubs approximately 16 inches (40 cm) in height. Overall shrub cover for roosting is usually about 35% and mixed with grasses 4–16 inches (10–40 cm) tall with 45% ground cover. Roosting cover should occupy at least 1% of breeding habitat. The nest is often placed in dense, shaded vegetation. Moderate cattle grazing (30–40% of grasses used) provides good habitat. The home range is 40–80 acres (16–32 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: 10–50% total veg cover, 4–16 inches (10–40 cm) tall Bare ground is an important feature, but no quantitative information is available	Moderate grazing in grass-dominated areas improves habitat by reducing grass density, creating more bare ground, & encouraging forb germination Prefers pastures grazed in rotation over those grazed year-round Overgrazing reduces residual grass cover, which is important to over winter survival	Can be used to promote the preferred mix of shrubs & grasses in shrub or grass-dominated areas	Does not readily use grass-dominated habitats	Decline in population size is related to establishment of CRP grasslands dominated by weeping lovegrass	Well distributed shrub cover of 5–15% is essential, but use declines in shrub-dominated habitat Shrubs for loafing should be 20–60 inches (0.5–1.5 m) tall Common shrubs of preferred habitat include sand sagebrush, cholla, acacia, four-wing saltbush, cacti, honey mesquite, sumacs, yucca, and broom snakeweed	Nonmigratory resident species — winter habitat is similar to breeding season habitat	Winter coveys begin forming in August and break up the following spring in March/April Range improvement designed to promote grasses by brush control — removes important food sources such as mesquite, snakeweed, & broomweed Gallinaceous guzzlers can be ineffective and impractical Ramps into and out of stock tanks can provide access to water

The **Long-billed Curlew** (*Numenius americanus*) is a large, cinnamon-brown shorebird with a long, downcurved bill (5–6 inches [13–15 cm] in males and 6.5–8 inches [16–20 cm] in females) used to probe for food deep in mud and soft soil. This species has pale gray legs, broad wings, and a loud voice.

- This is North America's largest shorebird, standing about 16 inches (40 cm) tall. Its "cur-lee" calls can be heard for long distances across the prairie.
- The Long-billed Curlew nests in shortgrass and mixed-grass prairies, with or without scattered shrubs. Once young have hatched, they are moved to areas with taller grass, scattered shrubs, and forbs. Curlews are often observed within a quarter-mile (400 m) of standing water, but this feature may not be a requirement. Defended territories are estimated to be 15–50 acres (6–20 ha). Like the Upland Sandpiper, the Long-billed Curlew needs a variety of habitat conditions to meet its nesting, foraging, and brood-rearing needs. As an example, a brood studied in Saskatchewan moved more than 4 miles (6.5 km) from the nest in the first six days after hatching.

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting: Veg <12 inches (30 cm) and often <4 inches (10 cm) — avg of 2.5 inches (6.5 cm) in a Utah study, 8.1 inches (20.6 cm) in a Colorado study. Bare ground averaged 35% in the pasture containing the nest, 18% at the nest itself in a Utah study **Foraging**: Usually <4 inches (10 cm) but up to 12 inches (30 cm) Will forage on prairie dog towns or crop fields	Light rotational grazing in shortgrass Moderate to heavy in mixed-grass to provide the preferred short (<10 cm) nesting vegetation Grazing should be timed in late winter No year-long grazing Will not use areas that have not been grazed for > 1 year	Will use area 0–2 years post-burn Improves habitat by removing shrubs and increasing openness Fall burns are recommended	Can be timed to provide short nesting habitat early in the season, but active nest should not be damaged from mid-March – August	Little information available — may use CRP as brood cover	Low, sparse shrubs or no shrub cover In a Colorado study, strongly preferred less than 1% shrub cover	Winters outside the four-state focus area	Proximity to water (stock ponds, irrigation structures) is important in habitat selection Vegetation adjacent to nest may be taller for shade or concealment of young; nest is often placed near cow manure or other conspicuous object Will forage in prairie dogs towns

The **Mountain Plover** (*Charadrius montanus*) is mostly light brown with a white throat and breast and white under the wing. It has a white forehead that contrasts with a dark brown cap. Adults also have a black line running from the beak to the eye. It is slightly smaller than the Killdeer and lacks the two dark bands found on the Killdeer's chest.

- The female Mountain Plover will sometimes lay eggs in one nest for a male to tend, then lay eggs in a second nest that she tends. About 99% of their diet consists of grasshoppers, beetles, and crickets. Young will depart the nest within three hours of hatching.
- Breeding habitat includes shortgrass prairie where the land is fairly flat and vegetation height is short, such as prairie dog towns or heavily grazed areas. Pairs will also nest on fallow or recently plowed crop fields, being attracted to the bare ground. Territory size is about 40 acres (16 ha), but an area of about 70 acres (28 ha) is needed to successfully raise a brood.

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting: Veg 2 inches (5 cm) or less; avg cover of 16% grass/forb in a Wyoming study, 68% in a Colorado study, 87% in another Colorado study; bare ground >30% **Foraging**: Veg 2 inches (5 cm) or less; bare ground >30%	Heavy spot grazing in late winter or summer best benefits breeding habitat within native mixed-grass areas Prefers vegetation height at or below 2.5 inches (6.4 cm), however long-term overgrazing may exclude Mountain Plover	0–2 years post-burn Burn in larger tracts (600+ acres [240 ha]), otherwise burned area may become a "sink" due to predation Burn in late winter	Does not use areas of taller grass that can be hayed, however, mowing can be used to create/maintain suitable habitat if vegetation is mowed below 4 inches and is done in early spring Will commonly nest in cultivated and fallow fields – plowing of nesting areas should be avoided during March to August	None – vegetation usually too tall and dense Conversion of land to CRP can be counter-productive to protection of birds	Low-growing, scattered shrubs (<10% cover) may be present, such as fringed sagebrush, prickly pear cactus, & Nuttall's saltbush	Winters outside the four-state focus area	Nest is often placed next to cow manure, rock, or vegetation clump Disturbance near nest results in lower nest success or abandonment Restrict mineral extraction or water development until after June Minimum breeding habitat size is 70 acres (28 ha) Limit pesticide use on potential Mountain Plover habitat – use mechanical or cultural treatments to control woody species instead Look for Mountain Plovers in or near disturbed areas where cattle concentrate Will nest and forage in areas grazed short by prairie dogs Maintain prairie dogs at highest level compatible with economic uses of your land Highest densities of Mountain Plover occur in prairie dog towns 15–125 acres (6–50 ha)

The **Upland Sandpiper** (*Bartramia longicauda*) is brown on the back and wings and paler brown on the breast with darker streaking. The belly is white, as is much of the underwings. They have long, thin necks, eyes that seem disproportionately large for their small heads, and long, yellow legs. Upland Sandpipers often perch on fence posts and, occasionally, power poles.

- During grasshopper invasions in Nebraska, Iowa, and Minnesota, this species sometimes appears in large numbers to feed on the insects. They also feed upon crawfish, which are pests in corn and rice fields.
- Typical breeding habitat is an area with tall grasses of up to 24 inches (60 cm) in height. Within that area of tall grass, the well-hidden nest is placed in a shallow depression surrounded by grass as short as 4 inches (10 cm). This species will also nest in wet meadows, hayfields, and, occasionally, in weedy fallow fields, roadsides, CRP lands, and row crops. Overall, this species prefers areas with few shrubs, little bare ground, and moderate to dense litter. The Upland Sandpiper requires a mosaic of vegetation heights to meet its nesting, foraging, and brooding needs. Territory size is 2.5–30 acres (1–12 ha), although nesting pairs require much more area than that in order to meet all of their foraging, nesting, and brood-rearing requirements. In some studies, nesting pairs required areas of suitable habitat that covered at least 75 acres (30 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting: At least 35% cover of grasses and other veg, 4–25 inches (10–64 cm) tall **Foraging**: At least 35% cover of grasses and other veg, <12 inches (30 cm) tall	Provide a mosaic of habitat types of various densities & heights Avoid season-long grazing Defer two or more pastures until mid to late June for nesting birds In general, requires short (<12 inches) vegetation for forage, short – medium (4–25 inches) for nesting, and taller vegetation for brood cover	1–3 year post burn Burn in either March/April or Oct/Nov Annually burn 20–30% of pastures <80 acres (32 ha) to help prevent shrub encroachment Burn parcels in rotation so that unburned habitat is always available, as undisturbed fields are needed for nesting	Where possible, cut after July 20 Cut hay several inches taller or leave islands of uncut hay in each field as refugia	Relatively uncommon, however may use CRP lands that have a medium frequency of forb occurrence	Few shrubs — typically prefers 5% cover or less In a North Dakota study, used areas with average of 5.7% cover	Winters outside the four-state focus area	Commonly seen perched on fence posts or other elevated perches

The **Burrowing Owl** (*Athene cunicularia*) is about 10 inches (25 cm) tall, long-legged, with white spots on the back and wings, and dark brown barring on the light brown breast and belly. Individuals are frequently observed standing near prairie dog burrows, as they commonly nest in these burrows.

- Zuni Indians called the Burrowing Owl the "Priest of the Prairie Dogs." The Burrowing Owl differs from most other North American owl species in that it is quite active in the daytime.
- The Burrowing Owl does not excavate its own burrow for nesting and roosting, but utilizes burrows dug by badgers, foxes, ground squirrels, and other burrowing mammals. The species is most strongly tied to prairie dogs and, where they occur, will utilize prairie dog burrows nearly to the exclusion of all others. As a result, Burrowing Owls tend to nest semi-colonially, i.e., pairs nest close to one another. Nests are usually about 27 inches (69 cm) below the soil surface and about 60 inches (150 cm) from the burrow entrance. Nest success is higher in areas with high density and acreage of prairie dogs, with success possibly being due to the greater ability to detect predators and the dilution effect of having high densities of prairie dogs. Areas of taller grasses in proximity to the nesting habitat provide important reserves for prey, which is mostly insects and small mammals. Territory size varies widely, depending on habitat suitability: 0.1–15 acres (0.04–6 ha). Individual owls may cover up to 2 square miles (5.2 sq km) while hunting.

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting: Veg <4 inches (10 cm) tall; 42% grass and forb cover in a Colorado study, 53–67% in a Wyoming study; 40–50% bare ground **Foraging**: Low veg (<4 inches [10 cm]) interspersed with some areas of taller veg (12–24 inches [30–60 cm])	Heavy by cattle and prairie dogs for nesting & roosting (<4 inches [10 cm]) Also requires enough permanent, taller vegetation nearby for foraging Creating a patchwork of habitats using rotational grazing or fire is important in maintaining prey populations	0–2 years post burn Fire creates suitable habitat by reducing vegetation around potential nest sites	Mowing may be used to control growth of grasses & woody vegetation in areas where prairie dogs have been eliminated & may enhance nest sites for owls returning from wintering grounds if done in mid-March Mowing throughout the breeding season does not appear to adversely affect nesting Burrowing Owls, however, mowing is not recommended for long-term sustainability of owls in the absence of prairie dogs	May use for forage if close to nest site	Shrubless areas or low shrubs, such as broom snakeweed; shrub cover 1–4% found in a Wyoming study	Winter habitat is probably similar to breeding season habitat	Postpone use of insecticides to control grasshoppers until August, when young owls have fledged Provide info on Burrowing Owl identification to hunters on your land & educate them about the owl's ecological importance Do not install raptor perches near prairie dog towns with Burrowing Owls Adults and young birds move around and use "satellite" burrows in addition to a nest burrow Active burrows can be identified by the presence of feathers and white droppings around the burrow entrance and/or by cow manure lining the burrow Owls return to the northern extent of their breeding range by April/May and migrate to wintering areas by mid-Oct; southern birds may remain year-round Rremoval or reduction of burrowing mammal colonies eradicates Burrowing Owls; retain prairie dog populations at highest level compatible with economic activities on your land Control only active prairie dog burrows in January/February before the owls arrive, or bait in the fall after the owls have left

The **Short-eared Owl** (*Asio flammeus*) is brown overall with long, narrow wings and piercing, yellow eyes. Females are somewhat darker than are males, as males have paler underparts. The "ears" of Short-eared Owls are actually clumps of feathers that can be flattened or erected to signal their mood and are unrelated to hearing, which their true ears, hidden under the feathers on the sides of their heads, do amazingly well.

- Short-eared Owl is in many ways the nocturnal equivalent of the Northern Harrier. The species forages by coursing low over fields and marshes searching for the telltale rustling of rodents. This is one of the world's most widely distributed owls, being found on six continents. Individuals are active both day and night, but are typically crepuscular, that is their activity is concentrated near dusk and dawn. They nest and roost on the ground in taller grasses.
- Preferred habitat includes large expanses of grasslands, shrub-steppe, tundra, and marshes. Nests are typically placed on the ground in vegetation dense enough to conceal the incubating female. The territory is 57–311 acres (23–126 ha), with an average of about 150 acres (60 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: 85–90% grasses and 10–15% forbs in a Montana study; typically <20 inches (0.5 m) tall	In northern mixed-grass prairie, light to moderate grazing to maintain May respond negatively to grazing in the Great Plains and western shrubsteppe	3+ years post-burn In tallgrass areas burn every 3–5 years to maintain prey habitat in late summer/fall to avoid breeding period (April through August)	Delay mowing until after July 15 Maintain dense cover in idle haylands by mowing fields rotationally or alternately every 3–5 years to stimulate plant growth	Will nest and forage in CRP		Winter habitat is similar to breeding season habitat	As a ground-nester, fragmentation of grasslands tracts may increase occurrence of Short-eared Owl nest predation Associated with large, open grassland expanses (>250 acres [100 ha]), although it may use smaller fragments if they are close to larger blocks of contiguous grassland

The **Scissor-tailed Flycatcher** (*Tyrannus forficatus*) has a pale gray back, head, and breast, black wings, and pinkish sides and wing linings. The extremely long tail — about 9 inches (23 cm) in the male and 6 inches (15 cm) in the female — makes this species unmistakable.

- As with all prairie birds, inclement weather is a significant cause of nest loss for the Scissor-tailed Flycatcher. Thunderstorms, high winds, tornadoes, hail, and other weather events are responsible for up to half of this species' nest failures in a given year.
- This species adapts well to human-created landscapes such as croplands, pastures, suburban parks, and golf courses — provided the basic elements of its habitat are present. The preferred habitat is open country with scattered trees and/or shrubs. The territory is 0.5–1.0 acres (0.2–0.4 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting: Nests in isolated small trees or large shrubs in open country **Foraging**: Needs scattered shrubs and trees — up to 30 feet (10 m) tall — to serve as perch sites; will also use fences and utility wires	Readily uses any open country for foraging; the timing and duration of grazing appears to have little impact	May avoid areas cleared of shrub cover	Readily uses any open country for foraging; the timing of haying, mowing, and crop production activities appear to have little impact	Will use CRP for foraging, provided there are perch sites available	Requires scattered trees and shrubs for nesting and foraging Management activities that completely remove shrub cover are detrimental to this species; where possible, leave strips or clumps of untreated shrubs	Winters in southern Mexico and Central America in habitat similar to summer habitat	

The **Loggerhead Shrike** (*Lanius ludovicianus*) is gray with black wings and tail, white throat and breast, white patches on the wings and a black mask across the eyes. Up close, the hooked beak can be seen.

- This species is sometimes called the butcher-bird, as shrikes impale prey on barbed wire, branches, or thorns. As for all shrikes in the world, the Loggerhead Shrike is a predator of vertebrates that does not have all of a vertebrate predator's tools, specifically, the strong feet and sharp talons required for holding prey while eating it. Therefore, shrikes co-opt other sharp objects in the environment to do the job for them. They will also leave some insects impaled on thorns for a day or two to allow toxins in the insect bodies to break down.
- Breeding habitat includes areas with scattered or clustered trees and shrubs in open country, with a mix of short (<4 inches [10 cm]) and tall (>8 inches [20 cm]) grasses and bare ground. Suitable sites include fencerows, shelterbelts, stream bottoms, and abandoned farmsteads. Common nesting shrubs include greasewood, saltbush, and sage; popular trees include hackberries, hawthorns, Russian olives, and junipers. Nests are more commonly placed in isolated trees or shrubs than in hedgerows. Nests from the previous season are sometimes reused. Territories range from 11 to 40 acres (4.5–16 ha), with most about 15–22 acres (6–9 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: Mix of short (<4 inches [10 cm]) and tall (>8 inches [20 cm]) vegetation	Light, deferred rotational grazing in shortgrass, especially in flat floodplains Moderate to heavy rotational grazing in taller grasslands to reduce vegetation height for foraging, but not so intensively to negatively impact shrubs & trees used for nesting	Initially responds negatively to burns in semi-arid desert areas Frequent fire may kill or reduce preferred shrub habitat Leave blocks of unburned shrubby habitat	Mow to maintain grass height at >8 inches for forage Prefers untilled pastures/grassland	Will hunt in CRP provided perch sites are available	Shrubby habitats in open country; common shrubs used include greasewood, buffaloberry, saltbush, sagebrush, hawthorn Preferred >10% shrub cover in a Colorado study Requires thorny shrubs or barbed wire on which to impale prey Commonly uses shelterbelts / abandoned homesteads	Winter habitat is similar to breeding season habitat	Reduce or eliminate pesticide use over large areas to control grasshoppers, which are the bulk of their diet Maintaining shrub thickets or fencerows throughout open pastures improves habitat

The **Horned Lark** (*Eremophila alpestris*) is grayish-brown on the back and wings and mostly white underneath, but with a yellow throat and a dark breast band, a dark mask, and tiny "horns." It has a mostly blackish tail with brown central tail feathers and white outer feathers.

- This species is the only lark species native to the New World, though there are dozens of species in the Old World. There are many different subspecies in North America, mainly differing in overall color tone and having either white or yellow "eyebrows" (technically, supercilia).
- The scientific name of the Horned Lark means "lark of the mountains," but the species is actually an open-country generalist, being found as a breeder and/or winterer in open country throughout most of the United States and Canada. Breeding habitat includes prairies, deserts, sage and/or saltbush flats, and tundra (both alpine and arctic). It also breeds in agricultural areas, inhabiting bare ground and fields of row crop stubble. Population densities are highest in heavily grazed areas where it can be one of the few local breeding species. The territory is 0.7–12.6 acres (0.3–5.1 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: Veg <1.5 inches (4 cm) tall; prefers areas with extensive amounts of bare ground Nest is placed on bare ground in an area of extensive bare ground	Heavily winter- or summer-grazed shortgrass for breeding that creates preferred low height & density of vegetation with no litter & uniform height of <4 inches (10 cm) Allow moderate grazing in wetter areas to increase habitat patchiness Late winter grazing makes breeding habitat available earlier	0–2 years post burn Burn in spring to reduce woody vegetation	Will use recently cut hayland or row crop stubble where vegetation is <4 inches (10 cm)	Little to no use because the veg is typically too tall and dense	Prefers little to no woody vegetation, but birds are sometimes found where scattered short shrubs are present, up to about 25% cover	Winter habitat is similar to breeding season habitat	On some ranges, Horned Lark is an indicator of degraded conditions Avoid using insecticides for grasshopper control over large areas – consider limiting use to the interface of agricultural lands and rangeland Expect to find Horned Larks more toward the interior of pastures, rather than along roads Uses areas grazed short by prairie dogs

The **Cactus Wren** (*Campylorhynchus brunneicapillus*) has a brown back, wings, and tail, all streaked with white, a reddish brown head marked by a bold white stripe just above the eye, and a dense cluster of black spots at the top of the tawny breast and belly. Unlike other wren species, the Cactus Wren does not usually cock its tail upwards. This is the largest wren species in the United States.

- This species builds a large domed nest, about 12 inches (30 cm) in diameter with a 6 inch (15 cm) long entrance tube extending to the side and often curving and/or turning downward; the entrance tube also includes a "doorstep" or perch at the mouth of the entrance. The substrate is usually a plant with thorns, such as cholla or prickly pear cactus. The nest is constructed of dried grasses, twigs, leaves, and rootlets, with the nest cavity lined with feathers and fine grasses. In spite of all the work involved in building such an elaborate structure in the midst of prickly thorns, the male often builds several additional nests while the female incubates eggs in the primary nest. These secondary nests are used for roosting by the adults and young, and for subsequent breeding attempts (in some areas, pairs may produce as many as three broods per year).
- The Cactus Wren occupies open brushland and desert with low scrub growth and cactus. The territory size is 2–12 acres (0.8–5 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting: Open brushy or scrubby areas, often wth mesquite, cholla, yucca, or creosote bush. The nest is typically placed 3–10 feet (1–3 m) high in a cholla cactus. **Foraging**: Habitat similar to nesting habitat. Grass height seems to be of little importance, although some bare ground is needed because the species frequently forages on the ground.	The timing and duration of livestock grazing seem to matter little to this species.	Avoids areas where fire has removed brush	Avoids hay meadows and cropland because of the lack of brushy growth	Probably does not use CRP because of the lack of brushy growth	Optimum habitat includes thorny shrubs at a density of about 50/acre (125/ha)	Year-round resident, occupying the same habitat in winter as in summer	

The **Sage Thrasher** (*Oreoscoptes montanus*) is slightly smaller than the American Robin. For a thrasher, it is short-billed and has longer wings. It is gray to gray-brown in color with streaking on the chest. The Sage Thrasher has white wing-bars that are conspicuous along with yellow eyes. The tail has white corners that are obvious in flight.

- This species is primarily an insectivore, favoring Mormon crickets and their eggs. It will also consume grasshoppers, beetles, weevils, ants, and small fruits and berries. The Sage Thrasher helps control Mormon crickets and grasshoppers.
- The Sage Thrasher is considered a sagebrush obligate typically found in habitats dominated by big sagebrush. The species is positively correlated with shrub cover, bare ground, and horizontal habitat heterogeneity. Within the breeding area, the nest site itself consists of tall (>22 inches [55 cm]), dense clumps of shrubs, typically sagebrush with a dense overstory; the dense shrubs conceal the nest from predators and provide shade. Territories are 1.0–4.5 acres (0.4–1.8 ha), although individuals may search for food over a larger area.

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and **foraging**: 5–20% cover of grass and other veg; >10% bare ground; nest sites are usually surrounded by dense vegetation Abundance is negatively correlated with grass cover (i.e., prefers shrubs rather than grass cover)	Grazing is beneficial when it results in an increase in shrub cover Grazing is detrimental when it results in an increase in abundance of annuals	Prefers areas burned at least two years prior Do not use fire to remove shrubs over large areas	Responds negatively to mowing due to the loss of shrub cover Avoids croplands because of the lack of shrub cover	In general, avoids CRP because of the lack of shrub cover	Typically 5–20%, but up to 40% around nest; 2–3 feet (60–100 cm) or taller Avoids areas where shrub cover is eliminated Prefers unbroken shrub cover — shrublands fragmented by grasslands or croplands are much less desirable	Winters in southern states and Mexico in habitat similar to breeding season habitat	Encroachment of cheatgrass is of concern because of changes in the understory and changes in the frequency of fire If shrublands must be treated to remove shrubs, treat strips no wider than 300 feet, alternating with 300–600-foot wide untreated strips

The **Sprague's Pipit** (*Anthus spragueii*) is a relatively stocky, short-tailed, and stout-billed bird. It is commonly confused with juvenile Horned Larks. In flight you can see a necklace of brown streaks along with extensive white on the outer tail feathers. Adults have a dark streaked crown and pale buffy face along with a dark streaked back and white wing bars.

- The Sprague's Pipit executes aerial song flights to attract mates. It is solitary and secretive, making it difficult to see on the ground. It will flush close at your feet then fly high and fold its wings as it plummets to the ground breaking its fall with wings spread just before hitting the ground.
- It prefers native grasslands with intermediate vegetation height. It is abundant in idle grasslands but will use habitats with light to moderate grazing. It prefers habitats with little or no woody vegetation and moderate litter cover. The territory size is 2.5–10 acres (1– 4 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting: Avg of 53% veg cover in one study, 5.5–11.5 inches (14–29 cm) tall; bare ground avg 17% in that same study **Foraging**: Typically <2 inches (5 cm) tall	Not conclusive, although it appears to be tolerant of some light to moderate grazing regimes Avoid heavy grazing in breeding range Standing residual grass cover is important — deferred, rotational grazing may be most appropriate mgmt Grazed grasslands generally support fewer pipits than ungrazed	2+ years post burn Burn parcels in rotation (every 2–4 years) so that unburned habitat is always available May initially be negatively impacted by fall burns	Mow hayland using a rotational schedule of every other year — divide large fields in half & mow each half in alternate years Completely idle hayfields can be detrimental Delay mowing until after July 15 in years of normal precipitation, after August 1 in drier years	Information unavailable, but they are most abundant in native grasslands	Sparse shrubs; avoids pastures with high shrub/tree densities	Winters outside the four-state focus area	Efforts should be made to provide both dry & wet habitats for breeding, as there may be a shift from year to year in use

The **Cassin's Sparrow** (*Aimophila cassinii*) has brown and gray streaking on the back, a pale gray throat and breast, the latter with fine dark streaks and spotting, and a white belly. The face is light gray and the white throat is outlined by dark malar stripes. The tail is fairly long and rounded, with distinct white corners.

- The Cassin's Sparrow is a quintessential grassland bird, showing many of the traits that sets this group of birds apart from most others. One of these typical behaviors is called skylarking — singing in flight over open country. Most endemic grassland bird species use this behavior to defend territory and attract mates as the habitat usually has few elevated perches from which to sing, as songbirds in other habitats have. Cassin's Sparrow song flights are conducted by males and are initiated from a perch, such as a shrub or fence post. Upon becoming airborne, the bird starts singing his unique song. Many songs end about the time that the bird has completed his glide to another perch, but many times, the bird will sing more than once on an individual song flight.
- Cassin's Sparrow breeds in shortgrass and mixed-grass prairies with scattered shrubs or other vegetation providing structure. The species is not particularly picky about the shrub species, using sandsage, yucca, cholla, rabbitbrush, mesquite, and oaks. The territory is 15–20 acres (6–8 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: Mixture of shrubs and grass; 40–80% cover of grasses and forbs; 20–35% bare ground	None or light grazing in areas of short, sparse grasses Will use grazed areas in less arid climates Suitable grazing prescriptions include deferred, rotation, deferred rotation, and rest-rotation	2+ years post burn Burn habitat blocks in rotation so that unburned blocks are always available	Mow or hay after July 20th for successful nesting	Will nest in CRP lands, but may prefer blue grama/sideoats mixtures May rely on CRP in shortgrass regions	Scattered shrubs (yucca, sandsage, rabbitbrush, four-wing saltbush) — will accept a wide range of shrub densities as long as grass cover exists	Winter habitat similar to breeding habitat	Benefits from mosaic landscapes of grassland parcels of differing heights and densities to provide breeding sites each year Will nest in small tamarisk shrubs in grasslands with mixed shrubs The presence of tamarisk poses a great risk of dominance & a subsequent loss of grassland community

The **Brewer's Sparrow** (*Spizella breweri*) is the smallest breeding sparrow on the Great Plains. The species is relatively long-tailed, small-billed, and round-headed. It has a complete whitish eye ring, but is otherwise drab in color. However, what it lacks in colorful plumage is made up for by its remarkable song. The song can be incredibly long and extremely varied, including a number of different series of trills and buzzes. Refer to the "North American Bird Reference Book" CD-ROM to experience this wonderful song.

- The rather long tail of the Brewer's Sparrow is deeply notched, a feature that can help distinguish it from all other sparrows in the region.
- This species breeds in flat or gently rolling shrublands with dense shrubs, and seems to prefer landscapes dominated by sagebrush, particularly Big Sagebrush, but it will also utilize sandsage, rabbitbrush, and greasewood. However, it is decidedly rarer and much more local in these habitats than in Big Sagebrush. The abundance of this species is positively correlated with percent cover of shrubs, forbs, and bare ground, and negatively correlated with percent cover of grasses and litter. Nests are placed low in large, dense shrubs (usually sagebrush). Territory sizes range from 0.5 to 1.4 acres (0.2 to 0.6 ha) but may be as large as 5 acres (2.0 ha) in areas of lower-quality habitat. Refer to Paige and Ritter (1999) for additional management information about Brewer's Sparrow.

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Closely tied to sagebrush and other shrubs **Nesting**: Nests placed in shrubs 20–35 inches (50–90 cm) tall **Foraging**: Forages in areas of 10–50% shrub cover; will forage in areas of bare ground or at the base of bunchgrasses; cover of grasses and forbs is of less importance although some research suggests that 30–80% grass and forb cover is preferable	Light or moderate grazing intensity encourages shrub growth and thus increases abundance of Brewer's Sparrow	Prefers areas that have not been burned for at least two years Avoids areas where fire has eliminated brush cover	Avoids cropland because of the lack of shrub cover	Avoids CRP because of the lack of shrub cover	10–50% cover acceptable, but prefers cover of about 25%, 20–40 inches (50–100 cm) tall	Winters in shrublands in the southern portions of the Southwest, and in northern and central Mexico	Replacement of native grasses by cheatgrass greatly reduces habitat suitability by greatly increasing fire frequency to the point where regeneration by shrubs cannot keep pace If shrublands must be treated to remove shrubs, treat strips no wider than 300 feet, alternating with 300–600-foot wide untreated strips Seems to prefer fairly flat sites (<30° slope)

The **Vesper Sparrow** (*Pooecetes gramineus*) is a relatively large sparrow with white outer tail feathers that are readily observable in flight. The belly is usually cream colored and brown streaking marks the chest area. There is also a white eye-ring and uniformly streaked back. A rufous patch is sometimes visible on the shoulder.

- In the 19th century, the Vesper Sparrow expanded its range following the clearing of forests for agriculture. The Vesper Sparrow may produce two or even three broods per year.
- The Vesper Sparrow is associated with sagebrush, grassland, and agricultural habitats. In sagebrush shrublands, it prefers open habitats with scattered shrubs and bunchgrass. In shrubsteppe/grassland habitats it prefers lightly grazed areas with an average vegetation height of 9 inches (23 cm). In all habitats, essential components are low vegetation with some elevated perches for singing, and bare ground (10–50% cover) for dust bathing. Territories are 0.7–6.0 acres (0.3–2.4 ha), with an average of about 2 acres (0.8 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting: Avg of about 40% grass, 23% forbs, avg of 9 inches (23 cm) tall; 10–50% bare ground **Foraging**: Low, sparse cover, often <2 inches (5 cm) tall; 10–50% bare ground	Little information is available, but probably any grazing regime that produces the preferred habitat conditions would be acceptable	Prefers areas that have not been burned for at least three years	This species responds well to no-till crop systems — the crop residue provides more foraging opportunities and more nesting cover, and the reduction in tillage operations keeps the nests from being destroyed Where possible, limit the use of insecticides in areas where Vesper Sparrows forage	Does not make much use of CRP land, probably because the vegetation tends to be too tall and dense	Open shrublands (<40% shrub cover)	Winter habitat in Texas and the Southwest is similar to the breeding habitat	Also favors areas where shrublands meet grasslands, croplands, or other open habitats

The **Lark Sparrow** (*Chondestes grammacus*) is one of North America's largest sparrow species. It has a long, rounded tail fringed with white. The head is boldly patterned with chestnut, black, and white. The whitish underparts are highlighted by a bold, blackish central breast spot.

- The courtship rituals of this species are unique in the sparrow world. Males strut like turkeys with their tails upright and wings dropped to the ground. Mated pairs sometimes pass a twig back and forth to each other to simulate courtship feeding behavior. Young can leave the nest as early as six days after hatching if the nest is disturbed. This is an important feature, as the species nests on the ground in relatively accessible sites and predators probably find a high percentage of the nests. Early nest departure is well developed in ground-nesting species due to this vulnerability. The legs often develop faster in ground-nesting species, reaching adult size by nine days of age, which aids in their ability to depart the nest quickly.
- Important breeding habitats include grasslands and savannah shrubsteppe, mesquite grasslands, and fallow fields with brushy edges. The species typically likes more arid locations with less grass cover than most sparrows, thus their population cycles at a given site probably go against the grain of those of the majority of grassland specialists. The Lark Sparrow prefers grasslands with moderate to dense shrub cover and has an affinity for shrub-steppe, including sagebrush, greasewood, and mesquite. Many individuals occupy sites that are disturbed by overgrazing. Territories range from 3.5 to 9.0 acres (1.4–3.6 ha), but a pair may use an area of 15 acres (6 ha) to meet all of their needs.

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: 40–100% cover of grasses and other vegetation, <6 inches (15 cm) tall Nest is placed on bare ground, but it is not known how much bare ground is preferred	Little information is available, but it is thought that a moderate level of grazing is sufficient to provide the sparse to moderate herbaceous & litter cover that Lark Sparrows prefer	Prefers areas that have not been burned for at least 3 years Conduct burns by early March before Lark Sparrows arrive on breeding grounds Burn at intervals of 5-8 years to increase amount of open foraging area Burns should be conducted at moderate temperatures to provide patches of unburned habitat for nesting & perching, while still providing open areas for foraging	Little information is available, but obviously any activity that removes the preferred vegetation cover would be detrimental	Not common in CRP fields or in fields of dense nesting cover, presumably due to lack of shrub component	>10% cover, 40–80 inches (1–2 m) tall Requires presence of shrubs for nesting and perching If doing brush removal, leave about 10% brush cover. Removal of all woody vegetation would make an area unsuitable for Lark Sparrows	Winters outside the four-state focus area	In Colorado, Lark Sparrows prefer shortgrass & mixed-grass uplands over tallgrass remnants or hayfields Lark Sparrows use a variety of habitats – riparian, shrubsteppe, mixed-grass & shortgrass uplands with a shrub component and sparse litter Even though insects comprise only 25% of this species' diet (the rest is grass and forb seeds), its size and appetite make it an excellent control agent for grasshoppers

The **Sage Sparrow** (*Amphispiza belli*) is medium sized with a relatively long tail. It is gray on the head, transitioning into pale gray-brown on the back. The tail is square and black with narrow white edges, and an isolated dark spot marks the chest. The Sage Sparrow also has a white eye-ring and white patch above the cone-shaped beak. Also look for the narrow throat stripes that contrast with the white below the eyes.

- This is typically a solitary bird seen running on the ground with its tail in the air. Once breeding is complete, individuals can be seen in loose flocks sometimes moving to higher elevations before migration. Males exhibit strong site fidelity to breeding territories and thus there may be a delay in their response to habitat changes.
- This species is considered a sagebrush obligate, meaning it must have sagebrush in its habitat. It is commonly found in sagebrush shrublands dominated by Big Sagebrush with bunchgrasses. The Sage Sparrow can also be found in shadscale, antelope brush, and rabbitbrush. In general, the Sage Sparrow prefers shrublands with tall shrubs and low grass cover. This is considered an area-sensitive species, meaning it prefers large patches of unfragmented habitat. Territory sizes range from 1.6 to 14.3 acres (0.6–5.8 ha), but an average size is probably about 2.0 acres (0.8 ha). See Paige and Ritter (1999) for more details on managing this and other sagebrush bird species in sagebrush-dominated habitats.

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: Closely tied to sagebrush and other shrubs, so grass and forb cover is less important Will abandon habitat if invaded by cheatgrass	In general, grazing has little effect on this species Removal of sagebrush to enhance forage production is detrimental	Avoids areas cleared of shrubs, so intense fires are detrimental. Will use areas where no more than 40–50% of sagebrush has been removed by burning. Such burns should create a habitat mosaic, with large blocks of unburned habitat interspersed with burned habitat.	Avoids croplands due to the absence of shrubs	Avoids CRP because of the absence of shrubs	Moderate to fairly dense cover, evenly spaced, 3–10 feet (1–3 m) tall	Winter habitat is similar to breeding season habitat	

The **Baird's Sparrow** (*Ammodramus bairdii*) is short-tailed, large-headed, large-beaked, and very secretive. The face has a general buffy-orange coloration that is practically unique in sparrows. Dark spots behind the eyes, a dark lateral throat stripe, blackish streaks on a buffy breast, and a white belly complete the roster of field marks.

- In the spring, rival males leap up from the grass, face to face, wings pumping and claws raking. This continues until the males sort out territory ownership. The Baird's Sparrow is a defining feature of bird life in mixed-grass and fescue prairies, though any but singing males are exceedingly difficult to see well.
- Preferred habitat is prairie with vegetation 8–40 inches (20–100 cm) tall, scattered shrubs (<5 % cover), no more than 10% bare ground, and moderately deep litter with abundant residual cover. Shrubs and clumps of tall grasses are used as song perches. In the shortgrass prairie, they are usually found in depressions or low-lying areas where grass is taller and denser. Typical habitat is ungrazed or lightly grazed mixed-grass prairie. Territory size is about 3.2 acres (1.3 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: Grass and forbs typically 4–12 inches (10–30 cm) tall, but up to 40 inches (100 cm) may be acceptable; <10% bare ground; litter depth up to 1.5 inches (4 cm)	Light deferred, rotational grazing Prefers dense, medium-height grasses	Generally avoids areas that have been burned in the last three years Burn to control shrub encroachment, but not so often as to prevent litter accumulation	Mow in late August Moderate mowing is beneficial in wetter areas, but detrimental in arid habitats	No information, however, they are thought to use CRP as they prefer decadent vegetation of medium – tall height	Prefers scattered low shrubs (<5% cover, but up to 25% may be acceptable) and matted vegetation	Winters outside the four-state focus area	Dynamic — birds appear to shift breeding habitats and range in wet and dry years

The **Grasshopper Sparrow** (*Ammodramus savannarum*) has a flat head and a short, spindly tail. The head has a white stripe down the middle of the crown, a complete whitish eye ring, and a white or off-white throat. The chest is buffy and is typically unmarked or only lightly marked at the sides. The male's song is a high-pitched, insect-like buzz, hence the bird's name. The Grasshopper Sparrow is commonly seen singing from the tops of weeds, tall grasses, or fences. This song is typically of such high frequency that many people cannot hear it.

- The song is somewhat unusual in the Grasshopper Sparrow. Males sing two completely different songs — one is an insect-like buzz, the other is more melodic. The female also sings, producing a trill to attract mates.
- This species is especially common in tall and mixed-grass prairies, but can also be found in shortgrass prairie where the grass is taller than normal (≥4 in.), e.g., in moister sites or in wetter years. CRP has been a boon to this species, as in many places, taller, non-native species have been planted that provide suitable habitat. Bare ground is an important feature of territories (up to 35%), because the Grasshopper Sparrow forages on the ground. It avoids areas with more than 35% shrub cover. The territory size ranges from 0.8 to 3.5 acres (0.3–1.4 ha), with an average of about 2.0 acres (0.8 ha). However, this species is area-sensitive, which means that it needs a large area around the nest — much larger than the 2-acre territory. Studies have shown that it will nest in isolated patches of prairie only when those areas are at least 25 acres (10 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: Grasses 4–12 inches (10–30 cm) tall; <35% bare ground	None or light grazing in areas of short, sparse grasses Prefers vegetation >4 inches	Generally avoids areas that have been burned in the last two years Burn parcels in rotation so that unburned habitat is always available	Hayland is an important habitat for nesting in many areas, especially where native grasses are short Delay haying until August 1st	Will nest in CRP lands planted to taller grasses & may be heavily reliant on these areas in the shortgrass region	Requires presence of tall forbs or shrubs for singing perches, but completely avoids areas with >35% shrub cover; it strongly prefers shrub cover well below the 35% level In a Colorado study, preferred < 1% cover	Winters outside the four-state focus area	Provide suitable habitat in at least 30-acre parcels of different structural stages in areas distanced from other land use (suburban, cropland, recreation) to accommodate breeding birds

The **Lark Bunting** (*Calamospiza melanocorys*) male in breeding plumage is black with bold white wing patches and a white-fringed black tail. Females (and males in winter plumage) are mostly brown with blackish streaking above, white with blackish streaking below. Both sexes have white wing patches and cream-colored corners on the tail. Males can start molting into winter plumage in July. These females and winter males are sometimes confused with Song Sparrows since the streaking on the chest tends to resemble a central spot, which is typical for the Song Sparrow. The Lark Bunting has a thick, conical (cone shaped) bill that is bluish in color. The Song Sparrow is typically found in wet areas, whereas the Lark Bunting is common on the dry prairie, so much so that Colorado designated it the state bird.

- In the 1800s and early 1900s, some farmers waited for the arrival of the Lark Bunting each spring before planting, since the arrival tended to coincide with more favorable spring weather. The Lark Bunting is among the latest of the grassland bird species to arrive on breeding grounds in the spring, with many females not arriving until early June, particularly in the northern parts of the breeding range. Like many grassland specialists, this species is nomadic, that is it does not exhibit high fidelity to breeding sites from year to year. Populations simply go wherever they need to find appropriate habitat.
- The Lark Bunting nests in open grassland with a mixture of short and tall grasses and scattered shrubs, and in shrublands with grassy openings. This species seems to require structure primarily for shade — on hot afternoons, individuals often seek shelter in the thin shade offered by fence posts. Territories are estimated to be 1.2–1.9 acres (0.5–0.75 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: 60–90% cover of grasses 3–8 inches (8–20 cm) tall; bare ground <15% The nest is typically placed next to a taller forb or clump of vegetation	Light to moderate in shortgrass habitats — heavy grazing can be detrimental because it increases bare ground cover, reduces vegetation height, & removes protective cover Moderate to heavy in mixed-grass in vegetation >30 inches Will use heavily winter-grazed areas for breeding	Generally avoids areas that were burned in the last two years Avoids areas where brush cover is eliminated	Hayland may be important habitat for nesting Delay haying until August 1st Occasionally nest in wheat cropland — no-till or minimum tillage ag systems are recommended as alternatives to fall cultivation	Common in CRP, though less common in areas with dense grass and legume cover	Scattered shrubs (2–30% total cover, although the lower end of this range is preferred) Shrub, tall grass, and forb cover should total 10–30% for nesting Shrub component especially important in savanna and sagebrush	Winter habitat is similar to breeding season habitat	Grasshopper control is detrimental to this species Adopt integrated pest management practices to retain some populations of invertebrates Area-sensitive — associated with large contiguous grasslands

The male **McCown's Longspur** (*Calcarius mccownii*) has a gray face with black crown and "moustache," grayish-black beak, gray back with black streaking, white throat, black across the breast, and white belly. Later in the summer, most of the underparts can be black or blackish, as the white tips to those feathers wear off to reveal the black bases. Chestnut-colored shoulders are especially noticeable in flight. An inverted black T, formed by a black band across the end of the tail and black central tail feathers, can be seen when the bird is in flight, as it contrasts with the remainder of the tail, which is white. The female is somewhat similar to the male in appearance, but her colors are more muted and browner and her beak is pinkish.

- Females sit tightly on their nests relying on their camouflage to avoid detection. One researcher had to actually lift the female off the nest in order to examine the eggs. The males skylark, as is typical of grassland birds, singing their tinkling song from on high and while floating toward earth with their wings held vertically.
- The McCown's Longspur inhabits shortgrass prairies where the vegetation is sparse. Individuals often use little-vegetated hilltops for displaying and nesting and require areas of bare soil. Nests are often on fairly barren hillsides or hilltops, usually placed next to some bit of structure such as a grass clump, cactus, or cow pie. This species is semi-colonial, meaning several pairs may nest fairly close together. Territory sizes average about 3.0 acres (1.2 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: Avg of 66% grass cover, 2 inches (5 cm) tall; avg of 24% bare ground	Moderate grazing on shortgrass Moderate to heavy on mixed- grass in summer May prefer continuously grazed native pastures & may avoid deferred grazed pastures (those grazed after July 15)	Generally avoids areas that have been burned in the last two years, but it depends on the severity of the burn	Does not use areas of taller grass that can be hayed Generally avoids cropland	None – vegetation usually too tall nd dense	Requires little or no cover of woody plants	Winter habitat is similar to breeding season habitat	Southern extent of breeding range is northern Colorado

The **Chestnut-collared Longspur** (*Calcarius ornatus*) male has a black crown and a strong face pattern with stripes of black and white and pale yellow on the lower half of the head; the back of the neck is chestnut. The female has brown streaks on her back and crown, a white throat, a vague brown necklace, a white belly, and faint brown streaks on her sides. On the tail, the species shows a black triangle, with the base at the tail tip, surrounded by white. This tail pattern is similar to that of the McCown's Longspur, but more extensively black.

- All longspurs have the hind toenail (claw) greatly elongated, which gives them their group name. This may assist them with walking on the ground, as opposed to the hopping that most songbirds do. Males skylark, but their flight during song is not quite as exaggerated as that of the McCown's Longspur, and they typically do not float vertically back to the ground.
- This species inhabits shortgrass or grazed mixed-grass prairie with scattered shrubs, preferring slightly taller vegetation than does the McCown's. In dry areas with sparse vegetation, it seeks out wet meadows and other low, moist areas where the vegetation is taller and denser. It prefers a mix of short and tall grasses, especially bunchgrasses but avoids tall, dense cover. Territories are estimated to range from 0.2 to 10.0 acres (0.08–4.0 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: Mix of short and mid grasses, especially bunchgrasses, 4–9 inches (10–23 cm) tall; 8–15% bare ground with very little plant litter	Light to moderate in shortgrass Moderate to heavy in mixed- grass Graze wetter areas to increase patch diversity and reduce tall, thick vegetation Preferred vegetation height is <8–12 inches	Generally avoids areas that have been burned in the last two years, but this response is variable and depends on the severity of the burn — in some cases, burned areas are very desirable	Mow to improve habitat in mixed-grass areas Annual mowing is more beneficial in northern mixed-grass prairie; however, grazed areas are preferable to mowed areas Avoids cropland	Generally avoids CRP because the vegetation is too tall and dense	Few if any; preferred <1% shrub cover in a Colorado study	Winter habitat is similar to breeding season habitat	Avoid managing for idle, dense vegetation Southern extent of breeding range is northern Colorado Pairs often return to the same site yearly to nest

The **Dickcissel** (*Spiza americana*) is a big-billed, short-tailed, stocky bird. The male is somewhat similar in plumage pattern to meadowlarks, but is considerably smaller and, upon closer inspection, exhibits much less yellow in the plumage and much more gray. There is a strong yellow line above the eye and another below the cheek. There is a black V below the neck and a yellow patch on the breast. Males have rufous shoulders with gray on the back of the neck. Females have a pale yellow stripe above each eye and white below each cheek. They also have light throat and yellow breast patches with a touch of rufous on their shoulders.

- The species is a typical grassland bird that greatly expanded its range east upon the destruction of the forests there by newly arrived Europeans. However, with the reversion of much of that area to secondary forest and changes in agricultural practices, the Dickcissel has retreated to its core range on the Great Plains. This species winters in northern South America where it is considered a major pest of rice crops, thus is exterminated in large numbers there. The species probably cannot sustain this magnitude of loss and Breeding Bird Survey data show declines in population size throughout the breeding range.
- This species was originally a breeder in disturbed mixed-grass and tallgrass prairies, particularly those with a strong clover component. However, the Dickcissel has adapted to a common crop, alfalfa, and in many parts of its range seems to prefer that habitat over native prairie. Unfortunately, many nests are lost during haying operations. The species also utilizes weedy fields and meadows, grain fields, tallgrass prairies, and pastures. The territory is 0.7–2.7 acres (0.3–1.1 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: 90–100% veg cover, 10–60 inches (25–150 cm) tall; at least 50% forb cover; litter 2–6 inches (5–15 cm) deep	Prefers dense, moderate to tall vegetation — particularly with some forbs — and moderately deep litter In shortgrass, none or light grazing is preferred In taller grass, moderately grazed (not below 10 inches) or idle cover is preferred Early spring grazing (March/ April) or late summer grazing (August and later) is preferable to avoid disturbances during the breeding season	Generally avoids areas that were burned in the last two years Burn on a rotational schedule (every 3–5 years) in early spring or fall to prevent woody plant invasion, maintain vegetation quality, and provide a mosaic of habitats Burn no more than 20–30% of a pasture annually Burning is preferable to mowing because the vegetation recovers more quickly	Haylands with abundant forbs attract high densities of Dickcissels Delay mowing until after the peak nesting period (April – mid August) when possible, do not mow much after mid-September in northern regions, as vegetation does not have time to recover before the winter & following spring Allow retired ag fields to undergo secondary succession Annual mowing or mowing during the breeding season results in high rate of nest failures	CRP lands provide important breeding habitat in northern and central U.S. Prefers unburned & unmowed CRP fields and fields with tall, native grasses with few forbs, deep litter, and residual vegetation Will use a restored field 2–4 years after reseeded to native grasses	Prefers shrubless areas with taller forbs and grasses Uses fence posts, small trees, and tall forbs (<6.5 feet tall [2 m]) for song perches	Winters outside the four-state focus area	All habitat management tools can provide suitable Dickcissel habitat by controlling succession and controlling woody plant encroachment; however, avoid implementing multiple treatments on the same site, as simultaneous treatments may decrease herbaceous vegetation and litter, thereby decreasing nest-site availability Where possible, create large, grassy areas near small prairie fragments – small fragments of less than 25 acres can support higher densities if surrounded by other grassland habitat Nests in low densities in cropland that is untilled or is under reduced tillage Appear to be relatively tolerant of habitat fragmentation, though probability of survival and breeding success increases in larger and closer grassland fragments Needs at least 10 elevated song perches per 2.5 acres (10 ha)

The male **Bobolink** (*Doliconyx oryzivorus*) in breeding plumage is black on the underside of the body with paler coloration above. Though this pattern is a reversal of the typical songbird pattern, it is not rare among grassland birds — both of the prairie-breeding longspurs have partly to entirely black underparts and paler upperparts. Male Bobolinks also have white rumps, a white patch in the black wings, and a straw-colored or pale yellow nape. The white rump is particularly noticeable in flight. Females are generally buffy yellow with a pale nape, dark streaking in the crown, behind the eye, and on the back, and the chest has light brown streaking.

a. The male is one of the most visually striking songbirds in North America, appearing as if it is wearing a tuxedo backward; in some areas, it is referred to as the "skunk blackbird." The species' round-trip migration from North America to southern South America is approximately 12,000 miles (20,000 kilometers). The song is a pleasing, bubbly song sung from perches or in song flights over territories.
b. The Bobolink originally nested in tall and mixed-grass prairies of the midwestern United States. It uses habitats containing a mixture of grasses and broad-leaved forbs and high litter cover. Like the Dickcissel, the Bobolink has adapted to using human-created habitats, specifically hay fields. This adaptation has, in many places, proven to be a detriment, as the first haying may happen before the Bobolink gets its young off the nest, thus losing the reproductive effort for the year. Delaying haying one or two weeks can enable this species to complete its nesting cycle before the habitat is removed. Territories are 1.2–5.0 acres (0.5–2.0 ha), but much more area than that may be necessary for breeding pairs to settle: research has shown that the species occurs in greater density in large (75 acres [30 ha]) than small (25 acres [10 ha]) fields.

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: 15–65% grass cover with equal or greater forb cover; 6–28 inches (15–70 cm) tall; <5% bare ground; high amounts of litter cover	Light to moderate grazing in mixed/ tall grass using a short-duration grazing treatment (such as 1 week in, 1 month out) in early spring (before early May) or after July 15 to create preferred habitat of vegetation of moderate height & density with adequate litter Require high grass cover & moderate forb cover	In mid-grass or tallgrass, frequent (every 2–4 years) rotational burning reduces thick litter accumulation & encroachment of woody vegetation Burn no more than 20–30% of field in any one year to create a variety of successional stages	Delay mowing until after July 15 Maintain dense cover in idle haylands by mowing fields rotationally or alternately Avoids cropland	Will nest in CRP, but seem to prefer CRP lands planted to cool-season grasses Will return to areas seeded to native grasses between 1–3 years following seeding	Prefers shrubless areas with taller forbs and grasses, but will tolerate up to 3% shrub cover Uses tall forbs as song perches	Winters outside the four-state focus area	Avoid disturbing nesting habitat during the breeding season, approximately early May to mid-July Treatments can be done in early spring or in the fall Bobolinks will return to the same areas year after year to nest

The **Eastern Meadowlark** (*Sturnella magna*) is a heavy-bodied, short-tailed, and long-billed denizen of grasslands and other open country throughout eastern North America. It is generally brown above, yellow below, with a prominent black V on the chest. The brown tail has white outer feathers that are obvious when the bird is in flight and individuals also typically flick their tails open and shut to expose those white feathers. The song is a short series of whistled notes that sound like *see-you-see-yer* — very different from the flute-like song of the Western Meadowlark. The two species do not overlap very much — primarily in the Great Plains but also in the desert Southwest. The Eastern Meadowlark that inhabits Arizona and New Mexico is believed by some experts to be a distinct species, which would mean that the U.S. has three virtually identical meadowlark species.

a. The Eastern Meadowlark performs valuable duty for landowners by consuming large quantities of grasshoppers, beetles, and caterpillars. This species often produces two broods per year, perhaps because its ground nest is easily found by predators such as snakes and skunks.
b. The habitat of the Eastern Meadowlark consists of farmland and grassland with significant grass cover. In winter, this species frequents grasslands, cultivated fields, and feedlots. The territory is 3–12 acres (1.2–4.8 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: >80% grass cover, with total veg cover >90%	In shortgrass, light to moderate summer & winter-grazed pastures OR heavily winter-grazed Avoids heavily summer-grazed pastures If possible, protect dry areas and graze wet areas to increase species diversity and patchiness May show little response to grazing so long as forb & grass cover is high, litter cover is low, & there is little or no shrub cover Grazing "tame" pastures in spring allows native pastures to recover from previous year	Generally avoids areas that have burned in the last 2–4 years In mixed-grass prairie conduct burns at varying intervals (2–3, 4–7, & 8–10 yrs.) to provide a mosaic of successional stages In tall grass prairie, burn CRP every 3–5 years to reduce dense & woody vegetation	Mow or hay after July 15 on a 3–5 year rotational basis to maintain good grass quality and improve habitat for the following year and should be followed by raking to reduce and loosen litter (esp. CRP land) Undercut wheat stubble in the spring instead of using surface tillage to avoid destroying nests & nestlings	Will nest in CRP	<5%	Winter habitat is similar to breeding habitat	Spot-spray weeds and delay any spraying until after July 15 if possible Avoid pest (grasshopper) outbreaks by maintaining healthy range conditions Avoid using toxaphene, diazinon, or fenthion to control mosquitoes and grasshoppers, which causes mortality in birds at certain concentrations

The **Western Meadowlark** (*Sturnella neglecta*) is virtually identical to the Eastern Meadowlark. Fortunately, the two species sing very different songs, making it possible to tell them apart, at least during the breeding season. The lively, gurgling, flute-like song of the Western Meadowlark is a characteristic sound of open country in the West.

a. The Western Meadowlark is one of our most abundant and widely distributed birds in the drier parts of western North America and at least six states have named it as their state bird. Meadowlarks are not actually larks, but, instead, belong to the diverse family of New World blackbirds.
b. The Western Meadowlark is most common in native grasslands and pastures. However, it is an adaptable species and can be found commonly in a large variety of open native and human-created habitats, e.g., short sage and/or saltbush shrublands, weedy edges, hay and alfalfa fields, and other cultivated habitats. Despite this adaptability, some populations are apparently declining. Meadowlarks typically place nests in pasture, prairie, or other grassland habitats with fairly dense vegetation. Territories may be 3–32 acres (1.2–13.0 ha), but most commonly 7–8 acres (2.8–3.2 ha).

PREFERRED VEG COVER	GRAZING PRESSURE	PRESCRIBED FIRE	HAY/MOW/ CROP	USE OF CRP	PREFERRED SHRUB COVER	WINTER	NOTES
Nesting and foraging: 60–100% short grass/forbs, and 40–100% tall grass/forbs	In shortgrass, light to moderate summer & winter-grazed pastures OR heavily winter-grazed Avoids heavily summer-grazed pastures If possible, protect dry areas and graze wet areas to increase species diversity & patchiness In mixed-grass, may show little response to grazing, so long as forb & grass cover is high, litter cover is low, & there is little or no shrub cover Grazing "tame" pastures in spring allows native pastures to recover from previous year	Generally avoids areas that have burned in the last 2–4 years In mixed-grass prairie conduct burns at varying intervals (2–3, 4–7, & 8–10 yrs.) to provide a mosaic of successional stages In tall grass prairie, burn CRP every 3–5 years to reduce dense & woody vegetation	Mow or hay after July 15 on a 3–5 year rotational basis to maintain good grass quality and improve habitat for the following year and should be followed by raking to reduce and loosen litter (esp. CRP land) Undercut wheat stubble in the spring instead of using surface tillage to avoid destroying nests & nestlings	Will nest in CRP Abundance is greater in CRP that has a lot of vertical patchiness, but not a lot of tall grass cover	0–3% cover, but may accept up to 25%, although meadowlark numbers decline with increasing shrub cover	Winter habitat is similar to breeding season habitat	Spot-spray weeds and delay any spraying until after July 15 if possible Avoid pest (grasshopper) outbreaks by maintaining healthy range conditions Avoid using toxaphene, diazinon, or fenthion to control mosquitoes and grasshoppers, which causes mortality in birds at certain concentrations When possible, direct recreational trails and roads to margins or edges of property, as abundance of meadowlarks increases with increasing distance from trails

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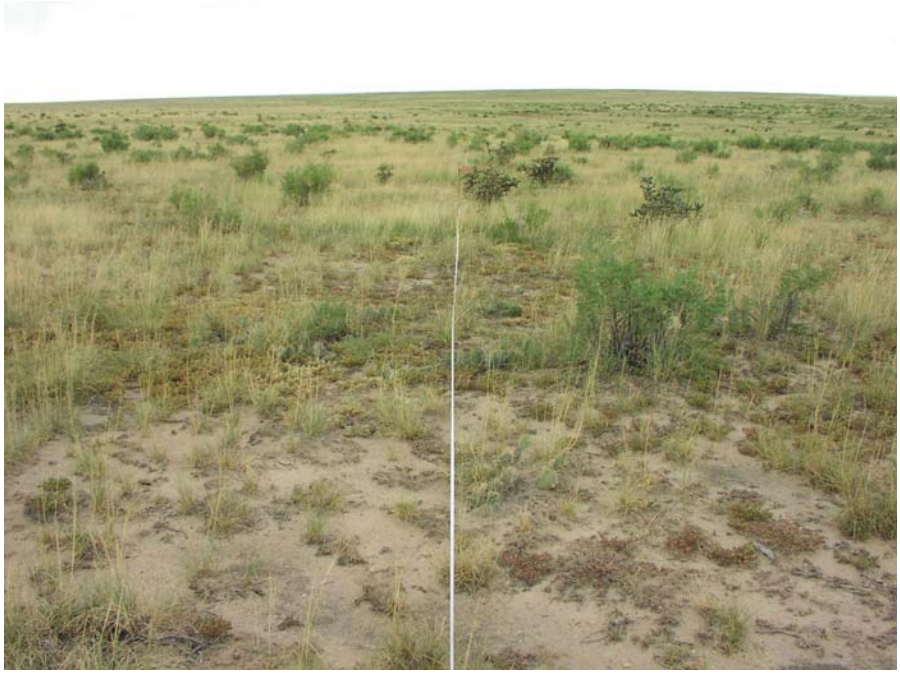
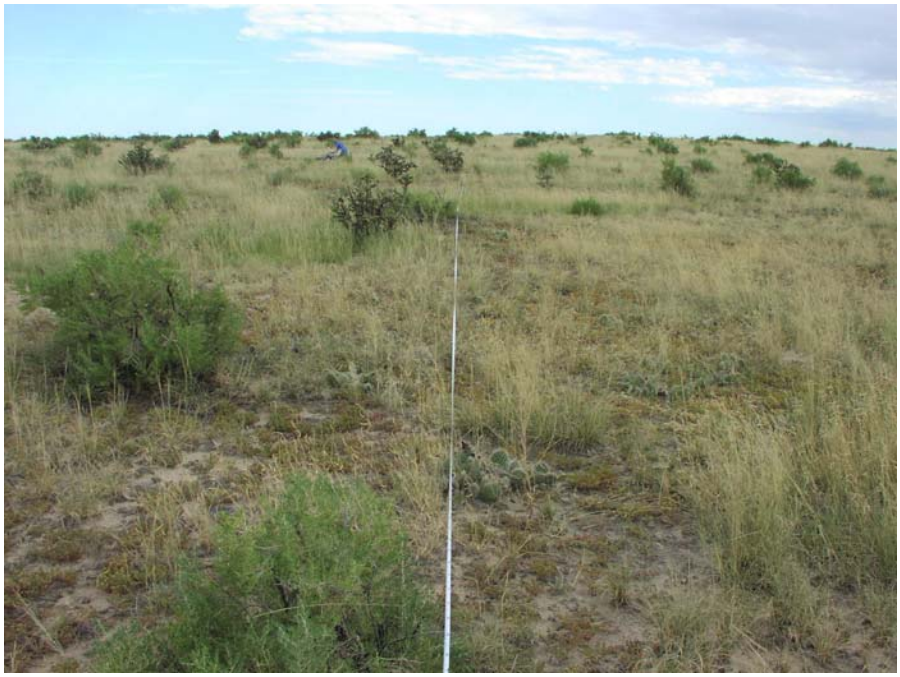
http://www.npwrc.usgs.gov/resource/othrdata/sheyenne/sheyenne.htm; Integrated Management of the Greater Prairie Chicken and Livestock on the Sheyenne National Grassland

Sharp-tailed Grouse Management Plan; Columbia River Wildlife Mitigation, Grand Coulee Dam Project – Washington Department of Wildlife

Appendix C: Shrub Cover Photos





1–5% shrub cover

5–10% shrub cover

11–15% shrub cover

15% shrub cover

21% shrub cover

Appendix D: Bare Ground Cover Photos

2% bare ground

10% bare ground

10% bare ground

12% bare ground

16% bare ground

30% bare ground

28% bare ground

34% bare ground

46% bare ground

56% bare ground

64% bare ground

88% bare ground