



Northern Harriers are year-round residents requiring forb- or grass-dominated areas. Harriers may need nearby wetlands and will forage in certain types of agriculture (Draft Grassland Bird Conservation Plan). *Photo: Steve Baranoff*

Enhancing Grassland Restoration for Grassland Birds

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Breeding bird surveys over the last four decades reveal a downward trend in California's grassland bird populations. About two decades ago grassland restoration efforts began in earnest in order to retain the benefits of California's native grassland diversity.

One of the often-cited justifications for native grassland restoration is to provide habitat for wildlife dependent on grasslands, including grassland dependent birds. However, we know relatively little about the specific habitat requirements of many species in California. It is important that we consider and account for how native grassland restoration projects can benefit grassland birds, especially since grassland birds vary significantly in their habitat

needs in terms of grassland composition and structure (Vickery and Herkert 2001).

Grassland Birds in Decline

Grassland birds are of real conservation concern, and grassland restoration certainly has an important role to play in reversing declines. Grassland birds are among the fastest and most consistently declining birds in North America (Peterjohn and Sauer 1999). Seventy percent of the grassland birds in North America continue to decline, and nearly half are of conservation concern according to the North American Bird Conservation Initiative (U.S. NABCI Committee 2009).

Several species are state listed as Species of Special Concern: grasshopper sparrow, burrowing owl, short-eared owl, northern harrier (breeding and/or winter), and mountain plover (winter only).

While considerable focus has been given to grassland birds in the Midwestern prairies, similar declines are evident in California for some species (e.g., western meadowlark,

Fig. 1). Major reasons for these declines are the same that have contributed to the loss of native California grasslands in general: habitat loss to agriculture, habitat

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fragmentation, disruption of natural fire regimes, encroachment of woody vegetation, and invasion of exotic plants.

How Many Birds Rely on Grasslands?

Many bird species use grasslands for at least part of their life history; however, the simple physical structure of grasslands results in relatively few grassland specialists, birds that depend almost exclusively on grassland habitats. Approximately 55 bird species are typically associated with grasslands in California. Miller (1951) and Goerrissen (2005) found 76 different species in grassland study plots across California. About 20 of these bird species rely heavily on grasslands or surrogate habitats (e.g., agricultural crops), and only eight of these are considered grassland specialists that breed and forage in

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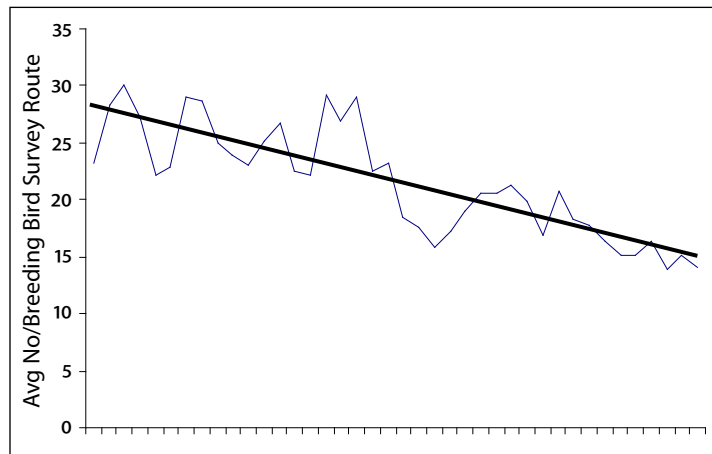


Figure 1. Western Meadowlark population trend in California, 1966–2007 (Sauer et al. 2008)

California grasslands extensively (Table 1). It is important to recognize that grasslands may provide particularly valuable overwintering habitat for these and many other species since the diversity and abundance of birds in California grasslands is significantly greater during the winter and spring than it is during the summer breeding season (Goerrissen 2005). Nevertheless, the value of grasslands as wintering habitat is often overlooked, and the availability and condition of grasslands during winter may have significant consequences for continued migration and subsequent breeding success (Herkert et al. 1996; Vickery and Herkert 2001).

Comparisons of Non-native and Native Grasslands

Very few studies have been completed on grassland bird habitat preferences in California, or how reproduction and survival are influenced by habitat type. However, the effects of grassland physical structure and plant species composition on bird communities have been studied more extensively in other regions (Rotenberry and Wiens 1980, Best et al. 1997, Herkert et al. 1996). Two recent studies have indicated that there are no clear relationships between grassland bird abundance or diversity and native plant cover (Goerrissen 2005, Gennet 2007). Goerrissen (2005) found that diversity and abundance of bird species did not

Table 1. Grassland specialist bird species in California

Species	Population Trend*
Northern harrier	-1.1
Ring-neck pheasant (non-native)	-1.7
Short-eared owl	-2.4
Burrowing owl	-1.4
Horned lark	-1.8
Savannah sparrow	-1.1
Grasshopper sparrow	-3.6
Western meadowlark	-0.9

*Breeding Bird Survey for U.S., 1966–2007



The grasshopper sparrow is a summer resident, but may be a year-round resident in some areas. It needs less than 30% total shrub cover, large patch size, and bunchgrasses (*Draft Grassland Bird Conservation Plan*)

Photo: Laura Erickson

significantly differ during the breeding season among native and exotic grasslands in California. However, when the type of native grassland was accounted for, grassland bird diversity and abundance were greater in native fields dominated by bunchgrasses, but not in fields dominated by creeping wildrye (*Leymus triticoides*). Goerrissen (2005) also found that many bird species not considered grassland specialists were strongly associated with annual grasslands and grasslands dominated by creeping wildrye. Northern harriers and mallards that nest in grasslands may prefer these due to increased cover for nests and their ability to use more dense grasslands. However, it is important to note that northern harriers aren't completely grassland birds in the traditional sense—they are often heavily associated with shrubs and wetlands and a mosaic of habitat types and have the ability to hunt in a diversity of habitat types.

Similarly, Gennet (2007) found that relationships between grassland specialist birds and native plant cover varied from year to year (possibly associated with rainfall), and there was great variation in response among different bird species to native plant cover. These results suggest that restoration of native grasslands does not automatically provide superior habitat for grassland birds. In other words, whether grassland is valuable habitat is more complicated than native versus nonnative.

The Importance of Structure and Composition

Structure and management of grasslands may be more important than species composition of the grassland (Table 2). Bird community composition and species abundance have been found to vary across gradients of structural heterogeneity in grasslands of the Midwestern prairie

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(Chapman et al. 2004, Sutter and Brigham 1998, Vickery and Herkert 1999) and in California (Goerrissen 2005, Gennet 2007). Not all grassland birds are created equal, and the degree to which they depend on grasslands of specific types varies. Grassland specialist birds may be particularly susceptible to differences in physical structure and presence or absence of specific kinds of plant species. These attributes are associated with both floristic composition and management of the grassland.

For example, the grasshopper sparrow preferentially selects and breeds more successfully in grasslands dominated by perennial bunchgrasses, presumably due

to the clumped structure of bunchgrasses like purple needlegrass (*Nassella pulchra*) in which they can more easily hunt insects among bare ground patches (Goerrissen 2005, Collier 1994, Vickery 1996). Grasshopper sparrows and other similar species tend to avoid grasslands with very dense structure, including that created by creeping wildrye, a grass species commonly found in riparian and estuarine uplands.

However, other bird species are less particular. Western meadowlarks, both in the breeding season and winter, are more tolerant of a range of grassland types, using both native bunchgrass and exotic annual grasslands (Goerrissen 2005, Rotenberry and Wiens 1980, Gennet 2007). And still

others, such as northern harriers (see photo, p. 9), appear to readily use dense grasslands such as those created by creeping wildrye, often in association with a mosaic of habitats, including freshwater wetlands and tidal marshes. Similarly, in Illinois, northern harriers and short-eared owls do not show a preference for native over non-native grasslands, but vary in their habitat selection based on grassland management that influences habitat structure (Herkert et al. 1999).

Floristic composition may also be critical. Many native grassland restorations tend to result in low-diversity monocultures when dominant species outcompete most

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Table 2. Focal Grassland Bird Species Status and Habitat Needs Based on the *Grasslands Bird Conservation Plan**

Species	Life History	State Status	Federal Status	Habitat Needs
Ferruginous hawk	Winters in California.	CSC	MNBMC FSC	Large patch size of grassland; has adapted to some forms of agriculture.
Grasshopper sparrow	Summer resident, may be year-round resident in some areas.	None	MNBMC	Less than 30% total shrub cover, large patch size, bunchgrasses.
Mountain plover	Winters in California.	CSC	FPT MNBMC	Sparsely vegetated or heavily grazed grasslands, disked agricultural lands, or nearly barren areas.
Northern harrier	Year-round resident, numbers augmented by birds migrating from the north in winter.	CSC	MNBMC	Forb- or grass- dominated areas, may need nearby wetlands; will forage in certain types of agriculture.
Western meadowlark	Year-round resident, numbers augmented by birds migrating from the north in winter.	None	None	Grassland generalist
Savannah sparrow	Dependent on subspecies, most remain in California year-round, numbers augmented by birds migrating from the north in winter.	Subspecies <i>beldingi</i> : SE	None	Dense vegetation in open country: meadows, pastures, fields, etc.
White-tailed kite	Year-round resident, may be nomadic in search of prey.	FP	None	Uses open areas (grasslands, oak woodland, savannah, riparian, and some agriculture) for foraging; nests and roosts in woodlands.

*Source: California Partners in Flight (2000), Chapter 3: Conservation Planning Process

NOTE: The burrowing owl was not selected as a focal species under the *Grassland Bird Conservation Plan*.

Other species that nest and/or primarily forage (summer or winter) in grasslands include tricolored blackbird, horned lark, wintering sandhill cranes, Swainson's hawk, song sparrow, blue grosbeak, mallard, cinnamon teal, gadwall and ring-necked pheasant.

MNBMC: Fish and Wildlife Service Migratory Non-game Bird of Management Concern; **CSC:** CDFG California Species of Special Concern

FP: California Department of Fish and Game (CDFG) Fully Protected; **FPT:** Federally Proposed for listing as Threatened

FSC: Federal Special Concern Species; **SE:** State listed as Endangered

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others (Lulow et al. 2007), whereas many grasslands that are diverse in plant species composition tend to support a greater diversity of birds (Herkert et al. 1996), even if that mix of plants includes exotic species. Forbs in particular may be a critical component, increasing the habitat value of grasslands for many birds by hosting more insects, which are frequently an essential food during the breeding season. Goerrissen (2005) found that forb diversity tended to be higher in remnant native grasslands and non-native annual grasslands than in restored grasslands, particularly if creeping wildrye was a major component.

In general, these and other results point to the importance of variable physical structure and floristic composition at local and landscape scales to provide high quality habitat for a diversity of grassland birds. Any grassland created or maintained as a monoculture may be less suitable because it does not allow for the structural diversity or floristic composition likely to support a diversity of birds.

Conclusions and Recommendations

This review of grassland bird habitat preferences relative to grassland restoration is not exhaustive, and there are many unknowns. However, the following recommendations for approaches or actions, if incorporated into our planning, could result in greater habitat value of grassland restoration sites for many birds that really



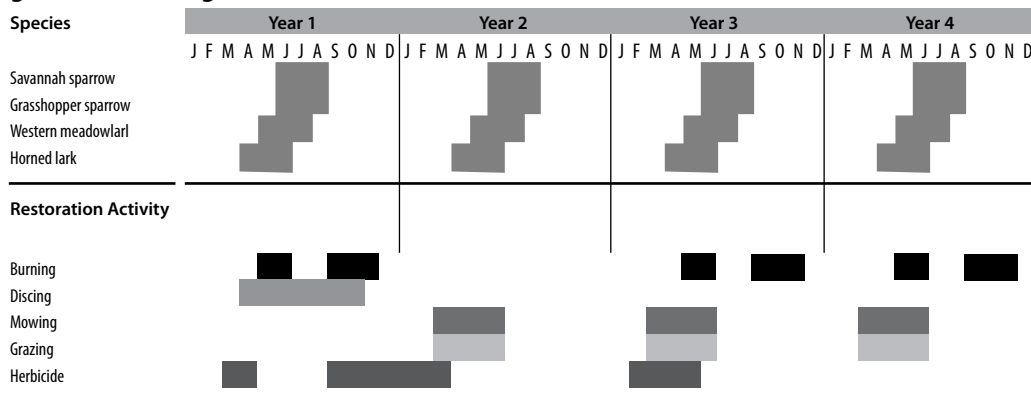
The Horned Lark is a year-round resident that nests in ground depressions lined with grasses next to a grass clump or clod of manure. The male does a courtship flight up to 800 ft high, circling and singing at the top, then diving down quietly (Stokes 1996). Photo: George Jameson

need the help. Goerrissen (2005) provides a valuable overview of impacts of varying restoration and management options for increasing the habitat value of California grasslands for birds.

- **Increase structural diversity of grasslands** or restore and manage to create structure appropriate for a target bird species. A dense stand of one

bunchgrass species over a large area, with few openings among bunches, can have limited habitat value for certain birds. Related to this is thatch buildup; dense thatch tends to prohibit nesting for some birds. Means to increase the structural complexity of grasslands are the same used to restore grasslands, but they need to be applied with enhancing bird habitat in mind. These

Figure 2. Overlap in breeding season of grassland nesting birds and typical timing of grassland management activities.



include appropriate selection and management for specific sets of plant species, use of reduced seeding rates that result in less dense stands, selective or rotational grazing, non-breeding season mowing, and/or prescribed burning.

- **Increase floristic diversity:** more diverse grasslands are likely to provide greater insect abundance that supports

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bird populations. However, this is a central challenge for grassland restoration, particularly in terms of successfully incorporating forbs.

One way to increase floristic diversity may be management that creates patches of different types within the landscape, as opposed to working toward having uniformly diverse grasslands. This is likely to include public and private landowners managing for the conservation of existing native grass and forb islands within annual-dominated grasslands. Also, it is worth considering the potential for reintroduction of native grasses and forbs into existing grasslands, then managing to maintain a mix of both natives and non-invasive exotic annuals. Such an approach may help increase diversity and structural complexity of the grassland without requiring the efforts typically required to recreate an entirely native system.

- **Identify specific bird targets** as part of the planning process for grassland restoration: this will enable a restoration planning team and land managers to identify the attributes and management options to create habitat for a particular set of bird species of conservation concern.
- **To the extent possible, time mowing, grazing, burning, and herbicide treatments to avoid the nesting season** (March through July). This is challenging because it overlaps with the best time to control invasive exotic weeds (Fig. 2). Bird response to these activities varies among species and depends on the timing and intensity of management action. For example, some species respond favorably to moderate to heavy grazing, while others do not, and this is usually related to preferences for specific structural characteristics. An important option is to rotate management actions among fields or sites each year so that there always remains some

portion of the managed landscape that is undisturbed or at a different stage every year. This is likely to increase the overall diversity of birds.

- **Use surveys to determine if sensitive species are present and breeding**, and change management to provide particular protection to these species.
- **Consider management of grasslands in winter** as an important component of managing a habitat for wintering songbirds and raptors. For example, in cases where management activities such as mowing or burning are being applied during winter for logistical reasons or to avoid the growing and breeding season, consider leaving some areas undisturbed that will remain as suitable winter habitat.

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The western meadowlark is a year-round resident and grassland generalist with numbers augmented by northern birds in winter (California Partners in Flight 2000)
Photo: Kevin Cole

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Key Concepts about Bird Conservation

from the *Draft Grassland Bird Conservation Plan*

The following list of key concepts for bird conservation should be communicated through education and outreach programs. These concepts are important to include in any program concerning conservation, and are indispensable in programs focusing on birds and riparian habitats.

Reproductive success may be the most important factor influencing population health. It contributes directly to a population's size and viability in an area. A number of factors influence reproductive success, including predation, parasitism, nest site availability, and food availability.

Nesting habitat requirements vary among species. Different bird species place their nests in different locations, from directly on the ground to the tops of trees. Most birds nest within 5 meters of the ground. Managers should consider that habitat needs for different species vary. Leave grass and forbs greater than 6 inches in height for ground nesters, shrubs and trees for low to mid-height nesters, dead trees and snags for cavity nesters, and old, tall trees for birds that build their nests in the canopy.

The breeding season is a short but vital period in birds' lives. Birds nest during the spring and early summer of each year and raise their young in a rather short period. Nestlings are particularly sensitive to changes in the environment and are sensitive indicators of ecosystem health. Disturbance, such as vegetation clearing, habitat restoration, and recreation, may result in nest abandonment, remove potential nest sites, directly destroy nests, expose nests to predators, and decrease food sources such as insects. Predators, such as domestic cats, skunks, and jays, can decimate breeding populations, and managers should avoid subsidizing their populations.

Understory (the weedy, shrubby growth underneath trees) is crucial to many birds. A healthy and diverse understory with lots of ground cover offers well-concealed nest and foraging sites. Manicured parks and mowed lawns provide poor nesting conditions for all but a few bird species.

Native plants are important to birds. Native bird populations evolved with the local vegetation, learning to forage upon and nest in certain species. Introduced plant species may not provide the same nutrition or nest site quality. Introduced plants can also quickly dominate an area, reducing the diversity of vegetation. Less diverse vegetation can lower the productivity and viability of a bird population.

Natural predator–prey relationships are balanced, but human disturbance creates an imbalanced system. Interactions with predators are a natural and essential part of an ecosystem. However, a preponderance of non-native predators or a sustained surplus of natural predators severely affects the health and persistence of bird populations. Feeding wildlife, especially foxes, raccoons, and skunks, should be discouraged. Feeders that are frequented by jays and crows and cowbirds should not be maintained during the breeding season (most songbirds feed their young insects). Domestic and feral cats are responsible for an estimated 4.4 million birds killed each day (Stallcup 1991). It is not true that a well-fed cat will not hunt! In fact, a healthy cat is a more effective predator.

Natural processes, such as flood and fire, are integral to a healthy ecosystem. They provide the natural disturbance needed in an area to keep the vegetative diversity high, an important factor for birds.

Source: California Partners in Flight and Point Reyes Bird Observatory 2000

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