

# The Sagebrush Bird Conservation Plan

*A Resource for Protecting and Managing Sagebrush Habitats and  
Associated Birds in California*



A project of California Partners in Flight  
and PRBO Conservation Science



Version 1.0, October 2005



“In a land so blessed with arid and semi-arid vegetation, we are apt to overlook the virtues of that homely plant, the “sage” (*Artemisia tridentata*). To be sure, its area of maximum distribution lies to northward and eastward, but we have here and there wholesome touches of it; while upon our eastern, and especially our northeastern borders lie great areas which entitle California to recognition among the Also Blest.”

- William Leon Dawson, *The Birds of California*. 1923.



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## Executive Summary

This document has been prepared to stimulate and support an active approach to conservation of landbird populations that depend on sagebrush habitats in eastern California. It represents a synthesis of published and unpublished information on birds in the region, the ecology of sagebrush systems, and conservation planning. This plan, along with an associated Geographic Information System (GIS) database of sagebrush habitat and bird monitoring data maintained at PRBO Conservation Science, is the first iteration in a process of developing and updating habitat conservation recommendations based on the latest available data.

This plan complements 5 previous plans prepared for important habitats in California that cover riparian, coastal scrub, coniferous forest, grassland, and oak woodland habitats (plans are available for download from [www.prbo.org](http://www.prbo.org)). As new data on the influence of management activities on wildlife and native plant communities become available, we will revise and expand upon the information and recommendations presented here. The goal is to create a feedback loop between land managers and scientists, enabling us to improve the process by which we ultimately hope to conserve habitats and wildlife populations.

Recommendations included in this document are intended to guide planning efforts and actions of land managers, expenditures of government and non-government organizations, and stimulate monitoring and research to support the conservation of landbirds. We also intend for recommendations to be further developed into detailed conservation strategies to be enacted at multiple geographic scales through interactions with more in-depth and spatially explicit planning efforts.

Specific goals of this document are to:

- Present an overview of the complex conservation issues affecting California's sagebrush habitats including altered fire regimes, loss of habitat, and woodland expansion.
- Promote the evaluation of impacts to landbirds when making planning decisions and carrying out management activities
- Provide resources and technical support for land managers for the development of Resource Management Plans and updates and for the evaluation of management activities.
- Provide resources and technical support for foundations supporting conservation work, agencies, private land-owners, and conservation organizations.

## Chapter 1. Introduction

Sagebrush ecosystems, typified by a number of species of woody *Artemisia*, occur over 62 million ha of western North America. Human activities and shifts in disturbance regimes since Euro-American settlement have resulted in significant losses of sagebrush (West 1996, West and Young 2000) and current estimates suggest approximately 43 million ha of sagebrush habitat remain (Comer et al. 2002, Wisdom et al. 2003a). Losses can be attributed to, among other things, agricultural conversion, invasions of exotic plants (Hann et al. 1997), damage from domestic livestock (Fleischner 1994, Donahue 1999), expansion of pinyon and juniper woodlands (Miller and Rose 1999, Miller and Tausch 2001), and urban and residential development. Thus, despite the seemingly vast expanse of remaining sagebrush ecosystems in western North America, degradation and loss across much of their range requires that urgent conservation measures are taken to ensure their survival (Allen-Diaz and Bartolome 1998, West 2000, Knick et al. 2003), and ultimately, the survival of birds and other wildlife that depend on the sagebrush biome.

### Birds and sagebrush

A number of bird species are primarily associated with sagebrush shrublands during at least part of the year and have been considered sagebrush obligate species (Braun et al. 1976, Paige and Ritter 1999). These include Greater sage-grouse, Sage Thrasher, Brewer's Sparrow, and Sage Sparrow. The Gray Flycatcher uses a variety of sagebrush and woodland habitats, but, overall the range of this species is closely tied to that of big sagebrush, and the term "near-obligate" has been used to describe its affinities to sagebrush habitat (Sterling 1999). Others, such as the Green-tailed Towhee, Lark Sparrow, Loggerhead Shrike and Black-throated Sparrow are associated with a greater variety of shrubland habitats – but nonetheless rely on sagebrush habitats to a large degree for breeding habitat within the intermountain West. Grassland species, such as Long-billed Curlew, Vesper Sparrow, and Western Meadowlark occur throughout the sagebrush biome where habitat conditions are adequate to meet their specific needs.

### California Partners in Flight

This Sagebrush Bird Conservation Plan is part of a habitat-based series of Bird Conservation Plans developed by California partners in Flight (CalPIF). In this series we synthesize information on the problems facing landbirds in California and provide habitat based conservation approaches to benefit populations of focal species.

The CalPIF Bird Conservation Plans are an outgrowth of the international movement Partners in Flight (PIF). CalPIF was formed in 1992 with participation of state, federal, and private land managers, scientists, and researchers interested in the conservation of Nongame landbirds. Please visit <http://www.prbo.org/calpif/> for more information on landbird conservation efforts in California.

### The North American Bird Conservation Initiative

In 1998, participants at a meeting of the International Association of Fish and Wildlife Agencies developed a vision to link all of the major bird conservation initiatives in Canada, the U.S. and Mexico (CEC 1998). The participants represented each of four major bird conservation initiatives already underway: The North American Waterfowl Management Plan, Partners in Flight, the Shorebird Conservation Plan, and the Colonial Waterbird Conservation Plan. This program, The North American All Bird Conservation Initiative (NABCI), seeks to synthesize existing efforts of these groups by creating “regionally based, biologically driven, landscape-oriented partnerships delivering the full spectrum of bird conservation across the entirety of conservation for both game and Nongame birds.” Subsequently, a framework for facilitating coordinated conservation planning, implementation, and evaluation among major bird initiatives was created through the establishment of geographic conservation regions. These Bird Conservation Regions (BCRs) were defined by adopting the hierarchical framework of nested ecological units delineated by the Commission for Environmental Cooperation. See [www.nabci-us.org](http://www.nabci-us.org) for more information on All-Bird Conservation.

The area covered in this plan is located primarily in the Great Basin BCR (BCR 9), with a small portion located in the Sierra Nevada BCR (BCR 15).

### Objective of California’s Sagebrush Bird Conservation Plan

Conservation and restoration of sagebrush communities have become top priorities of land management agencies, yet little information is available on how nongame bird species respond to even the most common land management activities such as livestock grazing (Saab et al. 1995) and fire (Knick et al. 2005). In this plan we seek to synthesize and summarize current information on the requirements of birds in California’s sagebrush habitats as well as provide some generic management recommendations.

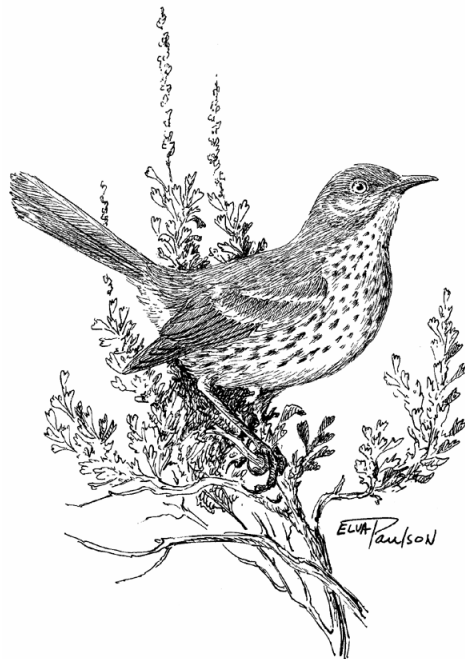
The ultimate goal of this document is to promote protection and restoration of sagebrush communities in California in order to support the long-term viability of native bird



populations. We hope that the concepts and ideas presented here will encourage the consideration of landbird habitat needs when land use decisions are made within the planning area. In addition, we hope that elements of the CalPIF strategy will be incorporated into regional and national planning efforts. Changes in sagebrush habitats, and the factors influencing ecosystem processes happen at large scales, and conservation planning must therefore occur at multiple and appropriate spatial scales (Wisdom et al. 2003a, Karl and Sadowski 2005).

The main goals of this effort are to:

- Present an overview of the complex conservation issues affecting California's sagebrush habitats including altered fire regimes, loss of habitat, and woodland expansion.
- Promote the evaluation of impacts to landbirds when making planning decisions and carrying out management activities.
- Provide resources and technical support for land managers for the development of Resource Management Plans and updates and for the evaluation of management activities.
- Provide resources and technical support for foundations supporting conservation work, agencies, private land-owners, and conservation organizations.



## Chapter 2. Sagebrush Habitats in California

### Extent and classification of sagebrush habitats in California

Sagebrush shrublands are estimated to cover 1.25 million ha of California (Comer et al. 2002), distributed east of the Cascade and Sierra Nevada mountain ranges. We recommend that conservation efforts in California's sagebrush habitats adopt as standard the International Classification of Ecological Communities (ICEC) for classification and nomenclature of sagebrush habitats. A subset of classifications covering sagebrush vegetation alliances and associations in the western U.S. was recently developed in consultation with many individuals and agencies as part of an interagency sagebrush classification and mapping project (Reid et al. 2002). Those that are found in California are listed in Table 1. A fully searchable source for the ICEC is available online: (<http://www.natureserve.org/explorer>).

Table 1. General habitat types and corresponding sagebrush alliances found in California. Complete descriptions of how they cross-walk to other classification systems, environments where they occur, and associated vegetation can be found in Reid et al. (2002), which, is available for download at <http://sagemap.wr.usgs.gov>

| General habitat        | Alliance  |
|------------------------|---|
| Low sagebrush          | <i>Artemisia arbusula</i> (spp. Longicaulis) shrubland                    |
|                        | <i>Artemisia arbusula</i> (spp. arbuscula) shrubland                      |
|                        | <i>Artemisia arbuscula</i> (spp. Arbuscula) shrub herbaceous              |
| Black sagebrush        | <i>Artemisia nova</i> shrubland   |
| Silver sagebrush       | <i>Artemisia cana</i> shrubland   |
| Basin big sagebrush    | <i>Artemisia tridentata</i> (spp tridentata/xericensis) shrubland         |
|                        | <i>Artemisia tridentata</i> (spp tridentata/xericensis) shrub herbaceous  |
| Wyoming big sagebrush  | <i>Artemisia tridentata</i> (spp. Wyomingensis) shrubland                 |
|                        | <i>Artemisia tridentata</i> (spp. Wyomingensis) shrub herbaceous          |
| Mountain big sagebrush | <i>Artemisia tridentata</i> (spp. Vaseyana) shrubland                     |
|                        | <i>Artemisia tridentata</i> (spp. Vaseyana) shrub herbaceous <sup>1</sup> |

<sup>1</sup>Has not been described for California, but likely exists at higher elevations

Despite an often held perception that sagebrush shrublands constitute homogenous stands of fairly uniform habitat, there is a great deal of variability in both structural and floristic characteristics within and across stands. Variation in soils, including variation at fine spatial scales, precipitation patterns, and disturbance histories are responsible for shaping a great variety of habitat mosaics. Broad characterizations can be made for the dominant species and subspecies of sagebrush listed in the preceding table.

Low sagebrush communities tend to grow on poorly drained soils that often, but not always contain a clay component. They can occur in association with a variety of landforms including flats and depressions, slopes, and ridges (Reid et al. 2002). Wyoming big sagebrush grows in a variety of conditions, but tends to occur at more xeric locations within the sagebrush biome. It is found in a variety of soil types on flats, rolling hills, and foothills, and often intergrades and co-occurs with basin big sagebrush. Basin big sagebrush typically occurs where deeper, well drained soils are found and is therefore sometimes associated with valley bottoms, but also occurs on sloping fans, and rolling hills where soil conditions permit summer moisture needs to be met (Reid et al. 2002). In contrast, mountain big sagebrush generally occurs at cooler and moister (and therefore mid to high elevation) sites than the other subspecies of big sagebrush. Mountain big sagebrush may occur in a mosaic with patches of mountain shrub associations, or occur in combination with bitterbrush (*Purshia tridentata*). Big sagebrush, while typically dominant, also co-occurs with other shrub species, including greasewood (*Sarcobates vermiculatus*), rabbitbrush (*Chrysothamnus* spp.), horsebrush (*Tetradymia* spp.), bitterbrush, Spiny hopsage (*Grayia spinosa*), desert peach (*Prunus andersonii*), Mormon tea (*Ephedra viridis*), and snowberry (*Symphoricarpos* spp.), among others.

Within the planning area, sagebrush shrublands intergrade with woodlands dominated by one or more of the following tree species: western juniper (*Juniperus occidentalis*), Utah juniper (*Juniperus osteosperma*), Singleleaf Pinyon (*Pinus monophylla*), and curl-leaf mountain mahogany (*Cercocarpus ledifolius*).

Bunchgrass, primarily seeded perennial species are an important component of many sagebrush communities. Common species include Bluebunch wheatgrass (*Pseudoregneria spicata*), Idaho fescue (*Festuca idahoensis*), bottlebrush squirreltail (*Elymus elymoides*), and a number of species in the genus *Achnatherum*. Thurber's needlegrass (*A. thurberiana*), Western Needlegrass (*A. occidentale*), Nevada needlegrass (*A. nevadensis*), and rice grass (*A. hymenoides*) among others.

Figures 1-6 illustrate some of the variety encountered within sagebrush habitats in eastern California.

Figure 1. Basin big sagebrush – black greasewood north of Shafer Mountain, Lassen County, California.



Figure 2. Mountain big sagebrush – western Juniper community, Modoc County, California.

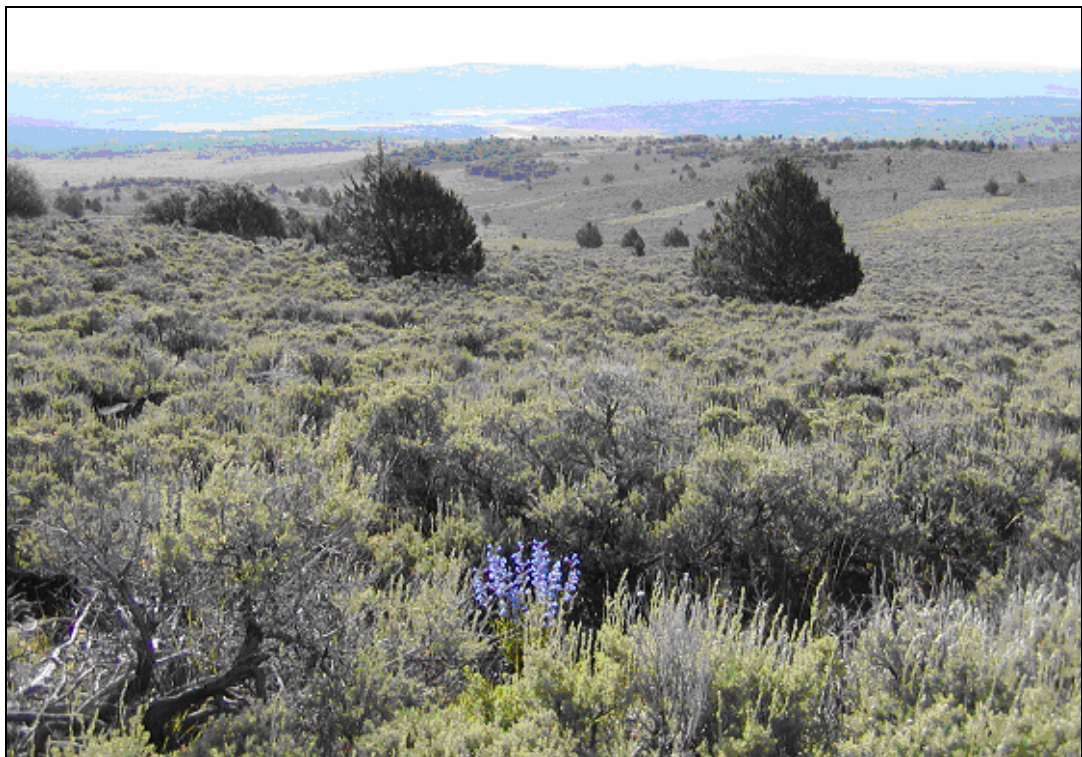


Figure 3. Wyoming big sagebrush – bluebunch wheatgrass community, Lassen County, California.



Figure 4. Wyoming and basin big sagebrush with cheatgrass understory, north of Skedaddle Mountain, Lassen County, California.



Figure 5. Low Sagebrush community with a rich diversity of perennial forbs.



Figure 6. Mountain big sagebrush – bitterbrush community, Bodie Hills, Mono County, California.



### Chapter 3. Conservation Planning Process and Focal Bird Species

Widespread population and habitat declines have been projected for numerous sagebrush-associated species (Knick and Rotenberry 1999, Knick et al. 2002, Wisdom et al. 2000). A growing sense of urgency over the outlook for sagebrush dependent wildlife has spawned numerous assessments and planning exercises at various scales (e.g. Partners in Flight Conservation Plans, Wisdom et al. 2000, Wisdom et al. 2003a and 2003b, NDOW 2004). As a result, hundreds of species associated with sagebrush habitats have been identified as being of conservation concern including 28 species of birds (Wisdom et al. 2002, Rich et al. 2005).

In response to the need for a holistic assessment procedure that can serve management needs of large numbers of species across large areas, a regional assessment approach has been outlined for species of concern (Wisdom et al. 2003a). California Partners in Flight supports the concept and use of regional assessments such as one recently completed for the Great Basin Ecoregion (Wisdom et al. 2003b) for several key reasons elucidated by the authors: threats to sagebrush habitats are regional in scale, and habitat conditions across large, often multi-state, areas cannot be managed effectively if each BLM Field Office or National Forest is assessed and managed independently of one another.

Target audiences for this document are those involved in local and mid-scale (<100,000 ha) habitat planning and management within California. Some, but not all, recommendations provided in this plan can be stepped-up to larger scales in the context of regional conservation and assessment efforts.

#### Focal species

Birds occupy a variety of ecological niches, are relatively easy to monitor compared to other taxa, and can serve as useful tools in the design of conservation efforts (Martin 1995, Askins 2000). Different species, whose requirements define different spatial attributes, habitat characteristics, and disturbance regimes, can be selected as a suite of “focal species”. The assumption in this approach is that a landscape managed to meet the focal species’ needs encompasses the requirements of other species (Lambeck 1997, Chase and Geupel 2005). To date there is little empirical evidence that the focal species approach is valid or effective (Wisdom et al. 2003a), although little effort has been put into evaluating it. Nonetheless, a strong case has been made for managing for multiple species and we encourage the testing of the assumptions inherent to the focal species strategy within California’s sagebrush habitats.

Eleven species of birds were selected as for consideration in this Bird Conservation Plan. Species were chosen to represent the full range of structural conditions of sagebrush communities in California. Specifically we included species that require a perennial grass understory (grassland associates), mature woodlands, and those classified as sagebrush obligates. Within the broad category of shrubland habitat we chose species that use different structural stages and plant community associations. The list is relatively inclusive as we elected to include multiple species within broad habitat groupings such as shrublands (Figure 7), as opposed to choosing a single focal species for each general habitat type. The inclusive nature of this list provides some middle ground between consideration of every species within the planning area and an approach of choosing a single species for each habitat type. In addition, the selected species encompass the full spectrum of nesting guilds by including species that nest on the ground, in shrub canopies, woodland canopies, and cavities. Finally, the majority of species are well suited to monitoring in that they are common enough to monitor using standard methods. We provide a summary of the conservation status (Table 2) and nesting substrate requirements for these species (Table 3).

Conservation strategies for Greater sage-grouse are being developed independently of this effort at multiple scales. Therefore, this document does not focus on management recommendations specific to this species. We do include a detailed species account summarizing what is known about California's Greater sage-grouse populations. Despite wide overlap in range between Greater sage-grouse and other birds that rely on sagebrush habitats (Rich et al. 2005), their efficacy as an "Umbrella Species" for other sagebrush-associated birds remains largely untested.

#### Population trends of focal species

Only 8 Breeding Bird Survey routes in California that include sagebrush habitat have been active in recent years (Knick et al. 2003). This small sample size effectively prevents us from measuring population change within the state. However, trend information is available at larger scales (e.g. west-wide, Bird Conservation Region, or by Physiographic region). California's sagebrush habitats fall almost entirely within the Great Basin Bird Conservation Region (Figure 8). Although California's portion of BCR9 is relatively small, issues facing sagebrush habitats in California are similar to those facing the region as a whole and it is not unreasonable to infer that these trends are representative of populations in our area. Long term trends derived from BBS data spanning 1966-2002 suggest widespread declines among CalPIF focal species (Table 4).



Figure 7. Focal species and general habitat types they were chosen to represent based on associations in eastern California.

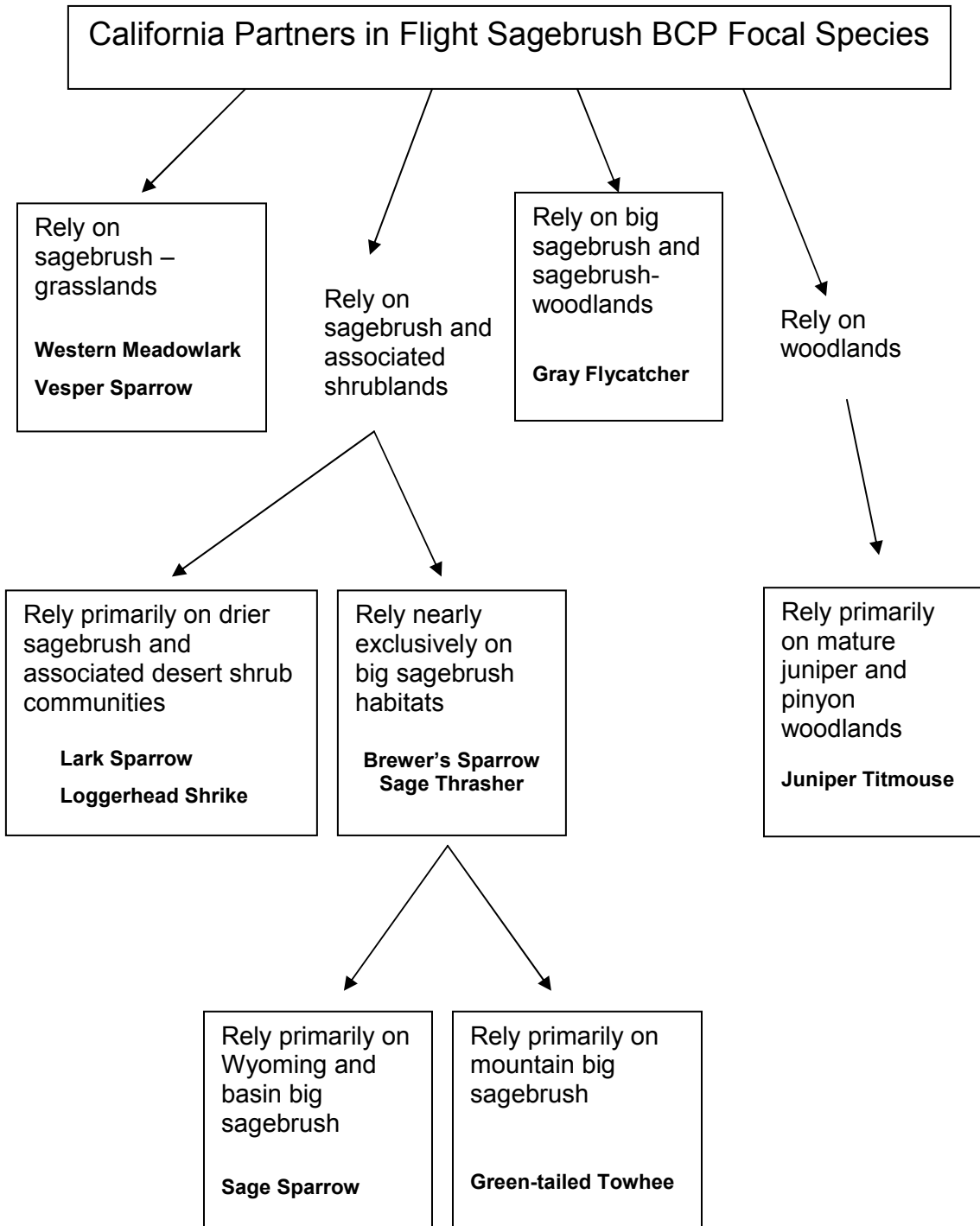


Table 2. Matrix of priority conservation status for focal species. California Bird Species of Special Concern (CA BSSC), Partners in Flight Great Basin Bird Conservation Region (PIF BCR9), USFWS species of conservation concern, BLM California special status species, and Forest Service sensitive species for regions 4 and 5.

| Species             | CA BSSC | PIF BCR 9 | USFWS BCR 9 | BLM | FS |
|---------------------|---------|-----------|-------------|-----|----|
| Greater sage-grouse | X       | X         | X           | X   | X  |
| Gray Flycatcher     |         | X         |             |     | X  |
| Loggerhead Shrike   | X       | X         | X           |     | X  |
| Juniper Titmouse    |         |           |             |     |    |
| Sage Thrasher       |         | X         |             |     |    |
| Green-tailed Towhee |         |           |             |     | X  |
| Brewer's Sparrow    |         | X         | X           |     |    |
| Vesper Sparrow      |         |           |             |     |    |
| Lark Sparrow        |         |           |             |     |    |
| Sage Sparrow        |         | X         | X           |     |    |
| Western Meadowlark  |         |           |             |     |    |

Table 3. Nesting substrate used by focal species.

| Species             | Ground | Shrub | Tree canopy | Tree cavity |
|---------------------|--------|-------|-------------|-------------|
| Greater sage-grouse | X      |       |             |             |
| Gray Flycatcher     |        | X     | X           |             |
| Loggerhead Shrike   |        | X     | X           |             |
| Juniper Titmouse    |        |       |             | X           |
| Sage Thrasher       | X      | X     |             |             |
| Green-tailed Towhee | X      | X     |             |             |
| Brewer's Sparrow    |        | X     |             |             |
| Vesper Sparrow      | X      |       |             |             |
| Lark Sparrow        | X      |       |             |             |
| Sage Sparrow        | X      | X     |             |             |
| Western Meadowlark  | X      |       |             |             |

Table 4. Population trends of CalPIF sagebrush habitat BCP focal species within the Great Basin Bird Conservation Region as derived from Breeding Bird Survey data 1966-2002.

| Species             | Trend credibility <sup>1</sup> | Trend | P      | N <sup>2</sup> | 95 % CI |      | Relative abundance <sup>3</sup> |
|---------------------|--------------------------------|-------|--------|----------------|---------|------|---------------------------------|
|                     |                                |       |        |                | low     | high |                                 |
| Gray Flycatcher     | A                              | 4.10  | 0.06   | 62             | 0       | 8.3  | 1.71                            |
| Loggerhead Shrike   | B                              | -2.70 | 0.00   | 106            | -4.3    | -1.1 | 1.18                            |
| Juniper Titmouse    | C                              | 19.90 | 0.38   | 16             | -22.8   | 62.6 | 0.15                            |
| Sage Thrasher       | A                              | -0.90 | 0.04   | 134            | -1.8    | -0.1 | 15.78                           |
| Green-tailed Towhee | A                              | -1.00 | 0.30   | 76             | -2.8    | 0.9  | 2.68                            |
| Brewer's Sparrow    | A                              | -3.20 | < 0.01 | 152            | -4.7    | -1.7 | 18.84                           |
| Vesper Sparrow      | A                              | -0.20 | 0.55   | 145            | -0.9    | 0.5  | 8.55                            |
| Lark Sparrow        | A                              | -1.70 | 0.03   | 125            | -3.3    | -0.2 | 2.72                            |
| Sage Sparrow        | B                              | 1.50  | 0.35   | 88             | -1.6    | 4.5  | 9.84                            |
| Western Meadowlark  | A                              | -0.60 | 0.03   | 212            | -1.2    | -0.1 | 50.31                           |

<sup>1</sup> A = This category reflects data with at least 14 samples in the long term, of moderate precision, and of moderate abundance on routes; B = This category reflects data with a deficiency. C = This category reflects data with an important deficiency (see <http://www.mbr-pwrc.usgs.gov/bbs/cred.html> for additional information on credibility of trend estimates.

<sup>2</sup> Number of survey routes on which a species occurs.

<sup>3</sup> Average detections per route.

## Chapter 4. Factors contributing to the degradation and loss of sagebrush habitats

There are numerous factors that have contributed to the current degraded nature of the sagebrush biome. These factors, tied to past and present human land use, interact with each other in a complex manner. One result has been altered fire cycles that have serious ramifications to sagebrush dependent bird populations. It is beyond the scope of this chapter to thoroughly investigate the mechanisms of habitat degradation. We hope to provide a brief overview, and refer the reader to the primary sources of information cited herein for further details.

Figure 8. Distribution of sagebrush communities (Comer et al. 2002) in relation to the Great Basin Bird Conservation Region (BCR 9) and borders of western states.



### Livestock grazing

The grazing of domestic livestock, and management of habitats for forage production has had a greater impact on western lands than any other land use (Fleischner 1994). It is the dominant use of sagebrush lands and truly pristine shrubsteppe habitat is thought to no longer exist (West 2000, West and Young 2000). Lasting effects of historic and current grazing practices include significant changes in the composition and structure of plant communities. Livestock have also been implicated in the spread of exotic vegetation (Belsky and Gelbard 2000). The continued use of sagebrush lands for livestock grazing may also pose an indirect threat to songbird species by changing nest predator composition and potentially increasing nest predation rates (Ammon and Stacey 1997, Jones and Longland 1999, Meaney et al. 2002), although further research is needed to identify potential effects in sagebrush communities.



### Exotic vegetation

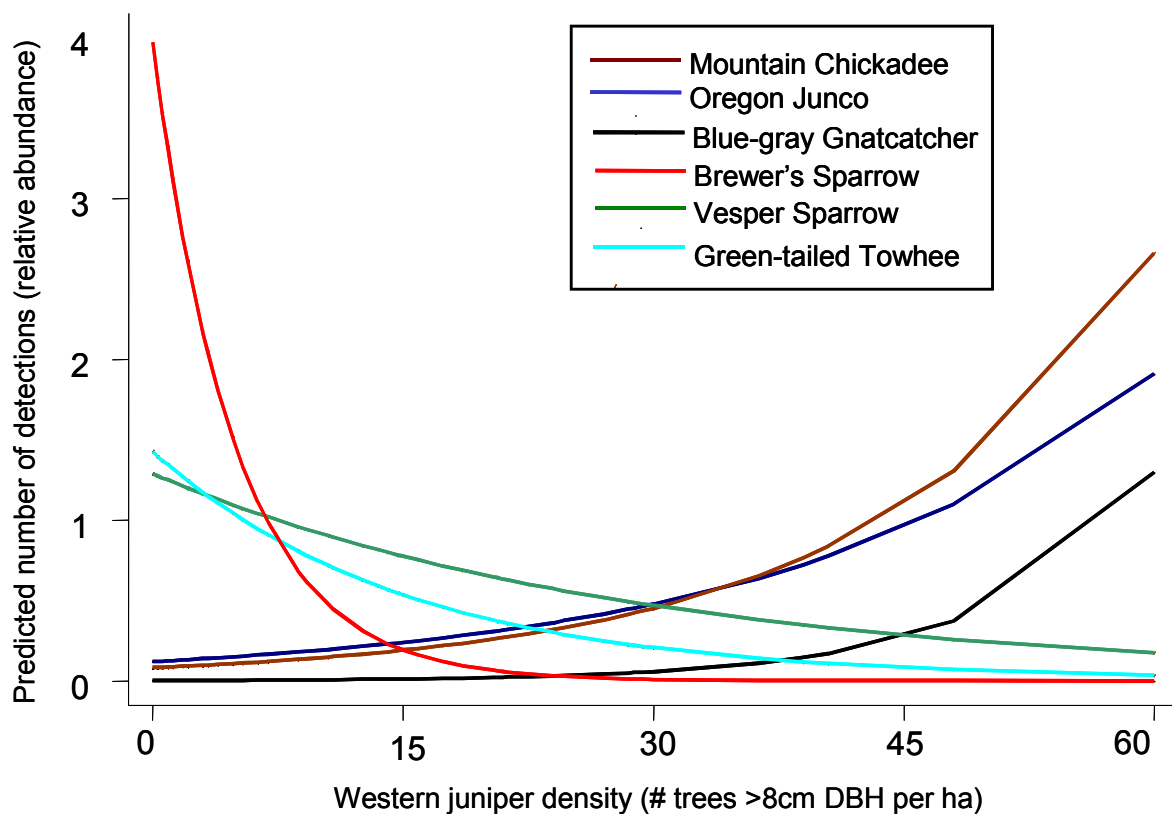
The establishment of cheatgrass (*Bromus tectorum*) to portions of the arid west has altered fire regimes by increasing the severity and frequency of fires. One well known case is in Idaho's Snake River Plains where frequencies have been reduced from an estimated historic rate of 30 to >100 years to the present frequency of 5-15 years (Whisenant 1990). The deleterious effects on shrubland birds are well documented (Knick and Rotenberry 1995; 1999, Knick et al. 2005). Other large areas in the intermountain West are also at risk to succumbing to this "cheatgrass-fire cycle" (Knapp 1998, West 2000). Recovery from conversion to exotic annual grassland may not be possible (Allen-Diaz and Bartolome 1998, West and Young 2000). A recent assessment for species of conservation concern in the Great Basin included all of the focal species adopted by this strategy except Juniper Titmouse and Western Meadowlark (Wisdom et al. 2003b). The percentage of sagebrush habitats used by those species found to be at moderate to high risk of displacement by cheatgrass ranged from 51.6 to 62.7%. A secondary impact to shrubland birds resulting from the dominance of nonnative annual grasses is the reduction in vegetative diversity and its corresponding reduction in habitat quality (Strait 1999).

### Expansion of woodland habitat

Juniper and pinyon woodlands currently occupy over  $70 \times 10^6$  ha in the Intermountain West (Miller and Tausch 2001). Prior to European settlement, pinyon-juniper woodlands are

estimated to have occupied less than  $3 \times 10^6$  ha (Gedney et al. 1999). Historically, there have been numerous expansions and contractions in pinyon and juniper woodland distribution (Tausch 1999). The current expansion stands out relative to those documented to have occurred during the Holocene due to its unprecedented magnitude (Miller and Wigand 1994). Livestock grazing has been implicated in the expansion for its role in fire suppression through the removal of fine fuels (Miller and Rose 1999). Another factor that has been considered and likely interacts with land use activities is shifting atmospheric and climatic conditions (Miller and Tausch 2001). Shifts in vegetation structure from sagebrush to woodland dominated landscapes result in different bird assemblages and densities (Medin et al. 2000, Knick et al. 2005; Figure 9).

Figure 9. Predicted community change with increasing western juniper cover. Predicted relationships derived from Poisson regression models developed using data collected in the Horse Lake Basin, Lassen County by PRBO in 2002.



In a recent study conducted in Lassen and Alturas counties, mountain big sagebrush communities with few or no juniper trees provided habitat for Brewer's Sparrow, Vesper Sparrow, and Green-tailed Towhee, among other species. Sites with moderate to high levels

of juniper cover supported a different bird community, characterized by Chipping Sparrow, Blue-gray Gnatcatcher, and Western Scrub Jay, among others. Generally, woodland associated species increased with increasing juniper cover while shrubland or grassland associated species decreased (Barton and Holmes 2004).

## Chapter 5. Focal species accounts

These accounts summarize the current state of knowledge for this plan's focal species within sagebrush and associated habitats in eastern California. Some cited documents are not available in the primary literature, but can be obtained by contacting the sponsoring organization or agency. Significant efforts have been undertaken by numerous stakeholders to address population declines and habitat needs of Greater sage-grouse in California and throughout its range, and much more specific information is available for Greater sage-grouse in California than any other species addressed in this plan. As such, its species account is longer than the others. In 2004 a "bi-state" sage-grouse conservation plan covering Nevada and portions of eastern California was released. We refer interested readers to the bi-state sage-grouse plan for additional information.

([www.ndow.org/wild/sg/plan/SGPlan063004\\_L.pdf](http://www.ndow.org/wild/sg/plan/SGPlan063004_L.pdf)).

Greater sage-grouse (*Centrocercus urophasianus*)

**Breeding Distribution:** A year-long resident throughout most of the sagebrush dominated portions of the Great Basin, Columbia Plateau, western Great Plains and Rocky Mountains in 11 western states, and Alberta and Saskatchewan in Canada (Schroeder et al. 2004).

Greater sage-grouse have been extirpated from Nebraska and British Columbia (Connelly et al. 2004). Sage-grouse range in California includes portions of the Modoc Plateau and Great Basin in parts of Modoc, Lassen, Mono and Inyo counties (Grinnell and Miller 1944). They formerly occupied portions of eastern Siskiyou, Shasta, Plumas, Sierra, and Alpine counties in California (Hall 1995).

**Range in northeast interior California:** Greater sage-grouse in northeastern California are most abundant in eastern Lassen County, north of Honey Lake and east of Eagle Lake, and in the Surprise Valley in northeastern Modoc County. These areas contain approximately two-thirds of all of California's sage-grouse populations (Hall 1995).

Ranges occupied before 1945, but not after, include those portions of eastern Siskiyou County west of Lower Klamath Basin (including Butte Valley), near Fall River Mills in eastern Shasta County, and Sierra Valley in eastern Sierra and Plumas counties (Grinnell and

Miller 1944). Areas occupied in 1945, but not since 1995, include eastern Siskiyou County west to the Lower Klamath Basin / Mt. Dome area, the Goose Lake Basin in northeastern Modoc County, the upper Pit River portion of Modoc County between Adin and Alturas (including near Canby), the Rocky Prairie area southwest of Alturas in Modoc County, the Honey Lake Valley area in Lassen County and south to near Hallelujah Junction in southern Lassen County (Hall 1995).

Large areas ( $\geq 800$  sq. km.) in Modoc County remain occupied by sage-grouse but only sparsely. These include the Devils Garden (1 active lek,  $< 50$  total population) and Likely Tables southeast of Alturas (1 active lek,  $< 50$  total population). Only anecdotal reports (no currently known active leks or regularly occupied range) remain in Big Valley between Bieber and Adin near the Modoc / Lassen County Line, Willow Creek Valley area in Lassen County, and northeastern Alpine County.

Mono and Inyo counties represent the southwestern extreme of Greater sage-grouse range. Sage-grouse in this region, including adjacent counties of Nevada, have been found to be genetically distinct as compared to Greater sage-grouse across the rest of their range (Oyler-McCance et al. 2005).

The largest numbers of sage-grouse in this region are centered in two parts of Mono County: Long Valley, surrounding Crowley Lake near the town of Mammoth Lakes; and the Bodie area, mainly in the Bodie Hills east of the town of Bridgeport but including the eastern slopes of the Sierra to the west. Smaller groups are found in Mono County in the Sweetwater Mountains and adjacent eastern slopes of the Sierra near Fales Hot Springs between Bridgeport and Walker, and in the Mono Basin in the vicinities of Parker Meadows, Sagehen Summit, Conway Ranch and Adobe Valley. Sage-grouse are also found in the White Mountains east of the town of Bishop, where they occur from northern Inyo County through Mono County and into Nevada. The relative number of sage-grouse in the White Mountains is currently unknown. Coyote Flat, in Inyo County southwest of the town of Bishop on the east slope of the Sierra, is the only area in this region where sage-grouse were previously reported and are no longer found.

**Breeding Habitat needs:** Sage-grouse males appear to form leks (strutting grounds) opportunistically at sites within or adjacent to potential nesting habitat. Leks, or breeding display sites, typically occur in open areas surrounded by sagebrush where visibility among males is unobstructed by vegetation or topography (Connelly et al 2000).



Mean height of sagebrush usually preferred by nesting sage-grouse ranges from 29 to 80 cm, and nests tend to be under the tallest sagebrush within a stand (Keister and Willis 1986, Wakkinen 1990, Apa 1998). In general, sage-grouse nests are placed under shrubs having greater canopy, ground and lateral cover than at random sites (Wakkinen 1990, Fischer 1994, Heath et al. 1997, Sveum et al. 1998a, Holloran 1999). Sagebrush cover near nest sites was greater around successful nests than unsuccessful nests in Montana (Wallestad and Pyrah 1974) and Oregon (Gregg 1991). Wallestad and Pyrah (1974) also indicated that successful nests were in sagebrush stands with greater average canopy coverage (27%) than those of unsuccessful nests (20%). The greatest nest success found by Gregg in Oregon occurred in mountain big sagebrush (*A. tridentata* Vaseyana) where shrubs 40-80 cm in height had greater canopy cover at the site of successful nests than at unsuccessful nests (Gregg 1991).

In Lassen County, nesting habitat selection was evaluated in relation to random sites within 1 km of nests of 45 females (Popham 2000, Popham and Gutiérrez 2003). Habitat selection by all nesting females was not significantly different than random sites but successfully nesting females selected greater total shrub height, rock cover, and total vertical cover disproportionately to their availability in the study area. Mean nest-lek distance for successful nests (3588m, SE=811, n=20, P=0.06) was almost twice as great as for unsuccessful nests (1964m, SE=386, n=20). The percentage of nests located under big sagebrush was 59%, lower than for other reported Greater sage-grouse nesting sites (Popham 2000, Popham and Gutiérrez 2003, Connelly et al, 2004).

Preliminary results from telemetry studies in the Bodie area suggested that nests in Mono County are also located under big sagebrush less often than reported in other studies. Nests are sometimes located under bitterbrush (*Purshia tridentata*), which forms dense mixed stands with big sagebrush and offers similar shrub height and cover characteristics (BLM, unpublished data, NDOW 2004). Follow up telemetry studies conducted throughout Mono County indicate most nests (n=109) are placed under big sagebrush (70%) or bitterbrush (24%; USGS, unpublished data). Successful nests were slightly farther from leks (1711m; n=33) than unsuccessful nests (1622; n=37), but not significantly so, and may be related to the smaller basins used by sage-grouse in this region (USGS, unpublished data).

**Breeding densities:** Greater sage-grouse are a lek forming species that aggregate nesting in appropriate habitat near to breeding sites. This results in clustering of nest sites, usually within 3 to 6 km of leks, and results in a clumped or heterogeneous distribution of nesting territories within suitable habitat (Connelly et al 2000). Densities of breeding sites (leks) could be calculated but few monitoring efforts have detected all leks per unit area on a regular basis. Almost all active leks in northeastern California have been monitored for

numbers of males in attendance since 1987 (Hall 1995). In Mono County, monitoring of most leks began in 1953; and standardized intensive monitoring has been conducted at almost all known active leks annually since 1987 (NDOW 2004). Efforts are currently underway to locate leks in the White Mountains where access is extremely difficult during the strutting season.

**Ecology:** Greater sage-grouse generally have low reproductive rates and high annual survival compared to most gallinaceous species and compared to most species of birds in general (Zablan 1993, Connelly et al. 1994, Connelly and Braun 1997, Schroeder 1997, Schroeder et al. 1999).

Greater sage-grouse are generally considered to be either resident (within  $\leq$  10 km of leks year-long) or migratory, spending summers and/or winters  $>$  10 km from breeding leks (Connelly, 2000). Some sage-grouse travel up to 70 to 80 km from breeding leks during each year (Dalke et al. 1963, Connelly et al. 1988), which complicates attempts to define populations.

Seventy-nine (79) sage-grouse captured and fitted with radio transmitters 1998-2000 from 9 leks in eastern Lassen County (NDOW 2004) were found to include some resident and some migratory individuals. Most nesting took place within 6-8 km of each lek (March-May). Brood rearing took place near nest sites but some females moved broods as far as 45 km by September (Popham 2000, Popham and Gutiérrez 2003). Nesting success averaged 42.1% (Popham 2000, Popham and Gutiérrez 2003), which was comparable to reported nesting success from other states (Connelly et al. 2004). Summer and early fall habitats included meadows, riparian sites and cropland adjacent to Wyoming big sagebrush (*Artemisia tridentata* Wyomingensis.), basin big sagebrush (*A. t. tridentata*), or mountain big sagebrush (*A. t. vaseyana*) near more mesic and higher elevation ( $>$  1850 m) sites. Most of the Lassen County and Surprise Valley (Modoc County) breeding populations migrate to western Washoe County either for winter (Lassen) or for brood rearing (Surprise Valley) (NDOW, 2004). Adults return to breeding sites at strutting grounds in late February through early March (Popham 2000, NDOW 2004).

In the Bodie area of Mono County, preliminary telemetry studies conducted by the Bureau of Land Management involving 31 radio-marked sage-grouse over 3 years also found a pattern of summer movement to more mesic and higher elevation sites. The majority of summer use occurred in the 2700 m to 3100 m elevation range. In late fall telemetered sage-grouse returned to the vicinity of leks (which range from 2079 m to 2576 m in the Bodie area) and remained there until the nesting season. Further study is needed to determine

wintering areas during years of heavier snow (BLM, unpublished data, NDOW 2004). Expanded telemetry studies (n=149) conducted by the U.S. Geological Survey from 2003-2005 indicated similar movements for the Bodie area, however, movement patterns differed markedly between population areas (USGS, unpublished data). Birds in some areas indicated fairly regular resident behavior with little migration out of overlapping seasonal use areas. Birds in other areas had at least one distinct seasonal use area, in close proximity to other overlapping seasonal use areas. Only birds from the Bodie area exhibited strong seasonal movements (migration) between winter and spring/summer habitats. Extreme winter events coincided with shifts in seasonal use areas within some study areas, but not others (USGS, unpublished data). Nominal nest success in Mono County was similar to estimates elsewhere in Greater sage-grouse range; however, large variation between study areas was observed (USGS, unpublished data).

### **Conservation and Management:**

Area sensitivity: Connelly et al (2000) provided extensive habitat guidelines for spatial and temporal management of Greater sage-grouse habitat. These included discouraging prescribed burns >50 ha, and not burning >20% of an area used by sage-grouse during winter within any 20-30-year interval for protection of sagebrush and herbaceous understory within 3.2 km of all occupied leks. For nonmigratory populations, leks should be considered the center of year-round activity and should be used as focal points for management efforts (Braun et al. 1977). For nonmigratory populations where sagebrush is not distributed uniformly (i.e high quality habitat but irregularly distributed), protection of suitable habitats for <5 km from all occupied leks is recommended. For migratory populations, identification and protection of breeding habitats within 18 km of leks in a manner similar to that described for nonmigratory sage-grouse is recommended. For migratory sage-grouse, leks generally are associated with nesting habitats but migratory birds may move >18 km from leks to nest sites. Thus, protection of habitat within 3.2 km of leks may not protect most of the important nesting areas (Wakkinen et al. 1992, Lyon 2000).

Response to fire and management activities: Connelly et al. (1994, 2000b) indicated that prescribed burning of Wyoming big sagebrush during a drought period resulted in a large decline (>80%) of a sage-grouse breeding population in southeastern Idaho. Similarly, Nelle et al. (2000) reported that burning mountain big sagebrush stands had long-term negative impacts on sage-grouse nesting and brood-rearing habitats. Canopy cover in mountain big sagebrush did not provide appropriate nesting habitat 14 years after burning (Nelle et al. 2000).

Fire may negatively affect sage-grouse brood-rearing habitat rather than improve it in Wyoming big sagebrush habitats (Connelly and Braun 1997) and its effects on sage-grouse habitats in mountain big sagebrush were suggested for further investigation (Connelly 2000). Byrne (2002) subsequently found generally negative effects for sage-grouse use of prescribed fire sites in mountain big sagebrush communities at Hart Mountain in Oregon.

Other Conservation Issues: There is little direct experimental evidence linking grazing practices to sage-grouse population levels (Braun 1987, Connelly and Braun 1997). However, grass height and cover is important to sage-grouse nest site selection and success (Wakkinen 1990, Gregg 1991, Gregg et al. 1994, Delong et al. 1995, Sveum et al. 1998a). This suggests that grazing that significantly reduces the herbaceous understory in breeding habitat may have negative impacts on sage-grouse populations (Braun 1987, Dobkin 1995).

Construction of roads, powerlines, fences, reservoirs, ranches, farms, and housing developments has resulted in sage-grouse habitat loss and fragmentation (Braun 1998).

Hall (NDOW 2004), in Lassen County, provided evidence that overhead lines and towers (power, communications, etc.) depressed male sage-grouse use of strutting grounds (and ultimately populations) up to 6 km from leks in one of three ways:

1. Golden eagles (*Aquila chryseatos*), which can be significant predator of adult sage-grouse, especially at leks, may hunt more efficiently from perches provided by towers.
2. Ravens (*Corvus corax*), which can be significant predator of nests and young sage-grouse, nest on the structures provided by towers
3. Some combination of the impact of these two species, which acted to reduce long-term (1953-2004) lek use near to these structures.

Hunting of sage-grouse is a potential conservation concern due to low reproductive rates and susceptibility to over-harvest. In California, limited entry hunting permit regulations which adjust the number of permits annually based on changes in male attendance at leks were implemented beginning in 1987. Recent harvest levels have been between about 3% and 6% of the breeding population in Lassen County. There is considerable evidence that current hunting is not a threat to sage-grouse populations in California (NDOW 2004, Hall 1995, Connelly et al 2004). For example, in the Lassen population, peak male attendance at index (trend sample) leks increased 78% (366 to 653) between 1996 and 1999 while 1,395 sage-grouse were taken by hunting during the same years from the same population.

Similarly, annual female mortality rates from 1998 - 2000 radio telemetry (n=102) showed hunting mortality was 5% and non-hunting mortality was 32% within the Lassen population (NDOW 2004). As added protection to peripheral populations, approximately 30% of the currently occupied range containing about 25% of California's total Sage-grouse population, mostly in Surprise Valley in Modoc County, has been closed to hunting since 1982. In Mono County, a very limited number of hunting permits are issued for Long Valley and the Bodie Hills (typically 10 - 20 per area) with the number determined annually in response to lek census data. Season lengths and bag limits have been limited to 2 days and 1 grouse per season, respectively. In 2005, the 35 permits issued for Long Valley represented approximately 1% of the estimated spring population based on male lek attendance.



## Gray Flycatcher (*Empidonax wrightii*)

**Breeding Distribution:** Breeds from the southern Okanagan Valley in south central British Columbia, in a narrow zone of central Washington, through eastern Oregon and easternmost California and east through southern Idaho and Nevada to western and central portions of south Wyoming, west and central Colorado, portions of north and east Arizona and western New Mexico (Sterling 1999).

**Range in northeast interior California:** Present in appropriate habitat from central Siskiyou County, throughout the Modoc Plateau and the Warner Mountains, the eastern two-thirds of Lassen County and along the eastern flank of the Sierra Nevada from Alpine County southeast to Inyo County and east to the Nevada border (Small 1994). Current monitoring efforts in sagebrush habitats of Lassen and Modoc counties suggest low densities and localized occurrence in the sagebrush communities north of Honey Lake, Lassen County (Humble et al. 2002). Shuford and Metropulos (1996) considered them a common and widespread breeder in the Glass Mountain region of Mono County, occurring in 74.3% of 74 atlas blocks. High elevation breeding limit in the White-Inyo Range is about 3,200 m (Johnson and Cicero 1986).

**Breeding Habitat needs:** Generally large sagebrush, often in association with antelope bitterbrush, mountain mahogany, western juniper, pinyon pine, Jeffrey pine or ponderosa pine (Grinnel and Miller 1944). In the Mono Lake Basin, Gaines (1988) reported avoidance of montane chaparral, shorter sagebrush communities, and forested habitats lacking large (1.2-1.8m) shrubs. Shuford and Metropulos (1996) report them from fairly tall to tall (1-1.8 m) sagebrush and bitterbrush and open woodlands. Reporting on recent surveys conducted in Mono County, Heath (2004) found Gray Flycatcher occurred at 8% of survey points in Wyoming big sagebrush within the Long Valley, but was absent in mountain sagebrush in the Bodie Hills. In Lassen County, CA, they were positively correlated with western juniper density (up to 40 trees >8cm DBH per ha) in a mountain big sagebrush landscape (Barton and Holmes 2004). In Wyoming and basin big sagebrush habitats of eastern Oregon, Holmes and Barton (2003) found abundance was negatively correlated with annual grass cover and positively associated with heterogeneity in the shrub canopy height.

**Ecology:** Migrant. Winters in central and western Mexico, generally arriving on breeding grounds in early May. Most are gone by the 3<sup>rd</sup> week of August (Small 1994). May overlap or occur in territories adjacent to Dusky Flycatcher on edges of shrublands with willow or aspen groves, some pine forests, and mountain mahogany (Shuford and Metropulos 1996).

**Breeding densities:**

Table 5. Breeding densities reported for Gray Flycatcher

| Location          | Habitat type             | Territories<br>per km <sup>2</sup> | Source                   |
|-------------------|--------------------------|------------------------------------|--------------------------|
| Inyo County, CA   | Pinyon pine              | 22                                 | Woodman 1978             |
| Mono County, CA   | Big sagebrush-juniper    | 23.5                               | Weston and Johnston 1980 |
| Mono County, CA   | Pinyon-juniper-sagebrush | 10.1                               | Weston and Johnston 1980 |
| Lassen County, CA | Big sagebrush            | 1                                  | Humple et al. 2002       |
| Central OR        | Western juniper          | 25                                 | Friedmann et al. 1977    |

**Conservation and Management:**

Area sensitivity: not known.

Response to fire and management activities: In mixed sagebrush-western juniper habitats in Harney County, Oregon, Holmes and Martz (2004) reported lower abundances at sites that were subject to juniper cutting or prescribed burning relative to adjacent untreated areas. Direct effects of livestock grazing remain unknown: one study in Nevada reported a positive response to heavy grazing (Page et al. 1978), while one in Idaho reported a negative response to moderate grazing (Reynolds and Trost 1981). Disturbance to soil and native vegetation by livestock can facilitate the establishment of exotic grasses that can threaten this species' habitat.

Other Conservation Issues: O'Meara et al. (1981) provided the following recommendations for chaining of pinyon-juniper woodland; 1) limit clearing widths to 200m, 2) use light chain (<30kg / link), and 3) cease chaining during winter. Although more expensive as a means to treat large areas, manual cutting of trees with chainsaws to create canopy breaks should result in much less damage to shrubs, understory vegetation, and soils and is therefore preferable to chaining activities.

## Juniper Titmouse (*Baeolophus ridgwayi*)

**Breeding Distribution:** Year round range extends from south-central Oregon southeast to the Mexican border at southeast Arizona, and from southern Idaho se to the extreme northwest corner of Okalahoma (Cicero 2000).

**Range in northeast interior California:** Occurs in suitable woodlands on the Modoc Plateau and Warner Mountains and south to Sierra County. Also occurs in eastern Mono County, and Inyo County (California Wildlife Habitat Relationships Program). Barton and Holmes (2004) report them as an uncommon breeder in western juniper woodlands of Lassen County. They were recorded on 25.7% of the atlas blocks in the Glass Mountain region of Mono County. Representative breeding locations include E. of Adobe Lake, slope of lower McGee Canyon, 2 mi SSW of Benton Hot Springs, and the Benton Range near Banner Ridge (Metropulos and Shuford 1996).

### **Breeding Habitat needs:**

Nests primarily in natural tree cavity or in woodpecker-excavated cavity, although use natural holes more heavily than excavated ones (Cicero 2000). They are most common where juniper is dominant and where large, mature trees are present to provide natural cavities (Cicero 2000). Younger woodlands tend not to support this species (PRBO data; Lassen and Modoc Counties). Hall and Morrison (2003) found use of nest boxes in the White Mountains to be associated with taller juniper trees and relatively sparse vegetation. Shuford and Metropolis (1996) characterize breeding habitat in the Glass Mountain area as moderately dense stands of pinyon woodland with fairly large trees.

### **Breeding densities**

Table 6. Breeding densities of Juniper Titmouse

| Location       | Habitat type             | Territories per km <sup>2</sup> | ource      |
|----------------|--------------------------|---------------------------------|------------|
| Lassen Co., CA | Western juniper woodland | 2.5                             | PRBO data  |
| Washoe Co., NV | Western juniper woodland | 10-50                           | Panik 1976 |

**Ecology:** During fall and winter will use other habitats including cottonwood, willow, buffalo-berry, and sagebrush shrublands (Gaines 1988).



Hall and Morrison (2003) reported on 10 Nests in Inyo County that were completed by late April or early May (mean May 2 SD = 3.5) and clutches were completed on May 16 (SD=15.1 days). Mean clutch size was 5.5 (Sd = 1.2). 10 of 11 nests fledged young from nest boxes (91%).

**Conservation and Management:**

Area sensitivity: not known.

Response to fire and management activities: So long as snags and large trees are protected, thinning and/or small prescribed burns will likely not impact this species, although this has not been tested. Removal of large trees, or stand replacing fire in juniper or pinyon pine communities would, however, be detrimental.

Other Conservation Issues: Because availability of cavities may be limiting (Cicero 1996) the retention of older trees with large twisted trunks is especially important.



## Loggerhead Shrike (*Lanius ludovicianus*)

**Breeding Distribution:** Widespread breeder in North America, occurring locally throughout except forested regions, mountains of the Pacific Northwest and much of the northeast.

**Range in northeast interior California:** Five subspecies occur in California, although subspecies delineations are still in debate (Pruitt 2000). *L. l. gambelli* breeds in the Great Basin and Modoc Plateau south to Sierra County. *L. l. excubitorides* (classified by Grinnell and Miller as *L.l. nevadensis* and *L.l. sonoriensis*) breeds in Mono and Inyo counties (Grinnell and Miller 1944). Breeding occurs in appropriate habitats throughout the planning area and up to about 2130 m in the White Mountains (Small 1994) and 2285 m east of the Sierra (Gaines 1988). They are an uncommon and local breeder, recorded on 36.5% of the Atlas blocks in the Glass Mountain area of Mono County (Shuford and Metropulos 1996). Recent surveys in Mono county found shrikes on 2% of survey points in the Long Valley and 3% in the Bodie Hills (Heath 2004).

**Breeding Habitat needs:** Prefer open country with perches and areas of dense shrubs for nesting. Generally are found in taller sagebrush communities, black greasewood flats, and open or broken juniper and pinyon pine woodlands. Avoid dense woodlands and shorter stature sagebrush communities. In big sagebrush habitats, shrikes nest in shrubs 1-2 m tall (Woods and Cade 1996, Nur et al. 2004), and optimal habitat has been described as late-seral big sagebrush with patches of tall shrubs in a mosaic with openings (Poole 1992). Foraging success decreased in eastern Washington with increasing amount of cheatgrass cover (Leu 1995). Found to frequently nest in squaw apple (*Peraphyllum ramosissimum*) during a 3 year study in Lassen County, CA (Barton and Holmes 2004).

**Ecology:** Generally, populations above 39°N are migratory (Pruitt 2000), although breeders generally vacate higher elevation locations throughout the planning area (even south of 39°N) outside of the breeding season. Thus, there is a sharp increase in this species from March or early April through August (Gaines 1988; PRBO data). Within northern populations only a minority of birds will attempt a second brood (Yosef 1996, Humple and Holmes in press), although re-nesting after failure is common and typically occurs within a few hundred meters of previous attempt. Clutch initiation ranged from the first week of April through the last week of June in Lassen County where nest survival was estimated at 47% (Barton and Holmes 2004).

**Breeding densities:** Information on breeding densities from sagebrush habitats is scarce in the literature. Mean territory size from 2 locations in southwestern Idaho was 8.9 and 25 ha (Woods 1994).

**Table 7. Breeding densities reported for Loggerhead Shrike**

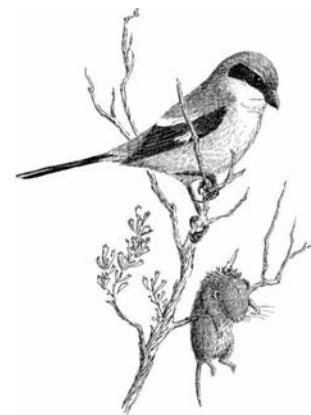
| Location         | Habitat type                  | Territories per km <sup>2</sup> | Source                 |
|------------------|-------------------------------|---------------------------------|------------------------|
| Lassen Co., CA   | Wyoming / basin big sagebrush | 1.6                             | Humple et al. 2002     |
| Morrow Co, OR    | Basin / wyoming big sagebrush | 1.5                             | Holmes and Geupel 1998 |
| South-central WA | Basin big sagebrush           | 3.4                             | Poole 1992             |
| South-central WA | Bitterbrush                   | 2.1                             | Poole 1992             |
| South-central WA | Wyoming big sagebrush         | 0.6                             | Poole 1992             |

**Conservation and Management:**

Area sensitivity: not known, but large territory size may preclude nesting in small fragments isolated by unsuitable habitat.

Response to fire and other management activities: Humple and Holmes (in press) reported that a breeding population of Loggerhead Shrikes in Morrow County, Oregon was reduced by approximately 50% in the years following a large wildfire. There was also some evidence of reduced productivity. Losses of big sagebrush communities to fire, and the risk of altered fire cycles associated with cheatgrass invasion, are the primary threats to breeding habitat. Direct effects of livestock grazing remain poorly understood. Several studies carried out in Nevada, Utah, and Idaho found either no effect (Reynolds 1980, Medin 1986) or a slightly positive one (Page et al. 1978).

Other Conservation Issues: The biggest challenge to reversing the declining trend in Loggerhead Shrike is that the causes behind it are poorly understood. More research, especially during migration and on wintering grounds, is needed to document and understand the threats before comprehensive management strategies can be developed to address them (Pruitt 2000). Maintaining breeding habitat, especially “old growth” basin big sagebrush and other tall shrub communities should be a priority. Use of insecticides (e.g., for grasshopper control) may reduce prey base (Yosef 1996) and should be avoided.



## Sage Thrasher (*Oreoscoptes montanus*)

**Breeding Distribution:** The Sage Thrashers breeding distribution closely matches that of big sagebrush. In summary, breeds from extreme south-central British Columbia south through central Washington, east of the Cascades in Oregon to eastern California south to Sierra County, and from Mono County south through Inyo County. Extends east through Nevada and s. Idaho to southern Montana, Wyoming, Utah, western and southern Colorado, and northern New Mexico and Arizona (Reynolds et al. 1999).

**Range in northeast interior California:** Eastern Modoc Plateau in Modoc County, south to Sierra County and again from Mono County through northwestern Inyo County. Uncommon breeder in White, Inyo and Panamint mountains in Inyo county (Small 1994). In the Glass Mountain area of Mono County, they were a nearly ubiquitous breeder, recorded in 82.4% of the Atlas Survey blocks (Shuford and Metropulos 1996). Recent Mono county surveys recorded Sage Thrasher on 30% of Wyoming big sagebrush survey points in the Long Valley and on 53% of mountain big sagebrush survey points in the Bodie Hills (Heath 2004). High elevation extent in the White Mountains is about 3,350 m (Johnson and Cicero 1986). Barton and Holmes (2004) found them to be uncommon in xeric Wyoming and basin big sagebrush communities around Skedaddle Mountain in Lassen County.

**Breeding Habitat needs:** Shrubsteppe and shrublands dominated by big sagebrush. Considered a sagebrush obligate (Braun et al. 1976) but also occurs in other shrub communities where surrounding landscapes are dominated by sagebrush. Records of breeding occur, for example, in black greasewood (*Sarcobatus vermiculatus*) habitat in California, Utah and Nevada, and bitterbrush in California and Washington (Shuford and Metropulos 1996, Fautin 1976, Medin 1990, Smith et al. 1997). In eastern Oregon abundance over 3 years of surveys was negatively correlated with the mean slope within 1 km and positively correlated with elevation, shrub cover, mean shrub height, and heterogeneity in shrub canopy height (Holmes and Barton 2003). Similarly, Wiens and Rotenberry (1981) found shrub cover in the 30 - 60cm height range and vertical heterogeneity of habitat to be positive correlates with abundance in eastern Oregon. Abundance is also negatively associated with high levels of grass cover (Dobler et al. 1996, Holmes and Barton 2003).

**Ecology:** Arrives in late March or early April in eastern Oregon (Littlefield 1972) and in mid March to late March in eastern California (Gaines 1988). Nest building begins within 1-2 weeks of arrival. Nests typically built in sagebrush, or on the ground beneath sagebrush. In shorter sagebrush communities most nests are placed on the ground (Reynolds et al. 1999; PRBO unpublished data). Double brooding reported from s. Idaho (Reynolds and Rich

1978), and in Wyoming (PRBO data) but is likely more common. Rejects Brown-headed Cowbird eggs (Rich and Rothstein 1985).

### Breeding densities

Table 8. Breeding densities reported for Sage Thrasher

| Location        | Habitat type                | Territories per km <sup>2</sup> | Source                                       |
|-----------------|-----------------------------|---------------------------------|--|
| Lassen Co., CA  | Basin/Wyoming big sagebrush | 0.7                             | Humple et al. 2002                           |
| WA              | Big sagebrush               | 10.4                            | Dobler et al. 1996                           |
| Sublette Co. WY | Wyoming Big sagebrush       | 10.8                            | Holmes and Churchwell 2002.                  |
| WA              | unknown                     | 36                              | Stephens 1985 <i>in</i> Reynolds et al. 1999 |

### Conservation and Management:

Area sensitivity: In eastern Washington, thrashers were not area limited, and nested in small (< 10ha) fragments in an agricultural matrix (Vander Haegen and Walker 1999). In southern Idaho, however, the probability of site occupancy increased with shrub patch size, and similarity of habitat within a 1-km radius (Knick and Rotenberry 1995).

Response to fire and other management activities: Partial (45%) removal of sagebrush canopy did not reduce densities 2-7 years post fire (Petersen and Best 1999). However, larger, more complete burns will result in reduced densities or local extirpation (McIntyre 2002, Welch 2002). Effects of livestock grazing are poorly studied, and reported effects are not consistent, although there is a tendency to increase in response to grazing based as reported in the limited research (Saab et al. 1995). No research that examines the effects of livestock on productivity has been published.

Other Conservation and Management Issues: In eastern Washington thrashers were less abundant on ranges sites classified as poor condition showing an affinity for less disturbed communities (Vander Haegen et al 2000). Management actions that reduce sagebrush cover below 10% over large areas probably negatively affect Sage Thrashers (Reynolds et al. 1999). Removal of sagebrush should only be considered in rare instances when necessary to meet ecological goals of habitat restoration (Wisdom et al. 2000). Burning, or other management activities undertaken to reduce sagebrush cover should generally be avoided in low rainfall zones as exotic plants can displace natives and sagebrush is slow to recover (Knick and Rotenberry 1995, Wisdom et al. 2000). Suggested steps to ensure the future of Sage Thrasher populations are to identify, acknowledge, and appropriately manage large remaining core areas of shrubsteppe vegetation where ecological integrity is still relatively high (Reynolds et al 1999, Wisdom et al. 2000).

## Green-tailed Towhee (*Pipilo chlorurus*)

**Breeding Distribution:** Breed in the montane and plateau interior of the western United States. Breeding occurs in extreme sw Washington, eastern Oregon, eastern California, most of Nevada, southern Idaho, southern Montana, Wyoming, western Utah, the western two thirds of Colorado, northern Arizona, and northern New Mexico. A few disjunctive breeding areas also occur in sw California, Baja California (Mexico), and northern Montana (Dobbs et al. 1998).

**Range in northeast interior California:** Occurs in appropriate habitat throughout the planning area including the Warner Mountains and the slopes and foothills of the Sierra Nevada into the Great Basin (Grinnell and Miller 1944, Small 1994). Nearly ubiquitous in Mono County, it was recorded on 97.3% of the Atlas blocks during the Glass Mountain Breeding Bird Atlas Project (Shuford and Metropulos 1996), on 80% of survey points in the Bodie Hills, and 73% of survey points in the Long Valley (Heath 2004).

**Breeding Habitat needs:** Breeds from mid to high elevations in a variety of habitats. Big sagebrush and post-disturbance shrubby second growth are most commonly used (Dobbs et al. 1998). This species avoids the drier Wyoming and basin big sagebrush habitats below 1500 m but can be one of the most common species in mountain big sagebrush (Barton and Holmes 2004). Usually occurs in areas with high diversity of shrub species, or within open woodlands (Wiens and Rotenberry 1981, Hutto 1995). Grinnell and Miller (1944) described their typical habitat as sagebrush or bitterbrush brushlands typically 0.6 – 1.2 m in height, and concluded that only scattered trees are tolerated. Also breeds in open mountain mahogany woodland, and the tall brushy edges of riparian thickets (Shuford and Metropulos 1996). Abundance was negatively correlated with the density of juniper trees and positively correlated with sagebrush cover in mountain big sagebrush of Lassen County (Barton and Holmes 2004). Probability of occurrence was likewise related to juniper density (figure 10).

### **Breeding densities**

**Table 9. Breeding densities reported for Green-tailed Towhee**

| Location       | Habitat type                    | Territories<br>per km <sup>2</sup> | Source                               |
|----------------|---------------------------------|------------------------------------|--------------------------------------|
| Lassen Co., CA | Montane shrub                   | 18.83                              | Humple and Burnett 2004              |
| Lassen Co., CA | Mountain sagebrush –<br>juniper | 5.2                                | PRBO data – Horse lake<br>basin 2003 |
| Colorado       | Mixed montane forest            | 8                                  | Winternitz 1976                      |

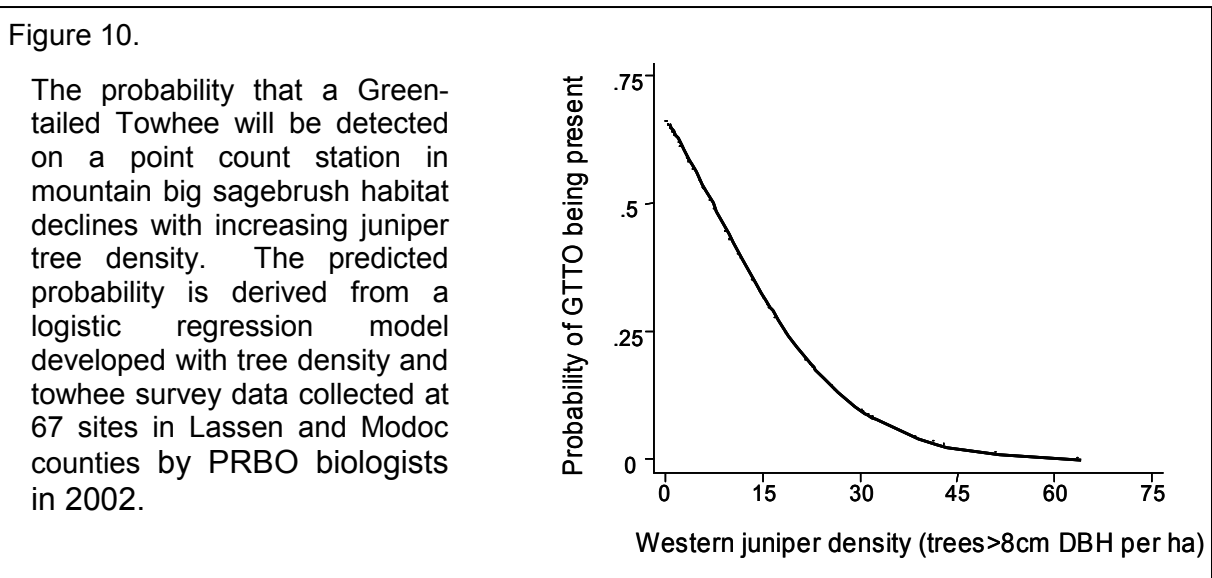
**Ecology:** Males arrive on breeding grounds typically up to one week before females. Nest building takes 2-5 days, and clutch is typically 3-4 eggs, which, are incubated by female alone. Probably double-brooded, but evidence is lacking (Dobbs et al. 1998), a fact that underscores the need for basic life history research for this species. Birds typically leave eastern California in September, and can be found in a variety of habitats on migration (Gaines 1988).

**Conservation and Management:**

Area sensitivity: not known

Response to fire and other management activities: Response to fire in sagebrush habitats is poorly documented. Recent work on the Sheldon National Wildlife Refuge in Nevada suggested no short-term effect of a recent wildfire that burned both mountain and Wyoming big sagebrush (McIntyre 2002). More abundant on thinned sites than adjacent uncut sites in big sagebrush-western juniper habitat on Steens Mountain, Oregon (Holmes and Martz 2004). The probability of being detected during the breeding season decreases steeply with increasing western juniper density (Figure 10). Page et al. (1978) reported a negative response to heavy grazing in big sagebrush.

Other Conservation Issues: Very little information available from sagebrush and sagebrush woodlands. Most research on this species has been conducted in mixed conifer and montane shrub habitats.



## Brewer's Sparrow (*Spizella breweri*)

**Breeding Distribution:** From the Okanagan Valley of southern British Columbia east to se Alberta and sw Saskatchewan, throughout the Columbia River Basin east of the Cascade Crest, and throughout the Great Basin and Sierra Nevada crest south to southern California, Nevada, and northern Arizona. Breeds in southern and eastern Idaho, Montana, and Wyoming. Also, east to nw New Mexico, e Colorado, nw Nebraska, and very small portions of Kansas, Oklahoma, and Texas. (Rotenberry et al. 1999).

**Range in northeast interior California:** Occurs in shrublands east of the Cascade-Sierra crest. Recorded on 97.3% of Atlas blocks during the Glass Mountain Breeding Bird Atlas Project in Mono County (Shuford and Metropulos 1996). Detected at 100% of survey points in a recent study of songbird use of sagebrush habitats of Mono County (Heath 2004).



**Breeding Habitat needs:** Closely associated with shrublands dominated by big sagebrush. Uses a wide spectrum of habitat conditions and shrub canopy cover values. Prefers flat or gently sloping terrain, and avoids woodlands (Figure 11). This species was correlated with both elevation and precipitation on surveys in eastern Oregon (Holmes and Barton 2003). PRBO research in arid Wyoming and basin big sagebrush communities north of Honey Lake shows that in 2002, and to a lesser extent, in 2003 and 2004, Brewer's Sparrows set up territories in May, but only a few persisted beyond a few weeks and actually initiated nesting attempts (Humble et al. 2002, Barton and Holmes 2004). Breeding density and nesting success were higher in nearby mountain big sagebrush communities (Barton and Holmes 2004). Surveys, thus, could overestimate the importance to population regulation of xeric shrub communities.

**Breeding densities:** Brewer's Sparrow exhibit high annual variability in densities. A site may be unoccupied one year and attain densities of 75 territories / km<sup>2</sup> in the next (Rotenberry et al. 1999). A site in Oregon monitored for 7 years ranged in density from 25-175 territories / km<sup>2</sup>.



Table 10. Breeding densities reported for Brewer's Sparrow

| Location          | Habitat type                                | Territories<br>per km <sup>2</sup> | Source                     |
|-------------------|---|------------------------------------|----------------------------|
| Lassen County, CA | Basin and Wyoming big sagebrush             | 19                                 | Humple et al (2002)        |
| Eastern Montana   | Shrubsteppe – shortgrass prairie transition | 62-98                              | Feist (1968)               |
| Wyoming           | Mountain big sagebrush                      | 38-65                              | McGee 1976                 |
| Colorado          | Pinyon/juniper woodland (some chained)      | 6-30                               | O'Meara et al. 1981        |
| Wyoming           | Big sagebrush                               | 75-110                             | Schroeder and Sturges 1975 |
| Oregon            | Big sagebrush                               | 200                                | Wiens and Rotenberry 1981  |
| w. Wyoming        | Wyoming big sagebrush                       | 45-97                              | Churchwell and Holmes 2002 |
| Se Idaho          | Most likely Wyoming                         | 58-96                              | Petersen and Best 1987     |

**Ecology:** Generally arrive on the breeding grounds earlier at lower latitudes and at lower elevations, and males generally arrive earlier than females (Rotenberry et al. 1999). Arrival date of females, and consequently, nest initiation can be variable by up to 2 weeks among years (Best and Peterson 1985, Walker 2000). First arrivals on breeding grounds in the Great Basin as early as mid to late March, with the bulk of migration in April and extending into May (Rotenberry et al. 1999). Nest initiation in Lassen County ranged from the first week of May through late June (Barton and Holmes 2004). Double, and rarely triple brooded (Mahoney et al. 2002).

**Conservation and Management:**

Area sensitivity: In southwestern Idaho, isolated patches of sagebrush were occupied less frequently than those in continuous habitat (Knick and Rotenberry 1995). Loss of nests to predation was higher in fragmented (median size 146 ha) than in areas of continuous shrubsteppe (median size 115,368 ha) in eastern Washington (Vander Haegen et al. 2002).

Response to fire and other management activities: In a recent review of response to fire (Knick et al. 2005), 6 of 7 studies reported reduced number of Brewer's Sparrow. The exception was a prescribed fire that burned approximately 45% of the treatment area. Welch (2002) found Brewer's Sparrow absent from 13 burns of varying histories, some of which had been replanted with exotic perennial grasses, but detected them at 92% of adjacent unburned transects. Mixed responses to livestock grazing have been published (Saab et al.



Vesper Sparrow (*Pooecetes gramineus*)

**Breeding Distribution:** Breeds from interior British Columbia east to Nova Scotia and south to s. California, s.-central New Mexico, sw. Kansas, s. Illinois, ne Tennessee, and w. Virginia (Jones and Cornely 2002).

**Range in northeast interior California:** From the Oregon border south to about Eagle Lake (Lassen County), along the east slope of the Sierra from just south of Honey Lake along lower elevations east of the Sierra except the Owens Valley. It is an uncommon breeder in the Inyo and White Mountains (Small 1994). Substantial nesting populations occur in Long Valley and the Bodie Hills. Grinnel and Storer found they were common in the vicinity of Mono Lake during the 20's, although this is no longer the case (Gaines 1988). Vesper Sparrow was recorded on 58.1% of the Glass Mountain Breeding Bird Atlas Project blocks (Shuford and Metropulos 1996), 5% of Wyoming big sagebrush survey locations in the Long Valley, and 40% of mountain big sagebrush survey locations in the Bodie Hills (Heath 2004). They are absent from an arid Wyoming big sagebrush / bluebunch wheatgrass shrubsteppe north of Honey Lake in Lassen County, but common in more productive mountain big sagebrush communities in the Horse Lake Mountain area and northward into Modoc County (Barton and Holmes 2004).

**Breeding Habitat needs:** Within sagebrush habitats, Vesper Sparrows utilize habitats with greater amounts of perennial grass cover. Shrub cover does not appear to be a deterrent as long as appropriate understory conditions are available. In fact, there was no significant relationship between shrub cover and Vesper Sparrow abundance in eastern Oregon once factors such as perennial grass and forb cover were taken into account. The two most important predictors of species abundance in Oregon sagebrush habitats were cover of perennial grasses and forbs (Holmes and Barton 2003).

**Breeding densities**

Table 11. Breeding densities for reported for Vesper Sparrow in sagebrush habitat

| Location            | Habitat type               | Territories<br>per km <sup>2</sup> | Source   |
|---------------------|----------------------------|------------------------------------|--|
| Nevada              | Shrubsteppe (type unknown) | 18-40                              | Jones and Cornely 2002                         |
| Montana             | Sagebrush (type unknown)   | 51                                 | Feist 1968 <i>in</i> Jones and<br>Connely 2002 |
| Northwestern states | Shrubsteppe (type unknown) | 2--21                              | Wiens and Rotenberry 1981                      |

**Ecology:** Arrives in eastern California in early- to mid-April (Gaines 1988). Females begin arriving shortly after males and build nests on the ground under, or at the base of vegetation (Jones and Cornely 2002). In shrubsteppe of eastern Washington, clutch initiation dates ranged from 26 March to 26 June with a peak in May (M.Vander Haegen *in* Jones and Cornely 2002). One to two broods per year, occasionally 3 (Jones and Cornely 2002).

**Conservation and Management:**

Area sensitivity: not reported.

Response to fire and other management activities: Three of 6 studies reported an increase in the years following a fire, with the others reporting no effect (Knick et al. 2005). A positive response may be conditional to an increase in perennial grass and forb cover following a burn. Mixed responses to livestock grazing have been reported (Saab et al. 1995). In general management that increases perennial grasses and forbs should benefit this species, whereas management that reduces cover of perennial grasses and forbs will be detrimental. In mountain big sagebrush communities of Lassen County, abundance of this species was negatively related to western juniper density and positively related to bunchgrass cover and elevation (Barton and Holmes 2004).



Lark Sparrow (*Chondestes grammacus*)

**Breeding Distribution:** From southern British Columbia through most of eastern Washington and Oregon, and ne California. Further east, breeds from w. Montana, s. Idaho, n. and central Nevada, and throughout most of central and e. Arizona, east to e-central Minnesota, w. Wisconsin, w. Indiana, portions of Missouri, Arkansas, and n. Louisiana, and throughout Texas. East through all other western states

**Range in northeast interior California:** From Siskiyou Co. east to the Nevada state line and south to Nevada Co. Also occurs in the Owens Valley (Small 1994).

**Breeding Habitat needs:** Generally avoids dense stands of mountain big sagebrush, but common in the drier Wyoming and Basin big sagebrush communities. Also frequents sagebrush dominated mixed-shrub communities containing horsebrush, bitterbrush, and spiny hopsage. Determinants of habitat use and density poorly understood, although in sagebrush habitats of eastern Oregon, the mean slope within a 1 km radius was positively correlated with Lark Sparrow abundance potentially demonstrating an avoidance of extensive flats and basins (Holmes and Barton 2003).

**Breeding densities**

Table 12. Breeding densities reported for Lark Sparrow in Sagebrush Habitats

| Location          | Habitat type             | Territories per km <sup>2</sup> | Source                    |
|-------------------|--------------------------|---------------------------------|---------------------------|
| Nevada, se Oregon | Likely basin and Wyoming | 15 – 140                        | Rotenberry and Wiens 1980 |
| Lassen County, CA | Wyoming and basin        | 5.8                             | Humple et al. 2002        |

**Ecology:** Nesting began in early May in Lassen County during 2002 and 2003 (PRBO data). Males defend an area immediately surrounding the nest site, but not larger territories. Sometimes attempt a second brood (Martin and Parrish 2000).

**Conservation and Management:**

Area sensitivity: not known

Response to fire and other management activities: Will abandon nesting areas where fire reduces shrub structure and area becomes dominated by dense exotic weeds (Martin and Parrish 2000). Was not detected on burned transects, but occurred on 15% of adjacent

unburned sites (Welch 2002). Humple and Holmes (2001) and Bock and Bock (1987) also reported reduced numbers following a wildfire in big sagebrush of Oregon and Montana, respectively. Response to livestock grazing in sagebrush habitats has not been evaluated, although authorities have suggested this species tends to colonize areas that have been subject to some level of disturbance (Martin and Parrish 2002).

Other Conservation Issues: Lark Sparrows are susceptible to cowbird parasitism. This is especially worrisome given their apparent affinity for disturbed habitat. Only 2 of 44 (5%) of nests in Lassen county were parasitized (Barton and Holmes 2004). In a north-central Oregon study in sagebrush habitats the parasitism rate was 10% (Holmes and Geupel 1998). Barton and Holmes (2004) reported nest survival of 15% with most failures due to nest predation.

Sage Sparrow (*Amphispiza belli*)

**Breeding Distribution:** Sagebrush habitats from central Washington, south through the Great Basin, east to the Rocky Mountains. Also breeds in chaparral and coastal sagebrush scrub of California and Baja California (Martin and Carlson 1998).

**Range in northeast interior California:** In appropriate sagebrush habitats throughout the planning area (From Siskiyou County, east to Nevada, south to Nevada County, In Mono County east to Nevada border, and south around the western rim of the Mojave Desert (Small 1994). During the Glass Mountain Breeding Bird Atlas Project they were recorded on 68.9% of the Atlas blocks in Mono County (Shuford and Metropulos 1996).

**Breeding Habitat needs:** Prefers large stands of sagebrush on flat or gently rolling ground. Abundance has been negatively correlated with grass cover (Holmes and Geupel 1998, Holmes and Barton 2003), demonstrating an association with open ground relative to high levels of grass cover. They are generally most abundant in Wyoming and basin big sagebrush as opposed to mountain big sagebrush or low sagebrush. Heath (2004) recorded them on 65% of Wyoming big sagebrush survey points but found them to be absent from mountain big sagebrush survey points. Prefer fairly high shrub cover with low shrub diversity (Wiens and Rotenberry 1981) and even stature stands with an average canopy height of 30-100 cm (Holmes and Barton 2003).

**Breeding densities:**

Table 13. Breeding densities reported for Sage Sparrow from sagebrush habitats

| Location               | Habitat type          | Territories         |                             |
|------------------------|-----------------------|---------------------|-----------------------------|
|                        |                       | per km <sup>2</sup> | Source                      |
| Lassen, Co. California | Wyoming and basin     | 11.3                | Humple et al. 2002.         |
| E Washington           | Wyoming and basin     | 16.5 - 45           | Shapiro and Associates 1996 |
| E. Washington          | Wyoming and basin     | 0.1-10.5            | Schuler et al. 1993         |
| Wyoming                | Wyoming big sagebrush | 16.9                | Churchwell and Holmes 2002  |

**Ecology:** High site fidelity, especially in males. Return rates of banded males was 55% of 46 males in Idaho (Petersen and Best 1987).

### **Conservation and Management:**

Area sensitivity/fragmentation: In eastern Washington found nesting only in large blocks of shrubsteppe (Vander Haegen et al. 2000). The minimum patch size found to be used by Sage Sparrows was about 130 ha (W.M. Vander Haegen personal communication, cited *in* Paige and Ritter 1999). Most abundant in large tracts of shrubsteppe, and probability of presence increased with increasing patch size and spatial similarity of sites (Knick and Rotenberry 1995). Where appropriate at a landscape scale, habitat should be provided in patches >1000ha.

Response to fire: Generally declines following fires. Five of 6 studies reported negative effects (Knick et al. 2005), and where no response was measured, a prescribed fire burned only 45% of the treatment area (Peterson and Best 1999). Few data on response to grazing (Saab et al. 1995), and reported effects are not consistent.

Other Conservation Issues: May be vulnerable to cowbird parasitism where livestock operations provide habitat for cowbirds (Rich 1978). In eastern Washington they were only an occasional cowbird host with 4% (n=244) of nests parasitized (Vander Haegen and Walker 1999). In Lassen County, CA, 29% (n=21) of nests were parasitized (Humple et al. 2002). Removal of sagebrush should only be considered in rare instances when necessary to meet ecological goals of habitat restoration (Wisdom et al. 2000). Burning, or other management activities undertaken to reduce sagebrush cover in low rainfall zones should generally be avoided as exotic plants can displace natives and sagebrush is slow to recover (Knick and Rotenberry 1995, Wisdom et al. 2000).





Western Meadowlark (*Sturnella neglecta*)

**Breeding Distribution:** Throughout the western states and south-western Canada east to the mid-west and south into central Mexico (Lanyon 1994)

**Range in northeast interior California:** Breed in suitable habitats throughout the planning area. Absent from the arid deserts (Small 1994). Shuford and Metropulos (1996) considered them an uncommon and local breeder in the Glass Mountain region of Mono County where they occurred on 29.7% of the breeding bird Atlas blocks. High elevation breeding limit in eastern Sierra is about 2285 m (Gaines 1988).

**Breeding Habitat needs:** Breeds in a variety of habitats – avoiding dense forests and shrublands lacking grass in the understory (Small 1994). In sagebrush habitats of eastern Oregon and Washington, grass cover was the most important determinant of abundance and explained almost 50% of the observed in count numbers (Holmes and Barton 2003). Previous research also shows a preference for habitats with higher coverage of litter and grass (Wiens and Rotenberry 1981).

**Breeding densities**

Table 14. Breeding densities reported for Western Meadowlark in sagebrush habitats

| Location      | Habitat type                | Territories per km <sup>2</sup> | Source             |
|---------------|-----------------------------|---------------------------------|--------------------|
| Lassen Co, CA | Wyoming and basin sagebrush | 7.6                             | Humple et al. 2002 |

**Ecology:** Arrive on breeding grounds in eastern California in mid-March (Gaines 1988). Females generally arrive 2-4 weeks after males and pair immediately upon arrival. Often polygynous, with males having 2 or even 3 mates concurrently. Some females raise 2 broods in a season (Lanyon 1994).

**Conservation and Management:**

Area sensitivity: no information from sagebrush habitats.

Response to fire and other management activities: Knick and Rotenberry (1999) reported a greater probability of occurrence in landscapes that had reduced shrub cover resulting from

recurring wildfires. Studies examining post fire changes at a site level have reported both positive and negative responses (Knick et al. 2005). Welch (2002) reported less than half the detections on 13 burned than on adjacent unburned transects located throughout 5 western states. Response to fire may be conditional on post-fire response of the herbaceous vegetation.



## Chapter 6. Conservation Action Recommendations

It is our hope that implementation of recommendations contained in this plan will occur at multiple scales through integration with local, bioregional, and national efforts. It is critical that a large-scale, geographically explicit approach to land-use and conservation planning be undertaken. Many such efforts are in various stages of development by sage grouse planning groups, and under cooperative efforts by the federal and state government agencies. Goals of any such effort need to include the identification of local initiatives, projects, and organizations capable of working as local partners to achieve habitat and restoration goals and the development of conservation and restoration acreage objectives based on inventory, assessment, and biological need.

Specific recommendations for conservation action including habitat protection, restoration, and management are offered here, accompanied by a very brief discussion of the rationale or scientific evidence that supports them.

### ***Objective 1: Identify and protect areas of sagebrush with high biological integrity.***

West (2000) estimated that less than 1% of sagebrush steppe remains in relictual conditions that approximate pristine conditions. Generally, these are sites that have escaped livestock pressures and other direct human influences because they have no surface water or are protected by difficult topography (West 2000). They are characterized by a good perennial understory and historically light livestock use. It is much cheaper and more effective to protect these sites than restore them once degradation occurs. Further, they can serve as a “toolbox” for restoration of other sites in the region by furnishing genetic materials and as reference sites for restoration efforts.

### **Recommendations**

#### **1.1 Prioritize sites representing a variety of sagebrush habitat types.**

Sagebrush habitats are variable in both structural and floristic composition. Different sagebrush species or subspecies support different wildlife communities. For example, Sage Sparrow is most common in Wyoming and basin big sagebrush communities, and Green-tailed Towhee is generally restricted to more mesic mountain big sagebrush communities. Within the planning area high quality sites representative of the full spectrum of habitat types should be identified so that they can be appropriately managed, restored and/or protected.

### **1.2 Promote Research Natural Area (RNA), Area of Critical Environmental Concern (ACEC), or Important Bird Area (IBA) designation for high quality sites.**

Increased consideration of wildlife values or ecosystem function can be afforded to sites with special-use status. Recent efforts by the Intermountain West Joint Venture (1995) and other nongovernmental and governmental habitat restoration initiatives have looked to such designations when developing implementation plans and other guiding documents for habitat restoration efforts in the sagebrush biome. Identification of an area as an RNA, ACEC, IBA, or other such designation is often used as justification for selecting an area over others for government-funded restoration projects.

### **1.3 Prioritize sites according to surrounding land use and patch size.**

Certain uses of land adjacent to sagebrush habitat may negatively impact the quality of that habitat for birds, and some species are area sensitive. For example, smaller patches of habitat isolated in an agricultural landscape do not support Sage Sparrows (Vander Haegen *in* Paige and Ritter 1999). Once identified, areas of adequate size or that provide habitat connectivity can then be prioritized for protection and restoration efforts.

### **1.4 Maintain remaining biological soil crust communities.**

Minimize sources of soil disturbance, such as off-road vehicle use or heavy livestock grazing (Paige and Ritter 1999). Although their structure and function are still relatively poorly understood, soil crusts are an important source of fixed carbon and nitrogen and influence the infiltration and retention rates of moisture as well as germination and recruitment rates of important plants (Belnap 2000).

### ***Objective 2: Manage for no net loss of sagebrush habitats.***

Sagebrush habitats are dynamic communities, and changes in condition occur through the influences of precipitation, fire, insects, drought, and community succession. Permanent losses may occur in conjunction with urban development, agriculture, and invasion of exotic plants. By recommending “no net loss” (Paige and Ritter 1999), it is inherently accepted that natural forces and management activities will alter the landscape. The goal, then, is that habitat conversion will be accompanied by habitat restoration elsewhere.

## **Recommendations**

### **2.1 Develop a “sagebrush budget”.**

Conduct habitat assessments at multiple spatial scales (Karl and Sadowski 2005), and within ecological constraints, identify target conditions associated with percentages of management area.

### **2.2 Manage at appropriate spatial scales.**

Coordinate management and conservation planning of existing sagebrush areas at the landscape level among landowners and federal and state resource agencies to conserve large blocks of relatively intact sagebrush (Montana PIF 2000, Knick et al. 2003).

### **2.3 Promote the permanent protection of sagebrush habitats.**

Currently, less than 3% of sagebrush habitats nationally are afforded permanent protection from conversion of land cover as National Parks or Wilderness Areas (Scott et al. 2001a, Wright et al. 2001). These areas do not represent the geographic variability of sagebrush systems (Knick et al. 2003) nor are they close to the 10% of coverage estimated to be necessary for long-term species protection (Scott et al. 2001b).

### **2.4 Work with local government and planning agencies.**

Work locally to identify important sagebrush habitat areas. Encourage local government and planning agencies to consider protection or avoidance of important habitats when making land zoning changes, developing urban service boundaries, and approving new developments.

### **2.5 Promote the restoration of lost or degraded sagebrush habitats to replace areas permanently lost to development and other land-use activities.**

A variety of tools are available including conservation easements, restoration cost-share programs, mitigation banks, and others that offer incentives for landowners to restore sagebrush habitats thereby replacing habitats lost to other land-use activities. Restoration efforts will be critical in mitigating continued loss of habitat elsewhere. Much of the need in promoting such efforts involves education in that most landowners simply aren't aware that such opportunities exist. Outreach and education can yield significant dividends to wildlife if landowners are made aware-of and are encouraged to avail themselves of restoration programs and other such opportunities.

## ***Objective 3: Identify and manage for key features important to wildlife.***

### **Recommendations**

#### **3.1 Identify cliffs and rock outcrops that are important to nesting raptors.**

Cliffs and large outcrops that provide important nest sites for raptors such as Prairie Falcon and Golden Eagle should be protected from excessive recreation (e.g. rock climbing) activities.

### **3.2 Protect isolated trees used by nesting raptors in otherwise open habitats.**

Large trees in otherwise open grass- or shrub-dominated landscapes can increase breeding diversity of birds greatly and provide nest sites for species such as Ferruginous Hawk and Red-tailed Hawk. These sites are often used perennially, and once identified should be protected from removal and from damage by livestock.

### **3.3 Maintain populations of burrowing mammals.**

Badger burrows are a principal source of nest sites for Burrowing Owls and may also be important for post-fledging survival. Predator control programs should take measures to avoid incidental or targeted mortality of badgers (Holmes et al. 2003). Further, burrowing rodents are an important food source for Burrowing Owls and other raptors, and their populations should be protected (Wellicome and Holroyd 2001). Provide incentives and education to ranchers and other rural landowners to encourage them to reduce indiscriminate killing of burrowing rodents.

### **3.4 Protect seeps, springs, and wet meadows from damage by livestock. (Paige and Ritter 1999).**

Wetlands and riparian zones are important habitat for young Greater sage-grouse and other species that depend on the forbs and the insects associated with them. Use buffers of at least 30m around these areas (Braun et al. 1976).

### **3.5 Retain large trees when conducting woodland thinning projects .**

Natural cavities are scarce in pinyon and juniper woodlands and may be a limiting factor for Juniper Titmouse and other secondary cavity nesters. Large trees should be retained when thinning or clearing of woodland occurs. In general, trees and stands with old growth characteristics should be managed for such attributes.

### **3.6 Protect microhabitats of taller sagebrush.**

Narrow strips of basin big sagebrush which occur along drainages in valley bottoms and small stands of tall sagebrush within a matrix of shorter stature shrubs can provide nesting habitat to many species of birds including Greater sage-grouse, Loggerhead Shrike, and Gray Flycatcher. In some cases these areas act as magnets for livestock who seek out their shade and use them as scratching posts, ultimately degrading their value (Figure 13).

Figure 12. Livestock tend to concentrate in riparian areas and wet meadows like this one.



***Objective 4: Restore degraded sagebrush systems to benefit healthy bird populations.***

The agencies responsible for managing public lands in the West are initiating large-scale programs for the restoration of sagebrush ecosystems (Beever and Pyke 2002, Bureau of Land Management (2002). Restoration of some altered sagebrush habitats will be very expensive and may require take decades or centuries (Henstrom et al. 2002). Clearly in the case of sagebrush ecosystems an ounce of prevention is worth a pound of cure underscoring the need for protecting intact communities (see objective 1).

**Recommendations**

**4.1 Use native vegetation in restoration and fire rehabilitation efforts.**

Federal agencies have policies that dictate a preferential use of native grasses and forbs (Richards et al. 1998). Because of a low availability of commercially available native seed non-native grasses such as crested wheatgrass continue to be widely used. Where possible,

local seeds should be collected and grown out which takes planning and long-term commitments from buyers. It is important to strive to use native species whenever possible in restoration efforts because of the tendency of non-native species to form monocultures, or even to become invasive, resulting in vegetative communities having less plant species diversity and lower quality wildlife habitat (Strait 1999).

Figure 13. Example of tall basin big sagebrush “island” within a large stand of low sagebrush. Shrub canopies here have been reduced in volume and vigor due to damage by cows that have used them as scratching posts.



**4.2 Prioritize restoration sites according to proximity to existing high quality sites.** When considering restoration projects, the proximity and connectivity to existing high quality sites should be taken into consideration. High quality habitats may be available in an area but remain unused if birds cannot find them, or can be detrimental to a species if the fragmentation results in altered nest predator composition or densities resulting in poor breeding success. Concentrating restoration efforts in close proximity to existing habitats and protected areas may help to reduce the effects of fragmentation and can provide corridors to other areas of quality habitat.



#### **4.3 Restore uplands in conjunction with riparian restoration.**

Projects that involve fencing riparian areas should consider getting more “bang for the buck” by including substantial areas of adjacent upland habitat. Consider protecting an entire watershed.

#### **4.4 Coordinate and integrate songbird conservation efforts with Greater sage-grouse planning and management efforts.**

Participation in local working groups (as those formed for the Greater sage-grouse bi-State Plan Area of Nevada and Eastern California, NDOW 2004), can provide the opportunity to incorporate the needs of multiple species into planning efforts. The local working group forum allows for communication and coordination among important stakeholders.

#### ***Objective 5: Improve the design and execution of woodland removal or treatment projects.***

Woodland removal to create or restore sagebrush or grassland communities is not appropriate in every situation! Careful consideration must be paid to identifying desired outcome of treatment and evaluating likelihood of success.

### **Recommendations**

#### **5.1 Do not remove pre-settlement trees with old-growth characteristics.**

Older trees provide nest and roost sites for many species of wildlife. In addition, they are important to Pinyon jay for their role in mast production. Old growth western juniper trees can be identified by a rounded or broken top (as opposed to a conical Christmas tree like shape), presence of lichen on branches, and/or presence of natural cavities. Generally these will be located along ridges, rocky areas, or in situations with perennially low levels of fuel.

#### **5.2 As appropriate, leave small clusters rather than isolated individual trees.**

Tree nesting songbirds may benefit more from a small cluster of trees rather than isolated trees.

#### **5.3 If prescribed fire is planned following a cut, set aside islands of unburned habitat, or consider jackpot burning of trees in order to retain shrub cover.**

Shrub nesting species that benefit from tree removal may be greatly reduced if prescribed fire is applied following a cut (Holmes and Martz 2004). In addition, downed trees provide “nurse” habitat and can encourage recruitment of desirable perennial grasses and forbs through protection from grazing animals and perhaps by increasing moisture retention.

**5.4 Do not disturb soil or use fire in situations where cheatgrass or other invasive plants are present.**

Evaluate, on a site by site basis, the potential for invasive plant establishment. Even where risk is low, care should be taken to minimize soil disturbance.

***Objective 6: Improve management of livestock facilities to reduce brood parasitism and avoidable mortality.***

**Recommendations**

**6.1 Manage livestock facilities to reduce food resources for Brown-headed Cowbirds.**

Eliminate waste grain in or near corrals, feedlots, and stock tanks (Paige and Ritter 1999) to reduce attractiveness to Brown-headed Cowbirds. Cowbirds have specific foraging needs which tie them to livestock, agriculture, and residential areas (Rothstein 1980, Goguen and Mathews 1999). Where corrals and other infrastructure are necessary, make them less attractive to cowbirds by raking and removing manure, hay or grain.

**6.2 Situate new livestock facilities in existing agricultural lands rather than in sagebrush (Walker 2004).**

There is some evidence that suggests the risk of cowbird parasitism in shrubsteppe increases with proximity to cowbird feeding areas (Rich 1978, Vander Haegen and Walker 1999). Eastern Sierra studies have demonstrated that cowbirds commute up to 7 km between morning breeding grounds and afternoon foraging areas where high concentrations of artificially rich food sources are available (Rothstein et al. 1980, Rothstein et al. 1984).

**6.3 Make sure livestock watering tanks are equipped with escape ramps.**

Make sure livestock watering troughs and tanks have adequate escape ramps for birds and other wildlife (Sherrets 1989).

***Objective 7: Manage for desirable perennial understory.***

The importance of perennial grasses and forbs to nesting birds has been documented for a number of species in sagebrush habitats. Ground nesting birds such as Western Meadowlark and Vesper Sparrow rely on grass cover for nest sites and concealment, and their distribution and abundance is positively correlated with grass cover (Holmes and Barton 2003).

## Recommendations

### **7.1 Avoid grazing sites with bluebunch wheatgrass during the growing season.**

To maintain the capacity for growth and reproduction of bluebunch wheatgrass avoid grazing during the growing season. Anderson (1991) suggests that recovery from a single heavy spring grazing season can require over 8 years under the best management.

### **7.2 Incorporate rotational grazing strategies to minimize effects of livestock.**

Effective use of rotational grazing practices allows deferring grazing for longer than is usually done during the important nesting months of May and June.

## **Objective 8: *Minimize potential for impacts from chemical application.***

### Recommendations

#### **8.1 If pesticides must be used, restrict to the minimum application rates on croplands that border sagebrush habitat.**

Organophosphate insecticides have been shown to sicken and kill sage grouse when aerially sprayed on croplands adjacent to used habitat (Blus et al. 1989). Burrowing Owl and other species are also at risk from agricultural chemicals (King 1996). Other species are likely impacted indirectly through a reduction in arthropod prey resources.

#### **8.2 Ensure that pesticide label instructions are followed.**

Pesticide drift onto non-target areas has the potential to damage important sagebrush habitats. It is critical that pesticide applicators closely follow pesticide container label instructions and apply materials only when weather and climatic conditions are suitable. Not only will such diligence reduce indirect impacts to wildlife and their habitats, but will also result in increased effectiveness and crop yields while reducing costs to the agricultural producer.

## **Objective 9: *Inform private landowners of the threats to sagebrush habitats due to habitat loss and degradation and subsequent effect on landbird populations.***

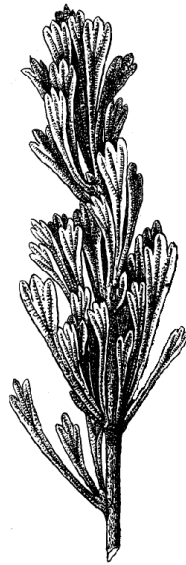
### Recommendations

#### **9.1 Encourage programs to inform private landowners.**

Many private landowners may be interested in managing for healthy habitats if given the opportunity to do so on a voluntary basis. Programs to provide technical as well as financial assistance for improving and managing upland habitats are available from a variety of public and private sources (Appendix A). Resource Conservation Districts that have established contacts with landowners are a good place to begin obtaining information on how to manage sagebrush habitats for birds.

**9.2 Distribute copies of “Keeping Birds in the Sagebrush Sea”.**

This brochure was designed for private landowners and is full of information regarding improvement of management and private lands for sagebrush birds. Available through Idaho Department of Fish and Game or PRBO Conservation Science (aholmes@prbo.org)



## Chapter 7. Outreach and Education

Scientific efforts for conservation have little impact without the support of local communities, including private landowners, government land managers, and the public of all ages. To gain crucial support, research, management, and conservation programs must share their findings and involve community groups and partners in conservation through education and outreach.

For the purposes of this chapter, outreach refers to communication with land managers, agencies, planners, business interests, nonprofit organizations, academia, and volunteers. Outreach activities include, but are not limited to, conferences and workshops that facilitate communication among experts, participation in land use planning, volunteer restoration and monitoring programs, field trips, and ecotourism.

Education, an important component of outreach, refers to the range of activities that educate and involve students and adults. Education activities include visits for classes and groups to field sites, interpretive displays, specialized curricula, and participation in festivals.

In this chapter of the plan, we will outline key messages to be disseminated through focused outreach programs, identify user groups to address through outreach programs, summarize existing resources for use by educators and outreach groups, and highlight examples of educational opportunities and successful programs.

### Key Messages to disseminate in sagebrush education and outreach programs

The following list of *Key Concepts for Bird Conservation* should be incorporated into education and outreach programs. These concepts are important to include in any program concerning conservation, and are indispensable in programs focusing on birds and habitats.

- Reproductive success may be the most important factor influencing bird population health. It contributes directly to a population's size and viability in an area. A number of factors influence reproductive success, including predation, nest parasitism by Brown-headed Cowbirds, 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 in sagebrush habitats nest within one meter of the ground. Managers must consider that habitat needs for different species vary and manage for this diversity accordingly. This can be accomplished by

managing for taller understory (grass and forbs) vegetation while retaining a structurally diverse shrub and/or tree layer for low to mid-height nesters, and dead trees and snags for cavity nesters.

- The breeding season is a short but vital period in birds' lives. Birds nest during the spring and early summer of each year (generally early-April through early August) and raise their young in a rather short period. Disturbances during the breeding season, such as vegetation clearing, habitat restoration activities, and recreation, may result in nest abandonment, remove potential nest sites, directly destroy nests, expose nests to predators, and decrease availability of insects and other food sources.
- Herbaceous understory (grasses and forbs) is crucial to many species of ground and shrub nesting birds. A healthy and diverse understory offers opportunities for well-concealed nest and foraging sites.
- Native plants are important to birds. Native bird populations evolved with the regional vegetation, learning to forage upon and nest in certain species. Introduced plant species may not provide adequate cover or food resources. 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.

### Key Audiences for Outreach

When designing and implementing education and outreach programs on sagebrush habitat in your region, you should ensure your program is addressing one or more of the target groups. The three key user groups that need to be targeted through sagebrush education and outreach programs are:

- Stakeholders (livestock operators, farmers, outdoor recreation companies)
- Community members (recreational users)
- Educators
- Land managers (government agencies, private landowners)

Each of the user groups is outlined here with suggestions of the types of outreach activities that are appropriate for each group.

Stakeholders: Stakeholders are people who rely on the habitat for their livelihood, ranching, farming, recreation companies, etc. These are often the group of people that have the

highest potential for protecting sagebrush birds at a local scale yet they may be the most difficult to reach. In order to effectively communicate with them, conservationists and educators need to find a common ground and build a relationship of trust. Highlighting the economic value of songbirds is a great way to reach these groups. One simple example is the role of songbirds as natural pest control at farms.

Effective programs that target stakeholders include restoration programs that provide incentives to landowners for restoration and conservation. There is a wide assortment of government funded agricultural/wildlife conservation programs for farmers (<http://www.nrcs.usda.gov/programs/farmland/2002/products.html>). Private landowners can be reached through flyers, brochures, posters, talks at local growers clubs, county fairs, farmers associations, Natural Resource Conservation Service (NRCS) groups, Resource Conservation Districts (RCD's), etc. Tours that take stakeholders into the field to observe the wildlife that depend and co-exist with their agricultural practices are another effective tool. Incorporating articles about songbirds into stakeholder newsletters is a great way to communicate key messages for songbirds in your region. Perhaps most important is person-to-person contact.

Community Members: Community members include the public, birders, local businesses, homeowners, families, and outdoor recreation groups. Economically, this group has a lot of influence especially in terms of access to recreation areas. In addition, community members can participate in conservation indirectly through creating favorable public sentiment, promoting legislation to protect wildlife habitat and voting on measures to protect and enhance habitat. As a result it is important that education and outreach programs be targeted to these users.

Appropriate programs for this group include general awareness building programs such as informational flyers, birding trips, mist-netting demonstrations, presentations within the community, outreach at local fairs, articles in newspapers and newsletters, and educational materials on the web. In this broad audience there will be users that are receptive to messages about songbird conservation such as birders or conservationists. Other users, such as homeowners, or equestrians, may be more difficult to reach because conservation measures may limit their activities. In this case, continued outreach is needed to slowly build a trusting relationship.

Educators: Providing information and tools to educators can increase the ability to reach large numbers of people. Training educators such as schoolteachers, naturalists, bird tour leaders, and docents in the key messages for sagebrush songbird conservation is essential.

Identifying existing education programs in schools, nature centers, and visitor centers and partnering to infuse conservation messages into their existing programs is a cost effective way to reach a broader audience.

Teacher trainings through existing networks and partnerships are an excellent way to train teachers. The provision of activities, posters, and bird identification guides is well received. Aligning educational programs with state science standards also makes the teachers more receptive to the messages presented through our materials. When trying to reach educators at nature centers or other docent groups, it is best to offer training for staff and provide them with outreach materials to distribute (informational flyers, posters, signs).

Land managers require more technical information to make informed decisions about management practices to benefit songbirds than other user groups. In addition to the development of policy based on sound science, targeted dissemination and interpretation of recent research results, and communication of long-term conservation goals it is important to for land managers to connect personally with songbirds. To that end, getting land managers into the field with biologists and facilitating this connection is critical.

### Educational Opportunities and Successful Programs

Education programs engage participants most effectively when they involve hands-on activities. Conservation education has the whole of the outdoors as a classroom—what better way to elicit the interest and enthusiasm of students and the public! The concepts and guidelines outlined in this chapter can be presented to the public and to students through a variety of media. Following is a list of common education opportunities and some suggestions for content.

**Classroom Education:** Programs in the classroom should focus on communicating key concepts to students through hands-on activities. Lessons should stress studying birds in the field - whether in the backyard, on school grounds, or in a nearby natural area - and include keeping field notes and observing natural behaviors of birds. Field trips to sagebrush habitats with groups conducting bird conservation and monitoring projects, fosters interest and enthusiasm for wildlife and teaches students the importance of conserving birds. One method of educational outreach, called project-based learning, allows an open-ended approach to solving a conservation problem. Students identify a local conservation issue in their community and through library and field research plan and implement a project from idea conception to project completion. Teachers and students work cooperatively to make important decisions, while working with biologists, land managers, business people, private



landowners and others in the community. Because of this investment and emphasis on self-direction, students take ownership of their work, and the lessons learned are profound and long lasting.

A great way to get students interested in birds is through bird observation in the field. While access to binoculars is sometimes limiting, you can contact your local Audubon Society, nature center or other local wildlife education group to see if sets are available for check out. If you feel uncertain of your birding skills, contact your local Audubon Society or other appropriate group to see if there are any docents or naturalists who will can join your class for a day of birding. An invaluable experience that catches students' interest immediately is to visit a mist-netting site where students have the opportunity to examine birds up close and interact with biologists.



There are many excellent sources for curriculum and hands-on bird activities for the classroom. A useful source is *A Guide to Bird Education Resources* produced by Partners In Flight and National Fish and Wildlife Foundation. Copies of this book are available from American Birding Association Sales, PO Box 6599, Colorado Springs, CO 80934, phone 1-800-850-2473, [member@aba.org](mailto:member@aba.org). In addition, the California Partners In Flight Education Committee is working on producing educational tools, kits, and resource guides for educators in California. Contact the CPIF Education Coordinator through the website at [www.prbo.org/cpif](http://www.prbo.org/cpif) to find out more.

**Volunteer Involvement:** Using volunteers to aid in data collection and restoration is an excellent way to gain additional help while teaching people about conservation. Increasingly, families and school groups have opportunities to participate in habitat restoration projects at local parks or nature preserves. Volunteers that participate in counting and studying birds quickly develop a connection to them, which intimately involves the volunteer in the conservation effort. Furthermore, volunteers provide additional support and resources that make long-term monitoring of songbirds viable. To ensure reliable data collection, supervisors must match monitoring techniques with the skill level of the volunteer.

Interpretation at Natural Areas

Interpretation is an excellent way to disseminate key concepts about bird conservation to the public. Displays at preserves, public parks, nature trails, picnic areas, and other natural areas should highlight the birds using the habitats and show the specific features of the habitat that are critical to bird reproduction and survival, including assemblages of native plants. Displays can effectively illustrate how individuals can make a difference at home (e.g. planting native plants in their yards or restraining cats from killing birds). These displays should be aimed at the general public. Again, integrating people as part of the solution encourages their support for conservation issues.

**Participation in Birding Festivals and Environmental Fairs:** Birding festivals are becoming a popular means of enhancing local economies through ecotourism, which can help to promote local support for conservation of natural areas – a requirement for long-term sustainability of conservation actions. Festivals also present an excellent opportunity to further educate people already familiar with birds about the scientific foundation underlying bird conservation efforts. Birders already recognize and love birds and can easily be taught the reasons for bird conservation and what a healthy bird population needs to survive. Birders also constitute a pool of experienced observers who may volunteer for monitoring programs. The Mono Basin Bird Chatauqua, held each year in June, is a great example of a festival that promotes a connection to the landscape and helps to inform the public about bird habitat needs and conservation.

Conducting an International Migratory Bird Day celebration is another excellent way to get local recognition of birds through this international program of the National Fish and Wildlife Foundation. International Migratory Bird Day celebrates the incredible journeys of migratory birds between their breeding grounds in North America and their wintering grounds in Mexico, Central, and South America. The event, which takes place on the second Saturday in May each year, encourages bird conservation and increases awareness of birds through hikes, bird watching, information about birds and migration, public events, and a variety of other education programs. Schedule a IMBD celebration near you. For additional information visit the following website: [www.birdday.org](http://www.birdday.org).

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## Appendix A. Additional Resources

### Focal Species resources

| Focal Species       | Birds of North America  |
|---------------------|-------------------------|
| Greater Sage-Grouse | Schroeder et al. 1999   |
| Gray Flycatcher     | Sterling 1999           |
| Juniper Titmouse    | Cicero 2000             |
| Loggerhead Shrike   | Yosef 1996              |
| Sage Thrasher       | Reynolds et al. 1999    |
| Green-tailed Towhee | Dobbs et al. 1998       |
| Brewer's Sparrow    | Rotenberry et al. 1999  |
| Vesper Sparrow      | Jones and Cornely 2002  |
| Lark Sparrow        | Martin and Parrish 2000 |
| Sage Sparrow        | Martin and Carlson 1998 |
| Western Meadowlark  | Lanyon 1994             |

### Web-based resources

| Website   | Description  |
|---|--|
| SAGEMAP<br><a href="http://sagemap.wr.usgs.gov">http://sagemap.wr.usgs.gov</a>  | A portal for spatial data needed for research and management of sage grouse and shrubsteppe systems. Links to current research reports.  |
| SBCN study areas database<br><a href="http://www.sagebrushbird.org">http://www.sagebrushbird.org</a>  | Sagebrush Bird Conservation Network website. Access an online database of study areas with a map interface. Query breeding status by species or study area. Links to reports and research protocols used by network participants.          |
| Sagebrush Assessment Project<br><a href="http://sagemap.wr.usgs.gov/sagebrush_assessment.htm">http://sagemap.wr.usgs.gov/sagebrush_assessment.htm</a> | The Sagebrush Assessment Project conducts research on habitats for species of conservation concern in the sagebrush ecosystem. The Project's focus is on landscape research in sagebrush-dominated ecoregions in the western United States |

### Education Resources

| Title  | Description  | Target age               | How to Order  |
|--|--|--------------------------|---|
| International Migratory Bird Day                     | Information on IMBD. Activities include bird walks, displays, videos   | All ages                 | <a href="http://www.fs.fed.us/dxnf/IMBD.html">http://www.fs.fed.us/dxnf/IMBD.html</a> .   |
| PRBO Teacher Resource Packets                        | 11 activities that teach students about birds and conservation   | Adaptable for all grades | PRBO Education Program<br>4990 Shoreline Hwy.<br>Stinson Beach, CA 94970<br>(415) 868-1221 or on the web:<br><a href="http://www.prbo.org/education">www.prbo.org/education</a> |
| Helping Birds at Bird Feeders                        | Handout on safe tips for feeding songbirds   | All ages                 | PRBO Education Program<br>(see contact information above)   |
| Birds Beyond Borders                                 | An international environmental education program linking students in the western US with western Mexico through birds. | Grades 3-6               | Rocky Mountain Bird Observatory<br>14500 Lark Bunting Lane<br>Brighton, CO 80601<br>303-659-4348<br><a href="mailto:education@rmbo.org">education@rmbo.org</a>                  |
| The Songbird Blues                                   | A trunk of materials and resources exploring neotropical birds   | Grades K-5               | Montana Natural History Center 1617 Roland Ave.<br>Missoula, MT 59801<br>406 543-6886   |
| Birds in Hand and Field                              | An activity booklet that makes a great accompaniment to a visit to a mist-netting or bird banding demonstration        | K-7                      | Rocky Mountain Bird Observatory<br>(see contact information above)  |
| Keeping Your Nest Box Safe for Songbirds in the West | Handout on how to safely use nest boxes  | All ages                 | PRBO Education Program<br>(see contact information above)   |
| Helping Birds At Home                                | Handout on how to landscape your yard to help songbirds  | All ages                 | PRBO Education Program<br>(see contact information above)   |
| Improving Songbird Habitat on Your Horse Ranch       | Handout on how to improve songbird Habitat on Your Horse Ranch   | All ages                 | PRBO Education Program<br>(see contact information above)   |
| Decreasing Crows and Ravens on Ranches and Dairies   | Handout on how to decrease crows and ravens associated with livestock operations                                       | All ages                 | PRBO Education Program<br>(see contact information above)   |

## Assistance for the private landowners

### **US Department of Agriculture—Natural Resources Conservation Service Programs**

While there are a variety of USDA programs available to assist people with their conservation needs, the following primarily financial assistance programs are the principal programs available. Locally led conservation groups are encouraged to contact the State offices of the appropriate agency for specific information about each program.

*For more information about any of the following NRCS programs:* <http://www.nrcs.usda.gov/>

Or write to:

Natural Resources Conservation Service  
Attn: Conservation Communications Staff  
P.O. Box 2890  
Washington, DC 20013

### **The Wildlife Habitat Incentives Program (WHIP)**

<http://www.nhq.nrcs.usda.gov/PROGRAMS/Animals/whip/index.htm>

A voluntary program for people who want to develop and improve wildlife habitat primarily on private lands. It provides both technical assistance and cost-share payments to help establish and improve fish and wildlife habitat.

Participants who own or control land agree to prepare and implement a wildlife habitat development plan. The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) offers participants technical and financial assistance for the establishment of wildlife habitat development practices. In addition, if the landowner agrees, cooperating State wildlife agencies and nonprofit or private organizations may provide expertise or additional funding to help complete a project.

### **Conservation Technical Assistance (CTA)**

The purpose of the program is to assist land-users, communities, units of state and local government, and other Federal agencies in planning and implementing conservation systems. The purpose of the conservation systems are to reduce erosion, improve soil and water quality, improve and conserve wetlands, enhance fish and wildlife habitat, improve air quality, improve pasture and range condition, reduce upstream flooding, and improve woodlands.

### **Conservation Reserve Program (CRP)**

The Conservation Reserve Program reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filterstrips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. Cost sharing is provided to establish the vegetative cover practices.

### **US Fish and Wildlife Service—Partners for Fish and Wildlife**

The mission of the U.S. Fish and Wildlife Service is, by working with others, to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. The Service's Partners for Fish and Wildlife Program helps accomplish this mission by offering technical and financial assistance to private (non-federal/non-state) landowners to voluntarily restore a variety of fish and wildlife habitats on their land. The cost-share program emphasizes the reestablishment of native vegetation and ecological communities for the benefit of fish and wildlife in concert with the needs and desires of private landowners.

*For more information on the Partners for Fish and Wildlife Program :*

<http://pacific.fws.gov/capartners/>

The Fish and Wildlife Service has a variety of other programs available for private and public landowners to encourage the restoration and protection of important habitats for landbirds and other fish and wildlife. Those programs include the Private Stewardship Grants Program, Coastal Program, Endangered Species Recovery Program, Federal Assistance grants, and others.

*For information on these and other habitat improvement programs offered by the Fish and Wildlife Service:*

<http://fws.gov>, or contact:

Habitat Restoration Coordinator  
Conservation Partnerships Program  
California/Nevada Operations Office  
2800 Cottage Way W-1916  
Sacramento, CA 95825  
916-414-6450

The assistance that the U.S. Fish and Wildlife Service offers to private landowners may take the form of informal advice on the design and location of potential restoration projects, or it may consist of designing and funding restoration projects under a voluntary cooperative agreement with the landowner. Under the cooperative agreements, the landowner agrees to maintain the restoration project as specified in the agreement for a minimum of 10 years.

Restoration projects may include, but are not limited to:

- planting native grasslands and other vegetation
- planting native trees and shrubs in formerly forested wetlands and other habitats
- prescribed burning as a method of removing exotic species and to restore natural disturbance regimes necessary for some species survival
- removal of exotic plants and animals which compete with native fish and wildlife and alter their natural habitats