

Conclusions

Overview

In this section, we identify the conservation strategies that frequently recur in our species and habitat accounts. In particular, we highlight the strategies that:

- 1) Provide the greatest benefits for multiple bird species
- 2) Generate a high conservation return on investments
- 3) Are critical for effective bird conservation

This section is intended for all plan users, but is most applicable for those who manage large landscapes that contain multiple habitat types and multiple Priority bird species. Those users with management obligations that center around particular species or habitats may wish to focus on the relevant species and habitat accounts. In contrast with the layout in the species and habitat accounts, we begin here with the more conceptual research, planning, and monitoring strategies, and progress to the more applied habitat strategies.

Research, Planning, and Monitoring Strategies

Improve Habitat Mapping and Classification

Poorly-Mapped Habitats

Some of Nevada's most important bird habitats are also the most poorly mapped. The problem is particularly acute for habitats that occur mainly in small or narrow patches. An effort to **significantly improve existing map products for lowland and montane riparian, springs, wet meadow, and aspen habitat** would greatly facilitate conservation planning and monitoring programs, not just for birds but for wildlife in general. Improving the existing map products for these habitats is also feasible, given the availability of high-quality aerial photography. As an example, a greatly improved map of mesquite-acacia habitat was generated as part of the Clark County MSHCP project (Clark County 2000) using a combination of classification approaches. Mapping of Joshua Tree habitat has also been problematic in the past due to limitations on remote sensing techniques for this habitat type, but efforts are underway in southern Nevada and surrounding regions to generate improved maps (Todd Esque, *pers. comm.*).

High-Quality Habitat Patches

The species accounts for sagebrush-associated birds repeatedly stress the need to identify and protect large remaining patches of "high-quality" habitat. This recommendation applies to other habitat types as well (with "high-quality" characteristics defined within the relevant habitat accounts), but it is particularly relevant to sagebrush habitat because:

- 1) Decades of livestock grazing and weed invasion have, in some areas, caused significant departures from a desired condition
- 2) Large areas of high-quality sagebrush shrubland have been lost to fire, particularly over the last decade

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- 3) Restoration of post-burn sagebrush habitat to its desired condition is very problematic because many sagebrush varieties are not well adapted to modern fire regimes, especially given the presence of invasive weeds

Unfortunately, the remaining high quality habitat patches that require protection are often poorly mapped. In many cases, their locations are known to local managers, but that knowledge is not often consolidated across the state in the form of maps that are available to those making statewide management decisions. Therefore **incorporating condition assessments into map products** would streamline the conservation planning process and allow for more efficient protection of valuable patches. Habitat types that would benefit most are sagebrush, aspen, and riparian, where condition maps could be used to pinpoint areas where restoration activities or additional protection are most needed.

Focus on Critical Landscape Mosaics

Conservation thinking and planning is often organized by habitat type, and in many cases this is appropriate. However, some landscape mosaics, where multiple habitat types constitute particularly suitable setting, can have greater conservation value than any of their component habitat types individually. Specific examples are covered below, under “Habitat Strategies: Landscape Mosaics”. These **high-value landscape mosaics should be preferentially targeted for conservation and restoration activities.**



Wilson's Phalarope. Photo by Larry Neel

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Consolidate Bird Data

A substantial effort was made in the preparation of this plan to consult and synthesize many sources of bird data. Still, some data sources were not fully utilized because they were difficult to access or had problems with formatting. This experience leads us to suspect that many management decisions affecting Nevada's birds are made without the benefit of all relevant bird data, simply because of access problems. Nevada's managers and conservation planners would benefit tremendously from an effort to **consolidate all relevant bird data in an easily accessible, uniform repository that is regularly update**. Readers are encouraged to consult eBird (www.ebird.org) for a demonstration of the power and functionality of consolidated data sets. There are tentative plans to consolidate Nevada's bird data using the Avian Knowledge Network (www.avianknowledge.net) data node model, but this effort will be labor intensive and will require funding support.

Address Gaps in Monitoring Coverage

Rigorous, well-designed monitoring programs are critical for determining the distribution, population status, trends, and habitat requirements of Nevada's birds, and furthermore will be needed to document the shifts in distribution and abundance that may accompany climate change. Although statewide monitoring coverage has improved greatly over the last 15 years, additional resources are needed to **improve long-term collection of monitoring data**. Existing monitoring programs include, but are not limited to:

- 1) NDOW's winter raptor counts, aerial waterfowl and waterbird counts, colonial waterbird and shorebird counts, WMA counts, lek counts, hunter surveys, regionally-focused counts (such as the Black Rosy-Finch winter roost site inventory and Sandhill Crane counts in northwestern Nevada), and special taxa counts (including Common Loon counts on Walker Lake)
- 2) GBBO partner-funded Nevada Bird Count, Aquatic Bird Count, special taxa counts (for example, the Snowy Plover inventory and colonial waterbird count), and focal area counts
- 3) USFWS's NWR counts and special taxa counts

Collectively, these programs provide good monitoring coverage for most diurnal landbirds, upland game birds, and waterfowl statewide, and waterbirds and shorebirds in established management areas (particularly Lahontan and Ruby Valleys, NWR's, and WMA's). Fair monitoring coverage is in place for most raptors and the Burrowing Owl. However, full statewide coverage is not in place for colonial or migrating waterbirds, and shorebirds like the Marbled Godwit, American Avocet, and Snowy Plover that are not well monitored outside the focal areas. Monitoring coverage is poor to non-existent for secretive marshbirds (except in a few focal areas), owls, hummingbirds, and nightjars. Special monitoring protocols have been developed for some of these under-surveyed groups (Conway 2009, Crow and Longshore 2010a, Fylling et al. 2009, Jones et al. 2003, Page et al. 2010, <http://ccb-m.org/nightjars.htm>), but not for others, especially hummingbirds. Additional planning and support is needed to attempt to fill some of these monitoring gaps. Also, some existing monitoring programs, including the Nevada

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Bird Count, could be improved by expanding the network of randomly selected monitoring locations to provide more inferential power.

Investigate Seasonal Distribution, Abundance, and Habitat Use

Most bird research and inventory efforts have focused on the breeding season. As a result, our knowledge of bird distribution, abundance, habitat use, and conservation status during the rest of the year is often inadequate. Yet, some of our year-round Priority birds may face their greatest conservation challenges during the non-breeding season (e.g., Black Rosy-Finches reliant on winter roost sites). Others may engage in poorly-documented seasonal movements (e.g., Pinyon Jay, Golden Eagle). Still others may be present only during migration (e.g., Common Loon, Least Sandpiper). Finally, some Nevada breeders may be far more numerous during the non-breeding season than during breeding (e.g., Bald Eagle, Wilson's Phalarope). Efforts should be made to **collect more information about priority birds during all critical periods of their seasonal cycle.**

Determine Patch Size Requirements

Knowledge of a bird's required habitat patch size is a fundamental component of effective conservation planning and management. Yet, a perusal through the species accounts in this plan demonstrates that this knowledge is lacking for many birds. Additional study is needed to **better determine habitat patch size requirements for all priority species.**



Burrowing Owl. Photo by Martin Meyers

Develop Integrated Short- and Long-Term Fire Management Strategies

Fire plays a fundamental, but complicated, role in bird conservation (see pp. *Conservation Concerns-3 and -5*). Extensive resources are devoted to fire-fighting and to fire prevention in

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Nevada, and in terms of conservation, these activities are often warranted to minimize the loss of important habitat, particularly sagebrush. Beyond this, what is needed is the **development of a comprehensive fire-management policy that integrates the immediate need for habitat and property protection with the longer-term needs for habitat maintenance and regeneration, which in some cases may require periodic fires** (see Habitat Strategies, below).

Plan for Climate Change

If climate change proceeds according to consensus projections, it will almost certainly have substantial effects on most, if not all, of Nevada's bird habitats. The potential impacts of climate change on birds are addressed in this plan (see habitat accounts), and they are a focus of the upcoming revision to the *Nevada Wildlife Action Plan* (Nevada Wildlife Action Plan Team 2006), both of which provide some basis for identifying possible mitigation strategies. In addition, we expect that future updates to this plan will address issues of changes in bird breeding and migration phenologies, and shifts in temporal and spatial resource availability, as more data become available on climate change effects.

Promote Agency Coordination and Use Adaptive Management

Although we do not make detailed recommendations in the plan regarding agency administrative issues and organization, we do encourage the establishment of **interagency working groups to address high-priority conservation needs** that can benefit from shared resources and coordinated planning. Additionally, we note that several of the strategies discussed, including improved monitoring coverage and consolidation of bird data, will be most effective if they are incorporated into an adaptive management framework that is endorsed by a wide variety of partners.

Outreach Strategies

Actively Promote, Distribute, and Update Plan; Develop an Implementation Plan

This plan will be most effective if it is widely available and actively promoted to the resource management community, and if it is regularly updated to reflect advances in bird conservation science. This agenda is a high priority for the Nevada Partners in Flight working group. Additionally, this group may explore options for developing an implementation plan to accompany this bird conservation plan to ensure conservation action. As new products (consolidated bird data, improved maps, etc.) become available, we will seek to actively distribute them and promote their use through the mechanism of regular plan updates that will be available online at www.gbbo.org/bird_conservation_plan.html.

Partner with Private Landowners and Permittees

Resource managers and NGOs should continue to seek partnerships with private landowners and permittees to implement the conservation strategies outlined in this plan. This approach is particularly critical for maintaining biologically-valuable agricultural, aspen, riparian, and wet meadow habitats, and for guiding the timing of agricultural activities to minimize impacts on

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Priority birds. Effective partnerships with private entities can also greatly facilitate the implementation of livestock grazing regimes that allow conservation of aspen, lowland riparian, and sagebrush habitats.

Promote Birding

Bird-watchers form an important constituency for bird conservation. Most NGOs and management agencies have programs in place to promote wildlife appreciation, and maintaining and expanding these programs is an important long-term conservation strategy. Efforts should be made to promote eBird (www.ebird.org) as a simple way for birders to contribute to conservation science. Increased educational efforts within the school system should also be actively pursued.

Publicize Restoration Successes

Habitat restoration is a critical component of bird conservation, and restoration projects are expensive. In a period of tight budgets, it becomes even more important to highlight and publicize successful restoration projects in order to build support for bird conservation and to celebrate successes in wildlife stewardship.

Engage the Public

There are opportunities to involve the public in implementing conservation strategies presented in this plan. Volunteer activities could include weed control, tree planting, bird listing, and others. The **IBA program is a particularly suitable umbrella for organizing such volunteer efforts and public promotion of bird conservation** in a variety of landscapes. In addition, it is beneficial for bird conservation to promote public appreciation of the habitats used for particular recreational activities (fishing, camping, hunting, etc).



Tundra Swans. Photo by Bob Goodman

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Habitat Strategies

Detailed habitat strategies are presented in the habitat accounts and, for the most part, these are not repeated here. Rather, this section is intended to present common themes that recur among multiple habitats, to provide landscape context, and to highlight and emphasize the most critical habitat-specific strategies.

Landscape Mosaic

Landscape mosaics consist of multiple habitat types that occur together in a way that they can all be accessed by Priority species that need multiple habitat types throughout their life cycle. **Where these landscape mosaics occur, they have enhanced value for birds and should be preferentially conserved.** Future revisions of this plan will highlight these landscape types in more detail.

Montane Mosaics: Montane landscapes where Montane Shrubland, Montane Riparian, Aspen, and Coniferous Forest habitats are juxtaposed or interspersed appear to be especially bird-rich, for example if the forested areas contain openings and snags, or pockets of aspen stands with trees in multiple age categories and a healthy herbaceous understory. Springs with surface water can be similarly valuable as riparian or aspen habitats in these landscapes.

Forest Burn Mosaic: Over a large area, it is clear that coniferous forests support the greatest abundance and diversity of birds if they are comprised of different-aged tree stands, and interspersed with openings and deadwood resulting from periodic small-scale fires.

Pinyon-Juniper / Sagebrush Edge: There is evidence that this woodland-shrubland ecotone is significantly more important to a suite of bird species than either woodland or shrubland alone. Understanding this habitat association better, and including this knowledge in adaptive management is especially critical given the current urgency for pinyon-juniper management activities.

Springs and Uplands: Although our data are not always definitive, there are many indications that upland areas have greater bird abundance and diversity the closer they are to springs or other sources of surface water and its associated vegetation.

Lowland Riparian / Marsh / Wet Meadow Mosaic: All of these habitat types are valuable on their own, but they are especially valuable when they are interspersed along an extended water course.

Fragmentation of Habitats

It is widely accepted that habitat fragmentation is detrimental to many Priority species, but two challenges occur in preventing fragmentation from reaching levels that are harmful to birds:

- 1) Current vegetation maps rarely incorporate habitat condition or quality as attributes, and it is therefore difficult to determine the current fragmentation status of a landscape except in its most obvious manifestations

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- 2) We often do not know the threshold patch size requirements for priority birds, and can therefore not determine when fragmentation is reaching critical levels.

The most practical long-term approach to these problems is to incorporate condition assessments into our habitat maps and to better determine bird area requirements. In the short term, it is important to **channel development and disturbances into areas that are already heavily impacted, and away from areas that appear to be more intact** based on our current sources of information. Similarly, fire-fighting efforts should be prioritized toward these larger intact areas, particularly in sagebrush.

Restoration

Restoration is perhaps the most critical habitat strategy for lowland riparian and other mesic habitats, and in general, it can be very effective where the possibility exists to manipulate water. In Nevada, highly effective projects have restored several natural river reaches, marshes, springs, wet meadows, and aspen stands. Artificially created wetlands and riparian areas can also be beneficial for many birds.

Restoration in uplands is more complicated because of longer successional processes of vegetation, complex ecosystem processes, the need for above-average moisture levels to facilitate seedling establishment, and native plant seedlings facing competition from invasive weeds. In forests, prescribed fire and manual thinning can be very beneficial, but they are expensive or administratively complex to apply across large areas. Post-fire seeding of burned shrublands may help tip the successional balance to favor native species over invasive plants in the case of sagebrush, but the success of these efforts is likely mixed. Interagency planning efforts that facilitate communication of effective strategies would be enormously beneficial to bird conservation.

Invasive Plants

Invasive plants are a threat in most habitat types that occur at low and intermediate elevations. A coordinated, multi-lateral, and geographically concentrated approach to weed management is likely the most effective and efficient approach, but weed management will remain an ongoing struggle in Nevada.

Key Habitat Strategies

Habitat-specific conservation strategies are fully covered in the habitat accounts. Below, we simply list, for a few selected habitat types, the habitat-specific strategies that we feel are the most critical for conserving priority birds. We refer the reader to the corresponding habitat accounts for details.

Pinyon-Juniper: Pinyon-Juniper management projects should maintain a complex, interspersed, and broad ecotone between pinyon-juniper woodland and sagebrush shrubland. Creating an abrupt edge eliminates a landscape mosaic element that is especially bird-rich.

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Sagebrush: Livestock and wild horse grazing, invasive plants, fire, and fragmentation form a vicious circle that has significantly degraded Nevada's signature habitat type. The situation can be improved by ensuring that:

- 1) **Grazing is kept at levels that sustain sagebrush and native understory components**
- 2) **Large, relatively intact habitat patches are protected from fire**
- 3) **Weed control is aggressively pursued in high-priority areas**
- 4) **Development projects are sited to prevent further fragmentation intact habitat patches**

Aspen: Many aspen stands in Nevada are in poor condition and vulnerable to permanent loss. The key strategy is to **allow stands to regenerate**. This may require creating livestock exclosures, reviewing grazing levels, using prescribed fire or manual methods to reduce conifer invasion and encourage aspen regeneration, and managing recreational activities.

Lowland Riparian (Great Basin and Mojave): Although they are degraded from past impacts, lowland riparian habitats can in many cases be fully restored by:

- 1) **Reinstating natural flow regimes or flows that mimic natural regimes**
- 2) **Engineering river channels to re-create natural meanders and floodplain processes**
- 3) **Intervening in the vegetation succession process to favor native plants over weeds**



Red-naped Sapsucker, an Indicator of healthy Aspen habitat. Photo by Scott Page

The case of saltcedar, especially in southern Nevada, deserves special mention. Several Priority birds now make use of saltcedar-dominated riparian areas. Ideally, restored riparian habitats would contain only native vegetation, but care should be exercised to ensure that **as saltcedar is removed or defoliated, revegetation efforts** occur as soon as possible.

Marsh, Ephemeral Wetland and Playa, and Open Water: Minimizing or eliminating loss of functional waterbodies and wetlands is a high conservation priority, and primarily a matter of **securing, maintaining, or in some cases increasing water inflows, and maintaining reasonable water quality standards** for wetlands and lakes. This conceptually simple but functionally challenging prescription is largely in the political and public realm, perhaps nowhere more than in the case of Walker Lake.

However, the issue of water availability for natural resources and bird conservation is worth serious exploration of all options.

Coniferous Forest: Nevada has overall few of the forestry-related conservation concerns that are common in other western states. The main conservation strategy in this habitat type to benefit

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birds is to **create the most natural possible fire regime**, which will create forest openings, produce snags, and maintain a large-scale multi-aged forest mosaic.

Agriculture: Several priority birds used agricultural landscapes. Key conservation strategies are to:

- 1) **Maintain traditional agricultural practices such as flood irrigation, stubble fields, and shelterbelts**
- 2) **Protect isolated large trees or tree groves**
- 3) **Conduct mechanized agricultural activities to avoid inadvertent impacts on nests and young during the most vulnerable periods** (typically May – early July, but variable by species)



American White Pelican. Photo by Fred Petersen