Nevada Comprehensive Bird Conservation Plan

Version 1.0, December 2010

Nevada's state bird, the Mountain Bluebird, *Sialia mexicana*. Photo by Martin Meyers.

Prepared by the Great Basin Bird Observatory

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Each major section (underlined) corresponds to the tabs in the plan binder.

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Snowy Plovers. Photo by Zachary Smith.

Other Acknowledgements

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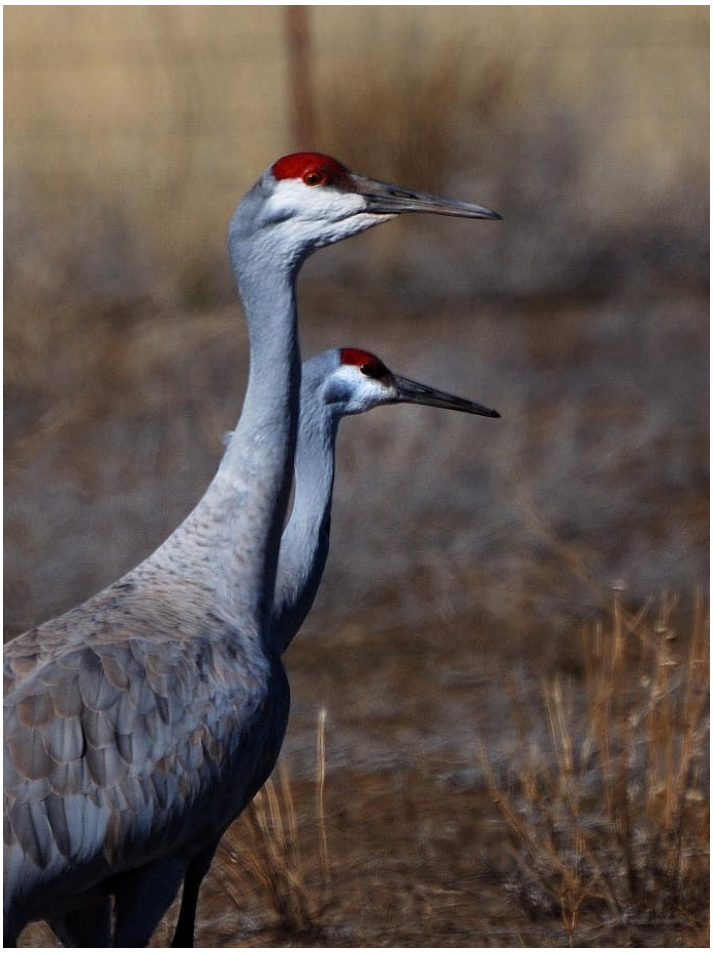

Sandhill Cranes. Photo by Larry Neel.

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Plan Conception and Objectives

The *Nevada Comprehensive Bird Conservation Plan* represents a concerted effort to summarize the best current knowledge about the conservation status of Nevada's birds and their habitats, to assess their conservation concerns, and to present effective conservation strategies. The plan is intended for an audience of resource managers, land owners, and other Nevada stakeholders in wildlife conservation. Because the plan was developed for a wide variety of agency and private partners, we intentionally focused on defining the most important bird conservation needs and effective strategies for any partner willing to engage in conservation implementation, rather than assigning roles and responsibilities to stakeholders.

Nevada is famously the driest state of the union, with an average of only 9 inches of precipitation annually, and its human population has been among the fastest-growing in the nation for most of the past two decades. These two facts conspire to generate significant pressure on our natural ecosystems, which are often more fragile and slow to recover from disturbances than is the case in more mesic regions. However, because 87 percent of Nevada's lands are publically owned and managed by federal and state agencies, Nevada also has unique opportunities for statewide conservation of birds and their habitats. Along with these opportunities comes the challenge of balancing conservation objectives with mandates for economic and recreational uses of public lands. This plan provides managers with a critical tool to assist them in addressing this challenge effectively.

Immature Northern Goshawk.
Photo by Fred Petersen.

This *Nevada Comprehensive Bird Conservation Plan* was first conceived in 2007, when the Nevada Working Group of Partners in Flight (NV-PIF) recognized the need for a revision of the original *Nevada Partners in Flight Bird Conservation Plan* (Neel 1999). The 1999 plan represented the first formal consensus among all major resource management agencies and other stakeholders regarding priority landbird species and habitat-based strategies for their management and conservation. However, at the time the original plan was written, information about the distribution and status of many of Nevada's landbird species was limited by the lack of comprehensive inventory and monitoring programs. Within the past ten years, however, several new datasets (described fully in *Appendix 1: Methods*) have become available that add significant knowledge to those previously available. Other planning tools, such as the *Partners in Flight North American Landbird Conservation Plan* (Rich et al. 2004) and the *Nevada Wildlife Action Plan* (Nevada

Wildlife Action Plan Team 2006), along with updated landcover maps and other spatial data, have also become available. Further highlighting the need for an updated plan are the significant changes in Nevada's landscape that have occurred over the last decade as a result of widespread fires, weed invasions, energy development projects, water projects, and other factors.

For developing this plan, a planning team was formed that consisted of representatives from the Great Basin Bird Observatory (GBBO), Nevada Department of Wildlife (NDOW), and the entire Nevada PIF Working Group (see *Acknowledgements*). At an early stage in the plan revision process, the planning team decided to expand the plan's scope beyond its original focus on non-game landbirds. Thus, this plan is truly comprehensive in that it includes upland gamebirds, waterfowl, waterbirds, and shorebirds. In expanding the plan's scope, we drew upon many data sources and conservation initiatives that were not available in the original 1999 plan.

The first major objective of the planning team was to identify the priority bird species to be covered in the plan. This process, along with all other methods used in the preparation of this plan, is described in *Appendix 1: Methods*, and the outcome of the priority species assessment is shown in *Appendix 2*. A second major task for the planning team was to formally define the goals of the plan. These goals were as follows:

a) Summarize, analyze, and integrate all relevant and reliable information about the conservation status, distribution, abundance, and habitat requirements of conservation priority birds in Nevada
b) Assess important threats and conservation issues affecting these birds, emphasizing those that can be addressed through management practices
c) Stress habitat management as the primary mechanism for bird conservation, recognizing that most threats to Nevada's birds are linked to habitat
d) Make this information available to resource managers in a concise, organized, standardized, and user-friendly format
e) Periodically update the plan as new information becomes available, and make updates readily available online

American Avocet. Photo by Larry Neel

The time period addressed by this plan is the ten years following its release (2011 – 2021). We recognize that effective short-term conservation strategies are not always identical to effective long-term strategies, which is why we envision this plan as a continually evolving product.

Habitat-based conservation strategies are heavily stressed in this plan, but we also present strategies involving research, monitoring, planning, public

outreach, and education. Habitat-based strategies are particularly important for bird conservation in Nevada, because overwhelming evidence indicates that most bird declines are linked to habitat change. We intentionally present only a moderate list of strategies that we believe will be the most effective for conservation of Nevada bird populations, rather than providing a long list of all activities that could be of possible benefit. Furthermore, we generally refrain from providing "best management practices" for habitats, and instead focus on the desired condition of a habitat type. For instance, we leave the particulars of grazing plans, fire management practices, riparian restoration practices, methods of weed control, and so forth, to our conservation partners, because they generally have the expertise required to create detailed and site-appropriate implementation plans. Instead, our recommendations provide guidance regarding the desired outcome of implementation efforts, such as "avoid removal of herbaceous understory", "increase cover of riparian woodlands and floodplain wetlands", "protect areas of tree recruitment", etc., which leave the options of how to accomplish these outcomes open to the conservation practitioner. In addition, although conservation goals are often pursued through the mechanisms of political advocacy, such strategies are not included in this plan. Similarly, we do not make recommendations regarding agency structure, operations, coordination, or administration, as these are within the purview of the agencies' planning processes.

Finally, we present birds not only as conservation targets in this plan, but also as tools to inform us about what constitutes "intact" habitat. In many cases, the presence or absence of conservation priority bird species alone is an effective way to evaluate habitat integrity. In other habitat types, carefully chosen "indicator" species can be used to gauge ecosystem health even when conservation priority species are absent. In general, birds are easier to monitor and survey than other wildlife groups, and many birds respond sensitively and quickly to habitat change. For these reasons, it is our premise that bird-focused conservation planning is one of the most practical and cost-effective ways of achieving general wildlife and habitat conservation goals.

Yellow Warbler, an Indicator species for healthy lowland riparian habitat. Photo by Martin Meyers.

Using the Plan

The plan's main sections include:

a) *Birds of Nevada*: An overview of Nevada's bird life
b) *Conservation Concerns*: A discussion of the major issues that affect Nevada's birds and their habitats
c) *Introduction to Habitat Accounts,* and *Habitat Accounts*: Habitat-based overviews and conservation strategies based on current knowledge of bird habitat requirements and threats. The introduction explains the content of the accounts, and should be consulted first
d) *Introduction to Species Accounts,* and *Species Accounts*: Species-based overviews and conservation strategies. The introduction explains the content of the accounts and should be consulted first
e) *Conclusions*: A summary and distillation of the most important bird conservation strategies
f) *Appendices*: A series of appendices that provide details on all methods used in the preparation of this plan, along with a series of tables providing useful information to support the species accounts and habitat accounts

We encourage all users of the plan to consult the *Conclusions* section, which highlights recurring conservation themes and overall priorities for bird conservation in Nevada. Resource managers responsible for large landscapes that contain many habitat types may find the *Conclusions* and the *Habitat Accounts* most useful for informing their own planning efforts. The strategies outlined in these sections have the advantage of benefitting a large number of priority bird species (and non-priority species) without requiring the resource manager to sort through the particular habitat requirements and conservation issues of each species. However, bird species do vary in their distributions, population status, particular habitat needs, and susceptibility to various threats, so the *Species Accounts* allow resource managers to customize their management activities towards particular species that are likely to occur in their areas of responsibility.

Relationship with other Planning Efforts

This plan was at first conceived with the goal of a revision of the earlier *Nevada Partners in Flight Bird Conservation Plan* (Neel 1999). Beyond this goal, the *Nevada Comprehensive Bird Conservation Plan* attempts to integrate, rather than duplicate, other bird conservation planning efforts in our region. However, there are circumstances in which resource managers should refer to other plans that cover additional perspectives, cover other wildlife taxa, or offer a more complete picture of agency-specific issues.


Peregrine Falcon. Photo by Bob Goodman

Nevada-specific plans that fall within this group include NDOW's *Nevada Wildlife Action Plan* (Nevada Wildlife Action Plan Team 2006), which presents a broad range of information and conservation strategies not only for birds, but also for other terrestrial vertebrates. The *Nevada Department of Wildlife Upland Game Species Management Plan* (NDOW 2008) provides a comprehensive source of distributional and management information for the upland gamebirds. The Nevada Sage-Grouse Conservation Team (2004) published the *Greater Sage-Grouse Conservation Plan for Nevada and Eastern California* which provides much more detail than we can provide here on the distribution, local management issues, and conservation opportunities associated with this high-priority bird. The two largest land management agencies in Nevada, the U.S. Forest Service (USFS) and the U.S. Bureau of Land Management (BLM) also prepare and regularly update detailed management plans that for the lands they administer. The USFS is currently preparing the 20-year revision of the *Humboldt-Toiyabe Forest Health Plan* and has already published the *Sierra Nevada Strategy and Framework* (USFS 2001) which provides extensive information for the Sierra Nevada region.

Nevada resource managers may also draw upon regional and continental plans by multi-lateral bird conservation initiatives, including the *Partners in Flight Plan North American Landbird Conservation Plan* (Rich et al. 2004), the *Intermountain West Regional Shorebird Plan* (Oring et al. 2007), the *Intermountain West Waterbird Conservation Plan* (Ivey and Herziger 2006) and the *North American Waterfowl Management Plan* (USFWS 1986, 1998), along with the Pacific Flyway Council's species-specific management plans at http://www.pacificflyway.gov. These regional and national plans were consulted when selecting priority species for the Nevada region (*Appendices 1 and 2*).

New Products and Future Updates

The *Nevada Comprehensive Bird Conservation Plan* incorporates a very wide array of bird data from Nevada, much of it gathered only in the last 10 – 15 years. This plan therefore presents a number of products that were not available in the original PIF plan (Neel 1999), including:

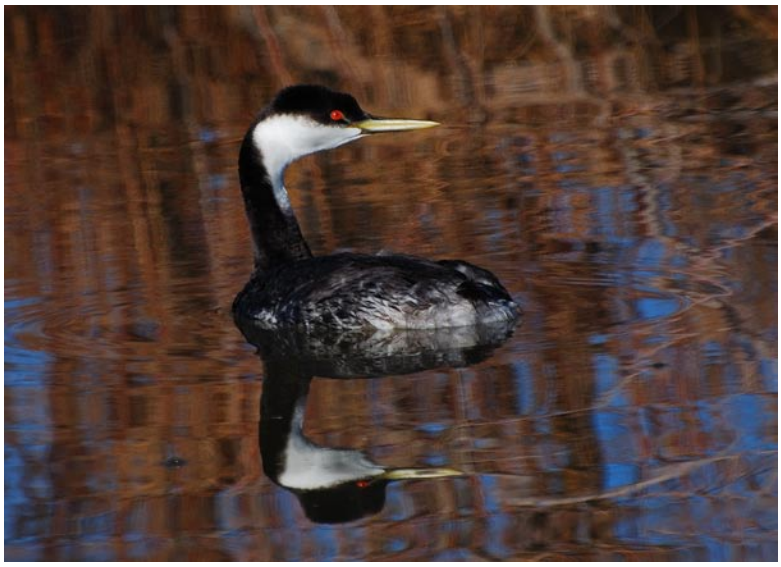
a) Detailed distribution maps for all conservation priority birds, created by combining data sets from major monitoring and survey efforts, NDOW databases, and other sources (see *Appendix 1*)

b) Statistical analyses of landbird-habitat relationships (*Appendix 3*), using data from the Nevada Bird Count (NBC) and GIS landcover maps (*Appendix 1*)
c) Newly-calculated Nevada population size estimates for landbirds (*Appendices 1 and 4*), based on NBC data
d) Newly-calculated density estimates by habitat type for landbirds, based on NBC data (*Appendix 1*)
e) An improved GIS habitat map that draws from several different landcover products (*Appendix 1*)
f) A formal habitat-based threats analysis (*Conservation Concerns* section and *Appendix 1*)

The wealth of information that has become available only in the last 15 years serves to highlight the fact that our understanding of bird ecology and conservation is constantly improving. Other new products, such as eBird (www.ebird.org), are also becoming more widely available, allowing conservation practitioners to better visualize and understand large volumes of data. For these reasons, it is our intention to maintain this plan as an electronic document that will be updated on a regular basis as new information becomes available. GBBO will maintain the platform for online access to this plan and its periodic revisions at

www.gbbo.org/bird_conservation_plan.html

The online version of the plan will incorporate a log of changes that allows the user to see at a glance what information has recently been added or revised. Links to this webpage by resource management agencies and other stakeholders are encouraged. We will also provide a mechanism at this web site for managers, researchers, and birders to submit verified sightings and other data that can be used to update this plan.



Western Grebe. Photo by Larry Neel.

Birds of Nevada

Overview

A total of over 480 species of birds have been recorded in Nevada (Nevada Bird Records Committee, *pers. comm.*), and of these, 300 species have either nested, or are estimated to occur with some regularity, in the state (*Appendix 2*). Of these 300 species, 252 are currently known to nest (Floyd et al. 2007), and 46 are not. The two remaining birds are special cases: the Elf Owl, a historical breeder that is extirpated in Nevada, and the Sharp-tailed Grouse, once extirpated and then reintroduced in Nevada. The majority of Nevada's breeding birds are landbirds, but a large percentage of the Priority species we identified are shorebirds and waterbirds, reflecting the importance of water bodies in a desert state. Nevada's mesic habitats, such as riparian, marsh, open water, aspen, wet meadows, and agricultural areas, support the majority of bird species in Nevada, but a small number of species with urgent conservation issues primarily occur in upland habitats, for example the Greater Sage-Grouse, Bendire's Thrasher, and Pinyon Jay. A complete summary of habitat use by our 78 Priority species in Nevada is provided in *Appendix 5*.

Conservation Profile

Total Number of Regularly Occurring Bird Species	300
Total Number of Birds Recorded To Date	482
Total Number of Priority Species	78
Habitat Types Most Commonly Used by Birds (% of all Nevada species)	Great Basin Lowland Riparian (38%) Mojave Lowland Riparian (33%) Marshes (27%) Open Water (24%) Agricultural (24%) Montane Riparian (22%) Aspen (20%)
Number of Important Bird Areas (IBAs)	40

Priority Species

Bald Eagle. Photo by Wendy Francis

Through our ranking process, we identified 78 Priority species. These were subdivided into 70 Conservation Priority species, five Stewardship species, and three Special Status species (see *Appendix 1: Methods*, and *Appendix 2* for a complete listing, definitions of these categories, and the selection process). The 70 Conservation Priority species were identified primarily by the fact that they were ranked as high priorities in one or more regional bird conservation initiatives. Most Conservation Priority species were designated as such by regional initiatives because of population declines, significant threats, dependence on restricted or threatened habitats, or small population size. Three species that were not ranked by regional initiatives (Northern Goshawk, Ferruginous Hawk, and Golden Eagle) were included as Conservation Priority species based on current concerns in Nevada and agency priorities. These birds were thought by the planning group's expert opinion to have "fallen between the cracks" in previous regional planning efforts.

Phainopepla, an Indicator species for Mojave Lowland Riparian and Mesquite-Acacia habitats. Photo by Scott Page

Interestingly, the Conservation Priority species were divided fairly equally between those that tend to occur in clusters as a result of their dependence on restricted habitat types (such as marshes or aspen woodlands) and those that are distributed over large landscapes dominated by shrubland or woodland habitats. Five Stewardship species were identified (Prairie Falcon, Common Poorwill, Gray Flycatcher, Green-tailed Towhee, and Sage Thrasher) because Nevada is estimated to support more than 20% of their global population. Several Conservation Priority species also exceeded this threshold (although most did not), and in these cases, the Conservation Priority ranking took precedence over the Stewardship ranking.

Three birds were designated as Special Status species, either because of their federal recovery status (Bald Eagle and Peregrine Falcon), or because conservation concerns are suspected, but additional research is needed in Nevada (Burrowing Owl).

Conservation Priority, Stewardship, and Special Status species are all considered to be Priority species in this plan, and all are treated in individual species accounts. Indicator species, in contrast, are not regarded as Priority species and are therefore not treated in individual species accounts. They are instead listed in the pertinent habitat accounts, where they serve the purpose of providing a tool for evaluation of habitat integrity for the habitat types that only have few, rare, or geographically restricted Priority species.

Important Bird Areas of Nevada

Carson Valley IBA. Photo by Anne Thomas

Important Bird Areas (IBAs) have been designated by the Audubon Society to highlight the most important conservation landscapes for bird diversity in the state, with emphasis on species of conservation priority. IBA-specific conservation plans, active partnerships, volunteer activities, monitoring, and outreach are being implemented by Audubon to increase public appreciation and participation, and to aid in conservation implementation for these hotspots. Therefore, the IBA program is a key partner in focusing Nevada bird conservation efforts on those landscapes that contain the greatest local densities and diversity of priority species. *Appendix 6* lists the occurrence of priority species in designated IBAs of Nevada.

We encourage our partners to take advantage of IBA program services, as well as site-specific conservation planning undertaken by the U.S. Fish and Wildlife Service for Nevada's National Wildlife Refuges, Nevada Department of Wildlife for Nevada Wildlife Management Areas and gamebird management, National Park Service for National Parks and Recreation Areas, Bureau of Land Management for Nevada BLM districts, U.S. Forest Service for Forest units and ranger districts, and by other agencies and organizations. These site-specific conservation efforts are extraordinarily useful for birds that tend to occur in clusters within particular sites or restricted habitat types.

Eared Grebe. Photo by Scott Page

Western Grebe. Photo by Fred Petersen

Overview

Bird conservation planning requires us to consider a wide variety of factors that can contribute to the decline of bird species. These factors are often described as "threats," “stressors,” or “agents of change” in conservation planning, but in this plan we have gathered them under the more general term of "conservation concerns.” After much discussion in the Nevada Partners in Flight working group, we felt this term to be a better fit for emphasizing the diverse, often indirect, and often contingent effects of these factors. For example, agricultural practices can benefit wildlife when they generates wet meadow habitat, flooded fields, and buffer areas, but may be a concern when pesticides are used intensively, or when large-scale impacts to ground nests occur. Many other land use practices may be harmful, neutral, or beneficial depending on their location, scale, intensity, and timing, and their effects likely vary among bird species. To simply label these practices as universal “threats” was thought by the group to be too inaccurate a concept. When we do use the term “threats”, we refer to specific cases and contexts where a particular scenario has been deemed to be harmful to a bird or to one or more habitat types.

The conservation concerns discussed in this chapter follow the basic categories of habitat and species concerns. Habitat concerns (for example, invasive weeds) act on birds indirectly, by affecting their habitats in some manner. Species concerns (for example, diseases) act on birds directly by affecting their survival or reproduction. For most of Nevada’s birds, the most important concerns are habitat-based. Species-based concerns, such as illegal takes and pesticides, still exist and are discussed in the species accounts, but we focus much of our attention in this plan on habitat concerns, where we believe to be the most far-reaching opportunities for resource managers to make contributions to bird conservation.

Assessing Conservation Concerns

The planning group assigned a committee to undertake a formal assessment of both habitat and species conservation concerns. The committee adapted the Conservation Action Planning (CAP) framework developed by The Nature Conservancy (TNC 2007) for this purpose, and held six meetings to generate this assessment. The process was organized primarily by habitat type, and the outcomes from the assessment were used to identify conservation concerns for habitats and species and to develop conservation strategies.

Although the CAP framework provided a useful formal structure for assessing conservation concerns, it was decided in our final committee meetings that, for the purposes of this plan, it would be preferable to focus on the broad outcomes of the CAP process rather than the detailed ranking procedures that fed into it. This decision was reached for several reasons. First, detailed rankings were difficult to apply uniformly, as the makeup of the committee was not always consistent throughout the assessment process. Second, given that we were applying the CAP framework to the entire state of Nevada, it was sometimes difficult to select a single ranking when the level of a

particular concern varied greatly among different geographical regions. In many cases, there was also uncertainty as to the severity of new threats, and thus many rankings were based on our most realistic predictions of upcoming threats. Finally, the group discussed the issue of separating ongoing impacts of past threats from new ones. For example, issues such as new energy developments, additional urban encroachment, and climate change are recent additions to our list of concerns, but historical, and in some cases irreversible, practices such as construction of major water diversions also continue to affect birds. In the end, both ongoing and new impacts to bird conservation concerns were considered in our rankings based on their estimated severity, geographic scope, and irreversibility.

Despite these sources of ambiguity, the committee felt that the CAP process was successful in formally identifying the most important conservation concerns affecting Nevada's birds and their habitats. We focused in this plan on those concerns that may lead to significant declines in Priority species over the next 10 years (2010 - 2020), and on those that apply broadly throughout Nevada. Conversely, we de-emphasized some concerns that may be locally significant, but have relatively little regional or statewide impact on bird populations.

Dark-phase Swainson's Hawk.
Photo by Martin Meyers

The sections below present the conservation concerns that were identified as important during the CAP assessment process, and they describe the nature and bird conservation context of each concern. Other potential conservation concerns were discussed by the committee, but through the CAP assessment process it became clear that some (e.g., commercial timber harvest or military activity) did not pose serious threats to Nevada's priority birds.

Habitat Concerns

Land Management Practices

Fire Suppression

Fire suppression, or the attempt to exclude all fires, can alter habitats in several ways (Keane et al. 2002). It may allow a buildup of fuels that eventually shift the fire regime from frequent, low-intensity fires to infrequent, high-intensity fires (Covington et al. 1994). It may increase encroachment of one habitat type into another, such as conifer trees into aspen stands or sagebrush. It may also contribute to changes in the overall structure of a habitat type, as has been proposed for pinyon-juniper woodland expansion

(Miller et al. 2008). Fire suppression is not highly prevalent in most of Nevada's non-residential landscapes, although in sensitive areas, such as those occupied by Greater Sage-Grouse, it is actually a key conservation strategy for protecting high-priority sites. Fire suppression is, in fact, clearly warranted in cases of sensitive habitats that may take centuries to recover after catastrophic fires, or may not recover in time to preserve bird populations. However, there are cases where fire suppression strategies that accomplish short-term habitat protection goals, but may have less desirable long-term effects in terms of habitat regeneration and maintenance. This conservation concern is therefore a good example of where case-by-case evaluation of the short-term and long-term strategies for managing a site or region is needed.

Fuels Reduction

Fuels reduction is related to fire suppression in that it is an attempt to reduce stand density that has increased from having fewer low-intensity fires (Graham et al. 2004). Fuels reduction is usually implemented in areas where protection of human settlements is a priority (e.g., Safford et al. 2009) or, in some cases, in areas where the risk of catastrophic fires is deemed to be high. Usually, these practices include removal of highly flammable shrubs, thinning of young and old trees, weed control, and creation of open buffer areas as fire breaks. Fuels reduction projects can inadvertently remove habitat components that are important to some bird species, such as dense underbrush, woody debris, or certain tree age classes. Usually these impacts are fairly limited, since fuels reduction activities are concentrated around the margins of human settlements in most cases.

Domestic Livestock

Domestic livestock (cattle and sheep) are a long-established component of most publicly managed lands in Nevada, except in Clark County, with varying levels of use in different habitat types and different regions of the state. Riparian, wetland, and other mesic habitat types, where they are accessible to livestock, typically receive the most intense use due to their higher-quality forage and access to water. Therefore, riparian and wetland bird communities may be particularly vulnerable to livestock impacts (Szaro 1991).

Livestock grazing, however, is not invariably harmful to birds, and it may sometimes be beneficial for achieving particular management objectives. To identify the subset of scenarios in which livestock grazing does present a potential concern, we use the term "overgrazing." In the context of this plan, overgrazing may involve the removal of understory vegetation at sensitive times, prevention of re-growth of important vegetation (e.g., willow, aspen, forbs), chronic changes in soil or water conditions, or permanent changes in vegetation composition and structure.

Wild Horses and Burros

Wild horses and burros occur in various densities on all public lands of Nevada, and in many respects, their impacts on birds and their habitats are similar to those of domestic

livestock. These feral grazers generally make more intensive use of the more productive, mesic habitat types (Beever et al. 2008), but burros are also known to graze on very dry vegetation (Abella 2008). Also, as with domestic livestock, the level of impact is directly related to the number of animals present in sensitive habitats, particularly during the growing season and plant establishment periods, and the duration and frequency of grazing activity.

Wild Ungulates

Occasionally, elk may have local impacts on bird habitats (Kaye et al. 2005). This usually occurs when elk concentrate in aspen stands and browse young stems or damage bark with antler rubbing. Elk are uncommon in Nevada, managed as a game species, so the level of threat that they pose to birds and habitats is overall considered low in the state.

Biocontrol Activities

This conservation concern was identified due to the introduction and range expansion of the saltcedar (tamarisk) leaf beetle, *Diorhabda elongata*. This species was introduced to the western region to combat saltcedar invasion in riparian areas. Where established, the beetle fully defoliates saltcedar over a large geographic scale, but its desired positive effects on recovery of native riparian vegetation have not yet been established (Hultine et al. 2009). Affected saltcedar trees survive defoliation for several years, during which time they cannot provide suitable nesting habitat for most riparian songbirds. Over the next ten years, it is likely that beetle defoliation will outpace any active revegetation efforts in riparian areas in Nevada. Because saltcedar provides one of the primary nesting substrates for several riparian Priority species, the beetle presents a concern for species such as Southwestern Willow Flycatcher, Lucy's Warbler, and Bell's Vireo.

Increased Fire Intensity or Frequency

This conservation concern was identified to acknowledge that fire intensity and/or frequency has increased over historic levels in several habitat types (e.g., Hunt and Stiver 2000), including particularly in conifer forests of the Sierra Nevada (Miller et al. 2009) and sagebrush shrublands. Causes for these changes vary widely, and may include fuel buildup due to fire suppression, invasive plants that increase fire frequency, new fire sources from public uses, climate change effects, and carryover from fires in other habitat types. Increased fire frequency raises the concern that vegetation communities may be unable to reach late-successional stages before the next burn, which can be detrimental to several Priority species (e.g., Sage Thrasher and Gray Flycatcher in sagebrush habitats). Increased fire intensity in forests may result in conversion of forest stands that are naturally maintained by low-intensity fires (e.g., ponderosa pine that is important to Priority species such as the Flammulated Owl and Grace's Warbler) to denser, younger stands as a result of stand-replacement fires (Covington et al. 1994). Fires generally increase the probability of weed invasion, which can result in a positive feed-back loop for a continuing increase in fire frequency.

Sandhill Cranes in a riparian transitional zone. Photo by Bob Goodman

Climate Change

Change in Precipitation and Snowmelt

Most climate change models predict overall decreased winter precipitation in Nevada and adjoining regions (Seager et al. 2007), and Nevada's local climates may change in complex ways (Ackerly et al. 2010). Most of Nevada's wetlands and other mesic habitat types receive the majority of their year-round water from snowmelt, which makes them obvious candidates for conservation concern based on climate change effects. A generally-held assumption is that many habitat types and bird species will shift their ranges northward and upward in elevation over time as a result of climate change. However, in the deserts of Nevada, these predictions may not be as straightforward as they appear. Some habitat types used by priority species have very long successional processes (e.g., about 200 years for Joshua tree woodlands), and their successional time may influence their ability to undergo northward and elevational range shifts. This issue is also compounded by the facts that many drought-adapted plants require events of greater-than-normal moisture to become established, and that native plants must contend with invasive weeds when they colonize new areas. In addition, the recovery time of some habitat types affects not only their ability to colonize, but also their ability to recover from secondary effects of climate change, such as prolonged droughts, large catastrophic fires, and insect outbreaks (West et al. 2009).

Increased Temperature

Increased temperatures are expected to cause shifts in seasonal prey availability for birds and change the phenology of breeding or migration of Priority species. Also, increased temperatures may favor the establishment of invasive weeds, which increases the threat

of catastrophic fires. Increasing temperature effects are difficult to separate conceptually from effects of decreased water availability, but at least in some cases, increased temperature alone poses threats to birds and habitats (Ackerly et al. 2010). For instance, recent research has shown earlier spring migration onset and a northward shift in wintering grounds for some birds (van Buskirk et al. 2009). Another widely-recognized concern tied to increasing temperatures is disruption to the synchronicity between landbird nesting and invertebrate production. If increased temperatures lead to earlier seasonal peaks in invertebrate production, landbird breeding seasons may become decoupled from the period of highest food availability. The overall consequences of changing migration and wintering patterns and changing food availability are not known for migrant birds.

Long-Term Climate Concerns

The impacts of climate change, including potential range shifts and extirpations (Carey 2009), are expected to occur beyond the ten-year scope of this document. Mitigating these impacts may require even more emphasis on landscape-scale approaches and adaptive management than has previously been the case (West et al. 2009). Updated information regarding the impacts of climate change and recommended land management responses should be incorporated into future revisions of this plan.

Water Management

Surface Water Diversions and Impoundments

Multiple demands for limited water always present conservation challenges in arid environments (Lemly 1994b). Surface water diversions refer to all infrastructure used to convey water away from its natural outflow system to agricultural and municipal uses. Most of this infrastructure has been in place for many decades in Nevada, but its conservation impacts continue in the form of dewatered rivers and streams, loss of floodplains and terminal wetlands, and degraded or fragmented riparian habitat. These structures continue to limit the potential for recovering species, but they also provide a significant opportunity for habitat restoration. As demonstrated by recent projects throughout Nevada and the West, riparian and wetland habitats can often be recovered by returning sufficient water to natural channels, creating the geomorphic or hydrological conditions that support regeneration and growth of mesic plants, and controlling weeds during the early recovery stages (e.g., Maguire and Hadley 2010).

Impoundments are generally installed along rivers or streams for upstream water storage. They often result in habitat conversion in downstream areas (Graf et al. 2002), but they also create habitat for species that favor large open-water bodies.

Groundwater Pumping

Unlike surface water diversions, groundwater pumping refers to all subsurface water retrieval for municipal and agricultural uses. It is a concern, if it occurs at levels that

significantly reduce water availability to habitats that depend on groundwater (Deacon et al. 2007). Groundwater pumping can lower water tables and reduce spring outflow if it occurs at unsustainable levels (e.g., Trammell et al. 2009). If water tables are lowered sufficiently, plants that require access to subsurface water may be negatively impacted (Brand et al. 2010a). The impact of groundwater pumping obviously depends on its rate, extent, and local recharge rates, which could also be affected in coming decades by climate change.

Flood Control

Flood control measures may include bank stabilization (rip-rapping, grading, installation of concrete) and channelization. As with surface water diversions, most of these measures were implemented in the past and are less often implemented during the present time. However, impacts of past flood control measures on riparian habitats and wetlands are expected to persist. Most flood control measures are restricted to larger rivers and streams that are near inhabited areas. In some areas (e.g., the Truckee River downstream from Reno-Sparks), river restoration projects have been implemented as an alternative to traditional flood control measures, which demonstrate opportunities for bird conservation implementation that may recover past bird population losses.

Agricultural, Industrial, and Urban Development

Agricultural Practices

Although the conversion of native habitat to cropland likely impacted birds historically, other birds have adapted to agricultural landscapes and benefit from their presence. Among beneficial agricultural practices are flood irrigation, wildlife-friendly harvest practices, and maintenance of shelterbelt areas. Conservation concerns that may occur in agricultural landscapes include applications of pesticides or herbicides if used intensively, and use of heavy machinery during sensitive nesting periods. As in most of North America, the trend toward replacing small, often family-operated ranch operations with industrial agriculture generally leads to negative impacts on birds, as trees, shelterbelts, return-flow wetlands, flooded fields, and native forbs and grasses are often sacrificed in the interests of operational efficiency.

Energy Development

This category includes all large-scale solar, wind, hydroelectric and geothermal energy projects, as well as traditional oil and gas, and their associated infrastructure. These energy developments have a large footprint on the landscape, result in a network of new access roads, and sometimes have high water requirements. Several large-scale renewable energy projects are currently being planned in Nevada (Devoe 2008), and they have the potential to negatively impact birds through habitat conversion and fragmentation, along with direct mortality from collisions. Research is still insufficient to understand the overall effects of wind farms on bird populations (Kuvlesky et al. 2007), but there are ways of lowering the risk of direct mortality by careful siting that avoids major flyways.

Mining

Generally, impacts from mining are similar those from energy development, but mining operations are not as limited to valley bottom areas and typically occur across a larger number of bird habitats. Mining operations also require water, and mine tailings and other soils around mining operations can impact water quality in surrounding habitats (Henny et al. 1994). Finally, mining claim markers have traditionally been left uncapped, which causes direct mortality in birds that attempt to roost in them and get trapped. Nevada is the largest U.S. supplier of gold, and a significant number of new mining applications are expected in the next ten years. Mine reclamation projects that involve significant habitat restoration can help mitigate impacts from mining operations.

Urban, Suburban, and Industrial Development

Primary threats from development lie in habitat conversion and edge impacts to adjoining habitats (Hansen et al. 2005, Schlesinger 2008). Indirect effects may occur as a result of other activities that are often associated with urban development, such as fuel reduction, fire suppression, introduced and human-subsidized predators (feral cats and others), invasive plants, and increased use for motorized recreation.

Recreation

Motorized Recreation

Dirt bikes, small all-terrain vehicles, and other four-wheel drive vehicles operating off of established roads may destroy vegetation, disturb burrows or nest sites, introduce weeds, cause erosion, and introduce a significant human disturbance into previously undisturbed habitats and into remote areas that may support the more sensitive bird species. In areas where off-highway vehicle (OHV) use is intense, new networks of informal trails may appear rapidly, causing habitat fragmentation (Ouren et al. 2007). Evidence of direct effects of OHV disturbance on bird abundance and nest success has been reported by Barton and Holmes (2007), but the greatest concern involves habitat impacts. Motorized recreation in the form of boating is also present in some open water habitats of Nevada, and effects on birds of this type of recreation are largely unknown.

Short-eared Owl.
Photo by Bob Goodman

Trails and Camping (Non-Motorized Recreation)

While generally considered low-impact, non-motorized recreation may result in small-scale habitat conversion from trails, campgrounds, and access roads. These impacts, however, often occur in areas such as aspen stands or along streams, which are particularly important to birds. Near heavily-used camping areas, understory vegetation may be cleared or trampled, and firewood removal may degrade habitat. Many opportunities exist to minimize potential impacts of non-motorized recreation through careful trail planning, camping site placement, and public education.

Invasive Plants

Invasive Weeds

Invasive weeds include a large variety of annual, perennial, and shrubby species that may or may not be classified as noxious. All habitat-altering species, such as perennial pepperweed, cheatgrass, red brome, medusahead, hoary cress, Russian knapweed, saltcedar, and many others are included in this concern category, and they can be significant threats in areas where they are aggressive invaders and are difficult to control (Dukes and Mooney 2004). Most of the problematic invasive plants in the Great Basin and Mojave Desert regions first established their presence in the state in the latter part of the 20th century. As a general rule, invasive weeds increase fire frequency and susceptibility in the habitat type they have invaded (Brooks et al. 2004), and thus, weed control can be a critical fire prevention measure and conservation strategy. In areas with significant infestations, invasive weeds often reduce both plant and wildlife diversity, and they can alter important ecosystem functions such as water availability and native plant recruitment. Most of the habitat types covered in this plan already have various degrees of weed invasion, and sagebrush in particular is vulnerable to local habitat conversion where weeds become the dominant vegetation.

Conifer Encroachment

Several habitat types are vulnerable to conifer encroachment in Nevada, particularly sagebrush and aspen. It is widely thought that conifer invasion is the result of decreased fire frequency, but the causal chain leading to conifer invasion may be multi-faceted and may also involve variations in long-term weather and climate patterns. In any case, conifer invasion into aspen stands is probably a process that is very distinct from pinyon-juniper invasion into sagebrush, and both have management implications that deserve further study.

Plant Disease and Pests

Insect Outbreaks

Spontaneous insect outbreaks may be a result of prolonged drought or of natural cycles in insect populations. This concern category does not include biocontrol measures, but

rather insect outbreaks that happen unintentionally. Currently, most insect outbreaks affect coniferous woodlands and sagebrush. The immediate effects of insect outbreaks on birds include loss of habitat components they require, for example dense tree or shrub canopies, and an increase in dry fuel load. Some bird species benefit in the short-term from natural outbreaks, if they are locally contained, but insect outbreaks are expected to increase in scale and frequency with a warming climate and greater vulnerability of drought-stressed vegetation, particularly in coniferous habitat types (Waring et al. 2009).

Plant Pathogens

Pathogens that have widespread impacts on their host plants may affect bird habitat in some cases (Kliejunas et al. 2009). For instance, recent aspen clone die-offs in the Great Basin region have been attributed to fungus infections. Pathogen outbreaks are expected to increase in the future with warming temperatures and reduced water availability that can lead to plant stress. Other than for aspen woodlands, plant pathogen effects on entire habitat types have, to our knowledge, not been studied in great detail in our region (although white pine blister rust has recently been found in Nevada; Smith et al. 2000).

Species Concerns

Habitat Fragmentation

This topic is intentionally presented in the Species Concerns section, because we distinguish between habitat loss and degradation, which affect all species that occupy that habitat type, and the additional needs of species that require large intact landscapes. Examples include the Greater Sage-Grouse, Golden Eagle, and Northern Goshawk, birds with large home ranges that are vulnerable not only to changes in local habitat condition, but to a significant degree on the compounding of multiple threats across the landscape. Other species, such as Sage Sparrow, may not have large home ranges in comparison to a raptor, but they are most abundant in areas where large habitat tracts remain unfragmented.

Direct Mortality

Electrocution and Collision

Some species are particularly vulnerable to mortality from collisions with infrastructure (e.g., windmills, towers, powerlines; Bevanger 1994) or from electrocution by powerlines (Lehman 2001). Guidelines exist that can reduce mortality from these sources (e.g., APLIC 2006).

Black-necked Stilt. Photo by Larry Neel

Introduced and Human-Subsidized Predators

In Nevada, most introduced predators that pose threats to birds are free-ranging pets or feral descendants of pets, particularly cats (Hilty et al. 2006). Near human population centers and rural settlements, both pet cats and feral cats can cause substantial mortality to nearby bird populations. Particularly vulnerable are ground- and near-ground nesters, but any species with a vulnerable fledgling stage may be affected. Human-subsidized native predators, such as Common Ravens, coyotes, or raccoons may also pose local threats in some areas (Kristan and Boarman 2007), but overall, human-subsidized predators are a lower concern than introduced predators.

Illegal Take

This category includes all illegal shooting, baiting, or other direct killing of birds, as well as illegal take of nestlings for falconry. Shooting and baiting was historically a concern for a number of species, but presently it is an issue primarily for raptors that are erroneously perceived as a threat to livestock or pets. The current impact of illegal take of raptors for falconry is not well documented, but the opinion of the committee was that it still presents a tangible threat to some species.

Ecotoxicology

Pesticides and Herbicides

Pesticides and herbicides are probably less of a concern in Nevada than in states with more extensive agricultural development, but local threats may exist. Some bird die-offs have occurred in the Great Basin as a result of pesticide use, for example in a population of sage-grouse in southern Idaho (Blus and Henny 1997). Although DDT has been

banned in the U.S. for decades, it can still be detected in some aquatic birds in Nevada, probably as a result of exposure on their wintering grounds (Yates et al. 2010).

Mercury

Mercury contamination is a legacy of mining in some areas of Nevada, especially where large mining operations exist in catchment basins of waterways, and mercury has been shown to have at least some effect on bird reproduction (Custer et al. 2007). Interactions with other physiological stressors likely exist (Hill et al. 2008), which can either mitigate or compound mercury effects on birds. Mercury contamination and bioaccumulation is a concern particularly for aquatic birds that feed on fish.

Disease and Parasitism

West Nile Virus

West Nile Virus has been shown to cause mortality in a variety of raptor species, corvids, and in Greater Sage-Grouse (Naugle et al. 2005). It is a mosquito-mediated disease that has been confirmed to be present throughout Nevada. It is currently not known how large a contribution this disease makes to species-specific bird mortality in Nevada.

Botulism and Avian Cholera

Several species are known to be vulnerable to outbreaks of these diseases, primarily waterfowl, colonial waterbirds, shorebirds, and marshbirds (Friend et al. 2001). As with West Nile Virus, the relative contribution of these diseases to bird mortality is currently unknown, but their incidence in Nevada is thought to be lower than in other nearby regions, including the Great Salt Lake. Outbreaks of botulism and avian cholera are usually associated with persistent stagnant conditions in water bodies used for staging and wintering.

Brown-headed Cowbird Parasitism

Cowbird parasitism was considered a major concern for many songbirds in recent decades. Cowbirds are a native species, but they have spread into new regions and habitat types, and have greatly increased in abundance in many areas (Rothstein 1994). Research on the impacts of cowbird parasitism on host nest success have shown mixed results, and as a result, concerns about cowbird impacts have been somewhat downgraded in recent years. Although some Priority species experience high nest parasitism rates in certain locations (especially Bell's Vireo and Southwestern Willow Flycatcher), it is unclear whether this represents a true limiting factor for their populations. In the case of the Willow Flycatcher in southern Nevada, cowbird control efforts had mixed results in terms of increasing nest success rates (e.g., Laymon and Halterman 1998). Parasitism impacts likely decline if patch sizes of intact habitat can be increased, since cowbirds utilize habitat edges and other open areas to visually search for nests to parasitize.

Introduction to Habitat Accounts

Overview

In the habitat accounts, we summarize the basic conservation and management information that addresses the habitat needs of the Priority bird species that are associated with each habitat type. As in the species accounts, the first page represents a concise summary of pertinent information, drawn primarily from bird conservation data, in a tabular format. We encourage the user to make use of that page to gain a basic understanding of:

1) Habitat and landscape features that are important to birds
2) Priority species potentially found within the habitat type
3) The conservation concerns relevant to the habitat type
4) Regions of greatest conservation interest
5) Important Bird Areas that contain significant amounts of the habitat type

Below we describe the information that can be found in each habitat account.

Conservation Profile

Estimated Cover in Nevada: Estimate of total area covered by the habitat type, based on our GIS habitat map (described in *Appendix 1: Methods*).

Landownership Breakdown: Breakdown of the habitat type by owner / managing agency.

Priority Bird Species: Priority species that use the habitat type to a significant degree. Species at the bottom on the list may be listed in parentheses, which indicate that the bird uses the habit occasionally, seasonally, or opportunistically, but is not primarily dependent upon it. This list allows the reader to easily consult those species accounts that may be relevant to a given habitat type.

Indicator Species: Species that are not Priority species in this plan, but can provide an index of habitat integrity based on their presence or abundance. Indicator species are listed here if: 1) Priority species are rare or infrequent enough that they cannot be relied upon as a gauge of habitat integrity, or 2) Priority species only encompass certain aspects of habitat integrity. **Indicator species should primarily be used for monitoring the effectiveness of conservation implementation**. We selected species that we expect to respond positively and relatively quickly to substantive habitat improvements.

Most Important Conservation Concerns: List of concerns and challenges that were identified by the threat committee as being relevant to the habitat type within the next 10 years.

Habitat Recovery Time: Estimated time needed to restore this habitat type from complete destruction to the seral stages that are suitable for its Priority species. This information was often not formally available to us. Therefore, we did our best to estimate recovery times based on recent restoration projects, historic information, and the life history of the oldest plant forms in the seral stages needed by priority species.

Regions of Greatest Conservation Interest: List of regions in Nevada where conservation action for this habitat type would be most beneficial.

Important Bird Areas: List of Important Bird Areas as identified by the Nevada IBA program that support significant amounts of this habitat type and its associated priority species.

Key Bird-Habitat Attributes

This table includes habitat parameters that were identified as important to the conservation of Priority species in that habitat type, and to the integrity of the habitat type itself. In general, we looked for commonalities among the habitat needs of the Priority birds associated with each habitat type. The table is customized for each habitat type to best reflect those habitat and landscape parameters that are deemed most important for bird conservation. We emphasize the entry for "**Ideal Scale for Conservation Action**", which reflects our best estimate of how much land would be ideally used for management implementation to accommodate the full suite of priority species.

Habitat Map

We display a map that shows approximately how each habitat type is distributed in Nevada (see *Appendix 1:Methods* for details). We encourage readers to use this map as an indication of **how prevalent a habitat type is within a particular region,** but caution that the map should not be assumed to be precise at increasingly finer resolutions. Many important bird habitat types occur in patches that are too small to visualize in the maps, or that simply are not mapped accurately.

Overview Section

In the overview section, we summarize relevant information about the **history, natural history, and conservation issues** of each habitat type as it relates to bird conservation. Because our expertise encompasses primarily birds, we tend to focus on the habitat factors that are relevant to birds, rather than attempting to present an in-depth review of all habitat conservation issues.

Main Concerns and Challenges

In this section, we provide a summary of **main concerns and challenges** for the habitat type, as were determined by a committee comprised of members from the plan revision working group. We only list those concerns ranked relatively high for each habitat type

.

Habitat Diagram

To aid in communicating our vision for habitat conservation, we include a diagram **of an idealized landscape** that summarizes the features important for bird conservation within each habitat. This diagram compresses various habitat features into a single view, but in reality the habitat elements displayed in the diagrams may co-occur only within relatively large areas.

The pinyon-juniper / sagebrush interface near McGill,
White Pine County. Photo by John Boone.

Conservation Strategies

Finally, we present the **conservation strategies** that we believe are most effective for bird conservation in each habitat type, subdivided into strategies that focus on: 1) habitat, 2), research, planning, and monitoring, and 3) public outreach. Conservation strategies were developed to accommodate the shared needs of Priority species within each habitat type. For complete conservation planning, **we encourage plan users to consult the species accounts and conservation strategies for each of the species that occur in their planning area**. For this, we recommend first reviewing the range maps of each of the species listed in the Conservation Profile table on the first page, and then reviewing the full accounts of the species that are likely to occur in a planning area. The species accounts will provide greater detail on the conservation needs of each species than can be summarized in the habitat accounts.

Cottonwood gallery forest on the Lower Truckee River
near Wadsworth. Photo by John Boone.

Agriculture

Agricultural area south of Lovelock, Pershing County. Photo by Elisabeth Ammon.

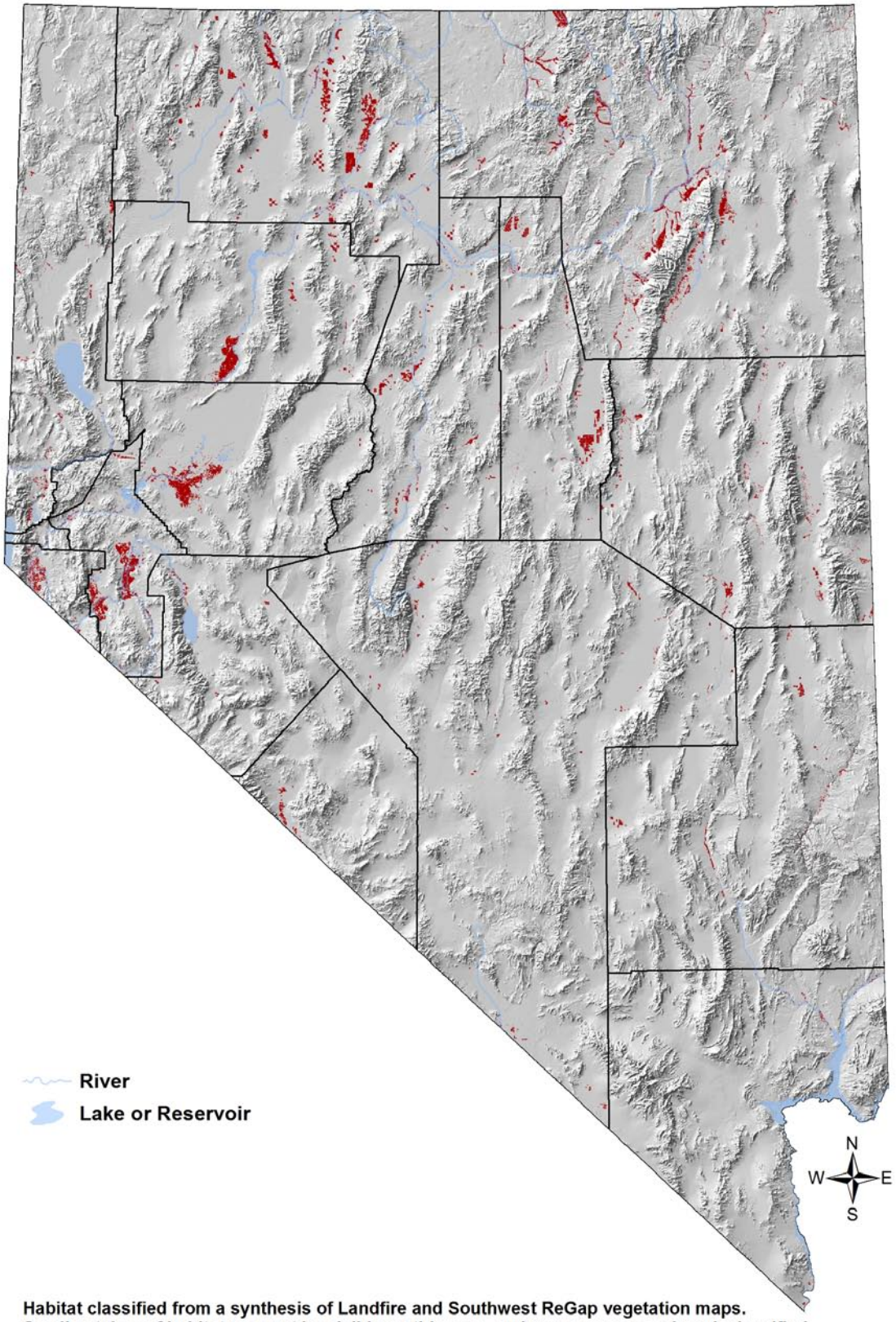
Key Bird-Habitat Attributes

Plant Species Composition	Multi-species mixtures ideal for grass; crops including barley, corn, wheat and similar large-seeded crops good for fall migrants; alfalfa suitable for Greater Sage-Grouse
Ideal Scale for Conservation Action	Whole field and border habitats
Crop Management	Haying schedules that avoid the main breeding season (May – mid-June) most suitable; flush-bars on agricultural equipment extremely beneficial
Trees	Old-growth deciduous trees desirable for nesting and perching of raptors and owls
Windbreaks and Hedgerows	Rows of native willows, alders , and other shrubs along ditches and streams particularly suitable for some species
Mosaic	Adjacent or imbedded wetlands, wet meadows, and riparian areas increase habitat value for Priority species
Other Features	Protection of nearby streams, springs, rivers from chemical and livestock impacts enhances overall wildlife value of agricultural lands Establishment of feral cats should be discouraged

Conservation Profile

Estimated Cover in Nevada	323,600 ha [800,000 ac] 1.1% of state
Landownership Breakdown	Private = 89% BLM = 5% Tribal = 3% Other = 3%
Priority Bird Species	Gambel's Quail White-faced Ibis Swainson's Hawk Sandhill Crane Long-billed Curlew (Cinnamon Teal) (Greater Sage-Grouse) (Snowy Egret) (Bald Eagle) (Prairie Falcon) (Franklin's Gull) (Short-eared Owl) (Abert's Towhee) (Tricolored Blackbird)
Indicator Species	Bobolink (in northern and NE Nevada) Winter raptors (Rough-legged Hawk, Ferruginous Hawk, and others)
Most Important Conservation Concerns	Climate change (change in precipitation and temperature) Groundwater pumping Change in agricultural practices Urban, suburban, and industrial development Invasive weeds
Habitat Recovery Time	2 years
Regions of Greatest Conservation Interest	Oasis, Overton, and Pahranagat Valley areas in the south; Lahontan, Smith, Mason, Ruby, Paradise, Kings River, Quinn River, and Humboldt River valleys in the north
Important Bird Areas	Boyd Humboldt Valley Wetlands Carson Valley Lahontan Valley Wetlands Lower Muddy River Meadow Valley Wash North Ruby Valley Oasis Valley Pahranagat Valley Complex Virgin River

Agriculture



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps.
Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Agriculture

Overview

Agriculture in Nevada centers in most cases around livestock production, with grasses, alfalfa, irrigated pastures, and a variety of grains being grown on the majority of active farmlands. For the purpose of this plan, we refer to agricultural lands as actively irrigated crop lands, although many of our conservation recommendations also apply to non-irrigated pastures and hayfields. Irrigated agricultural lands are geographically restricted in Nevada, comprising only about one percent of total land cover, yet they support several Priority bird species in Nevada, which in some cases use agricultural lands year-round. The beginning of irrigation season in April features such species as White-faced Ibis, Sandhill Crane, and Long-billed Curlew, which seek out flood-irrigated fields to probe and glean for invertebrates after arrival from migration. These species often end up nesting on the ground in or near agricultural fields in many parts of the state, usually from May through early July. Other species, such as Swainson's Hawk and Short-eared Owl, hunt for rodents in croplands. Greater Sage-Grouse occasionally bring their broods into agricultural fields for cover, forage, and night-roosting. During the fall migration season, waterfowl and waterbirds (including Sandhill Cranes) forage on crop waste and tilled fields to fuel up for migration and wintering.

Crops such as winter-wheat, rye, and corn are important resources for migrating, staging, and wintering waterfowl, and wheat and barley crops often support waterfowl at other times of year (Kadlec and Smith 1989). Old, deciduous border trees support raptor nests and roosts, and other native buffer zones around fields are often used by ground-nesters, such as Cinnamon Teal and Short-eared Owl. Nearby wetlands are also beneficial for birds in agricultural settings, because they provide additional foraging opportunities for species that rely on aquatic invertebrates and pond vegetation. Adjoining wet meadows with high species richness in grasses, sedges, rushes, and forbs increase overall habitat value for several species, including the Indicator species Bobolink. In Figure Hab-1-1, we illustrate an idealized agricultural landscape consisting of a hayfield or pasture with adjoining buffer areas.

Main Concerns and Challenges

The following eight concerns were identified in our planning sessions for Agriculture habitat in Nevada:

- Urban, suburban, and industrial development
- Change in agricultural practices (loss of traditional methods)
- Pesticides, insecticides, and herbicides
- Change in precipitation and snowmelt resulting from climate change
- Change in temperature resulting from climate change
- Groundwater pumping
- Invasive weeds
- Introduced or human-subsidized predators

The primary concerns for agricultural areas are habitat conversion for urban and other uses, and changes in agricultural practices from relatively small-scale operations to mechanically intensive industrial agriculture. Small-scale family-owned operations usually feature most of the habitat

elements that maintain Priority bird species, particularly native buffer areas around fields, light applications of pesticides, retention of trees and shelterbelts, and allowing return-flow wetlands to persist. If herbicides, insecticides, and rodenticides are used intensively, they may inadvertently affect birds that ingest food items containing these chemicals.

We also included climate change effects (changes in precipitation, snowmelt, and temperature) in our list of concerns for agricultural lands. Because of the economic significance of agricultural lands of Nevada, water allocations will likely mitigate for these effects as long as it is feasible to sustain a given agricultural operation. However, in the longer term, our concerns are that climate change will have a compounding effect on other conservation concerns (e.g., increased groundwater pumping, reduction of nearby wetlands and shelterbelts, increased pressure toward water and crop efficiency), and that it will eventually threaten the sustainability of some agricultural operations.

Invasive weeds affect agricultural areas (especially native buffer zones and shelterbelts) in similar ways as wet meadow and riparian areas, by reducing habitat suitability for birds. Therefore, weed control for invasive species may not only benefit the agricultural operation, but also help to retain suitable habitat for Priority bird species. However, aggressive application of herbicides can have unintended effects on birds through toxicity and reduction in nest success.

Introduced or subsidized predators are a concern in agricultural areas, particularly feral cat colonies that are often associated with human settlement. Even if artificial food supplies are provided, feral cats can cause significant mortality rates in birds, particularly those that nest on or near the ground, or use ground vegetation for cover. Human-subsidized predators, such as raccoons, coyotes, and ravens, take advantage of increased rodent populations, crop waste, and livestock feed that is often available near agricultural operations, and in turn, they may engage heavily in nestling predation. This is why we recommend removing such subsidies as much as is feasible. Finally, one conservation concern that occurs occasionally in agricultural operations is the perception of raptors as a threat to livestock or pets, which is largely unfounded. Most raptors that occur in agricultural areas prey on rodents and rabbits that occur in open fields, and are therefore generally beneficial to the goals of agriculture.

Agriculture

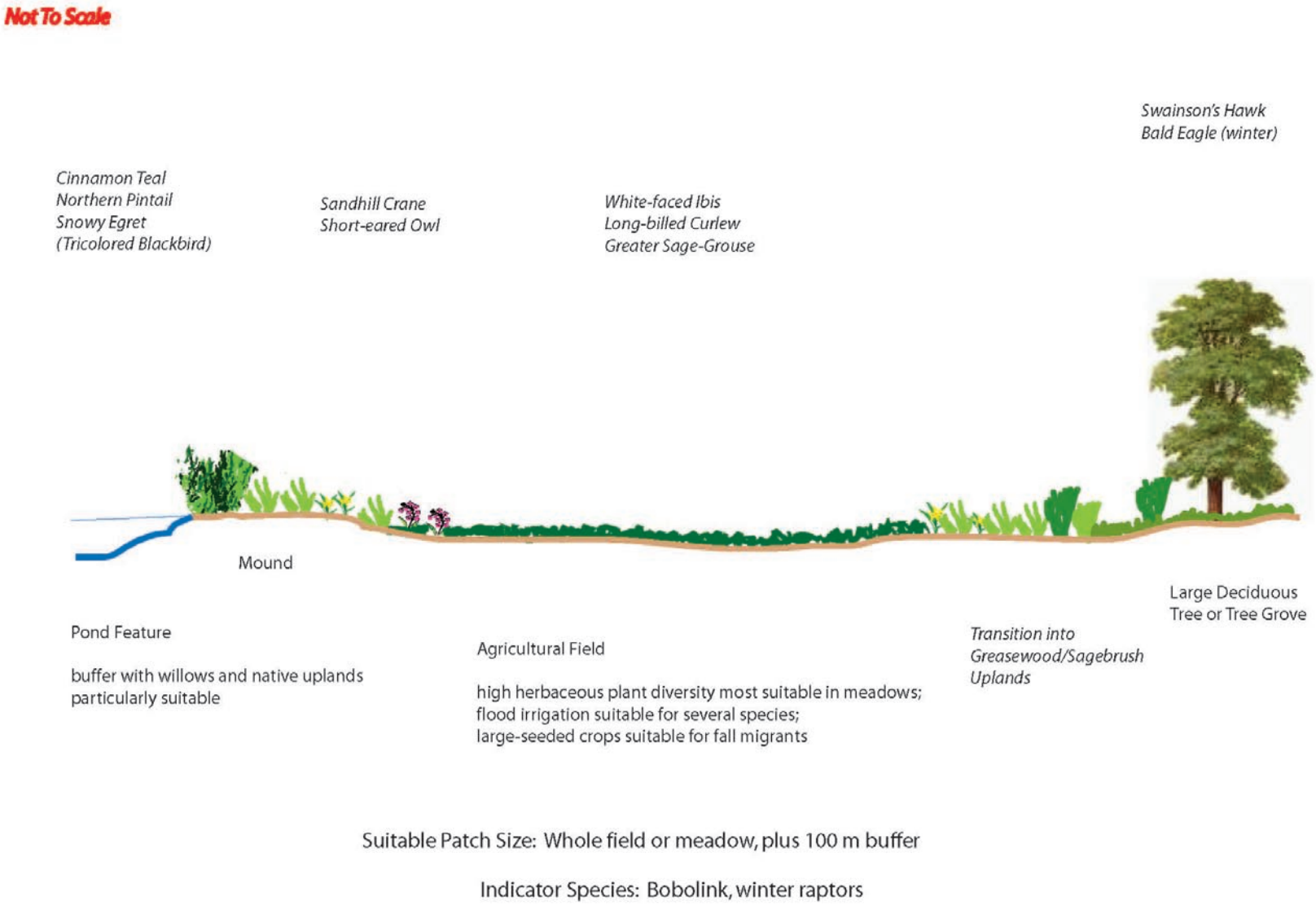


Figure Hab-1-1: Idealized agricultural landscape to maximize the number of agriculture associated Priority species.

Conservation Strategies

Habitat Strategies

- **Manage at the scale of one or multiple irrigated fields**, ideally with each field having a buffer of native vegetation, and the entire area having a 100 m [330 ft] buffer of mostly native vegetation (but may include maintenance roads, ditches, fences, or trails). **Single old trees** or tree stands are beneficial to several species and attract species that feed on rodents. Bordering windbreaks and **hedgerows** should ideally consist of native species such as willow, alder, rose, etc.
- If **wetlands** are nearby, any measures to protect water quality are beneficial to birds. Shorelines buffers (≥ 100 m [330 ft]) are important for ground-nesting species.
- Removal of **invasive plants** should be followed by **active restoration** of agricultural crops or native vegetation in the removal sites, as weedy species often take advantage of disturbed soils and become more easily re-established in the absence of competition.
- The majority of priority bird species nest between May 1 and July 15, and some of them are particularly sensitive to nest disturbance. We recognize that necessary agricultural operations also occur in this time period, but **recommend delaying harvest or other vegetation removal**, ideally through mid-June. The most sensitive period for ground-nesting species is the beginning of the nesting season (**1 May – June 15**), and any effort to defer removal of groundcover during all or even some of this period will be extremely beneficial for these species.
- Installation of **flush-bars** on agricultural equipment, **escape ramps** for livestock waterholes, **perch sites** for rodent-hunting raptors, and **wildlife-friendly fencing** are all extraordinarily valuable for reducing inadvertent bird mortality and attracting birds. Recommendations for these and for **wildlife-friendly shelterbelt plants** can be obtained through the Nevada Important Bird Area program and other partners.

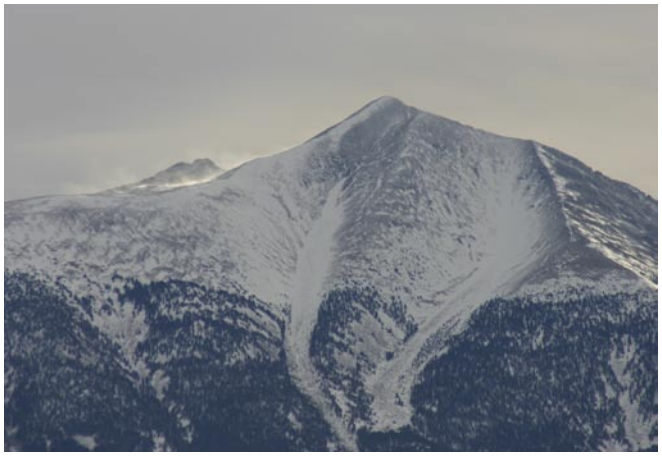
Research, Planning, and Monitoring Strategies

- As losses of crop lands to **habitat conversion** continue, **mitigation** for these losses should be actively planned through open space, conservation easements, or other assistance programs for agricultural lands, particularly in **Important Bird Areas**.
- Continue **long-term monitoring of landbirds** statewide through the Nevada Bird Count.
- Consider **expansion of statewide monitoring** to assess status and habitat use of migrating and wintering species of agricultural areas.

Public Outreach Strategies

- **Promote pride of landowners in wildlife** attracted to their property. Outreach may include pocket field guides to birds, tips on agricultural practices and habitat features that enhance habitat value to birds, and natural history related “fun facts.”
- **Provide educational materials** on threats from domestic and feral cats to birds, benefits of birds to agricultural operation (control of rodents), and on wildlife-compatible crop management, grazing practices, and weed control.

Alpine



Alpine habitat on Wheeler Peak, White Pine County. Photo by Elisabeth Ammon.

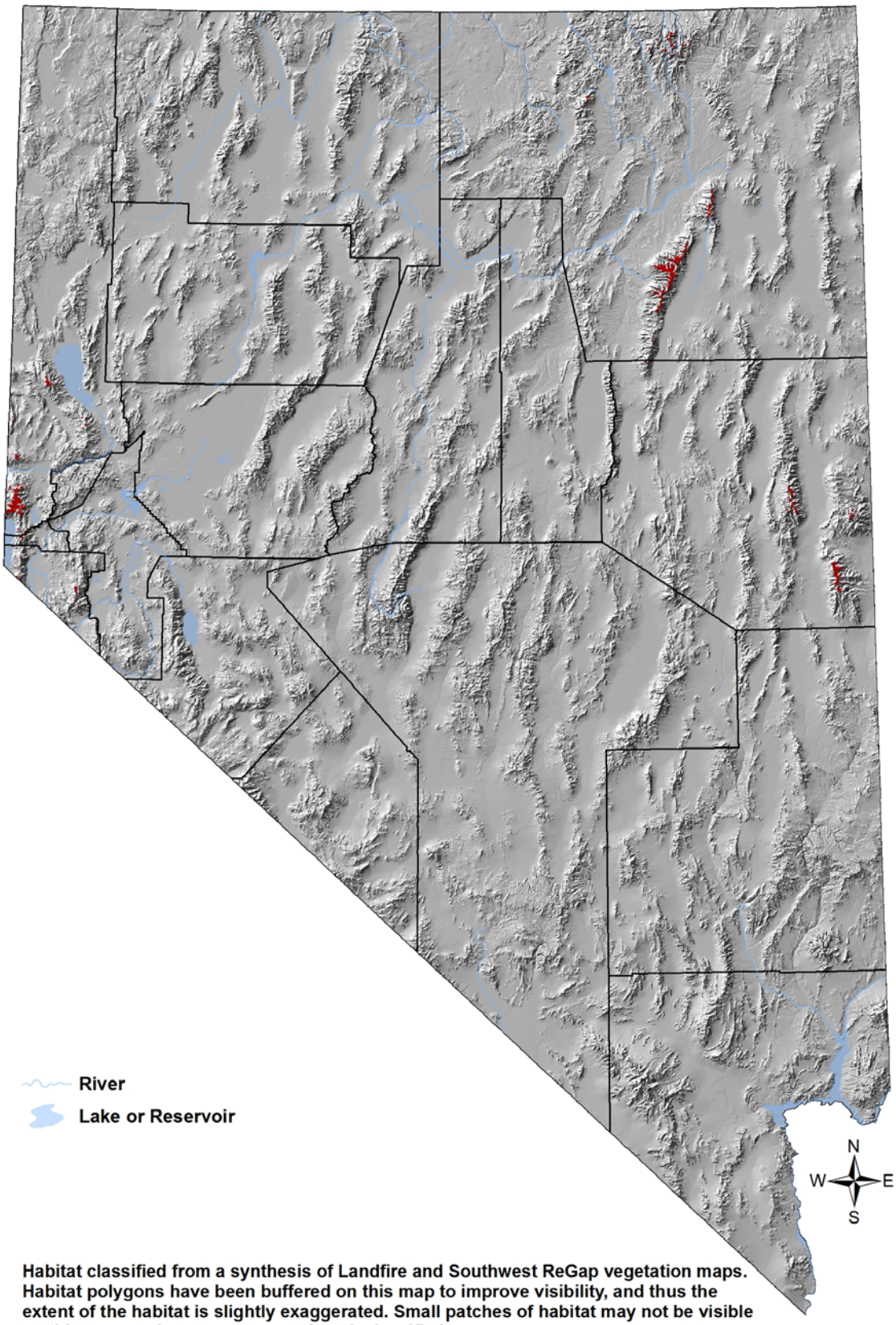
Key Bird-Habitat Attributes

Plant Species Composition	Low-growing shrubs of multiple species, flowering forbs, graminoids; interspersed with snowpockets, cliffs, and talus
Ideal Scale for Conservation Action	Whole patch
Vegetation Structure	Mostly low-growing shrubs, but horizontal diversity (mosaic of different patches) increases value; forbs particularly beneficial
Mosaic	Nearby mesic areas (snowpocket aspen, willows, and streams) increase habitat value Adjacent or embedded cliffs may increase habitat value
Other Features	Abandoned mineshafts, tall cliffs (>30 m [100 ft]), and talus fields add habitat value

Conservation Profile

Estimated Cover in Nevada	789 ha [1,950 ac] < 0.01% of state
Landownership Breakdown	USFS = 70% NPS = 21% BLM = 7% Other = 2%
Priority Bird Species	Black Rosy-Finch
Indicator Species	None
Most Important Conservation Concerns	Climate change (change in precipitation and temperature)
Habitat Recovery Time	50-100 years
Regions of Greatest Conservation Interest	Northeastern and eastern Nevada mountain ranges, Carson Range, Spring Mountains
Important Bird Areas	Carson Range Goshute Mountains Great Basin National Park Jarbidge Mountains Mount Grant Northern Snake Range Ruby Mountains Spring Mountains Toiyabe Range

Alpine



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps. Habitat polygons have been buffered on this map to improve visibility, and thus the extent of the habitat is slightly exaggerated. Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Alpine

Overview

Alpine birds and their habitats have been studied very little in Nevada and, therefore, not much is known about their conservation needs. Traditionally, few land uses have occurred in Nevada's alpine zone due to difficult access, long periods of snowpack, and low productivity of alpine vegetation. Similarly, major disturbance regimes such as fire play little or no role in maintaining alpine vegetation. As a result of its short growing season and cold temperatures, alpine vegetation requires an enormous recovery time after destruction, which is estimated here at 50-100 years. A well-developed layer of forbs and grasses is probably critical to wildlife using alpine areas, which either depend on these plants directly, or depend indirectly on the insects supported by them. Alpine areas in Nevada are fairly small and isolated in comparison to some other western states. The only Priority species designated for this habitat, the Black Rosy-Finch, is documented from only the larger alpine patches, and thus our emphasis for monitoring and conservation are Nevada's larger alpine areas, specifically those that occur in the Carson Range, the Ruby Mountains, the Snake and Schell Creek ranges, and the Jarbidge Range. However, it is worth noting that smaller alpine areas in central Nevada have received very little monitoring effort, a situation that should be rectified. To a large degree, Alpine habitat is naturally protected by its relative inaccessibility, but some areas may be used for recreation and mining activities, which should be monitored to determine whether conservation action is necessary. The primary threat that we currently recognize is climate change, which threatens to eliminate alpine areas due to warming trends. The Black Rosy-Finch is the only Priority species whose nesting is restricted to the alpine tundra, and it is therefore an often-cited bellwether species for gauging the impacts of climate change in the West.

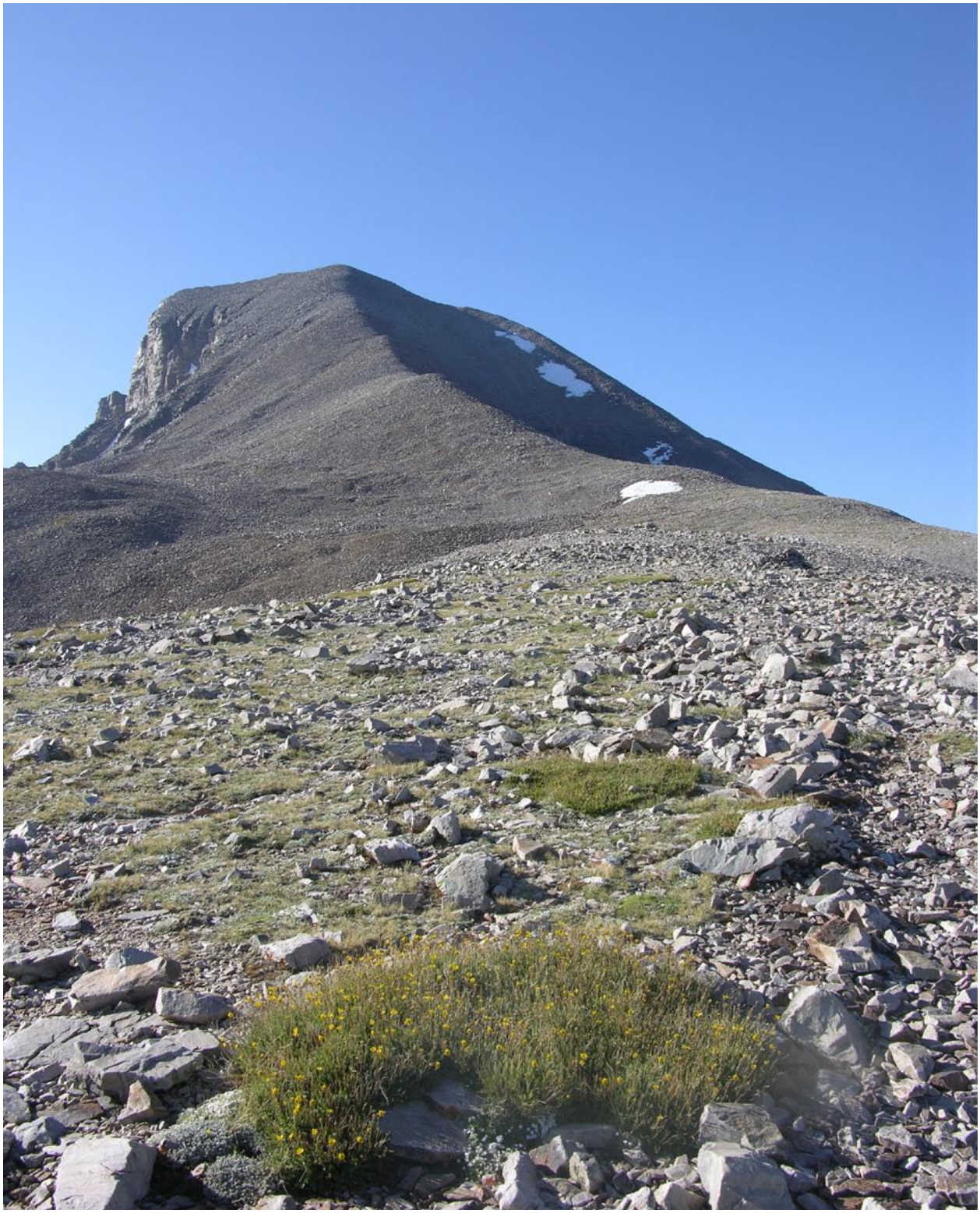
Main Concerns and Challenges

The following top two concerns were identified in our planning sessions for Alpine habitat in Nevada:

- Change in precipitation and snowmelt related to climate change
- Change in temperature related to climate change

Because alpine tundra is adapted to long snowpack periods and very short growing seasons, an increase in temperature and reduction in snowfall are clear threats to this vegetation and to the bird species that are most closely tied to it. In contrast to other habitat types in Nevada, alpine zones do not have the potential recourse of shifting their distribution upward in elevation. The only local actions that are possible to mitigate this threat are to avoid compounding threats (such as heavy recreational uses) where possible.

Alpine



Alpine habitat, Wheeler Peak, White Pine County. Photo by John Boone.

Alpine

Figure Hab-2-1: Idealized alpine landscape to maximize the number of alpine associated priority bird species.

Conservation Strategies

Habitat Strategies

- **Manage at the scale** of the whole mountaintop's alpine zone, if possible, with connectivity to adjacent habitat types (Coniferous Forest, Montane Shrubland, Montane Riparian, Aspen). High shrub species diversity, high patch type diversity that includes talus, snowpocket wetlands, and snowfields, and a healthy forb, grass, moss, and lichen component all benefit priority bird species and their prey
- Proximity to **water** (riparian areas, springs, wet meadows), and presence of **cliffs** (> 30 m [100 ft]) tall raise the priority level of a site for bird conservation

Research, Planning, and Monitoring Strategies

- **Monitor changes** in Nevada's alpine communities in a changing climate. Mitigation options are probably very limited in Nevada, but research and planning that explores mitigation opportunities, particularly in a regional context, is a high priority
- **Expand the Nevada Bird Count program** to include coverage of alpine tundra for long-term monitoring of climate change effects

Public Outreach Strategies

- **Promote public understanding of climate change** effects through additional outreach, using alpine tundra landscapes and the Black Rosy-Finch as bellwether cases.
- Encourage **low-impact recreational uses** of alpine tundra

Aspen

Aspen patch in the Great Basin (Peavine Peak, Washoe County).
Photo by John Boone.

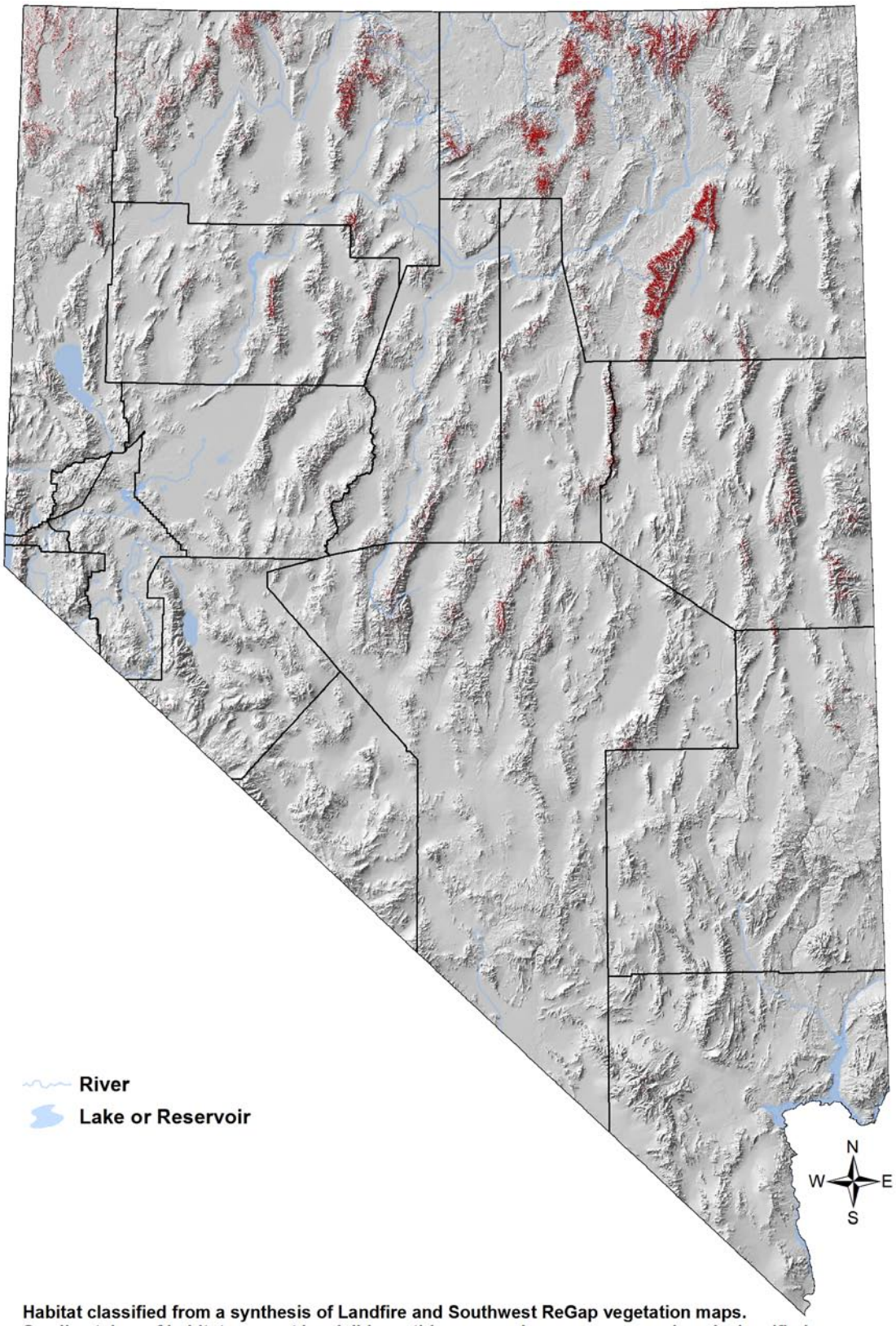
Key Bird-Habitat Attributes

Stand Structure	Aspen of various age classes, with understory of mesic shrubs, grasses, and flowering forbs Canopy closure ~ 30 – 40% ideal Understory cover > 50% ideal Large standing snags > 30 cm [12 in] dbh
Ideal Scale for Conservation Action	Whole stand
Plant Species Composition	Aspen, wild rose, currant, and other mesic species, flowering forbs and native graminoids
Understory	Intact graminoid and flowering forb understory important Understory cover > 50% ideal
Mosaic	Juxtaposed or interspersed Montane Riparian and Montane Shrubland habitat beneficial (except where bordered by Coniferous Forest)
Presence of Cliffs > 30 m [100 ft] Tall	Presence of tall cliffs increases value to birds

Conservation Profile

Estimated Cover in Nevada	274,000 ha [677,200 ac] 1% of state
Landownership Breakdown	USFS = 51% BLM = 31% Private = 14% Other = 4%
Priority Bird Species	Sooty Grouse Dusky Grouse Mountain Quail Northern Goshawk Flammulated Owl Calliope Hummingbird Rufous Hummingbird Lewis's Woodpecker Williamson's Sapsucker Green-tailed Towhee (Greater Sage-Grouse)
Indicator Species	Dusky Flycatcher Orange-crowned Warbler MacGillivray's Warbler Red-naped Sapsucker
Most Important Conservation Concerns	Livestock and wild horse grazing Conifer encroachment Changes in fire regimes Motorized and non- motorized recreation Climate change (change in precipitation and temperature) Plant pathogens Insect outbreaks Invasive weeds Mining
Recovery Time	30 years
Regions of Greatest Conservation Interest	Elko, Humboldt, Washoe, White Pine, Lander, Eureka, and northern Nye counties
Important Bird Areas	Bilk Creek-Montana Mountains Carson Range Great Basin National Park Jarbidge Mountains Northern Snake Range Ruby Mountains Sheldon NWR Spring Mountains Toiyabe Range

Aspen



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps.
Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Aspen

Overview

Quaking aspen (*Populus tremuloides*) is the most widely distributed native tree in North America (Rogers et al. 2007), but it covers only about one percent of Nevada's landscape. These limited patches of aspen rank among Nevada's most important wildlife habitats (Flack 1976, Dobkin et al. 1995), and also among the most threatened. From our observations during Nevada Bird Count surveys, the majority of Nevada's aspen stands are small, and they are most often associated with an obvious water source, such as alpine snowpockets, montane riparian systems, montane springs, and ephemeral snowmelt drainages. The majority of scientific literature about aspen comes from studies of larger, "upland" stands that are common in the Rocky Mountain states (e.g., Flack 1976). In Nevada, however, large non-riparian stands are mostly restricted to areas with higher-than-average precipitation, such as the Ruby Mountains. Therefore, more study is needed of small stands of aspen in more arid settings, especially in the central Great Basin.

Aspen woodlands invariably draw the attention of hikers, campers, riders, and passing sightseers, and they are also sought out by grazing animals for forage and shade. Aspen stands are likewise a magnet for birds for several reasons. They are associated with relatively moist, rich soils, and are therefore more productive than uplands (Rogers et al. 2007). Aspen also stand out in their propensity to become infected with heartrot fungi (primarily *Phellinus tremulae*) while still alive, with up to 20% of trees infected by 100 years of age (Hart and Hart 2001). This makes them ideal for the construction of nest cavities by birds. The heartwood is easily excavated while the sapwood remains intact, allowing a tree to be used for years, if not decades, before it finally dies (Hart and Hart 2001). Because a dead aspen usually falls within a few years, more cavities can typically be found in live aspens than in dead ones. The cavities created by woodpeckers also benefit many secondary cavity nesters, such as House Wrens, swallows, chickadees, bluebirds, and small owls (Dobkin et al. 1995).

Aspen is unusual in that it is a clonal species, with short-lived (generally < 150 years) genetically identical trees arising from the parental root system (Rogers et al. 2007). Most aspen reproduction in the American West is vegetative, with suckers arising from nodes on the roots. Sexual reproduction via seed is extremely rare in this region, and the modern climate is believed to be mostly unsuitable for seeds to germinate and establish. Romme et al. (2001) argued, however, that while vegetative reproduction is effective for maintaining aspen in a stable climate, occasional seedling establishment is necessary for aspen to adapt to changing environmental conditions and to colonize new patches. While some stands remain stable over long periods (Mueggler 1985), most stands occasionally require a stand-replacing disturbance, such as fire, in order to persist over the long term. When the overstory trees are killed in a healthy stand, growth suppressants produced in the leaves no longer reach the roots, and new stems resprout profusely throughout the clone (Schier et al. 1985).

Aspen stands typically have high bird abundance and richness, and thus it is critical for avian conservation to protect as many existing aspen stands as possible (Griffis-Kyle and Beier 2003). Figure Hab-3-1 illustrates an idealized aspen stand in a typical Nevada setting with the habitat elements required by Priority bird species.

Aspen

Main Concerns and Challenges

The following top conservation concerns were identified for aspen in our planning sessions:

- Persistent overgrazing by domestic livestock and feral horses
- Conifer encroachment (primarily in western Nevada)
- Changes in fire regimes
- Motorized and non-motorized recreation
- Change in precipitation and snowmelt resulting from climate change
- Change in temperature resulting from climate change
- Plant pathogens
- Insect outbreaks
- Invasive weeds
- Mining (where habitat conversion occurs)

Most researchers and forest managers have concluded that a large proportion of the aspen stands across Nevada and much of the west are in decline (Brown et al. 2006). In many regions, it is easy to locate sites of stands that are now extirpated, or in imminent danger of extirpation, due to lack of vegetative regeneration. Causes of decline vary by region, but commonly-attributed factors include sustained overgrazing (which we define to include over-browsing in the context of Aspen habitat), reduced fire return intervals, invasion of aspen stands by conifers, climate change effects, plant disease, and heavy recreational use. These factors can conspire to prevent or discourage vegetative recruitment and, when sustained for long periods of time, lead to stand senescence and eventual death. Additionally, they often result in degradation or destruction of the understory layer. Threats may be compounded, for example, when fire removes the overstory trees and overgrazing eliminates the post-fire regeneration (Mueggler 1985, Schier et al. 1985). Large-scale mortality of aspen also has been increasing in recent years in a phenomenon known as “Aspen Dieback” (or Sudden Aspen Decline). This not only causes stem die-off, but also kills much or all of the root systems of aspen clones. Stand maturation, drought, elevation, aspect, and secondary agents, such as cankers, bark beetles, borers, all appear to play a role (Worrall et al. 2008), but the phenomenon is still poorly understood.

In western Nevada, conifer invasion is perhaps the most immediate threat to persistence of aspen stands, but in many other parts of Nevada, sustained grazing that discourages the establishment of young trees has emerged as a leading concern (Kay 2001). Low elevation aspen stands are particularly vulnerable because of their accessibility. When overgrazing continues over many years or decades, aspen clones eventually become physiologically exhausted, lose their ability to produce new growth, and die out. Aspen stands at risk for this outcome have a distinctive appearance – they consist exclusively of older trees with relatively little understory vegetation. In fact, degraded aspen woodlands have become so prevalent in Nevada that they are assumed by many to represent the normal condition. However, if successful stem regeneration is allowed to occur occasionally (by providing occasional rest periods from grazing pressure), young aspen stems should become well enough established to rejuvenate the stand.

Aspen

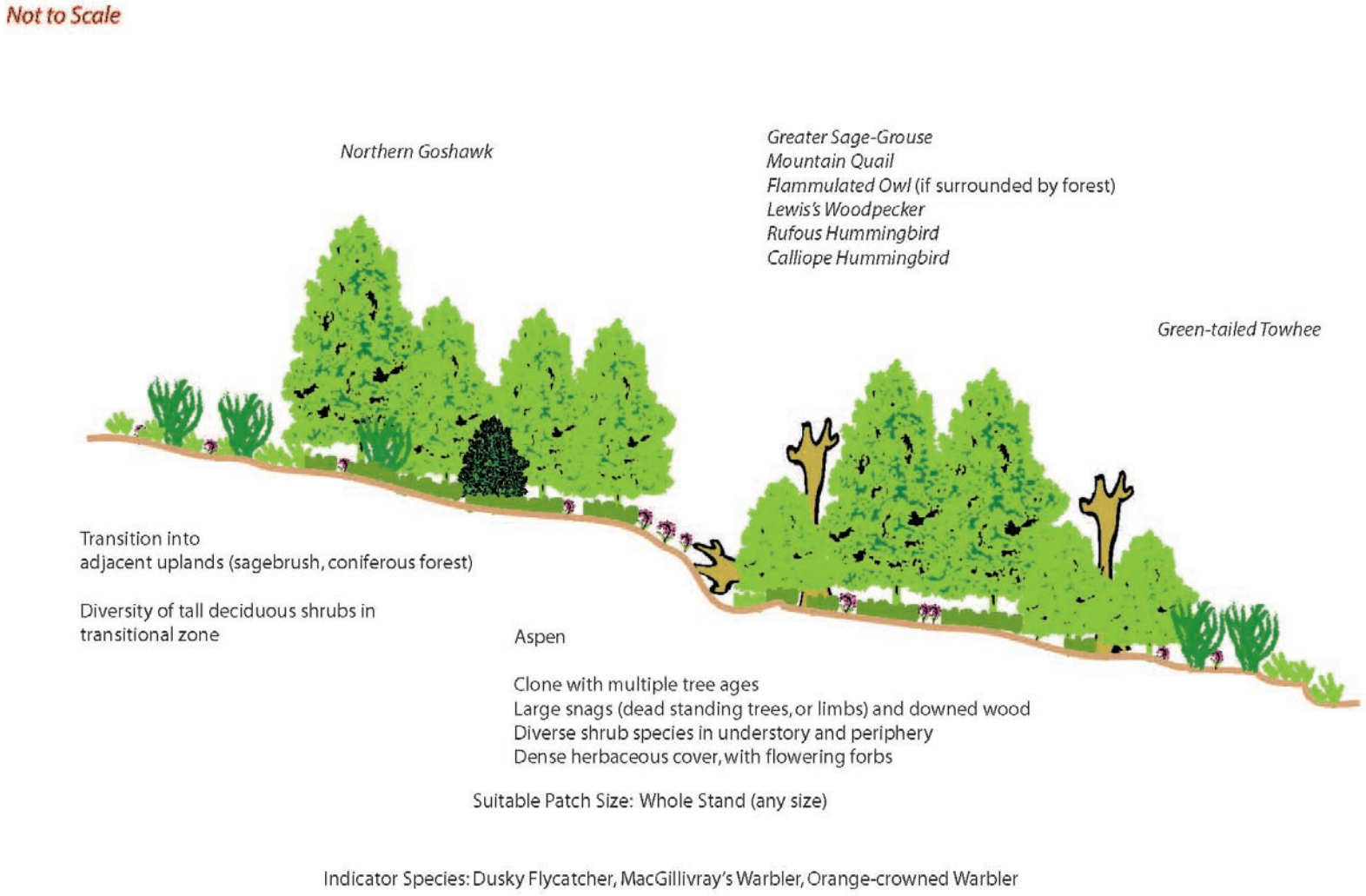


Figure Hab-3-1: Idealized aspen woodland landscape to maximize the number of aspen associated priority bird species.

Conservation Strategies

Habitat Strategies

- **Manage at the scale of a whole aspen stand** if possible
- A **diversity of age and size classes, active recruitment of root sprouts, preservation of snags, and intact forb understory** are keys habitat values for all Priority species (see parameters above in Key Bird–Habitat Attributes table). Any land uses that chronically reduce aspen recruitment and native understory vegetation inside the stand and in adjacent areas should be minimized
- **Stand replacement by fire** may be used as a management tool to encourage aspen regeneration; however, sites where large individual trees or snags provide nesting opportunities for Priority species (Northern Goshawk, Lewis's Woodpecker) may need to be excluded from such treatments
- **Restoration efforts**, especially livestock exclosures, grazing rest periods, or conifer thinning, can be effective in allowing heavily impacted stands to recover
- **Recreational uses** should be actively managed in areas that are popular. Alternate shade structures, trail planning to avoid aspen recruitment and understory patches, and discouragement of wood carvings are priorities

Research, Planning, and Monitoring Strategies

- The **Nevada Aspen Working Group** (http://www.aspensite.org/Nevada.html) should continue to conduct inventories and research, publicize aspen conservation values, and raise funds for protection and restoration. Aspen stands have, to date, not been fully inventoried in the state, particularly stands that are too small to be reflected in remote sensing maps. The lack of a **comprehensive aspen inventory** prevents us from monitoring losses and implementing adaptive management in light of climate change effects.
- A **Western Aspen Alliance** is being developed between The Forest Service Rocky Mountain Research Station and Utah State University to address aspen issues that occur in the west (http://www.western-aspen-alliance.org/)
- Continue **long-term monitoring of landbirds** in Nevada aspen stands through the Nevada Bird Count.

Public Outreach Strategies

- Distribution of **public education materials**, such as the "Aspen: Oasis in the Desert" poster of the **Nevada Aspen Working Group**, should be pursued to promote appreciation of, and prevention of unintentional damage to, Nevada's aspen. Additional materials may be prepared for popular trail heads to encourage recreationists to practice low-impact use of aspen stands
- **Workshops** for land managers and private landowners, such as those held by the **Nevada Aspen Working Group**, should continue in order to educate people about the unique values of, and threats to, aspen stands
- **Outreach to landowners and land managers** through the IBA program and partner agencies should continue to be pursued to assist with specific conservation actions in high-priority aspen areas.

Cliff

Peregrine Falcon nest cliff near Lake Mead, Clark County. Photo by Elisabeth Ammon.

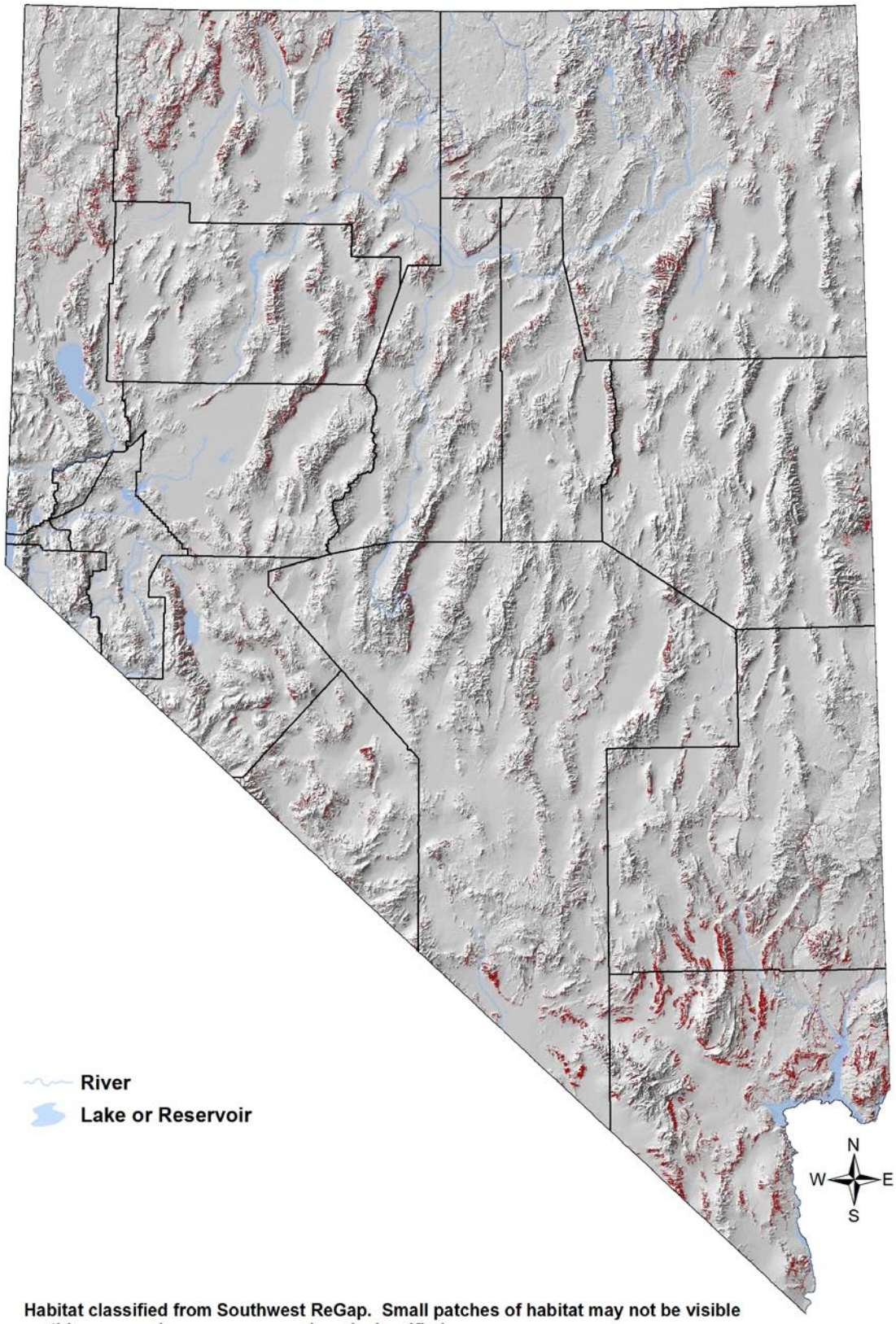
Key Bird-Habitat Attributes

Physical Structure	Golden Eagle: 25.5 (± 14.8) m [80 ± 50 ft];; multiple ledges preferred Peregrine Falcon: 12 – 200 m [40 – 640 ft] tall, mean height 100 m [330 ft] tall, with ledges ~ 1/3 down, usually oriented to north or west; some overhead cover preferred Prairie Falcon: 25 m [80 ft] to 100 m [325 ft], usually ~ 30 m [100 ft] White-throated Swift: Estimated at ≥ 40 m [130 ft]
Ideal Scale for Conservation Action	Whole cliff and surrounding lands within 10 km [6 mi] or more for prey populations
Mosaic	Cliffs with undisturbed adjacent landscapes most suitable, including sagebrush, salt desert, riparian, open water, marsh, or wet meadows
Distance to Water	Proximity to water increases habitat value
Other Features	Cliffs that are at least 1 km [0.6 mi] away from regular anthropogenic disturbances most suitable

Conservation Profile

Estimated Cover in Nevada (Cliffs and Talus)	455,000 ha [1,123,000 ac] 1.6% of state
Landownership Breakdown	BLM = 62% USFS = 10% USFWS = 7% DOD = 7% Private = 6% NPS = 3% Other = 5%
Priority Bird Species	Golden Eagle Peregrine Falcon Prairie Falcon White-throated Swift
Most Important Current Threats	Human disturbance Mining Climate change (temperature change)
Habitat Recovery Time	N/A
Regions of Greatest Conservation Interest	All suitable cliff habitat near sagebrush, Mojave scrub, or salt desert shrublands, or rivers, marshes, lakes, or meadows
Important Bird Areas	Bilk Creek-Montana Mountains Carson Range Goshute Mountains Great Basin National Park High Rock Resource Area Jarbidge Mountains Lake Mead Mount Grant Northern Snake Range Ruby Mountains Sheldon NWR Spring Mountains Toiyabe Range Wellington-Pine Grove Hills

Cliff



Habitat classified from Southwest ReGap. Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Cliff

Overview

Besides being a spectacular part of the Nevada landscape, cliffs also provide essential habitat elements for several Priority bird species. Peregrine Falcons, Prairie Falcons, and Golden Eagles nest almost exclusively on cliffs, and availability of these sites may limit some populations of Golden Eagles and Prairie Falcons (Suter and Joness 1981). White-throated Swifts nest in large colonies on cliffs overlooking rivers or reservoirs. In addition to nest sites, cliffs also provide many bird species with protection from predators and weather extremes, and suitable thermal conditions for soaring (Ward and Anderson 1998).

Few land uses affect cliffs directly, but human disturbance may cause nest abandonment, render a nest site less productive, or prevent a nest site from being occupied. Rock climbing is one of the most proximal disturbances (Camp and Knight 1998), but industrial noise or motorized recreation in the immediate area of a cliff nest may cause similar problems. All cliff-nesting birds also require access to adjacent foraging areas where prey is sufficiently abundant, and they often range far from their nest or roost site while hunting. For our large birds of prey, this may include hundreds of square miles of rangeland, and healthy prey populations in the surrounding landscape may be more important in nest site selection that the physical attributes of the cliff itself (Grebence and White 1989). In Nevada, the highest Golden Eagle densities have been observed in long stretches of cliffs located along river systems (Herron et al. 1985), and Peregrine Falcons in Nevada are concentrated around the Lake Mead NRA, where they nest on earthen and rock cliffs. Figure Hab-4-1 illustrates an example of a cliff landscape that includes surrounding habitat types that are suitable for some Priority species. Others are more likely to be found in more mesic landscapes that include wet meadows, open water, and riparian vegetation.

Main Concerns and Challenges

The following top three conservation concerns were identified in our planning sessions for Cliff habitat in Nevada:

- Human disturbance (non-motorized and motorized recreation, industrial operations)
- Change in temperature due to climate change
- Mining

Cliff nesters are potentially vulnerable to human disturbances, either from recreational activities or from motorized equipment or vehicle traffic operating nearby. Although some cliff nesters appear to tolerate highways and dirt road traffic, they are generally less tolerant of unexpected disturbances, such as off-road-vehicle traffic, new infrastructure development, and recreational visitors. Increasing temperature is a conservation concern for cliff nesters because they generally select nest site ledges based at least in part on thermal conditions. We expect that birds could mitigate increased temperatures to some degree by selecting cooler sites, but these responses

should be monitored for developing adaptive management strategies. Finally, in some cases mining activity could directly alter cliff habitat, although those situations appear to be relatively infrequent.

As a general rule, we expect that the conservation concerns associated with surrounding habitats that support prey populations are more important to cliff nesting birds than the conservation concerns affecting the cliffs directly. These concerns are outlined in the habitat accounts for the Montane Shrubland, Sagebrush, Salt Desert Scrub, Wet Meadow, Great Basin and Mojave Lowland Riparian and Montane Riparian, and Open Water habitat types.

Cliff in the Spring Mountains. Photo by John Boone.

Cliff

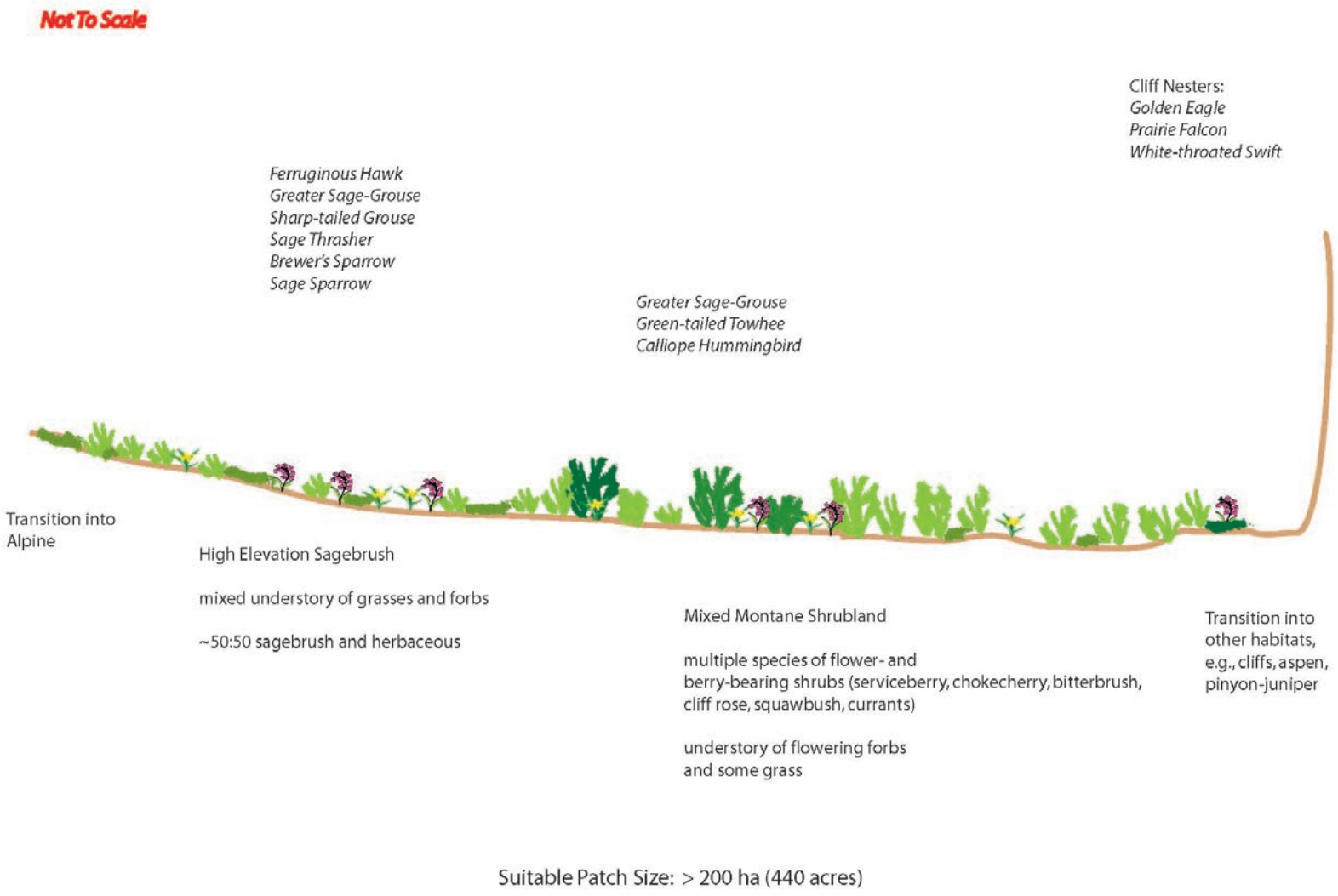


Figure Hab-4-1: Idealized cliffs landscape for some cliff nesters using the example of montane shrublands. Other types of landscape mosaics containing cliffs (which may include open water, wet meadows, riparian areas, sagebrush, or salt desert shrubland) may be more suitable for other cliff nesters.

Conservation Strategies

Habitat Strategies

- **Manage at a landscape scale (1,000 ha [2,500 ac])** that includes relatively undisturbed adjacent habitat types (montane shrublands, riparian areas, sagebrush, wet meadows, open water) with sufficiently abundant prey populations (jackrabbits, cottontails, ground squirrels, small rodents for raptors, flying insects for swifts) in proximity to potential nesting cliffs that are > 30 m [100 ft] high
- Consult **conservation strategies of adjacent habitat types** for management practices that benefit foraging habitats of cliff nesters
- At actual or potential cliff nest sites, establish **disturbance-free buffer zones of 1 km [0.6 miles]** where possible (Suter and Joness 1981); unexpected disturbances (off-road activities of any sort) are of particular concern
- The majority of priority bird species nest between **April 1 and July 15**, during which disturbances should be avoided

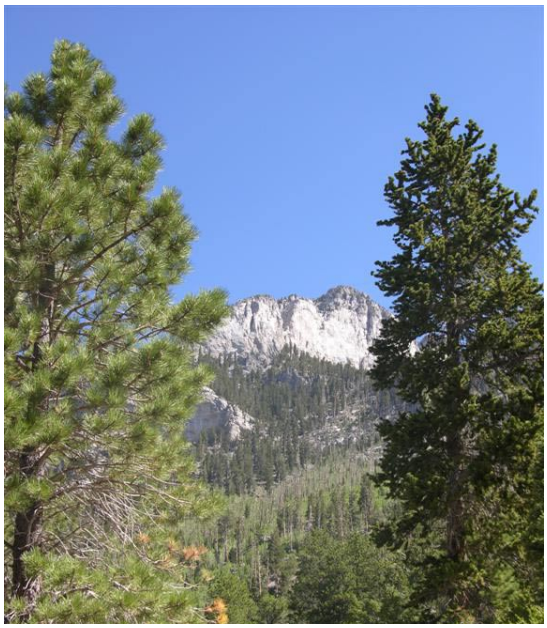
Research, Planning, and Monitoring Strategies

- Research on Nevada **landscape and habitat requirements of all cliff-nesters** is needed. Most of the literature on cliff-nesters is from other regions, and nesting habits and foraging habitats have not been studied in great detail in the central Great Basin
- Spatial modeling or **inventory of cliffs** suitable for nesting by Priority species is needed for Nevada

Public Outreach Strategies

- **Public outreach to rock climbing and OHV groups** would be beneficial for raising awareness of disturbances to cliff-nesting species. Seasonal closures in popular recreation areas may also be needed to protect nest sites, if priority species are nesting.

Coniferous Forest



Coniferous Forest near Mt. Charleston, Spring Mountains, Clark County. Photo by John Boone.

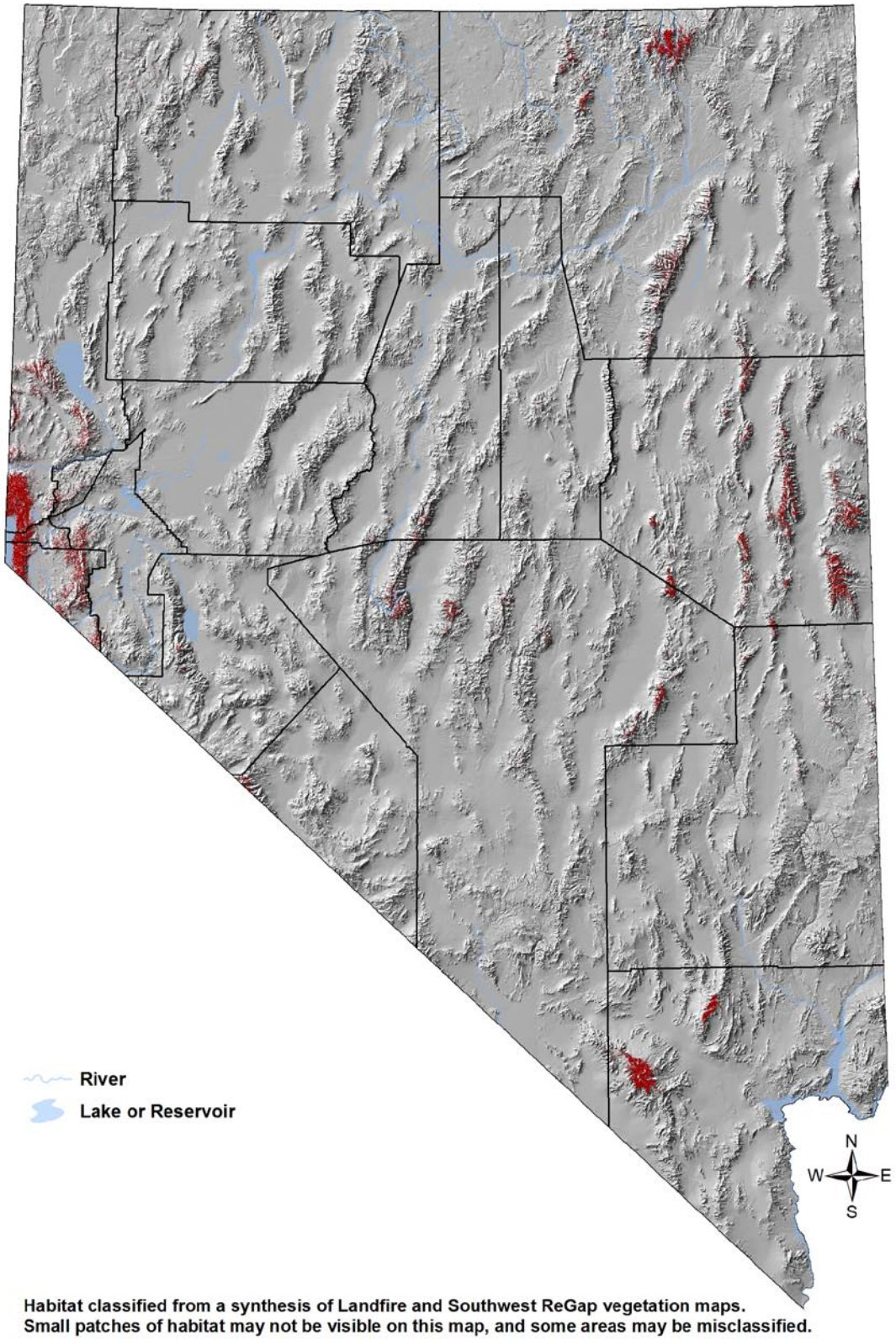
Key Bird-Habitat Attributes

Stand Structure	Multi-aged stands with mosaic of open canopy patches with shrub understory, small aspen patches, and dense-canopy groves; patch size within forest mosaic vary from 2-5 ha scale or larger, except for openings which may be relatively small
Ideal Scale for Conservation Action	500 ha [1,200 ac] or more
Plant Species Composition	Stands with 3 or more coniferous species (e.g., white pine, white fir, Jeffrey pine, lodgepole pine, and limber pine) better than monotypic stands; large-seeded conifers particularly valuable to birds; forbs, deciduous shrubs, and multiple species of xeric shrubs in the understory or in openings
Plant Condition	Healthy trees with seed crops beneficial; snags (> 30 cm [12 in] dbh) of conifers and deciduous trees important
Distance to Riparian/Spring Habitats	Proximity of water-dependent habitat increases value to birds
Presence of Cliffs > 30 m [100 ft] Tall	Presence of tall cliffs increases value to birds

Conservation Profile

Estimated Cover in Nevada	222,500 ha (550,000 acres) 0.8% of state
Landownership Breakdown	USFS = 58% BLM = 20% Private = 13% Other = 9%
Priority Bird Species	Sooty Grouse Dusky Grouse Mountain Quail Northern Goshawk Band-tailed Pigeon Flammulated Owl Spotted Owl Calliope Hummingbird Williamson's Sapsucker White-headed Woodpecker Olive-sided Flycatcher Hermit Warbler Grace's Warbler (Bald Eagle) (Lewis's Woodpecker)
Indicator Species	None needed
Most Important Conservation Concerns	Increased fire frequency or intensity Insect outbreaks Plant pathogens Climate change (change in precipitation and temperature) Urban, suburban, and industrial development Non-motorized recreation
Recovery Time	50-100 years
Regions of Greatest Conservation Interest	Carson, Jarbidge, Ruby, Snake, Schell Creek ranges, Spring Mountains, Sheep Range
Important Bird Areas	Carson Range Goshute Mountains Great Basin National Park Jarbidge Mountains Mount Grant Northern Snake Range Ruby Mountains Spring Mountains Toiyabe Range Wellington-Pine Grove Hills

Coniferous Forest



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps.
Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Coniferous Forest

Overview

Coniferous forests (excluding pinyon-juniper) are relatively scattered on the Nevada landscape, accounting for less than one percent of its total land area. Coniferous forests tend to occur in fairly small patches throughout the state above the pinyon-juniper zone, although in the Carson Range of western Nevada and in some other ranges, they do occur in larger stands. Forest types vary greatly with elevation and local climate. Some Priority bird species are restricted to the more productive mixed-conifer forests of the Sierra Nevada, while others occur in the more isolated mountain ranges of the central Great Basin. Yet another group of species makes use of the ponderosa pine stands of southern and eastern Nevada.

The many Priority species that rely on Coniferous Forest habitat have a diverse set of requirements, and therefore maintenance of heterogeneity across the forested landscape will be of key importance in conserving them all. That said, the Flammulated Owl's (p. Spp-45-1) habitat requirements capture most of this diversity, and it therefore serves fairly well as a single species "model" for coniferous forest management. Its preferences include mixed species / mixed age stands, a deciduous tree presence, snags, and forest openings with a well developed understory. Major forest components (such as different age classes of trees, or stands with different amounts of canopy closure) should occur in patches of 2 ha [5 ac] or larger (and at least occasionally in much larger patches), although forest openings will often be much smaller. This formula, applied over large landscapes, will generally meet the needs of more specialized species, including those requiring larger stands of closed-canopy forest (Spotted Owl and Hermit Warbler), those requiring forest openings (Olive-sided Flycatcher), those requiring large snags and/or deciduous trees (the woodpeckers), and those requiring open park-like stands of old pines with an understory (Grace's Warbler). Figure Hab-5-1 summarizes an idealized forest mosaic.

It should be noted that fire management, including use of prescribed fire where appropriate, is a critical element in managing forests to sustain this landscape diversity. Specific fire management tactics, however, will vary with forest type, size, and geographical location.

Main Concerns and Challenges

The following top seven conservation concerns were identified for coniferous forests in our planning sessions:

- Increased fire frequency or intensity
- Insect outbreaks
- Plant pathogens
- Change in precipitation and snowmelt related to climate change
- Change in temperature related to climate change
- Urban, suburban, and industrial development
- Non-motorized recreation

In contrast to most western states, Nevada has very little of the timbering activity that often dominates forest conservation issues in other regions. However, we share with other western

states an increase in the frequency of large intense fires, especially in the Sierra Nevada (Miller et al. 2009). This may be in part due to fuel buildup from fire suppression, which also allows shade-tolerant species such as white fir to increase the stand density of otherwise more open pine stands (Raumann and Cablk 2008). Climate change is expected to further increase the likelihood of extensive crown fires due to lower precipitation and earlier snowmelt (Westerling et al. 2006). Although some bird species benefit from local fires (e.g., Olive-sided Flycatcher), others do not, and a primary management challenge is to maintain an appropriate balance of fire on the landscape in light of an increased frequency of catastrophic fires.

Fuels reduction is one tool used to slow fire spread and reduce fire intensity, especially near human settlements (Reinhardt et al. 2008). Although it is questionable whether it can be a universal remedy for managing fires (Schoennagel et al. 2004), some successes are reported from the Lake Tahoe basin (Safford et al. 2009). More study is needed on the effects fuel reduction on wildlife (Elliot et al. 2010). In general, however, we expect that fuels reduction benefits birds that prefer more open forests, but its effects on species that need dense forest stands and dead wood are poorly documented. To integrate fuels reduction treatments with wildlife conservation goals (Lehmkuhl et al. 2007), we therefore recommend assessing which Priority species are present in a stand, or are expected to be present, and attempting to accommodate their habitat requirements (see respective species accounts) within the fuels reduction plan where possible.

Local insect outbreaks or pathogen infections are natural occurrences in coniferous forests and even beneficial to many bird species, especially woodpeckers (Drever and Martin 2010). However, recent outbreaks have become more extensive and uncontrollable than they appear to have been historically. This may be in part due to the increasing density of stands in some areas (Smith et al. 2005), or due to the homogenization of forests from past logging (Drever et al. 2006). Climate change effects are expected to increase the severity and longevity of insect outbreaks even more (Waring et al. 2009). Given that climate change is also expected to increase the likelihood of crown fires, maintaining diverse healthy forests that meet the habitat requirements of a diverse suite of bird species will probably become more challenging. The combined effects of all these factors on bird populations should be studied on an ongoing basis for adaptive management.

In some parts of the state, urban or suburban encroachment into Coniferous Forest habitat is a concern, especially in the Spring Mountains near Las Vegas and in the Lake Tahoe basin (Raumann and Cablk 2008, Heckman et al. 2008). Habitat loss or degradation as a result of development of infrastructure, as well as direct human disturbance, is expected to impact bird populations (Schlesinger et al. 2008) in these areas. Indirect effects of urban development, such as intensive fuels reduction, introduced predators, fire suppression, and artificial ignition sources are also concerns.

Coniferous Forest

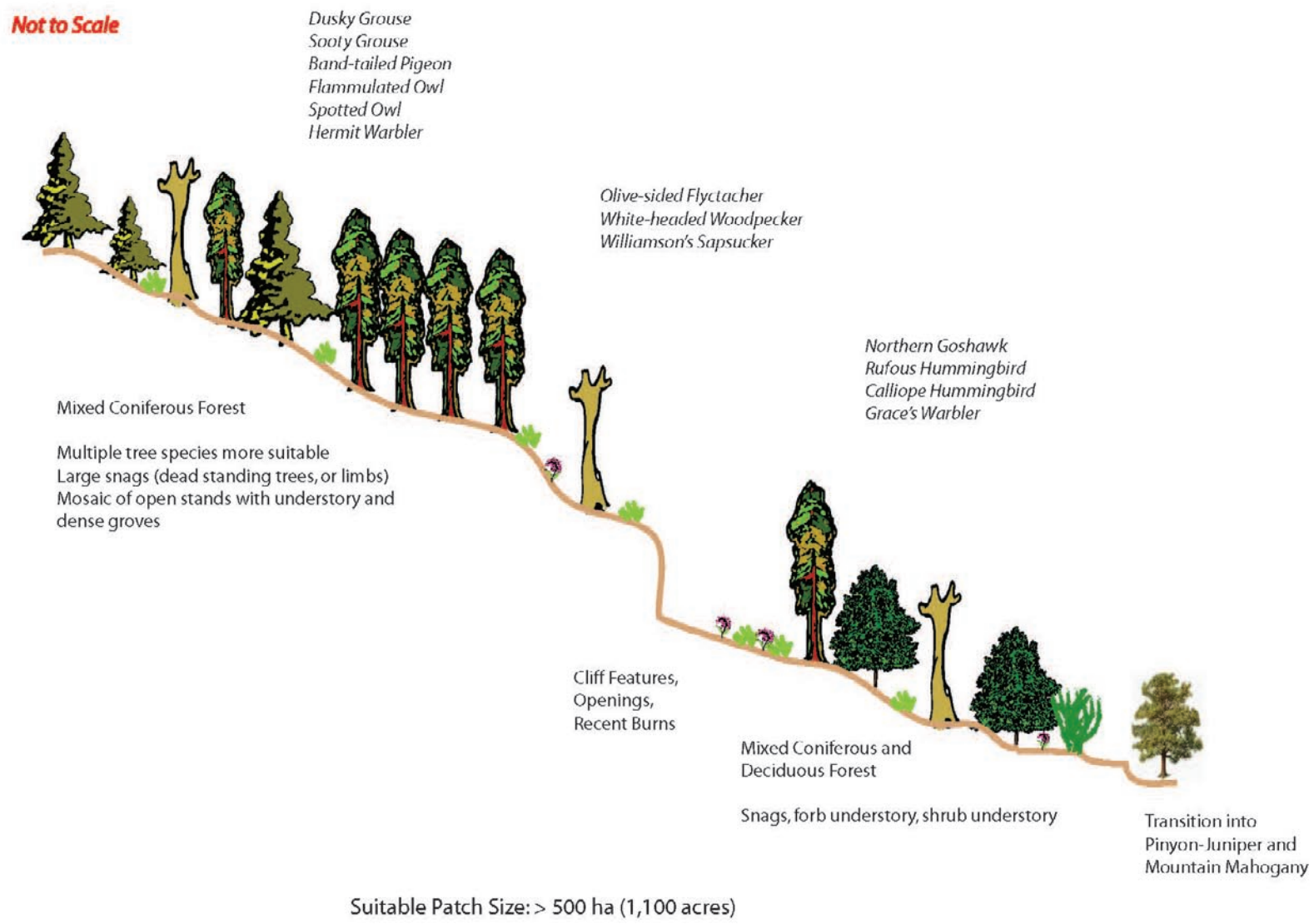


Figure Hab-5-1: Idealized coniferous forest landscape to maximize the number of coniferous forest associated Priority bird species.

Conservation Strategies

Habitat Strategies

- Manage at **landscape scale (> 500 ha [1,200 ac])** with the goal of maintaining a diverse mosaic of mixed-age, -size, and -density tree stands, large snags, deciduous tree components (especially aspen and willow), and forest openings
- Priority for conservation action should be given to sites where mosaics of **mixed-age conifer forest, deciduous woodland, and shrubland** either already exist or can be achieved
- **Protect even small patches of aspen or willow** that are interspersed within the conifer forest matrix (Griffis-Kyle and Beier 2003)
- Protect mature coniferous forest in the Carson Range, with focus on closed-canopy stands of > 50 ha [125 ac]
- **Design fuels reduction projects** to retain older and mixed-age stands, large-diameter trees and snags, and to create moderate canopy closure at the recommended patch sizes, where possible
- Fuels reduction that **thins smaller trees** to reduce fuel ladders can help to protect important older stands from catastrophic fire
- **Fire management** should generally encourage small-scale, patchy fires that increase diversity of the forest mosaic and create forest openings. Active reforestation with native species, particularly those that help increase tree species diversity. may be desirable
- Proximity to **water** (riparian areas, springs, wet meadows), **cliffs** (> 30 m [100 ft] tall, or **abandoned mines** (which may be gated) raise the importance of a site for bird conservation
- The majority of Priority bird species nest between **May 1 and July 15**, and some of them are particularly sensitive to nest disturbance. This is the time period when intensive treatments or potentially disruptive activities should be avoided when possible

Research, Planning, and Monitoring Strategies

- Conduct additional research to better **determine habitat and patch size requirements, and the importance of riparian habitat within the forested landscape** for species such as Grace's Warbler, Williamson's Sapsucker, and White-headed Woodpecker
- Investigate the **role of fire intensity, scale, and frequency** in providing suitable habitat for various species; review fire management strategies accordingly
- **Continue and expand forest bird monitoring** as part of the Nevada Bird Count program to better assess population trends of a complex suite of species

Public Outreach Strategies

- **Promote public appreciation** of the wildlife values provided by a healthy coniferous forest, including education about the role of fire
- Encourage "**responsible recreation,**" including use of maintained trails to protect understory, avoiding disturbance to sensitive nest and roost sites, etc.

Ephemeral Wetland and Playa

Ephemeral wetland in Churchill County.
Photo by Steve Ting.

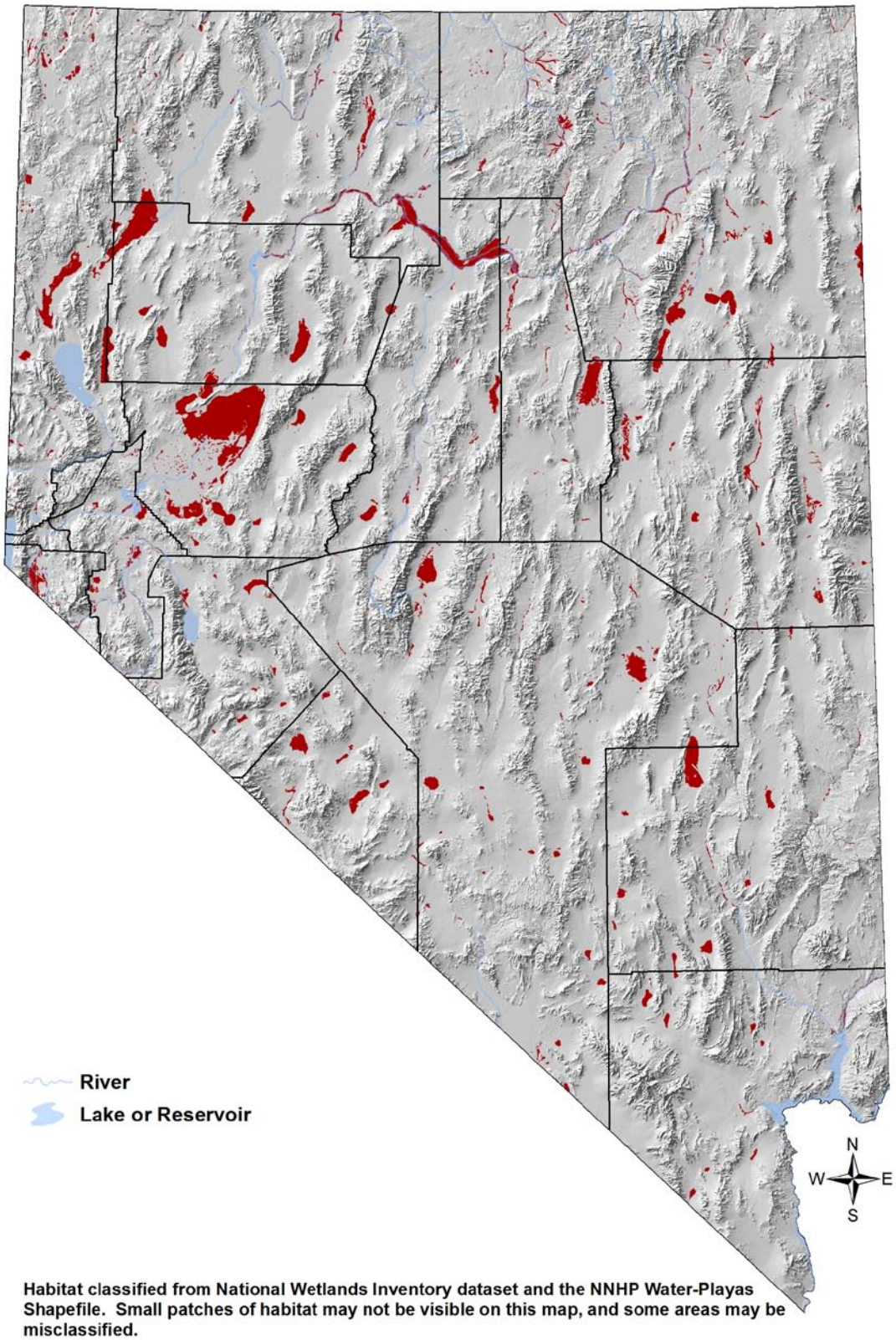
Key Bird-Habitat Attributes

Plant Species Composition	Playa wetlands are often sparsely vegetated, but may have rushes and sedges when wet, especially in areas where inundation is relatively frequent; adjacent areas may have saltgrass, greasewood, creosote bush, and salt bush, or be relatively barren
Ideal Scale for Conservation Action	Entire high-water perimeter and adjacent shoreline
Land Uses	Few land use impacts; when water is present, OHV use may damage playa beds and could possibly reduce its ability to retain water
Other Features	Natural environment includes very sparse vegetation and embedded rocks that may be important to nest site selection of some priority species

Conservation Profile

Estimated Cover in Nevada	490,000 ha [1.2 million ac] 1.7% of state
Landownership Breakdown	BLM = 60% USBR = 10% Private = 10% DOD = 8% Other = 12%
Priority Bird Species	Snowy Plover Black-necked Stilt American Avocet Western Sandpiper Least Sandpiper Long-billed Dowitcher Wilson's Phalarope Red-necked Phalarope (Cinnamon Teal) (Marbled Godwit)
Indicator Species	None needed
Most Important Conservation Concerns	Surface water diversions, impoundments Climate change (change in precipitation and temperature) Motorized recreation
Habitat Recovery Time	1 year
Regions of Greatest Conservation Interest	Northwestern, central, and southern Nevada
Important Bird Areas	Ash Meadows NWR Franklin Lake Gridley Lake High Rock Resource Area Lahontan Valley Wetlands Monitor Valley Oasis Valley Sheldon NWR Swan Lake Washoe Valley

Ephemeral Wetland and Playa



Habitat classified from National Wetlands Inventory dataset and the NNHP Water-Playas Shapefile. Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Ephemeral Wetland and Playa

Overview

Ephemeral wetlands and playas are characteristic features of the Great Basin and Mojave Desert regions that come alive during wet years when water covers the flat valley-bottoms. Birds that depend on ephemeral wetlands have adapted to annual variation in water conditions, and are known for their flexible annual distribution patterns. Recent research indicates that these birds rely on a large network of playas and other wetlands that extend over hundreds of miles, selecting each year from among the subset of sites that are sufficiently wet (Robinson and Oring 1996; see also American Avocet species account, p. Spp-32-1). Therefore, while one particular ephemeral wetland is likely not critical to the conservation of a Priority species, a regional wetland network is critical.

Ephemeral wetland environments are characterized by short, infrequent, and unpredictable water availability, which determines if and when birds are present. The majority of Great Basin playas and associated wetlands are fed by snowmelt runoff, and unless other water sources are available, the amount of snowmelt and summer temperatures determine how long water stays within the wetland. In the Mojave Desert region, ephemeral wetlands may also receive water through snowmelt channeled down ephemeral washes, but many receive water only from occasional heavy rain events that occur during the monsoon season. Some ephemeral wetlands are located on the periphery of a permanent or semi-permanent water source (such as a spring, a terminal marsh, or agricultural return flows) and may consequently receive more frequent and predictable inflows. These sites can be particularly important for conservation, as they serve as insurance that at least some birds have access to suitable habitat during long drought periods. The key habitat feature for many of the Priority species that specialize on ephemeral wetlands is the availability of very shallow shoreline areas (< 2.3 cm [6 in] water depth) and mudflats. Most Priority species using these sites probe and peck for invertebrates that inhabit the shallows and the wet shorelines. Figure Hab-7-1 illustrates habitat elements of typical ephemeral wetlands that are used by Priority species.

We mostly associate Ephemeral Wetland and Playa habitat with shorebirds like the Snowy Plover, American Avocet, and Black-necked Stilt. However, anecdotal evidence suggests that ephemeral wetlands also provide important stopover opportunities for a large variety of species. The playa lake of Eldorado Valley (Dry Lake, south of Boulder City in Clark County) only has water from winter rains once every five years, on average. In September of 1997, sixty Sandhill Cranes, a Red Knot, several Snowy Plovers, a Pectoral Sandpiper, several Semipalmated Plovers, several Baird's Sandpipers, a Black-bellied Plover, several Greater and Lesser Yellowlegs, and a few Solitary Sandpipers and Marbled Godwits were among the hundreds of birds stopping over at Dry Lake after a recent downpour (Meyers et al. 1998). These sites may only have water for a few weeks, but if they are located in a migratory pathway and are flooded at the right time, they may provide much-needed invertebrate resources and resting opportunities for migrating shorebirds on their journey across the desert.

Ephemeral Wetland and Playa

Main Concerns and Challenges

The following top four conservation concerns were identified in our planning sessions for ephemeral wetlands or playas in Nevada:

- Surface water diversion, impoundments
- Change in precipitation and snowmelt resulting from climate change
- Change in temperature resulting from climate change
- Motorized recreation

Playas are among the least economically productive habitat types and are therefore not used heavily. Perhaps the most immediate threat to ephemeral wetlands is the diversion of water that would otherwise flow into the playa bed. The extent to which this actually reduces wetland extent and availability has not been closely studied outside of major management areas, but it seems reasonable to suspect that the effect can be considerable. Therefore, opportunities for restoration exist whenever it would be possible to make water runoff more available to playa beds in historical wetland sites.

In the longer term, changes in precipitation and temperature that are predicated as the result of climate change are even larger concerns. The fauna of ephemeral wetlands operates close to its physiological limits even in "normal" climate conditions, with invertebrates routinely going into dormancy through years of drought and birds wandering through the region in search of wetlands. Limits on viability of invertebrate prey and on bird persistence in these extreme environments are poorly understood, particularly when climate change is factored in. However, the conservative view is that such thresholds are more likely to be reached if temperatures warm and snowpacks decrease.

Groundwater pumping was listed as a concern for the case of ephemeral wetlands that receive inflows from springs or groundwater sources. It was not clear how frequently this situation might occur, so we recommend that this concern be evaluated on a case-by-case basis.

Finally, we listed motorized recreation as the only active land use of concern of which we are aware. The concern lies in the potential for motorized vehicles to damage the waterproof sediment layer of the wetland bed that helps to retain ephemeral water. If this layer is broken, water may seep into deeper soil layers and become more rapidly lost.

Ephemeral Wetland and Playa

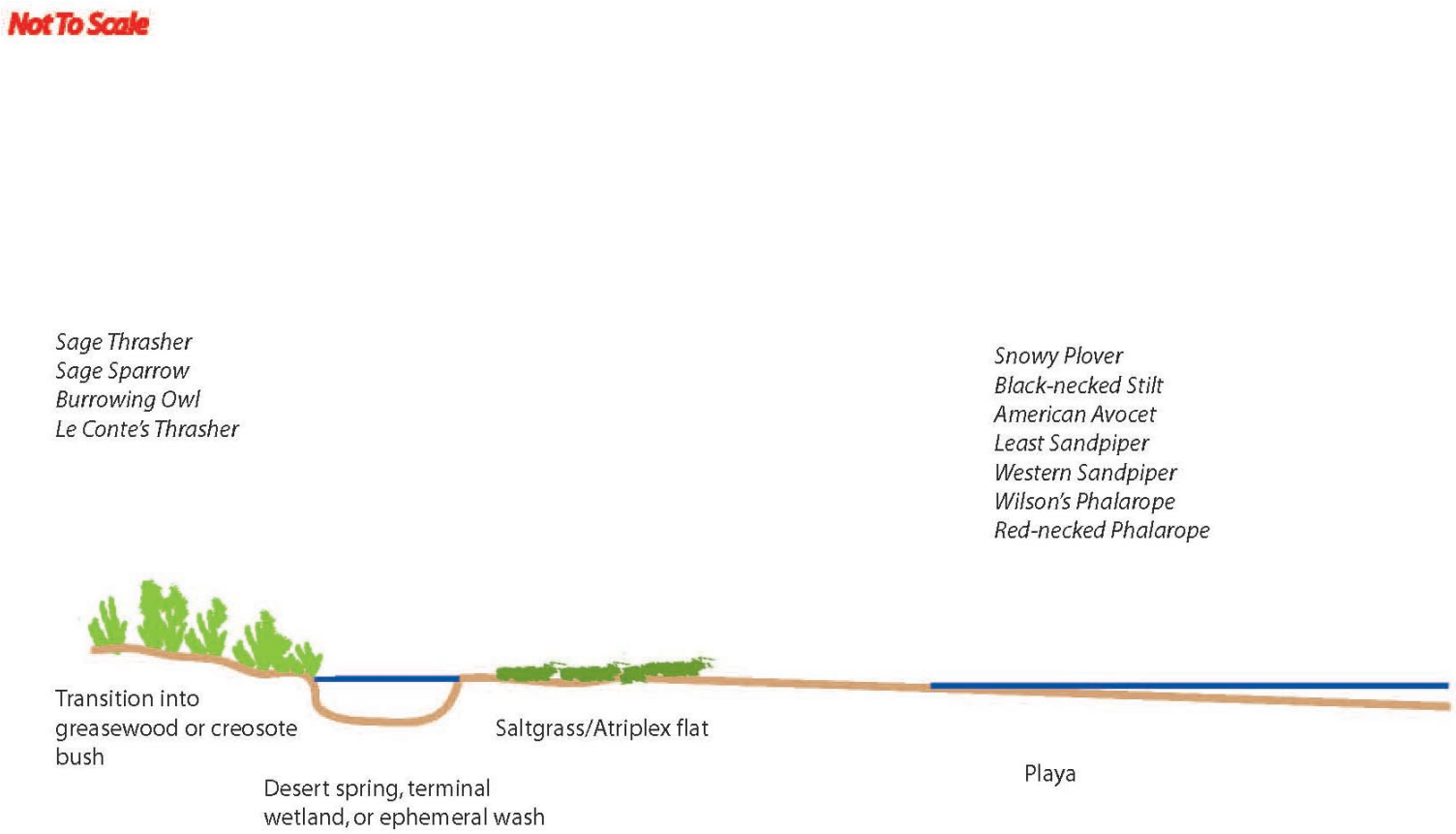


Figure Hab-6-1: Idealized ephemeral wetland and playa landscape to maximize the number of ephemeral wetland associated priority bird species.

Conservation Strategies

Habitat Strategies

- Manage at the scale of the **entire playa and wetland complex**. In wet conditions, the wetted perimeter of the complex and the sparsely vegetated playa shore should be protected from all significant disturbances, including heavy OHV use
- Where opportunities exist to **reduce surface water diversion** to allow additional snowmelt flow into an ephemeral wetlands, this measure is a valuable conservation strategy, particularly in major migration corridors
- If the wetland complex is supported by **groundwater**, limit pumping to levels that do not cause habitat conversion

Research, Planning, and Monitoring Strategies

- Planning and research should identify a **minimum-sized regional network of ephemeral wetlands** necessary to provide sufficient breeding and migratory habitat for Priority species. Prior to this research, planning could also determine opportunities for having at least some ephemeral wetlands in a regional network flooded at any given time during the seasonal periods most important to Priority birds
- A statewide **monitoring plan for migratory and breeding shorebirds** of ephemeral wetlands needs to be developed and implemented. This would likely involve a statistical sampling scheme, not complete coverage, of ephemeral systems in the state

Public Outreach Strategies

- **Promote public appreciation** of ephemeral wetlands through promotional materials, birding trips, and school classes (e.g., using dormant invertebrates as educational material, field trips to ephemeral wetlands).

Great Basin Lowland Riparian

Lowland riparian corridor along the Lower Truckee River, Washoe County. Photo by Stewart Rood.

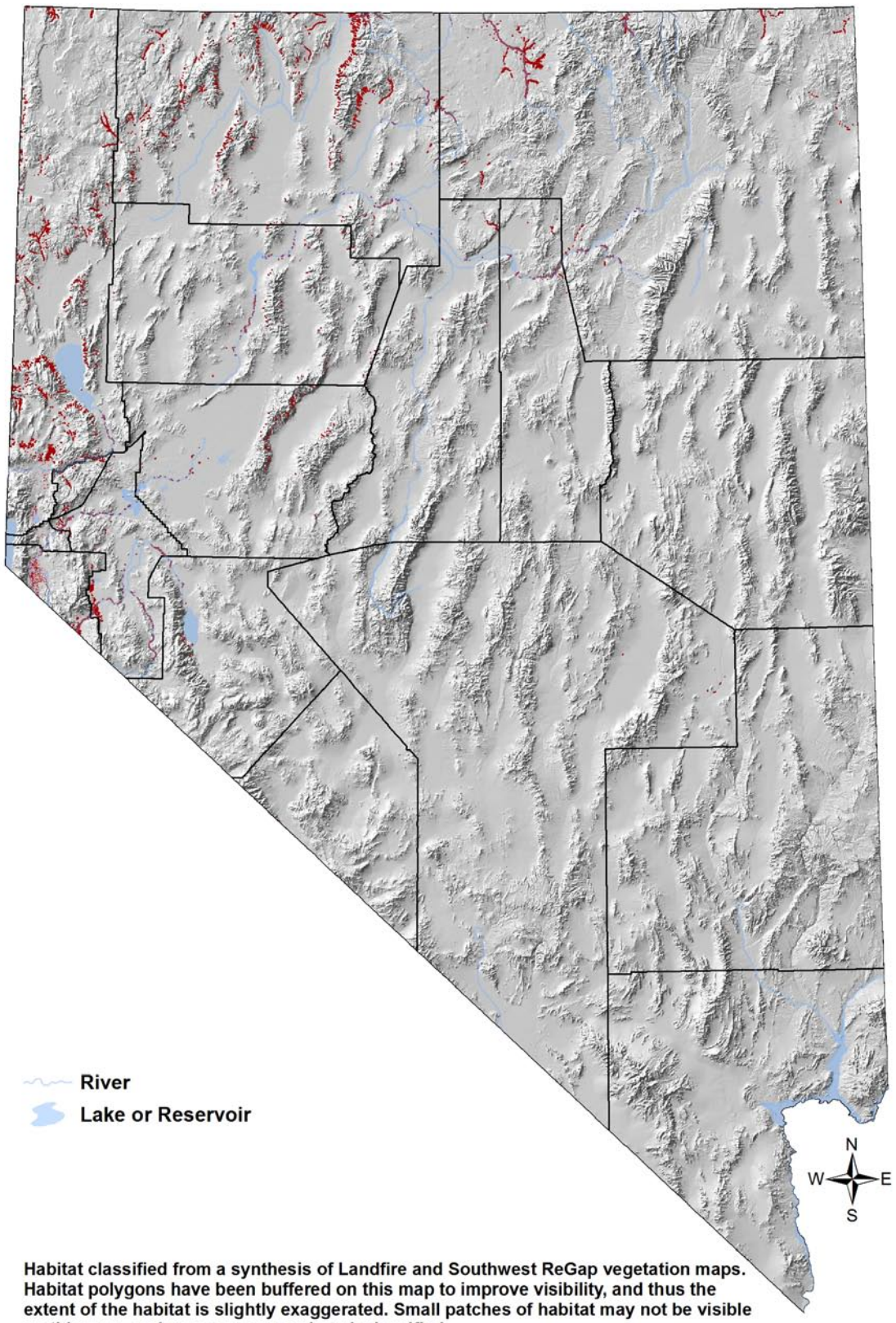
Key Bird-Habitat Attributes

Stand Structure	Multi-aged tree stands with riparian shrub understory, interspersed with groves of dense riparian shrubs (willows and others) and floodplain wetlands
Ideal Scale for Conservation Action	50 ha [125 ac] or more
Plant Species Composition	Mixed stands of cottonwood and tree willow with multiple species of shrubs as understory; tree willows especially productive for birds
Plant Condition	Connection to groundwater critical for riparian woodlands; dying off of shrubs or young trees often first sign that connection to water is being lost
Mosaic	Patches with saturated soils and presence of river-associated wetlands are highly beneficial
Connectivity with Uplands	A buffer of 500 m [1,600 ft] or more is desirable around riparian corridors to accommodate transitional habitats (e.g. buffaloberry) and access by upland bird species
Presence of Cliffs > 30 m [100 ft] Tall	Presence of tall cliffs increases value to birds

Conservation Profile

Estimated Cover in Nevada	15,500 ha [38,300 ac] 0.05% of state
Landownership Breakdown	Private = 77% BLM = 12% Tribal = 3% Other = 8%
Priority Bird Species	Snowy Egret Bald Eagle Swainson's Hawk Sandhill Crane Yellow-billed Cuckoo White-throated Swift Rufous Hummingbird Willow Flycatcher (Cinnamon Teal) (Northern Pintail) (Greater Sage-Grouse) (American White Pelican) (Willet) (Short-eared Owl)
Indicator Species	Yellow Warbler (breeding) Wilson's Warbler (migration)
Most Important Conservation Concerns	Surface water diversions, impoundments Flood control Livestock, wild horse and burro grazing Invasive weeds Urban, suburban, and industrial development Biocontrol activities Climate change (change in precipitation and temperature) Groundwater pumping
Habitat Recovery Time	25 years
Regions of Greatest Conservation Interest	Truckee, Carson, Walker, and Humboldt rivers, and multiple smaller streams and rivers, such as Mary's, Reese, Little Humboldt, Quinn and King's rivers
Important Bird Areas	Boyd Humboldt Valley Wetlands Carson River Delta Carson Valley Lahontan Valley Wetlands Mary's River Monitor Valley North Ruby Valley Washoe Valley

Great Basin Lowland Riparian



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps. Habitat polygons have been buffered on this map to improve visibility, and thus the extent of the habitat is slightly exaggerated. Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Great Basin Lowland Riparian

Overview

Although they only cover about one-half percent of the Nevada landscape, lowland riparian woodlands in the Great Basin have historically supported a large proportion of its bird species. Riparian-obligate breeding birds are most often thought of in this context, but it should also be noted that riparian woodlands are perhaps the most important migration stop-over habitat for many other landbird species that pass through the Great Basin. Riparian habitat, in addition, provides benefits to some upland birds, such as Greater Sage-Grouse, Rufous Hummingbird, and Brewer's Sparrow, in the form of sheltering and foraging opportunities. Additionally, upland vegetation located adjacent to riparian zones may be more "lush" than normal because it can access groundwater, and may therefore be especially suitable for some upland birds. Finally, the rivers that support significant fish populations are important for birds such as American White Pelican, Snowy Egret, and Bald Eagle, that wander throughout the Great Basin during the post-breeding, migration, or winter seasons in search of productive fishing areas.

Great Basin Lowland Riparian habitat is distinct in several ways from Mojave Lowland Riparian habitat, which is treated separately (p. Hab-11-1). Dominant tree species in Great Basin systems include Fremont cottonwood (*Populus fremontii*), narrowleaf cottonwood (*P. angustifolia*), and various willows (*Salix* spp.). Other riparian shrubs, trees and a large variety of sedges, rushes, grasses and forbs are also found in intact systems, and a diverse plant species composition is likely important for maintaining the richest possible bird community. Recent reviews of the historic changes in the bird communities of the lower Truckee and Carson Rivers (Ammon 2002, Ketner and Ketner 2002) indicate that the widespread loss of riparian woodland that occurred over the last century severely impacted riparian birds. These reviews, along with recent data from the Walker River (GBBO unpublished data), also indicate that the loss of riparian-associated wetlands, such as oxbows, backwaters, and sloughs, is a major cause of reduced bird species richness. Therefore, the restoration of riparian shrub thickets, gallery forests, and floodplain wetlands are all critical for optimizing habitat for Nevada's riparian birds.

The key feature of intact, healthy lowland riparian habitats is a high diversity of microhabitats, including old-tree groves, shrub thickets, shrub willow, early-successional woodlands, sedge and forb meadows, oxbows and backwaters, and transitional mesic shrubs along the periphery of the riparian corridor. In combination, these elements support birds with a diverse array of habitat needs and food requirements (Figure Hab-8-1). Fortunately, if a river system has a natural or semi-natural hydrological regime, sufficient water flows, and is not channelized, it can usually generate and maintain a desirable microhabitat mosaic as a result of natural dynamic processes. Achieving these prerequisites, however, is challenging in many settings.

Main Concerns and Challenges

The following top nine conservation concerns were identified in our planning sessions for Great Basin lowland riparian habitats in Nevada:

- Surface water diversions, impoundments
- Flood control
- Overgrazing by livestock, wild horses and burros
- Invasive weeds
- Urban, suburban, and industrial development
- Biocontrol activities
- Change in precipitation and snowmelt related to climate change
- Change in temperature related to climate change
- Groundwater pumping

Historical losses of riparian habitat throughout the West have been well-documented (Ohmart 1994), and Nevada is no exception. For instance, along the lower Truckee River corridor, an estimated 80% of the original riparian habitat cover has been lost (Otis Bay Environmental Consultants, *pers. comm.*) to surface water diversions, impoundments, channelization, and habitat conversion to agricultural and urban uses, and we suspect this pattern is fairly typical of other major rivers in the state. Continued demands on water, particularly given the prospect of a warmer climate with less winter precipitation, will continue to pose significant challenges to resource managers. In addition, riparian habitats are susceptible to compounded threats. For instance, water diversions and flood control engineering often disconnect the river channel from its floodplain, leaving riparian vegetation "high and dry", and creating conditions largely unsuitable for germination of seedlings. At the same time, overgrazing may further degrade remaining habitat, while urban or agriculture development converts it.

Habitat protection efforts (ensuring sustainable grazing levels, engaging in weed control, revegetation with native species, etc.) are probably best directed towards riparian reaches where floodplain connectivity and hydrological dynamics are still relatively intact, or where they can potentially be restored. Significant riparian restoration efforts of this sort are underway along the Truckee River and other riparian systems in Nevada, and careful planning and implementation of similar projects may lead to some recoveries of historic bird habitat.

One new concern has only recently surfaced related to a biocontrol agent, the tamarisk beetle, that has been deployed to combat tamarisk (saltcedar) invasion. The beetle, which defoliates large stands of saltcedar, has been released throughout riparian areas in the Great Basin portion of Nevada. While saltcedar control is an understandable objective of riparian management, our concern lies in the apparent lack of recovery of native riparian vegetation following defoliation of saltcedar. The treated sites appear to remain dominated by dead or dying saltcedar "skeletons", which render the site unsuitable for most riparian associated birds. In the affected areas, active revegetation with plantings will likely be necessary to recover native habitat in a reasonable time frame.

Great Basin Lowland Riparian

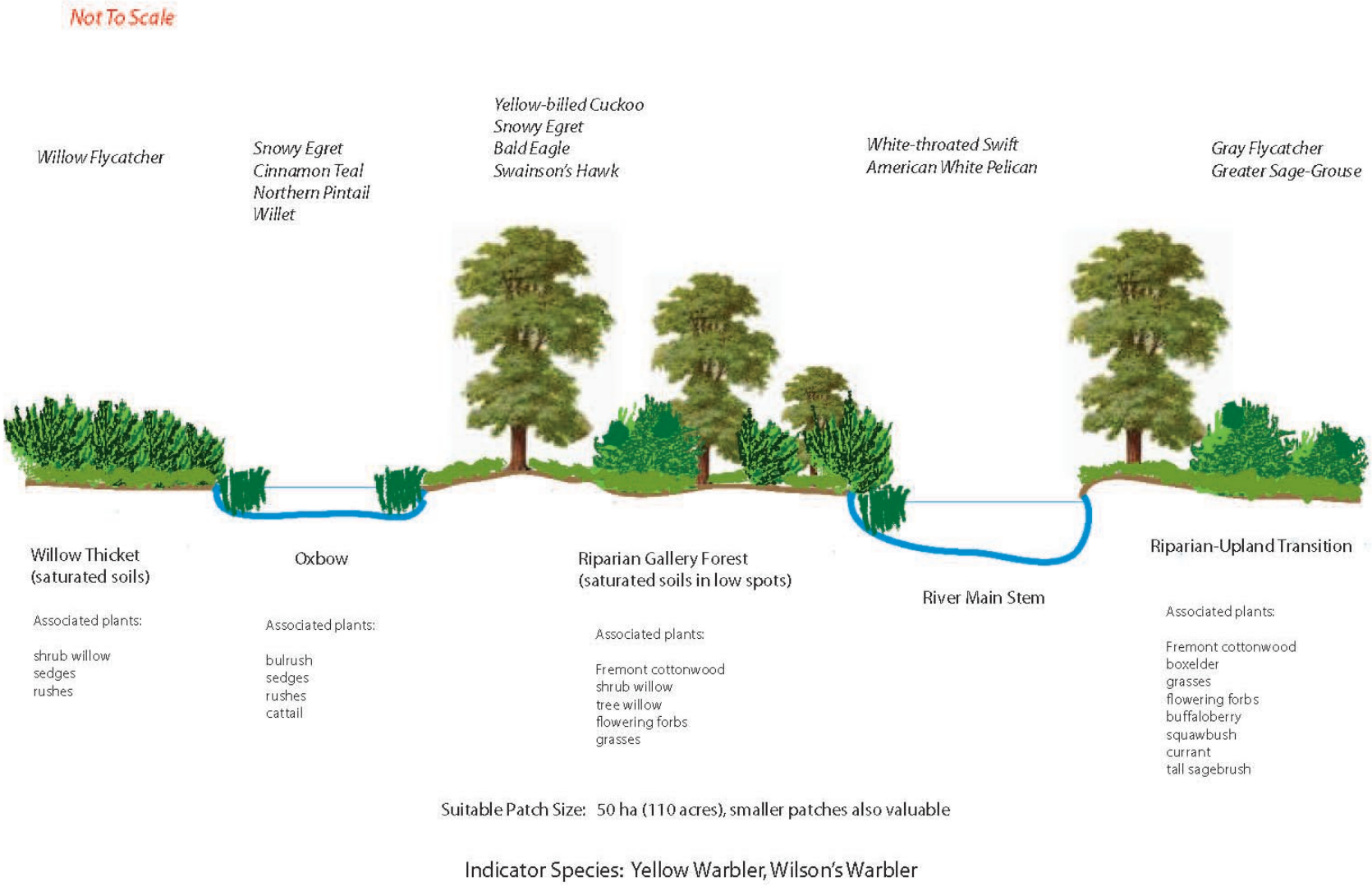


Figure Hab-7-1: Idealized Great Basin lowland riparian landscape to maximize the number of riparian associated priority bird species.

Conservation Strategies

Habitat Strategies

- **Manage at a landscape scale (> 50 ha or [125 ac]),** but smaller patches are also valuable if intact. Maintain or restore a mosaic of open, mixed-age tree canopy, riparian shrub thickets, flowering shrubs and forbs, and interspersed floodplain wetlands. High species richness in plants and presence of willows are particularly beneficial. Patch sizes within the mosaic may be small (0.1 – 0.4 ha [0.25 - 1 ac]), but the overall riparian and wetland corridor should be contiguous.
- Old-growth trees are important to several Priority species, but the overall value of a patch is most often improved by adding a **native riparian shrub and wetland** component
- Riparian areas near urban or rural settlements in particular attract feral cats and other predators. Strategic plantings of particularly **impenetrable shrubs** (e.g., wild rose) are useful for discouraging opportunistic predators and cowbirds.
- Presence of nearby **cliffs** (> 30 m, [100 ft]) tall raises the value of a site for bird conservation
- Removal of invasive plants, such as tamarisk (salt cedar), Russian olive, or tall whitetop, should be immediately followed by **active restoration of native riparian vegetation** in treatment areas, as weedy species often take advantage of recently disturbed soils
- Maintain **grazing activity** at levels that do not permanently impact the shrub and forb understory or cause soils to be exposed
- The majority of Priority bird species nest between **May 1 and July 15**, and some of them are particularly sensitive to nest disturbance. This is the time period when intensive treatments or potentially disruptive activities should be largely avoided

Research, Planning, and Monitoring Strategies

- Given the value of any riparian patch to overall species conservation, **habitat restoration opportunities** should be aggressively explored, in collaborative efforts between agency and private partners, for **all regions and all stream sizes.** In particular, the Humboldt River system and its smaller tributaries appears to have significant restoration potential

Public Outreach Strategies

- **Promote public appreciation** of healthy lowland riparian habitat and its bird communities, particularly with regard to native understory vegetation and their potential impacts. Outreach through fishing and other outdoor-recreation groups, as well as through urban open space planning, may be particularly effective

Joshua Tree

Joshua tree and *Yucca* landscape,
Esmeralda County.
Photo by Elisabeth Ammon.

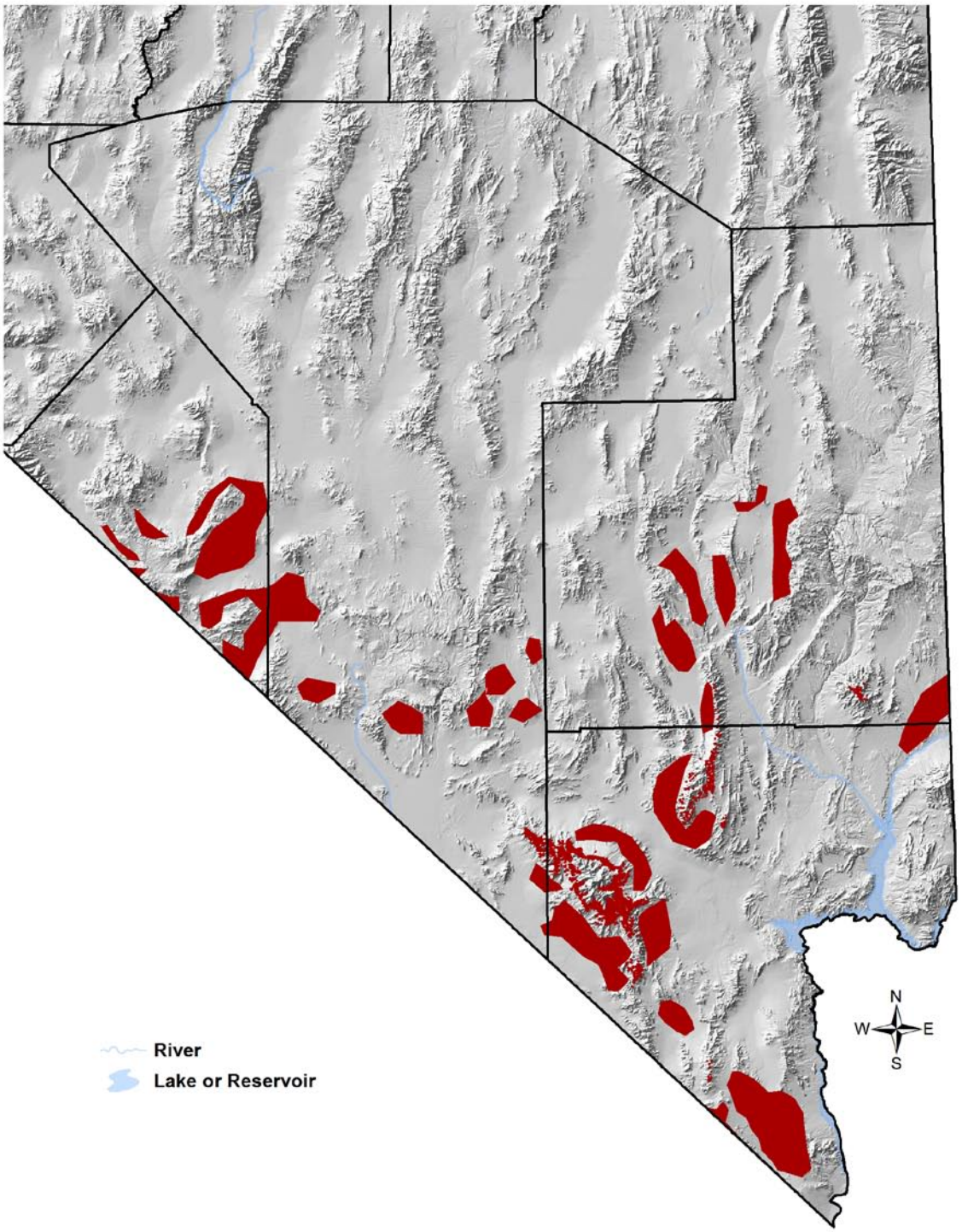
Key Bird-Habitat Attributes

Stand Structure	Multiple species of shrubs in a park-like setting; Joshua trees and other *Yuccas*; older larger Joshua trees and *Yuccas* useful to some Priority species; healthy shrub understory and litter layer for foraging opportunities
Ideal Scale for Conservation Action	> 200 ha [500 ac]
Understory and Invasive Species	Species-rich shrub understory, ideally with flowering forbs and shrubs; invasive plants detrimental
Fire Regime; Invasive Plants	Fire prevention important; invasive plants increase risk of fire and should be managed aggressively in this habitat type
Distance to Riparian/Spring Habitats	Proximity of water features increases habitat value to birds
Presence of Cliffs > 30 m [100 ft] Tall	Presence of tall cliffs increases value to birds

Conservation Profile

Estimated Cover in Nevada	626,000 ha [1,547,000 ac] 2.2% of state
Landownership Breakdown	BLM = 72% FWS = 10% DOD = 7% DOE = 5% Other = 6%
Priority Bird Species	Costa's Hummingbird Gilded Flicker Bendire's Thrasher Le Conte's Thrasher Black-chinned Sparrow (Golden Eagle) (Prairie Falcon) (Burrowing Owl)
Indicator Species	Cactus Wren Scott's Oriole
Most Important Conservation Concerns	Climate change (change in precipitation temperature) Increased fire frequency/intensity Invasive plants Urban, suburban, and industrial development Motorized recreation Livestock, wild horse, and burro grazing
Habitat Recovery Time	150-200 years
Regions of Greatest Conservation Interest	Clark, Esmeralda, and southern Nye, Lincoln counties
Important Bird Areas	Lake Mead Pahranagat Valley Complex Spring Mountains Desert NWR Wee Thump Joshua Tree Forest

Joshua Tree



Habitat classified by from broad-scale Joshua Tree maps provided by USGS (Todd Esque, pers. comm.). Some areas may be misclassified.

Joshua Tree

Overview

In this plan, Joshua Tree (*Yucca brevifolia*) habitat includes all Mojave mid-elevation mixed scrub that supports Joshua trees, other *Yucca* species, and cactuses. The overriding conservation challenge associated with this habitat type is its long recovery time (150-200 years), meaning that once habitat is destroyed, it is unlikely to be recovered within time frames relevant to ongoing conservation planning. Any loss of Joshua Tree habitat should therefore be considered functionally irreversible, and should be avoided whenever possible. Of particular concern are invasive plants that increase vulnerability to fire (particularly red brome, *Bromus rubens*), and ignition of fires by humans (Brooks and Matchett 2006). Particular areas of interest for protection include the McCullough and Newberry Mountains in southern Clark County, because they contain the full suite of Priority species for this habitat type (Beason and Jentsch 2001). Other Joshua tree areas have not yet been as well-inventoried as these two mountain ranges, but likely contain areas of bird conservation interest, as well.

A few Nevada species are very strongly associated with Joshua Tree habitat, including two Priority species, Bendire's Thrasher and the very rare Gilded Flicker. For both of these species, Joshua trees, *Yucca*s, and cactuses need to have reached a mature or old-growth stage before they are suitable for nesting. Black-chinned Sparrows occur at the upper elevation range of Joshua Tree habitat where it interfaces with the pinyon-juniper zone and provides a diverse shrub understory. Costa's Hummingbird and Le Conte's Thrasher are additional Priority species that use this habitat type, especially if it occurs in close proximity to ephemeral washes, springs, or riparian areas. The two Indicator species Cactus Wren and Scott's Oriole were selected because they are relatively common birds than can reliably be found in intact, healthy Joshua Tree habitat even when the Priority species are absent. Figure Hab-9-1 illustrates an idealized and compressed version of the Joshua tree landscapes that favor Priority bird species.

Main Concerns and Challenges

The following top seven conservation concerns were identified in our planning sessions for Joshua Tree habitat in Nevada:

- Change in precipitation and snowmelt related to climate change
- Change in temperature related to climate change
- Increased fire frequency or intensity
- Invasive weeds
- Urban, suburban, and industrial development
- Motorized recreation
- Livestock/wild horse and burro grazing

Traditional concerns for Joshua Tree habitat include loss to development and impacts from motorized recreation, domestic livestock, wild horses, and burros. However, habitat-destroying

fire and changes in precipitation and temperature are far more threatening for this habitat type over the longer term. Even though Joshua trees and *Yuccas* are drought-adapted, they require relatively wet conditions for establishment of young plants, which grow very slowly even in ideal conditions (Vamstad and Rotenberry 2010). Survival of young plants, even after establishment, may be greatly compromised by prolonged droughts (DeFalco et al. 2010). Invasion by annual weeds is a compounding threat for this habitat type, mostly because it increases the risk of large fires, which usually eliminate young Joshua trees and reduce survival of older trees (DeFalco et al. 2010). Furthermore, fires are likely to occur more frequently in weed-infested areas, which may keep native plants from ever reaching the late-successional stages (Vamstad and Rotenberry 2010) required by Bendire's Thrasher and Gilded Flicker. Several large fires destroyed significant amounts of Joshua Tree habitat in the mid-2000's, and efforts should be made to prevent further losses wherever possible.

Nevada Bird Count transect in Joshua Tree habitat. Photo by Jen Ballard.

Joshua Tree

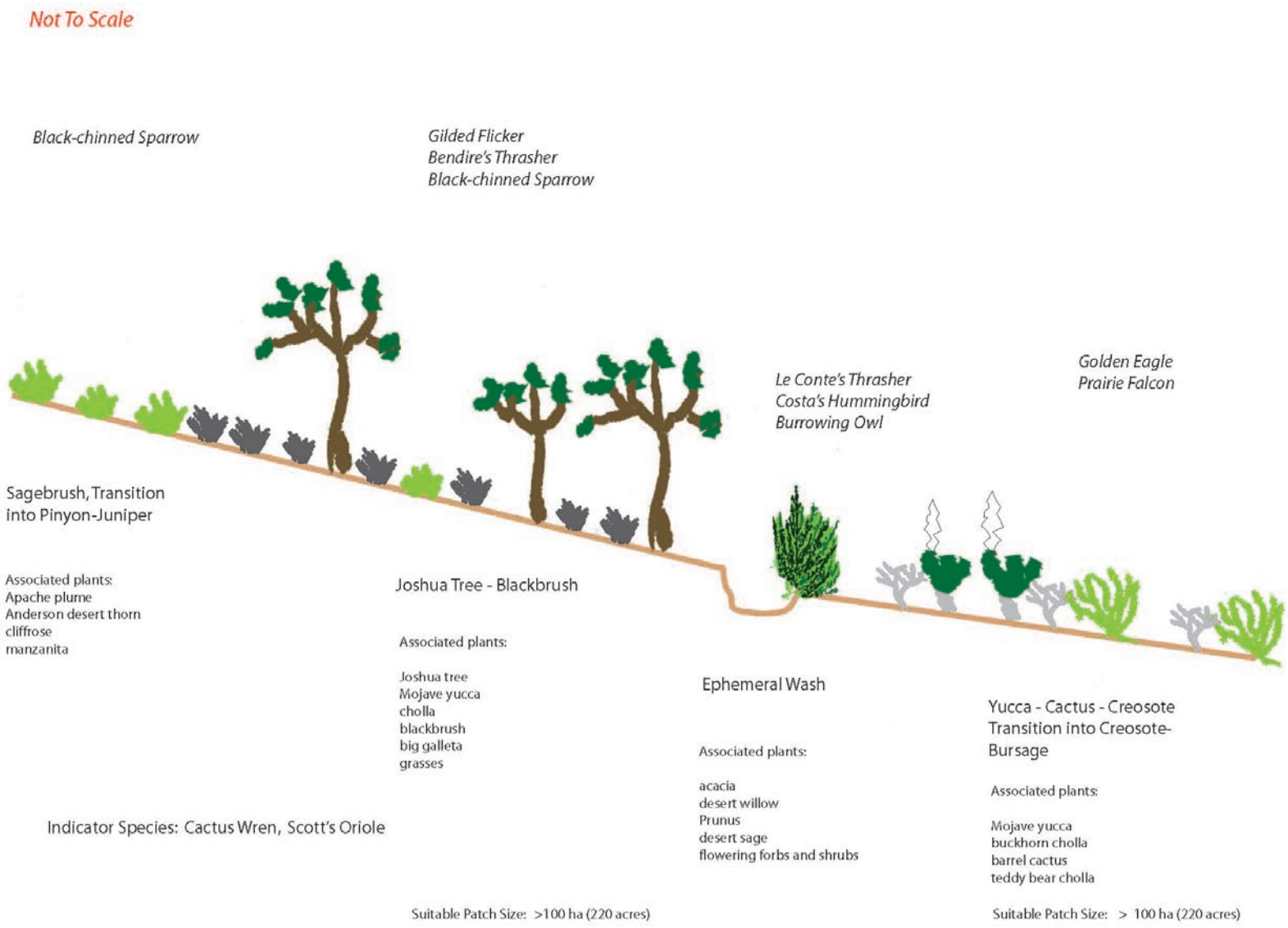


Figure Hab-8-1: Idealized Joshua tree landscape to maximize the number of Joshua tree associated Priority bird species.

Conservation Strategies

Habitat Strategies

- **Manage at landscape scale (> 200 ha [500 ac])**. High species richness in shrubs, old-growth *Yucca* spp., and cholla cactuses are particularly suitable for birds
- **Aggressive fire prevention** and **weed control** in Joshua Tree habitat are currently the most important stop-gap measures for habitat loss. Fire management and invasive weed control may be coordinated across agencies to be most effective
- Proximity to **ephemeral washes or springs**, presence of **cliffs** > 30 m [100 ft] tall, or **abandoned mines** (which may be gated) raise the priority level of a site for bird conservation. However, due to the long habitat recovery time, we recommend avoiding **all** future losses of Joshua Tree habitat to the maximum extent possible
- Where removal of Joshua trees, Yuccas, and cactuses cannot be avoided, we strongly recommend that they be **replanted in suitable sites**, such as recently-burned Joshua tree areas
- The majority of Priority bird species nest between **April 1 and July 1**, and some of them are sensitive to nest disturbance, which should be minimized when possible

Research, Planning, and Monitoring Strategies

- Joshua tree stands in Nevada are not fully mapped yet. We recommend that Clark County's Desert Conservation Program's current effort to map these habitats in Clark County be expanded into Nye and Esmeralda counties through a multi-agency inventory effort, and further that other Joshua Tree mapping efforts underway by USGS be used to generate the best possible GIS maps of Joshua tree occurrence, density, and condition
- **Monitoring stand conditions and habitat loss** will be critical for effective adaptive management efforts in light of climate change and increased fire frequency. Therefore, we recommend that a comprehensive monitoring plan for Joshua Tree habitats, perhaps similar to forestry monitoring practices, be developed and implemented
- Continue **long-term monitoring of landbirds** statewide through the Nevada Bird Count
- **Research the effects of new threats**, such as new invasive weeds, motorized recreation, and climate change to determine the most effective management strategies

Public Outreach Strategies

- **Promote public appreciation** of healthy Joshua Tree – *Yucca* landscapes and bird communities, particularly with regard to native understory vegetation and threats from off-road vehicle recreation

Marsh

Marsh along the Lower Truckee River, Washoe County. Photo by Elisabeth Ammon.

Key Bird-Habitat Attributes

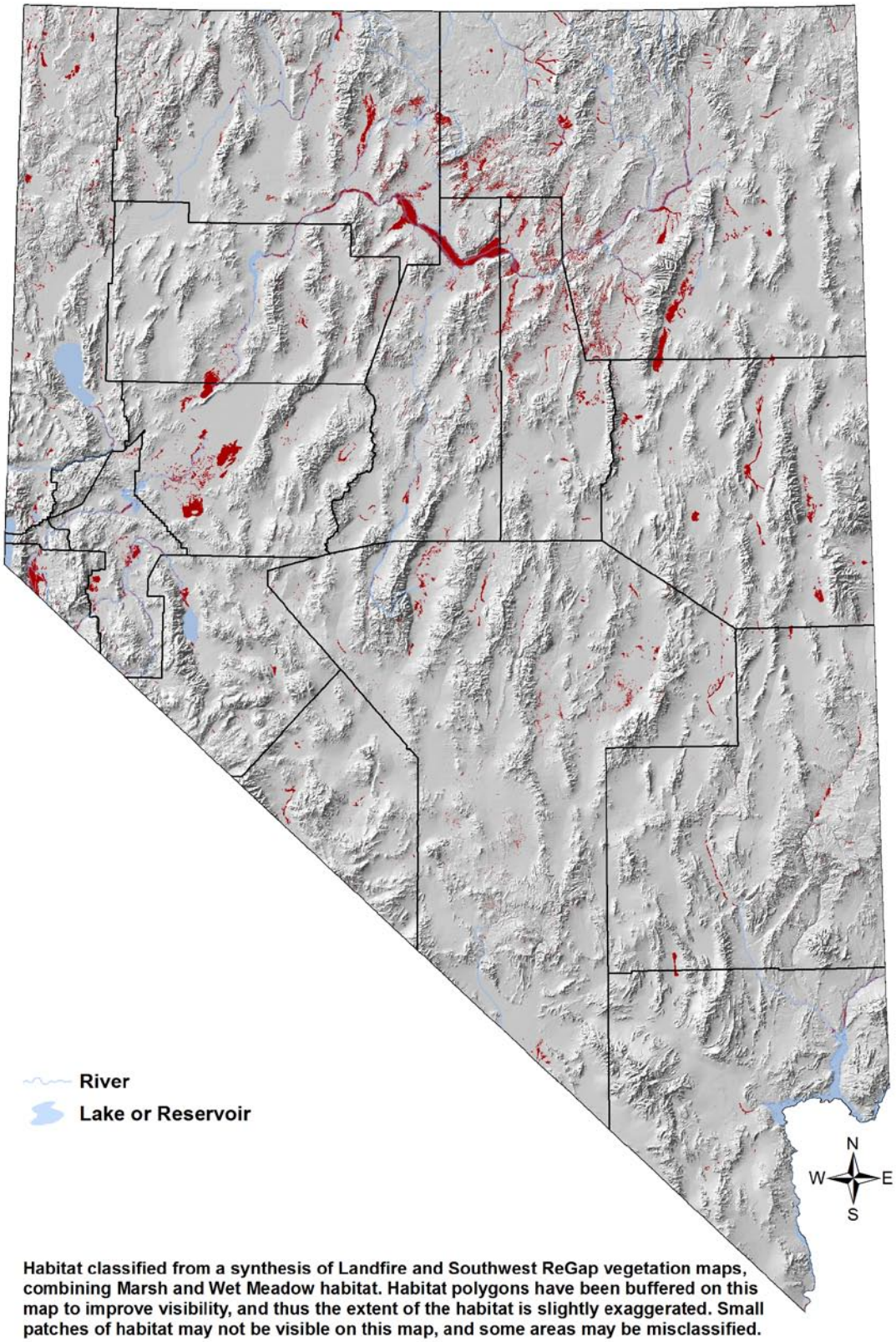
Plant Species Composition	Multi-species emergent and submerged vegetation, particularly with bulrush in deep sections and rushes and sedges at shorelines
Ideal Scale for Conservation Action	Marsh complexes > 5 ha [12 ac] ideal, but 1 ha [2.5 ac] and smaller patches useful also; > 100 m buffer of native vegetation around most shorelines ideal
Emergent Vegetation Cover	Mosaic of approximately 1:1 ratio of open water and emergent vegetation (hemi-marsh), with more open water in deeper sections
Hydrology	Marshes with inflow and outflow system ideal, but terminal marshes also valuable; permanent water ideal, or seasonal flooding during much of the year
Other Features	Islands particularly beneficial, especially in larger wetlands; sedge islands (semi-submerged) and islands with dry vegetation both useful

Conservation Profile

Estimated Cover in Nevada	35,500 ha [87,800 ac] 0.1% of state
Landownership Breakdown	Private = 41% Undesignated waterbodies = 18% BLM = 12% BOR = 11% Other = 18%
Priority Bird Species	Trumpeter Swan Tundra Swan Cinnamon Teal Northern Pintail Canvasback Redhead Lesser Scaup Eared Grebe Least Bittern (Mojave) Snowy Egret White-faced Ibis Clapper Rail (Mojave) Sandhill Crane Willet Marbled Godwit (western Nevada) Long-billed Dowitcher Wilson's Phalarope Franklin's Gull Black Tern Tricolored Blackbird (Carson Valley) (Willow Flycatcher and four other Priority species use marshes secondarily)
Indicator Species	None needed
Most Important Conservation Concerns	Surface water diversion and impoundments Groundwater pumping Climate change (change in precipitation and temperature) Livestock, wild horse and burro grazing Recreation
Habitat Recovery Time	5-10 years
Regions of Greatest Conservation Interest	Churchill, Humboldt, Washoe, Elko, Clark counties; Nye and Lincoln counties
Important Bird Areas	Carson Valley, Boyd Humboldt Valley Wetlands, Ruby Lake, North Ruby Valley, Boyd Humboldt Valley Wetlands, Franklin Lake, Lahontan Valley Wetlands, Carson River Delta, Washoe Valley, Swan Lake, Mary's River, Monitor Valley, Ash Meadows NWR, Pahranagat Valley Complex, Moapa Valley, Virgin River, Oasis Valley

Marsh

Map shows <u>combined</u> extent of Marsh and Wet Meadow habitat types



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps, combining Marsh and Wet Meadow habitat. Habitat polygons have been buffered on this map to improve visibility, and thus the extent of the habitat is slightly exaggerated. Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Marsh

Overview

Marshes with emergent vegetation and permanent water occupy just a tiny fraction of Nevada, but, along with open water bodies, they support more Priority species than any other habitat type, as can be readily determined by examining the Conservation Profile table. Many of the Priority waterfowl species use marshes and their shorelines for nesting, and then shift to larger open water bodies for migration and wintering. In addition to the large number of Priority species that are wetland obligates, many upland birds also use marshes periodically for foraging, shelter, or access to water. Riparian / marsh landscape complexes are critical strongholds for birds in Nevada and should therefore be considered among the overall highest priorities for habitat conservation. In the marsh setting, intact emergent vegetation such as alkali and hardstem bulrush, sedges, and rushes are major determinates of bird-habitat value. Also, sago, horned, and Richardson's pondweeds, water buttercup, milfoil, widgeon grass, pickleweed, Olney three-square and other aquatic and emergent vegetation are important to some Priority species, particularly waterfowl (Kadlec and Smith 1989).

An "ideal" marsh for birds consists of approximately equal proportions of open water and emergent vegetation, and aquatic bird usually prefer that emergent vegetation stands contain patchy open water inclusions. Islands are especially valuable for nesting and resting for many species because they are free of terrestrial predators. Therefore, restored or artificial wetlands should be designed, where possible, to incorporate emergent or dry islands near the center of the marsh, surrounded by relatively deep water (Picman et al. 1993). Our patch size recommendation for marsh conservation is ≥ 5 ha [11 ac] (Brown and Dinsmore 1986), although smaller marshes also have bird habitat value, particularly in more arid areas where they may be a critical resource for upland birds. In a landscape context, connectivity of marshes with other mesic habitats, including additional marshes, open waterbodies, wet meadows, riparian areas, and agricultural areas is very desirable, and should factor into conservation prioritization and restoration design. In Figure Hab-10-1, we illustrate an idealized marsh landscape that shows important habitat features that support conservation priority species.

The hydrology of a marsh can be critical for bird conservation. Ideally, a marsh will be fully inundated and have a stable water level during the period when most birds are nesting, and water levels will remain reasonably high throughout the fall migration period. However, where marshes become overgrown due to lack of natural disturbances, or where invasive plants are a problem, occasional water draw-downs, mowing, or prescribed fire, followed by re-inundation (> 20 cm [8 in] depth) can be effective treatments (Kadlec and Smith 1989). We also encourage land mangers to actively pursue opportunities for creating shrub willow habitat in saturated wetland soils (recommended patch size > 0.4 ha [1 ac], but smaller patches are useful, too), as this habitat element has been historically lost to agricultural uses in many wetland sites. The Willow Flycatcher's dramatic decline in historic times, both in the southwest and the Great Basin, is most likely attributable to widespread losses of this habitat feature.

Main Concerns and Challenges

The following top six conservation concerns were identified in our planning sessions for marshes in Nevada:

- Surface water diversion and impoundments
- Groundwater pumping
- Change in precipitation and snowmelt related to climate change
- Change in temperature related to climate change
- Livestock, wild horse and burro grazing
- Recreation

Marshes, of course, require water in order to function as marshes, and therefore the first four conservation concerns are all related to maintaining sufficient water supplies. They include water diversions, which were mostly engineered long ago but which continue to impact the amount of water available to marshes, as well as more recently developing concerns about the impacts that climate change may have on the overall water supply. All of these factors are related to one another, and collectively they will determine the amount of water that eventually finds its way into marshes. Unfortunately, this amount of water will be limited, and therefore it is important to determine how to prioritize our efforts to conserve and restore marshes. Our conservation recommendation is to focus protection and enhancement efforts on sites that can be sustained in the long term. Additionally, although all marshes are valuable, the greatest conservation return can be realized by adding effective acreage to existing wetland or wetland/riparian complexes, as opposed to protecting or restoring smaller, more isolated marshes.

Where overgrazing occurs, it can have detrimental effects on marsh vegetation and local impacts on breeding birds, but this issue is less of a concern than it is in riparian areas. Likewise, recreational use may have impacts, but these are usually local in nature.

Marshes, along with riparian woodlands, differ from most other focal habitat types in two important ways that bear consideration. First, they are largely privately owned. Although Nevada's most productive marsh complexes are already protected in NWR's and WMA's, there is significant potential to conserve birds by engaging in a concerted and sustained effort to form partnerships and stewardship agreements with private landowners. The Tricolored Blackbird's only regular Nevada breeding location, which is privately owned and not formally protected, is a case in point. Partnerships can be accomplished through vehicles like the Nevada Important Bird Areas program, or the public outreach offices of resource management agencies. Second, marshes respond quickly and positively to well-planned enhancement or restoration efforts. Ideally, these would occur in high priority landscapes, as described above, but there is also value in seizing opportunities to create (or re-create) marshes wherever water supplies become available.

Marsh

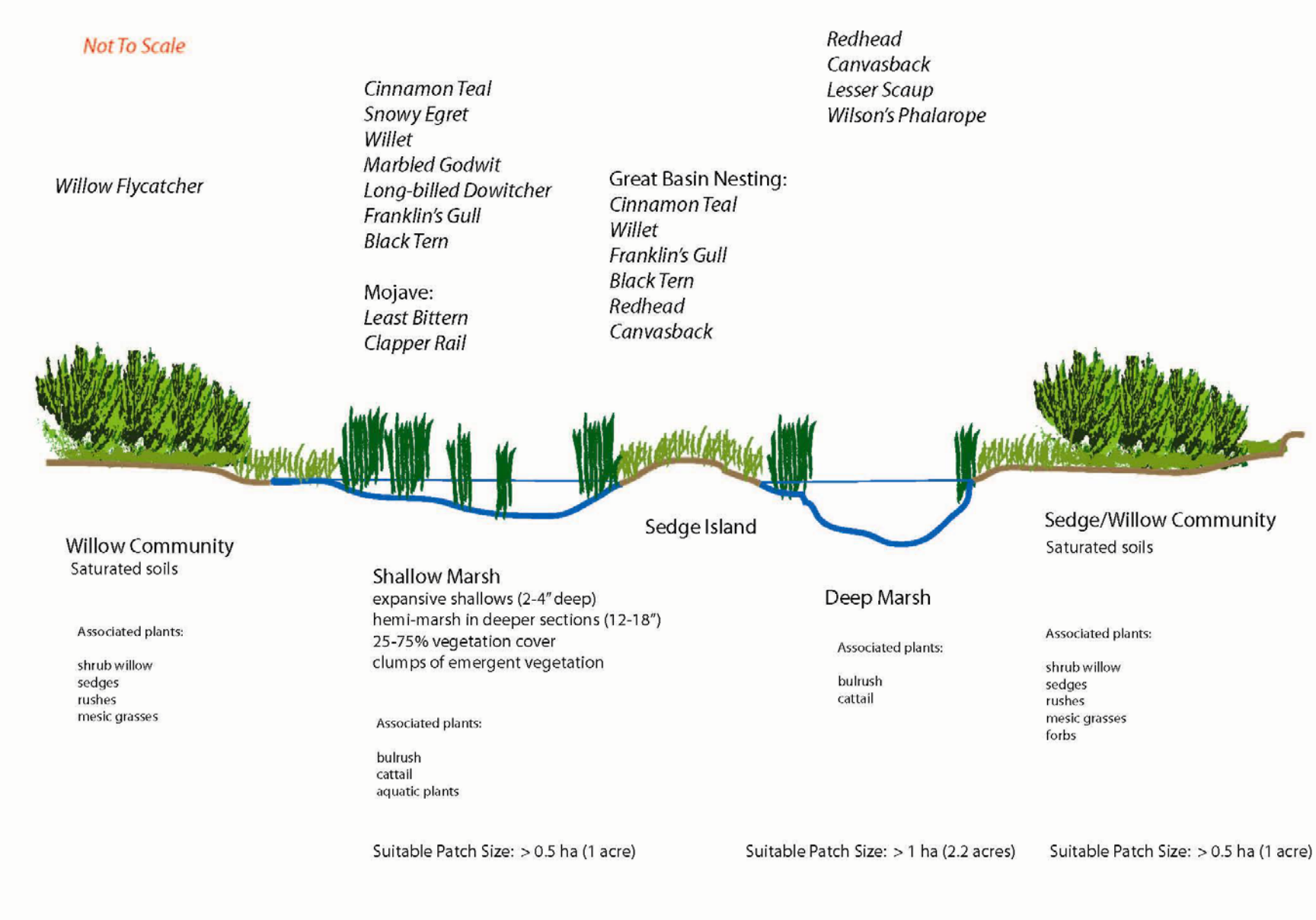


Figure Hab-9-1: Idealized marsh landscape to maximize the number of marsh associated Priority bird species.

Conservation Strategies

Habitat Strategies

- **Manage at the scale of the entire wetland or wetland complex** that can be supported by available water. Small patches are also valuable, but ideal patch sizes exceed 1 ha [2.5 ac]. Buffers of native vegetation around marshes are beneficial for many bird species
- **Islands** are particularly valuable in marsh complexes and should be protected from disturbances during the breeding season, and possibly during migration
- **Intensive agricultural practices**, such as sustained grazing and heavy pesticide use, should be avoided because they increase the risk of weed invasion and negatively impact water quality
- Proximity to **other marshes, open water, riparian areas, springs, wet meadows** and **cliffs** > 30 m [100 ft] tall raise the priority level of a site for bird conservation.
- Hydrology of the wetland ideally features **year-round (or near year-round) inundation** with an **inflow/outflow system,** but terminal marshes that are semi-permanent from spring runoff are also valuable
- The majority of priority bird species nest between **May 1 and July 15**, and some of them are particularly sensitive to nest disturbance. This is the time period when intensive treatments or heavy land uses should be largely avoided, and when water levels should remain stable whenever possible

Research, Planning, and Monitoring Strategies

- Develop a comprehensive, statewide wetlands conservation strategy that seeks out **all opportunities** for protecting existing wetlands (particularly in **Important Bird Areas**), and expanding wetland acreage in areas where these can be sustained in the long term. **Close coordination** among resource management agencies, private landowners, and other organizations will be necessary for maximum effectiveness.
- A comprehensive **inventory of all wetland systems** of Nevada, including small habitat patches, has not been completed in recent times, and will be necessary for documenting wetland losses and effects of climate change.
- Continue and increase **long-term monitoring of aquatic birds, shorebirds, and marshbirds** statewide through existing programs (NWR and WMA counts, NDOW and USFWS aerial waterfowl, shorebird, and colonial waterbird surveys, and the Aquatic Bird Count program), and explore mechanisms to share and integrate data produced by different monitoring programs

Public Outreach Strategies

- **Promote wildlife-friendly wetland practices** with **private landowners** and agencies. Highlight wetland protection and enhancement as one of the most important overall bird conservation measures that can be implemented in Nevada
- **Promote low-impact recreational uses** to raise public appreciation of wetland resources, using careful outreach and recreational infrastructure planning, including trail design, board walks and observation decks, hunting blinds, and educational material available to visitors.

Mesquite-Acacia

Mesquite bosque near Corn Creek, Clark County.
Photo by Elisabeth Ammon.

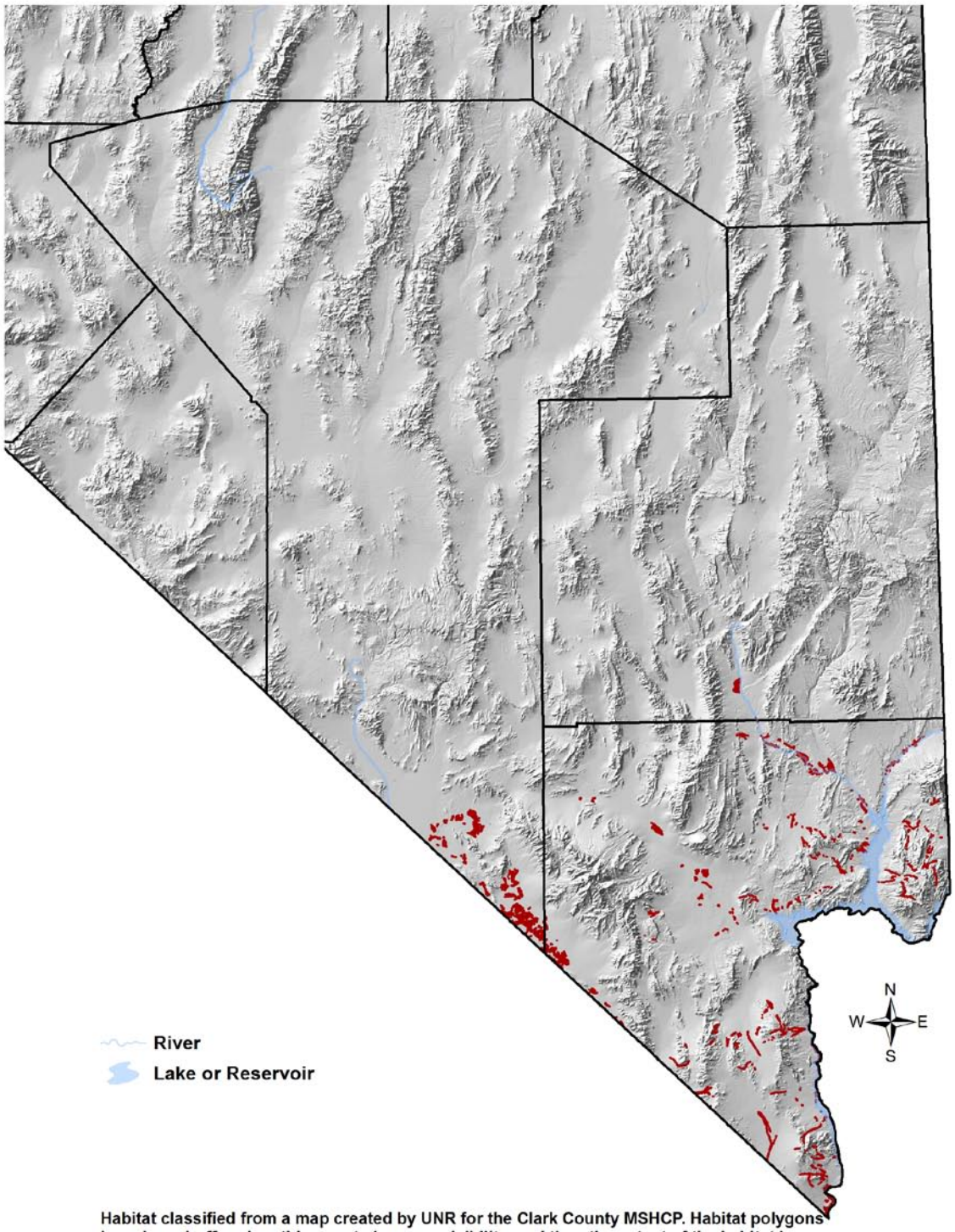
Key Bird-Habitat Attributes

Stand Structure	Multi-aged, open stands of mesquite, acacia, or both, with forb understory
Ideal Scale for Conservation Action	Whole stand (usually 16 – 32 ha [40-60 ac] or more)
Plant Species Composition	Both species of mesquite are useful, areas with tall-growing trees encouraged; mistletoe infections particularly beneficial
Plant Condition	Healthy trees that support mistletoe most useful; shrub and forb understory should be intact, particularly hummingbird plants
Distance to Riparian/Spring Habitats	Proximity of water-dependent habitat increases value to birds
Presence of Cliffs > 30 m [100 ft] Tall	Presence of tall cliffs increases value to birds

Conservation Profile

Estimated Cover in Nevada	11,400 ha [28,200 acres] 0.04% of state
Landownership Breakdown	BLM = 56% Private = 27% FWS = 8% NPS = 7% Other = 2%
Priority Bird Species	Gambel's Quail Costa's Hummingbird Bendire's Thrasher Le Conte's Thrasher Lucy's Warbler Abert's Towhee (Rufous Hummingbird) (Bell's Vireo)
Indicator Species	Phainopepla
Most Important Conservation Concerns	Urban, suburban, and industrial development Invasive weeds Climate change (change in precipitation and temperature) Motorized recreation Livestock, wild horse and burro grazing Increased fire frequency or intensity
Habitat Recovery Time	25 years
Regions of Greatest Conservation Interest	Southern Nye County, Sandy Valley, Las Vegas Valley, southern Clark County
Important Bird Areas	Ash Meadows NWR Catclaw Washes Lake Mead Moapa Valley Virgin River

Mesquite-Acacia



Habitat classified from a map created by UNR for the Clark County MSHCP. Habitat polygons have been buffered on this map to improve visibility, and thus the extent of the habitat is slightly exaggerated. Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Mesquite-Acacia

Overview

In Nevada, Mesquite-Acacia habitat occurs in generally small patches scattered around the Mojave Desert region. For the purpose of this plan, we do not include mesquite stands that are associated with lowland riparian corridors, which are covered in the Mojave Lowland Riparian account. Most non-riparian Mesquite-Acacia habitat occurs either within ephemeral washes or in "bosques" where trees can access upwelling groundwater. Both types of mesquite-acacia stands are important to a set of Priority species, including Gambel's Quail, Costa's Hummingbird, and Abert's Towhee. Additionally birds that are primarily shrubland inhabitants may benefit from the shelter and foraging opportunities provided by nearby mesquite-acacia stands. Of all birds, however, the Phainopepla, an Indicator species in this plan, is perhaps the best-known avian associate of Mesquite-Acacia habitat. Probably the largest historical concentration of mesquite-acacia in Nevada occurred in Las Vegas Valley, where it has been converted to urban developments in all but a few remnant areas (Krueger 2000). Therefore, preserving remaining patches of non-riparian mesquite-acacia is a high priority. A critical element in determining the value of a mesquite-acacia patch for birds appears to be the presence of mistletoe infections. Birds use mistletoes directly for their berries and for nesting substrate, and they may also take advantage of increased prey density that is likely associated with them. Figure Hab-11-1 illustrates the habitat features that we believe are most important to mesquite-acacia Priority species.

Main Concerns and Challenges

The following top eight conservation concerns were identified in our planning sessions for Mesquite-Acacia habitat in Nevada:

- Urban, suburban, and industrial development
- Groundwater pumping
- Invasive weeds
- Change in precipitation and snowmelt
- Change in temperature
- Motorized recreation
- Livestock, wild horse and burro grazing
- Increased fire frequency or intensity

None of these concerns were ranked very highly, except direct loss of habitat to development. Groundwater pumping was a moderate concern, in that it could reduce the upwellings upon which mesquite bosques rely. Invasive weeds and fire can have local impacts, as can grazing, but these have not been well documented for this habitat type. Off-highway vehicle (OHV) use and firewood gathering may also cause localized habitat degradation. Climate change was listed as a concern, given that non-riparian mesquite-acacia stands exist only where they have access to elevated subsurface moisture. Under a changing climate, subsurface moisture associated with occasional flash flooding events (ephemeral washes) and groundwater upwellings could decline.

Mesquite-Acacia

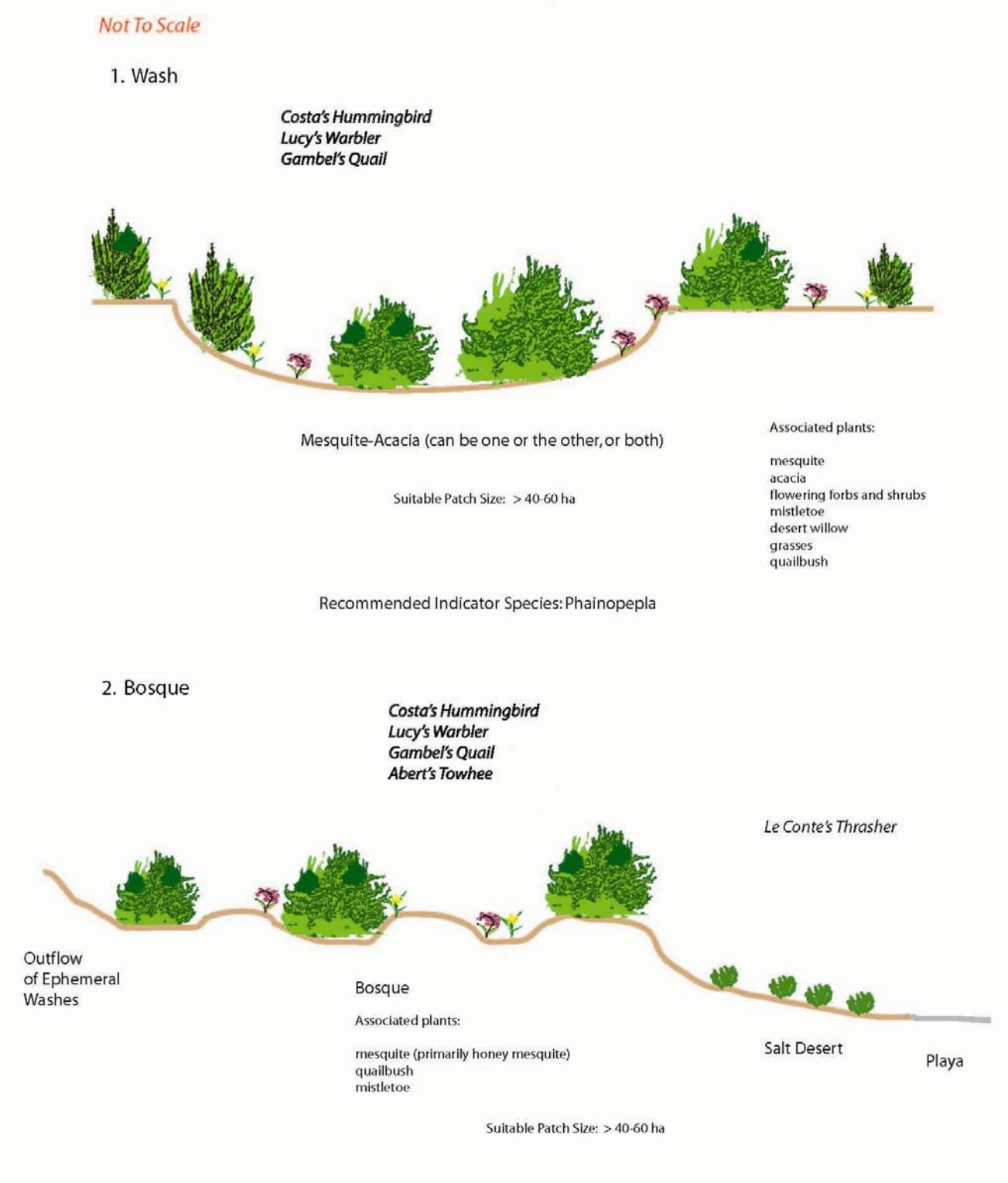


Figure Hab-10-1: Idealized mesquite-acacia landscapes to maximize the number of mesquite-acacia associated Priority bird species.

Conservation Strategies

Habitat Strategies

- **Manage at the scale of a whole stand** (usually about 20 ha [50 ac], but larger patches are more valuable) with the goal of maintaining healthy trees, mistletoe infections, and intact understory plants, particularly forbs and shrubs that provide hummingbird resources
- **Prevent habitat conversion** to the extent possible in remaining mesquite-acacia stands
- **Recreation** should be managed to keep motorized uses away from mesquite-acacia stands to the extent possible. Established trails may be placed to avoid the healthiest stands, and alternate shade opportunities may be provided
- Evaluate effects of **local groundwater pumping** on mesquite-acacia viability and pursue opportunities to keep it at non-impact levels
- Urban or rural settlements attract **feral cats and other subsidized predators**. Feral cat colonies should be discouraged in mesquite-acacia areas where possible
- Proximity to **water** (riparian areas, desert springs, wet meadows) and presence of **cliffs** > 30 m [100 ft] tall raise the priority level of a site for bird conservation
- Management of **invasive plants** is useful for this habitat type, as they degrade habitat integrity and may increase fire risk
- Maintain **grazing and OHV use** at levels that do not permanently impact the shrub and forb understory or cause soils to be unnaturally exposed
- The majority of priority bird species nest between **April 1 and July 1**, and some of them are particularly sensitive to nest disturbance. This is the time period when disturbances should be minimized

Research, Planning, and Monitoring Strategies

- **Mitigation opportunities** should be sought throughout the historic range of mesquite-acacia, both for future impacts and for past habitat conversions
- **Monitor mesquite-acacia stands** for adaptive management in light of climate change effects and increased demands on groundwater
- Study **effects of OHV use** on priority landbirds and habitat integrity
- Continue **long-term monitoring of landbirds** statewide through the Nevada Bird Count

Public Outreach Strategies

- **Promote responsible OHV uses and low-impact recreation**, such as hiking, bird-watching, and photography

Female Phainopepla. Photo by Scott Page.

Mojave Lowland Riparian

Mojave Lowland Riparian habitat along Lake Mohave, Clark County. Photo by Elisabeth Ammon.

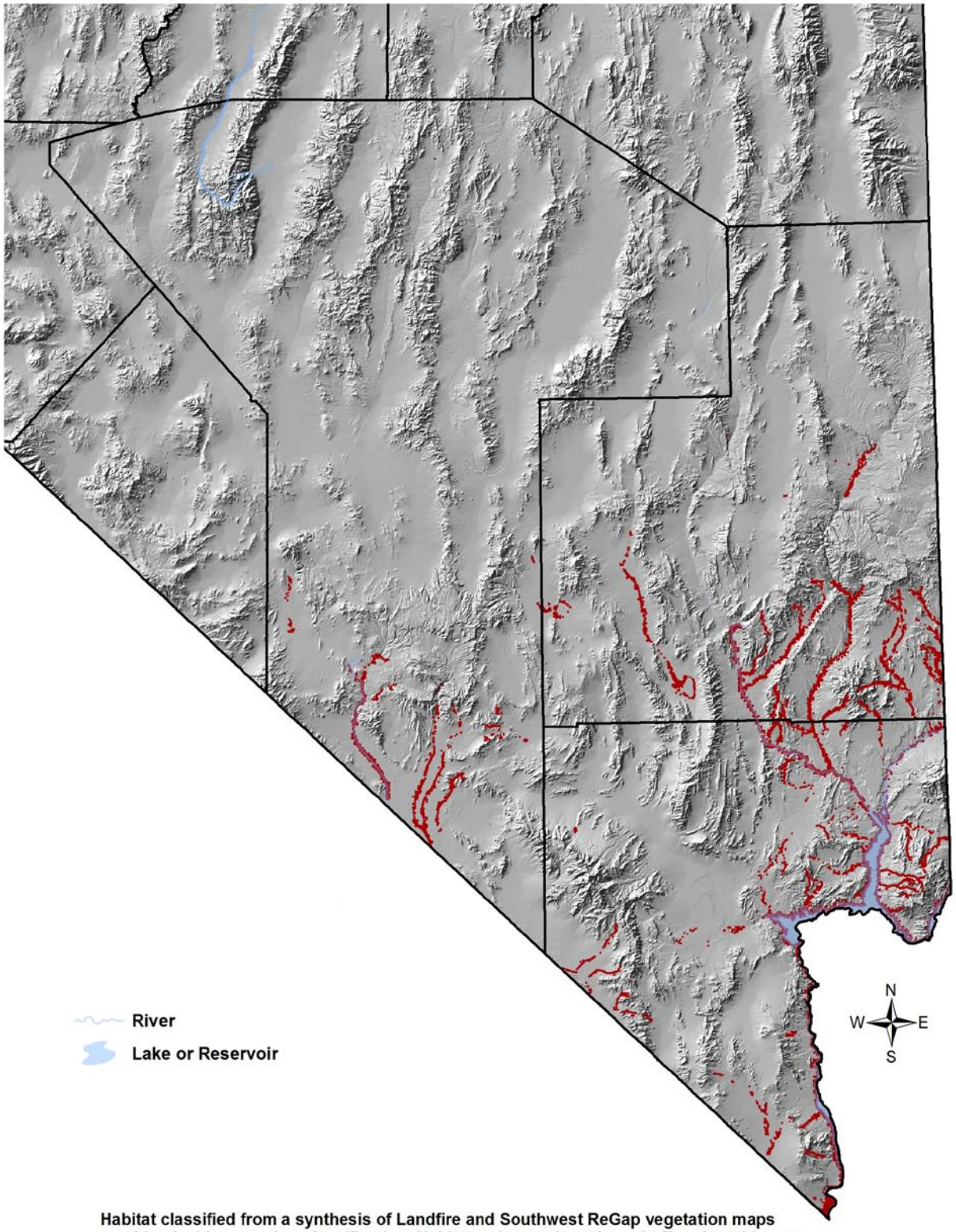
Key Bird-Habitat Attributes

Stand Structure	Multi-aged tree stands with riparian shrub understory, interspersed with groves of dense riparian shrubs (willows and others) and floodplain wetlands
Ideal Scale for Conservation Action	50 ha [125 ac] or more
Plant Species Composition	Mixed stands of cottonwood and tree willow with multiple species of shrubs as understory, with emphasis on willows; tree willows especially productive for birds; saturated soils or patchy wetlands particularly valuable
Snags	Old-growth riparian trees, including snags and large dead branches add nesting opportunities for several Priority species
Salt Cedar	Removal of saltcedar should be followed by immediate revegetation, to the extent possible; tamarisk beetle invasion should be closely monitored and loss of large stands mitigated to the extent possible with revegetation
Presence of Cliffs > 30 m [100 ft] Tall	Presence of tall cliffs increases value to birds

Conservation Profile

Estimated Cover in Nevada	16,150 ha [39,900 ac] 0.06% of state
Landownership Breakdown	BLM = 40% NPS = 36% Private = 8% State Lands = 5% Tribal = 4% FWS = 2% Other = 5%
Priority Bird Species	Gambel's Quail Snowy Egret Swainson's Hawk Yellow-billed Cuckoo White-throated Swift Costa's Hummingbird Rufous Hummingbird Willow Flycatcher Bell's Vireo Lucy's Warbler Abert's Towhee (Least Bittern) (Clapper Rail)
Indicator Species	Yellow Warbler (breeding) Wilson's Warbler (migration)
Most Important Conservation Concerns	Surface water diversion, impoundments, and flood control Invasive plants Biocontrol activities Urban,suburban, and industrial development Groundwater pumping Climate change (change in precipitation and temperature) Livestock, wild horse and burro grazing Increase in fire frequency or intensity Motorized recreation
Habitat Recovery Time	25 years
Regions of Greatest Conservation Interest	Virgin and Muddy Rivers, Lake Mojave and Big Bend of Colorado River, Meadow Valley Wash, Pahranagat Valley, Ash Meadows NWR, and many small spring systems
Important Bird Areas	Ash Meadows NWR Lake Mead Lower Muddy River Meadow Valley Wash Moapa Valley Oasis Valley Pahranagat Valley Complex Virgin River

Mojave Lowland Riparian



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps combined with manual re-classification. Habitat polygons have been buffered on this map to improve visibility, and thus the extent of the habitat is slightly exaggerated. Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Mojave Lowland Riparian

Overview

Mojave lowland riparian areas have been historical strongholds of bird species richness in Nevada, even though they only cover less than one percent of the Nevada landscape. Ideally, their complex mix of gallery forest, shrub willows, and floodplain wetlands can provide oases of food-rich, cool environments in the desert landscape, and checklists of over 200 bird species are not unheard of for relatively intact sites. Dominant woody species include Fremont cottonwood (*Populus fremontii*), Goodding's willow (*Salix gooddingii*), and various species of shrub willows (*Salix* spp.), and, in higher elevations, velvet ash (*Fraxinus velutina*). Other riparian shrubs and trees, such as honey mesquite (*Prosopis glandulosa*), and a variety of native herbaceous plants are also found in intact systems, and their presence is important for Priority species such as Lucy's Warbler. Mojave Lowland Riparian habitats are home to some of the birds of greatest conservation concern in Nevada, such as the Southwestern Willow Flycatcher and Yellow-billed Cuckoo. Additionally, the Elf Owl was historically found in old-growth riparian woodlands at the southern tip of Nevada (Rosenberg et al. 1991) and may be poised for a return as it was recently recorded just outside Nevada in Utah's Washington County (Floyd 2000).

Ideal Mojave lowland riparian landscapes consist of a mosaic of dense shrub willow thickets, groves of riparian trees, backwaters and oxbow wetlands, a dynamic floodplain that maintains different successional stages, and a buffer of intact transitional habitat types, such as quailbush, mesquite, and flowering shrubs (Fig. Hab-12-1). These conditions are most often achieved along streams or rivers that have natural flow regimes, or flows that mimic natural regimes. If flows are significantly altered, the probability of native riparian plant loss and weed invasion, particularly by saltcedar, increases (Merritt and Poff 2010). All rivers in the Mojave Desert of Nevada have been altered to various degrees through surface water diversions, channelization, impoundments, and resulting invasive plants. However, careful weed control efforts, water management, and habitat restoration programs can re-create close-to-historic conditions even in these altered riparian systems, as has occurred (or is occurring) in Ash Meadows NWR, Pahranagat NWR, Key Pittman WMA, and along parts of the Lower Colorado River (LCR MSCP 2004). In addition to pursuing active intensive restoration, we also encourage planners and resource managers to seek out opportunities for natural recovery of riparian habitat patches in smaller, free-flowing systems, such as spring outflows and small tributaries, wherever feasible. Generally this will require that stream flows remain in a semi-natural state, or that these flows can be re-established.

Main Concerns and Challenges

The following top conservation concerns were identified in our planning sessions for Mojave Lowland Riparian habitat in Nevada:

- Surface water diversion, impoundments, and flood control
- Invasive weeds
- Biocontrol activities
- Urban, suburban, and industrial development
- Groundwater pumping
- Change in precipitation and snowmelt related to climate change

- Change in temperature related to climate change
- Overgrazing by livestock, wild horses and burros
- Flood control
- Increase in fire frequency or intensity
- Motorized recreation

The list of conservation concerns associated with Mojave Lowland Riparian habitat is long and challenging. Given that riparian areas support a disproportionate share of bird diversity, and that they provide crucial migration stopover habitat for landbirds, we are very concerned about any further losses of this habitat, which has already been greatly diminished from historic water development projects and agricultural uses. Several of the top conservations concerns are related in one way or another to maintaining or re-establishing sufficient water flows. Accomplishing this will require concerted effort given the multiple demands on water, along with increasing temperatures and the possibility of reduced precipitation and more frequent droughts.

Starting in the 1970s, lowland riparian areas of the southwest were invaded by saltcedar (tamarisk), following major habitat perturbations such as channelization, impoundments, and surface water diversion (Stromberg et al. 2009). Much has been reported on the relatively low habitat value of saltcedar compared to native vegetation it replaced (e.g., Brand et al. 2008), and as a result, conservation literature for the southwest from the 1980-90s often focused on saltcedar eradication. However, several Priority species, including Southwestern Willow Flycatcher, Bell's Vireo, and Lucy's Warbler, have since colonized saltcedar as nesting habitat, and today, often rely on mixed or pure saltcedar stands over large reaches of river (Walker 2006). In the mid-2000s, the tamarisk beetle *Diorhabda* was released in the Lower Colorado River system as a biocontrol agent for eradicating saltcedar (Hultine et al. 2010). The beetle defoliates saltcedar, but does not necessarily kill it right away, leaving large stands without a canopy and, thus, unsuitable for birds. More details on this threat are described in the Willow Flycatcher species account (p. Spp-59-1). Recent research suggests that saltcedar eradication alone is often ineffective in restoring native riparian vegetation (Harms and Hiebert 2006), and active revegetation is generally required to achieve optimal restoration benefits for wildlife. Therefore, revegetation using native riparian plants is a key strategy for restoration areas that can sustain native plants.

The invasion by saltcedar and alteration of floodplains has also contributed to increased fire frequency in Mojave Lowland Riparian habitat. Because saltcedar and drought-stressed native vegetation are highly flammable, the fires that occur due to human ignitions or lightning strikes can be catastrophic for sites that are occupied by Priority species. While the recovery time of this habitat type is relatively short, it usually requires active restoration measures to prevent the site from being converted to weeds or upland vegetation. Therefore, we recommend that areas occupied by the highest-priority bird species receive full efforts for protection from fire, in the form of prevention efforts, response planning, and dedication of adequate firefighting resources.

Mojave Lowland Riparian

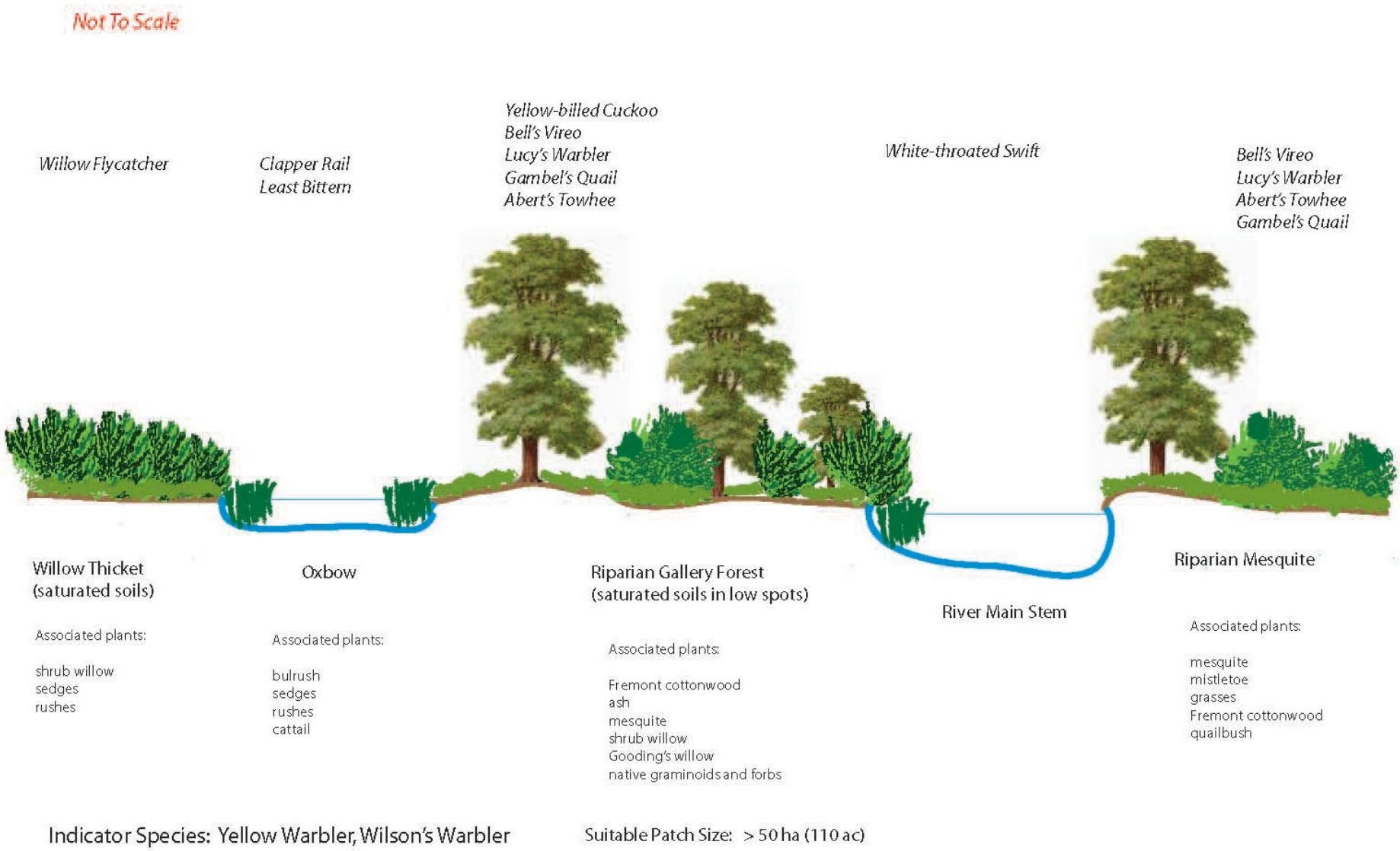


Figure Hab-11-1: Idealized Mojave lowland riparian landscape to maximize the number of riparian associated Priority bird species.

Conservation Strategies

Habitat Strategies

- **Manage at landscape scale (> 50 ha [110 ac]**, but smaller patches are also valuable if intact) with the goal of maintaining mosaic of open, mixed-age tree canopy, riparian shrub thickets, flowering shrubs and forbs, and interspersed floodplain wetlands. High species richness in plants and presence of willows are particularly suitable for birds. Patch sizes within the mosaic may be small (< 0.4 ha [1 ac], but the overall riparian woodland corridor should be contiguous
- **Old-growth trees** are important to several Priority species, but in sites that already have trees, the value of a patch is likely most improved by adding a **native riparian shrub and wetland** component
- **Opportunities to restore channels with natural flow regimes**, or flows that mimic natural regimes, should be aggressively pursued
- **Active revegetation** should be done in all areas where saltcedar is eradicated and native vegetation can be supported
- Maintain **grazing and OHV use** at levels that do not permanently impact the shrub and forb understory or cause soils to be unnaturally exposed
- The majority of priority bird species nest between **April 1 and July 1**, and some of them are particularly sensitive to nest disturbance. This is the time period when intensive treatments or heavy land uses should be largely avoided
- Riparian areas near urban or rural settlements may attract **feral cats and other subsidized predators**. Strategic plantings of impenetrable shrubs (e.g., wild rose) are useful for discouraging opportunistic predators and cowbirds. Feral cat colonies should be moved away from riparian areas

Research, Planning, and Monitoring Strategies

- Planning that allows for **opportunistic habitat restoration** in places that become available may be key to maintaining riparian resources. Even small patches of intact riparian habitat are highly beneficial to nesting and migrating landbirds
- **Fire** prevention, immediate response planning, and management of fire-prone recreational activities are critical for areas that support high-priority conservation species
- **Monitoring of riparian resources** throughout the region and **effectiveness monitoring of restoration activities** are high priorities
- Continue **long-term monitoring of landbirds** statewide through the Nevada Bird Count, and continue species specific monitoring programs for species of special concern, such as Southwestern Willow Flycatcher and Yellow-billed Cuckoo
- Monitor status of **invasive weeds, including saltcedar, and the tamarisk beetle** to assess threat level and to implement adaptive management
- Encourage **low-impact recreation** in riparian areas, move trails away from sensitive areas, and provide observation decks, boardwalks, and educational materials along trails

Conservation Strategies - continued

Public Outreach Strategies

- **Promote public appreciation** of intact lowland riparian areas with carefully planned recreational opportunities that raise public profile without impacting vegetation (bird-watching, photography, fishing, nature walks, etc.)
- **Promote public stewardship** of riparian areas through educational materials that explain the threats from feral and domestic cats, fire dangers, and value of native riparian vegetation to migrating songbirds
- **Promote low-impact recreation activities** to aid in public appreciation and stewardship of high-priority sites, particularly in river reaches that are accessible from urban areas

Saltcedar in bloom. Photo by Jen Ballard.

Mojave Lowland Riparian

Small patch of Mojave Lowland Riparian habitat with nearby cliff.
Photo by Jen Ballard.

Mojave Scrub

Mojave Scrub habitat in Esmeralda County. Photo by Elisabeth Ammon.

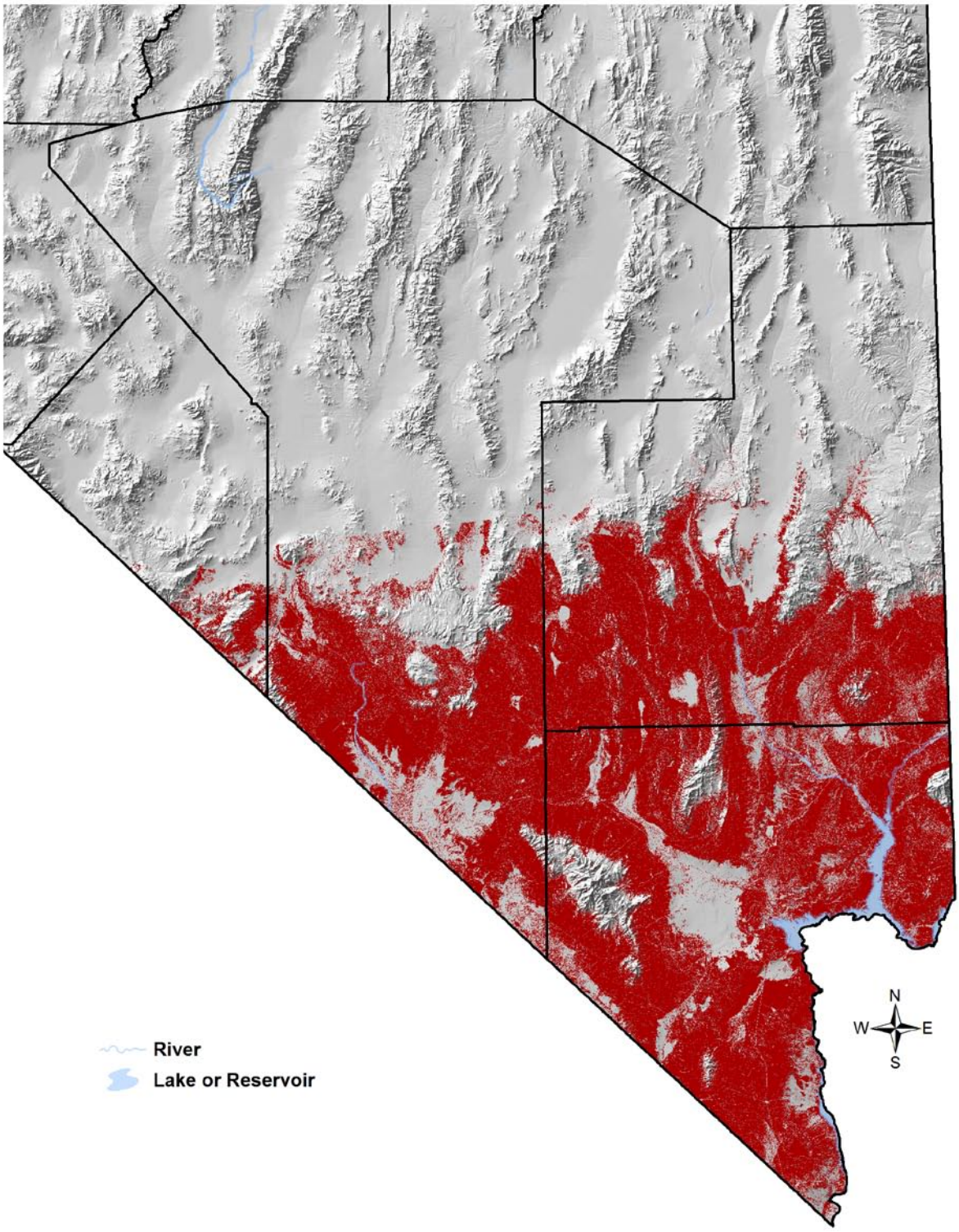
Key Bird-Habitat Attributes

Stand Structure	Mixed creosote-bursage stands at natural densities including other xeric shrub species; plant litter, cryptobiotic soils, and forb understory important
Ideal Scale for Conservation Action	1,000 ha [2,500 ac] or larger
Distance to Riparian/Spring Habitats and Ephemeral Washes	Proximity of mesic habitat types, springs, or presence of ephemeral washes increases value to birds
Presence of Cliffs > 30 m [100 ft] Tall	Presence of tall cliffs increases value to birds

Conservation Profile

Estimated Cover in Nevada	3,120,000 ha ([,706,000 ac] 11% of state
Landownership Breakdown	BLM = 55% DOD = 17% DOE = 8% NPS = 6% Private = 4% Other = 10%
Priority Bird Species	Prairie Falcon Costa's Hummingbird Le Conte's Thrasher (Golden Eagle) (Peregrine Falcon) (Burrowing Owl) (Common Poorwill) (Bendire's Thrasher)
Indicator Species	Black-throated Sparrow
Most Important Conservation Concerns	Energy development Urban, suburban, and industrial development Climate change (change in precipitation and temperature) Mining Motorized recreation Invasive weeds Increased fire frequency or intensity Grazing by wild horses and burros
Habitat Recovery Time	25-50 years
Regions of Greatest Conservation Interest	Clark, Nye, and Lincoln counties
Important Bird Areas	Ash Meadows NWR Catclaw Washes Lake Mead Moapa Valley Oasis Valley Virgin River Wee Thump Joshua Tree Forest

Mojave Scrub



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps.
Some areas may be misclassified.

Mojave Scrub

Overview

Mojave Scrub habitat covers most of southern Nevada. Yet, the Priority species that specialize on this habitat are sparsely distributed on the landscape, and their local presence is often unpredictable from year to year (e.g., Le Conte's Thrasher, Burrowing Owl, and Golden Eagle). The majority of the Mojave scrub landscape is dominated by the creosote-bursage (*Larrea - Ambrosia*) shrub assembly, but can also include blackbrush (*Coleogyne ramosissima*) at higher elevations and in the transitional zone with the Great Basin. Minor occurrences of Joshua trees and other *Yucca* species are sometimes present, but where these are common, we classify them as Joshua Tree habitat for the purpose of this plan. Thorny vegetation components, such as cholla cactuses and low-growing, dense scrubs, are also sometimes present, and are particularly valuable for some Priority species. Finally a suite of native understory plants and cryptobiotic soils are important for several Priority species, including litter probers such as Le Conte's Thrasher, and the Costa's Hummingbird that seeks out flowering plants.

Birds in the Mojave Scrub environment are generally thought to be living at the edge of their physiological limits, particularly with regard to obtaining sufficient water and thermal cover. Resources used by these birds are often ephemeral and unpredictable in this environment and, because of this, most Mojave Scrub specialist species are known to be somewhat nomadic in their year-to-year movements. For instance, Le Conte's Thrashers search for arthropods in the sparse litter around live shrubs, but the presence of arthropods in any given location is not highly predictable from year to year. Similarly, Golden Eagle and Prairie Falcon depend on terrestrial vertebrates that undergo significant population fluctuations in the desert environment. Therefore, we recommend targeting very large patch sizes (> 900 ha [2,200 ac]) for effective conservation and land management. Especially useful are areas that feature tall and semi-mesic shrubs, such those found along ephemeral washes. Similarly, areas that are located within 2 km [1.2 mi] of springs, wetlands, or riparian areas, which provide reliable resources to birds even in difficult years, are a priority. Figure Hab-12-1 illustrates the landscape features of Mojave Scrub habitat that, to the best of our knowledge, promote its Priority species, at least if they occur at a sufficiently large spatial scale.

Mojave Scrub habitat is not the subject of active management efforts in most cases, although some high-priority areas are protected as ACECs (Areas of Critical Environmental Concern) by the BLM, and domestic livestock have been removed from Clark County public lands. Still, large expanses of scrubland are at risk of loss to urban and suburban developments, energy development, and mining. Therefore, our recommendations for conservation focus primarily on avoidance of habitat conversion where possible (or failing that, minimizing fragmentation that results from habitat conversion), and minimizing major soil disturbances (e.g., OHV use) by channeling recreational activities into appropriate designated areas.

Mojave Scrub

Main Concerns and Challenges

The following top conservation concerns were identified in our planning sessions for Mojave Scrub habitat in Nevada:

- Energy development
- Urban, suburban, and industrial development
- Change in precipitation and snowmelt related to climate change
- Change in temperature related to climate change
- Mining
- Motorized recreation
- Invasive weeds
- Increased fire frequency or intensity
- Wild horses and burros

This long list of concerns highlights the challenge of managing lands that are subject to a variety of demands, many of which stem from urban development associated with the metropolitan area of Las Vegas. Most important, perhaps, is the recognition that many plants and animals are likely to be near their physiological limits in this very arid and hot environment. Climate change effects (increased temperature and reduced winter/spring precipitation) are expected to exacerbate natural drought effects, leading to reduced plant vigor and recruitment even in these drought-adapted communities. Of particular concern are secondary effects on arthropod and vertebrate prey communities that depend on healthy vegetation and intact soils. Energy development (particularly new, renewable energy projects), urban and industrial development, and mining are a particular concern for this habitat type. Additive impacts from many of these developments scattered across the landscape result in significant habitat loss and fragmentation, which are problematic given our large recommended patch size for conservation in this habitat type.

Motorized recreation, invasive weeds, and increased fire frequency are also conservation concerns in Mojave Scrub habitat, and they are generally most intense near urban areas. Off-highway-vehicle (OHV) recreation, among the most popular outdoor activities in the Mojave Desert, generates networks of dirt roads, disturbs soils and burrows, damages cryptobiotic soils, reduces vegetation cover, and increases soil erosion (Brooks and Lair 2005). It also concerns us because of introduction of invasive weeds (particularly red brome) into vulnerable sites, which increase the flammability of the vegetation and thereby increase the chances of large fires.

Livestock use has been reduced significantly since Clark County removed domestic livestock from most lands in the county. However, horses and burros continue to use this habitat and pose a concern in high-use areas (Abella 2008).

Mojave Scrub

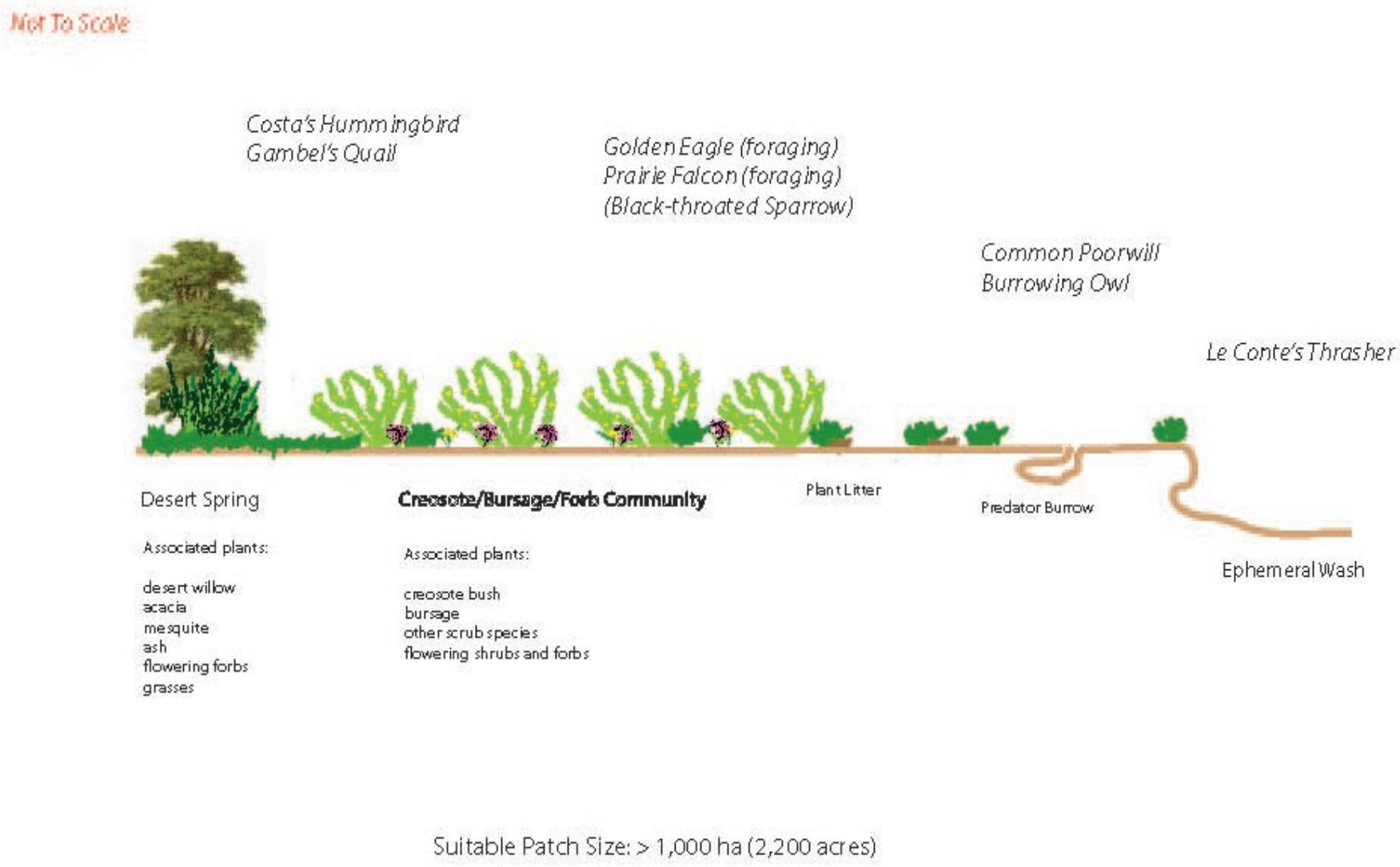


Figure Hab-12-1: Idealized Mojave warm desert scrub landscape to maximize the number of associated priority bird species.

Conservation Strategies

Habitat Strategies

- **Manage at a large landscape scale** (> 1,000 ha [2,500 ac] with the goal of maintaining **natural shrub densities, cryptobiotic soils, understory and litter**. Areas with ephemeral washes and nearby wetland, spring, or riparian habitats are of particular importance
- Proximity to **water** (riparian areas, desert springs, wet meadows), presence of **cliffs** > 30 m [100 ft] tall, or **abandoned mines** (which may be gated) raise the priority level of a site for bird conservation
- **Invasive plants** should be controlled to the extent possible to avoid impacts on fire frequency and integrity of native understory.
- Recreational uses, particularly **OHV recreation**, should be managed to avoid sensitive areas, which include ephemeral washes, and areas adjacent to mesic habitats and tall cliffs. Large patches of creosote-bursage that are currently occupied by Priority species may be fully excluded from off-road motorized recreation
- The majority of priority bird species nest between **April 1 and July 1**, and some of them are particularly sensitive to nest disturbance. This is the time period when disturbances should be minimized

Research, Planning, and Monitoring Strategies

- **Map suitable habitat** for Mojave Scrub Priority species at the recommended patch scale for effective conservation planning and impact avoidance
- **Monitor invasive weeds and OHV trails** for adaptive management
- Study **effects of OHV use** on Priority landbirds and habitat integrity
- Continue **long-term monitoring of landbirds** statewide through Nevada Bird Count

Public Outreach Strategies

- **Promote public appreciation** of fragile desert environments, their bird communities, and threats from off-road vehicle recreation and weed invasion. This may be done through brochures, nature trails, and promotion of other low-impact outdoors activities.

Montane Riparian

Montane Riparian habitat at China Creek in the Montana Range, Humboldt County. Photo by Elisabeth Ammon.

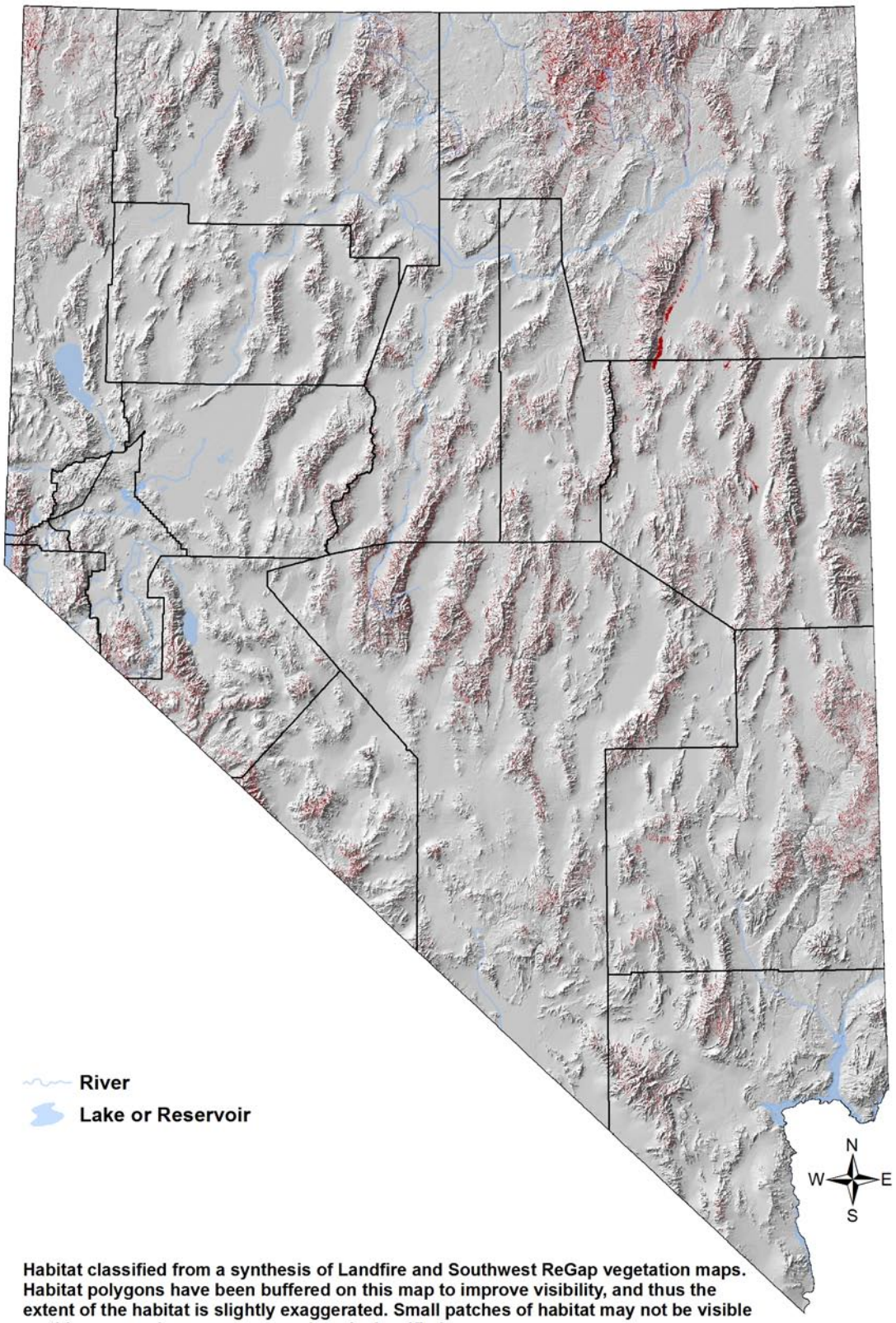
Key Bird-Habitat Attributes

Stand Structure	Dense, dwarf trees and shrubs of mesic species, with grass and flowering forb understory, transition into montane shrublands with additional deciduous shrub species
Ideal Scale for Conservation Action	10 ha [25 ac] or more, or minimum of 0.6 – 3 km [1-5 mi] of linear stream distance
Plant Species Composition	Aspen, shrub willows, water birch, alder, wild rose, currant, and other mesic species
Aspen and Cottonwood	Single trees or small stands of old aspen or cottonwood add particular value for some Priority species
Understory	Closed-canopy shrub thickets interspersed with natural meadow openings ideal
Presence of Cliffs > 30 m [100 ft] Tall	Presence of tall cliffs increases value to birds

Conservation Profile

Estimated Cover in Nevada	188,000 ha [466,000 ac] 0.7% of state
Landownership Breakdown	BLM = 39% USFS = 33% Private = 18% Other = 10%
Priority Bird Species	Sharp-tailed Grouse Mountain Quail Calliope Hummingbird Rufous Hummingbird Lewis's Woodpecker Willow Flycatcher Virginia's Warbler Green-tailed Towhee (Greater Sage-Grouse) (White-throated Swift) (Grace's Warbler)
Indicator Species	Cooper's Hawk MacGillivray's Warbler Yellow Warbler Wilson's Warbler Yellow-breasted Chat
Most Important Conservation Concerns	Livestock, wild horse and burro grazing Surface water diversion, impoundments Climate change (change in precipitation and temperature) Motorized recreation Non-motorized recreation Increased fire frequency or intensity Plant pathogens
Recovery Time	> 20 years
Regions of Greatest Conservation Interest	Elko, Humboldt, Washoe, White Pine, Lander, Eureka, and Clark counties
Important Bird Areas	Bilk Creek – Montana Mountains Carson Range David E. Moore Bird and Wildlife Sanctuary Goshute Mountains Great Basin National Park High Rock Resource Area Jarbidge Mountains Monitor Valley Mount Grant North Ruby Valley Northern Snake Range Ruby Mountains Spring Mountains Toiyabe Range Wellington-Pine Grove Hills

Montane Riparian



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps. Habitat polygons have been buffered on this map to improve visibility, and thus the extent of the habitat is slightly exaggerated. Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Montane Riparian

Overview

Montane Riparian habitat is scarce on Nevada's landscape, and is often so restricted that our land cover maps do not effectively capture them. In the past, montane riparian areas were often the lifeblood for homesteads and outlying ranches, because in many areas they provided the only source of water. Therefore, riparian areas were altered during early settlement for diverting water and for sustaining livestock, and as a result, many montane riparian areas have undergone channel downcutting, loss of riparian vegetation, soil compaction, and reduction of instream flows.

Riparian zones are also the lifeblood of important ecosystems and a major contributor to biodiversity, and at least half of the bird species in some western regions are estimated to depend on riparian habitats (Knopf et al. 1988). Typically, an intact montane riparian area supports narrow stands of willows, some aspen pockets, and a variety of mesic groundcovers throughout the year (Smith et al. 1995, Dickson et al. 2009). At higher elevations, conifer species such as white fir (*Abies concolor*) and Engelmann spruce (*Picea engelmannii*) may be present (Smith et al. 1995). For montane birds, these mesic environments become particularly important during the hottest part of the year, where they provide thermal cover, protection from predators, access to water and, most importantly, foraging opportunities for forbs and insects (e.g., brood-rearing Greater Sage-Grouse, Mountain Quail, and a variety of songbirds). Mist-netting of birds in these riparian habitats has documented a surprisingly large number of upland species, aside from the expected suite of riparian birds (e.g., Heath and Ballard 2003). In Figure Hab-14-1, we illustrate an idealized landscape that features habitat elements required by montane riparian bird species.

Main Concerns and Challenges

The following top conservation concerns were identified in our planning sessions for Montane Riparian habitat in Nevada:

- Overgrazing by livestock, wild horses and burros
- Surface water diversion, impoundments
- Change in precipitation and snowmelt related to climate change
- Change in temperature related to climate change
- Motorized recreation
- Non-motorized recreation
- Increased fire frequency or intensity
- Plant pathogens

Montane Riparian

Both riparian vegetation and bird communities change along elevational gradients (e.g., Dobkin and Wilcox 1986, Dickson et al. 2009), and their distributions are therefore expected to change with climate. Because of the vertical linearity and topographic complexity of montane riparian habitats, the effects of climate change will probably not be as simple as moving up or down in elevation (Fleishman et al. 2001), but increases or decreases in the timing or amount of water availability will affect entire stream courses. Riparian ecosystems are naturally resilient, provide linear habitat connectivity, and create thermal refugia for wildlife, all of which could contribute to mitigation of climate change effects (Seavy et al. 2009). Riparian areas could provide critical buffering of climate change effects for riparian birds and birds of adjacent habitats (Ackerly et al. 2010). Conservation and restoration planners should therefore consider options for how they can enhance the resilience of riparian ecosystems to climate change (Seavy et al. 2009).

Today, past impacts still leave their mark on Nevada's Montane Riparian habitats, and are compounded by new threats, such as climate change, prolonged droughts, and motorized recreation. Overgrazing by livestock, wild horse and burros, and stream diversions are the two primary disturbance factors affecting montane riparian vegetation, and either one can prevent riparian systems from reaching their ecological potential (Smith et al. 1995). Prolonged overgrazing impacts riparian areas through physical removal of vegetation and simplification of structure, hydrological changes from soil compaction, and channel alteration (Belsky et al. 1999), and negative effects of grazing on riparian bird populations have been well documented (Saab et al. 1995). In some cases, these impacts are a result of increased nest predation that occurs after grazing opens up vegetation structure and reduces nest concealment (Ammon and Stacey 1997). Impacts to riparian vegetation also occur from stream downcutting caused by prolonged road development, livestock use, or natural runoff events (Green et al. 2003).

Fortunately, montane riparian plant communities respond readily to restoration and enhancement efforts if sufficient water is available (Stromberg 2001). Many areas that are no longer critical for other land uses can be relatively easily restored, as has been demonstrated by multiple protection and restoration projects conducted on lands managed by BLM and the USFS, where sections of stream corridor have been fenced off to allow for passive recovery. These projects create substantial conservation returns in exchange for relatively modest expenditures, and are therefore one of our main recommended conservation actions for Montane Riparian habitat.

Montane Riparian

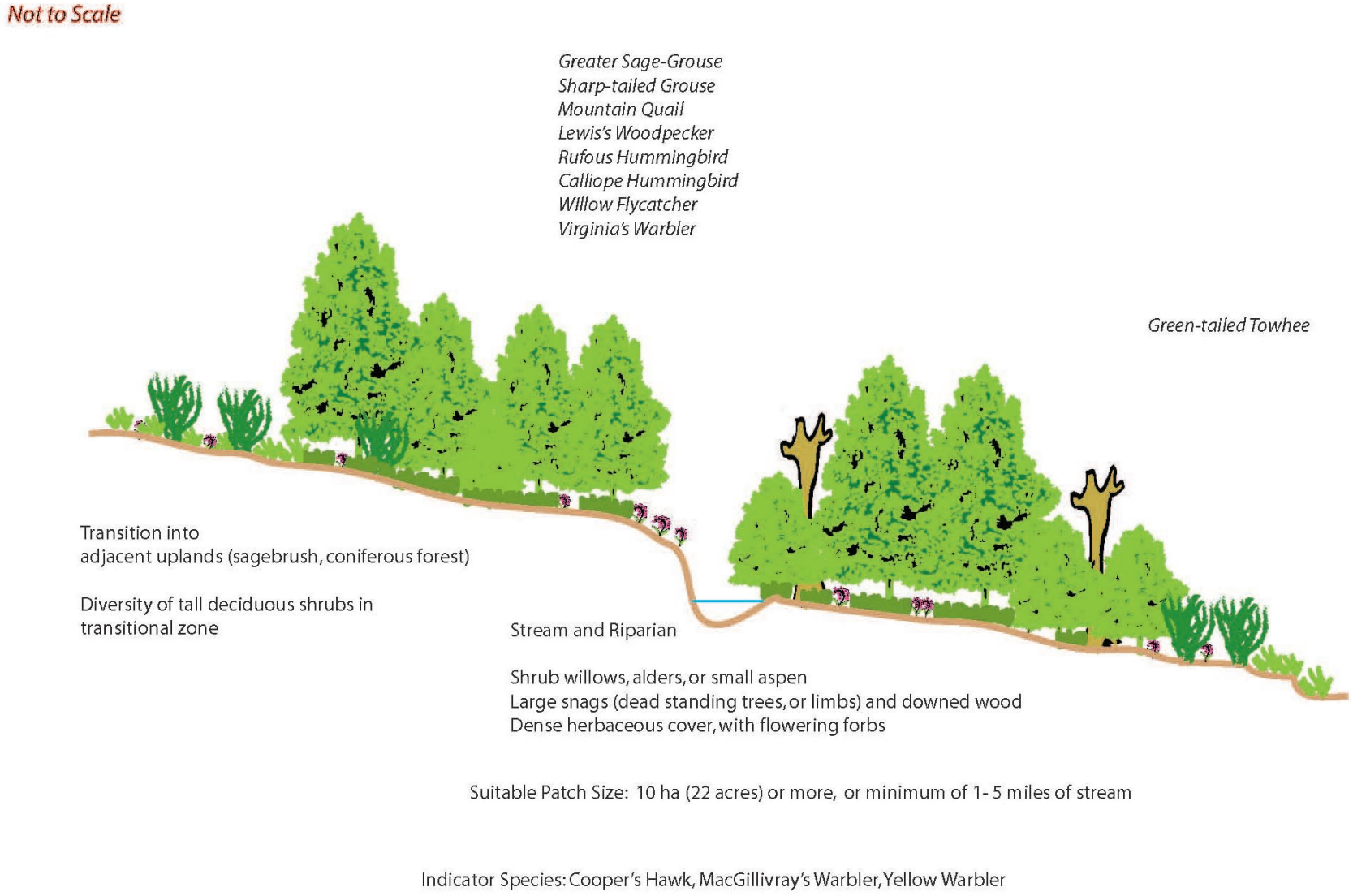


Figure Hab-13-1: Idealized montane riparian landscape to maximize the number of riparian associated Priority bird species.

Conservation Strategies

Habitat Strategies

- Manage at a relatively small scale, if necessary, of **10 ha [25 ac], or 1.6 – 8 km [1-5 mi]** of stream, with preference given to larger areas, wider riparian corridors, or more miles of stream. Even small patches are valuable, but the desired mesic conditions are better achieved with larger overall patch sizes
- Important habitat components include **dense shrub thickets** (willow, alder, wild rose, or other mesic species) with patches of herbaceous cover interspersed. Land uses that have impacts to these vegetation components, such as prolonged overgrazing and recreation, may be excluded by fencing and providing alternate access to water and shade
- Single **large trees**, or small stands, and **large snags** provide important resources for some Priority species, and should therefore be protected from loss and disturbance to the extent possible
- Presence of **cliffs** > 30 m [100 ft] tall raises the priority level of a site for bird conservation
- Mitigation for past or current losses may include **restoration of historic stream channels and associated floodplains**. The primary requirement is sufficient water, and if no source vegetation is available, plantings of native species will significantly accelerate restoration
- Maintain **grazing and OHV use** at levels that do not permanently impact the shrub and forb understory or cause soils to be exposed
- The majority of priority bird species nest between **May 1 and July 15**, and some of them are particularly sensitive to nest disturbance. This is the time period when disturbances should be minimized

Research, Planning, and Monitoring Strategies

- Narrow riparian areas are badly under-inventoried throughout the state, because available land cover maps often misclassify or omit them. One of the highest statewide priorities for riparian planning is to **generate a comprehensive, accurate map** of riparian habitats and springs
- Mapping of Montane Riparian should include a **stand condition assessment** characterizing the habitat elements that support Priority bird species. This inventory, which would ideally be an interagency effort, could then be turned into a periodic (e.g., every 10 years) monitoring effort of riparian areas.
- Continue **long-term monitoring of landbirds** statewide through the Nevada Bird Count
- Monitor status of **invasive weeds** to assess threat level locally and statewide

Public Outreach Strategies

- **Promote the value and important features** of riparian habitat to private landowners and the public (e.g. Schenk and Goldblatt 2005). Materials may include tips on avoiding unintentional impacts to riparian resources

Montane Shrubland

Montane Shrubland habitat in the Santa Rosa Range, Humboldt County. Photo by Elisabeth Ammon.

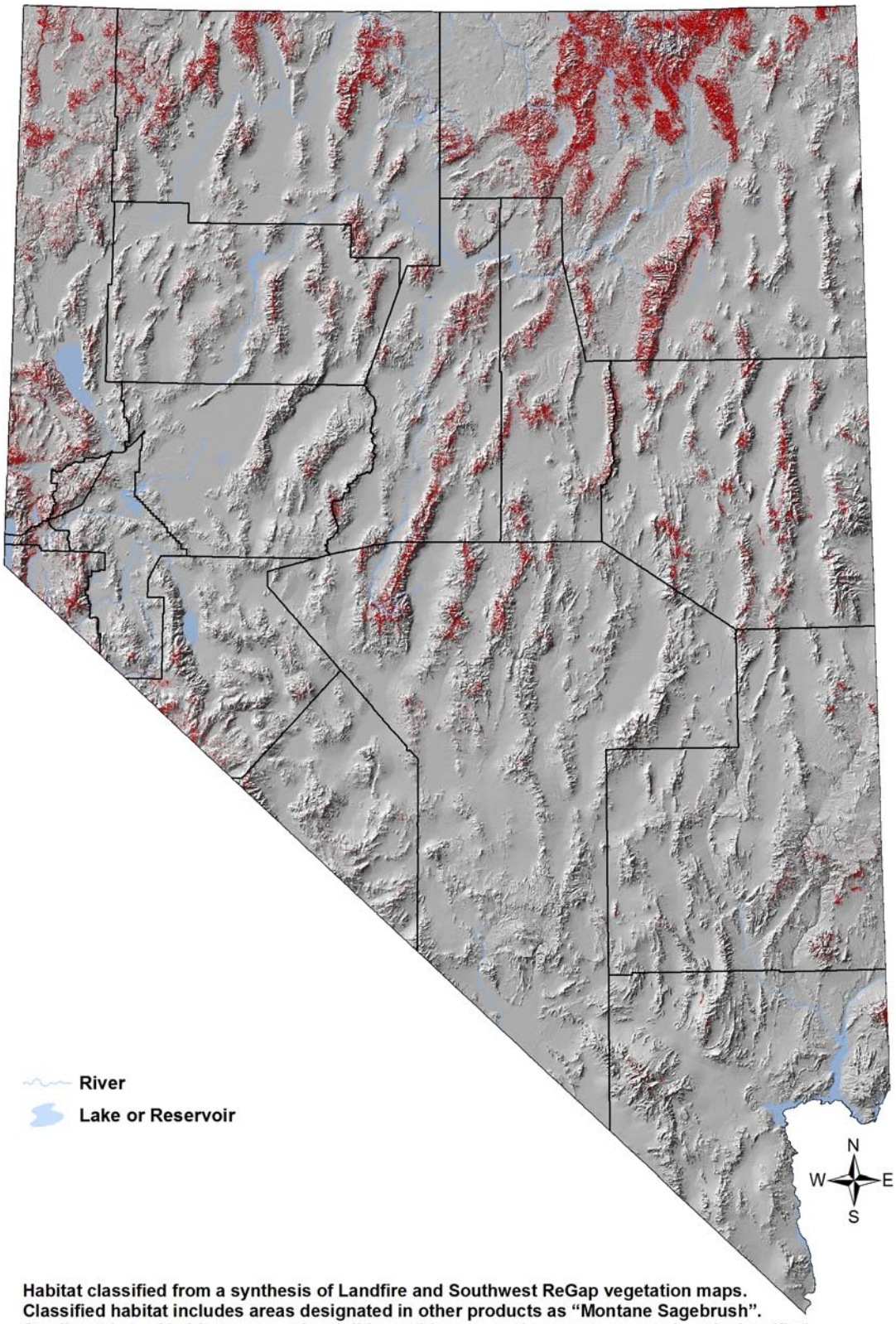
Key Bird-Habitat Attributes

Vegetation Composition	Diverse species of deciduous shrubs, sage, and herbaceous components (mostly perennial bunchgrasses and forbs); mountain big sagebrush, manzanita, snowberry, currants, serviceberry, chokecherry, buckbrush, bitterbrush, cliffrose, hawthorn, and similar flower and berry-producing shrubs increase habitat value significantly; flowering forbs critical to several Priority species
Ideal Scale for Conservation Action	200 ha [500 ac] or larger to accommodate different patch types and avoid fragmentation
Vegetation Structure	Mostly low-growing shrubs, 20-40% cover, with herbaceous layer up to 60-80% and at least 8-12 inches [20-30 cm] high (for sharp-tailed grouse); horizontal diversity (mosaic of different patches) increases value
Plant Species	Multiple shrub and forb species increase habitat value for birds
Distance to Water	Mesic habitats (riparian, wetland, open water, springs) within 1,000 m [3,300 ft] increase habitat value
Other Features	Abandoned mineshafts and cliffs >30 m [100 ft] tall add habitat value for some species

Conservation Profile

Estimated Cover in Nevada	1,055,000 ha [2,608,000 ac] 3.7% of state
Landownership Breakdown	BLM = 48% USFS = 30% Private = 18% Other = 4%
Priority Bird Species	Greater Sage-Grouse Sooty Grouse Dusky Grouse Sharp-tailed Grouse Mountain Quail Common Poorwill Calliope Hummingbird Gray Flycatcher Sage Thrasher Virginia's Warbler Green-tailed Towhee Brewer's Sparrow Black-chinned Sparrow (Black Rosy-Finch)
Indicator Species	None needed
Most Important Conservation Concerns	Changes in fire frequency or intensity Climate change (change in precipitation and temperature) Livestock, wild horse and burro grazing Motorized recreation Invasive weeds Conifer encroachment
Habitat Recovery Time	25-50 years
Regions of Greatest Conservation Interest	Northern, northeastern, eastern, and central Nevada
Important Bird Areas	Bilk Creek – Montana Mountains Carson Range Goshute Mountains Great Basin National Park High Rock Resource Area Jarbidge Mountains Monitor Valley Mount Grant Northern Snake Range Ruby Mountains Sheldon NWR Spring Mountains Toiyabe Range Wellington-Pine Grove Hills

Montane Shrubland



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps.
Classified habitat includes areas designated in other products as "Montane Sagebrush".
Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Montane Shrubland

Overview

Montane Shrubland habitat includes several shrub communities within and above the pinyon-juniper zone, with the most common one being montane sagebrush. Other shrublands of montane areas include mixes of species such as snowberry, serviceberry, bitterbrush, and sumac. Sage steppe and montane riparian plant communities are interspersed in these landscapes, and the diversity of shrubland types makes accurate land cover mapping difficult. In the Sierra Nevada ecoregion, successional shrublands in forest openings are often dominated by buckbrush (*Ceanothus velutinus*), green-leaf manzanita (*Arctostaphylos patula*), and currants, which can form a particularly dense shrub cover with little understory. Montane shrublands are among the more species-rich bird habitats of Nevada. For instance, in an elevational assessment of bird communities in Great Basin National Park, both bird abundance and bird species richness were reported to be highest in plots with a substantial component of mountain big sagebrush (Medin et al. 2000).

Montane sagebrush is similar to lowland sagebrush in many ways, but it often has higher shrub cover and higher forb productivity (Davies and Bates 2010). Historical fire return intervals are thought to have been relatively frequent (10–25 years) in more mesic communities (Knick et al. 2005), but in drier sites, sagebrush could probably not have been maintained with such frequent disturbance (Welch and Criddle 2003). Unlike in lowland sagebrush, fire intervals may have lengthened in some montane shrublands in recent times due to removal of fine fuels by grazing, and to a lesser extent, fire suppression (Miller and Rose 1999).

Both a healthy shrub canopy and an intact herbaceous understory are important elements for montane shrubland birds (Figure Hab-14-1). A diversity of shrub species is important to some bird species, such as Green-tailed Towhee and Sharp-tailed Grouse, but more homogeneous stands of montane sagebrush are heavily used by Brewer's Sparrows. A healthy forb layer is especially important in montane sagebrush to species such as Greater Sage-Grouse that rely on forbs in late summer, when forb understories in the lowlands begin to dry up.

Main Concerns and Challenges

The following top seven conservation concerns were identified in our planning sessions for Montane Shrubland in Nevada:

- Changes in fire frequency or intensity
- Change in precipitation and snowmelt related to climate change
- Change in temperature related to climate change
- Livestock, wild horse and burro grazing
- Motorized recreation
- Invasive weeds
- Conifer encroachment

These concerns are somewhat difficult to rank, since none of them are thought to be exceptionally severe at the present time.

Mountain big sagebrush communities generally are more resilient to disturbance and recover more rapidly than either basin or Wyoming big sagebrush because of greater precipitation and possibly longer seed viability (Provencher et al. 2007). Some montane shrub species may be favored over montane sagebrush by fire in the long term, because they can resprout from the roots when fire removes competing shrubs.

In some areas, altered fire regimes along with other factors have resulted in conifer expansion into Montane Shrubland habitat. Hypotheses for the expansion of pinyon-juniper woodlands over the last century include altered fire regimes, grazing, natural dynamic processes, recovery from past impacts, and a changing climate (Romme et al. 2009). In the Sierra Nevada, montane shrublands are predisposed to recurring fires that have been observed to perpetuate shrub cover on sites otherwise suited for trees, so the artificial exclusion of fire has caused the total montane shrubland area to shrink by over 60%, and the heterogeneity of montane landscapes has been correspondingly reduced (Nagel and Taylor 2005). Fire can promote growth of desirable shrubs and control conifer encroachment, but it can also lead to sagebrush declines and promote invasive weeds or undesirable shrubs (Giesen and Connelly 1993). Fire can enhance native perennial forbs and grasses (e.g., Holmes 2007), particularly where sagebrush is abundant and exotic species are limited. In some mountain big sagebrush communities, where shrub canopy cover exceeds 35%, perennial forbs can increase 2-3 fold following fire (Crawford et al. 2004). However, the response of perennial forbs and grasses following fire is highly variable (Nelle et al. 2000). A patchwork of small disturbances is probably required to maintain a balance between shrubs and forbs.

Great Basin shrubland plant species are not well adapted to intense, continuous grazing pressure (Mack and Thompson 1982), but livestock or feral horse grazing can be accommodated without unacceptable conservation consequences as long as herbaceous understories are preserved. That said, grazing pressure sometimes exceeds this threshold. For example, chronic grazing pressure from horses has been correlated with reduced plant species richness in some areas (Beever et al. 2008), and grouse species that consume forbs during parts of their seasonal cycle often select areas that are the least modified by grazing (Saab and Marks 1992). Other studies of grazing effects on shrubland birds have shown mixed results (Page et al. 1978, Saab et al. 1995).

Exotic annual grasses, such as cheatgrass, usually do not greatly affect relatively mesic and cool montane shrublands dominated by mountain big sagebrush (Crawford et al. 2004). However, this threat could increase with climate change (Bradley 2009). Likely effects of climate change on montane shrublands have not been systematically evaluated. However, they exhibit sharply reduced productivity in drought years (Bradley and Mustard 2008), and reduced precipitation likely reduces the productivity and diversity of the forb community that is so critical to several Priority bird species. Changing temperatures and altered fire regimes could also affect the rate of conifer encroachment (Fleishman and Dobkin 2009). Invasive species will become more of a threat as higher elevation sites become warmer. The incidence of sustained grazing and its associated impacts are also expected to increase with a warmer and drier climate (Provencher et al. 2007).

Montane Shrubland

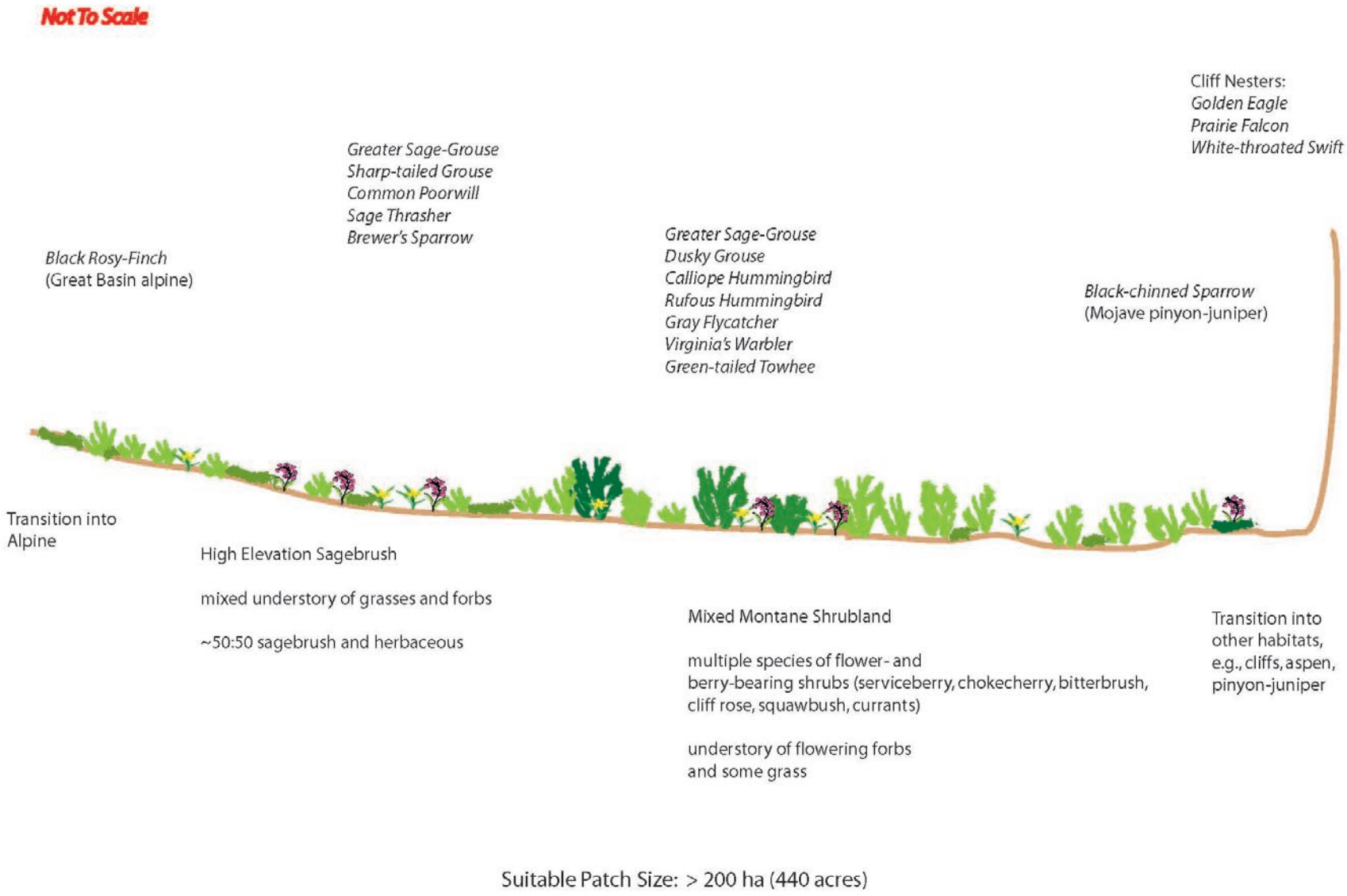


Figure Hab-14-1: Idealized montane shrubland landscape to maximize the number of montane shrubland associated Priority bird species.

Conservation Strategies

Habitat Strategies

- **Manage at a landscape scale of 200 ha [500 ac]** or larger, if possible. Where grouse occur, conservation strategies from grouse initiatives and species accounts should be implemented at the recommended spatial scales. Montane shrubland landscapes without a significant sagebrush component ideally would vary in shrub size classes, densities, and amount of understory with a patch size of approximately 2-10 ha [5 – 25 ac] depending on soil conditions and fire history. High shrub species diversity, high patch type diversity, and a healthy forb component all benefit Priority bird species.
- Where possible, concentrate grazing activity within the plants' dormant season and **protect current season's growth** through the bird nesting season (**May 15 – July 15**), to preserve at least 50% of annual growth (Paige and Ritter 1999).
- **Highest priority for protection are more mesic areas** that have high cover of succulent forbs and provide high-quality late-summer brood rearing areas for Priority upland game species (Atamain et al. 2010).
- Adjacent habitat types, such as tall cliffs, aspen, pinyon-juniper, montane riparian, and snow pockets increase the potential value of a particular site to Priority species. We recommend that disruptive land uses are avoided to the extent possible within **1,000 m [3,300 ft] or more** of these complex habitat interface zones.
- **Abandoned mine entrances** can provide important winter habitat for Black Rosy-Finches. Before closing mines, winter surveys should be conducted to determine rosy-finch use, and if they are present, gating is preferable.

Research, Planning, and Monitoring Strategies

- Study the relationships between montane shrub birds and the landscape patterns and habitat changes that result from **altered fire regimes** (Donovan et al. 2002).
- Investigate **effects of OHV use** on Priority landbirds and habitat integrity.
- Continue **long-term monitoring of landbirds** statewide through the Nevada Bird Count.

Public Outreach Strategies

- Bird conservation initiatives may increase outreach to land managers by holding **workshops on montane birds** and their habitat needs, providing "best management practices" tools, and helping to review siting plans for development.

Open Water

Stone Mother on Pyramid Lake, Washoe County, with waterbirds in the foreground. Photo by Elisabeth Ammon.

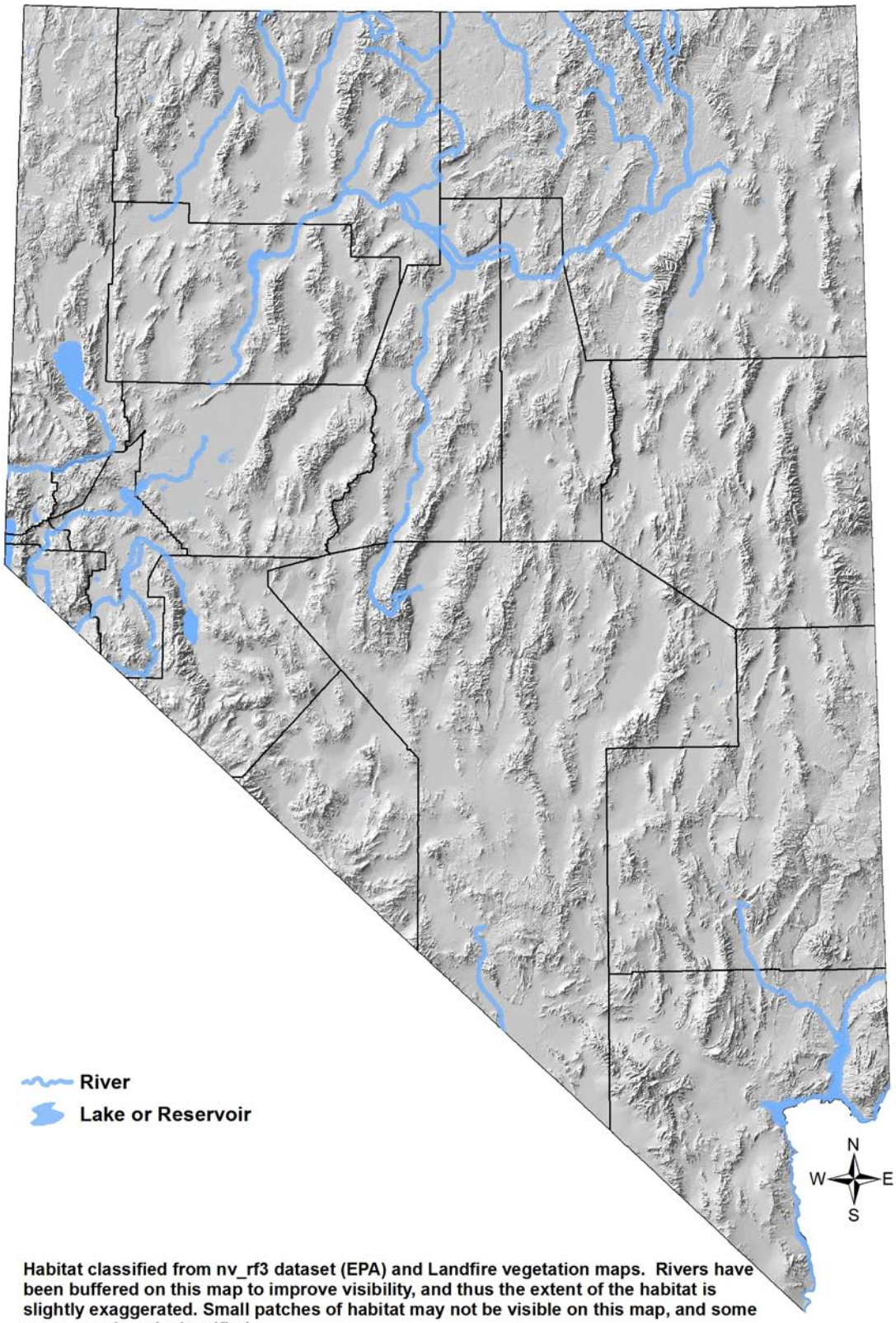
Key Bird-Habitat Attributes

Aquatic Habitats	A variety of water depths ranging from shallow (< 2 m [6 ft]) to deep sections (> 6 m [20 ft]) and an overall bathymetry that allows for ample aquatic vegetation and fish populations; shallow, sparsely-vegetated mudflats (water depth < 15 cm [6 in]) on shorelines benefit shorebirds
Ideal Scale for Conservation Action	Overall waterbody sizes of > 150 ha [370 ac] best for many migrants
Vegetation Cover	Emergent vegetation along shorelines and shallow sections desirable, but should remain a minor component; patches of dense submerged aquatic vegetation desirable
Fish	Fish populations required by several Priority species in various size classes, particularly smaller fish (5 – 20 cm [2 – 8 in])
Other Features	Islands particularly beneficial to colony nesters, both sparsely vegetated upland islands, and densely vegetated wetland islands; ideally, these are located at a distance from the shorelines, with deep water between island and shore

Conservation Profile

Estimated Cover in Nevada	137,500 ha [340,000 ac] 0.5% of state
Landownership Breakdown	Undesignated waterbodies = 63% NPS = 30% Other = 7%
Priority Bird Species	Trumpeter Swan Tundra Swan Cinnamon Teal Northern Pintail Canvasback Redhead Lesser Scaup Common Loon Eared Grebe Western Grebe Clark's Grebe American White Pelican Bald Eagle Black-necked Stilt American Avocet Marbled Godwit Western Sandpiper Least Sandpiper Long-billed Dowitcher Wilson's Phalarope Red-necked Phalarope Franklin's Gull Black Tern (Snowy Egret) (Snowy Plover)
Indicator Species	None needed
Most Important Conservation Concerns	Surface water diversion, impoundment Climate change (change in precipitation and temperature) Mining Flood control
Habitat Recovery Time	2-5 years
Regions of Greatest Conservation Interest	Pyramid Lake, Walker Lake, Lahontan Valley, Rye Patch Reservoir, East Fork Reservoir, Pahranagat Valley, Lake Mead, Lake Mohave
Important Bird Areas	Carson River Delta Franklin Lake Lahontan Valley Wetlands Lake Mead Pahranagat Valley Complex Pyramid Lake Ruby Lake Swan Lake Walker Lake Washoe Valley

Open Water



Habitat classified from nv_rf3 dataset (EPA) and Landfire vegetation maps. Rivers have been buffered on this map to improve visibility, and thus the extent of the habitat is slightly exaggerated. Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Open Water

Overview

Open Water habitats are far less abundant in Nevada than in many other western states, but they host a very high proportion of our Priority bird species, which are most abundant during migration stopover and wintering periods. Open Water sites include natural lakes, such as Pyramid and Walker, but the majority of our Open Water habitat is provided by reservoirs (including Lahontan and Rye Patch reservoirs and Lakes Mead and Mohave). Nevada's larger rivers are also included in this habitat type, although generally, only the fish-rich rivers support appreciable numbers of waterbirds.

Most Priority species prefer large, ice-free water bodies over small ones, and depending on their foraging strategy (shallow divers/submerged vegetation, deep divers and fish-eaters, dabblers and skimmers), require a variety of water depths and food items during their season of use (Figure Hab-16-1). Islands are extraordinarily valuable, as they not only provide nesting opportunities for colonial species, but are also preferred as roosting and resting sites by many migrants. Isolation from land predators, such as coyotes, appears to be the driving force behind bird use of islands, and even islands near the shore are heavily utilized if the surrounding water is sufficiently deep to discourage predators. For instance, Virginia Lake in Reno is a small artificial water body with a central island that attracts a surprisingly large variety and abundance of aquatic birds during migration periods and in the winter, despite high recreational use of the area and many potential predators (dogs, raccoons, etc.) along its shores.

Although migration and winter is a time of particular abundance of aquatic birds, there are also significant breeding populations of Priority ducks, grebes, and shorebirds associated with open water, most notably American White Pelicans that breed on Anaho Island in Pyramid Lake. Most of these species, when not nesting on protected islands, need at least some vegetation cover at the nest site, which may be located in emergent vegetation along shorelines, on floating mats of vegetation, or in adjacent uplands. There are exceptions, however, including most notably the Snowy Plover, which nests in very sparse vegetation cover. Only two of the open water Priority species regularly use mature trees, the Snowy Egret and the Bald Eagle. Both prefer small groves of older larger trees adjacent to a water body that has abundant fish populations. Shorebirds require a variety of vegetation cover densities, so the emphasis on shoreline management should be to provide, where possible, a mosaic of different patches (emergent vegetation, mudflats, sparse grass cover, dense ground cover, and occasional groves of trees) to accommodate the greatest variety of species (Figure Hab-16-1). Disturbance-free buffers along shorelines are important in areas where nesting of Priority species is confirmed.

Water bodies in Nevada receive very different levels of bird monitoring depending on their ownership status. Lake Mead for instance, is regularly monitored by the US Park Service, and lakes with significant fish populations and/or migratory bird populations are monitored by NDOW and the USFWS. However, as a rule, non-game bird species that cannot be easily surveyed by aircraft receive notable incomplete statewide monitoring coverage at the present time. The effects of recreational activities, such as jet-skiing, boating, and shoreline camping, have not been comprehensively studied for possible impacts during sensitive periods.

Open Water

Main Concerns and Challenges

The following top five conservation concerns were identified in our planning sessions for Open Water habitats in Nevada:

- Surface water diversion and impoundment
- Change in precipitation and snowmelt related to climate change
- Change in temperature related to climate change
- Mining
- Flood control

The main threat to Open Water habitats is reduction or loss of critical inflows to maintain water levels and water quality. This most often occurs because water is diverted to agricultural or municipal use. Walker Lake provides a case study for this dilemma, as discussed in the Common Loon species account (p. Spp-13-1). Reduced inflows lead to decreased lake depth (which is harmful to some fish), reduced lake surface area, increased salinity, which has a host of secondary effects, and altered shoreline profiles that in some cases are unsuitable for shorebirds that prefer broad mud flats. In extreme cases, islands may become accessible to predators by land bridges, which make them unsuitable for roosting and nesting by many species. The increased temperatures and reduced precipitation that are projected as a result of climate change will tend to compound these problems, as will increasing water demands associated with additional residential or agricultural development. Clearly the solutions to these problems involve a large measure of political and societal effort, preferably in a collaborative framework.

Water quality problems in Nevada tend to be localized rather than systemic. Mercury contamination from mining has been documented in a number of water bodies in Nevada, and fish-eating birds can be harmed by repeatedly ingesting contaminated fish. Botulism and avian cholera can cause large die-offs in waterbird populations, typically in smaller water bodies that can become stagnant or warm for extended periods.

Finally, Nevada waters have recently been invaded by exotic mollusks, particularly the quagga mussel (*Dreissena bugensis*) that was first found in the Lake Mead National Recreational Area in 2007. The mussel's population has increased dramatically in Lakes Mead and Mohave, significantly reduced fine algae, and it is easily transmitted to other water bodies through boats. Effects on bird populations are currently unknown.

Open Water

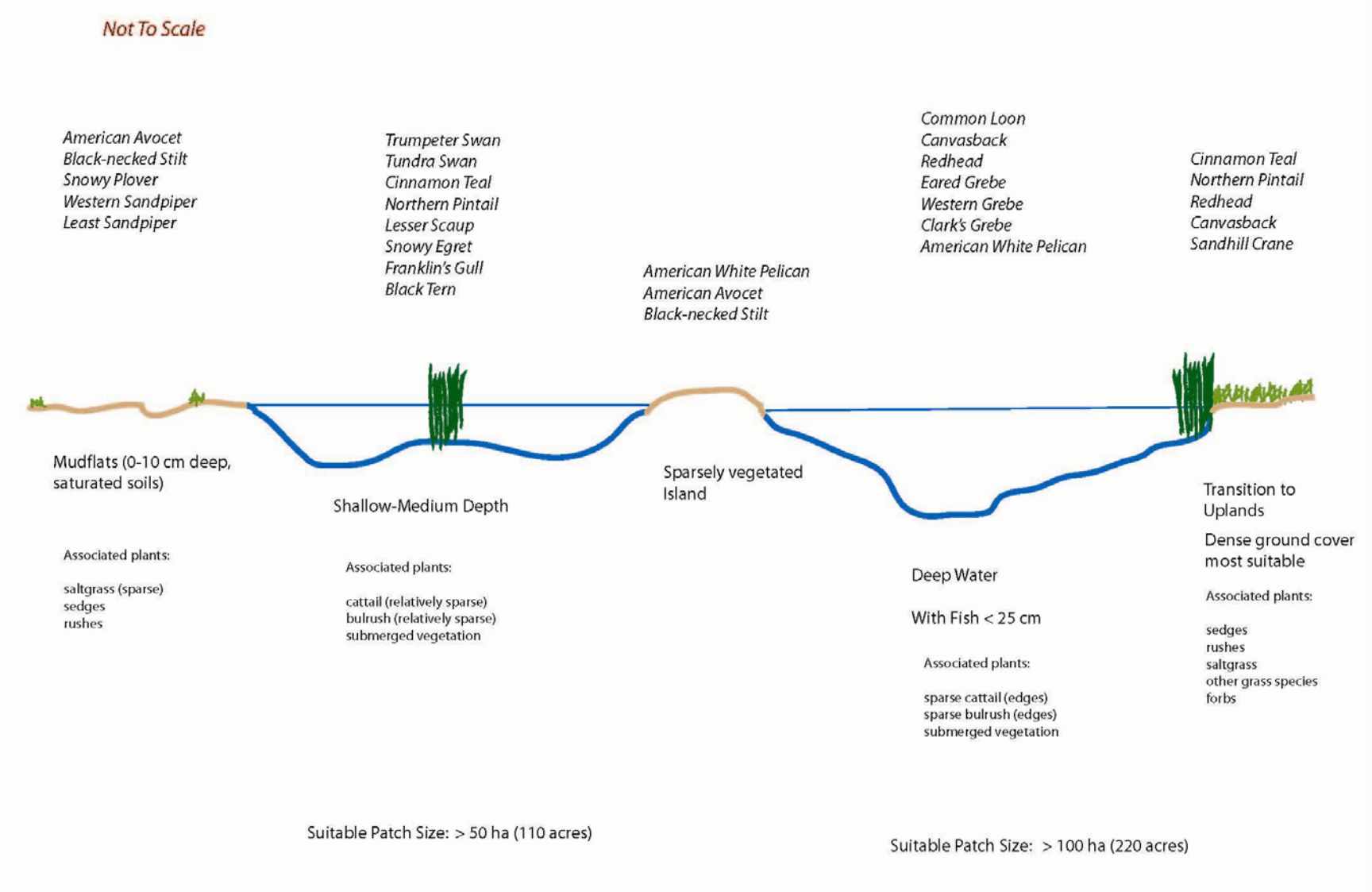


Figure Hab-15-1: Idealized open water landscape to maximize the number of open water dependent priority bird species.

Conservation Strategies

Habitat Strategies

- **Manage at the scale of the entire waterbody** and surrounding areas that provide shoreline mudflats or vegetated shores. Most existing waterbodies cannot be easily reshaped, but if new ones are created, **islands and varying water depths** that allow for a **diversity of fish, invertebrates, and submerged vegetation** are important. Fish are desirable, particularly if a diversity of size classes (especially those < 25 cm [10 in]) can be provided
- **Excessive fluctuation and drops of lake levels** should be avoided in managed water bodies to the extent possible, in order to maintain vegetation and fish habitat in relatively shallow areas (< 6 m [20 ft]). If managed lakes need to be dried up for maintenance, this should ideally be done during low-use seasons of the Priority species that regularly use the site
- **Water quality** should be managed to minimize contaminants, sediment disturbance, and stagnant conditions. Prescribed burns along adjacent shorelines are generally well-tolerated by open water birds, although we recommend avoiding all burns of emergent vegetation during the primary breeding season (**May 1 through July 15**)

Research, Planning, and Monitoring Strategies

- **Expand monitoring coverage** of aquatic birds in under-surveyed areas, particularly for those species that are poorly represented in aerial surveys. The Aquatic Bird Count program provides a framework for this effort, and high priority sites for expanded coverage need to be identified
- When circumstances do not allow for the maintenance of desirable water levels in some water bodies, planning for **mitigation of habitat loss** may be necessary, particularly in **Important Bird Areas**.
- Monitor and research **effects of invasive mollusks** on bird habitat quality and habitat use of open water birds.
- Monitor and research **effects of lake recreational uses** on aquatic birds to be better able to plan for protection of sensitive areas.

Public Outreach Strategies

- **Promote year-round birding** on important water bodies, such as Walker Lake, Pyramid Lake, East Fork Reservoir, and Rye Patch Reservoir. This may be achieved through promotion of eBird maps that show under-birded areas, active outreach to Audubon chapters, IBA volunteer projects, and production of checklists and brochures for the under-birded areas / seasons.
- **Promote sustainable recreational use** of open water sites, including avoidance of sensitive areas by boaters, providing alternate camping options in areas where shorelines need to be protected, and preventing the spread of quagga mussels.

Pinyon-Juniper

Pinyon-Juniper habitat on the east slope of Wheeler Peak, White Pine County. Photo by Elisabeth Ammon.

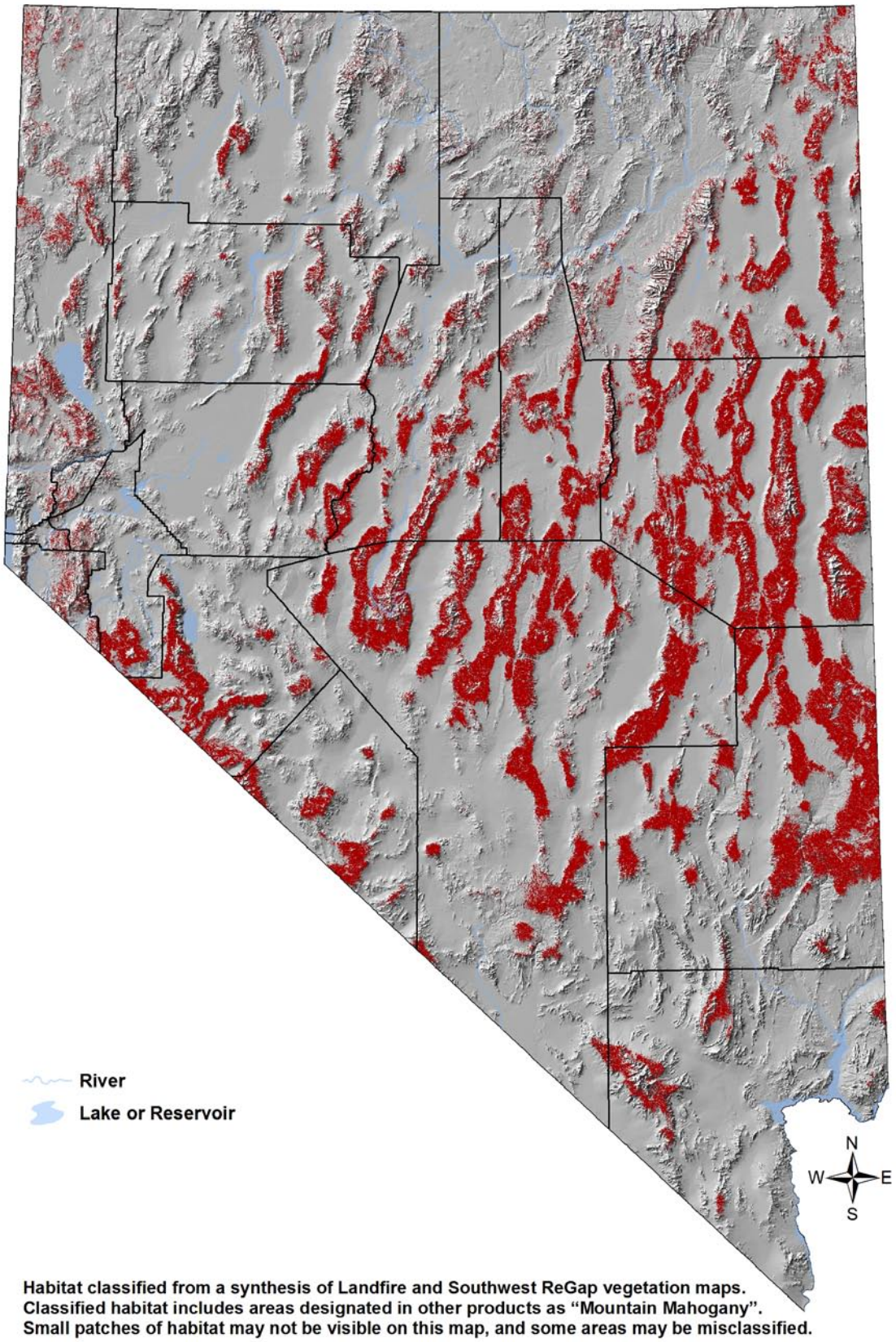
Key Bird-Habitat Attributes

Stand Structure	Multi-aged stands with shrub understory (parkland setting), frequent shrubby openings, and occasional dense-canopy stands
Ideal Scale for Conservation Action	1,400 ha [3,500 ac] or more
Plant Species Composition	Mixed stands of pinyon pine, juniper spp., mountain mahogany (where these can grow), with multiple species of shrubs (often sagebrush) as understory; forbs and flowering shrubs beneficial
Plant Condition	Pine nut and juniper berry crops important to birds; old trees provide snags for cavities; localized insect outbreaks pose little threat, but may create problems if widespread
Distance to Riparian/Spring Habitats	Proximity of water-dependent habitat increases value to birds
Presence of Cliffs > 30 m [100 ft] Tall	Presence of tall cliffs increases value to birds
Other Features	Abandoned mine shafts increases value to birds; may be gated

Conservation Profile

Estimated Cover in Nevada	3,695,000 ha [9,130,000 acres] 13% of state
Landownership Breakdown	BLM = 64% USFS = 26% Private = 5% Other = 5%
Priority Bird Species	Ferruginous Hawk Common Poorwill Gray Flycatcher Gray Vireo Pinyon Jay Virginia's Warbler Green-tailed Towhee Black-chinned Sparrow (Northern Goshawk) (Golden Eagle) (White-throated Swift)
Indicator Species	Juniper Titmouse Black-throated Gray Warbler
Most Important Conservation Concerns	Changes in fire intensity / frequency Insect outbreaks Livestock grazing Climate change (changes in precipitation) Urban, suburban, and industrial development Motorized recreation Invasive weeds
Recovery Time	75 years
Regions of Greatest Conservation Interest	White Pine, Lincoln, Lander, Clark, and northern Nye counties
Important Bird Areas (McIvor 2005)	Carson Range D.E.M. Bird and Wildlife Sanctuary Goshute Mountains Great Basin National Park Jarbidge Mountains Monitor Valley Mount Grant Northern Snake Range Ruby Mountains Spring Mountains Toiyabe Range Wellington-Pine Grove Hills

Pinyon-Juniper



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps.
Classified habitat includes areas designated in other products as "Mountain Mahogany".
Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Pinyon-Juniper

Overview

Pinyon pine and juniper woodlands currently cover 12% of Nevada, approximately 3.5 million ha [9.1 million ac], accounting for an estimated 15% of their range-wide distribution (Mitchell and Roberts 1999). Nevada contains several juniper species, but Utah juniper (*Juniperus osteosperma*) is predominant. Of the two species of pinyon pines found within the Great Basin, only the single-leaf pinyon (*Pinus monophylla*) is known to occur in Nevada (Charlet 1996). Over the past 150 years, pinyon-juniper woodlands throughout the West and in Nevada have expanded into other habitat types and increased in density (Miller et al. 1995, Bauer and Weisberg 2009). The reasons for this range expansion and stand infill are speculated to include altered fire regimes, grazing, natural range expansion, recovery from past impacts, and a changing climate (Romme et al. 2009). Regardless of underlying mechanisms, which are undoubtedly complex, the changes in pinyon-juniper woodlands cause two main concerns to the wildlife manager: 1) the conversion of other high-priority habitat types (e.g., sagebrush) into woodlands, and 2) impacts of increasingly dense stand conditions on pinyon-juniper associated wildlife species, and its possible role in increasing the risk of large-scale destructive fires.

Ironically, despite the increased amount of Pinyon-Juniper habitat on the landscape, species such as Pinyon Jay, Western Scrub-Jay, and Mountain Chickadee are undergoing steep and significant population declines in the pinyon-juniper biome (Sauer et al. 2008). As non-migratory seed-eaters, these species represent a suite of birds that rely almost exclusively on pinyon-juniper woodlands. Therefore, significant bird conservation concerns exist not only for habitat types that are being encroached upon by pinyon-juniper, but for Pinyon-Juniper habitat itself.

From a bird conservation perspective, the ideal pinyon-juniper woodland has a mostly open canopy with a significant shrub understory (Fig. Hab-16-1). Based on Nevada Bird Count data, the Priority bird species associated with pinyon-juniper woodland are more abundant in these types of stands than in predominantly closed-canopy stands. Small groves of high-density trees interspersed in the woodland landscape are tolerated, and may in fact be beneficial for some species or for a subset of life history requirements. More generally, trees of diverse ages should be present within large pinyon-juniper landscapes, with at least some mature, seed-bearing trees (Gillihan 2006). The preferred open canopy structure is most often observed in two situations; 1) old-growth stands on rocky ridges and ravines, and 2) early-mid successional woodland stages that typify the pinyon-juniper “expansion” zones.

Currently, pinyon-juniper management typically focuses on removal of trees in so-called Phase I and II stands, which equate to the early and mid-successional encroachment sites that appear to be most valuable to birds (Miller et al. 2008). The goal of these treatments is often to reclaim sagebrush habitat, but the result of these treatments is often the removal of perhaps the most biologically valuable part of the pinyon-juniper woodland. Phase III stands (late-successional stands with high canopy closure), which are bird-poor and which have the potential to carry fire over long distances, are rarely targeted for tree removal projects because they are less accessible and are not perceived to be a threat to sagebrush. It is our recommendation that the processes that promote woodland infill, the ecology of pinyon-juniper expansion, and the inter-relationship of these factors with fire regimes and fire risk need to be carefully evaluated in order to determine the most beneficial management actions within the pinyon-juniper / sagebrush interface zone.

Pinyon-Juniper

Minimally, pinyon-juniper projects seeking to reclaim sagebrush habitat should try to avoid creating sharp habitat edges between reclaimed shrubland and dense, closed-canopy woodland

Main Concerns and Challenges

The following top seven conservation concerns were identified in our planning sessions for Pinyon-Juniper habitat in Nevada:

- Changes in fire regimes and intensity
- Insect outbreaks
- Livestock, wild horse and burro grazing
- Change in precipitation and snowmelt related to climate change
- Urban, suburban, and industrial development
- Motorized recreation
- Invasive weeds

In the near term, the main challenge associated with managing pinyon-juniper woodlands is that there are different perceptions within the resource management community about the nature of current pinyon-juniper dynamics, different interpretations of desirable condition, and different priorities regarding the most pressing issues to address. Pinyon-Juniper woodland distribution is inherently unstable, given the evolution of dispersal mechanisms (seed caching by birds and rodents) that result in variable local colonization events. The differing opinions about how to best intercede in this system to facilitate beneficial wildlife outcomes and manage fire risk reflect the complexity of the interrelated mechanisms that determine woodland distribution and structure.

Interestingly, research on past and current fire regimes shows mixed results, and the notion that low-intensity, frequent fires maintained pinyon-juniper woodlands historically is not necessarily supported (Baker and Shinneman 2004). Instead, fires in pinyon-juniper woodlands were likely severe, with long average return intervals of > 400 years (Baker and Shinneman 2004, Bauer and Weisberg 2009). Therefore, fire exclusion, which is often cited as a factor in pinyon-juniper expansion, likely occurred primarily in adjacent shrublands rather than in woodlands (Bauer and Weisberg 2009).

Most of the other conservation concerns tend to be fairly localized in scope and modest in severity. The impacts of climate change, in contrast, are difficult to predict and could be systemic. Growth of pinyon pines decreases with decreased winter/spring precipitation and increased June temperatures, and their regeneration may be threatened by increasingly long droughts (Barger et al. 2009). Prolonged droughts are also considered a significant contributor to insect outbreaks that can kill large stands of trees (Breshears et al. 2005).

Pinyon-Juniper

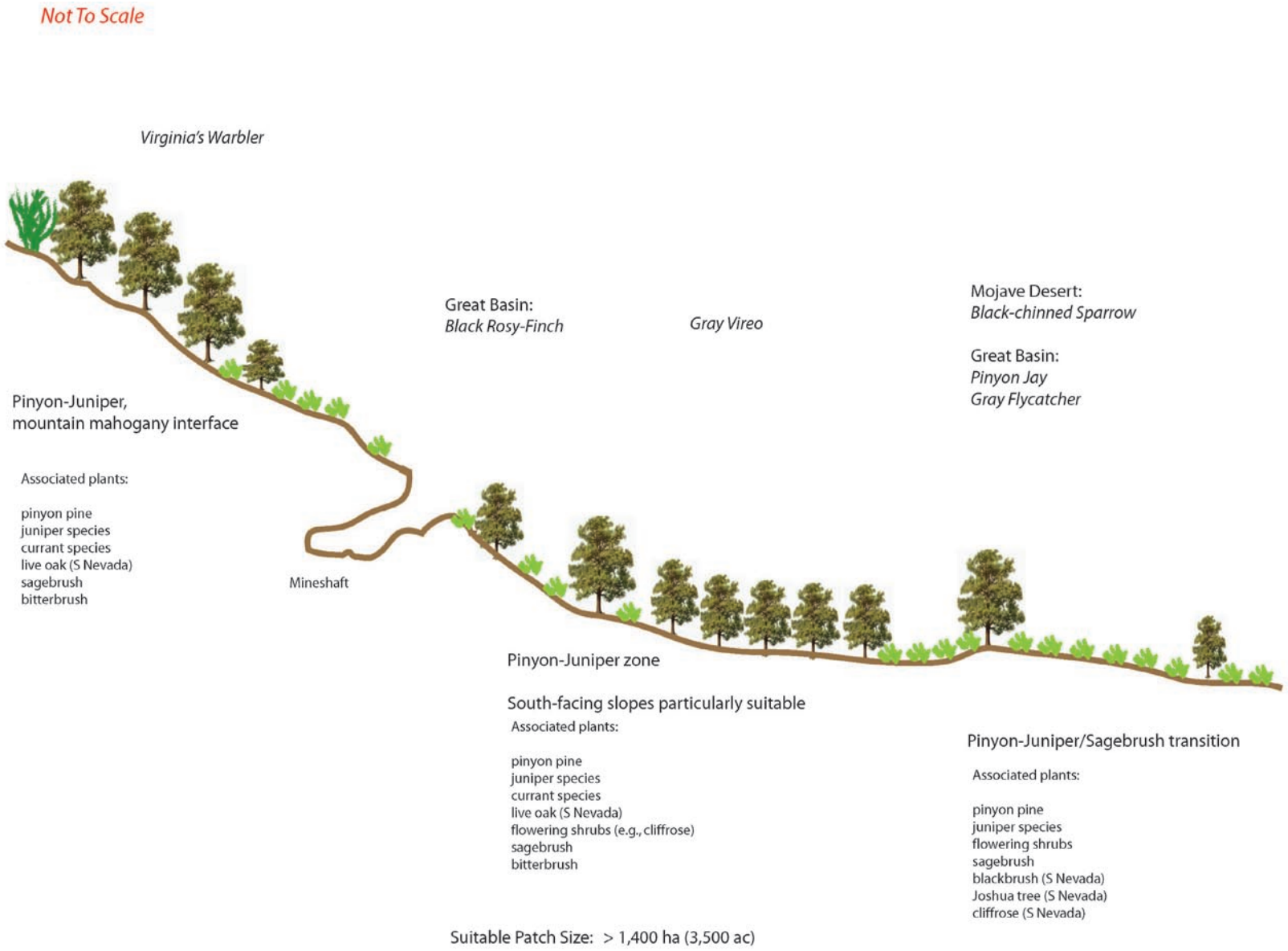


Figure Hab-16-1: Idealized pinyon-juniper woodland landscape to maximize the number of pinyon-juniper associated Priority bird species.

Conservation Strategies

Habitat Strategies

- **Manage at landscape scale** (> 1,400 ha [3,500 ac]) with the goal of maintaining predominantly **open woodlands with xeric shrub understory**, including flowering shrubs and forbs, and a variety of tree ages, including cone-bearing trees. Multiple overstory species (pinyon pine, juniper spp., mountain mahogany), and **high plant species richness** in the understory, where environmental conditions exist to support them, are particularly desirable for Priority bird species
- Proximity to **water** (riparian areas, springs, wet meadows), presence of **cliffs** > 30 m [100 ft]) tall, or **abandoned mines** (which may be gated) raise the priority level of a site for bird conservation
- When implementing pinyon-juniper control measures, creation of sharp woodland edges should be avoided. Instead, **feathering of the woodland / shrubland edge preferred,** with the goal of creating a varied transition zones is recommended. Treatments that generate patchiness within dense extensive stands would likely benefit most Priority species
- Maintain **grazing and OHV use** at levels that do not permanently impact the shrub and forb understory or cause soils to be unnaturally exposed
- The majority of priority bird species nest between **May 1 and July 15**, and some of them are particularly sensitive to nest disturbance. This is the time period when disturbances should be avoided whenever possible
- In the **southern regions** of Nevada (primarily Clark, Lincoln, and Nye counties), protect old-growth stands on **rocky ridges and ravines**, and at the **interface with Joshua Tree woodlands** from impacts to habitat integrity in order to preserve Gray Vireo and Black-chinned Sparrow strongholds.

Research, Planning, and Monitoring Strategies

- Encourage **experimental treatments** of mid-elevation pinyon-juniper that is overgrown to determine whether open woodlands with sufficient shrub understory can be restored in the interior of woodlands, away from the pinyon-sagebrush edge
- **Monitor effects of pinyon-juniper treatments** for effectiveness and bird responses, and monitor habitat variables important to Priority species
- Continue **long-term monitoring of landbirds** statewide through the Nevada Bird Count

Public Outreach Strategies

- **Promote public appreciation** of healthy pinyon-juniper woodlands, their bird community, aesthetics of trees, sustainable pine nut harvest, importance of native understory vegetation, and threats from off-road vehicle recreation and weed invasion.

Sagebrush

Sagebrush habitat in Duck Creek Valley, White Pine County. Photo by Elisabeth Ammon.

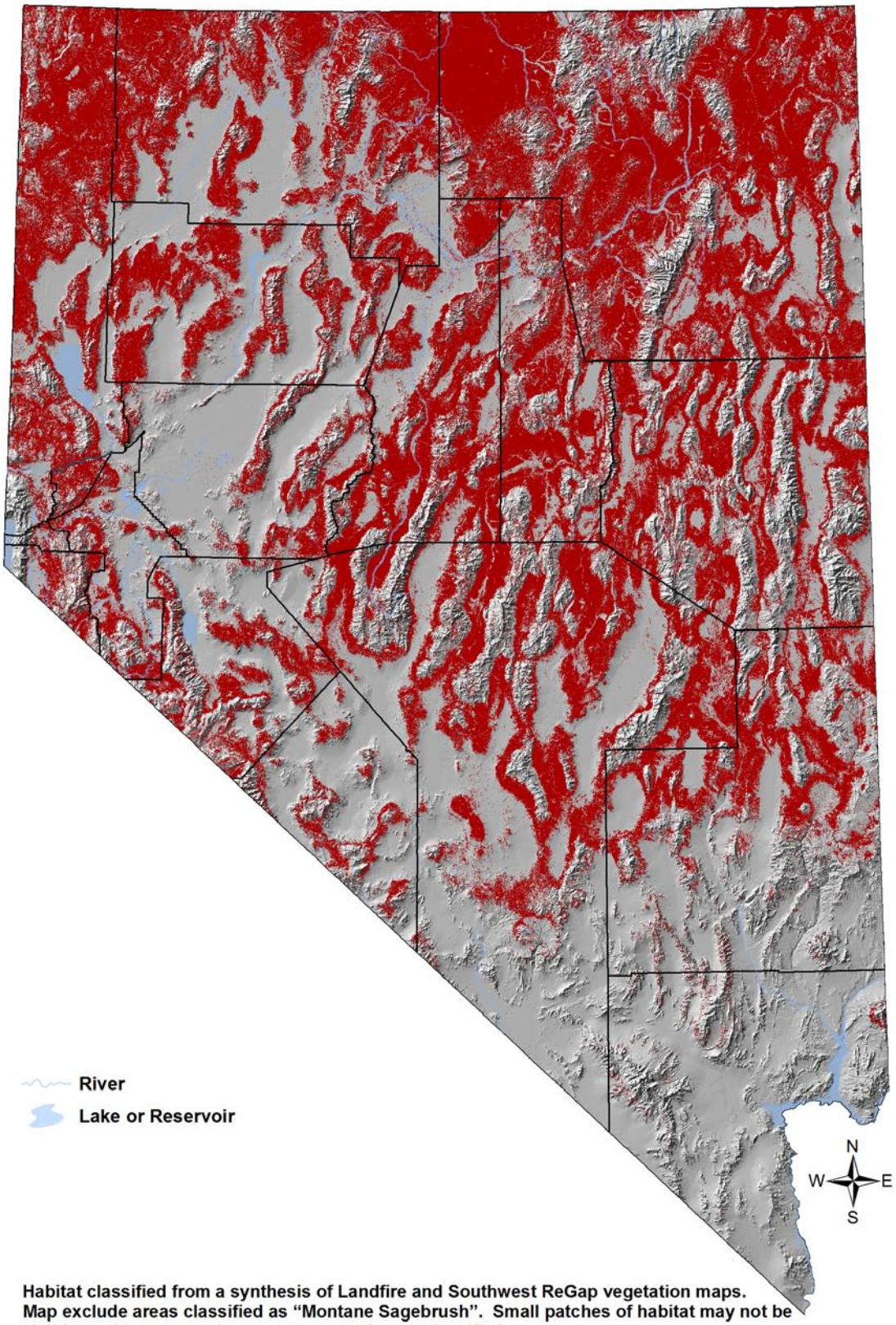
Key Bird-Habitat Attributes

Plant Composition	In sagesteppe (northern NV), about a 1:1 ratio of sagebrush and herbaceous vegetation (mostly perennial bunchgrasses and forbs); in sagebrush shrublands (central and eastern NV), multiple size classes of sagebrush with lesser component of herbaceous understory including forbs
Ideal Scale for Conservation Action	200 ha [500 ac] or larger to accommodate different patch types and avoid fragmentation
Vegetation Structure	Taller sagebrush (~ 1 m [3.3 feet]) are the most valuable, but large landscapes should contain different shrub canopy heights; understory and bare ground preferences vary among Priority species, so maintaining landscape diversity is important
Plant Species	Multiple shrub and forb species increase habitat value for birds
Distance to Water	Water-associated habitats (riparian, marsh, open water, springs) within 1000 m [3,300 ft] increase habitat value
Other Features	Mammal burrows, mineshafts, cliffs, and ephemeral washes add significant value for some priority species

Conservation Profile

Estimated Cover in Nevada	10,450,000 ha [25,800,000 ac] 37% of state
Landownership Breakdown	BLM = 76% Private = 13% USFS = 5% Other = 6%
Priority Bird Species	Greater Sage-Grouse Swainson's Hawk Ferruginous Hawk Golden Eagle Prairie Falcon Burrowing Owl Common Poorwill Gray Flycatcher Sage Thrasher Brewer's Sparrow Sage Sparrow (Sharp-tailed Grouse) (Short-eared Owl) (Pinyon Jay) (Black Rosy-Finch)
Indicator Species	None needed
Most Important Conservation Concerns	Increased fire frequency or intensity Invasive weeds Livestock, wild horse and burro grazing Energy development Conifer encroachment Climate change (change in precipitation and temperature) Urban, suburban, and industrial development Motorized recreation Mining
Habitat Recovery Time	25-100 years
Regions of Greatest Conservation Interest	Northern, northeastern, eastern, and central Nevada
Important Bird Areas	Bilk Creek – Montana Mountains Goshute Mountains Great Basin National Park High Rock Resource Area Jarbidge Mountains Monitor Valley North Ruby Valley Northern Snake Range Ruby Mountains Sheldon NWR Toiyabe Range Washoe Valley Wellington – Pine Grove Hills

Sagebrush



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps. Map exclude areas classified as "Montane Sagebrush". Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Sagebrush

Overview

Of all habitat types in this plan, sagebrush covers the largest portion of Nevada. It occurs primarily in the mid-to-low elevations of the Great Basin portion of the state and in smaller patches at high elevations in the Mojave portion. In this plan, we include only lowland sagebrush communities (< 1,800 m [5,900 ft]) within the Sagebrush habitat type, whereas montane sagebrush is included within the Montane Shrub habitat type. In northern and northwestern Nevada, sagebrush steppe ("sagesteppe") is characterized by a significant understory of grasses and forbs. In eastern and central Nevada, "Great Basin sagebrush" is often denser and taller, but has relatively little herbaceous understory.

Despite being so widespread, sagebrush shrublands have been degraded to the point that many sagebrush bird species are clearly declining (Rich et al. 2005). The combined effects of altered fire regimes, grazing, and invasive weeds, particularly cheatgrass (*Bromus tectorum*), have stressed large areas beyond their ability to naturally recover (Knick et al. 2003). The vast scale of the problem requires that habitat restoration efforts be carefully planned to address synergistic threats (e.g., Forbis et al. 2006).

Lowland sagebrush canopy cover is typically 6-20% (Davies et al. 2006), with many sagebrush birds preferring the upper end of this range. Tall, dense sagebrush is required by several priority species, but more open, low-growing shrubs or grassy areas are used by others. Understory requirements likewise vary by species, although in general, presence of an understory layer is beneficial both to birds and to increased resilience against invasive weeds (Anderson and Inouye 2001). Most plants that are characteristic of Sagebrush habitats are not well-adapted to continuous grazing pressure (Mack and Thompson 1982), but grazing can be sustainable as long as herbaceous understories are preserved. Studies of grazing effects on sagebrush birds have shown mixed results (Page et al. 1978, Saab et al. 1995).

The role of fire in Nevada's shrublands, both historically and in a modern context, is complex and deserving of continued study study (Donovan et al. 2002). Fire is thought to have been relatively common historically in sagesteppe landscapes, but was apparently far less frequent in Great Basin sagebrush, probably due to the relative lack of fine fuels (Paige and Ritter 1999). Fire is thought to have played some role in shaping the sagebrush / pinyon-juniper interface zone. However, sagebrush is readily killed by fire, and most ecotypes do not resprout from roots and can only regenerate from seed. This suggests that, in general, sagebrush is not well-adapted to fire (BLM 2002). Recovery times for sagebrush stands can be 25 to 100 years or more, and there is little evidence that fire was historically more frequent than in modern times; in fact the opposite could be true. Therefore, fire suppression likely has had little effect in most lowland sagebrush areas (Baker 2006).

In the modern era, the appearance of invasive weeds, sustained grazing by domestic livestock and wild horses, and direct human impacts on fire frequency and intensity have fundamentally altered fire regimes in Great Basin shrublands. Given these new realities, it is imperative to determine how to best manage fire to protect key wildlife habitat in the short-term, while still ensuring long-term habitat viability (BLM 2002).

Sagebrush

Main Concerns and Challenges

The following top conservation concerns were identified in our planning sessions for Sagebrush habitat in Nevada:

- Increased fire frequency or intensity
- Invasive weeds
- Overgrazing by livestock, wild horses and burros
- Energy development
- Conifer encroachment
- Change in precipitation and snowmelt related to climate change
- Change in temperature related to climate change
- Urban, suburban, and industrial development
- Motorized recreation
- Mining

The variety of threats to sagebrush ecosystems have been well reviewed (Paige and Ritter 1999, Dobkin and Sauder 2004, Suring 2005, Chambers et al. 2008, Miller et al. 2011). The most serious threats to lowland sagebrush in Nevada involve the interrelated problems of invasive grasses, increased fire frequency, sustained grazing, and climate change (Knapp 1996, Hunt and Stiver 2000, Neilson et al. 2005, Baker 2006, Chambers et al. 2007, Bradley 2010). Almost one million acres in Nevada, mostly consisting of sagebrush, have been invaded by cheatgrass, and over six million acres of sagebrush have burned since 1999 (23% of total sagebrush cover; NDOW *pers. comm.*). Cheatgrass invasion across this vast landscape, especially in northern Nevada, has increased fire frequency to the point that native shrubsteppe plants cannot re-establish naturally in many places (Whisenant 1990). Therefore, to maintain and restore habitat for sagebrush-dependent species, fire suppression has been recommended for areas where there is a threat of cheatgrass invasion (WAFWA 2009). Fire is likely to be detrimental if intact sagebrush ecosystems have not had time to fully recover from previous disturbances, or if it destroys native understory plants beyond recovery (Baker 2006). For these cases, fire prevention and green-stripping are likely needed as stop-gap measures (Pellant 1994).

Livestock grazing is the most widespread land use on sagebrush ecosystems throughout the Great Basin (Knick et al. 2003), and should be carefully managed to prevent further loss of native herbaceous understories. Sustained heavy grazing by livestock and wild horses can be detrimental when it chronically removes understory vegetation and seedlings, and affects soil integrity (Young 1994, Saab et al. 1995). Additionally, it may compound the problems discussed above by helping to facilitate cheatgrass invasion. Pinyon-juniper expansion into sagebrush is also considered a problem statewide (Suring et al. 2005, Miller et al. 2008), though we believe this concern deserves additional study as discussed in the Pinyon-Juniper habitat account (p. Hab-16-1).

Several sagebrush Priority species are more likely to occur in large patches of sagebrush than in small ones (Knick and Rotenberry 2002), and others are vulnerable to landscape fragmentation (e.g., Greater Sage-Grouse; Knick and Rotenberry 2002). For this reason, the scale at which we recommend managing sagebrush is fairly large, but even larger landscapes that include high-

Sagebrush

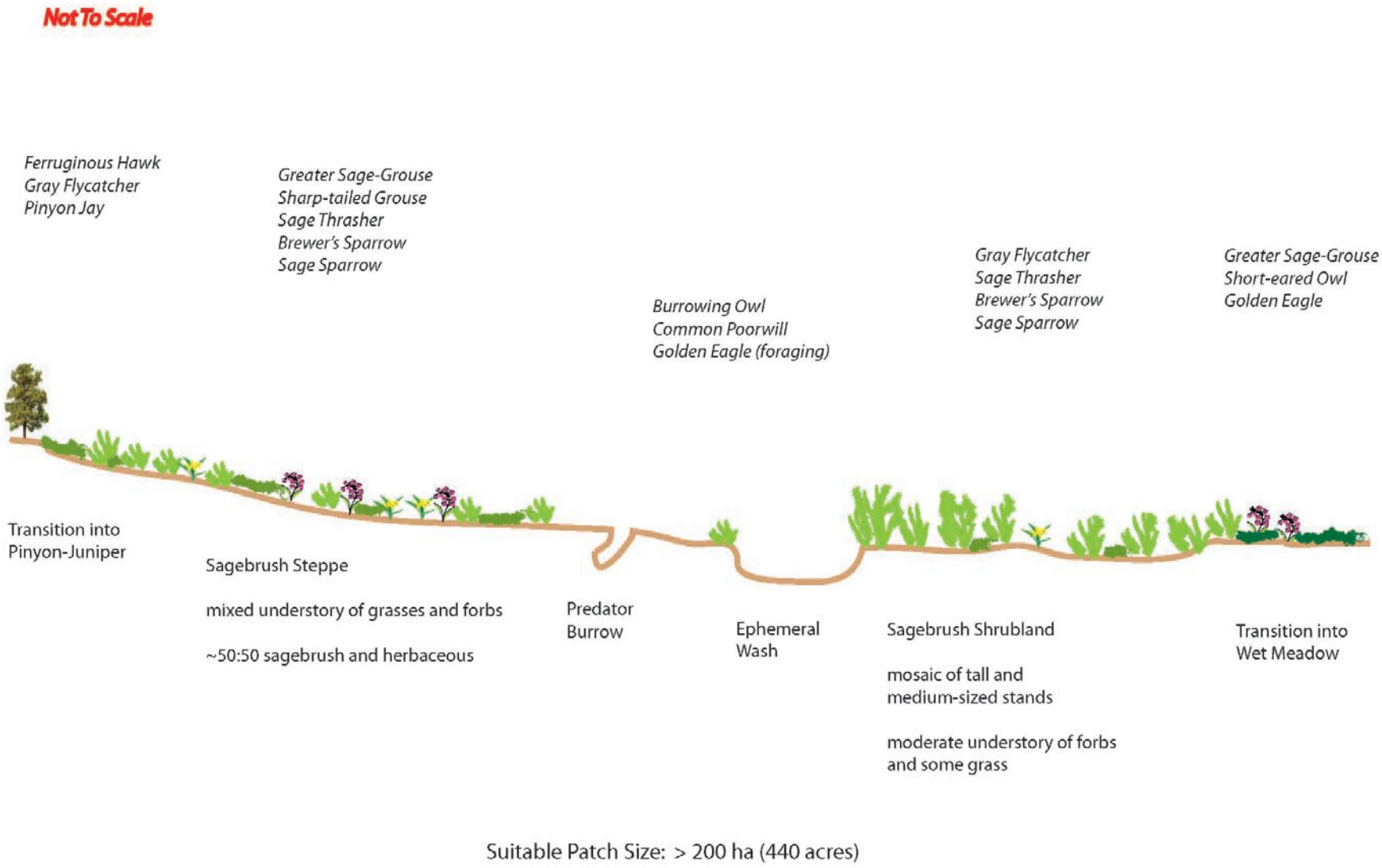


Figure Hab-17-1: Idealized sagebrush landscape to maximize the number of sagebrush associated Priority bird species.

elevation and mesic habitats are required to maintain some species, especially Greater Sage-Grouse. Details on sage-grouse requirements should be based on more specific recommendations provided by the Nevada Sage-Grouse Conservation Team (2004). Habitat conversion and fragmentation from agriculture and development is a concern in many western states (Vander Haegen 2007, Leu et al. 2008), but in Nevada fragmentation of high-quality sagebrush more often occurs as a result of fire or habitat degradation. Similarly, habitat conversion from urban, industrial and energy development can be locally a significant concern (Torregrosa and Devoe 2008, Walston et al. 2009), particularly where high-priority conservation areas such as sage-grouse leks are concerned. Intensive OHV recreational uses can impact sagebrush birds through destruction of herbaceous understory, fragmentation of the landscape, increased fire danger, and introduction of invasive weeds (Barton and Holmes 2007, Ouren et al. 2007).

Climate change is of concern because it may further accelerate the spread of invasive weeds, and establish conditions where fires become more likely. Bradley (2010) predicted that climate change is most likely to negatively impact sagebrush ecosystems in southern Nevada first.

Sagebrush habitat in North Spring Valley,
White Pine County. Photo by John Boone.

Conservation Strategies

Habitat Strategies

- **Manage at a landscape scale of 200 ha [500 ac])** or larger, if possible. The sagebrush landscape should be allowed to vary in size classes, shrub densities, and amount of understory at a natural scale, depending on soil conditions and fire history. Fragmentation through habitat conversion should be avoided to the extent possible. Because adjacent habitats, especially **mesic areas**, are beneficial to Priority species, impacts should largely be avoided in areas within 1,000 m [3,300 ft] of these features
- Where **Greater Sage-Grouse** occur, species-specific conservation strategies (Spp-8-1) should be implemented at the recommended spatial scales. The majority of these strategies favor other sagebrush-associated species, as well.
- **Native grass and forb understories** should be protected wherever possible. Grazing impacts can be decreased by focusing it on the plants' dormant season and by protecting current season's growth through the nesting season. Manage for at least 50% of annual vegetative growth to remain (Paige and Ritter 1999)
- **Fire prevention and green-stripping** may be a necessary stop-gap measure in areas of critical importance to sage-grouse (e.g., Montana, Bilk Creek, Santa Rosa ranges), but interagency **fire response planning** is needed to ensure long-term maintenance of high-quality sagebrush
- Proximity to **water** (riparian areas, desert springs, wet meadows), presence of **cliffs** > 30 m [100 ft] tall, or **abandoned mines** (which may be gated) raise the priority level of a site for bird conservation. Cliffs and abandoned mines should be surveyed for cliff-nesting Priority species and Black Rosy-Finches in proposed development projects site (see also Hab-4-1)
- The majority of priority bird species nest between **May 1 and July 15**, and some of them are particularly sensitive to nest disturbance. This is the time period when disturbances should be avoided to the extent possible

Research, Planning, and Monitoring Strategies

- Interagency planning of fire management, livestock management, and cheatgrass prevention efforts may be expanded into a **climate-change effects response network** emphasizing increased drought effects (Chambers et al. 2008, 2009)
- **Monitor effects of pinyon-juniper treatments** for effectiveness, and monitor habitat variables important to Priority species, as well as bird responses
- Study **effects of OHV use** on Priority landbirds and habitat integrity
- Continue **long-term monitoring of landbirds** statewide through the Nevada Bird Count
- Monitor status of **invasive weeds** to assess threat level locally and statewide.

Conservation Strategies - continued

Public Outreach Strategies

- Increase public outreach that emphasizes the **fragility and beauty of intact sagebrush** expanses, with emphasis on responsible off-highway-vehicle use, fire prevention, control of invasive plants, and appreciation of sagebrush birds. Help debunk the notion that sagebrush are "weeds."
- Increase **outreach to land managers** by holding workshops on sagebrush birds and their habitat needs, providing "best management practices" tools (e.g. *Birds in a Sagebrush Sea*; *Pocket Guide to Sagebrush Birds*: http://www.sagestep.org/pubs/birdguide.html), and helping review project plans.

Sagebrush habitat in Duck Creek Valley,
White Pine County. Photo by John Boone.

Salt Desert Scrub

Salt Desert Scrub vista, with playa in the foreground and sand dune in the background, Churchill County. Photo by Elisabeth Ammon.

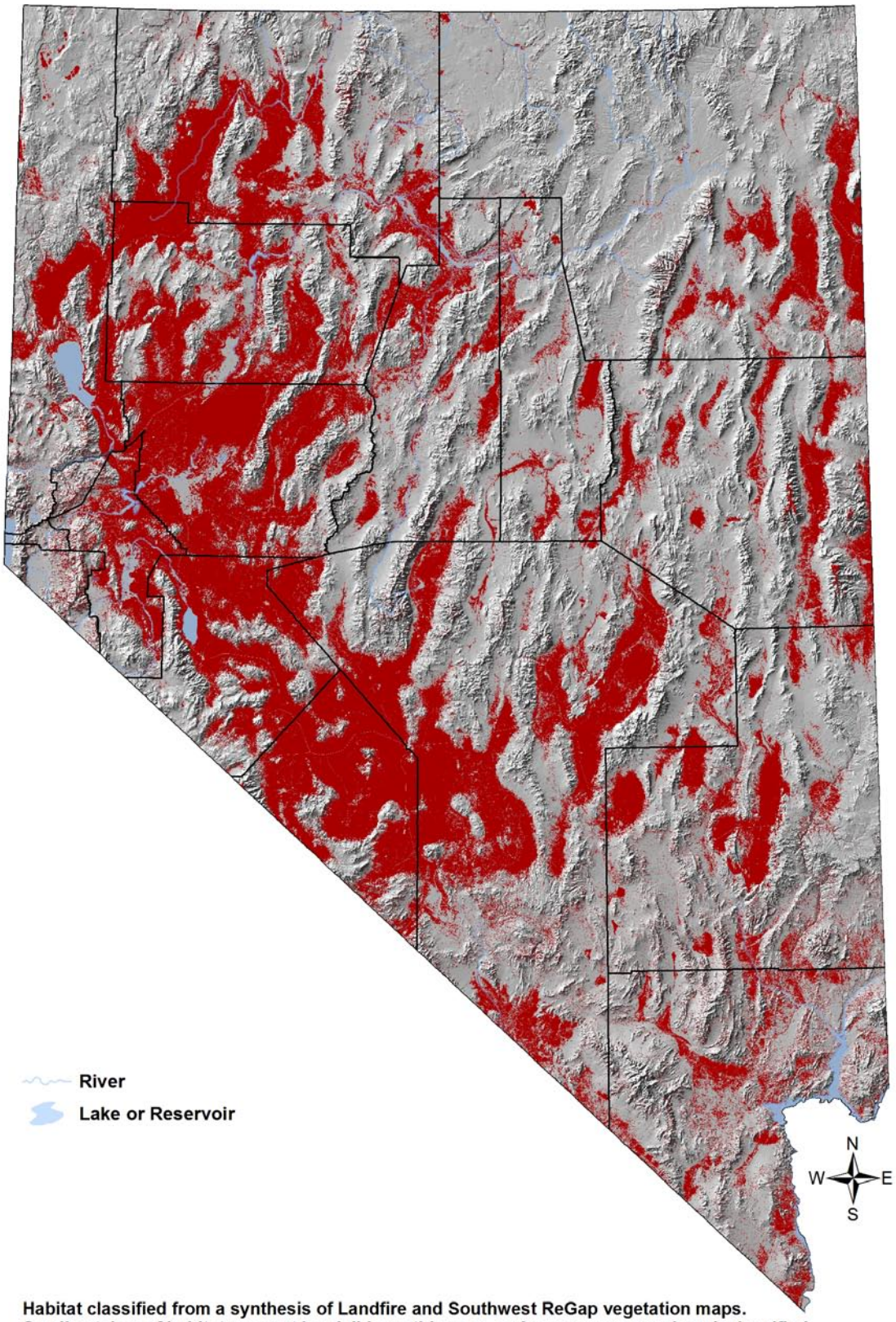
Key Bird-Habitat Attributes

Stand Structure	Open scrub stands with several shrub species and varying heights and densities, usually based on available soils and water; understory usually sparse, but important where present; sparsely vegetated and bare patches also important to some priority species
Ideal Scale for Conservation Action	> 200 ah [500 ac], preferably much larger
Plant Species Composition	Saltbush and associated shrubs, often with saltgrass; some Great Basin areas almost pure greasewood, which are important if they are tall
Plant Condition and Ephemeral Washes	Plants located in ephemeral washes have access to additional moisture, and provide important resources for birds during drought periods
Distance to Riparian/Spring Habitats	Proximity of water-dependent habitats increases value to birds
Presence of Cliffs > 30 m [100 ft] Tall	Presence of tall cliffs increases value to birds

Conservation Profile

Estimated Cover in Nevada	6,022,000 ha [14,880,000 ac] 21% of state
Landownership Breakdown	BLM = 75% Private = 11% DOD = 7% Other = 7%
Priority Bird Species	Prairie Falcon Burrowing Owl Sage Thrasher Le Conte's Thrasher Brewer's Sparrow Sage Sparrow (Ferruginous Hawk) (Golden Eagle) (Common Poorwill)
Indicator Species	Black-throated Sparrow
Most Important Conservation Concerns	Energy development Motorized recreation Livestock, wild horse and burro grazing Invasive weeds Urban development
Habitat Recovery Time	25-50 years
Regions of Greatest Conservation Interest	Washoe, Humboldt, Churchill, Lincoln, and Clark counties
Important Bird Areas	Ash Meadows NWR Catclaw Washes Franklin Lake Gridley Lake High Rock Resource Area Lahontan Valley Wetlands Moapa Valley North Ruby Valley Oasis Valley Pahranagat Valley Complex Pyramid Lake Swan Lake Walker Lake Washoe Valley

Salt Desert Scrub



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps.
Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Salt Desert Scrub

Overview

At first glance, the Priority species list for the driest of Nevada's habitats, Salt Desert Scrub, seems relatively impressive. However, large expanses of salt desert have very limited bird life. The salt desert is one of the most difficult western environments for both plants and wildlife. Vegetation consists primarily of drought-adapted plants such as saltbush, shadscale, budsage, and several forb species. For the purpose of this plan, we also include in this habitat type greasewood-dominated plant communities that usually occur near playas or in other locations where they can access groundwater. As in Mojave Scrub habitats, birds that can tolerate living in the salt desert generally have large home ranges within which they forage for sparse and ephemeral resources, and they are often attracted to features that interrupt the salt desert landscape, such as cliffs, ephemeral washes, burrows, sandy areas, or patches of dense, tall shrubs (Figure Hab-19-1-a and b).

Despite its foreboding nature, Salt Desert Scrub is one of the primary habitats for Le Conte's Thrasher in Nevada. As recent work has shown (D. Fletcher *pers. comm.*, Floyd et al. 2007), Le Conte's Thrasher occurs in a spotty and seemingly unpredictable pattern across the Mojave region's salt deserts, likely because its food resources naturally occur in an ephemeral pattern over space and time. This pattern conjures the image of salt desert birds "living on the edge" ecologically, and it is likely that impacts to their habitat have effects in similarly unpredictable ways.

Main Concerns and Challenges

The following top five conservation concerns were identified in our planning sessions for Salt Desert Scrub habitat in Nevada:

- Energy development
- Motorized recreation
- Livestock, wild horse and burro grazing
- Invasive weeds
- Urban, suburban, and industrial development

Land uses of the salt desert are generally light because of their relative lack of desirable resources. Cattle grazing is widespread throughout most of Nevada, but where salt deserts are part of the livestock range, they typically experience light use unless springs or other mesic habitats are interspersed in the landscape. However, in the Mojave region, burro use continues to be a concern, as burros appear more adept at foraging in very dry vegetation than other types of livestock (Abella 2008). OHV recreation, accelerating energy development, and invasive plants pose threats of more recent genesis to this habitat type. Groundwater pumping may also pose a threat to greasewood stands that depend on access to ground water near playas or where upwelling occurs.

Salt Desert Scrub

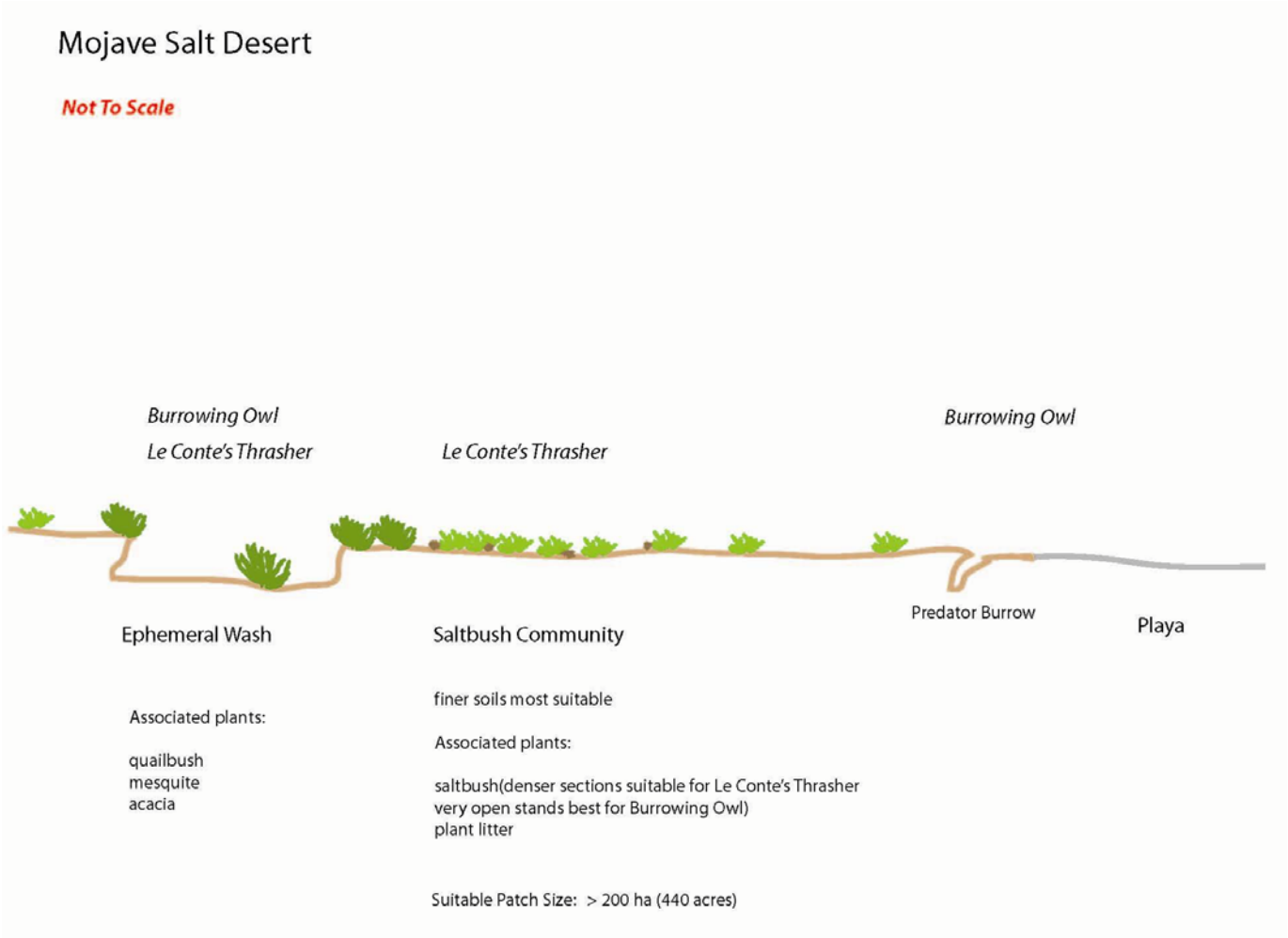


Figure Hab-18-1-a: Idealized Mojave salt desert landscape to maximize the number of salt desert associated Priority bird species.

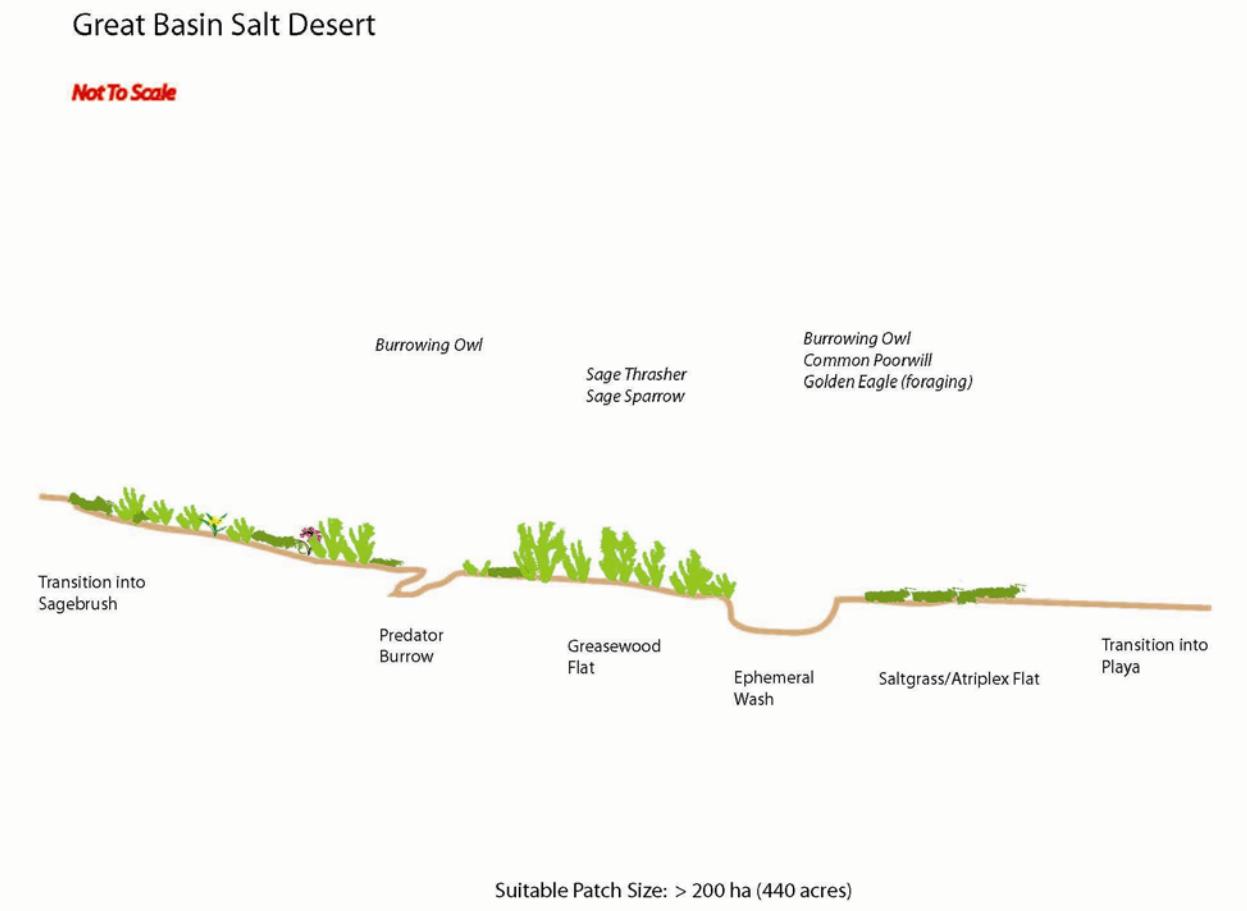


Figure Hab-18-1-b: Idealized Great Basin salt desert landscape to maximize the number of salt desert associated Priority bird species.

Conservation Strategies

Habitat Strategies

- **Manage at a landscape scale (> 200 ha [500 ac])** with the goal of maintaining a natural mosaic of stand types, size classes, and different densities and understories. If other habitats are interspersed, for example cliffs > 30 m [100 ft] tall, springs, playas with ephemeral water, or ephemeral washes, conservation efforts should focus on these areas by avoiding habitat conversion and degradation within a radius of > 1,000 m [3,300 ft] from these features
- **Weed control** is recommended where invasive annuals are becoming established, because they change fire regimes and are largely unsuitable for Priority species
- **Wild horses, burros, and domestic livestock** should be managed to minimize their use of high priority areas, particularly those occupied by Le Conte's Thrasher
- Maintain **grazing and OHV use** at levels that do not permanently impact the shrub layer or forb understory
- The majority of priority bird species nest between **April 1 and July 15**, and some of them are particularly sensitive to nest disturbance. This is the time period when disturbances should be minimized

Research, Planning, and Monitoring Strategies

- **Clarify habitat requirements** of species that may rely on ephemeral resources, such as Le Conte's Thrasher, Prairie Falcon, Golden Eagle, and Burrowing Owl. Particularly needed is information on **patch size requirements and landscape variables** that need to be considered in effective conservation planning
- Study **effects of OHV use** on Priority landbirds and habitat integrity
- Continue **long-term monitoring of landbirds** statewide through the Nevada Bird Count
- Monitor status of **invasive weeds** to assess threat level locally and statewide

Public Outreach Strategies

- **Promote responsible OHV uses**, such as avoiding nesting areas of Priority species

Springs

A spring in Washoe County.
Photo by Elisabeth Ammon.

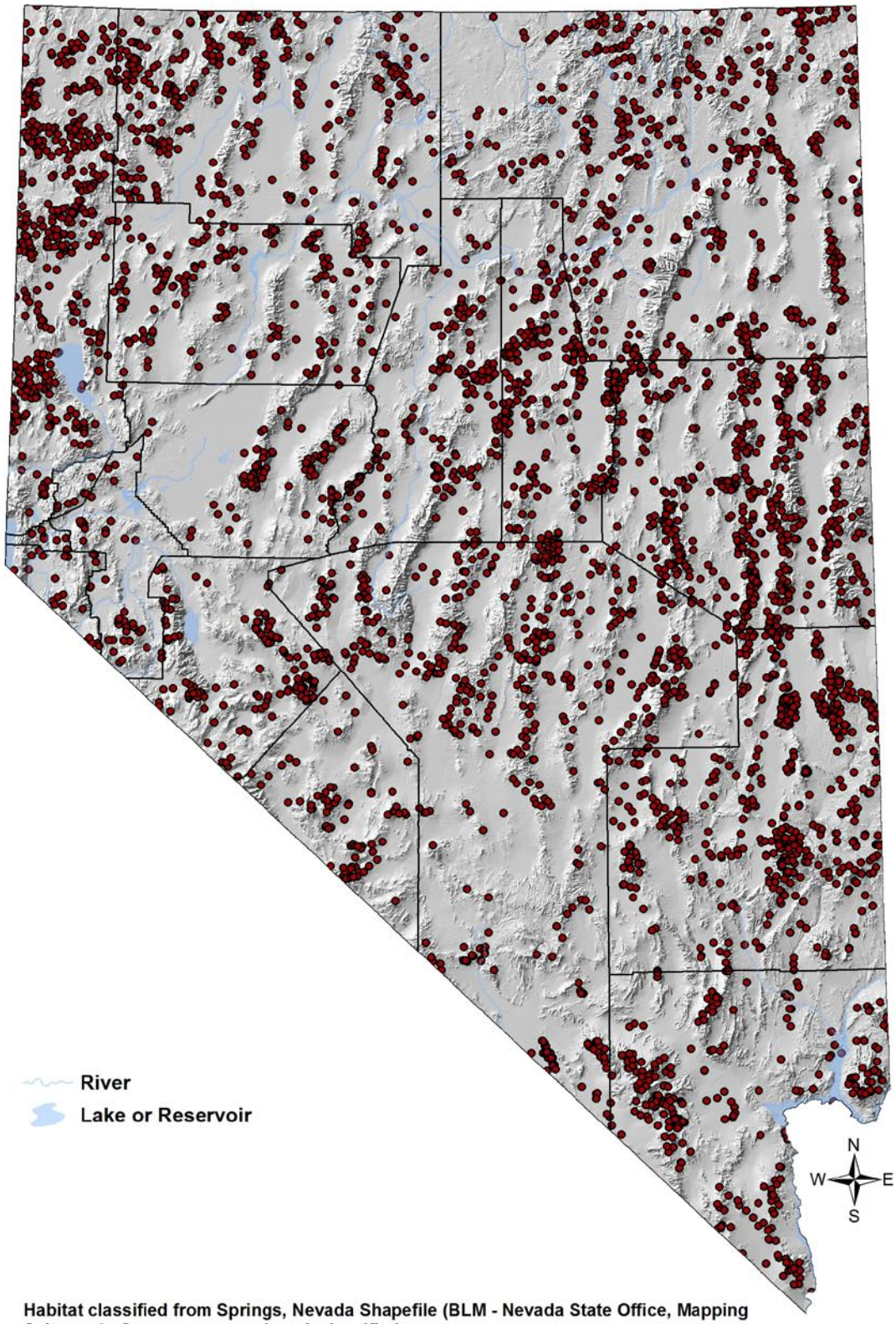
Key Bird-Habitat Attributes

Stand Structure	Dense, often small deciduous trees, mesic shrubs, and grass and flowering forb understory; transition into upland often with other deciduous shrub species
Ideal Scale for Conservation Action	10 ha [25 ac] or more, including a minimum of 2 km [1 mi] of outflow stream where applicable
Plant Species Composition	For larger springs, willow, mesquite, baccharis, quailbush, alder, aspen, water birch, wild rose, currant, and other mesic species; for smaller springs, saltgrass, rushes, sedges, and aquatic (submerged) plants
Understory	Closed-canopy shrub thickets interspersed with natural meadow openings ideal
Presence of Cliffs > 30 m [100 ft] Tall	Presence of tall cliffs increases value to birds

Conservation Profile

Estimated Cover in Nevada	4,179 individual springs (Great Basin: 3,752; Mojave: 427)
Landownership Breakdown (% of springs)	BLM = 60% Private = 21% USFS = 12% Other = 7%
Priority Bird Species	Gambel's Quail Costa's Hummingbird Calliope Hummingbird Rufous Hummingbird Willow Flycatcher (SWFL) Abert's Towhee (Greater Sage-Grouse) (Mountain Quail) (Northern Goshawk) (Yellow-billed Cuckoo) (Lucy's Warbler)
Indicator Species	Yellow Warbler
Most Important Conservation Concerns	Livestock, wild horse and burro grazing Surface water diversion and impoundments Groundwater pumping Invasive weeds Climate change (change in precipitation and temperature) Motorized recreation
Recovery Time	15-20 years (with available water)
Regions of Greatest Conservation Interest	Southern Nevada (Clark, Nye, Lincoln counties), northwestern and central Nevada
Important Bird Areas	Ash Meadows NWR Bilk Creek – Montana Mountains Great Basin National Park Lahontan Valley Wetlands Lake Mead Moapa Valley Monitor Valley North Ruby Valley Oasis Valley Pahranagat Valley Complex Sheldon NWR Spring Mountains Toiyabe Range

Springs



Habitat classified from Springs, Nevada Shapefile (BLM - Nevada State Office, Mapping Sciences). Some areas may be misclassified.

Springs

Overview

Springs occur throughout Nevada, from valley bottoms to high mountains. Montane springs are often the result of water surfacing from seasonal underground sources (e.g., snowmelt seeping into rocky slopes), while valley springs are often the result of groundwater upwells. For this plan, springs are defined as surface water bodies generated by an upwelling, along with their associated mesic vegetation and outflow channels. Springs usually occur in patches too small to reliably support riparian or aquatic obligate bird populations, although larger patches of Springs habitat and smaller patches of riparian woodland by be functionally equivalent. Springs are thought to provide valuable shelter, water, and foraging opportunities for many upland bird species, particularly in an arid state like Nevada. Greater Sage-Grouse, for instance, seek out wetter areas rich in forbs and insects during critical periods of their annual cycle, and springs may often provide these resources. Other upland species, such as Brewer's Sparrow, are more likely to occur where surface water is nearby (p. Spp-73-1). Therefore, while smaller springs may not support significant bird populations by themselves, they may greatly increase the abundance and diversity of birds in upland landscapes within which the springs occur.

Research quantifying the role of springs in sustaining bird communities is limited. Richardson et al. (2007) recently studied bird responses to high-elevation springs of the Spring Mountains. They found that 34 species became less abundant with increasing distance from the spring, up to a distance of 500 m [1,600 ft]. The importance of lowland desert springs to birds has been largely unstudied, although expert opinion of the planning group was that springs and transitional areas were critical for several Mojave Desert Priority species, including Costa's Hummingbird, Gambel's Quail, and Abert's Towhee. We encourage research that evaluates the use of springs by upland Priority species throughout the state. In Figure Hab-19-1, we illustrate the Springs habitat elements that are important to Priority species.

In addition to being understudied, springs are badly under-inventoried throughout the state. They are often misclassified or simply missing from land cover maps, and even where springs are correctly plotted, few of their attributes are classified, and their associated mesic vegetation cover is usually too limited in extent to even register on the map. With over 4,000 springs that were originally mapped in Nevada, one of our strongest conservation recommendations is therefore to conduct a comprehensive inventory of historic spring sites to determine how many have been lost or altered, and how many are intact. We further recommend developing a formal sampling effort to monitor springs for signs of change in discharge or in mesic habitat cover, which may be attributable to climate change and increased demands on water.

Main Concerns and Challenges

The following top seven conservation concerns were identified in our planning sessions for Spring habitat in Nevada:

- Overgrazing by livestock, wild horses and burros
- Surface water diversion, impoundments
- Groundwater pumping

Springs

- Invasive weeds
- Change in precipitation and snowmelt related to climate change
- Change in temperature related to climate change
- Motorized recreation

Springs are vulnerable to many of the same impacts as riparian areas (pp. Hab-7-1, Hab-11-1, and Hab-13-1), including overgrazing, water diversions, and invasive weeds. Wet areas invariably draw attention from grazing animals, and because spring patches are typically so small, they can be degraded more quickly than larger riparian zones. Invasive weeds, facilitated by disturbance, may then take hold. For the same reason, even relatively small changes in water availability can significantly alter a spring's hydrology and outflow. Climate change is therefore a significant concern, since many springs depend on snowpack and precipitation for their discharge. Climate change may affect spring systems earlier and more severely than other mesic habitat types that occur in larger patches and have access to more abundant water supplies. Given that little is known about how birds depend on access to springs, especially in desert regions, it is not possible to estimate how the loss of springs or the degradation of their associated mesic vegetation might affect bird conservation. As mentioned above, a significant effort is needed to inventory and monitor springs and their associated bird communities throughout Nevada in order to better understand these issues.

The upside of springs conservation is that restoration efforts can often be very effective in a fairly short time span, and for relatively moderate costs, as long as spring outflows are still present. Several successful spring restoration projects have been conducted in Nevada by management agencies (e.g., Ash Meadows NWR), which benefitted not only the spring itself but associated wetlands and riparian areas. Restoration projects may involve creating exclosures, altering the timing of grazing activity, providing alternative water and shade sources for domestic livestock, conducting weed control, and even re-engineering of the spring itself. Assuming that the spring and its associated mesic vegetation are in good condition, it is also important to manage adjacent upland areas to maximize their habitat quality. Both suitable uplands and intact springs are required to realize their full synergistic benefits to birds.

Springs

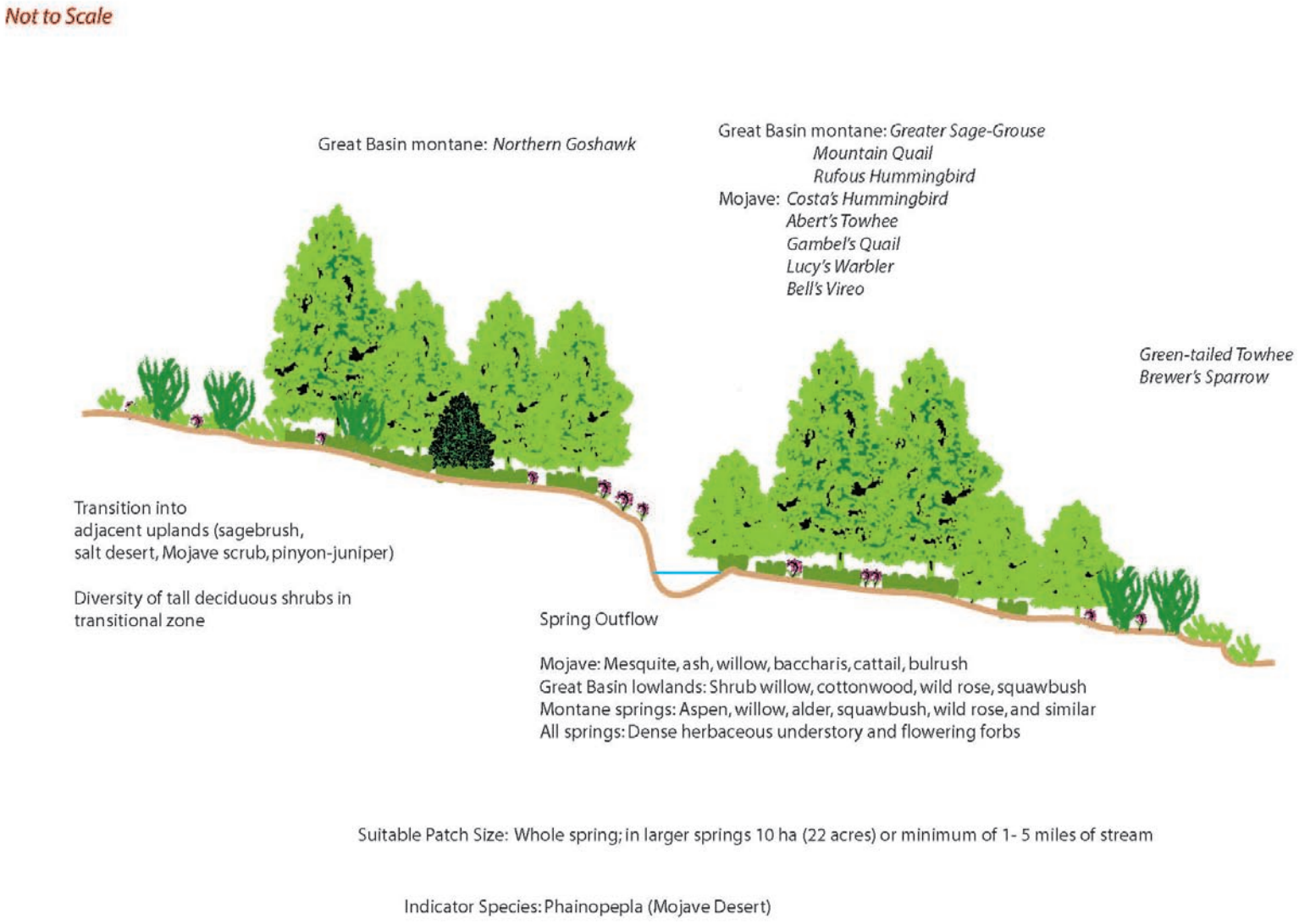


Figure Hab-19-1: Idealized springs landscape to maximize the number of springs-associated Priority bird species.

Conservation Strategies

Habitat Strategies

- Manage **whole spring** or, for larger springs, **10 ha [25 ac] and/or 2-3 km [1 – 5 mi] of outflow channel and associated floodplain**, with preference given to larger areas, wider outflow corridors, or more linear distance of outflow stream. Even small spring patches are valuable, but the desired mesic conditions are better realized with larger overall patch sizes. Sufficient **buffers** (up to 1 km [0.6 mi]) of adjacent transitional and upland habitat types are desirable to provide connectivity for upland birds
- Protect, to the extent possible, the **water source** of springs, particularly for larger, perennial springs
- Critical habitat components include **dense shrub thickets** (mesquite, willow, alder, wild rose, or other mesic species) with patches of **mesic herbaceous cover** interspersed. Sites that cannot support deciduous woodlands are also important if native herbaceous cover and access to water exists. Potentially detrimental land uses, such as prolonged livestock, wild horse, or burro grazing and motorized recreation, may be controlled by fencing and providing alternate access to water and shade
- Single **large trees**, small groves, and large snags provide important opportunities for some Priority species, and should therefore be protected to the extent possible.
- **Restoration of historic outflow channels** and associated floodplains is a high priority for larger springs that have been altered for water diversion. The primary requirement is sufficient water, and if no source vegetation is available, plantings of native woodlands will significantly accelerate restoration.

Research, Planning, and Monitoring Strategies

- One of the highest statewide priorities for Spring habitat conservation planning is to **inventory historic spring sites**, determine condition of remaining springs, and to develop a **monitoring plan that can capture trends associated with changing climate or changing water supplies**
- Expand current efforts of **long-term monitoring of landbirds** through the Nevada Bird Count to better capture Spring habitat sites

Public Outreach Strategies

- **Promotional materials** that convey the value of springs to wildlife and ways to avoid unintentional impacts should be made available to private landowners, managers, and the general public.

Wet Meadow

Wet meadow in south Steptoe Valley, White Pine County. Photo by Elisabeth Ammon.

Key Bird-Habitat Attributes

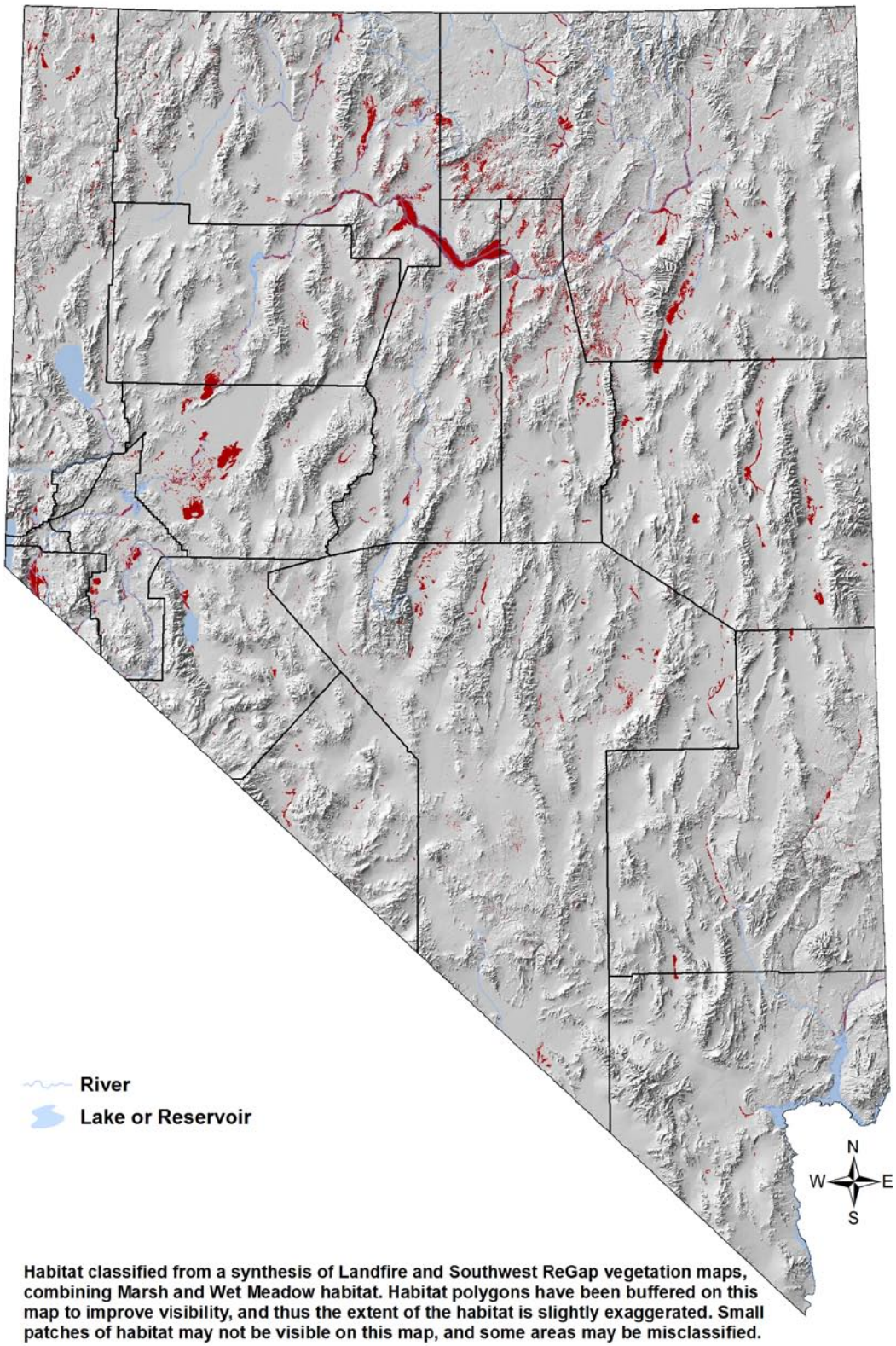
Plant Species Composition	Multi-species mixtures of graminoids and forbs ideal
Ideal Scale for Conservation Action	Whole meadow and border habitats
Land Uses	Haying schedules that avoid the main breeding season (May – mid-June) most suitable; flush-bars on agricultural equipment extremely beneficial; grazing practices that avoid creation of bare soil
Windbreaks and Hedgerows	Rows of native willows, alders , and other shrubs along ditches and streams particularly suitable for some species
Other Features	Protection of nearby streams, springs, rivers from chemical and livestock impacts enhances overall wildlife value; feral cat colonies should be discouraged

Conservation Profile

Estimated Cover in Nevada	222,100 ha [549,000 ac] 0.8% of state
Landownership Breakdown	BLM = 46% Private = 43% Other = 11%
Priority Bird Species	Greater Sage-Grouse White-faced Ibis Sandhill Crane Willet Long-billed Curlew Short-eared Owl Rufous Hummingbird (Lesser Scaup) (Swainson's Hawk) (Golden Eagle) (Prairie Falcon) (Wilson's Phalarope)
Indicator Species	Bobolink (in northern and NE Nevada)
Most Important Conservation Concerns	Change in agricultural practices Surface water diversion, impoundments Groundwater pumping Invasive weeds Climate change (change in precipitation and temperature) Livestock and wild horse grazing Motorized recreation
Habitat Recovery Time	5-10 years
Regions of Greatest Conservation Interest	Northeastern and eastern Nevada
Important Bird Areas	Boyd Humboldt Valley Wetlands Carson Valley Franklin Lake High Rock Resource Area Lahontan Valley Wetlands Meadow Valley Wash Monitor Valley North Ruby Valley Oasis Valley Pahranagat Valley Complex Sheldon NWR Washoe Valley

Wet Meadow

Map shows <u>combined</u> extent of Marsh and Wet Meadow habitat types



Habitat classified from a synthesis of Landfire and Southwest ReGap vegetation maps, combining Marsh and Wet Meadow habitat. Habitat polygons have been buffered on this map to improve visibility, and thus the extent of the habitat is slightly exaggerated. Small patches of habitat may not be visible on this map, and some areas may be misclassified.

Wet Meadow

Overview

Wet Meadow habitat supports a number of Priority bird species in Nevada, most notably the Long-billed Curlew and Sandhill Crane. Greater Sage-Grouse also make use of wet meadows in the brood-rearing period, especially as shrubland forbs start to dry out as the summer progresses. For the purpose of this plan, we define Wet Meadow habitat as non-irrigated areas that are dominated by herbaceous vegetation. Most wet meadows receive water from spring runoff, near-surface groundwater, spring outflows, or by virtue of proximity to floodplain wetlands, lakes, and marshes. Although not intentionally irrigated, many wet meadows develop along the paths of water runoff from agricultural areas

Wet meadows are not very common in Nevada, and most are managed by the BLM and private landowners. As is the case with most "wet" habitats, wet meadows may enhance landscape quality for birds that are primarily associated with drier habitats. For instance, Short-eared Owls typically nest in uplands, but focus their hunting efforts in nearby wet meadows where voles are far more abundant. High-quality Wet Meadow habitat is characterized by dense, uninterrupted groundcover comprised of a diversity of grasses, sedges, rushes, and forbs (Figure Hab-20-1). Plant species diversity is important, as it maximizes foraging value for birds that feed on forbs, insects, or rodents. Old, deciduous border trees are rare in native wet meadows in Nevada, but as in agricultural lands, if they are present, they may support raptor nests and roosts. Nearby wetlands and riparian areas add significant landscape value for birds, many of which are most abundant where these different habitat types are juxtaposed.

Main Concerns and Challenges

The following top eight conservation concerns were identified in our planning sessions for Wet Meadow habitat in Nevada:

- Change in agricultural practices
- Surface water diversion, impoundments
- Groundwater pumping
- Invasive weeds
- Change in precipitation and snowmelt related to climate change
- Change in temperature related to climate change
- Overgrazing by livestock, wild horses and burros
- Motorized recreation

The most serious concerns are those that could deprive wet meadows of their water source. Climate change is among these in that it could reduce some sources of moisture for wet meadows. Locally intensive grazing may be harmful to birds if it exposes bare soils and facilitates invasive weeds. However, grazing can also benefit some wet meadow birds, notably the Long-billed Curlew, if properly managed (p. Spp-34-1), and wet meadows can recover

rapidly if they are rested from overgrazing. Weeds and soil erosion are also a concern where OHV traffic is intensive, particularly in areas that have water-saturated soils.

Wet meadow complex in Spring Valley, White Pine County.
Photo by John Boone.

Wet Meadow

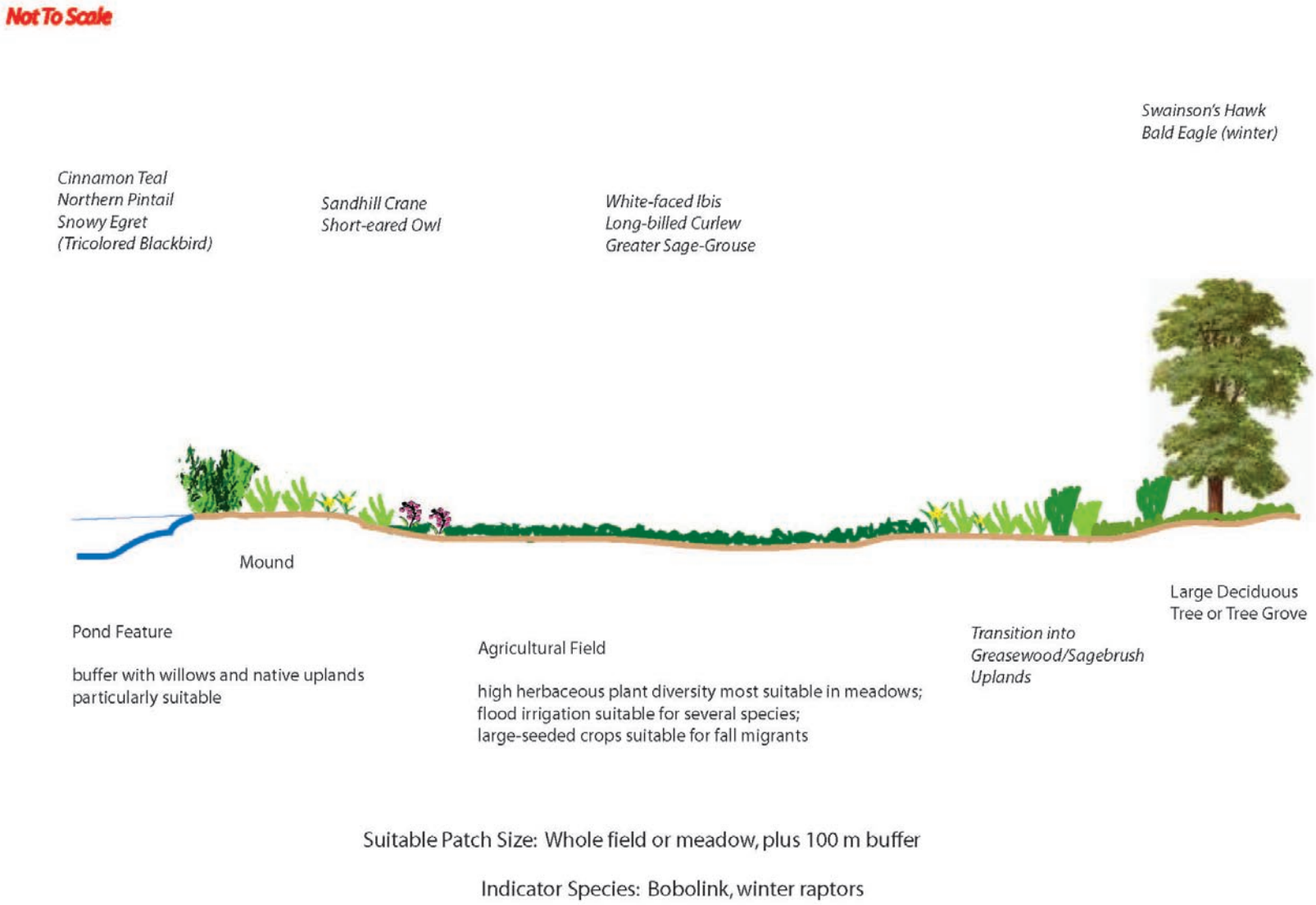


Figure Hab-20-1: Idealized wet meadow landscape to maximize the number of wet meadow associated Priority bird species.

Conservation Strategies

Habitat Strategies

- Manage at the scale of the **whole wet meadow or meadow complex**, ideally with each unit having a buffer of native vegetation, and the entire area having a 100 m [330 ft] buffer of mostly native vegetation (but may include maintenance roads, fences, or trails)
- Grazing should be managed to avoid permanently reducing vegetation cover or plant species diversity
- Organize **grazing and haying schedules** leave some wet meadow areas undisturbed during the main nesting period (**1 April – 1 July**), and other areas undisturbed during the brood rearing period (July – early September), especially if Greater Sage-Grouse use the area
- If a wet meadow is supported by groundwater, **maintain pumping levels** that do not cause habitat conversion
- Removal of invasive plants should be followed by **active restoration of native vegetation** in the removal sites, as weedy species often take advantage of disturbed soils and become more easily re-established in the absence of competition
- Proximity to **water** (riparian areas, springs, marshes, etc.) and presence of **cliffs** > 30 m [100 ft] tall raise the priority level of a site for bird conservation.
- Maintain **OHV use** at levels that does not permanently impact the grass and forb layer or cause soils to be exposed

Research, Planning, and Monitoring Strategies

- **Map and monitor extent and condition of wet meadows** statewide in light of climate change, and develop an adaptive management strategy
- Continue **long-term monitoring of landbirds** statewide through the Nevada Bird Count
- Monitor status of **invasive weeds** to assess threat level locally and statewide

Public Outreach Strategies

- **Promote pride of landowners and ranchers in wildlife** attracted to their lands. Outreach may include tips on agricultural practices and habitat features that enhance habitat value to birds
- **Provide educational materials** on threats from domestic and feral cats to birds, benefits of birds to agricultural operation (control of rodents), and on wildlife-compatible grazing practices and weed control.

Introduction to Species Accounts

Overview

The following species accounts contain information we think the reader needs when planning conservation actions that may affect Priority bird species. We picture a resource manager or decision-maker consulting these species accounts with a particular project or management area in mind, which may involve habitat enhancements, restoration actions, weed control, grazing plans, recreation plans, energy projects, development of infrastructure, or anything else that may affect the birds that live in a particular area. For projects designed to benefit many different bird species simultaneously, **we recommend first consulting the habitat accounts for the major habitat types that are present in the project area**. The habitat accounts have a list of the Priority bird species that are characteristic of each habitat type, and they describe habitat-specific conservation strategies that benefit these Priority species and the bird community as a whole. Conservation strategies presented within the species accounts are designed to be consistent with strategies presented in the habitat accounts, but they are typically more detailed and species-specific, particularly with regard to needed research and monitoring actions. All users can benefit from reviewing the species accounts, but they will be most critical for those that have a special interest in one species or a small number of species. The species accounts are structured using a uniform layout, which makes it easier for users to locate the information they need.

Layout

We chose to present the most critical information about each Priority species in summary tabular format on the first page of each species account. Only information that we considered critical to conservation planning was included on this page. This table page for each species account includes:

1) A **Conservation Profile** that characterizes the level of urgency for conservation action
2) A **Habitat Use Profile** that details the key habitat features that the species is known or likely to require in Nevada
3) A **Natural History Profile** that summarizes a few critical ecological and life history parameters

Because space is limited on most table pages, sources of information are indicated in the form of footnote superscripts, and the corresponding footnote key containing brief citation information (author and year) appears at the end of each account. For consistency, the footnote citation format necessitated by the table page is retained throughout the species accounts. Full citations are available in the *Literature Cited* section. The **abbreviation "EO" (= expert opinion) is used where important information was not available in the published literature and we relied on overwhelming expert opinion** from reviewers, members of the planning group, and other bird conservation professionals.

We also provide **confidence rankings** for key habitat parameters, historical and recent trends, population size estimates, and range maps, using symbols that are explained in the footer section of the first page. These subjective rankings represent the degree of confidence we have in a given piece of information. "High" confidence means we are almost certain that the information is

reasonably accurate. “Low” confidence means that we regard the information as either incomplete or somewhat conjectural. “Moderate”, which is the most commonly applied ranking, indicates an intermediate level of confidence.

On the following pages of each account, we present:

1) A summary of distribution and seasonal presence in the form of a **range map** (see pp. App-1:18-19, for details). Our knowledge of true distributions varies greatly among species, which we indicated with a confidence ranking on each species map
2) An **Overview** summarizing the key factors about each bird’s conservation issues
3) Quantitative data on **abundance and occupancy by habitat** and **Nevada-specific studies and analyses,** where available (see pp. App-1:13-14 for details)
4) A list of the **Main Threats and Challenges** for the species in Nevada
5) **Conservation Strategies** that represent our best knowledge of the most actions that will most effectively preserve the species in Nevada

In the remainder of this chapter, we provide important definitions, sources of information, methods, and recommended uses regarding the specific information presented in each species account.

Trumpeter Swans. Photo by Martin Meyers

Conservation Profile

***Priority Status*:** Identifies whether the species is a Conservation Priority, Stewardship, or Special Status Species (see pp. Birds of Nevada 1-2; App-1:1-2; and *Appendix 2* for details). Generally, we recommend treating all three types of Priority birds as categories with equal conservation concern.

***Species Concerns*:** This is a summary of the main concerns that led to conservation ranking of the species by regional initiatives, which was the basis for species inclusion in this plan. Concerns may include:

1) Known or likely declines in populations, either in historical times or more recently
2) Restricted species distributions or small population sizes
3) Dependence on threatened or restricted habitat type(s)
4) Known or likely habitat threats
5) Listed as threatened or endangered under Endangered Species Act (ESA), or a candidate for listing
6) High stewardship responsibility due to a significant portion of the species' global population being present in Nevada

***Other Rankings*:** This item provides rankings by regional conservation initiatives and government agencies with significant responsibilities for bird conservation. For more details on these rankings, please consult the sources listed here:

1) *Partners in Flight Continental Plan (PIF)*: http://www.partnersinflight.org/cont_plan/
2) *Audubon Watchlist*: http://birds.audubon.org/species-by-program/watchlist
3) *Nevada Natural Heritage Program's state rankings*: http://heritage.nv.gov/spelists.htm
4) *U.S. Fish and Wildlife Service's rankings under the ESA*: http://www.fws.gov/endangered/species/us-species.html
5) *U.S. Fish and Wildlife Service Birds of Conservation Concern*: http://library.fws.gov/Bird_Publications/BCC2008.pdf
6) *U.S. Fish and Wildlife Service's ranking under the Migratory Bird Treaty Act*: http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html
7) *U.S. Bureau of Land Management*: Internal "Sensitive Species" list. http://www.blm.gov/nv/st/en/info/state_directory.html
8) *U.S. Forest Service*: Internal Humboldt-Toiyabe Forest "Sensitive Species" list http://www.fs.fed.us/r4/resources/wildlife/index.shtml
9) *Nevada Department of Wildlife / Nevada Wildlife Action Plan*: http://www.ndow.org/wild/conservation/cwcs/
10) *Intermountain West Shorebird Conservation Plan*: http://www.fws.gov/shorebirdplan/RegionalShorebird/downloads/IMWEST4.doc
11) *Intermountain West Waterbird Conservation Plan*: http://www.pwrc.usgs.gov/nacwcp/pdfs/regional/MainTextV12nocover.pdf
12) *Pacific Flyway Council (various documents)*: http://www.pacificflyway.gov/Management.asp
13) Various habitat conservation plans, as cited in individual accounts

***Trends*:** This section lists historical (pre-1970s) and recent (post-1970) population trends to the best of current knowledge. Population trends were obtained from analyses of BBS data (Sauer et al. 2008), regional bird conservation initiatives, *Birds of North America* species accounts (Poole and Gill 1992-2002, http://bna.birds.cornell.edu/bna/), and other published sources. Wherever possible, we focus on Nevada-specific trends, but in many cases (as noted in the species accounts), we were forced to rely on regional trends due to lack of information in Nevada.

Population Size Estimate: Nevada population size estimates for most landbirds were obtained from NBC data analyses, or alternately from an unpublished analysis of BBS data (Rich et al. 2004) (for details see pp. App-1:14-18, and *Appendix 4*). These sources are indicated parenthetically in the table, either (NBC) or (BBS). For shorebirds, waterbirds, waterfowl, and marshbirds, population estimates were obtained from regional management plans (Ivey and Herziger 2006, Oring et al. 2000), from survey data collected by Larry Neel of the Nevada Department of Wildlife, or from other published sources. Population estimates for remaining species groups (some owls, raptors, hummingbirds) were obtained from various published sources, or in some cases were simply not available. For global population size estimates, we consulted national and continental conservation plans by the major bird conservation initiatives, as indicated in the citations.

Population Objective: The entry identifies how much change in population trend is needed to achieve the desired conservation status. The objectives were largely based on continental objectives of the major bird conservation initiatives, as indicated in the citations, but in some cases the objectives were amended by expert opinion based on Nevada-specific considerations.

***Monitoring Coverage*:** Here, we list the Nevada programs (Source) under which the species is currently monitored, and our opinion of how adequately the species is surveyed by these monitoring efforts (Coverage in NV). In cases where Coverage in Nevada is ranked "Fair" or "Poor", additional monitoring efforts are needed.

***Key Conservation Areas*:** This section lists the general regions, valleys, mountain ranges, or habitat types in which we estimate that conservation action will be most effective. It is divided into Protection, which refers to species stronghold areas that need continuing or expanded protection, and Restoration, which refers to areas where population could be increased if restoration actions were undertaken. This table entry does not necessarily represent *all* worthy Protection or Restoration areas in Nevada; rather it simply provides our recommendations of areas, in which conservation action may be most effective.

Habitat Use Profile

***Habitats Used in Nevada*:** This section allows the user to quickly determine the **habitat accounts** that are relevant to the species. It lists all major habitat types (as defined on pp. App-1:7-12) regularly used by the species in Nevada, roughly in order of importance. Habitat types shown in parentheses are used less regularly, or more locally, than the others. In all cases, we recommend that these habitat accounts be used in tandem with the species accounts, as they cover opportunities for habitat conservation that benefits multiple species.

***Key Habitat Use Parameters*:** This section identifies the key habitat features needed by the species. Many subcategories are used for various species, which cover plant species composition, plant density and structure, landscape mosaic (i.e. mixtures of different habitat types or resources over large areas), and other parameters. We only list those habitat features that may be affected by threats, and that a resource manager can potentially address through conservation action. Habitat features that cannot be influenced by management actions are generally excluded.

***Area Requirements*:** This section lists estimated **area requirements for effective conservation**, including minimum patch size (if known), recommended patch size for maintaining a sustainable population, and territory and/or home range sizes. In all cases, we would refer conservation planners to the **recommended patch size**, as this is the minimum area that we estimate is needed to maintain a functional *population*, rather than just individual birds.

Natural History Profile

***Seasonal Presence in Nevada*:** This section identifies the seasons during which the bird is primarily present in Nevada. Migrant populations are only mentioned if Nevada is known to provide significant stopover habitat for a species, if migrants have a notable presence in an area of the state where they are otherwise absent, or if some particular conservation concern is associated with migrant populations. In some cases, this entry is subdivided to refer to different regions of the state (for instance, a bird may have only a breeding presence in northern Nevada, but may be present year-round in southern Nevada). We frequently consulted eBird (www.ebird.org) to fine-tune our understanding of seasonal presence in Nevada.

***Known Breeding Dates in Nevada*:** Breeding phenologies were derived largely from the Nevada Breeding Bird Atlas project, supplemented by published sources and by expert opinion from the planning group. The range of dates broadly describes the **complete breeding season**, including mating, nest building, incubation, and brood-rearing.

***Nesting Habits*:** This section describes the species' habits for nest placement and site fidelity. **Nest Placement** refers to microsite requirements (e.g., dense shrub branches, tall tree, or vicinity to wetland edge) that need to be provided for successful nesting and brood rearing. **Site Fidelity** describes in simple categorical terms how rigid individuals are in terms of re-using their nest site, breeding territory, or habitat patch location over multiple years. This information is useful for land managers who need to estimate how likely a species is to use alternate habitat or colonize a newly-restored habitat patch. For non-breeding birds, Site Fidelity is sometimes used to indicate the likelihood of repeated annual use of key wintering or migratory stopover sites.

***Food Requirements*:** This section describes the mode by which a bird gathers food (Basic), the food items most important to the species (Primary Diet), and the most common alternate or seasonal food items (Secondary Diet). This information is particularly relevant for species such as the Golden Eagle, where many conservation goals can be accomplished by managing for healthy prey populations.

Range Map

The range maps were carefully designed to represent our best knowledge of the current distributions of birds in Nevada. They represent a compromise between simply reporting known locations as dots on a map, and the most inclusive approach of field guides that block out wide regions to indicate a range. Here, we settled on an intermediate approach, which – in most cases – provides us with sufficient resolution to **describe a species' distribution accurately without underestimating the extent of its range based on spotty survey coverage**. Details on map construction and data sources are covered on pp. App-1:18-19, and readers with an interest in the range maps are encouraged to review this section carefully.

Rufous Hummingbird. Photo by Jacque Lowery

It is important to note that the maps are only reliable within the bounds set by their intrinsic mapping scale (whole basin or range, whole waterbodies). This means that **a species will not *necessarily* be present at all locations within areas that are highlighted as known range**. At these finer scales, the maps are only useful to indicate that a species *may* be present in a particular site, but **will almost certainly be absent in inappropriate habitat types** (e.g., a riparian associated species will only occur in riparian patches in the indicated region). Likewise, it should not be assumed that a bird is *necessarily* absent in all areas not highlighted in the map (see confidence ranking).

As described on pp. App-1:18-19, the basic mapping units for landbirds are **whole mountain ranges or basins**, for waterbirds, waterfowl, shorebirds, and marshbirds **major waterbodies, marsh complexes, and rivers,** and for ephemeral wetland species, **waterbodies and playas**. In the case of a few very rare landbirds, however, we departed from the basin and mountain range

scheme because it over-represented the very limited geographical range of these rare species. The mapping units used for these birds are explained in the footnotes.

On the range maps, different colors are associated with different seasonal periods, as indicated on the map legends. **Solid, dark** versions of these colors indicate areas where **presence has been confirmed by data. Paler, semi-transparent** versions of these same colors indicate the broader areas in which **we expect the species to occur within suitable habitat types**, although we had no data to confirm it.

Determining when and how to illustrate a species' migratory presence in the state was difficult. On the one hand, all of Nevada's bird that are not year-round residents have a migratory presence, but attempting to plot this distinctly on the maps would have been difficult, and would have distracted from more important map elements. We therefore decided to **combine migratory and winter range for most birds**. In part, this decision was based on the fact that many of Nevada's breeding birds that migrate south for the winter maintain small (and usually poorly-documented) wintering populations in southern Nevada. Where it was possible or important to clearly distinguish between migratory and winter range, we do so. We also chose to highlight migratory range for some species that are primarily or exclusively present in the state during their migratory stopovers.

Finally, we note that the range maps were prepared and included in this plan not only to illustrate our current knowledge, but also to encourage managers, researchers, and birders to focus their survey efforts in areas where our knowledge of distributions may be inadequate. **We encourage submissions of verified sightings to GBBO that can be used to improve these maps** (see pp. Introduction, 5-6).

Overview Section

The Overview section summarizes issues of conservation interest for each species, along with any important information that does not fit well into the tables on the first page. It characterizes the key issues relevant for managing the species, but does not repeat in detail the information listed in the tables on the first page of the account.

Abundance and Occupancy by Habitat

For landbirds that are well-sampled by the Nevada Bird Count (NBC), this section includes our estimates of **habitat-specific densities**, as described in detail on p. App-1-14. In some cases, we report densities for birds that were not well-surveyed by NBC based on other sources.

Nevada-Specific Studies and Analyses

This section focuses primarily on statistical analyses of **bird-habitat relationships in Nevada**. Most of these analyses were based on datasets derived from NBC and GIS habitat maps, as described in detail on p. App-1-13. In some cases, analyses from other datasets were available in the published literature. We present only statistical analyses based on Nevada data, or from data that are clearly relevant to Nevada.

Main Threats and Challenges

This section lists the specific threats and management challenges that apply to the species, based on published literature and the deliberation and review of experts in the planning group. We focus only on threats that are known or likely to apply in Nevada, and further on threats that can be influenced by management actions. We distinguish between habitat-based threats and challenges presented by lack of adequate monitoring, research, or planning.

Conservation Strategies

Conservation strategies are in many ways the most important output of this plan. They were developed collaboratively by the planning group during a series of meetings and review cycles, and were informed by numerous published sources and agency reports. As described in the *Introduction* (pp. 2-3), we stress habitat-based strategies, along with strategies that call for gathering more conservation data through research and monitoring. We do not attempt to prescribe strategies that would usurp the interagency planning process, nor strategies involving political action or advocacy. Conservation strategies were categorized as follows:

***Established Strategies*:** For some species, successful conservation strategies have already been developed to meet regulatory requirements, or have been successfully implemented by previous conservation plans. We highlight the most important elements of these established strategies, and refer the reader to the original sources for further detail.

***Habitat Strategies*:** These include strategies for management, protection, or restoration of habitat. We used the Habitat Use and Natural History Profile tables from the first page of each account to derive a vision for desired habitat conditions for the species, and then determined the strategies needed to achieve this vision in the face of known and likely habitat threats.

***Research, Planning, and Monitoring Strategies*:** For many species, we need to gather more information about threats, trends, status, distribution, habitat requirements, or basic biology in order to identify the most effective approaches to conservation. Collecting this information may require additional research studies, planning activities, or monitoring efforts. We tended not to focus much on future planning in this section, but planning strategies are discussed in greater depth in the habitat accounts.

***Public Outreach Strategies*:** These strategies involve educating the public, seeking to increase public support for conservation objectives, or conducting outreach to modify public activities.

Log of Changes

The online version of this plan, maintained at **www.gbbo.org/bird_conservation_plan.html,** will include a Log of Changes section for each species account that will list all changes and additions associated with each revision of the species account. This log will enable a user to quickly determine whether or not a more recent version of a given species account contains information that is of interest.

Trumpeter Swan

Cygnus buccinator

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Marsh Open Water	
Key Habitat Parameters ●	
Plant Composition	Cattail, bulrush, sedges, willows, submerged aquatic vegetation
Plant Density	Varying densities of emergent vegetation[3]
Mosaic	Irregular shorelines with patches of emergent vegetation (hemi-marsh), areas with significant aquatic vegetation, and areas of open water; presence of islands surrounded by deep water highly desirable[3]
Water Depth	> 50 cm [20 in] around nest site; < 130 cm [51 in] for foraging[3]
Water Quality	Low salinity, little or no pollution [EO]
Hydrology	Minimal daily fluctuation in stage during nesting [EO]
Response to Vegetation Removal	Probably negative [EO]
Area Requirements ◑	
Minimum Patch Size	5 ha [12.3 ac] [EO], including ≥ 2 ha [4.9 ac] of unobstructed open water[3]
Recommended Patch Size	> 150 ha [370 ac] [EO]
Home Range / Territory Size	Unknown

Conservation Profile

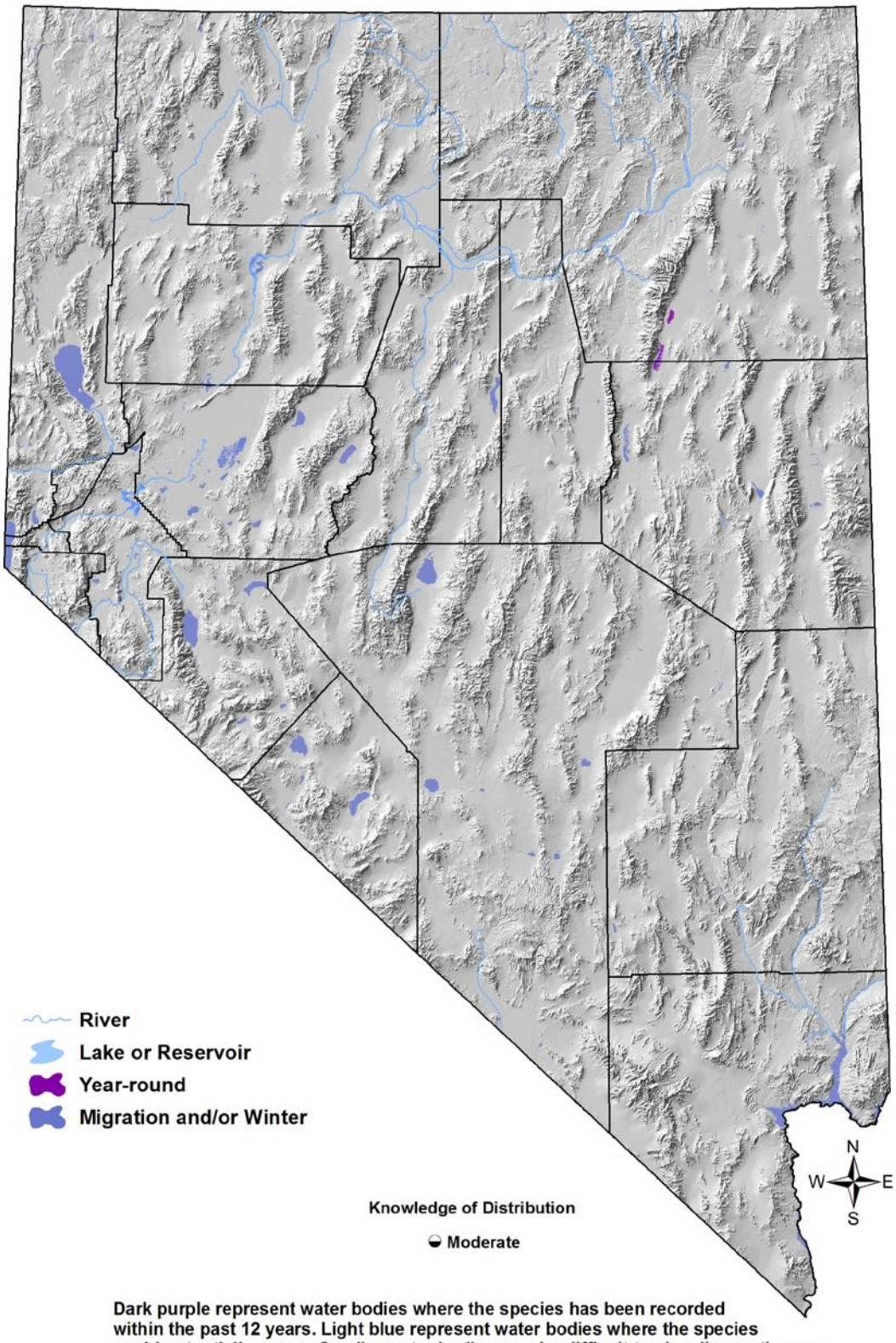
Priority Status	
Conservation Priority Species	
Species Concerns	
Small population size Habitat threats Historical declines	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S1b
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	None
Pacific Flyway Council	High
Trends	
Historical ●	Nearly extinct south of Canada by 1935; subsequently, slowly recovering[3, 4]
Recent ○	Probably stable in Nevada[3, 5]
Population Size Estimates	
Nevada ◑	≤ 30 (breeding)[5]
Global ◑	16,000 [3]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	NWR surveys, NDOW aerial surveys
Coverage in NV	Good at Ruby Lake; Fair / Poor elsewhere
Key Conservation Areas	
Protection	Ruby Valley
Restoration	Ruby Valley

Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
Early May – mid-August[1]	
Nest and Nesting Habits	
Nest Placement	Nests on islands, hummocks, or floating vegetation[3]
Site Fidelity	High for breeding sites[3]
Food Habits	
Basic	Dabbler
Primary Diet	Submerged and emergent vegetation[3]
Secondary Diet	Cygnets: aquatic invertebrates[3]

Trumpeter Swan

Cygnus buccinator



Dark purple represent water bodies where the species has been recorded within the past 12 years. Light blue represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Trumpeter Swan

Cygnus buccinator

Overview

Nevada's small breeding population of Trumpeter Swans at Ruby Lake is the result of a successful reintroduction of the species in the 1940's-50's, following its earlier extirpation from the state. While persistent, this breeding population is very small and highly disjunct from other breeding populations farther to the north and east, and it appears to have become sedentary and abandoned migration.[3] Reintroduction of additional breeding populations elsewhere in the state is possible, but it is not a current priority for management agencies.[5] Given that Trumpeter Swan breeding populations to the east of Nevada are increasing in abundance (T. Floyd, *pers. comm.*), natural expansion of Nevada's breeding population seems possible as well. There is limited information on non-breeding occurrence of this species outside of Ruby Valley, and it is speculated that wintering birds, presumably individuals from populations that breed farther to the north, are found widely, albeit rarely, across the state.[2]

Abundance and Occupancy by Habitat

No information

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat and Other Threats

- Sensitive to water pollution and vulnerable to changes in water level during the incubation period[3]
- Sensitive to nest-site disturbances[3]
- Cygnets at Ruby Lake suffer high predation rate,[5] although the relative levels of depradation by coyotes, Common Ravens, and other predators is not clear
- Nevada's breeding population is small, disjunct, and may have minimal genetic interchange with other breeding populations[3]

Research, Planning, and Monitoring Challenges

- Post-breeding and winter occurrence and habitat use in Nevada not well documented

Trumpeter Swan

Cygnus buccinator

Conservation Strategies

Established Strategies

- Ruby Lake NWR management plan and monitoring program
- Pacific Flyway Council oversees the monitoring of regional and continental populations, and sets or recommends policies and regulations related to harvest, management, and conservation (http://www.pacificflyway.gov/)

Habitat Strategies

- Open Water (p. Hab-15-1) and Marsh (p. Hab-9-1) habitat conservation strategies benefit this species
- Ruby Lake NWR population is carefully and effectively managed; implement similar management policies if other breeding populations are established, including the following:
    - Protect water quality
    - Maintain water level during incubation period
    - Protect nest sites from human disturbance

Research, Planning, and Monitoring Strategies

- Continue current Ruby Lake NWR monitoring program
- Conduct more intensive statewide surveys to determine post-breeding, migration, and winter presence and distribution of Trumpeter Swans in Nevada

Public Outreach Strategies

- None identified

References: [1]GBBO unpublished Atlas data; [2]Ivey (1990); [3]Mitchell and Eichholz (2010); [4]Shea et al. (2002); [5](C. Mortimore, *pers. comm.*); [EO] Expert opinion

Tundra Swan

Cygnus columbianus

Photo by Fred Petersen

Habitat Use Profile

Habitats Used in Nevada	
Marsh Open Water	
Key Habitat Parameters ●	
Plant Composition	Cattail, bulrush, sedges, sago pondweed; and other aquatic vegetation; agricultural crops
Plant Density	Mostly open water with scattered emergent vegetation; dense aquatic (submerged) vegetation preferred[2, 4]
Mosaic	Mostly open, relatively shallow water, fringed by patches of emergent vegetation[2]
Water Depth	< 100 cm [39 in] for foraging[2]
Water Quality	Tolerates variety of salinities [EO]
Response to Vegetation Removal	Probably neutral for emergent vegetation, but negative for submerged vegetation [EO]
Area Requirements ◑	
Minimum Patch Size	130 ha [320 ac] for migration stopover water bodies[2]
Recommended Patch Size	> 150 ha [370 ac] [EO]
Home Range / Territory Size	Unknown

Conservation Profile

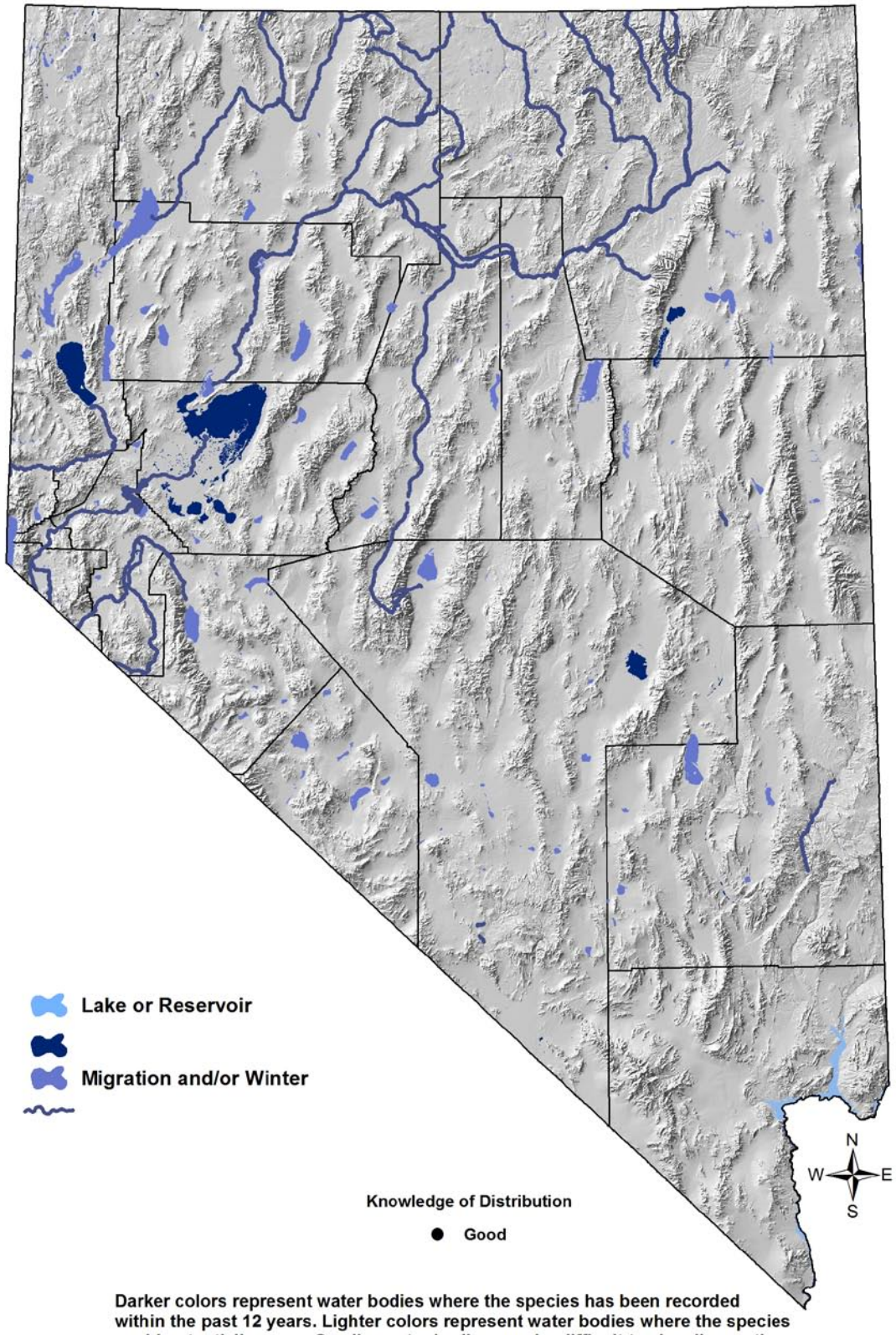
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical declines Habitat threats Moderate stewardship responsibility (wintering)	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	None
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	None; Gamebird
Pacific Flyway Council	High/Medium
Trends	
Historical ●	Rangewide declines[2]
Recent ○	Stable to increasing[2, EO]
Population Size Estimates	
Nevada ◑	1,000 –10,000 (wintering), possibly more[4, EO]
Global ◑	150,000 [2]
Percent of Global	~ 4% of global population; ~ 8% of Western population[2]
Population Objective	
Maintain [EO]	
Monitoring Coverage	
Source	USWFS winter surveys, NDOW aerial surveys, NWR and WMA counts
Coverage in NV	Good
Key Conservation Areas	
Protection	Lahontan Valley, Ruby Valley
Restoration	All open water and marsh complexes

Natural History Profile

Seasonal Presence in Nevada	
Fall – Winter	
Known Breeding Dates in Nevada	
N/A	
Nest and Nesting Habits	
Nest Placement	N/A
Site Fidelity	High for wintering sites[2]
Food Habits	
Basic	Dabbler
Primary Diet	Aquatic and emergent vegetation[2]
Secondary Diet	Agricultural crops, aquatic invertebrates[2]

Tundra Swan

Cygnus columbianus



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Tundra Swan

Cygnus columbianus

Overview

The Tundra Swan breeds in the Arctic, and occurs in Nevada only through the winter and during migration. The species is divided into a "Western population" and "Eastern population" based on the location of wintering grounds.[2] The western population of Tundra Swans nests in western and northwestern Alaska and winters in the Western United States and coastal British Columbia. The number of swans in the western population has been increasing since the 1950s. Managers intend to maintain a western population of at least 60,000 swans.[3]

Nevada hosts nearly 10% of the Western population's wintering swans. About 35,000 – 40,000 Tundra Swans migrate through the entire Great Basin, which represents about half of the swans using the Pacific Flyway.[1] Variations in weather substantially affect the distribution of swans during fall migration and winter. The abundance of fall and winter water in the west has a marked effect on annual distribution of swans. The distribution of snow- and ice-free habitats also can significantly alter the phenology of migration and winter distribution of swans among Pacific Flyway states.[3] Current management appears sufficient to maintain Nevada's wintering populations, but their water-dependent habitats are potentially subject to a variety of threats that merit further investigation.

Abundance and Occupancy by Habitat

No information

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- No threats specific to Tundra Swans were identified, but more general threats to Open Water (p. Hab-15-1) and Marsh (p. Hab-10-1) habitat are potential concerns

Research, Planning, and Monitoring Challenges

- Additional research is needed to determine if significant habitat threats exist
- Emphasis should be directed towards detecting avian cholera and applying methods to minimize losses from this disease.[3]

Tundra Swan

Cygnus columbianus

Conservation Strategies

Established Strategies

- Pacific Flyway Council oversees the monitoring of regional and continental populations, and sets or recommends policies and regulations related to harvest, management, and conservation (http://www.pacificflyway.gov/)[3]

Habitat Strategies

- Open water (p. Hab-15-1) and Marsh (p. Hab-9-1) habitat conservation strategies benefit this species
- Manage wintering and migration habitat to encourage healthy growth of sago pond-weed[4]

Research, Planning, and Monitoring Strategies

- Conduct additional research on Tundra Swan distribution, abundance, and habitat use to better determine the nature and severity of any habitat threats

Public Outreach Strategies

- None identified

References: [1]Kadlec and Smith (1989); [2]Limpert and Earnst (1994); [3]Pacific Flyway Council. (2001); [4](C. Mortimore, *pers. comm.*); [EO] Expert opinion

Cinnamon Teal

Anas cyanoptera

Photo by Steve Ting

Habitat Use Profile

Habitats Used in Nevada	
Marsh Open Water (Ephemeral Wetland and Playa) (Great Basin Lowland Riparian (oxbows)) (Agriculture)	
Key Habitat Parameters ●	
Plant Composition	Cattail, bulrush, sedges, rushes, willows, submerged aquatic vegetation
Plant Density	Patches of high density emergent vegetation[1]
Mosaic	Shallow marsh or waterbody with variable stem densities of emergent vegetation, interspersed with dry spots, mudflats, open water[1]
Water Depth	< 20 cm [8 in] along vegetated shorelines for foraging[1]
Water Quality	Tolerant of moderately saline conditions[1]
Hydrology	Permanent or ephemeral wetland, as long as vegetation is present[1]
Response to Vegetation Removal	Probably negative [EO]
Area Requirements ○	
Minimum Patch Size	Unknown, but uses relatively small water bodies, including farm ponds
Recommended Patch Size	> 15 ha [37 ac] [EO]
Home Range	< 10 ha [25 ac], overlapping[1]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Habitat threats High stewardship responsibility (especially migration)	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S5b
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority, Gamebird
Pacific Flyway Council	Medium
Trends	
Historical ○	Unknown
Recent ○	Probably stable[6, 7]
Population Size Estimates	
Nevada ○	> 10,000 (breeding)[4]
Global ◑	~ 300,000 [1, 5, 8]
Percent of Global	> 3 %
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	NDOW aerial counts, NWR and WMA counts, NV Aquatic Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Ruby Valley, Lahontan Valley, Ash Meadows NWR, Lake Mead, Key-Pittman WMA
Restoration	Degraded marshes

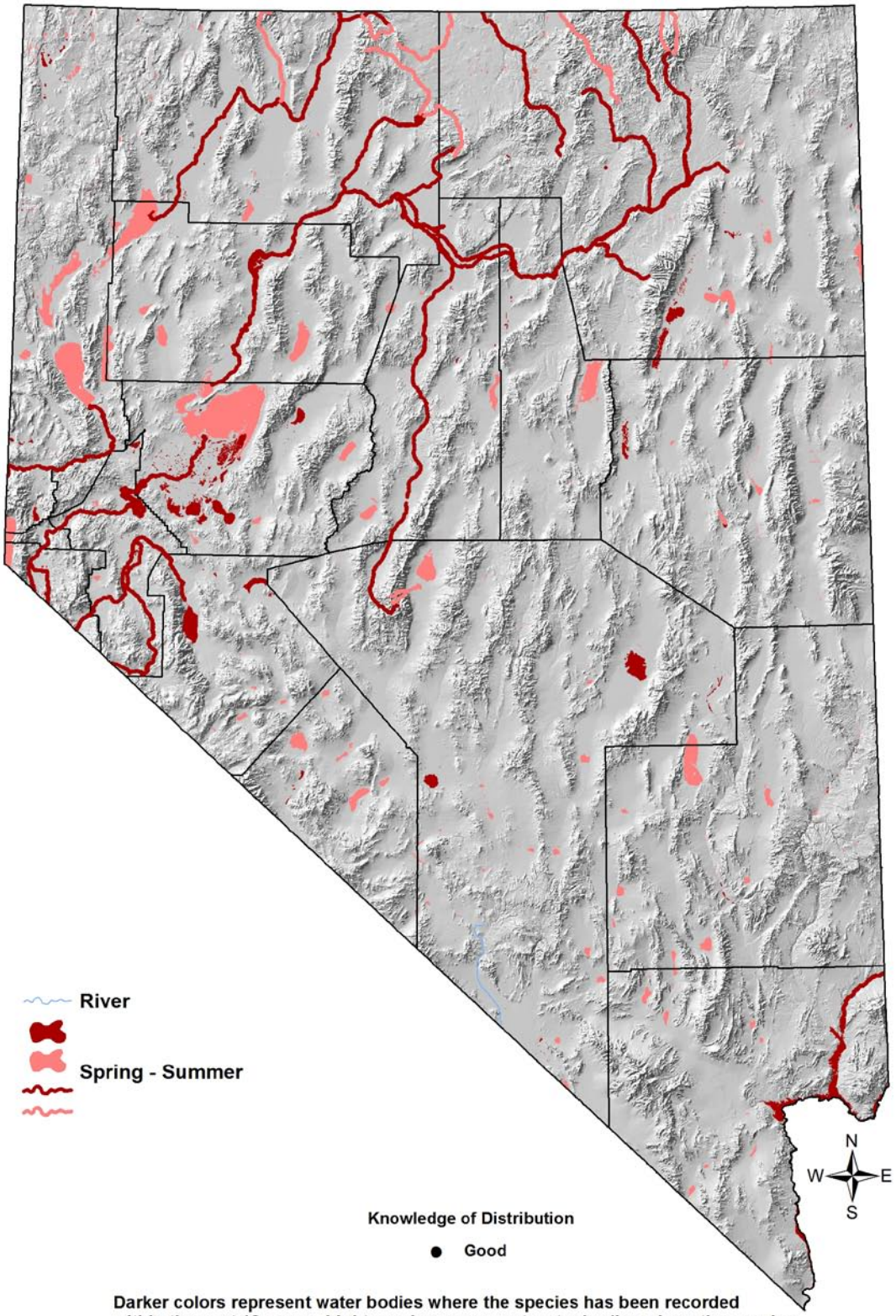
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer Fall (migration, March-April peak) Spring (migration, August-September peak)	
Known Breeding Dates in Nevada	
May – August[2]	
Nest and Nesting Habits	
Nest Placement	Near shoreline or over water in dense vegetation < 60 cm [23 in] tall[1]
Site Fidelity	Moderate to high for breeding site[1]
Other	Multiple nests, re-nesting, moves eggs[1]
Food Habits	
Basic	Dabbler
Primary Diet	Aquatic vegetation, aquatic invertebrates, zooplankton[1]
Secondary Diet	N/A

Confidence in Available Data: ●High ◑Moderate ○ Low

Cinnamon Teal

Anas cyanoptera



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Cinnamon Teal

Anas cyanoptera

Overview

The Cinnamon Teal is one of Nevada's most common nesting ducks, but at the continental scale it is one of least abundant dabbling ducks of North America.[1] Consequently, Nevada has a substantial stewardship responsibility for this species, especially during migration, when the number of Cinnamon Teals in Nevada swells markedly, probably exceeding 100,000 birds.[3] Thus, many of the areas delineated in the map above as "Spring – Summer" range may be equally, or more, important as migratory habitat. Some Cinnamon Teals are present in southern and western Nevada during the winter months (www.ebird.org), but it is not clear whether these birds are stragglers, or instead representative of a real, if small, overwintering presence.

Much of the Cinnamon Teal's continental breeding range lies outside of major waterfowl survey areas, so population size estimates are somewhat conjectural. Survey coverage in Nevada, however, is relatively good, and current management efforts appear to be successful in maintaining stable populations. As with other waterfowl, population trends are closely monitored and harvest limits adjusted as needed by NDOW and Pacific Flyway Council.

Abundance and Occupancy by Habitat

No information

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat and Other Threats

- Loss and degradation of marsh, open water, and ephemeral wetland habitat due to water diversions, declines in water quality, or development[1]
- Although many Cinnamon Teal use managed wetlands, many also use smaller wetlands on private lands
- Susceptible to botulism type C, especially in shallow Great Basin wetlands[1]

Research, Planning, and Monitoring Challenges

- None identified

Cinnamon Teal

Anas cyanoptera

Conservation Strategies

Established Strategies

- Annual harvest rates are set by NDOW in consultation with the Pacific Flyway Council

Habitat Strategies

- Marsh (p. Hab-9-1) and Open Water (p. hab-15-1) habitat conservation strategies benefit this species.
- Manage for steady water levels during breeding period (1 May – 1 July)
- Preserve wide bands of emergent vegetation and wet meadow buffers around nesting wetlands

Research, Planning, and Monitoring Strategies

- Continue current monitoring programs

Public Outreach Strategies

- Work with private landowners to promote conservation of small private ponds and wetlands used by Cinnamon Teals

References: [1]Gammonley (1996); [2]GBBO unpublished Atlas data; [3]Kadlec and Smith (1989); [4]Nevada Wildlife Action Plan Team (2006); [5]Rich et al. (2004); [6]Sauer et al. (2008); [7]USFWS (1998); [EO] Expert opinion

Northern Pintail

Anas acuta

Photo by Chris Nicolai

Habitat Use Profile

Habitats Used in Nevada	
Marsh Open Water (Great Basin Lowland Riparian (oxbows))	
Key Habitat Parameters ●	
Plant Composition	Cattail, bulrush, sedges, rushes, saltgrass, submerged aquatic vegetation, agricultural crops
Plant Density	Spring-Fall: Patches of varying emergent stem densities and ample aquatic vegetation; Winter: sparse emergent vegetation[1]
Mosaic	Shallow marsh or water body with patches of emergent vegetation interspersed with open water, buffered by shrubland, grassland, or agriculture[1, 2]
Water Depth	< 30 cm [12 in] for foraging[1]
Hydrology	Large variety of water regimes tolerated[1]
Response to Vegetation Removal	Probably negative in breeding habitat [EO]
Area Requirements ◑	
Minimum Patch Size	Unknown, but uses moderately small water bodies [EO]
Recommended Patch Size	> 15 ha [37 ac] for water body, buffered by > 3 km [1.9 mi] of uplands [EO]
Home Range	Up to 500 ha [1,240 ac][1]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and recent population declines Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S5
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority, Gamebird
Pacific Flyway Council	High Priority
Trends	
Historical ●	Rangewide declines of 50% [1, 8]
Recent ◑	Continuing declines[1, 8]
Population Size Estimates	
Nevada ◑	5,000 (breeding), annually variable[4]
Global ◑	3,000,000, annually variable[1, 8]
Percent of Global	< 1%
Population Objective	
Increase by 100% [EO]	
Monitoring Coverage	
Source	NDOW aerial surveys, NWR and WMA counts, NDOW harvest counts, NV Aquatic Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Lahontan and Ruby valleys, Humboldt River system
Restoration	Degraded marsh and open water

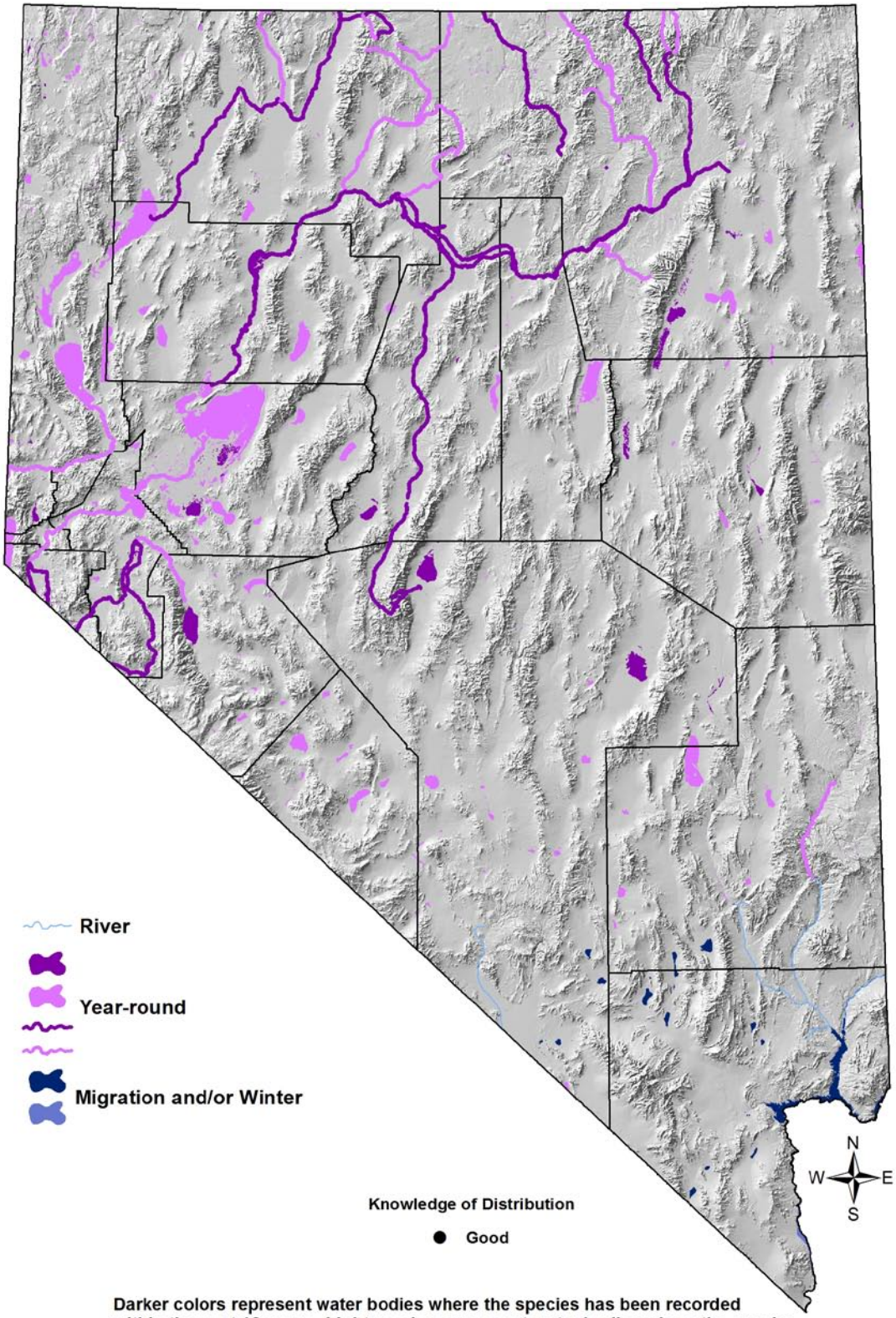
Natural History Profile

Seasonal Presence in Nevada	
Year-round (northern Nevada) Winter (southern Nevada) Fall (migration, statewide, October peak) Spring (migration, statewide, March peak)	
Known Breeding Dates in Nevada	
Late April – mid-August[3]	
Nest and Nesting Habits	
Nest Placement	On ground in dense upland vegetation up to 3 km [1.9 mi] from water[1]
Site Fidelity	High for post-breeding habitat;[1] moderate for wintering[6]
Food Habits	
Basic	Dabbler
Primary Diet	Aquatic invertebrates and plant material[1]
Secondary Diet	N/A

Confidence in Available Data: ●High ◑Moderate ○ Low

Northern Pintail

Anas acuta



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Northern Pintail

Anas acuta

Overview

The Northern Pintail is one of the west's most conspicuous and numerous ducks, but it has suffered sustained declines for several decades. Pintails are popular gamebirds, but current harvest rates are not believed to impact population trends.[5,6] The underlying causes of ongoing declines are not fully understood, but probably involve habitat issues on the main breeding grounds far to the north. The current North American population objective is 5.6 million birds,[8] approximately twice the current number.

In Nevada, numbers of Northern Pintails swell greatly during spring and fall migration, and winter populations also appear to exceed summer populations by a noticeable margin (www.ebird.org), although specific seasonal population estimates are currently not available. The main seasonal difference in the habitat requirements of Northern Pintails is that during the breeding season, they require a sizable buffer of upland vegetation or other suitable habitat (such as traditional agricultural fields) around waterbodies for nesting.[1] Despite our traditional focus on the breeding season, Nevada's main contribution to Northern Pintail conservation probably occurs during migration and wintering seasons. As with other waterfowl, population trends are closely monitored and harvest limits adjusted as needed by NDOW and the Pacific Flyway Council.

Abundance and Occupancy by Habitat

- Breeding density positively correlated with wetland acreage[1]

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat and Other Threats

- Loss and degradation of marsh and open water habitat due to water diversions, declines in water quality, or development[1]
- Haying and other inadvertent agricultural disturbances in upland breeding sites during the nesting period[1]
- Predation on nesting females can be substantial in some areas[1]
- Susceptibility to avian botulism and cholera[1]

Northern Pintail

Anas acuta

Research, Planning, and Monitoring Challenges

- Causes of sustained declines are not well understood
- Migration and wintering sites may need additional study to estimate Nevada population sizes, habitat threats, and habitat requirements

Conservation Strategies

Established Strategies

- Annual harvest rates are set by NDOW in consultation with the Pacific Flyway Council

Habitat Strategies

- Marsh (p. Hab-9-1) and Open Water (p. Hab-15-1) habitat conservation strategies benefit this species
- Disturbances and disruptive land uses should be minimized within a 3 km [1.9 mi] wide upland strip surrounding marshes and lakes used by breeding pintails during the nesting period (15 April – 15 July)
- Pintails readily use restored marshes and other wetlands, so restoration projects should benefit the species during all seasons

Research, Planning, and Monitoring Strategies

- Winter and migration habitat use, specific habitat threats, and population size estimation may be addressed in additional studies
- Continue post- and pre- breeding season banding studies conducted by NDOW in cooperation with the California Department of Fish and Game, the California Waterfowl Association, and the Yukon Delta NWR

Public Outreach Strategies

- In areas where pintails nest on privately owned agricultural areas, encourage landowners to avoid haying or other disruptive activities during the nesting period (15 April – 15 July)

References: [1]Austin and Miller (1995); [2]Fleskes et al. (2003); [3]GBBO unpublished Atlas data; [4]Nevada Wildlife Action Plan Team (2006); [5]Nicolai et al. (2005); [6]Rice et al. (2010); [7]Robertson and Cooke (1999); [8]USFWS (1998); [EO] Expert opinion

Canvasback

Aythya valisineria

Photo by Chris Nicolai

Habitat Use Profile

Habitats Used in Nevada	
Marsh Open Water	
Key Habitat Parameters ●	
Plant Composition	Cattail, bulrush, sedges, submerged aquatic plants[5]
Plant Density	100 – 400 stems / m^2 [9 – 37 / ft^2] of emergent plants for breeding[3]
Mosaic	Breeding: Shallow marsh with variable emergent plant stem densities, interspersed with open water; Winter: open water with aquatic plants[5]
Water Depth	40 – 80 cm [16 – 31 in] for nest;[3] up to 5 m [16 ft] for foraging[5]
Hydrology	Minimal daily stage fluctuations during nesting[3]
Response to Vegetation Removal	Probably negative for breeding [EO]
Area Requirements ◑	
Minimum Patch Size	Unknown
Recommended Patch Size	Breeding: > 50 ha [125 ac]; Migration: > 100 ha [250 ac]; Winter: large open water bodies[3, 4, EO]
Home Range / Territory Size	Unknown

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Historical declines Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S3, S4
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority, Gamebird
Pacif. Flyway Council	High
Trends	
Historical ●	Rangewide declines[7]
Recent ◑	Stable[6, 8]
Population Size Estimates	
Nevada ○	4,600 (excluding migrants)[6]
Global ◑	580,000 – 740,000 [5, 8]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	NDOW aerial surveys, NWR and WMA counts, NDOW hunter surveys, NV Aquatic Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Ruby Valley and Lahontan Valley
Restoration	Degraded marshes and open water

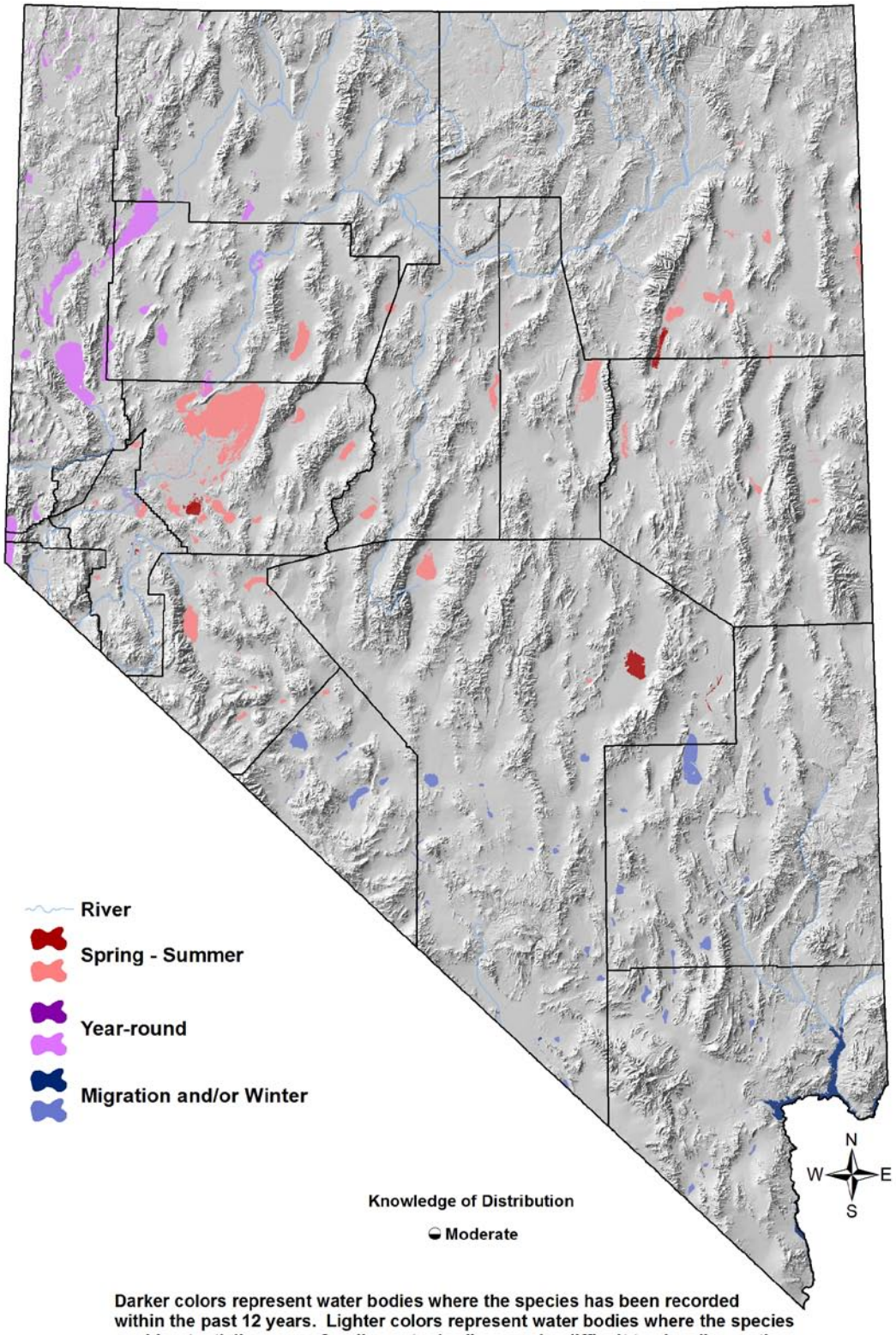
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer (northern Nevada) Winter (southern and northwestern Nevada) Spring (migration, statewide, March peak) Fall (migration, statewide, October peak)	
Known Breeding Dates in Nevada	
May – July[1]	
Nest and Nesting Habits	
Nest Placement	Over water, on platform in emergent vegetation[2]
Site Fidelity	Probably high for breeding territory,[5] moderate for wintering sites[7]
Food Habits	
Basic	Diver
Primary Diet	Aquatic plants and aquatic invertebrates[5]
Secondary Diet	N/A

Confidence in Available Data: ●High ◑Moderate ○ Low

Canvasback

Aythya valisineria



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Canvasback

Aythya valisineria

Overview

Although it is one of North America's less numerous ducks, the Canvasback has been intensively studied and monitored, perhaps due to its popularity as a game bird. Canvasbacks have complicated patterns of season abundance and distribution in Nevada. They are well-established, if not particularly numerous, as breeders, and Ruby Lake and Lahontan Valley support the species' most southerly large breeding populations.[3] Canvasback numbers increase greatly during spring and fall migration (www.ebird.org), and many of the areas shown in the map above as "Spring – Summer" range may be equally or more important as migration habitat. Approximately 50,000 Canvasbacks are estimated to migrate through the Great Basin region,[2] although the Nevada portion of this total has not been determined. Canvasbacks also winter in Nevada, primarily in the far west and south, with significant numbers having been recorded by the Nevada Aquatic Bird Count in Pahranagat NWR and Ash Meadows NWR, among other locations. It is not clear whether there are individual birds that remain within Nevada year round, but it seems most likely that there are distinctive seasonal cohorts. For example, birds from the Ruby Valley breeding population are known to winter in central and southern California.[4]

Canvasbacks have distinctive seasonal habitat use patterns. They place their nests over water on matted-down emergent vegetation, and their foraging activity during the breeding season necessarily occurs within these emergent marshes. In migration and winter, however, Canvasbacks frequent large bodies of open water with relatively little emergent vegetation.

Canvasback populations appear to be stable, and current management actions and protocols are probably adequate. As with other waterfowl, population trends are closely monitored and harvest limits adjusted as needed by NDOW and Pacific Flyway Council.

Abundance and Occupancy by Habitat

No information

Nevada-Specific Studies and Analyses

Kruse et al.[3, 4]

At Ruby Lake, average nest success was 50%. In comparison to failed nests, successful nests were located over shallower water, but were further from shore, and in wider bands of emergent vegetation with lower stem densities. Successful nest tended to be located 4 – 25 m [13 – 82 ft] from the shoreline. Unusual fluctuations in water level also reduced nest success.

Canvasback

Aythya valisineria

Main Threats and Challenges

Habitat and Other Threats

- Loss and degradation of marsh and open water habitat due to water diversions, declines in water quality, or development[5]
- May abandon breeding efforts during years of drought,[5] or suffer nest failure in high water years[3]

Research, Planning, and Monitoring Challenges

- Key migration and wintering sites need to be better identified

Conservation Strategies

Established Strategies

- Annual harvest rates are set by NDOW in consultation with the Pacific Flyway Council

Habitat Strategies

- Marsh (p. Hab-9-1) and Open Water (p. Hab-15-1) habitat conservation strategies benefit this species
- In breeding marshes, maintain a consistent water level during the nesting period (1 May – 15 July)
- Open water migration and wintering habitat should be managed to maintain the presence of submerged aquatic plants up at depths up to 5m [16ft]

Research, Planning, and Monitoring Strategies

- Important winter and migration sites need to be better identified, though improved inventory and monitoring efforts

Public Outreach Strategies

- None identified

References: [1]GBBO unpublished Atlas data; [2]Kadlec and Smith (1989); [3]Kruse et al. (2003a); [4]Kruse et al. (2003b); [5]Mowbray (2002); [6]Nevada Wildlife Action Plan Team (2006); [7]Robertson and Cooke (1999); [8]USFWS (1998); [EO] Expert opinion

Redhead

Aythya americana

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Marsh Open Water	
Key Habitat Parameters ●	
Plant Composition	Cattail, bulrush, sedges, rushes, submerged aquatic vegetation
Plant Density	Patches of high-density emergent vegetation[8]
Mosaic	Hemi-marsh, with patches of emergent vegetation > 1 m [3.3 ft] high, ~ 75% open water, and some water > 1 m [3.3. ft] deep[6, 8]
Water Depth	20 – 200 cm [8 – 80 in] throughout most of water body, ~ 1 -2 m [3.3 – 6.6 ft] in primary foraging areas[6, 8]
Hydrology	Little fluctuation in stage where nesting[8]
Response to Vegetation Removal	Unknown
Area Requirements ○	
Minimum Patch Size	> 4 ha [9.9 ac] for breeding[6, 8]
Recommended Patch Size	> 100 ha [250 ac] [EO]
Home Range / Territory Size	Unknown

Conservation Profile

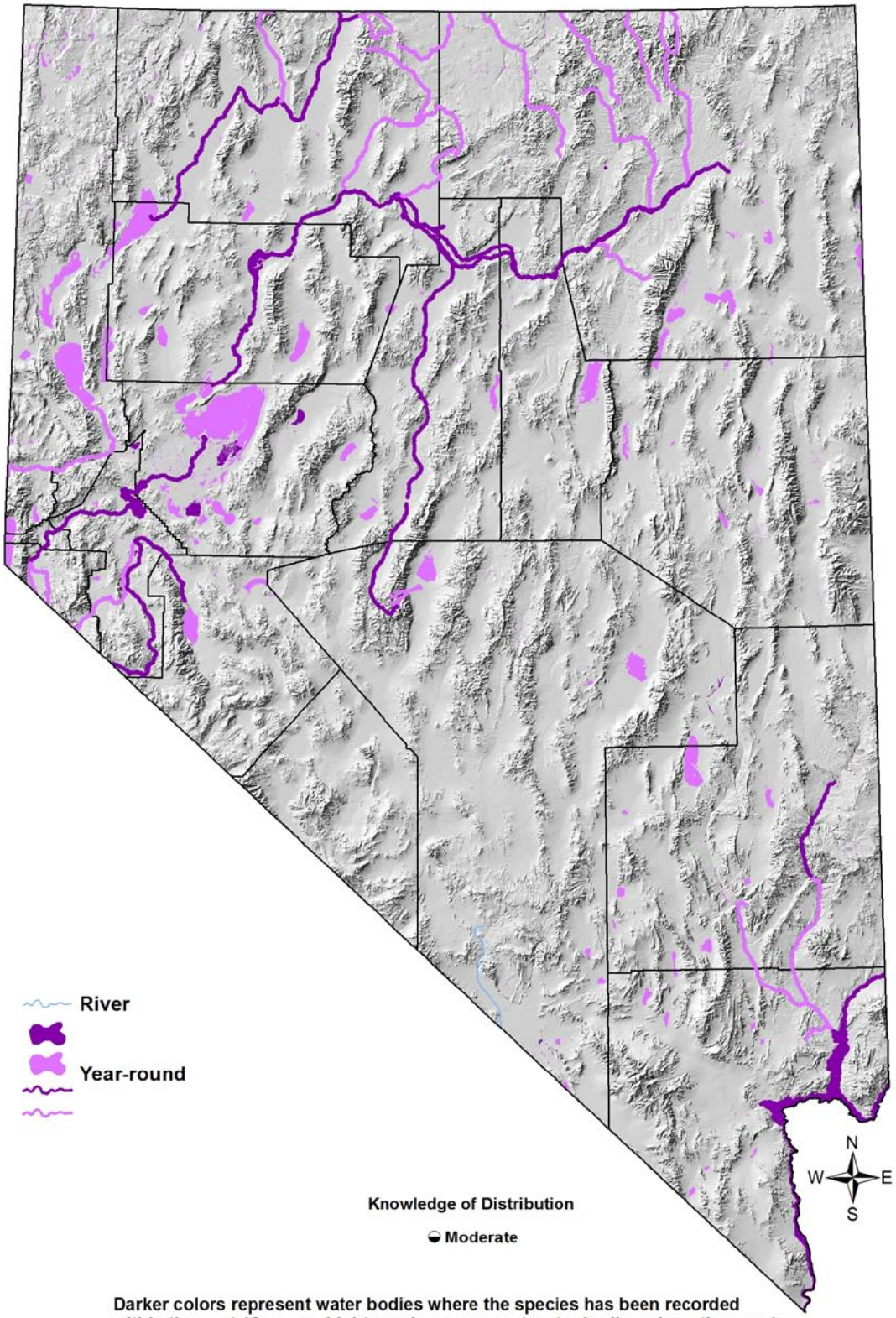
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical declines Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S4b
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority; Gamebird
Pacific Flyway Council	High
Trends	
Historical ●	Rangewide declines prior to 1960's [8]
Recent ◑	Stable or increasing[7]
Population Size Estimates	
Nevada ◑	4,500, annually variable[4]
Global ◑	1,200,000, annually variable[7]
Percent of Global	1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	NDOW aerial surveys, NWR and WMA counts, NDOW hunter surveys, Aquatic Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Lahontan Valley, Ruby Valley, Humboldt system, Pahranagat NWR, Ash Meadows NWR
Restoration	Degraded marshes

Natural History Profile

Seasonal Presence in Nevada	
Year-round (migration peaks in April, October)	
Known Breeding Dates in Nevada	
Late April – July[2, 8]	
Nest and Nesting Habits	
Nest Placement	Over water 20 -50 cm [8 – 20 in] deep, in dense emergent vegetation, or on ground (sometimes islands) within 3 m [10 ft] of water edge[8]
Site Fidelity	Unknown
Food Habits	
Basic	Diver (shallow)
Primary Diet	Submerged aquatic plants [6, 8]
Secondary Diet	Aquatic invertebrates;[6] and fish eggs[5]

Redhead

Aythya americana



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Redhead

Aythya americana

Overview

The Redhead has its breeding stronghold in the Prairie Pothole region of central North America, but nevertheless it is reported to be the second most common breeding duck in Nevada (C. Mortimore, *pers. comm.*). Nevada has a small but meaningful stewardship responsibility for the species, particularly during migration, when numbers are substantially higher than in the breeding season (www.ebird.org). Up to 200,000 Redheads may migrate through the Great Basin region, although the proportion of these passing through Nevada is not known.[3] Redheads are a year-round bird in most parts of Nevada, although the breeding distribution in southern Nevada is much spottier than in the north.[1] Seasonal cohorts are probably different, although this has not been conclusively shown. There is little evidence about differences (if any) in seasonal habitat use patterns, and seasonally-specific population estimates for Nevada are not available.

In a Canadian study, most females nested in small, semi-permanent wetlands and were successful in wetlands with large bands of emergent cover. Success was associated with water depth at the nest and distance between the nest and dry land. Brood-rearing females switched from smaller wetlands used for nesting to larger, semi-permanent wetlands. These results support a landscape approach to wetland management and emphasize the need for plans that reduce impact to wetland margins.[9]

Redhead populations appear fairly stable and close to population targets.[7] Because Redheads are relatively flexible in their habitat use, habitat management strategies that benefit other ducks are likely to benefit Redheads as well. However, their requirement for relatively deep summer water (>1 m; [3 ft]) does make then vulnerable to changes in water levels.[6, 8] As with other waterfowl, population trends are closely monitored and harvest limits adjusted as needed by NDOW and Pacific Flyway Council.

Abundance and Occupancy by Habitat

- 6 – 12 pairs / 100 ha [2.4 – 4.8 / 100 ha] in suitable habitat[8]

Nevada-Specific Studies and Analyses

No information

Redhead

Aythya americana

Main Threats and Challenges

Habitat Threats

- Loss and degradation of marsh and open water habitat due to water diversions, declines in water quality, or development[6]
- Drought and low water conditions adversely affect breeding success and increase predation pressure[8]

Research, Planning, and Monitoring Challenges

- Key migration and wintering sites need to be better identified

Conservation Strategies

Established Strategies

- Annual harvest rates are set by NDOW in consultation with the Pacific Flyway Council

Habitat Strategies

- Marsh (p. Hab-9-1) and Open Water (p. Hab-15-1) habitat conservation strategies benefit this species
- In breeding marshes, maintain a consistent water level during the nesting period (1 May – 15 July)

Research, Planning, and Monitoring Strategies

- Important winter and migration sites need to be better identified, though improved inventory and monitoring efforts

Public Outreach Strategies

- None identified

References: [1]Floyd et al. (2007); [2]GBBO unpublished Atlas data; [3]Kadlec and Smith (1989); [4]Nevada Wildlife Action Plan Team (2006); [5]Noyes (1985); [6]Shuford and Gardali (2008); [7]USFWS (1998); [8]Woodin and Michot (2002); [9]Yerkes (2000); [EO] Expert opinion

Lesser Scaup

Aythya affinis

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Marsh Open Water (Wet Meadow)	
Key Habitat Parameters ◑	
Plant Composition	Cattail, bulrush, sedges, wet meadow grasses
Plant Density	For breeding, overhead cover of 36 – 45%, height 20 – 60 cm [8 – 23 in][1]
Mosaic	Water bodies with shallows for foraging and sufficiently dense shoreline or upland vegetation cover for nests[1]
Water Depth	< 3 m [10 ft] in open-water foraging areas[1]
Water Quality	Uses fresh to moderately saline water[1]
Response to Vegetation Removal	Negative for breeding [EO]
Area Requirements ○	
Minimum Patch Size	Unknown, but may breed in small lakes or marshes[1]
Recommended Patch Size	> 10 ha [25 ac] [EO]
Home Range / Territory Size	Unknown

Conservation Profile

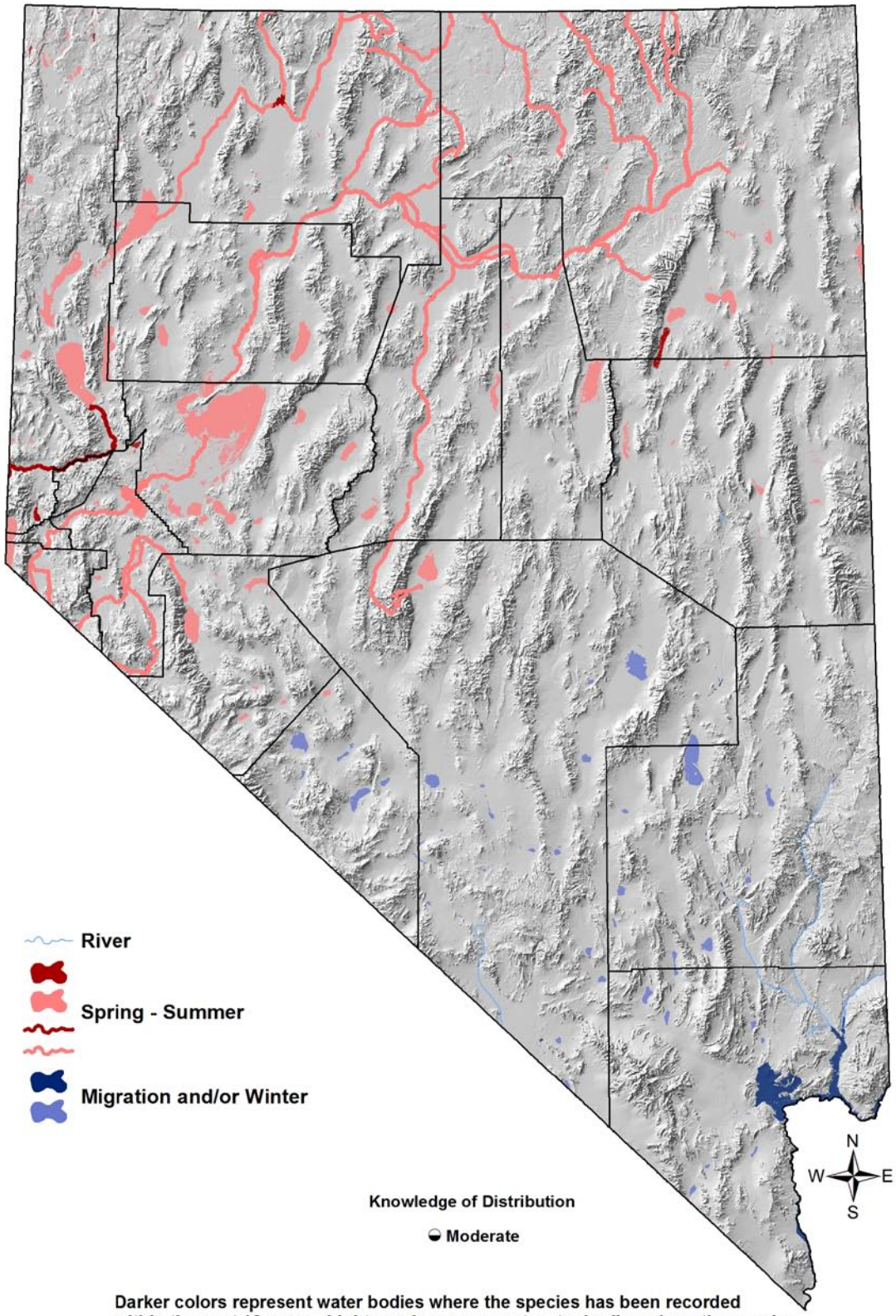
Priority Status	
Conservation Priority Species	
Species Concerns	
Recent declines Habitat threats Possibly small population size	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S1B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Gamebird
Pacific Flyway Council	High
Trends	
Historical ○	Unknown
Recent ◑	Declining[1, 2, 3]
Population Size Estimates	
Nevada ○	~ 650 (breeding), annually variable[4, EO]
Global ◑	4,500,000 [1, 3]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	NDOW aerial surveys, NWR and WMA counts, NDOW hunter surveys, Aquatic Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Ruby Lake NWR
Restoration	Degraded marshes

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer (northern Nevada) Winter (southern Nevada) Spring (migration, statewide, April-May peak) Fall (migration, statewide, October peak)	
Known Breeding Dates in Nevada	
May – August[1]	
Nest and Nesting Habits	
Nest Placement	Usually on ground near water or on uplands < 160 m [525 ft] from water edge, under dense vegetation cover[1]
Site Fidelity	Unknown
Food Habits	
Basic	Diver
Primary Diet	Aquatic invertebrates, including molluscs[1]
Secondary Diet	Plant material[1]

Lesser Scaup

Aythya affinis



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Lesser Scaup

Aythya affinis

Overview

The Lesser Scaup is the most widespread and abundant diving duck in North America,[1] but in Nevada it is breeding at the far southern margin of its continental breeding range. As such, Scaup are present in small numbers and distributed sporadically across the northern part of the state, with a concentration in northeastern Nevada and one clear breeding "hotspot" at Ruby Lakes NWR.[5] Interestingly, Lesser Scaup are either absent or rare as breeders in Lahontan Valley, in contrast to our other waterfowl. They are also very late spring migrants, and nesting does not begin until late May.[1]

Lesser Scaup are present in Nevada in substantially greater numbers during migration, but no seasonally-specific population estimates are available. Therefore many of the areas shown in the map above as "Spring – Summer" range may be equally or more important as migration habitat. Scaup have been confirmed to winter in southern Nevada, and there is possibly scattered wintering in the north as well (www.ebird.org), although evidence of this is less compelling.

In most respects, Lesser Scaup are not well studied despite their relative continental ubiquity.[1] They accept a fairly wide range of water conditions and wetland sizes, but for nesting, they require the presence of dense terrestrial vegetation near the shoreline, with wet meadows being especially suitable. Breeders tend to gravitate towards small ephemeral or semi-permanent wetlands.[1] Winter and migration distribution and habitat requirements are not as well known, although like many other ducks Lesser Scaup use larger and more open water bodies during the non-breeding season.

Ongoing regional declines are a concern, and continental population remain well below the goal of 6.3 million set by USFWS.[3] In Nevada, key strategies are the protection of major breeding areas, conservation of smaller semi-permanent wetlands, and learning more about seasonal status and needs. As with other waterfowl, population trends are closely monitored and harvest limits adjusted as needed by NDOW and Pacific Flyway Council.

Abundance and Occupancy by Habitat

- Average count at Ruby Lake NWR is 400 birds, with high annual variability[1, 4]
- Nevada breeding population estimate is based on Ruby Lake NWR estimate plus a smaller number for other areas of the state

Nevada-Specific Studies and Analyses

No information

Lesser Scaup
Aythya affinis

Main Threats and Challenges

Habitat Threats

- Loss and degradation of marsh and open water habitat due to water diversions, declines in water quality, or development
- Reduction of shoreline cover or trampling during nesting season due to livestock grazing[1]

Research, Planning, and Monitoring Challenges

- Key migration and wintering sites need to be better identified

Conservation Strategies

Established Strategies

- Annual harvest rates are set by NDOW in consultation with the Pacific Flyway Council

Habitat Strategies

- Marsh (p. Hab-9-1) and Open Water (p. Hab-15-1) habitat conservation strategies benefit this species
- Protect shoreline vegetation in breeding sites by deferring grazing or other disruptive activities during the nesting period (15 May – 1 August)
- Manage smaller semi-permanent wetlands to maintain water through August, and for intact shoreline vegetation

Research, Planning, and Monitoring Strategies

- Important winter and migration sites need to be better identified, though improved inventory and monitoring efforts

Public Outreach Strategies

- In areas where small breeding wetlands are located on private lands, encourage landowners to defer grazing and potentially disruptive land uses along shoreline areas until after the nesting period (15 May – 1 August)

References: [1]Austin et al. (1998); [2]Austin et al. (2000); [3]USFWS (1998); [4]USFWS (2001); [5]Floyd et al. (2007); [EO] Expert opinion

Greater Sage-Grouse

Centrocercus urophasianus

Photo by Steve Ting

Habitat Use Profile

Habitats Used in Nevada
Sagebrush Montane Shrubland Wet Meadow (Agriculture, Springs) (Montane Riparian, Aspen) (Great Basin Lowland Riparian)

Key Habitat Parameters ●	
Plant Composition	All sagebrush species (esp. Wyoming big sagebrush, mountain big sagebrush, and low sagebrush[EO]), flowering forbs, agricultural crops (particularly alfalfa), variety of montane shrubs, aspen, alder, willow
Plant Seasonal Composition, Mosaic, Density, & Height[6, 24]	Winter: dense sagebrush that reaches above snow Lek: open areas near good nesting habitat Nest: 15-38% sagebrush cover, 36 - 79 cm [14 – 31 in] shrub height, with significant herbaceous understory Brood: dense forb layer in wet meadows or agricultural lands Pre- and post-breeding: montane shrubs and meadows with forbs
Response to Fragmentation	Very sensitive to fragmentation of habitats[24]
Distance to Water	Proximity to water probably important for brood-rearing and post-breeding season[24]
Response to Vegetation Removal	Negative [EO]

Confidence in Available Data: ●High ◑Moderate ○ Low

Conservation Profile

Priority Status
Conservation Priority Species
Species Concerns
ESA listing: Candidate Species Historical and recent declines Habitat threats High stewardship responsibility

Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S3S4
USFWS	Candidate Species, Bird of Conservation Concern
BLM	Sensitive Species
USFS	Sensitive Species
NDOW	Conservation Priority, Gamebird
NV Upland Game Management Plan	Very High Concern

Trends	
Historical ●	Large declines and range contraction[24]
Recent ◑	Continuing declines, but possibly stabilized in some areas[5]

Population Size Estimates	
Nevada ◑	68,000-88,000 [18]
Global ◑	150,000 [23, 24]
Percent of Global	~ 50%

Population Objective
Increase by 100%[23]

Monitoring Coverage	
Source	NDOW lek counts; intensive research
Coverage in NV	Good

Key Conservation Areas	
Protection	Montana, Bilk Creek, Santa Rosa, and Jarbidge ranges; Sheldon NWR; n. Washoe, Humboldt, and Elko counties
Restoration	Meadow, riparian, and sagebrush habitat throughout Great Basin

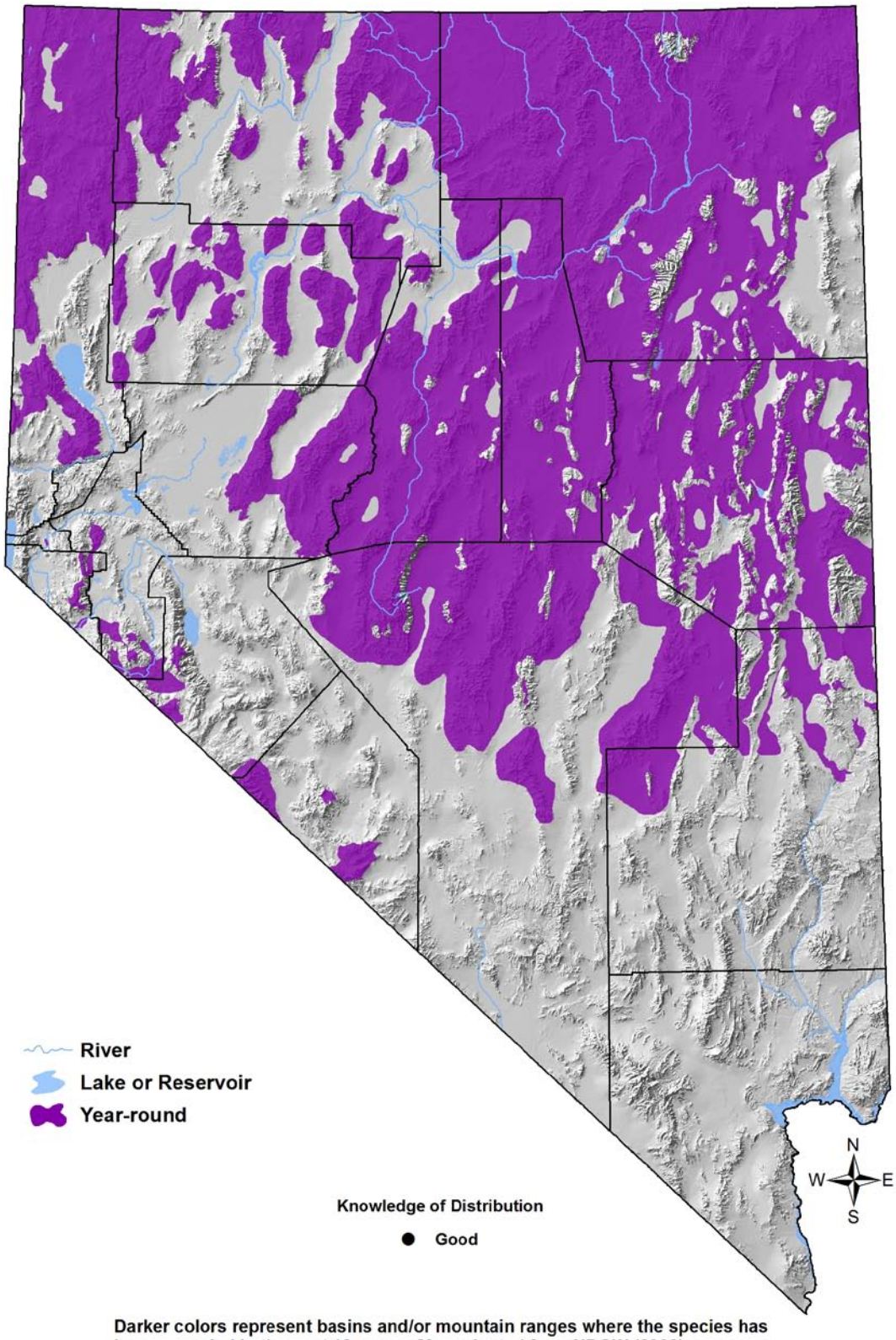
Habitat Use Profile - continued

Area Requirements ●	
Minimum Patch Size	Unknown; but > 4,000 ha [10,000 ac][6]
Recommended Patch Size	1,500 km^2 [580 mi^2][EO]
Home Range	Up to 442 km^2 [170 mi^2] over annual cycle for most populations,[24] but up to 2,700 km^2 [1,000 mi^2] for some[4]

Natural History Profile - see p. Spp-8-3

Greater Sage-Grouse

Centrocercus urophasianus



Darker colors represent basins and/or mountain ranges where the species has been recorded in the past 12 years. Map adapted from NDOW (2008).

Greater Sage-Grouse

Centrocercus urophasianus

Natural History Profile

Seasonal Presence in Nevada	
Year-round (substantial seasonal movements)	
Known Breeding Dates in Nevada	
Early March – mid May (nesting), through late July (broods)[24, EO]	
Nest and Nesting Habits	
Nest Placement	On ground under shrub, with adequate herbaceous cover[6]
Site Fidelity	High for lek and nesting areas[24]
Other	Lek sites, nest and brood areas all important for conservation
Food Habits	
Basic	Forages from ground, primarily herbivorous
Primary Diet	Sagebrush leaves, buds, and flowers of forbs in fall through spring[24]
Secondary Diet	Insects and forbs during breeding and brood rearing[24]

Overview

Because of its persistent population declines, well-documented threats, and ESA candidate status, no other bird within our state has probably been the subject of greater study or conservation interest than the Greater Sage-Grouse. Nevada still has many intact sagebrush landscapes and hosts roughly half of the global sage-grouse population, but the continuing loss, degradation, and fragmentation of high-quality habitat to fire and other threats in recent years is cause for concern.[10] In an effort to stabilize and recover populations, the Nevada Department of Wildlife and its partners have pursued a strategy of proactive management and monitoring, which is organized into 62 Population Management Units and draws upon many ongoing research projects and local conservation efforts.[18] The bi-state population of sage-grouse in the Mono Basin area of California and adjacent portions of Nevada has been recognized by the USFWS as a Distinct Population Segment (DPS), and is itself a candidate for ESA protection. Given that this DPS is relatively isolated and may have distinctive habitat requirements, it is covered by its own local conservation plan under the *Greater Sage-Grouse Conservation Plan for Nevada and Eastern California*. [13,18]

Sage-grouse require the presence of several distinct landscape components, as described in the Habitat Profile table above. Over the course of an annual cycle, they can travel long distances across large elevational ranges in order to reach seasonally-appropriate habitat.[26] Thus, interspersion and juxtaposition of required habitats, or the lack thereof, are likely to have a substantial influence on landscape quality as it relates to sage-grouse.[6] Efforts to conserve, recover, or restore any one required habitat component are unlikely to be fully effective for sage-grouse conservation if they occur in landscapes where other critical habitat components are absent or degraded.[8]

Even within sagebrush habitat, sage-grouse exhibit temporally-variable structural preferences. Preferred shrub height ranges from 25–80 cm [9 – 31 in] seasonally, and shrub canopy cover ranges from 12–43%.[6] For nesting, presence of adequate herbaceous cover may be as important as shrub density in determining nest success,[6] and chick survival is directly linked to availability of food (forbs and insects) and cover of short grasses.[11,21] High quality brood-rearing habitat, where forbs remain green through late summer, may be a limiting factor in much of Nevada.[2] Although sage-grouse have a high reproductive potential, it is not realized in most years,[7] and large recruitment spikes, presumably associated with high-precipitation years, may be important for long-term population persistence.[27] For this reason, the effects of climate change on precipitation levels in Nevada are of concern to sage-grouse conservation.

On a landscape scale, the long-term persistence of sage-grouse populations requires at least 25% cover (preferably 65%) of good-quality sagebrush within a given 30 km [19 mi] radius.[1] Fires, particularly in recent years, have pushed many areas below this threshold.[10,16] For this reason, the Western Association of Fish and Wildlife Agencies (WAFWA) recommends that managers avoid burning Wyoming big sagebrush as a habitat management measure, but instead implement alternative treatments to maintain sagebrush cover.[28] Burning may be beneficial in mountain sagebrush systems with high shrub cover (> 35%), conifer encroachment, and few invasive weeds, but should probably not be used where sagebrush cover is in danger of falling beneath the 25% minimum cover threshold.[7]

This overview can only briefly summarize the wealth of material available on sage-grouse ecology, management, and conservation. Resource managers should consult the references listed below in the Nevada Specific Studies and Analysis section for additional detail.

Abundance and Occupancy by Habitat

No comprehensive assessment for many seasonal habitats was available for Nevada in this plan version, but NDOW collects and maintains a long-term, statewide database for lek attendance

Nevada-Specific Studies and Analyses

Key findings from several important Nevada-focused studies are briefly summarized as follows:

- Atamian et al. (2010):[2] During the late brood rearing period, high-quality brood habitat on which sage-grouse chicks were successfully reared represented 0.3% of the study area and was highly restricted in spatial distribution. This suggests that availability of suitable brood-rearing habitat may be a critical limiting resource for sage-grouse in some areas

- Coates and Delehanty (2010):[3] Increased raven numbers have negative effects on sage-grouse nest success, especially in areas with relatively low shrub canopy cover
- Lammers et al. (2007):[14] Golden Eagle predation appears to play only a minor role in sage-grouse population dynamics, even where eagles have artificial perch sites available
- Rebholz (2007):[21] Increasing amounts of grass cover beneath the nest shrub improved the likelihood of nest success. Conversely, grass cover at early brood sites was negatively associated with chick survival, while greater forb cover was associated with a higher probability of chick survival
- Van Kooten et al. (2007):[27] Long-term variation in population data from Elko County showed strong effects of yearly climate variation, a possible weak effect of cattle stocking rates, and no apparent effect of predator control. It was not possible to discern an overall population trend

In addition, the following resources provide critical information about sage-grouse conservation and management, although several have a regional, rather than a statewide, focus:

- SAGEMAP - A GIS Database for Sage-Grouse and Shrubsteppe Management in the Intermountain West: http://sagemap.wr.usgs.gov/index.aspx
- Nevada Department of Wildlife Sage-Grouse Conservation site: http://www.ndow.org/wild/conservation/sg/index.shtm
- Nevada Upland Game Species Management Plan[17]
- Greater Sage-Grouse Conservation Plan for Nevada and Eastern California:[18] http://www.ndow.org/wild/conservation/sg/plan/index.shtm
- Energy and Infrastructure Development Standards to Conserve Greater Sage-Grouse Populations and their Habitats in Nevada" [19] http://www.ndow.org/wild/conservation/sg/resources/nevada_energy_standards_for_sage-grouse_2010.pdf
- Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats:[5] http://www.ndow.org/wild/conservation/sg/resources/assessment.shtm
- Ecology and Conservation of Greater Sage-Grouse: a Landscape Species and its Habitats:[12] http://sagemap.wr.usgs.gov/monograph.aspx
- Sage-Grouse Habitat Restoration Symposium Proceedings:[25] http://www.fs.fed.us/rm/pubs/rmrs_p038.html
- Greater Sage-Grouse Comprehensive Conservation Strategy:[26] http://www.wafwa.org/documents/pdf/GreaterSage-grouseConservationStrategy2006.pdf

Finally, established monitoring protocols are covered in:

- Monitoring Populations of Sage-Grouse. Proceedings of a Symposium:[22] http://sgrp.usu.edu/files/uploads/grouseProcdngs4.pdf
- Nevada Department of Wildlife Lek Survey Protocol: http://www.ndow.org/wild/conservation/sg/plan/SGPlan063004_G.pdf

Main Threats and Challenges

Habitat and Other Threats

- As presented in the *Greater Sage-Grouse Management Plan for Nevada and Eastern California*,[18] the greatest threats are:
  - Loss of habitat to:
    - Fire
    - Pinyon-juniper encroachment
  - Decline in habitat quality due to:
    - Invasive plants
    - Inadequate grazing management systems, which can particularly impact brood-rearing meadows[7]
- Other threats that have been identified include:
  - Fragmentation of landscapes and simplification of the flora across landscapes. This process can reduce availability of, or connectivity between, seasonally important habitats
  - Energy (solar and wind) development[9]
  - Raven predation of eggs and young may be high in some areas[3]
  - Sage-grouse are vulnerable to adult mortality from West Nile virus,[15] but the disease's overall impacts in Nevada are not yet known

Research, Planning, and Monitoring Challenges

- Further research is needed to determine the best management strategies for the pinyon-juniper / sagebrush interface zone for multi-species benefits
- Although short-term fire management strategies are established, further research and planning is needed to clarify the most beneficial longer-term fire management strategies

Conservation Strategies

Established Strategies

- Detailed management strategies for the Greater Sage-Grouse already exist in several of the sources identified above.[18,26,30] Key strategies presented in the *Greater Sage-Grouse Management Plan for Nevada and Eastern California*[18] include:
    - Protect key habitat from wildlife by emphasizing importance of these areas to federal firefighting personnel
    - Improve grazing management systems to better protect important brood-rearing habitat and other seasonally important habitats
    - Undertake appropriate pinyon-juniper management projects in encroached areas
    - Pursue opportunities to restore large crested wheatgrass plantings to native grasses and forbs where feasible
    - Expand efforts to restore former habitat impacted by recent fires, especially in areas formerly dominated by Wyoming big sagebrush, mountain big sagebrush, and low sagebrush
- *Energy and Infrastructure Development Standards to Conserve Greater Sage-Grouse Populations and their Habitats in Nevada* [19] provides additional strategies relevant to energy development projects

Habitat Strategies

- Sagebrush (p. Hab-17-1), Montane Shrubland (p. Hab-14-1), and Wet Meadow (p. Hab-20-1) habitat conservation strategies benefit this species.
- In addition, we recommend that pinyon-juniper management projects consider the importance of maintaining a natural, interspersed interface zone between sagebrush shrublands and pinyon-juniper woodlands, as discussed in the Pinyon-Juniper habitat account (p. Hab-16-1)
- Prescribed burning should be avoided unless restoration of native vegetation can be expected on a particular site.[28] Prescribed burns > 50 ha [124 ac], or that burn > 20% of an area used by sage-grouse during winter, or that are within a period shorter than local sagebrush habitat recovery time may be problematic[4]
- Manage livestock grazing and other land uses to minimize damage to perennial herbaceous cover and to minimize invasive weeds

Research, Planning, and Monitoring Strategies

- Identify and map high-quality sagebrush habitat and landscapes, which are characterized by availability of patches with:
    - 15 – 25% sagebrush canopy cover
    - Perennial herbaceous cover > 18 cm [7 in] high, with 15% canopy cover of grasses and 10% cover of diverse forbs[4]

continued

Conservation Strategies (continued)

  - A landscape that contains at the recommended patch size (see Habitat Profile table, above):
    - Multi-aged sagebrush shrubland with structurally-diverse patches as quantified above
    - Brood-rearing areas with sufficient perennial herbaceous cover, and preferably with sufficient moisture to allow persistence of green forbs until late summer
    - Suitable fall/winter habitat, which may vary among different regions
    - Historical lek sites
- Conduct additional research to determine how to pinyon-juniper management projects can both benefit sage-grouse and the larger suite of birds that use the pinyon-juniper / sagebrush interface zone (see p. Hab-16-1)
- Conduct additional research and planning to generate a fire-management strategy balancing the need for short-term protection and the need for long-term habitat viability
- Further study of the relative impacts of grazing by livestock, horses, and burros on habitat quality
- Investigate the possible impacts of losses of traditional water sources on sage-grouse such as springs, wet meadows, and other wetlands

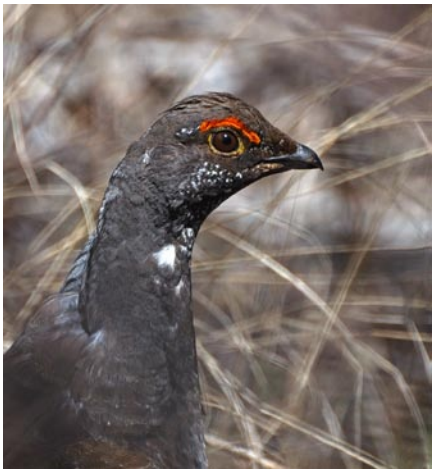
Public Outreach Strategies

- Continue outreach to diverse stakeholders, as exemplified by the Nevada Governor's Sage-Grouse Conservation Team[18,19]

References: [1]Aldridge et al. (2008); [2]Atamian et al. (2010); [3]Coates and Delehanty (2010); [4]Connelly et al. (2000); [5]Connelly et al. (2004); [6]Connelly et al. (2011; *in press*); [7]Crawford et al. 2004); [8]Doherty et al. (2010); [9]Drew and Espinosa (2008); [10]Espinosa and Phenix (2008); [11]Gregg and Crawford (2009); [12]Knick and Connelly (2011; *in press*); [13]Kolada et al. (2009); [14]Lammers et al. (2007); [15]Naugle et al. (2005); [16]Nelle et al. (2000); [17]NDOW (2008); [18]Nevada Governor's Sage-Grouse Conservation Team (2004); [19]Nevada Governor's Sage-Grouse Conservation Team (2010); [20]Paige and Ritter (1999); [21]Rebholz (2007); [22]Reese and Bowyer (2007); [23]Rich et al. (2004); [24]Schroeder et al. (1999); [25]Shaw et al. (2005); [26]Stiver et al. (2006); [27]Van Kooten (2007); [28]WAFWA (2009); [29]Wisdom et al. (2002); [EO] Expert opinion

Sooty Grouse and Dusky Grouse ("Blue" Grouse)

Dendragapus fuliginosus and *D. obscurus*



Sooty Grouse. Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Coniferous Forest Aspen Montane Shrubland	
Key Habitat Parameters ●	
Plant Composition	Mixed conifers, including white and red fir, ponderosa, limber, and Jeffrey pine, Douglas fir; also aspen, willow, mountain mahogany, serviceberry, currants, rose and other montane shrubs
Plant Density	Dense shrub and/or herbaceous understory (30 – 60% cover); open, dry forest mixed with shrubs are typical[6, EO]
Mosaic	Mixture of coniferous and deciduous woodlands near waterways[6]
Distance to Water	Nest: 10 – 800 m [33 – 2600 ft][6]
Response to Vegetation Removal	Probably negative, especially removal of understory [EO]
Area Requirements ◑	
Minimum Patch Size	Unknown
Recommended Patch Size	> 150 ha [370 ac][EO]
Home Range	Up to 42 ha [104 ac], depending on season[6]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Recent declines Habitat threats	
Other Rankings	
Continental PIF	Sooty: Watch List; Dusky: None
Audubon Watchlist	Sooty: Yellow; Dusky: None
NV Natural Heritage	"Blue": S3
USFWS	None
BLM	None
USFS	None
NDOW	Conservation Priority
NV Upland Game Plan	High Concern
Trends	
Historical ○	Probable declines in Nevada[1]
Recent ◑	Declined 50% in western U.S. since 1960s; declines continue[5, 6]
Population Size Estimates	
Nevada ◑	Unknown (annual harvest ~ 1,700) [2]
Global ◑	2,600,000 [4]
Percent of Global	Unknown
Population Objective	
Increase by 100% [4, EO]	
Monitoring Coverage	
Source	Not systematically monitored
Coverage in NV	Poor
Key Conservation Areas	
Protection	Carson Range, coniferous forest and aspen habitat within occupied ranges (see map below)
Restoration	Same, especially degraded aspen stands

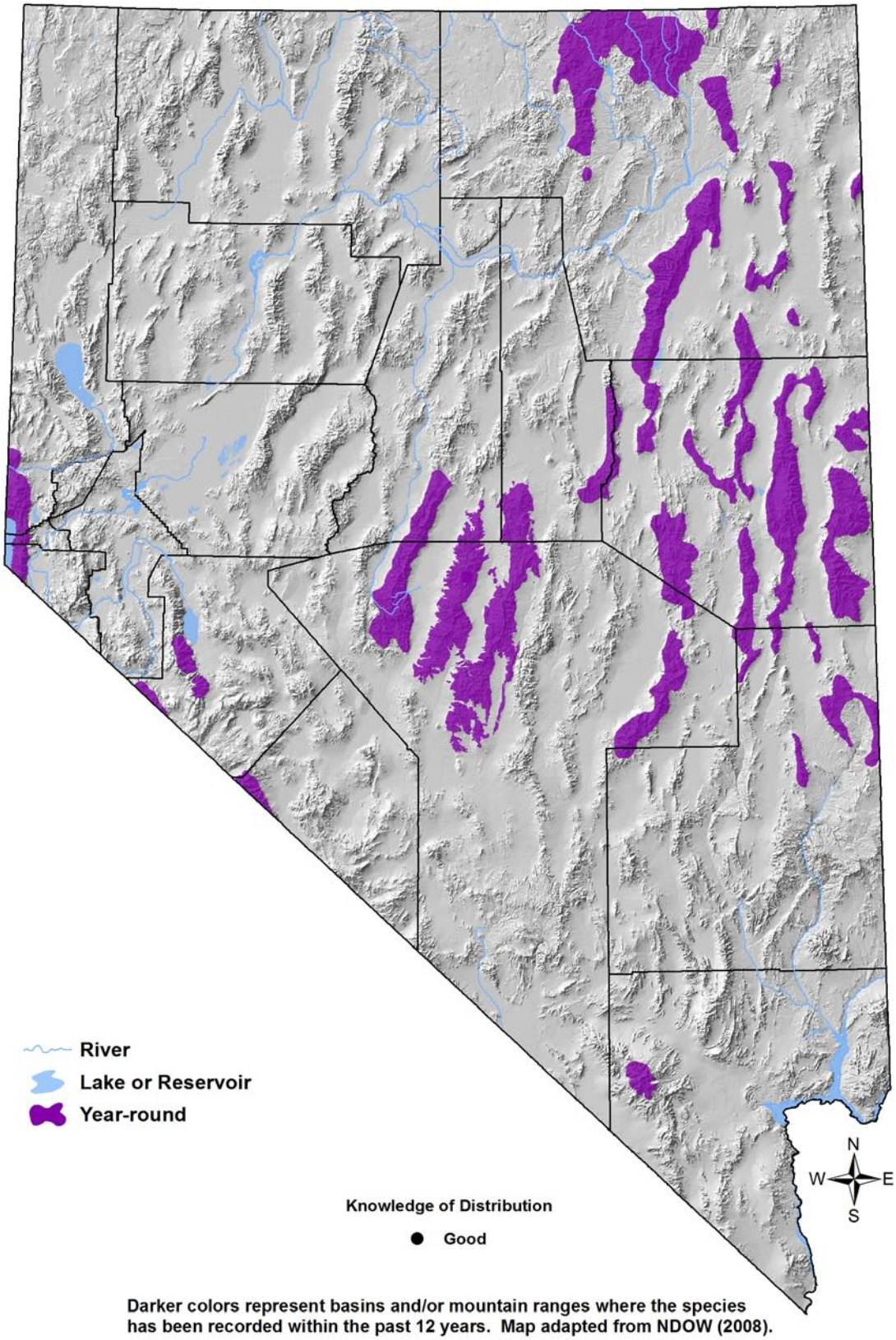
Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
Mid-April – July[3]	
Nest and Nesting Habits	
Nest Placement	On ground under dense cover[6]
Site Fidelity	High for breeding territory[6]
Food Habits	
Basic	Ground forager
Primary Diet	Leaves, flowers, fruit year-round; conifer needles in winter[6]
Secondary Diet	Terrestrial invertebrates during breeding[6]

Confidence in Available Data: ●High ◑Moderate ○ Low

Sooty Grouse and Dusky Grouse ("Blue" Grouse)

Dendragapus fuliginosus and *D. obscurus*



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Map adapted from NDOW (2008).

Sooty Grouse and Dusky Grouse ("Blue" Grouse)

Dendragapus fuliginosus and *D. obscurus*

Overview

The Dusky and Sooty Grouse were, until 2007, regarded as a single species, the "Blue" Grouse. They are treated together here because most of the available data and information do not distinguish between the two species. In Nevada, the Sooty Grouse occurs in the Carson Range, and the Dusky Grouse occurs in all other locations to the east and south of the Carson Range, with the possible exception of Esmeralda and Mineral counties, where records of "Blue" Grouse have not yet been ascribed to either species. Dusky Grouse populations in Nevada are patchy and isolated, and disconnected from larger population centers to the east and north.

Sooty and Dusky Grouse are montane birds, and in Nevada they appear to require the availability of aspen and montane riparian woodlands (where riparian shrubs and insect communities provide the spring and summer diet), along with coniferous forest (which provides important winter forage).[6] Dusky Grouse are more inclined than Sooty Grouse to leave the woodlands, ranging up to 2 km [1.2 mi] from the forest edge into areas dominated by sagebrush, montane shrubs, and mountain mahogany, especially in late fall and early winter.[2,EO] Both species move upward in elevation to denser forests for the winter.[2,6] The most immediate conservation need is to better determine the respective habitat needs and conservation issues for these two grouse, which may still be declining in Nevada.

Abundance and Occupancy by Habitat

Sooty or Dusky Grouse were detected on 14 of 248 NBC transects that were located within montane habitats. The table below summarizes the percentage of different cover types (as defined in NBC; Montane Sagebrush is subsumed by Montane Shrubland in this plan, and Mt. Mahogany is subsumed by Pinyon-Juniper) present on occupied transects versus unoccupied transects.

Habitat Type (GIS classified)	Occupied Transects (% cover)	Unoccupied Transects (% cover)
Aspen	15.3	6.9
Coniferous Forest	27.5	9.3
Montane Riparian	7.9	6.3
Montane Sagebrush	7.2	11.4
Montane Shrubland	4.7	0.7
Mt. Mahogany	12.2	4.3
Pinyon-Juniper	13.3	27.8

Nevada-Specific Studies and Analyses

- George Barrowclough (American Museum of Natural History) collected DNA samples from Sooty and Dusky Grouse in Nevada. Results of this research, which are currently pending, may improve or knowledge of the true geographical ranges of the two species

Sooty Grouse and Dusky Grouse ("Blue" Grouse)

Dendragapus fuliginosus and *D. obscurus*

Main Threats and Challenges

Habitat Threats

- Little information exists about specific threats to Dusky or Sooty Grouse. It is probable that threats to Aspen (p. Hab-3-1), Montane Riparian (p. Hab-13-1), and Coniferous Forest (p. Hab-5-1) habitats affect both species. Heavy grazing and large fires in particular are likely threats

Research, Planning, and Monitoring Challenges

- Lack of knowledge about specific threats, and about the distinctions between the habitat needs and conservation status of the two species

Conservation Strategies

Established Strategies

- As for all managed game birds, NDOW has developed detailed conservation and management priorities for Dusky and Sooty Grouse,[2] with key elements including:
  - Develop survey protocols to determine distribution of both species in Nevada
  - Improve data gathering from harvested grouse
  - Conduct research to better determine ecological needs of both species
  - Conduct research on possible impacts of West Nile virus

Habitat Strategies

- Aspen (p. Hab-3-1), Montane Riparian (p. Hab-13-1), and Coniferous Forest (p. Hab-5-1) habitat conservation strategies benefit this species
- Give conservation priority to montane mosaics of mixed-age conifer forest, deciduous woodland, and shrubland

Research, Planning, and Monitoring Strategies

- Conduct research to better identify important threats to each species, and to better map the distribution of each species

Public Outreach Strategies

- None identified

References: [1]Alcorn (1988); [2]NDOW (2008); [3]Nevada Wildlife Action Plan Team (2006); [4]Rich et al. (2004); [5]Sauer et al. (2008); [6]Zwickel (1992); [EO] Expert opinion

Sharp-tailed Grouse

Tympanuchus phasianellus

Photo by Joe Williams

Habitat Use Profile

Habitats Used in Nevada	
Montane Shrubland Aspen (winter) Montane Riparian (winter) (Sagebrush)	
Key Habitat Parameters ◑	
Plant Composition	Diverse montane shrubs including sagebrush; high plant species richness preferred; [2] avoids cheatgrass [EO]
Plant Density	Dense shrub and grass/forb cover with structural complexity preferred[2]
Mosaic	Floristically diverse montane shrublands near aspen stands or montane riparian woodlands[2]
Distance to Water	Unknown, but require montane riparian or aspen habitat for wintering
Response to Vegetation Removal	Negative [EO]
Area Requirements ●	
Minimum Patch Size	3,000 ha [7,400 ac][2, 3]
Recommended Patch Size	> 3,000 ha [7,400 ac] [EO]
Home Range	≤ 200 ha [500 ac][2]

Conservation Profile

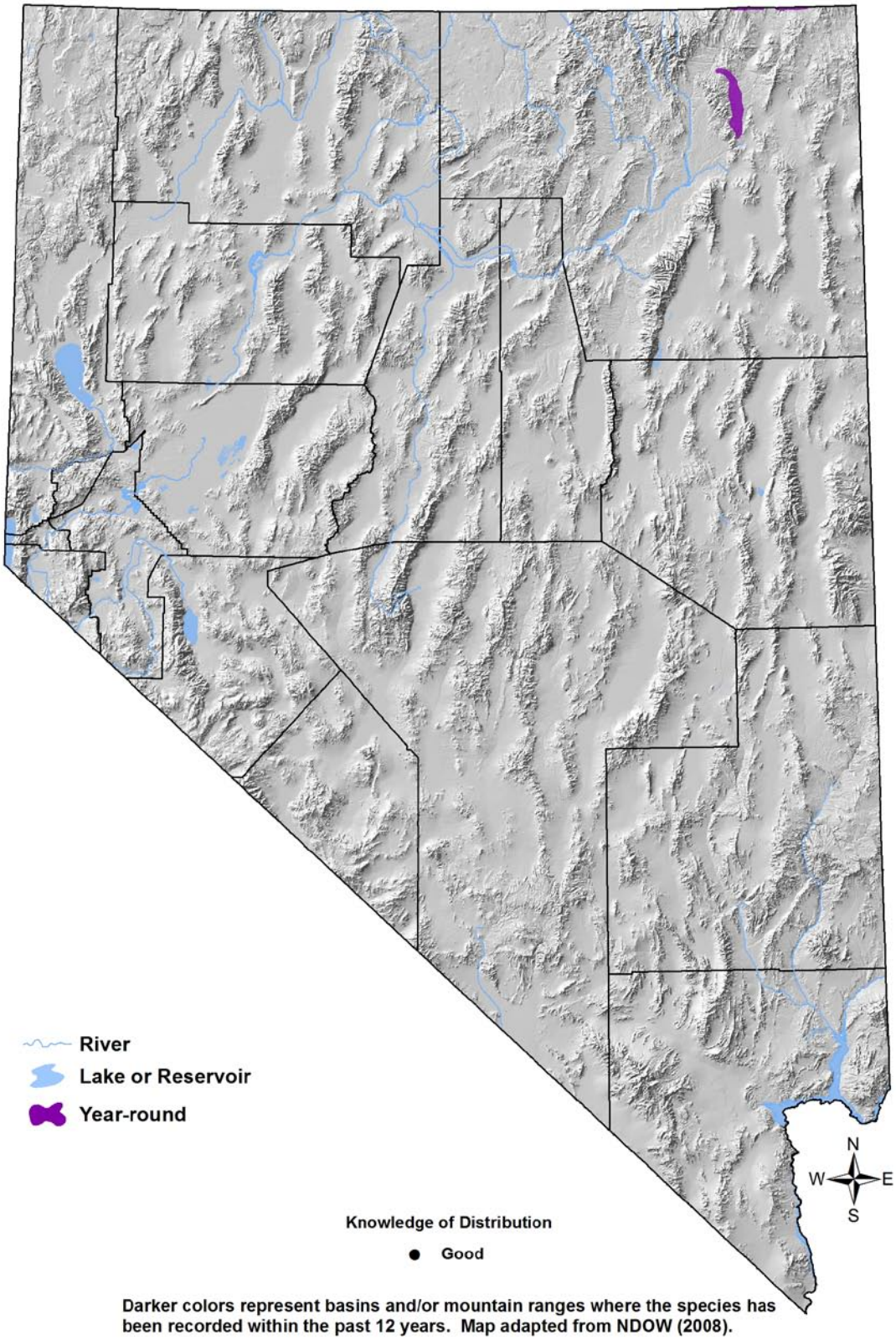
Priority Status	
Conservation Priority Species	
Species Concerns	
Small population size Habitat threats	
Other Rankings	
Continental PIF	Stewardship Species
Audubon Watchlist	None
NV Natural Heritage	S1
USFWS	None
BLM	None
USFS	None
NDOW	Conservation Priority
NDOW Upland Game Plan	High
Trends	
Historical ●	50% decline rangewide; extirpated in Nevada in 1952 [2]
Recent ◑	Reintroduced in Nevada in late 1990s, apparently stable[3]
Population Size Estimates	
Nevada ◑	226 (number introduced)[3]
Global ◑	1,200,000 (includes all subspecies)[9]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	NDOW lek surveys
Coverage in NV	Good
Key Conservation Areas	
Protection	Snake Mountains in Elko County
Restoration	Elko County

Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
April – early August[2]	
Nest and Nesting Habits	
Nest Placement	On ground under dense shrub or small tree[2]
Site Fidelity	High for lek sites; possibly high for nesting sites[2]
Food Habits	
Basic	Ground forager and gleaner
Primary Diet	Forbs, fruits, seeds, buds year-round[2]
Secondary Diet	Terrestrial arthropods during breeding[2]

Sharp-tailed Grouse

Tympanuchus phasianellus



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Map adapted from NDOW (2008).

Sharp-tailed Grouse

Tympanuchus phasianellus

Overview

The western subspecies of the Sharp-tailed Grouse (Columbian, *T. p. columbianus*) has declined precipitously throughout its U.S. range. These declines have been attributed to a number of factors, including habitat losses to agriculture, habitat fragmentation, excessive livestock grazing, and fire. In Nevada, the Columbian Sharp-tailed Grouse was extirpated by 1952. In 1999-2002, birds captured in Idaho were reintroduced to Nevada.[1] The Snake Mountains in Elko County were selected as the initial reintroduction site because of their large expanses of higher-elevation shrubland habitat adjoining lower-elevation sagebrush with relatively well-developed bunchgrass component.[3]

Sharp-tailed Grouse fare best in large intact tracts of montane shrubland with well-developed herbaceous and shrub cover.[2] Nesting areas tend to be selected where a mix of grasses, forbs, and shrubs provide structural diversity and good cover.[2,10] One study demonstrated that nest success increased with vegetation cover and structural diversity as far as 50 m [160 ft] from the nest site, and decreased when agricultural lands (and their associated populations of ravens and other nest predators) were closer than 1,600 m [1 mi] to the nest.[6] Columbian Sharp-tailed Grouse, at least in some areas where they have been studied, are heavily dependent on riparian and upland deciduous plant species (e.g. serviceberry, snowberry, chokecherry, hawthorn, aspen) for winter cover and food, and may move substantial distances to reach them in the winter.[2,4,7]

Nevada's single population of Sharp-tailed Grouse is well-monitored by NDOW, is not hunted, and is probably safe from major threats at this time, although catastrophic fires remain a concern. The main need is a better understanding of the factors promoting the species' long-term persistence (within both its current range and potential new translocation sites), along with protection of its current range from fragmentation.

Abundance and Occupancy by Habitat

No information for Nevada

Nevada-Specific Studies and Analyses

- Coates[1] conducted a Master's Thesis study on the movements, survivorship, and reproductive behaviors of Sharp-tailed Grouse translocated into Nevada

Main Threats and Challenges

Habitat and Other Threats

- In Nevada, energy development and large destructive fires are the most important threats; conifer encroachment could also be a local issue

- The small size and isolation of the Nevada population renders it vulnerable to episodic "survival filters," such as unusually severe winters, etc.

Research, Planning, and Monitoring Challenges

- The parameters of fire regimes that promote long-term population persistence are not well defined

Conservation Strategies

Established Strategies

- NDOW has developed detailed conservation and management priorities for the Sharp-tailed Grouse as a managed game bird,[7] with key elements including:
  - Continue current monitoring and study of the existing population
  - Evaluate other areas as potential reintroduction sites, and conduct reintroductions where appropriate
  - Manage habitat to maintain healthy shrub cover with well-developed grass component in minimum patch sizes of several thousand acres
  - Seek to limit agricultural interspersion into occupied habitat[8]
  - Development activities should avoid known lek sites; all human activity should be curtailed within 800 m [0.5 mi] of an active lek (March – June)[8]

Habitat Strategies

- Montane Shrubland (p. Hab-14-1), Montane Riparian (p. Hab-13-1), and Aspen (p. Hab-3-1) habitat conservation strategies benefit this species

Research, Planning, and Monitoring Strategies

- Conduct additional study of winter habitat use in Nevada
- Determine parameters of fires that potentially benefit the species versus those that should be aggressively controlled

Public Outreach Strategies

- None identified

References: [1]Coates (2001); [2]Coates et al. (2006); [3]Connelly et al. (1998); [4]Giesen and Connelly (1993); [5]Manzer and Hannon (2005); [6]Marks and Marks (1988); [7]NDOW (2008); [8]Paige and Ritter (1999); [9]Rich et al. (2004); [10]Saab and Marks (1992); [EO] Expert opinion

Mountain Quail

Oreortyx pictus

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Montane Riparian Aspen Montane Shrubland Coniferous Forest (Springs)	
Key Habitat Parameters ●	
Plant Composition	Ponderosa, Jeffrey and pinyon pines; juniper, aspen, currants, willows, squawbush, bitterbrush, sagebrush, variety of other montane shrubs and forbs
Plant Density	Dense shrub cover, well-developed forb understory[4, EO]
Mosaic	Tall and dense shrubs close to drinking water and escape cover (rock formations, ravines)[1]
Distance to Water	< 200 m [650 ft][4]
Slope	Steep slopes preferred[4]
Movement Corridor	Seasonal movements ≤ 25 km [16 mi] along streams to lower elevation winter grounds[4]
Other	Uses guzzlers[2]
Response to Vegetation Removal	Negative [EO]
Area Requirements ◑	
Minimum Patch Size	Unknown
Recommended Patch Size	> 25 km [16 mi] of intact stream corridor[4, EO]
Home Range	In summer, 140 ha [345 ac][9]

Conservation Profile

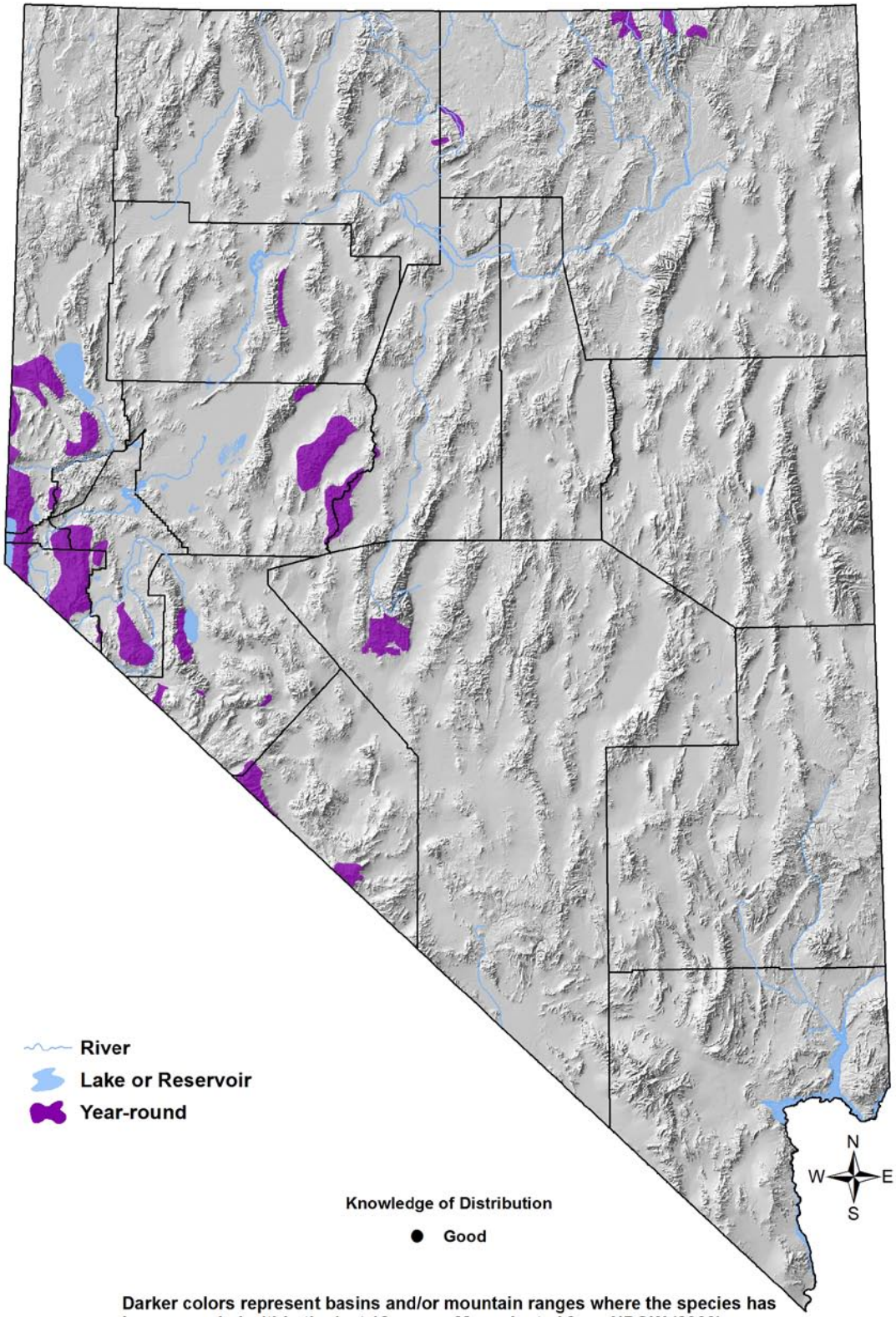
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and recent declines Small population size Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S3
USFWS	None
BLM	Sensitive Species
USFS	Sensitive Species
NDOW	Conservation Priority
NV Upland Game Plan	High Concern
Trends	
Historical ●	Rangewide declines[4]
Recent ◑	In Nevada, significant declines[4]
Population Size Estimates	
Nevada (BBS) ◑	840
Global ◑	160,000 [9]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [9, EO]	
Monitoring Coverage	
Source	NDOW surveys, Nevada Bird Count
Coverage in NV	Good / Fair
Key Conservation Areas	
Protection	Carson, Pine Nut, Desatoya, Clan Alpine, Wassuk, and White Mountain ranges
Restoration	Same as above

Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
April – July[3]	
Nest and Nesting Habits	
Nest Placement	On ground under dense shrub or tree cover[4]
Site Fidelity	Unknown
Food Habits	
Basic	Ground forager
Primary Diet	Seeds, fruits, flowers[4]
Secondary Diet	Terrestrial arthropods during nesting season[4]

Mountain Quail

Oreortyx pictus



Darker colors represent basins and/or mountain ranges where the species has been recorded within the last 12 years. Map adapted from NDOW (2008).

Mountain Quail

Oreortyx pictus

Overview

Mountain Quail are patchily distributed in montane areas of western Nevada. The species is known to be native to the Carson Range, but other scattered populations have been reported.[5] Regardless, several of Nevada's fragmented populations were likely extirpated by the 1940s,[6] and declines have apparently continued since that time. Mountain Quail are not closely tied to any particular habitat type, but instead are strongly associated with dense montane shrub and forb cover. Steep landscapes, where intact coniferous forests, deciduous woodlands, and montane shrublands exist in close proximity to a stream probably represent ideal conditions.[7] Degradation of streamside habitat due to chronic livestock grazing is a known threat to the species. The role of fire in Mountain Quail management is complicated; fire may be beneficial by maintaining a landscape mosaic of different seral stages, but large, intense fires may also threaten the survival of isolated populations.

Abundance and Occupancy by Habitat

- 3.6 – 12 individuals / 40 ha [0.04 – 0.12 / ac] across range, but not directly measured in Nevada[4]

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Degradation of montane riparian and shrubland habitats due to:[4]
  - Sustained livestock grazing
  - Large, intense fires
  - Invasive plants
  - Water diversions
  - Fuel reduction projects

Research, Planning, and Monitoring Challenges

- Although Mountain Quail are thought to be declining, rates of decline are not well-quantified
- Winter habitat requirements and the factors affecting winter survival have not been well-studied
- Some expert opinion suggests that Nevada population size is significantly larger than the estimate derived from NBC data

Mountain Quail

Oreortyx pictus

Conservation Strategies

Established Strategies

- As a managed game bird, detailed conservation and management priorities for the Mountain Quail have been developed by NDOW [5] and the *Western Quail Management Plan*,[10] with key elements including:
    - Improving monitoring and inventory protocols, and current distribution map
    - Introducing birds into suitable unoccupied habitat where appropriate
    - Reviewing hunting season dates to improve winter survival
    - Promoting management of montane riparian zones to ensure availability of early-successional, shrub-dominated habitat, and to maintain a patchy landscape mosaic of different successional stages and structural classes
    - Protecting water sources, and developing artificial water sources where appropriate

Habitat Strategies

- In addition to the strategies listed above, Montane Riparian (p. Hab-13-1), Aspen (p. Hab-3-1), Montane Shrubland (p. Hab-13-1), and Coniferous Forest (p. Hab-5-1) habitat conservation strategies benefit this species
- Manage livestock grazing to prevent chronic degradation of aspen and montane shrubland habitats

Research, Planning, and Monitoring Strategies

- Identify and map large montane areas exhibiting the desired habitat parameters and mosaic and prioritize these for conservation efforts
- Winter habitat requirements should receive additional study
- Additional research and monitoring to quantify apparent declines and better define their causes would be beneficial
- Implement monitoring protocols that have been recently tested[8]
- Develop fire management plans that maintain a diverse montane habitat mosaic

Public Outreach Strategies

- None identified

References: [1]Brennan et al. (1987); [2]Delehanty et al. (2004); [3]GBBO unpublished Atlas data; [4]Gutierrez and Delehanty (1999); [5]NDOW (2008); [6]Nevada Wildlife Action Plan Team (2006); [7]Reese et al. (2005); [8]Heekin and Reese (2007); [9]Rich et al. (2004); [10]Zornes and Bishop (2009); [EO]Expert opinion

Gambel's Quail

Callipepla gambelii

Photo by Amy Leist

Habitat Use Profile

Habitats Used in Nevada	
Mesquite-Acacia Mojave Lowland Riparian Springs Agriculture	
Key Habitat Parameters ●	
Plant Composition	Mesquite, acacia, salt cedar, willow, saltbush, prickly pear, cholla, desert thorn
Plant Density	Variable-density shrub and/or ground cover required (roost above ground)[1, 7]
Mosaic	Shrubby patches near riparian, dry washes, or agriculture[1, 7]
Distance to Water	< 1,000 m [0.6 mi][1, EO]
Other	Attracted to wildlife guzzlers
Response to Vegetation Removal	Negative, but exotic weed control encouraged [EO]
Area Requirements ◑	
Minimum Patch Size	~ 10 ha [25 ac] [EO]
Recommended Patch Size	> 80 ha [200 ac] [EO]
Home Range	8 - 38 ha [20 – 94 ac][1, 7]

Conservation Profile

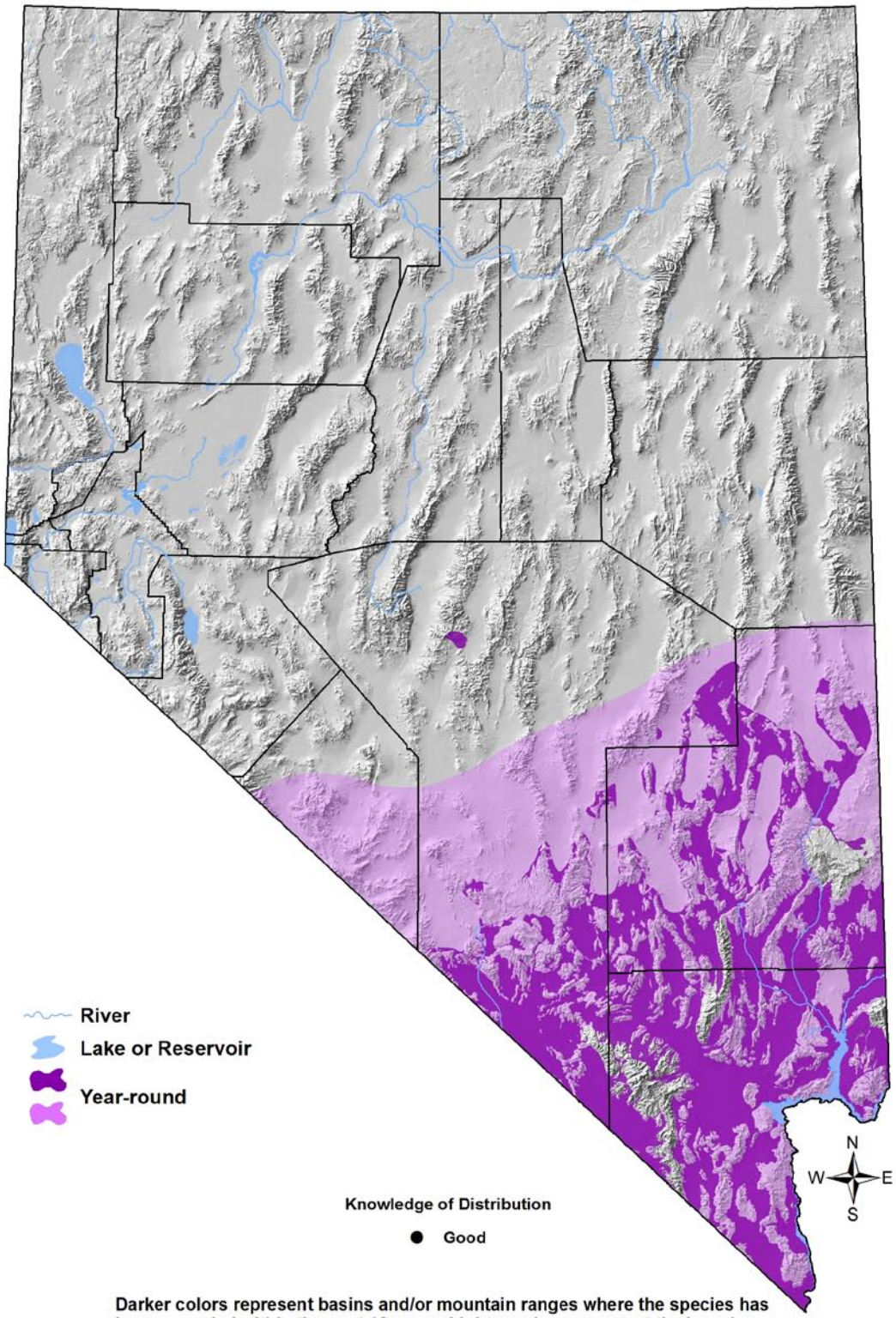
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical declines Habitat threats Possible high stewardship responsibility	
Other Rankings	
Continental PIF	Stewardship Species
Audubon Watchlist	None
NV Natural Heritage	None
USFWS	None
BLM	None
USFS	None
NDOW	Upland Gamebird
NDOW Upland Game Plan	High Concern
Trends	
Historical ●	Rangewide declines and contractions[1]
Recent ◑	Stable, but high annual variability[1]
Population Size Estimates	
Nevada (NBC) ○	260,000
Global ◑	1,100,000 [6]
Percent of Global	Up to 24%, but probably lower
Population Objective	
Maintain [6, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Lowland Riparian and Spring habitats in Clark and Nye counties
Restoration	Same

Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
March – July[1, 2]	
Nest and Nesting Habits	
Nest Placement	On ground under dense cover[1]
Site Fidelity	Unknown; probably high [EO]
Food Habits	
Basic	Ground forager
Primary Diet	Mesquite seeds, annual plants, cactus fruits[1]
Secondary Diet	Terrestrial insects during breeding[1]

Gambel's Quail

Callipepla gambelii



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types. Map adapted from NDOW (2008).

Gambel's Quail

Callipepla gambelii

Overview

Gambel's Quail is widely distributed in the brushy lowlands of southern Nevada, but its overall geographical range is limited to a subset of the Sonoran and Mojave Desert regions. Gambel's Quail may be found in a variety of habitat types where cover is sufficiently dense, and where water or succulent vegetation is available. Most spring breeding occurs in honey mesquite woodland, moving to denser screwbean mesquite or riparian habitats in the fall.[7] Annual production and survival is dependent on winter precipitation and the resulting degree of "green-up" the following spring.[1] Annual plants are important in the early spring when mesquite pods are less available.[7] Mortality within populations during dry years may reach 90%, but clutch size and survival may be very high during wet years.[1] Access to surface water improves survival rates, and NDOW has therefore constructed more than 400 artificial water sources in quail habitat in southern Nevada.[3] In our recent analyses, these guzzlers were indeed associated with increased abundances of Gambel's Quail (see below). Even with water improvements, however, Gullion[3] estimated that less than 7% of Nevada's Mojave region would be suitable for this species.

Because of their pronounced annual population fluctuations, it is difficult to determine this managed game bird's true conservation status. Analysis of NDOW's harvest data to shed additional light on long-term trends is therefore an important priority. Currently, invasive plants (particularly red brome) are considered a threat, particularly because they degrade habitat and increase the risk of fire and the consequent loss of woody vegetation.[4] In the longer-term, Gambel's Quail's sensitivity to drought suggests that it could be vulnerable under some climate change scenarios.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Mojave Region

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Lowland Riparian	86% (31/36)	7.8 (5.3 – 10.3)
Mesquite-Acacia	76% (11/14)	8.8 (4.1 – 13.5)
Agriculture	80% (4/5)	8.9 (3.1 – 14.7)
Joshua Tree	35% (7/30)	4.6 (1.3 – 7.9)
Mojave Scrub	64% (14/22)	5.3 (3.0 – 7.6)

- Densities of 0.15 – 2.40 / ha [0.06 – 0.98 / ac] reported throughout range[1]
- The BBS-derived Nevada population estimate[6] of 14,000 is much smaller than the NBC-derived estimate of 260,000 birds. It is not clear at this time which estimate is more accurate. Based on the table above, NBC data may have overestimated the density of Gambel's Quail in Mojave Scrub habitat, which would have inflated the population size estimate

Gambel's Quail
Callipepla gambelii

Nevada-Specific Studies and Analyses

Landscape Associations (NBC data)

Statistical analysis (*Appendix 3*) of data from 176 NBC transects within the Mojave region indicated a strong and significant association between Gambel's Quail abundance and Lowland Riparian, Mesquite-Acacia, Agriculture, and to a lesser extent Mojave Scrub habitats. There was also a strong and significant association between Gambel's Quail abundance and proximity to water sources (streams, springs, or guzzlers). This association became non-significant if guzzlers were removed from the analysis, so it appears very likely that guzzlers promote higher quail numbers, at least locally.

Gullion Study

In 1960 Gullion[3] published a peer-reviewed study of the basic ecology of Gambel's Quail in Nevada, which may provide useful baseline information

Main Threats and Challenges

Habitat Threats

- Fire has affected > 3,600 km^2 [900,000 ac] of quail habitat in southern Nevada in recent years; this commonly results in invasion of red brome, which may then promote more frequent fires that prevent or slow re-establishment of native vegetation[5]
- Loss or degradation of habitat due to:
    - Invasive plants (particularly red brome, see above)[4]
    - Wild horse and burro grazing
    - Urban and suburban development
    - Energy development
    - Other Mojave Lowland Riparian habitat threats (p. Hab-11-1)
- Loss or degradation of water sources

Research, Planning, and Monitoring Challenges

- Pronounced annual fluctuations in numbers and survival makes it difficult to detect underlying long-term population trends

Gambel's Quail

Callipepla gambelii

Conservation Strategies

Established Strategies

- NDOW, in conjunction with the Western Quail Management Plan,[8] has developed detailed conservation and management priorities for the Gambel's Quail,[5] with key elements including:
    - Protecting unburned habitat from fire and subsequent red brome invasion
    - Maintaining wild horses and burros in quail habitat at the lower range of defined Appropriate Management Levels
    - Support of post-fire habitat restoration and stabilization efforts
    - Maintaining existing artificial water sources, and establishing new artificial sources where appropriate
    - Protecting or restoring natural water sources
    - Improving weed control efforts
    - Re-establishing populations in previously-occupied areas where appropriate and feasible
    - Creating an improved and detailed map of current Gambel's Quail distribution

Habitat Strategies

- Mesquite-Acacia (p. Hab-10-1), Mojave Lowland Riparian (p. Hab-11-1), Springs (p. Hab-19-1), and Agriculture (p. Hab-1-1) habitat conservation strategies benefit this species
- New developments (residential, industrial, energy) should be sited where possible to avoid impacting high-quality Gambel's Quail habitat
- Feral and free-ranging cat control may be useful where occupied habitat adjoins residential areas

Research, Planning, and Monitoring Strategies

- Analyze NDOW harvest data to better determine long-term population trends
- Additional research should focus on determining seasonal water needs, grazing impacts, and microhabitat characteristics of nest sites[7]

Public Outreach Strategies

- Encourage pet owners near occupied habitat to keep cats indoors

Gambel's Quail
Callipepla gambelii

References: [1]Brown et al. (1998); [2]GBBO unpublished Atlas data; [3]Gullion (1960); [4]Kuvlesky et al. (1992); [5]NDOW (2008); [6]Rich et al. (2004); [7]Rosenberg et al. (1991); [8]Zornes and Bishop (2009); [EO] Expert opinion

Gambel's Quail habitat at Bird Canyon Springs. Photo by Dawn Fletcher

Common Loon

Gavia immer

Photo by Fred Petersen

Habitat Use Profile

Habitats Used in Nevada	
Open Water	
Key Habitat Parameters ◑	
Plant Density	No emergent vegetation
Water Depth	Depth at foraging locations usually 20-27 m [66 - 122 ft];[2] water body must be deep enough to support prey populations[1]
Water Quality	Sufficient to support healthy fish populations; heavy metals detrimental[1]
Area Requirements ○	
Minimum Patch Size	Unknown, but must be large enough to allow loons to become airborne
Recommended Patch Size	Not specifically quantified; at least several km[1,EO]
Home Range / Territory Size	N/A during migration [EO]

Conservation Profile

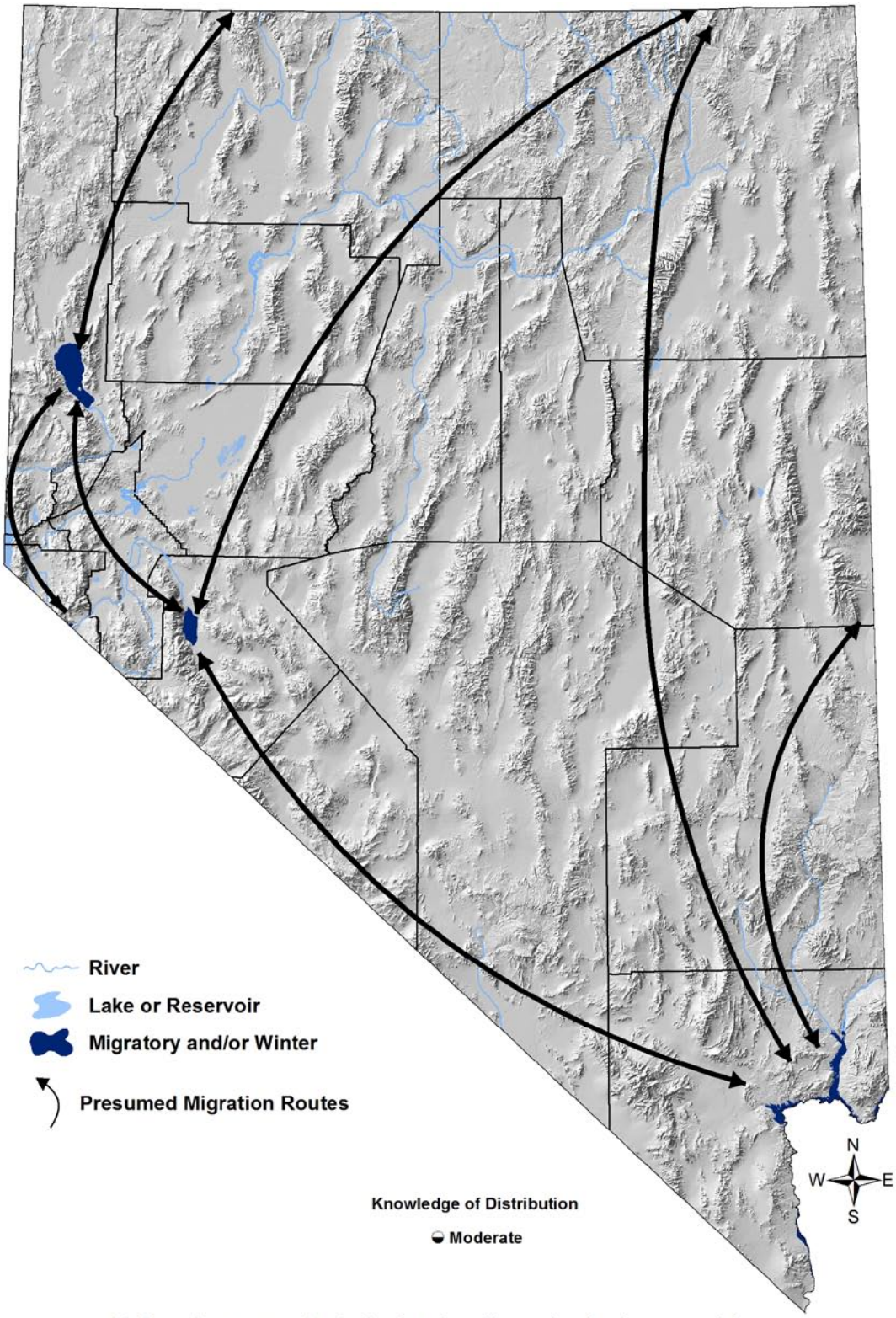
Priority Status	
Conservation Priority Species	
Species Concerns	
Habitat threats Recent declines (migration)	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S2N
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Waterbird Plan	Moderate/High Concern
Trends	
Historical ○	Unknown
Recent ●	Declines in number of migrants[4]
Population Size Estimates	
Nevada ◑	~500 migrants, variable among years [EO]
Global ◑	600,000 [1, 3]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	NDOW Walker Lake surveys, Aquatic Bird Count
Coverage in NV	Fair
Key Conservation Areas	
Protection	Walker, Pyramid, & Topaz Lakes and other Great Basin waterbodies large enough to allow takeoff
Restoration	Walker Lake

Natural History Profile

Seasonal Presence in Nevada	
Spring (migration peak in April) Fall (migration peak in October) Winter (Mojave)	
Known Breeding Dates in Nevada	
N/A	
Nest and Nesting Habits	
Nest Placement	N/A
Food Habits	
Basic	Diver
Primary Diet	Small fish < 20 cm [8 in] long[1]
Secondary Diet	Aquatic invertebrates[1]

Common Loon

Gavia immer



Darker colors represent water bodies where the species has been recorded within the past 12 years. Smaller water bodies may be difficult to visualize on the map.

Common Loon

Gavia immer

Overview

In Nevada, the Common Loon has become emblematic of the serious problems facing Walker Lake, where diversion of inflows from the Walker River is threatening the lake's fishery and, in the longer-term, its very existence. Historically, Walker Lake is thought to have hosted more migrating loons than any other inland site. Even as recently as the 1990s, a typical year saw approximately 1,000 migrants at Walker Lake, with reported peaks of about 1,400 birds. More recently however, as the water level continued to decline and water salinity increased, average numbers of migrating loons have fallen below 300, and evidence suggests that similar declines have also occurred on Pyramid Lake.[5] Inflows at Pyramid Lake are now secure, and conservation actions there should focus on maintaining water quality and fishery health. A focus on fishery health is also appropriate for other smaller water bodies (such as Topaz Lake) known to host loons. Walker Lake, however, does not have adequate guaranteed inflows, and securing them is a complex undertaking that lies largely within the political sphere. Without securing adequate inflows, other conservation actions at Walker Lake are secondary.

Although conservation attention is focused primarily on migrating loons in Nevada, some reports suggest that loons may winter on Lake Mead in southern Nevada, at least in some years. This possibility deserves additional study.

Currently, loons at Walker Lake are monitored by means of an annual survey that occurs in mid-October each year. Because the timing of migration peaks can vary among years, and because the timing of migration may be systemically shifting in response to a warming climate, it would be beneficial to expand this monitoring effort across several survey dates each year so that it more effectively captures the migration peak. Additionally, it would be beneficial to broaden this monitoring effort to include other lakes known or suspected of hosting migrant loons.

Abundance and Occupancy by Habitat

In recent years, annual counts at Walker Lake have averaged ~ 285 birds, compared to ~ 1,000 birds in the 1990s. Surveys have not been systematically conducted at other potentially important lakes, but preliminary data[2] suggest that Topaz Lake is also commonly used by migrating loons

Nevada-Specific Studies and Analyses

The Walker Lake survey data set (NDOW) indicates a pronounced decline in number of migrating loons at Walker Lake. Yates[6] conducted some preliminary telemetry study of loons at Walker Lake, but the study is ongoing and results are pending.

Common Loon

Gavia immer

Main Threats and Challenges

Habitat Threats

- Inadequate inflows to Walker Lake, resulting in increased water salinity and decline in fish prey base
- Decline in fisheries in other lakes because of declines in water quality or other issues
- Mercury contamination in fish[4, 6]

Research, Planning, and Monitoring Challenges

- Currently, monitoring occurs only at Walker Lake, and only at one fixed time point each year (see Overview, above)

Conservation Strategies

Habitat Strategies

- The Open Water (p. Hab-15-1) habitat conservation strategy benefits this species
- Secure adequate guaranteed inflows for Walker Lake to stabilize its fishery
- Maintain good water quality and healthy fisheries in other lakes used by loons (Pyramid Lake, Topaz Lake, and Lake Mead)

Research, Planning, and Monitoring Strategies

- Expand current monitoring protocol at Walker Lake to cover a range of survey dates during fall migration, to cover spring migration, and to cover additional lakes known or suspected to be used by loons
- Further investigate the possibility that loons winter on Lake Mead, and if so, determine their conservation status and needs
- Study the possible impact of mercury contamination on loons

Public Outreach Strategies

- Continue efforts coordinated by the Walker Lake Working Group to build public support for saving Walker Lake (http://www.walkerlake.org/about/about_issues.html)

References: [1]Evers et al. (2010); [2]GBBO unpublished data; [3]Kushlan et al. (2002); [4]Nevada Wildlife Action Plan Team (2006); [5]Serdehely (2006); [6]Yates (1999b); [EO] Expert opinion

Eared Grebe

Podiceps nigricollis

Photo by Jacque Lowery

Habitat Use Profile

Habitats Used in Nevada	
Open Water Marsh	
Key Habitat Parameters ◑	
Plant Composition	Cattail, bulrush, sedges, rushes, submerged aquatic vegetation
Plant Density	Unknown
Mosaic	Unknown
Water Depth	Up to 4 m [13 ft] for foraging[3]
Water Quality	Tolerant of saline conditions[3]
Response to Vegetation Removal	Probably negative for breeding sites [EO]
Area Requirements ◑	
Minimum Patch Size	Unknown; estimated at 20 ha [49 ac] [EO]
Recommended Patch Size	> 50 ha [124 ac] [EO]
Home Range / Territory Size	Unknown

Conservation Profile

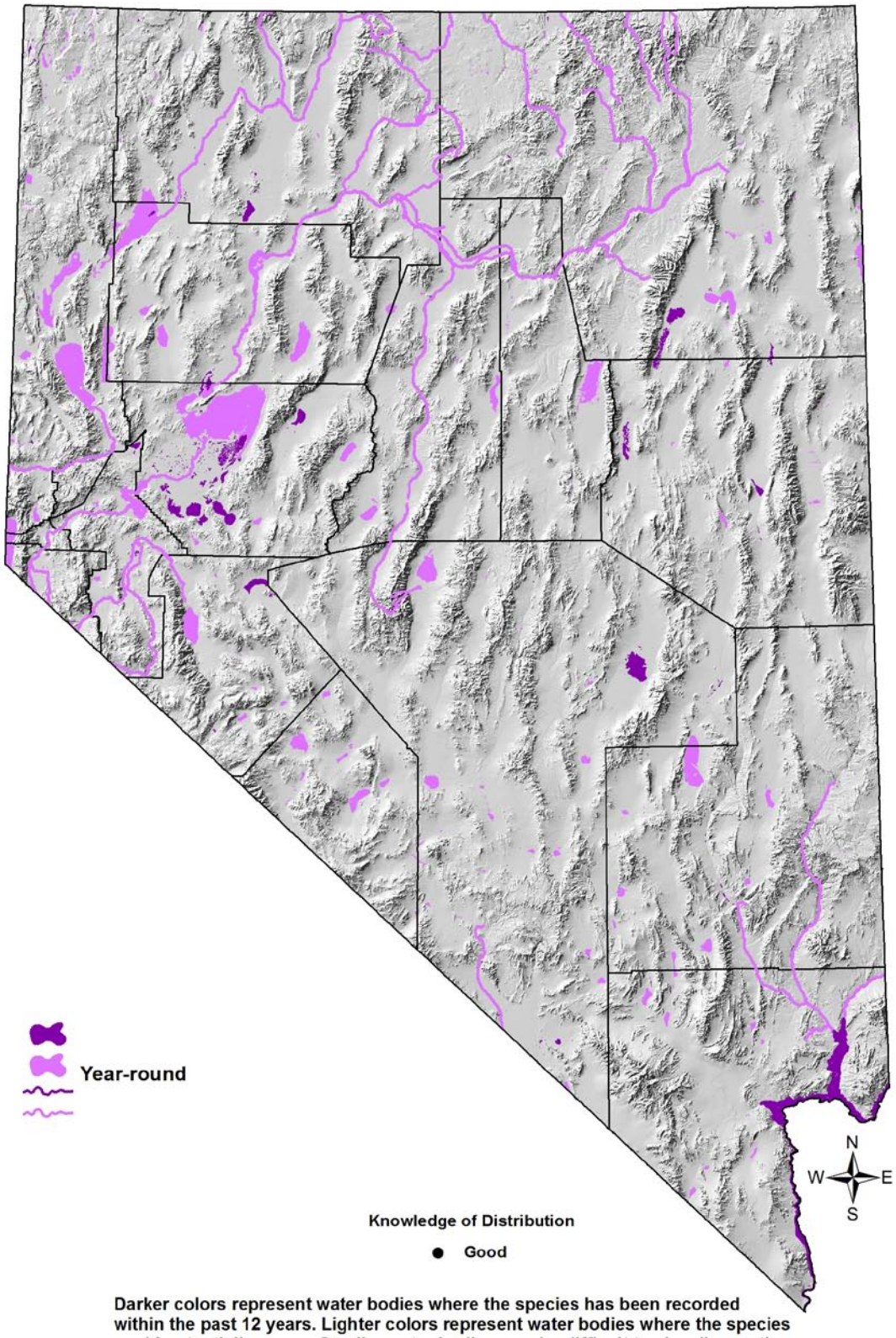
Priority Status	
Conservation Priority Species	
Species Concerns	
Small population size (breeding) Possible habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S4B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Waterbird Plan	High Concern
Trends	
Historical ○	Unknown
Recent ◑	Stable or increasing[5]
Population Size Estimates	
Nevada ◑	400 (breeding); [5] more migrants [EO]
Global ◑	4,100,000 [6]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Good / Fair
Key Conservation Areas	
Protection	Ruby Valley, Lahontan Valley, Walker and Pyramid Lakes
Restoration	Degraded and at-risk marshes

Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
May – August[3]	
Nest and Nesting Habits	
Nest Placement	Floating, attached to emergent vegetation[3]
Site Fidelity	Moderate for breeding territory[3]
Other	Nests colonially, but Nevada colonies usually small [3, 4]
Food Habits	
Basic	Diver
Primary Diet	Aquatic invertebrates[3]
Secondary Diet	Small fishes and other vertebrates[3]

Eared Grebe

Podiceps nigricollis



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Eared Grebe

Podiceps nigricollis

Overview

The Eared Grebe is distinctive in at least two ways from Nevada's other Conservation Priority grebes (the Clark's and Western). First, Eared Grebes feed primarily on invertebrates, while Clark's and Western Grebes are primarily fish-eaters. Secondly, unlike the other grebes, Eared Grebes are strongly associated with saline / alkaline wetlands, though primarily so during the non-breeding season.[3] Immediately after breeding, most Eared Grebes from Nevada and surrounding areas wander to either Mono Lake or Great Salt Lake, where they congregate in very large numbers to feed on brine shrimp prior to fall migration.[3] Compared to the Western and Clark's grebes, the Eared Grebe appears to engage in little, if any, significant staging activity within Nevada itself, but they are abundant here throughout the subsequent migration season, and are also present throughout the winter in more modest numbers. Thus while the Eared Grebe has a year-round presence in Nevada, its seasonal cohorts are largely comprised of different birds. The number of migrating Eared Grebes found in Nevada is far larger than the breeding population,[EO] and more attention needs to be devoted to studying the distribution, abundance, habitat use, and conservation needs of these migrants. As a case in point, Lake Mead reportedly hosted 50,000 – 100,000 non-breeders annually as recently as 1972, but shortly thereafter these numbers fell precipitously.[3] Apparently, no definitive explanation for this large decline was ever found.

Abundance and Occupancy by Habitat

- High counts for breeding population are as follows:
  - 600 breeders recorded at Ruby Lake in 1983 [1]
  - Several hundred nests recorded annually at both Carson Lake and Stillwater NWR during wet years in the mid-1990's [2]
- Nevada's migrant population is "much larger" [EO] than the breeding population, but has not been quantified

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Loss or degradation of marshes (particularly alkaline marshes) due to water diversions, declines in water quality, or development

Eared Grebe

Podiceps nigricollis

Research, Planning, and Monitoring Challenges

- The distribution, abundance, habitat use, and conservation needs of migrating and wintering Eared Grebes have not been well studied

Conservation Strategies

Habitat Strategies

- Open Water (p. Hab-15-1), and Marsh (p. Hab-9-1) habitat conservation strategies benefit this species
- Maintaining healthy populations of aquatic invertebrates is probably important year-round, but especially so in alkaline marshes during the fall migration period

Research, Planning, and Monitoring Strategies

- Conduct additional surveys and monitoring to better document the Eared Grebe's distribution, abundance, habitat use, and conservation needs during the post-breeding, migration, and winter seasons
- Monitor water quality in occupied sites

Public Outreach Strategies

- None identified

References: [1]Alcorn (1988); [2]Chisholm and Neel (2002); [3]Cullen et al. (1999); [4]Floyd et al. (2007); [5]Ivey and Herziger (2006); [6]Kushlan et al. (2002); [EO] Expert opinion

Western Grebe

Aechmophorus occidentalis

Photo by Fred Petersen

Habitat Use Profile

Habitats Used in Nevada	
Open Water (Marsh)	
Key Habitat Parameters ◑	
Plant Composition	Cattail, bulrush, sedges, pondweeds and submerged aquatic plants
Plant Density	Patches of dense emergent vegetation or pond weed mats for nesting[5]
Mosaic	Mostly open water, with emergent or floating vegetation along shoreline for nesting (no emergent vegetation needed for migration)[5]
Water Depth	Moderate to deep, sufficient to support small fish[5]
Water Quality	Sufficient to support fish[5]
Response to Vegetation Removal	Negative in breeding sites; otherwise neutral [EO]
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	> 200 ha [500 ac] of open water [EO]
Home Range / Territory Size	Unknown

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
High stewardship responsibility (migration) Small population size (breeding) Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S4B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Waterbird Plan	High Concern
Trends	
Historical ○	Unknown
Recent ○	Unknown
Population Size Estimates	
Nevada ◑	~ 250 (breeding)[1, 2, 4]
Global ○	110,000 [3]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	Nevada Colonial Waterbird Inventory, NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Fair
Key Conservation Areas	
Protection	Lahontan and Ruby Valleys; Pyramid and Walker Lakes (migration); Lake Mead (year-round)
Restoration	Degraded or at-risk marshes

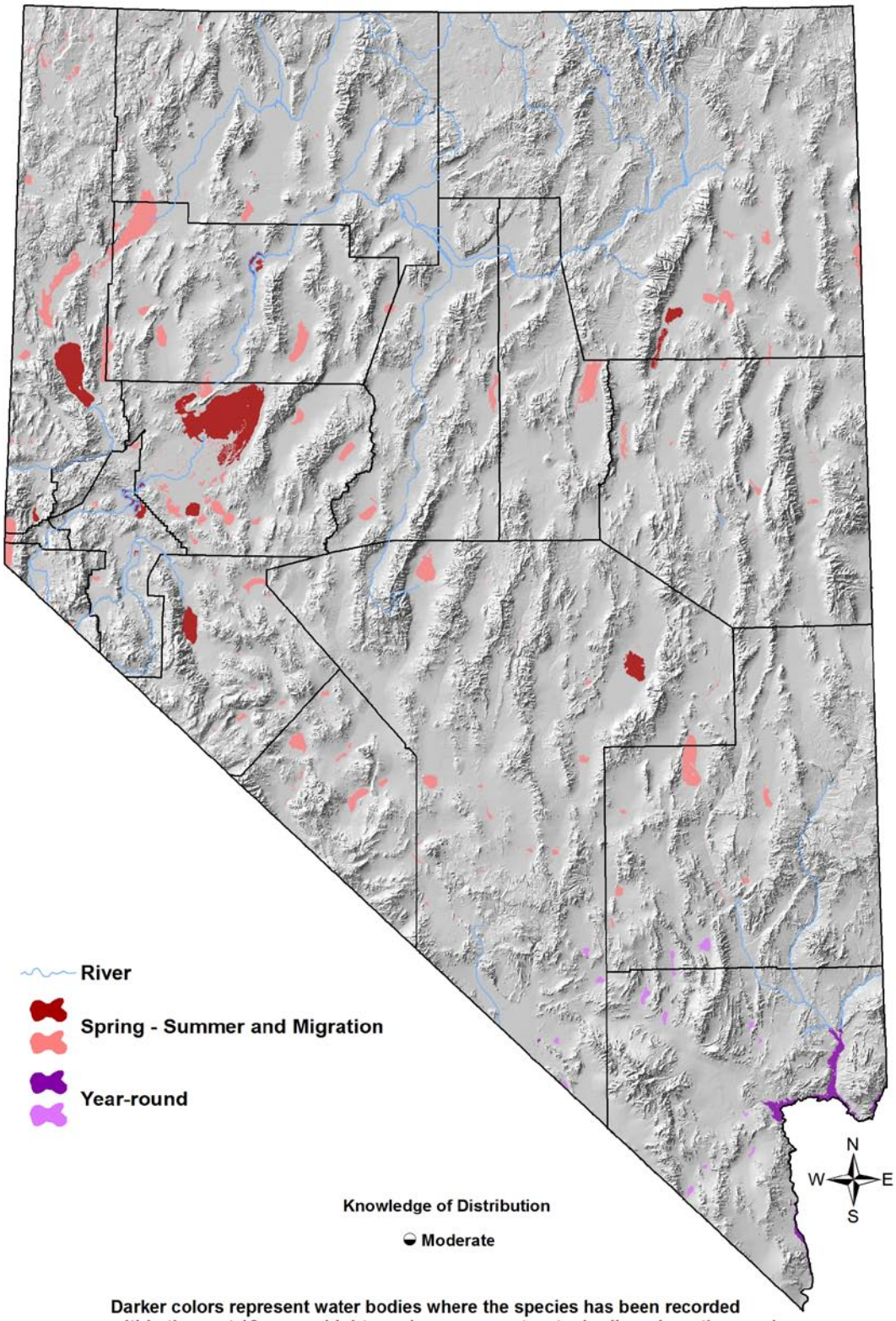
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer, Fall (Great Basin) Year-round (Mojave)	
Known Breeding Dates in Nevada	
April – August [5, EO]	
Nest and Nesting Habits	
Nest Placement	On mound of matted emergent vegetation or floating vegetation[5]
Site Fidelity	Moderate for colony sites[5]
Other	Usually nests in small colonies of < 10 pairs[5, EO]
Food Habits	
Basic	Diver
Primary Diet	Small fish[5]
Secondary Diet	Aquatic invertebrates[5]

Confidence in Available Data: ●High ◑Moderate ○ Low

Western Grebe

Aechmophorus occidentalis



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Western Grebe

Aechmophorus occidentalis

Overview

Western Grebes often co-occur with Clark's Grebes in Nevada. The two species are very similar in many respects, and little information exists to distinguish between their respective conservation statuses and needs. Therefore, at this time these two species are probably best managed as a single taxon until differences in their distributions, abundances, habitat use patterns, and conservation needs are better understood. Although Nevada's population of breeding Western Grebes is fairly small and scattered, it appears to be stable. The ongoing Nevada Colonial Waterbird Inventory project being conducted by GBBO and NDOW as part of a regional USFWS colonial waterbird inventory initiative should significantly improve our knowledge of breeding colony locations and lead to a better estimate of the statewide breeding population.

Post-breeding and migratory birds are drawn to Nevada's larger fish-rich waterbodies, such as Pyramid and Walker Lakes, from a wider region, and are much numerous than breeding birds, although data are not sufficient to make precise estimates. Lake Mead is a particularly important resource for Western Grebes in Nevada, as it supports large numbers of Western Grebes year-round.

Abundance and Occupancy by Habitat

- Data from the Nevada Aquatic Bird Count show that during September, Pyramid Lake typically hosts at least several thousand staging and migrating Western and Clark's Grebes
- Data from the Nevada Aquatic Bird Count show that Lake Mead hosts at least 200 Western and Clark's Grebes during every month of the year. This number increase several-fold in spring and fall, and shows a pronounced peak (> 1,000 birds) in April

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat and Other Threats

- Loss or degradation of marshes or open waterbodies due to water diversions, declines in water quality, or development
- Increasing salinity in Walker Lake, and associated decline of fishery[4]
- Disturbance from close approach of motorized watercraft[4]

Western Grebe

Aechmophorus occidentalis

Research, Planning, and Monitoring Challenges

- Lack of sufficient information about the distribution, abundance, habitat use, and conservation issues for staging, migrating, and wintering populations

Conservation Strategies

Habitat Strategies

- The Open Water (p. Hab-15-1) habitat conservation strategy benefits this species

Research, Planning, and Monitoring Strategies

- Increase inventory and monitoring coverage through the Nevada Colonial Waterbird Inventory or other avenues to collect additional information on the distribution, abundance, habitat use, and conservation status of breeding, post-breeding, staging, migrating, and wintering populations
- Conduct studies to identify any conservation-relevant differences between Clark's and Western Grebes
- Monitor water quality in occupied sites

Public Outreach Strategies

- Educate recreationalists using motorized watercraft to minimize disturbance of nesting areas and staging hotspots
- Support efforts to protect and restore water inflows into Walker Lake

References: [1]Floyd et al. (2007); [2]Ivey and Herziger (2006); [3]Kushlan et al. (2002); [4]Nevada Wildlife Action Plan Team (2006); [5]Storer and Nuechterlein (1992); [EO] Expert opinion

Clark's Grebe

Aechmophorus clarkii

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Open Water (Marsh)	
Key Habitat Parameters ◑	
Plant Composition	Cattail, bulrush, sedges, pondweed and submerged aquatic plants, willow along shoreline
Plant Density	Patches of dense emergent vegetation or pond weed mats for nesting[5]
Mosaic	Mostly open water, with emergent or floating vegetation along shoreline for nesting (no emergent vegetation needed for migration), variable water depths[5]
Water Depth	Unknown, but dives deeper than Western Grebe[5]
Water Quality	Sufficient to support fish[5]
Response to Vegetation Removal	Negative in breeding sites, otherwise neutral [EO]
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	> 300 ha [740 ac] of open water[5]
Home Range / Territory Size	Unknown

Conservation Profile

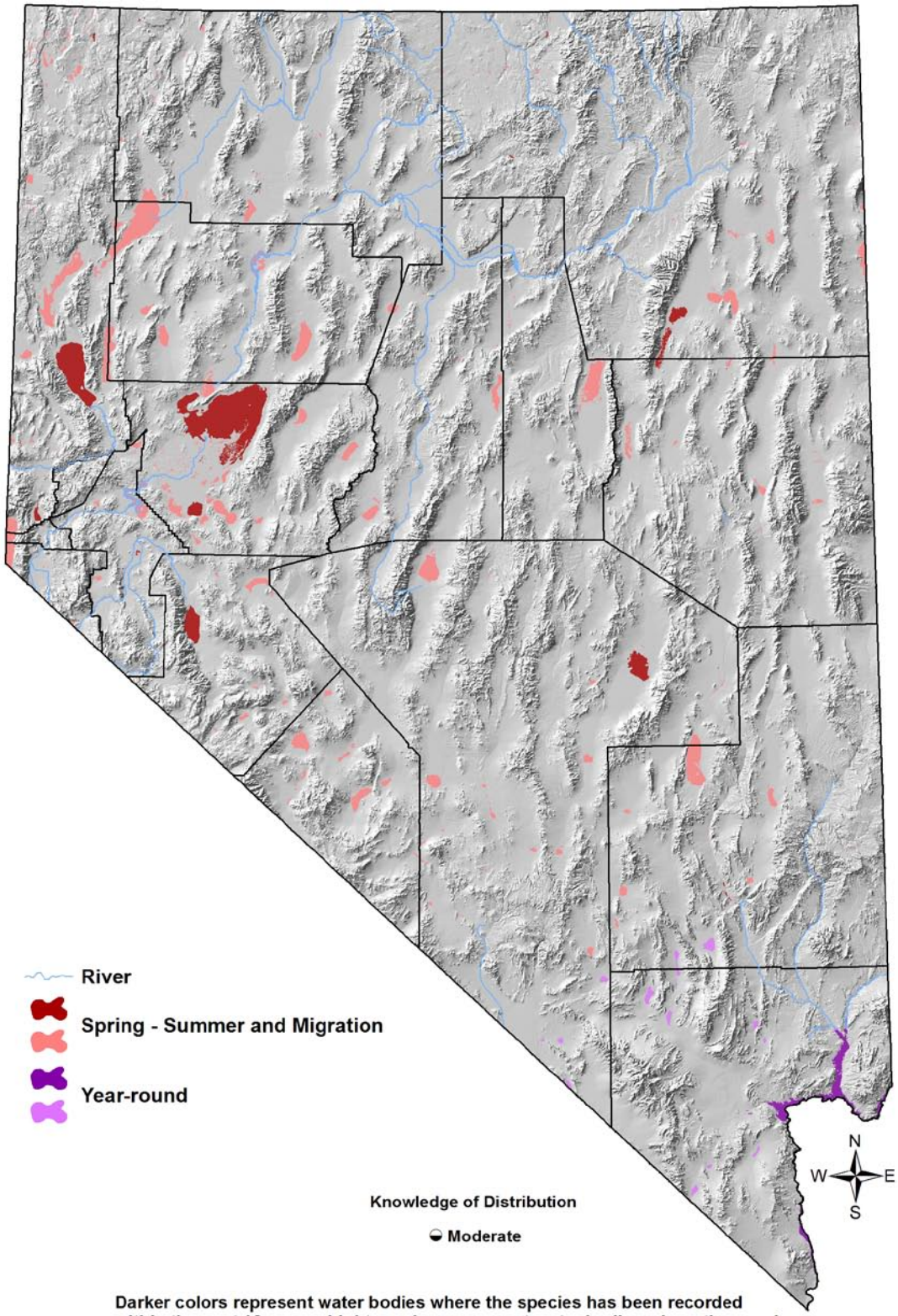
Priority Status	
Conservation Priority Species	
Species Concerns	
High stewardship responsibility (migration) Small population size (breeding) Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S4B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Waterbird Plan	High Concern
Trends	
Historical ○	Unknown
Recent ○	Probably stable[2]
Population Size Estimates	
Nevada ◑	~ 300 (breeding)[1, 2, 4]
Global ○	10,000 - 20,000 [3]
Percent of Global	~ 2%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	Nevada Colonial Waterbird Inventory, NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Fair
Key Conservation Areas	
Protection	Lahontan and Ruby Valleys; Pyramid and Walker Lakes (migration); Lake Mead (year-round)
Restoration	Degraded or at-risk marshes

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer, Fall (Great Basin) Year-round (Mojave)	
Known Breeding Dates in Nevada	
April – August [5, EO]	
Nest and Nesting Habits	
Nest Placement	On mount of matted emergent vegetation or floating vegetation[5]
Site Fidelity	Moderate for colony sites[5]
Other	Usually nests in small colonies[45]
Food Habits	
Basic	Diver
Primary Diet	Small fish[5]
Secondary Diet	Aquatic invertebrates[5]

Clark's Grebe

Aechmophorus clarkii



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Clark's Grebe

Aechmophorus clarkii

Overview

Clark's Grebes often co-occur with Western Grebes in Nevada. The two species are very similar in many respects, and little information exists to distinguish between their respective conservation statuses and needs. Therefore, at this time these two species are probably best managed as one taxon until differences in their distributions, abundances, habitat use patterns, and conservation needs are better understood. Although Nevada's population of breeding Clark's Grebes is fairly small and scattered, it appears to be stable. The ongoing Nevada Colonial Waterbird Inventory project being conducted by GBBO and NDOW as part of a regional USFWS colonial waterbird inventory initiative should significantly improve our knowledge of breeding colony locations and lead to a better estimate of the statewide breeding population.

Post-breeding and migratory birds are drawn to Nevada's larger fish-rich water bodies, such as Pyramid and Walker Lakes, from a wider region, and are much numerous than breeding birds, although data are not sufficient to make precise estimates. Lake Mead is a particularly important resource for Western Grebes and large numbers of Clark's Grebes year-round.

Abundance and Occupancy by Habitat

- Data from the Nevada Aquatic Bird Count show that during September, Pyramid Lake typically hosts at least several thousand staging and migrating Clark's and Western Grebes
- Data from the Nevada Aquatic Bird Count show that Lake Mead hosts at least 200 Clark's and Western Grebes during every month of the year. This number increase several-fold in spring and fall, and shows a pronounced peak (> 1,000 birds) in April

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

<u>Habitat and Other Threats</u>

- Loss or degradation of marshes or open waterbodies due to water diversions, declines in water quality, or development
- Increasing salinity in Walker Lake, and associated decline of fishery[4]
- Disturbance from close approach of motorized watercraft[4]

Clark's Grebe

Aechmophorus clarkii

Research, Planning, and Monitoring Challenges

- Lack of sufficient information about the distribution, abundance, habitat use, and conservation issues for staging, migrating, and wintering populations

Conservation Strategies

Habitat Strategies

- The Open Water (p. Hab-15-1) habitat conservation strategy benefits this species
- Lakes and reservoirs with healthy fisheries are particularly important to this species

Research, Planning, and Monitoring Strategies

- Increase inventory and monitoring coverage through the Nevada Colonial Waterbird Inventory or other avenues to collect additional information on the distribution, abundance, habitat use, and conservation status of breeding, post-breeding, staging, migrating, and wintering populations
- Conduct studies to identify any conservation-relevant differences between Clark's and Western Grebes
- Monitor water quality in occupied sites

Public Outreach Strategies

- Educate recreationalists using motorized watercraft to minimize disturbance of nesting areas and staging hotspots
- Support efforts to protect and restore water inflows into Walker Lake

References: [1]Floyd et al. (2007); [2]Ivey and Herziger (2006); [3]Kushlan et al. (2002); [4]Nevada Wildlife Action Plan Team (2006); [5]Storer and Nuechterlein (1992); [EO] Expert opinion

American White Pelican

Pelicanus erythrorhynchos

Photo by Bob Goodman

Habitat Use Profile

Habitats Used in Nevada	
Open Water (Great Basin Lowland Riparian)	
Key Habitat Parameters ●	
Plant Density	No emergent vegetation cover
Colony Site	Large, dry, sparsely-vegetated island in large lake
Mosaic	For foraging, open waterbodies of various sizes, with a diverse depth profile
Water Depth	Deep sections for fisheries, shallow areas < 2 m deep [6.6 ft] for foraging[3]
Water Quality	Sufficient to support healthy fish populations
Area Requirements ●	
Minimum Patch Size	Probably 20 - 40 ha [50 -100 ac] for colony island; smaller for foraging water bodies [EO]
Recommended Patch Size	Unknown
Home Range	1,000s of km^2 (see Overview, below)

Conservation Profile

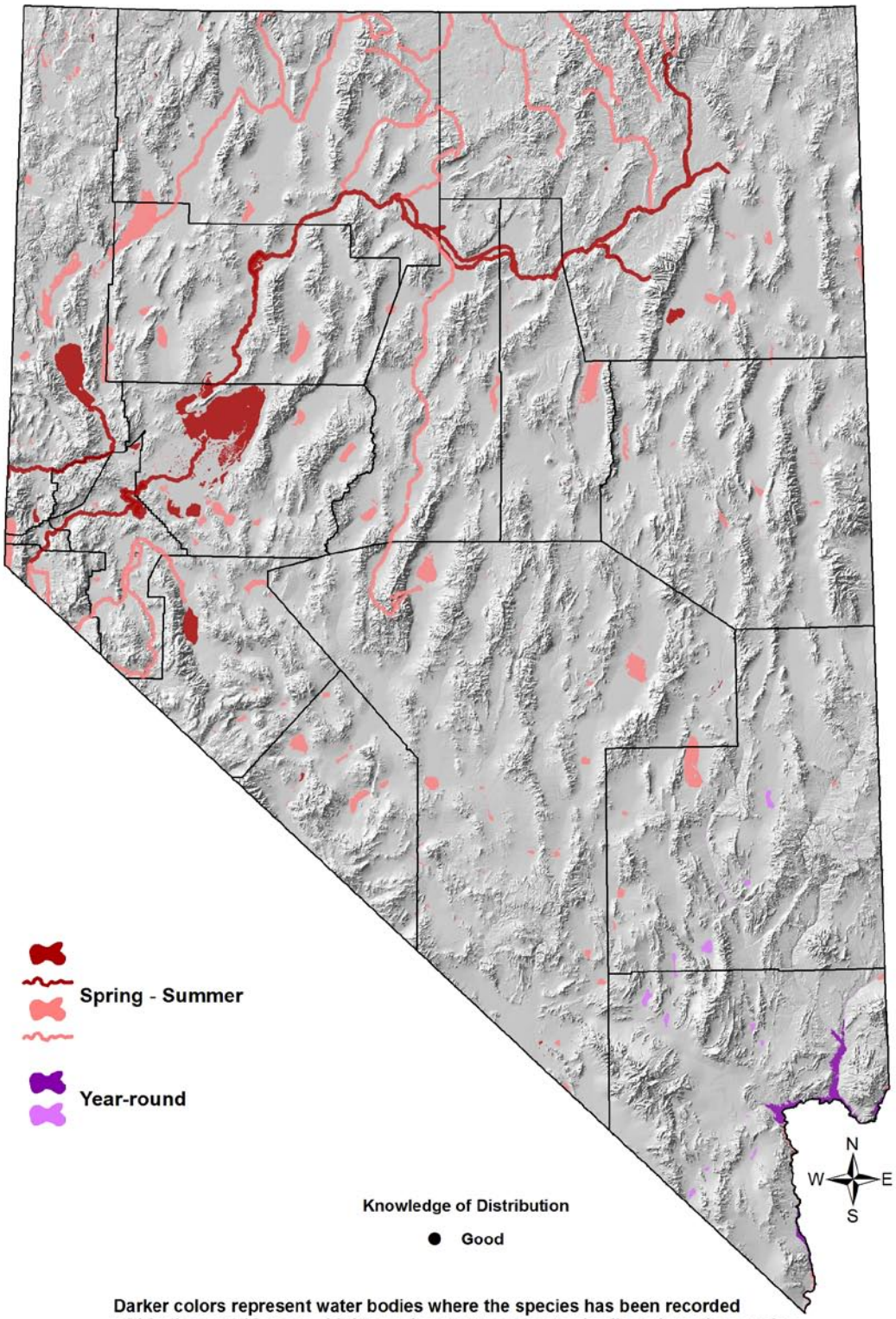
Priority Status	
Conservation Priority Species	
Species Concerns	
Restricted habitat (breeding colony) Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S4B
USFWS	Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
IW Waterbird Plan	High Concern
Trends	
Historical ●	Decreases until 1960s; then increases[3]
Recent ◑	Probably stable[4]
Population Size Estimates	
Nevada ◑	Average 8,600, highly variable among years[10]
Global ◑	134,000 [4]
Percent of Global	~ 6 %
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	Anaho Island NWR annual colony counts and other NWR migration counts[10]
Coverage in NV	Good
Key Conservation Areas	
Protection	Pyramid Lake, Truckee River, Walker Lake, Topaz Lake
Restoration	All Great Basin rivers and open waterbodies with fisheries

Natural History Profile

Seasonal Presence in Nevada	
Spring-Summer, Fall Year-round (Mojave)	
Known Breeding Dates in Nevada	
Mid March – early September[1]	
Nest and Nesting Habits	
Nest Placement	On ground on large colony island located on large water body[3, 10]
Site Fidelity	High for Anaho Island colony, variable elsewhere[3]
Other	May form new colonies in high water years[3, 10]
Food Habits	
Basic	Fishes by dabbling
Primary Diet	Fish up to 70 cm [27 in] long[3, 9]
Secondary Diet	None

American White Pelican

Pelicanus erythrorhynchos



American White Pelican

Pelicanus erythrorhynchos

Overview

The American White Pelican is unique among the Conservation Priority species covered in this plan in that its Nevada breeding population is almost entirely represented by a single large colony located on Pyramid Lake's Anaho Island. This is one of the ten largest colonies in North America.[2] Birds from this colony forage not only in Pyramid Lake, but they frequently commute long distances (regularly exceeding 100 km [62 mi] one-way), to other relatively shallow waterbodies,[12] as reflected in the range map shown above. In these widespread sites, they hunt for fish such as cui-ui (*Chasmistes cujus*), tui chub (*Gila bicolor*), and similar-sized species that are about 21-69 cm in length [8 – 27 in].[9,11] In wet years, pelican numbers may be double of those of dry years,[11] and reproductive success on Anaho Island is positively correlated with Truckee River spring and summer flows.[6] Also during wet years, smaller colonies may form and breed on ephemeral islands in the Carson Sink, at Franklin Lake in Ruby Valley, or elsewhere in the Great Basin,[7] but this is a very intermittent phenomenon. After breeding, birds from Anaho Island wander throughout the state until they eventually migrate along the west coast to their wintering grounds in southern California, Arizona, the Sea of Cortez, and Central America.[12] In the fall, migrating pelicans from the north pass through Nevada and often make foraging stopovers. Some birds also winter along the lower Colorado River system.

The Pyramid Lake colony is monitored annually by Anaho Island NWR, and Anaho Island is well-protected from disturbances. Therefore, the primary threats to American White Pelicans within Nevada probably take the form of threats to their prey populations.

Abundance and Occupancy by Habitat

The Anaho Island colony has persisted annually from the time of the original record of the site. The number of breeders present at Anaho Island over the past 50 years has varied from 2,670 to 21,500 birds, with an annual average of 8,600 and a typical ten-year peak of 13,500.[10] All bodies of open water that contain fish in the preferred size range are potential foraging habitat for pelicans during the breeding, post-breeding, or fall migration season. However, densities of birds at foraging sites have not been systematically determined.

Nevada-Specific Studies and Analyses

The Anaho Island colony has been surveyed annually for about 50 years by Anaho Island NWR,[10] resulting in detailed productivity, survival, and demographic information.

American White Pelican

Pelicanus erythrorhynchos

Main Threats and Challenges

Habitat and Other Threats

- Decline in water quality or water inflow volume, resulting in decline of prey populations within key waterbodies such as Pyramid Lake, Walker Lake, Lahontan Valley wetlands, and Humboldt Sink
- Foraging adults are sensitive to human disturbance
- Pelicans are susceptible to Type C Botulism and West Nile Virua[8,12]

Research, Planning, and Monitoring Challenges

- Systematic monitoring of important foraging and stopover sites and compilation of all existing data would be valuable

Conservation Strategies

Habitat Strategies

- The Open Water (p. Hab-15-1) habitat conservation strategy benefits this species
- Protect or restore water quality and inflow volume for key foraging areas (Pyramid Lake, Walker Lake, Humboldt River, and other large waterbodies and rivers in the Great Basin) in order to maintain healthy populations of prey fish

Research, Planning, and Monitoring Strategies

- Monitor water quality where declines in water quality may be occurring
- Collect and compile monitoring data from important foraging areas and intermittent colony areas outside of Pyramid Lake
- Conduct additional study on the possible population-level impacts of West Nile Virus and Type C Botulism

Public Outreach Strategies

- None identified

References: [1]GBBO unpublished Atlas data; [2]King and Anderson (2005); [3]Knopf and Evans (2004); [4]Kushlan et al. (2002); [5]Murphy (2005); [6]Murphy and Tracy (2005); [7]Nevada Wildlife Action Plan Team (2006); [8]Rocke et al. (2005); [9]Scoppettone et al. (2006); [10]Anaho Island NWR data; [11]Wiemeyer and Saake (2007); [12]Yates (1999a); [EO]Expert opinion

Least Bittern

Ixobrychus exilis

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Marsh (Mojave Lowland Riparian)	
Key Habitat Parameters ◑	
Plant Composition	Cattail, bulrush, sedges
Plant Density	Dense emergent vegetation[7]
Mosaic	Shallow marsh with moderate to high stem density of emergent vegetation, interspersed with open water and woody vegetation; approximately equal proportion of open water and emergent vegetation[7]
Water Depth	At nest, 8 – 96 cm [3 – 37 in]; for foraging, < 60 cm [23 in][7]
Hydrology	Minimal daily fluctuation in stage probably preferred [EO]
Response to Vegetation Removal	Negative [EO]
Area Requirements ○	
Minimum Patch Size	2 – 6 ha [5 – 15 ha][10]
Recommended Patch Size	> 10 ha [25 ac][9]
Home Range / Territory Size	Unknown; home range at least 2 ha [5 ac] in other regions[1]

Conservation Profile

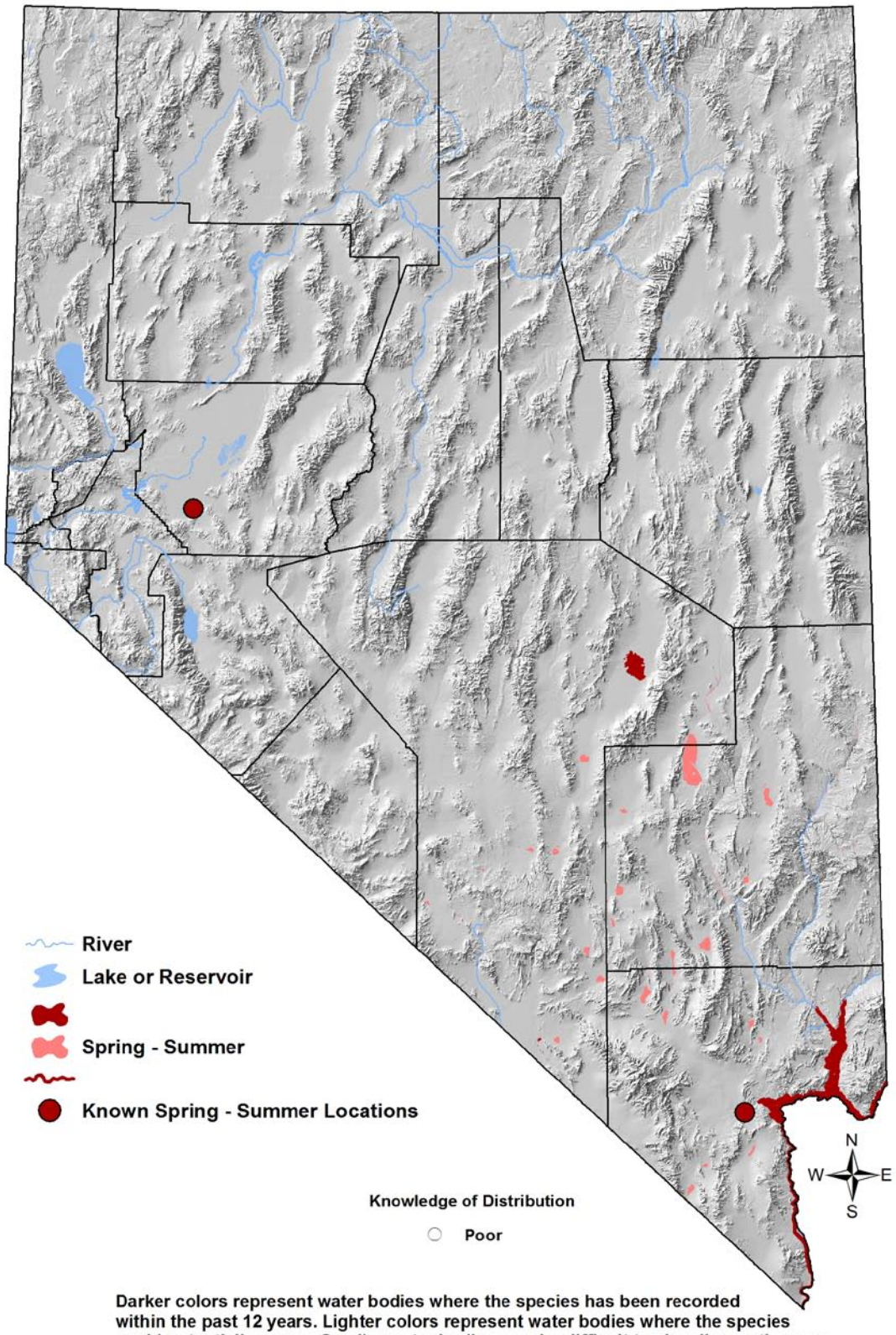
Priority Status	
Conservation Priority Species	
Species Concerns	
Habitat threats Restricted habitat Possible declines Small population size	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S2b
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Waterbird Plan	Moderate Concern
Other	Covered by Lower Colorado River MSCP[6]
Trends	
Historical ○	Unknown, but declines probable[7]
Recent ○	Unknown, possible declines[7]
Population Size Estimates	
Nevada ○	Unknown
Global ○	Unknown
Percent of Global	Unknown
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	Secretive-marshbird surveys by BOR, SNWA, and others
Coverage in NV	Unknown
Key Conservation Areas	
Protection	Muddy and Virgin Rivers, Ash Meadows NWR, Henderson Bird Viewing Preserve, Las Vegas Wash, Pahranagat NWR, Lahontan Valley
Restoration	Degraded Mojave region marshes

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer Possibly Year-round and Migration	
Known Breeding Dates in Nevada	
May – August, possibly earlier[7]	
Nest and Nesting Habits	
Nest Placement	Platform in emergent or adjacent woody cover 15 – 76 cm [6 – 30 in] above water; less than 10 m [33 ft] from open water[7]
Site Fidelity	Unknown
Food Habits	
Basic	Ambush predator and prober
Primary Diet	Small fish, aquatic invertebrates[7]
Secondary Diet	Crustaceans, small mammals, plant material, eggs[7]

Least Bittern

Ixobrychus exilis



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Least Bittern

Ixobrychus exilis

Overview

Secretive marshbirds like the Least Bittern are generally not detected by multi-species survey and inventory protocols. For this reason, we are only now beginning to understand the distribution of Least Bitterns in Nevada. The Nevada Breeding Bird Atlas project[4] confirmed earlier evidence of breeding in Lahontan Valley (at Carson Lake, with the earlier reports also including Stillwater NWR), and found evidence of likely breeding at Overton WMA and Pahranagat NWR. Other areas with confirmed breeding include wetlands along the Virgin and Muddy Rivers, the Henderson Bird Viewing Preserve, and the Las Vegas Wash restoration area, where Least Bitterns have been regular breeders since at least 2006 [2, 8, 10] (D. VanDooremolen, *pers. comm.*). Although Least Bitterns are likely breeders at Pahranagat NWR (based on atlas observations and old records), no recent breeding confirmation has been obtained (C. Tomlinson, *pers. comm.*). Ruby Valley also has old breeding records, but no recent confirmations. These findings suggest a very spotty breeding distribution, but as with other secretive marshbirds, it is likely that there are breeding locations in the state that are yet to be identified. The Least Bittern is also known or suspected to use Nevada during migration and winter,[5] but there are no data available that pinpoint key locations during the non-breeding seasons.

It has been suggested that Least Bitterns have fairly narrow habitat requirements, and further study is needed to quantify key habitat parameters, so that resource managers can adjust conservation strategies to be maximally effective. Now that a survey protocol has been developed specifically for secretive marshbirds,[3] it is also a high priority to implement this protocol in areas where Least Bitterns could potentially occur. SNWA and BOR are already beginning to perform these surveys, and it would be beneficial if they were implemented in wider areas of the state and into the migration and winter seasons in southern Nevada.

Abundance and Occupancy by Habitat

- ~ 1 bird / ha [0.4 / ac] in suitable marshes along the Lower Colorado River[7]

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Loss or degradation of marshes due to water diversions, declines in water quality, or development

- Water fluctuations during breeding season[7]
- Possible effects of selenium accumulation [EO]

Research, Planning, and Monitoring Challenges

- Least Bitterns require specific survey methods[3] because of their secretive habits
- Distribution and seasonal use patterns in Nevada are incompletely known
- Specific habitat parameters remain to be quantified

Conservation Strategies

Habitat Strategies

- The Marsh (p. Hab-9-1) habitat conservation strategy benefits this species
- Protect water inflows and water quality for known or likely breeding, migration, and wintering marshes
- Maintain consistent water stage in known breeding sites during nesting season (estimated to be 1 May – 15 July)
- Discourage development and disturbances in or near known breeding locations
- Conduct marsh restoration projects where feasible within the Least Bittern's known or likely range

Research, Planning, and Monitoring Strategies

- Inventory known and likely breeding, migration, and wintering sites using the secretive marshbird survey protocol developed by Conway[3]
- Conduct studies to better determine specific preferred habitat parameters
- Investigate possible impacts of accumulated selenium
- Monitor water quality in occupied sites

Public Outreach Strategies

- None identified

References: [1]Bogner and Baldassare (2002); [2]Braden et al. (2009); [3]Conway (2009); [4]Floyd et al. (2007); [5]Ivey and Herziger (2006); [6]LCRMSCP (2004); [7]Poole et al. (2009); [8]Rathbun and Braden (2003); [9]Shuford and Gardali (2008); [10]Southern Nevada Water Authority, unpublished Las Vegas Wash survey data (2010); [EO] Expert opinion

Snowy Egret

Egretta thula

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada
Marsh Great Basin and Mojave Lowland Riparian (Agriculture) (Open Water)

Key Habitat Parameters ●	
Plant Composition	Cottonwoods, willows, Russian olive, cattail, bulrush, sedges
Plant Density & Size	Nesting: Large cottonwoods, large willow patches, or very dense emergent vegetation; Foraging: marsh vegetation of intermediate density[7]
Mosaic	Large groves of riparian trees or willows located near a large marsh and waterway[7, EO]
Water Depth	< 20 cm [8 in] for foraging[7]
Hydrology	No known relationship; more vulnerable to mercury in drought years[2, 3]
Response to Vegetation Removal	Negative [EO]

Area Requirements ◑	
Minimum Patch Size	Unclear; uses marshes of different sizes for foraging, but probably requires large habitat patches for nesting [EO]
Recommended Patch Size	> 150 ha [370 ac] of riparian – marsh complex [EO]
Home Range	~ 500 ha [1,240 ac] [EO]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and possible recent declines Habitat threats Small population size	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S4B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Waterbird Plan	High Concern
Trends	
Historical ●	Rangewide declines, followed by increases[7]
Recent ○	Declining regionally,[4] but increasing rangewide[5]
Population Size Estimates	
Nevada ◑	~ 600, with high annual variability[6]
Global ◑	143,000 [5]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	Nevada Colonial Waterbird Inventory, NDOW aerial surveys, NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	All major rivers, Lahontan Valley
Restoration	Degraded riparian – marsh complexes along major rivers

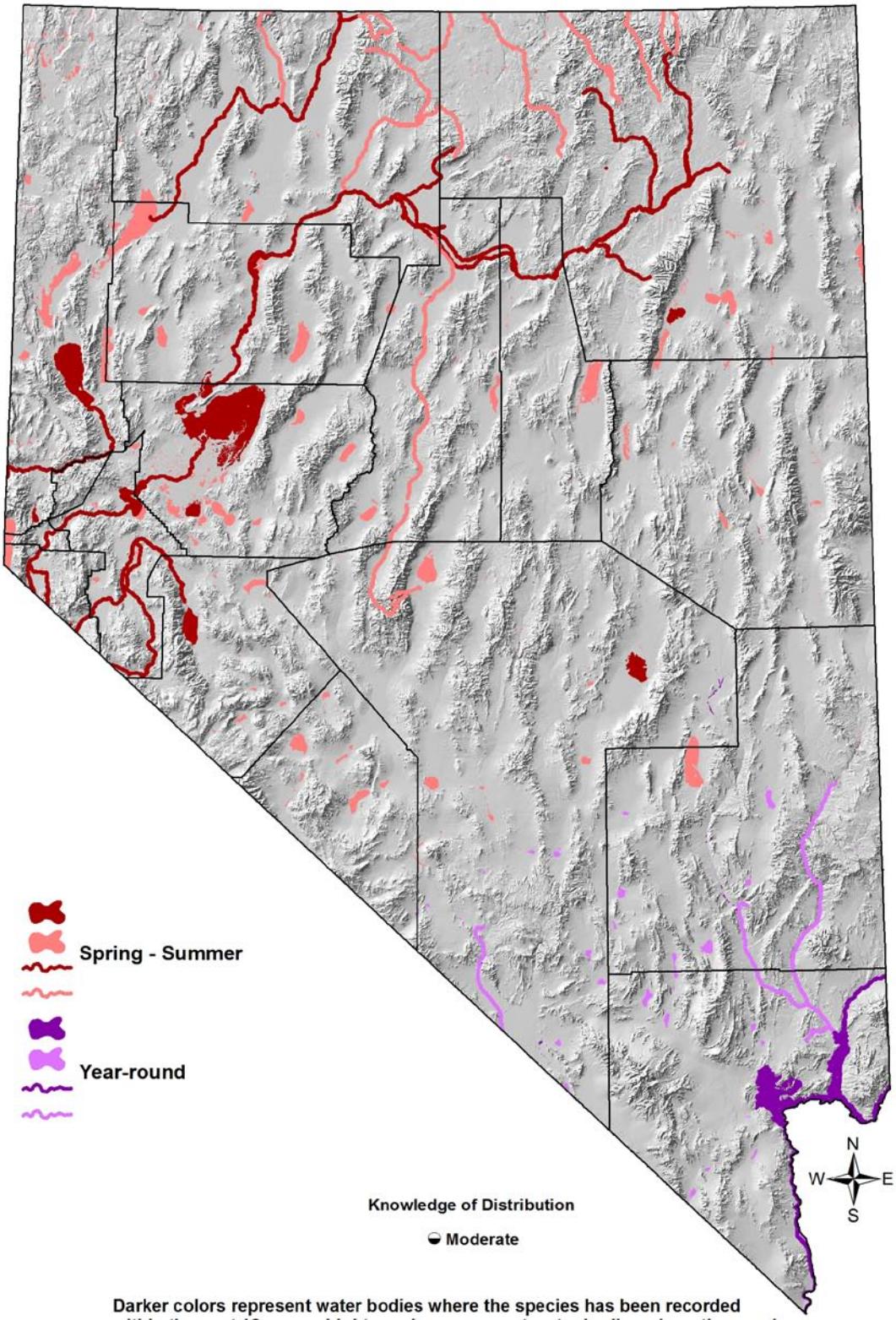
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer (Great Basin) Year-round (Mojave)	
Known Breeding Dates in Nevada	
April – early June[1]	
Nest and Nesting Habits	
Nest Placement	Platform nests in trees or thickets[7]
Site Fidelity	High for colony site[7]
Other	Highly colonial nester in mixed or single species colonies, may re-use nests[7]
Food Habits	
Basic	Ambush predator
Primary Diet	Fish, crustaceans, aquatic invertebrates[7]
Secondary Diet	Small amphibian and terrestrial vertebrates[7]

Confidence in Available Data: ●High ◑Moderate ○ Low

Snowy Egret

Egretta thula



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Snowy Egret

Egretta thula

Overview

Snowy Egrets have a particularly complex regional pattern of population trends, and it is not clear how Nevada fits into these broader patterns. After serious historical declines related to feather harvesting for the millinery trade, the Snowy Egrets resurged in many areas, only to suffer new setbacks beginning in the late 20th century.[7] The most recent trend information is mixed and somewhat contradictory,[8] and it is further complicated by substantial annual population variations related to drought-cycles and precipitation patterns. Ivey and Herziger's[4] report of declines in the Intermountain West is probably reliable, but it is possible that trends within Nevada itself are more stable.[6] The ongoing Nevada Colonial Waterbird Inventory project being conducted by GBBO and NDOW as part of a regional USFWS colonial waterbird inventory initiative should significantly improve our knowledge of breeding colony locations and population size, but further work to determine Nevada trends is merited. In addition, it would be helpful to determine key areas in Nevada for migrating and wintering Snowy Egrets. Limited data from the Nevada Aquatic Bird Count suggest that the Lake Mead area, the Virgin River, and Ash Meadows NWR are important in this respect.

Abundance and Occupancy by Habitat

- Most recent ten-year peak for Lahontan Valley was 1,000 birds in 2004 (L. Neel, *pers. comm*.)

Nevada-Specific Studies and Analyses

Mercury – Drought Studies on the Lower Carson River

The complexity of the factors controlling population stability and reproductive output in Snowy Egrets is well illustrated by studies conducted by Henny et al.[2] and Hill et al.[3] The Carson River carries high levels of mercury as a result of historical upstream mining operations. These coordinated ten-year studies on the lower Carson River and Lahontan Reservoir revealed that mercury exposure had a negative impact on reproductive success in Snowy Egrets, but only during drought years when water levels were low. Impacts were much smaller during high-water years.

Main Threats and Challenges

Habitat and Other Threats

- Loss or degradation of lowland riparian and marsh habitats due to:
    - Habitat conversion
    - Water diversions
    - Sustained livestock grazing

  - Invasive plants
  - Altered hydrology that prevents effective recruitment of cottonwoods
- Prolonged droughts
- Mercury contamination, particularly along the Carson River system during drought years[2,3]

Research, Planning, and Monitoring Challenges

- Population trend for Nevada populations is unknown
- Winter and migration distribution within Nevada is poorly documented

Conservation Strategies

Habitat Strategies

- Marsh (p. Hab-9-1), Great Basin Lowland Riparian (p. Hab-7-1), and Mojave Lowland Riparian (p. Hab-11-1) habitat conservation strategies benefit this species
- Manage emergent marshes in known or potential breeding locations to ensure sufficient water inflows and sufficient stem densities for platform nests during the nesting period (1 May – 15 July)
- River restoration projects have the potential to create large areas of suitable habitat for Snow Egrets
- Ensure that riverine marshes near egret rookeries support fish populations throughout the breeding season, at least during most years

Research, Planning, and Monitoring Strategies

- Continue the Nevada Colonial Waterbird Inventory, Aquatic Bird Count, or other similar efforts to better document breeding distribution, numbers, and Nevada trends
- Conduct surveys outside of the breeding season to identify key areas for wintering and migrating Snowy Egrets
- Include plans for the creation of suitable colony nesting and foraging habitat as part of river restoration projects

Public Outreach Strategies

- None identified

References: [1]GBBO unpublished Atlas data; [2]Henny et al. (2007); [3]Hill et al. (2008); [4]Ivey and Herziger (2006); [5]Kushlan et al. (2002); [6] Nevada Wildlife Action Plan Team (2006); [7]Parsons and Master (2000); [8]Sauer et al. (2008); [EO] Expert opinion

White-faced Ibis

Plegadis chihi

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Marsh Wet Meadow Agriculture	
Key Habitat Parameters ●	
Plant Composition	Cattail, bulrush, sedges, pasture grasses, hay crops, willows, salt cedar
Plant Density	Nesting: Dense emergent vegetation or flooded shrub thickets; Foraging: Moderately dense, flooded wet meadow or agricultural vegetation[6]
Mosaic	Shallow marsh with emergent vegetation, < 6 km [3.7 mi] from flooded agricultural fields or wet meadows;[6, EO] population requires both core and peripheral breeding sites distributed over a large area[1]
Water Depth	< 30 cm [12 in] for foraging [EO]
Hydrology	Requires flooded conditions in foraging areas[6]
Response to Vegetation Removal	Negative in nesting site [EO]
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	> 1,200 ha [2,960 ac][6, EO]
Home Range / Territory Size	Unknown

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Unknown population trend Habitat threats Possible high stewardship responsibility	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S3B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Waterbird Plan	Moderate Concern
Trends	
Historical◑	Significant declines[6]
Recent ○	Unknown, but possibly declining
Population Size Estimates	
Nevada ◑	~ 5,000 – 6,000 with high annual variability[3, 5, EO]
Global ○	> 100,000 [4]
Percent of Global	< 10%
Population Objective	
Increase by 20% [EO]	
Monitoring Coverage	
Source	Nevada Colonial Waterbird Inventory, NDOW aerial surveys and Lahontan Valley counts, NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Lahontan and Ruby Valleys, Humboldt River system
Restoration	Degraded marshes and wet meadows

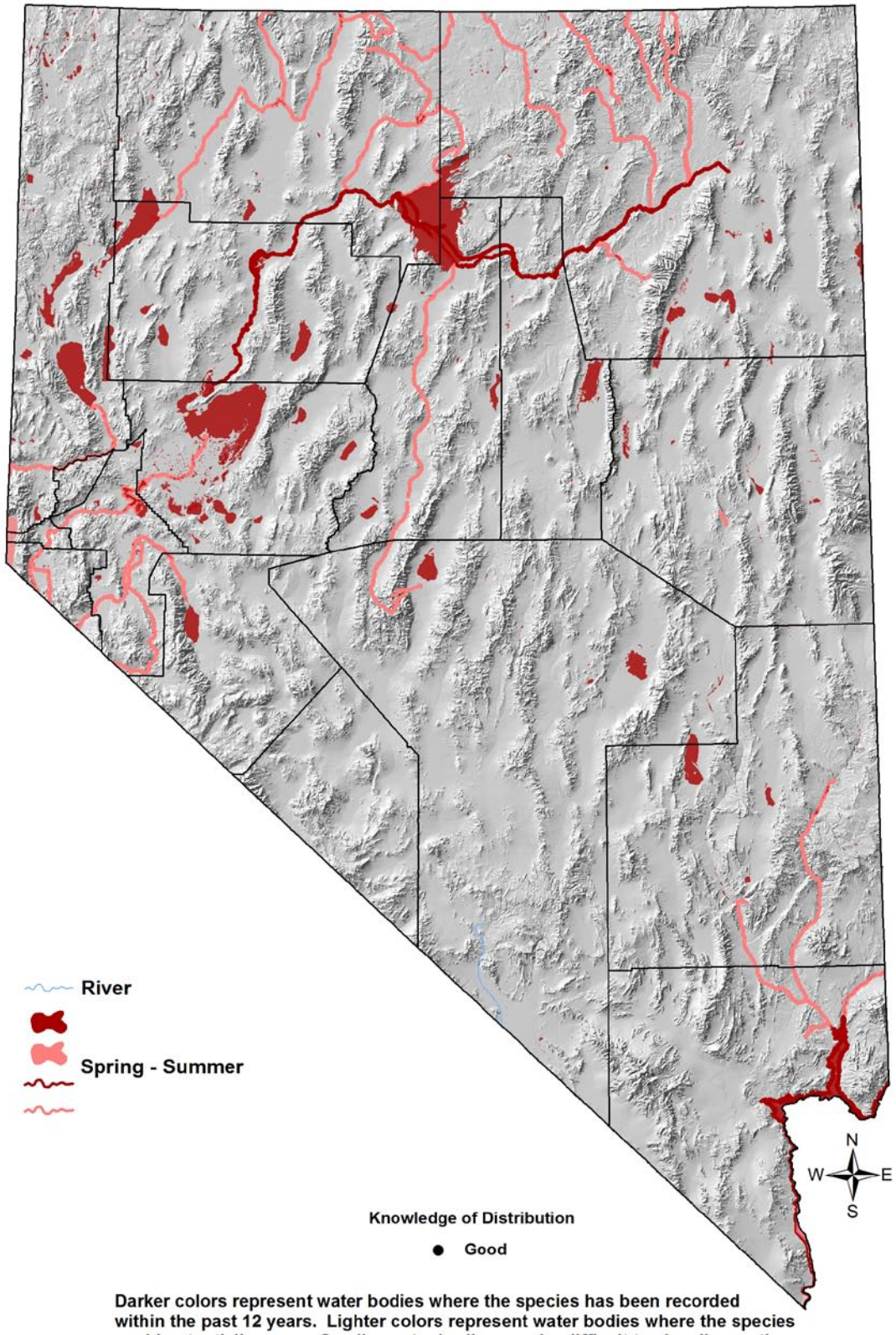
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
May – July[2]	
Nest and Nesting Habits	
Nest Placement	20 – 50 cm [8 – 20 in] above water in tall emergent vegetation or flooded shrubs[6]
Site Fidelity	High for colony site[6]
Other	Highly colonial nester[6]
Food Habits	
Basic	Prober
Primary Diet	Benthic, aquatic, and soil invertebrates[6]
Secondary Diet	Small vertebrates[6]

Confidence in Available Data: ●High ◑Moderate ○ Low

White-faced Ibis

Plegadis chihi



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

White-faced Ibis

Plegadis chihi

Overview

Determining the population trend and conservation status of the White-Faced Ibis in Nevada is surprisingly difficult considering that it is a fairly common and easily detected species. White-faced Ibises have suffered significant historical declines due to habitat loss and pesticides, but staged a strong recovery beginning in the 1980s.[1,3,6] Until recently, it appeared that ibis numbers had stabilized in Nevada (subject to normal precipitation-driven fluctuations),[5] but more recent data suggest the possibility of a renewed declining trend. Evidence comes primarily from Lahontan Valley, the White-faced Ibis's breeding stronghold in the state. The current ten-year average count for Lahontan Valley is 4,200 birds, substantially lower than the three-year average reported in 1999 (12,200),[3] the five-year average reported in 2000 (11,300; L. Neel pers. comm.), and far below the peaks reported in the 1980s and early 1990s.[1,6] If the species is indeed declining in Nevada, this would contrast with the regionally-reported trend towards increases or stability over the past few decades.[6]

Determining whether recent counts indicate a real population decline, or represent an extended, precipitation-driven fluctuation, is a high priority. The ongoing Nevada Colonial Waterbird Inventory project being conducted by GBBO and NDOW as part of a regional USFWS colonial waterbird inventory initiative should help in this regard. However, White-faced Ibises are nomadic during their seasonal tenure in Nevada, and they are known to shift colony sites flexibly based on local conditions[1,3] (L. Neel, *pers. comm*.), which can complicate monitoring efforts and add an additional element of uncertainty to population and trend estimates.

Abundance and Occupancy by Habitat

The current population estimate is based on a 10-year average of Lahontan Valley counts, plus an estimated 800 birds in Ruby Valley and elsewhere in Nevada. Densities of 75 – 150 nests / ha [30 – 60 / ac] have been recorded at Carson Lake and Lahontan Valley.[6]

Nevada-Specific Studies and Analyses

Earnst et al.[1] conducted a detailed analysis of White-faced Ibis monitoring and inventory data from the Great Basin for the 1985 – 1997 time period. Data from different states, including Nevada, were broken out separately in their presentation. During the period analyzed, ibis numbers nearly tripled, a phenomenon that appeared to be partly, though not completely, explained by annual precipitation patterns. The authors discussed the nomadic habits of the White-faced Ibis as an adaptive strategy to cope with shifting resource availability, and introduced the concepts of core and peripheral breeding areas, both of which are needed for long-term population health and persistence.

White-faced Ibis

Plegadis chihi

Main Threats and Challenges

Habitat and Other Threats

- Loss or degradation of marsh and wet meadow habitat due to water diversions, declines in water quality, or development
- Water level fluctuations during nesting may cause nest failure[6]
- Changes in traditional flood irrigation practices in or near critical nesting areas, which reduces foraging opportunities
- Human disturbance at colony sites can cause nest abandonment[3]
- White-faced Ibises are susceptible to avian botulism[3,5]

Research, Planning, and Monitoring Challenges

- Current population trends in Nevada are not known
- White-faced Ibises are challenging to monitor because of high annual variability and frequent nomadic movements within and among years
- Patch size requirements need further study

Conservation Strategies

Habitat Strategies

- Marsh (p. Hab-9-1), Wet Meadow (p. Hab-20-1), and Agriculture (p. Hab-1-1) habitat conservation strategies benefit this species; also, Ivey et al.[7] provide additional conservation strategies for Great Basin populations
- Protect marshes near wet meadows and flood-irrigated agricultural fields from water diversions and development
- Maintain water levels in breeding sites during the nesting period (1 May – 15 July)
- Protect colony sites from human disturbance

Research, Planning, and Monitoring Strategies

- Explore existing data, collect additional data, and conduct studies to determine population status of White-faced Ibises in Nevada
- Continue the Nevada Colonial Waterbird Inventory, Aquatic Bird Count, or other similar efforts to better document breeding distribution, numbers, and Nevada trends
- Investigate patch size requirements
- Assess whether both core breeding sites and a network of peripheral sites[1] are healthy and adequately protected

Public Outreach Strategies

- Encourage traditional practices in agricultural areas within known range, including flood irrigation

References: [1]Earnst et al. (1998); [2]GBBO unpublished Atlas data; [3]Ivey and Herzinger (2006); [4]Kushlan et al. (2002); [5]Nevada Wildlife Action Plan Team (2006); [6]Ryder and Manry (1994); [7]Ivey et al. (2004); [EO] Expert opinion

Bald Eagle

Haliaeetus leucocephalus

Photo by Wendy Francis

Habitat Use Profile

Habitats Used in Nevada	
Open Water Great Basin (and Mojave) Lowland Riparian (Coniferous Forest) (Agriculture)	
Key Habitat Parameters ●	
Plant Composition	Pines, spruces, fires, cottonwoods. Conifers preferred as winter roost sites[1], but deciduous trees also used
Plant Density, Size	Nests placed in trees ~ 20 – 60 m [60 – 200 ft] high and 50 – 190 cm [20 – 75 in] DBH; usually a tree larger than its neighbors[1]. Winter roost trees usually 30 – 100 cm [12 – 40 in] DBH, 15 – 60 m [50 – 200 ft] high[1]
Mosaic	Nest trees usually in open canopy area and/or near forest edge[1]
Distance to Water	Nests in tree close to lake, river, or other water body, usually < 2 km [1 mile][1]
Other	Summer and winter habitat similar, but in winter, roost sites that provide shelter from weather exposure important[1]
Area Requirements ◑	
Minimum Patch Size	300 km^2 [74,000 ac] in winter[1]
Recommended Patch Size	> 500 km^2 [120,000 ac] in winter[EO]
Home Range / Territory Size	5 – 20 km^2 [1,200 – 4,800 ac] home range in breeding season; ~ 300 km^2 [74,000 ac] in winter. Typical territory size ~ 1 – 2 km^2 [250-500 ac][1]

Conservation Profile

Priority Status	
Special Status Species	
Species Concerns	
Historical declines	
Other Rankings	
Continental PIF	Stewardship Species
Audubon Watchlist	None
NV Natural Heritage	G5, S1B, S3N
USFWS	Eagle Act, Migratory Bird, Bird of Conservation Concern
BLM	None
USFS	Sensitive Species
NDOW	Conservation Priority
Trends	
Historical ◑	Substantial declines regionally and in Nevada[1]
Recent ◑	Stable/increasing regionally and in Nevada[1, 5]
Population Size Estimates	
Nevada ●	~ 10 breeders[3, 4]; > 120 wintering birds[1]
Global ●	330,000 [4]
Percent of Global	< 1 %
Population Objective	
Maintain / Increase[7, EO]	
Monitoring Coverage	
Source	NDOW winter raptor surveys, USFS and USFWS breeding surveys
Coverage in NV	Good for breeding
Key Conservation Areas	
Protection	Lake Tahoe Basin; Carson River; known winter roost sites
Restoration	Potential winter roost sites near all open water

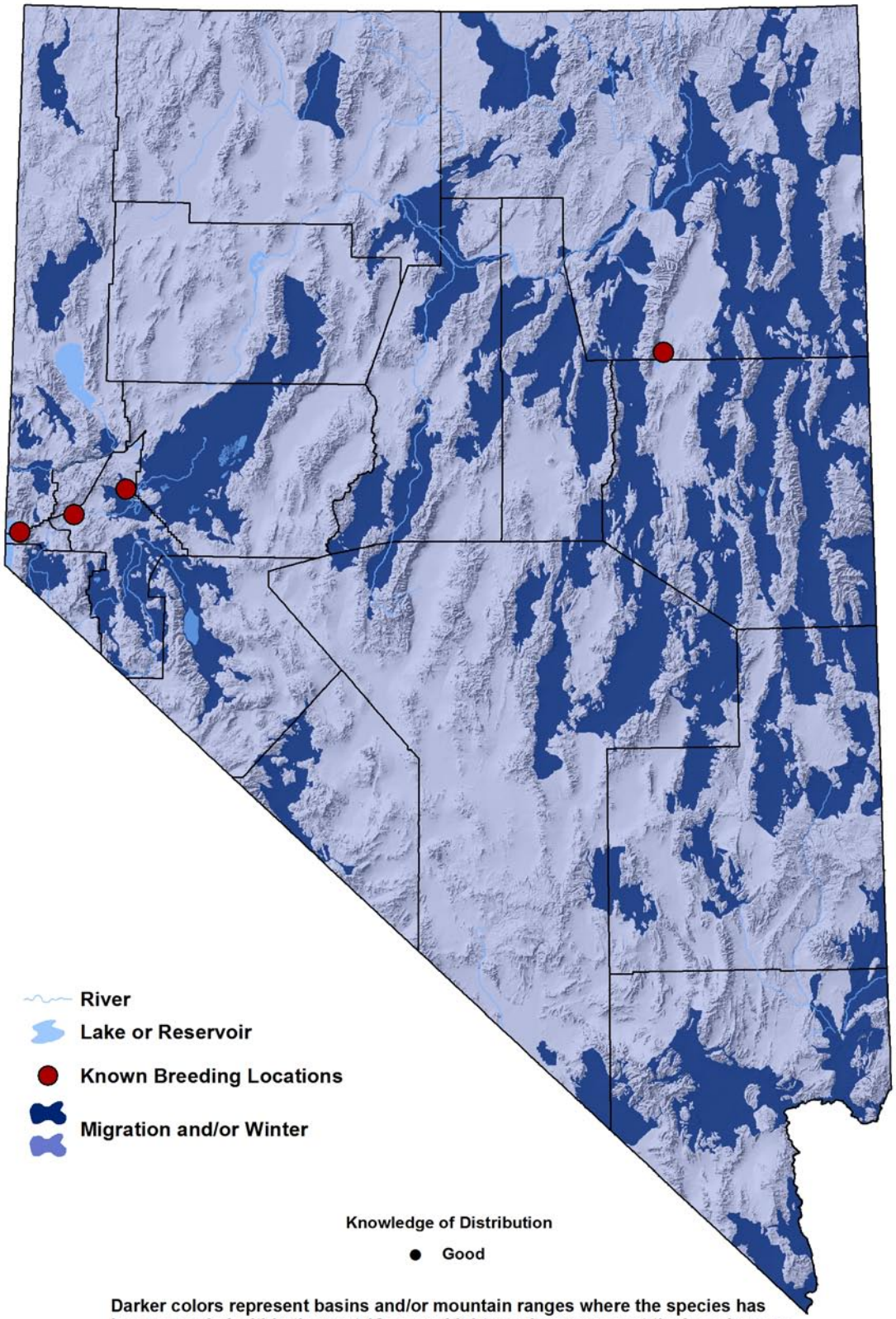
Natural History Profile

Seasonal Presence in Nevada	
Winter; small Spring-Summer breeding population	
Known Breeding Dates in Nevada	
Early May – August[1, 2]	
Nest and Nesting Habits	
Nest Placement	Platform stick nests in large trees (cliffs more rarely) near large water body, usually > 500 m from human development[1]
Site Fidelity	High for breeding sites and winter roosts[1]
Food Habits	
Basic	Predatory; hunts from air, scavenger, food pirate
Primary Diet	Fish (34-38 cm [13-15 in] length preferred during breeding season)[1]
Secondary Diet	Carrion, waterfowl, small mammals[1]

Confidence in Available Data: ●High ◑Moderate ○ Low

Bald Eagle

Haliaeetus leucocephalus



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Bald Eagle

Haliaeetus leucocephalus

Overview

Bald Eagles inhabit Nevada primarily during the winter. A small breeding population was detected in the state in the mid 1980s and continues to be present, following more than a century in which no Nevada breeding was recorded.[8] However, breeding activity in Nevada is likely still more restricted (and irregular) than it was in the early 19th century -- historical accounts exist of nesting Bald Eagles in several locations (such as Anaho Island in Pyramid Lake) that are no longer used.[8] Given current management practices, it is possible that Nevada's nesting population will slowly increase over the coming years.

In winter, roost sites (each often hosting several eagles) are often located near lakes and reservoirs that are large enough to remain unfrozen. However, eagles sometimes forgo proximity to water in exchange for roost sites offering good protection from weather extremes. An informal review of current information suggests many of Nevada's wintering Bald Eagles are not, in fact, located in immediate proximity to water bodies. For instance, in northeastern Nevada, mixed species roost sites with both Bald and Golden Eagles are found in high-elevation coniferous forests (P. Bradley *pers. comm.*), where they have been reported to prey primarily upon jackrabbits.[8] There are also reports of Bald Eagles wintering in proximity to agricultural areas where they opportunistically feed upon calving afterbirth.[3]

The Bald Eagle is regarded as a Special Status species in this plan based upon its recent de-listing in 2007. Despite modest declines in Nevada's wintering population in the 1990s,[6] current trends appear to be stable or slightly positive. As might be expected given its iconic status, Bald Eagles in Nevada are generally well-monitored and closely managed. One important monitoring objective for the species, however, is to develop a thorough inventory of Bald Eagle winter roost sites.

Abundance and Occupancy by Habitat

No information

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Loss of suitable nest and roost trees or forest patches in proximity to large water bodies

Bald Eagle

Haliaeetus leucocephalus

- Human activity close to nest sites and winter roosts can cause nest or roost abandonment or interfere with required activity patterns; it may also prevent eagles from attempting to breed in otherwise suitable locations[1]
- Bio-accumulated mercury from fish or exposure to other pesticides may interfere with reproduction or cause direct mortality[1, 3]

Conservation Strategies

Established Strategies

- USFS Lake Tahoe Basin Management Unit (http://www.fs.fed.us/r5/ltbmu/) guidelines prohibit logging, human disturbance, and use of chemicals toxic to eagles within a primary zone of ~ 100 m [330 ft] around nest sites, and less stringent restrictions within a secondary zone of at least 200 m [660 ft] around nest sites

Habitat Strategies

- Open Water (p. Hab-15-1) and Great Basin Lowland Riparian (p. Hab-7-1) habitat conservation strategies benefit this species
- In areas near known nest sites, several large trees (especially known nest trees) in proximity to large water bodies with large fish should be left intact
- Tree removal should be restricted or closely supervised in known winter roost areas
- Restrict human disturbances and pesticide use near nest sites per current USFS guidelines
- Manage recreational use of lakes and reservoirs to prevent undue disturbance of nest sites and actively used foraging areas
- Monitor and, if necessary, manage human disturbance in proximity to winter roost sites

Research, Planning, and Monitoring Strategies

- Conduct a thorough inventory of winter roost sites, coordinated with the Midwinter Bald Eagle Survey[7]

Public Outreach Strategies

- Conduct additional outreach to private landowners that have stewardship over winter roost sites or potential breeding sites to encourage appropriate land use practices
- Support ongoing outreach efforts, such as the annual Eagles and Agriculture Festival in Gardnerville

References: [1]Buehler (2000); [2]Nevada Breeding Bird Atlas unpublished data; [3]Nevada Wildlife Action Plan Team (2006); [4]Rich et al. (2006); [5]Sauer et al. (2008); [6]Steenhof et al. (2002); [7]Steenhof et al. (2008); [8]U.S. Fish and Wildlife Service (1986); [EO] Expert opinion

Northern Goshawk

Accipiter gentilis

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Aspen Coniferous Forest (Pinyon-Juniper) (Springs)	
Key Habitat Parameters ●	
Plant Composition	Aspen, mixed coniferous trees, sagebrush, willows, montane shrubs
Plant Density & Size	Nests in mature tree stands (usually aspen) with ≥ 60% canopy closure; nest trees 10 – 15 m [33 – 50 ft] tall[3, 12]
Mosaic	Mature aspen stands surrounded by undisturbed coniferous forest and/or montane shrubland for foraging[7, 12]
Distance to Water	Close to water[3, 12]
Response to Vegetation Removal	Negative[EO]
Area Requirements ●	
Minimum Patch Size	Aspen stand: ≥ 0.8 ha [2 ac], at least 180 m [600 ft] long, 23 m [75 ft] wide[3]
Recommended Patch Size	> 3,500 ha [8,700 ac] including foraging areas [12]
Home Range	570 – 3,500 ha [1,400 – 8,700 ac][12]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Restricted habitat Small population size Possible recent declines Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S2
USFWS	Migratory Bird
BLM	Sensitive Species
USFS	Sensitive Species
NDOW	Conservation Priority
Trends	
Historical ○	Unknown in the West
Recent ◑	In Nevada, information mixed, but recent declines possible[3, 5, 6 ,EO]
Population Size Estimates	
Nevada (NBC) ◑	700 [3]
Global ◑	580,000 [8]
Percent of Global	< 1%
Population Objective	
Maintain / Increase[EO]	
Monitoring Coverage	
Source	USFS, NDOW raptor surveys, Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Carson, Jarbidge, Schell Creek, Snake, Toiyabe, Monitor, Bull Run, Independence, Ruby, and East Humboldt ranges
Restoration	Degraded Great Basin aspen stands

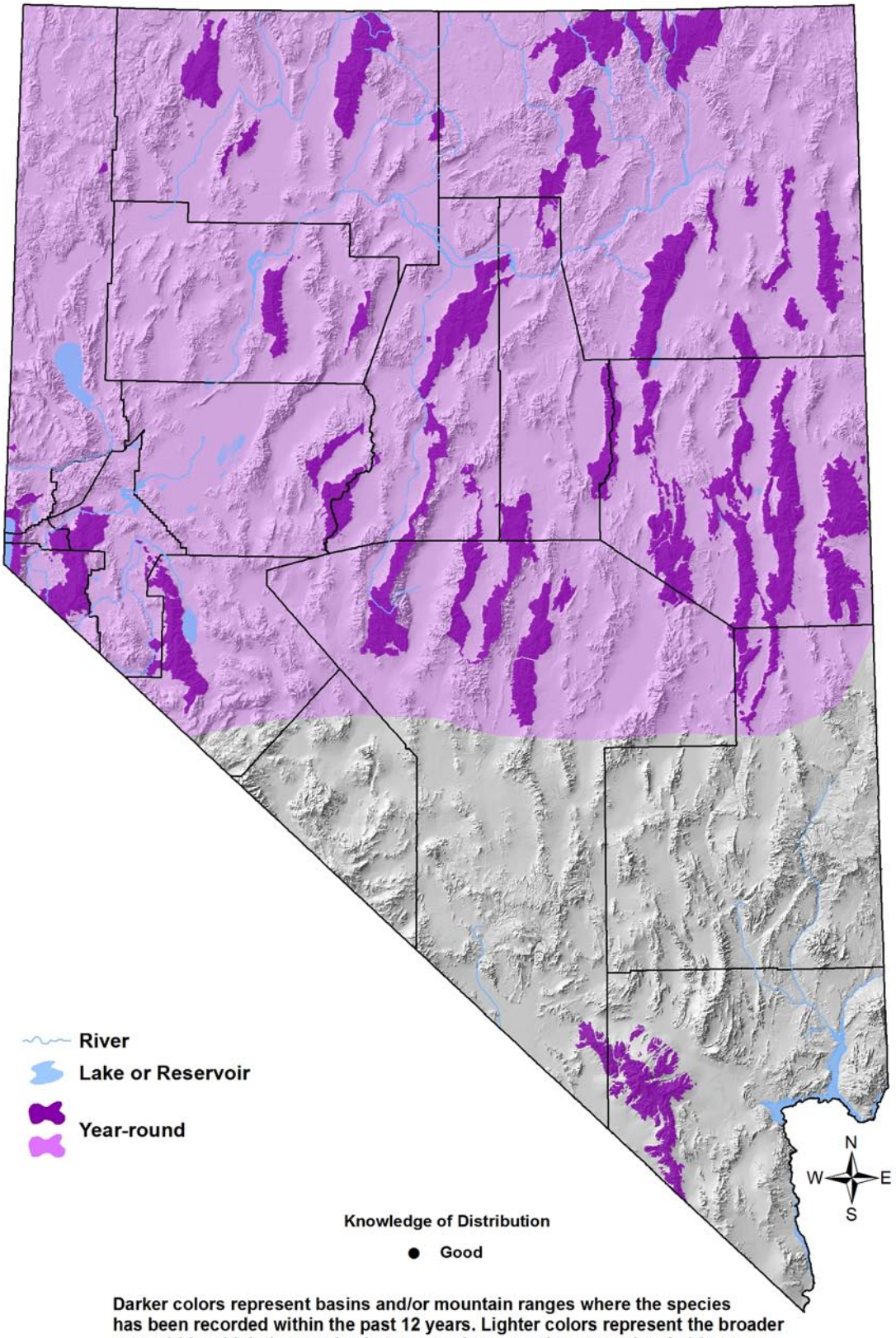
Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
Early April – August[1, 12]	
Nest and Nesting Habits	
Nest Placement	In large top branches of mature tree [9, 12]
Site Fidelity	High for nesting area[EO]
Other	Multiple alternate nests used within stand[12]
Food Habits	
Basic	Aerial predator
Primary Diet	Small to medium sized mammals and birds[12]
Secondary Diet	n/a

Confidence in Available Data: ●High ◑Moderate ○ Low

Northern Goshawk

Accipiter gentilis



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Northern Goshawk

Accipiter gentilis

Overview

Although the Northern Goshawk is not a priority species in most regional or national conservation plans, they are a definite conservation priority in Nevada, particularly on USFS lands in the Sierra Nevada, where detailed management guidelines have been developed.[7,14] Concern for goshawks in Nevada is related to their strong association with aspen woodlands, which are limited in extent and subject to many threats (p. Hab-3-1), and recent data suggest that the species is declining.[5] There has also been a wider regional conservation concern for goshawks since at least the 1990s, when an unsuccessful attempt was made to list the bird under the ESA.[3]

Unlike some other raptors, goshawks do not appear to select nesting areas based on prey abundance, but rather based on forest structure.[2] Goshawks in Nevada usually nest in mature aspen stands (or less commonly, coniferous stands) with trees large enough to support their substantial stick nest.[16] This association with aspen in Nevada is somewhat unique, for in most other parts of the West, goshawks more typically nest in coniferous forest.[12] It should be noted that there are at least two recent reports of goshawk nests in pinyon-juniper woodlands (Kathleen Johnson and Adam Ryba, *pers. comm.*), and the possibility that this occurs more widely should be further explored. Current information regarding the need for understory cover within aspen nesting habitat is somewhat contradictory and needs to be clarified. Winter habitat use is also poorly understood, but preliminary data on immature birds suggest that they wander within a radius of about 150 km [95 miles] during the post-breeding season.[11]

Nevada's aspen stands are at significant risk of decline and loss, and therefore a conservation strategy to promote the health and persistence of aspen stands is probably the most beneficial strategy for Northern Goshawks in Nevada.

Abundance and Occupancy by Habitat

- The NBC population estimate and the estimate provided by Herron[3] are in close agreement (~ 700 birds)
- In Nevada, there is usually a single pair per aspen patch.[3] There are usually < 5 pairs / 100 km^2 [25,000 ac][12]

Nevada-Specific Studies and Analyses

- NDOW aerial and ground surveys from 2000 – 2010[4] suggest population declines in eastern and southern Nevada, with more than half of historical nesting sites currently unoccupied by goshawks (Pete Bradley *pers. comm.*)
- In the Sierra Nevada region, the USFS conducts annual monitoring of historically occupied goshawk territories as well as surveys of potential habitat, using the *USFS Pacific Southwest Regional Survey Methodology for Goshawks*. [11] Detections and survey efforts are recorded in a national USFS database.

- Recent research in the Lake Tahoe Basin highlights the effects of anthropogenic disturbance and provides guidance on how to prioritize territory locations for restoration. [4]

Main Threats and Challenges

Habitat and Other Threats

- Loss or degradation of mature aspen stands, which may be caused by:
  - Livestock or other ungulate grazing and browsing that prevents stand regeneration or removes understory vegetation
  - Tree pathogens or Aspen Decline Syndrome (p. Hab-3-1)
  - Stand-wide fires that destroy suitable nesting trees (although less intense fires may stimulate regeneration)
  - Invasion and eventual replacement of aspen stands by conifers
- Illegal take of eggs or nestlings for falconry
- Human recreational activity in proximity to nest sites may be detrimental

Research, Planning, and Monitoring Challenges

- The importance of aspen understory integrity is not known
- It is possible that nesting occurs outside of aspen stands (i.e., in pinyon-juniper) more often than is currently realized
- It is not known whether or not West Nile Virus might be a significant source of mortality, as suggested by anecdotal reports
- The frequency and impact of illegal take of eggs or nestlings is currently unknown and should be investigated

Small aspen stand in western Nevada. Photo by John Boone.

Northern Goshawk

Accipiter gentilis

Conservation Strategies

Established Strategies

- Northern Goshawk management guidelines and standards for USFS lands in the Sierra Nevada region are specified in the *Sierra Nevada Framework Plan Amendment*. [14] This document recommends a two-year pre-project survey be conducted in suitable habitat to determine if goshawks are present. Occupied areas can be protected by specific strategies including limitations on land disturbance near nesting areas and during other critical time periods (15 April – 15 July)
- Reynolds et al.[7] provide detailed goshawk management guidelines for the southwest region, but these were primarily based on areas where goshawks nest in conifers

Habitat Strategies

- The Aspen (p. Hab-3-1) and Coniferous Forest (p. Hab-5-1) habitat conservation strategies, with emphasis on the following elements, benefit this species
- Protect aspen stands from levels of grazing and motorized recreation that prevent stand regeneration
- Allow regenerating burns to occur in stands where active or traditional nest sites are not at risk
- Remove conifers encroaching aspen stands where appropriate and feasible
- Retain intact, relatively undisturbed mosaics of suitable habitat (aspen stands of the recommended size and adjacent coniferous forest or shrubland) at the recommended patch size (< 3,500 ha [8,700 ac]) wherever possible
- Continue stringent restrictions on egg and nestling take until trends in Nevada are better quantified, and consider increased law enforcement during the nesting season

Research, Planning, and Monitoring Strategies

- Continue and broaden coverage by current monitoring programs to allow better determination of statewide trends
- Increase efforts to quantify nesting outside of aspen stands
- Study habitat requirements during the non-breeding season
- Investigate the scope and impact of illegal takes
- Investigate the susceptibility of Northern Goshawks to West Nile Virus and possible impacts
- Consider statewide implementation of the nationwide monitoring strategy that has been developed by the USFS [15] and applied in the Lake Tahoe Basin. [10]

continued

Conservation Strategies (continued)

Public Outreach Strategies

- None identified

References: [1]GBBO unpublished Atlas data; [2]Greenwald et al. (2005); [3]Herron (1999); [4]Morrison et al. (2010); [5]NDOW unpublished ground and aerial raptor survey data 2000-2010 (Pete Bradley pers. comm.); [6]Nevada Wildlife Action Plan Team (2006); [7]Reynolds et al. (1992); [8]Rich et al. (2004); [9]Shuford and Gardali (2008); [10]Slauson et al. (2008); [11]Smith (2000); [12]Squires and Reynolds (1997); [13]USFS (2000); [14]USFS (2001); [15]Woodbridge and Hargis (2006); [16]Younk and Bechard (1994); [EO] Expert opinion

Aspen patch in western Nevada. Photo by John Boone.

Swainson's Hawk

Buteo swainsoni

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Great Basin and Mojave Lowland Riparian Agriculture Sagebrush (Wet Meadow)	
Key Habitat Parameters ●	
Plant Composition	Fremont cottonwood, agricultural crops (especially alfalfa), perennial grasses, sedges and rushes, sagebrush and sagebrush-associated shrubs[2]
Plant Density	Sparse tree cover, or single old-growth cottonwoods; avoids dense forest stands[2]
Mosaic	Open riparian woodlands with significant expanses of pasture, agricultural fields, wet meadow, or open shrublands with grass cover in immediate vicinity[2]
Distance to Water	In Nevada, usually occurs close to riparian or other wet habitats[EO]
Response to Vegetation Removal	Negative to tree removal, otherwise response depends on prey populations[EO]
Area Requirements ◑	
Minimum Patch Size	Unknown; varies with prey density
Recommended Patch Size	> 10,000 ha [25,500 ac][EO]
Home Range	70 – 8,700 ha [170 – 21,500 ac] [9]

Conservation Profile

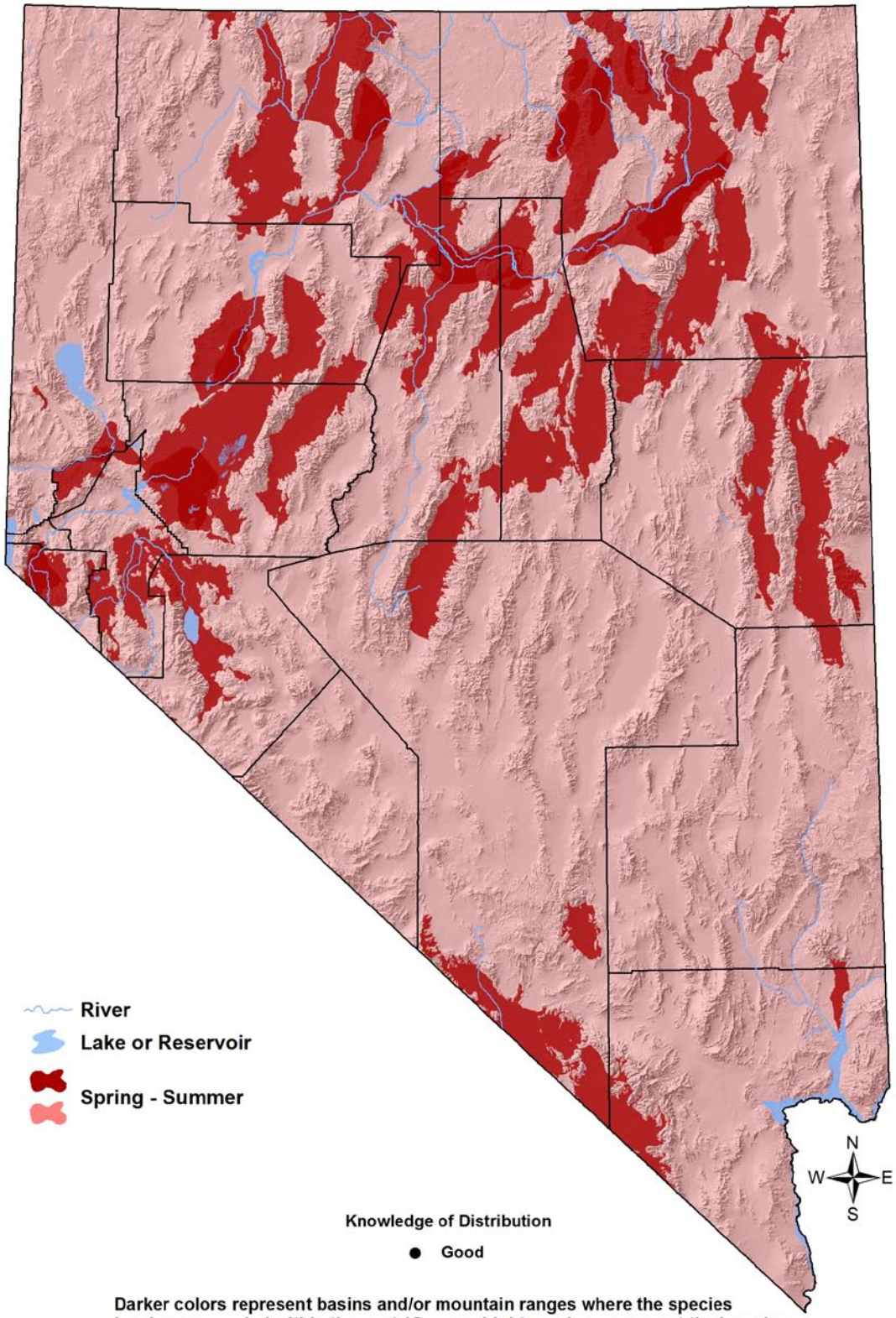
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and recent declines Small population size Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S2B
USFWS	Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
Trends	
Historical ●	Rangewide declines and range contractions[2]
Recent ◑	Probable declines[2, 7]
Population Size Estimates	
Nevada ○	~ 300 [7]
Global ◑	460,000 [10]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [7, EO]	
Monitoring Coverage	
Source	NDOW raptor surveys, Nevada Bird Count
Coverage in NV	Good / Fair
Key Conservation Areas	
Protection	Great Basin lowland riparian and agricultural habitats
Restoration	Same

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
April – August[2, 5]	
Nest and Nesting Habits	
Nest Placement	Platform in old large tree with overhead cover, or on cliff ledge, juniper[2, EO]
Site Fidelity	High for breeding territory[2]
Other	Often re-uses old raptor or heron nests[EO]
Food Habits	
Basic	Aerial predator
Primary Diet	Small to medium-sized mammals, especially ground squirrels and rabbits[2]
Secondary Diet	Reptiles, large insects[2]

Swainson's Hawk

Buteo swainsoni



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Swainson's Hawk

Buteo swainsoni

Overview

Several aspects of the Swainson's Hawk's biology are particularly interesting, including their long-distance migration to wintering grounds in Argentina, and the contrast between their winter diet (primarily insects) and summer diet (ground squirrels and other small mammals).[2] Historical and recent declines have been relatively well documented for this species, and it may encounter threats on the breeding grounds, wintering grounds, and along the migration routes.[2] A decline of 90% from historical levels in the Central Valley of California was thought to be due to loss of riparian woodland, introduction and spread of nonnative annuals and perennials, alteration of fire regime, overgrazing by livestock, and alteration and degradation of habitat.[4]

Swainson's Hawks have adapted to agricultural landscapes in Nevada, and the greatest threats to the species in this state are probably loss of traditional alfalfa fields to other uses, and loss of nesting trees within several kilometers of suitable foraging areas.[3] An ideal landscape for the Swainson's Hawk provides large riparian nesting trees, agricultural fields, and open shrublands within relatively close proximity. Its use of agricultural fields on the wintering grounds (Argentina) unfortunately resulted in a severe die-off (at least 5% of the global population) during the 1990s from pesticides that are not used in the United States.[6]

Our best estimate of population size for Swainson's Hawk is now over 25 years old,[7] and it is important to obtain a current population estimate given ongoing regional population declines. Because of its association with agricultural landscapes, Swainson's Hawk offers an opportunity for landowner outreach that encourages the retention of nest trees and conveys the benefits of traditional agricultural practices.

Abundance and Occupancy by Habitat

- Typical densities in Nevada < 0.4 pairs / 100 ha [0.2 / 100 ac][8]
- Population estimates derive from NBC (21,000) and BBS (7,700)[10] (*Appendix 4*) are not considered reliable because soaring birds are difficult to relate to a defined surface area during surveys

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Loss of traditional agricultural and riparian landscapes, including large trees and tree groves
- Residential development

- Loss of prey populations (small to medium-sized mammals) to crop conversion, development, or shrubland degradation

Research, Planning, and Monitoring Threats

- Population and trend estimates are not current
- Current monitoring efforts (NBC) overestimate the numbers of soaring birds such as Swainson's Hawk
- Effects of agricultural pesticide use are not well understood

Conservation Strategies

Habitat Strategies

- Great Basin Lowland Riparian (p. Hab-7-1), Mojave Lowland Riparian (p. Hab-11-1), Agriculture (p. Hab-1-1), and Sagebrush (p. Hab-17-1) habitat conservation strategies benefit this species
- Encourage conservation of traditional agricultural and riparian landscapes that support large scattered trees or groves and healthy prey populations

Research, Planning, and Monitoring Strategies

- Review NBC data collection techniques to reduce possibility of over-counting
- Using modified monitoring techniques and data, develop updated population size and trend estimates
- A statewide monitoring program in California may provide opportunities for collaboration (http://www.dfg.ca.gov/rap/projects/swainsonhawk/)[1]
- Conduct research on the possible effects of pesticide use on prey populations and Swainson's Hawks

Public Outreach Strategies

- Support outreach to private landowners to encourage retention of nesting trees and promote the value of traditional agricultural practices for wildlife

References: [1]Anderson et al. (2007); [2]Bechard et al. (2010); [3]Brown et al. (2008); [4]Estep (2009); [5]GBBO unpublished Atlas data; [6]Goldstein et al. (1997); [7]Herron et al. (1985); 8[5]Neel (1999); [9]Nevada Wildlife Action Plan Team (2006); [10]Rich et al. (2004); [EO]Expert opinion

Ferruginous Hawk

Buteo regalis

Photo by Teri Slatauski

Habitat Use Profile

Habitats Used in Nevada	
Sagebrush Pinyon-Juniper (Salt Desert Scrub)	
Key Habitat Parameters ◑	
Plant Composition	Sagebrush spp., juniper spp., upland grasses and forbs
Plant Density	Details unknown, but avoids heavily forested areas[1]
Mosaic	Variety of open habitats with widely spaced juniper or pine trees[1]
Distance to Water	Unknown
Prey Populations	Typically associated with high-density prey populations[1]
Response to Vegetation Removal	Negative, if prey populations are reduced[EO]
Area Requirements ◑	
Minimum Patch Size	Unknown
Recommended Patch Size	> 8,000 ha [20,000 ac][EO]
Home Range	590-760 ha [1,450 – 1,900 ac][1]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Possible recent declines Small population size Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S2
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
Trends	
Historical ○	Unknown
Recent ◑	Declines in the 1980s, probably declines more recently in Nevada[1, 5, 6]
Population Size Estimates	
Nevada (NBC) ◑	1,200
Global ○	6,000 – 22,500 [1, 7]
Percent of Global	≥ 5%
Population Objective	
Maintain [EO]	
Monitoring Coverage	
Source	NDOW raptor surveys, Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Northern and eastern Nevada
Restoration	Same

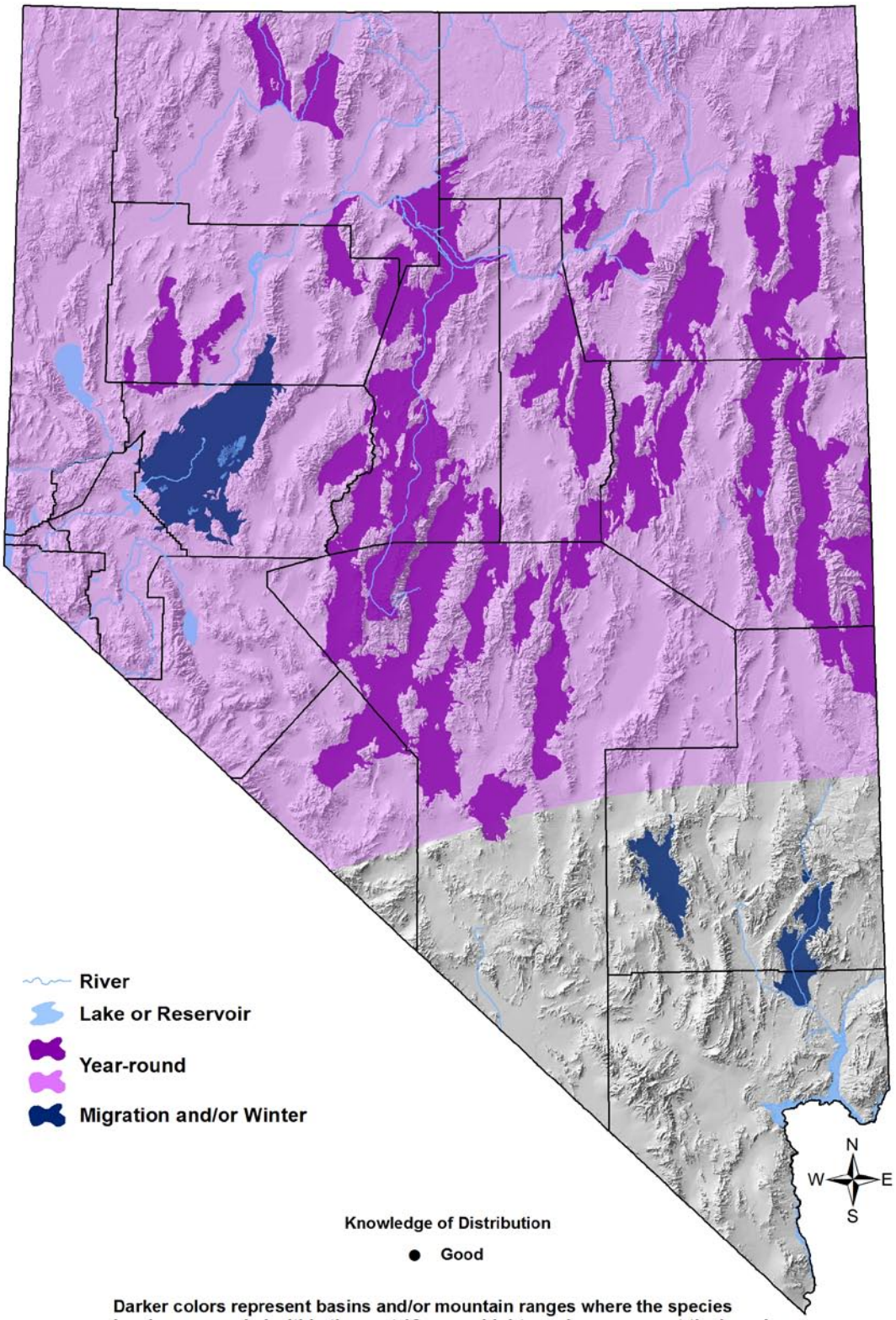
Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
March – August[1, 3]	
Nest and Nesting Habits	
Nest Placement	Stick platform on isolated trees, ledges, poles, ground[1]
Site Fidelity	High for breeding territory[2]
Food Habits	
Basic	Aerial predator
Primary Diet	Jackrabbits, cottontails[1]
Secondary Diet	Ground squirrels, birds, reptiles[1]

Confidence in Available Data: ●High ◑Moderate ○ Low

Ferruginous Hawk

Buteo regalis



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Ferruginous Hawk

Buteo regalis

Overview

Open, rolling sagebrush near the pinyon-juniper interface is the preferred landscape for breeding Ferruginous Hawks in Nevada. Usually a "sit-and-wait" predator, this hawk forages where scattered tree perches are available near open shrubland.[1] Ferruginous Hawks are known for their extensive post-breeding vagrancy, and the birds that winter in Nevada are often different individuals than those that breed here. They may also range into a wider variety of habitats than is the case during the breeding season. Ferruginous Hawks exhibit substantial annual variability in numbers and in nest success as a function of the fluctuating abundance of jackrabbits and cottontails, their preferred prey items. Clear population trends are therefore difficult to obtain. Ferruginous Hawks in Nevada reportedly prefer landscapes where the human presence is minimal,[EO] and they are generally more sensitive to nest disturbances than most other raptors.[1,10] In other states and regions, however, Ferruginous Hawks sometimes exhibit either an aversion[8] or an affinity[4] for the shrubland-agriculture interface.[2] The relationship between agriculture and Ferruginous Hawks in Nevada therefore merits further investigation.

Based on widespread population declines in the 1980s, Ferruginous Hawks were petitioned for listing under the ESA in 1991,[1] but were not subsequently listed. Nonetheless, the Ferruginous Hawk remains a conservation priority among land management agencies in Nevada due to its small numbers and probable declines. Keys to management are providing suitable nest sites, protecting active nest areas from disturbance, and improving habitat for prey.[2]

Abundance and Occupancy by Habitat

- The highest densities of Ferruginous Hawks in Nevada have been reported in relatively remote valleys where native vegetation is mostly intact and where human activities are minimal [EO]
- Densities of Ferruginous Hawks may be as high as 1 pair / 40 km^2 [1 pair / 4,000 ha] under optimal conditions (Pete Bradley, *pers. comm*.)

Nevada-Specific Studies and Analyses

NDOW Telemetry Studies in Northeastern Nevada (Pete Bradley, *pers. comm*.)

Ferruginous Hawks monitored by radio-telemetry spent 97% of their June foraging time in sagebrush and salt desert habitats. Birds nearly always remained within 4 km [2.5 mi] of their breeding territory until early July, when they began to make 1-3 day foraging trips (sometimes accompanied by fledged young) to adjacent valleys up to 46 km [29 mi] from the nest site. Post-fledging migrational movements of 40 – 600 km [25 – 370 mi] per day began in late July. Tagged birds wintered in a variety of areas outside Nevada, to the east, south, and west, suggesting that Nevada's wintering population and breeding population are not comprised of the same individuals.

Ferruginous Hawk

Buteo regalis

Photo by Larry Neel

Main Threats and Challenges

Habitat and Other Threats

- Sensitive to factors negatively affecting prey populations, including invasive plants, habitat fragmentation, fire, and development
- More sensitive to nest site disturbances than other *Buteo*s, especially during early stages of nesting cycle[1, 10]
- Loss of nesting trees (usually isolated junipers) at the shrubland-woodland interface
- Illegal take of eggs or nestlings[EO]

Research, Planning, and Monitoring Challenges

- Relative impacts of specific modes of habitat degradation (invasive plants, livestock grazing, fragmentation) are not clear

Ferruginous Hawk

Buteo regalis

Conservation Strategies

Habitat and Other Strategies

- Sagebrush (p. Hab-17-1) and Pinyon-Juniper (p. Hab-16-1) habitat conservation strategies benefit this species
- Maintain or create a sagebrush / pinyon-juniper interface in which scattered or lone trees are present; fuels reduction and pinyon-juniper management projects should avoid creating an abrupt shrubland-woodland edge
- Manage rangelands to promote healthy prey populations and maintain intact herbaceous understory[6]
- Attempt to control invasive plants, particularly cheatgrass and *Halogeton*
- Trails, access roads, and other developments should be sited to maintain a non-disturbance buffer (minimally 250 m [820 ft], ideally 4 km [2.5 mi]) around nest sites[9, EO]
- Minimize fragmentation in sagebrush habitats by consolidating development and land impacts as much as possible
- From 1 April – 30 June, consider seasonal road closures and increased law enforcement presence in key breeding areas to reduce illegal take of eggs or nestlings

Research, Planning, and Monitoring Strategies

- Continue monitoring to better determine population trends in Nevada, and document important nesting areas and regions
- Develop and implement a fire management plan that prioritizes conservation of productive sagebrush habitat, especially near the pinyon-juniper interface
- Where disturbances do occur in proximity to nesting locations, document nesting outcomes to improve our knowledge of necessary buffer areas
- Conduct research to investigate the relationships between prey density, land use practices, and site occupancy or abundance
- Explore the use of artificial nest platforms by this species[1] as a short-term management tool to mitigate for nest site losses to impacts.

Public Outreach Strategies

- None identified

Ferruginous Hawk

Buteo regalis

References: [1]Bechard and Schmutz (1995); [2]Dechant et al. (1999); [3]GBBO unpublished Atlas data; [4]Leary et al. (1998); [5]Olendorff (1993); [6]Paige and Ritter (1999); [7]Rich et al. (2004); [8]Schmutz (1987); [9]Suter and Joness (1981); [10]White and Thurow (1985); [EO] Expert opinion

Sagebrush-woodland interface with scattered junipers, White Pine Co. Photo by John Boone

Golden Eagle

Aquila chrysaetos

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Cliffs Sagebrush (Salt Desert Scrub) (Mojave Scrub) (Joshua Tree) (Mojave Lowland Riparian) (Wet Meadow) (Pinyon-Juniper)	
Key Habitat Parameters ●	
Plant Composition	Variety of open / semi-open landscapes with sufficient mammalian prey base; avoids heavily forested areas[10]
Cliff Properties (mean ± 1 SD)	25.5 (± 14.8) m [80 ± 50 ft] in SW Idaho; 21.7 (± 12.8) m [72 ± 42 ft] in N Utah[1]; multiple ledges preferred, with no consistent orientation preference[10]
Mosaic	Require suitable nest sites and sufficient prey base[10]
Distance to Water	No known relationship
Area Requirements ◑	
Minimum Patch Size	~ 250 km² [60,000 ac][EO]
Recommended Patch Size	> 1,000 km² [250,000 ac][EO]
Home Range / Territory Size	Variable by location, prey density, and season, but typical home range of ~ 250 km² / pair [60,000 ac / pair] in breeding season; defend territory of 20–35 km² [5,000 – 8,600 ac] or more[10]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Historical declines Possible recent declines	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	G5, S4
USFWS	Eagle Act, Migratory Bird, Bird of Conservation Concern
BLM	Sensitive Species
USFS	None
NDOW	None
Trends	
Historical ●	Substantial declines[10]
Recent ◑	Recent data suggest declines regionally and in Nevada[10, 15]
Population Size Estimates	
Nevada (NBC) ◑	3,000
Global ◑	172,000 [14]
Percent of Global	2 %
Population Objective	
Maintain[EO]	
Monitoring Coverage	
Source	NDOW winter raptor surveys, Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Intact shrublands near suitable nesting cliffs
Restoration	Degraded / fragmented shrublands near suitable nesting cliffs

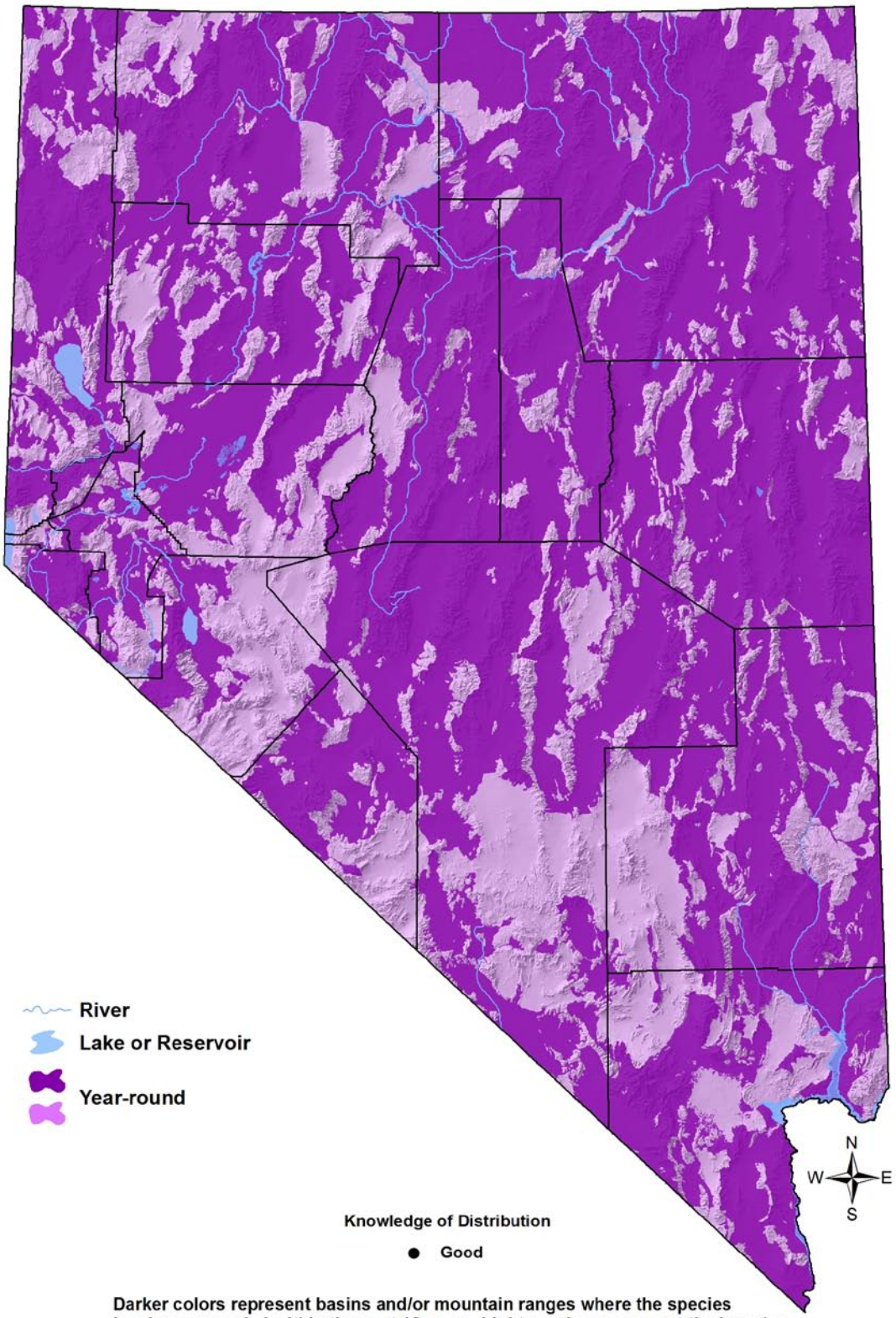
Natural History Profile

Seasonal Presence in Nevada	
Year-round, more abundant in winter	
Known Breeding Dates in Nevada	
Late January –August[5, 10]	
Nest and Nesting Habits	
Nest Placement	Most often on cliffs, but sometimes on ground, in trees, or on steep hillsides[10, 12]
Site Fidelity	High for breeding sites[10]
Food Habits	
Basic	Terrestrial hunter
Primary Diet	Jackrabbits, cottontails, large rodents[10]
Secondary Diet	Medium-sized birds (500 – 2,000 g) [1 – 4.5 lbs][10]

Confidence in Available Data: ●High ◑Moderate ○ Low

Golden Eagle

Aquila chrysaetos



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Golden Eagle

Aquila chrysaetos

Overview

The Golden Eagle's distribution is largely restricted to the west, with some of its highest densities in the shrubsteppe habitats of the Great Basin.[10] In Nevada, the only habitats routinely avoided by the Golden Eagle are forests, large agricultural areas, and urban areas. Although the Golden Eagle is a year-round resident of Nevada, home ranges, densities, and activity patterns likely shift seasonally.

Key limiting factors for Golden Eagle populations are prey densities and availability of nest sites near suitable prey populations.[2,10] For these reasons, habitat management should primarily focus on maintaining populations of jackrabbits, cottontails, and larger rodents such as ground squirrels. Once Golden Eagles reach adulthood, their main source of premature mortality appears to be collisions with structures and electrocutions from power lines or other electrical equipment.[12] Direct disturbance of nests appears to be infrequent, but localized disturbances can cause nest failure or abandonment.[10, EO]

Of particular concern are recent data suggesting that after several decades of relative stability, Golden Eagle numbers may again be declining in the West, particularly in the sagesteppe region.[4,6,8,10,16] This possibility needs to be further investigated in Nevada. Also of concern are possible effects of large-scale energy developments on the Golden Eagle's foraging habitat. Monitoring has been conducted by west-wide aerial surveys from 2003-2009.[11] In 2011, the Great Basin Bird Observatory and NDOW will conduct a statewide inventory of Golden Eagle nesting sites, which will supplement NDOW raptor surveys and the Nevada Bird Count and improve our ability to evaluate population trends.

Abundance and Occupancy by Habitat

- The NBC-based Nevada population estimate of 3,000 is close to Herron's[7] earlier estimate of 2,400
- Nest spacing of 0.8 – 16 km (mean 4.3 km) [0.5 – 10 mi, mean 2.7 mi] is typical in suitable habitat in southwestern Idaho[10]
- In Nevada, the highest Golden Eagle densities have been observed in long stretches of cliff located along river systems[7]

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat and Other Threats

- Reduction in prey populations due to degradation or loss of rangelands
- Large-scale wind/solar energy developments in rangelands could reduce prey densities and hunting opportunities

- Electrocution may be significant source of mortality in some areas; vehicles on roadways may also cause significant mortality in some areas[10,12,EO]
- Human disturbance or activity may cause nest abandonment, render a nest site less productive, or prevent a suitable nest site from being utilized[10,13]
- Shooting and poisoning are much less common than in the past, but still may occur; the most important current source of poisoning may be mine tailings and heap leach [EO]

Conservation Strategies

Habitat Strategies

- Cliff (p. Hab-4-1) and Sagebrush (p. Hab-17-1) habitat conservation strategies benefit this species
- Manage open habitats for healthy mammalian prey populations, particularly jackrabbits and cottontails
- When siting energy developments, proximity to known or likely Golden Eagle nesting areas should be avoided, ideally with a 10 km or 6 mile buffer
- In areas with actual or potential nest disturbance issues, establish disturbance-free buffer zones of 1 km (0.6 mile) around nest locations where possible[3,17]
- To minimize electrocution deaths, use Eagle Guards on transmission lines with high electrocution risk,[3] and ensure that new lines are built to specifications established by the Avian Power Line Interaction Committee (newly updated)[1]
- Encourage burial of mining drip lines to minimize risk of poisoning[EO]

Research, Planning, and Monitoring Strategies

- Improve monitoring and survey coverage, and conduct additional analysis, to better quantify current population trends, conservation requirements, and habitat needs
- U.S. Fish and Wildlife Service has new inventory and monitoring protocols that should be implemented in Nevada[13]

Public Outreach Strategies

- Pursue road signage and public education to reduce the frequency of vehicular deaths[EO]

References: [1]Avian Power Line Interaction Committee (2006); [2]Beecham and Kochert (1975); [3]DeLong (2004); [4]Farmer et al. (2008); [5]GBBO unpublished Atlas data; [6]Good et al. (2007); [7]Herron (1985); [8]Hoffman and Smith (2005); [9]Kochert and Steenhof (2002); [10]Kochert et al. (2002); [11]Nielson et al. (2010); [12]Page and Seibert (1973); [13]Pagel et al. (2010); [14]Rich et al. (2004); [15]Sauer et al. (2008); [16]Smith et al. (2008); [17]Suter and Joness (1981); [EO] Expert opinion

Peregrine Falcon

Falco peregrinus

Photo by Christy Klinger

Habitat Use Profile

Habitats Used in Nevada	
Cliffs (Mojave Lowland Riparian) (Mojave Scrub) (Marsh)	
Key Habitat Parameters ◑	
Plant Composition and Density	Does not have strong vegetation preferences
Mosaic	Many habitat types flown or foraged over, but always near cliffs or elevated nesting sites and suitable prey populations[11]
Distance to Water	Usually breeds in proximity to a water body[4]
Prey Populations	Presence of suitable avian prey base required
Cliff Properties	Usually 12 – 200 m [40 – 640 ft] tall, mean height 100 m [330 ft] tall, with ledges ~ 1/3 down, usually oriented to north or west [11, EO] ; some overhead cover preferred[11]
Area Requirements ◑	
Minimum Patch Size	~ 400 km^2 [100,000 ac][EO]
Recommended Patch Size	> 1,200 km^2 [300,000 ac][EO]
Home Range	Typically 300 – 1,500 km^2 [75,000 – 375,000 ac], but varies greatly with prey abundance; typically forages ~ 10 km [6 mi] from nest site[11]

Conservation Profile

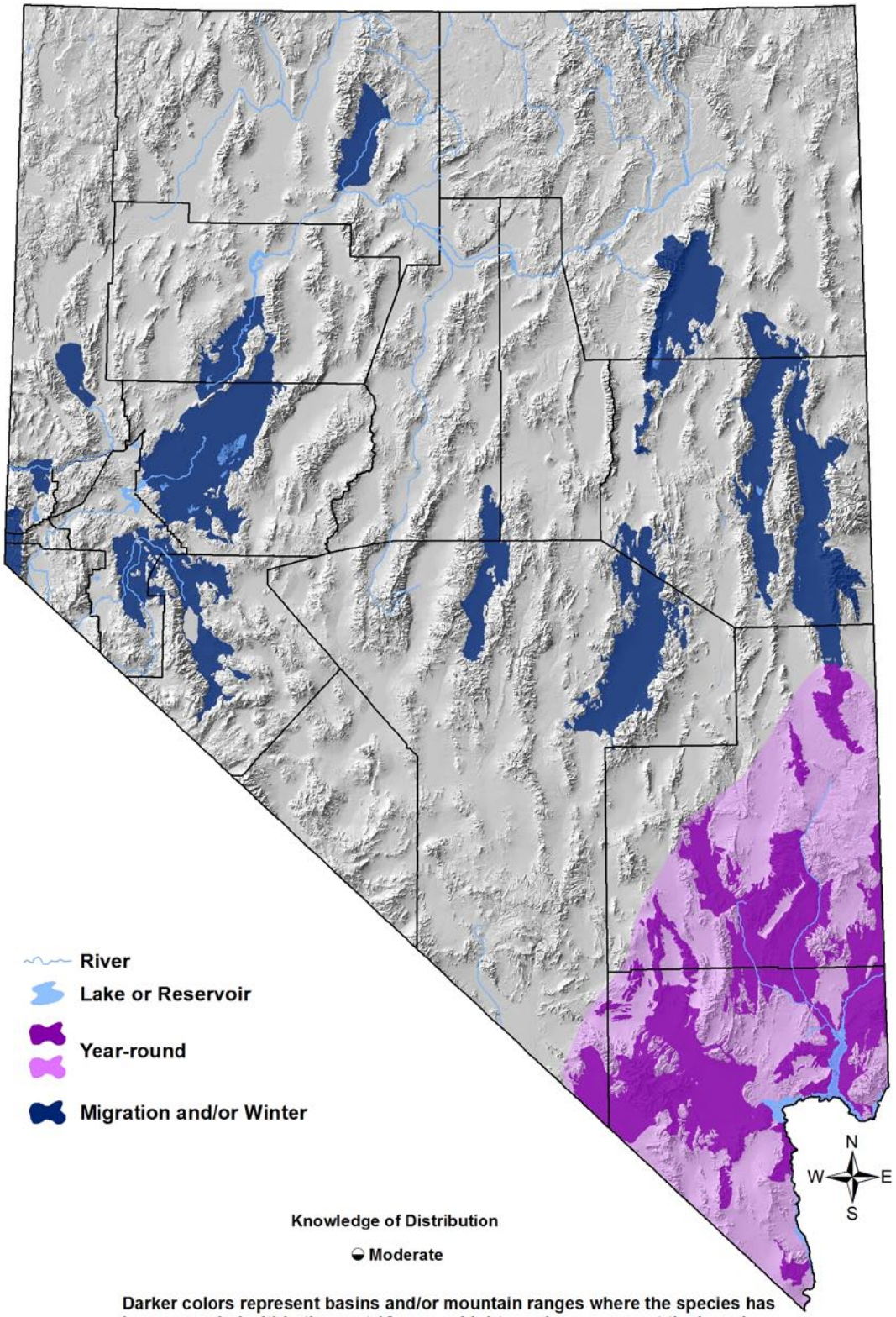
Priority Status	
Special Status Species	
Species Concerns	
Historical declines	
Other Rankings	
Continental PIF	Stewardship Species
Audubon Watchlist	None
NV Natural Heritage	G4, S2
USFWS	ESA De-listed, Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	Sensitive Species
NDOW	Conservation Priority
Trends	
Historical ●	Historical declines, with very large declines in 1950s - 1970s [11]
Recent ◑	Stable or increasing[11]
Population Size Estimates	
Nevada ◑	140-180 [EO]
Global ◑	340,000 [9]
Percent of Global	< 1%
Population Objective	
Maintain / Increase[10, EO]	
Monitoring Coverage	
Source	NDOW and Lake Mead NRA surveys
Coverage in NV	Good
Key Conservation Areas	
Protection	Lake Mead NRA
Restoration	Areas with depleted prey base near suitable cliffs

Natural History Profile

Seasonal Presence in Nevada	
Year-round in Lake Mead area; Summer – Spring and/or Migration elsewhere	
Known Breeding Dates in Nevada	
Late Feb – July[EO]	
Nest and Nesting Habits	
Nest Placement	Cliffs or building ledges[11]
Site Fidelity	High [11]
Other	See Cliff Properties in Habitat Use Profile
Food Habits	
Basic	Aerial predator
Primary Diet	Mid- to small-sized birds[11]
Secondary Diet	Occasionally bats or other mammals[11]

Peregrine Falcon

Falco peregrinus



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropiate habitat types.

Peregrine Falcon

Falco peregrinus

Overview

The Peregrine Falcon is a flagship species of avian conservation, and is among the largest and most successful species recovery effort of the Endangered Species Act.[2] After the near-extinction caused by widespread use of eggshell-thinning DDT and other chlorinated hydrocarbons in the 1950s – 1970s, Peregrine Falcons recovered sufficiently to be removed from the Endangered Species List in 1999.

After a period of absence, the Peregrine Falcon was rediscovered in Nevada when a breeding pair was detected along the cliffs of Lake Mead in 1985. An ongoing natural recolonization was then augmented by NDOW's reintroduction of 48 birds between 1988 and 1993.[7] At present, Peregrine Falcons in Nevada are concentrated around the Lake Mead NRA, where they nest on earthen and rock cliffs surrounding the reservoir. This apparent Mojave Desert orientation of the species, however, is at least partly an artifact of an incomplete recovery that is presumably being driven by colonizers from the south.[11] Historical breeding occurred throughout a greater portion of Nevada, and some of this former breeding range could eventually be reoccupied. Indeed, new territories are discovered in southern Nevada each year, progressively farther away from the core Lake Mead population center. Populations in northern California are doing very well and may be a source for new dispersal into western Nevada.[6] In summer of 2003, a nesting pair was observed in the White Pine Range in eastern Nevada, and in 2009, four young were fledged in Lincoln County.[7, (C. Klinger *pers. comm.*)] Marshes and nearby uplands throughout much of the state are already used as foraging sites by migrating falcons. Migrant population counts have also increased in the Goshute Mountains (1983-2001).[5] Given this pattern of expansion, the range map shown above (which currently indicates no breeding in the Great Basin portion of Nevada) may well require revision in the future.

The species remains closely monitored, and many species protection measures are in place.[10] Key conservation needs are protecting known nesting locations from excessive disturbances and maintaining sufficient avian prey populations. Conserving marshes may also benefit migrating Peregrine Falcons. The Peregrine Falcon is a Covered Species in the Clark County MSHCP[3], and is also covered in the Humboldt-Toiyabe National Forest Plan and the Regional Plan for the Lake Tahoe Basin.

Abundance and Occupancy by Habitat

The population estimate given in the Conservation Profile Table (140 – 180 birds) is based on approximately 100 known breeding birds detected in 2010, plus an estimated 40 – 80 undetected breeders throughout the state (C. Klinger, *pers. comm.*). The *Nevada Wildlife Action Plan*[8] reports a lower breeding population (10 nesting pairs), probably based on earlier information.

Peregrine Falcon
Falco peregrinus

Nevada-Specific Studies and Analyses

NDOW and Lake Mead NRA Monitoring Studies

Ongoing monitoring of known breeding territories suggest stable to increasing rates of nest occupancy, success, and productivity in southern Nevada (C. Klinger, *pers. comm*.).

Main Threats and Challenges

Habitat and Other Threats

- As a well-managed recovering species, there are currently no major threats known
- Energy development (wind and solar) may impact foraging areas
- Nest disturbance (i.e. recreational rock climbing), illegal or legal falconry take, or persecution may be localized threats

Recently fledged Peregrine Falcon. Photo by Joe Barnes.

Peregrine Falcon

Falco peregrinus

Conservation Strategies

Established Strategies

- Monitoring of Peregrine Falcons is prescribed by the USFWS' *Monitoring Plan for the American Peregrine Falcon*[10]

Habitat Strategies

- The Cliff (p. Hab-4-1) habitat conservation strategy benefits this species
- Manage habitat near known or likely nesting locations and consistently-used migratory sites for avian prey productivity
- Protect known nesting cliffs or structures and adjacent foraging habitat from disturbance

Research, Planning, and Monitoring Strategies

- As a delisted species, the Peregrine Falcon is well-monitored in known breeding range[10]; however other monitoring programs should be primed to document breeding range expansions, should they occur
- Conduct exploratory surveys for new breeding activity. A call-playback protocol developed under the Clark County MSHCP specifically for Peregrine Falcons may be ideal for this purpose (J. Barnes *pers. comm*.)
- Conduct research to determine the presence of preferred habitat characteristics in areas distant from current high-quality breeding areas near water

Public Outreach Strategies

- Encourage seasonal closures of recreational climbing routes near known nest locations on managed lands

References: [1]Blancher, unpublished PIF data; [2]Cade et al. (1988); [3]Clark County (2000); [4]Herron et al. (1985); [5]Hoffman and Smith (2003); [6]Kauffman et al. (2004); [7]NDOW (2010); [8]Nevada Wildlife Action Plan Team (2006); [9]Rich et al. (2004); [10]U.S. Fish and Wildlife Service (2003); [11]White et al. (2002), [EO]Expert opinion

Peregrine Falcon

Falco peregrinus

Peregrine Falcon nesting cliffs, Grand Wash, southern Nevada. Photo by Joe Barnes.

Prairie Falcon

Falco mexicanus

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Cliff Sagebrush Mojave Scrub Salt Desert Scrub (Joshua Tree) (Wet Meadow) (Agriculture)	
Key Habitat Parameters ◑	
Plant Composition	Forage over saltbush, sagebrush, creosote bush, greasewood, agricultural crops, winterfat, native perennial grasses
Cliff Properties	Nesting cliff heights range from <25 m [80 ft] to >100 m [325 ft]; 60% of nests located on cliffs <30 m [100 ft] high[3]
Mosaic	Cliffs near suitable prey habitat; avoids dense cheatgrass[4, 8]
Distance to Water	No known relationship
Response to Vegetation Removal	Probably negative to shrub loss, depending on prey population response[4, 9, EO]
Area Requirements ◑	
Minimum Patch Size	~ 7,500 ha [18,500 ac][EO]
Recommended Patch Size	> 20,000 ha [50,000 ac][EO]
Home Range	5,000 – 7,500 ha [12,400 – 18,500 ac] or more[8]

Conservation Profile

Priority Status	
Stewardship Species	
Species Concerns	
High stewardship responsibility Unknown population trend	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S4
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Stewardship
Trends	
Historical ○	Unknown
Recent ○	Trends in Nevada unknown, possibly stable[7, EO]
Population Size Estimates	
Nevada (NBC) ◑	11,500
Global ◑	36,000 [6] (other estimates lower[3])
Percent of Global	~ 30%
Population Objective	
Maintain [EO]	
Monitoring Coverage	
Source	Nevada Bird Count, NDOW raptor counts
Coverage in NV	Good
Key Conservation Areas	
Protection	Shrub and scrub lands near suitable nesting cliffs
Restoration	Same

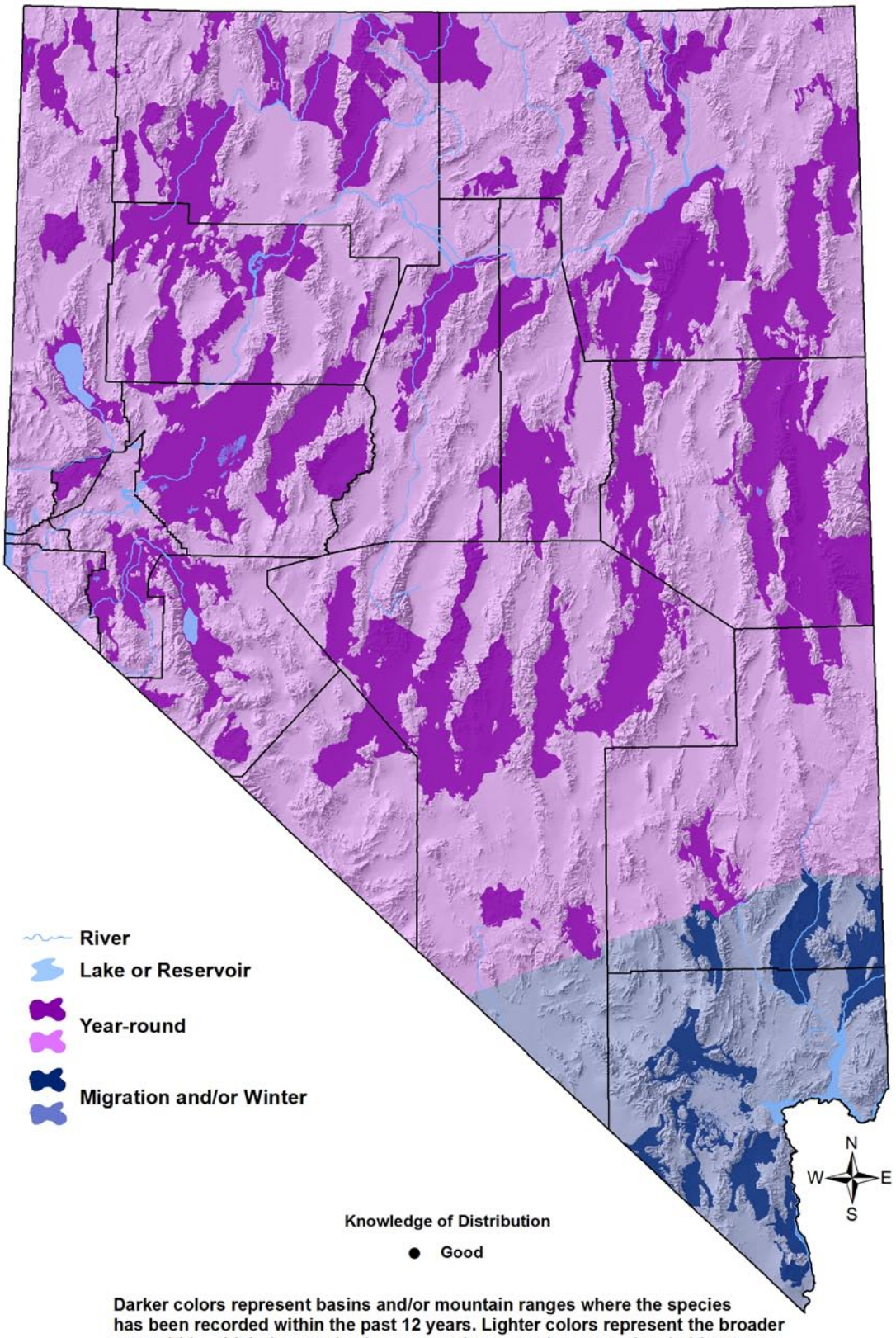
Natural History Profile

Seasonal Presence in Nevada	
Year-round; Winter only in southern Nevada	
Known Breeding Dates in Nevada	
February – July[2]	
Nest and Nesting Habits	
Nest Placement	On cliff ledge, usually on upper half of cliff, most often facing south or east[3, 5]
Site Fidelity	High for breeding sites[5]
Food Habits	
Basic	Aerial predator
Primary Diet	Small mammals, especially Townsend's ground squirrel[1, 4, 5, 8]
Secondary Diet	Small birds (especially in winter), reptiles[8]

Confidence in Available Data: ●High ◑Moderate ○ Low

Prairie Falcon

Falco mexicanus



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Prairie Falcon

Falco mexicanus

Overview

A significant proportion of the world's Prairie Falcons inhabit Nevada, where their preferred landscapes (cliffs adjacent to arid valleys with low vegetation) are abundant. Prairie Falcons are most often observed foraging over a variety of sagebrush, salt desert, and Mojave scrub shrublands throughout the year, and they also occur in agricultural lands, especially during the winter months. Although the range map shown above correctly suggests a valley-bottom orientation, Prairie Falcons have also been documented to nest at higher elevations in foothills and lower mountain ranges (Teri Slatuaski, *pers. comm.*). Density and home range sizes vary considerably over time and space, depending on prey abundance patterns and the availability of suitable cliffs for nesting. Apart from localized disturbances to nesting cliffs, no serious threats to the species have been identified. However, given our high stewardship responsibility, it is important to maintain an ongoing monitoring effort in order to better understand population trends, which are currently not clear. Because Prairie Falcons respond strongly to prey availability, management of habitat to maintain or restore healthy populations of ground squirrels and other small mammals is likely to be an effective conservation strategy.

Abundance and Occupancy by Habitat

- Nests may be spaced as closely as ~ 0.5 km [0.3 mi] in good habitat; more typically 1 – 10 km [0.6 – 6.0 mi][8]
- Highest densities in Nevada reported to be "near mouth of narrow canyons, overlooking riparian vegetation and agricultural lands" [3]
- Herron et al.[3] estimated Nevada's population at 2,500 birds in 1985, considerably lower than the NBC-generated estimate of 11,500 birds and the BBS-generated estimate of 8,500 birds[6]

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Human disturbances near nest sites may cause nest abandonment, especially when disturbances take place on the cliff top, above the nest[5]
- Small mammal (prey) populations can be negatively impacted if livestock grazing in shrublands significantly reduces forb and grass cover

- Heavy infestations of cheatgrass or other weeds may reduce small mammal (prey) density

Research, Planning, and Monitoring Challenges

- The possible impacts of illegal take for falconry are not known
- The manner in which various rangeland fire scenarios affect prey populations needs further study

Conservation Strategies

Habitat Strategies

- Cliff (p. Hab-4-1), Sagebrush (p. Hab-17-1), Salt Desert Scrub (p. Hab-18-1), and Mojave Scrub (p. Hab-12-1) habitat conservation strategies benefit this species
- If development or significant activity is occurring or planned near potentially suitable cliffs, survey for Prairie Falcon nests
- Where possible, maintain a 1 km [0.6 mi] disturbance-free buffer zone around nesting cliffs[10]
- To benefit prey populations, manage shrublands in the vicinity of cliffs to maintain or restore habitat-appropriate grass and forb cover, and to control invasive weeds

Research, Planning, and Monitoring Strategies

- Continue monitoring to better estimate ongoing population trend and population size
- Attempt to determine whether illegal take of Prairie Falcons negatively impacts population stability
- Further study how rangeland fires of varying size and intensity affect prey populations in the short and long term

Public Outreach Strategies

- None identified

References: [1]Dobkin and Sauder (2004); [2]GBBO unpublished Atlas data; [3]Herron et al. (1985); [4]Marzluff et al. (1997); [5]Paige and Ritter (1999); [6]Rich et al. (2004); [7]Sauer et al. (2008); [8]Steenhof (1998); [9]Steenhof et al. (1999); [10]Suter and Jones (1981); [EO] Expert opinion

Clapper Rail

Rallus longirostris

Photo by Jenny Ross

Habitat Use Profile

Habitats Used in Nevada	
Marsh (Mojave Lowland Riparian)	
Key Habitat Parameters ●	
Plant Composition	Cattail, bulrush, sedges, willows, saltcedar
Plant Density	Low to moderate stem densities (< 80 / m^2 [7.5 / ft^2]) required[9]
Mosaic	Shallow marsh with low to moderate stem densities and little residual vegetation, interspersed with dry spots, mudflats, and open water, and buffered by riparian zones[5, 9]
Water Depth	Some water < 30 cm [12 in] around margins of marsh, with some deeper water acceptable[3, 9]
Hydrology	Minimal fluctuation in stage[9]
Response to Vegetation Removal	Positive to prescribed burns in densely vegetated marshes[4, 9]
Area Requirements ●	
Minimum Patch Size	8 ha [20 ac][9]
Recommended Patch Size	> 150 ha [370 ac][9]
Home Range	< 24 ha [59 ac][9]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
ESA listing: Endangered subspecies (Yuma Clapper Rail) Small population size Habitat threats Restricted Habitat	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S1
USFWS	Endangered subspecies, Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Endangered
Other	Covered by Clark County MSHCP amendment,[1] Lower Colorado River MSCP,[8] Virgin River HCRP[11]
Trends	
Historical ◑	Rangewide subspecies declines, but pattern in Nevada unclear[5]
Recent ◑	Stable or increasing[6]
Population Size Estimates	
Nevada ●	20 – 40 [6]
Global ◑	7,000 (Yuma Clapper Rail only)[9]
Percent of Global	0.4%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	Secretive marshbird surveys by USFWS, BOR, SNWA, NWR's and others
Coverage in NV	Good
Key Conservation Areas	
Protection	Muddy and Virgin Rivers, Amargosa River, Ash Meadows NWR
Restoration	LV Wash and degraded or overgrown marshes

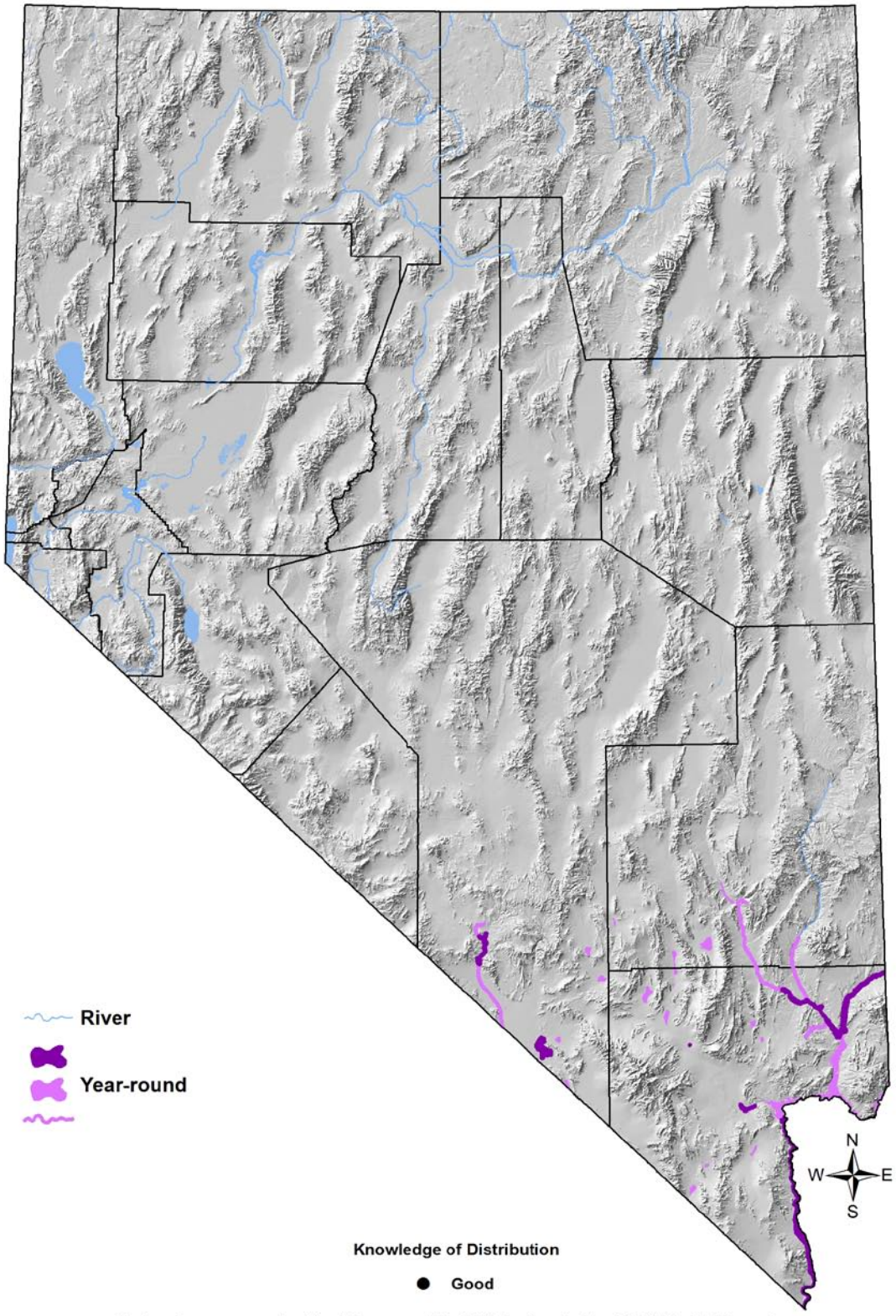
Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
Late March – August[5]	
Nest and Nesting Habits	
Nest Placement	Near shoreline in emergent vegetation, over ground or water < 2.5 cm [1 in] deep[5, 9]
Site Fidelity	Moderate for breeding territory[45]
Other	Multiple nests, re-nesting, moving of eggs[5, 9]
Food Habits	
Basic	Prober and pecker
Primary Diet	Crustaceans, especially crayfish,[9] clams
Secondary Diet	Small fishes, other vertebrates, seeds, insects, eggs[5]

Confidence in Available Data: ●High ◑Moderate ○ Low

Clapper Rail

Rallus longirostris



Dark colors represent critical Year-round habitat designated by USFWS. Lighter colors represent the areas within which the species could potentially occur.

Clapper Rail

Rallus longirostris

Overview

Clapper Rails inhabiting the inland southwest, including southern Nevada, belong to the "Yuma" subspecies, *R.l. yumanensis*. Unlike their coastal relatives, Yuma Clapper Rails are mostly restricted to a freshwater environment along the lower Colorado River system and its tributaries. Clapper Rails are found in large, shallow marshes with a moderate density of emergent vegetation, avoiding both open water and overgrown emergent stands.[9] Prescribed fire in overgrown marshes has recently been shown to be beneficial for this species without adversely affecting sympatric species, and thus might be a replacement for the historical floods that once provided the necessary disturbances.[4]

Most Clapper Rails in Nevada have been documented along the Virgin and Muddy Rivers,[8] but more recently, they were also confirmed at Ash Meadows NWR (C. Lundblad, *pers. comm.*). In addition to known breeding areas, other sites where breeding could potentially occur include the Las Vegas Wash and Pahranagat NWR. In Nevada, an average of about 14 Clapper Rails are detected during annual inventories,[6] but research indicates that only about 40% of the rails that are actually present are detected using standard survey methods.[3] Therefore, our conservative population estimate for Nevada is 20 - 40 individuals, with the range of values allowing for the annual variations that have been observed since the species was first surveyed in 2000. It is possible that Clapper Rails have become more common in Nevada in recent decades due to water impoundments and resulting marsh development along the lower Colorado River in areas that are farther north than the species' presumed historical range.[6] Clapper Rails may therefore be able to respond to projected warming trends with continue northward movements, if sufficient marsh habitat is available to them. Clapper Rails are thought to be mostly sedentary,[5] but their ability to disperse or move seasonally has not been examined in great depth.

As one of only two federally endangered bird subspecies in Nevada, detailed management recommendations for the Yuma Clapper Rail have been developed,[9] and are currently undergoing revision.[10] Our current understanding of the Yuma Clapper Rail's population trends, threats, and habitat requirements is derived largely from studies of Arizona populations, but with a continuation of current Nevada-based research and monitoring programs, a better understanding of Nevada's population will likely emerge.

Abundance and Occupancy by Habitat

- Nevada population estimate based on average of 14 birds detected annual, with a 40% detectability correction factor[3, 6]
- Density ranges from 0.1 – 0.8 birds / ha [0.04 – 0.32 / ac] in suitable habitat in Arizona[5]

Nevada-Specific Studies and Analyses

Species inventories by USFWS, SNWA, BOR, and others

Clapper Rail

Rallus longirostris

Main Threats and Challenges

Habitat Threats

- Loss or degradation of marshes due to water diversions, decline in water quality, development, or overgrowth
- Large changes in water level during nesting period

Research, Planning, and Monitoring Challenges

- Yuma Clapper Rails are assumed to be sedentary, but seasonal movement patterns have not been studied
- Clapper Rails require special survey techniques[2] because of their secretive habits

Conservation Strategies

Established Strategies

- The Yuma Clapper Rail Recover Plan,[9] currently under revision,[10] specifies conservation strategies for the subspecies. Key elements include:
    - Maintain consistent water levels in marshes in the Virgin and Muddy River Valleys
    - Control invasive plants in marshes
    - Control nest predators where unusual predation levels are documented
    - Continue ongoing monitoring and research to better determine population trends, threats, and habitat requirements

Habitat Strategies

- The Marsh (p. Hab-9-1) habitat conservation strategy benefits this species
- Yuma Clapper Rails probably respond positively to creation of artificial wetlands if habitat parameters are suitable
- Prescribed fire in overgrown marshes has been shown to have beneficial effects for these rails[4,9]

Research, Planning, and Monitoring Strategies

- Implement secretive marshbird survey protocols[2] in potential habitat
- Conduct studies to determine whether seasonal movements occur

Public Outreach Strategies

- None identified

References: [1]Clark County (2000); [2]Conway (2009); [3]Conway et al. (1993); [4]Conway et al. (2010); [5]Eddleman and Conway (1998); [6]Garnett et al. (2004); [7]LCRMSCP (2004); [8]Rathbun and Braden (2003); [9]USFWS (1983); [10]USFWS (2009); [11](Jeri Krueger, *pers. comm.*); [EO] Expert opinion

Sandhill Crane

Grus canadensis

Photo by Steve Ting

Habitat Use Profile

Habitats Used in Nevada	
Wet Meadow Marsh Agriculture Great Basin Lowland Riparian	
Key Habitat Parameters ◑	
Plant Composition	Bulrush, sedges, rushes, willows, grasses, agricultural crops (pasture, wheat, barley crops)
Plant Density	Unknown
Mosaic	Diversity of wetland types and structures, interspersed with agriculture[10]
Distance to Water	Always near water; nest success higher if surrounded by deeper water (> 30 cm [12 in])[8]
Hydrology	Seasonally stable stage preferred[10]
Response to Vegetation Removal	Negative [EO]
Area Requirements ◑	
Minimum Patch Size	Unknown; but larger wet meadow / agricultural complexes probably preferred [EO]
Recommended Patch Size	> 150 ha [370 ac] [EO]
Territory Size	10 – 23 ha [25 - 57 ac][10]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Historical declines High stewardship responsibility (Lower Colorado River Valley population) Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S3B
USFWS	Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
IW Waterbird Plan	High Concern
Trends	
Historical ●	Range contractions and declines [5, 10]
Recent ◑	Stable or increasing[5, 10]
Population Size Estimates	
Nevada ◑	650 – 1,000 [9, EO]
Global ◑	700,000 [10]
Percent of Global	< 1% global; > 32% of Lower Colorado River Valley population [EO]
Population Objective	
Maintain [EO]	
Monitoring Coverage	
Source	NDOW aerial surveys, NWR and WMA counts, Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Ruby Valley, Humboldt River and tributaries, Owyhee watershed, Boyd Wetland IBA
Restoration	Pahranagat Valley, main stem of Humboldt River system from Elburz to Mote

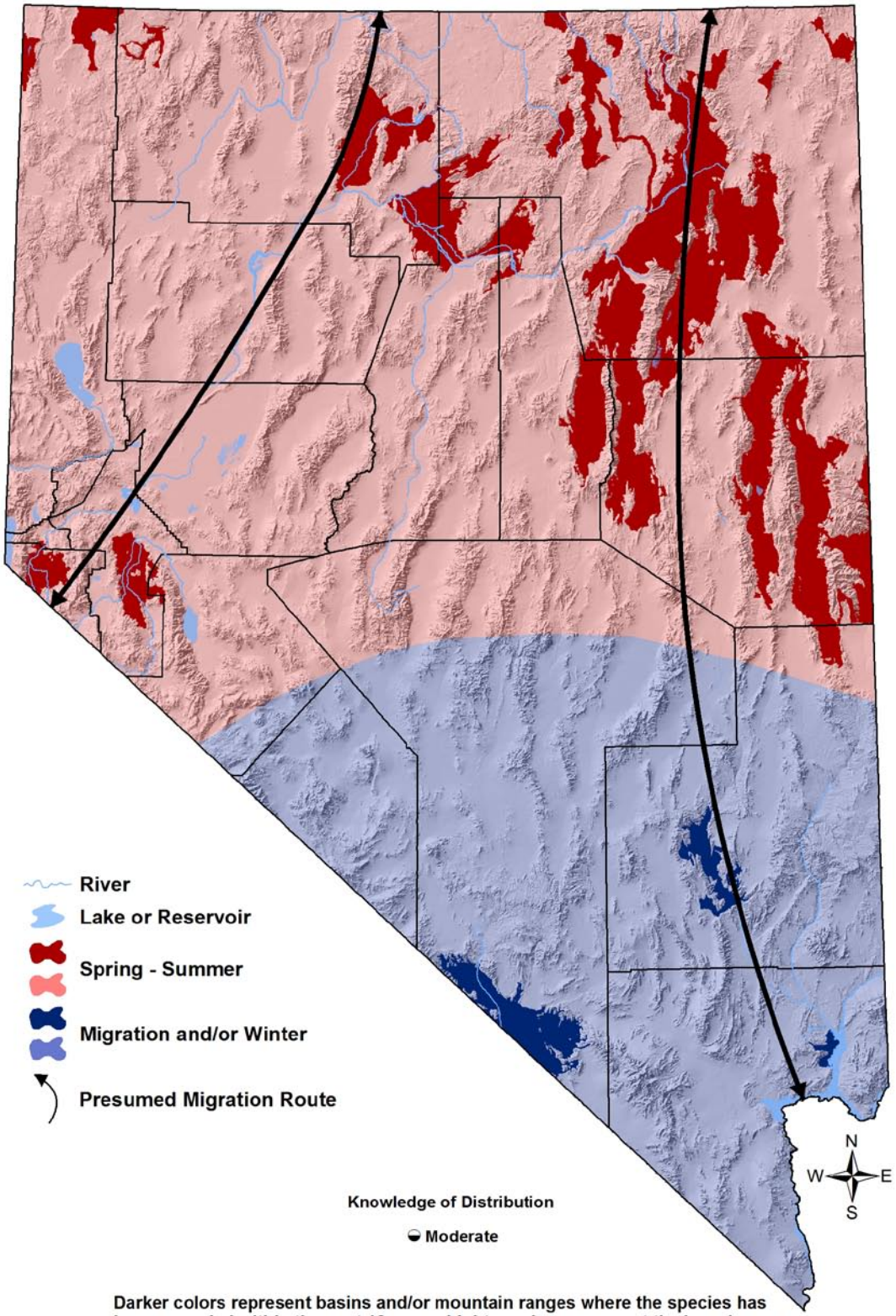
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer (Great Basin) Spring and Fall (migration, especially Mojave)	
Known Breeding Dates in Nevada	
Early May – early August[4]	
Nest and Nesting Habits	
Nest Placement	On ground near water's edge or platform over water in marsh or flooded field[10]
Site Fidelity	Moderate to high for breeding sites[10]
Food Habits	
Basic	Prober and gleaner
Primary Diet	Invertebrates, grains, seeds, tubers[10]
Secondary Diet	Roots, small vertebrates[10]

Confidence in Available Data: ●High ◑Moderate ○ Low

Sandhill Crane

Grus canadensis



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Sandhill Crane

Grus canadensis

Overview

Nevada contains some of the Sandhill Crane's southernmost breeding sites, which are disjunct from the species' main breeding range in Canada and Alaska. Nevada breeding cranes belong to the subspecies *G. c. tabida*, the Greater Sandhill Crane. Within this subspecies, two distinct populations, named for their wintering grounds, breed here, the Lower Colorado River Valley population (LCRVP) in northwestern and central Nevada, and the Central Valley population (CVP) in western Nevada.[10] Sandhill Cranes occupy flat river valleys and basins, often where the landscape offers a mix of marsh, riparian, wet meadow, and agricultural habitats. They nest on or near water, preferentially using small islands or peninsulas where available. Foraging takes place in adjacent wet terrestrial habitats. Nevada also provides Sandhill Cranes with important migratory stopover sites, including several in southern Nevada where breeding does not occur.

Sandhill Cranes from both population segments are stable or increasing in Nevada, although low recruitment has occurred in some years and should be monitored.[3,6] The majority of Nevada's cranes depend significantly upon habitat on privately-owned lands, and public outreach is therefore an important component of a comprehensive conservation strategy. Additional work is needed to determine whether or not specific conservation issues exist at key migration stopover areas. Any such efforts should be coordinated closely with the existing Sandhill Crane research group headed by NDOW, which has been conducting radio-telemetry studies and species inventories at five-year intervals for the LCRVP. [1,2,7] Similar research and inventory efforts for the CVP would also be beneficial.

Abundance and Occupancy by Habitat

As part of its obligation under the Pacific Flyway Council LCRV Population Management Plan, NDOW conducts an aerial nesting population survey for Sandhill Cranes at five-year intervals. In 2005, NDOW documented a record high of 641 cranes in northern Nevada, including at least 215 breeding pairs.[7]

Nevada-Specific Studies and Analyses

NDOW is currently conducting radio-telemetry studies of the LCRVP, with full results forthcoming.[1,2,7] No comprehensive studies of the CVP in Nevada have been conducted.

Main Threats and Challenges

<u>Habitat and Other Threats</u>

- Loss or degradation of wet meadow, marsh, and riparian habitat due to:
    - Habitat conversion (agriculture, gravel operations, development, etc.)
    - Water diversions
    - Possible impacts of groundwater pumping in occupied areas

  - Heavy livestock grazing during nesting and fledging season, particularly in wet meadows
  - Invasive plants
- Loss of traditional crop agriculture in migration stopover sites [EO]
- Early haying that impacts nests or young
- Effects of predator populations have been noted, but predator control efforts do not always increase crane productivity[7]

Research, Planning, and Monitoring Challenges

- Habitat threats at migration stopover sites need more study
- The CVP in Nevada has received less monitoring and study than the LCRVP

Conservation Strategies

Habitat Strategies

- Wet Meadow (p. Hab-20-1), Marsh (p. Hab-9-1), Agriculture (p. Hab-1-1), and Great Basin Lowland Riparian (p. Hab-7-1) habitat conservation strategies benefit this species
- Manage wet meadows for maximum vegetation cover from 1 April – 15 July
- Protect water inflows in marsh and wet meadow areas used by cranes

Research, Planning, and Monitoring Strategies

- Continue monitoring of the LCRVP at five-year intervals
- Implement a five-year interval monitoring program for the CVP
- In areas potentially impacted by groundwater pumping, monitor for changes in water supplies and for impacts on crane productivity

Public Outreach Strategies

- Work with landowners in areas used by cranes to encourage:
  - Deferring haying until after 15 July
  - Use of flushbars on harvest equipment, especially before 15 July
  - Conservation of wet meadows, marshes, and riparian woodlands on private land
  - Encourage traditional agricultural practices

References: [1]August et al. (2009); [2]Bradley (2005); [3]Drewien et al. (1995); [4]GBBO unpublished Atlas data; [5]Ivey and Dugger (2008); [6]Ivey and Herziger (2006); [7]Laca et al. (2008); [8]McWethy and Austin (2009); [9]Nevada Wildlife Action Plan Team (2006); [10]Tacha et al. (1992); [EO] Expert opinion

Snowy Plover

Charadrius alexandrinus

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Ephemeral Wetland and Playa (Open Water (shorelines))	
Key Habitat Parameters ●	
Plant Density	Very sparse or barren; avoids all moderately to densely vegetated areas[6]
Mosaic	Alkali flat, mudflat, or flat beach adjacent to permanent or seasonal surface water; unvegetated or nearly so; often in highly alkaline soils[6]
Hydrology & Water Quality	Readily accepts ephemeral wetlands and alkaline conditions, but water must be present during breeding season, even if only as a small seep[6, 10]
Response to Vegetation Removal	Neutral or positive [EO]
Area Requirements ○	
Minimum Patch Size	Unquantified, but sometimes present adjacent to very small seeps[10]
Recommended Patch Size	> 10 ha [25 ac] [EO]
Home Range and Territory Size	Unknown

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and possible recent declines Habitat threats Small population size	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S3B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
IW Shorebird Plan	Critically Important
Trends	
Historical ◑	Rangewide declines[6]
Recent ○	Declining regionally, trends in Great Basin not well quantified
Population Size Estimates	
Nevada ◑	~ 350 – 1,000, with high annual variability[2, 3]
Global ○	18,000 [4] (North American population)
Percent of Global	2% (% of North American population)
Population Objective	
Increase by 100% [EO]	
Monitoring Coverage	
Source	NDOW shorebird surveys, NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Fair for established management areas, Poor for many playa lakes
Key Conservation Areas	
Protection	Northwest playa lakes, Lahontan Valley
Restoration	Playa lakes or springs that are dewatered during the breeding season

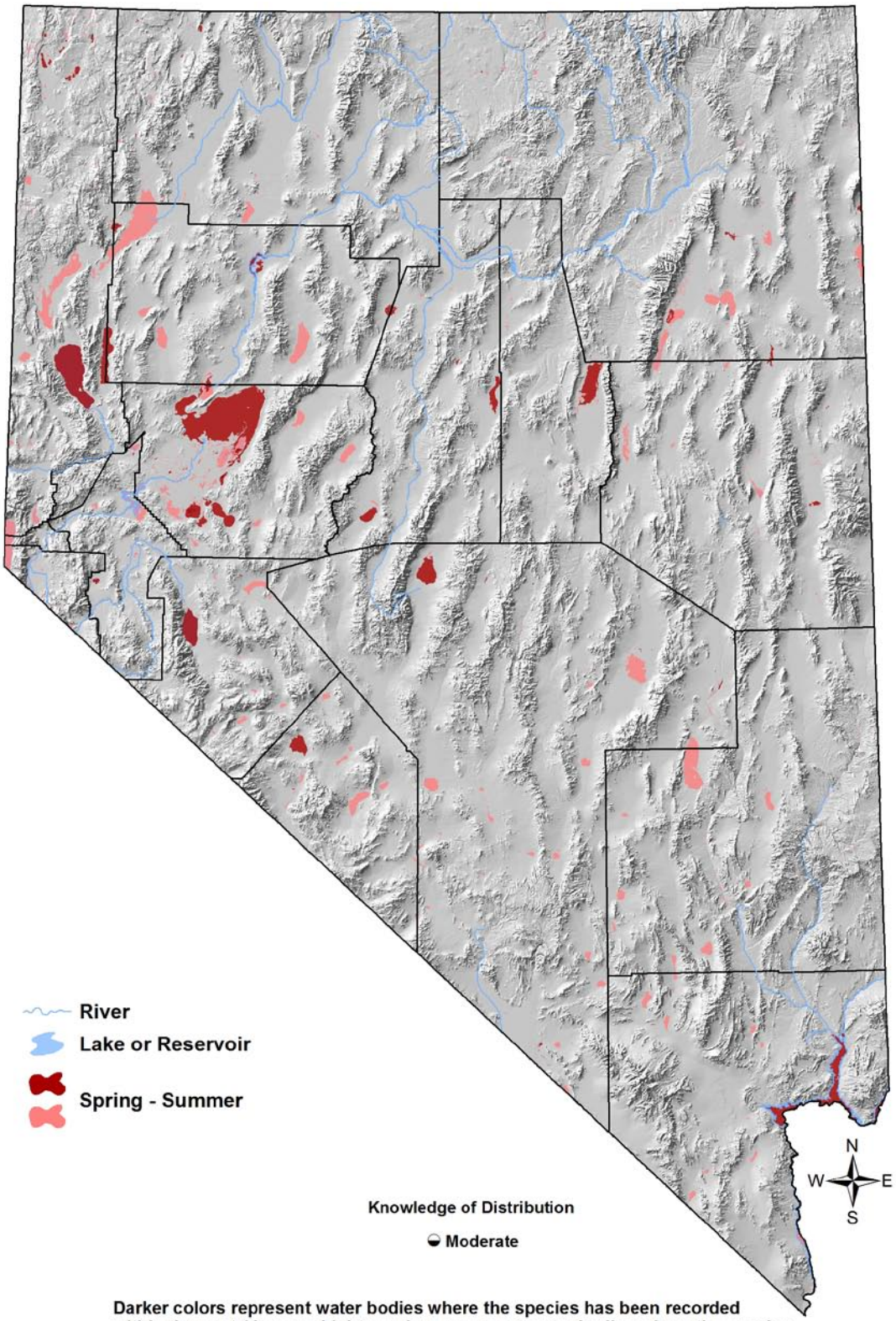
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Late March – July[1, 2]	
Nest and Nesting Habits	
Nest Placement	Scrape on bare ground, usually near water edge but can be up to 3 km [1.8 mi] away[6]
Site Fidelity	Moderate for breeding sites with predictable water[6, 10]
Food Habits	
Basic	Prober and ground gleaner
Primary Diet	Benthic, aquatic, and terrestrial invertebrates, such as brine flies and brine shrimp[6]
Secondary Diet	N/A

Confidence in Available Data: ●High ◑Moderate ○ Low

Snowy Plover

Charadrius alexandrinus



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Snowy Plover

Charadrius alexandrinus

Overview

It is easy to describe the Snowy Plover's habitat preferences in Nevada, namely the barren shorelines of alkaline playa lakes. Nevada breeders are part of the species' interior population, and they are not part of the federally listed Western Snowy Plover population of the Pacific coast. The interior population has its own conservation issues, however, which have been best studied at Great Salt Lake, where at least half of the inland population breeds.[7] In Nevada, at least 85 sites either have confirmed Snowy Plover records, or meet the basic breeding habitat requirements of the species. In the recent USFWS Regional Inventory of Western Snowy Plovers, conducted in Nevada by GBBO and NDOW in 2007-2008, Snowy Plovers were located at 20 sites, 14 of which had confirmed breeding. One of these, Lake Mead, had not previously been known as a Snowy Plover breeding site. In this inventory, 350 adults were recorded, with the greatest numbers of birds at Big Well (Railroad Valley), Gridley Lake, the Muddy River delta of Lake Mead, Massacre Lakes, and Stillwater NWR. In other recent surveys, Carson Lake in Lahontan Valley and Ash Meadows NWR have also been hotspots for the species.

The Snowy Plover has been declining regionally for an extended period, and it seems likely that Nevada's population has been declining as well. Quantifying a long-term trend for Nevada is difficult, however, because it is obscured by the "noise" of shorter-term fluctuations that occur in response to drought cycles or other factors, both regional and local. For instance, counts in western Nevada playas in 1988 totaled only 71% of 1980 population levels,[4,5] probably due to drier conditions and loss of water in many playas. At the same time, however, the number of plovers increased on Walker Lake, probably because recent drops in the lake's water level created new habitat consisting of recently exposed, moist, and barren shoreline.[5] Also during the same time frame, a severe decline in Snowy Plover numbers in Owens Lake, CA, was reversed by the shallow flooding of large areas for dust control.[8] These complex spatial and temporal patterns of plover abundance highlight an important feature of the species' biology, namely that overall population health depends on being able to shift to alternative breeding locations when conditions at the primary locations are unsuitable.

The most obvious threat facing Snowy Plovers in Nevada is the diversion of runoff water away from the terminal playas where it historically collected.[9] Further efforts are needed to catalogue the scope of this problem, and to determine the degree to which it can be reversed or mitigated. Additionally, the possible impacts of other habitat threats have received very little study or attention.

Abundance and Occupancy by Habitat

Known peak population in recent decades was ~ 900 breeding birds in northwestern Nevada in 1980.[3] In the most recent inventory (2007-2008), Nevada populations were estimated at < 400.

Snowy Plover

Charadrius alexandrinus

Nevada-Specific Studies and Analyses

There have been at least two systematic Snowy Plover inventory efforts in Nevada, one by Page et al.[5] in the late 1980s, and more recently by GBBO and NDOW in 2007-2008. There has been no species-specific ecological or conservation research in the state, however.

Main Threats and Challenges

Habitat Threats

- Dewatering of playas or springs during the breeding season due to water diversions or drought

Research, Planning, and Monitoring Challenges

- Nevada-specific population trends need to be better clarified
- Dewatering of playas by water diversion needs to be more systematically catalogued and monitored

Conservation Strategies

Habitat Strategies

- The Ephemeral Wetland and Playa (p. Hab-6-1) habitat conservation strategy benefits this species
- Protect or restore season water inflow for playas through the end of the breeding season (approximately 1 July)
- Manage or restrict playa activities to protect the integrity of the clay soil pan and maximize water retention

Research, Planning, and Monitoring Strategies

- Continue periodic species-specific (or playa-centric) inventory efforts to clarify long-term population trends
- Investigate the extent to which water diversions reduce the amount of suitable breeding habitat for Snowy Plovers, and investigate opportunities to reverse or mitigate dewatering

Public Outreach Strategies

- None identified

References: [1]GBBO unpublished Atlas data; [2]GBBO unpublished Snowy Plover inventory data; [3]Herman et al. (1988); [4]Morrison et al. (2006); [5]Page and Stenzel (1991); [6]Page et al. (2009); [7]Paton (1995); [8]Ruhlen et al. (2006); [9]Shuford et al. (2002); [10]Shuford and Gardali (2008); [EO] Expert opinion

Black-necked Stilt

Himantopus mexicanus

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Ephemeral Wetland and Playa Open Water (shorelines)	
Key Habitat Parameters ●	
Plant Composition	Cattail, sedges, rushes
Plant Density	Sparse or no emergent vegetation[1]
Mosaic	Shallow marsh with sparse emergent vegetation, interspersed with dry spots, mudflats; also playa margins[7]
Water Depth	< 30 cm [12 in] [EO]
Water Quality	Prefers relatively low salinity[7]
Hydrology	Stage can be variable [EO]
Response to Vegetation Removal	Probably neutral [EO]
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	> 130 ha [320 ac][7]
Home Range / Territory Size	Unknown

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S3S4B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Shorebird Plan	Critically Important
Trends	
Historical ◑	Range contractions, but extent of declines unclear[7]
Recent ◑	Unknown, thought to be declining in Nevada [EO]
Population Size Estimates	
Nevada ◑	~ 3,000, with high annual variability [EO]
Global ◑	175,000 [1, 4]
Percent of Global	~ 2 %
Population Objective	
Increase by 30% [EO]	
Monitoring Coverage	
Source	NDOW Lahontan Valley counts, NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Good in managed areas, Fair / Poor elsewhere, especially playas
Key Conservation Areas	
Protection	Lahontan Valley, Humboldt system, Lake Mead
Restoration	Degraded / dewatered marshes and playa wetlands, mitigation wetlands

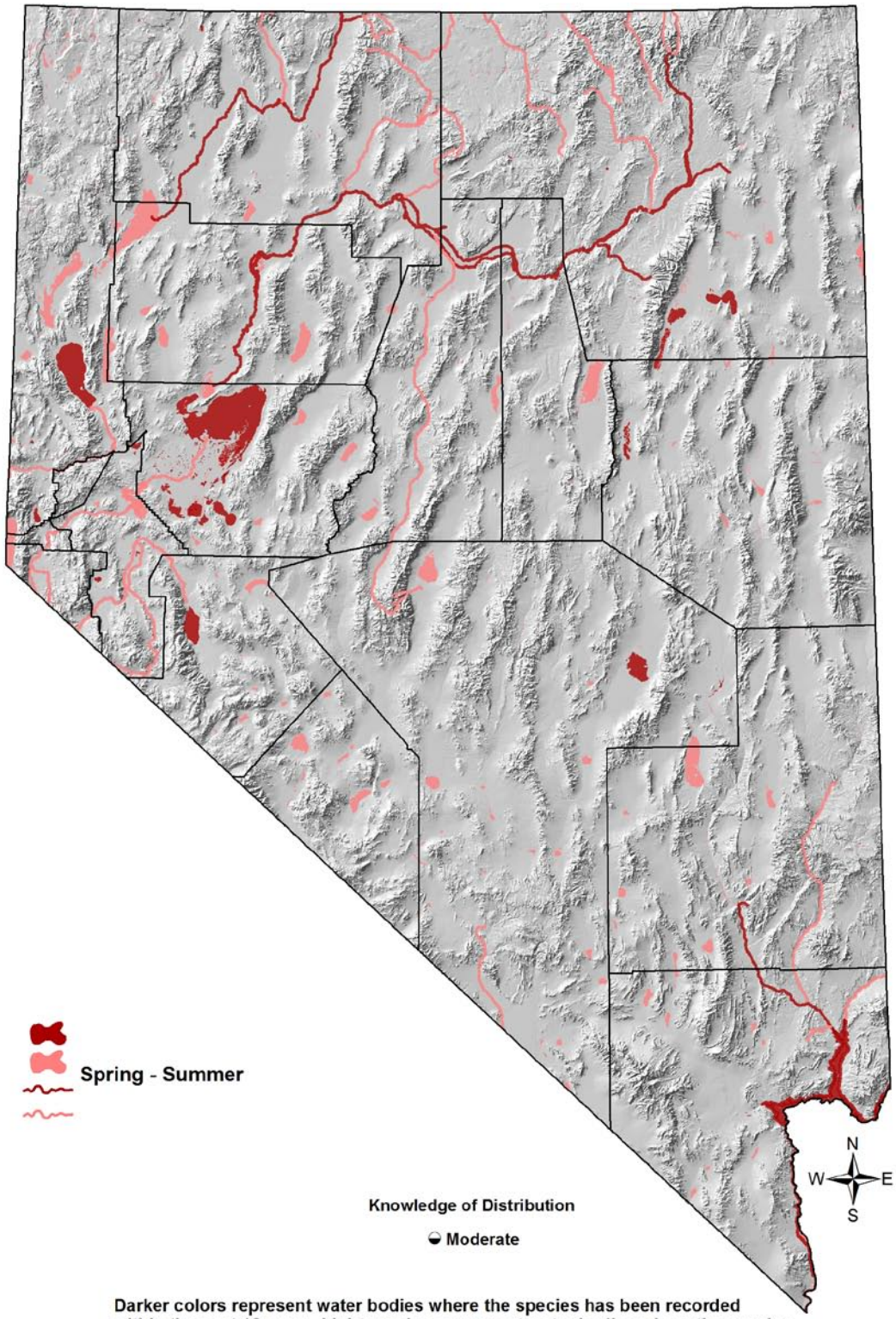
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer Fall and Spring (migration)	
Known Breeding Dates in Nevada	
Early April – July[2]	
Nest and Nesting Habits	
Nest Placement	On ground near shore in sparse vegetation, or slightly elevated over water on mats of vegetation[7, EO]
Site Fidelity	Unknown
Other	Semi-colonial nester[7]
Food Habits	
Basic	Prober
Primary Diet	Invertebrates from sediment or water[7]
Secondary Diet	Small fish, seeds[7]

Confidence in Available Data: ●High ◑Moderate ○ Low

Black-necked Stilt

Himantopus mexicanus



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Black-necked Stilt

Himantopus mexicanus

Overview

Like the more numerous and equally handsome American Avocet, the Black-necked Stilt is able to exploit ephemeral wetlands and other temporarily favorable wetland conditions. During wet years, when suitable habitat is widely available, their populations can show significant peaks. Compared to avocets, stilts are somewhat less tolerant of saline or alkaline waters, are less colonial, and also are more likely to forage within emergent vegetation.[7] Overall, the American Avocet is slightly better documented in Nevada than the Black-necked Stilt, probably because its population is larger. Stilts breed more commonly in the Great Basin portion of the state, but southern Nevada has breeding strongholds as well in the Lake Mead area and at Ash Meadows NWR. As is the case with many other Conservation Priority shorebirds, Lahontan Valley is Nevada's most consistently important site for Black-necked Stilts. For this reason, it has been designated as a "Site of Hemispheric Importance" by the Western Hemisphere Shorebird Reserve Network (www.whsrn.org).

Black-necked Stilts are also common in Nevada during migration, particularly during the fall.[8] They wander widely across the Great Basin in the post-breeding season, moving among wetlands as the summer progresses and some sites dry out or become otherwise unsuitable, and this ability to shift among seasonally-available ephemeral wetlands is a critical feature of the Black-necked Stilt's adaptive biology.[6] Conservation strategies need to provide for the protection of suitable wetland habitat well beyond the breeding season. This complicates the management challenge, since the sites that are important for breeding may not be the same as the sites that are important for post-breeding wandering and migration. Because of their substantial similarities, Black-necked Stilts and American Avocets can be regarded as having the same management needs in most circumstances.

Abundance and Occupancy by Habitat

- The Nevada population estimate is based on an average count of 2,400 for Lahontan Valley and 600 in other scattered sites across the state (L. Neel, pers. comm.)
- The most recent ten-year peak population estimate is ~ 7,000 birds,[3] and a peak of 8,000 birds in Lahontan Valley alone was recorded in 1987 [5]

Nevada-Specific Studies and Analyses

No information

Black-necked Stilt

Himantopus mexicanus

Main Threats and Challenges

Habitat and Other Threats

- Loss or degradation of ephemeral and permanent wetlands due to water diversions or development
- Increased salinization of wetlands and accumulation of contaminants[7]
- Because Black-necked Stilts use ephemeral wetlands and wet playas extensively, they may be impacted by changing precipitation patterns associated with climate change

Research, Planning, and Monitoring Challenges

- Populations using ephemeral wetlands are not well monitored
- The impact of water quality is not well-studied

Conservation Strategies

Habitat Strategies

- Ephemeral Wetland and Playa (p. Hab-6-1) and Open Water (p. Hab-15-1) habitat conservation strategies benefit this species
- Promote seasonal fresh-water runoff into ephemeral wetlands and playas, as well as into sparsely-to-moderately vegetated permanent marshes, sufficient to create mudflats and maintain a shallow-water shoreline for the longest possible period
- Manage or restrict playa activities to protect the integrity of the clay soil pan and maximize water retention
- Wetlands with uneven bottoms and shallow islands are especially important for nesting [EO]
- Artificial mitigation wetlands can provide productive breeding habitat. Ideal configuration is > 130 ha [320 ac] wetland with a 2:1 ratio of shallow water (<15 cm [6 in]) feeding areas to elevated nesting areas[1]

Research, Planning, and Monitoring Strategies

- Improve monitoring coverage of ephemeral wetlands and playas from the breeding season through the post-breeding and fall migration periods[9]
- Conduct additional study to determine tolerance to water quality variations

Public Outreach Strategies

- None identified

References: [1]Brown et al. (2001); [2]GBBO unpublished Atlas data; [3]IWJV (in prep.); [4]Morrison et al. (2006); [5]Neel and Henry (1996); [6]Robinson and Oring (1996); [7]Robinson et al. (1999); [8]Shuford et al. (2002); [9]Warnock et al. (1998); [EO] Expert opinion

American Avocet

Recurvirostra americana

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Ephemeral Wetland and Playa Open Water (shorelines)	
Key Habitat Parameters ●	
Plant Composition	Cattail, bulrush, sedges, rushes, saltgrass
Plant Density	Sparse or no emergent vegetation[9]
Mosaic	Shallow marsh with sparse emergent vegetation, large mudflats, and dry islands; also playa margins[9]
Water Depth	< 20 cm [8 in] preferred[9]
Water Quality	Tolerant of alkaline, saline conditions, but chicks require fresh water inflows[6]
Hydrology	Requires shallow standing water[9]
Response to Vegetation Removal	Probably neutral [EO]
Area Requirements ◑	
Minimum Patch Size	~ 130 ha [320 ac] [EO]
Recommended Patch Size	>150 ha [370 ac] [EO]
Home Range and Movements	Unknown breeding home range, but 200 km [125 mi] movements common post-breeding[7]

Conservation Profile

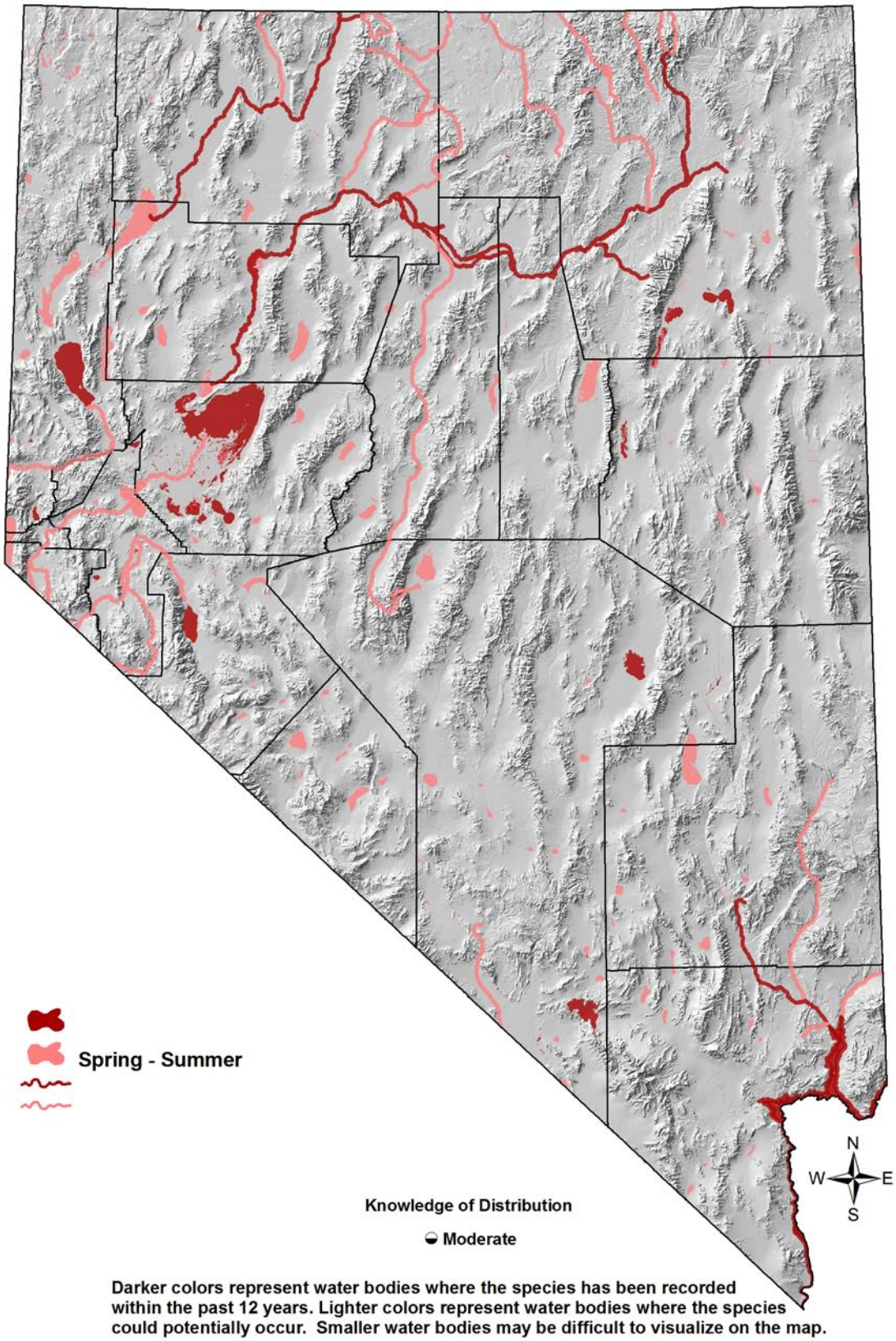
Priority Status	
Conservation Priority Species	
Species Concerns	
Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S4B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Shorebird Plan	Critically Important
Trends	
Historical ◑	Range contractions, but extent of declines unclear[9]
Recent ◑	Stable[1]
Population Size Estimates	
Nevada ◑	~ 18,000, with high annual variability [EO]
Global ◑	450,000 [1]
Percent of Global	~ 4%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	NDOW Lahontan Valley counts, NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Good in managed areas, Fair / Poor elsewhere, especially playas
Key Conservation Areas	
Protection	Lahontan Valley, Humboldt system, Ash Meadows NWR, Lake Mead
Restoration	Degraded/dewatered marshes and playa wetlands, mitigation wetlands

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer Fall and Spring (migration)	
Known Breeding Dates in Nevada	
Early April – July[2]	
Nest and Nesting Habits	
Nest Placement	Ground on sparsely vegetated shoreline or island, or on matted-down vegetation[9, EO]
Site Fidelity	Probably low [EO]
Other	Semi-colonial breeder[9]
Food Habits	
Basic	Prober
Primary Diet	Invertebrates from sediment or water[9]
Secondary Diet	Small fish, seeds[9]

American Avocet

Recurvirostra americana



American Avocet

Recurvirostra americana

Overview

The American Avocet is one of Nevada's most visible and characteristic shorebirds, often seen in association with Black-necked Stilts, which it typically outnumbers. Compared to stilts, avocets are more tolerant of alkaline and saline conditions, are more colonial, and are less likely to forage in emergent vegetation. Although the avocet's breeding range extends throughout Nevada, they are more often recorded in the northern half of the state, and more intermittently distributed in the south. American Avocets readily use ephemeral wetlands, including playa lakes, and as such, their numbers can vary substantially from year to year depending on precipitation patterns. They are also found on mudflats along larger waterbodies, particularly on shorelines recently exposed by receding water, or where newly-flooded areas become available.[4] As is the case with many other Conservation Priority shorebirds, Lahontan Valley is Nevada's most consistently important site for American Avocets. For this reason, it has been designated as a Site of Hemispheric Importance by the Western Hemisphere Shorebird Reserve Network (www.whsrn.org).

Avocets in our region wander widely among Great Basin wetlands after breeding to locate alternate wetlands as the summer progresses and some sites dry up or become otherwise unsuitable. Migrants are also very common in Nevada, particularly in the fall,[10] when they are often seen on mudflats exposed by receding waters.[6] In fact, peak fall migration numbers probably exceed peak breeding numbers by a considerable margin.[5] During the post-breeding and migration period, avocets depend on the availability of low-elevation ephemeral and permanent wetlands scattered across very large landscapes (> 10,000 km^2 [2.5 million ac]).[7] This ability to shift among seasonally-available ephemeral wetlands is a critical feature of the avocet's biology.[8] Conservation strategies should therefore address the protection of suitable wetland habitat well beyond the breeding season and across regions. This complicates the management challenge, since the sites that are important for breeding may not be the same as the sites that are important for post-breeding wandering and migration.

Abundance and Occupancy by Habitat

- The Nevada population estimate is based on an average count of 12,500 for Lahontan Valley, plus 5,500 birds from other consistently productive sites (L. Neel, *pers. comm.*)
- The most recent ten-year population peak is ~ 33,000 birds[3]

Nevada-Specific Studies and Analyses

No information

American Avocet

Recurvirostra americana

Main Threats and Challenges

Habitat and Other Threats

- Loss or degradation of ephemeral and permanent wetlands due to water diversions or development
- Loss of fresh-water inflows needed by chicks during brood-rearing[6]
- Because American Avocets use ephemeral wetlands and wet playas extensively, they are likely to be impacted by changing precipitation patterns associated with climate change

Research, Planning, and Monitoring Challenges

- Populations using ephemeral wetlands are not well monitored
- Although American Avocets are tolerant of alkaline and somewhat saline conditions, the impact of other water quality parameters is not well-studied

Conservation Strategies

Habitat Strategies

- Ephemeral Wetland and Playa (p. Hab-6-1) and Open Water (p. Hab-15-1) habitat conservation strategies benefit this species
- Promote seasonal fresh-water runoff into ephemeral wetlands and playas, as well as into sparsely-vegetated permanent marshes, sufficient to create mudflats and maintain a shallow-water shoreline for the longest possible period
- Manage or restrict playa activities to protect the integrity of the clay soil pan and maximize water retention
- Wetlands with uneven bottoms and shallow islands are especially important for nesting [EO]
- Artificial mitigation wetlands can provide productive breeding habitat. Ideal configuration is > 130 ha [320 ac] wetland with 2:1 ratio of shallow water (<15 cm [6 in]) feeding areas to elevated nesting areas[9]

Research, Planning, and Monitoring Strategies

- Improve monitoring coverage of ephemeral wetlands and playas from the breeding season through the post-breeding and fall migration periods[11]
- Conduct additional study to determine tolerance to water quality variations

Public Outreach Strategies

- None identified

References: [1]Brown et al. (2001); [2]GBBO unpublished Atlas data; [3]IWJV (in prep.); [4]Manning and Paul (2003); [5]Neel and Henry (1996); [6]Oring and Reed (1996); [7]Plissner et al. (1999, 2000); [8]Robinson and Oring (1997); [9]Robinson et al. (1997); [10]Shuford et al. (2002); [11]Warnock et al. (1998); [EO] Expert opinion

Willet

Tringa semipalmata

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Wet Meadow Marsh (Great Basin Lowland Riparian)	
Key Habitat Parameters ●	
Plant Composition	Sedges, spike rush and other rushes, wet meadow grasses and forbs, some agricultural and pasture crops
Plant Density & Height	Low-growing (< 15 cm [6 in]), dense emergent or wet meadow vegetation[5]
Mosaic	Wet meadow expanses next to marsh, open water, or ephemeral wetlands; adjacent open uplands or agricultural areas for foraging; no trees or dense shrubs [5, 6, 7]
Water Depth	< 8 cm [3.1 in] depth, and/or saturated soils[5]
Response to Vegetation Removal	Unknown
Area Requirements ●	
Minimum Patch Size	100 ha [250 ac] [5, 7]
Recommended Patch Size	> 150 ha [375 ac] [EO]
Home Range	~ 45 ha [110 ac][7]

Conservation Profile

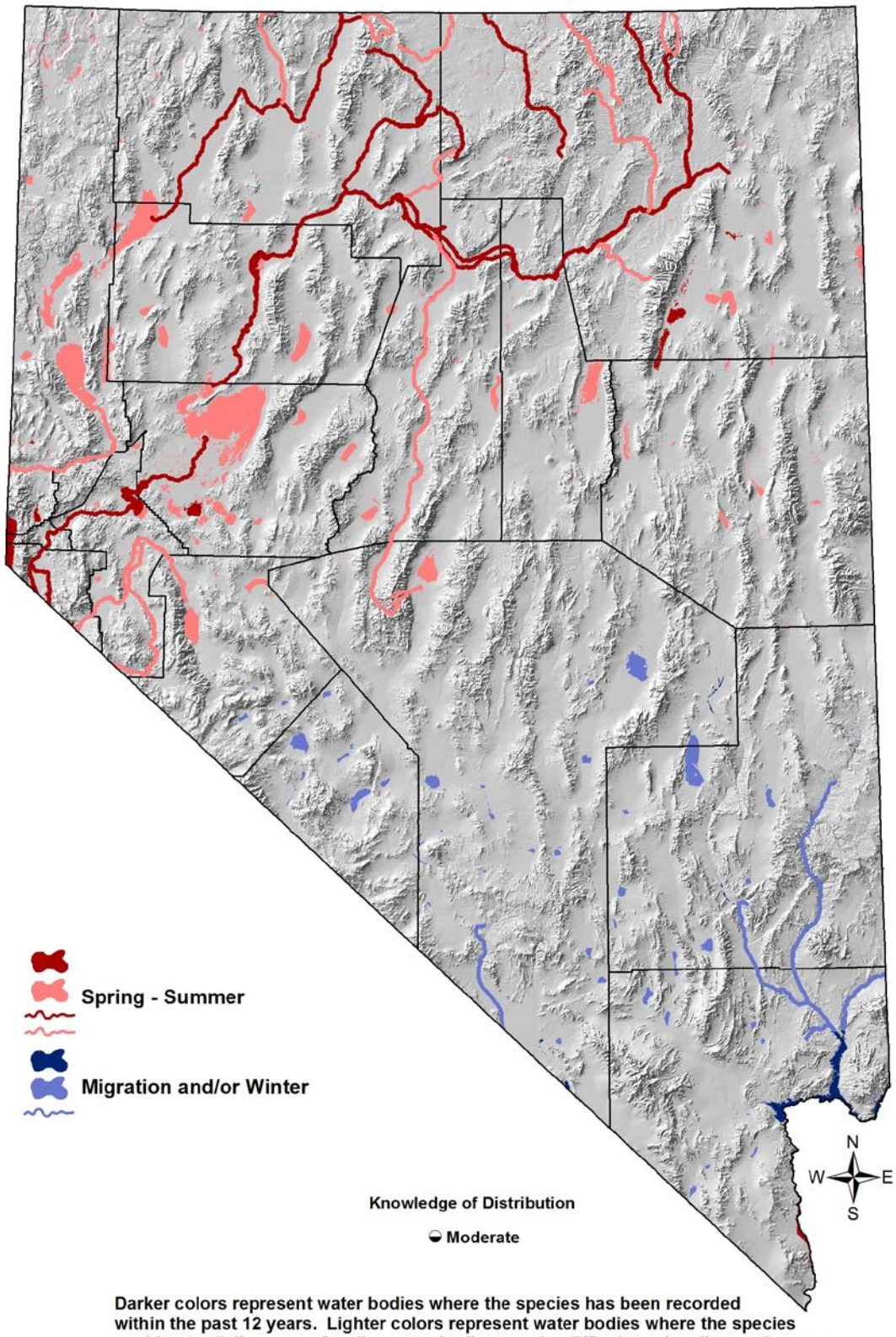
Priority Status	
Conservation Priority Species	
Species Concerns	
Habitat threats Historical declines Possible high stewardship responsibility	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S3B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Shorebird Plan	Very Important
Trends	
Historical ◑	Rangewide declines[5]
Recent ◑	Stable[1]
Population Size Estimates	
Nevada ◑	2,100 [EO]
Global ◑	250,000;[1] much less for Western Willet
Percent of Global	~1%; much higher but unquantified percent of Western Willet population
Population Objective	
Maintain [EO]	
Monitoring Coverage	
Source	NWR and WMA counts, Nevada Bird Count, Aquatic Bird Count
Coverage in NV	Fair / Poor in most of the state
Key Conservation Areas	
Protection	Lahontan, Ruby, Carson, Washoe, and Mason Valleys, Humboldt River, Lake Mead
Restoration	Same

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer Spring and Fall (migration)	
Known Breeding Dates in Nevada	
Early April – July[2]	
Nest and Nesting Habits	
Nest Placement	On dry ground near shoreline or wet meadow[5]
Site Fidelity	Unknown
Food Habits	
Basic	Prober, pecker, fisher
Primary Diet	Terrestrial, benthic and aquatic invertebrates[5]
Secondary Diet	Small fishes[5]

Willet

Tringa semipalmata



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Willet

Tringa semipalmata

Overview

Nevada's Willets belong to the *inornatus* subspecies, known as the Western Willet. Like the Long-billed Curlew, the Willet's habitat is not limited to shoreline areas, but it does not typically stray as far from water or saturated soils as the curlew often does. Willets use a diverse array of wet habitat types, including irrigated agricultural lands, although not to the same extent as the Long-billed Curlew or Sandhill Crane. Willet territories tend to be large, and they may therefore be more sensitive to fragmentation or wet landscapes than some other shorebirds. Nevada Aquatic Bird Count data and other sources suggest that Nevada probably supports more migrating Willets than breeding Willets, with the largest number of migrants recorded in Ruby Valley and Lake Mead, and smaller numbers at many other sites throughout most of the state.[3, 8] Most of the areas shown in the map above as "Spring – Summer" range may therefore be equally or more important as migratory stopover locations.

Given that Nevada probably hosts a fairly large, if unquantified, proportion of the total Western Willet breeding population, this species is not sufficiently-well studied or monitored in our state, nor have its threats received enough investigation. Specific habitat preferences during migration also need to be better determined.

Abundance and Occupancy by Habitat

The Nevada population estimate was generated by multiplying the amount of suitable habitat in Humboldt, Truckee, Carson, and Walker River systems, Lahontan Valley, and Ruby Valley by a mean density of 2 birds / 100 acres, which is typical of the Humboldt River system.[8] The total statewide population estimate may be conservative in that densities in some of these areas are probably higher than the density within the Humboldt River system.

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Loss of wet meadows to water diversions, groundwater pumping, or development
- Loss or degradation of marsh habitat due to water diversions, declines in water quality, or development
- Loss of flood irrigated agricultural fields to habitat conversion
- Fragmentation of wet landscapes

- Heavy livestock grazing or haying during the nesting period

Research, Planning, and Monitoring Challenges

- Nevada population size and total Western Willet population size need to be better estimated, and presumed stable trend needs better confirmation
- Willets are not sufficiently-well sampled by current monitoring programs, partly because they are not vocal during the incubation period[4]

Conservation Strategies

Habitat Strategies

- Wet Meadow (p. Hab-20-1) and Marsh (p. Hab-9-1) habitat conservation strategies benefit this species
- Prioritize protection of large landscapes with a continuous mosaic of wet meadows, marshes, and irrigated agricultural lands
- Manage wet meadows for maximum density of low vegetation cover during the nesting period (1 April – 15 July) by deferring grazing or haying
- Burning or grazing after the nesting season can help to create desirable low vegetation conditions for the subsequent breeding season

Research, Planning, and Monitoring Strategies

- Improve or supplement current monitoring programs to better sample Willets during the breeding and migration seasons
- Conduct additional studies to better understand population size, trends, distribution, habitat needs, and seasonal movements

Public Outreach Strategies

- Where Willets nest on or use privately owned lands, encourage landowners to defer haying and grazing until after the nesting period (1 April – 15 July)

References: [1]Brown et al. (2001); [2]GBBO unpublished Atlas data; [3]GBBO unpublished Nevada Aquatic Bird Count data; [4]Gratto-Trevor (2006); [5]Lowther et al. (2001); [6]Oring and Reed (1996); [7]Ryan and Renken (1987); [8]Shuford et al. (2002); [EO] Expert opinion

Long-billed Curlew

Numenius americanus

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Agriculture Wet Meadow	
Key Habitat Parameters ●	
Plant Composition	Agricultural crops and pastures, perennial grasses, annual grasses
Plant Density & Height	Naturally short grasslands and short-stubble agriculture; height 4-15 cm [1.5 – 5.9 in] throughout home range,[13] < 10 cm [4 in] at nest sites;[2] seek denser cover for broods[2, 7]
Mosaic	Landscapes with grasslands and irrigated agricultural fields. May benefit from nearby marshes with mudflats or wet soils and shallow shorelines[2]
Water Depth	< 16 cm [6.2 in] for foraging[2]
Distance to Water	Unclear whether foraging opportunities along shorelines are important during breeding season[3]
Response to Vegetation Removal	Positive to shortening (grazing) prior to breeding, but neutral/negative during brood rearing[2]
Area Requirements ●	
Minimum Patch Size	50 ha [125 ac][2]
Recommended Patch Size	> 100 ha [250 ac][2]
Home Range	6 -14 ha [16 - 36 ac][2]

Conservation Profile

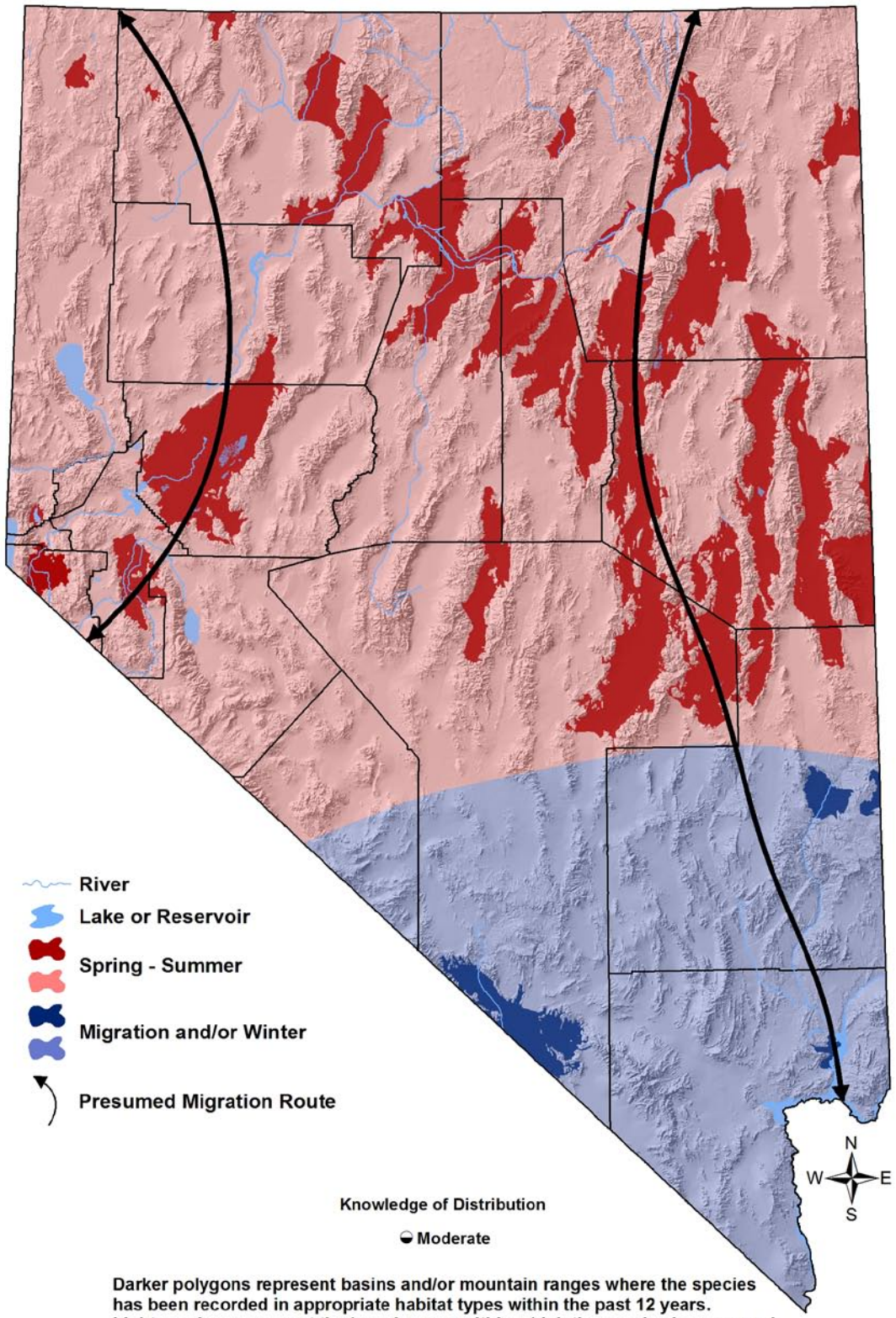
Priority Status	
Conservation Priority Species	
Species Concerns	
Habitat threats Historical declines	
Other Rankings	
Continental PIF	None
Audubon Watchlist	Yellow
NV Natural Heritage	S2S3B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
IW Shorebird Plan	Critically Important
Trends	
Historical ●	Rangewide declines[2]
Recent ◑	Stable or increasing[3]
Population Size Estimates	
Nevada ◑	1,150 [3]
Global ◑	160,000; 40,000 in Great Basin [3]
Percent of Global	~ 1%
Population Objective	
Maintain [EO]	
Monitoring Coverage	
Source	Nevada Bird Count, NWR and WMA counts
Coverage in NV	Good / Fair
Key Conservation Areas	
Protection	Ruby Valley, Humboldt River system
Restoration	Degraded wet meadows

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
April – July[4] (nest initiation in Ruby Valley 17 April - 31 May)[7]	
Nest and Nesting Habits	
Nest Placement	Scrape on ground[2]
Site Fidelity	High[3]
Food Habits	
Basic	Prober
Primary Diet	Medium to large terrestrial and soil invertebrates[2]
Secondary Diet	Small vertebrates[2]

Long-billed Curlew

Numenius americanus



Darker polygons represent basins and/or mountain ranges where the species has been recorded in appropriate habitat types within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Long-billed Curlew

Numenius americanus

Overview

Long-billed Curlews breed across northern Nevada, but there is a pronounced concentration in the northeast quadrant of the state, which is regarded as a breeding stronghold.[9] Although the Great Basin contains only a modest portion of the global population of Long-billed Curlews, research conducted here has made a disproportionately large contribution to our knowledge of the species.[1,5,6,7,11,12] Compared to other shorebirds, curlews breed in surprisingly dry areas (the photo above was taken during migration). In Nevada, they are found breeding and foraging in open habitats with moderate grass or other ground cover. Areas with trees, high shrub densities, and tall dense grass are generally avoided.[11,13] The curlew's foraging habitats during the nesting and brood-rearing period contrast markedly with its use of shorelines and shallow water for foraging during other parts of the year.

Historically, breeding Long-billed Curlews were associated with native perennial grasslands, but they have adapted well to the wet meadows and agricultural lands located along major Great Basin waterways.[6, 7] Irrigated pastures and hayfields, along with their reliable invertebrate food sources, appear to be particularly suitable for Nevada breeding populations. Taller row crop production areas are generally avoided, however.[3] In Ruby Valley, where suitable agricultural landscapes are abundant, curlews nest at very high densities that are comparable to their historical densities in the prairie grasslands.[6] Agricultural lands are clearly critical to Long-billed Curlews in Nevada and the Great Basin, a situation that remains somewhat distinct from that seen elsewhere within the species' range. Flooding during the nesting period and predators, such as coyotes and Prairie Falcons, appear to be the main sources of reproductive failure, with livestock impacts also contributing to nest mortality.[7] Because Long-billed Curlews have a large presence on privately-owned lands, outreach and coordination with landowners are important parts of this bird's conservation strategies. Little is known about the curlew's migratory habitats in Nevada, but they are not commonly observed in wet meadows, agricultural areas, and marshes during migration.

Abundance and Occupancy by Habitat

- As many as 450 Long-billed Curlews have been inventoried in North Ruby Valley, with densities recorded of ~ 7 males / km^2 [6 birds / 100 ac],[5] and 5 birds / km^2 [2 birds / 100 ac][3]

Nevada-Specific Studies and Analyses

Oring Group Studies

Seminal studies on the Long-billed Curlew's habitat use, breeding biology, and conservation status within the Great Basin have been conducted by Lew Oring and his colleagues at the University of Nevada, Reno.[5,6,7] These studies are the primary source of our information about the Long-billed Curlew's biology and conservation needs in Nevada.

Long-billed Curlew

Numenius americanus

Main Threats and Challenges

Habitat Threats

- Loss of wet meadows to water diversions, groundwater pumping, or development
- Loss of flood-irrigated agricultural fields to habitat conversion
- Heavy livestock grazing, haying, or dragging that cause inadvertent nest losses[2,9]

Research, Planning, and Monitoring Challenges

- None identified

Conservation Strategies

Habitat Strategies

- Agriculture (p. Hab-1-1) and Wet Meadow (p. Hab-20-1) habitat conservation strategies benefit this species
- Conserve and protect whole landscapes with a mix of different habitats (agriculture, wet meadow, perennial grasses, and marshes)[9]

Research, Planning, and Monitoring Strategies

- Determine whether proximity to marshes benefits curlews during the breeding season
- Bolster NBC and other monitoring programs to better monitor curlew population concentrations following rangewide survey and monitoring guidelines[8]
- Where groundwater pumping occurs, monitor impacts on wet meadows used by curlews

Public Outreach Strategies

- Continue outreach and coordination efforts to private landowners to encourage wildlife-friendly agricultural practices (e.g., installation of flushbars on mowing equipment, retaining native grasses and forbs, and low pesticide use)
- Encourage deferment of haying and other mechanized treatments until after the main nesting period during 15 April – 1 July (but any delays to avoid the first half of the breeding season are also beneficial)
- Rotational grazing occurring prior to (or after) breeding season may be beneficial for curlews
- Encourage stable water levels in irrigated pastures during breeding season, and discourage large irrigation pulses

References: [1]Allen (1980); [2]Dugger and Dugger (2002); [3]Fellows and Jones (2009); [4]GBBO unpublished Atlas data; [5]Hartman (2008); [6]Hartman and Oring (2006); [7]Hartman et al. (2009); [8]Jones et al. (2003); [9]Nevada Wildlife Action Plan Team (2006); [9]Paige and Ritter (1999); [10]Pampush and Anthony (1993); [11]Redmond and Jenni (1986); [12]Saalfeld et al. (2010); [EO]Expert opinion

Marbled Godwit

Limosa fedoa

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada
Marsh Open Water (shorelines) (Ephemeral Wetland and Playa)

Key Habitat Parameters ○	
Plant Composition	Bulrush, sedges, rushes, cattail[1]
Plant Density	Variable[2]
Mosaic	Variety of types and sizes of marshes, lakes, and ephemeral wetlands, with emergent vegetation, open shoreline, and mudflats; availability of aquatic plant tubers especially important during migration[2]
Water Depth	≤ 13 cm [5 in][2]
Hydrology	Unknown
Water Quality	Unknown
Response to Vegetation Removal	Unknown

Area Requirements ○	
Minimum Patch Size	Unknown, but often seen at smaller marshes and water bodies [EO]
Recommended Patch Size	> 10 ha [25 ac] [EO]
Home Range / Territory Size	Unknown

Conservation Profile

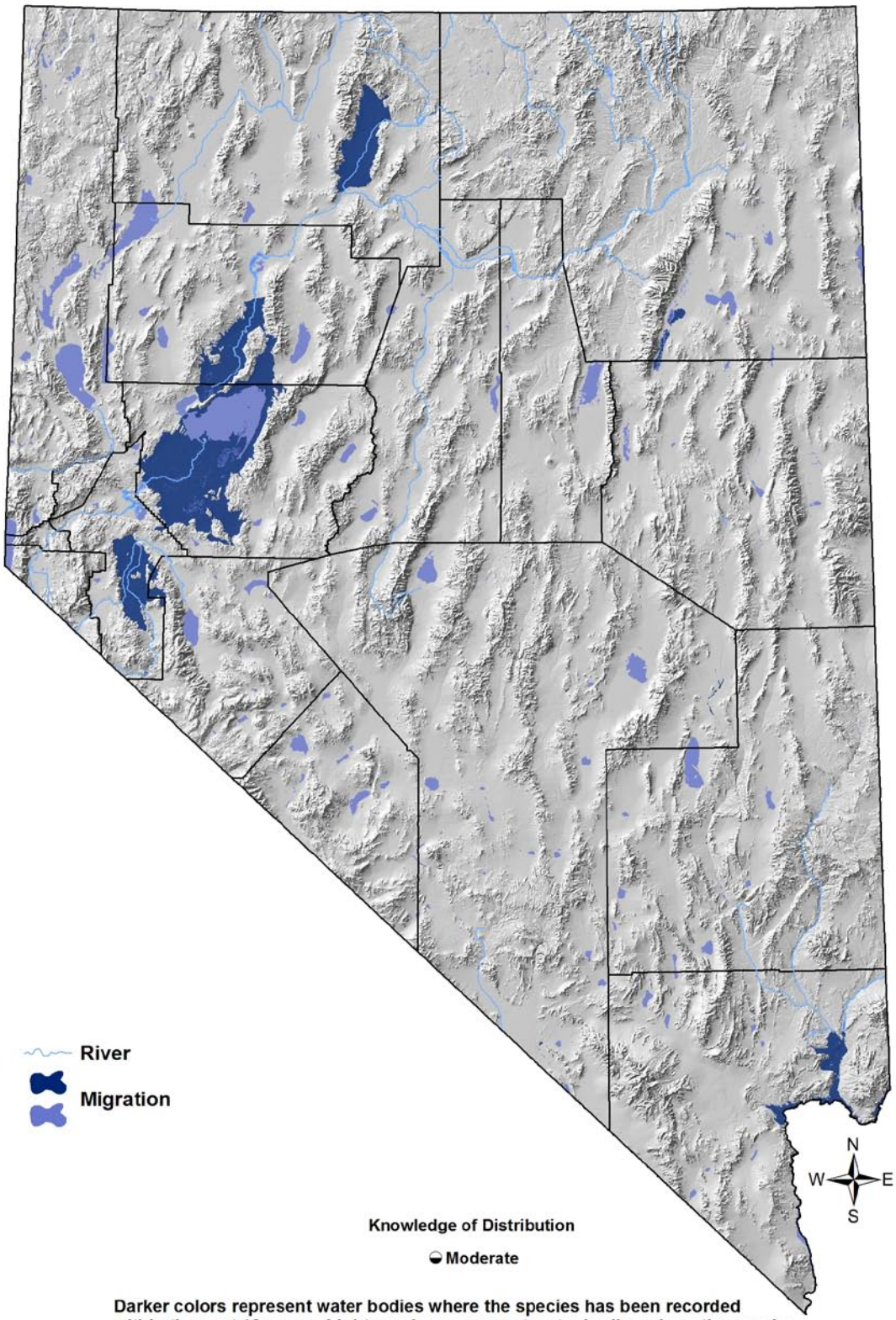
Priority Status	
Conservation Priority Species	
Species Concerns	
Habitat threats Historical and recent declines Insufficient knowledge of habitat requirements	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S3M
USFWS	Migratory Bird; Bird of Conservation Concern
BLM	None
USFS	None
NDOW	Stewardship
IW Shorebird Plan	Very Important
Trends	
Historical ◑	Declines[2]
Recent ◑	Probably declining in Nevada[1, EO]
Population Size Estimates	
Nevada ◑	350 [EO]
Global ◑	175,000 [4]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	WMA and NWR counts, Aquatic Bird Count
Coverage in NV	Fair in WMA's and NWR's; Poor elsewhere
Key Conservation Areas	
Protection	Lahontan Valley, Upper Walker River
Restoration	Unknown

Natural History Profile

Seasonal Presence in Nevada	
Spring (migration, May peak) Fall (migration, late June – August peak)	
Known Breeding Dates in Nevada	
N/A	
Nest and Nesting Habits	
Nest Placement	N/A
Site Fidelity	Unknown
Food Habits	
Basic	Prober
Primary Diet	Invertebrates, usually from sediment[2]
Secondary Diet	Plant tubers, especially during migration[2]

Marbled Godwit

Limosa fedoa



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Marbled Godwit

Limosa fedoa

Overview

These large shorebirds are only present in Nevada during migration stopovers, more commonly in the spring than in the fall, although it is possible that fall migrants are under-reported because godwits begin their southward migration several weeks earlier than other shorebirds. There are nearby wintering areas in California's Sacramento Valley, and there have been reports of wintering birds in western Nevada, although there are no recent records. At migration stopover sites, Marbled Godwits tend to be seen around smaller water features where they forage on mudflats or in shallow water with or without emergent vegetation. Although godwits are fairly conspicuous during migration, there is not much information about their habitat use, their conservation needs, or any threats. For instance, it is not clear whether or not birds migrating through Nevada primarily eat aquatic plant tubers, which has been reported as a general characteristic of migrating populations.[2] In fact, the Marbled Godwits is a poorly studied bird in general,[2] which is particularly unfortunate given that it appears to be declining.

Apart from simply protecting the water supplies of marshes and ephemeral wetlands during the migration periods, the main conservation need for this species is to collect better information on nearly every aspect of its biology, ecology, and conservation status. The Marbled Godwit's early fall migration pattern could pose management challenges in situations where its seasonal needs may not correspond to other shorebirds on a more "normal" migration schedule.

Abundance and Occupancy by Habitat

- High counts recorded in Lahontan Valley were 1,000 birds in 1947, and 465 birds in 1989 [5]

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Diversion of water, causing shrinking or drying of marshes, ponds, or lakes before the fall migration peak
- Enhancing water availability will also help diminish the deleterious effects of contaminants[3]

Marbled Godwit

Limosa fedoa

Research, Planning, and Monitoring Challenges

- Very little is known about the Marbled Godwit's biology, ecology, or conservation needs
- We need a better understanding of habitat quality at stopover sites, as indicated by a) length of stay and turnover rates, and b) body condition[3]
- Monitoring coverage is inadequate

Conservation Strategies

Habitat Strategies

- Marsh (p. Hab-9-1) and Open Water (p. Hab-15-1) habitat conservation strategies should benefit this species
- Protect / maintain inflows into key stopover areas that are sufficient to provide water through the migration peaks[3]
- Marshes and lakes with broad muddy shorelines may be preferred by Marbled Godwits and should receive priority management consideration

Research, Planning, and Monitoring Strategies

- Supplement current monitoring programs, especially during the fall migration period (21 June – 31 August) to collect better information on distribution, trends, and habitat use
- A significant program of research is needed to gather information about the Marbled Godwit's biology, ecology, habitat use, threats, and conservation status[3]

Public Outreach Strategies

- None identified

References: [1] Brown et al. (2001); [2]Gratto-Trevor (2000); [3]Melcher et al. (2010); [4]Morrison et al. (2006); [5]Neel and Henry (1996); [EO] Expert opinion

Western Sandpiper

Calidris mauri

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Open Water (shorelines) Ephemeral Wetland and Playa	
Key Habitat Parameters ●	
Plant Density	Very sparse or no vegetation[8]
Mosaic	Shallow-water shorelines and mudflats with saturated soils and little or no vegetation[8]
Water Depth	< 4 cm [1.6 in][8]
Water Quality	Tolerates variety of salinities EO
Response to Vegetation Removal	Neutral EO
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	> 100 ha [250 ac] EO
Home Range / Territory Size	Unknown

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Recent declines High stewardship responsibility (migration) Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S5M
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	None
IW Shorebird Plan	Very Important
Trends	
Historical ○	Unknown
Recent ◑	Probably declining[1]
Population Size Estimates	
Nevada ◑	~ 12,000, with high annual variability[2]
Global ●	3,500,000 [1]
Percent of Global	< 1%
Population Objective	
Increase by 30% EO	
Monitoring Coverage	
Source	NDOW shorebird surveys, NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Good in Lahontan Valley, Fair elsewhere
Key Conservation Areas	
Protection	Lahontan and Ruby Valleys, Humboldt and Key-Pittman WMA's, Pyramid Lake, all open water habitat with muddy shoreline
Restoration	Threatened open water shorelines, dewatered playas

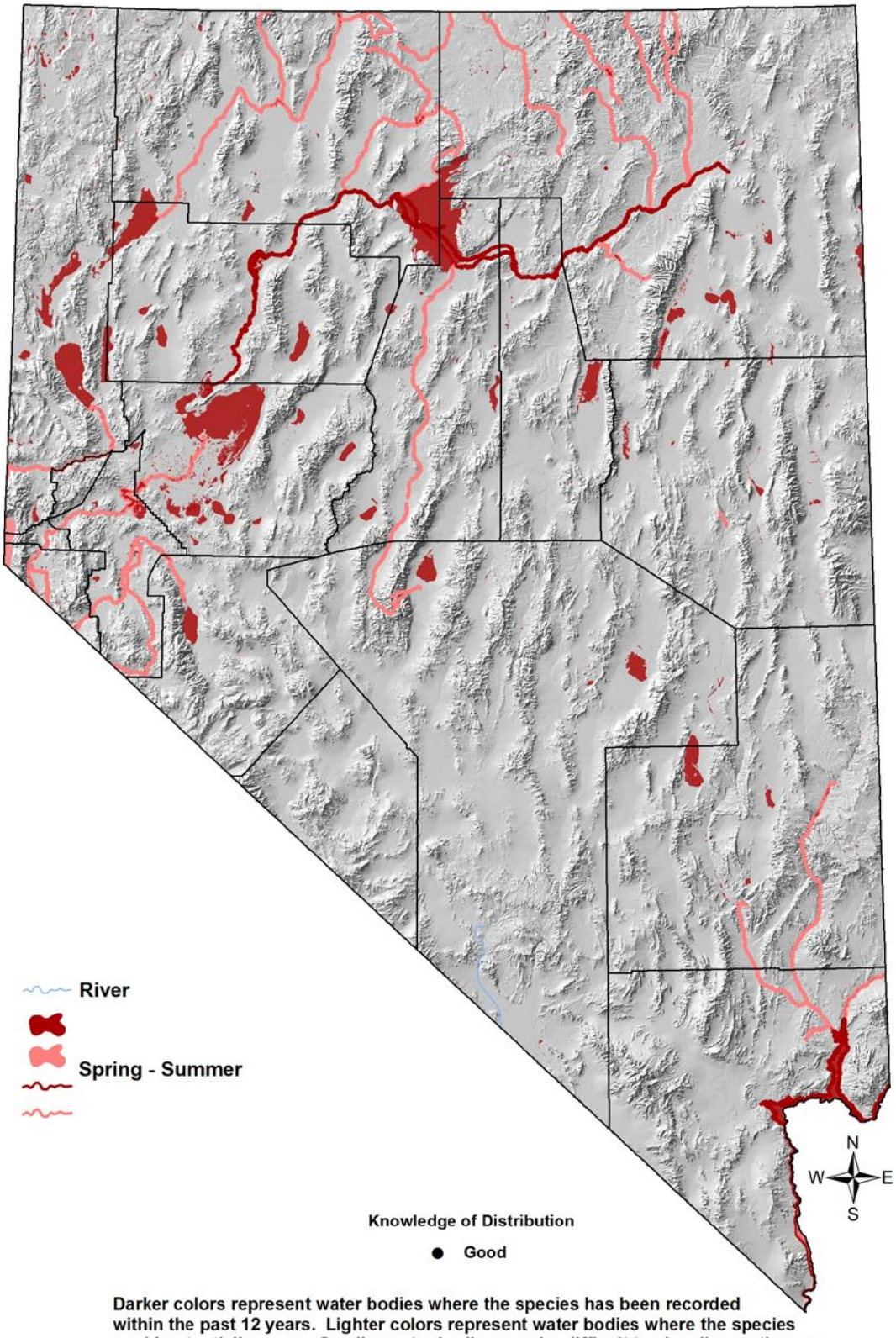
Natural History Profile

Seasonal Presence in Nevada	
Spring (migration, peak April) Fall (migration, peak August - September)	
Known Breeding Dates in Nevada	
N/A	
Nest and Nesting Habits	
Nest Placement	N/A
Site Fidelity	Probably low - moderate for migration stopover sites EO
Food Habits	
Basic	Prober
Primary Diet	Benthic invertebrates[8]
Secondary Diet	Terrestrial invertebrates[8]

Confidence in Available Data: ●High ◑Moderate ○ Low

Western Sandpiper

Calidris mauri



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Western Sandpiper

Calidris mauri

Overview

Although most Western Sandpipers migrate between their Arctic breeding grounds and wintering grounds using a route that parallels the Pacific Coast, significant numbers take inland routes through the Great Basin where they are the most commonly observed small sandpiper. Western Sandpipers use shallow ephemeral wetlands, mudflats, and recently exposed or otherwise damp shorelines and beaches of Nevada's open water habitats. Numbers of spring and fall migrants are roughly equivalent, with a modest preponderance of spring migrants in the Great Basin,[7] which contrasts with the preponderance of fall migrants along other migration routes through the continent's interior.[8] As is the case with many other Conservation Priority shorebirds, Lahontan Valley provides Nevada's most critically important habitat for Western Sandpipers.[5] For this reason, it has been designated as a "Site of Hemispheric Importance" by the Western Hemisphere Shorebird Reserve Network (www.whsrn.org). In addition to Lahontan Valley, Western Sandpipers also have a well-establish migratory presence across most of Nevada, including Ruby Lake NWR in the east and Lake Mead in the far south. They commonly use shorelines along ephemeral wetlands and playas, if water is present.

Western Sandpipers appear to be declining across their range, and it has been suggested that threats during migration and on the wintering grounds play a role in this decline. Beyond this general statement, however, the precise causes of declines have not been the subject of any significant study. Gathering more data on migrating populations in Nevada might therefore be especially helpful in determining specific conservation strategies. In particular, further study and attention should be given to determining the relative importance of ephemeral wetlands and playas to Western Sandpipers.

Abundance and Occupancy by Habitat

The ten-year average seasonal count for Lahontan Valley is 7,600 birds, with 4,400 estimated to occur in other locations across Nevada (L. Neel, pers. comm.). Ten-year peaks in Lahontan Valley typically exceed 45,000, with highest recorded peak (which included some Least Sandpipers) of 66,700 in 1987, and another slightly smaller peak of 59,000 in 1990.[4]

Nevada-Specific Studies and Analyses

Shuford et al. (2002)[7] provides the most comprehensive data for migratory shorebirds in the Intermountain West region, including Nevada.

Main Threats and Challenges

Habitat and Other Threats

- Loss or degradation of flat, muddy open water shorelines due to water diversions, declines in water quality, or development

- Because Western Sandpipers may use ephemeral wetlands and wet playas extensively, they may be impacted by changing precipitation patterns associated with climate change
- Mid-summer dewatering of traditional or potential fall migration stopover sites
- Dewatering of ephemeral wetlands and playas due to diversion of seasonal runoff

Research, Planning, and Monitoring Challenges

- Extent and causes of declines are not well understood[3]
- The relative importance of ephemeral wetlands such as flooded playas, particularly during spring migration, has not been well-studied[6]

Conservation Strategies

Habitat Strategies

- Open Water (p. Hab-15-1) and Ephemeral Wetland and Playa (p. Hab-6-1) habitat conservation strategies benefit this species
- Maintain flooded conditions in important stopover habitat during the migration periods (20 April – 10 May; 1 – 30 August); prevent mid-summer dewatering of traditional or potential fall migration stopover sites
- Allow or encourage seasonal runoff into ephemeral wetlands and playas sufficient to create mudflats with water depth < 4 cm [1.6 in] during migration periods

Research, Planning, and Monitoring Strategies

- Devote more inventory and monitoring effort to ephemeral wetlands and playas to determine their relative importance as migration habitat
- Continue and expand current monitoring efforts to confirm and better quantify population trend and identify possible causes

Public Outreach Strategies

- None identified

References: [1]Brown et al. (2001); [2]IWJV (in prep.); [3]Fernández et al. (2010); [4]Neel and Henry (1996); [5]Oring and Reed (1996); [6]Oring et al. (2000); [7]Shuford et al. (2002); [8]Wilson (1994); [EO]Expert opinion

Least Sandpiper

Calidris minutilla

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Open Water (shorelines) Ephemeral Wetland and Playa	
Key Habitat Parameters ◑	
Plant Density	Sparse emergent and shoreline vegetation[4]
Mosaic	Shallow waters near shoreline with sparse vegetation, interspersed with mudflats, wet meadows, and flooded agricultural stubble fields[4]
Water Depth	< 4 cm [1.6 in][4]
Water Quality	Tolerant of a variety of salinities EO
Hydrology	Tolerant of stage fluctuations EO
Response to Vegetation Removal	Probably neutral EO
Area Requirements ○	
Minimum Patch Size	Unknown, but uses smaller waterbodies than some other shorebirds[4]
Recommended Patch Size	> 50 ha [125 ac] EO
Home Range / Territory Size	Unknown

Conservation Profile

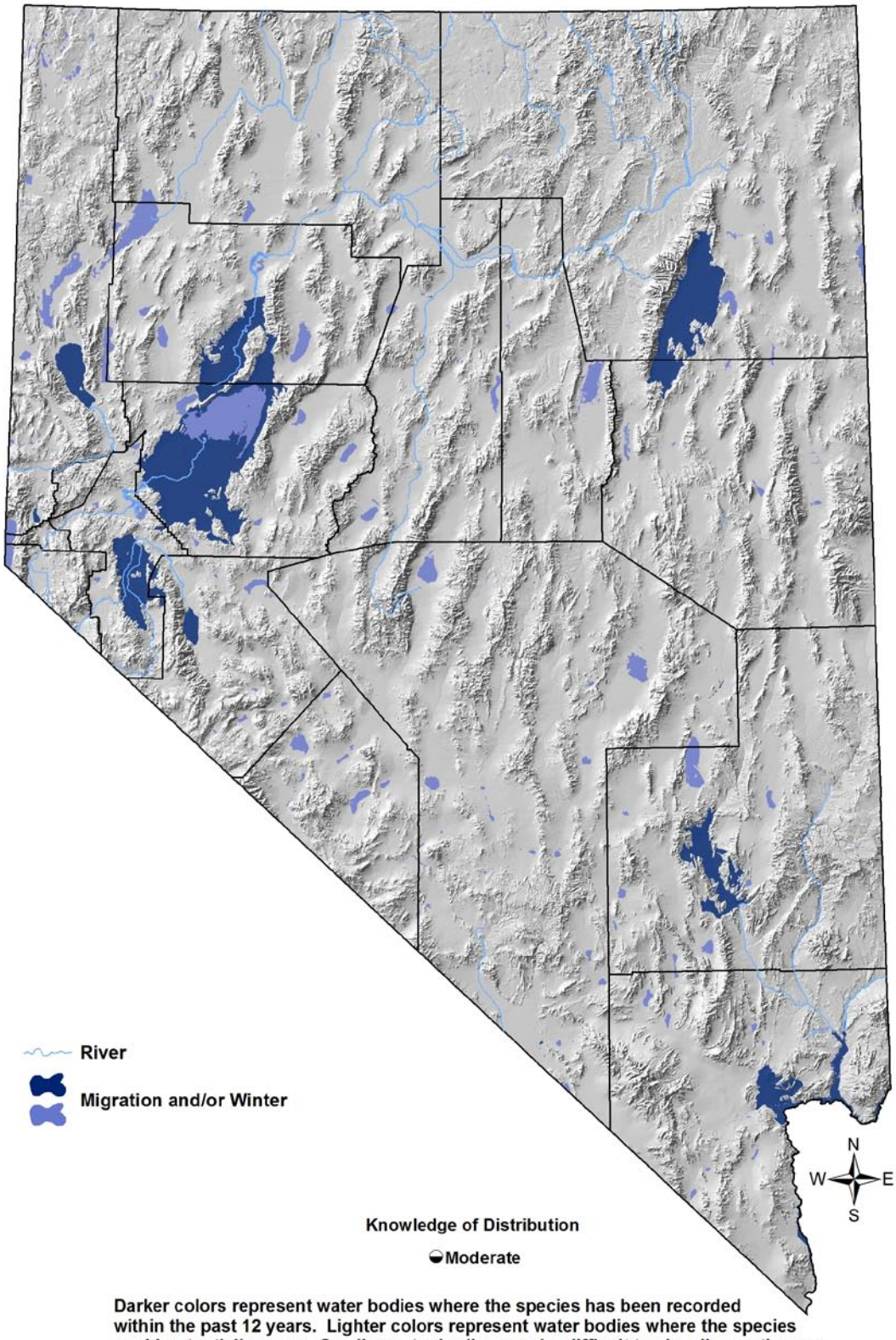
Priority Status	
Conservation Priority Species	
Species Concerns	
Recent declines Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S4N
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Shorebird Plan	Very Important
Trends	
Historical ○	Unknown
Recent ◑	Declining[1]
Population Size Estimates	
Nevada ◑	~ 2,200, with high annual variablility[2]
Global ○	600,000 - 700,000 [1, 3]
Percent of Global	< 1%
Population Objective	
Maintain / Increase EO	
Monitoring Coverage	
Source	NDOW shorebird surveys, NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Good in Lahontan Valley, Fair / Poor elsewhere
Key Conservation Areas	
Protection	Lahontan and Ruby Valleys, Mojave wetlands
Restoration	Threatened open water shorelines

Natural History Profile

Seasonal Presence in Nevada	
Spring (migration, peak April) Fall (migration, peak August) Winter (southern Mojave)	
Known Breeding Dates in Nevada	
N/A	
Nest and Nesting Habits	
Nest Placement	N/A
Site Fidelity	Unknown
Food Habits	
Basic	Prober
Primary Diet	Aquatic invertebrates < 6 mm [0.2 in] long[4]
Secondary Diet	Terrestrial invertebrates[2]

Least Sandpiper

Calidris minutilla



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Least Sandpiper

Calidris minutilla

Overview

The Least Sandpiper is seen most often in Nevada in mixed, migrating flocks, usually with Western Sandpipers, which are generally more numerous. Like the Western Sandpiper, Least Sandpipers use shallow water and mudflats for foraging, but they are more likely to also forage on the drier parts of beaches and shorelines than their flock-mates.[4] Least Sandpipers are also more likely to use small habitat patches,[4] which are typically more vulnerable to habitat conversion than larger water features.[7] Least Sandpipers tend to be more numerous during spring migration than fall migration, with the greatest numbers occurring in Lahontan Valley, followed by Ruby Valley, southern Nevada (primarily Lake Mead and Ash Meadows NWR), and Pyramid Lake.[6] According to data from the Nevada Aquatic Bird Count program, some Least Sandpipers also remain in far southern Nevada throughout the winter, primarily in Lake Mead, but also in smaller numbers at Ash Meadows NWR. As is the case with many other Conservation Priority shorebirds, Lahontan Valley provides Nevada's most critically important habitat for Least Sandpipers. For this reason, it has been designated as a "Site of Hemispheric Importance" by the Western Hemisphere Shorebird Reserve Network (www. whsrn.org).

Because of their affinity for mixed-species flocks, it is difficult to obtain accurate counts of Least Sandpipers, and population estimates for Nevada are somewhat suspect. Least Sandpipers appear to be declining, though perhaps more sharply in the eastern part of North America than in the west. It has been suggested that ongoing declines are related to threats associated with migration or wintering grounds, but specific mechanisms of decline, or possible management responses, have not yet been identified.[7] It is unclear whether Least Sandpipers use ephemeral wetlands and playas (when wet) to the extent postulated for Western Sandpipers. Further investigation into this issue seems warranted.

Abundance and Occupancy by Habitat

The ten-year average seasonal count for Lahontan Valley is 2,000 birds, with 200 birds estimated to occur in other locations around Nevada (L. Neel, pers. comm.). The most recent ten-year peak for Lahontan Valley was 8,300 birds in 2001 (L. Neel, pers. comm.)

Nevada-Specific Studies and Analyses

Shuford et al. (2002)[6] provides the most comprehensive data for migratory shorebirds in the Intermountain West region, including Nevada.

Least Sandpiper

Calidris minutilla

Main Threats and Challenges

Habitat Threats

- Loss or degradation of flat, muddy open water shorelines due to water diversions, declines in water quality, or development
- Mid-summer dewatering of traditional or potential fall migration stopover sites

Research, Planning, and Monitoring Challenges

- Extent and causes of declines are not well understood
- The relative importance of ephemeral wetlands such as flooded playas, particularly during spring migration, has not been well-studied[5]

Conservation Strategies

Habitat Strategies

- Open Water (p. Hab-10-1) and Ephemeral Wetland and Playa (p. Hab-6-1) habitat conservation strategies benefit this species
- Maintain flooded conditions in important stopover habitat during the migration periods (20 April – 10 May; 1 – 30 August); prevent mid-summer dewatering of traditional or potential fall migration stopover sites
- Allow or encourage seasonal runoff into ephemeral wetlands and playas sufficient to create mudflats with water depth < 4 cm [1.6 in] during migration periods

Research, Planning, and Monitoring Strategies

- Devote more inventory and monitoring effort to ephemeral wetlands and playas to determine their relative importance as migration habitat
- Continue and expand current monitoring efforts to confirm and better quantify population trend and identify possible causes

Public Outreach Strategies

- None identified

References: [1]Brown et al. (2001); [2]IWJV (in prep.); [3]Morrison et al. (2006); [4]Nebel and Cooper (2008); [5]Oring et al. (2000); [6]Shuford et al. (2002); [7]Thomas et al. (2006); [EO] Expert opinion

Long-billed Dowitcher

Limnodromus scolopaceus

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada
Marsh Open Water Ephemeral Wetland and Playa
Key Habitat Parameters ◑
Plant Composition: Cattail, bulrush, sedges, rushes, submerged aquatic vegetation
Plant Density: Forages in open (shallow) water or where stem density is low[9]
Mosaic: Shallow marsh with low stem densities, interspersed with mudflats and shallow open water[9]
Water Depth: < 16 cm [6.2 in] for foraging[9]
Water Quality: Tolerates variety of salinities[7, 9]
Response to Vegetation Removal: Probably neutral [EO]
Area Requirements ○
Minimum Patch Size: Unknown
Recommended Patch Size: > 50 ha [125 ac] [EO]
Home Range / Territory Size: Unknown

Conservation Profile

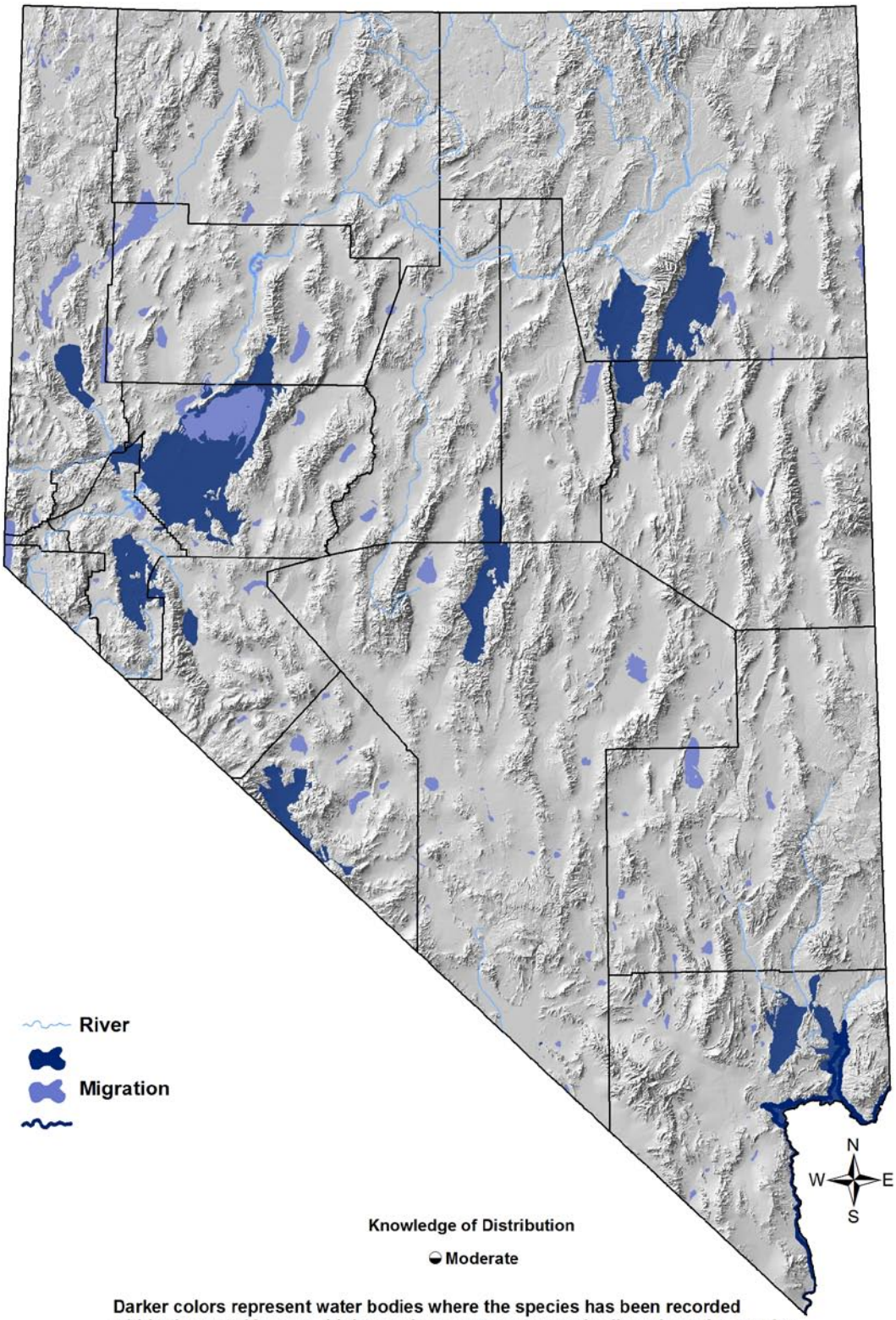
Priority Status	
Conservation Priority Species	
Species Concerns	
Habitat threats Historical and recent declines High stewardship responsibility (migration)	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S4N
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Shorebird Plan	Critically Important
Trends	
Historical ●	Rangewide declines[9]
Recent ○	Probably declining[5, 10]
Population Size Estimates	
Nevada ◑	14,000 – 20,000, with high annual variability[3, 10]
Global ○	500,000 [1]
Percent of Global	~ 3%, but much higher in peak years
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	NDOW shorebird counts, NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Good in Lahontan Valley and NWR's; Fair elsewhere
Key Conservation Areas	
Protection	Lahontan and Ruby Valleys
Restoration	Degraded marshes

Natural History Profile

Seasonal Presence in Nevada	
Spring (migration, May peak) Fall (migration, September peak)	
Known Breeding Dates in Nevada	
N/A	
Nest and Nesting Habits	
Nest Placement	N/A
Food Habits	
Basic	Prober
Primary Diet	Benthic and soil invertebrates[9]
Secondary Diet	Terrestrial invertebrates, seeds[10]

Long-billed Dowitcher

Limnodromus scolopaceus



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Long-billed Dowitcher

Limnodromus scolopaceus

Overview

The Great Basin provides critical migration stopover habitat for Long-Billed Dowitchers in both fall and spring.[7, 8] and this species is one of the most numerous migrant shorebirds in the big wetland complexes of western Nevada,[6] where they typically spend their time wading in shallow open water, probing for invertebrates.[9] The Lahontan Valley is particularly important for migrating dowitchers, hosting perhaps 90% of all birds passing through Nevada. As such, it has been designated as a "Site of Hemispheric Importance" by the Western Hemisphere Shorebird Reserve Network (www.whsrn.org). Other locations with significant numbers include Lake Mead, Ash Meadows NWR, and Ruby Valley, along with a number of smaller sites, including some ephemeral wetlands.[2] A few Long-billed Dowitchers are present in mid-winter in western Nevada near Reno (www.ebird.org), but it is not clear if this is a regular or unusual phenomenon, or whether it involves overwintering birds or late / early migrants.

Most Long-billed Dowitchers in Nevada use areas that are actively managed for birds and have some level of protection, but nonetheless the population may be declining. Long-billed Dowitcher numbers in Lahontan Valley have recently been averaging ~ 14,000 – 20,000 birds,[3, 10] down substantially from levels seen in the 1980's.[5] While some of this decline can perhaps be attributed to water diversions and cyclic drought, dowitchers have not rebounded as might be expected during periods when available water increased (L. Neel, pers. comm.). Apart from the obviously critical issue of water supply, factors that might be responsible for lower numbers are not known.

Abundance and Occupancy by Habitat

NDOW and USFWS inventories in Lahontan Valley in the 1980's documented peak annual numbers in excess of 100,000 birds, in two different years.[5] Average numbers for this period were approximately 30,000 birds, with annual differences attributable to precipitation patterns and available water. During the peak years, Nevada may have hosted up to 30% of the global Long-billed Dowitcher population.[5]

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Diversion of water, causing shrinking or drying of marshes, ponds, or lakes before the fall migration peak

Long-billed Dowitcher

Limnodromus scolopaceus

Research, Planning, and Monitoring Challenges

- It is not known whether apparent declines are directional or cyclical, and if the former, their causes are unclear
- There is little information on the impacts of water quality

Conservation Strategies

Habitat Strategies

- Marsh (p. Hab-9-1), Open Water (p. Hab-15-1), and Ephemeral Wetland and Playa (p. Hab-6-1) habitat conservation strategies benefit this species
- Protect / maintain inflows into key stopover areas that are sufficient to provide water through the migration peaks
- Where the inflow volume can be controlled, flooding of mudflats to a depth of $\leq$ 10 cm [4 in] from April 20 – May 10, and from August 1 – 30 creates maximum numbers of benthic prey items for the migration periods [EO]

Research, Planning, and Monitoring Strategies

- Possible declines need to be further investigated to determine if they are "real" or a cyclic fluctuation, and if real, the possible causes should be researched and assessed
- The effects of water quality need further research

Public Outreach Strategies

- None identified

References: [1]Brown et al. (2001); [2]GBBO unpublished Nevada Aquatic Bird Count data; [3]IWJV (in prep.); [4]Morrison et al. (2006); [5]Neel and Henry (1996); [6]Neel et al. (2000); [7]Oring and Reed (1996); [8]Shuford et al. (2002); [9]Takekawa and Warnock (2000); [10]Nevada Wildlife Action Plan Team (2006); [EO] Expert opinion

Wilson's Phalarope

Phalaropus tricolor

Photo by Steve Ting

Habitat Use Profile

Habitats Used in Nevada	
Marsh Open Water Ephemeral Wetland and Playa (Wet Meadow)	
Key Habitat Parameters ●	
Plant Composition	Breeding: Spikerush, sedges, other short, dense vegetation near shore[3]
Plant Density	Breeding: Variable, but often dense, short vegetation within 100 m [330 ft] of shore[3, EO]
Mosaic	Breeding: Variety of large and small marshes with sufficient shoreline vegetation; Staging / migration: larger saline lakes comprised of mostly open water[3]
Water Depth	Variety of depths, but most often < 2 m [6.6 ft][3, EO]
Water Quality	Breeding: Freshwater; Staging / migration: saline lakes[3]
Response to Vegetation Removal	Neutral [EO]
Area Requirements ◑	
Minimum Patch Size	Unknown
Recommended Patch Size	> 10 ha [25 ac] [EO]
Home Range	Breeding: Small territories with nest spacing as close as 5 m [16 ft], but may be more solitary in NV[3, EO]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and recent declines Habitat threats High stewardship responsibility (staging and migration)	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S2S3B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	None
IW Shorebird Plan	Critically Important
Trends	
Historical ◑	Significant declines[3]
Recent ◑	Probable declines[1 EO]
Population Size Estimates	
Nevada ◑	3,000 (breeding); ~12,000 (staging and migration), with high annual variability[7, EO]
Global ○	1,500,000 [1, 3, 10]
Percent of Global	< 1%
Population Objective	
Maintain / increase [EO]	
Monitoring Coverage	
Source	NODW shorebird counts, WMA and NWR counts, Aquatic Bird Count
Coverage in NV	Good / Fair in Lahontan Valley, NWR's, and WMA's; Fair / Poor elsewhere
Key Conservation Areas	
Protection	See "Overview", below
Restoration	Degraded or at-risk marshes, lakes, and ponds

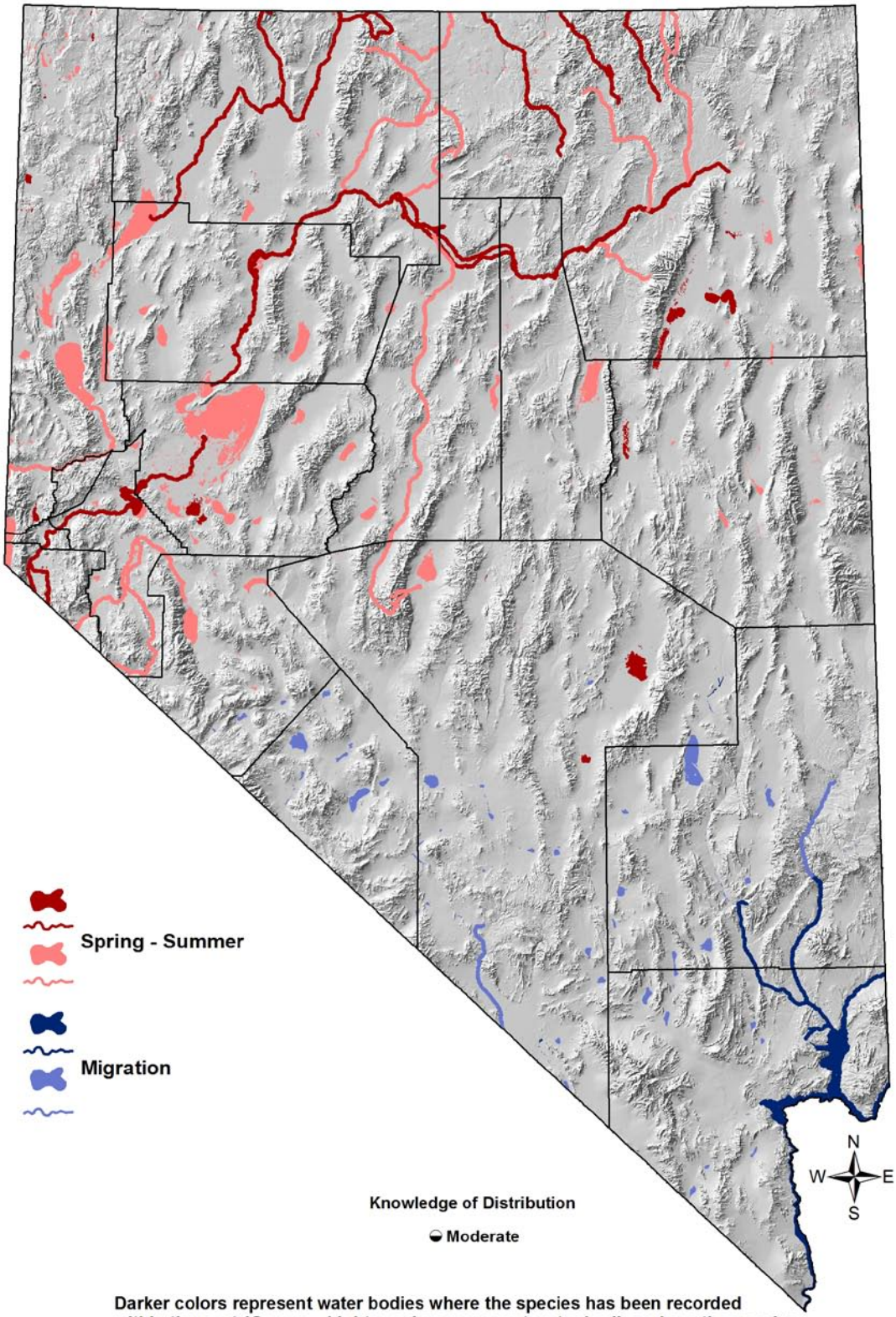
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer (breeding) Fall and Spring (migration)	
Known Breeding Dates in Nevada	
May – July[1, 6]	
Nest and Nesting Habits	
Nest Placement	Ground nests in wet areas with vegetation cover, < 100 m [330 ft] from water edge[3]
Site Fidelity	Probably low[4]
Other	Gregarious nester[3]
Food Habits	
Basic	Dabbler and prober
Primary Diet	Invertebrates from water column or sediment[3]
Secondary Diet	Terrestrial invertebrates[3]

Confidence in Available Data: ●High ◑Moderate ○ Low

Wilson's Phalarope

Phalaropus tricolor



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Wilson's Phalarope

Phalaropus tricolor

Overview

Wilson's Phalarope is well known for the huge flocks that congregate at saline lakes prior to their long-distance fall migration,[8] especially just outside Nevada's borders at the Great Salt Lake and Mono Lake. Although the Wilson's Phalarope's presence in our state is more modest, Nevada does contain important staging sites, particularly in Lahontan Valley, where a peak staging abundance of 67,000 birds was recorded in 1987.[11] Because of their critical importance to staging Wilson's Phalaropes and other species, the Lahontan Valley Wetlands have been designated as a "Site of Hemispheric Importance" by the Western Hemisphere Shorebird Reserve Network (www. whsrn.org). Ruby Lake NWR, the Henderson Sewage Ponds, Lake Mead, Pyramid Lake, and several WMA's are also known staging locations.[14]

Wilson's Phalaropes also breed fairly widely across the northern part of the Nevada, in permanent or ephemeral freshwater marshes and ponds. Their nesting habitat may extend somewhat beyond the actual marsh edge into dense cover in meadows, grasslands, or irrigated agricultural fields.[3] In addition to Lahontan Valley, important breeding locations include Ruby Lake NWR, wetlands along the Humboldt River, and Washoe Valley.[5, EO] Although Nevada's staging population has been reasonably well characterized, less information has been collected on the breeding population. This is unfortunate, because indications are that Wilson's Phalaropes, though still numerous, have been declining rather steadily within Nevada and the greater region for some time. Better identification of the specific threats to this bird, during both the breeding season and the staging period, is a critical prerequisite to identifying effective conservation strategies.[9]

Abundance and Occupancy by Habitat

Although the fall staging population is typically ~ 12,000 birds (mostly in Lahontan Valley), peak numbers reached 67,000 in Lahontan Valley alone in 1987.[11] Even larger counts were reported in Lahontan Valley in 1970's, but have not recurred since.[2]

Nevada-Specific Studies and Analyses

Shuford et al. (2002)[14] provides the most comprehensive data for migratory shorebirds in the Intermountain West region, including Nevada.

Main Threats and Challenges

Habitat Threats

- Loss or degradation of marshes, ponds, and lakes due to water diversions, declines in water quality, development, or climate change[13]

- Possible negative impacts of livestock grazing / trampling on wet terrestrial habitats used for nesting[13]

Research, Planning, and Monitoring Challenges

- The relative importance of ephemeral wetlands such as flooded playas, particularly during spring migration, has not been well-studied and deserves further investigation[12]
- The conservation needs of breeding birds have not been well studied

Conservation Strategies

Habitat Strategies

- Open Water (p. Hab-15-1), Ephemeral Wetland and Playa (p. Hab-6-1), and Marsh (p. Hab-9-1) habitat conservation strategies benefit this species
- Maintain conditions that produce healthy populations of aquatic invertebrates (brine shrimp, brine flies, and others) during the spring and fall migration periods
- Manage livestock grazing, recreation, and other land uses to minimize the disturbance of shoreline and wet meadow vegetation that provide nest cover

Research, Planning, and Monitoring Strategies

- Improve current monitoring programs to better count peak migration numbers
- Devote more inventory and monitoring effort to ephemeral wetlands to determine their relative importance as migration habitat
- Conduct studies to better determine breeding habitat requirements and conservation needs
- Monitor water quality in occupied sites, especially key staging areas

Public Outreach Strategies

- None identified

References: [1]Brown et al. (2001); [2]Chishom and Neel (2002); [3]Colwell and Jehl (1994); [4]Colwell and Oring (1988); [5]Floyd et al. (2007); [6]GBBO unpublished Atlas data; [7]IWJV (in prep.); [8]Jehl (1988); [9]Lesterhuis and Clay (2010); [10]Morrison et al. (2006); [11]Neel and Henry (1996); [12]Oring et al. (2000); [13]Powers and Glimp (1996); [14]Shuford et al. (2002); [EO] expert opinion

Red-necked Phalarope

Phalaropus lobatus

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Open Water Ephemeral Wetland and Playa (Marsh)	
Key Habitat Parameters ◑	
Plant Density	Low density of emergent plants[6]
Mosaic	Variety of lakes, ponds, and marshes dominated by open water; no other habitat features known to be important[6]
Water Depth	Not quantified, but occurs on water bodies of varying sizes and depths[6]
Water Quality	Tolerates variety of salinities, but often associated with saline or hypersaline wetlands[6, EO]
Response to Vegetation Removal	Neutral [EO]
Area Requirements ◑	
Minimum Patch Size	Unknown; small wetlands used[6]
Recommended Patch Size	> 50 ha [125 ac] [EO]
Home Range / Territory Size	Unknown

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
High stewardship responsibility (staging and migration) Historical and possible recent declines Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S4M
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Shorebird Plan	Very Important
Trends	
Historical ◑	Significant declines[6]
Recent ○	Possible declines[2, 6]
Population Size Estimates	
Nevada ◑	~3,000 (staging and migration), with high annual variability[3]
Global ○	2,500,000 [1, 4]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	NDOW shorebird counts, NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Good in Lahontan Valley, NWR's, and WMA's; Fair / Poor elsewhere
Key Conservation Areas	
Protection	Lahontan Valley (esp. Big Soda Lake), Humboldt Sink, Walker Lake
Restoration	Degraded or at-risk marshes, lakes, and ponds

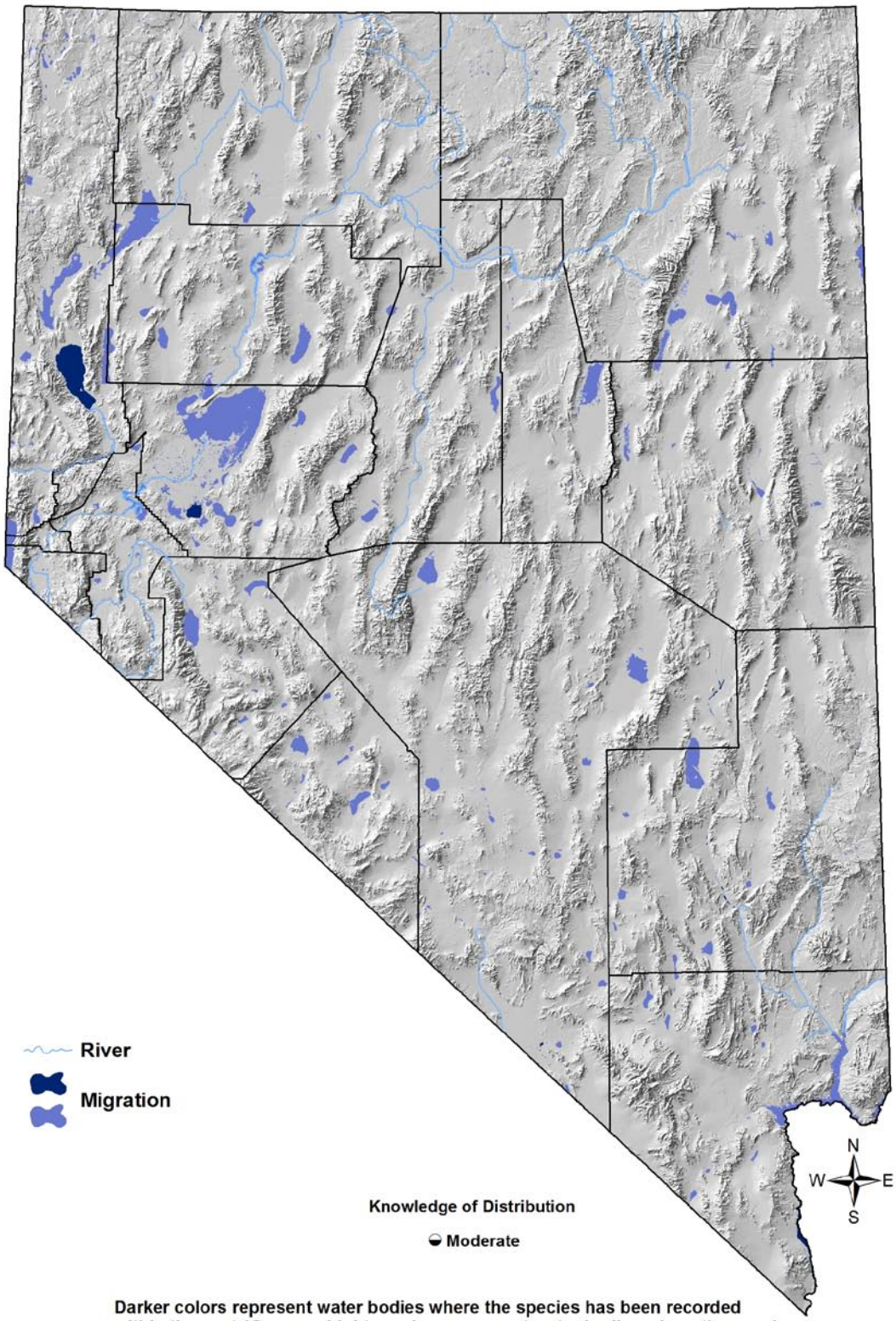
Natural History Profile

Seasonal Presence in Nevada	
Fall (migration, late July - early August peak, variable) Spring (migration, April - May peak, variable)	
Known Breeding Dates in Nevada	
N/A	
Nest and Nesting Habits	
Nest Placement	N/A
Site Fidelity	Unknown
Food Habits	
Basic	Dabbler
Primary Diet	Small aquatic invertebrates[6]
Secondary Diet	Some flying insects[6]

Confidence in Available Data: ●High ◑Moderate ○ Low

Red-necked Phalarope

Phalaropus lobatus



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Red-necked Phalarope

Phalaropus lobatus

Overview

Although taxonomically a shorebird, Red-necked Phalaropes spend most of their lives at sea. Significant numbers of these long-distance migrants, however, stage or stop over in Nevada during migration, particularly in Lahontan Valley. Numbers vary greatly from year to year, but when ideal conditions are present, the number of phalaropes may be many times greater than in a typical year. For instance, in the late 1980's, approximately 30,000 birds were estimated to be present in Big Soda Lake (Lahontan Valley Wetlands) alone (L. Neel, *pers. comm.*). Even larger congregations are typical of nearby areas such as Great Salt Lake and Mono Lake.[6]

Fall migrants consistently outnumber spring migrants in Nevada and surrounding areas by wide margin.[7] That said, however, phalarope numbers are difficult to assess accurately during migration, as migration peaks are short, and their timing is variable. Additionally, fall migration generally occurs earlier (late July) than for most other shorebirds (L. Neel, *pers. comm.*), and is therefore not always effectively captured by multi-species migration counts. For these reasons, population size estimates for Nevada need to be confirmed with further research and monitoring.

The Red-necked Phalarope is a Conservation Priority Species in part because Nevada (particularly Lahontan Valley) provides migration stopover habitat for several thousand birds each year. In recognition of their critical importance to Red-Necked Phalaropes and other shorebirds,[4, 7] the Lahontan Valley Wetlands have been designated as a "Site of Hemispheric Importance" by the Western Hemisphere Shorebird Reserve Network (www. whsrn.org).

Abundance and Occupancy by Habitat

Although about 3,000 Red-necked Phalaropes are estimated to stopover in Nevada, on average, numbers vary substantially from "wet" years to "dry" years. Peak counts of 16,200 have been observed in Lahontan Valley as recently as 1987,[1] and 30,000 in the late 1980s (L. Neel, *pers. comm.*).

Nevada-Specific Studies and Analyses

Shuford et al. (2002)[7] provides the most comprehensive data for migratory shorebirds in the Intermountain West region, including Nevada.

Main Threats and Challenges

Habitat Threats

- Loss or degradation of marshes, ponds, and lakes due to water diversions, declines in water quality, or development

Red-necked Phalarope

Phalaropus lobatus

Research, Planning, and Monitoring Challenges

- The relative importance of ephemeral wetlands such as flooded playas, particularly during spring migration, has not been well-studied and deserves further investigation[5]

Conservation Strategies

Habitat Strategies

- Open Water (p. Hab-15-1) and Ephemeral Wetland and Playa (p. Hab-6-1) habitat conservation strategies benefit this species
- Maintain conditions that produce healthy populations of aquatic invertebrates (brine shrimp, brine flies, and others) during the spring and fall migration periods

Research, Planning, and Monitoring Strategies

- Improve current monitoring programs to better count peak migration numbers
- Devote more inventory and monitoring effort to ephemeral wetlands to determine their relative importance as migration habitat
- Monitor water quality in occupied sites

Public Outreach Strategies

- None identified

References: [1]Alcorn (1988); [2]Brown et al. (2001); [3]IWJV (in prep.); [4]Oring and Reed (1996); [5]Oring et al. (2000); [6]Rubega et al. (2000); [7]Shuford et al. (2002); [EO] Expert opinion

Franklin's Gull

Leucophaeus pipixcan

Photo by Fred Petersen

Habitat Use Profile

Habitats Used in Nevada	
Marsh Open Water (Agricultural)	
Key Habitat Parameters ◑	
Plant Composition	Bulrush, cattail, sedges, rushes, submerged aquatic vegetation
Plant Density	Patches of emergent vegetation with low-intermediate stem densities[2]
Mosaic	Marshes with emergent vegetation patches with low-intermediate stem densities for nesting, open water and nearby agricultural lands for foraging[3]
Water Depth	30 – 60 cm [12-24 in] at nest site, surrounded by deeper water[3]
Hydrology	Minimal fluctuation in stage during incubation [EO]
Response to Vegetation Removal	Probably positive to prescribed burns in upland habitats in overgrown sites [EO]
Area Requirements ○	
Minimum Patch Size	Unknown, but prefers larger wetland complexes for nesting
Recommended Patch Size	200 ha [494 ac] for total marsh size [EO]
Home Range / Territory Size	Unknown

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Small population size Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S3B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Waterbird Plan	High Concern
Trends	
Historical ◑	Slow increases in Great Basin in past 75 years[3]
Recent ○	Increasing[4]
Population Size Estimates	
Nevada ◑	350 [EO]
Global ○	500,000 – 1,000,000 [3, 4, 5]
Percent of Global	< 1%
Population Objective	
Maintain [EO]	
Monitoring Coverage	
Source	NWR and WMA counts, Aquatic Bird Count
Coverage in NV	Good in NWR's and WMA's, Fair / Poor elsewhere
Key Conservation Areas	
Protection	Ruby Valley, Lahontan Valley
Restoration	Degraded marshes

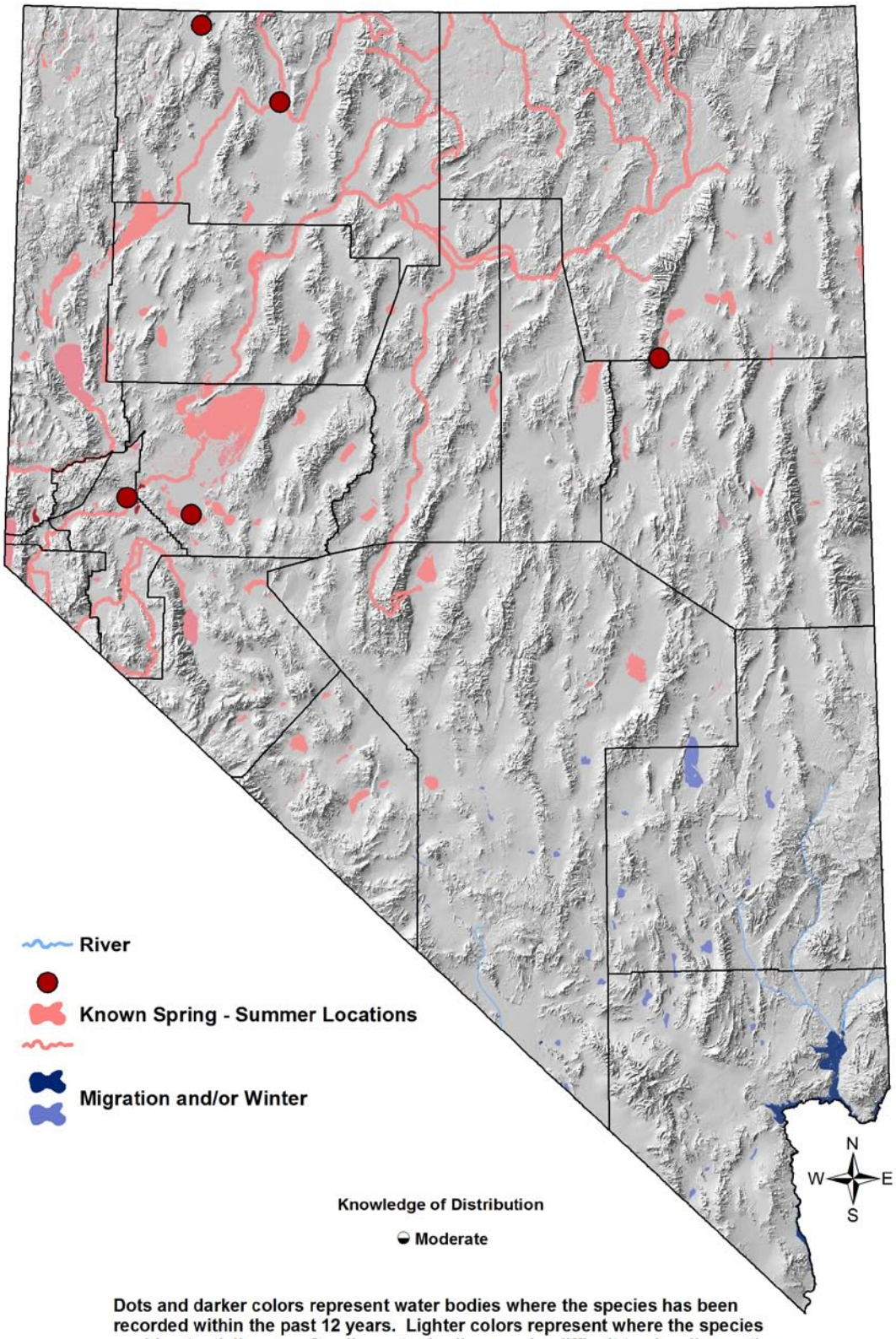
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer Fall (migration)	
Known Breeding Dates in Nevada	
May – July[3]	
Nest and Nesting Habits	
Nest Placement	On mats of floating vegetation[3]
Site Fidelity	Unknown
Other	Nests colonially[3]
Food Habits	
Basic	Dabbles and forages aerially and terrestrially
Primary Diet	Terrestrial and aquatic insects, seeds[3]
Secondary Diet	Plant matter[3]

Confidence in Available Data: ●High ◑Moderate ○ Low

Franklin's Gull

Leucophaeus pipixcan



Dots and darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent where the species could potentiall occur. Smaller water bodies may be difficult to visualize on the map.

Franklin's Gull

Leucophaeus pipixcan

Overview

Historical and recent population trends of the Franklin's Gull in the western U. S. are complex and variable across the species' breeding range.[3] In Nevada, however, at the southern margins of their breeding range, Franklin's Gulls have slowly increased. Franklin's Gulls were apparently unknown in the Great Basin until approximately 75 years ago, and the first Nevada breeding records date from only 1970 or 1971.[1, 3, 4] Until recently, Nevada's breeding population was very small (about 20 birds, occasionally peaking at about 50), but beginning in 2006 or 2007, number of breeders began to increase, especially in Ruby Lake NWR, which now hosts most of the state's known breeding pairs. Despite these increases, the Franklin's Gull is still a Conservation Priority species because of its small population size and its sensitivity to human disturbance and changing water levels in the breeding colony sites. Franklin's Gulls engage in significant post-breeding vagrancy prior to southward migration,[3] and birds migrating from farther north use a number of stopover sites in Nevada. Additional work is needed to determine whether conservation issues exist for post-breeding or migratory Franklin's Gulls in Nevada.

Abundance and Occupancy by Habitat

- Nest spacing in colonies may be as close as 1 m (more typically ~ 3 m) [3]
- Although Nevada's numbers have historically been small (< 50 pairs / site), they are increasing, and could potentially become significantly larger, as is the case in Oregon, Idaho, and Utah[3, 4]

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

<u>Habitat and other Threats</u>

- Loss or degradation of marshes due to water diversions, declines in water quality, or development
- Vulnerable to human disturbance during nesting[3]
- Sensitive to changes in water level during incubation[3]

Franklin's Gull
Leucophaeus pipixcan

Research, Planning, and Monitoring Challenges

- Additional survey and monitoring efforts in areas other than NWR's and WMA's would be useful to better determine Nevada's breeding population size and identify any significant breeding locations
- The degree to which Franklin's Gulls use Nevada marshes during the post-breeding and fall migration periods needs to be better understood

Conservation Strategies

Habitat and Other Strategies

- Marsh (p. Hab-9-1) and Open Water (p. Hab-15-1) habitat conservation strategies benefit this species
- Manage marshes to provide the preferred vegetation composition and density (see Habitat Use Profile table, above). More specifically, alkali bulrush and emergent narrowleaf pondweed are desirable vegetation components as they provide ideal material for nest platforms [EO]
- Maintain water at a consistent stage throughout the breeding season (1 May – 15 July), or at least during the incubation period (1 May – 15 June)[3]
- Limit human disturbance at colony sites

Research, Planning, and Monitoring Strategies

- Conduct additional surveys and monitoring to identify any significant breeding locations outside NWR's and WMA's
- Conduct additional surveys to better determine the extent to which post-breeding birds and fall migrants use Nevada marshes
- Monitor water quality in important breeding sites

Public Outreach Strategies

- None identified

References: [1]Alcorn (1988); [2]Burger (1974); [3]Burger and Gochfield (2009); [4]Ivey and Herziger (2006); [5]Kushlan et al. (2002); [EO] Expert opinion

Black Tern

Chlidonias niger

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Marsh Open Water	
Key Habitat Parameters ◑	
Plant Composition	Pondweed, bulrush, sedges, rushes[2]
Plant Density	25-75% cover within patches of emergent vegetation[2]
Mosaic	Large marsh complexes (avoids small isolated marshes); roughly equal amounts of open water and emergent vegetation; < 50% tilled upland[2, 5]
Water Depth	0.5 – 1.2 m [1.6 – 3.9 ft] at nest site[2]
Water Quality	Presumed to require very low salinity [EO]
Hydrology	Minimal fluctuation in stage during incubation [EO]
Response to Vegetation Removal	Probably negative [EO]
Area Requirements ◑	
Minimum Patch Size	20 ha [49 ac][2]
Recommended Patch Size	> 1,000 ha [2,500 ac] based on requirement of marsh complexes[2, EO]
Home Range / Territory Size	Unknown

Conservation Profile

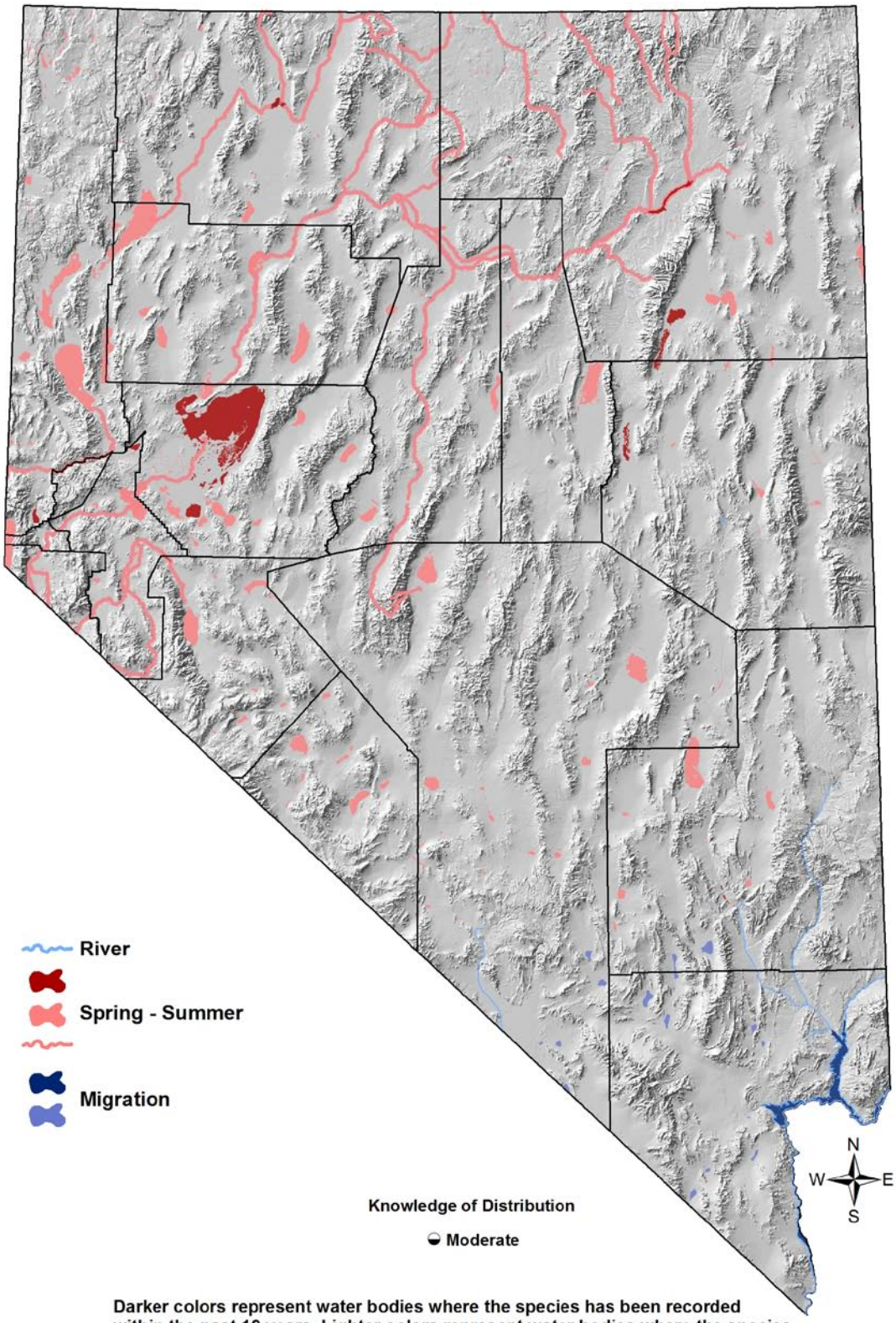
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and recent declines Small population size Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S2S3B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
IW Waterbird Plan	High Concern
Trends	
Historical ●	Rangewide declines[6]
Recent ◑	Declining[3]
Population Size Estimates	
Nevada ◑	700 [EO]
Global ◑	300,000 [4]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	Ruby Lake NWR surveys, Aquatic Bird Count
Coverage in NV	Good at Ruby Lake NWR, Fair / Poor elsewhere
Key Conservation Areas	
Protection	Ruby Valley
Restoration	Lahontan Valley, Ruby Valley

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Late June – August[1]	
Nest and Nesting Habits	
Nest Placement	Floating nest in emergent or dense mats of submerged vegetation, near open water[2]
Site Fidelity	Low fidelity to nest area[2]
Other	Semi-colonial, 11-50 pairs, nests spaced 5 - 20 m [2]
Food Habits	
Basic	Aerial forager and dipper
Primary Diet	Insects; fish 2.5-3 cm [1-1.2 in] in length[2]
Secondary Diet	Unknown

Black Tern

Chlidonias niger



Darker colors represent water bodies where the species has been recorded within the past 12 years. Lighter colors represent water bodies where the species could potentially occur. Smaller water bodies may be difficult to visualize on the map.

Black Tern

Chlidonias niger

Overview

The Black Tern is one of several Conservation Priority species covered in this plan that are declining in Nevada for no clearly identified reason. The regional loss and degradation of marshes is undoubtedly an important factor, but this does not explain why Black Terns seem to be declining more rapidly than most other marsh-associated species. Until very recently, the main Black Tern breeding colony in Nevada has been located at Ruby Lake NWR. However, no breeding has been observed in this colony since 2006, which is particularly disturbing because waterbird habitats in this NWR are well-managed and protected from most threats. Biologists have not yet developed concrete hypotheses for the recent loss of this colony, nor is there any information about whether it is the result of regional declines, or simply a displacement of birds to other breeding locations. It should be noted that the Black Tern's declining trends in Nevada are mostly attributable to the decline and recent loss of the Ruby Lake NWR colony. Confirming definitive statewide trends (that may also include migrant populations) will require collecting additional survey and monitoring data from a wider area. Apart from Ruby Lake NWR, other known historical and current breeding sites within Nevada include the Lahontan Valley, Humboldt Sink, Mason Valley WMA, the Boyd Humboldt Valley IBA, Quinn River, and Pahranagat NWR. The numbers of breeders at these sites have always been relatively low and variable, at least over recent decades. Possible breeding locations that deserve further study include Kirch WMA, and Key Pittman WMA, which are currently migration stopover sites for the species. Because several nearby sites in California provide important migration stopover location for Black Terns,[7] it is likely that many of the Nevada sites shown in the map above as Spring–Summer range also provide important migration habitat.

Abundance and Occupancy by Habitat

The Nevada population estimate shown above in the Conservation Profile table is based on recent historic average of 600 breeders at Ruby Lake NWR before 2006, plus an estimate of 100 additional breeders [EO] at scattered locations throughout state.

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat and Other Threats

- Loss or degradation of marshes due to water diversions, declines in water quality, or development
- Changes in water level during incubation may destroy nests
- Heavy metal contamination may be a threat

- Human nest disturbance, invasive plants, and pesticides have also been suggested as threats, but not well documented[2]

Research, Planning, and Monitoring Challenges

- Causes of ongoing declines are not well understood and require more detailed research and monitoring in order to determine appropriate conservation actions
- Enhanced monitoring and survey efforts are needed to better determine breeding numbers and distributions at known or potential breeding sites across the state. This could also help to determine whether current declines, which are largely attributable to the decline and recent loss of the Ruby Lake NWR breeding colony, are systemic across Nevada

Conservation Strategies

Habitat Strategies

- Marsh (p. Hab-9-1) and Open Water (p. Hab-15-1) habitat conservation strategies benefit this species; Shuford[8] provides additional Black Tern conservation strategies
- Restored or artificial marshes can provide suitable habitat if the amount of emergent vegetation is appropriate.[5] Additionally, artificial nest platforms may be beneficial in waterbodies where water fluctuations would otherwise threaten nests
- River restoration projects along the Humboldt River system and elsewhere in historic breeding habitat can benefit Black Terns, if river-associated wetlands are created[2]

Research, Planning, and Monitoring Strategies

- Additional research and monitoring is needed to document the ongoing status of the Ruby Lake NWR, and to determine the causes for the cessation of breeding activity in 2006
- Expanded statewide surveys and monitoring efforts are needed to determine:
    - The numbers distribution of breeders at other sites
    - Whether declines are systematic
    - The extent to which Nevada marshes provide important migration stopover habitat
- Monitor water quality in important breeding sites

Public Outreach Strategies

- None identified

References: [1]GBBO unpublished Atlas data; [2]Heath et al. (2009); [3]Ivey and Herziger (2006); [4]Kushlan et al. (2002); [5]Naugle et al. (2000); [6]Sauer et al. (2008); [7]Shuford and Gardali (2008); [8]Shuford (1999); [EO] Expert opinion

Band-tailed Pigeon

Columba fasciata

Photo by Steve Ting

Habitat Use Profile

Habitats Used in Nevada	
Coniferous Forest	
Key Habitat Parameters ●	
Plant Composition	Mixed-conifer, including white fir, ponderosa pine, Jeffrey pine, red fir, lodgepole pine; may also use pinyon, juniper, manzanita, oak[4]
Plant Density & Size	150 - 500 trees / ha [60 – 200 trees / ac][1]; typical dbh 16-32 cm [6-12 in][4]; nests more likely where canopy closure and tree height are greater than average for the area[3]
Shrub Understory	Not required[4]
Distance to Water	Unknown
Response to Vegetation Removal	Probably negative to overstory removal, neutral to understory[EO]
Area Requirements ◑	
Minimum Patch Size	Unknown
Recommended Patch Size	Entire mountain range[EO]
Home Range	Typically 11,000 ha [27,000 ac]; range 300 – 180,000 ha [750 – 450,000 ac][4]

Conservation Profile

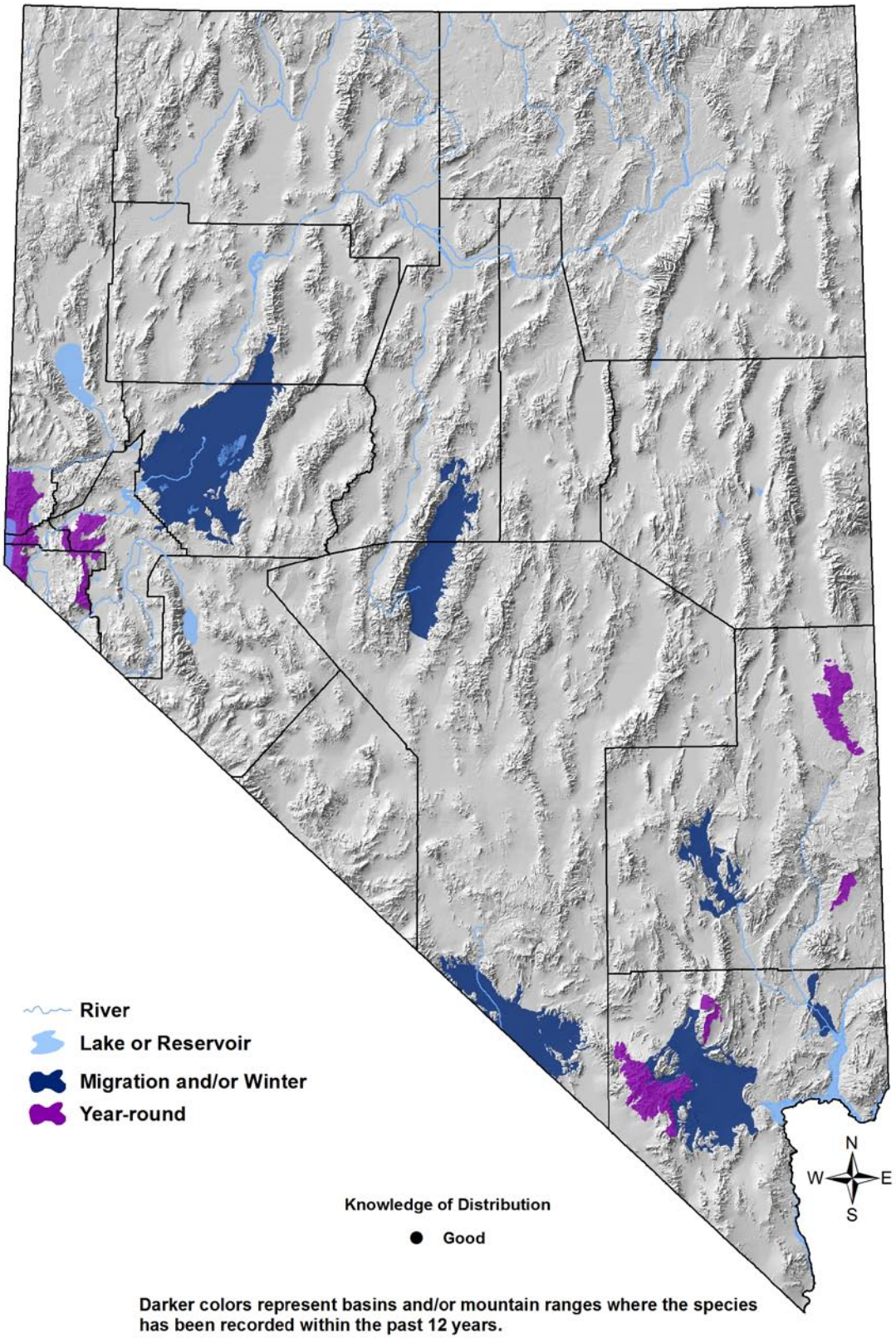
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and recent declines Small population size Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	None
NV Natural Heritage	S3
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Upland Gamebird
Trends	
Historical ◑	Rangewide declines[4]
Recent ●	In West, annual decline of 1.4 - 2.1% [8]
Population Size Estimates	
Nevada (NBC) ◑	615
Global ◑	970,000 [7]
Percent of Global	< 1%
Population Objective	
Maintain / Increase[EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Fair
Key Conservation Areas	
Protection	Carson Range, Spring Mountains
Restoration	Carson Range

Natural History Profile

Seasonal Presence in Nevada	
Year-round (with seasonal movements)	
Known Breeding Dates in Nevada	
Mid May – October[2]	
Nest and Nesting Habits	
Nest Placement	Tall conifer limb, often facing S/SW, with open flyway to nest[4]
Site Fidelity	Probably moderate[4]
Food Habits	
Basic	Arboreal gleaner[3]
Primary Diet	Fruits, grains, acorns, pine nuts[4]
Secondary Diet	Flowers and buds of trees and shrubs[4]
Other	Grit, mineral salts, and salt licks required; feeders may be visited[4]

Band-tailed Pigeon

Columba fasciata



Band-tailed Pigeon

Columba fasciata

Overview

The Band-tailed Pigeon presents a conservation dilemma that is fortunately unusual; that of a species undergoing a steady decline for which there is no confirmed (or even plausibly hypothesized) explanation. Because of this species' very large home range requirements, however, it seems possible that landscape-level changes in habitat mosaics may play an important role. There are two distinct populations (subspecies) of Band-tailed pigeon that enter Nevada at opposite ends of the state. They are concentrated in the coniferous forests of the Carson Range and the Spring Mountains. They also occur patchily around the margins of the state, but appear to be mostly absent from the central region as breeders. In winter, they engage in downward elevational movements and occur across a somewhat wider geographic area. Given the prospect of continuing declines, and the lack of a specific explanation for these declines, a significant effort at expanded monitoring and research is warranted. Each population has its own management plan, developed by the Pacific and Central Flyways.[6]

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Coniferous Forest	26% (5/19)	1.0 (0.2 – 1.8)
Mojave		
Coniferous Forest	50% (2/4)	0.2 (n/a)

- BBS-derived Nevada population estimate (7,500 birds)[7] is much larger than the NBC estimate (615)

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Causes of observed declines not well understood range-wide or in Nevada, but given the Band-tailed Pigeon's exceptional large home range requirements, landscape-level changes may play a role [EO]

Band-tailed Pigeon

Columba fasciata

Research, Planning, and Conservation Challenges

- Management of these birds is especially challenging. It is difficult to reliably estimate population size because of the difficulty in locating and observing pigeons.[6]
- Lack of information about causes of ongoing population declines

Conservation Strategies

Habitat Strategies

- Until further information is gathered, it is assumed that the Coniferous Forest habitat conservation strategy (p. Hab-5-1) benefits this species
- Maintain a forest mosaic that includes older-aged closed-canopy patches interspersed with open-canopy patches and forest openings
- Providing supplemental salt / mineral blocks may be beneficial

Research, Planning, and Monitoring Strategies

- Improve monitoring coverage to confirm population trends and more accurately determine occupied range and population size; several potential monitoring protocols have been tested in Arizona.[5] Monitoring strategies at mineral sources developed for Pacific populations[1] do not work as well for interior populations, which do not visit mineral deposits as regularly
- Conduct research to better determine habitat needs, area requirements, and causes for declines
- Investigate incidence of disease and disease vulnerability

Public Outreach Strategies

- None identified

References: [1]Cassaza et al. (2005); [2]GBBO unpublished Atlas data; [3]Hughes (2007); [4]Keppie and Braun (2000); [5]Kirkpatrick et al. (2005); [6]Pacific Flyway Study Committee (2001); [7]Rich et al. (2004); [8]Sauer et al. (2009); [EO] Expert opinion

Yellow-billed Cuckoo

Coccyzus americanus

Photo by Murrelet Halterman

Habitat Use Profile

Habitats Used in Nevada	
Mojave Lowland Riparian Great Basin Lowland Riparian (historically) (Springs)	
Key Habitat Parameters ●	
Plant Composition	Fremont cottonwood, willows, saltcedar, mesquite
Plant Density & Height	High-density (≥ 50% cover) riparian woodlands with canopy heights varying from 5-30 m [16 – 100 ft][2, 8]
Mosaic	Large intact patches of riparian gallery forest, or tall riparian shrub thickets; diverse vertical structure important[8]
Distance to Water	< 100 m [330 ft] from water[8]
Response to Vegetation Removal	Negative [EO]
Area Requirements ◑	
Minimum Patch Size	> 20 ha [50 ac][2, 4, EO]
Recommended Patch Size	> 80 ha [200 ac][8, 12]
Home Range	~ 20 ha [50 ac] with core area of ~ 4 ha [10 ac][20]

Conservation Profile

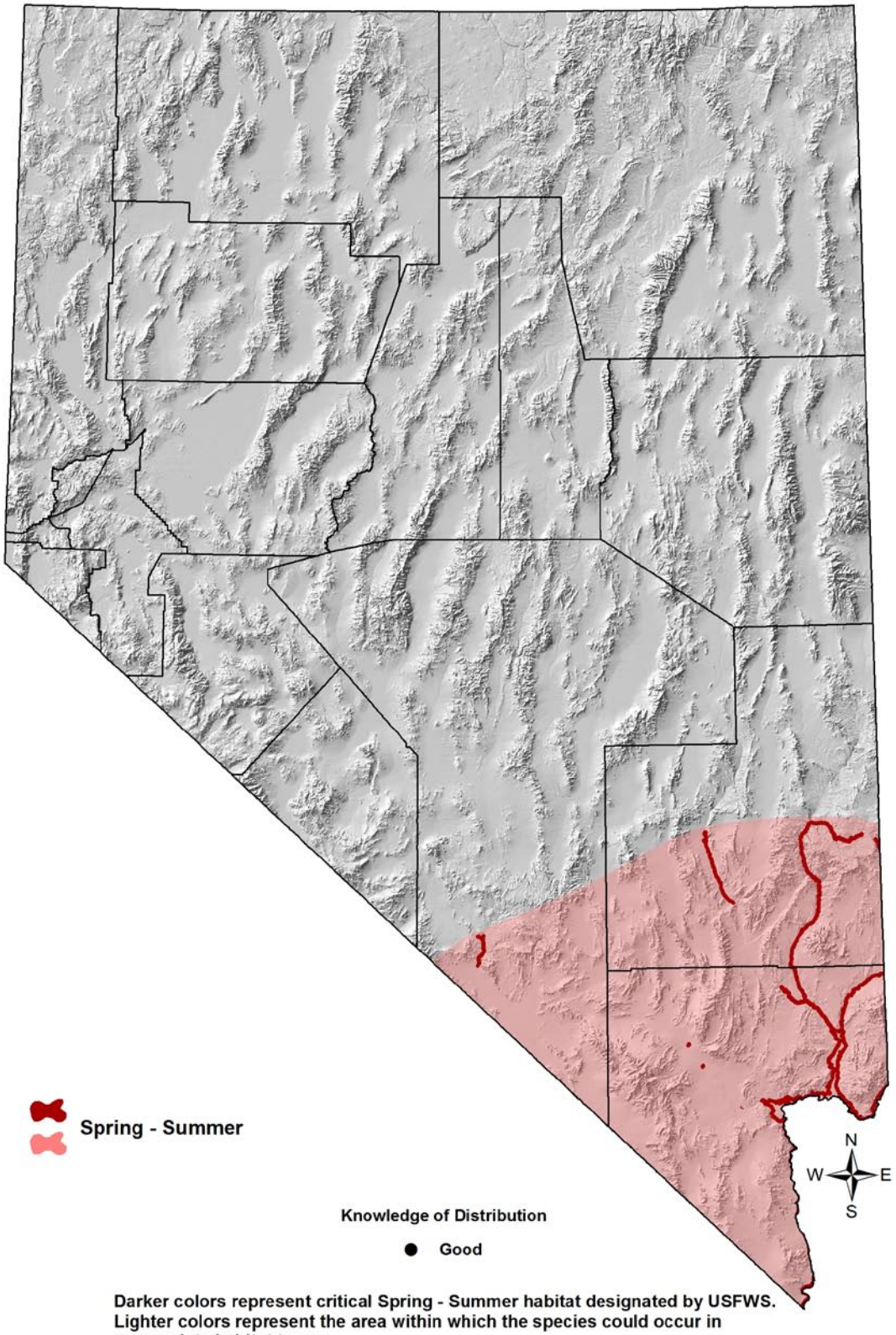
Priority Status	
Conservation Priority Species	
Species Concerns	
ESA listing: Candidate species - Historical declines Small population size - Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S1B
USFWS	Candidate Species; Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	Sensitive Species
NDOW	Conservation Priority
Other	Covered by Clark County MSHCP,[3] Lower Colorado River MSCP,[18] and Virgin River HCRP[19]
Trends	
Historical ●	Steep declines in west[8]
Recent ○	Unknown[16]
Population Size Estimates	
Nevada ◑	10-20 [14]
Global ◑	< 2,000 west of Rocky Mountains[8]
Percent of Global	~ 1% of western population
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	Special surveys by USBR, USFWS, NDOW, SNWA and others
Coverage in NV	Good
Key Conservation Areas	
Protection	All currently occupied habitat
Restoration	All lowland riparian areas, and springs in Mojave region

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Late June – early September [EO]	
Nest and Nesting Habits	
Nest Placement	Above ground (< 10 m [33 ft] high) in dense riparian thicket[8]
Site Fidelity	Probably moderate for breeding site [EO]
Other	Not territorial[8]
Food Habits	
Basic	Shrub gleaner
Primary Diet	Large terrestrial insects, e.g., cicadas, caterpillars, grasshoppers, crickets[8]
Secondary Diet	Small vertebrates, eggs[8]

Yellow-billed Cuckoo

Coccyzus americanus



Darker colors represent critical Spring - Summer habitat designated by USFWS. Lighter colors represent the area within which the species could occur in appropriate habitat types.

Yellow-billed Cuckoo

Coccyzus americanus

Overview

Although the Yellow-billed Cuckoo is common and widespread in the Great Plains and eastward, its western populations have suffered drastic declines and range reductions since the settlement period. Once suspected in the 1970s of being extirpated from Nevada,[8] Yellow-billed Cuckoos now breed semi-regularly along the Virgin and Muddy Rivers.[14,15] Surveys by the Nevada Department of Wildlife and others have discovered cuckoos in a few additional locations in southern Nevada,[14] and the Nevada Bird Count and Nevada Breeding Bird Atlas projects have added records in western and northeastern Nevada, although these probably involved nomadic non-breeders.[12]

Yellow-billed Cuckoos require large patches of multi-layered riparian gallery forest, with cottonwoods and willows (ideally both) clearly being preferred.[5,11] Riparian mesquite habitats may be used, but usually only when willow-cottonwood habitat is unavailable.[12] Key habitat features are dense foliage, especially within 10 m [33 ft] of the ground,[4] and moist conditions.[8] Cuckoos may require the relatively cool temperatures and high humidity that only larger patches of dense forest next to open water can provide.[8,9] On the lower Colorado River, cuckoo habitat is characterized by a dense overstory dominated by cottonwoods and willows, a subcanopy with willow and, often, saltcedar components, and a sparse understory. However, sites where the subcanopy is dominated by saltcedar are less likely to be used.[9] Cuckoos will forage in pure saltcedar stands, but they have not been found breeding in them, except in New Mexico.[17] Cuckoos will readily use younger forest stands with canopy heights of 10 m [33 ft] or less,[4] as is the case with restoration sites on the South Fork of the Kern River (CA).[11,13] In this restoration project, sites with less than 40% canopy closure were not used by cuckoos, and those with greater than 65% canopy closure were deemed optimal.

Cuckoos may use patches of forest as small as 10-20 ha [25-50 ac] in area and 100 m [330 ft] wide,[4] but ideally habitat patches should be > 80 ha [200 ac] or > 600 m [2,000 ft] wide and contain open water within 100 m [330 ft] of the bird's activity center.[12] Although cuckoos appear to respond more strongly to local patch features than to the surrounding landscape mosaic,[5] the presence of multiple patches of suitable habitat in close proximity to one another is still thought to be beneficial for the species' population dynamics. Thus fragmentation and isolation of remaining habitat is a concern, as are potentially low colonization rates for newly-restored sites.[12] Fortunately, there has been recent evidence that in some cases, cuckoos can find new restoration sites more rapidly than previously expected.[4,11,20] Beyond some threshold distance from source areas, however, colonization does appear to be slow. As an example, apparently suitable habitat that has been restored within the cuckoo's historical Great Basin breeding range has yet to be colonized.

Yellow-billed Cuckoo

Coccyzus americanus

Abundance and Occupancy by Habitat

No information

Nevada-Specific Studies and Analyses

Because of its status as an ESA candidate species, Yellow-billed Cuckoos are heavily monitored and studied in Nevada by NDOW, USBR, USFWS, SNWA, and others.

Relevant Conservation Plans and other legal documents can be found at:
http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06R

A thorough review of the Yellow-billed Cuckoo's natural history and a survey protocol are available at: [7]
http://www.southernsierraresearch.org/cuckoo_methodology_May2010%5B1%5D.pdf

Main Threats and Challenges

Habitat and Other Threats

- Loss, degradation, and fragmentation of riparian habitat due to:[10]
  - Surface water diversion and flood control projects
  - Saltcedar invasion
  - Fire
  - Livestock grazing, primarily in historically-occupied Great Basin areas
- High-water events of long duration that can kill cottonwoods and willows[9]
- Disturbance of nesting area, which may cause nest abandonment[11]
- The tendency of cuckoo populations to decline after warm years has been suggested as a possible indication of sensitivity to climate change[1]

Research, Planning, and Monitoring Challenges

- Reasons for the continued absence of Yellow-billed Cuckoos from apparently suitable habitat in the Great Basin need further investigation

Yellow-billed Cuckoo

Coccyzus americanus

Conservation Strategies

Habitat Strategies

- Mojave Lowland Riparian (p. Hab-11-1) and Great Basin Lowland Riparian (p. Hab-7-1) habitat conservation strategies benefit this species
- Protect current Yellow-billed Cuckoo habitat from additional loss or degradation
- Promote natural recruitment of cottonwoods and willows by facilitating channel-scouring hydrological processes, where possible
- Restore native riparian habitat, where opportunities exist, to create patches of suitable size in all historical locations, including the corridors of the Colorado River and tributaries in southern Nevada, and the Walker, Truckee, and Carson River corridors in northern Nevada
- In currently grazed river reaches with diminished foliage density, removal of cattle has been shown to increase cuckoo numbers[10, 13]

Research, Planning, and Monitoring Strategies

- Continue current population monitoring efforts
- Identify areas where potential exists to restore native riparian vegetation in patches of 40 ha [100 ac] or larger, and pursue partnerships and strategies to implement restoration projects
- Conduct additional surveys of potential breeding areas in northern and western Nevada
- Where groundwater pumping or channel diversions, or flood control projects occur, monitor effects on potential habitat
- Design and implement a coordinated fire management strategy that protects occupied remnants of cuckoo habitat

Public Outreach Strategies

- None identified

Yellow-billed Cuckoo

Coccyzus americanus

References: [1]Anders and Post (2006); [2]Biosystems Analysis (1989); [3]Clark County (2000); [4]Gaines and Laymon (1984); [5]Girvetz and Greco (2009); [6]Greco (2008); [7]Halterman et al. (2009); [8]Hughes (1999); [9]Johnson et al. (2008); [10]Krueper et al. (2003); [11]Laymon (1998); [12]Laymon and Halterman (1989); [13]Laymon et al. (1997); [14]NDOW (2009); [15]Rathbun and Braden (2003); [16]Sauer et al. (2008); [17]Sogge et al. (2008); [18]LCR MSCP (2004); [19](Jeri Krueger, *pers. comm.*); [20]Sechrist et al. (2009); [EO]Expert opinion

Yellow-billed Cuckoo habitat in the Mojave region. Photo by Jen Ballard.

Flammulated Owl

Otus flammeolus

Photo by Fred Petersen

Habitat Use Profile

Habitats Used in Nevada	
Coniferous Forest Aspen	
Key Habitat Parameters ●	
Plant Composition	Ponderosa and Jeffrey pines, white fir, mix of other coniferous species, aspen; prefers well-developed shrub understory in forest stands[1, 4, 6]
Plant Density & Size	At nest sites,138-1040 trees/ha [56 – 420 / ac]; canopy closure 35-75%; trees present with dbh > 50 cm [20 in]; shrub density 182-776 shrubs/ha [74–315 / ac][6]
Mosaic	Mature forest with large-diameter (dbh 44-87 cm [17 – 34 in]) snags, forest openings, clumps of saplings and shrubs, multiple canopy layers, aspen groves[6]
Slope	16 – 30% [6]
Response to Vegetation Removal	Negative [EO]
Area Requirements ●	
Minimum Patch Size	Estimated at 50 ha [125 ac][6, EO]
Recommended Patch Size	> 150 ha [370 ac] [EO]
Home Range / Territory Size	3 - 16 ha [7 - 40 ac][6]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Small population size Habitat threats Unknown population trend	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S4B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	Sensitive Species
NDOW	Stewardship
Trends	
Historical ○	Unknown
Recent ○	Unknown
Population Size Estimates	
Nevada ○	Uncertain; < 2,500 [EO]
Global ◑	29,000 [9]
Percent of Global	Unknown
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	No systematic monitoring
Coverage in NV	Poor
Key Conservation Areas	
Protection	Spring Mountains, Carson, Schell Creek and Snake Ranges
Restoration	Unknown

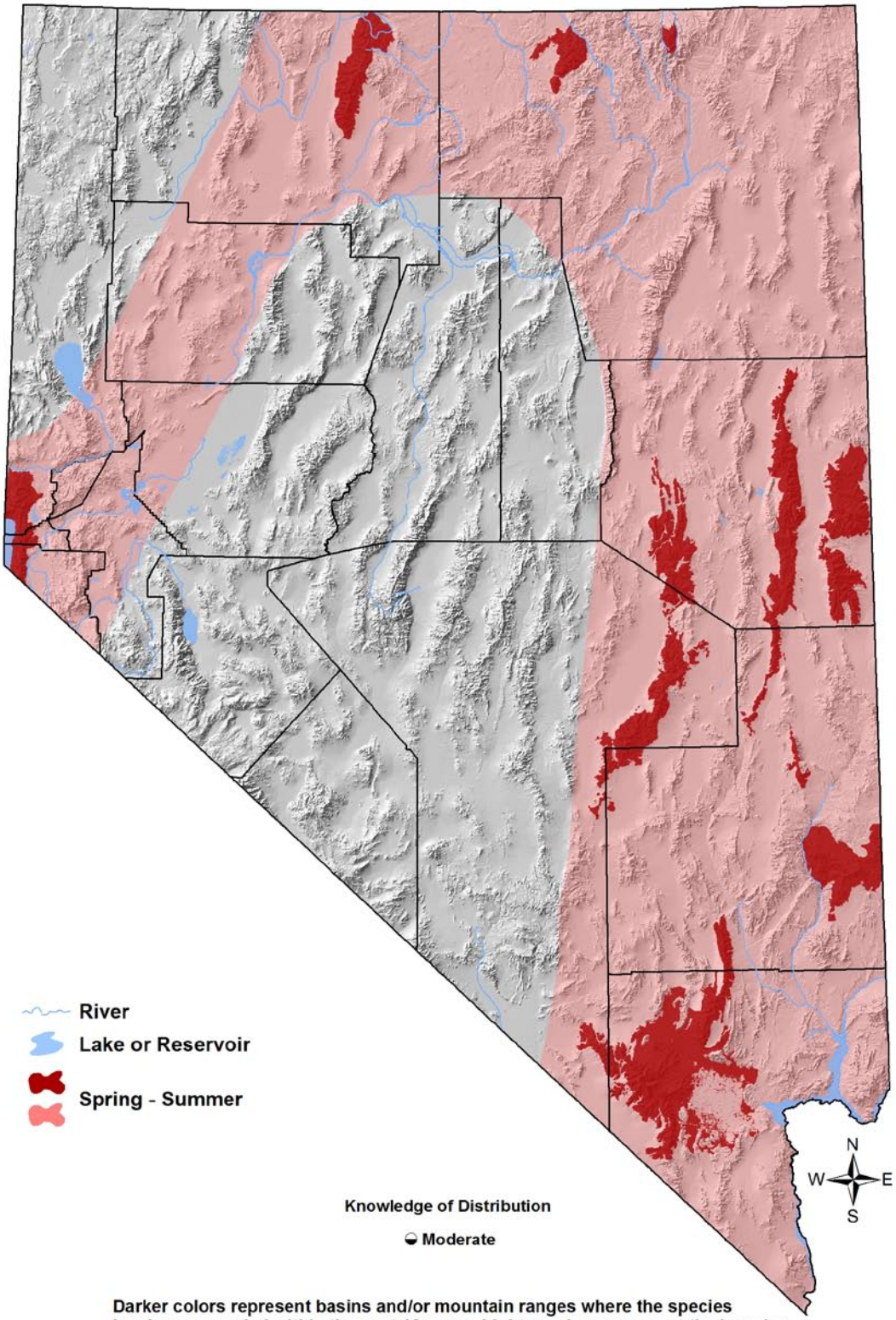
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Late May – early August[3, EO]	
Nest and Nesting Habits	
Nest Placement	Large woodpecker cavity in large snag[6]
Site Fidelity	High for breeding territory[6]
Other	Nest within 30-100 m [100 – 330 ft] of forest opening[6]
Food Habits	
Basic	Aerial insectivore
Primary Diet	Nocturnal flying insects, especially moths[6]
Secondary Diet	n/a

Confidence in Available Data: ●High ◑Moderate ○ Low

Flammulated Owl

Otus flammeolus



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Flammulated Owl

Otus flammeolus

Overview

Although its habitat needs are relatively well characterized, much less is known about the Flammulated Owl's numbers, distribution, or conservation status in Nevada. Records have come from the Santa Rosa, Jarbidge, Spring, Schell Creek, Quinn Canyon, White Pine, Sheep, Clover, Snake, Highland, Bull Run, and Carson ranges, but this small owl could potentially occur in other ranges as well.[2] Recent inventories in the central Nevada ranges, however, suggest that it may be absent there, as it may be more generally absent from large landscapes where suitable habitat is sparsely scattered.[10] The Flammulated Owl's preference for a varied forest mosaic would seem to suggest that they occupy only in the larger forested patches that can provide this structural diversity, but in reality they have been found in forest patches of < 50 ha [125 ac].[2] All of these factors suggest that Flammulated Owl distribution may be affected not only by local habitat factors, but by the spatial arrangement of suitable habitat patches across large landscapes.

Flammulated Owls are most often associated with ponderosa pine, but populations in southeastern Idaho and northern Utah are known to nest in large aspen stands with no pine in the area.[5, 8] Several of the species' known locations in Nevada also lack ponderosa pine.[2] Natural openings in the forest (for foraging) are apparently critical, as are clumps of understory vegetation for roosting. Perhaps the key management factor for this bird is managing forests to ensure the presence of large-diameter snags. Flammulated Owls often breed in loose clusters comprised of multiple pairs, making targeted protection of nesting areas easier.[1]

Abundance and Occupancy by Habitat

No information

Nevada-Specific Studies and Analyses

Arsenault et al.,[1] Dunham et al.,[2] and Mika[7] have conducted detailed studies of various aspects of Flammulated Owl biology in Nevada.

Main Threats and Challenges

Habitat and Other Threats

- Loss of large snags to fuel gathering, fuels reduction activities, or large, high-severity fires[EO]
- Simplification of the forest mosaic as a result of large, high-severity fires (although smaller, patchy fires may be beneficial by creating forest openings and increasing stand diversity)
- Recent genetic studies suggest that Nevada populations may be smaller, more isolated, and less stable than others in the West[7]

Flammulated Owl

Otus flammeolus

Research, Planning, and Monitoring Challenges

- Current population trends in Nevada are not known
- Factors controlling distribution patterns are poorly understood

Conservation Strategies

Habitat Strategies

- Coniferous Forest (p. Hab-5-1) and Aspen (p. Hab-3-1)habitat conservation strategies benefit this species
- Manage fuels reduction and harvesting activities to conserve large-diameter snags
- In occupied ranges, manage forests to encourage a mosaic of older trees (especially ponderosa and Jeffrey pine), younger-aged trees, and forest openings with a well-developed shrub layer
- Fire management strategies should generally encourage smaller-scale patchy fires that increase diversity of the forest mosaic, and actively discourage large-scale stand-replacing fires

Research, Planning, and Monitoring Strategies

- Conduct additional study and monitoring to determine population trends and conservation status of Flammulated Owls
- A Western network of Flammulated Owl monitoring programs is being considered (http://sites.google.com/site/pifwesternworkinggroup/projects/flammulated-owl-monitoring); Nevada should seek to become involved in such a program if it is implemented
- Additional study of occupancy patterns in Nevada mountain ranges (and their possible controlling factors) would be beneficial

Public Outreach Strategies

- None identified

References: [1]Arsenault et al. (2003); [2]Dunham et al. (1996); [3]GBBO unpublished. Atlas data; [4]Herron et al. (1985); [5]Marti (1997); [6]McCallum (1994); [7]Mika (2010); [8]Powers et al. (1996); [9]Rich et al. (2004); [10]Wright (1996); [EO] Expert opinion

Burrowing Owl

Athene cunicularia

Photo by Derek Hall

Habitat Use Profile

Habitats Used in Nevada	
Sagebrush Salt Desert Scrub (Mojave Scrub) (Joshua Tree)	
Key Habitat Parameters ●	
Plant Composition	Treeless areas with low vegetation; usually sagebrush or salt desert, but also urban / suburban and disturbed sites[10]
Plant Density & Size	Vegetation must be low (< 15 cm [6 in] acceptable, < 5 cm [2 in] preferred),[6, 10, 19] with < 30% ground cover[EO]
Mosaic	Burrows dug by rodents or other small to medium sized mammals must be available, along with sufficient prey base[10, 19]
Distance to Water	Unknown, probably unimportant[10]
Response to Vegetation Removal	Often present where disturbance or grazing has shortened or removed some vegetation[10]
Area Requirements ◑	
Minimum Patch Size	~ 80 ha [200 ac][EO]
Recommended Patch Size	> 300 ha [750 ac][EO]
Home Range	50 – 500 ha [120 – 1,200 ac], but most activity occurs within 600 m [2,000 ft] of burrow[10]

Conservation Profile

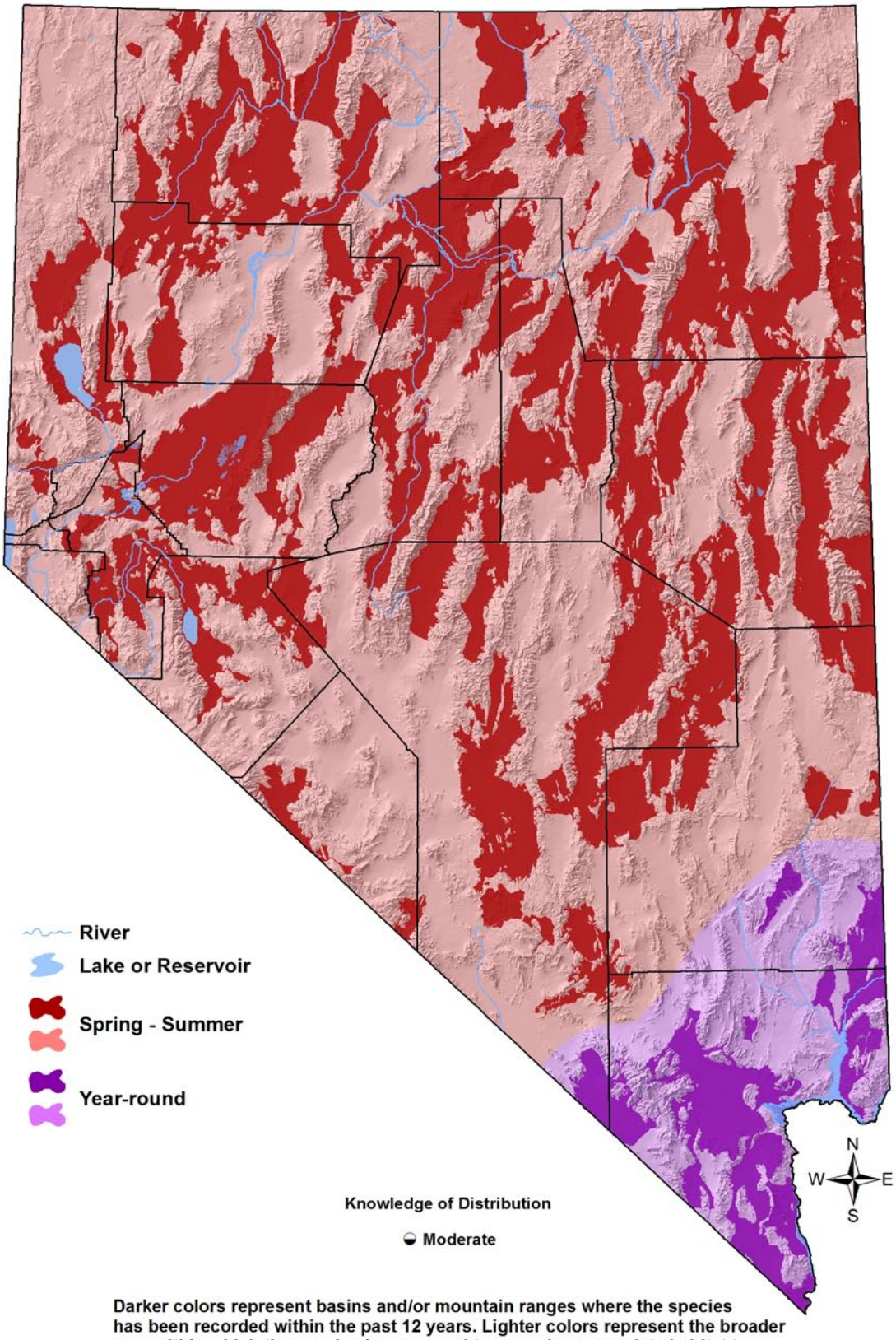
Priority Status	
Special Status Species	
Species Concerns	
Unknown population trend	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	G4T4, S3B
USFWS	Migratory Bird, Bird of Conservation Concern
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
Other	Proposed Covered Species under Clark County MSHCP amendment,[21] Covered Species under Coyote Springs Investment HCP[21]
Trends	
Historical ●	Large declines (> 50% in Nevada)[4, 10, 14]
Recent ○	Mixed in the West; patterns in Nevada uncertain[4, 10, 18]
Population Size Estimates	
Nevada (NBC) ◑	3,000
Global ◑	2,000,000 [15]
Percent of Global	< 1 %
Population Objective	
Maintain / Increase[EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Fair
Key Conservation Areas	
Protection	Known colony sites
Restoration	Former colony sites

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer; Year-round in Mojave region[7, 11, 12]	
Known Breeding Dates in Nevada	
Mid-April – early August[5]	
Nest and Nesting Habits	
Nest Placement	Nests in burrows dug by burrowing animals, or artificial burrows[8, 10, 19, EO]
Site Fidelity	High for general breeding area; may also re-use burrows[10, 19]
Food Habits	
Basic	Terrestrial predator (nocturnal and diurnal)
Primary Diet	Variety of arthropod, small mammalian and reptilian prey[9, 10, 19, EO]
Secondary Diet	Carrion[10]

Burrowing Owl

Athene cunicularia



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Burrowing Owl

Athene cunicularia

Overview

Across much of its range, the Burrowing Owl has long been considered to be a declining species. It has also been the subject of many local and regional status assessments and planning documents, including the Western Burrowing Owl Assessment.[12] As a result, the Burrowing Owl is generally prominent on the "conservation radar screen", and in Nevada it is currently an Evaluation Species in the Clark County MSHCP.[1] Certainly Burrowing Owls have undergone substantial historical declines, but these have occurred mainly in the prairie regions to the east of Nevada, where loss of prairie dogs and large-scale agricultural conversion greatly reduced the amount of suitable habitat. In these regions, declines appear to be continuing, but the population status of the Burrowing Owl in Nevada and other parts of the arid west is harder to decipher, with verdicts ranging from "declining" to "increasing", depending on the source consulted.[4,10,12,13,18] The main reason for these contradictory results is that survey data on Burrowing Owls in Nevada are inadequate to determine statewide trends. This uncertainty is the reason for giving the Burrowing Owl a "Special Status Species" designation in this plan. The main need at this time is to determine whether or not the species is declining in Nevada, and if so, to identify the most important threats.

In Nevada, Burrowing Owls occur sporadically in valley bottoms, sometimes in loose colonies.[8,14] Apart from their need for burrows, suitable prey, and low vegetation, the importance of other habitat parameters and landscape features are not well understood.[4] The fact that disturbed areas are used by Burrowing Owls, though, suggests some flexibility in habitat use as long as the basic requirements are met.[12,17]

Abundance and Occupancy by Habitat

- NBC data show that 44% of observations occurred in Sagebrush habitat, 22% in grasslands, 21% in Salt Desert Scrub, and 9% in Agriculture
- The NBC population estimate for Nevada (3,000 birds) corresponds well with the population size range reported by Klute et al.[12] (1,000 – 10,000 birds), but is much lower than the BBS-derived estimate of 22,000 [15]

Nevada-Specific Studies and Analyses

Nevada National Security Site (Formerly Nevada Test Site) Studies

In Nevada, the Burrowing Owl has been most extensively studied at the Nevada National Security Site (NNSS). These studies have produced detailed information about the owl's natural history, ecology, breeding biology, and current status.[8,9] Interestingly, Burrowing Owls at the NNSS appeared to be fairly tolerant of human activities, and were frequently observed using human-created structures (culverts, pipes) as artificial burrows. USGS studies are also ongoing in southern and central Nevada, but results were not yet available at the time of this plan release.

Burrowing Owl

Athene cunicularia

Main Threats and Challenges

Habitat Threats

- Habitat loss to urbanization, agriculture, or other development
- Reduction in populations of burrowing animals
- Disturbance of breeding colonies by humans or dogs in some areas[10]
- Possible pesticide impacts[10]

Research, Planning, and Monitoring Challenges

- Population status and trends in Nevada are not known

Conservation Strategies

Habitat Strategies

- Elements of the Sagebrush (p. Hab-17-1) and Salt Desert Scrub (p, Hab-18-1) habitat conservation strategies benefit this species, insofar as they allow for areas of very low vegetation
- Manage known colony locations to maintain short vegetation, healthy populations of burrowing animals, and healthy owl prey populations (small vertebrates, arthropods)
- If possible, establish a no-disturbance buffer zone of 60 m (200 ft) around active nest burrows[8]
- Providing artificial burrows can be effective in helping to restore populations[10, 20]

Research, Planning, and Monitoring Strategies

- Establish and implement effective monitoring programs[2,3] and determine population status and trend in Nevada

Public Outreach Strategies

- Educate the public and private landowners about the impacts of disturbance
- Where breeding owls are present near agricultural lands, encourage absence of pesticide use within 600 m [2,000 ft] of nest burrows[4,14]

References: [1]Clark County (2000); [2]Conway and Garcia (2008); [3]Conway and Simon (2003); [4]Dobkin and Sauder (2004); [5]GBBO unpublished Atlas data; [6]Green and Anthony (1989); [7]Greger and Hall (2009); [8]Hall et al. (2003); [9]Hall et al. (2009); [10]Haug et al. (1993); [11]Herron et al. (1985); [12]Klute et al. (2003); [13]NatureServe (2010); [14]Paige and Ritter (1999); [15]Rich et al. (2004); [16]Rosenberg (2004); [17]Saab et al. (1995); [18]Sauer et al. (2008); [19]Shuford and Gardali (2008); [20]Trulio (1995); [21](Jeri Krueger, *pers. comm.*); [EO] Expert opinion

Spotted Owl

Strix occidentalis

Photo by Brian Harsha

Habitat Use Profile

Habitats Used in Nevada	
Coniferous Forest	
Key Habitat Parameters ●	
Plant Composition	White, red, and Douglas firs; white, Jeffrey and ponderosa pines; and other high-elevation conifer species
Plant Density, Age, & Size	Canopy closure ≥ 40%,[5] with > 70% closure in nest vicinity;[1] old-growth or late seral stages with multiple canopy layers; some trees with dbh > 90 cm [35 in]; ample downed woody debris; little or no shrub understory[5]
Mosaic	Multiple seral stages over larger landscape[5]
Distance to Water	No known relationship
Response to Vegetation Removal	Negative, but proscribed fires may be beneficial[2, EO]
Area Requirements ◑	
Minimum Patch Size	Unknown
Recommended Patch Size	> 5,000 ha [12,000 ac] [EO]
Home Range	~ 1,500 ha [3,700 ac][4]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Small population size Historical declines Possible recent declines Restricted habitat Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S1B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	Sensitive Species
NDOW	Conservation Priority
Trends	
Historical ◑	Large declines likely in Sierra Nevada[5]
Recent ◑	Continuing declines assumed but not confirmed in Sierra Nevada[5]
Population Size Estimates	
Nevada ◑	12 or less[8]
Global ◑	11,000 [9]
Percent of Global	< 1%
Population Objective	
Increase by 100% [9, EO]	
Monitoring Coverage	
Source	USFS and NDOW surveys
Coverage in NV	Good
Key Conservation Areas	
Protection	Carson Range
Restoration	Carson Range

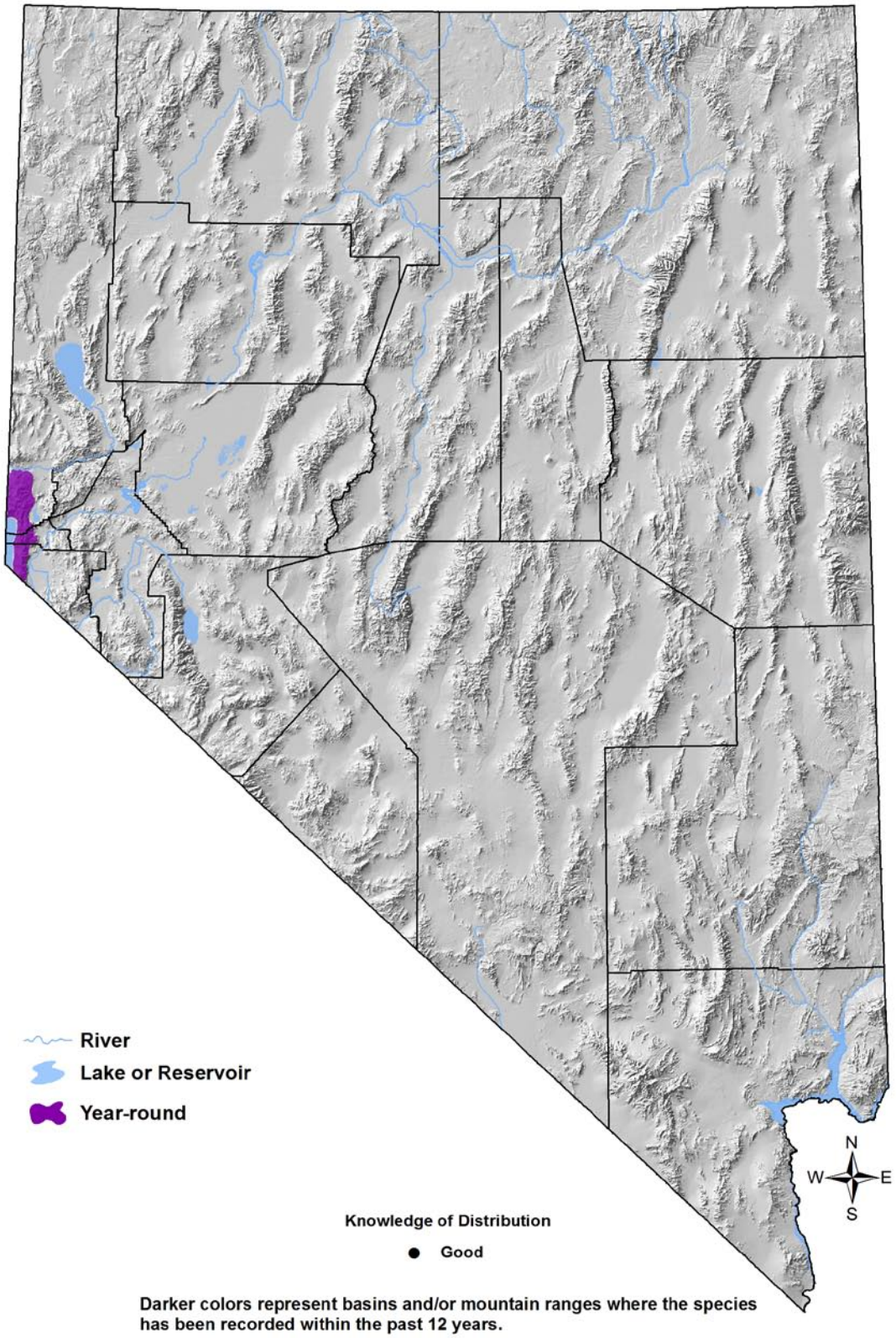
Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
Mid-May – early August [EO]	
Nest and Nesting Habits	
Nest Placement	In large pre-existing tree cavity[5]
Site Fidelity	High for breeding territory[5]
Food Habits	
Basic	Aerial predator
Primary Diet	Small to medium-sized mammals, especially woodrats and flying squirrels[5]
Secondary Diet	n/a

Confidence in Available Data: ●High ◑Moderate ○ Low

Spotted Owl

Strix occidentalis



Spotted Owl

Strix occidentalis

Overview

The distribution of the California Spotted Owl (*S. o. occidentalis*) lies primarily west of the Sierra Nevada crest, with only a few documented cases on the east side.[12] This includes Nevada, however, where a small number Spotted Owls occurs within the Carson Range. Although breeding in Nevada had long been suspected, it was not confirmed until 2009 (M. Easton *pers. comm.*). Spotted Owls are associated with large contiguous tracts of old-growth or late-seral coniferous forest in the Pacific Northwest, but pairs in the Carson Range have been noted to occur in smaller, more isolated forest stands. Studies specific to the Sierra Nevada found that occupied territories had more mature conifer forest than non-use sites,[10] with Spotted Owls spending most of their time (78%) in forests having > 40% canopy cover,[4] and nesting in stands with > 70% canopy cover[1] and concentrations of larger trees with DBH > 77 cm [30 in].[2] After nesting is completed, Spotted Owls may migrate downward in elevation,[7] but generally do not leave the confines of coniferous forest habitat.

As is the case with several other birds species associated with coniferous forests, conservation concerns that are common elsewhere in the west, specifically commercial logging, are not a concern in Nevada. Furthermore, because the locations of our nesting pairs are typically well known to managers, inadvertently harmful forest management practices are avoided. Managing fires and fuels to adequately balance wildlife habitat benefits with private property protection is an ongoing challenge. Although not yet a threat, it is possible that Barred Owls (*Strix varia*) may soon expand their range into western Nevada, where they have the potential to displace Spotted Owls as they have done elsewhere.[6] Continuing current monitoring and management practices is, in the meantime, the main conservation need.

Abundance and Occupancy by Habitat

- For California Spotted Owls in the Sierra Nevada, densities range from 0.12 – 0.21 owls / km^2 [0.31 – 0.54 / sq mi]

Nevada-Specific Studies and Analyses

- USFS Carson District and NDOW are actively monitoring and studying Spotted Owls in the Carson Range

Main Threats and Challenges

<u>Habitat Threats</u>

- One or more large fires could destroy a significant portion of suitable habitat

- Insect outbreaks, urban encroachment, or other factors that fragment old forest tracts could be detrimental

Research, Planning, and Monitoring Challenges

- None identified

Conservation Strategies

Established Strategies

- The *Sierra Nevada Forest Plan Amendment*[11] provides detailed recommendations and guidance for managing Spotted Owls in the Sierra Nevada Range

Habitat Strategies

- The Coniferous Forest (p. Hab-5-1) habitat conservation strategy benefits this species, with a focus on conserving old-growth and late-seral forest stands with preferred age, size, and density parameters (see Habitat Use Profile)
- Fuels reduction projects that thin smaller trees and reduce fuel ladders can help to protect older stands from catastrophic fires

Research, Planning, and Monitoring Strategies

- Continue current monitoring and research efforts in the Carson Range
- Within the currently occupied region, conduct additional surveys searching for Spotted Owls in atypical habitat (smaller forest patches, mixed-age tracts, etc.)
- Study juvenile dispersal and season movements, perhaps using radio-telemetry, to better determine conservation needs specific to Nevada's Spotted Owl population
- Conduct studies to determine the conservation needs of primary prey species (woodrats and flying squirrel) in the eastern Sierra Nevada

Public Outreach Strategies

- None identified

References: [1]Blakesley et al. (2005); [2]Bond et al. (2002); [3]Bond et al. (2004); [4]Call et al. (1992); [5]Gutiérrez et al. (1995); [6]Kelly et al. (2003); [7]Laymon (1989); [8]Nevada Wildlife Action Plan Team (2006); [9]Rich et al. (2004); [10]Seamans and Gutiérrez (2007); [11]USFS (2001); [12]Verner et al. (1992); [EO] Expert opinion

Short-eared Owl

Asio flammeus

Photo by Larry Neel

Habitat Use Profile

Habitats Used in Nevada	
Wet Meadow (Sagebrush) (Agriculture) (Marsh) (Great Basin Lowland Riparian)	
Key Habitat Parameters ●	
Plant Composition	Perennial grasses and forbs, pasture and hay crops, sagebrush steppe with well-developed grass layer
Plant Density	Very high density grass or other herbaceous cover; sufficiently dense to host vole populations[7]
Mosaic	Wet meadow or grassland bordered by open shrublands or other dry habitat; marsh component beneficial; little or no urban encroachment[7, EO]
Other	Uses undisturbed pinyon-juniper or riparian woodlands for winter roosting[7]
Response to Vegetation Removal	Presumed neutral, if prey populations are unaffected [EO]
Area Requirements ◑	
Minimum Patch Size	100 ha [250 ac][7]
Recommended Patch Size	> 150 ha [395 ac] [EO]
Home Range	Poorly known for western populations, possibly as large as 200 ha [500 ac][3]

Conservation Profile

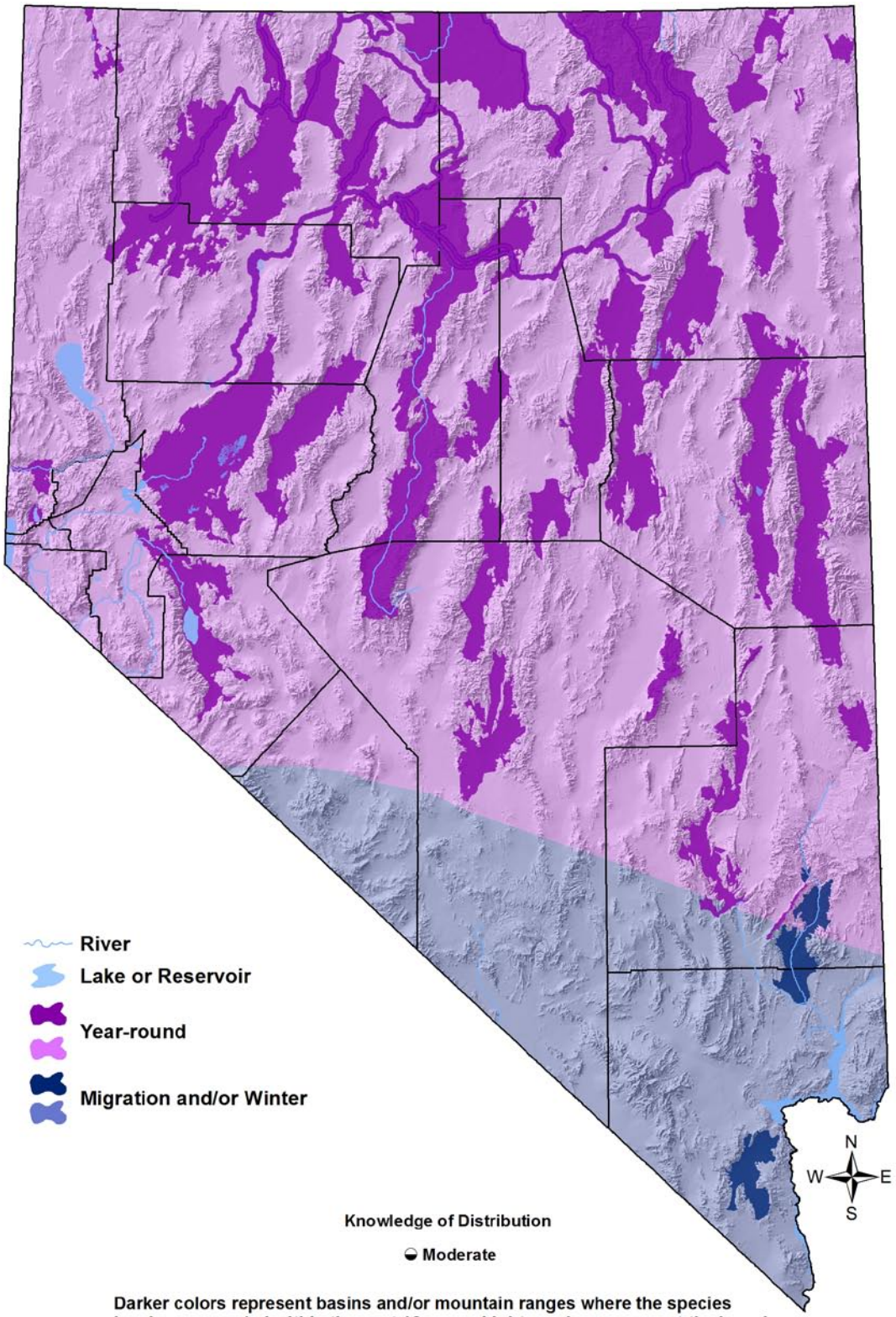
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical declines Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S4
USFWS	Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
Trends	
Historical ●	Rangewide declines[7]
Recent ○	Possibly stable,[6] but difficult to determine due to large inter-annual fluctuations
Population Size Estimates	
Nevada (BBS) ◑	5,000 [5]
Global ◑	710,000 [5]
Percent of Global	< 1%
Population Objective	
Increase by 100% [5, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Fair
Key Conservation Areas	
Protection	All wet meadows and traditional agricultural lands in Great Basin
Restoration	Same

Natural History Profile

Seasonal Presence in Nevada	
Year-round (with seasonal movements)	
Known Breeding Dates in Nevada	
March – early July[2]	
Nest and Nesting Habits	
Nest Placement	On dry ground near grassland / meadow, with vegetation 35 – 55 cm [14 – 21 in] tall[7]
Site Fidelity	Unknown; probably low[7]
Other	Often nest semi-colonially[7]
Food Habits	
Basic	Aerial predator
Primary Diet	Specialist on voles and similar-sized rodents[7]
Secondary Diet	Small birds and large insects[7]

Short-eared Owl

Asio flammeus



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Short-eared Owl

Asio flammeus

Overview

Typically a bird of dense grasslands, the Short-eared Owl is relatively uncommon in Nevada, but it can also be found in diverse types of open country where small mammal populations are sufficiently dense. Voles, their preferred prey, are typically most numerous in wet meadows, grasslands, or crop fields where herbaceous cover is well-developed, and Short-eared Owls often mirror their distribution patterns. Because voles are diurnally active, Short-eared Owls can often be seen hunting during daylight hours. Short-eared Owls populations also tend to follow annual fluctuations in vole abundance, which can be very pronounced. These predator-prey population "booms and busts" make it difficult to distinguish underlying population trends of the Short-eared Owl or to accurately estimate population size. Conservation concern exists because the Short-eared Owl's preferred habitats are threatened by a variety of land-use demands, including intensified agriculture, locally heavy grazing pressure, and water withdrawals. Additionally, Short-eared Owls appear to be particularly sensitive to habitat fragmentation, and it has been suggested that patches of suitable habitat > 100 ha [250 ac] in size are needed.[7] Although Short-eared Owls are present year-round in most of Nevada, the species exhibits pronounced seasonal movements, and is migratory in some parts of its range. These owls often roost communally during the winter, and they may breed semi-colonially in some situations.[1]

Abundance and Occupancy by Habitat

No information

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Loss, degradation, or fragmentation of habitat with well-developed herbaceous cover (wet meadows, grasslands) due to:
    - Habitat conversion
    - Livestock grazing,[1] especially during the early part of the breeding season
    - Intensified / altered agricultural practices, including early haying that disturbs nests
    - Water withdrawals that negatively affect herbaceous cover, especially during the early breeding season
    - Invasive plants

Short-eared Owl
Asio flammeus

Research, Planning, and Monitoring Challenges

- Pronounced fluctuations in abundance make it difficult to determine current population trends
- Short-eared Owls are not well-monitored by current methods; an adaptation of diurnal raptor surveys may do better

Conservation Strategies

Habitat Strategies

- The Wet Meadow (p. Hab-20-1) habitat conservation strategy benefits this species
- Short-eared Owls respond positively to many conservation measures conducted to benefit shorebirds, water birds, and waterfowl[4]
- Manage for good grass / herbaceous cover and productivity from nest initiation (mid-late March) through fledging (June) in areas where voles are present

Research, Planning, and Monitoring Strategies

- Continue monitoring through NBC, and enhance monitoring through other means when possible, to attempt to determine population trend in Nevada
- Conduct additional research on the distributions and habitat requirements of wintering populations

Public Outreach Strategies

- None identified

References: [1]Fondell and Ball (2004); [2]GBBO unpublished Atlas data; [3]NatureServe (2010); [4]Paige and Ritter (1999); [5]Rich et al. (2004); [6]Sauer et al. (2008); [7]Wiggins et al. (2006); [EO] Expert opinion

Common Poorwill

Phalaenoptilus nuttallii

Photo by Will Richardson

Habitat Use Profile

Habitats Used in Nevada	
Sagebrush Pinyon-Juniper Montane Shrubland (Salt Desert Scrub) (Mojave Scrub)	
Key Habitat Parameters ○	
Plant Composition	Sagebrushes, mountain mahogany, juniper, pinyon pine and associated shrubs[EO]
Plant Density & Size	Low, sparse vegetation[4]
Mosaic	Interspersion of physiographic elements, including dry washes, sloping uplands, and rocks[4]
Distance to Water	Unknown
Response to Vegetation Removal	Unknown, possibly positive[EO]
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	Unknown
Home Range / Territory Size	Unknown

Conservation Profile

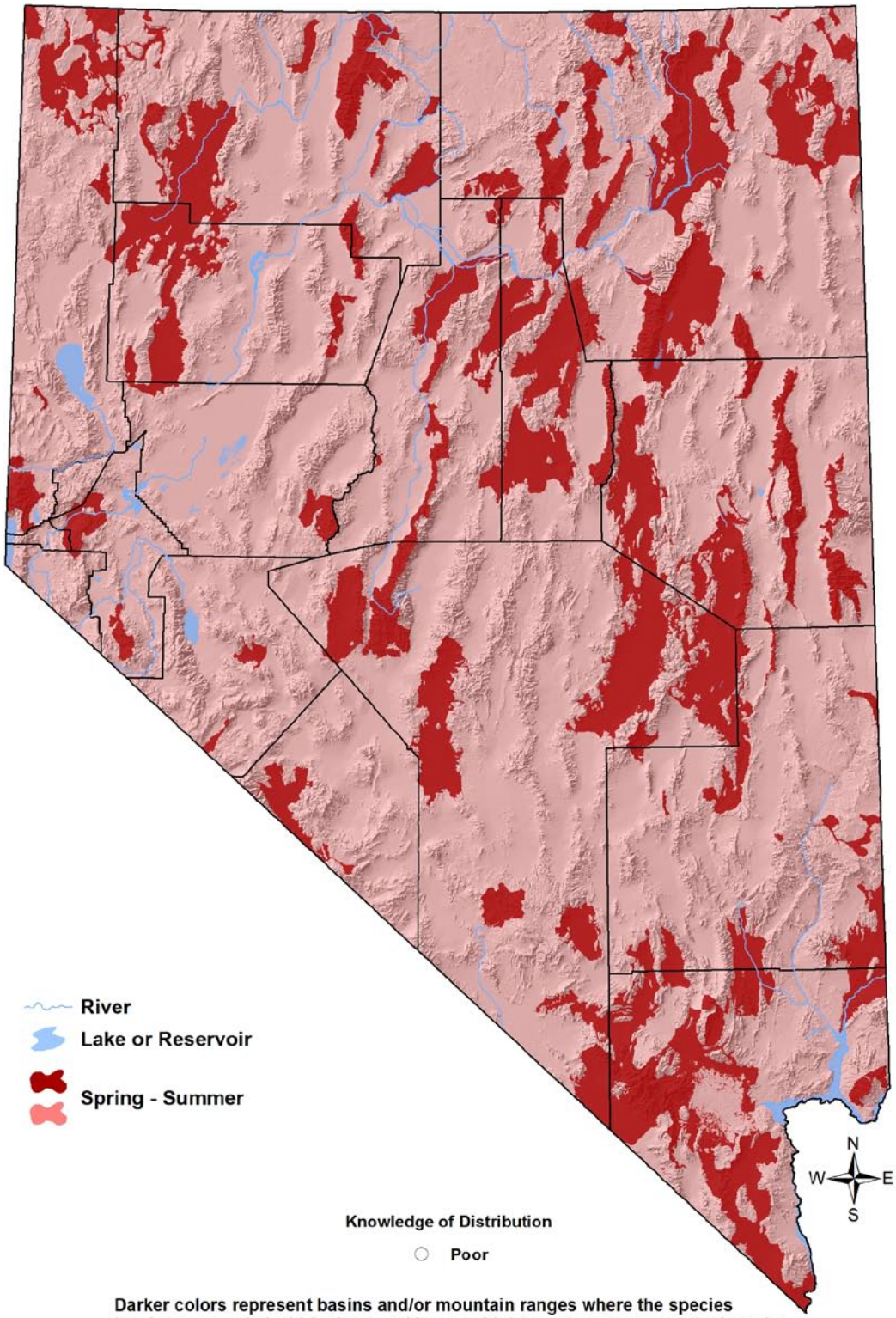
Priority Status	
Stewardship Species	
Species Concerns	
High stewardship responsibility Possible recent declines	
Other Rankings	
Continental PIF	None
Audubon Watchlist	None
NV Natural Heritage	S5B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	None
Trends	
Historical ○	Unknown
Recent ○	Unknown, but possible declines[3]
Population Size Estimates	
Nevada ○	Unknown
Global ○	3,000,000 [2]
Percent of Global	Unknown
Population Objective	
Maintain [EO]	
Monitoring Coverage	
Source	Nevada Bird Count, Breeding Bird Survey
Coverage in NV	Poor
Key Conservation Areas	
Protection	Unknown
Restoration	Unknown

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer, possibly Year-round in Mojave	
Known Breeding Dates in Nevada	
May – August[4] , possibly earlier[EO]	
Nest and Nesting Habits	
Nest Placement	On bare ground, often partially shaded by rock, low shrub, or prickly pear cactus[4]
Site Fidelity	Unknown
Food Habits	
Basic	Aerial forager
Primary Diet	Nocturnal flying insects[4]
Secondary Diet	n/a

Common Poorwill

Phalaenoptilus nuttallii



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Common Poorwill

Phalaenoptilus nuttallii

Overview

Because of its nocturnal habits and extreme inconspicuousness during daylight hours, very little is known, or even conjectured, about the habitat use requirements and conservation status of the Common Poorwill. It is apparent, though, that Nevada has a relatively large proportion of the global population of Common Poorwills, despite representing a much smaller fraction of the bird's geographical range. Common Poorwills are therefore regarded as a Stewardship Species in this plan.

Common Poorwills are most commonly detected in open scrublands, especially those dominated by sagebrush or salt desert shrubs. One recent study in the Sonoran Desert found that poorwill abundance was positively associated with presence of washes, uplands, and rocky substrate, and negatively associated with low grass cover,[1] and similar patterns appear to hold in Nevada.[EO] Improving our understanding of this cryptic bird will require implementation of a species-appropriate nocturnal survey and monitoring program in representative locations throughout the state.

Abundance and Occupancy by Habitat

- A new 32 km [20 mi] night-driving survey route in far northern Nevada documented 34 Common Poorwills, or 1 poorwill / km [1.7 poorwill / mi] (Pete Bradley, pers. comm.)

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Nothing definitive is known about the impacts of typical land uses in Sagebrush, Pinyon-Juniper, or Salt Desert habitats
- Habitat-destroying fire and invasion of exotic plants are likely to be detrimental, but no data exist to confirm this

Common Poorwill
Phalaenoptilus nuttallii

Research, Planning, and Monitoring Challenges

- The dearth of any reliable information about conservation status, threats, or trends make it difficult to manage Common Poorwills effectively

Conservation Strategies

Habitat Strategies

- It is likely that Sagebrush (p. Hab-17-1), Pinyon-Juniper (p. Hab-16-1), and Montane Shrubland (p. Hab-14-1) habitat conservation strategies benefit this species

Research, Planning, and Monitoring Strategies

- Implement night survey / monitoring programs at strategic locations throughout state to better determine distribution, trends, population density, and habitat requirements
- Standard protocols for the United States Nightjar Survey Network are available at: http://ccb-wm.org/nightjars.htm
- Encourage research projects on the species to better understand habitat, mosaic, and area requirements

Public Outreach Strategies

- None identified

References: [1]Hardy et al. (1998); [2]Rich et al. (2004); [3]Sauer et al. (2008); [3]Woods et al. (2005); [EO] Expert opinion

White-throated Swift

Aeronautes saxatalis

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada
Cliff Great Basin and Mojave Lowland Riparian Montane Riparian (Pinyon-Juniper)

Key Habitat Parameters ◑	
Plant Composition	n/a
Mosaic	Cliffs adjacent to riparian, open water, marsh, or wet meadow habitats[4]
Cliff Height	Unknown; estimated at ≥ 40 m [130 ft][EO]
Distance to Water	Specifics unknown, but nests close to water[4]
Response to Vegetation Removal	n/a

Area Requirements ◑	
Minimum Patch Size	Unknown
Recommended Patch Size	> 3,000 ha [7,400 ac] around suitable nesting cliff [EO]
Home Range / Territory Size	Specifics unknown; home range at least several ha [ac][4]

Conservation Profile

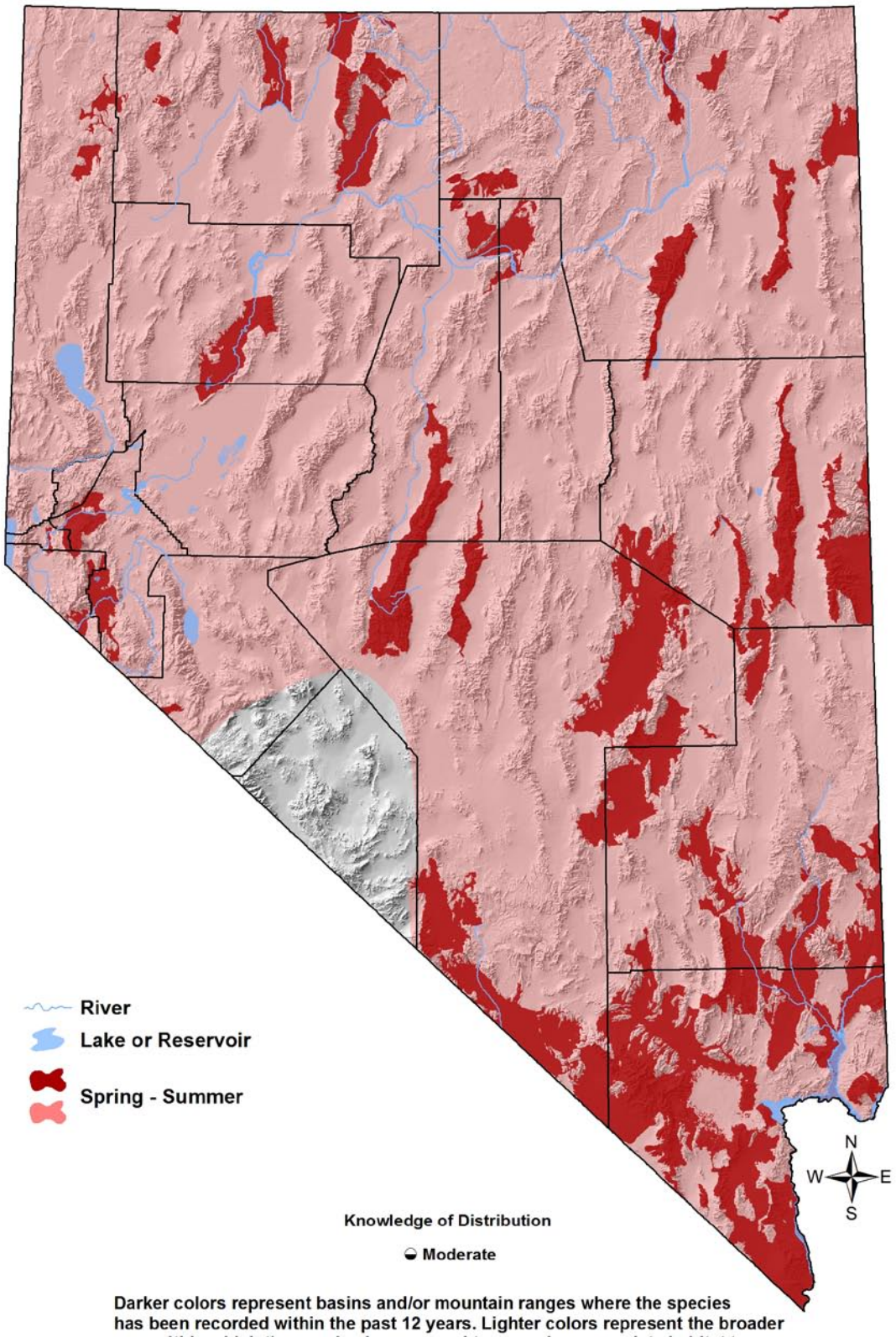
Priority Status	
Conservation Priority Species	
Species Concerns	
Possible recent declines	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	None
NV Natural Heritage	S4B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Trends	
Historical ○	Unknown
Recent ○	Rangewide declines suspected; most recently appears to be stabilizing regionally;[5] Nevada trends unknown
Population Size Estimates	
Nevada (NBC) ◑	14,000
Global ◑	280,000 [2]
Percent of Global	5%
Population Objective	
Increase by 100% [2]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	All suitable cliff habitat near rivers, marshes, lakes, or meadows
Restoration	Rivers, marshes, lake, and meadows near cliffs

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
April – September[1, 4]	
Nest and Nesting Habits	
Nest Placement	In crevice of cliff or artificial structure[4]
Site Fidelity	Very high for breeding sites[4]
Food Habits	
Basic	Aerial forager
Primary Diet	Exclusively flying insects[4]
Secondary Diet	n/a

White-throated Swift

Aeronautes saxatalis



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White-throated Swift

Aeronautes saxatalis

Overview

White-throated Swifts breed throughout Nevada wherever suitable nesting cliffs or artificial structures are present in proximity to water and to sufficient flying insect populations. The species usually breeds communally, with numbers of birds varying greatly among sites. Taller cliffs near rivers seem to be preferred as nest sites,[3, EO] and White-throated Swifts are especially common around Lake Mead and along southern Nevada rivers.[EO] Because of their foraging habits, they can also be seen with some frequency over a broad array of upland habitat types. Current monitoring efforts primarily capture mainly the smaller, and relatively numerous, communal breeding sites that are spread across the state. They do not, however, provide adequate coverage of the most productive communal breeding sites, which are more patchily distributed across the state. For this reason, population size and trend estimates generated from existing data must be viewed with caution. Nevada's most productive White-throated Swift communal breeding sites should be systematically inventoried and monitored to provide a better basis for future population status assessments.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Lowland Riparian	9% (6/66)	3.5 (0.6 – 6.4)
Montane Riparian	5% (4/88)	2.7 (0.3 – 5.1)
Mojave		
Lowland Riparian	19% (7/36)	8.8 (-3.5 – 21.1)

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Loss or degradation of marsh and riparian habitat which negatively affects foraging opportunities
- Disturbance of communal breeding sites
- Possible pesticide bioaccumulation effects, especially near agricultural areas

White-throated Swift

Aeronautes saxatalis

Research, Planning, and Monitoring Challenges

- The most productive breeding sites are few in number and widely scattered. The Nevada Bird Count effectively samples the smaller breeding sites, but misses many of most productive sites
- Basic area requirements, trends, and population size are not well known

Conservation Strategies

Habitat Strategies

- Cliff (p. Hab-4-1), Great Basin Riparian (p. Hab-7-1), Mojave Riparian (p. Hab-11-1), and Montane Riparian (p. Hab-13-1) habitat conservation strategies benefit this species

Research, Planning, and Monitoring Strategies

- Identify, monitor, and protect most productive communal breeding cliffs and structures
- Improve existing monitoring effort with targeted surveys in most productive breeding sites, to generate better estimates of population size and trends
- If White-throated Swifts in Nevada are confirmed to be declining, conduct additional research to determine causes of declines, with possible focus on pesticide impacts

Public Outreach Strategies

- None identified

References: [1]GBBO unpublished Atlas data; [2]Rich et al. (2004); [3]Rossi and Knight (2009); [4]Ryan and Collins (2000); [5]Sauer et al. (2008); [EO] Expert opinion

Costa's Hummingbird

Calypte costae

Photo by Scott Page

Habitat Use Profile

Habitats Used in Nevada	
Mojave Scrub Springs Mojave Lowland Riparian Mesquite-Acacia Joshua Tree	
Key Habitat Parameters ◑	
Plant Composition (Woody)	Joshua tree, other *Yucca* spp., acacia, mesquite, desert willow, willow spp., cactuses, pinyon pine, juniper (post-breeding)
Plant Composition (Nectar)	Bladderpod, creosote bush, penstemon spp., squaw cabbage, desert willow, and other flower-bearing forbs and shrubs[1]
Plant Density	3-10 suitable flowering shrubs in territory[1]
Mosaic	Unknown
Distance to Water	Unknown; springs or dry washes important
Response to Vegetation Removal	Probably negative[EO]
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	> 100 ha [250 ac][1, EO]
Home Range / Territory Size	Unknown

Conservation Profile

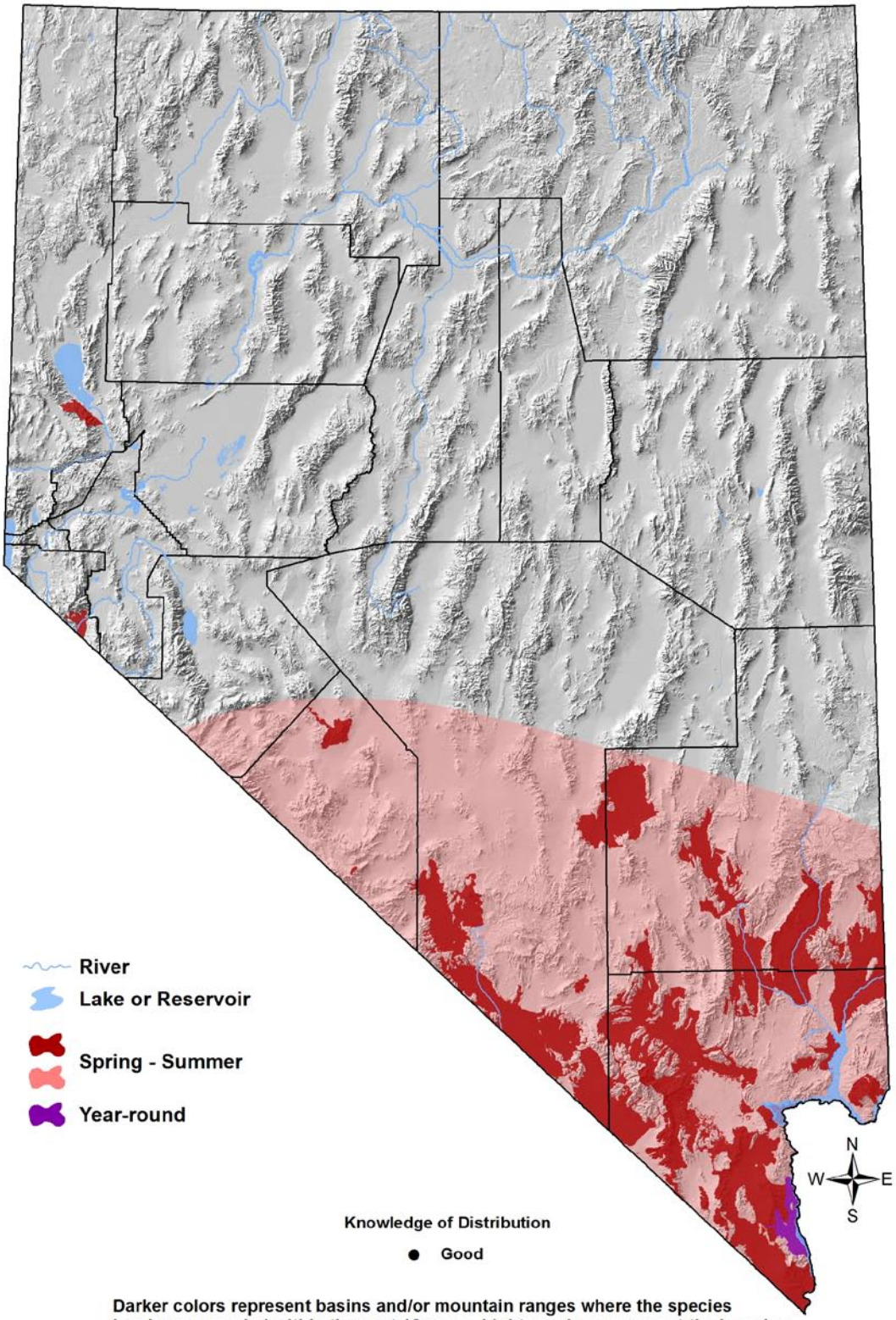
Priority Status	
Conservation Priority Species	
Species Concerns	
Recent population declines Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S3B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Trends	
Historical ◑	No changes in NV reported[1]
Recent ○	Apparent declines in West, unknown in NV [5]
Population Size Estimates	
Nevada (NBC) ◑	14,000
Global ◑	1,800,000 [3]
Percent of Global	< 1%
Population Objective	
Maintain / Increase[4, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Fair
Key Conservation Areas	
Protection	Springs, riparian, ephemeral washes, Joshua tree and transitional habitats in Clark and Nye counties
Restoration	Same

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer; Year-round along lower Colorado River	
Known Breeding Dates in Nevada	
Late March – early July[2, EO]	
Nest and Nesting Habits	
Nest Placement	In woody plant or cactus, < 3 m [10 ft] off ground[1]
Site Fidelity	Low; site occupancy highly variable[1]
Food Habits	
Basic	Forb/shrub layer; also fly-catches
Primary Diet	Nectar and small invertebrates[1]
Secondary Diet	n/a

Costa's Hummingbird

Calypte costae



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Costa's Hummingbird

Calypte costae

Overview

Costa's Hummingbird is traditionally regarded as a Mojave Desert bird in Nevada, but the Nevada Bird Count and the Nevada Breeding Bird Atlas project confirmed that it also occurs sporadically as far north as Pyramid Lake. Further study is needed to determine whether this geographical pattern represents an ongoing northward range expansion or simply increased survey efforts, but this species is known for regular vagrancy into Oregon and beyond.[1] Costa's Hummingbird is found in a variety of valley and foothill habitat types, and is less commonly associated with feeders than other hummingbirds (which are dominant).[1] Nonetheless, many records in Nevada are from feeder sightings outside the breeding season. Unfortunately, we have comparatively little information on habitat and foraging requirements during the nesting season. Considered to be a bird of desert scrub, springs and desert washes may also be critical.[1, 4] Because hummingbirds are difficult to monitor effectively, the causes of apparent declines are not well understood. An additional complicating factor is the possible impact of climate change on the blooming phenology and distribution of important food plants. As with the other Conservation Priority hummingbirds, the implementation of a monitoring effort specifically designed to capture more information about hummingbirds would be very useful in assessing conservation status and determining appropriate management actions.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Mojave Region

Primary Habitat at Transect	Transects Occupied	Birds /40 ha (95% C.I.)
Lowland Riparian	17% (3/36)	1.7 (0.3 – 3.0)
Mojave Scrub	14% (3/22)	1.5 (.05 – 2.0)
Mesquite-Acacia	14% (2/14)	0.8 (n/a)
Joshua Tree	25% (5/20)	0.7 (0.0 – 1.4)
Montane Shrubland	25% (2/8)	0.2 (n/a)
Montane Riparian	22% (2/9)	0.1 (n/a)

Nevada-Specific Studies and Analyses

Landscape Associations (NBC)

Costa's Hummingbirds were detected on 24 of the NBC transects in the Mojave region (several in peripheral habitats not shown on the table above). On a landscape scale, they were most strongly associated with the presence of Mojave Scrub habitat, although most transects with Costa's Hummingbirds also had a significant Lowland Riparian, Springs, or Mesquite-Acacia component. This supports the potential importance of proximity to water or to the flowering plants associated with moist habitats.

Costa's Hummingbird

Calypte costae

Main Threats and Challenges

Habitat Threats

- No clear habitat threats have been identified for this species
- Possible threats include water diversions and groundwater pumping, which may impact blooming plants around riparian and spring areas; invasive plants that compete with preferred food plants, and destruction or degradation of habitat by fire or heavy grazing that significantly reduces abundance of blooming plants during critical times

Research, Planning, and Monitoring Challenges

- Population trends, habitat needs, and threats need further investigation

Conservation Strategies

Habitat Strategies

- Mojave Scrub (p. Hab-12-1), Springs (p. hab-19-1), Mojave Lowland Riparian (p. Hab-11-1), Mesquite-Acacia (p. Hab-10-1), and Joshua Tree (p. Hab-8-1) habitat conservation strategies benefit this species
- Areas with well-developed flowering shrubs and forbs that are located near springs or other water sources should be protected from grazing pressure that would significantly reduce bloom abundance
- Implement weed control programs in these areas as needed

Research, Planning, and Monitoring Strategies

- Develop and implement a monitoring program suited to hummingbirds, and develop better estimates of current trends
- Conduct studies to clarify habitat requirements, use of urban food sources, and threats
- Where groundwater pumping occurs, monitor effects on flowering plant communities
- Develop strategy to attack fires that threaten desert spring vegetation
- Investigate opportunities to integrate research and monitoring efforts with national hummingbird conservation networks; http://www.hummonnet.org

Public Outreach Strategies

- None identified

References: [1]Baltosser and Scott (1996); [2]GBBO unpublished Atlas data; [3]Rich et al. (2004); [4]Rosenberg et al. (1991); [5]Sauer et al. (2008); [EO] Expert opinion

Calliope Hummingbird

Stellula calliope

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Montane Shrubland Montane Riparian Aspen Coniferous Forest Springs	
Key Habitat Parameters ◑	
Plant Composition (Woody)	Aspen, willow, mixed deciduous and coniferous trees[1]
Plant Composition (Nectar)	Requires blooming understory, primarily forbs[1, EO]
Plant Density	Canopy closure < 40% [1]
Mosaic	Mixed-age stand structure, usually early- to mid-successional; typically near forest openings or adjacent to montane shrublands or meadows; also benefits from presence of sap wells made by sapsuckers[1]
Distance to Water	Near water[1]
Other Habitats Used	In migration, lowland riparian, (sub)urban areas with feeders[1]
Response to Vegetation Removal	Negative, especially for understory[EO]
Area Requirements ◑	
Minimum Patch Size	Unknown
Recommended Patch Size	Entire stand of deciduous woodland [EO]
Home Range	4 km [2.5 mi] of linear habitat[1]

Conservation Profile

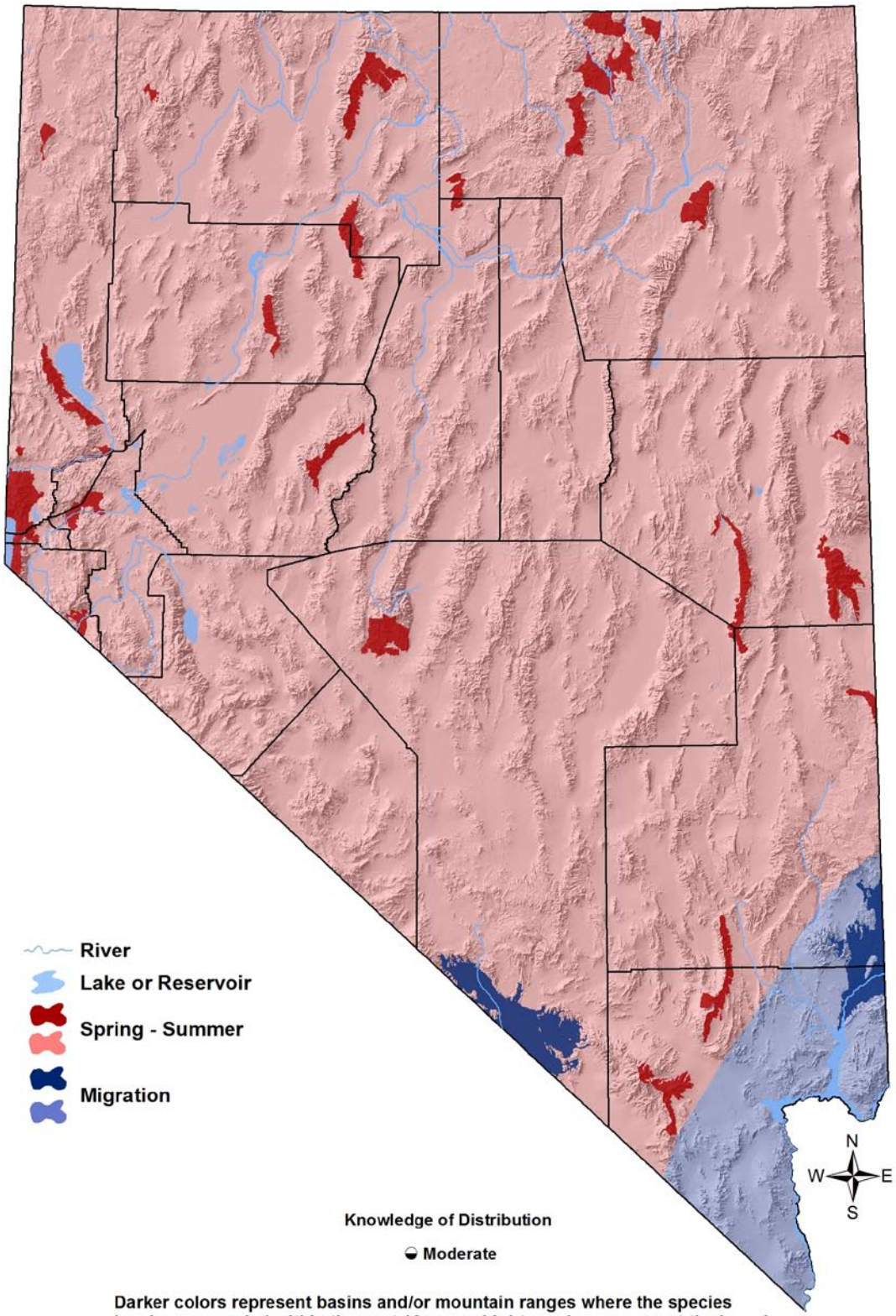
Priority Status	
Conservation Priority Species	
Species Concerns	
Possible habitat threats Unknown population trend	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	None
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	Stewardship
Trends	
Historical ○	Unknown
Recent ○	Poor data, possibly stable[6]
Population Size Estimates	
Nevada (NBC) ○	9,500
Global ◑	1,000,000 [5]
Percent of Global	1%
Population Objective	
Maintain / Increase[5, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Fair
Key Conservation Areas	
Protection	Carson , Jarbidge, and Toiyabe ranges
Restoration	All Great Basin Montane Riparian and Aspen habitat

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Late April – July[2, 3]	
Nest and Nesting Habits	
Nest Placement	On tree branch 2-12 m [6.5 – 40 ft] off ground, concealed by higher branch[1]
Site Fidelity	Moderate to high for breeding territory[1]
Food Habits	
Basic	Nectarivore and insectivore in forb/shrub layer
Primary Diet	Nectar and small insects from flowers[1]
Secondary Diet	Sap wells made by sapsuckers[1]

Calliope Hummingbird

Stellula calliope



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Calliope Hummingbird

Stellula calliope

Overview

The Calliope Hummingbird is a fairly common breeder in mixed forests of the Carson Range and Jarbidge Mountains. It also occurs in smaller numbers throughout much of the state, for example the Spring Mountains and Sheep Range of southern Nevada. Calliope Hummingbirds are most associated with a montane mosaic of deciduous woodland, blooming understory, and forest edges and openings.

The difficulty of monitoring hummingbird populations accurately is apparent in the widely varying statewide population estimates produced by the Nevada Bird Count (9,500) and Partners in Flight (60,000).[5] For this reason, we encourage development of more targeted monitoring approach than has been available in the past for this and other hummingbird species. Better monitoring protocols and additional research would allow us to better estimate trends, and to more accurately determine habitat requirements and potential threats. At present, conservation concern for the Calliope Hummingbird is somewhat conjectural. It bears noting that hummingbirds that depend upon montane blooms may be impacted in some manner if and when climate change alters blooming phenology in their currently occupied range.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Montane Riparian	2% (2/88)	1.3 (0.1 – 2.5)
Aspen	11% (2/18)	0.7 (0.6 – 0.8)
Coniferous Forest	26% (5/19)	0.6 (0.4 – 0.8)
Mojave		
Montane Riparian	11% (1/9)	0.2 (n/a)
Aspen	14% (1/7)	1.0 (n/a)

- Across wider region, estimated density 0.7 – 2 birds / ha in good breeding habitat[1]
- BBS-based population estimate for Nevada is 60,000 [5]

Nevada-Specific Studies and Analyses

No information

Calliope Hummingbird

Stellula calliope

Main Threats and Challenges

Habitat Threats

- No clear habitat threats have been identified for this species
- Habitat threats to Aspen (p. Hab-3-1), Coniferous Forest (p. Hab-5-1), Montane Riparian (p. Hab-13-1), Montane Shrubland (p.Hab-14-1) and Springs (p. Hab-19-1) habitats apply to this species

Research, Planning, and Conservation Challenges

- Population trends and population size are not known
- Beyond general landscape preferences, specific habitat needs and threats are not well understood

Conservation Strategies

Habitat Strategies

- In the absence of more specific information, Aspen (p. Hab-3-1), Coniferous Forest (p. Hab-5-1), Montane Riparian (p. Hab-13-1), Montane Shrubland (p.Hab-14-1) and Springs (p. Hab-19-1) habitat conservation strategies should benefit this species
- Manage montane areas to maintain a multi-age mosaic of deciduous woodlands (willows and aspen), coniferous forest, montane shrubs, and forest openings and meadows that support flowering forbs
- Seek opportunities to protect productive flowering meadows from grazing pressure if it significantly reduces bloom abundance

Research, Planning, and Monitoring Strategies

- Develop and implement a monitoring program suited to hummingbirds, and develop better estimates of trends and population size
- Conduct studies to clarify habitat requirements and threats
- Investigate opportunities to integrate research and monitoring efforts with national hummingbird conservation networks[4]

Public Outreach Strategies

- None identified

References: [1]Calder and Calder (1994); [2]GBBO unpublished Atlas data; [3]Heath and Ballard (2003); [4]Hummingbird Monitoring Network, www.hummonnet.org; [5]Rich et al. (2004); [6]Sauer et al. (2008); [EO] Expert opinion

Rufous Hummingbird

Selasphorus rufus

\ Photo by Scott Page

Habitat Use Profile

Habitats Used in Nevada	
Montane Riparian Great Basin and Mojave Lowland Riparian Aspen Wet Meadow Springs (Mesquite-Acacia)	
Key Habitat Parameters ◑	
Plant Composition	Red tubular, nectar-rich flowers: *Castilleja, Aquilega, Epilobium, Delphinium, Penstemon, Monarda, Linaria, Cleome, Lonicera* spp. and similar[1]
Plant Density	Unknown; highly territorial, so high densities most beneficial[EO]
Mosaic	Unknown; flower density appears to be more important than habitat mosaic[EO]
Distance to Water	Unknown, but preferred nectar plants are more common in wetter areas[EO]
Response to Vegetation Removal	Negative to removal of forb layer[EO]
Area Requirements ○	
Minimum Patch Size	Unknown; estimated at 0.1 ha [0.25 ac][EO]
Recommended Patch Size	Whole patch with forb understory[EO]
Home Range	Unknown; depends on flower density[1]

Conservation Profile

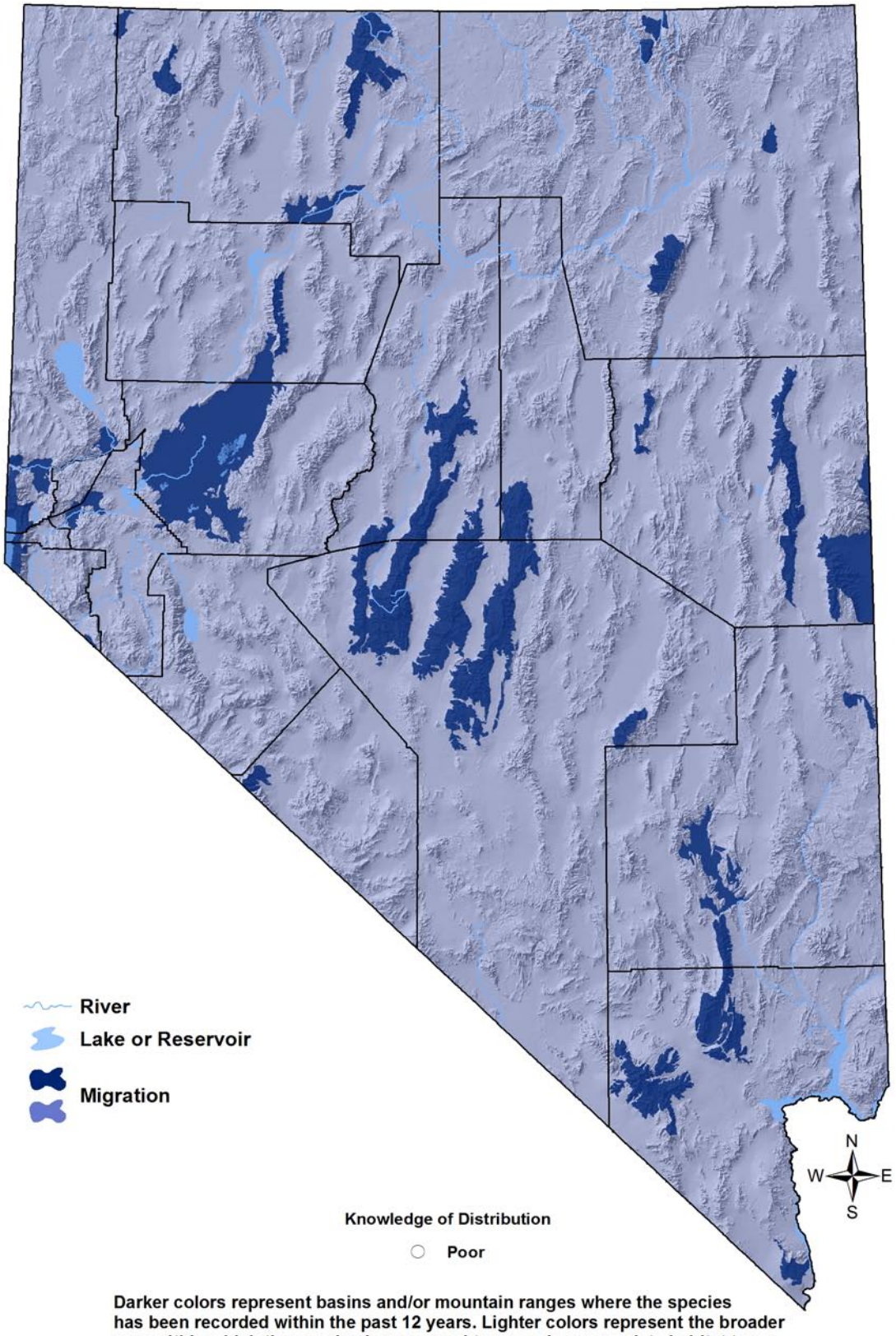
Priority Status	
Conservation Priority Species	
Reasons for Priority Status	
Habitat threats High stewardship responsibility (migration)	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	None
NV Natural Heritage	S3M
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Trends	
Historical ○	Unknown
Recent ◑	Declines of 2% / year in the West; Nevada unknown[5]
Population Size Estimates	
Nevada ○	Unknown; estimated at > 1,000,000 [EO]
Global ◑	6,500,000 [3]
Percent of Global	≥ 15%
Population Objective	
Increase by 100% [3, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Fair / Poor
Key Conservation Areas	
Protection	All montane riparian, montane shrubland, aspen, wet meadow, springs, lowland riparian
Restoration	Same

Natural History Profile

Seasonal Presence in Nevada	
Fall migration (July – September)[1, EO]	
Known Breeding Dates in Nevada	
Does not breed in Nevada	
Nest and Nesting Habits	
Nest Placement	n/a
Site Fidelity	Unknown; 1-2 week stopover in suitable patch[1]
Food Habits	
Basic	Nectarivore
Primary Diet	Nectar[1]
Secondary Diet	Sapsucker wells, hummingbird feeders[1]

Rufous Hummingbird

Selasphorus rufus



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Rufous Hummingbird

Selasphorus rufus

Overview

The Rufous Hummingbird is the most abundant and widespread migrant hummingbird in Nevada during fall migration. During this period, it occurs in a wide variety of primarily montane habitats where flowering plants are present in sufficiently dense patches. Interestingly, most published breeding range maps suggest breeding in the northeast corner of Nevada, even though breeding has never been confirmed in the state. Spring migration occurs mostly in the Sierra Nevada and further to the west.

Though still numerous, Rufous Hummingbirds are declining steadily in numbers, with no confirmed cause. Our conservative estimate of migrant population size in Nevada is based on the number of birds estimated to use urban feeders. NBC data (which capture some of the earlier migrants) suggest that Rufous Hummingbirds also heavily use the montane forb-rich habitats that are presumably their traditional migration stopover habitat. Populations of hummingbirds using wet meadows on the eastern base of the Sierra are strongly affected by the yearly variation in flower density, which has implications for climate change.[4] Additional study is needed to determine the cause of ongoing declines, and whether migration stopover habitat plays an important role in the declines. This latter issue is particularly important for Nevada, through which a significant proportion of all fall migrants pass. Targeted monitoring of the Rufous Hummingbird during the peak of fall migration would provide useful data to supplement that collected in the species' breeding range.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions*

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Aspen	6% (1/18)	3.8 (n/a)
Coniferous Forest	11% (2/19)	1.0 (n/a)
Montane Riparian	7% (6/88)	0.7 (0.4 – 1.0)
Mojave		
Aspen	43% (3/7)	0.6 (0.1 – 1.1)

* NBC sampling terminates in late July, prior to fall migration peak

Nevada-Specific Studies and Analyses

No information

Rufous Hummingbird

Selasphorus rufus

Main Threats and Challenges

Habitat Threats

- No clear habitat threats have been identified for this species in Nevada's migratory stopover areas
- Possible threats include destruction or degradation of habitat by fire or heavy grazing that significantly reduces abundance of blooming plants during the fall migration period

Research, Planning, and Monitoring Challenges

- Causes of declines not yet determined[1]
- Rufous Hummingbirds in fall migration are incompletely monitored by the breeding-season NBC program

Conservation Strategies

Habitat Strategies

- Montane Riparian (p. Hab-13-1), Aspen (p. Hab-3-1), Great Basin (p. Hab-7-1) and Mojave (p. Hab-11-1) Lowland Riparian, Wet Meadow (p. Hab-20-1), and Springs (p. hab-19-1) habitat conservation strategies benefit this species
- Montane areas with well-developed flowering shrubs and forbs should be protected from grazing pressure that would significantly reduce bloom abundance during the fall migration period
- Manage primary habits to encourage structural and floristic diversity that results in patches with high forb / flow density

Research, Planning, and Monitoring Strategies

- Investigate possibility of breeding in northeast Nevada
- Pursue a fall migration monitoring effort that would allow determination of migrant population size, trends, and habitat use
- Investigate opportunities to integrate research and monitoring efforts with national hummingbird conservation networks[2]

Public Outreach Strategies

- Promote hummingbird-friendly plantings and feeders
- Rufous Hummingbirds are suitable subjects for citizen science projects through eBird or similar outreach tools[2]

References: [1]Healy and Calder (2006); [2]Hummingbird Monitoring Network, www.hummonnet.org; [2]Rich et al. (2004); [4]Russell et al. (1994); [5]Sauer et al. (2008); [EO]Expert opinion

Lewis's Woodpecker

Melanerpes lewis

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Aspen Montane Riparian (Coniferous Forest)	
Key Habitat Parameters ●	
Plant Composition	Aspen, cottonwoods, ponderosa and Jeffrey pines
Plant Density & Size	Prefers snags of dbh ≥ 31 cm [12 in] at density of 2 / ha [1 / ac]; tree canopy closure 30% for nesting; shrub cover 50% [7]
Mosaic	Intact deciduous tree and shrub layers in riparian / aspen zones; multiple age-classes with older-aged component in adjacent coniferous forest[7]
Distance to Water	Usually in close proximity in Nevada[3]
Response to Vegetation Removal	Negative [EO]
Prey Populations	May benefit from presence of anthills which are used as a food source[7]
Area Requirements ○	
Minimum Patch Size	Unknown, but can occur in small / narrow riparian patch[EO]
Recommended Patch Size	Entire riparian / aspen stand[EO]
Home Range / Territory Size	Territories 1 – 6 ha [2 - 15 ac]; foraging area much larger[7]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Historical declines Possible recent declines Habitat threats Stewardship responsibility	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Red
NV Natural Heritage	S3
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
Trends	
Historical ●	Declines and range contractions[7]
Recent ◑	Probable declines[6]
Population Size Estimates	
Nevada (NBC) ◑	13,000
Global ◑	130,000 [5]
Percent of Global	10 %
Population Objective	
Maintain / Increase[5, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Carson, Ruby, Jarbidge, East Humboldt, Independence, Bull Run, and Monitor Ranges
Restoration	Montane Riparian and Aspen habitat in northern 2/3 of Nevada

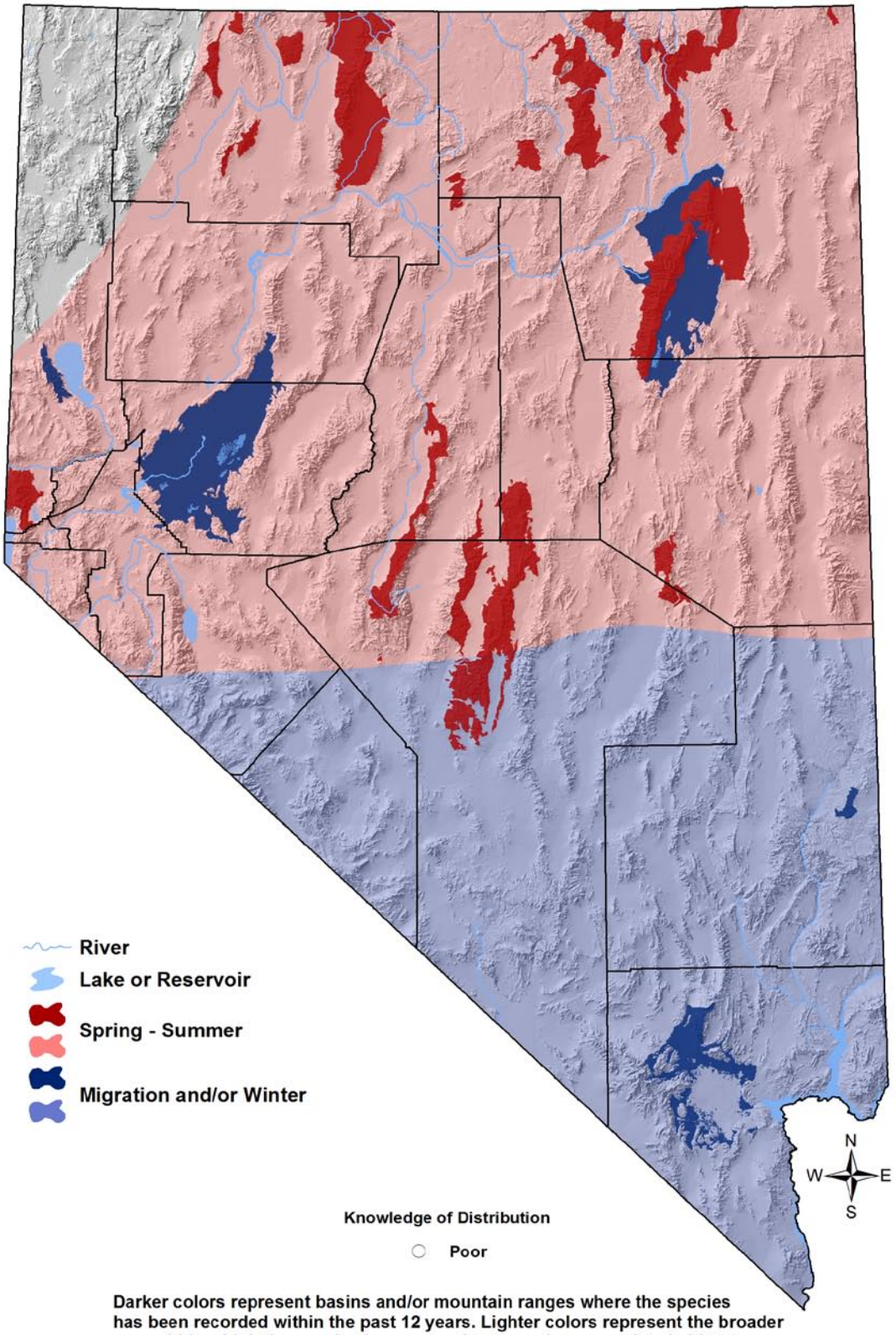
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer; possibly Winter in Mojave region	
Known Breeding Dates in Nevada	
Mid-May – early September[2]	
Nest and Nesting Habits	
Nest Placement	Cavity excavator or re-user; requires large trunk or branch on snag[7]
Site Fidelity	Low[7]
Food Habits	
Basic	Arboreal / terrestrial gleaner and fly-catcher[7]
Primary Diet	Ants, flying insects[7]
Secondary Diet	Nuts and fruits in non-breeding season[7]

Confidence in Available Data: ●High ◑Moderate ○ Low

Lewis's Woodpecker

Melanerpes lewis



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Lewis's Woodpecker

Melanerpes lewis

Overview

Throughout most of its geographical range, the Lewis's Woodpecker is regarded as a specialist on open forests of ponderosa pine, burned pine forests, oak woodlands, and cottonwood galleries. In Nevada, however, this species is most strongly associated with deciduous riparian woodlands dominated by aspen or cottonwood.[3] Nomadic movements often extend its activities into other habitat types, mainly Coniferous Forest, and in the far-western Carson Range, this habitat type is also used for breeding. Lewis's Woodpecker is no longer known to breed in the valley-bottom riparian woodlands where they are thought to have historically occurred.

As a weak excavator, the Lewis's Woodpecker is even more dependent on dead trees than other woodpeckers. Key habitat factors include the presence of large, partly-decayed snags, an open forest structure for aerial foraging, and a well-developed shrub or native herbaceous layer that promotes healthy populations of flying insects.[1] Annual variation in Lewis's Woodpecker numbers and their very patchy breeding distribution within the state make it hard to pinpoint current trends in Nevada, but the species is a conservation concern because of historic rangewide declines and Nevada's moderately high global stewardship responsibility.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Aspen	33 % (6/18)	2.7 (0.6 – 4.8)
Montane Riparian	7% (6/88)	1.5 (0.3 – 2.7)
Mojave		
Aspen	14% (1/7)	0.3 (n/a)
Montane Riparian	22% (2/9)	1.0 (n/a)

Nevada-Specific Studies and Analyses

- Analysis of NBC data indicates that Lewis's Woodpecker has a significant ($p=0.01$) statistical association with the Aspen and Montane Riparian habitat types

Lewis's Woodpecker

Melanerpes lewis

Main Threats and Challenges

Habitat Threats

- Loss or degradation of aspen stands and associated understory due to improper livestock grazing, conifer invasion, and aspen decline (due to pathogens, drought, reductions in stream flows, climate change, and other factors)
- Degradation of deciduous Montane Riparian habitat and associated understory due to grazing pressure from domestic livestock and wild horses and burros

Research, Planning, and Monitoring Challenges

- The most beneficial fire regime (scale, return interval, etc.) is unclear
- Home range, patch size requirements, and preferred landscape structure is not sufficiently well understood

Conservation Strategies

Habitat Strategies

- Aspen (p. Hab-3-1) and Montane Riparian (p. Hab-13-1) habitat conservation strategies benefit this species
- Manage grazing in Aspen and Montane Riparian habitats to protect the integrity of understory vegetation and allow sufficient tree regeneration[4]
- Retain large snags in Aspen and Montane Riparian habitats
- Conduct restoration / exclosure efforts to in Aspen and Montane Riparian habitats to re-establish understory vegetation and tree regeneration
- Pending further information, manage for small-scale stand-rejuvenating fire

Research, Planning, and Monitoring Strategies

- Continue monitoring to better determine current population trends
- Conduct further research to determine area requirements and most beneficial fire regime

Public Outreach Strategies

- None identified

References: [1]Abele et al. (2004); [2]GBBO unpublished Atlas data; [3]GBBO unpublished NBC data; [4]Newlon (2005); [5]Rich et al. (2004); [6]Sauer et al. (2008); [7]Tobalske (1997); [EO] Expert opinion

Williamson's Sapsucker

Sphyrapicus thyroideus

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Coniferous Forest Aspen	
Key Habitat Parameters ●	
Plant Composition	Ponderosa, Jeffrey, and lodgepole pines, and Douglas-fir for foraging; often aspen for nesting[2]
Plant Density & Size	Little information; probably prefers > 30 snags/ ha [12 / ac] with dbh > 30 cm [12 in][2, 4]
Mosaic	Coniferous Forest juxtaposed with Aspen stands, with standing snags[2]
Distance to Water	No known relationship
Response to Fragmentation	Probably fairly tolerant due to small home ranges[2]
Response to Vegetation Removal	Negative to tree/snag removal; tolerates fires well if some living timber and standing snags remain[2, EO]
Area Requirements ◑	
Minimum Patch Size	~ 15 ha [38 ha][EO]
Recommended Patch Size	> 100 ha [250 ac][EO]
Home Range	~ 4 – 9 ha [10 - 22 ac][2]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Possible declines[2] Restricted habitat	
Other Rankings	
Continental PIF	Stewardship
Audubon Watchlist	Yellow
NV Natural Heritage	S2
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	Management Indicator
NDOW	Stewardship
Trends	
Historical ○	Unknown
Recent ◑	Pronounced declines in 1980's; more recent trends unclear[2, 7]
Population Size Estimates	
Nevada (NBC) ◑	1,500
Global ◑	310,000 [6]
Percent of Global	< 1%
Population Objective	
Maintain[6]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Carson Range, White Pine County, Spring Mountains
Restoration	Same

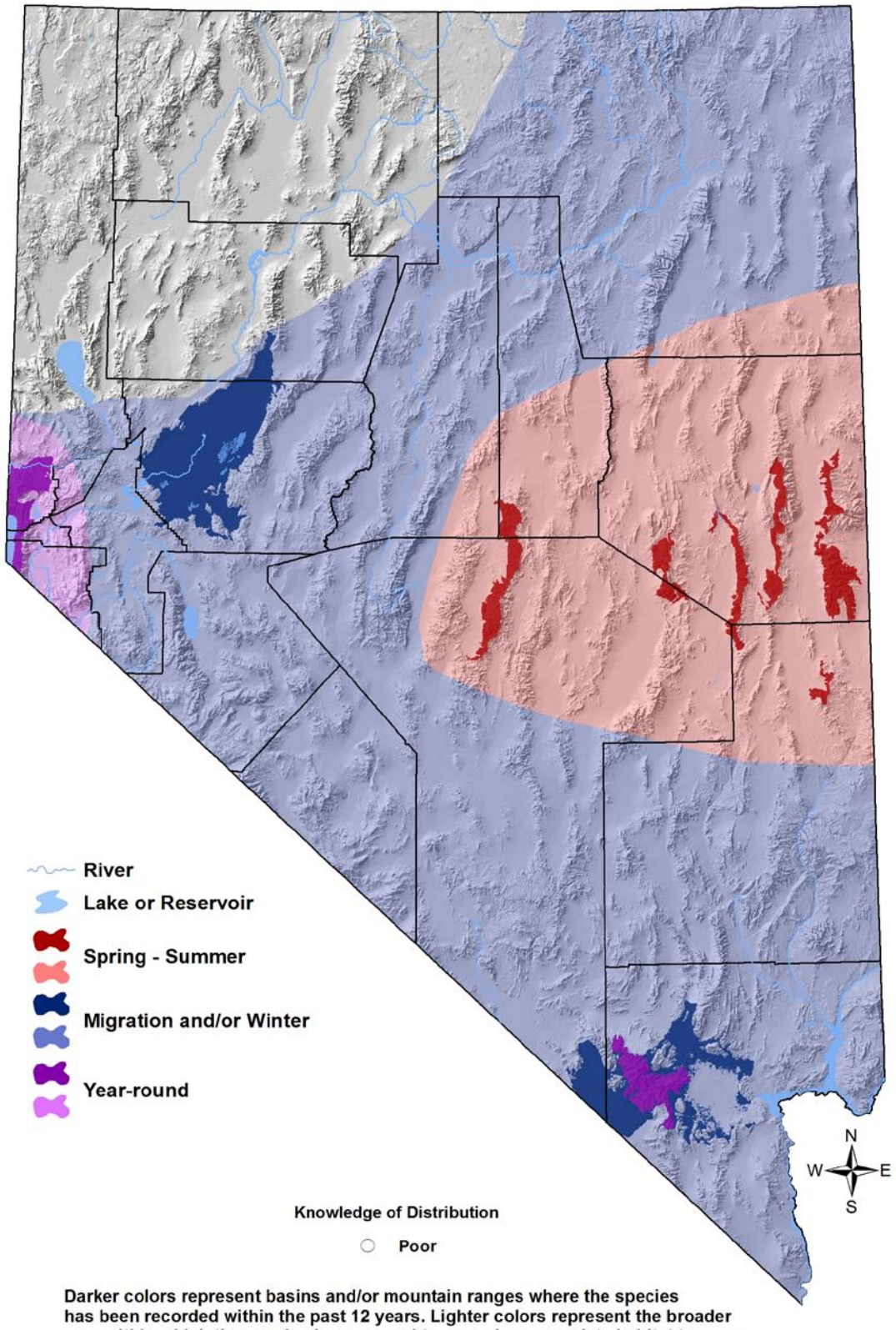
Natural History Profile

Seasonal Presence in Nevada	
Year-round in Carson Range and Spring Mts; Spring – Summer elsewhere[2, EO]	
Known Breeding Dates in Nevada	
May – mid-August[2, 3]	
Nest and Nesting Habits	
Nest Placement	Excavates cavity most often in aspen snag 25 – 70 cm [10 – 27 in] dbh; also in living aspen or conifer with dead top[2, 3]
Site Fidelity	High for breeding territory[2]
Other	Usually excavates new cavity every year[2]
Food Habits	
Basic	Tree trunk prober, gleaner, and borer[2]
Primary Diet	Conifer sap wells, especially in non-breeding season[2]
Secondary Diet	Ants and other insects in breeding season[2]

Confidence in Available Data: ●High ◑Moderate ○ Low

Williamson's Sapsucker

Sphyrapicus thyroideus



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Williamson's Sapsucker

Sphyrapicus thyroideus

Overview

Williamson's Sapsucker is somewhat unusual in that it is tightly tied to one forest type (Aspen) for nesting, and another (Coniferous Forest) for foraging. Populations in Nevada are fragmented, and the species apparently does not breed in large portions of central Nevada despite the availability of presumably suitable habitat. In western and southern Nevada, Williamson's Sapsuckers occur year-round, and in eastern Nevada, they are summer breeders that migrate. Their seasonal distribution around the state is very poorly known, and the range map shown above could change significantly with the collection of additional data. During migration, Williamson's Sapsuckers may occur broadly in pinyon-juniper or riparian woodlands.[2]

Because Williamson's Sapsuckers nest primarily in snags or live trees with broken or dead tops, older forest stands with some decadence will usually be most suitable,[5, EO] especially if snags are concentrated in patches and relatively large.[1] Possible threats are poorly characterized, although it can be inferred that loss or degradation of higher-elevation aspen stands or a significant decrease in snag density would be detrimental. Preserving a landscape matrix in which healthy Coniferous Forest and Aspen habitats are both readily available will be beneficial.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin Region
(Mojave data insufficient)

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Coniferous Forest	32% (6/19)	1.8 (0.4 – 3.2)
Aspen	11% (2/18)	0.4 (-0.1 – 0.9)

- Where measured elsewhere within the West, densities range from 2 – 8 birds / 40 ha[2]
- BBS-based population estimate for Nevada (500 birds)[5] is lower than NBC estimate (1,500)

Nevada-Specific Studies and Analyses

Landscape Associations (NBC data)

- Seven out of eight NBC transects where Williamson's Sapsuckers were present were dominated by montane Coniferous Forest (the eighth had a large Pinyon-Juniper component); six of the transects had a secondary Aspen component (1-7% of land cover according to GIS vegetation map).

Williamson's Sapsucker

Sphyrapicus thyroideus

Main Threats and Challenges

Habitat Threats

- Reported to be relatively resistant to many typical habitat disturbances such as fire, grazing, and logging as long as some forest patches and snags remain[2]
- Loss of snags to fire, salvage logging
- Loss or degradation of aspen woodland

Research, Planning, and Monitoring Challenges

- Habitat use and patch size requirements for Nevada populations is not fully understood
- The seasonal distribution of the species is very poorly understood

Conservation Strategies

Habitat Strategies

- Coniferous Forest (p. Hab-5-1) and Aspen (p. Hab-3-1) habitat conservation strategies benefit this species
- Within known range, give special conservation consideration to aspen stands located within a coniferous forest matrix
- Retain aspen snags of the preferred size range, in clumps wherever possible

Research, Planning, and Monitoring Strategies

- Continue monitoring to better determine current population trends
- Conduct surveys in suitable habitat in areas where Williamson's Sapsucker is currently undocumented
- Conduct research to better determine habitat and patch size requirements, and seasonal distribution patterns

Public Outreach Strategies

- None identified

References: [1]Conway and Martin; [2]Dobbs et al. (1997); [3]GBBO unpublished Atlas data; [4]GBBO (2008a); [5]Gyug et al. (2009); [6]Rich et al. (2004); [7]Sauer et al. (2008); [EO] Expert opinion

White-headed Woodpecker

Picoides albolarvatus

Photo by Steve Ting

Habitat Use Profile

Habitats Used in Nevada	
Coniferous Forest	
Key Habitat Parameters ●	
Plant Composition	Ponderosa, Jeffrey, sugar, and lodgepole pines, white fir, incense cedar, Douglas-fir[1]
Plant Density, Size, & Age	Prefers multi-storied forest with 50-70% canopy closure; high number of large trees (dbh > 53 cm [21 in]); 45 snags/ 40 ha with dbh > 58 cm [23 in][1]; average tree spacing ~ 8.2 m [27 ft][5]
Mosaic	Older-aged, multi-canopied, multi-species forest with ample wood decay; understory not required[1]
Distance to Water	No known relationship
Response to Fragmentation	Probably sensitive[1]
Response to Vegetation Removal	Negative to tree/snag removal[EO]
Area Requirements ◑	
Minimum Patch Size	~ 500 ha [1,250 ac][EO]
Recommended Patch Size	> 2,000 ha [5,000 ac][EO]
Home Range	100 - 300 ha or more [250 - 750 ac][1]

Conservation Profile

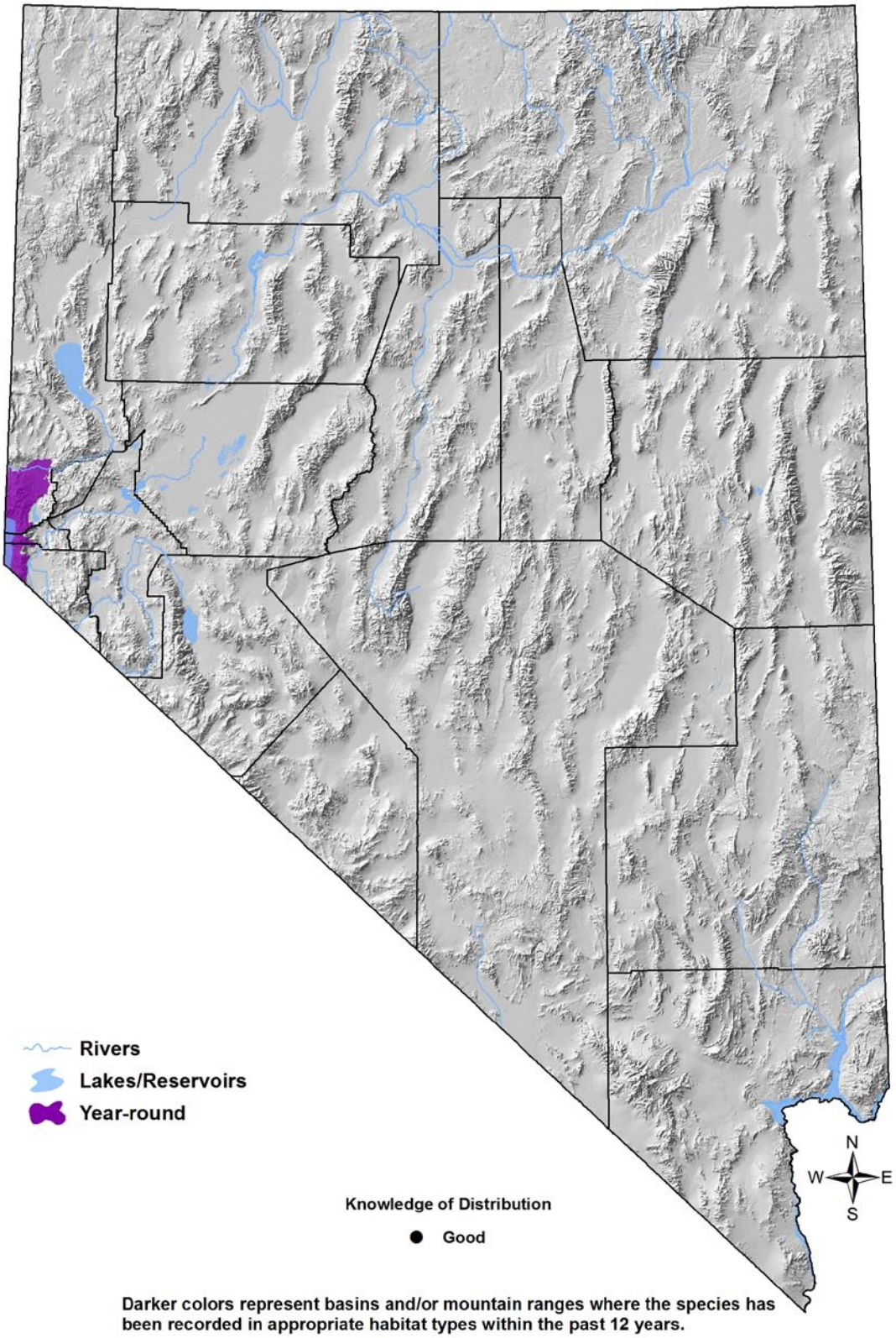
Priority Status	
Conservation Priority Species	
Species Concerns	
Small population size Restricted habitat	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S2
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	Sensitive Species
NDOW	Conservation Priority
Trends	
Historical ○	Unknown, declines suspected[1]
Recent ◑	Stable[4]
Population Size Estimates	
Nevada (NBC) ◑	840
Global ◑	72,000 [3]
Percent of Global	1%
Population Objective	
Maintain[3, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Carson Range
Restoration	Carson Range

Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
May – mid-August[1]	
Nest and Nesting Habits	
Nest Placement	Excavates cavity in large, decayed coniferous snag > 60 cm [24 in] dbh[1, 6, EO]
Site Fidelity	High for breeding territory[1]
Other	Usually excavates new cavity every year[1]
Food Habits	
Basic	Arboreal prober and gleaner
Primary Diet	Large pine seeds; bark insects while breeding[1]
Secondary Diet	n/a

White-headed Woodpecker

Picoides albolarvatus



White-headed Woodpecker

Picoides albolarvatus

Overview

White-headed Woodpeckers are restricted to the Carson Range of far western Nevada, at the eastern edge of their core geographical range which runs through the Sierra Nevada - Cascade axis. This is strictly a bird of Coniferous Forest habitats, particularly those with large trees, older or mixed-age forest structure, mixed-species tree composition (as long as pines are present), and a high density of standing snags. Though this woodpecker is not typically associated with post-burn landscapes, it may respond positively to low-severity fire,[1] or even tolerate high-severity if snags are not removed.[2] A mosaic of burn severities across the landscape may, in fact, improve white-headed woodpecker habitat by opening forest canopies in the higher severity burn areas, while retaining decayed nags created before wildfire and live, cone-producing trees in unburned or low-severity burn areas.[6]

Traditional forestry practices that result in loss of large-diameter trees and snags may present a threat to this species, but such practices rarely occur in Nevada. The primary conservation strategies are management of forests to maintain patches of old-growth stands with moderate canopy closure, and continued population monitoring to confirm that numbers remain stable.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Carson Range

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Coniferous Forest	32% (6/19)	1.3 (0.7 – 1.9)

Nevada-Specific Studies and Analyses

Landscape Associations (NBC data)

White-headed Woodpeckers occurred on eight NBC transects. Six were classified as Coniferous Forest habitat, one as Aspen habitat, and one as Montane Riparian habitat, but all eight transects contained > 60% cover of coniferous forest within their boundaries

Main Threats and Challenges

Habitat Threats

- Characteristic threats within other parts of the White-headed Woodpecker's geographical range (clear-cutting, even-age stand management, forest fragmentation) occur infrequently in the Carson Range

- Possible threats in Nevada include changes in historical fire regimes and fuels reduction projects that result in removal of snags and/or simplification of forest structure and composition

Conservation Strategies

Habitat Strategies

- The Coniferous Forest (p. Hab-5-1) habitat conservation strategy benefits this species
- Design fuels reduction projects to retain older and mixed-age stands with moderate canopy closure at the recommended patch size
- Maintenance of large snags and large-diameter conifers (especially pines) is important for this species

Research, Planning, and Monitoring Strategies

- None identified

Public Outreach Strategies

- None identified

References: [1]Garrett et al. (1996); [2] Hanson and North (2008); [3] Rich et al. (2004); [4] Sauer et al. (2008); [5] Siegel and DeSante (2003); [6]Wightman et al. (2010); [EO] Expert opinion

Gilded Flicker

Colaptes chrysoides

Photo by Harold Stiver

Habitat Use Profile

Habitats Used in Nevada	
Joshua Tree (Mojave Lowland Riparian (conjectural))	
Key Habitat Parameters ○	
Plant Composition	Joshua tree, other tall *Yucca* spp., various cactus species
Plant Density & Size	Requires trees with ≤ 30-50 cm [12 – 20 in] dbh[4]
Mosaic	Unknown
Distance to Water	No known relationship
Response to Vegetation Removal	Negative, but exotic weed control encouraged [EO]
Area Requirements ○	
Minimum Patch Size	~ 100 ha [250 ac][EO]
Recommended Patch Size	> 1000 ha [2,500 ac][EO]
Home Range	50 – 100 ha [120 – 240 ac][4]

Conservation Profile

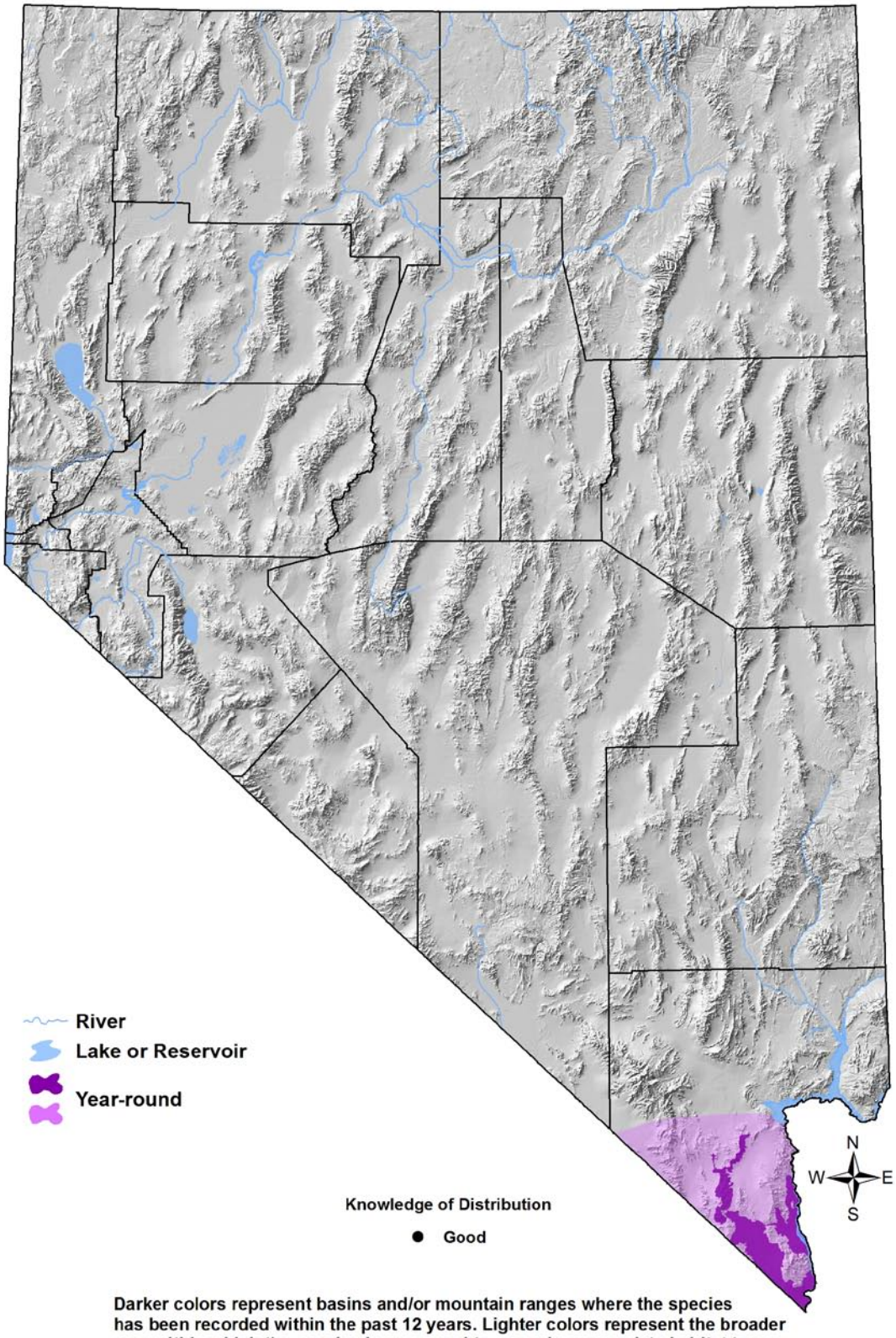
Priority Status	
Conservation Priority Species	
Species Concerns	
Small population size Habitat threats	
Other Rankings	
Continental PIF	None
Audubon Watchlist	Red
NV Natural Heritage	S1
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	None
Trends	
Historical ○	Unknown
Recent ○	Appears stable range-wide, but may be declining in Mojave region [7]
Population Size Estimates	
Nevada ◑	< 100 [2]
Global ◑	1,000,000 [5]
Percent of Global	< 1%
Population Objective	
Maintain / Increase[EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Fair / Poor
Key Conservation Areas	
Protection	Joshua tree habitat in Eldorado Valley, McCullough and Newberry ranges
Restoration	Joshua tree stands throughout Clark and Nye counties

Natural History Profile

Seasonal Presence in Nevada	
Probably Year-Round	
Known Breeding Dates in Nevada	
Early April – July[3, 4]	
Nest and Nesting Habits	
Nest Placement	Excavates cavity in large tree, primarily *Yucca* spp. in Nevada[4]
Site Fidelity	Unknown
Food Habits	
Basic	Omnivorous ground forager
Primary Diet	Terrestrial insects[4]
Secondary Diet	Fruits, seeds[4]

Gilded Flicker

Colaptes chrysoides



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Gilded Flicker

Colaptes chrysoides

Overview

Prior to the Nevada Breeding Bird Atlas project, Gilded Flickers were not known to breed within the state. During atlas surveys, however, a small but persistent breeding population was discovered in southern Nevada not far from Searchlight. It is unknown whether Gilded Flickers have had a long-term presence here, or whether these birds are the result of a recent colonization event.[EO] Gilded Flickers in Nevada are clearly associated with Joshua Trees and other tall *Yucca*s that provide a substrate for nest cavities. In Tucson (AZ), they were more commonly found at sites with more native desert scrub vegetation in the landscape (within 1.7 km [1 mi]).[8] They have also used Mojave Lowland Riparian habitat along the Lower Colorado River (mostly outside of Nevada), but fewer than 300 remain.[6] Continued monitoring and additional research are needed to better understand the status and needs of this bird, but in the meantime, its limited habitat in Nevada should be protected from development or excessive disturbances.

Abundance and Occupancy by Habitat

- No information for Nevada; 20 birds / 40 ha recorded in Arizona[4]

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Habitat threats for Gilded Flickers in Nevada are conjectural, but may include loss or degradation of habitat due to:
    - Suburban / urban development
    - Energy development
    - Fire
    - Heavy OHV use
    - Invasive weeds that increase fire frequency
    - Fragmentation of existing habitat through any of the preceding mechanisms

Research, Planning, and Monitoring Challenges

- Lack of detailed knowledge of distribution, status, and ecological requirements

Gilded Flicker

Colaptes chrysoides

Conservation Strategies

Habitat Strategies

- The Joshua Tree habitat conservation strategy (p. Hab-8-1) benefits this species; the Mojave Lowland Riparian (p. Hab-11-1) may benefit this species
- Protect current known habitat from development and heavy recreational use
- Aggressively fight fire that threatens known habitat

Research, Planning, and Monitoring Strategies

- Search for additional breeding locations in areas with suitable habitat, including Wee Thump Joshua Tree Wilderness Area
- Use current monitoring and research programs (NBC, Clark County MSHCP[1], etc.) to look for occurrences of Gilded Flicker in or near Mojave Lowland Riparian Habitat
- Conduct research to determine habitat needs, patch size, and seasonal movements of Gilded Flickers in Nevada
- Continue and enhance monitoring to better estimate population size and determine trends

Public Outreach Strategies

- None identified

References: [1]Clark County (2000); [2]Floyd et al. (2007); [3]GBBO unpublished Atlas data; [4]Moore (1995); [5]Rich et al. (2004); [6]Rosenberg et al. (1991); [7]Sauer et al. (2007); [8]Turner (2006); [EO] Expert opinion

Olive-sided Flycatcher

Contopus cooperi

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Coniferous Forest	
Key Habitat Parameters ●	
Plant Composition	Ponderosa and Jeffrey pines, red fir
Plant Density & Age	Canopy closure ≤ 39%, excluding forest openings;[12] late-successional forest[1]
Mosaic	Closely associated with natural or disturbance-created forest openings with dense shrub layer[1]
Distance to Water	Usually close to surface water[1]
Response to Vegetation Removal	Positive to creation of forest openings, but requires shrub layer within openings[1]
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	> 200 ha (500 ac) EO
Home Range	Up to 45 ha [110 ac][1]

Conservation Profile

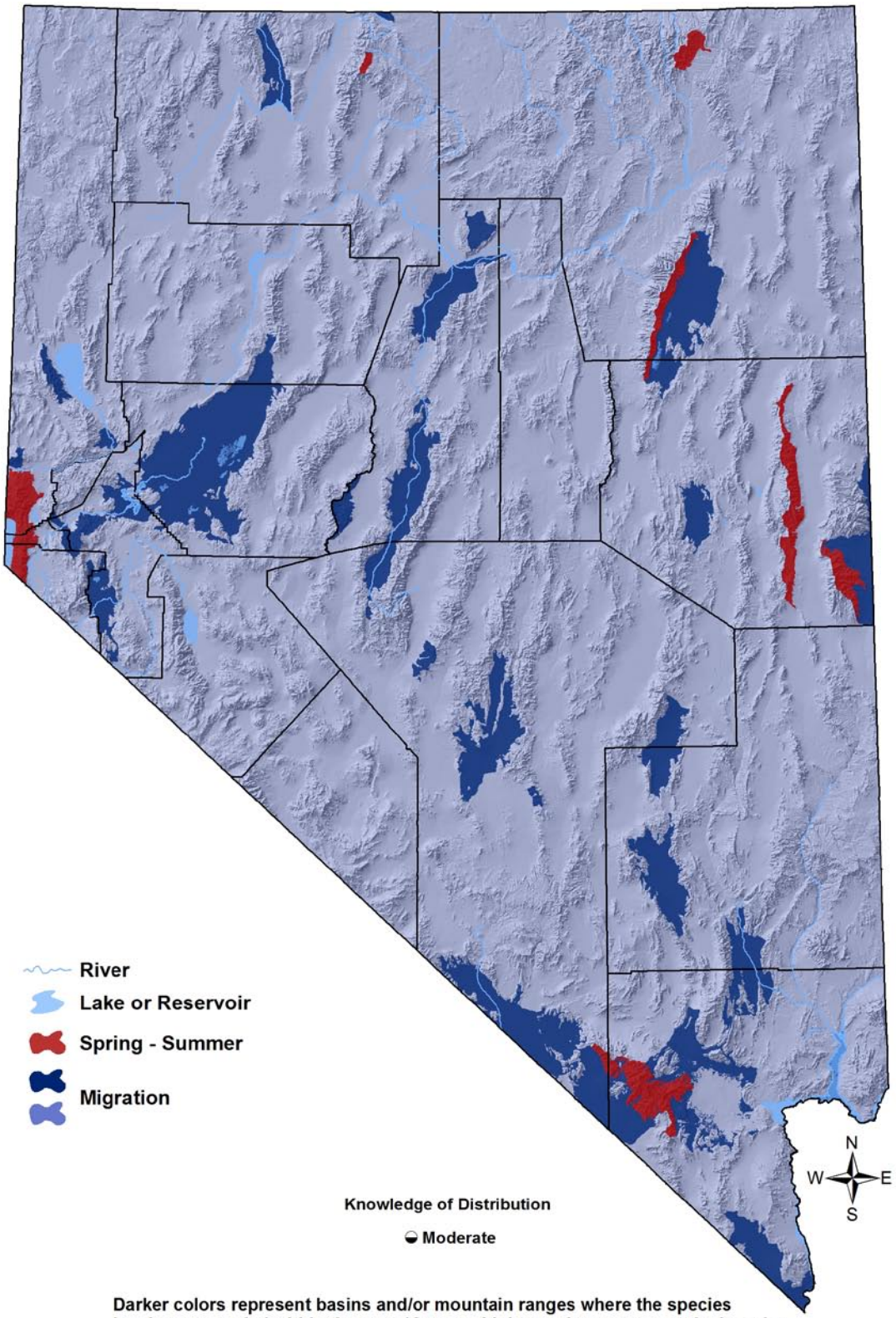
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and recent declines Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S2B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Trends	
Historical ●	Significant range contraction[1]
Recent ◑	Declines of 3% / year in West[10]
Population Size Estimates	
Nevada (NBC) ◑	5,600
Global ◑	1,200,000 [8]
Percent of Global	< 1%
Population Objective	
Increase by 100% [8, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Carson, Pine Nut, Toiyabe, Monitor and nearby ranges
Restoration	Same

Natural History Profile

Seasonal Presence in Nevada	
Spring - Summer	
Known Breeding Dates in Nevada	
Mid-June – early August[2]	
Nest and Nesting Habits	
Nest Placement	At tip of high horizontal branch in conifer[1, 11]
Site Fidelity	Probably high for breeding area[6]
Food Habits	
Basic	Fly-catcher
Primary Diet	Flying insects, exclusively[1]
Secondary Diet	n/a

Olive-sided Flycatcher

Contopus cooperi



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Olive-sided Flycatcher

Contopus cooperi

Overview

This long-distance migrant breeds in coniferous forests across Nevada, although its distribution is notably patchy within the state. The range map shown above illustrates only confirmed spring-summer range, but it is possible that heretofore undetected breeding occurs in other mountainous areas. Fire is thought to play an important role in creating the Olive-sided Flycatcher's preferred landscape, which consists of mature coniferous forest interspersed with brush-filled openings for foraging.[1] This combination of foraging perches located next to open foraging spaces can occur at forest edges, in patchily burned or partially logged stands, or in open boreal (subalpine) forest. Olive-sided Flycatchers are one of several bird species that make ready use of open patches of snags created by stand-replacement fires.[3] Limited studies of reproductive success in burned vs. logged stands have had conflicting results.[5, 9]

The Olive-sided Flycatcher is declining steadily and the causes for the decline are still not fully understood,[1] although changes in historical fire regimes have been suggested as a likely culprit.[4] Breeding populations in central, eastern, and southern Nevada are smaller and more isolated than is the case within most of the species' breeding range, and this may render the species especially vulnerable to local habitat threats.[7]

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Coniferous Forest	42% (8/19)	3.5 (1.4 – 5.6)
Aspen	17% (3/18)	0.9 (0.5 – 1.3)
Pinyon-Juniper	3% (2/70)	0.6 (n/a)
Mojave		
Coniferous Forest	75% (3/4)	0.4 (0.3 – 0.5)

- The BBS-derived population estimate[8] of 1,000 birds in Nevada is much lower than the NBC-derived estimate of 5,600 birds. It is not clear which estimate is more realistic

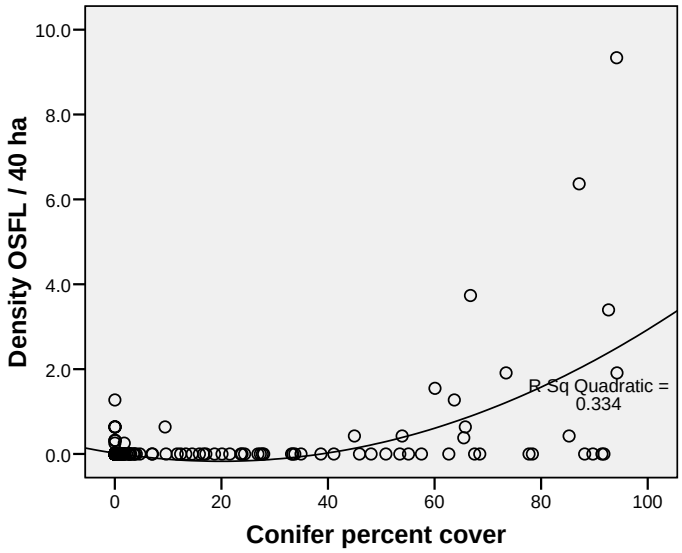
Olive-sided Flycatcher

Contopus cooperi

Nevada-Specific Studies and Analyses

Landscape Associations (NBC data)

- NBC data indicate that Olive-sided Flycatchers are most often found in areas where > 50% of the landscape is covered by coniferous forest (see graph below; OSFL = Olive-sided Flycatcher)



- NBC data show that except in western Nevada, Olive-sided Flycatchers may occasionally breed in aspen and pinyon-juniper woodlands that are relatively distant from coniferous forest. Densities and frequencies of occurrence in these alternate habitats tend to be lower than in coniferous forest

Main Threats and Challenges

Habitat Threats

- Causes of ongoing declines in Nevada are not known, but in the Sierra Nevada region, it has been suggested that changes in historical fire regimes have contributed to declines.[1] It is likely that fire suppression has reduced the frequency of smaller fires that create the forest openings that this species prefers
- Although not immediately relevant to Nevada resource managers, it has been suggested that habitat loss and degradation on the Olive-sided Flycatcher's wintering grounds in South and Central America may be contributing to the species' declines[1]

Olive-sided Flycatcher

Contopus cooperi

Research, Planning, and Monitoring Challenges

- Causes of ongoing declines are not fully understood
- Uncertainty about the most beneficial fire regime for the species
- Possibility that the species' full breeding range in Nevada has not yet been delineated

Conservation Strategies

Habitat Strategies

- The Coniferous Forest (p. Hab-5-1) habitat conservation strategy benefits this species
- Allow small stand-replacing fires to burn when possible to create and maintain forest openings
- Manage forests to retain standing snags and isolated trees, which provide beneficial sallying stations

Research, Planning, and Monitoring Strategies

- Continue monitoring to determine if trends in Nevada reflect regional trends, and to better estimate population size
- Search for Olive-sided Flycatchers in mountain ranges where there is currently no breeding evidence
- Conduct additional research on populations in central, southern, and eastern Nevada (which have not been as well-studied as those in western Nevada) to determine whether they have unique habitat requirements
- Investigate the role of fire intensity, scale, and frequency in creating suitable habitat for Olive-sided Flycatchers, and develop fire management strategies based upon these findings

Public Outreach Strategies

- None identified

References: [1]Altman and Sallabanks (2000); [2]GBBO unpublished Atlas data; [3]Hutto (1995); [4]Kotliar (2007); [5]Meehan and George (2003); [6]Nevada Wildlife Action Plan Team (2006); [7]Reed (1995); [8]Rich et al. (2004); [9]Robertson and Hutto (2007); [10]Sauer et al. (2008); [11]Shuford and Gardali (2008); [12]Verner (1980); [EO] Expert opinion

Olive-sided Flycatcher

Contopus cooperi

Olive-sided Flycatcher habitat near Lake Tahoe. Photo by Dave Catalano.

Willow Flycatcher

Empidonax traillii

Photo by Martin Meyers

NOTE: Information specific to the Southwestern Willow Flycatcher (*E. t. extimus*) is coded "SWFL"; Information specific to *E. t. adastus* and *brewsteri* in the Great Basin is coded "GB"

Habitat Use Profile

Habitats Used in Nevada	
Mojave and Great Basin Lowland Riparian Montane Riparian, Springs (Marsh)	
Key Habitat Parameters ●	
Plant Composition	Willows, salt cedar, Fremont cottonwood, alder, ash
Plant Density & Height	Dense riparian vegetation ≥ 4 m [13 ft] high (or 2-4 m [6.5.-13 ft] in montane areas[26]); > 50% cover in territory, > 80% cover at nest;[4, 30, 31] tall canopy trees scattered or absent [21, 25]
Mosaic	Extensive thickets of willow or other riparian shrubs with saturated soils and nearby surface water[21]
Distance to Water	< 40 m [130 ft][21]
Response to Vegetation Removal	Negative, including defoliation of saltcedar [EO]
Area Requirements ●	
Minimum Patch Size	0.4 ha [1 ac] for GB;[21] > 1 ha [2.5 ac] in montane areas;[26, 31] 0.8 ha [2 ac] for SWFL[25]
Recommended Patch Size	> 6 ha [15 ac][4, EO]
Territory Size	0.3 -0.6 ha [0.7 -1.5 ac] for GB;[10, 21] 0.1 – 2.3 ha [0.25 – 5.7 ac] for SWFL [25]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
ESA listing: Endangered subspecies (SWFL) Historical and recent declines Habitat threats Small population size	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S3B (SWFL: S1B)
USFWS	Endangered subspecies (SWFL), Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	Sensitive Species (SWFL)
NDOW	Conservation Priority, Endangered (SWFL)
Other	Covered by several HCPs, see below[5, 29]
Trends	
Historical ●	Rangewide declines [21]
Recent ◑	Declining at 3% / year for GB;[20] SWFL probably stable[21]
Population Size Estimates	
Nevada (BBS) ◑	1,500; SWFL: 90 [27]
Global ◑	3,300,000; [16] 2,400 for SWFL[15]
Percent of Global	< 1%; 7.5% for SWFL
Population Objective	
Increase by 50% [16, EO]	
Monitoring Coverage	
Source	SWFL surveys by USBR, USFWS, NDOW and others; Nevada Bird Count for GB
Coverage in NV	Good
Key Conservation Areas	
Protection & Restoration	See Overview, below See Overview, below

Natural History Profile

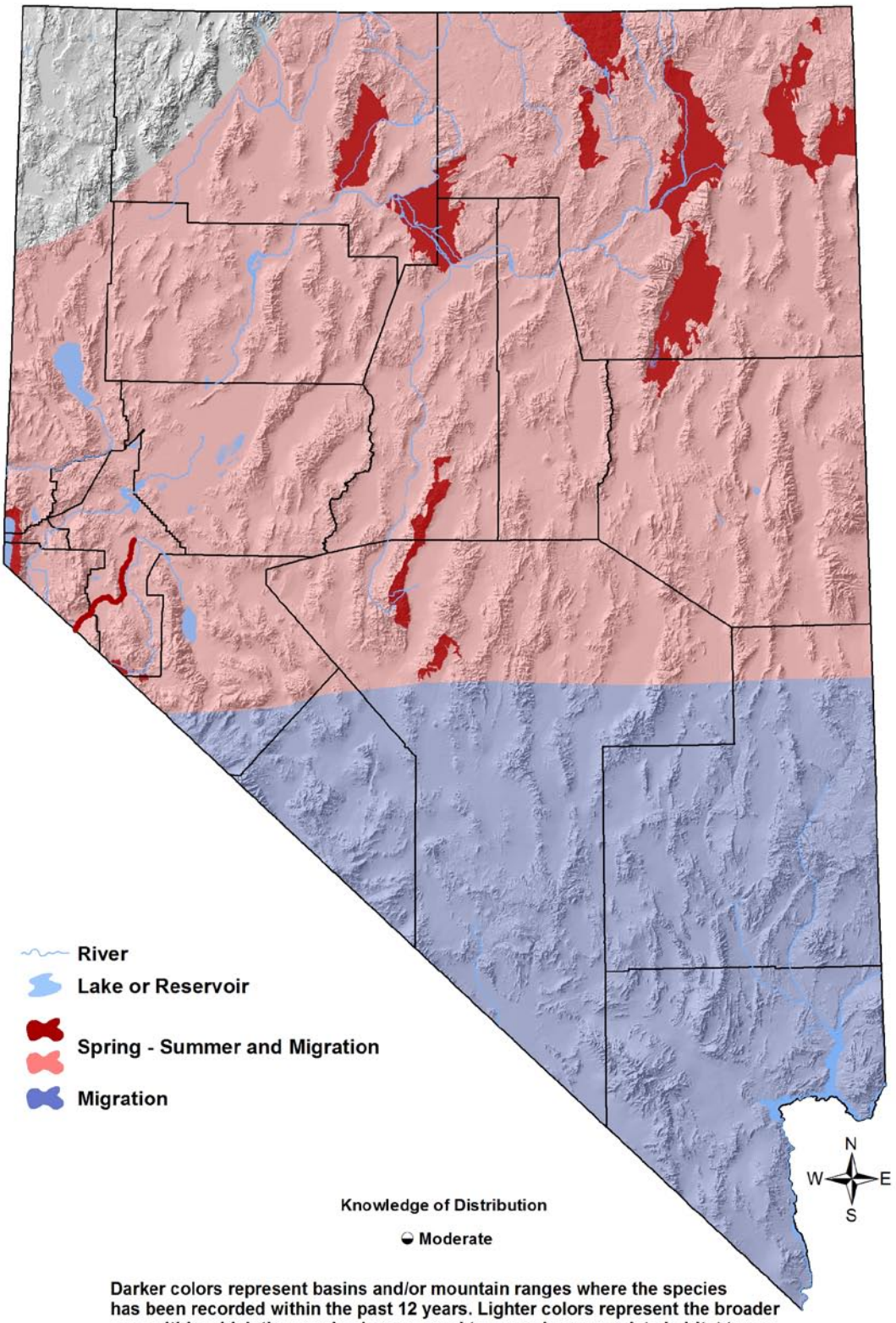
Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Late May – August[8, 27]	
Nest and Nesting Habits	
Nest Placement	In crotch of tall (> 4 m, [13 ft]), very dense riparian shrub[21]
Site Fidelity	High for specific drainage
Food Habits	
Basic	Fly-catcher
Primary Diet	Variety of flying insects[21]
Secondary Diet	n/a

Confidence in Available Data: ●High ◑Moderate ○ Low

Willow Flycatcher

Empidonax traillii

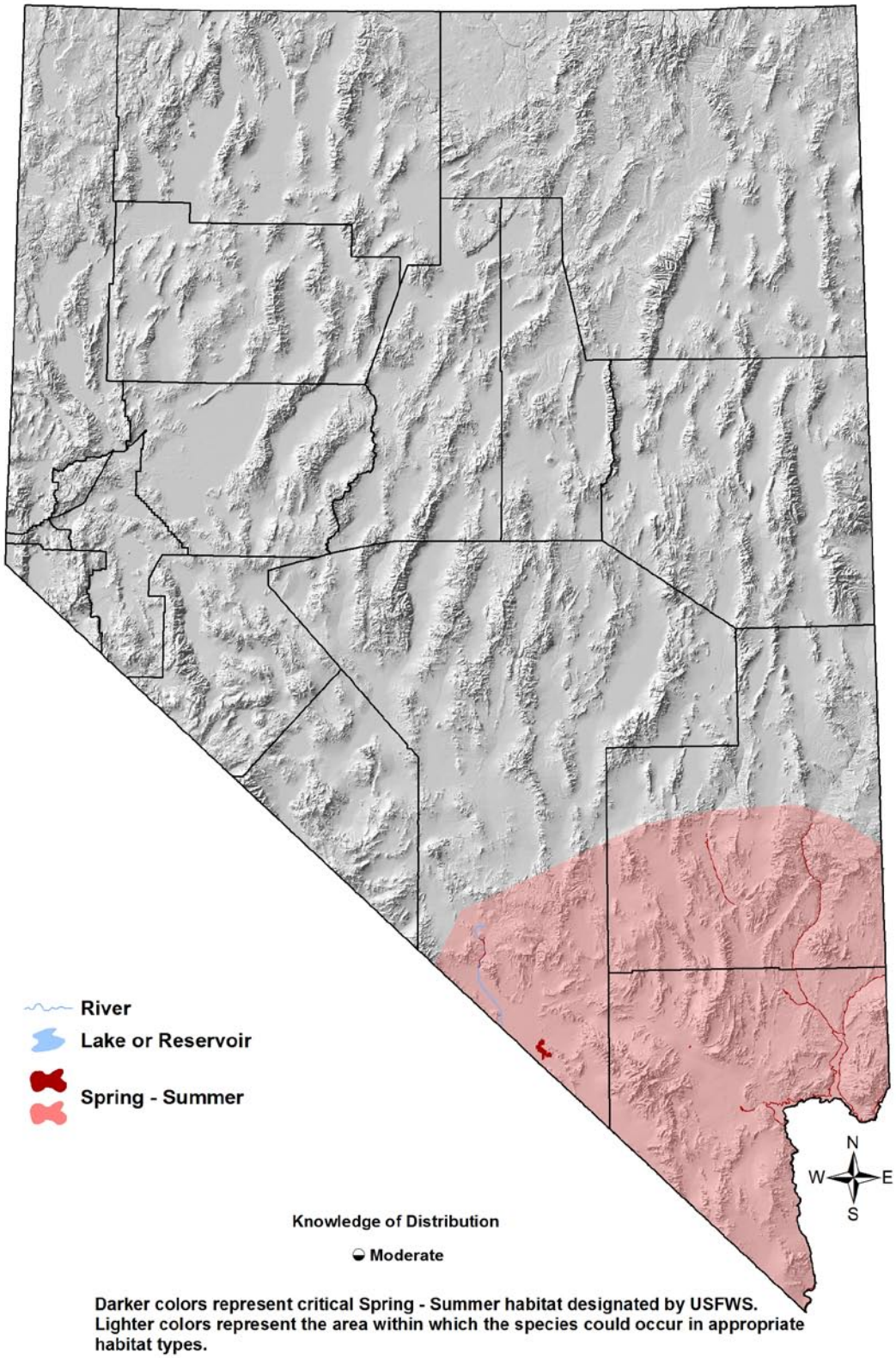
E .t. adastus and *E .t. brewsteri*



Willow Flycatcher

Empidonax traillii

E .t. extimus



Willow Flycatcher

Empidonax traillii

Overview

Although fairly common in states to the north and east of Nevada, the Willow Flycatcher is far less abundant in the arid West, where much of its historical riparian habitat has been lost or degraded.[16] Three subspecies breed in Nevada: the endangered Southwestern Willow Flycatcher, *E. t. extimus* (SWFL) in the Mojave region along the Colorado, Virgin, and Muddy Rivers, and in the Meadow Valley Wash, Pahranagat Valley, and Ash Meadows NWR[14,27]; *E .t. adastus* throughout the Great Basin portion of Nevada in small numbers[2]; and *E. t. adastus* may be replaced in far-western Nevada by *E. t. brewsteri*, from which it is difficult to distinguish.[10] NBC data show that in far-western Nevada, Willow Flycatchers are primarily found in montane riparian habitat, with some spillover into lowland riparian areas. In central, eastern, and northern Nevada, the rare *E. t. adastus* is found in both lowland and montane riparian habitats, and occasionally in other inundated areas such as aspen stands or wet meadows. All three subspecies use the lower Colorado River corridor during migration.[30]

Because of its listing under the ESA, SWFL has been intensively studied, and detailed recovery strategies have been developed.[30] *E. t. brewsteri* in the Sierra Nevada has also been studied in some depth.[4, 10, 26] However, there have been no studies in Nevada of the increasingly rare *E .t. adastus* subspecies, despite the substantial declines it has suffered over recent decades. Consequently, the Great Basin lowland populations of Willow Flycatcher receive little conservation attention.

All three Willow Flycatcher subspecies are riparian-obligates and have undergone large historical declines because of the widespread loss of dense, shrubby riparian habitat with water-saturated soils. Willow Flycatchers were common in the Sierra Nevada until 1910, and at least locally abundant through 1940, with noticeable declines occurring after 1950.[15] In recent surveys, birds were absent from 53 of 135 previously known sites,[10] and there may now be only 300-400 individuals left in the entire Sierra Nevada,[10, 26] with only a small fraction of these in our state. Willow Flycatchers in Nevada's Great Basin have become exceedingly rare in recent decades, and historical data from the lower Truckee River indicate that the species was considered abundant in the late 1800s, but is absent as a breeder today.[1] Similar declines almost certainly occurred along other Great Basin rivers as well, and remaining populations are small and fragmented.[6,10]

Willow Flycatchers breed in tall dense shrubs, and in most studies, occupancy and nesting success is related to shrub cover and volume.[4,15,22] Willows are the traditionally preferred vegetation,[25] but other shrub species are also used, although riparian mesquite bosques are usually avoided (except in Ash Meadows NWR).[30] The SWFL will readily nest in saltcedar stands, as long as they are sufficiently tall and dense. About 25% of all known SWFL breeding territories are now located at sites dominated by salt cedar,[24] and intensive studies in Arizona have found no apparent drop in any measure of foraging or nesting success for birds nesting in saltcedar stands.[15] Cover of overstory trees is variable across occupied sites, but they are generally only scattered and often absent. All

subspecies are tied to wet areas (standing water or highly saturated soils),[10] and the SWFL is particularly dependent on the presence of permanent surface water.[30] For example, a severe drought in 2002 may have completely eliminated SWFL reproduction in some areas.[15] Heterogeneity of vegetation structure may be an important factor in determining habitat suitability,[15] as large patches of riparian shrubs without interspersed openings are often avoided.[10,31] Willow Flycatchers can breed in very small patches (0.1 ha [0.25 ac]),[10,31] but aggregations of suitable patches promote healthy population dynamics. Individuals will readily move among patches within a drainage, sometimes up to 30-40 km [19-25 mi].[15] The width and continuity of the riparian vegetation can also be important.[19,22] Narrow strips < 10 m [33 ft] wide are generally not occupied.[30]

Most threats to Willow Flycatchers and lowland riparian habitats have been well-documented (see Main Threats and Challenges, below).[30] Threats to montane populations are less well-studied, but probably center upon the dewatering of riparian or meadow patches as a result of water diversions, or lowering of local water tables (and the consequent impacts on riparian shrubs) by gully erosion from heavy livestock use, road building, or natural runoff events.[10] Cowbird parasitism is low in montane populations, but it can be problematic in lowland populations, and has been a major concern for SWFL.[33] Cowbird trapping has been shown to increase the local reproductive output of SWFL in the short-term, but it is not clear that it has benefits to long-term population recovery. Trapping is therefore an expensive and short-term solution recommended only in emergencies.[17]

The SWFL currently makes extensive use of saltcedar stands, and would suffer if large areas of saltcedar were removed without restoring suitable replacement habitat.[24] A new threat has therefore emerged with the release of the tamarisk leaf beetle (*Diorhabda* spp.) as a biocontrol agent.[11] The tamarisk beetle continues to expand across the southwestern landscape, defoliating large expanses of saltcedar fairly rapidly, and consequently increasing the need to accelerate the process of restoring native vegetation in areas of defoliation. Saltcedar is not only common in southern Nevada, but also has significant presence in the Great Basin, where releases of tamarisk beetles have also occurred. Because *E. t. adastus* has received such limited study, impacts of saltcedar defoliation on the Great Basin populations are not known.

Habitat restoration plays a key role in conservation planning for the Willow Flycatcher in Nevada. SWFL in particular seem to prefer relatively young vegetation, and new sites can become suitable just 3-5 years after disturbance,[15] providing an unusually rapid return on habitat restoration efforts. Indeed, restoration projects conducted to benefit SWFL in the Mojave region have been quite successful. In the Great Basin, however, recovery of Willow Flycatcher populations following habitat restoration could be hindered by the relative lack of sufficient regional source populations. In general, given the species' need for both specific microhabitats and a favorable landscape mosaic, it is important that long-term management plans consider the geomorphology, hydrology, and successional dynamics of whole river reaches.[9,30]

Willow Flycatcher

Empidonax traillii

The SWFL is a covered species under the Clark County MSHCP,[5] the Lower Colorado River MSCP,[29] the Southeastern Lincoln County HCP (Jeri Krueger, *pers. comm.*), and the Virgin River Habitat Conservation and Recovery Plan (HCRP) (Jeri Krueger, *pers. comm.*). Key conservation and restoration areas for SWFL include the Muddy and Virgin River corridors and Pahranagat Valley. Key conservation and restoration areas for the Great Basin populations include the Humboldt, Carson, Truckee, and Walker River systems.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Lowland Riparian	12% (8/66)	2.7 (0.0 – 5.4)
Montane Riparian	6% (4/88)	1.6 (0.3 – 2.9)
Mojave		
Lowland Riparian	14% (5/36)	0.5 (0.2 – 0.8)

- Additional information on abundance is available in the sources listed in the following section
- Because Willow Flycatchers are late breeders, standard breeding season surveys such as NBC and BBS detect a large number of spring migrants that ultimately breed outside of Nevada. Population size estimates derived from these surveys are therefore significantly inflated and unreliable

Nevada-Specific Studies and Analyses

Numerous sources document the Willow Flycatcher (particularly SWFL) in great detail, although few are exclusively focused on Nevada. The most important and useful resources include:

- USGS SWFL site
  http://sbsc.wr.usgs.gov/cprs/research/projects/swwf/
- US Fish and Wildlife Service SWFL Home Page
  http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B094
- US Fish and Wildlife Service Arizona Ecological Services SWFL site
  http://www.fws.gov/southwest/es/arizona/Southwes.htm
- Final Recovery Plan for the Southwestern Willow Flycatcher[30]
  http://www.fws.gov/southwest/es/arizona/SWWF_RP.htm

- A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher (newly updated 2010)[25]
  http://pubs.usgs.gov/tm/tm2a10/
- Status, Ecology, and Conservation of the Southwestern Willow Flycatcher[7]
  http://www.fs.fed.us/rm/pubs/rmrs_gtr060.html
- Southwestern Willow Flycatcher Surveys, Demography, and Ecology Along the Lower Colorado River and Tributaries, 2003 – 2007 [13]
  http://www.lcrmscp.gov/worktasks/systemmonitoring/D2/5year0307.pdf

Main Threats and Challenges

Great Basin

Habitat Threats

- Loss, degradation, and fragmentation of lowland riparian habitat due to
  - Surface water diversions impoundments, and flood control[6, 21]
  - Heavy livestock grazing[26]
- Desiccation of montane riparian and wet meadow habitat from water diversion, drought, or gullying[10]
- Increase in nest predator access due to meadow desiccation and conifer encroachment[10]

Research, Planning, and Monitoring Challenges

- The detailed distribution, population sizes, and current trends of Willow Flycatchers in the Great Basin need to be more thoroughly studied
- Lack of knowledge about the geographical boundaries between *adastus* and *brewsteri* subspecies, and uncertainty as to whether distinctions between these subspecies have conservation implications
- Lack of knowledge about the possible impacts of saltcedar defoliation on Great Basin populations
- Lack of conservation urgency despite significant (and probably continuing) declines

Mojave (SWFL)

Habitat Threats

- Surface water diversion, flood control activities, groundwater pumping that dewater habitat
- High-intensity, habitat-converting fire
- Sudden removal of large amounts of saltcedar as a result of biocontrol agents or restoration efforts, if timely revegetation cannot occur
- Brown-headed Cowbird parasitism

Research, Planning, and Monitoring Challenges

- None currently identified; because of SWFL's ESA status, managers can draw on a large number of studies, data sets, and planning documents

Conservation Strategies
Great Basin

Habitat Strategies

- Great Basin Lowland Riparian (p. Hab-7-1), Montane Riparian (p. Hab-13-1), and Springs (p. Hab-19-1) habitat conservation strategies benefit these subspecies
- Manage shrub willow habitat to maintain or restore patches > 6 ha [15 ha], preferably multiple patches along a given riparian reach[4,26]
- Manage grazing at sustainable levels that do not significantly fragment or reduce the density of willow patches
- Maintain the presence of wet soils and nearby surface water[10, 26]
- Emphasize restoration of vegetation and hydrology in potential habitat, especially in areas within easy colonization distance from currently-occupied habitat[26]
- Where necessary, limit or manage human activities to allow for the recovery of degraded areas[26, 28]
- Reduce nest predator access by preventing conifer encroachment into montane nesting habitat, and by maintaining or restoring hydrology and vegetation as described above[10, 26]

Research, Planning, and Monitoring Strategies

- Expand current monitoring protocol to cover all known or likely breeding sites of Great Basin subspecies. The following protocol may be appropriate, particularly if it can be adapted to multi-species monitoring protocols: *A Willow Flycatcher Survey Protocol for California*[3] http://dfg.ca.gov/wildlife/nongame/docs/wifl_2003_protocol.pdf
- Conduct research on the distribution, trends, population size, subspecies ranges, and specific ecological needs of Willow Flycatcher in Nevada's Great Basin
- Determine the extent to which Willow Flycatchers in the Great Basin use saltcedar habitat, and, if necessary, develop strategies to compensate for losses of both saltcedar and native riparian shrubs.

Public Outreach Strategies

- None identified

Willow Flycatcher
Empidonax traillii

Conservation Strategies
Mojave (SWFL)

Established Strategies

- Extensive conservation measures outlined in the USFWS's 2002 *Final Recovery Plan for Southwestern Willow Flycatcher*[30] and the 2005 Designation of Critical Habitat[31]

Habitat Strategies

- The Mojave Lowland Riparian (p. Hab-11-1) habitat conservation strategy benefits this subspecies
- Protect all known nesting habitat from disturbances, habitat conversion, and other threats
- Restore lost or degraded riparian habitat to a willow-dominated condition. Phase restoration projects to avoid removing large amounts of saltcedar before creating suitable replacement habitat. Creating even as little as 20% cover by native vegetation in saltcedar stands has significant value for Willow Flycatchers[32]
- Develop strategies to address the potential loss of current saltcedar breeding habitat to biocontrol agents

Research, Planning, and Monitoring Strategies

- Develop comprehensive fire management strategies emphasizing initial attack to protect important breeding habitat
- Continue current monitoring and research efforts, as described in *A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher* (http://pubs.usgs.gov/tm/tm2a10) [25]

Public Outreach Strategies

- None identified

Willow Flycatcher

Empidonax traillii

References: [1]Ammon (2002); [2]Bergstrom (1998); [3]Bombay et al. (2003a); [4]Bombay et al. (2003b); [5]Clark County (2000); [6]Dobkin and Sauder (2004); [7]Finch and Stoleson (2000); [8]GBBO unpublished Atlas data; [9]Graf et al. (2002); [10]Green et al. (2003); [11]Hatten et al. (2010); [12]Hultine et al. (2010); [13]McLeod et al. (2008); [14]NDOW (2009); [15]Paxton et al. (2007); [16]Rich et al. (2004); [17]Rothstein et al. (2003); [18]Rourke et al. (1999); [19]Sanders and Edge (1998); [20]Sauer et al. (2008); [21]Sedgwick (2000); [22]Sedgwick and Knopf (1992); [23]Sogge et al. (2003); [24]Sogge et al. (2008); [25]Sogge et al. (2010); [26]Stefani et al. (2001); [27]Swett (1999); [28]Taylor and Littlefield (1986); [29]LCRMSCP (2004); [30]USFWS (2002); [31]USFWS (2005); [32]Van Riper (2008); [33]Whitfield and Sogge (1999); [34]Yong and Finch (1997); [EO] Expert opinion

Willow Flycatcher habitat in the Mojave region. Photo by Jen Ballard.

Gray Flycatcher

Empidonax wrightii

Photo by Fred Petersen

Habitat Use Profile

Habitats Used in Nevada	
Pinyon-Juniper Sagebrush Montane Shrubland	
Key Habitat Parameters ◑	
Plant Composition	Pinyon pine, juniper, tall sagebrush species, bitterbrush, mountain mahogany
Plant Density & Size	Open tree stands with shrub understory or tall shrubland;[6] requires at least some shrubs or trees > 1 m [1.6 ft] tall[6]
Mosaic	Mixed shrublands and woodlands of varying canopy densities; avoids closed-canopy woodlands[6]
Distance to Water	Probably attracted to areas near riparian or wetland edge [EO]
Response to Vegetation Removal	Negative to tree/shrub removal [EO]
Area Requirements ◑	
Minimum Patch Size	Unknown
Recommended Patch Size	> 50 ha [120 ac] [EO]
Territory Size	1 – 5.3 ha [2.5 - 13 ac][6]

Conservation Profile

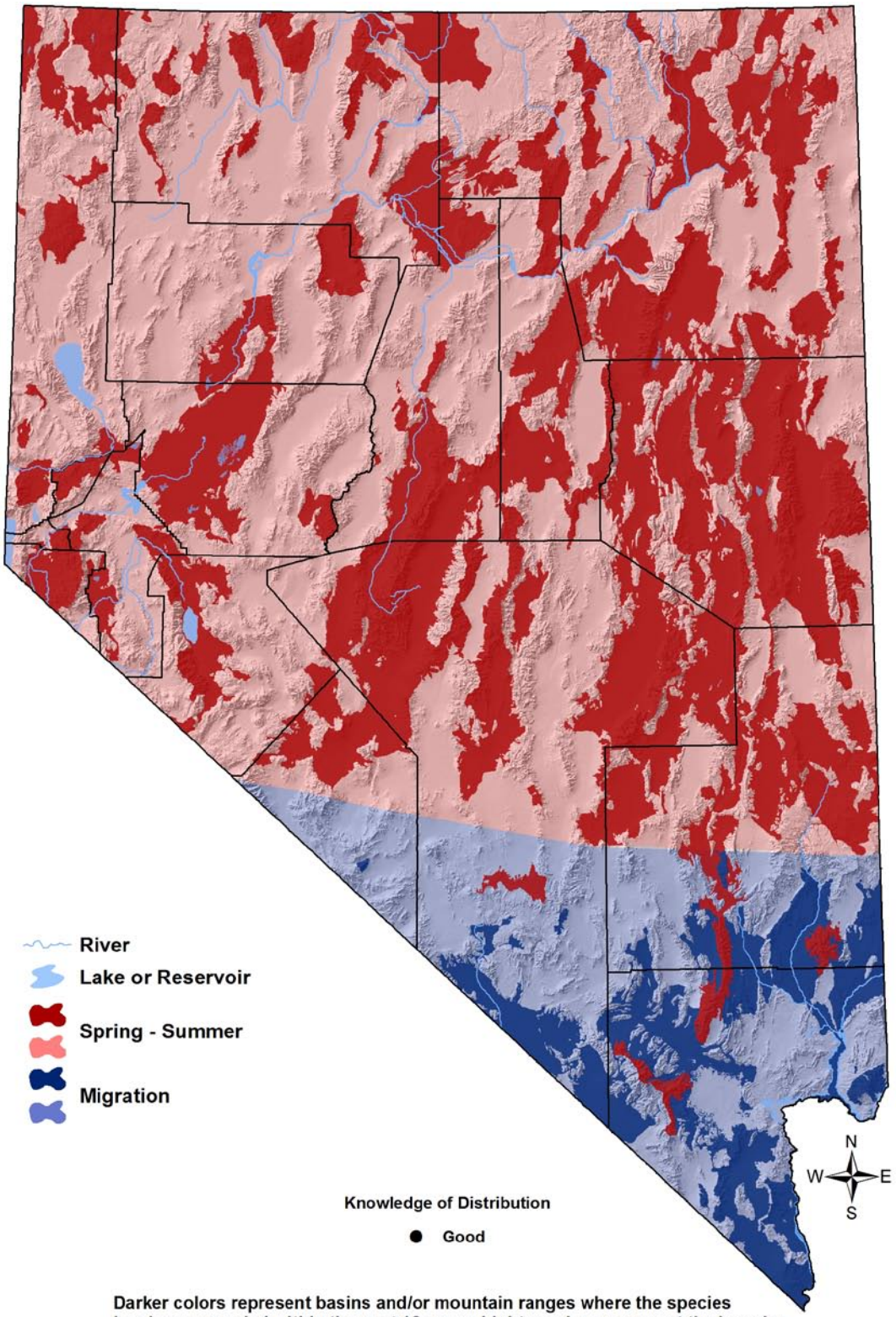
Priority Status	
Stewardship Species	
Species Concerns	
High stewardship responsibility	
Other Rankings	
Continental PIF	Stewardship
Audubon Watchlist	None
NV Natural Heritage	S4B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Stewardship
Trends	
Historical ○	Unknown
Recent ○	Uncertain, possibly stable[5]
Population Size Estimates	
Nevada (NBC) ◑	650,000
Global ◑	1,200,000 [4]
Percent of Global	> 50%
Population Objective	
Maintain[3, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Great Basin sagebrush / pinyon-juniper transition zones
Restoration	Same

Natural History Profile

Seasonal Presence in Nevada	
Spring - Summer	
Known Breeding Dates in Nevada	
Late May – early August[2, 6]	
Nest and Nesting Habits	
Nest Placement	In densely foliated branch of small pine or juniper; occasionally in tall shrub[6]
Site Fidelity	Probably low for breeding territory[6]
Food Habits	
Basic	Fly-catcher
Primary Diet	Flying insects[6]
Secondary Diet	Terrestrial arthropods on shrubs or ground[6]

Gray Flycatcher

Empidonax wrightii



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Gray Flycatcher

Empidonax wrightii

Overview

Gray Flycatchers are widespread and common in Nevada, which hosts over half of the species' global breeding population according to the best available population estimates.[4] This species is most often associated with pinyon-juniper / sagebrush transition zones, or with tall stands of mature sagebrush and / or bitterbrush. It also occurs in the lower-elevation bands of montane woodland and shrubland, and in southern Nevada it sometimes uses Joshua tree stands. Although it usually avoids denser patches of trees, one study in pinyon-juniper woodlands of New Mexico found nests in denser than average stands of trees.[3] Beyond these general associations, the specific habitat characteristics that promote presence and abundance are not fully understood.[1] During migration, the Gray Flycatchers are particularly abundant in montane and lowland riparian habitat, but they occur in many other habitat types as well.

Although Gray Flycatchers would appear to be secure in Nevada for the time being, their preferred habitats are the subject of substantial conservation concern. Significant acreages of tall mature sagebrush stands have been lost to fire in recent years (p. Hab-17-1), and optimizing management strategies for the pinyon-juniper / sagebrush transition zone in the face of pinyon-juniper expansion is the subject of ongoing investigation and evaluation (p. Hab-16-1). The main conservation needs for Gray Flycatchers are protection of high-quality habitat, maintenance of favorable pinyon-juniper / sagebrush transition zones, and ongoing monitoring to detect changes in population status.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Pinyon-Juniper	74% (52/70)	7.0 (5.5 – 8.5)
Sagebrush	24% (8/33)	2.2 (0.6 – 3.8)
Montane Shrubland	45% (9/20)	5.3 (1.5 – 9.1)
Montane Riparian	19% (17/88)	3.7 (1.9 – 5.5)
Mojave		
Pinyon-Juniper	67% (8/12)	0.9 (0.5 – 1.3)
Sagebrush	46% (12/26)	3.9 (2.4 – 5.4)
Montane Shrubland	75% (6/8)	1.0 (0.3 – 1.7)
Montane Riparian	44% (4/9)	1.9 (0.7 – 3.1)
Joshua Tree	55% (11/20)	0.5 (0.2 – 0.8)

Gray Flycatcher
Empidonax wrightii

Nevada-Specific Studies and Analyses

Habitat Requirements (NBC data)

An analysis of ground-measured habitat variables on NBC transects (*Appendix 3*) indicated that sites where Gray Flycatchers were present had a greater density of trees (including junipers and pinyon pines), greater litter cover, and lower density of shrub and grass cover than unoccupied sites. These findings are consistent with the Gray Flycatcher's reported use of fairly open pinyon–juniper / sagebrush transitional habitats. It may be consistent with use of mature sagebrush stands characterized by larger, spaced-out shrubs, although this merits more investigation.

Landscape Associations (NBC data)

Transects classified as Pinyon-Juniper had over twice the density of Gray Flycatchers as transects classified as Sagebrush (table above). This would be expected because many Pinyon-Juniper transects contain substantial sagebrush cover, whereas Sagebrush transects contain (by definition) no significant cover of pinyon-juniper. A within-transect analysis found that Gray Flycatchers were strongly associated with both pinyon-juniper and sagebrush cover.

Main Threats and Challenges

Habitat Threats

- Loss of early-mid successional pinyon pine and juniper from the woodland / sagebrush transition zone leads to declines in Gray Flycatchers[6]
- Loss of landscapes dominated by tall mature sagebrush and associated shrubs to fire or other disturbances

Research, Planning, and Monitoring Challenges

- Lack of uniform strategy to maintain favorable pinyon-juniper / sagebrush transition zones while still addressing other habitat management and fuels management needs
- Uncertainty as to current population trends in Nevada

Gray Flycatcher

Empidonax wrightii

Conservation Strategies

Habitat Strategies

- Pinyon-Juniper (p. hab-16-1), Sagebrush (p. Hab-17-1), and Montane Shrubland (p. Hab-14-1) habitat conservation strategies benefit this species
- Protect stands of tall, mature sagebrush and associated shrubs from loss to fire
- Maintain or restore broad, intergraded transition zones between pinyon-juniper woodlands and sagebrush. These zones should be characterized by widely and irregularly spaced trees. Such transition zones are especially important where the shrub understory is tall and mature

Research, Planning, and Monitoring Strategies

- Conduct additional research and planning to identify and implement a set of guidelines for pinyon-juniper treatment projects that balances the need to maintain transition zones with the need to manage pinyon-juniper encroachment and fuels
- Continue monitoring to determine current population trends
- The possible importance of riparian and/or meadow habitats during the post-fledgling stage should be further investigated

Public Outreach Strategies

- None identified

References: [1]Dobkin and Sauder (2004); [2]GBBO unpublished Atlas data; [3]Goguen et al. (2005); [4]Rich et al. (2004); [5]Sauer et al. (2008); [6]Sterling (1999); [EO] Expert opinion

Gray Flycatcher

Empidonax wrightii

Gray Flaycatcher nest in big sagebrush. Photo by Jen Ballard.

Bell's Vireo

Vireo bellii

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Mojave Lowland Riparian (Mesquite-Acacia) (Springs)	
Key Habitat Parameters ●	
Plant Composition	Cottonwoods, willows, saltcedar, mesquite (particularly honey mesquite), arrow-weed, *Baccharis*[11]
Plant Density & Size	Dense shrub understory up to 3 m [10 ft] high;[1] tree overstory either relatively open or absent
Mosaic	Prefers structurally diverse habitat and patches of saturated soils;[11] in areas dominated by saltcedar, interspersion of some native trees increases habitat value
Distance to Water	< 1,000 m [0.6 mi] from water; standing water is an important habitat element [11]
Response to Vegetation Removal	Negative, especially for shrub layer[8, 11]
Area Requirements ◑	
Minimum Patch Size	Probably > 5 ha [12 ac],[EO] preferably with opportunity to place territory > 400 m [1,300 ft] from habitat edge[10]
Recommended Patch Size	> 20 ha [49 ac][11, 12, EO]
Home Range	0.2 - 1.6 ha [0.5 - 4.0 ac][11]

Conservation Profile

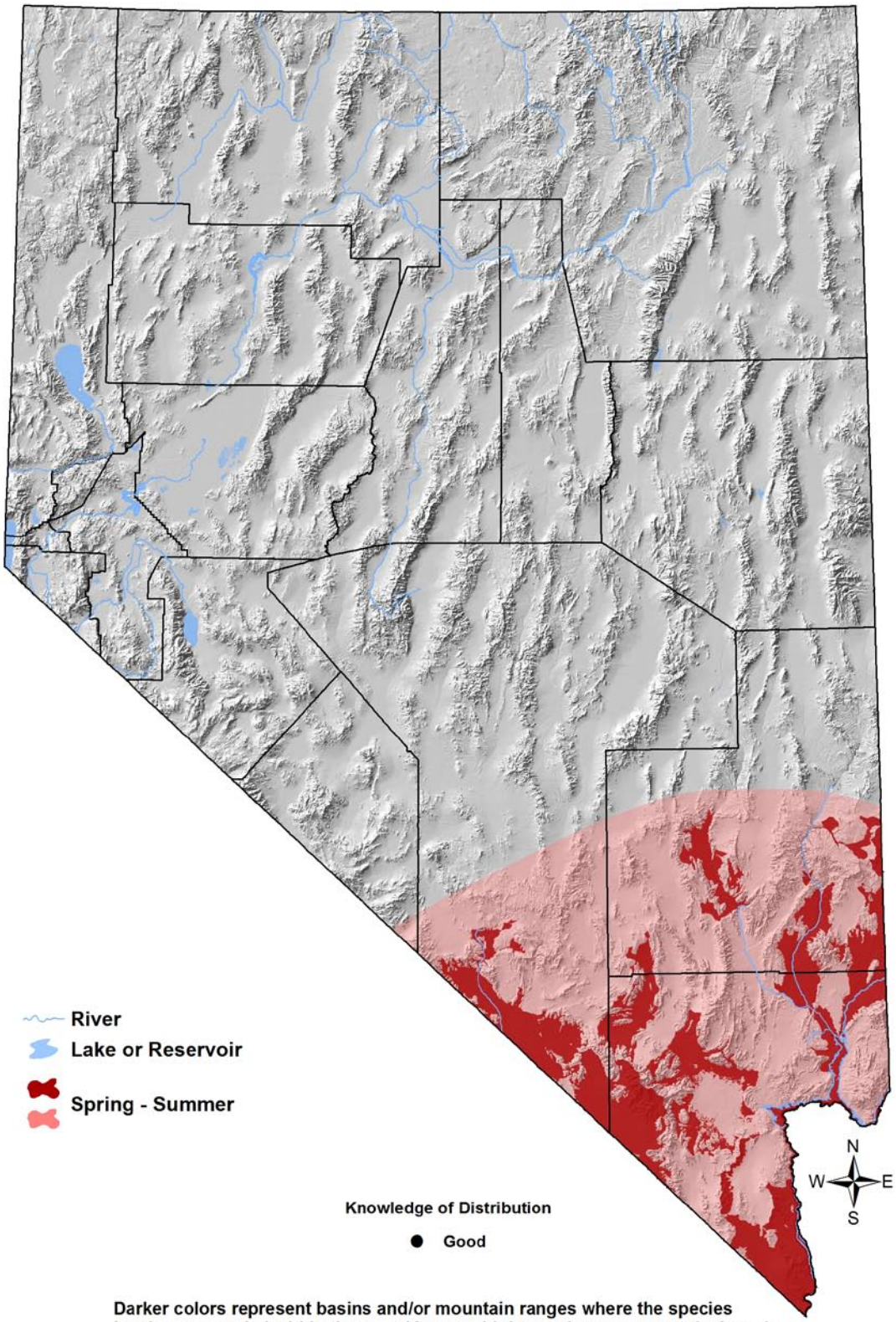
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and recent declines Restricted habitat Small population size Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Red
NV Natural Heritage	S2B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Other	Covered by Clark County MSHCP[4] and Lower Colorado River MSCP[18]
Trends	
Historical ◑	Rangewide declines[11, 16]
Recent ◑	Persistent declines of ~ 2.7% / year, most recently stabilizing[16]
Population Size Estimates	
Nevada (NBC) ◑	1,000
Global ◑	1,100,000 [14]
Percent of Global	< 1%
Population Objective	
Increase by 100% [14, EO]	
Monitoring Coverage	
Source	Nevada Bird Count, LCR MSCP[18]
Coverage in NV	Good
Key Conservation Areas	
Protection	Muddy and Virgin Rivers, Ash Meadows NWR, Meadow Valley Wash
Restoration	Same

Natural History Profile

Seasonal Presence in Nevada	
Spring - Summer	
Known Breeding Dates in Nevada	
April – July[6]	
Nest and Nesting Habits	
Nest Placement	Suspended from dense riparian branches, 0.5 - 1.5 m [1.6 – 5 ft] above ground[11]
Site Fidelity	High[11]
Food Habits	
Basic	Arboreal and shrub gleaner
Primary Diet	Insects and spiders[11]
Secondary Diet	n/a

Bell's Vireo

Vireo bellii



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Bell's Vireo

Vireo bellii

Overview

The only Bell's Vireo subspecies currently known to be present in southern Nevada is *Vireo bellii arizonae,*the Arizona Bell's Vireo. However, the federally endangered Least Bell's Vireo (*V. b. pusillus*) has recently been documented < 50 km [30 mi] from Nevada in the Tecopa – Shoshone area of California (Carl Lundblad, *pers. comm.*), and until pending genetic tests are completed, the possibly that Least Bell's Vireos are present in Nevada's Ash Meadows NWR or other border areas cannot be dismissed. Regardless, the Arizona Bell's Vireo is a conservation concern in its own right because of long-term population declines and continuing threats to its lowland riparian habitats.

Bell's Vireos breed in riparian areas dominated by willow, cottonwood, riparian mesquite, or salt cedar,[11] but in all cases presence of dense understory is the crucial habitat feature. Research consistently shows that the risk of cowbird parasitism[11] and sometimes nest predation[3] decreases as understory vegetation becomes denser. Most recommendations for habitat management and restoration focus on increasing the density of understory vegetation.[3,17] In one restoration project, vireo abundance more than doubled within four years of cattle removal (and resulting increases in understory density) on the San Pedro River in Arizona.[8] In addition to understory density, patch size is also important. Bell's Vireos were found to be more abundant and successful in larger cottonwood and willow patches (> 160 ha [435 ac]) in the lower Colorado River valley.[11,12] Finally, presence of nearby surface water is also an important component of habitat suitability.[10,11]

The Bell's Vireo has adopted salt cedar as a breeding substrate, and several studies have shown that nesting densities in saltcedar and native riparian vegetation are roughly comparable,[1,11] although this may be less applicable in hotter desert climates.[19] On the San Pedro River in Arizona, Bell's Vireos had similar densities in saltcedar and native vegetation, although nest production was higher in native vegetation.[2] In surveys along the lower Colorado River,[5] Bell's Vireos were generally neutral to the amount of saltcedar present, but they did not use any sites where saltcedar cover exceeded 90%, suggesting that saltcedar stands with a native vegetation component are more suitable than monotypic saltcedar. Restoration projects seeking to replace invasive saltcedar with native vegetation should be geographically and temporally staggered, and appropriately scaled to avoid eliminating large amounts of usable breeding habitat without concurrently generating native habitat. It is possible that, at least in some cases, reintroducing a native component to areas currently dominated by monotypic saltcedar is the most efficient short-term approach to restoration from the standpoint of the Bell's Vireo.

The Bell's Vireo is particularly susceptible to parasitism by Brown-headed Cowbirds (*Molothrus ater*), which can seriously impact populations within certain areas. However, cowbird parasitism is not thought to be a main driver of declines in Bell's Vireo, but rather a local contributing factor.[11] Cowbird trapping has been shown to increase nest success in *V. b. arizonae,*[13] and sometimes population size in *V.b. pusillis,*[9] but it is an expensive and short-term solution recommended only in emergencies.[15]

Bell's Vireo
Vireo bellii

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Mojave Region

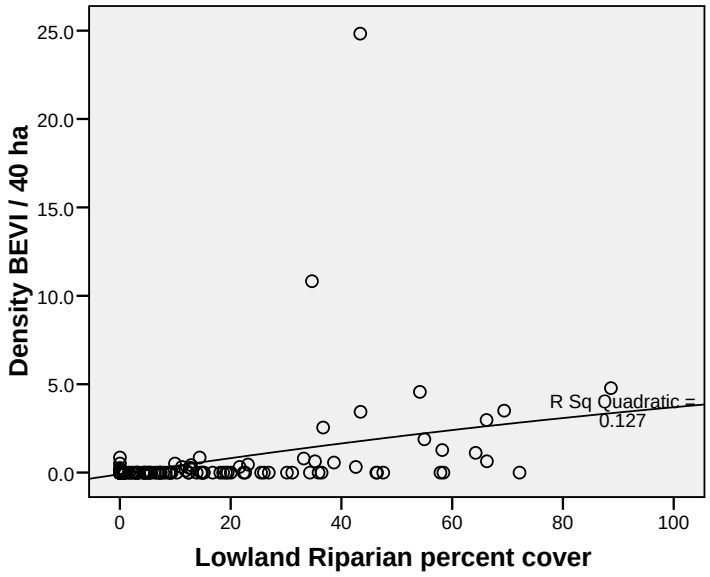
Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Lowland Riparian	64% (23/36)	3.3 (1.1 – 5.5)
Mesquite-Acacia	21% (3/14)	0.4 (0.1 – 0.7)

- Pair densities across geographical range vary from 0.5 – 200 / 40 ha [0.005 – 2.0 / ac][11]
- In southwest, densities in mesquite are highly variable[11]

Nevada-Specific Studies and Analyses

Landscape Associations (NBC)

As expected, transect-level logistic regressions indicated that Bell's Vireos were closely associated with Mojave Lowland Riparian habitat (which includes saltcedar), and were also more likely to be found in close proximity to water. All 30 transects where Bell's Vireos were detected were classified as Lowland Riparian based on either visual examination or the presence of at least 10% riparian cover as indicated within the GIS habitat classification. As shown in the figure below, density of Bell's Vireos appears to be closely related to the percent cover by Lowland Riparian habitat in the transect.



Bell's Vireo
Vireo bellii

Main Threats and Challenges

Habitat and Other Threats

- Loss or degradation of habitat and surface water due to water diversions, flood control, or groundwater pumping
- Loss of habitat to fire
- Removal of large amounts of saltcedar without concurrent creation of suitable replacement habitat
- Human disturbance may reduce nest success[7, 10]
- Cowbird nest parasitism[11]

Research, Planning, and Monitoring Challenges

- Possible presence of Least Bell's Vireo in Nevada has not been conclusively resolved

Bell's Vireo habitat near the Lower Colorado River. Photo by Amy Leist.

Bell's Vireo
Vireo bellii

Conservation Strategies

Habitat Strategies

- The Mojave Lowland Riparian (p. Hab-11-1) habitat conservation strategy benefits this species
- Manage riparian habitat to provide early and intermediate successional stages characterized by dense shrub understory
- Protect existing native riparian woodlands (cottonwood, willow, and riparian mesquite) that exhibit suitable shrub understory density
- Restore degraded areas or those dominated by saltcedar, but plan restorations so that large amounts of saltcedar are not removed without concurrently creating suitable replacement habitat

Research, Planning, and Monitoring Strategies

- Continue monitoring for population trends
- Develop fire management strategies balancing the need short-term habitat protection and long-term habitat regeneration
- Conduct nesting studies in Nevada to better assess the relative habitat quality of native vegetation versus saltcedar
- Investigate possible presence of Least Bell's Vireo within Nevada, especially at Ash Meadows NWR

Public Outreach Strategies

- None identified

References: [1]Averill-Murray et al. (1999); [2]Brand et al. (2010b); [3]Budnik et al. (2002); [4]Clark County (2000); [5]GBBO (2009); [6]GBBO unpublished Atlas data; [7]Greaves (1989); [8]Krueper et al. (2003); [9]Kus and Whitfield (2005); [10]Kus et al. (2008); [11]Kus et al. (2010); [12]Lynn (1996); [13]Morrison and Averill-Murray (2002); [14]Rich et al. (2004); [15]Rothstein and Peer (2005); [16]Sauer et al. (2008); [17]Sharp and Kus (2006); [18]LCRMSCP (2004); [19]Walker (2006); [EO] Expert opinion

Gray Vireo

Vireo vicinior

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Pinyon-Juniper	
Key Habitat Parameters ●	
Plant Composition	Pinyon pine, juniper, variety of understory shrubs, especially sagebrush
Plant Density & Size	Open woodland with well-developed shrub understory;[1, 8] canopy closure ~ 5 – 15%;[8, 10] shrub height typically 0.5 – 2m [1.6 – 6.6 ft]; nest tree height ~ 3 m [10 ft]; vegetation typically dense within the vireo's vertical foraging profile, which ranges from 1 – 4 m [3.3 – 13 ft] above ground[1]
Mosaic	Open woodlands with variable ages and densities of trees and shrubs; shallow drainages at base of slope or escarpment may be preferred [EO]
Distance to Water	No apparent relationship
Response to Vegetation Removal	Negative [EO]
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	> 100 ha [250 ac] [EO]
Territory Size	2 -10 ha [5 - 25 ac][1]

Conservation Profile

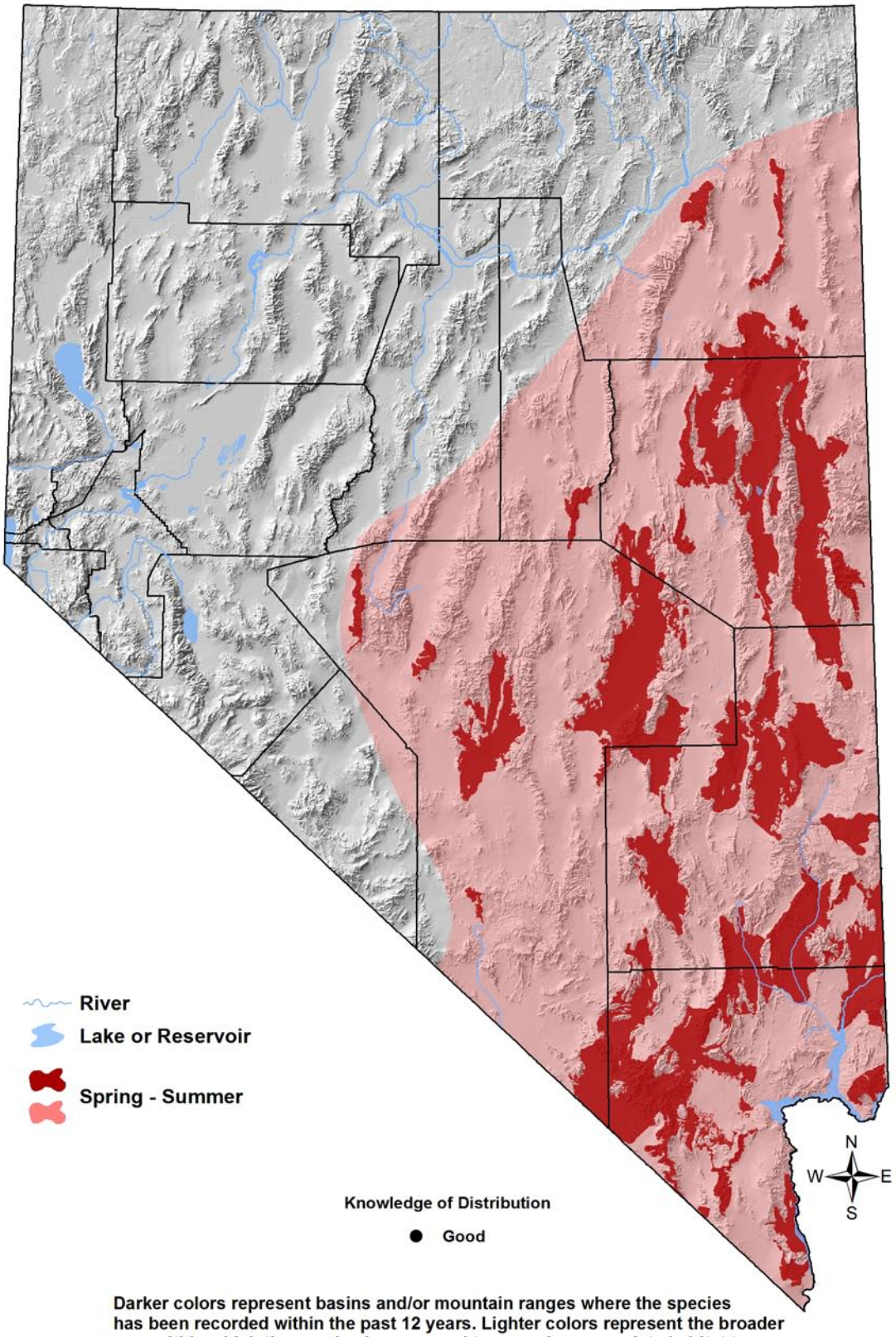
Priority Status	
Conservation Priority Species	
Reasons for Priority Status	
Possible recent declines Possible habitat threats High stewardship responsibility	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S3B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
Trends	
Historical ○	Unknown
Recent ○	Conflicting data[3, 7]
Population Size Estimates	
Nevada (NBC) ◑	78,000
Global ◑	360,000 [6]
Percent of Global	22%
Population Objective	
Maintain[6, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Lower- to mid-elevation pinyon-juniper woodlands in Clark and Lincoln counties
Restoration	Same

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Late March – mid-July[4, EO]	
Nest and Nesting Habits	
Nest Placement	In dense, live branch of tree, usually juniper; often facing west or north[1]
Site Fidelity	Probably high[9]
Food Habits	
Basic	Arboreal and shrub gleaner
Primary Diet	Arthropods[1]
Secondary Diet	n/a

Gray Vireo

Vireo vicinior



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Gray Vireo

Vireo vicinior

Overview

The global breeding range of the Gray Vireo is largely restricted to the American Southwest. Within the last twelve years, the Nevada Breeding Bird Atlas project and the Nevada Bird Count extended the known breeding range of the Gray Vireo northward by a substantial distance into eastern and central Nevada (White Pine County, southern Elko County, northern Nye County, and southern Eureka County). Confirmation of this new breeding range also resulted in a substantial increase in the estimated Nevada population size of Gray Vireos. With this new information, it is now estimated that Nevada hosts over 20% of this species' breeding population.

Gray Vireos use mature or mixed-age pinyon-juniper woodlands with scattered trees and open canopies, preferably where juniper is dominant.[8, 10] They also favor sites with a well-developed and often diverse shrub understory, within which they frequently forage. Gray Vireos typically occur in relatively narrow mid- or lower-elevation bands within the pinyon-juniper zone, often at the warmer bases of rocky slopes.[10] As might be expected, Gray Vireos in the Mojave region usually occupy higher elevations[5] than those further to the north in Nevada (GBBO unpublished NBC data). Average densities of Gray Vireos tend to be lower than other birds characteristic of pinyon-juniper woodlands, and their territories are large for a songbird.[8] These factors, along with the Gray Vireo's somewhat scattered pattern of occurrence, should be considered when evaluating potential threats, and they form part of the basis for inclusion of the Gray Vireo as an Evaluation Species within the Clark County MSHCP.[2] Much remains to be clarified about this bird, including Nevada population trends.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Pinyon-Juniper	26% (18/70)	3.5 (1.9 – 5.1)
Mojave		
Pinyon-Juniper	75% (9/12)	2.8 (1.5 – 4.1)
Montane Riparian	44% (4/9)	3.1 (0.0 – 6.6)
Montane Shrubland	63% (5/8)	1.3 (0.5 – 2.1)
Coniferous Forest	75% (3/4)	1.3 (0.0 – 3.0)

- Estimated density 2.56 birds / 40 ha [0.026 / ac] in northern Arizona and southern Utah[8]

Gray Vireo
Vireo vicinior

Nevada-Specific Studies and Analyses

Habitat Requirements (NBC data)

Analysis of ground-collected habitat data from sites occupied by Gray Vireos and nearby control sites indicated that occupied sites within pinyon-juniper woodland were characterized by having less bare ground, lower tree density, and a higher proportion of juniper trees to pinyon pines than unoccupied sites.

Landscape Associations (NBC)

In addition to the well-known association of Gray Vireos with Pinyon-Juniper habitat, logistic regression using land cover types suggested that Gray Vireos may be directly or indirectly avoiding mountain mahogany stands, although the negative association was not quite statistically significant (*Appendix 3*). They were present on only one of the 50 transects having > 1% cover of Mountain Mahogany habitat. Distance to water does not influence the distribution or density of this species.

Main Threats and Challenges

Habitat Threats

The nature and severity of threats to Gray Vireos are not well studied, and are somewhat conjectural. Possible threats include:

- Increasing canopy closure of pinyon-juniper woodlands as a function of altered fire regimes and successional processes
- Heavy livestock grazing that decreases the density or diversity of shrub understory
- Invasive plants
- Brown-headed Cowbird (*Molothrus ater*) parasitism may have negative impacts on reproductive output, but this has not been confirmed or quantified [EO]

Research, Planning, and Conservation Challenges

- Uncertainty about population trends within Nevada is perhaps the most critical knowledge deficit
- Detailed information about some habitat parameters is incomplete or contradictory
- Possible importance of other habitat types (montane riparian, montane shrubland) within the landscape matrix are unknown

Gray Vireo
Vireo vicinior

Conservation Strategies

Habitat Strategies

- The Pinyon-Juniper (p. Hab-16-1) habitat conservation strategy benefits this species
- Pinyon-juniper thinning / removal projects would be most beneficial to Gray Vireos in areas where
    - Pinyon-juniper canopy closure currently exceeds 35%
    - Potential for further development of a desirable shrub understory is high, and potential for invasive weeks is low or manageable
- Manage livestock grazing and other land uses to maintain or restore well-developed shrub understory communities within open pinyon-juniper woodland

Research, Planning, and Monitoring Strategies

- Continue monitoring to determine population trend within Nevada
- Conduct additional studies to clarify habitat requirements, including canopy closure and preferred shrub density and species composition
- Conduct additional studies to determine the scope and severity of habitat threats to Gray Vireos, and potential impacts from cowbird parasitism

Public Outreach Strategies

- None identified

References: [1]Barlow et al (1999); [2]Clark County (2000); [3]Dobkin and Sauder (2004); [4]GBBO unpublished Atlas data; [5]Johnson (1972); [6]Rich et al. (2004); [7]Sauer et al (2008); [8]Schlossberg (2006); [9]Shuford and Gardali (2008); [10]Walker and Doster (2009); [EO] Expert opinion

Gray Vireo
Vireo vicinior

Gray Vireo habitat in northern Nevada. Photo by Jen Ballard.

Pinyon Jay

Gymnorhinus cyanocephalus

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Pinyon-Juniper (Sagebrush)	
Key Habitat Parameters ●	
Plant Composition	Pinyon pine, juniper, sagebrush; occasionally Ponderosa or Jeffrey pine
Plant Density & Age	Wide range of tree densities and ages, but less common in very dense, closed-canopy settings[1, 3, EO]
Mosaic	Woodlands with stand diversity, large canopy openings, and shrub understory; may prefer proximity to broad woodland / shrubland transition zones over woodland interiors[1, 3, EO]
Elevation, Aspect	Lower elevations within pinyon-juniper zone; appear to prefer sunny aspects[1, 3, EO]
Distance to Water	No information
Response to Vegetation Removal	Positive to creation of openings in closed-canopy stands, otherwise negative [EO]
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	> 3,000 ha [7,400 ac][3]
Home Range	1,400 – 2,000 ha [3,500 – 5,000 ac][3]

Conservation Profile

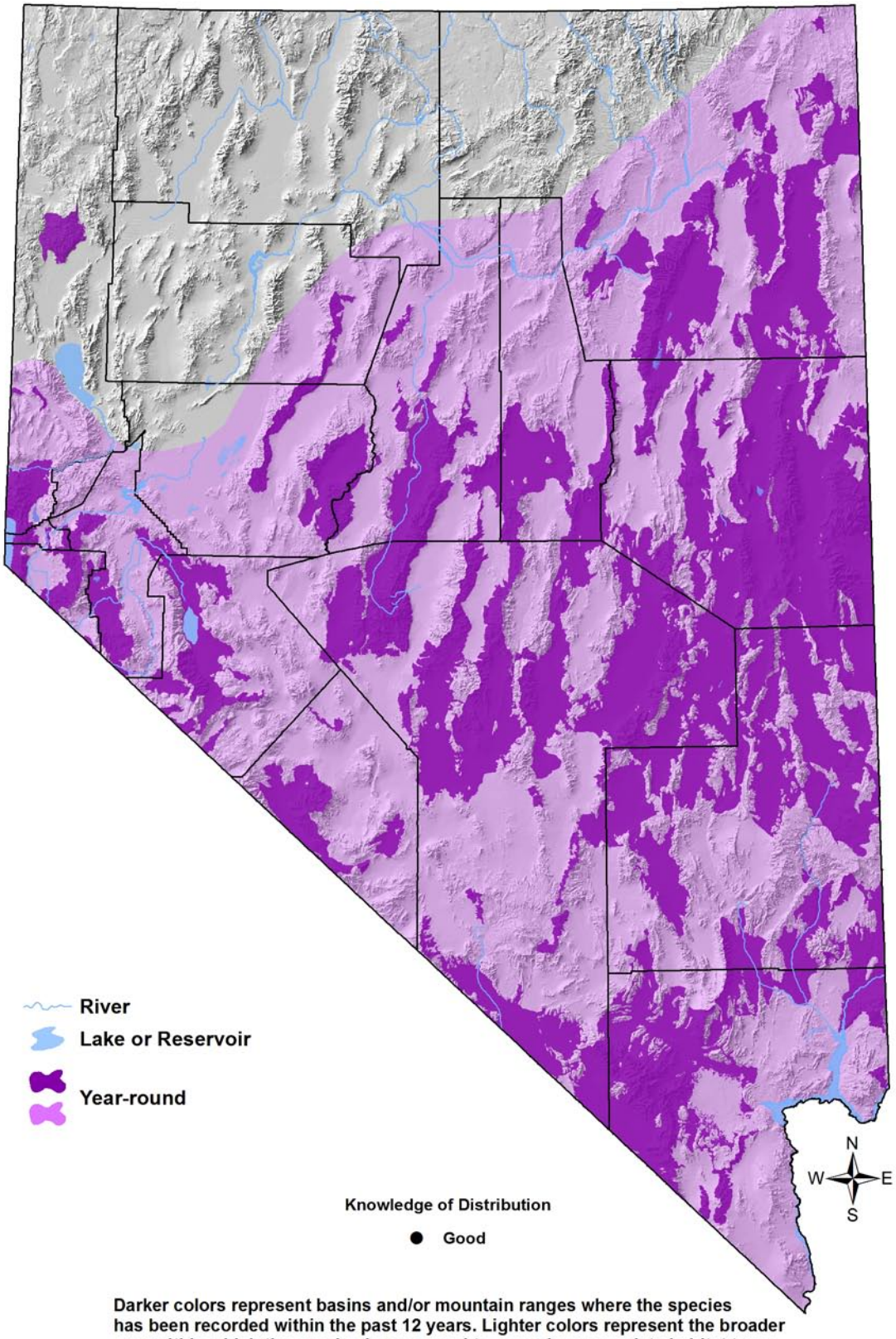
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and recent declines Habitat threats High stewardship responsibility	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S3S4
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
Trends	
Historical ◑	Probable rangewide declines[1]
Recent ●	Rangewide declines of 4.4 – 6.4% / year[6]
Population Size Estimates	
Nevada (NBC) ◑	428,000
Global ○	4,100,000 [5]
Percent of Global	> 10%
Population Objective	
Increase by 100% [5, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Pinyon-juniper woodland where pinyon pine is present, especially woodland / shrubland transition zones
Restoration	Same, plus woodland interiors that could be thinned to create open stands

Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
Late March – August[2]	
Nest and Nesting Habits	
Nest Placement	Interior of mature pine or juniper near trunk, often on south-facing slope[1]
Site Fidelity	Unknown
Other	Highly social year-round, including nesting[1, 3]
Food Habits	
Basic	Mostly granivorous
Primary Diet	Pinyon pine seeds[1]
Secondary Diet	Arthropods during nesting, other seeds, and feeders where available[1]

Pinyon Jay

Gymnorhinus cyanocephalus



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Pinyon Jay

Gymnorhinus cyanocephalus

Overview

Pinyon Jays present both a conservation challenge and a paradox. During the same period when the species has been declining at a rapid rate, its preferred habitat, pinyon-juniper woodland, has been expanding. Compounding this management challenge, nearly everything that was known until very recently about Pinyon Jay habitat requirements was based on the long-term study of a single flock in New Mexico, near the southern edge of the species' geographical range.[1]

In 2007 the Great Basin Bird Observatory conducted an initial radio-telemetry study of five Pinyon Jay flocks in White Pine County. The data collected during this study indicated that Pinyon Jays prefer a mixed-age mosaic of woodland transitioning into, or interspersed with, sagebrush shrubland. Although Pinyon Jays were observed to roost and build nests within relatively dense groves of trees, these groves were typically located within 2 km [1.2 mi] of the woodland-sagebrush habitat edge. These findings, if representative of all Great Basin populations, would suggest that the large expanses of closed-canopy pinyon-juniper woodland that have become more common in Nevada over the past century are largely unsuitable for Pinyon Jays. Mixed-age woodland mosaics with shrubby openings and a complex habitat edge, in contrast, appear to have decreased in extent during the same period (see Pinyon-Juniper habitat account, p. Hab-16-1).[4, 7] Thus, one hypothesis for the species' declines involves changes in the age profile and structural features of pinyon-juniper woodlands, not in their overall extent. Another possible factor is the Pinyon Jay's well-known dependence on pinyon pine nut production. Further research on the ecological correlates of pine nut production might generate additional hypotheses for the Pinyon Jay's decline.

Pinyon Jays make heavy use of pine nut crops during their production period (early to late fall), but rely for the rest of the year on seed caches or other food sources. Seed caches are usually located in the woodland-shrubland transition zone, or in pure shrublands within ~ 2 km [1.2 mi] of the woodland edge (GBBO unpublished data). It therefore seems likely that the Pinyon Jay's association with edge habitat is at least partly related to the location of cache sites.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Pinyon-Juniper	41% (29/70)	6.0 (2.4 – 9.6)
Sagebrush	6% (2/33)	6.4 (n/a)
Mojave		
Pinyon-Juniper	67% (8/12)	14.0 (0.0 – 36.0)

- Pinyon Jays are usually detected in the form of flocks that occur sporadically across the landscape. Mean density within areas where flocks are present during

the survey period are not representative of average density across the landscape. NBC density estimates in the table above should be interpreted accordingly

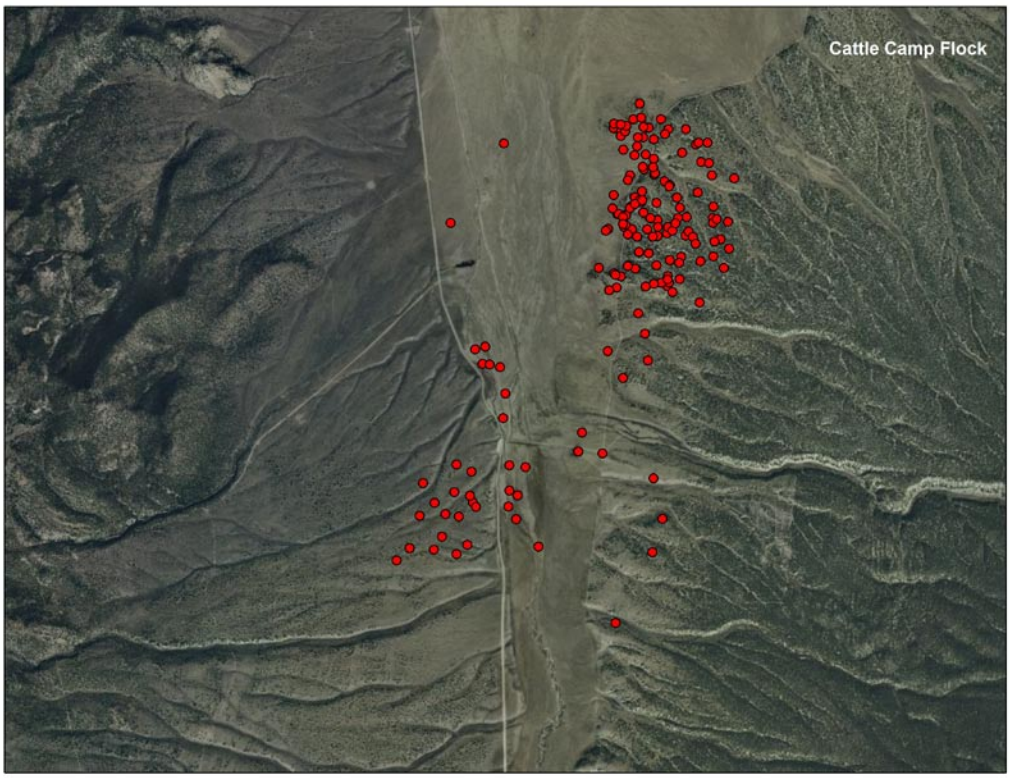
- Transects with any pinyon-juniper present are classified as Pinyon-Juniper in the table above, even if they contained a substantial amount of sagebrush cover
- Pinyon Jays were also detected on at least 10% of NBC transects classified as Montane Shrub (both Great Basin and Mojave), and Montane Riparian (Mojave)
- The BBS-derived population estimate for Pinyon Jays in Nevada is 1,650,000,[5] considerably larger than the NBC-derived estimate of 428,000. The NBC-estimate is extrapolated from more sampling points and is therefore probably more accurate

Nevada-Specific Studies and Analyses

Habitat Requirements (unpublished GBBO radio-telemetry study, White Pine County)

Study of radio-tagged Pinyon Jays in White Pine County in 2007-2009 produced the following findings:

- Foraging Pinyon Jays appeared to favor transitional areas where pinyon-juniper woodland is interspersed with sagebrush
- During daytime, jays were usually found within 800 m [2,600 ft] of the woodland edge, and always within 2 km [1.2 mi] of the edge, as shown in the figure below.



Telemetry locations for a Pinyon Jay flock in South Steptoe Valley, White Pine County, over a one-week period in August 2009. Darker areas on the aerial photo are pinyon-juniper woodland, lighter areas are sagebrush.

- For roosting and nesting, jays went deeper (but usually no more than 3 km [1.8 mi]) into the woodland interior to denser trees stands
- Jays were nearly always found in areas with diverse woodland canopy closure and age structure; they were not observed in large contiguous areas of mature, dense woodland
- Although very large flocks have been reported elsewhere, we most often observed smaller subflocks (< 30 birds) that periodically joined other subflocks to form flocks of 50-100 birds.
- Sub-flock home ranges were < 20 km^2 [5,000 ac] in all cases
- Findings were similar for all five flocks studied, regardless of whether they had access to urban feeders
- Presumably, Nevada flocks wander more widely when local food supplies are insufficient,[1] though such vagrant movements were not detected during the study

Landscape Associations (NBC)

Logistic regression analysis confirmed the importance of Pinyon-Juniper habitat to this species, but added little additional insight (*Appendix 3*). Given the manner in which landcovers were assigned in the GIS map (i.e. areas with any pinyon-juniper present were classified as "Pinyon-Juniper", regardless of the amount of sagebrush cover they contained) we could not yet quantify the importance of sagebrush microhabitat within the woodland mosaic

Main Threats and Challenges

Habitat Threats

- Preliminary data suggest that Pinyon Jay declines may be at least partly related to substantial increases in the acreage of closed-canopy, mature (or senescent) woodland with a poor shrub understory, coupled with a corresponding loss of mixed-age woodland mosaics with openings and a complex shrubland edge. These landscape scale changes are largely the result of altered fire regimes, although grazing pressure and invasive plants may be contributing factors.

Research, Planning, and Monitoring Challenges

- Monitoring is challenging because flocks are irregularly distributed across the landscape
- The factors controlling pinyon pine nut production, and their short and long-term impacts on jay populations, need further study
- Lack of clear strategies that make pinyon-juniper habitat treatment programs compatible with the habitat requirements of Pinyon Jays

Pinyon Jay

Gymnorhinus cyanocephalus

Conservation Strategies

Habitat Strategies

- The Pinyon-Juniper (p. Hab-16-1) habitat conservation strategy benefits this species
- Maintain or increase the proportion of pinyon-juniper woodland that is characterized by mixed-age structure, woodland openings, interspersion with sagebrush habitat, and well-developed shrub understory. An ideal landscape would contain (within a patch size of ~ 3,000 ha [7,400 ac]) mature cone-bearing trees, some dense closed-canopy stands near the woodland edge, and large numbers of younger trees interspersed with shrubland
- Pinyon-juniper treatment projects should try to avoid creating a sharp, well-defined edge between dense woodland and recovered shrubland

Research, Planning, and Monitoring Strategies

- Continue monitoring for population trends
- Additional studies need to be conducted to confirm, refine, or revise the preliminary findings derived from the radio-telemetry studies described above
- In-depth studies of the landscape-scale successional processes that may impact or control pinyon pine nut production would be valuable. The possible impact of climate change on pinyon nut production also deserves consideration and study

Public Outreach Strategies

- None identified

References: [1]Balda (2002); [2]GBBO unpublished Atlas data; [3]GBBO unpublished telemetry data; [4]Miller et al. (2008); [5]Rich et al. (2004); [6]Sauer et al. (2008); [7]Tausch et al. (1981); [EO] Expert opinion

Sage Thrasher

Oreoscoptes montanus

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Sagebrush Montane Shrubland Salt Desert Scrub	
Key Habitat Parameters ●	
Plant Composition	Sagebrush, greasewood, various salt desert or montane shrub species; avoids cheatgrass[8, EO]
Plant Density & Height	Shrub cover 11 – 44%,[9] average height 30 – 90 cm (1 – 3 ft), but can be taller; sparse to moderate ground cover[8, EO]
Mosaic	High-quality shrubland with spatial variability in density and height and structural complexity; patches of bare ground are acceptable [8]
Distance to Water	May prefer nearby water[2]
Response to Vegetation Removal	Negative to reducing shrub cover below 10%; exotic weed control encouraged[8, EO]
Area Requirements ◑	
Minimum Patch Size	Unknown, but thought to avoid small patches
Recommended Patch Size	> 100 ha [250 ac] [EO]
Territory Size	0.64 – 1.9 ha [1.6 – 4.7 ac][8]

Conservation Profile

Priority Status	
Stewardship Species	
Species Concerns	
High stewardship responsibility Habitat threats	
Other Rankings	
Continental PIF	Stewardship Species
Audubon Watchlist	None
NV Natural Heritage	S5B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	Stewardship
Trends	
Historical ○	Unknown
Recent ◑	Stable, or slight declines[11]
Population Size Estimates	
Nevada (NBC) ◑	1,500,000
Global ◑	7,900,000 [10]
Percent of Global	~ 20%
Population Objective	
Maintain[10, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	High-quality Great Basin sagebrush and montane shrubland
Restoration	Degraded / burned Great Basin sagebrush and montane shrubland

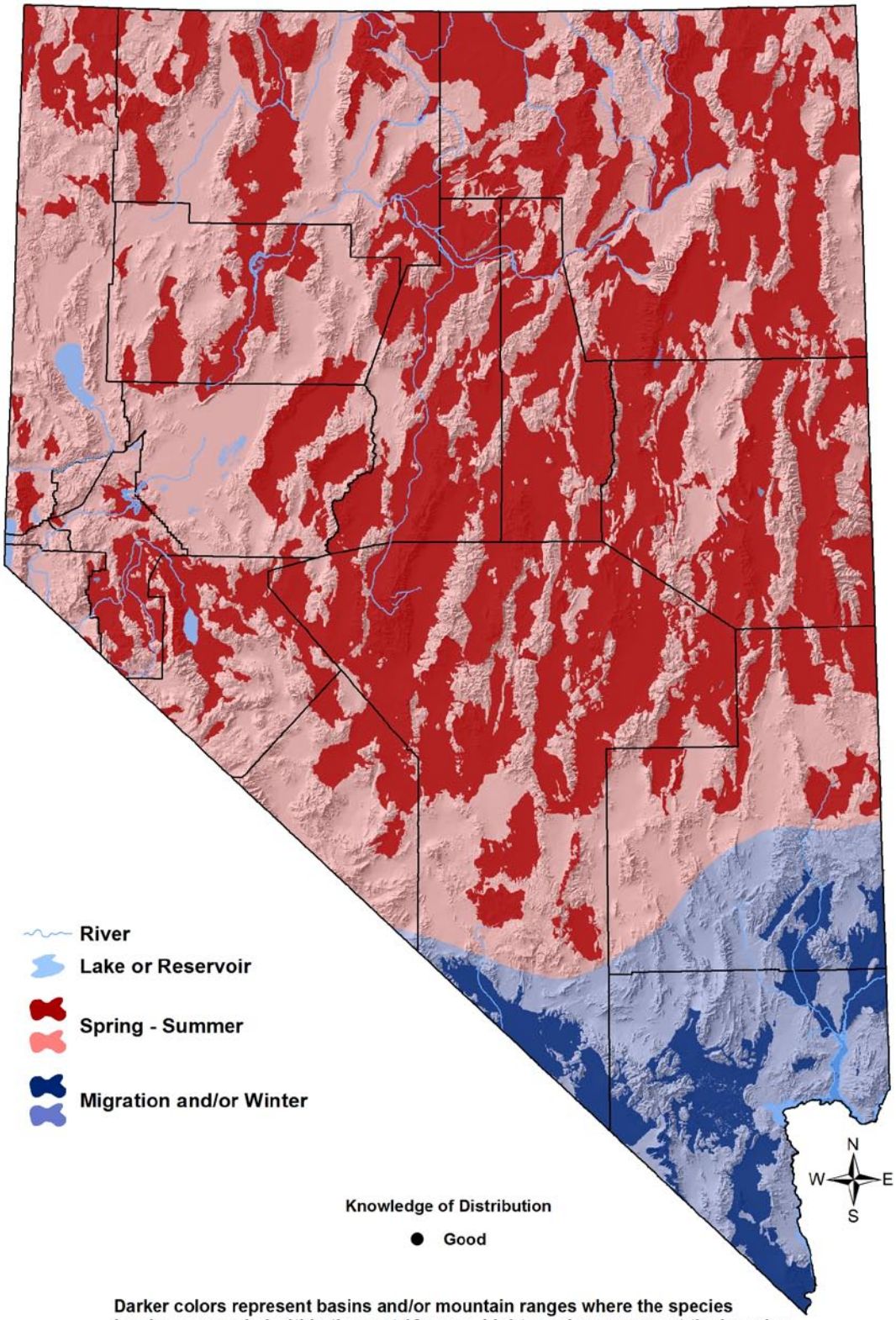
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
April – late August[1]	
Nest and Nesting Habits	
Nest Placement	On ground or low branch of dense shrub > 70 cm [27 in] tall; sometimes with roof[8, 9]
Site Fidelity	Moderate for breeding territory[8]
Food Habits	
Basic	Ground forager
Primary Diet	Medium-sized terrestrial insects, such as crickets[8]
Secondary Diet	Berries and seeds in non-breeding season[8]

Confidence in Available Data: ●High ◑Moderate ○ Low

Sage Thrasher

Oreoscoptes montanus



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Sage Thrasher

Oreoscoptes montanus

Overview

Nevada provides a home for about one-fifth of the global population of Sage Thrashers. They primarily inhabitat sagebrush valleys, but can also be found breeding in salt desert (especially where it intergrades with sagebrush or where greasewood predominates) and montane shrubland.[2, 3, 6] For reasons that are unclear, Sage Thrashers are not declining to the same degree as several other sagebrush-associated songbirds, including Brewer's Sparrow (p. Spp-73-1).[8] Still, Breeding Bird Survey results indicate possible declines in Nevada dating from approximately 1980.[11]

Sage Thrashers are consistently more numerous in areas with greater cover of high-quality sagebrush,[5,8] and they are often positively associated with greater shrub height[4] and vertical complexity.[13] They avoid areas with junipers, even if they are present in low densities.[6] On a landscape scale, Sage Thrashers are more likely to occur where uninterrupted sagebrush cover is present over large spatial expanses.[5] Any treatment that decreases or fragments sagebrush cover is likely to be detrimental,[4, 12] and indeed, Sage Thrashers were shown to be negatively affected by fire in two studies involving sagebrush cover in a montane setting.[3, 6] However, at least one study in eastern Washington found Sage Thrashers to be relatively insensitive to patch size, although fragmentation of habitat by agriculture appears to reduce reproductive success.[12] Although primarily associated with the Great Basin region of Nevada, the Sage Thrasher's breeding range extends southward into the northern Mojave region in the areas where sagebrush habitat is present. Effective conservation and management of healthy sagebrush landscapes in Nevada (see p. Hab-17-1) is the key factor for ensuring the stability of the Sage Thrasher.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Sagebrush	76% (25/33)	4.6 (3.1 – 6.1)
Salt Desert	83% (19/23)	3.9 (2.8 – 5.0)
Montane Shrubland	40% (8/20)	5.5 (2.9 – 8.1)
Mojave		
Sagebrush	77% (20/26)	5.8 (4.0 – 7.6)

- Other data for the Great Basin indicate that density rarely exceeds 12 birds / 40 ha [0.12 / ac] even in high-quality local sites[7]

Sage Thrasher

Oreoscoptes montanus

Nevada-Specific Studies and Analyses

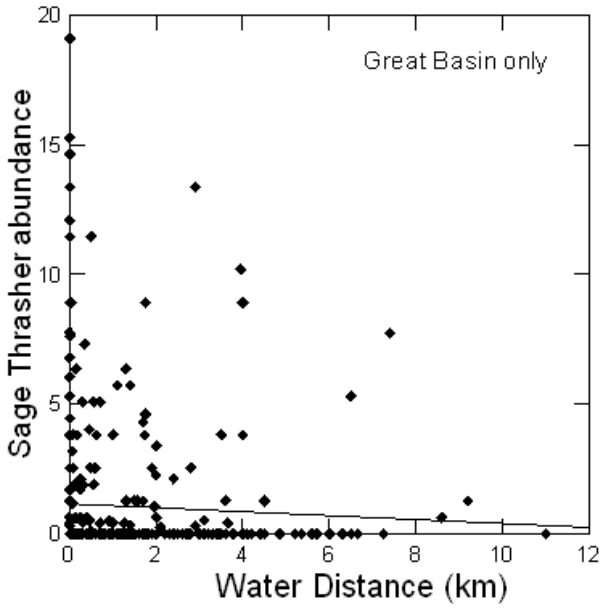
Habitat Requirements (NBC data)

The multivariate analysis (*Appendix 3*) summarized in the table below was based on ground-collected microhabitat measurements taken on NBC transects where Sage Thrashers were present. Sage Thrasher abundance was significantly associated with higher shrub density and lack of trees. There was no significant association with herbaceous cover, and only a weak association with shrub height (variables not shown).

Vegetation parameter	Multivariate p-value and sign
Shrub Cover %	<0.001 (+)
Herbaceous Cover %	0.175 (-)
Tree Density (#/ha)	0.001 (-)
Area under ROC curve	**0.797**

Landscape Associations (NBC data)

Both linear and logistic analyses (*Appendix 3*) confirmed that sagebrush cover was preferred, and that use of Salt Desert and Montane Shrubland habitats was at least partly dependent on the presence of juxtaposed or interspersed sagebrush. Sage Thrashers appeared to be more common closer to water (as shown in the figure below). However, this relationship was not statistically definitive, and could have been a function of some unmeasured covariate, such as elevation.



Sage Thrasher

Oreoscoptes montanus

Main Threats and Challenges

Habitat Threats

Loss, degradation, or fragmentation of high-quality sagebrush shrubland due to:

- Fire
- Invasive plants, especially cheatgrass
- Expansion of pinyon-juniper woodland into sagebrush
- Heavy livestock grazing
- Heavy OHV use

Research, Planning, and Monitoring Challenges

- Further research is needed to determine the best management strategies for the pinyon-juniper / sagebrush interface zone for multi-species benefits
- Although short-term fire management strategies are established, further research and planning is needed to clarify the most beneficial longer-term fire management strategies that protect important habitat while promoting its long-term viability
- Further study is needed to determine the Sage Thrasher's patch size requirements, and to better quantify its sensitivity to patch size

Sage Thrasher habitat in central Nevada. Photo by John Boone.

Sage Thrasher

Oreoscoptes montanus

Conservation Strategies

Habitat Strategies

- Sagebrush (p. Hab-17-1), Montane Shrubland (p. Hab14-1), and Salt Dessert Scrub (p. Hab-18-1) habitat conservation strategies benefit this species
- Protect large expanses of high-quality sagebrush (see below) from fire to the extent possible
- Within large expanses of high-quality sagebrush with few invasive plants, attempt to channel activities that can promote establishment or maintenance of cheatgrass, including heavy livestock grazing and heavy OHV use, to areas that are already degraded
- Where pinyon-juniper encroachment is known to have recently occurred within high-quality sagebrush habitat, conduct pinyon-juniper removal projects. However, we recommend that pinyon-juniper management projects consider the importance of maintaining a natural, interspersed interface zone between sagebrush shrublands and pinyon-juniper woodlands, as discussed in the Pinyon-Juniper (p. Hab-16-1) habitat conservation plan

Research, Planning, and Monitoring Strategies

- Identify and map large patches of intact, mature sagebrush (especially Wyoming big sagebrush) that contain dense shrubs and little cheatgrass
- Develop a fire management strategy that ensures that high-quality sagebrush habitat receives priority fire suppression efforts in the immediate future. Additionally, develop fire management strategies that balance the need for short-term habitat protection with long-term habitat viability
- Conduct additional research to determine how to pinyon-juniper management projects can both benefit Sage Thrashers as well as the suite of birds that use the pinyon-juniper / sagebrush interface zone (see p. Hab-16-1)
- Continue monitoring to better determine population trends and the extent to which breeding activity occurs the Mojave region of Nevada

Public Outreach Strategies

- None identified

References: [1]GBBO unpublished Atlas data; [2]GBBO unpublished NBC data; [3]Holmes (2007); [4]Kerley and Anderson (1995); [5]Knick and Rotenberry (1995); [6]Noson et al. (2006); [7]Paige and Ritter (1999); [8]Reynolds et al. (1999); [9]Rich (1980); [10]Rich et al. (2004); [11]Sauer et al. (2008); [12]Vander Haegan (2007); [13]Wiens and Rotenberry (1981); [EO] Expert opinion

Bendire's Thrasher

Toxostoma bendirei

Photo by Dorothy Crowe

Habitat Use Profile

Habitats Used in Nevada	
Joshua Tree Mesquite-Acacia (Mojave Scrub)	
Key Habitat Parameters ●	
Plant Composition	Joshua tree, *Yucca* spp., cholla (*Cylindropuntia* spp.), mesquite, acacia, squawtea, cheese bush, desertthorn, and similar shrubs[3, 6, EO]
Plant Density	Intermediate[3]
Mosaic	Patches of preferred overstory species, interspersed with Mojave Scrub shrubs (creosote bush, cholla, or transitional areas into blackbrush) and open areas[3]
Distance to Water	Unimportant[EO]
Response to Vegetation Removal	Negative, but exotic weed control encouraged[3]
Area Requirements ◑	
Minimum Patch Size	200 ha [500 ac][3, EO]
Recommended Patch Size	> 1,000 ha [2,500 ac][EO]
Home Range / Territory Size	Unknown

Conservation Profile

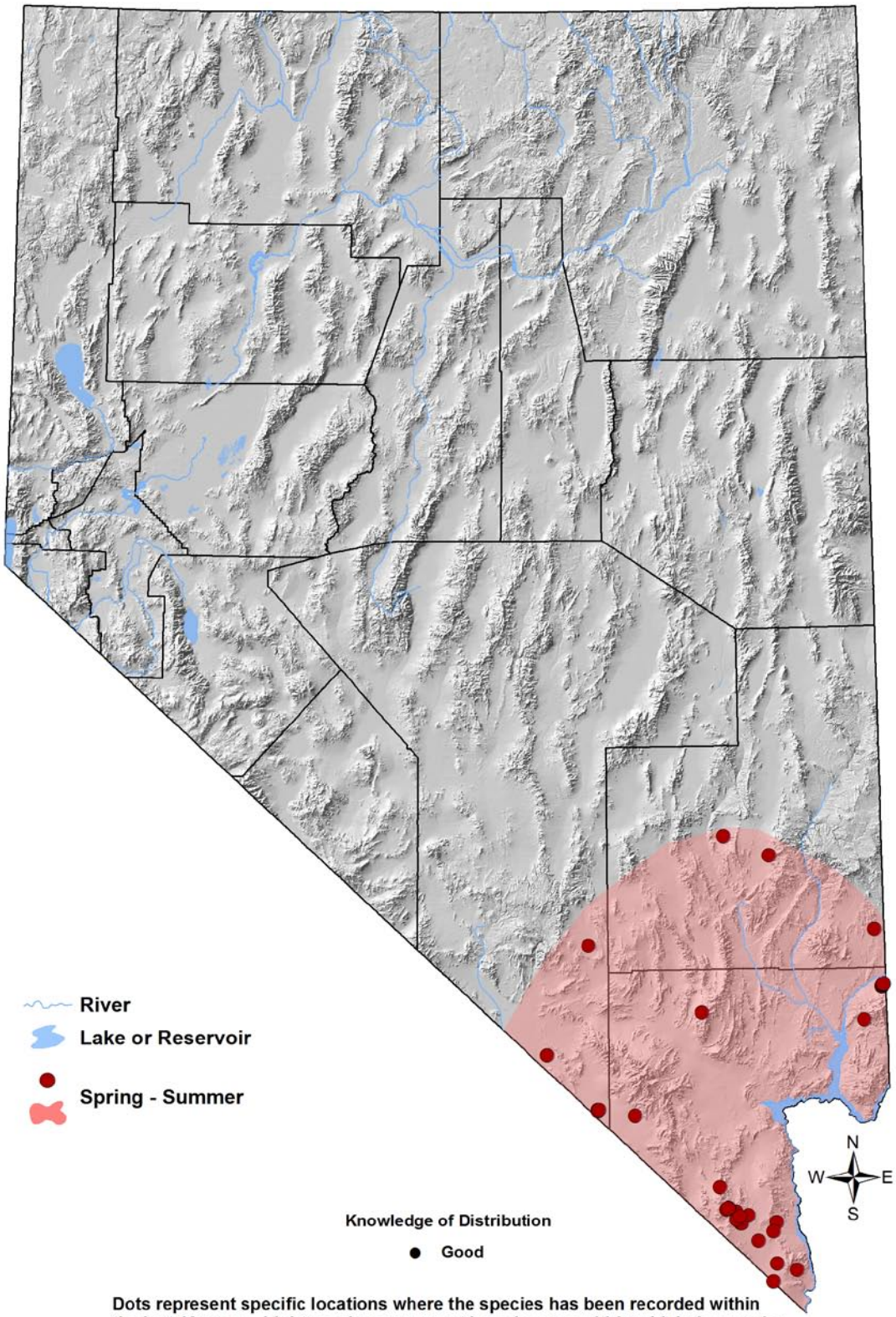
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and recent declines Small population size Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Red
NV Natural Heritage	S1
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Trends	
Historical ●	Rangewide declines of 5.7% / year since 1966 [7]
Recent ○	Recently stabilizing, but patterns in Nevada unclear[1]
Population Size Estimates	
Nevada ◑	< 50 [EO]
Global ◑	130,000 [5]
Percent of Global	< 1%
Population Objective	
Increase by 100% [5, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Fair / Poor
Key Conservation Areas	
Protection	Valleys and foothills of the McCullough and Newberry Mts., Tule Desert, Delamar Valley, Joshua Tree habitats throughout Clark and Nye counties
Restoration	Joshua Tree habitats throughout Clark and Nye counties

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Mid-March – early July[4, 6]	
Nest and Nesting Habits	
Nest Placement	1 – 1.5 m [3 – 5 ft] above ground in trees or tall shrubs[3]
Site Fidelity	Unknown
Food Habits	
Basic	Ground / litter forager
Primary Diet	Terrestrial invertebrates[3]
Secondary Diet	Seeds, berries[3]

Bendire's Thrasher

Toxostoma bendirei



Dots represent specific locations where the species has been recorded within the last 12 years. Lighter colors represent broader area within which the species may occur in appropiate habitat types.

Bendire's Thrasher

Toxostoma bendirei

Overview

Bendire's Thrasher, much like Le Conte's Thrasher, has a restricted geographical range whose northern extent includes a small population in Nevada's Mojave Desert region. However, unlike Le Conte's Thrasher, Bendire's Thrasher partially migrates southward out of Nevada during the winter. Many aspects of the biology, habitat use, and conservation status of Bendire's Thrasher have not been well-studied, but this work has recently been initiated by Dawn Fletcher of the Public Lands Institute at UNLV and NPS, and will need to be continued to gain a better understanding of the species' conservation needs. It appears that Bendire's Thrasher prefers landscapes with a scattered presence of taller vegetation (such as Joshua trees or mesquite) within a broader Mojave shrubland mosaic. Bendire's Thrasher also tends to occur in areas where shrubs are denser and taller than is the case for Le Conte's Thrasher.

Bendire's Thrasher has suffered substantial declines over the last half-century,[7] and is particularly vulnerable to further declines because of its small population size and use of restricted habitat. For these reasons, it is an Evaluation Species under the Clark County MSHCP.[1] Unfortunately, Bendire's Thrasher is difficult to monitor satisfactorily using standard multi-species monitoring programs (BBS and NBC) because of its global rarity and spotty occurrence across the landscape. Development of a more focused and effective monitoring strategy is therefore a priority.

Nevada's population is probably < 50 birds, compared with California's estimated population of < 400 birds,[2] although rigorous estimates are difficult to generate. The greatest known concentration of birds in the Mojave Desert is located just outside the Nevada border in the vicinity of the New York Mountains east of Baker, California.[6] Successful conservation of the Mojave population may therefore best be approached in coordination with California agencies managing these lands.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Mojave Region

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Joshua Tree	15% (3/20)	0.3 (0.1 – 0.5)
Mesquite-Acacia	14% (2/14)	1.3 (n/a)
Mojave Scrub	4.5% (1/22)	1.0 (n/a)

Bendire's Thrasher

Toxostoma bendirei

Nevada-Specific Studies and Analyses

Landscape Associations (NBC data)

Bendire's Thrashers have been detected on only six point-count transects, which are insufficient for conducting statistical analysis. However, of these six transects:

- All six contained a substantial amount of the Mojave Scrub habitat type
- All six contained at least some of the denser shrub cover associated with dry washes
- Only one transect had substantial mesquite cover
- Joshua Trees were present on three of the six occupied transects

Main Threats and Challenges

Habitat Threats

The basis for assessing threats is incomplete, but there is cause for concern about the following causes of potential habitat loss or degradation:[EO]

- Urban, suburban, and agricultural development
- Energy (wind and solar) development
- Fire
- Invasive plants
- Heavy OHV use
- As with Le Conte's Thrasher, habitat fragmentation may be a concern, but further information on home range requirements is needed to make this evaluation

Research, Planning, and Monitoring Challenges

- Incomplete understanding of habitat use parameters, particularly regarding the importance of Joshua Trees or other taller vegetation
- Nature, scope, and severity of threats are not well understood
- Tolerance of Bendire's Thrasher to human encroachment and disturbances of intermediate-to-low intensity is unknown in Nevada, and conflicting reports exist for other parts of the species' range[3]

- Monitoring is difficult due to the species' rarity and its unpredictability in occurrence across the landscape. Bendire's Thrashers may take advantage of ephemeral resources from year to year, and may therefore require large landscapes to support vagrancy

Conservation Strategies

Habitat Strategies

- Joshua Tree (p. Hab-8-1) and Mesquite-Acacia (p. Hab-10-1) habitat conservation strategies benefit this species
- Protect occupied habitat at the recommended patch size from habitat conversion, energy development, and fire as much as possible
- Monitor and (if necessary) limit OHV use in occupied habitat
- Control invasive weeds in and near occupied habitat to reduce fire risk, wherever possible

Research, Planning, and Monitoring Strategies

- Inventory and map important habitat, especially Joshua Tree habitat
- Developed an improved, focused method for monitoring Bendire's Thrashers; this may include use of call playback surveys (Dawn Fletcher, pers. comm.)
- Collect additional monitoring and survey data, including data from areas outside the current known range of the species, to better determine northern extent of breeding range, and to improve estimates of population size and trends in Nevada
- Conduct studies to better estimate minimum patch size, home range, landscape mosaic use, vagrancy, and response to edge effects
- Estimate population losses to solar and wind development scenarios

Public Outreach Strategies

- Promote additional land protections for critical habitat

Bendire's Thrasher

Toxostoma bendirei

References: [1]Clark County (2000); [2]England and Laudenslayer (1989); [3]England and Laudenslayer (1993); [4]GBBO unpublished Atlas data; [5]Rich et al. (2004); [6]Shuford and Gardali (2009); [7]Sauer et al. (2008); [EO] Expert opinion

Bendire's Thrasher habitat in southern Nevada. Photo by Dawn Fletcher.

Le Conte's Thrasher

Toxostoma lecontei

Photo by Dawn Fletcher

Habitat Use Profile

Habitats Used in Nevada	
Salt Desert Scrub (Mojave region) Mojave Scrub Mesquite-Acacia Joshua Tree	
Key Habitat Parameters ◑	
Plant Composition	Saltbush, cholla (*Cylindropuntia* spp.), *Yucca* spp., cactus (*Opuntia* spp.),mesquite, creosote bush (but usually avoids pure stands)[9]
Plant Density & Size	Shrub spacing usually < 15 m [50 ft], shrub height usually < 2.5 m [8 ft][9]
Mosaic	Multiple species of shrub, tree, or cactus preferred; ephemeral washes with high shrub cover favored[9, EO]
Soil, Litter Cover	Undisturbed, sandy soils with ample shrub litter cover[8]
Distance to Water	Unimportant[9]
Response to Vegetation Removal	Negative, but exotic weed control encouraged[EO]
Area Requirements ●	
Minimum Patch Size	160 ha [400 ac][8, EO]
Recommended Patch Size	> 1,000 ha [2,500 ac][5, EO]
Home Range	Year-round 40 - 100 ha [100 – 250 ac][9]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Small population size Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S2
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
Trends	
Historical ◑	Rangewide declines, pattern in Nevada unclear[9]
Recent ○	Assumed to be stable[7]
Population Size Estimates	
Nevada ◑	< 100 [EO]
Global ◑	150,000 [6]
Percent of Global	< 1%
Population Objective	
Maintain / Increase[6, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Fair
Key Conservation Areas	
Protection	Salt Desert Scrub, Joshua Tree / *Yucca* spp., and ephemeral washes in Clark and Nye Counties; see "Conservation Strategies" for additional detail
Restoration	Same

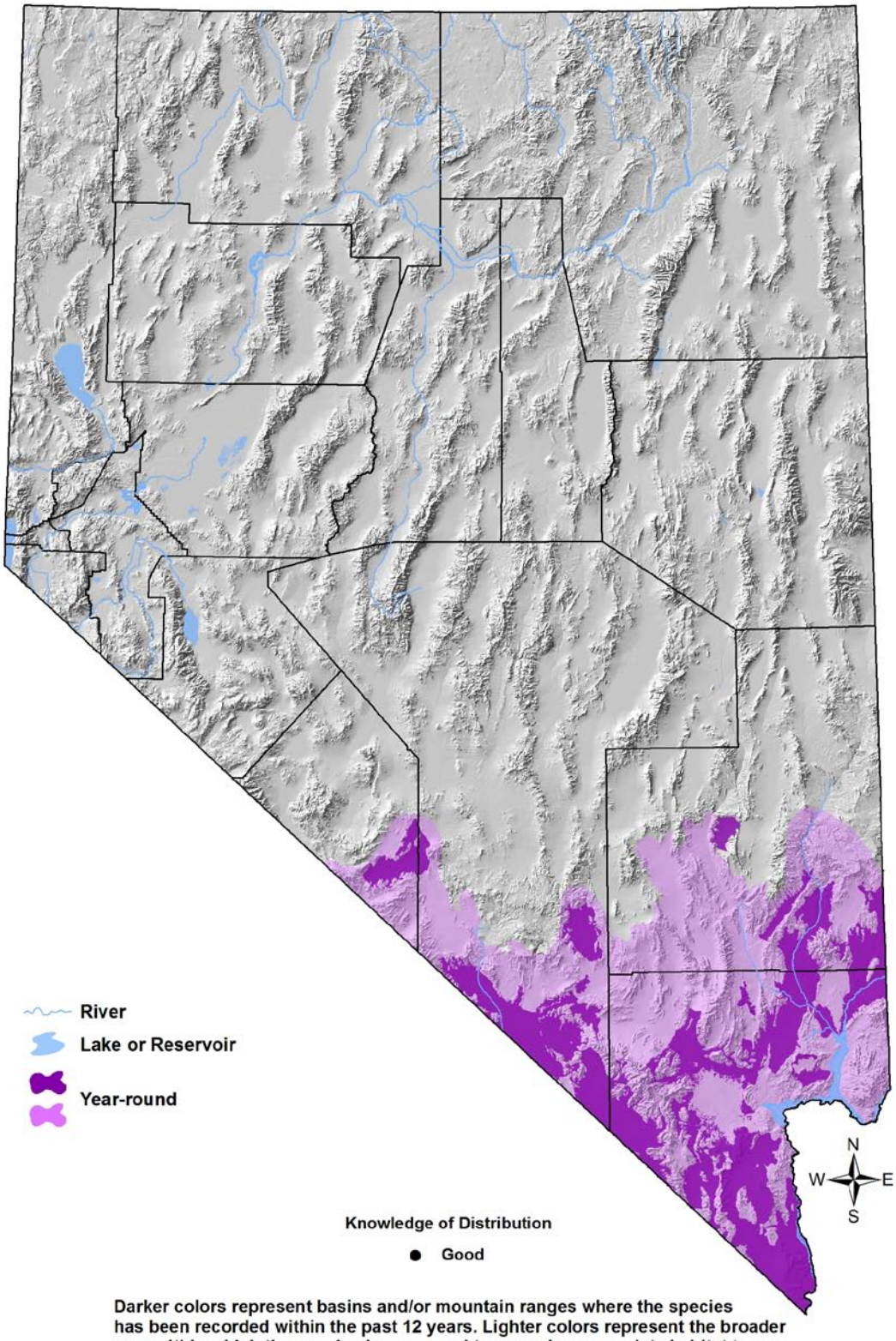
Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
Late February – July[3]	
Nest and Nesting Habits	
Nest Placement	Above ground in dense, often thorny shrub, such as *Cylindropuntia* spp., saltbush[9]
Site Fidelity	Unknown
Other	Maintain territory year-round[9]
Food Habits	
Basic	Ground / litter forager
Primary Diet	Terrestrial arthropods; seeds[9]
Secondary Diet	Lizards [EO]

Confidence in Available Data: ●High ◑Moderate ○ Low

Le Conte's Thrasher

Toxostoma lecontei



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Le Conte's Thrasher

Toxostoma lecontei

Overview

Le Conte's Thrasher has a small geographical range within which it is patchily distributed at low densities. It occurs in low elevation (-75 – 500 m [-250 – 1600 ft]), sandy desert habitats, where it can survive and nest without any access to water.[8, 9] Home ranges are large and may encompass substantial movements within or across years.[8, 9] This thrasher is generally associated with nearly flat landscapes with short, open stands of scrublands with specific shrub components, such as saltbush, cholla (specifically *Cylindropuntia* spp. [EO]), prickly pear cactus, or yucca.[2, 4] Creosote bush is often present, but not in pure stands.[9] Mesquite-Acacia habitat is frequently inhabited, but only if these key shrub components are present. Based on anecdotal data, Le Conte's Thrasher appears to use mesquite stands that are not occupied by Crissal Thrasher.[8] Similarly, Le Conte's and Bendire's Thrashers also seem to partition habitat, with Le Conte's using areas where shrubs are less dense and lower than those used by Bendire's.[9] Interestingly, Le Conte's Thrasher is part of a nesting guild (including Cactus Wren and Loggerhead Shrike) that may compete for limited nest sites among thorny dense plants.[8] Therefore, areas that contain cholla or similarly desirable nesting substrates may be of particular conservation interest for this species. It has also been suggested (though not yet demonstrated) that Le Conte's Thrashers have substrate preferences for the sediments associated with ancient Pliestocene lakebeds.[EO]

Le Conte's Thrasher is an Evaluation Species under the Clark County MSHCP[1], but it is still insufficiently studied in Nevada. These thrashers are known to be sensitive to habitat disturbances and conversion[9], and they are at risk of declines (which have been substantial in the California desert)[10] because of their small population size and large home range requirements.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Mojave Region

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Mesquite-Acacia	50% (7/14)	3.3 (-2.0 – 8.6)
Mojave Scrub	32% (7/22)	1.3 (0.4 – 2.3)
Salt Desert	20% (2/10)	1.9 (0.0 – 3.9)
Joshua Tree	10% (2/20)	2.3 (-11.1 – 15.8)

Nevada-Specific Studies and Analyses

Landscape Associations (NBC data)[4]

Although detected only on a small number of transects, a multivariate association with "Mesquite-Acacia" and "Barren" habitat was apparent (table below; note that as classified, Barren habitat often contained sparse cover of Mojave Scrub and Salt Desert shrubs). Raw NBC data suggest further that Le Conte's Thrashers are not dependent on large amounts of Mesquite vegetation itself, but rather are associated with some combination of Mojave Scrub, Salt Desert, and Barren habitat vegetation. Le Conte's Thrashers were detected farther from water than average, indicating that the bird does not require access to surface water.

Logistic Regression Summary

Habitat Type (Proportion w/in 200 m)	sign	p-value
Mojave Scrub	+	0.283
Mesquite-Acacia	+	**0.003**
Salt Desert Scrub	+	0.325
Barren	+	**0.001**
DISTANCE TO WATER	+	**0.015**

Fletcher Thesis[2]

Models based on 45 detections indicated that Le Conte's Thrashers occur within areas of little topographic relief such as valley bottoms near dry lake beds (playas). They were never observed on slopes greater than 5 degrees. There were strong positive associations with playas and saltbush assemblages (specifically, *Atriplex polycarpa* and *A. canescens*). Positive associations were also determined for three other plant assemblages: wash vegetation, cholla (*Cylindropuntia* spp.), and Mojave mixed scrub (dominated by *Yucca schidigera*). A predictive map was created that identified 4,000 km^2 [990,000 ac] of potentially suitable habitat within Clark County.

Main Threats and Challenges

Habitat Threats

- Due to their requirement for large home ranges, the Le Conte's Thrashers are sensitive to habitat fragmentation, degradation, or conversion stemming from a variety of disturbances, including development (urban, agricultural, or industrial), heavy OHV use, and fire[9]

- Extended, late-summer livestock grazing is harmful to habitat[10]
- Of particular concern in southern Nevada are plans for developing large solar energy gathering facilities which could affect significant acreages of occupied habitat[EO]
- Invasive plants may degrade habitat, if they change the open habitat structure and fire frequency of a site
- Feral cats and dogs reduce nest success near human settlements[9]

Research, Planning, and Monitoring Challenges

- Le Conte's Thrashers are challenging for resource managers because they occur at low densities, have a small population size, and may be absent from large areas of seemingly suitable habitat

LeConte's Thrasher habitat in southern Nevada. Photo by Dawn Fletcher.

Le Conte's Thrasher

Toxostoma lecontei

Conservation Strategies

Habitat Strategies

- Salt Desert Scrub (p. Hab-18-1), Mojave Scrub (p. Hab-12-1), Mesquite-Acacia (p. Hab-10-1), and Joshua Tree (p. Hab-8-1) habitat conservation strategies benefit this species
- Specific areas that merit conservation attention [EO] include
    - Saltbush stands in vicinity of Corn Creek field station, Desert NWR (IBA candidate area)
    - Piute Valley between Searchlight and Cal-Nev-Ari
    - Valleys and washes between McCullough Range and Highland Mts., and between McCullough Range and Lucy Gray Mts.
- Protect occupied habitat at the recommended patch size from habitat conversion, energy development, and fire as much as possible
- Maintain corridors of suitable habitat at the recommended patch size between currently occupied areas
- Where development proceeds in or near occupied habitat, encourage contiguous rather than patchy development patterns to minimize habitat fragmentation
- Monitor and (if necessary) limit OHV use in occupied habitat
- Control invasive weeds in and near occupied habitat to reduce fire risk, wherever possible

Research, Planning, and Monitoring Strategies

- Inventory and map critical habitat
- Assess invasive weed, fire, land use, and energy development threats to critical habitat
- Estimate population losses to solar and wind development scenarios
- Improve monitoring efforts (especially during the early breeding season which is currently poorly monitored) and generate improved population size and trend estimates
- Investigate the possible role of substrate type in determining species distribution

Public Outreach Strategies

- Promote additional land protections for critical habitat
- Educate the public about the impacts of free-ranging cats in / near critical habitat

References: [1]Clark County (2000); [2]Fletcher (2009); [3]GBBO unpublished Atlas data; [4]GBBO unpublished NBC data; [5]Nevada Wildlife Action Plan Team (2006); [6]Rich et al. (2004); [7]Sauer et al. (2008); [8]Sheppard (1973); [9]Sheppard (1996); [10]Shuford and Gardali (2008); [EO] Expert opinion

Virginia's Warbler

Oreothlypis virginiae

Photo by Greg Scyphers

Habitat Use Profile

Habitats Used in Nevada	
Pinyon-Juniper Montane Shrubland Montane Riparian	
Key Habitat Parameters ◑	
Plant Composition	Montane shrubs, mountain mahogany, pinyon pine, juniper, willows, possibly aspen
Plant Density	Dense shrub layer, open woodlands; no quantitative information on plant density[4]
Mosaic	Steep brushy areas within or in proximity to open pinyon – juniper, mountain mahogany, or montane riparian woodlands[4]
Distance to Water	Unknown
Response to Vegetation Removal	Unknown
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	100 ha [250 ac] [EO]
Territory Size	0.8 – 2.3 ha [2 - 6 ac][4]

Conservation Profile

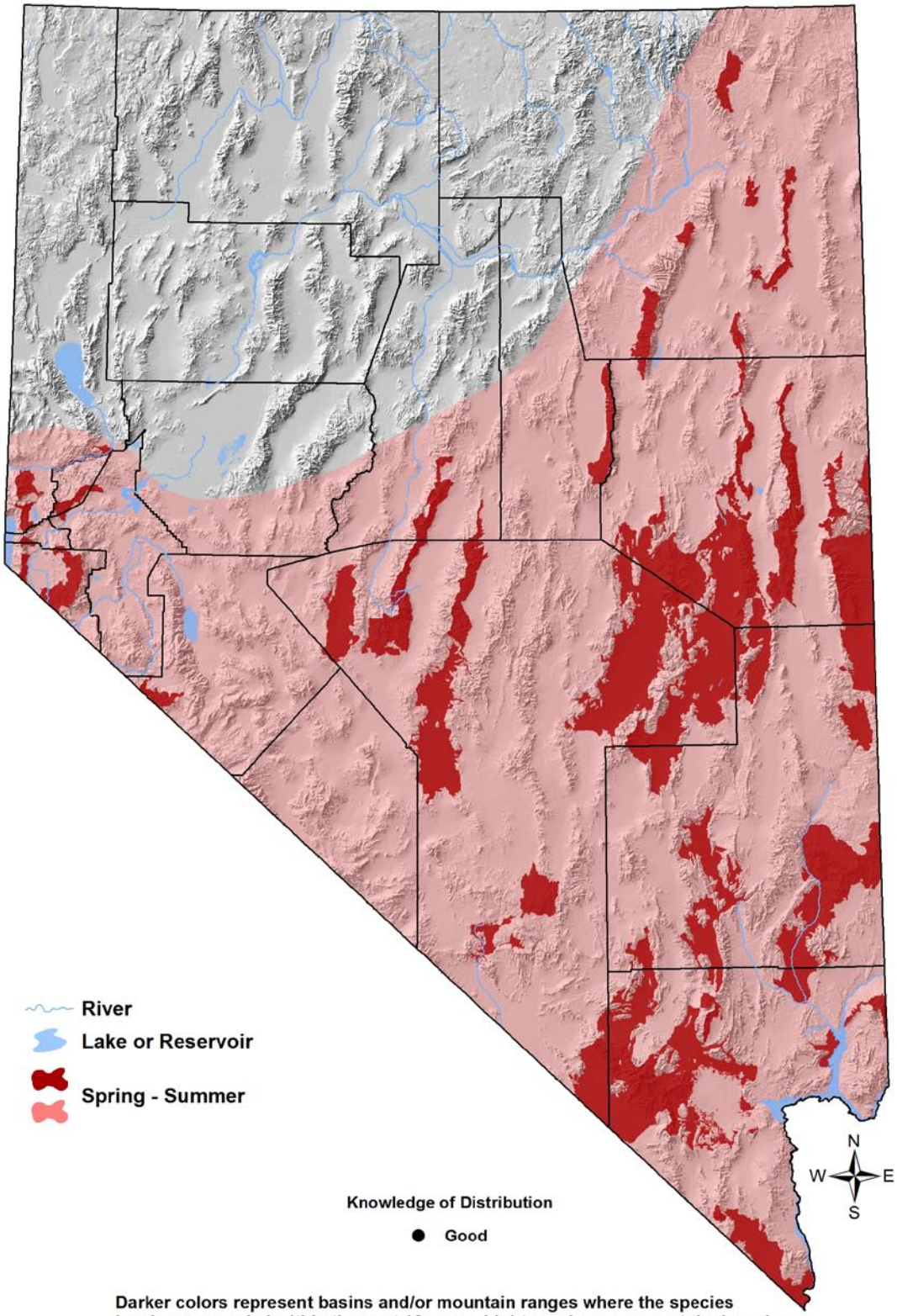
Priority Status	
Conservation Priority Species	
Species Concerns	
Insufficient knowledge of habitat requirements Unknown population trend Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S4B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Trends	
Historical ○	Unknown
Recent ○	Limited information suggests stable trend rangewide, less certain in Nevada[5]
Population Size Estimates	
Nevada (NBC) ◑	8,200
Global ◑	410,000 [5]
Percent of Global	2%
Population Objective	
Maintain / Increase[4, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Brushy mid-elevations of central and eastern mountains
Restoration	Same

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Late May – July[3]	
Nest and Nesting Habits	
Nest Placement	On ground under vegetation cover, often on slope[4]
Site Fidelity	Unknown
Food Habits	
Basic	Arboreal and shrub gleaner
Primary Diet	Terrestrial or flying arthropods[4]
Secondary Diet	n/a

Virginia's Warbler

Oreothlypis virginiae



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Virginia's Warbler

Oreothlypis virginiae

Overview

Virginia's Warbler is most often described as a breeder in pinyon-juniper and oak woodlands.[4] In Nevada, at the northwest periphery of its range, its habitat associations appear to be somewhat more complex. Most often, Virginia's Warbler are found on mid-elevation slopes with a mixture of dense brush and open woodland, but specific habitat parameters are not well quantified, and this warbler's patterns of occurrence and abundance cannot be adequately explained as a function of any single defined habitat type. In Colorado, it was found on steep slopes with large shrubs, lower tree canopy cover, high shrub diversity, and more habitat edge; [7] or, in another study, areas with many small and dense patches of shrubs, often with skunkbush and scattered juniper and pine.[1]

Because the Virginia's Warbler tends to occur at the interface of basins and ranges (i.e. foothills), its local distribution patterns are not well captured in the range map shown above, which misleadingly suggests that it is present in valley bottoms. Of potential importance in Nevada is the Virginia's Warbler's reported affinity for mountain mahogany stands,[EO] which is consistent with NBC data. It is not clear whether or not Virginia's Warblers benefit from proximity to water, or whether occasional reports of breeding in aspen woodlands in southern Nevada are representative or exceptional.

Virginia's Warblers arrive late on the breeding grounds (late April to early May), are patchily distributed throughout most of their range, and are often absent from apparently suitable habitat.[2] This patchy distribution, uncertainty about population trends, and the likelihood that specific habitat requirements exist that are not yet quantified, form the basis for conservation concern about this species.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Montane Riparian	5% (4/88)	1.4 (0.5 – 2.3)
Pinyon-Juniper	7% (5/70)	1.9 (0.9 – 2.9)
Mojave		
Montane Riparian	33% (3/9)	1.9 (0.0 – 3.8)
Montane Shrubland	38% (3/8)	1.2 (0.6 - 1.8)
Pinyon-Juniper	17% (2/12)	0.4 (n/a)

Nevada-Specific Studies and Analyses

Landscape Associations (NBC data)

The strongest explanatory factors for Virginia's Warbler presence/abundance in logistic regression analysis (*Appendix 3*) were cover of mountain mahogany, pinyon-juniper

woodland, and coniferous forest. Montane riparian woodland may be important at the microhabitat scale, but was not significant in the analysis at the transect (i.e. landscape) scale. In the raw NBC data, presence of Pinyon-Juniper habitat was the most consistent property of transects on which Virginia's Warblers were present

Main Threats and Challenges

Habitat Threats

- Habitat threats have not been determined, but may include:[EO]
  - Grazing by livestock or wild horses and burros
  - Fire
  - Invasive plants
  - Residential development, especially in southern Nevada

Research, Planning, and Monitoring Challenges

- Lack of detailed knowledge of preferred habitat parameters, population trends, and habitat threats

Conservation Strategies

Habitat Strategies

- Pinyon-Juniper (p. Hab-16-1), Montane Shrubland (p. Hab-14-1), and Montane Riparian (p. Hab-13-1) habitat conservation strategies benefit this species
- Manage mid-elevation slopes in occupied range to favor the persistence of landscapes comprised of interspersed or adjoining patches of dense brush, montane riparian woodlands, pinyon-juniper woodland, and mountain mahogany

Research, Planning, and Monitoring Strategies

- Continue monitoring to better determine trends, occupancy patterns, and habitat associations
- Conduct additional study to better determine habitat preferences, including the possible importance of mountain mahogany and proximity to water, and the possible use of aspen habitat in southern Nevada

Public Outreach Strategies

- None identified

References: [1]Berry and Bock (1998); [2]Dobkin and Sauder (2004); [3]GBBO unpublished Atlas data; [4]Olson and Martin (1999); [5]Rich et al. (2004); [6]Sauer et al. (2008); [7]Sedgwick (1987); [EO]Expert opinion

Lucy's Warbler

Oreothlypus luciae

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Mojave Lowland Riparian Mesquite-Acacia (Springs)	
Key Habitat Parameters ◑	
Plant Composition	Riparian mesquite (especially honey mesquite), willow, Fremont cottonwood, saltcedar
Plant Density &Age	Dense mid-story, relatively sparse shrub understory; older stands of mesquite preferred, but unclear whether Lucy's Warblers use mature cottonwood gallery woodland[4, EO]
Mosaic	Prefers intact riparian mesquite, but also uses washes with old mesquite and saltcedar[3, EO]
Distance to Water	Always close to water but distance not quantified
Response to Vegetation Removal	Negative [EO]
Area Requirements ○	
Minimum Patch Size	Unknown, probably ~ 5 ha [12 ac][EO]
Recommended Patch Size	> 20 ha [50 ac] [EO]
Territory Size	Often < 0.5 ha [1.2 ac][3]

Conservation Profile

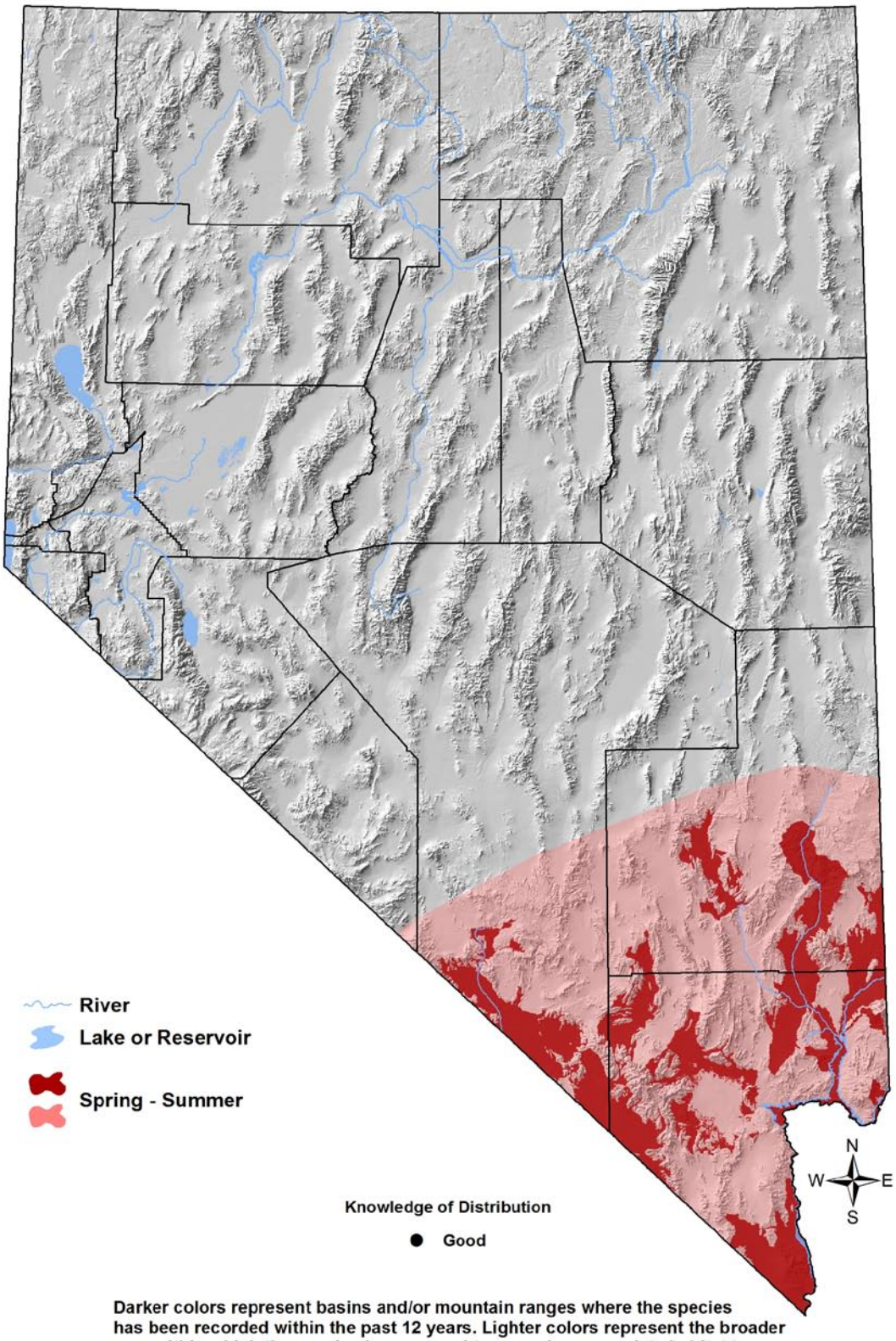
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical declines Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S2S3B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
Trends	
Historical ◑	Declines[3, 7]
Recent ○	Stable regionally, uncertain in Nevada[6]
Population Size Estimates	
Nevada (NBC) ◑	2,900
Global ◑	920,000 [5]
Percent of Global	< 1%
Population Objective	
Maintain / Increase[5, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Muddy, Virgin, and Lower Colorado River corridors, Meadow Valley Wash, Ash Meadows NWR, Pahranagat Valley, Springs
Restoration	Same

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Early March – early August[2]	
Nest and Nesting Habits	
Nest Placement	Pre-existing cavities and cavity-like crevices (under peeling bark) 1 – 6 m [3 – 20 ft] above ground in large trees[3]
Site Fidelity	Unknown, probably high for breeding territory[EO]
Food Habits	
Basic	Foliage gleaner
Primary Diet	Arthropods[3]
Secondary Diet	n/a

Lucy's Warbler

Oreothlypus luciae



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Lucy's Warbler

Oreothlypus luciae

Overview

Lucy's Warbler is one of several Conservation Priority Species covered in this plan with a restricted southwestern geographical range that includes southern Nevada. Unlike the other representatives of this group, however, Lucy's Warbler can occur in particularly high densities within its preferred habitat. This unusual cavity-nesting warbler prefers dense riparian mesquite woodlands (especially honey mesquite) with older, larger trees for nesting.[3] Nest cavities are either created by woodpeckers or provided by peeling bark or other structural fissures within tree trunks. Cottonwood and willow woodlands with a relatively open understory are also suitable for Lucy's Warblers, as are non-riparian mesquite-acacia stands in seasonal washes.[4] However, breeding densities are generally lower as the distance from permanent water increases.

Many areas formerly occupied by native riparian woodlands are now dominated by saltcedar. As is the case with several other Mojave lowland riparian birds, Lucy's Warblers now make use of saltcedar habitat for nesting, presenting a potential dilemma to resource managers wishing to restore native vegetation. Complete removal of saltcedar without creating suitable native habitats afterwards may leave Lucy's Warbler without suitable habitat within a treatment area. Lucy's Warbler's use of saltcedar and dry washes suggests that they may be relatively resilient to the effects of groundwater depletion, but further loss of its preferred native riparian habitat would still be detrimental.[1]

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Mojave Region

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Lowland Riparian	86% (31/36)	6.1 (4.3 – 7.9)
Mesquite - Acacia	43% (6/14)	6.3 (-2.2 – 14.8)

Note: Lowland Riparian habitat as defined by the NBC includes mesquite – acacia habitat occurring within the riparian zone. Mesquite-Acacia refers exclusively to non-riparian stands of mesquite-acacia

- Densities up to 25 birds / ha [10 / ac] have been reported in optimal habitat[3]

Nevada-Specific Studies and Analyses

Landscape Associations (NBC Data)

Nearly all NBC transects with significant numbers of Lucy's Warblers had at least some Mojave Lowland Riparian habitat, including mesquite, present. The presence of this habitat type was the strongest explanatory factor for Lucy's Warbler abundance in the logistic regression model (*Appendix 3*). Transects closer to water also had significantly more Lucy's Warblers than those at greater distances from water. Mesquite-Acacia habitat (comprised exclusively of non-riparian mesquite stands) was also an important predictive variable after controlling for Lowland Riparian habitat.

Lucy's Warbler

Oreothlypus luciae

Main Threats and Challenges

Habitat Threats

- Loss or degradation of native riparian habitat (including mesquite) due to
  - Wood-cutting
  - Fire
  - Water diversions
  - Invasive plants
  - Recreational activities
- Loss of saltcedar habitat during restoration efforts, unless suitable restored habitat becomes available shortly after removal

Research, Planning, and Monitoring Challenges

- None identified

Conservation Strategies

Habitat Strategies

- Mojave Lowland Riparian (p. Hab-11-1) and Mesquite–Acacia (p. Hab-10-1) habitat conservation strategies benefit this species
- Protect mature mesquite stands and intact lowland riparian woodlands
- Restore native riparian woodlands (including mesquite), but do not remove large expanses of saltcedar within a short time frame; instead, stagger restoration spatially and temporally so that suitable new habitat can be created as saltcedar is removed

Research, Planning, and Monitoring Strategies

- Continue monitoring to better determine population size and trends
- Collect additional information on microhabitats selected
- Develop fire management and suppression priorities that favor the long-term persistence of mature riparian and mesquite woodlands

Public Outreach Strategies

- None identified

References: [1]Brand et al. (2010a); [2]GBBO unpublished Atlas data; [3]Johnson et al. (1997); [4]Meents et al. (1984); [5]Rich et al. (2004); [7]Sauer et al. (2008); [8]Shuford and Gardali (2008); [EO] Expert opinion

Hermit Warbler

Dendroica occidentalis

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Coniferous Forest	
Key Habitat Parameters ◑	
Plant Composition	Douglas fir, Jeffrey, ponderosa, and lodgepole pines, incense cedar, red fir
Plant Density	Closed-canopy stands preferred; understory apparently unimportant; typical foraging height 30 m [100 ft][4]
Mosaic	Largely unknown; prefers mid to late successional forests; avoids clearings and edges[4]
Distance to Water	No known relationship
Response to Vegetation Removal	Negative [EO]
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	> 50 ha [125 ac] [EO]
Home Range	0.35 ha [0.9 ac][4]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Small population size Restricted habitat Unknown population trend	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S2B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Trends	
Historical ○	Unknown
Recent ○	Stable in core of range, uncertain in Nevada[6]
Population Size Estimates	
Nevada (NBC) ◑	140
Global ◑	2,400,000 [5]
Percent of Global	< 1%
Population Objective	
Maintain / Increase[5, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Fair
Key Conservation Areas	
Protection	Carson Range
Restoration	Carson Range

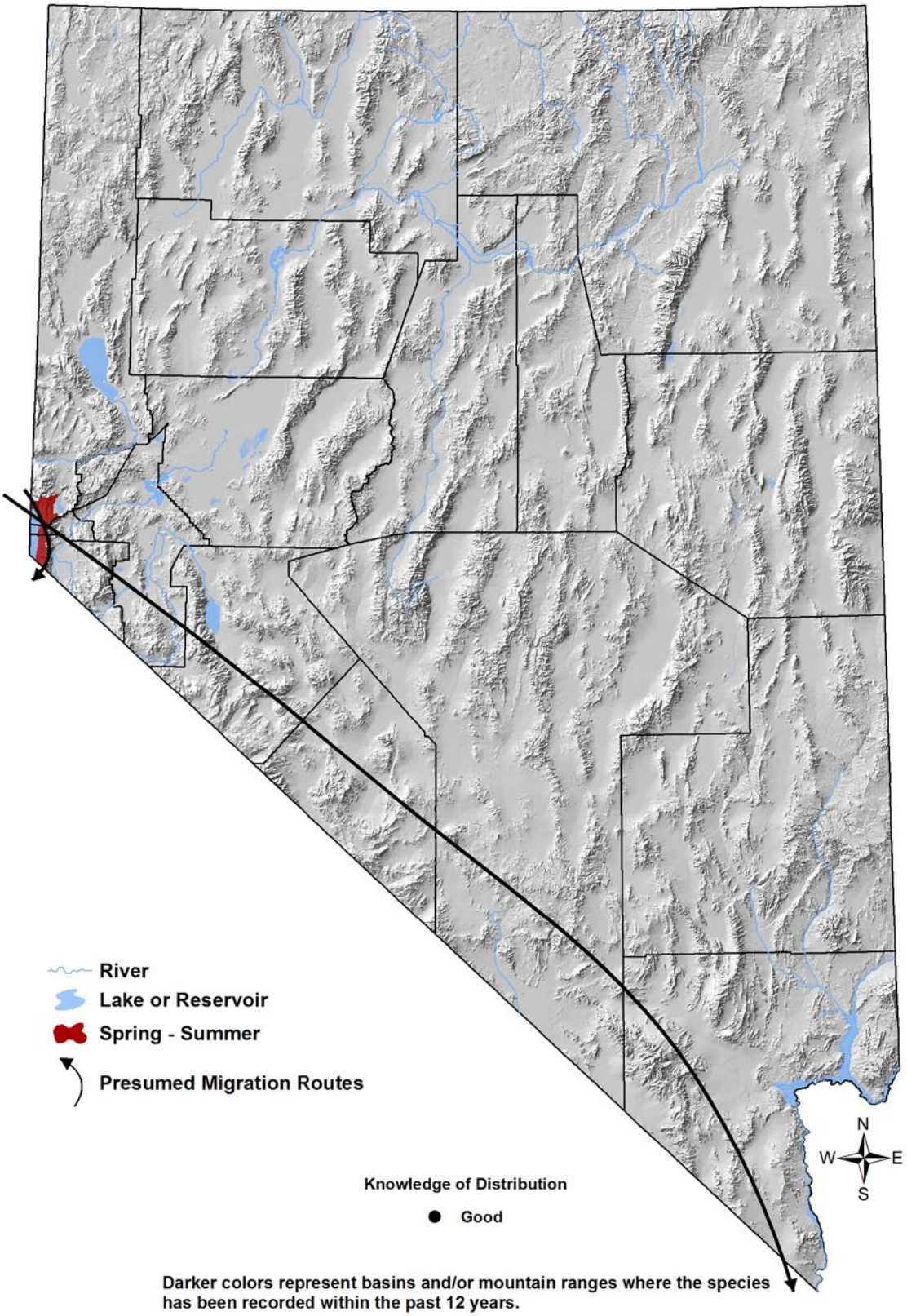
Natural History Profile

Seasonal Presence in Nevada	
Spring - Summer	
Known Breeding Dates in Nevada	
Mid-April – July[4]	
Nest and Nesting Habits	
Nest Placement	In live, dense conifer branch ≤ 7 m [23 ft] high;[4] no nests yet found in Nevada
Site Fidelity	Unknown
Food Habits	
Basic	Arboreal (canopy) gleaner
Primary Diet	Terrestrial arthropods[4]
Secondary Diet	n/a

Confidence in Available Data: ●High ◑Moderate ○ Low

Hermit Warbler

Dendroica occidentalis



Hermit Warbler

Dendroica occidentalis

Overview

Hermit Warblers breed in montane coniferous forests in the Pacific Northwest and the northern and central Sierra Nevada. Nevada's breeding population in the Carson Range is small and located at the periphery of the species geographical range. The Hermit Warbler is one of our very few presumed breeding birds for which a nest has yet to be located, due to its highly secretive nesting habits.

Hermit Warblers require large tracts of mature coniferous forest. They apparently tolerate moderate forest thinning or removal of trees in small patches,[7] but extensive thinning that creates a large amount of habitat edge is detrimental.[4] Likewise, stand-replacement fires will decrease the habitat suitability for Hermit Warblers.[2] It has also been shown to be negatively affected by development in the Lake Tahoe Basin.[3] Unlike most other warblers, this species rarely uses hardwood stands.[1] In July, after breeding is completed, Hermit Warblers often migrate upwards in elevation in small flocks that persist until the initiation of fall migration.[4]

The greatest needs for this species are to conserve larger tracts of mature coniferous forest in the Carson Range, and to expand monitoring efforts to better determine its population and conservation status.

Abundance and Occupancy by Habitat

- In some areas west of the Sierra crest, Hermit Warblers can be the most abundant bird species detected in some forests, with densities reported from 40 – 70 birds / 40 ha [0.4 – 0.7 / ac][4]

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Habitat threats have not been determined; possible threats include forest fragmentation due to fire, disease, or residential development

Hermit Warbler

Dendroica occidentalis

Research, Planning, and Monitoring Challenges

- Lack of specific knowledge about habitat requirements, area requirements, population trends, or threats in Nevada
- Secretive habits, dense habitat, and small numbers make the species more difficult to monitor than most other songbirds

Conservation Strategies

Habitat Strategies

- The Coniferous Forest (p. Hab-5-1) habitat conservation strategy benefits this species
- Protect and conserve mature coniferous forest in the Carson Range, with focus on closed-canopy stands of > 50 ha [125 ac]

Research, Planning, and Monitoring Strategies

- Increase monitoring coverage in the Carson Range to better determine population status and trends, and attempt to locate nests and quantify nesting microhabitat
- Determine minimum patch size requirements and preferred forest mosaic
- Conduct studies to determine Hermit Warbler response to forest thinning / fuel reduction
- Develop a fire management plan that promotes the long-term conservation of the Hermit Warbler's preferred forest type

Public Outreach Strategies

- None identified

References: [1]Airola and Barrett (1985); [3]Fontaine et al. (2009); [3]Manley et al. (2007); [4]Pearson (1997); [5]Rich et al. (2004); [6]Sauer et al. (2008); [7]Siegel and DeSante (2003); [EO]Expert opinion

Grace's Warbler

Dendroica graciae

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Coniferous Forest (Montane Riparian)	
Key Habitat Parameters ●	
Plant Composition	Ponderosa pine, white fir, bristlecone pine, juniper, pinyon pine
Plant Density	Park-like stands with 14 - 46 m [46 – 150 ft] spacing between large trees; average 46% canopy closure, ~ 911 trees / ha [370 / ac], 80 snags / ha [32 / ac][7]
Mosaic	Trees of mixed age and size classes[6]
Slope, Aspect	Average 10%, north or east[7]
Distance to Water	Available information is contradictory[7, EO]
Response to Vegetation Removal	Positive to thinning of overgrown stands, negative to complete removal [EO]
Area Requirements ◑	
Minimum Patch Size	Unknown, but assumed to require large area [EO]
Recommended Patch Size	100 ha [250 ac] [EO]
Territory Size	1 – 6.25 ha [2.5 - 15 ac][7]

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Small population size Restricted habitat Possible habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S2B
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Trends	
Historical ○	Unknown[6]
Recent ◑	Stable or slowly declining[6, 7]
Population Size Estimates	
Nevada (NBC) ◑	610
Global ◑	1,000,000 [4]
Percent of Global	< 1%
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good / Fair
Key Conservation Areas	
Protection	Spring Mountains, Sheep Range, Clover Mountains
Restoration	Same

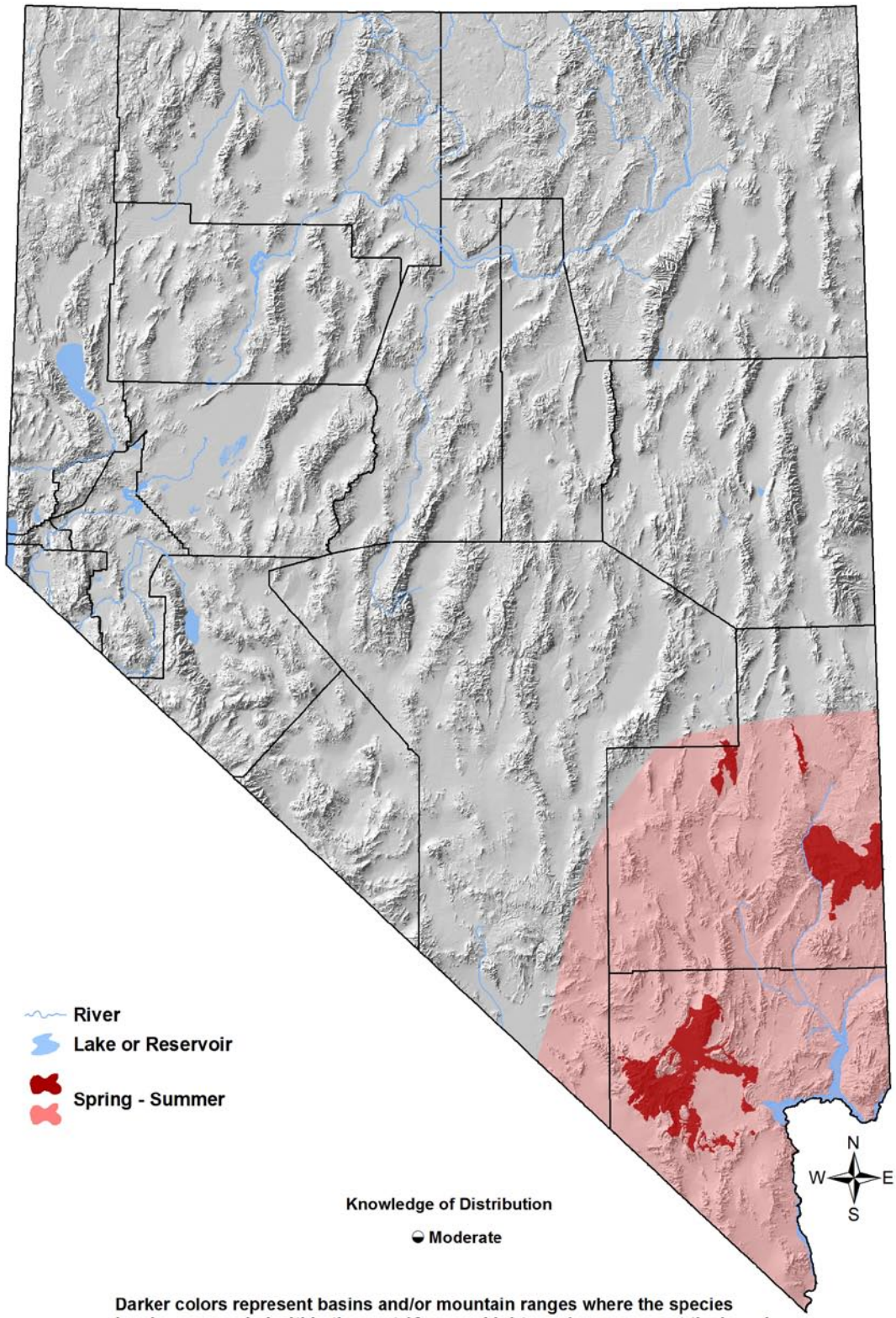
Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Late April – late July[1, EO]	
Nest and Nesting Habits	
Nest Placement	In live conifer branch, 6 - 18 m [20 – 60 ft] off ground[7]
Site Fidelity	Unknown
Food Habits	
Basic	Arboreal gleaner
Primary Diet	Arboreal arthropods[7]
Secondary Diet	n/a

Confidence in Available Data: ●High ◑Moderate ○ Low

Grace's Warbler

Dendroica graciae



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Grace's Warbler

Dendroica graciae

Overview

Grace's Warblers may have reached southern Nevada only during the last 50 years as the result of a northward range expansion.[2] They are still not very numerous in the state, and exhibit substantial annual variation in numbers.[7] Grace's Warblers are largely restricted to ponderosa pine forests with tall trees, but beyond this, many aspects of their habitat needs and conservation status have not been well characterized, particularly in Nevada.[7] The species has been documented in a relatively small number of mountain ranges, and additional work needs to be done to determine whether Grace's Warblers breed in other southern ranges that provide appropriate habitat.

The response of Grace's Warbler to fire will depend on both severity and spatial scale of the disturbance as well as pre-fire forest structure. In general, low-severity fires that help maintain open pine forest structure should be beneficial, and high-severity fires that threaten the limited ponderosa pine forests in Nevada should be detrimental. However, studies of the effect of moderate to severe fire in Arizona are ambiguous.[3, 5] More study is required to identify the most beneficial fire management practices Although the PIF continental population objective for the species is to increase numbers by 50%,[3] maintaining current numbers in Nevada is a more reasonable goal given the limited opportunities for creating new habitat.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Mojave Region

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Coniferous Forest	75% (3/4)	1.1 (0.8 – 1.4)
Montane Riparian	22% (2/9)	1.0 (n/a)

Nevada-Specific Studies and Analyses

No information

Main Threats and Challenges

Habitat Threats

- Threats are poorly known.[7] Issues of possible concern include:
  - Loss of park-like ponderosa pine forests to large, intense fires
  - Loss of surface water sources within forests due to diversions or plugging of springheads
  - Urban encroachment in the Spring Mountains
  - Outbreaks of conifer pathogens and insects causing forest degradation

Grace's Warbler
Dendroica graciae

Research, Planning, and Monitoring Challenges

- Uncertainty about distribution, population size, trends, and conservation threats
- Uncertainty about most appropriate fire management strategies
- The possible importance of montane riparian habitat and proximity of water needs clarification

Conservation Strategies

Habitat Strategies

- The Coniferous Forest (p. Hab-5-1) habitat conservation strategies benefit this species
- Maintain ponderosa pine forests in occupied range (especially in the Key Conservation Areas, see above) in healthy condition with multiple age classes, large trees, and adequate regeneration
- Moderate silvicultural thinning to open forest structure can be beneficial if existing forest tree density is high[7]

Research, Planning, and Monitoring Strategies

- Continue current monitoring to better document trends and population size
- Investigate other possible breeding locations within potential breeding range (see map above), including the Virgin, Hiko, and Grant ranges
- Determine fire management rules to benefit the species and promote long term persistence of healthy ponderosa pine forests
- Conduct research to determine whether availability of montane riparian habitat and water sources are important to Grace's Warblers
- Assuming that water sources are beneficial, protect or restore springheads in the Spring Mountains and Sheep Range

Public Outreach Strategies

- None identified

References: [1]GBBO unpublished Atlas data; [2]Johnson (1994); [3]Kirkpatrick et al. (2006); [4]Rich et al. (2004); [5]Saab et al. (2007); [6]Sauer et al. (2008); [7]Stacier and Guzy (2002); [EO] Expert opinion

Green-tailed Towhee

Pipilo chlorurus

Photo by Bob Goodman

Habitat Use Profile

Habitats Used in Nevada	
Montane Shrubland Aspen Pinyon-Juniper Montane Riparian	
Key Habitat Parameters ●	
Plant Composition	Aspen, currants, willows, alder, sagebrush, squawbush, other montane riparian and transitional shrubs; high species richness of shrubs preferred[3]
Plant Density & Height	High density shrub cover, 0.5 – 1.5 m [1.6 – 5 ft] tall[1]
Mosaic	Patches of different montane shrub species[1, 3]
Distance to Water	Water or mesic habitats usually within 1 km [0.6 mi][3]
Response to Vegetation Removal	Positive in coniferous forest canopy, if shrub layer benefits; negative for shrub removal[1]
Area Requirements ◑	
Minimum Patch Size	Unknown
Recommended Patch Size	> 10 ha (22 ac) [EO]
Territory Size	Averages 0.9 ha [2.2 ac][1]

Conservation Profile

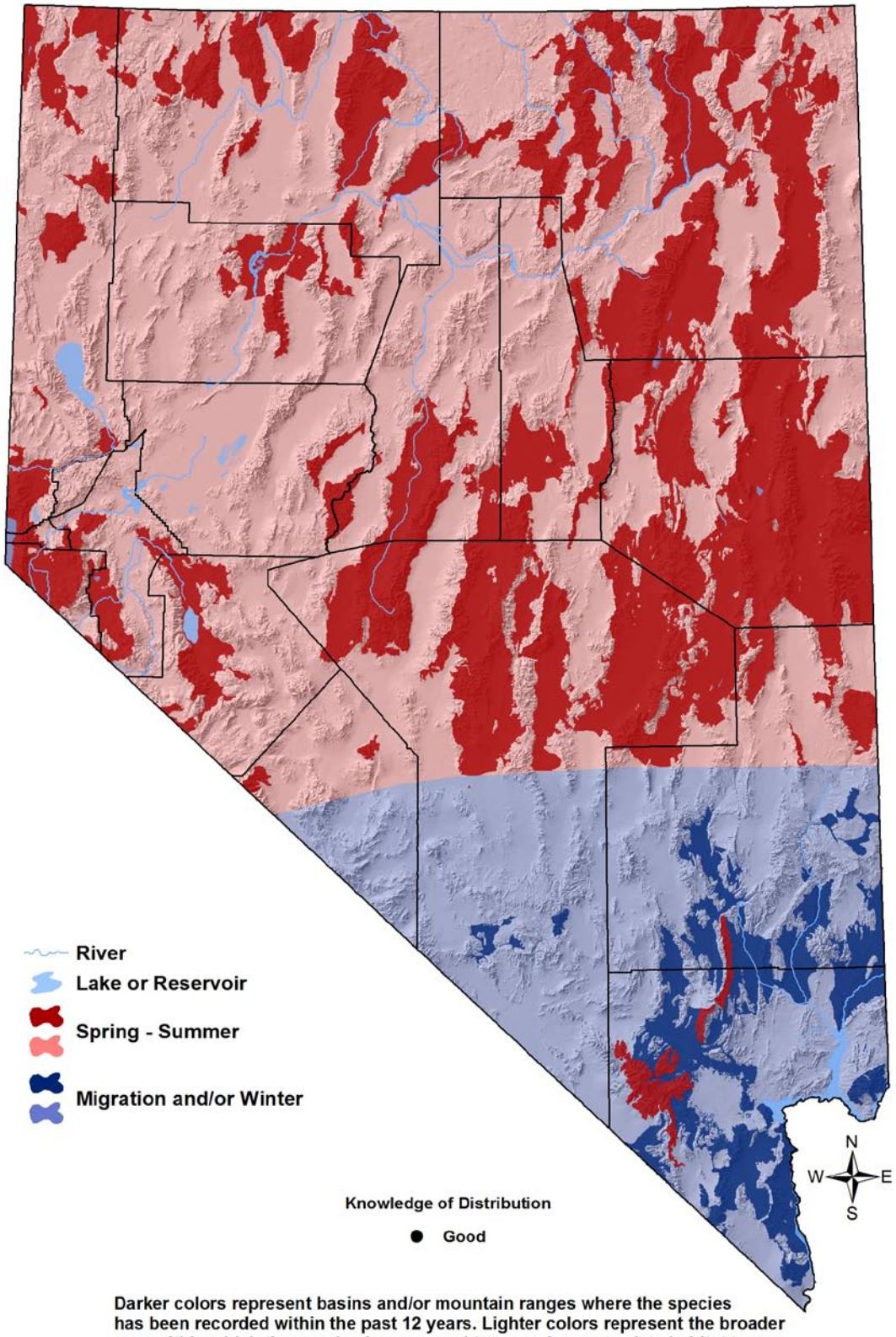
Priority Status	
Stewardship Species	
Species Concerns	
High stewardship responsibility Historical declines	
Other Rankings	
Continental PIF	Stewardship
Audubon Watchlist	None
NV Natural Heritage	None
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	Stewardship
Trends	
Historical ◑	Probable declines[1]
Recent ○	Stable[1, 8]
Population Size Estimates	
Nevada (NBC) ◑	885,000
Global ◑	4,100,000 [7]
Percent of Global	22%
Population Objective	
Maintain [7, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Great Basin montane riparian, aspen, montane shrubland habitat
Restoration	Great Basin montane riparian and aspen woodlands

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer (Great Basin) Winter (Mojave)	
Known Breeding Dates in Nevada	
Mid-May – early August[2]	
Nest and Nesting Habits	
Nest Placement	On or within 1 m [3 ft] of ground in or under dense shrub[1]
Site Fidelity	Moderate for breeding territory[1]
Food Habits	
Basic	Ground or near-ground forager
Primary Diet	Terrestrial arthropods, seeds[1]
Secondary Diet	Fruit [1]

Green-tailed Towhee

Pipilo chlorurus



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Green-tailed Towhee

Pipilo chlorurus

Overview

The Green-tailed Towhee is nearly always found within dense shrub cover in montane settings, especially in transitional zones that feature high shrub species diversity, interspersed trees, and a high proportion of edge habitat. As such, this bird's distribution patterns do not neatly align with standard habitat type categories. For instance, favored habitat in northwestern Nevada has been described as ecotones between "sagebrush and other shrub species, especially mountain mahogany",[6] whereas in southeastern Oregon, Green-tailed Towhees were shown to prefer intermediate levels of juniper cover.[6] Green-tailed Towhees were recorded on many different NBC-defined habitat types, as shown in the table below.

Beyond the general preference for dense, diverse cover of montane shrubs, there is surprisingly little detailed information about habitat use of Green-tailed Towhees, especially given that the species is widespread and relatively common. Nevada, as the home of about one-fifth of the global breeding population, therefore has an opportunity to make significant contributions to our knowledge about this bird and to its conservation. Fortunately, current trends appear to be stable, and habitat threats to montane shrublands appear overall less severe than for many other habitat types.

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Montane Shrubland	75% (15/20)	8.6 (4.8 – 12.4)
Montane Riparian	57% (50/88)	4.7 (3.5 – 5.9)
Aspen	83% (15/18)	5.9 (3.8 – 8.0)
Coniferous Forest	47% (9/19)	2.1 (0.0 – 4.4)
Pinyon-Juniper	59% (41/70)	6.6 (4.9 – 8.3)
Mojave		
Montane Shrubland	75% (6/8)	5.1 (0.0 – 13.8)
Montane Riparian	67% (6/9)	0.3 (0.1 – 0.5)
Aspen	86% (6/7)	3.6 (2.0 – 5.2)
Coniferous Forest	75% (3/4)	3.2 (2.6 – 3.8)
Pinyon-Juniper	58% (7/12)	0.9 (0.3 – 1.5)

Green-tailed Towhee

Pipilo chlorurus

Nevada-Specific Studies and Analyses

Landscape Associations (NBC data)

Green-tailed Towhees had positive associations (*Appendix 3*) with several different habitat types that often contain dense shrub layers, including Montane Shrubland, Pinyon-Juniper, Mountain Mahogany (an NBC-defined habitat type, and subset of Pinyon-Juniper habitat as defined in this plan), Montane Riparian, and Aspen. As in other parts of its range, Green-tailed Towhees appear to use openings in coniferous forests in Nevada, although their density in such settings is usually lower than in other montane habitat types. Green-tailed Towhees were somewhat more common on transects closer to water, and were most numerous on transects characterized by a diversity of available habitat types.

Main Threats and Challenges

Habitat Threats

- Historically, loss of shrublands is thought to have reduced Green-tailed Towhee numbers, but current threats are not well characterized[1]
- Reduction in fire return intervals due to fire suppression may have reduced landscape complexity and diversity in the long-term, but prescribed fire has been shown to have a negative effect on Green-tailed Towhees for at least five years after the initial fire[4]
- Heavy grazing or browsing that reduces shrub cover or diversity may negatively impact this bird

Research, Planning, and Monitoring Challenges

- Substantial additional research is needed to better defined this species' microhabitat preferences, and to quantify its preferred landscape mosaic
- Additional studies are needed to determine the nature and severity of any current habitat threats
- Additional research is needed to determine the most beneficial long-term fire regime for diverse montane shrubland systems, and to develop a fire-management plan that incorporates these findings

Green-tailed Towhee

Pipilo chlorurus

Conservation Strategies

Habitat Strategies

- Montane Shrubland (p. Hab-14-1), Montane Riparian (p. Hab-13-1), Aspen (p. Hab-3-1), and Pinyon-Juniper (p. Hab-16-1) habitat conservation strategies benefit this species
- Conserve and protect montane areas with diverse, dense shrubs and interspersion of habitat types
- Manage livestock grazing to maintain dense shrub layers within Aspen and Montane Riparian habitats

Research, Planning, and Monitoring Strategies

- Continue monitoring to detect any changes from current population stability
- Conduct research to:
    - Better determine microhabitat preferences and quantify preferred landscape mosaic
    - Further investigate possible habitat threats
    - Identify preferred fire regime for montane shrubland systems to maintain long-term shrub and habitat diversity

Public Outreach Strategies

- None identified

References: [1]Dobbs et al. (1998); [2]GBBO unpublished Atlas data; [3]GBBO unpublished NBC data; [4]Jehle et al. (2006); [5]Knopf et al. (1990); [6]Noson et al. (2006); [7]Rich et al. (2004); [2]Sauer et al. (2008); [EO] Expert opinion

Green-tailed Towhee

Pipilo chlorurus

Green-tailed Towhee habitat in western Nevada. Photo by Elisabeth Ammon.

Abert's Towhee

Melozone aberti

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Mojave Lowland Riparian Mesquite-Acacia Springs (Agriculture)	
Key Habitat Parameters ◑	
Plant Composition	Willow, cottonwood, mesquite, acacia, saltcedar, quailbush, and other dense, mesic or semi-mesic shrubs and small trees[7]
Plant Density	Dense shrub and forb/grass cover
Mosaic	No known landscape mosaic requirements
Distance to Water	Most abundant close to water [EO]
Response to Vegetation Removal	Negative to shrub/understory removal[7]
Area Requirements ○	
Minimum Patch Size	Unknown, estimated 3 ha [7 ac] [EO]
Recommended Patch Size	> 20 ha [50 ac] [EO]
Territory Size	1.2 ha [3.0 ac][7]

Conservation Profile

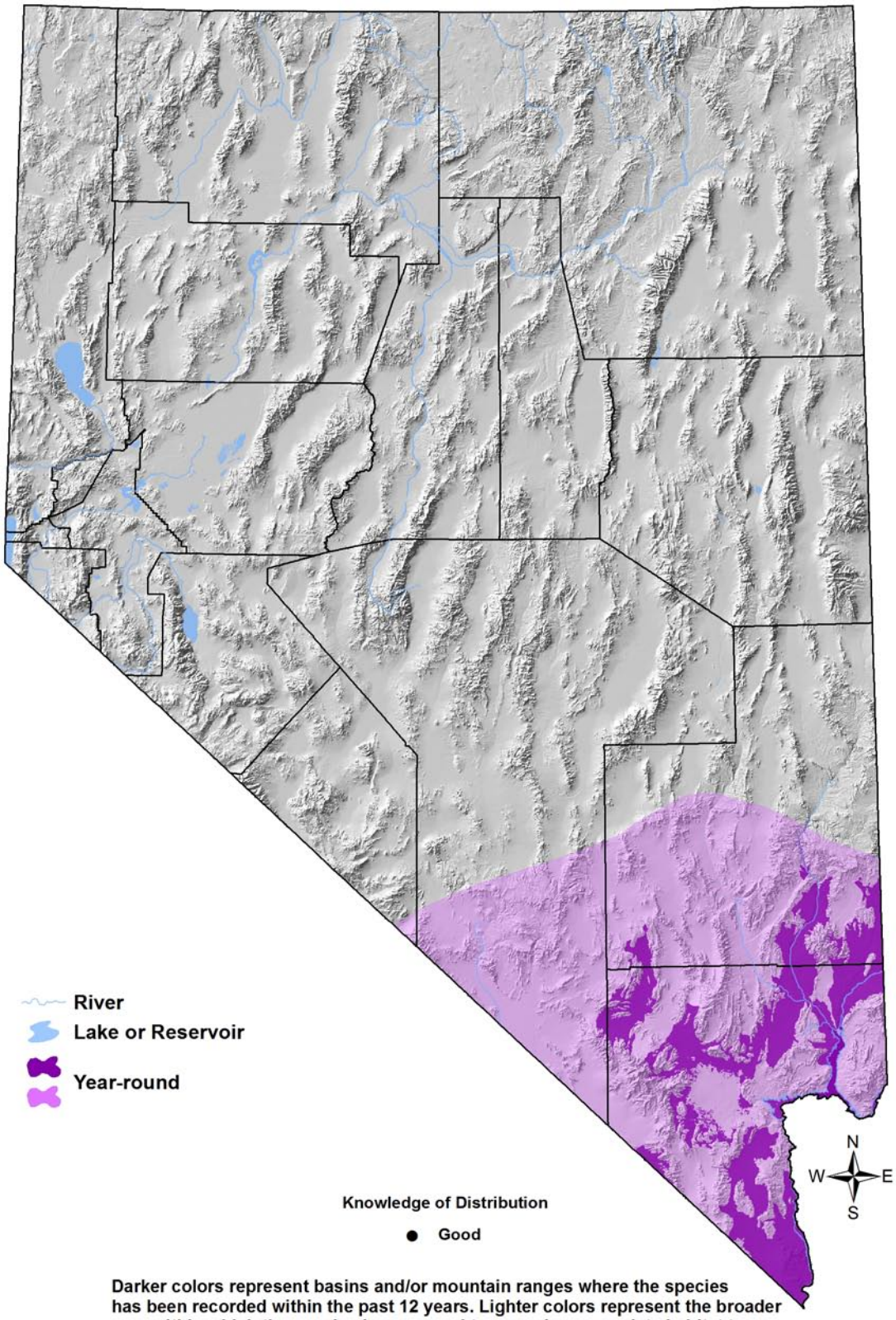
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical declines Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S3
USFWS	Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Trends	
Historical ●	Rangewide declines[7]
Recent ●	Stable[6]
Population Size Estimates	
Nevada (NBC) ◑	2,300
Global ◑	210,000 [5]
Percent of Global	1%
Population Objective	
Maintain / Increase [5, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Muddy and Virgin Rivers, Mesquite-Acacia washes
Restoration	Muddy and Virgin Rivers, Springs

Natural History Profile

Seasonal Presence in Nevada	
Year-round	
Known Breeding Dates in Nevada	
Early April – early August[2]	
Nest and Nesting Habits	
Nest Placement	In dense shrub or tree, 1.5-2.5 m [4.9 – 8.2 ft] above ground[7]
Site Fidelity	High; species is sedentary with year-round residency
Other	Usually nests near water[7]
Food Habits	
Basic	Ground / litter forager
Primary Diet	Invertebrates[7]
Secondary Diet	Seeds, especially outside the breeding season[7]

Abert's Towhee

Melozone aberti



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Abert's Towhee

Melozone aberti

Overview

In southern Nevada, Abert's Towhees occur in dense, shrubby riparian vegetation up to 1,300 m [4,300 ft] in elevation,[7] and are especially numerous in the Colorado, Muddy, and Virgin River Valleys, and in the Las Vegas Wash. They also occur in smaller riparian and spring areas, Mesquite-Acacia washes characterized by dense understory, and in some agricultural lands.

Ideal habitat is characterized by high foliage density at the shrub and ground level, presence of cottonwoods and willows, and nearby water.[4] However, like several other southern Nevada riparian birds, Abert's Towhee has adapted to saltcedar stands in areas where native riparian vegetation has been lost or severely degraded. In such cases, it is important that efforts to restore native vegetation avoid removing large saltcedar stands very rapidly. Restoration should instead occur in a stepwise manner to ensure that a significant amount of usable habitat is always present in the project area. Unintended defoliation of saltcedar by biocontrol agents (see Willow Flycatcher account for details, pp. Spp-59-1) poses similar risks. Fortunately, Abert's Towhee responds very well to most riparian restoration efforts, including those that target Southwestern Willow Flycatcher.[7] For example, densities of Abert's Towhees doubled on the San Pedro River in Arizona only three years after cattle were removed to allow for recovery of riparian shrubs and ground covers.[3]

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Mojave Region

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Lowland Riparian	50% (18/36)	5.3 (3.3 – 7.3)
Agriculture	80% (4/5)	2.6 (0.6 – 4.6)
Mesquite-Acacia	14% (2/14)	0.5 (n/a)

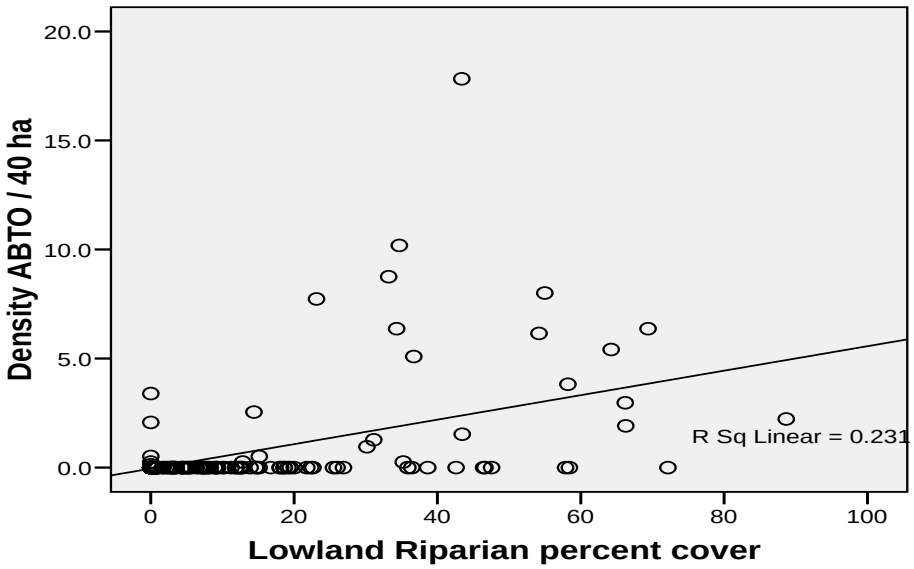
Nevada-Specific Studies and Analyses

Landscape Associations (NBC data)

The density of Abert's Towhee was statistically related to the amount of Lowland Riparian habitat present within survey transects (see figure below). Strong correlations were also found with the amount of Agricultural habitat present and the proximity to water (*Appendix 3*).

Abert's Towhee

Melozone aberti



Main Threats and Challenges

Habitat Threats

- Heavy livestock grazing that significantly reduces foliage density in the shrub and ground cover layers [EO]
- Water diversions or groundwater pumping that lower water tables and reduce density of native riparian shrubs, forbs, and grasses.[EO] Saltcedar is more resistant to these impacts[1]
- Flood control and other channel engineering activity that physically damage habitat or alter hydrology [EO]
- Removal of large areas of saltcedar without revegetation efforts of native riparian habitat
- Loss of habitat to fire

Research, Planning, and Monitoring Challenges

- Patch size and landscape mosaic preferences are not well characterized
- Factors promoting the use of agricultural lands and mesquite-acacia washes are not explicitly known, although foliage density of understory and ground cover is important

Abert's Towhee

Melozone aberti

Conservation Strategies

Habitat Strategies

- Mojave Lowland Riparian (p. Hab-11-1), Mesquite-Acacia (p. Hab-10-1), and Springs (p. Hab-19-1) habitat conservation strategies benefit this species
- Manage livestock grazing and other land uses to maintain dense riparian shrub and ground cover
- Pursue restoration of native riparian habitat in suitable areas, such as Las Vegas Wash and other revegetation projects. Where saltcedar is removed, ensure that native habitat is restored in a timely manner

Research, Planning, and Monitoring Strategies

- In situations where water diversions or groundwater pumping may lower water tables or impact riparian shrubs, monitor for impacts on Abert's Towhees
- Develop fire management strategies that emphasize the protection of native riparian habitat
- Conduct additional research on the factors that promote Abert's Towhee use of agricultural lands and mesquite-acacia habitat

Public Outreach Strategies

- None identified

References: [1]Brand et al. (2010); [2]GBBO unpublished Atlas data; [3]Krueper et al. (2003); [4]Meents et al. (1981); [5]Rich et al. (2004); [6]Sauer et al. (2008); [7]Tweit and Finch (1994); [EO]Expert opinion

Abert's Towhee

Melozone aberti

Mojave Lowland Riparian Habitat. Photo by Jen Ballard.

Brewer's Sparrow

Spizella breweri

Photo by Jacque Lowery

Habitat Use Profile

Habitats Used in Nevada	
Montane Shrubland (primarily montane sagebrush) Sagebrush Salt Desert Scrub	
Key Habitat Parameters ●	
Plant Composition	Sagebrush, greasewood, perennial upland grasses
Plant Density & Size	High shrub density preferred, shrub canopy height usually < 1.5 m [5 ft][9]
Mosaic	Bare ground avoided[9]
Distance to Water	More likely to be present < 1 km [0.6 mi] from water[3]
Response to Vegetation Removal	Negative to all reduction in plant cover[9]
Area Requirements ◑	
Minimum Patch Size	Unknown; estimated at 20 ha [50 ac][EO]
Recommended Patch Size	> 150 ha [370 ac][EO]
Territory Size	0.5-2.4 ha [1.2 – 5.9 ac][9]

Conservation Profile

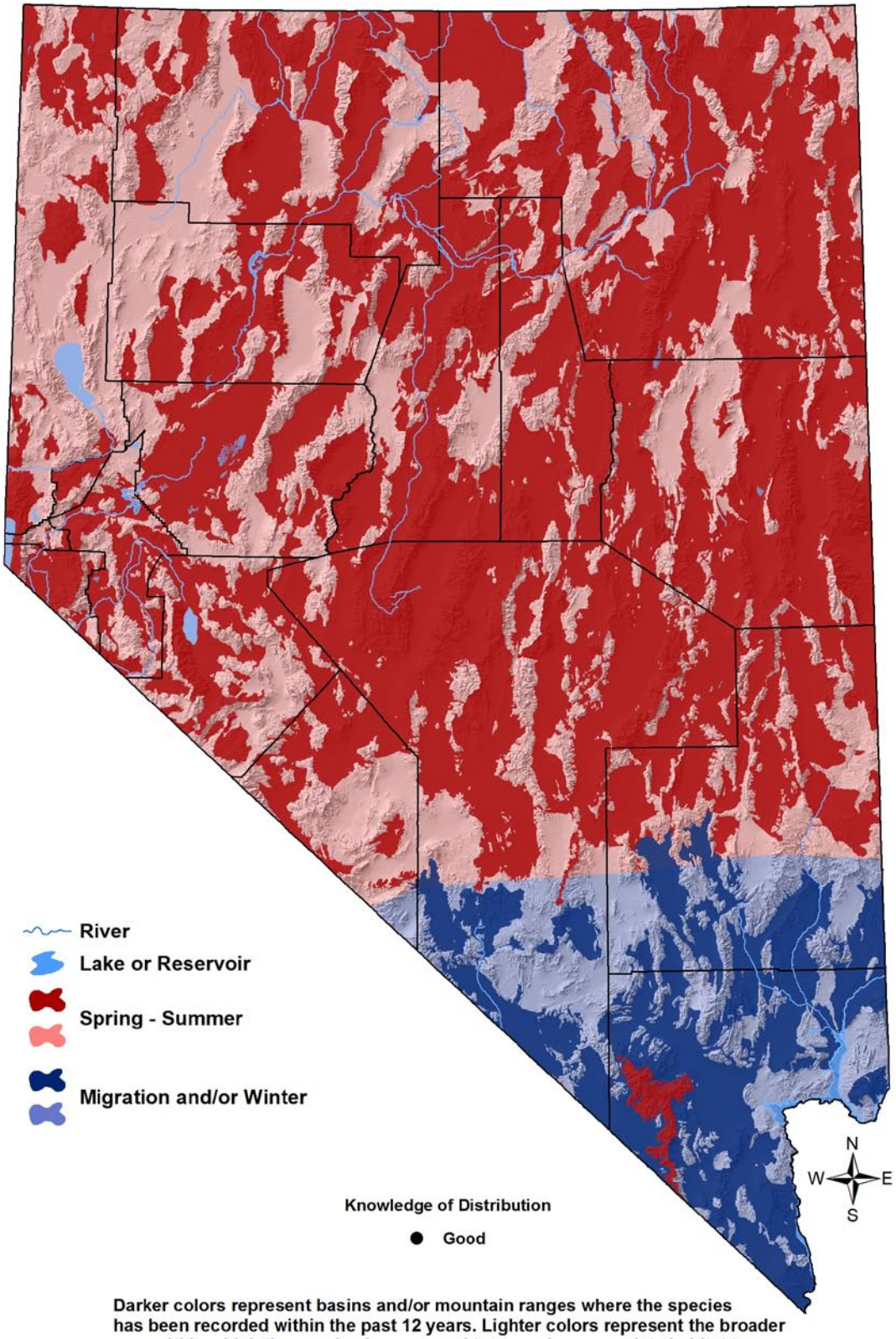
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and recent declines Habitat threats High stewardship responsibility	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Yellow
NV Natural Heritage	S4B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Trends	
Historical ●	Rangewide declines since 1968 [9, 10]
Recent ●	Declines of 2% / year across West[10]
Population Size Estimates	
Nevada (NBC) ◑	7,400,000
Global ◑	16,000,000 [8]
Percent of Global	> 40%
Population Objective	
Increase by 20% [EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Montane shrubland and high-quality sagebrush in Great Basin
Restoration	Degraded sagebrush, particularly if close to water

Natural History Profile

Seasonal Presence in Nevada	
Spring-Summer (Great Basin) Winter (Mojave)	
Known Breeding Dates in Nevada	
Mid April – early August[2]	
Nest and Nesting Habits	
Nest Placement	In dense crown of tall shrub, about 0.7 m [2.3 ft] off-ground[9]
Site Fidelity	Moderate for breeding territory[9]
Food Habits	
Basic	Shrub gleaner and forager
Primary Diet	Insects within shrub layer[9]
Secondary Diet	Small seeds[9]

Brewer's Sparrow

Spizella breweri



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Brewer's Sparrow

Spizella breweri

Overview

One of Nevada's most widely distributed and abundant birds,[1] the Brewer's Sparrow is nonetheless a conservation concern due to ongoing regional and rangewide declines,[10] along with the fact that Nevada hosts approximately 40% of the global breeding population. The Nevada Bird Count and Nevada Breeding Bird Atlas project extended the Brewer's Sparrow's confirmed breeding range to southern Nevada, although it is far more abundant in the Great Basin portion of the state. Brewer's Sparrows are attracted to sagebrush in many different settings, not only within the relatively monotypic "sagebrush sea" of the valley floors.[5] For instance, NBC data indicate that Brewer's Sparrows have especially high breeding densities in montane sagebrush (which occurs within the NBC-defined Montane Shrubland habitat type),[3] and they even occur in sagebrush-dotted meadows that are embedded within conifer forest zones, provided that the meadows are not highly isolated.[12] Proximity to forest edge, however, appears to increase the potential for nest predation, and Brewer's Sparrow densities and nest success rates are consequently highest in treeless areas.[6]

Although the Brewer's Sparrow uses a wider variety of landscapes and is probably less sensitive to fragmentation than the Sage Sparrow,[5] the species is still most abundant in relatively large habitat patches, and it is negatively affected by the widespread loss and degradation of high-quality sagebrush habitat.[7] Several studies provide insight about the Brewer's Sparrow's landscape and patch-size affinities. For instance, one study in eastern Washington showed that reproductive success was lower in landscapes fragmented by agriculture than in continuous shrubsteppe landscapes.[11] Others demonstrated in a somewhat contradictory fashion that while Brewer's Sparrows generally decline after large-scale burns,[4] they may not be seriously affected by patchier burn patterns affecting < 50% of the landscape, as long as the unaffected areas provide the habitat structure required by nesting birds.[6] Nevada Bird Count analyses and other sources[7] indicate that Brewer's Sparrows are most abundant when the landscape mosaic provides varying shrub densities, and furthermore, that they are most likely to occur within 1,000 m [3,300 ft] of surface water.[3]

Threats to Brewer's Sparrow are primarily those that result in the loss or degradation of mature sagebrush cover,[7] which the species uses almost exclusively during the breeding season. Although PIF's "North American Landbird Conservation Plan" [8] suggested a population objective of "Increase by 100%" for the Brewer's Sparrow, we believe that in Nevada, a more realistic goal is a population increase of 20% , which could be achieve through restoration or regeneration of habitat lost to fire over the last decade, coupled with improved livestock management.

Abundance and Occupancy by Habitat

Brewer's Sparrows occurred on fourteen different NBC-defined habitat types, generally as a function of the sagebrush patches that were embedded within or located in

juxtaposition to the dominant vegetation. Densities in the table below are shown only for habitats with a large sagebrush component.

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Sagebrush	94% (31/33)	16.0 (11.1 – 20.9)
Montane Shrubland	85% (17/20)	24.6 (15.2 – 34.0)
Pinyon-Juniper	54% (38/70)	7.9 (5.3 – 10.5)
Salt Desert	74% (17/23)	10.7 (6.7 – 14.7)
Mojave		
Sagebrush	85% (22/26)	21.2 (14.3 – 28.1)
Montane Shrubland	75% (6/8)	10.0 (0.0 – 21.4)

Nevada-Specific Studies and Analyses

Habitat Requirements (NBC data)

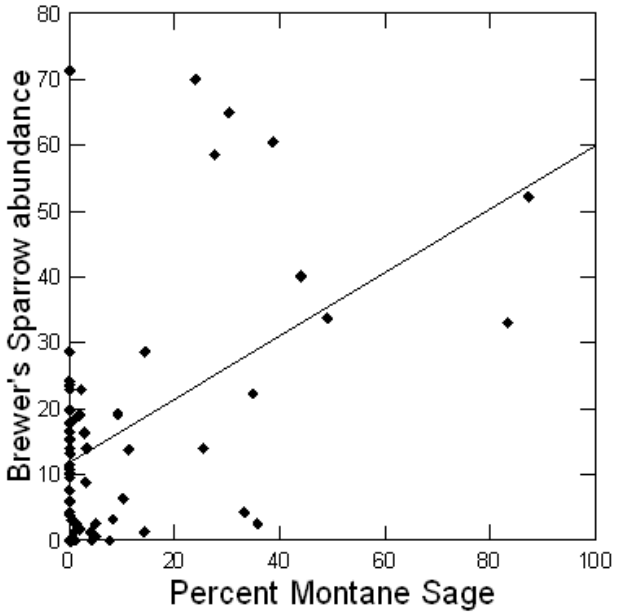
According to logistic regression analysis (*Appendix 3*). Brewer's Sparrows were more likely to be detected on sites with fewer trees ($p < 0.001$), greater sagebrush heights ($p < 0.001$), and the presence of surface water within 1 km [0.6 mi] ($p < 0.001$) as compared to non-detection sites. Litter cover, however was a poorer predictor ($p = 0.09$). The odds of finding Brewer's Sparrows within 1 km of surface water were very high. It is unclear whether the association of Brewer's Sparrow with proximity of water was due to the physical availability of water itself, or an indirect result of better shrub cover in areas that are closer to water.

Landscape Associations (NBC data)

Although ubiquitous in valley-floor Sagebrush habitat ($p < 0.001$), the Brewer's Sparrow had an even stronger positive relationship with montane sagebrush (when separated out from the Montane Shrubland habitat type; see graph below). Thus the Brewer's Sparrow exhibits a much wider use of the full elevational range of sagebrush vegetation than either the Sage Thrasher or Sage Sparrow Associations were still positive, but not as strong, for landscapes with significant pinyon-juniper ($p = 0.07$) or lowland riparian ($p = 0.04$) components after controlling for sagebrush. The Brewer's Sparrow's association with Salt Desert was less pronounced than was the case for Sage Sparrow and Sage Thrasher. At the landscape scale (10 km [6.2 mi]), Brewer's Sparrows were not as strongly associated with proximity to water as they were in the microhabitat analysis described above (*Appendix 3*).

Brewer's Sparrow

Spizella breweri



Main Threats and Challenges

Habitat Threats

Loss, degradation, or possibly fragmentation of high-quality sagebrush and montane sagebrush shrubland due to:

- Fire
- Invasive plants, especially cheatgrass
- Expansion of pinyon-juniper woodland into sagebrush
- Heavy livestock grazing
- Heavy OHV use

It is likely that some of these threats are more pronounced and require more management attention in lowland sagebrush habitat than in montane sagebrush.

Research, Planning, and Monitoring Challenges

- Uncertainty about the Brewer's Sparrows sensitivity to habitat fragmentation, and of minimum acceptable patch sizes
- Further research is needed to determine the best management strategies for the pinyon-juniper / sagebrush interface zone for multi-species benefits
- Although short-term fire management strategies are established, further research and planning is needed to clarify the most beneficial longer-term fire management strategies that protect important habitat while promoting its long-term viability

Brewer's Sparrow

Spizella breweri

Conservation Strategies

Habitat Strategies

- Montane Shrubland (p. Hab-14-1), Sagebrush (p. Hab-17-1), and Salt Desert Scrub (p. Hab-18-1) habitat conservation strategies benefit this species
- Protect large expanses of high-quality sagebrush (see below) from fire to the extent possible
- Within large expanses of high-quality sagebrush with few invasive plants, attempt to channel activities that can promote establishment or maintenance of cheatgrass, including heavy livestock grazing and heavy OHV use, to areas that are already degraded
- Where pinyon-juniper encroachment is known to have recently occurred within high-quality sagebrush habitat, conduct pinyon-juniper removal projects. However, we recommend that pinyon-juniper management projects consider the importance of maintaining a natural, interspersed interface zone between sagebrush shrublands and pinyon-juniper woodlands, as discussed in the Pinyon-Juniper (p. Hab-16-1) habitat account

Research, Planning, and Monitoring Strategies

- Identify and map large patches of intact, mature sagebrush that contain dense shrubs and little cheatgrass
- Develop a fire management strategy that ensures that high-quality sagebrush habitat receives priority fire suppression efforts in the immediate future. Additionally, develop fire management strategies that balance the need for short-term habitat protection with long-term habitat viability
- Conduct additional research to determine how to pinyon-juniper management projects can both benefit Brewer's Sparrows as well as the suite of birds that use the pinyon-juniper / sagebrush interface zone (see p. Hab-16-1)
- Continue monitoring to better determine phenology and extent of breeding in southern Nevada

Public Outreach Strategies

- None identified

References: [1]Floyd et al. (2007); [2]GBBO unpublished Atlas data; [3]GBBO unpublished NBC data; [4]Holmes (2007); [5]Knick and Rotenberry (1995); [6]Knick et al. (2005); [7]Paige and Ritter (1999); [8]Rich et al. (2004); [9]Rotenberry et al. (1999); [10]Sauer et al. (2008); [11]Vander Haegan (2007); [12]Wilson et al. (2009); [EO] Expert opinion

Black-chinned Sparrow

Spizella atrogularis

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Pinyon-Juniper Montane Shrubland Joshua Tree	
Key Habitat Parameters ◑	
Plant Composition	Pinyon pine, juniper, ponderosa pine, manzanita, yucca, sagebrush, and variety of other xeric shrubs;[8] high shrub diversity probably preferred [EO]
Plant Density	Open tree canopy (closed-canopy stands avoided), dense shrub canopy at 1-2 m [3 – 7 ft] height[8]
Mosaic	Mature, open woodland interspersed with open patches containing dense shrubs[2, 8]
Aspect	South-facing slopes probably preferred[8]
Response to Vegetation Removal	Negative [EO]
Area Requirements ○	
Minimum Patch Size	Unknown; estimated at 20 ha [50 ac][EO]
Recommended Patch Size	> 100 ha [250 ac][EO]
Territory Size	1.6 - 4 ha [4 - 10 ac][8]

Conservation Profile

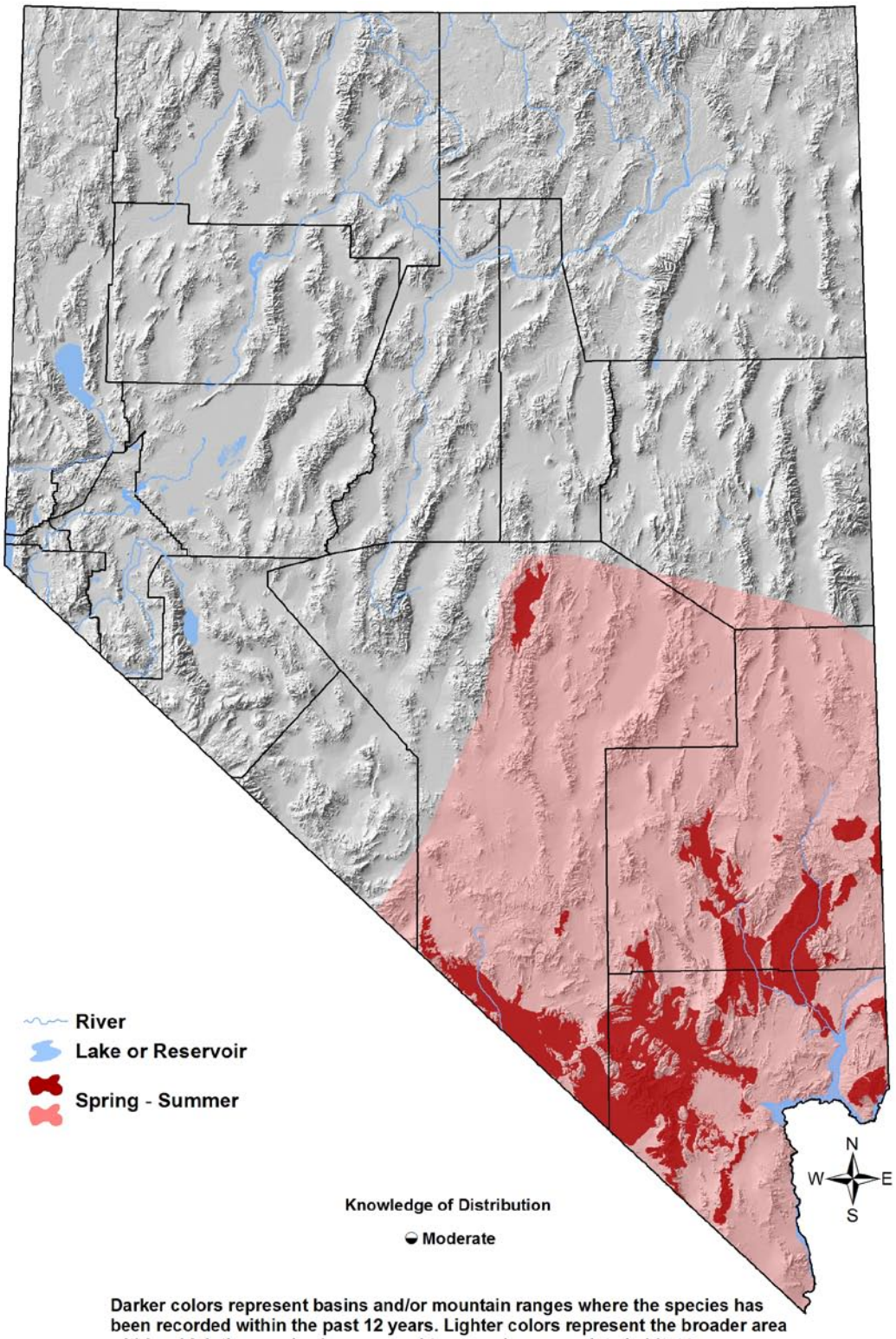
Priority Status	
Conservation Priority Species	
Species Concerns	
Probable Recent Declines Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Red
NV Natural Heritage	S3B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Trends	
Historical ○	Unknown
Recent ○	Rangewide declines of 5%/year, declines probable but not confirmed in Nevada[7, EO]
Population Size Estimates	
Nevada (NBC) ◑	8,400
Global ◑	3,900,000 [6]
Percent of Global	< 1%
Population Objective	
Increase by 50% [6, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Spring Mountains, Sheep Range, Virgin Mountains
Restoration	Unknown

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Late March – mid August[3, EO]	
Nest and Nesting Habits	
Nest Placement	Above ground in dense shrub[8]
Site Fidelity	Low[8]
Food Habits	
Basic	Shrub gleaner
Primary Diet	Insects[8]
Secondary Diet	Seeds during non-breeding season[8]

Black-chinned Sparrow

Spizella atrogularis



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Black-chinned Sparrow

Spizella atrogularis

Overview

Although the Nevada Bird Count and the Nevada Breeding Bird Atlas project significantly expanded the known range and the population size estimate for this species, Nevada's Black-chinned Sparrow population may be somewhat disjunct from the main breeding populations in the Southwest and Mexico. Indeed, Black-chinned Sparrows are patchily distributed throughout much of their occupied range, and are sometimes absent from apparently suitable habitat.[8] This, in part, may be due to a preference for some particular (but not yet quantified) "blend" of juxtaposed habitat types. Data from the Nevada Bird Count have provided some insight into the Black-chinned Sparrow's key habitat requirements in Nevada (see below), but a there is still a large and problematic deficit in our knowledge of the biology and conservation needs of this reclusive species.[5] Some evidence exists that Black-chinned Sparrows tend to avoid close proximity to development,[1] and furthermore, their habitat preferences seem to vary among the different regions within their breeding range.[4]

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Mojave Region

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Pinyon-Juniper	92% (11/12)	2.0 (0.9 – 3.1)
Montane Shrubland	75% (6/8)	0.9 (0.3 – 1.5)
Montane Riparian	44% (4/9)	1.4 (0.1 – 1.5)
Joshua Tree	15% (3/20)	1.1 (0.3 – 1.9)

- In southern California chaparral, densities as high as 37 birds / 40 ha [0.37 / ac] reported[4]

Nevada-Specific Studies and Analyses

Landscape Associations (NBC data)

Black-chinned Sparrows were strongly associated with percent cover of Pinyon-Juniper habitat in both multivariate and univariate regressions (*Appendix 3*). More interestingly, they were especially numerous in NBC transects where Pinyon-Juniper and Mojave Scrub habitats were both present (i.e. "edge" areas between lower-elevation shrubland and higher-elevation woodland), as shown by a strong interaction term between these two cover types in the multivariate logistic regression. There were positive but weaker associations of Black-chinned Sparrow density with Montane Shrubland and Montane Riparian habitats. The species was never detected on transects containing any Mesquite-Acacia habitat, or more than 3% cover of Salt Desert habitat. These findings are consistent with a preference for a specific "blend" of different woodland and grassland patches.

Black-chinned Sparrow

Spizella atrogularis

Main Threats and Challenges

Habitat Threats

Threats are not well documented, but may include:

- Alteration of fire regimes that are increasing the density of pinyon-juniper woodlands
- Heavy grazing by horses, burros, or livestock[8]
- Invasive plants EO
- Heavy OHV use[8]

Research, Planning, and Monitoring Challenges

- Poor understanding of Nevada population trends and habitat / landscape preferences
- Poor understanding of the causes of probable, ongoing declines

Conservation Strategies

Habitat Strategies

- Pinyon-Juniper (p. Hab-16-1), Montane Shrubland (p. Hab-14-1), and Joshua Tree (p. Hab-8-1) habitat conservation strategies benefit this species
- Thinning overgrown pinyon-juniper woodlands near their shrubland interface may be beneficial

Research, Planning, and Monitoring Strategies

- Conduct studies to better pinpoint key habitat and landscape features that are important to Black-chinned Sparrows
- Continue monitoring to determine Nevada population trends
- Conduct further research to identify and quantify conservation threats

Public Outreach Strategies

- None identified

References: [1]Bolger et al (1997); [2]Floyd et al. (2007); [3]GBBO unpublished Atlas data; [4]Hargrove (2010); [5]Nevada Wildlife Action Plan Team (2006); [6]Rich et al. (2004); [7]Sauer et al. (2008); [8]Tenney (1997); [EO] Expert opinion

Sage Sparrow

Amphispiza belli

Photo by Jacque Lowery

Habitat Use Profile

Habitats Used in Nevada	
Sagebrush Salt Desert Scrub	
Key Habitat Parameters ●	
Plant Composition	Sagebrush, saltbushes, greasewood, and other xeric shrubs
Plant Density & Height	Variable shrub density with shrub height up to 1 – 2 m [3.3 – 6.6 ft]; typically low amounts of grass / forb cover[7]
Mosaic	Treeless sagebrush or salt desert shrubland with little or no cheatgrass invasion[7]
Distance to Water	No relationship[3, 7]
Response to Vegetation Removal	Negative; but exotic weed control encouraged[7, EO]
Area Requirements ◑	
Minimum Patch Size	Unknown, but avoids small patches
Recommended Patch Size	> 200 ha [430 ac][8, EO]
Territory Size	0.65 – 5.8 ha [1.6 – 14.3 ac][7]

Conservation Profile

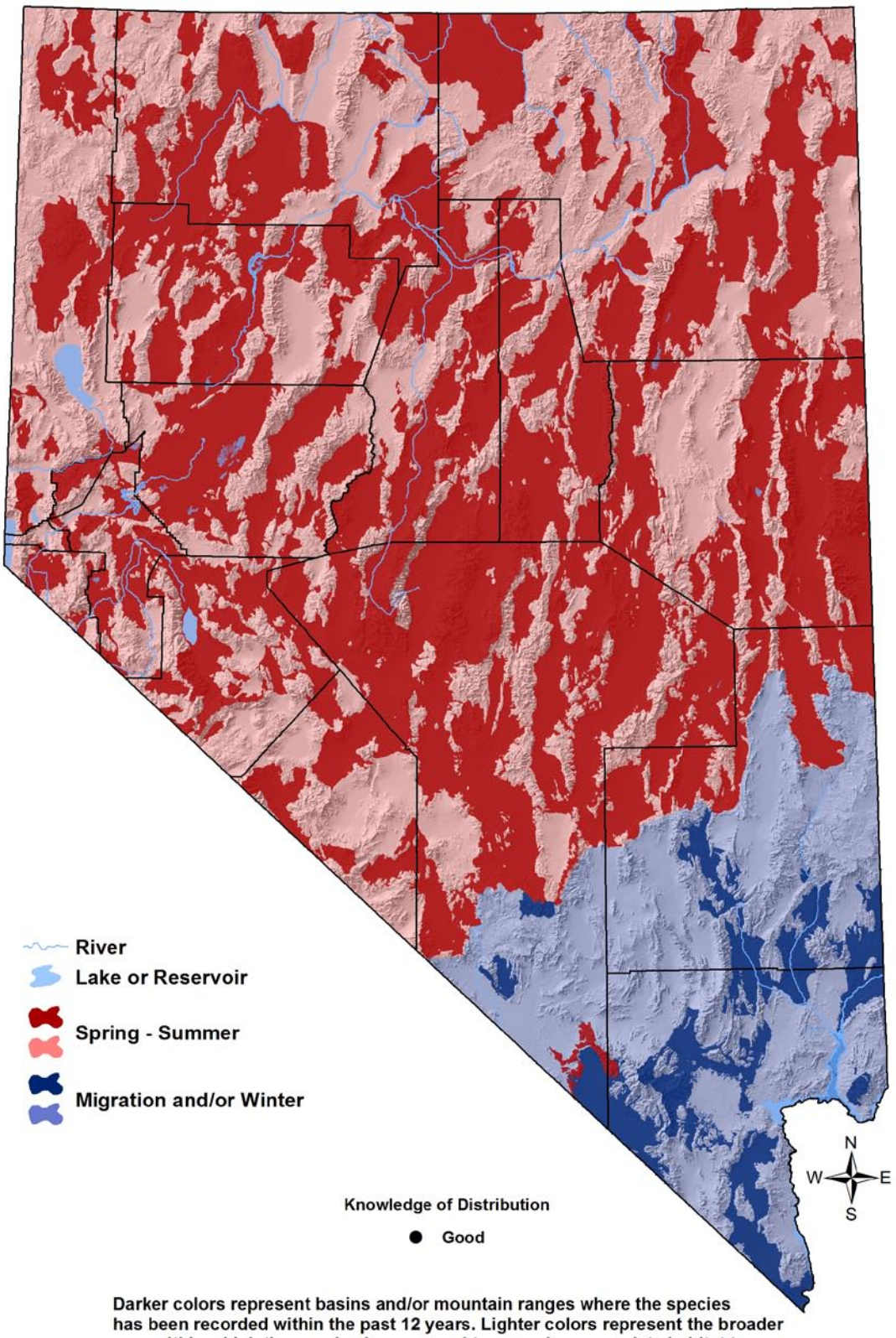
Priority Status	
Conservation Priority Species	
Species Concerns	
Historical and possible recent declines Habitat threats High stewardship responsibility	
Other Rankings	
Continental PIF	Stewardship Species
Audubon Watchlist	Yellow
NV Natural Heritage	S4B S4N
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	None
USFS	None
NDOW	Conservation Priority
Trends	
Historical ●	Rangewide declines[14]
Recent ○	Assessments vary, but probably close to stable[1, 14]
Population Size Estimates	
Nevada (NBC) ◑	2,900,000
Global ○	3,900,000 [11]
Percent of Global	> 50%
Population Objective	
Maintain[11, EO]	
Monitoring Coverage	
Source	Nevada Bird Count
Coverage in NV	Good
Key Conservation Areas	
Protection	Extensive, intact sagebrush landscapes
Restoration	Degraded / burned sagebrush

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer (Great Basin) Winter (Mojave)	
Known Breeding Dates in Nevada	
Early April – early August[2]	
Nest and Nesting Habits	
Nest Placement	In dense crown of 50-100 cm [20 – 40 in] tall shrub, [9] or on ground under shrub[EO]
Site Fidelity	High for breeding territory[7]
Food Habits	
Basic	Ground forager
Primary Diet	Arthropods[7]
Secondary Diet	Seeds and other plant matter[7]

Sage Sparrow

Amphispiza belli



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Sage Sparrow

Amphispiza belli

Overview

The Sage Sparrow is abundant in Nevada, but it is nonetheless a significant conservation concern here because of its history of declines, threats to its preferred habitat, and Nevada's stewardship of approximately one-half of the species' global breeding population. Nevada also has among the highest known breeding densities for the Sage Sparrow. Sparrows are most abundant in sagebrush habitat, but they also breed in salt desert scrub more frequently than other sagebrush "obligate" birds.[6] Greasewood may also be used as a breeding substrate with some frequency, although existing evidence is ambiguous.[17] Some Sage Sparrows winter in southern Nevada, usually in sagebrush or Mojave scrub shrublands, but also in honey mesquite stands.[7]

Sage Sparrows avoid highly fragmented landscapes and are most abundant in large expanses of unbroken shrubland.[5, 16] Where present in fragmented landscapes, they are usually found nesting in only the largest shrubland fragments, although the minimum patch size threshold differs among studies,[6, 8] and nest success is typically reduced as fragmentation increases.[15] Landscape level attributes that have been positively correlated with Sage Sparrow abundance include high sagebrush density, large patch size, spatial homogeneity, and low levels of disturbance.[5, 12] At a microhabitat scale, Sage Sparrows are positively associated with density of sagebrush, total shrub cover, and amount of bare ground, and they tend to occur where shrub height is locally greater than is typical of surrounding areas.[4, 8] Sage Sparrows may also prefer a locally heterogeneous shrub-clumping pattern, but the data are not definitive.[7] The Sage Sparrow is thought to be sensitive to cheatgrass invasion because it results in less sagebrush cover for nesting and less bare ground suitable for foraging.[8] Although such information is valuable, managing directly for sagebrush microhabitat structure is difficult, in part because preferred microhabitat may vary among years, across space, and with different landscape contexts.[10, 12, 13] Fortunately, if sagebrush habitat is managed to ensure the presence of healthy intact landscapes, appropriate microhabitat will be present within this mosaic.[12]

Abundance and Occupancy by Habitat

Birds / 40 ha on NBC Transects in the Great Basin and Mojave Regions

Primary Habitat at Transect	Transects Occupied	Birds/40 ha (95% C.I.)
Great Basin		
Sagebrush	76% (25/33)	14.4 (9.8 – 19.0)
Salt Desert Scrub	70% (16/23)	8.0 (5.1 – 10.9)
Montane Shrubland	35% (7/20)	5.5 (1.6 – 9.4)
Mojave		
Sagebrush	46% (12/26)	12.4 (5.6 – 19.2)
Salt Desert Scrub	20% (2/10)	0.4 (0.0 – 0.9)

Sage Sparrow
Amphispiza belli

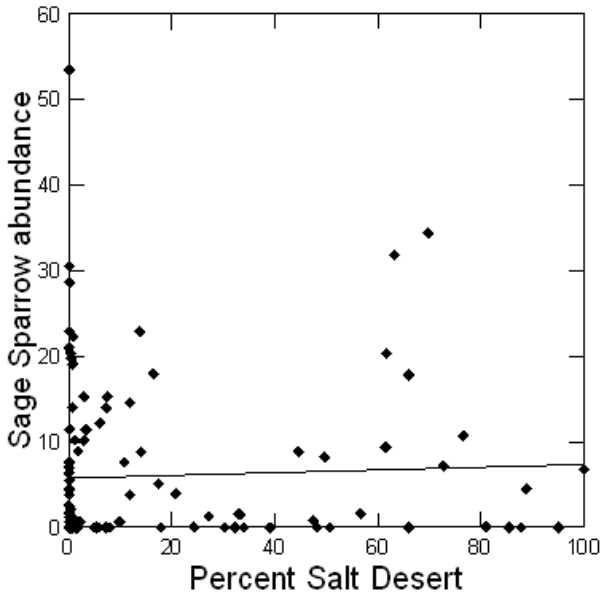
Nevada-Specific Studies and Analyses

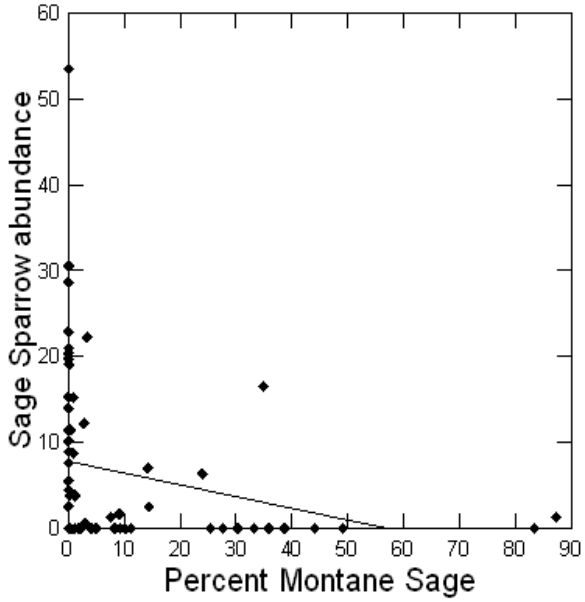
Habitat Requirements (NBC data)

Sage Sparrows were strongly associated with greater shrub cover ($p = 0.003$) and the absence of trees ($p = <0.001$). They were negatively associated with greater herbaceous cover ($p = <0.001$), shrub height was not a strong predictor, and there was no relationship to proximity of water (*Appendix 3*).

Landscape Associations (NBC data)

Sage Sparrows were strongly associated with Sagebrush habitat, and secondarily with Salt Desert Scrub habitat ($p < 0.001$ for both), and were negatively associated with most other habitat types (*Appendix 3*). Sage Sparrows were more likely to use Salt Desert Scrub habitat than any of the other sagebrush "obligate" birds (e.g. Brewer's Sparrow, Sage Thrasher). In fact, as demonstrated in the first graph below (where the X-axis shows the proportion of Salt Desert Scrub habitat present within transects containing only Sagebrush and Salt Desert Scrub habitats), they appear to use the two habitats almost interchangeably. Although the table of densities shown above suggests some association with Montane Shrubland habitat (which includes Montane Sagebrush, an NBC-defined habitat type), a more detailed analysis indicates that Sage Sparrows occurred in Montane Shrubland transects only when they contained or adjoined large amounts of (lowland) Sagebrush habitat. This is demonstrated in the second graph, where the X-axis shows the amount of "Montane Sage" habitat present within the transects that contained only Montane Sagebrush (i.e. Montane Shrubland) and (lowland) Sagebrush habitats.





The pattern of results obtained in these analyses suggest that Sage Sparrows tend to be "edge avoiders" that prefer large patches of suitable, unfragmented shrubland.

Main Threats and Challenges

Habitat Threats

Because Sage Sparrows prefer relatively large expanses of intact shrubland,[8] they are negatively affected by many factors that fragment their habitat or alter its basic structure, including:

- Fire
- Cheatgrass invasion
- Heavy livestock use
- Expansion of Pinyon-Juniper woodland into shrubland
- Heavy OHV use

Additionally, Sage Sparrows may attempt to nest unsuccessfully in degraded habitat because of persistent fidelity to breeding territories.[7]

Research, Planning, and Monitoring Challenges

- Minimum patch size needs to be further investigated in different shrubland types
- Although short-term fire management strategies are established, further research and planning is needed to clarify the most beneficial longer-term fire management strategies that protect important habitat while promoting its long-term viability

Sage Sparrow habitat in eastern Nevada. Photo by John Boone.

Sage Sparrow
Amphispiza belli

Conservation Strategies

Habitat Strategies

- Sagebrush (p. Hab-17-1) and Salt Desert Scrub (p. Hab-18-1) habitat conservation strategies benefit this species
- Protect large expanses of high-quality sagebrush (see below) from fire
- Within large expanses of high-quality sagebrush with few invasive plants, attempt to channel activities that can promote establishment or maintenance of cheatgrass, including heavy livestock grazing and heavy OHV use, to areas that are already degraded
- Where pinyon-juniper encroachment is known to have recently occurred within high-quality sagebrush habitat, conduct pinyon-juniper removal projects. However, we recommend that pinyon-juniper management projects consider the importance of maintaining a natural, interspersed interface zone between sagebrush shrublands and pinyon-juniper woodlands, as discussed in the Pinyon-Juniper (p. Hab-16-1) habitat conservation plan
- Development activities should be conducted to minimize the fragmentation of large expanses of high-quality habitat
- Preserve soil integrity in salt desert scrub shrubland

Research, Planning, and Monitoring Strategies

- Identify and map large patches of intact, mature sagebrush that contain dense shrubs and little cheatgrass
- Develop a fire management strategy that ensures that high-quality sagebrush habitat receives priority fire suppression efforts in the immediate future. Additionally, develop fire management strategies that balance the need for short-term habitat protection with long-term habitat viability
- Conduct additional research to determine how pinyon-juniper management projects can both benefit Sage Sparrows as well as the suite of birds that use the pinyon-juniper / sagebrush interface zone (see p. Hab-16-1)

Public Outreach Strategies

- None identified

References: [1]Dobkin and Sauder (2004); [2]GBBO unpublished Atlas data; [3]GBBO unpublished NBC data; [4]Holmes and Johnson (2005); [5]Knick and Rotenberry (1995); [6]Knick et al. (2008); [7]Martin and Carlson (1998); [8]Paige and Ritter (1999); [9]Petersen and Best (1985); [10]Petersen and Best (1987); [11] Rich et al. (2004); [12]Rotenberry and Knick (1999); [13]Rotenberry and Wiens (2009); [14] Sauer et al. (2008); [15]Vander Haegan (2007); [16]Vander Haegan et al. (2000); [17]Wiens and Rotenberry (1981); [EO] Expert opinion

Tricolored Blackbird

Agelaius tricolor

Photo by Martin Meyers

Habitat Use Profile

Habitats Used in Nevada	
Marsh (Agriculture (foraging))	
Key Habitat Parameters ◑	
Plant Composition	Cattail, bulrush, sedges, willows
Plant Density	High-density emergent vegetation[2]
Mosaic	Large patches of emergent vegetation, adjacent to open water and large agricultural areas, pastures, or wet meadow[2, EO]
Water Depth	Unknown, but estimated < 30 cm [12 in] at nest sites [EO]
Hydrology	Permanent wetland or recently flooded wet meadow; requires water through nesting season[1]
Response to Vegetation Removal	Negative [EO]
Area Requirements ◑	
Minimum Patch Size	> 0.8 ha [2 ac] for wetland[1]
Recommended Patch Size	>1,500 ha [3,700 ac] for colony and surround foraging area[2]
Territory Size	< 0.1 ha [0.2 ac] within colony [EO]

Conservation Profile

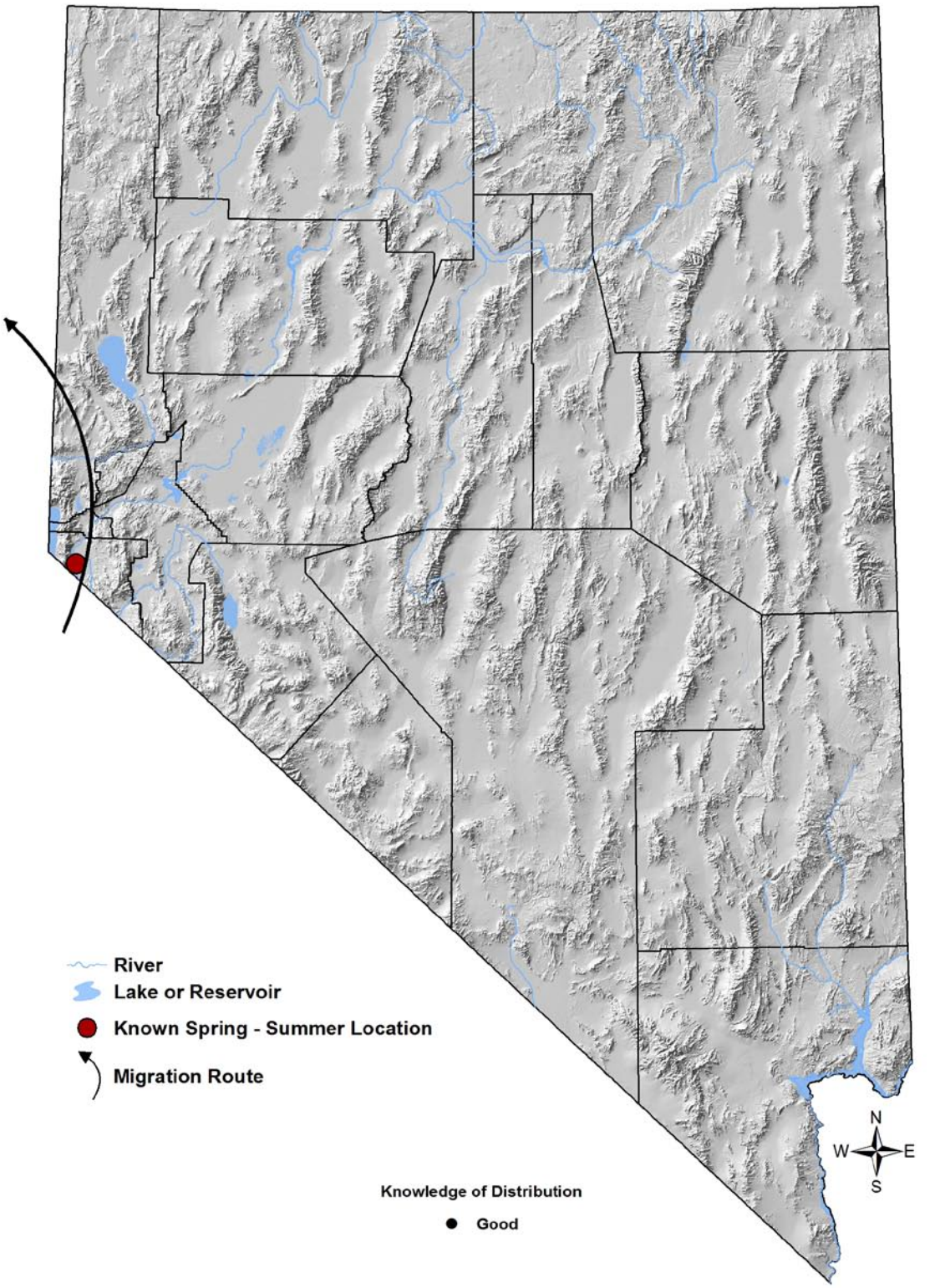
Priority Status	
Conservation Priority Species	
Species Concerns	
Small population size Historical declines Unknown population trend Restricted habitat Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Red
NV Natural Heritage	S1B
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
Trends	
Historical ●	Rangewide declines[2]
Recent ○	Declines slowing rangewide, uncertain in Nevada[4]
Population Size Estimates	
Nevada ◑	< 100 [1]
Global ◑	250,000 [3]
Percent of Global	< 1%
Population Objective	
Increase by 100% [3, EO]	
Monitoring Coverage	
Source	GBBO special species inventory
Coverage in NV	Good, but future of inventory uncertain
Key Conservation Areas	
Protection	Carson Valley
Restoration	Carson Valley

Natural History Profile

Seasonal Presence in Nevada	
Spring – Summer	
Known Breeding Dates in Nevada	
Late March – July[1]	
Nest and Nesting Habits	
Nest Placement	Attached to tall emergent vegetation 0.1 – 1.5 m [0.3 – 4.9 ft] above water or ground[2]
Site Fidelity	High for colony site[1]
Other	Highly colonial[1, 2]
Food Habits	
Basic	Ground forager and shrub gleaner
Primary Diet	Terrestrial invertebrates during breeding[2]
Secondary Diet	Agricultural grains, seeds post-breeding[2]

Tricolored Blackbird

Agelaius tricolor



Dots represent specific locations where the species has been recorded within the past 12 years.

Tricolored Blackbird

Agelaius tricolor

Overview

The overwhelming majority of Tricolored Blackbirds reside year-round in central California, where they have suffered from significant loss of wetland habitats. Nevada's single reliable breeding colony is migratory, and is peripheral and disjunct from the main population of Tricolored Blackbirds, which it rejoins in the winter months. This colony usually breeds in a small privately-owned marsh in Douglas County, in close proximity to both Red-winged and Yellow-headed Blackbirds.[1] There have also been periodic reports of additional small breeding colonies in other nearby marshes in Carson Valley, but their locations, sizes, and annual regularity of occurrence have not been systematically recorded. The degree to which nearby dairy farming and cattle ranching activities in Carson Valley provide a valuable foraging resource to the breeding colony has not been explicitly documented, but in the core of their breeding range (Central Valley of California), Tricolored Blackbirds forage in similar agricultural lands. The main conservation need in Nevada is to secure some form of protection for the single reliable breeding location and for other nearby (within a minimum radius of 5 km [3 mi]) marshes that may also host breeding colonies. Additional needs are ensuring that population monitoring is continued, and conducting searches for additional breeding sites in Carson Valley or elsewhere in western Nevada.

Abundance and Occupancy by Habitat

- Colonial breeder, ~ 20 pairs annually on average in Nevada[1]

Nevada-Specific Studies and Analyses

- Ammon and Woods[1] reported on the status of the species in Nevada as of 2008

Main Threats and Challenges

Habitat threats

- Nevada's single persistent breeding colony inhabits a small (0.8 ha [2 ac]) marsh located on private land. This site is not managed specifically for wildlife, and thus could be vulnerable to many of the threats described in the Marsh habitat account (p. Hab-9-1); to date, however, no specific habitat threats have been identified

Research, Planning, and Monitoring Challenges

- The single persistent breeding colony is located on privately-owned land with no management guidelines currently in place
- It is unclear whether additional breeding colonies are present rarely or frequently, and the factors controlling their presence on a year-to-year basis are not known

Tricolored Blackbird

Agelaius tricolor

Conservation Strategies

Habitat Strategies

- The Marsh (p. Hab-9-1) habitat conservation strategy benefits this species

Research, Planning, and Monitoring Strategies

- Continue monitoring of known persistent breeding colony
- Search for other breeding sites in Nevada, and if found, document their breeding colonies and the annual frequency of breeding
- Attempt to secure some form of protection for the known and possible breeding marshes, through the IBA program or other mechanisms
- Conduct studies of Nevada breeding population(s) and compare habitat use and foraging patterns to those of larger California populations

Public Outreach Strategies

- Encourage landowners at and around known persistent colony to continue their stewardship
- Explore incentives and assistance programs to secure landowner stewardship

References: [1]Ammon and Woods (2008); [2]Beedy and Hamilton (1999); [3]Rich et al. (2004); [4]Sauer et al. (2008); [EO] Expert opinion

Black Rosy-Finch

Leucosticte atrata

Photo by Greg Scyphers

Habitat Use Profile

Habitats Used in Nevada	
Alpine (Montane Shrubland (winter)) (Sagebrush (winter))	
Key Habitat Parameters ◑	
Plant Composition	Summer: treeless alpine tundra; Winter: sagebrush and montane shrubs
Plant Density	Unknown
Mosaic	Summer: alpine shrubs and herbaceous cover,interspersed with talus, cliffs and snowpockets; Winter: shrublands within 10 km [6 mi] of suitable roost sites[1, 4]
Other	Requires cave, mine entrances, or large rock fissures in sagebrush/pinyon-juniper zone in winter for roosting [1, 4, EO]
Response to Vegetation Removal	Unknown
Area Requirements ○	
Minimum Patch Size	Unknown
Recommended Patch Size	Summer: entire alpine patch; Winter: area of 10 km [6 mi] radius around roost site[1, EO]
Home Range / Territory Size	Unknown

Conservation Profile

Priority Status	
Conservation Priority Species	
Species Concerns	
Unknown population trend Small population size Restricted habitat (summer and winter) Habitat threats	
Other Rankings	
Continental PIF	Watch List
Audubon Watchlist	Red
NV Natural Heritage	S3
USFWS	Bird of Conservation Concern, Migratory Bird
BLM	Sensitive Species
USFS	None
NDOW	Conservation Priority
Trends	
Historical ○	Unknown
Recent ○	Unknown
Population Size Estimates	
Nevada ○	Unknown
Global ●	20,000 [6]
Percent of Global	Unknown
Population Objective	
Maintain / Increase [EO]	
Monitoring Coverage	
Source	Not systematically monitored
Coverage in NV	Poor
Key Conservation Areas	
Protection	Ruby, E. Humboldt, Schell Creek, Snake, and Jarbidge ranges; eastern Nevada valleys with concentrations of caves or mine shafts
Restoration	Degraded / sealed winter roost sites

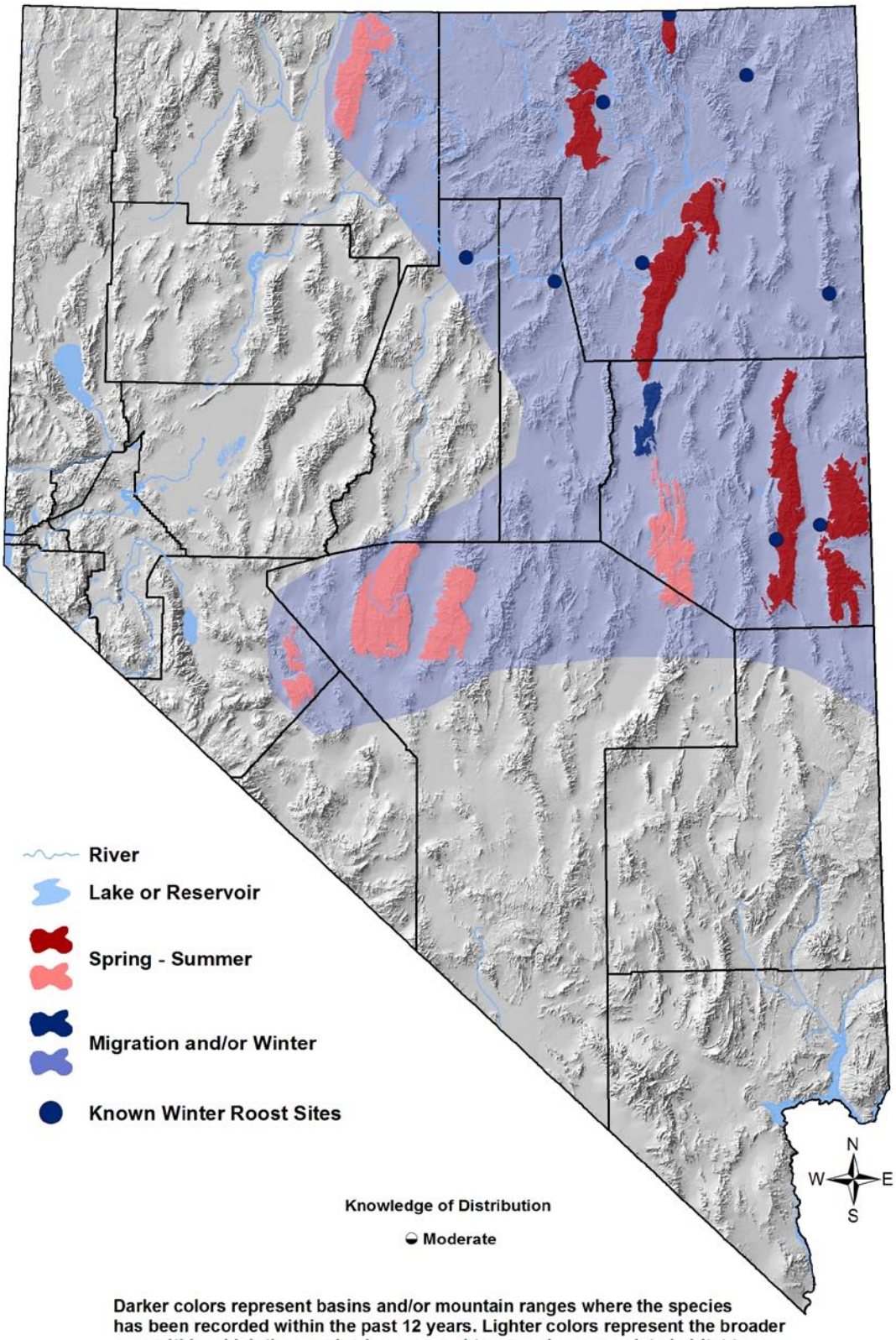
Natural History Profile

Seasonal Presence in Nevada	
Year-round (elevational migrant)	
Known Breeding Dates in Nevada	
Late June – July[3, 4]	
Nest and Nesting Habits	
Nest Placement	On ground in alpine meadow, talus or cracks of cliffs[4]
Site Fidelity	Unknown
Food Habits	
Basic	Ground forager
Primary Diet	Insects and seeds on snowbanks in summer[4]
Secondary Diet	Seeds in winter[4]

Confidence in Available Data: ●High ◑Moderate ○ Low

Black Rosy-Finch

Leucosticte atrata



Darker colors represent basins and/or mountain ranges where the species has been recorded within the past 12 years. Lighter colors represent the broader area within which the species is presumed to occur in appropriate habitat types.

Black Rosy-Finch

Leucosticte atrata

Overview

Black Rosy-Finches breed in remote alpine habitats, where they are difficult to monitor and study. They are more easily observed after they descend to lower elevations for the winter, where they often join with Gray-crowned Rosy-Finches (*Leucosticte tephrocotis*) in mixed foraging and roosting flocks of 25 – 1,000 individuals.[1] In addition to the confirmed ranges shown in the map above, breeding may also occur in other high ranges (Toiyabe, Toquima, White Pine ranges).[2, 4] Nevada trends and population size are unknown, and breeding populations are small and discontinuous. The Black Rosy-Finch's high-elevation breeding areas are not subject to most of the habitat threats characteristic of more accessible areas, but the potential impact of climate change on Nevada's limited alpine habitat is a concern. Most of the conservation attention for this bird is focused on protecting communal winter roost sites (which are critical for survival) and winter foraging areas.

Abundance and Occupancy by Habitat

No information

Nevada-Specific Studies and Analyses

NDOW Winter Telemetry Studies[1]

Winter telemetry studies in northeastern Nevada revealed that Black Rosy-Finches, which are often present with Gray-crowned Rosy-Finches in mixed flocks of 25 – 1,000 birds, depend heavily upon the shelter offered by below-ground communal roost sites, including abandoned mine shafts, caves, and deep fissures in metamorphic rock outcrops. The flocks return to these roost sites every evening after foraging in sagebrush or montane shrubland habitat up to 10 km [6 mi] away. Flocks may remain in the roosts for extended periods when the weather is inclement. Known roost sites were located at elevations ranging from 1,400 – 2,800 m [4,600 – 9,200 ft] within a matrix of sagebrush, montane shrubland, and pinyon-juniper habitats, and were typically higher in elevation than their associated foraging sites.

Main Threats and Challenges

Habitat Threats

- On the wintering grounds, threats include:
  - Mine entrance sealings (see photo, below), especially within 10 km [6 mi] of known winter foraging sites
  - Disturbance of winter roosting sites
  - Possible wind energy development on foraging sites
- Climate change is the main threat to alpine breeding habitat

Research, Planning, and Monitoring Challenges

- Lack of information about population trends and size, and full breeding range

Black Rosy-Finch
Leucosticte atrata

Conservation Strategies

Habitat Strategies

- The Alpine (p. Hab-2-1) habitat conservation strategies benefit this species
- Encourage gating rather than sealing of mine entrances in wintering range
- Limit disturbances within 9 km [5.5 mi] of known winter roost sites

Research, Planning, and Monitoring Strategies

- Attempt to better document population trends and full breeding range
- Perform full inventory of important winter roost sites (partially completed by NDOW Elko office) and protect from disturbance through cooperative roost conservation strategies[5]
- Conduct further study of wintering biology to determine any additional threats
- Model possible impacts of climate change and develop mitigation strategies if possible

Public Outreach Strategies

- None identified

References: [1]Bradley and Voget (2005); [2]Floyd et al. (2007); [3]GBBO unpublished Atlas data; [4]Johnson (2002); [5]Nevada Wildlife Action Plan Team (2006); [6]Rich et al. (2004); [EO] Expert opinion

Sealing of a mine and former winter roost site, Ellen D. Mountain, Elko Co.
Photo by Pete Bradley.

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

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

Conclusions

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

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

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

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

Conclusions

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

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 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.

Conclusions

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

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

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Glossary

Glossary of Terms Frequently Used in the Nevada Comprehensive Bird Conservation Plan

Aerial	In this plan, refers to the foraging habit of catching prey items on the wing (e.g., Common Poorwill catching moths in the air)
Aquatic	In this plan, usually refers to plants or prey items that are fully submerged under water (or birds dependent on open water)
Area Requirements	These include all known data on minimum patch size, recommended patch size, and territory or home range sizes to provide a scale for effective conservation action
Arthropod	Invertebrate with hard exoskeleton, including insects, spiders, centipedes, millipedes, crabs, and others, and includes their soft immature stages
Benthic	In this plan, refers to prey items that are buried in the soil substrates of wetlands or wet meadows
Clonal; Clone	Refers to plants that spread vegetatively, usually through the root system (e.g., aspen)
Colonial	Refers to birds (or other biota) that occur in clusters during all or part of their life stage; e.g., colonial waterbirds that nest in close proximity to one another
Conservation Priority	In this plan, all bird species defined as either Conservation Species or Stewardship Species
Conservation Species	In this plan, all species that are targeted by conservation efforts because of regional concerns, such as population declines, habitat threats, or restricted population sizes
Crepuscular	Describes animals that are primarily active during the twilight hours of dawn and dusk (e.g., Common Poorwills)
Dabbler	Refers to waterbirds that feed on aquatic prey or plant material while floating at the water surface, without diving; these species are often associated with shallow waterbodies
Diurnal	Describes animals that are primarily active during the daylight hours (e.g., Lewis's Woodpecker)
Diver	Refers to waterbirds that acquire aquatic prey and plant material by diving under water; these species are often associated with intermediate or deep water depths
Emergent	Refers to vegetation that is rooted under water but has significant growth above the water surface

Glossary

Forb	Broadleaved herbaceous plant species, including typical wildflower species and other, less showy cousins
Gleaning	Refers to foraging habit of picking prey items from the surface of a substrate (usually foliage)
Graminoid	Non-broadleaved herbaceous species, including grasses, sedges, and rushes
Granivorous	Feeds primarily or exclusively on seeds
Habitat	Term describing environmental requirements or suitable environments of one or more species of birds (including, but not restricted to, vegetation parameters); in this plan, often used interchangeably with “habitat type”
Habitat type	Bird habitat type, loosely defined as a major land cover type or local setting providing the basis for a unique bird assemblage; in this plan, often used interchangeably with “habitat”
Hemi-marsh	A marsh with 30 - 60% cover of emergent vegetation, large open water areas, and areas where small patches of emergent vegetation and open water are interspersed; ideal for many Priority bird species
Herbivory	Feeds primarily or exclusively on plant material
Herbaceous	All non-woody plants, including graminoids, forbs, and emergent aquatic plants such as cattail and bulrushes
Home Range	Area of activity by one breeding pair or vagrant during their stay in Nevada; home ranges are not actively defended against intruders
Important Bird Area	Nationally recognized hotspot for bird conservation, featuring a variety and abundance of conservation priority species; program administered by Audubon Society
Indicator species	Bird species that are not themselves conservation priorities, but only occur in intact habitat conditions that are presumed to be suitable for a majority of the native bird community; species selected based on expert opinion
Insectivorous	Feeds primarily on invertebrates, including insects, spiders, other arthropods and worms
Invasive plants	All plant species that have a tendency to colonize and dominate native plant communities in disturbed states, including noxious weeds, exotics, and some native species
Invertebrate	All animals that are not vertebrates, including insects, spiders, worms, clams, and crustaceans

Glossary

Key Conservation Area	Regions or sites that are known to be particularly important to the species and in which conservation action is likely most effective; areas for protection are important for preserving existing populations, and areas for restoration are those regions where populations may be recovered through conservation and restoration
Landscape	The wider area beyond the habitat patch an organism occurs in; the mixture of cover types and other elements in this area, the ways an organism uses them, or the ways in which they affect the organism
Mesic	A relative term referring to plants or plant communities with greater access to water; although usually referring to conditions between xeric deserts and hydric wetlands, in this plan it is often used to refer to the entire wetter part of the continuum, including riparian and wetland habitats
Mosaic	In this plan, refers to habitat patchiness within a major land cover type; for instance, a grebe may use dense marsh vegetation for breeding, but it is important that open water is available for foraging within the same waterbody; the term can also refer to the arrangement of land cover types in the wider landscape
Nevada Bird Count	Statewide landbird monitoring program administered by GBBO since 2002; addresses long-term trend monitoring for all birds, but is most effective for diurnal landbirds
Nocturnal	Describes animals that are primarily active at night (e.g., Flammulated Owl)
Patch Size	Area of land in appropriate habitat required by a breeding pair or migrant; minimum patch size refers to the area required to attract at least one individual or pair; recommended patch size refers to the area estimated to be minimally necessary for achieving conservation effectiveness
Phenology	Particular pattern of a sequence of events; for instance, nesting phenology can be described with seasonal timing of onset, timing of peaks, and duration of breeding activities
Phreatophyte	A deep-rooted plant that obtains its water from the water table or the layer of sil immediately above it
Piscivorous	Feeds primarily or exclusively on fish
Predatory	In this plan, refers to birds that hunt primarily for terrestrial vertebrates
Probing	Refers to retrieving prey or other food items by inserting the bill into substrate (usually soil or bark)
Riparian	Associated with streams and rivers; usually short for “riparian habitat”, which refers to plant and insect communities and physical conditions associated with streamsides or river floodplains with direct access to water

Glossary

Seral stage	Refers to successional stage of particular plant or plant assemblage
Special Status Species	These include species that are not included as conservation species, but for which at least a moderate conservation concern, major research needs, or written agency policies exist
Species Concerns	Refers to reasons why the species was ranked as a Conservation Priority or Special Status species
Site Fidelity	Estimated degree of dependence on historically occupied sites; if ranked high, birds are unlikely to use alternate sites if their historic location is destroyed; if ranked low, birds are not particularly tied to any location on the landscape and readily colonize new sites if appropriate habitat becomes available
Stewardship Species	In this plan, Priority species that are not ranked as Conservation Species, but for which Nevada has a significant responsibility for maintaining populations because ≥ 20% of their global population occurs in the state
Stressor	Process or activity that can have negative effects on bird populations or bird habitats
Territory Size	Area used and defended by a breeding pair, or by a migrant during its stopover in Nevada; differs from home range in that territory only refers to the actively defended area, usually around the nest or an important food resource
Uplands	Refers in this plan to non-mesic habitat types, such as salt desert, Mojave scrub, Joshua tree, coniferous forest, pinyon-juniper, etc.; the distinction is made to distinguish from wetland, riparian, open water, or aspen, which display vegetation that either directly or indirectly accesses water most of the time

Acronyms

Acronyms Frequently Used in the Nevada Comprehensive Bird Conservation Plan

ABC	American Bird Conservancy
ACEC	Area of Critical Environmental Concern (BLM designation)
AKN	Avian Knowledge Network (data sharing program administered by Cornell Lab of Ornithology)
BBS	Breeding Bird Survey (national bird monitoring program administered by USGS)
BLM	Bureau of Land Management (U.S. Department of Interior)
CAP	Conservation Action Planning (TNC process)
CC MSHCP	Clark County Multiple Species Habitat Conservation Plan (administered by Clark County Desert Conservation Program)
CSI MSHCP	Coyote Springs Investments LLC Multiple Species Habitat Conservation Plan
DBH	Diameter at Breast Height (4.5 feet)
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
ESA	Endangered Species Act (USFWS)
GBBO	Great Basin Bird Observatory
GAP	Gap Analysis Program (USGS)
GIS	Geographic Information Systems (spatial analysis software)
IBA	Important Bird Area (administered by Audubon Society)
IWJV	Intermountain West Joint Venture
LCR MSCP	Lower Colorado River Multi-Species Conservation Program (administered by USBR)
NBC	Nevada Bird Count Program (administered by GBBO)
NDOW	Nevada Department of Wildlife (State of Nevada)
NGO	Non-governmental organizations (such as ABC, GBBO, or TNC)
NNHP	Nevada Natural Heritage Program
NPS	National Park Service (U.S. Department of Interior)

Acronyms

NRA	National Recreation Area (managed by NPS or USFS)
NVPIF	Nevada chapter of Partners-in-Flight (PIF)
NWAP	Nevada Wildlife Action Plan (NDOW)
NWI	National Wetlands Inventory (USFWS)
NWR	National Wildlife Refuge (managed by USFWS)
OHV	Off-highway-vehicle (popular tool for recreation in Nevada)
PIF	Partners in Flight (multi-organizational, national bird conservation initiative)
SLC HCP	Southeastern Lincoln County Habitat Conservation Plan
SNC MSHCP	Southern Nye County Multiple Species Habitat Conservation Plan
SNWA	Southern Nevada Water Authority
SW ReGAP	Southwest Regional Gap Analysis Project
TNC	The Nature Conservancy
UNR	University of Nevada, Reno
USBR	U.S. Bureau of Reclamation (U.S. Department of Interior)
USFS	U.S. Forest Service (U.S. Department of Agriculture)
USFWS	U.S. Fish and Wildlife Service (U.S. Department of Interior)
USGS	U.S. Geological Survey (U.S. Department of Interior)
VR HCRP	Virgin River Habitat Conservation and Recovery Program
WAFWA	Western Association of Fish and Wildlife Agencies
WMA	Wildlife Management Area (managed by NDOW)

Appendices

Appendix 1: Methods

Selection of Priority Species

General Selection Criteria

Priority bird species for this plan were selected based on a set of systematic qualifying criteria. By default, a species was given priority status if it: 1) regularly occurs in Nevada (*Appendix 2*), and 2) meets one or more of the following criteria as determined by agencies, bird conservation initiatives, legal mandate, or Nevada stewardship responsibility:

a) *Audubon Watchlist*: Red or Yellow List rankings
b) *Partners in Flight North American Landbird Conservation Plan* (Rich et al. 2004): Watch List ranking
c) *Intermountain West Waterbird Conservation Plan* (Ivey and Herziger 2006): High or Moderate Concern rankings
d) *Intermountain West Regional Shorebird Plan* (Oring et al. 2000): Critically Important or Very Important rankings
e) Pacific Flyway portions of the *North American Waterfowl Management Plan* (USFWS 1986, 1998): High-ranking species with significant presence in Nevada
f) *Nevada Department of Wildlife Upland Game Species Management Plan* (NDOW 2008): High Concern ranking
g) Listed by USFWS under the Endangered Species Act (ESA), including candidate species
h) Protected under the Bald and Golden Eagle Protection Act
i) Significant species stewardship responsibility: ≥ 20% of the estimated global population occurs in Nevada.

Priority species were divided into three different categories, following the usage of Chase and Geupel (2005). All Priority species, regardless of category, are treated in an individual species account. Each category is described below.

Conservation Priority Species

Conservation Priority species require active conservation efforts, such as habitat protection, habitat restoration, special or enhanced monitoring efforts, further research, or additional public education. Generally, there are tangible reasons for concern about a Conservation Priority species, which may include:

a) Known or probable population declines
b) Dependence on restricted habitats
c) Small population size
d) Habitat threats

Although the habitat-based conservation strategies presented in this plan were designed to benefit entire bird communities, they were initially motivated by the needs of Conservation Priority species.

Stewardship Species

There were four species that qualified for Priority status based only upon the fact that Nevada is estimated to support ≥ 20% of global population. These were designated as Stewardship species. We believe these Stewardship species deserve priority consideration in Nevada because significant threats in the state can have significant impacts on the entire species. In some cases, Conservation Priority species also had high Nevada stewardship percentages; this is noted in the "Conservation Profile" tables within the species accounts.

Special Status Species

The Special Status designation was used for three species that did not qualify as Conservation Priority or Stewardship Species, but that still merited attention in this plan. Two of these species, Bald Eagle and Peregrine Falcon, have recently been de-listed under the ESA and require ongoing population monitoring. The third species, Burrowing Owl, was included in this category because its conservation status is currently difficult to assess. On the one hand, there are conservation concerns about Burrowing Owls in many western states, but on the other, we could find no evidence of population declines or serious threats in Nevada. We anticipate being able to determine whether or not Burrowing Owl should be assigned Conservation Priority status in some future revision of this plan.

Exceptions

Northern Goshawk and Ferruginous Hawk were included as Conservation Priority species despite not formally qualifying under the guidelines listed above. Both are considered priority species by management agencies in Nevada (USFS, BLM, NDOW), and the Nevada PIF working group felt that their omission from the regional planning documents listed above was an oversight that should be corrected in this plan.

Sources of Information

In preparing this plan, we reviewed and synthesized many sources of information about the status, ecology, and management of Priority species and their habitats in Nevada. We relied most heavily on the following set of sources that were particularly well-suited to the needs of the plan:

Published Sources

Birds of North America (BNA) Species Accounts (Poole and Gill 1992-2002; cited individually in the *Literature Cited* section): This catalog of species accounts generally features an exhaustive literature review and synthesis of knowledge about every North American bird. As such, it is often the best source of information about a given species' ecology, distribution, habitat use,

breeding and foraging habits, migration patterns and phenology, population trends, threats, and conservation needs. In practice, not all species accounts cover these topics with equal thoroughness, and Nevada-specific information was available for some species but not for others.

Partners in Flight North American Landbird Conservation Plan (Rich et al. 2004): The continental Partners in Flight (PIF) plan provided global population estimates for landbirds, which were needed for estimating percent of global population size present in Nevada. Global population estimates were based on an analysis of Breeding Bird Survey (BBS) data for the North American portion of a species' distribution. These global estimates were stepped down to the state level by Peter Blancher and colleagues, which provided us with one source of statewide landbird population estimates for Nevada, which we referred to as the "PIF estimate." [These estimates can be found online at the Partners in Flight Landbird Population Estimates Database: http://rmbo.org/pif_db/laped/] Because Nevada has only a few historically-active BBS routes from which to extrapolate, the stepped-down statewide population estimates may be unreliable for some species.

Intermountain West Regional Shorebird Plan (Oring et al. 2000): This regional plan was created under the umbrella of the U.S. Fish and Wildlife Service's *U.S. Shorebird Conservation Plan* (Brown et al. 2001). It provides an excellent source of information about the status, trends, population sizes, hotspots, and conservation issues regarding Nevada's shorebirds.

Intermountain West Waterbird Conservation Plan (Ivey and Herziger 2006): This regional plan was created under the umbrella of the "Waterbird Conservation for the Americas Initiative," which produced the *North American Waterbird Conservation Plan* (Kushlan et al. 2002). It provides an excellent source of information about the status, trends, population sizes, distributions, and conservation issues of Nevada's nongame waterbirds.

Nevada Upland Game Species Management Plan (NDOW 2008): This plan was consulted as the best single source of information about the status, trends, population sizes, distributions, and management concerns of Nevada's upland game birds.

Other published sources

We expended considerable effort to glean as much information as possible from scientific journals and agency reports. We gave the greatest weight to quantitative, species-specific conservation or habitat related data from Nevada or immediately adjacent regions. Next in priority were sources relevant to wider regions (such as the Intermountain West) that had some applicability to Nevada. These are cited throughout the plan with full references collected in the *Literature Cited* section.

Data Sources

Nevada Bird Count

The Nevada Bird Count (NBC) was the most heavily used source of data for this plan. Due to its length, a full description of this program is presented at the end of this section (p. App-1-5).

Breeding Bird Survey (BBS) Trends and Analyses

The latest trends analyses of BBS data (Sauer et al. 2008; http://www.mbr-pwrc.usgs.gov/bbs/) were consulted to determine regional and continental population trends for the period 1966 – 2007. For most species, reliable Nevada-specific trends were not available, but trend estimates were often available for wider geographic regions that included Nevada.

Nevada Breeding Bird Atlas Project

The Nevada Breeding Bird Atlas project, conducted by the Great Basin Bird Observatory (GBBO), involved systematic statewide data collection to document all confirmed and probable breeding bird species during the period 1997 – 2000 (see Floyd et al. 2007 for details). The database that was generated by the atlas contains over 30,000 bird observation records, and it provides one of the major sources of data on bird distribution, breeding status, and breeding phenology in Nevada. The atlas database is available upon request to GBBO. Atlas methods were well-suited for surveying most diurnal landbirds and some secretive species, such as owls, but they were less effective for birds that tend to congregate in large numbers in widely scattered sites (e.g., many shorebirds, waterbirds, and waterfowl), for upland game birds with sporadic, disconnected distributions, and for a handful of other bird taxa that are difficult to survey with a standard multi-species protocol (e.g., nightjars, hummingbirds). Many of the species that were under-surveyed by atlas methods were better covered by data sets residing at the federal and state wildlife agencies, which were also consulted for this plan.

Nevada Department of Wildlife Diversity Database

The Nevada Department of Wildlife maintains a database of wildlife occurrence records that are collected during the course of the agency's work across the state. This database, combined with databases from the Nevada Bird Count and the Nevada Breeding Bird Atlas project, was used for determining distribution patterns and creating range maps (see "Range Maps" section, below).

Site-Specific Waterbird and Shorebird Surveys

Site-specific monitoring of waterbirds and shorebirds is routinely performed on National Wildlife Refuges by USFWS refuge staff and on Nevada's State Wildlife Management Areas by NDOW staff. Additionally, NDOW conducts annual aerial surveys of colonial waterbirds and waterfowl, and seasonal migration surveys of shorebirds in the Lahontan Valley area (Larry Neel, *pers. comm.*). Collectively, these data sources allow us to estimate waterbird and shorebird numbers, abundance peaks, distributions, and, in some cases, trends. These data sources were compiled by Larry Neel (NDOW) for use in this plan.

Aquatic Bird Count

The Aquatic Bird Count is a GBBO program for aquatic bird monitoring throughout Nevada. Although this program's survey activities vary in scope from year to year, it has generated a database that is useful in helping to determine the distributions and seasonal presence of

waterfowl, waterbirds, and shorebirds in many areas of the state. The Aquatic Bird Count database is available upon request to GBBO.

eBird

eBird (www.ebird.org), an offering of the Cornell Laboratory of Ornithology and partners, is a web-based repository of observations and sightings uploaded by birders and ornithologists from across the globe. Its visualization tools are especially useful for determining seasonal presence, phenology, and distribution of birds across any area of interest.

Other

Other data sources consulted for particular species included:

a) Raptor nest surveys conducted by NDOW, USFS, BLM, and their partners (including the "Great Basin Raptor Nest Survey" program coordinated by HawkWatch International; see www.hawkwatch.org/conservation-science/raptor-nest-survey)
b) Winter raptor surveys conducted by NDOW and partners (Southern Nevada Water Authority, GBBO)
c) Special surveys conducted for species of interest (including Yellow-billed Cuckoo, Southwestern Willow Flycatcher, Peregrine Falcon, Yuma Clapper Rail, Snowy Plover, Bendire's Thrasher, and Flammulated Owl) by a variety of agencies, organizations, consultants, or academic scientists

Nevada Bird Count (detailed program description)

Overview: The Nevada Bird Count (NBC) is a standardized statewide landbird monitoring program that was initiated by the Great Basin Bird Observatory in 2002. Like the atlas project, it is focused on the breeding season, but NBC uses a more quantitative approach to sampling in order to more effectively detect long-term population trends (e.g. Bart 2005a). NBC monitoring has been conducted every year since program inception, and its dataset at the time this plan was prepared included eight years (2002-2009) of monitoring results from 546 transects. As such, it provides the most useful single source of information about the distributions, habitat relationships, population sizes, and densities for Nevada's landbirds.

The NBC uses a standard point-count protocol combined with area search/spot-mapping surveys in a double-sampling effort, in order to obtain detectability estimates for as many species as possible. It is an "all-bird" protocol, meaning that all species detected during a survey are recorded, but detection rates are best for small diurnal landbirds, such as songbirds, woodpeckers and their allies, and similar species that are readily visible or detectable by sound.

The NBC dataset was heavily used in the preparation of this plan, especially for generating:

a) Nevada population size estimates
b) Density estimates by habitat type
c) Statistical analyses of habitat associations

d) Range maps, in combination with atlas data and NDOW data, as described above

NBC Study Design: The NBC sampling plan is habitat-stratified (see "Habitat Types" section below for a complete description of the habitat designations used). To the extent possible, transects were randomly selected within each habitat type with the help of GIS land cover maps, although adjustments were sometimes required due to access issues or poorly mapped habitat types. All transects were located off-road, except in sites where roads could not be avoided (e.g., riparian areas in canyons), or where roads are part of the habitat type being surveyed (e.g., agricultural areas). Allocation of survey effort among habitat types was determined by conservation priorities, agency needs, and a statistical power analysis conducted during the first two years of the NBC program.

Several partner organizations and agencies were willing to integrate their ongoing monitoring efforts by adhering to NBC protocols and contributing their data to the NBC database. These partners included the Clark County Desert Conservation Program, Great Basin National Park, the USFS Humboldt-Toiyabe National Forest, NDOW, BLM, Lake Mead National Recreation Area, Southern Nevada Water Authority, the USFWS National Wildlife Refuge system, and the U.S. Bureau of Reclamation. This coordination has greatly improved the scope and statistical power of the NBC database.

NBC Survey Protocol: Full descriptions of NBC survey protocols can be obtained at http://www.gbbo.org/data.html. Briefly, NBC surveys are conducted between April 25 and June 30 in the Mojave Desert region, and between May 25 and July 10 in the Great Basin region. Each transect (location) is covered using an array of ten point-count stations. A 10-minute survey is conducted at each point, in fair weather conditions, and with all ten points of one transect completed within four hours after daybreak. All birds detected by sight and sound are recorded in three time intervals (0-3 min, 3-5 min, 5-10 min) and at three distance intervals (0-50 m, 50-100 m, > 100 m).

Detectability: Point-count data are affected by species-specific detectability, and thus the NBC protocol includes a double-sampling effort that combines areas searches with point-counts to estimate species-specific detectability (Bart and Earnst 2002). Results to date show that for moderately vocal or visible species, the 10-minute survey protocol for point counts results in a detection ratio of close to 1.0 within a 100 m distance (all birds present are detected). Therefore, all NBC-based analyses (in particular, densities and population size estimates) presented in this plan assume a detection ratio of 1.0. All cryptic species, or species groups known to be poorly sampled by NBC, are assumed to have a detection ratio of significantly < 1.0, and these species are excluded from NBC-based analyses in this plan.

Vegetation Assessments: Vegetation and habitat assessments are part of the NBC protocol, as more fully described at http://www.gbbo.org/data.html. We used NBC-derived habitat measurements for statistical analyses of habitat relationships for a small number of relatively common Priority species in this plan.

Transect Habitat Assignments: Many NBC transects were located entirely within a single relatively uniform habitat type. In order to survey habitat types that occur in small or narrow

patches, however, many transects had to cross habitat type boundaries. Rules were therefore established to ensure that a minimum amount of the target habitat type was present, and to generate an acceptable level of consistency in habitat-based analyses.

Habitat Types

Habitat types are defined, for the purpose of this plan, as distinct land cover categories that support relatively distinct bird communities. While the term "habitat" technically describes only the environmental needs of one particular species, here we embrace the less formal use of the word, where "habitat" means a major land cover type or local setting providing environmental requirements or suitable environments for a unique bird assemblage. This definition allows us to group bird species under the umbrella of shared habitat conservation strategies.

The process of selecting habitat types for this plan paralleled the processes used in the original *Nevada PIF Bird Conservation Plan* (Neel 1999) and the Nevada Bird Count (NBC) habitat stratification. For both the 1999 plan and NBC, habitat types were created by lumping together land cover types identified in the GAP vegetation map (Homer et al. 1998). For instance, several land cover types that were dominated by coniferous trees were combined into a "Coniferous Forest" habitat type (we capitalize formal habitat type designations to distinguish them from more casual references to dominant vegetation). Other coniferous land cover types were combined to form "Pinyon-Juniper" habitat. In the more recent *Nevada Wildlife Action Plan* (Nevada Wildlife Action Plan Team 2006), the same general approach was used, but it was based primarily on land cover types identified by the Southwest Regional Gap Analysis Project (SW ReGAP) mapping effort (Prior-Magee et al. 2007). We also used the same approach in this plan, but chose to consider land cover types as defined in several different mapping efforts. A more detailed description of this process is given below in the "Spatial Habitat Data" section.

The habit types designated in the four efforts described above were very similar, but there were some variations resulting from the use of different fundamental land cover types, different approaches to grouping land cover types, and different terminology. The relationships between habitat types designated in these four efforts are summarized in Table App-1-1, below.

Table App-1-1: Cross-walk of habitat types defined by four different programs / plans. 1999 Plan = original PIF bird plan (Neel 1999); NWAP = Nevada Wildlife Action Plan

This Plan	1999 Plan[1]	NBC	NWAP [2]	Short Description for This Plan
Agriculture	Ag Lands	Agriculture	Agricultural Lands	All irrigated agricultural fields and associated infrastructure
Alpine	(not included)	(not included)	Alpine and tundra	Above treeline (tundra)
Aspen	Aspen	Aspen	Aspen woodland	All aspen-dominated woodlands

This Plan	1999 Plan[1]	NBC	NWAP [2]	Short Description for This Plan
Cliff	Cliffs and Talus	(not included)	Cliffs and Canyon	Prominent cliffs and talus
Coniferous Forest	Coniferous Forest	Coniferous Forest	Intermountain (and Sierra) conifer forests and woodlands	All mixed and pure coniferous woodlands except pinyon-juniper
Springs	(included under Wetlands/ Lakes)	(not included)	Springs and springbrooks	All spring systems that are too small to form major riparian or wetland patches
Ephemeral Wetland and Playa	(included under Wetlands/ Lakes)	(not included)	Desert playas and ephemeral pools	All wetlands without perennial, or mostly perennial, water
Great Basin Lowland Riparian	Lowland Riparian	Lowland Riparian	Intermountain Rivers and streams	Streamside vegetation and river-fed wetlands that are mostly restricted to valley floors in the Great Basin (generally < 5,500 ft or 1,800 m)
Joshua Tree	(included under Mojave Shrub)	Joshua Tree	Mojave mid-elevation mixed Desert Scrub	Mid-elevation Mojave uplands that have a significant component of Joshua tree or other *Yucca* spp.
Marsh	(included under Wetlands/ Lakes)	(included under Wetland)	Marshes	Permanent wetlands dominated by emergent vegetation, interspersed with open water
Mesquite-Acacia	Mesquite-Catclaw	Mesquite-Catclaw	Mesquite bosques and Desert washes	Mesquite and/or *Acacia*-dominated washes and bosques in the Mojave Desert

This Plan	1999 Plan[1]	NBC	NWAP [2]	Short Description for This Plan
Mojave Lowland Riparian	Lowland Riparian	Lowland Riparian	Mojave rivers and streams	Streamside vegetation and river-fed wetlands that are mostly restricted to valley floors in the Mojave Desert and White River Valley (generally < 4,000 ft or 1,300 m)
Mojave Scrub	Mojave Shrub	Mojave Scrub	Mojave/ Sonoran Warm Desert Scrub	Low-mid elevation scrub communities of the Mojave Desert, usually dominated by creosote
Montane Riparian	Montane Riparian	Montane Riparian	Intermountain rivers and streams	Streamside vegetation that is mostly restricted to montane areas (generally > 5,000 ft or 1,600 m)
Montane Shrubland	Montane Shrub and Sagebrush	Montane Shrub and Montane Sagebrush	(shared among several habitat types)	Deciduous and non-deciduous shrubs generally at or above the pinyon-juniper zone, but not including the alpine zone, including Montane Sagebrush
Open Water	Wetlands/ Lakes	(not included)	Lakes and Reservoirs	Water bodies that are usually large and have only a minor component of emergent vegetation, such as lakes and reservoirs
Pinyon-Juniper	Pinyon-Juniper and Mountain Mahogany	Pinyon-Juniper and Mountain Mahogany	Lower Montane woodlands	Pinyon-juniper dominated landscapes, including mountain

This Plan	1999 Plan[1]	NBC	NWAP [2]	Short Description for This Plan
				mahogany components and open woodlands with shrub understory
Sagebrush	Sagebrush (including Montane Sagebrush)	Sagebrush (excluding Montane Sagebrush)	Sagebrush (including Montane Sagebrush)	Sagebrush-dominated shrublands below the pinyon-juniper zone (not including Montane Sagebrush – see Montane Shrubland)
Salt Desert Scrub	Salt Desert	Salt Desert Scrub	Intermountain cold desert scrub	Desert scrub below the sagebrush or Mojave Scrub zone, often dominated by saltbush, greasewood, and other salt-tolerant species
Wet Meadow	Wetlands/ Lakes and Montane Parkland	Wetland	Wet Meadows	Mesic graminoid-dominated meadows (sedges, rushes, grasses) that have ample access to water, but little emergent vegetation

[1] Neel (1999); [2] Nevada Wildlife Action Plan Team (2006)

The 20 habitat types listed above provide the basis for the habitat accounts presented in this plan, where we describe the physical and floristic characteristics of each habitat type, relate these characteristics to bird habitat suitability, list major threats, and recommend conservation strategies. These habitat types account for most of the surface area in Nevada. The remaining portions of the state consist mostly of developed areas (urban, suburban, rural, industrial, roads), barren areas, and exotic vegetation, none of which were considered conservation priority habitats. There are also very limited upland areas of native grassland, but they are difficult to distinguish accurately from irrigated fields or wet meadows in GIS maps, so they were not included in our habitat classification.

Spatial Habitat Data

Overview

In order to analyze NBC data as a function of habitat, we needed to define habitat types listed above in terms of underlying land cover categories (we refer to this process as a "roll-up" hereafter), and then map the spatial distributions of each habitat type. We felt that all of the individual mapping efforts upon which the roll-ups could be based had inadequacies, and further that these inadequacies could be partly rectified by combining their more reliable features. Therefore, we used land cover categories derived from several different sources as the basis for rolling-up habitat types.

Habitat classification and mapping

We relied primarily on the multi-partner LandFire Existing Vegetation Type (EVT) map (www.landfire.gov) as a source of land cover categories. The LandFire Existing Vegetation Type (EVT) map, in particular, is thought to capture small-scale riparian features more effectively than the Southwest ReGAP map (Peterson 2008), which was a major basis for our decision. Table App-1-2 shows the sources of the land cover categories that were used for habitat type roll-ups in this plan. A detailed accounting and rationale of exactly which land cover categories were used to define each habitat type is available from GBBO upon request. Below, we describe the exceptions to the general pattern of rolling up either LandFire land cover categories.

1) Cliff and talus distribution was best mapped by the Southwest ReGAP product (Prior-Magee et al. 2007), which was used as a basis for our Cliff habitat type
2) Ephemeral Wetland and Playa habitat was mapped based on the National Wetlands Inventory (NWI) dataset (http://www.fws.gov/wetlands/) and the Nevada Natural Heritage Program's water-playa shapefile (http://heritage.nv.gov/gis/gis.htm)
3) The boundary between the Great Basin Lowland Riparian and Mojave Lowland Riparian habitat types was based on the accepted eco-regional boundary between these two regions, although this boundary may vary slightly in different products. Our ecoregional shapefile is available upon request to GBBO
4) Joshua Tree was poorly classified by LandFire and ReGAP land cover types. Instead, we used a first-generation Joshua Tree habitat map created by USGS (Todd Esque, *pers. comm.*)
5) Marshes and wetlands were captured best by the Southwest ReGAP product, which was used as a basis for the Marsh habitat type
6) Mesquite-Acacia was poorly classified by LandFire and ReGAP land cover categories. Instead, we used a map of Mesquite-Acacia habitat that was created by the University of Nevada Reno (UNR) as part of the Clark County MSHCP project (Clark County 2000)
7) The LandFire land cover categories contributing to the Mojave Lowland Riparian habitat type roll-up severely overestimated the extent of actual riparian vegetation, as determined by systematic overlays of these land covers with aerial photography. We conducted an in-depth effort to reclassify this habitat type based primarily on a stream-order determination using Arc GIS tools. Details are available upon request to GBBO

8) Montane Riparian habitat could often be separated from the two lowland riparian habitat types based on the definition of underlying land cover categories. In other cases, however, a land cover category spanned what we felt to be the reasonable boundary between the montane and lowland riparian zones. In these cases, we defined Montane Riparian habitat to occur above 1,600 m in elevation, and Lowland Riparian (either Great Basin or Mojave, depending on location) below 1,600 m (5,280 feet)
9) Springs habitat could not be distinguished from vegetation-based land covers in the ReGAP or LandFire products. Instead, we used a springs shapefile provided by BLM as the basis for our Springs map
10) Wet Meadow was best captured by examining both LandFire and ReGAP land cover categories in tandem, as both resulted in misclassifications considered individually

Table App-1-2: Source of land cover categories used in defining habitat types.

Habitat Type	Land Cover Source
Agriculture	LandFire
Alpine	LandFire
Aspen	LandFire
Cliff	ReGAP
Coniferous Forest	LandFire
Ephemeral Wetland and Playa	National Wetlands Inventory, Nevada Natural Heritage program shapefile
Great Basin Lowland Riparian	LandFire, < 1,600 m elevation threshold, and Great Basin / Mojave ecoregional boundary
Joshua Tree	USGS shapefile
Marsh	ReGAP
Mesquite-Acacia	UNR / Clark County MSHCP shapefile
Mojave Lowland Riparian	LandFire, < 1,600 m elevation threshold, Great Basin / Mojave ecoregional boundary, and manual reclassification based on stream order
Mojave Scrub	LandFire
Montane Riparian	LandFire, > 1,600 m elevation threshold
Montane Shrubland	LandFire
Open Water	LandFire
Pinyon-Juniper	LandFire
Sagebrush	LandFire
Salt Desert Scrub	LandFire
Springs	BLM springs shapefile
Wet Meadow	LandFire and ReGAP

In general, we believe that our final habitat type map was as accurate as possible, given the limitations of its underlying spatial datasets. Map accuracy is poorest for habitats that occur in small or narrow patches, including all Riparian habitat types, Wet Meadow, and Aspen. Improved mapping efforts would significantly improve our ability to analyze bird – habitat relationships.

Analytical and Statistical Methods

Bird – Habitat Analyses

For the priority songbirds in this plan that were sufficiently well sampled by the NBC, we conducted analyses of NBC data using GIS-derived transect attributes as explanatory variables. In general, we referred to this as "landscape-level" analysis, which was distinct from the microhabitat analysis described in the next section.

The first step required was to define the area effectively sampled by an NBC transect. To do this, we applied a 200 m radius buffer around each survey point, and then merged the buffered points within a given transect into a single polygon in GIS. The 200 m radius buffers were selected because they capture nearly all of the effectively surveyed area around each survey point. Significantly smaller buffers would have resulted in discontinuous transect polygons and may have under-represented the habitats that were actually used by the detected birds. Once the transect polygons were defined, they were intersected with the habitat map described in the previous section, as well as a landownership map. Attributes were then created for each transect polygon, as follows:

1) Surface area of each transect polygon occupied by each habitat type that was present
2) Shortest distance from any portion of the transect polygon to the nearest year-round water source
3) Landownership breakdown of the transect polygon

We also investigated the possibility of extracting transect attributes from maps of recent burn activity, but found that too few NBC transects were located in areas of recent burn activity to permit meaningful analysis.

We used logistic regression to analyze the model the relationships between bird presence (detection or non-detection) and habitat type or distance to water. For most of the species analyzed, data were sufficient to support up to three variables in a multivariate model. For a few of the most common species, we were able to conduct additional analyses by using abundance data in a linear regression analysis. We note these in the species accounts only if they changed the resulting conclusion. Data from the Great Basin and Mojave Desert were analyzed separately.

Microhabitat Analyses

For a few priority songbirds, we also conducted statistical analyses of bird abundance and presence as a function of detailed vegetation measurements that were collected "on the ground" as part of the NBC protocol (see www.gbbo.org/data.html). These analyses were originally presented in a GBBO technical report (GBBO 2008b), where details of these analyses are presented.

Appendices

Bird Density and Occupancy Rates by Habitat Type

For the Priority species with sufficient NBC data, we calculated average density within each habitat type. Habitat-specific densities were calculated separately for the Great Basin and Mojave Desert regions of Nevada. Density estimates were based on the actual number of birds detected within 100 m of each NBC survey point (assuming a detection probability of 1.0 within this radius), divided by the area of a 100 m radius circle. Results were then standardized to birds per 40 ha. Many transects were surveyed in multiple years, and some were surveyed multiple times within a year, and in these cases we avoided bias by using a single average density for a given transect. Averages for each transect were then averaged again to create the overall density estimate, which is presented in the species accounts along with an estimate of error. For a given species, we averaged densities only from the transects where the bird was present (i.e., zero-density transects were not used). This step was necessary to avoid skewing results for birds whose geographical range in Nevada is smaller than the spatial extent of the habitats they use. The best way to interpret our density estimates, therefore, is that they provide an indication of the average habitat-specific density of a given bird within the parts of the state where they occur.

In calculating density estimates, we considered only the single habitat type designator associated with each NBC transect. We did not create subgroups of points within transects that overlaid multiple habitat types. This created situations where a bird has a non-zero density for a habitat type that it rarely, if ever, uses. For instance, a bird that always occurs within Coniferous Forest habitat may have been counted on some Montane Shrubland transects that contained a small amount of Coniferous Forest habitat. This bird will therefore show a non-zero density within the Montane Shrubland habitat type. To allow us to better detect and interpret these anomalies, we also present "occupancy rate" in the species accounts, which are defined as the proportion of all transects of a given habit type on which the bird was detected during NBC surveys. If a bird's occupancy rate for a given habitat is very low, then its associated density estimate for that habitat type is not very meaningful.

Population Size Estimates

Increasingly, bird conservation initiatives have desired to have estimates of the total population sizes of bird species of concern; within a project area, within a state, or within the entire range of the species (i.e. "global"). This is an attempt to explicitly quantify current population status in relation to future conservation targets (Rosenberg and Blancher 2005). Inspired by the success of the North American Waterfowl Management Plan (USFWS 1986, 1998) in following this strategy, the major bird conservation initiatives produced in the last decade have all produced global population size estimates for their focal species (Brown et al. 2001, Kushlan et al. 2002, Rich et al. 2004), which we use as source material in this plan. Below, we discuss the sources of Nevada population size estimates used in this plan.

Partners in Flight's BBS-based Population Size Estimates

Partners in Flight generated global or continental estimates for landbird population sizes based on Breeding Bird Survey (BBS) data, as part of their development of a continental plan (Rich et al. 2004). The next step was to calculate the proportion of this population estimated to occur in

Nevada. We have taken these estimates from an unpublished spreadsheet produced by Peter Blancher (*pers. comm.*). However, BBS coverage in Nevada has been poor in past decades, and in order to produce these estimates, it was sometimes necessary to extrapolate from adjoining regions outside of the state (especially for the Sierra Nevada ecoregion). Because of this limitation, we decided to use NBC data to produce a new set of Nevada population size estimates for landbirds.

NBC-Based Population Size Estimates

The large Nevada Bird Count database provided us with an opportunity to generate new population size estimates for the state that were improvements on previously available estimates. For species that were well-sampled by the NBC, data-based population estimates were obtained by extrapolating observed bird densities across the entire landscape, while accounting for habitat-based and regional differences in these densities. As with density estimation, we considered only the single habitat type designator associated with each transect; but in contrast, we remained entirely within the framework of the original GAP-based habitat type designators used to stratify the NBC sampling plan throughout this exercise (Table App-1-1). Also in contrast to the density estimation exercise, we used all transects (including those on which a given bird species did not occur). Otherwise, we would have created inflated population size estimates by extrapolating densities that were uncharacteristic of Nevada as a whole.

Data for population size estimates were obtained from 546 NBC transects that were surveyed at variable frequencies between 2002 and 2009. These transects received an average of 2.5 surveys each during this period, generating 1376 transect-visits. Data from multiple surveys for a given transect were averaged to produce a single density estimate for each species. In order to account for the fact that many species are not distributed equally throughout the entire extent of their habitats, we divided Nevada into five geographical regions (north, west, central, east, and south) based on natural ecoregional boundaries that correspond well with most breeding ranges (Figure M1; see also Floyd et al. 2007). For example, the Gray Vireo is concentrated in Pinyon-Juniper habitat in the south region, is also present in smaller but still significant densities in the east region, and is almost totally absent from Pinyon-Juniper habitat in the remaining regions. The Pinyon Jay, in contrast, uses Pinyon-Juniper habitat statewide, except in the north region where it is mostly absent. Therefore, density estimates were generated for each unique combination of species, habitat type, and region, and those estimates were extrapolated based on the area occupied by that same habitat-region combination to arrive at a population estimate for that habitat-region. Statewide population estimates were then generated by adding all of the unique habitat-region population estimates. Systematic intra-regional variation in density within a habitat type, which no doubt occurs, was not addressed by this method, although it is reasonable to assume that it averaged out in most cases, and did not result in significantly skewed estimates.

Table App-1-3 shows the number of transects that were surveyed, by habitat type, in each of the five regions (see also Figure App-1-1). In many (though not all) cases where there appears to be poor NBC survey coverage for a given habitat-region combination, this was a result of few or no such habitat-region combinations existing. For instance, Mesquite-Catclaw habitat occurs only in southern Nevada, and is simply not present in the other four regions of the state.

Figure App-1-1: Division of Nevada into regions for population estimates, and locations of NBC transects.

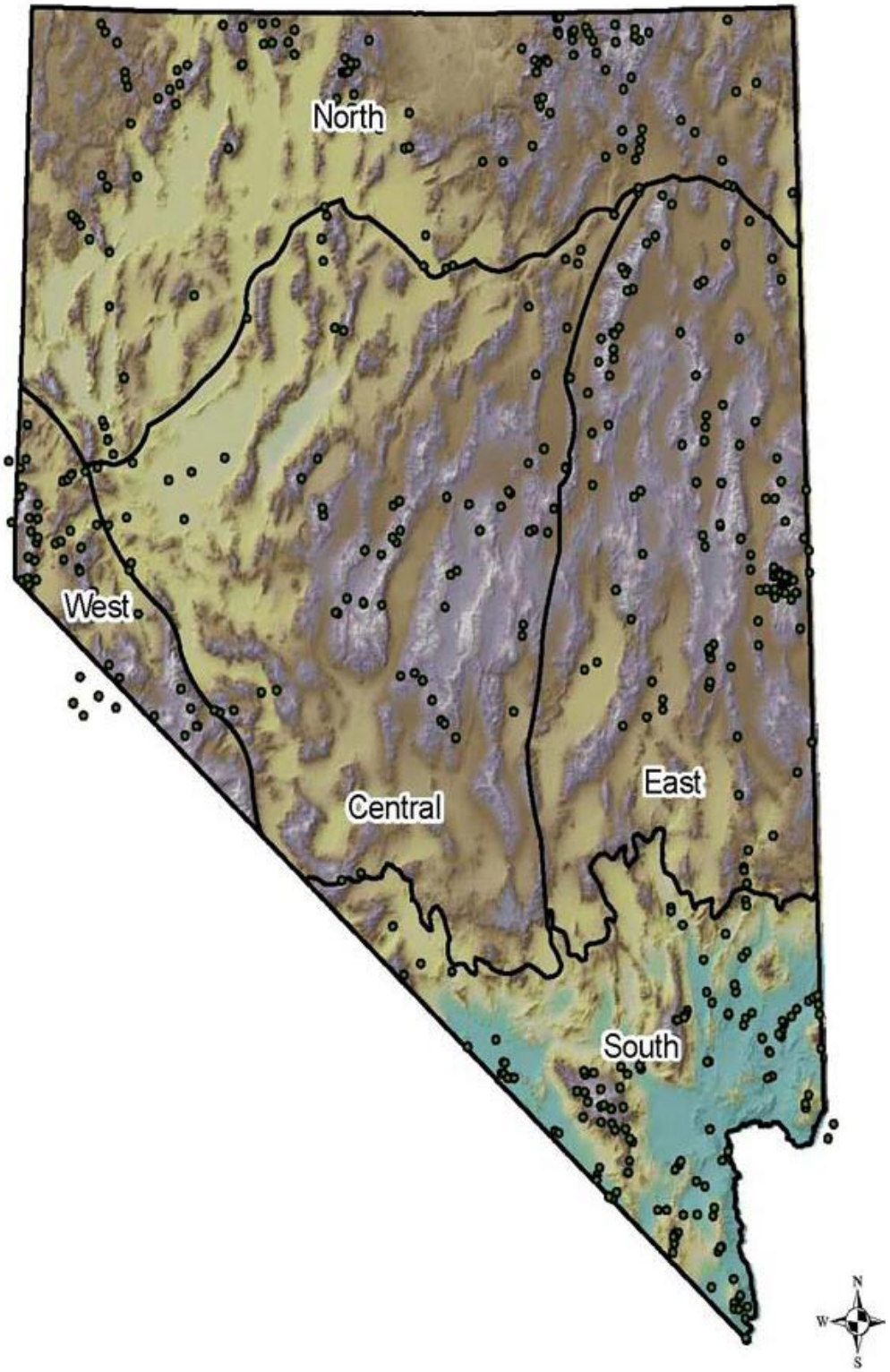

Table App-1-3: Number of NBC transects surveyed by habitat and region, 2002-2009. Habitat types are those identified in the original GAP-based NBC stratification process.

Habitat Type	Region					
	Central	East	North	West	South	Total
Agricultural	2	0	0	1	5	8
Aspen	2	7	5	4	7	25
Coniferous Forest	0	2	3	14	4	23
Joshua Tree	1	0	0	0	20	21
Lowland Riparian	15	9	26	16	36	102
Mesquite-Catclaw	0	0	0	0	14	14
Mojave Scrub	0	0	0	0	22	22
Montane Riparian	6	35	34	13	9	97
Montane Sagebrush	3	2	4	2	3	14
Montane Shrub	3	4	2	0	5	14
Mountain Mahogany	1	4	4	0	0	9
Pinyon-Juniper	13	35	5	8	12	73
Sagebrush	20	6	4	3	26	59
Salt Desert	5	17	0	1	10	33
Wetland	6	22	1	1	2	32

The following formal sequence of steps was used to derive NBC-generated population estimates:

a) We determined the total number of hectares for each habitat type within each of the five regions based on the GAP map (Table App-1-4). Using this approach, 93% of the state's total land area could be classified as one of the NBC focal habitat types. The remainder consisted of cover types such as urban, barren, cliffs, alpine, etc. Thus this 7% of the state's total land area was excluded from the analysis
b) We calculated species-specific average density estimates (birds per 40 ha) for every NBC transect
c) We averaged the density estimates for all transects within a given habitat-region combination, and repeated this step for all other habitat-region combinations
d) We multiplied the overall density estimate for each habitat-region combination by the number of hectares of that habitat-region combination to produce a series of population size estimates for each habitat- region combination.
e) We summed all resulting population size estimates for a given species to produce a statewide population estimate

Table App-1-4: Total area of land, in hectares, covered by each habitat type in each region of Nevada.

Habitat Type	Region				
	North	South	West	Central	East
Agriculture	191,253	18,060	59,157	149,950	97,400
Aspen	56,131	0	114	5,352	37,345
Coniferous Forest	8,840	29,393	59,990	1,760	126,442
Lowland Riparian	16,030	12,376	6,238	9,077	8,041
Mesquite-Catclaw	0	7,539	0	0	0
Mojave Scrub (combined with Joshua Tree)	0	2,878,464	0	65,941	123,822
Montane Riparian	1,186	0	556	4,242	2,389
Montane Shrubland	62,664	60,496	14,099	48,771	185,060
Mountain Mahogany	2,939	0	1,327	57,504	89,819
Montane Sagebrush	574,378	2	65,434	322,470	161,712
Pinyon-Juniper	59,300	115,978	228,094	984,092	1,484,705
Sagebrush	4,623,741	202,593	579,070	3,661,461	2,792,070
Salt Desert	1,730,663	473,072	107,785	3,211,603	1,244,730
Other (not used)	527,605	168,466	75,891	490,738	133,697
Wetland	1,768	318	2,826	69,884	31,396
TOTAL	7,856,496	3,966,756	1,200,584	9,082,845	6,518,627

Population size estimates were created for all priority passerine birds, hummingbirds, woodpeckers, doves, and easily-detected upland game birds and raptors. Although NBC methods were not designed specifically for raptors, NBC-derived population estimates for this species group corresponded fairly well with previous estimates, with some exceptions. Population size estimates for all species analyzed were rounded to the nearest round number within 5%. This was done to emphasize the imprecise nature of population size estimation, which differs from a total population count in that it includes error from extrapolation and sampling. We decided on a species by species basis whether or not the NBC population estimate was the best available estimate, as presented in the species accounts (see *Appendix 4* for a summary).

Other Population Size Estimates

Population estimates for many of this plan's Priority species could not reasonably be derived from either NBC or BBS data, particularly for waterfowl, waterbirds, shorebirds, and owls. Additionally, NBC-derived population estimates for some upland game birds and raptors were unreliable enough to merit consideration of other population size estimates. For these species groups, we relied on the key sources described previously to obtain population size estimates.

Because we chose only one population estimate to report on the front page of the species accounts, readers may wish to examine *Appendix 4*, where the comparison of all available estimates is summarized in tabular form. In the species accounts, we discuss the factors that might weigh in favor of one estimate or the other where appropriate.

Error Estimation for Population Size Estimates

It is generally understood that population estimates derived from any currently available data source are necessary very approximate. Methods of calculating population size estimates are continuing to be critically reviewed and recommendations being made (Thogmartin et al. 2006). The most important recommendation, of course, would be the collection of more and better monitoring data.

There are many sources of potential error in the process of generating a population size estimate, and integrating them meaningfully into a single error index is a very complex undertaking that deserves careful attention (e.g. Bart 2005b, Thogmartin 2010). Rather than reporting oversimplified (and possibly misleading) estimate errors, we chose to defer this exercise until a future revision of this plan.

Range Maps

For species range maps, we used actual detections of a species as the basis for creating known and presumed distributions within Nevada. This was a conservative, data-driven approach that contrasted, to some extent, with more typical approaches to range map creation. Detection records were obtained primarily from NBC data, the Nevada Breeding Bird Atlas project, the GBBO Aquatic Bird Count, and the NDOW diversity database (see "Sources of Information" section, above). For all of these sources, only records collected since the beginning of the Nevada Breeding bird atlas project (i.e. 1997) were used in order to avoid inadvertently plotting distributions that no longer apply. Other data sources, notably the *Nevada Upland Game Species Management Plan* (NDOW 2008) and personal observations from reliable experts, were occasionally used to supplement these sources, as noted in the species accounts. Once detections were mapped, the range maps were created using the following approaches.

For landbirds, we used the USGS basin and range shapefile to divide the state into a contiguous array of basins and mountain ranges. A bird sighting that occurred within a given basin or mountain range resulted in the extrapolation of "known distribution" to that entire basin or mountain range. For species present at intermediate elevations, detections often occurred in both basins and mountain ranges. Presumed ranges were then superimposed on known range by a subjective, iterative process involving opinion from several experts, outside map review, and biological context.

For waterbirds, waterfowl, shorebirds, and marshbirds, we used a similar approach employing the shapefiles that defined Open Water and Ephemeral Wetland and Playa habitats (see above), rather than basins and mountain ranges. A detection that occurred within or adjacent a water bodies was extrapolated throughout that water feature. Presumed range was then extrapolated to other water bodies, using a process similar to that described above for landbirds.

Despite our efforts to systematize the distribution mapping process, judgment calls were still required in many cases. It is important to note that the absence of a mapped "known" distribution for a species within a given part of the state is NOT intended to imply that the species is known to be absent from that area. Rather, it has not yet been observed, and definitive determination of presence or absence will require focused local survey efforts. We show both known and presumed range on most species maps to avoid this possible misinterpretation.

Threats Determination and Conservation Strategies

Assessment of conservation concerns and threats is primarily discussed in the *Conservation Concerns* chapter of this plan. Determinations as to whether or not conservation concerns represented threats to a given habitat or bird species were the result of integrating the Conservation Action Planning (CAP) outputs (TNC 2007), literature review, analysis, and substantial discussion among the Nevada PIF planning group. In presenting what we determined to be significant threats, we tended to focus on threats that may lead to significant negative changes in habitats or in the abundance / distribution of Priority species over the next ten years. We did not attempt to formally rank threats to a given bird or habitat; rather we presented only the threats that we regarded to be credible.

Likewise, conservation strategies were formed as the result of literature review, analysis, and feedback from the Nevada PIF planning group. Two PIF meetings were devoted entirely to developing group consensus on conservation strategies.

Appendices

Appendix 2: Nevada Bird List and Statuses.

Table App-2-1: Bird species that occur with some regularity in Nevada. Priority species under this plan are shown in **bold type**, with suffixes defined as follows: (C) = Conservation Priority species; (S) = Stewardship species; (SS) = Special Status species. Seasonal Status (in Nevada) is defined as follows:

Breeder = primarily present during the breeding season

Breeder/Migrant = both breeding populations and significant migrant populations that breed elsewhere occur in the state, and migrants are of conservation importance in areas where the species does not breed

Breeder/Winter = occurs in the state during all seasons, but not necessarily in the same areas

Migrant/Winter = non-breeding populations are most abundant and of greatest conservation interest (breeders are rare or absent relative to other seasons)

Extirpated = species historically nested in Nevada, but was extirpated in recent decades

Reintroduced = species historically nested in Nevada and was reintroduced after extirpation

Names and taxonomic order are in accordance with the AOU checklist through the 51st supplement (Chesser et al. 2010)

Common Name	Genus	Species	Seasonal Status
Greater White-fronted Goose	*Anser*	*albifrons*	Migrant
Snow Goose	*Chen*	*caerulescens*	Migrant/Winter
Ross's Goose	*Chen*	*rossii*	Migrant
Cackling Goose	*Branta*	*hutchinsii*	Migrant
Canada Goose	*Branta*	*canadensis*	Breeder/Winter
Trumpeter Swan (C)	***Cygnus***	***buccinator***	**Reintroduced**
Tundra Swan (C)	***Cygnus***	***columbianus***	**Migrant/Winter**
Wood Duck	*Aix*	*sponsa*	Breeder/Winter
Gadwall	*Anas*	*strepera*	Breeder/Winter
American Wigeon	*Anas*	*americana*	Breeder/Winter
Mallard	*Anas*	*platyrhynchos*	Breeder/Winter
Blue-winged Teal	*Anas*	*discors*	Breeder/Migrant
Cinnamon Teal (C)	***Anas***	***cyanoptera***	**Breeder/Migrant**
Northern Shoveler	*Anas*	*clypeata*	Breeder/Winter
Northern Pintail (C)	***Anas***	***acuta***	**Breeder/Migrant**
Green-winged Teal	*Anas*	*crecca*	Breeder/Winter
Canvasback (C)	***Aythya***	***valisineria***	**Breeder/Migrant**
Redhead (C)	***Aythya***	***americana***	**Breeder/Winter**
Ring-necked Duck	*Aythya*	*collaris*	Breeder/Winter
Greater Scaup	*Aythya*	*marila*	Migrant
Lesser Scaup (C)	***Aythya***	***affinis***	**Migrant/Winter**
Bufflehead	*Bucephala*	*albeola*	Migrant/Winter
Common Goldeneye	*Bucephala*	*clangula*	Migrant/Winter
Hooded Merganser	*Lophodytes*	*cucullatus*	Migrant/Winter
Common Merganser	*Mergus*	*merganser*	Breeder/Winter
Red-breasted Merganser	*Mergus*	*serrator*	Migrant
Ruddy Duck	*Oxyura*	*jamaicensis*	Breeder/Winter

Appendices

Common Name	Genus	Species	Seasonal Status
Chukar	*Alectoris*	*chukar*	Breeder
Himalayan Snowcock	*Tetraogallus*	*himalayus*	Breeder
Gray Partridge	*Perdix*	*perdix*	Breeder
Ring-necked Pheasant	*Phasianus*	*colchicus*	Breeder
Ruffed Grouse	*Bonasa*	*umbellus*	Breeder
Greater Sage-Grouse (C)	*Centrocercus*	*urophasianus*	Breeder
Dusky Grouse (C)	*Dendragapus*	*obscurus*	Breeder
Sooty Grouse (C)	*Dendragapus*	*fuliginosus*	Breeder
Sharp-tailed Grouse (C)	*Tympanuchus*	*phasianellus*	Reintroduced
Wild Turkey	*Meleagris*	*gallopavo*	Breeder
Mountain Quail (C)	***Oreortyx***	***pictus***	**Breeder**
California Quail	*Callipepla*	*californica*	Breeder
Gambel's Quail (C)	***Callipepla***	***gambelii***	**Breeder**
Common Loon (C)	***Gavia***	***immer***	**Migrant**
Pied-billed Grebe	*Podilymbus*	*podiceps*	Breeder/Winter
Horned Grebe	*Podiceps*	*auritus*	Migrant
Eared Grebe (C)	***Podiceps***	***nigricollis***	**Breeder/Migrant**
Western Grebe (C)	***Aechmophorus***	***occidentalis***	**Breeder/Migrant**
Clark's Grebe (C)	***Aechmophorus***	***clarkii***	**Breeder/Migrant**
American White Pelican (C)	***Pelecanus***	***erythrorhynchos***	**Breeder/Migrant**
Double-crested Cormorant	*Phalacrocorax*	*auritus*	Breeder/Winter
American Bittern	*Botaurus*	*lentiginosus*	Breeder/Migrant
Least Bittern (C)	***Ixobrychus***	***exilis***	**Breeder**
Great Blue Heron	*Ardea*	*herodias*	Breeder/Winter
Great Egret	*Ardea*	*alba*	Breeder/Winter
Snowy Egret (C)	***Egretta***	***thula***	**Breeder/Migrant**
Cattle Egret	*Bubulcus*	*ibis*	Breeder
Green Heron	*Butorides*	*virescens*	Breeder
Black-crowned Night-Heron	*Nycticorax*	*nycticorax*	Breeder/Migrant
White-faced Ibis (C)	***Plegadis***	***chihi***	**Breeder/Migrant**
Turkey Vulture	*Cathartes*	*aura*	Breeder/Migrant
Osprey	*Pandion*	*haliaetus*	Breeder/Migrant
White-tailed Kite	*Elanus*	*leucurus*	Breeder
Bald Eagle (SS)	***Haliaeetus***	***leucocephalus***	**Migrant/Winter**
Northern Harrier	*Circus*	*cyaneus*	Breeder/Migrant
Sharp-shinned Hawk	*Accipiter*	*striatus*	Breeder/Winter
Cooper's Hawk	*Accipiter*	*cooperii*	Breeder/Winter
Northern Goshawk (C)	***Accipiter***	***gentilis***	**Breeder/Winter**
Red-shouldered Hawk	*Buteo*	*lineatus*	Breeder
Swainson's Hawk (C)	***Buteo***	***swainsoni***	**Breeder/Migrant**
Red-tailed Hawk	*Buteo*	*jamaicensis*	Breeder/Winter
Ferruginous Hawk (C)	***Buteo***	***regalis***	**Breeder/Winter**
Rough-legged Hawk	*Buteo*	*lagopus*	Migrant/Winter
Golden Eagle (C)	***Aquila***	***chrysaetos***	**Breeder/Winter**
American Kestrel	*Falco*	*sparverius*	Breeder/Migrant
Merlin	*Falco*	*columbarius*	Migrant
Peregrine Falcon (SS)	***Falco***	***peregrinus***	**Breeder/Migrant**

Appendices

Common Name	Genus	Species	Seasonal Status
Prairie Falcon (S)	***Falco***	***mexicanus***	**Breeder/Winter**
Clapper Rail (C)	***Rallus***	***longirostris***	**Breeder**
Virginia Rail	*Rallus*	*limicola*	Breeder/Winter
Sora	*Porzana*	*carolina*	Breeder/Winter
Common Moorhen	*Gallinula*	*chloropus*	Breeder/Winter
American Coot	*Fulica*	*americana*	Breeder/Winter
Sandhill Crane (C)	***Grus***	***canadensis***	**Breeder/Migrant**
Black-bellied Plover	*Pluvialis*	*squatarola*	Migrant
Snowy Plover (C)	***Charadrius***	***alexandrinus***	**Breeder**
Semipalmated Plover	*Charadrius*	*semipalmatus*	Migrant
Killdeer	*Charadrius*	*vociferus*	Breeder/Winter
Black-necked Stilt (C)	***Himantopus***	***mexicanus***	**Breeder/Migrant**
American Avocet (C)	***Recurvirostra***	***americana***	**Breeder/Migrant**
Spotted Sandpiper	*Actitis*	*macularius*	Breeder/Migrant
Solitary Sandpiper	*Tringa*	*solitaria*	Migrant
Greater Yellowlegs	*Tringa*	*melanoleuca*	Migrant
Willet (C)	***Catoptrophorus***	***semipalmatus***	**Breeder/Migrant**
Lesser Yellowlegs	*Tringa*	*flavipes*	Migrant/
Whimbrel	*Numenius*	*phaeopus*	Migrant
Long-billed Curlew (C)	***Numenius***	***americanus***	**Breeder/Migrant**
Marbled Godwit (C)	***Limosa***	***fedoa***	**Migrant**
Sanderling	*Calidris*	*alba*	Migrant
Semipalmated Sandpiper	*Calidris*	*pusilla*	Migrant
Western Sandpiper (C)	***Calidris***	***mauri***	**Migrant**
Least Sandpiper (C)	***Calidris***	***minutilla***	**Migrant**
Baird's Sandpiper	*Calidris*	*bairdii*	Migrant
Pectoral Sandpiper	*Calidris*	*melanotos*	Migrant
Dunlin	*Calidris*	*alpina*	Migrant
Short-billed Dowitcher	*Limnodromus*	*griseus*	Migrant
Long-billed Dowitcher (C)	***Limnodromus***	***scolopaceus***	**Migrant**
Wilson's Snipe	*Gallinago*	*delicata*	Breeder/Winter
Wilson's Phalarope (C)	***Phalaropus***	***tricolor***	**Breeder/Migrant**
Red-necked Phalarope (C)	***Phalaropus***	***lobatus***	**Migrant**
Franklin's Gull (C)	***Leucophaeus***	***pipixcan***	**Breeder/Migrant**
Bonaparte's Gull	*Chroicocephalus*	*philadelphia*	Migrant
Ring-billed Gull	*Larus*	*delawarensis*	Breeder/Winter
California Gull	*Larus*	*californicus*	Breeder/Migrant
Herring Gull	*Larus*	*argentatus*	Migrant/Winter
Caspian Tern	*Sterna*	*caspia*	Breeder
Black Tern (C)	***Childonias***	***niger***	**Breeder/Migrant**
Common Tern	*Sterna*	*hirundo*	Migrant
Forster's Tern	*Sterna*	*forsteri*	Breeder/Migrant
Rock Pigeon	*Columba*	*livia*	Breeder/Winter
Band-tailed Pigeon (C)	***Columba***	***fasciata***	**Breeder/Winter**
Eurasian Collared-Dove	*Streptopelia*	*decaocto*	Breeder/Winter
White-winged Dove	*Zenaida*	*asiatica*	Breeder
Mourning Dove	*Zenaida*	*macroura*	Breeder/Winter

Common Name	Genus	Species	Seasonal Status
Inca Dove	*Columbina*	*inca*	Breeder
Yellow-billed Cuckoo (C)	***Coccyzus***	***americanus***	**Breeder**
Greater Roadrunner	*Geococcyx*	*californianus*	Breeder/Winter
Barn Owl	*Tyto*	*alba*	Breeder/Winter
Flammulated Owl (C)	***Otus***	***flammeolus***	**Breeder**
Western Screech-Owl	*Otus*	*kennicottii*	Breeder/Winter
Great Horned Owl	*Bubo*	*virginianus*	Breeder/Winter
Northern Pygmy-Owl	*Glaucidium*	*gnoma*	Breeder/Winter
Elf Owl	*Micrathene*	*whitneyi*	Extirpated
Burrowing Owl (SS)	***Athene***	***cunicularia***	**Breeder**
Spotted Owl (C)	***Strix***	***occidentalis***	**Breeder/Winter**
Long-eared Owl	*Asio*	*otus*	Breeder/Migrant
Short-eared Owl (C)	***Asio***	***flammeus***	**Breeder/Winter**
Northern Saw-whet Owl	*Aegolius*	*acadicus*	Breeder/Winter
Lesser Nighthawk	*Chordeiles*	*acutipennis*	Breeder
Common Nighthawk	*Chordeiles*	*minor*	Breeder/Migrant
Common Poorwill (S)	***Phalaenoptilus***	***nuttallii***	**Breeder/Migrant**
Mexican Whip-poor-will	*Caprimulgus*	*arizonae*	Breeder
Vaux's Swift	*Chaetura*	*vauxi*	Migrant
White-throated Swift (C)	***Aeronautes***	***saxatalis***	**Breeder/Migrant**
Black-chinned Hummingbird	*Archilochus*	*alexandri*	Breeder/Migrant
Anna's Hummingbird	*Calypte*	*anna*	Breeder/Migrant
Costa's Hummingbird (C)	***Calypte***	***costae***	**Breeder**
Calliope Hummingbird (C)	***Stellula***	***calliope***	**Breeder/Migrant**
Broad-tailed Hummingbird	*Selasphorus*	*platycercus*	Breeder/Migrant
Rufous Hummingbird (C)	***Selasphorus***	***rufus***	**Migrant**
Belted Kingfisher	*Megaceryle*	*alcyon*	Breeder/Winter
Lewis's Woodpecker (C)	***Melanerpes***	***lewis***	**Breeder/Winter**
Williamson's Sapsucker (C)	***Sphyrapicus***	***thyroideus***	**Breeder/Winter**
Red-naped Sapsucker	*Sphyrapicus*	*nuchalis*	Breeder
Red-breasted Sapsucker	*Sphyrapicus*	*ruber*	Breeder
Ladder-backed Woodpecker	*Picoides*	*scalaris*	Breeder/Winter
Downy Woodpecker	*Picoides*	*pubescens*	Breeder/Winter
Hairy Woodpecker	*Picoides*	*villosus*	Breeder/Winter
White-headed Woodpecker(C)	***Picoides***	***albolarvatus***	**Breeder/Winter**
American Three-toed Woodpecker	*Picoides*	*dorsalis*	Breeder/Winter
Black-backed Woodpecker	*Picoides*	*arcticus*	Breeder/Winter
Northern Flicker	*Colaptes*	*auratus*	Breeder/Winter
Gilded Flicker (C)	***Colaptes***	***chrysoides***	**Breeder**
Pileated Woodpecker	*Dryocopus*	*pileatus*	Breeder/Winter
Olive-sided Flycatcher (C)	***Contopus***	***cooperi***	**Breeder**
Western Wood-Pewee	*Contopus*	*sordidulus*	Breeder/Migrant
Willow Flycatcher (C)	***Empidonax***	***traillii***	**Breeder/Migrant**
Hammond's Flycatcher	*Empidonax*	*hammondii*	Breeder/Migrant
Gray Flycatcher (S)	***Empidonax***	***wrightii***	**Breeder/Migrant**
Dusky Flycatcher	*Empidonax*	*oberholseri*	Breeder/Migrant

Common Name	Genus	Species	Seasonal Status
Pacific-slope Flycatcher	*Empidonax*	*difficilis*	Probable Migrant
Cordilleran Flycatcher	*Empidonax*	*occidentalis*	Breeder/Migrant
Black Phoebe	*Sayornis*	*nigricans*	Breeder/Migrant
Say's Phoebe	*Sayornis*	*saya*	Breeder/Migrant
Vermilion Flycatcher	*Pyrocephalus*	*rubinus*	Breeder
Ash-throated Flycatcher	*Myiarchus*	*cinerascens*	Breeder
Brown-crested Flycatcher	*Myiarchus*	*tyrannulus*	Breeder
Cassin's Kingbird	*Tyrannus*	*vociferans*	Breeder
Western Kingbird	*Tyrannus*	*verticalis*	Breeder
Eastern Kingbird	*Tyrannus*	*tyrannus*	Breeder
Loggerhead Shrike	*Lanius*	*ludovicianus*	Breeder/Migrant
Northern Shrike	*Lanius*	*excubitor*	Migrant/Winter
Bell's Vireo (C)	***Vireo***	***bellii***	**Breeder**
Gray Vireo (C)	***Vireo***	***vicinior***	**Breeder**
Plumbeous Vireo	*Vireo*	*plumbeus*	Breeder/Migrant
Cassin's Vireo	*Viireo*	*cassinii*	Breeder/Migrant
Warbling Vireo	*Vireo*	*gilvus*	Breeder/Migrant
Steller's Jay	*Cyanocitta*	*stelleri*	Breeder
Western Scrub-jay	*Aphelocoma*	*californica*	Breeder
Pinyon Jay (C)	***Gymnorhinus***	***cyanocephalus***	**Breeder**
Clark's Nutcracker	*Nucifraga*	*columbiana*	Breeder
Black-billed Magpie	*Pica*	*hudsonia*	Breeder
American Crow	*Corvus*	*brachyrhynchos*	Breeder
Common Raven	*Corvus*	*corax*	Breeder
Horned Lark	*Eremophela*	*alpestris*	Breeder/Migrant
Tree Swallow	*Tachycineta*	*bicolor*	Breeder/Migrant
Violet-green Swallow	*Tachycineta*	*thalassina*	Breeder/Migrant
Northern Rough-winged Swallow	*Stelgidopteryx*	*serripennis*	Breeder/Migrant
Bank Swallow	*Riparia*	*riparia*	Breeder/Migrant
Cliff Swallow	*Petrochelidon*	*pyrrhonota*	Breeder/Migrant
Barn Swallow	*Hirundo*	*rustica*	Breeder/Migrant
Black-capped Chickadee	*Poecile*	*atricapilla*	Breeder
Mountain Chickadee	*Poecile*	*gambeli*	Breeder
Juniper Titmouse	*Baelophus*	*ridgwayi*	Breeder
Verdin	*Auriparus*	*flaviceps*	Breeder
Bushtit	*Psaltriparus*	*minimus*	Breeder
Red-breasted Nuthatch	*Sitta*	*canadensis*	Breeder
White-breasted Nuthatch	*Sitta*	*carolinensis*	Breeder
Pygmy Nuthatch	*Sitta*	*pygmaea*	Breeder
Brown Creeper	*Certhia*	*americana*	Breeder
Cactus Wren	*Campylorhynchus*	*brunneicapillus*	Breeder
Rock Wren	*Salpinctes*	*obsoletus*	Breeder
Canyon Wren	*Catherpes*	*mexicanus*	Breeder
Bewick's Wren	*Thryomanes*	*bewickii*	Breeder
House Wren	*Troglodytes*	*aedon*	Breeder
Pacific Wren	*Troglodytes*	*pacificus*	Breeder
Marsh Wren	*Cistothorus*	*palustris*	Breeder/Migrant

Common Name	Genus	Species	Seasonal Status
American Dipper	*Cinculus*	*mexicanus*	Breeder
Golden-crowned Kinglet	*Regulus*	*satrapa*	Breeder/Migrant
Ruby-crowned Kinglet	*Regulus*	*calendula*	Breeder/Migrant
Blue-gray Gnatcatcher	*Polioptila*	*caerulea*	Breeder
Black-tailed Gnatcatcher	*Polioptila*	*melanura*	Breeder
Western Bluebird	*Sialia*	*mexicana*	Breeder
Mountain Bluebird	*Sialia*	*currucoides*	Breeder/Migrant
Townsend's Solitaire	*Myadestes*	*townsendi*	Breeder/Migrant
Swainson's Thrush	*Catharus*	*ustulatus*	Breeder/Migrant
Hermit Thrush	*Catharus*	*guttatus*	Breeder/Migrant
American Robin	*Turdus*	*migratorius*	Breeder/Migrant
Gray Catbird	*Dumetella*	*carolinensis*	Breeder
Northern Mockingbird	*Mimus*	*polyglottos*	Breeder/Migrant
Sage Thrasher (S)	***Oreoscoptes***	***montanus***	**Breeder/Migrant**
Bendire's Thrasher (C)	***Toxostoma***	***bedirei***	**Breeder**
Crissal Thrasher	*Toxostoma*	*crissale*	Breeder
Le Conte's Thrasher (C)	***Toxostoma***	***lecontei***	**Breeder**
European Starling	*Sturnus*	*vulgaris*	Breeder/Migrant
American Pipit	*Anthus*	*rubescens*	Breeder/Migrant
Bohemian Waxwing	*Bombycilla*	*garrulus*	Migrant/Winter
Cedar Waxwing	*Bombycilla*	*cedrorum*	Breeder/Migrant
Phainopepla	*Phainopepla*	*nitens*	Breeder
Orange-crowned Warbler	*Oreothlypis*	*celata*	Breeder/Migrant
Nashville Warbler	*Oreothlypis*	*ruficapilla*	Breeder/Migrant
Virginia's Warbler (C)	***Oreothlypis***	***virginiae***	**Breeder/Migrant**
Lucy's Warbler (C)	***Oreothlypis***	***luciae***	**Breeder**
Yellow Warbler	*Dendroica*	*petechia*	Breeder/Migrant
Yellow-rumped Warbler	*Dendroica*	*coronata*	Breeder/Winter
Black-throated Gray Warbler	*Dendroica*	*nigrescens*	Breeder/Migrant
Townsend's Warbler	*Dendroica*	*townsendi*	Migrant
Hermit Warbler (C)	***Dendroica***	***occidentalis***	**Breeder**
Grace's Warbler (C)	***Dendroica***	***graciae***	**Breeder**
MacGillivray's Warbler	*Oporornis*	*tolmiei*	Breeder/Migrant
Common Yellowthroat	*Geothlypis*	*trichas*	Breeder/Migrant
Wilson's Warbler	*Wilsonia*	*pusilla*	Breeder/Migrant
Yellow-breasted Chat	*Icteria*	*virens*	Breeder/Migrant
Summer Tanager	*Piranga*	*rubra*	Breeder
Western Tanager	*Piranga*	*ludoviciana*	Breeder/Migrant
Green-tailed Towhee (S)	***Pipilo***	***chlorurus***	**Breeder/Migrant**
Spotted Towhee	*Pipilo*	*maculatus*	Breeder/Winter
Abert's Towhee (C)	***Melozone***	***aberti***	**Breeder/Winter**
Rufous-crowned Sparrow	*Aimophila*	*ruficeps*	Breeder
American Tree Sparrow	*Spizella*	*arborea*	Winter
Chipping Sparrow	*Spizella*	*passerina*	Breeder/Migrant
Brewer's Sparrow (C)	***Spizella***	***breweri***	**Breeder/Migrant**
Black-chinned Sparrow (C)	***Spizella***	***atrogularis***	**Breeder**
Vesper Sparrow	*Pooecetes*	*gramineus*	Breeder/Migrant

Appendices

Common Name	Genus	Species	Seasonal Status
Lark Sparrow	*Chondestes*	*grammacus*	Breeder/Migrant
Black-throated Sparrow	*Amphispiza*	*bilineata*	Breeder/Migrant
Sage Sparrow (C)	***Amphispiza***	***belli***	**Breeder/Winter**
Savannah Sparrow	*Passerculus*	*sandwichensis*	Breeder/Winter
Fox Sparrow	*Passerella*	*iliaca*	Breeder/Migrant
Song Sparrow	*Melospiza*	*melodia*	Breeder/Winter
Lincoln's Sparrow	*Melospiza*	*lincolnii*	Breeder/Migrant
White-crowned Sparrow	*Zonotrichia*	*leucophrys*	Breeder/Winter
Golden-crowned Sparrow	*Zonotrichia*	*atricapilla*	Migrant/Winter
Dark-eyed Junco	*Junco*	*hyemalis*	Breeder/Winter
Lapland Longspur	*Calcarius*	*lapponicus*	Winter
Chestnut-collared Longspur	*Calcarius*	*ornatus*	Migrant
Black-headed Grosbeak	*Pheucticus*	*melanocephalus*	Breeder/Migrant
Blue Grosbeak	*Passerina*	*caerulea*	Breeder
Lazuli Bunting	*Passerina*	*amoena*	Breeder/Migrant
Indigo Bunting	*Passerina*	*cyanea*	Probable Breeder
Bobolink	*Dolichonyx*	*oryzivorus*	Breeder/Migrant
Red-winged Blackbird	*Agelaius*	*phoeniceus*	Breeder/Winter
Tricolored Blackbird (C)	***Agelaius***	***tricolor***	**Breeder/Migrant**
Western Meadowlark	*Sturnella*	*neglecta*	Breeder/Winter
Yellow-headed Blackbird	*Xanthocephalus*	*xanthocephalus*	Breeder/Migrant
Brewer's Blackbird	*Euphagus*	*cyanocephalus*	Breeder/Winter
Great-tailed Grackle	*Quiscalus*	*mexicanus*	Breeder/Winter
Brown-headed Cowbird	*Molothrus*	*ater*	Breeder/Migrant
Hooded Oriole	*Icterus*	*cucullatus*	Breeder
Bullock's Oriole	*Icterus*	*bullockii*	Breeder/Migrant
Scott's Oriole	*Icterus*	*parisorum*	Breeder
Gray-crowned Rosy-Finch	*Leucosticte*	*tephrocotis*	Migrant/Winter
Black Rosy-Finch (C)	***Leucosticte***	***atrata***	**Breeder/Winter**
Pine Grosbeak	*Pinicola*	*enucleator*	Breeder/Winter
Cassin's Finch	*Carpodacus*	*cassini*	Breeder/Winter
House Finch	*Carpodacus*	*mexicanus*	Breeder/Winter
Red Crossbill	*Loxia*	*curvirostra*	Breeder/Winter
Pine Siskin	*Spinus*	*pinus*	Breeder/Winter
Lesser Goldfinch	*Spinus*	*psaltria*	Breeder/Winter
American Goldfinch	*Spinus*	*tristis*	Breeder/Winter
Evening Grosbeak	*Coccothraustes*	*vespertinus*	Breeder/Winter
House Sparrow	*Passer*	*domesticus*	Breeder/Winter

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Appendices

Appendix 3: Statistical Results

We gather here the statistical results for the NBC-based analyses summarized in the species accounts under the "Nevada-Specific Studies and Analyses" heading. For the priority songbirds in this plan that were sufficiently well sampled by the NBC, we conducted analyses of NBC data using GIS-derived transect attributes as explanatory variables. In general, we referred to this as "landscape-level" analysis. The statistical analyses are described in detail in *Appendix 1,* apart from the results which are reported below. In brief, the dependent variable was presence/absence of a given priority species. Most of the explanatory variables examined were proportional surface areas of each habitat type within each transect's effective sampling area (defined as the region lying within 200 m of at least one of the transect's ten point-count stations). Habitat types were those identified in the original GAP-based NBC stratification process, which varied slightly from the habitat types otherwise defined in this plan (see *Appendix 1*). One additional explanatory variable was:

> DISTANCE TO WATER: Shortest distance from any portion of the transect sampling area to the nearest year-round water source (with a maximum value of 10 km). Note that a positive relationship with distance would mean that the bird was more likely to occur farther from water.

We used logistic regression to analyze the relationships between bird presence (detection or non-detection) and habitat types or distance to water. The p-values of the univariate relationships are reported in the following tables:

Table App-3-1: Univariate p-values for habitat models of six Priority species in the **Great Basin** region. Significant positive relationships are in **Bold.** Positive relationships are denoted by "(+)" and negative relationships by "(-)".

Habitat Type (Proportion)	**Brewer's Sparrow**	**Gray Fly-catcher**	**Green-tailed Towhee**	**Pinyon Jay**	**Sage Sparrow**	**Sage Thrasher**
Mojave Scrub						
Salt Desert Scrub	0.241(+)	0.007(-)	<.001(-)	0.098(-)	**<.001(+)**	**<.001(+)**
Lowland Sagebrush	**<.001(+)**	**0.013(+)**	0.276	0.213(-)	**<.001(+)**	**<.001(+)**
Montane Sagebrush	**<.001(+)**	0.475	**0.001(+)**	0.038(-)	0.139(-)	0.550
Montane Shrub	0.495	0.038(-)	0.798	0.515	0.197(-)	0.290
Montane Riparian	0.579	0.047(-)	0.133(+)	0.277	0.002(-)	0.009(-)
Aspen	0.562	0.038(-)	**<.001(+)**	0.034(-)	0.004(-)	0.003(-)
Mt. Mahogany	0.063(-)	0.084(-)	**0.001(+)**	0.652	0.014(-)	0.004(-)
Pinyon-Juniper	<.001(-)	**<.001(+)**	**0.001(+)**	**<.001(+)**	<.001(-)	<.001(-)
Coniferous Forest	<.001(-)	0.012(-)	0.194(+)	0.149(-)	0.030(-)	0.011(-)
Mesquite-Catclaw						
Lowland Riparian	0.238(-)	0.190(-)	0.069(-)	0.561	0.118(-)	0.090(-)
Wet Meadow	0.055(-)	0.032(-)	0.006(-)	0.151(-)	0.158(-)	0.060(-)
Wetland	0.081(-)	0.109(-)	0.045(-)	0.226(-)	0.300(-)	0.300
Agricultural	0.089(-)	0.009(-)	0.003(-)	0.110(-)	0.084(-)	0.390
Developed	0.057(-)	0.023(-)	0.324	0.719	0.524	0.060(-)
DISTANCE TO WATER	0.110(-)	0.588	0.274	0.027(+)	0.017(+)	0.590

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Table App-3-2: Univariate p-values for habitat models of five Priority species in the Mojave Desert region. Significant positive relationships are in **Bold.** Positive relationships are denoted by "(+)" and negative relationships by "(-)".

Habitat Type (Proportion)	Abert's Towhee	Bell's Vireo	Lucy's Warbler	Gambel's Quail	Black-chinned Sparrow
Mojave Scrub	0.233(-)	0.091(-)	0.131(-)	**0.002(+)**	0.140(+)
Salt Desert Scrub	0.456	0.441	0.410	0.320	0.234(-)
Lowland Sagebrush	0.178(-)	0.208(-)	0.119(-)	0.017(-)	0.064(-)
Montane Sagebrush	0.276	0.370	0.204(-)	0.099(-)	0.230(-)
Montane Shrub	0.251	0.759	0.117(+)	0.399	**0.011(+)**
Montane Riparian	0.151(-)	0.865	0.188(-)	0.012(-)	**<.001(+)**
Aspen					
Mt. Mahogany		0.577	0.639	0.084(-)	0.841
Pinyon-Juniper	0.217(-)	0.725	0.384	0.239(-)	**<.001(+)**
Coniferous Forest	0.468	0.619	0.492	0.325	0.486
Mesquite-Catclaw	0.902	**0.064(+)**	**0.012(+)**	**0.015(+)**	
Lowland Riparian	**<.001(+)**	**<.001(+)**	**<.001(+)**	**<.001(+)**	0.021(-)
Wet Meadow		0.425	0.524	0.281	0.633
Wetland	0.525	0.676	**0.022(+)**		0.446
Agricultural	**<.001(+)**	**0.012(+)**	**0.003(+)**	**0.029(+)**	0.535
Developed	**0.035(+)**	0.439	**0.003(+)**	0.587	0.527
DISTANCE TO WATER	**0.008(-)**	**0.013(-)**	**0.003(-)**	0.119(-)	0.731

Table App-3-3: Univariate p-values for habitat models of two Priority species whose range encompassed both southern and east-central Nevada. Significant positive relationships are in **Bold.** Positive relationships are denoted by "(+)" and negative relationships by "(-)". Only data from the south and east NBC regions were analyzed (*see Appendix 1*).

Habitat Type (Proportion)	Gray Vireo	Virginia's Warbler
Mojave Scrub	0.065(+)	0.075(-)
Salt Desert Scrub	0.122(-)	0.318
Lowland Sagebrush	0.022(-)	0.068(-)
Montane Sagebrush	0.095(-)	0.727
Montane Shrub	0.410	0.711
Montane Riparian	0.753	0.168(+)
Aspen	0.253	0.560
Mt. Mahogany	0.144(-)	**0.002(+)**
Pinyon-Juniper	**0.001(+)**	**0.001(+)**
Coniferous Forest	0.310	**<.001(+)**
Mesquite-Catclaw	0.270	
Lowland Riparian	0.229(-)	0.347
Wet Meadow	0.203(-)	0.384
Wetland	0.432	0.552
Agricultural	0.182(-)	0.345
Developed	0.233(-)	0.158(+)
DISTANCE TO WATER	0.790	0.524

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Appendix 4: Comparison of Population Size Estimates for Priority Species in Nevada.

Because we report only one population size estimate on the front pages of the species accounts, here we gather all sources of estimates for comparison. One methodological issue should be noted. BBS-based estimates (Rich et al. 2004, and unpublished Blancher spreadsheet; see *Appendix 1: Methods*) are adjusted by several "correction factors" based on bird detectability. The most important is that raw count numbers are automatically doubled, under the assumption that only males are being detected. NBC estimates, in contrast, do not use correction factors, based on our indications that most of the more visible or local landbirds are being detected within the defined sample area of each survey point (see *Appendix 1: Methods*). Refinement of correction factors and determining when their use is appropriate are priority considerations for improving the population estimation process (Thogmartin et al. 2006).

Table App-4-1: Population size estimates for Priority species. NBC = Nevada Bird Count; BBS = Breeding Bird Survey, with analysis by Blancher (i.e. "Blancher spreadsheet"). Numbers in **bold** are the ones reported in the species accounts. "Source for reported estimate" gives citations or other source information about the estimate shown in bold. WAP = Wildlife Action Plan.

SPECIES	NBC	BBS	Other	Source for reported estimate
Trumpeter Swan			**≤ 30 breeding**	Census
Tundra Swan			**1–10,000 winter**	Expert Opinion
Cinnamon Teal			**> 10,000**	Nevada WAP Team 2006
Northern Pintail			**5,000 breeders**	Nevada WAP Team 2006
Canvasback			**4,600 breeders**	Nevada WAP Team 2006
Redhead			**4,500 breeders**	Nevada WAP Team 2006
Lesser Scaup			**~650 breeders**	USFWS (2001)
Greater Sage-Grouse			**68-88,000**	Nevada WAP Team 2006
Blue Grouse		174	**Unknown**	
Sharp-tailed Grouse			**226**	NDOW reintroductions
Mountain Quail		**840**		Blancher spreadsheet
Gambel's Quail	**260,000**	14,000		Nevada Bird Count
Common Loon			**500 migrants**	Expert Opinion
Eared Grebe			**400 breeders**	Ivey and Herziger 2006
Western Grebe			**250**	Nevada WAP Team 2006
Clark's Grebe			**300**	Nevada WAP Team 2006
American White Pelican			**8,600**	Anaho Island NWR data
Least Bittern			**Unknown**	
Snowy Egret			**600**	Nevada WAP Team 2006
White-faced Ibis	16,000		**5–6,000**	Ivey and Herziger 2006
Bald Eagle			**~ 10; >120**	Buehler 2000; WAP 2006
Northern Goshawk	700	17	**700**	Herron 1999
Swainson's Hawk	21,000	7,700	**300**	Herron et al. 1985
Ferruginous Hawk	**1,200**	900		Nevada Bird Count
Golden Eagle	**3,000**	6,200	2,400	Nevada Bird Count

SPECIES	NBC	BBS	Other	Source for reported estimate
Peregrine Falcon			**140-180**	Klinger,NDOW,*pers.comm.*
Prairie Falcon	**11,500**	8,600	2,500	Nevada Bird Count
Clapper Rail			**20-40**	Garnett et al. 2004
Sandhill Crane	3,300		**650 – 1,000**	Bradley 2005
Snowy Plover			**350 – 1,000**	GBBO unpublished data
Black-necked Stilt			**3,000**	Expert Opinion
American Avocet			**18,000**	Expert Opinion
Willet	6,800		**2,100**	Expert Opinion
Long-billed Curlew	15,000		**1,150**	Fellows and Jones 2009
Marbled Godwit			**350**	Expert Opinion
Western Sandpiper			**12,000 migrants**	IWJV (in prep.)
Least Sandpiper			**2,200**	IWJV (in prep.)
Long-billed Dowitcher	174		**14–20,000**	IWJV (in prep.);WAP 2006
Wilson's Phalarope			**3,000 breeders** **12,000 migrants**	IWJV (in prep.) Expert Opinion
Red-necked Phalarope			**3,000**	IWJV (in prep.)
Franklin's Gull			**350**	Expert Opinion
Black Tern			**700**	Expert Opinion
Band-tailed Pigeon	**615**	7,500		Nevada Bird Count
Yellow-billed Cuckoo			**10-20**	NDOW 2009
Flammulated Owl			**< 2,500**	Expert Opinion
Burrowing Owl	**3,000**	22,000		Nevada Bird Count
Spotted Owl			**<12**	Nevada WAP Team 2006
Short-eared Owl		**5,000**		Blancher spreadsheet
Common Poorwill			**Unknown**	
White-throated Swift	**14,000**	4,300		Nevada Bird Count
Costa's Hummingbird	**14,000**			Nevada Bird Count
Calliope Hummingbird	**9,500**	60,000		Nevada Bird Count
Rufous Hummingbird	218		**>1,000,000 migrants**	Expert Opinion
Lewis's Woodpecker	**13,000**	10,000		Nevada Bird Count
Williamson's Sapsucker	**1,500**	480		Nevada Bird Count
White-headed Woodpecker	**840**	660		Nevada Bird Count
Gilded Flicker			**<100**	Floyd et al 2007
Olive-sided Flycatcher	**5,600**	1,000		Nevada Bird Count
Willow Flycatcher	7,300	**1,500**		Blancher spreadsheet
SW Willow Flycatcher			**90**	Swett 1999
Gray Flycatcher	**650,000**	601,000		Nevada Bird Count
Bell's Vireo	**1,000**			Nevada Bird Count
Gray Vireo	**78,000**	300		Nevada Bird Count
Pinyon Jay	**428,000**	1,353,000		Nevada Bird Count
Sage Thrasher	**1,500,000**	3,820,000		Nevada Bird Count

SPECIES	NBC	BBS	Other	Source for reported estimate
Bendire's Thrasher	3,100	1,000	**<50**	Expert Opinion
Le Conte's Thrasher	20,000	9,700	**<100**	Expert Opinion
Virginia's Warbler	**8,200**	101,857		Nevada Bird Count
Lucy's Warbler	**2,900**	29,000		Nevada Bird Count
Hermit Warbler	**140**	7,300		Nevada Bird Count
Grace's Warbler	**610**	170		Nevada Bird Count
Green-tailed Towhee	**885,000**	686,000		Nevada Bird Count
Abert's Towhee	**2,300**			Nevada Bird Count
Brewer's Sparrow	**7,400,000**	7,000,000		Nevada Bird Count
Black-chinned Sparrow	**8,400**			Nevada Bird Count
Sage Sparrow	**2,900,000**	1,824,000		Nevada Bird Count
Tricolored Blackbird			**<100**	Ammon and Woods 2008
Black Rosy-finch			**Unknown**	

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Appendices

Appendix 5: Habitat Use of Conservation Priority, Stewardship, and Special Status Species.

Table App-5-1: The habitats used by Priority species, as listed in the individual species and habitat accounts. Habitat types are defined in *Appendix 1:Methods*. Dark grid cells indicate the habitat type(s) most commonly associated with a given species. Lighter gray grid cells indicate the habitat type(s) that are used less commonly, or seasonally. Species are listed in AOU taxonomic order.

	Agriculture	Alpine	Aspen	Cliff	Coniferous Forest	Ephemeral Wetland and Playa	Great Basin Lowland Riparian	Joshua Tree	Marsh	Mesquite-Acacia	Mojave Lowland Riparian	Mojave Scrub	Montane Riparian	Montane Shrubland	Open Water	Pinyon-Juniper	Sagebrush	Salt Desert Scrub	Springs	Wet Meadow
Trumpeter Swan									■						■					
Tundra Swan									■						■					
Cinnamon Teal	▒					▒	▒		■						■					
Northern Pintail							▒		■						■					
Canvasback									■						■					
Redhead									■						■					
Lesser Scaup									■						■					▒
Greater Sage-Grouse	▒		▒				▒						▒	■			■		▒	■
Sooty / Dusky ("Blue") Grouse			■		■									■						
Sharp-tailed Grouse			■										■	■			▒			
Mountain Quail			■		■								■	■					▒	
Gambel's Quail	■									■	■								■	
Common Loon															■					
Eared Grebe									■						■					
Western Grebe									▒						■					
Clark's Grebe									▒						■					
American White Pelican							▒								■					
Least Bittern									■		▒									
Snowy Egret	▒						■		■		■				▒					
White-faced Ibis	■								■											■
Bald Eagle	▒				▒		■				▒				■					
Northern Goshawk			■		■											▒			▒	
Swainson's Hawk	■						■				■						■			▒
Ferruginous Hawk																■	■	▒		
Golden Eagle				■				▒			▒	▒				▒	■	▒		▒
Peregrine Falcon				■					▒		▒	▒								

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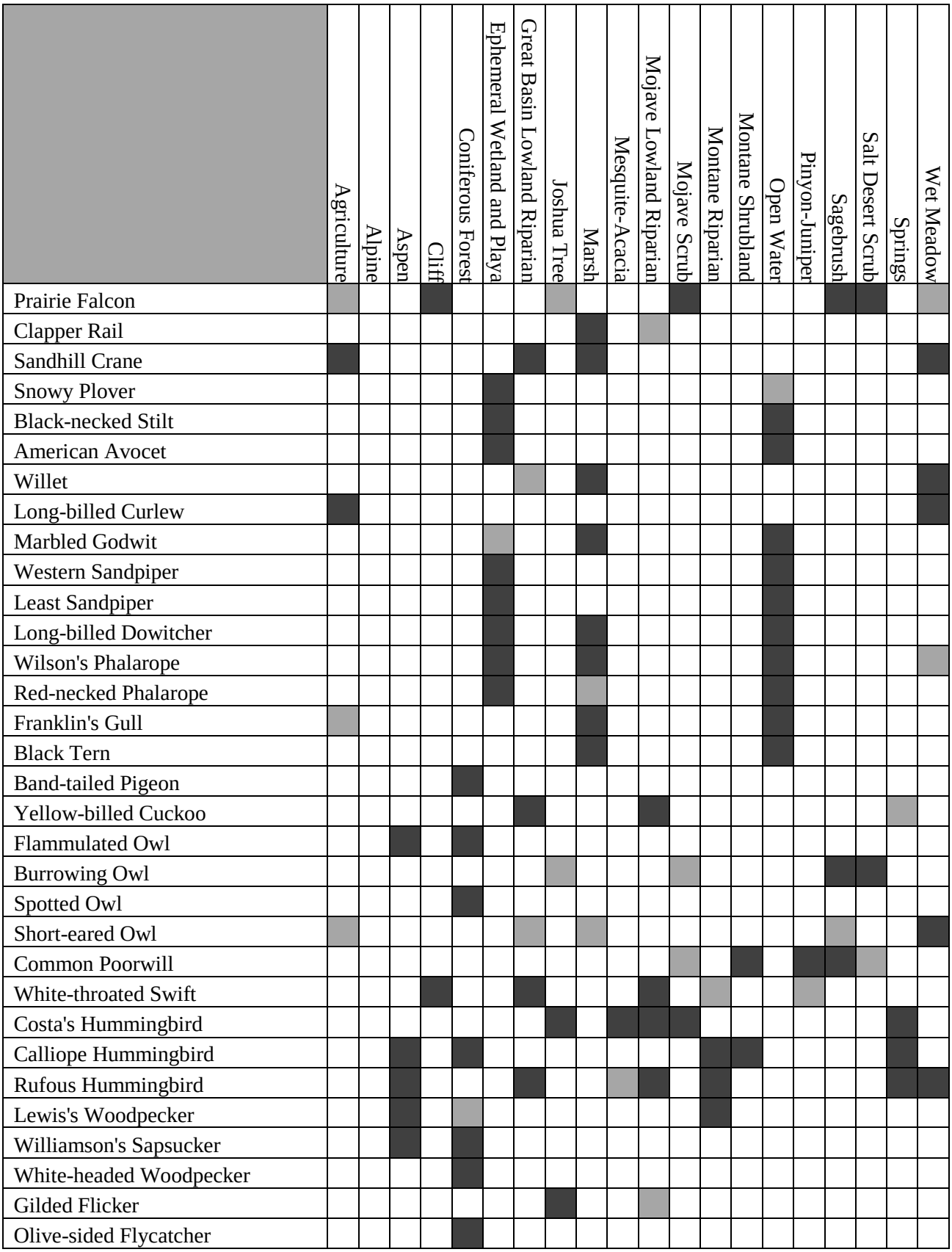
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Cliff
Coniferous Forest
Ephemeral Wetland and Playa
Great Basin Lowland Riparian
Joshua Tree
Marsh
Mesquite-Acacia
Mojave Lowland Riparian
Mojave Scrub
Montane Riparian
Montane Shrubland
Open Water
Pinyon-Juniper
Sagebrush
Salt Desert Scrub
Springs
Wet Meadow
Prairie Falcon
Clapper Rail
Sandhill Crane
Snowy Plover
Black-necked Stilt
American Avocet
Willet
Long-billed Curlew
Marbled Godwit
Western Sandpiper
Least Sandpiper
Long-billed Dowitcher
Wilson's Phalarope
Red-necked Phalarope
Franklin's Gull
Black Tern
Band-tailed Pigeon
Yellow-billed Cuckoo
Flammulated Owl
Burrowing Owl
Spotted Owl
Short-eared Owl
Common Poorwill
White-throated Swift
Costa's Hummingbird
Calliope Hummingbird
Rufous Hummingbird
Lewis's Woodpecker
Williamson's Sapsucker
White-headed Woodpecker
Gilded Flicker
Olive-sided Flycatcher

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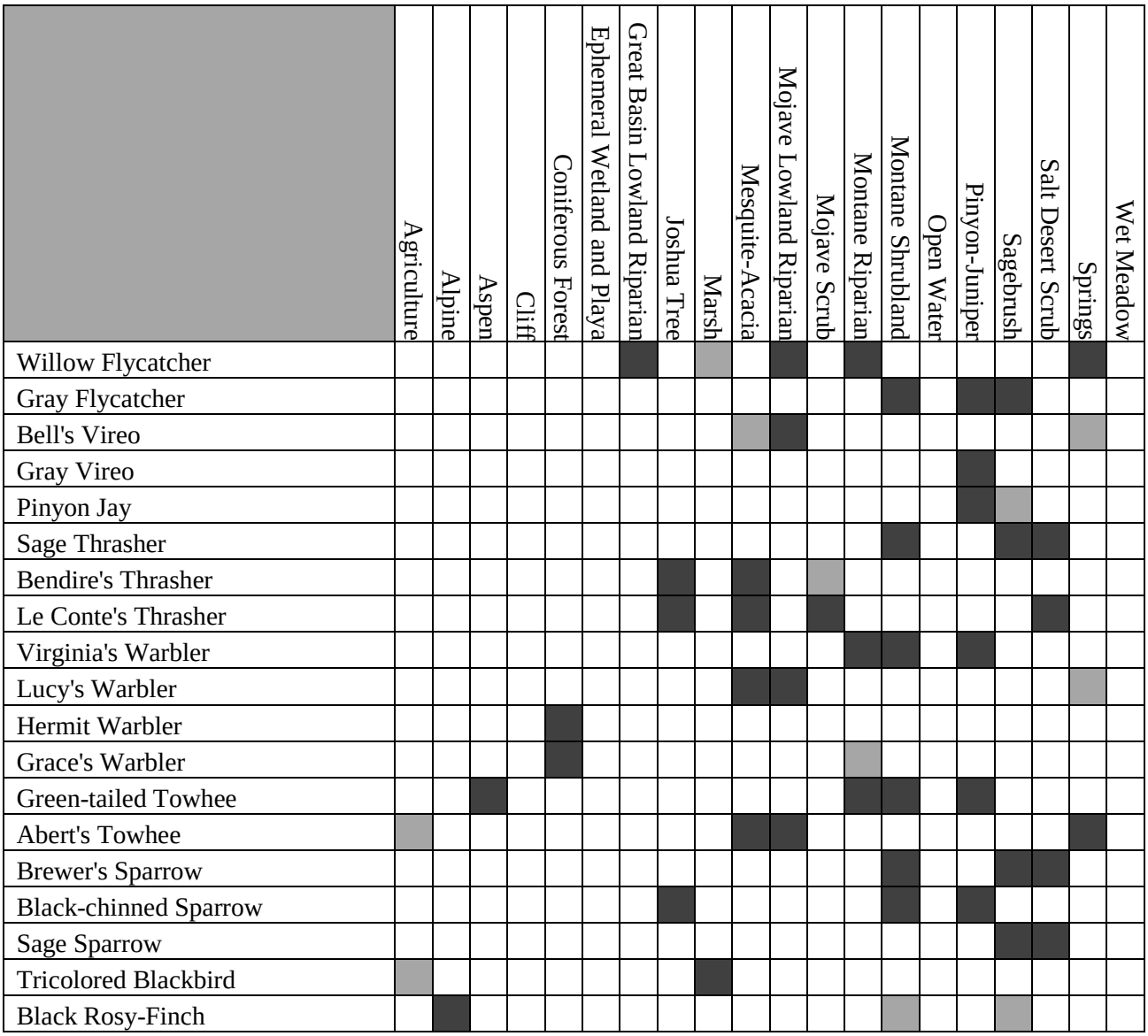
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Alpine
Aspen
Cliff
Coniferous Forest
Ephemeral Wetland and Playa
Great Basin Lowland Riparian
Joshua Tree
Marsh
Mesquite-Acacia
Mojave Lowland Riparian
Mojave Scrub
Montane Riparian
Montane Shrubland
Open Water
Pinyon-Juniper
Sagebrush
Salt Desert Scrub
Springs
Wet Meadow
Willow Flycatcher
Gray Flycatcher
Bell's Vireo
Gray Vireo
Pinyon Jay
Sage Thrasher
Bendire's Thrasher
Le Conte's Thrasher
Virginia's Warbler
Lucy's Warbler
Hermit Warbler
Grace's Warbler
Green-tailed Towhee
Abert's Towhee
Brewer's Sparrow
Black-chinned Sparrow
Sage Sparrow
Tricolored Blackbird
Black Rosy-Finch

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Appendices

Appendix 6: Priority Species Occurrence in Nevada Important Bird Areas

Many of the "Key Conservation Areas" listed in the species accounts are designated as Important Bird Areas under the Lahontan Audubon Society's Important Bird Area in Nevada Program (http://www.nevadaaudubon.org/iba.html). This program provides an excellent framework within which to organize bird conservation efforts, restoration projects, and activities involving public participation. The tables below summarize the seasonal occurrence of Priority species in all of Nevada's Important Bird Areas.

Table App-6-1: Confirmed and presumed occurrences of Priority species in Nevada's Important Bird Areas, **northwestern region**, with all historical records included. Species are listed in AOU taxonomic order. B = confirmed breeding; b = presumed breeding; M = confirmed migration (including winter); m = presumed migration (including winter); W = confirmed winter; w = presumed winter; N = confirmed non-breeding (excluding migration and winter); n = presumed non-breeding (excluding migration and winter).

Region	**Northwest**													
County	**Washoe / Carson City**						**Humboldt**		**Lyon**	**Douglas**		**Churchill**	**Mineral**	
Species	Carson Range	High Rock Resource Area	Pyramid Lake	Sheldon NWR	Swan Lake	Washoe Valley	Bilk Creek - Montana Ranges	Gridley Lake	Carson River Delta	Carson Valley	Wellington- Pine Grove Hills	Lahontan Valley Wetlands	Mount Grant	Walker Lake
Trumpeter Swan														
Tundra Swan			W	M	W	W			W			W		M
Cinnamon Teal			M	B	B	B	B	M	B	B		B		M
Northern Pintail			M	B	b	B			b	B		B		M
Canvasback			W	B	B	W				b		B		W
Redhead			M	B	B	B		M	b	B		B		W
Lesser Scaup			M	B	M	B			m	m		M		M
Greater Sage-Grouse		B		B			B				B		B	
Dusky Grouse														
Sooty Grouse	B												B	
Sharp-tailed Grouse														
Mountain Quail	B										B			
Gambel's Quail														
Common Loon			M			M								M
Eared Grebe			M	B	B	b				b		B		M
Western Grebe			M	B	b	B			b	B		B		B?
Clark's Grebe			M	B	b	B			b	B		B		B?
American White Pelican			B			n			n			B		N
Least Bittern												B		
Snowy Egret			B	M	m	B				B		B		
White-faced Ibis				M	b	B			M	b		B		M

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Region	Northwest													
	Washoe / Carson City						Humboldt		Lyon	Douglas		Churchill	Mineral	
County														
Species	Carson Range	High Rock Resource Area	Pyramid Lake	Sheldon NWR	Swan Lake	Washoe Valley	Bilk Creek - Montana Ranges	Gridley Lake	Carson River Delta	Carson Valley	Wellington- Pine Grove Hills	Lahontan Valley Wetlands	Mount Grant	Walker Lake
Bald Eagle	B		W	W		W			B	B	W	W		W
Northern Goshawk	B									w				
Swainson's Hawk				B		b	B		b	B		B		
Ferruginous Hawk				B		w	B			w		B		
Golden Eagle	B	B	B	B	N	N	B	N	N	B	B	B	B	b
Peregrine Falcon												M		
Prairie Falcon		B	B	B		b	B	b	b	W	B	B	b	b
Clapper Rail														
Sandhill Crane				B	M	M				B				
Snowy Plover			M	B		M		B				B		B
Black-necked Stilt			M	B	B	B		B		B		B		b
American Avocet			M	B	B	B		B	N	B		B		b
Willet				B	M	B		b	b	B		B		
Long-billed Curlew			M	B	M	B		B		B		B		
Marbled Godwit			M		M	M		M		M		M		M
Western Sandpiper			M	M	M	M		M	M	M		M		M
Least Sandpiper			M	M	M	M		M	M	M		M		M
Long-billed Dowitcher			M	M	M	M		M	M	M		M		M
Wilson's Phalarope			M	B	M	B		b	M	b		B		M
Red-necked Phalarope			M		M	N		n	n			N		N
Franklin's Gull			N		N	n						B		n
Black Tern			M		M	M		m	m	M		B		M
Band-tailed Pigeon	B													
Yellow-billed Cuckoo									(b)					
Flammulated Owl	B													
Burrowing Owl				B	B		B			b		B		b
Spotted Owl	B													
Short-eared Owl				B	W		B	b		w		B	b	
Common Poorwill	B	b	b	b			b	b	b		b	b	b	b
White-throated Swift		B					B		b					b
Costa's Hummingbird														
Calliope Hummingbird	B	b		b			b					B	b	
Rufous Hummingbird	m	m		M		m	m		m	M	m	M	m	
Lewis's Woodpecker	B			M								M		
Williamson's Sapsucker	B													
White-headed Woodpecker	B													

Appendices

Region	Northwest													
County	Washoe / Carson City						Humboldt		Lyon	Douglas		Churchill	Mineral	
Species	Carson Range	High Rock Resource Area	Pyramid Lake	Sheldon NWR	Swan Lake	Washoe Valley	Bilk Creek - Montana Ranges	Gridley Lake	Carson River Delta	Carson Valley	Wellington- Pine Grove Hills	Lahontan Valley Wetlands	Mount Grant	Walker Lake
Gilded Flicker														
Olive-sided Flycatcher	B			M		m						M		
Willow Flycatcher	B			M		n			b	n				
Gray Flycatcher	b	B		B		b	B			b	b	M	b	
Bell's Vireo														
Gray Vireo														
Pinyon Jay	B									N	B		b	
Sage Thrasher		B		B			B	b			B		B	b
Bendire's Thrasher														
Le Conte's Thrasher														
Virginia's Warbler											b		b	
Lucy's Warbler														
Hermit Warbler	b													
Grace's Warbler														
Green-tailed Towhee	B	B		B		b	b			b	B	M	B	
Abert's Towhee														
Brewer's Sparrow	B	B		B	b	b	B	b		b	b	b	B	
Black-chinned Sparrow														
Sage Sparrow		B	b	B	b	b	B	b	b	b	B	B	B	b
Tricolored Blackbird										B				
Black Rosy-Finch														

Table App-6-2: Confirmed and presumed occurrences of Priority species in Nevada's Important Bird Areas, **eastern and northern regions**, all historical records included. Species are listed in AOU taxonomic order. B = confirmed breeding; b = presumed breeding; M = confirmed migration (including winter); m = presumed migration (including winter); W = confirmed winter; w = presumed winter; N = confirmed non-breeding (excluding migration and winter); n = presumed non-breeding (excluding migration and winter).

Region	**East/North**										
County	**Elko**								**White Pine**		
Species	Boyd Humboldt Valley Wetlands	Franklin Lake	Goshute Mountains	Jarbidge Mountains	Mary's River	North Ruby Valley	Ruby Lake	Ruby Mountains	David E Moore Bird Sanctuary	Great Basin National Park	Northern Snake Range
Trumpeter Swan							B				
Tundra Swan							W				
Cinnamon Teal	B	B			B	B	B				
Northern Pintail	b	B			b	B	B				
Canvasback	b	B					B				
Redhead	b	B			N		B				
Lesser Scaup	m	m				m	B				
Greater Sage-Grouse		B		B	B	B	B	B		B	B
Dusky Grouse			B	B				B	b	B	B
Sooty Grouse											
Sharp-tailed Grouse				B							
Mountain Quail											
Gambel's Quail											
Common Loon							M				
Eared Grebe		B					B				
Western Grebe		B					B				
Clark's Grebe		B					B				
American White Pelican							B				
Least Bittern											
Snowy Egret	B				M		B				
White-faced Ibis	B	B			N	b	B				
Bald Eagle	w	w	M	w	w	B	n	w		w	w
Northern Goshawk			M	B	B			B		B	B
Swainson's Hawk	B		M	B	b	B	B	B			
Ferruginous Hawk	w	B	B			B	B	B			
Golden Eagle		n	B	b	n	b	N	B			B
Peregrine Falcon		M	M				M			b	
Prairie Falcon			b	B	b	b	B	B		b	b
Clapper Rail											
Sandhill Crane	M	b		b	B	b	B		n		
Snowy Plover		b									
Black-necked Stilt		B					B				
American Avocet		B				b	B				

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Region	East/North										
County	Elko								White Pine		
Species	Boyd Humboldt Valley Wetlands	Franklin Lake	Goshute Mountains	Jarbidge Mountains	Mary's River	North Ruby Valley	Ruby Lake	Ruby Mountains	David E Moore Bird Sanctuary	Great Basin National Park	Northern Snake Range
Willet	B	B				B	B				
Long-billed Curlew	B	B			b	B	B		B		
Marbled Godwit	M	M					M				
Western Sandpiper		M					M				
Least Sandpiper		M					M				
Long-billed Dowitcher		M					M				
Wilson's Phalarope	B	B			B	B	B				
Red-necked Phalarope		B					M				
Franklin's Gull		N					B				
Black Tern	B	b			m		B				
Band-tailed Pigeon											
Yellow-billed Cuckoo											
Flammulated Owl			N	B	B			b		B	B
Burrowing Owl	B	b				b	B		b	b	
Spotted Owl											
Short-eared Owl	B	b			N	b	B				
Common Poorwill		b		B	b	b	B	b	b	B	b
White-throated Swift				B	b			B		B	B
Costa's Hummingbird											
Calliope Hummingbird				B	N	b	B	B		B	
Rufous Hummingbird	m	M	m	m	m	m	M	m	m	m	m
Lewis's Woodpecker				B	B			B		M	m
Williamson's Sapsucker				b						B	b
White-headed Woodpecker											
Gilded Flicker											
Olive-sided Flycatcher				B				b		B	
Willow Flycatcher					B	b	B	b		b	b
Gray Flycatcher				b	B	b	B	B		b	b
Bell's Vireo											
Gray Vireo											
Pinyon Jay								B	B	B	B
Sage Thrasher	b	b	b	b	B	b	B	B	b	B	B
Bendire's Thrasher											
Le Conte's Thrasher											
Virginia's Warbler				b				B	b	B	b
Lucy's Warbler											
Hermit Warbler											
Grace's Warbler											
Green-tailed Towhee				B	B			B	b	B	b

Region	East/North										
County	Elko								White Pine		
Species	Boyd Humboldt Valley Wetlands	Franklin Lake	Goshute Mountains	Jarbidge Mountains	Mary's River	North Ruby Valley	Ruby Lake	Ruby Mountains	David E Moore Bird Sanctuary	Great Basin National Park	Northern Snake Range
Abert's Towhee											
Brewer's Sparrow		b	b	B	B	B	B	B	b	B	B
Black-chinned Sparrow											
Sage Sparrow	b	b	b	b	b	b	B	b	b	B	B
Tricolored Blackbird											
Black Rosy-Finch								B	n	B	

Table App-6-3: Confirmed and presumed occurrences of Priority species in Nevada's Important Bird Areas, **central and southern regions**, all historical records included. Species are listed in AOU taxonomic order. B = confirmed breeding; b = presumed breeding; M = confirmed migration (including winter); m = presumed migration (including winter); W = confirmed winter; w = presumed winter; N = confirmed non-breeding (excluding migration and winter); n = presumed non-breeding (excluding migration and winter).

Region	Central/South													
County	Nye				Lincoln		Clark							
Species	Toiyabe Range	Monitor Valley	Oasis Valley	Ash Meadows NWR	Meadow Valley Wash	Pahranagat Valley Complex	Catclaw Washes	Lake Mead	Moapa Valley	Spring Mountains	Sheep Range	Virgin River	Lower Muddy River	Wee Thump Joshua Tree Forest
Trumpeter Swan														
Tundra Swan														
Cinnamon Teal				B		B		w				m	B	
Northern Pintail				B		B		w				n	B	
Canvasback		M				W		W						
Redhead		b		B		B		W	b				b	
Lesser Scaup		m		M		M		M						
Greater Sage-Grouse	B	B												
Dusky Grouse	B													
Sooty Grouse														
Sharp-tailed Grouse														
Mountain Quail														
Gambel's Quail			b	B	B	B	B	B	B	B	B	B	B	B

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Region	Central/South													
County	Nye				Lincoln		Clark							
Species	Toiyabe Range	Monitor Valley	Oasis Valley	Ash Meadows NWR	Meadow Valley Wash	Pahranagat Valley Complex	Catclaw Washes	Lake Mead	Moapa Valley	Spring Mountains	Sheep Range	Virgin River	Lower Muddy River	Wee Thump Joshua Tree Forest
Common Loon								W						
Eared Grebe				b		B		W					W	
Western Grebe				M		B		b					b	
Clark's Grebe				M		B		b?					b	
American White Pelican						M		W?					M	
Least Bittern								b	b			b	b	
Snowy Egret				M		b		B	b			b	M	
White-faced Ibis			n	M		B		M	b			M	M	
Bald Eagle	w	w		W		W		W				w	W	
Northern Goshawk	B	B								B				
Swainson's Hawk	B		b	B	m	m			m			m	m	
Ferruginous Hawk	B	B	w	w	w	w			w			w	w	w
Golden Eagle	B	b	b	b	N	N	b		N	b	b	N	N	b
Peregrine Falcon				M	M	M		B		B		B	N	
Prairie Falcon	B	b	b	b	b	B	b	B	b	b	b	b	b	b
Clapper Rail				n					b			B	b	
Sandhill Crane						M								
Snowy Plover				B				B						
Black-necked Stilt		B		B		B		b	b			b	b	
American Avocet		B		b		n		b				b	b	
Willet		b		M		M							M	
Long-billed Curlew		b		M		M							M	
Marbled Godwit		M				M			m				M	
Western Sandpiper		M		M		M		M	m				M	
Least Sandpiper		M		M		M		M	m				M	
Long-billed Dowitcher		M		M		M		M	M				M	
Wilson's Phalarope		M		M		M		M	M				M	
Red-necked Phalarope		M		M		M		M	M				M	
Franklin's Gull				M		M		M	m				m	
Black Tern		m		M		M		M	M				M	
Band-tailed Pigeon										B	b			
Yellow-billed Cuckoo			b	n	b	B			B			B		
Flammulated Owl										B	B			
Burrowing Owl			b	B		N	b	B	b					b
Spotted Owl														
Short-eared Owl						B								
Common Poorwill	b	b	b	b	b	B	b	b	b	B	b			b
White-throated Swift	B			B				B	B	b	b	b		b

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Region	Central/South													
County	Nye				Lincoln		Clark							
Species	Toiyabe Range	Monitor Valley	Oasis Valley	Ash Meadows NWR	Meadow Valley Wash	Pahranagat Valley Complex	Catclaw Washes	Lake Mead	Moapa Valley	Spring Mountains	Sheep Range	Virgin River	Lower Muddy River	Wee Thump Joshua Tree Forest
Costa's Hummingbird			b	b	b	N	b	B	B	B	b	b	b	b
Calliope Hummingbird	B					M					b			
Rufous Hummingbird	m	m	m	M	m	M	m	m	m	m	m	m		m
Lewis's Woodpecker	B					M							M	
Williamson's Sapsucker										B	b			
White-headed Woodpecker														
Gilded Flicker														B
Olive-sided Flycatcher				M		M				B	b			
Willow Flycatcher	B		b	B	B	B		B	B	B		B	b	
Gray Flycatcher	B	B	n	n		N				B	B	n		(B)
Bell's Vireo			b	B	b	B	b	B	B	B		B		
Gray Vireo	B				n				n	B	B			B
Pinyon Jay	B	B								B	B			n
Sage Thrasher	B	B		W		W								
Bendire's Thrasher														B
Le Conte's Thrasher				B		B	b					b	b	B
Virginia's Warbler	B			M		M				B	B			
Lucy's Warbler			b	B	b	B	b	B	B			B		
Hermit Warbler														
Grace's Warbler										B	B			
Green-tailed Towhee	B	b		M		M			M	B	B			
Abert's Towhee			b	b?	b	b?	b	B	B			B	b	b
Brewer's Sparrow	B	B	n	B		B	w		w	b				w
Black-chinned Sparrow					n					B	B			b
Sage Sparrow	B	B	n	B		B	w		W	b				w
Tricolored Blackbird														
Black Rosy-Finch														