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.