Chapter 6

Species of Conservation Concern and Environmental Stressors: Local, Regional and Global Effects

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Executive Summary

Southern Nevada's unique landscapes and landforms provide habitat for a diversity of plant and wildlife species of conservation concern including many locally and regionally endemic species. The high population density and urbanization of the Las Vegas metropolitan area is the source of many local and regional stressors that affect these species and their habitats: nitrogen deposition; solar and wind energy and water development; recreation, insects and disease; livestock, wild horse, burro, and elk grazing; invasive species; and altered fire regimes. Global stressors also affect these species and include climate change and CO_2 enrichment.

Resource managers must simultaneously consider local, regional, and/or global scale stressors for effective management of species of conservation concern. In the sections below we provide specific examples of how stressors can affect the range and/or habitat of select species of conservation concern within the major ecosystem types of southern Nevada. We also provide suggestions for targeted management of southern Nevada's species of conservation concern. This information addresses Sub-goal 1.4 in the SNAP Science Research Strategy, which is to "Sustain and enhance southern Nevada's biotic communities to preserve biodiversity and maintain viable populations" (see table 1.1).

Alpine and Bristlecone Pine Ecosystems

Alpine and bristlecone pine ecosystems are susceptible to various stressors and disturbances. Global and regional stressors include climate change and atmospheric nitrogen deposition. Local stressors include recreation (e.g., snow skiing, rock climbing), invasive species (e.g., dandelion), and stochastic disturbance events (e.g., avalanches). The limited amount of habitat available in these ecosystems limits the degree to which species—especially plants—can respond to stressors. Changes in plant communities can affect the habitats of animal species that depend on these ecosystems. Management options include monitoring the changes occurring in these ecosystems and developing approaches for preventing establishment of invasive species and assisting the migration of plant species like bristlecone pine. Minimizing the effects of recreation can be important for species of conservation concern.

Mixed Conifer Ecosystem

The mixed conifer ecosystem is affected by a suite of local and regional stressors including invasive species, altered fire regimes, fire and fuels management activities,

recreation, and urban and water development. The effect of climate change on episodic and stochastic weather events coupled with long-term effects associated with fire suppression, invasive species, and recreation may combine to affect the persistence of endemic butterfly species in the Spring Mountains. Four species have been identified as conservation priorities including a candidate species for Federal listing including the Mt. Charleston blue butterfly (*Plebejus shasta charlestonensis*). Extreme climate events potentially linked to climate change may be adversely affecting butterflies with small restricted populations. Ongoing climate change and historical fire suppression have promoted fuel accumulation, which can lead to high intensity fires that burn large areas and compromise habitat integrity. Also, various forms of recreational use, including hiking, rock climbing, and skiing, may be affecting habitat in this ecosystem. The mixed conifer ecosystem is the focus of a diverse and varied set of management programs including vegetation and fuels management, rare species conservation, invasive species management, endemic butterfly research, and more. Increased pressure from urbanization and recreation will continue to challenge resource managers to find compromises between various user groups and species conservation in this ecosystem type.

Piñon-Juniper Ecosystem

The expansion of the piñon and juniper trees into other ecosystem types (e.g., sagebrush)—due to climate change, increased CO_2 concentrations, livestock grazing, and fire suppression—is occurring in southern Nevada. Progressive infilling of the trees following expansion causes reduced dominance or loss of understory plant species, increased fuel loads, and a greater risk of larger and higher severity fires. Lower elevation ecosystems with depleted understories are highly susceptible to invasion and dominance by annual grasses following fire. These changes can significantly affect species of conservation concern within these ecosystems, including the desert bighorn sheep and select species of birds. Pinyon jay, gray vireo, and gray flycatcher are experiencing significant population reductions due to stand in-filling and piñon die-off in piñon-juniper ecosystems. Resource managers should consider using fire, tree-thinning, invasive species management, and restriction of recreational uses when managing this ecosystem. Dynamics brought about by a changing climate, including drought and associated interactions with insects or other pathogens, will continue to challenge local resource managers.

Sagebrush Ecosystem

The sagebrush ecosystem is subject to a variety of stressors. Sagebrush types at intermediate to high elevations are exhibiting piñon and juniper expansion and progressive increases in tree dominance have the potential to compromise the integrity of sagebrush ecosystem for specific species or guilds. Sagebrush types at low to intermediate elevations are highly susceptible to invasion by annual grasses, including cheatgrass (*Bromus tectorum*) and red brome (*B. madritensis*). Conversion to annual grass dominance alters soil morphology, soil biota, and native plant diversity, as well as diversity of invertebrates, small mammals, reptiles, and birds. Bird species of conservation concern in the sagebrush ecosystem include the sage thrasher, sage sparrow, burrowing owl, and others. Each of these species is negatively affected by habitat degradation and loss due not only to invasive species and altered fire regimes but also urbanization, energy, and other development. Management actions for species of concern should consider climate model projections of species range expansion. Also, because so little of this ecosystem type naturally occurs in the region, protection of what remains should be a land management priority.

Blackbrush/Shadscale Ecosystem

The blackbrush/shadescale ecosystem is used as winter forage by deer and bighorn sheep and is habitat for numerous species of birds and small mammals. Blackbrush is one of the most flammable vegetation types in the Mojave Desert, and fires typically burn plants to ground level and deplete soil seedbanks. Because natural recruitment is low for most plant species in blackbrush vegetation, it may take centuries for natural recovery to occur following fire. Disturbances including grazing and recreation facilitate establishment of invasive annual grasses (e.g., *Bromus* spp.), the initiation of a grass-fire cycle and, ultimately, type-conversion to invasive annual dominance. Management should focus on protecting the remaining remnant patches of the blackbrush/shadscale ecosystem by controlling recreation and grazing and preventing fire. Because natural regeneration is so limited, especially for blackbrush, it is feared that this ecosystem could disappear without both restoration and active management.

Mojave Desert Scrub Ecosystem

The Mojave Desert scrub ecosystem is the most widespread and diverse of all ecosystems in southern Nevada. It is represented by several subtypes, including bajadas, sand dunes, and gypsum soils. Increased urbanization promotes human activities that have placed this ecosystem type and the habitat it provides for species of concern, like the desert tortoise and burrowing owl, at risk. Recreation and associated human activities such as target shooting and vehicle impacts are known to directly kill or injure desert tortoises. Off-highway vehicles (OHV) use and livestock grazing also have direct effects on desert tortoise and also affect tortoise habitat through reductions in native vegetation and increases in invasive species. Desert tortoises are subject to diseases including upper respiratory tract disease and a shell disease. The Mojave Desert scrub ecosystem will be subjected to increased threats from local, regional, and global stressors over time. Management efforts should concentrate on large landscape scales to maintain natural shrub densities, soil crusts, and healthy native vegetation where disturbance has been minimal.

Riparian/Aquatic Ecosystem

The riparian/aquatic ecosystem occurs along the Virgin, Muddy, and Colorado rivers and Las Vegas Wash, and may be the most degraded and manipulated ecosystem in southern Nevada. Stressors to this ecosystem include climate change, invasive species, altered fire regimes, recreation, and water diversion and extraction. Tamarisk (*Tamarix* spp.), an invasive tree, is highly competitive with native species and in many cases is the dominant species. Efforts to control tamarisk include the use of chemicals, mechanical methods, and fire and, most recently, the release of a biocontrol agent, the northern tamarisk beetle (*Diorhabda carinulata*), which is native to Eurasia. The riparian/aquatic ecosystem is home to numerous species of conservation concern including the Federally endangered southwestern willow flycatcher, which was listed due to small population sizes, population declines, and habitat threats. Concern exists about the direct and indirect effects of the biocontrol beetle on the southwest willow flycatcher. Management should consider protecting and potentially enhancing large to medium patches of habitat for species of conservation concern with the goal of maintaining a heterogeneous habitat complex of open, varied age canopy, shrub thickets dominated by native trees, shrubs, and forbs with floodplain and wetland sites intermixed.

Spring Ecosystems

Spring ecosystems are comprised of a range of biophysically diverse sites due to differences in water chemistry, slope, substrate type, persistence, morphology, and size. These ecosystems are highly sensitive to environmental stressors. Most springs have been invaded by invasive aquatic and terrestrial species that can affect ecosystem properties. Springs provide habitat for many spring-obligate species including invertebrates and vertebrates. Some of these species have highly limited distributions like the relict leopard frog (*Rana onca*), which is a candidate for Federal listing under the Endangered Species Act. The decrease in relict leopard frog populations occurred concurrently with the loss or alteration of aquatic habitat due to spring drainage and/or water development for agricultural and urban applications. Feral burros also have been implicated in the reduction of frog populations due to overgrazing of shoreline vegetation, trampling, and urination and defecation into the water. Chytrid fungus is an infectious disease of amphibians, and reports suggest that the fungus is most virulent at temperatures ≤23 °C, but that its pathogenicity and virulence decline significantly at ≥27 °C. It appears that thermal springs in the region provide critical habitat where frogs can persist despite the presence of chytrid fungus, and that the relict leopard frog occurs naturally only in thermal springs that all have source temperatures >30 °C. The habitats that support these spring-dependent species are highly imperiled due to direct effects of historical and ongoing manipulation of spring sites and the water sources that supply them.

Knowledge Gaps, Research Guidance, and Management Implications

Actions such as limiting grazing or closing OHV trails have historically been some of the primary tools used by land managers in southern Nevada to reduce the effects of anthropogenic stressors on species of conservation concern. However, managers are increasingly faced with complex and wider spanning issues that are often beyond the reach of regionally or locally based management plans. Research that can help disentangle local or regional effects from global effects is needed for conservation planning and management of species of conservation concern. This information could help focus management toward factors and actions most likely to make a difference.

The overview of species of conservation concern provided here is not a complete review of all species and stressor effects, but it is a good representation of the nature of single species research in southern Nevada. It is evident from this body of research that very little is known about the relative threats posed to, or the mitigation actions needed to protect, virtually any species, except perhaps the desert tortoise. Too often research jumps immediately to mitigation strategies without first determining what specific factors pose the greatest threats and are the most important to mitigate. In addition, the evaluation of potential threats typically focuses upon the usual anthropogenic suspects (e.g. OHVs, livestock grazing, invasive species, and climate change) without first carefully considering which factors are most likely to pose the greatest threats. Finally, fundamental science associated with the life history characteristics and habitat requirements of species typically receives the least attention, even though these topics are where research programs should actually start. For a complete discussion of topics in this executive summary, see *Chapter 6, Species of Conservation Concern and Environmental Stressors: Local, Regional, and Global Effects*, in "The Southern Nevada Agency Partnership Science and Research Synthesis—Science to Support Land Management in Southern Nevada" (RMRS-GTR-303).

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