

# Nevada

# Wildlife Action Plan

Developed by the:  
**Wildlife Action Plan Team**

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## Foreword

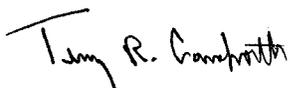
Nevada's tremendous diversity of wildlife is derived from its climate and complex geography; the many mountain ranges are effectively isolated from one another by arid and treeless basin. The varied habitats and landscapes of the Great Basin, Mojave Desert, Sierra Nevada, and Columbia Basin all contribute to the biological complexity of our great state. Among the 50 states, Nevada ranks eleventh in overall biological diversity. This rich diversity of wildlife and habitats helped form Nevada's wildlife heritage and provides the setting important to many of our family traditions. Our children and future generations deserve the chance to enjoy this valuable wildlife legacy.

Nevada's Comprehensive Wildlife Conservation Strategy, now known as Nevada's Wildlife Action Plan, is a "roadmap" for conserving the full array of Nevada's wildlife by sustaining healthy wildlife populations and preventing wildlife from becoming threatened or endangered. Nevada's plan targets the species of greatest conservation need and the key habitats on which they depend, with strategies for on the ground actions for conserving wildlife in each key habitat.

Healthy habitats and diverse wildlife populations are extremely important to the economy of Nevada. Over 600 million dollars are spent each year on wildlife-associated recreation in Nevada. The economic impacts would be significant in Nevada if even one of our vulnerable species were listed as endangered. Taking action to conserve wildlife before it becomes scarce is environmentally sound and fiscally responsible.

We are indebted to the commitment and talent of our partners that helped develop the Nevada Wildlife Action Plan: the Nature Conservancy's Nevada Chapter, the Lahontan Audubon Society, and the Nevada Natural Heritage Program. A grant from the Nevada Division of State Land's Question One Bond program funded the development of the plan. The public input and partnership involvement throughout the development phases of the plan were critical to the successful completion of the plan. We are pleased to announce that the plan was approved by the U.S. Fish and Wildlife Service on December 5, 2005, so that federal funding for Nevada's wildlife diversity program will continue.

Nevada's Wildlife Action Plan will provide an essential foundation for the future of wildlife conservation, allowing for unprecedented conservation of wildlife diversity. It is truly a historic move forward for wildlife conservation in America. With our committed and diverse partnerships and sufficient, dedicated funding, we look forward to plan implementation. Working together we can make a significant contribution to the mission of comprehensive wildlife conservation in Nevada and ensure healthy populations of our valuable natural resources for future generations.



Terry R. Crawforth, Director  
Nevada Department of Wildlife



## **Acknowledgments**

The Nevada WAP is the result of the hard work of numerous partners whose contributions range from technical input to text review, to physically drafting some portion of the strategy. This work is a team effort in every sense. The Nevada WAP team is indebted to many contributors, too numerous to name, but we want all to know that their efforts are deeply appreciated.



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## **Executive Summary**

Congress passed the State Wildlife Grants program (SWG) in 2001 in recognition of the need for funding of wildlife diversity programs. Congress mandated each state and territory to develop a Comprehensive Wildlife Conservation Strategy (subsequently renamed Wildlife Action Plan (WAP)) by October 2005 in order to continue to receive federal funds through the SWG program. Nevada's WAP is intended to serve as a plan of action for state wildlife conservation and funding by targeting the species of greatest conservation need and the key habitats on which they depend, and lays out strategies for conserving wildlife in each of the key habitats. The strategies are also an impetus to engage state and federal agencies and other conservation partners to strategically think about their individual and coordinated roles in prioritizing conservation efforts.

Among the 50 states, Nevada ranks eleventh in overall biological diversity and is unfortunately ranked fifth in the number of species extinctions. Nevada's diversity of life is derived from its geography; the many mountain ranges are effectively isolated from one another by arid and treeless basins. Nevada's borders encompass about 28,732,680 hectares (71 million acres), making it the seventh largest state. The federal government administers 86 percent of the land base.

Nevada is uniquely challenged in approaching effective wildlife conservation in part because of its arid climate, geography and limited water resources, which has created a unique endemic biota easily subject to threats and stressors. Throughout Nevada, water is a scarce and valuable resource essential for both human needs and maintenance of wildlife and their habitats, thus the alteration of hydrologic resources is a significant source of stress to wildlife resources. Nevada is also one of the fastest growing states in the nation with human population creating a need for additional development into open space, causing habitat loss. Invasive, exotic and feral species are critical problems facing both terrestrial and aquatic species and habitats in Nevada.

Nevada Department of Wildlife recruited a partnership to develop the Nevada WAP which included The Nature Conservancy's Nevada Chapter, the Lahontan Audubon Society, and the Nevada Natural Heritage Program. A grant from the Nevada Division of State Land's Question One Conservation Bond program was awarded to assemble Nevada's WAP. Public involvement and partnership development was initiated during scoping meetings held across the state in 2003 to present the concept and opportunity of the WAP. After developing a series of draft products in March 2005, the WAP Development Team took the draft on a seven city tour of Nevada to receive a second round of input. Conservation partners including federal and state resource agencies, county governments, tribes, sportsmen's groups, environmental groups, conservation organizations and others were invited and attended these open house meetings. In addition, eight open houses were provided through special appointments requested by partners. In all, attendance at WAP open houses and workshops exceeded 150 individuals representing over 60 organizations. A final partnership group was convened in May 2005 of partners from the Governor's Sage Grouse Conservation Team. This group developed a set of guiding principles for the WAP writing team to consider while preparing the Draft Plan. Nevada's WAP Team stayed in close contact

and coordinated with federal land management agencies and Tribal governments throughout the development of the Strategy.

With the help of experts from all taxonomic fields, the WAP Team identified a total of 263 Species of Conservation Priority, including 72 bird species, 49 mammal species, 40 fish species, 20 reptiles, 7 amphibians, 74 gastropods, and 1 bivalve. Locations of key areas essential to the conservation of fish and wildlife species were identified utilizing GIS and documented occurrences of wildlife species within Nevada's landscapes.

From data derived from the Southwest Regional Gap Analysis Project, the various ecological systems of the state were organized into 27 key habitat types. Multi-level strategies were devised for these 27 key habitats that integrate conservation needs for species assemblages as well as individual species. Each strategy describes the habitats, their values to wildlife, land uses within the habitat and problems facing the species and habitats. This information provides support to the goals, objectives and actions that follow. The objectives and actions are derived from existing conservation plans, where available, and feedback from multiple meetings with species experts and conservation partners during the development of the WAP. Each strategy includes a list of key conservation partners, programs, and projects likely to fulfill the

objectives for each key habitat, and identifies preliminary focal areas for action through a process that involved coordination with partners and concurrent planning processes.

It will be the task of Nevada's wildlife conservation partnership to evaluate the 27 strategies, set priorities, design implementation plans, monitor progress and evaluate the results. The Strategy describes work prioritization and quantifiable objectives, key partnerships and implementation mechanisms, including several proposed examples to achieve successful implementation of the WAP. During implementation of Nevada's WAP, it is critical to recognize the importance of monitoring success and adjusting priorities and actions (adaptive management). Monitoring of Nevada's WAP will be comprised of two tiers: WAP monitoring and species/habitat monitoring. While habitat monitoring remains primarily the purview of the various land management partners, the WAP can lend valuable support to success monitoring through the provision of wildlife monitoring services at various partnership levels.

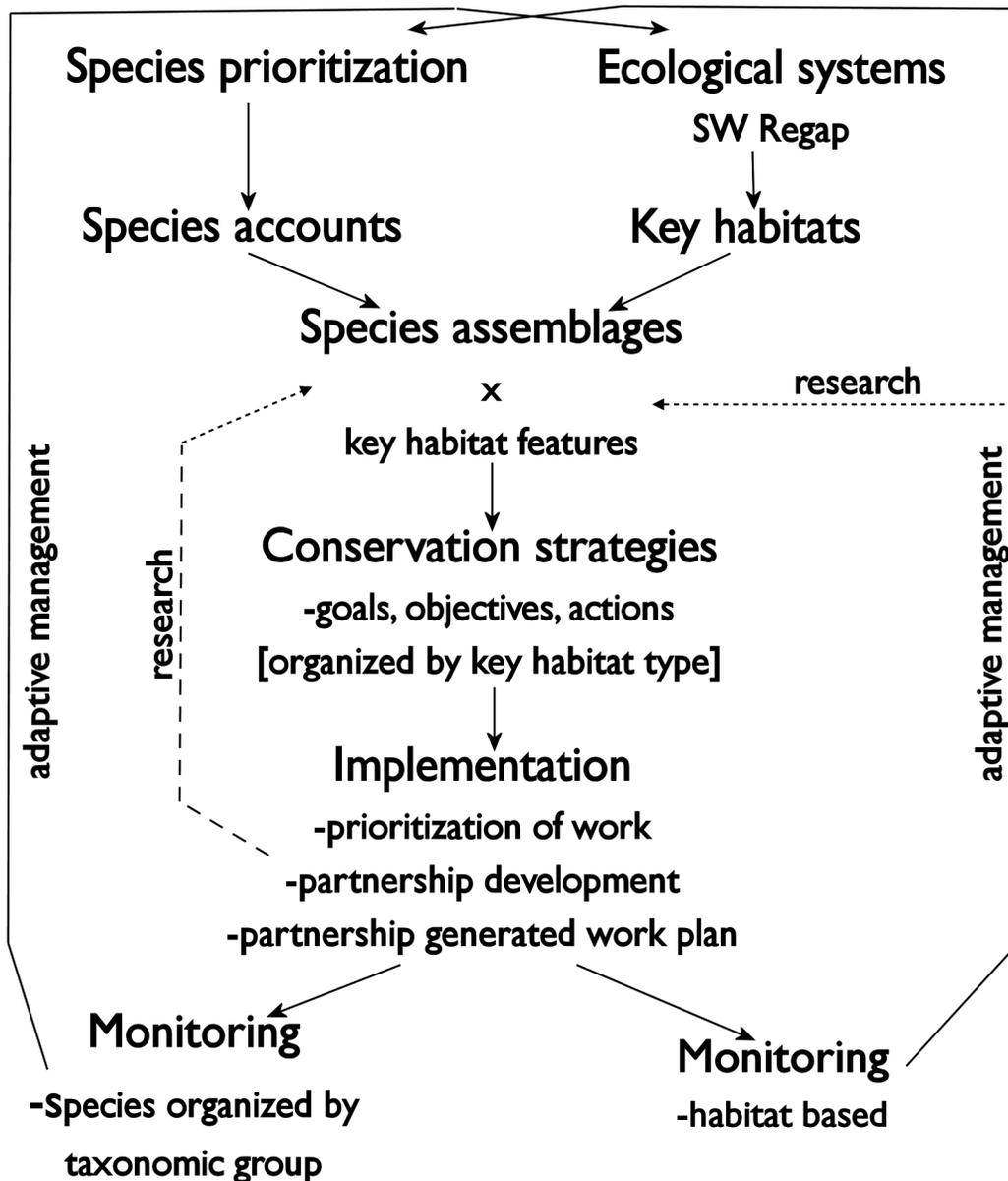
On behalf of the greater wildlife conservation partnership of Nevada, the Nevada Department of Wildlife invites the reader to find in this document opportunities to get involved and make a significant contribution to the mission of comprehensive wildlife conservation in the Silver State.

## How to Use this Plan

The Nevada Wildlife Action Plan is organized into five major sections that are intended to compliment each other and work together to describe the overwhelming task of comprehensive wildlife conservation in Nevada, the partners expected to participate in its ultimate achievement, and the expectations and methods of implementation. Each major section is organized individually to best meet its commission, and the reader may sometimes be challenged to comprehend how the major elements are intended to work together. It is hoped the reader will find this guide and diagram (Figure 1) helpful in understanding the various elements of the Strategy and track conservation thought and action seamlessly from section to section. To assist the reader in orientation throughout the document, we have placed a copy of Figure 1 at the beginning of each major section with that section's name and/or its discussions highlighted on the diagram.

The **Introduction** describes the purpose and intent of the WAP, its legislative mandate, and the major guidance provided by Congress to structure a successful communication between the State of Nevada and Congress. **An Overview of Nevada** describes the nature of Nevada's ecological setting, its socioeconomic history and setting, issues influencing wildlife conservation, and the partners that play significant roles in the delivery of successful wildlife conservation in the state. **Nevada's Wildlife Heritage** describes the state's current wildlife resource as influenced by geological and historical processes – why Nevada has the species it has, and why and how species develop conservation risk. The process for determining the Species of Conservation Priority to be featured in this Strategy is described in general terms in this section, with a detailed description of the species prioritization processes used occurring in Appendix (A). The development of the ecological framework for strategy development is described in **Defining Nevada's Landscape for Wildlife**. Here, the reader can find our process for developing the 27 Key Habitats from Southwest ReGAP habitat type inventory to provide our basic strategy units (the Key Habitats), the process by which we linked Species of Conservation Priority to the 27 Key Habitats to interlock species conservation strategy development with habitat types, and the process by which we identified potential focus areas where conservation strategy for the species and key habitats was likely to be applied.

The **Conservation Strategies for Nevada's 27 Key Habitats and Their Associated Wildlife** provides the main description of the conservation task at hand in Nevada. Here the reader will find descriptions of the 27 major habitat groups that occur in the state along with each key habitat's particular importance to wildlife, each key habitat's associated Species of Conservation Priority organized by the important features of the habitat type that most influence the presence of the species ("key habitat elements important to wildlife"), and each key habitat's current condition, current land uses, and current problems in meeting its full contribution to statewide comprehensive wildlife conservation. A Conservation Strategy has been designed for each key habitat, consisting of goals written in terms of desired landscape conditions, directional objectives (increase, decrease, maintain) that are measurable with respect to their overall trend by the end of the planning period, and suggested management actions that could significantly contribute toward the movement of the objectives into the desired direction. While



**Figure 2.** Schematic diagram of the organization of the Nevada WAP and how key sections relate to one another, and are connected by adaptive management and research processes.

most management actions are habitat-based, working under the assumption that the most effective method for maintaining healthy, diverse wildlife populations is

through responsible habitat management, some management actions are non-habitat-based and refer to a single species or sometimes groups of species. While

species-based actions could occur across a variety of habitat types, we attempted to present actions in the habitat type that is key to their implementation to avoid redundancy in the text. For readers with a species-based focus, we have provided a separate section of **Species Accounts** that not only provide status, distribution, and natural history information for each Species of Conservation Priority, but also attempt to capture all of the conservation strategies from the Key Habitat discussions relevant to a particular species and consolidate them in one place for quick review.

The **Implementation, Effectiveness Monitoring, and Adaptive Management** section describes how the conservation strategies from the Key Habitats section will be prioritized, bundled and integrated into the appropriate planning processes, distributed for local working group implementation, monitored for effectiveness, collectively analyzed and adjusted to meet new perceptions of need. Methods of partnership development of WAP services and products and partnership guidance of overall implementation are discussed in this section.

## Use of this Plan

The Nevada WAP serves as a comprehensive, landscape level plan, identifying the species of greatest conservation need and the key habitats on which they depend, with the intent to prevent wildlife species from becoming threatened or endangered. The WAP contains conservation actions to provide guidance to successfully conserve Nevada's key habitats and priority species. Many of the conservation actions within the WAP are strategies identified in other existing conservation plans. The WAP's recommended conservation actions in no way represent a mandate or expectation for a given party to carry out or implement these actions. During WAP implementation, conservation actions developed at the state or local level would be used to provide guidance to address

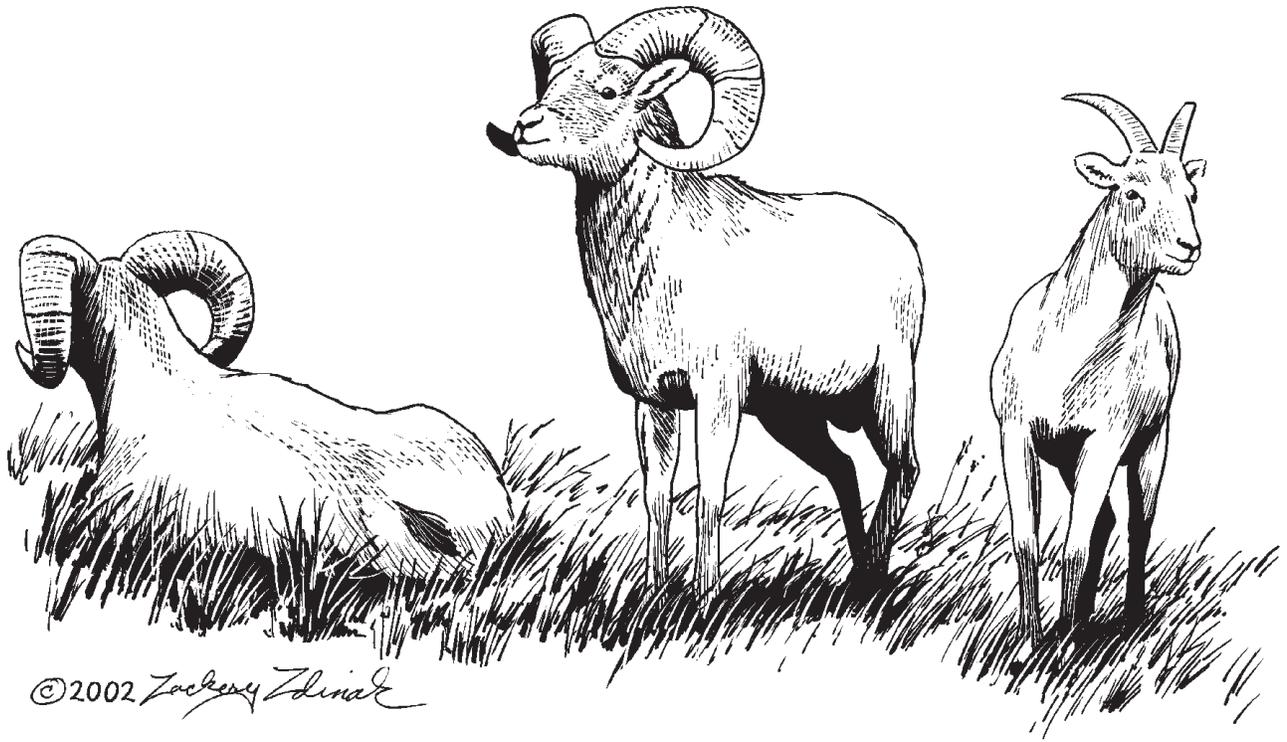
site-specific conditions as appropriate. Some of these actions may be applicable at the land use plan level, and some more appropriately applied at an activity plan or site-specific plan level.

The next step in implementation will be to tier down possible actions identified in the WAP that will form the basis for prioritized work plans, site-specific decisions, and planned actions. Wildlife conservation partners and stakeholders will be encouraged to contribute to and review these implementation processes.

## Guiding Principles

Conservation partners from the Governor's Sage Grouse Conservation Team convened in May 2005 to develop a set of "guiding principles" for the WAP writing team while preparing the Draft Plan. The guiding principles decided upon included:

- the WAP is a guidance document for enhanced conservation, not a de facto regulatory document
- the WAP will function as a usable document incorporating adaptive management theory
- the WAP is a road map linking existing plans into common effort
- the WAP is primarily focused on the conservation of wildlife
- the WAP operates under a collaborative process
- the WAP recognizes all authorities, jurisdictions, and citizens rights, including property rights
- the WAP is primarily designed to address the needs of species before they become imperiled through the creation and implementation of incentives, services, and benefits
- Regulation is recognized as a sometimes necessary mechanism when voluntary processes fail; regulation should be developed as an open, collaborative, citizen based process.



# Introduction

## Purpose and Scope of the Nevada Wildlife Action Plan

To establish an action plan to effectively conserve all wildlife species, Congress charged each state and territory with developing a state Wildlife Action Plan (WAP). The state wildlife strategies will provide an essential foundation for the future of wildlife conservation and an opportunity for the states, federal agencies, and other conservation partners to strategically evaluate their individual and coordinated roles in conservation efforts across the nation. The Nevada WAP is intended to serve as the plan of action for state wildlife conservation and funding by targeting the species of greatest conservation need and the key habitats on which they depend, and lays out strategies for conserving wildlife in each of the key habitats.

## Legislative Mandate and Guidance

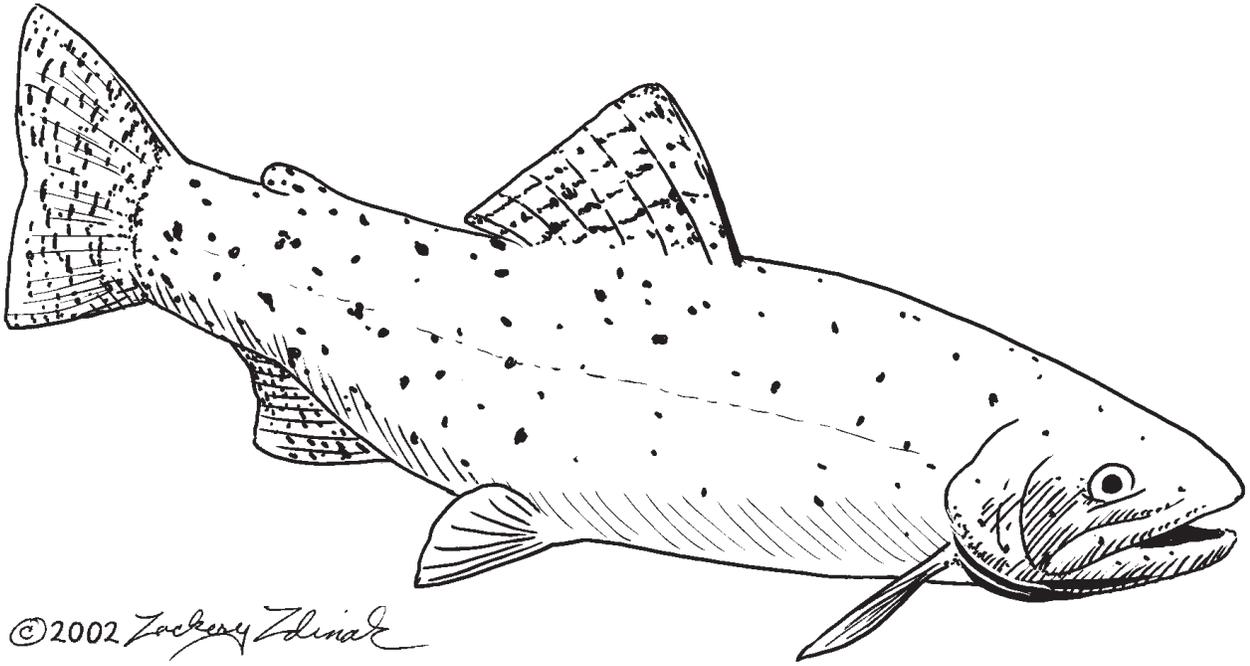
In the 106th Congress, the House passed the Conservation and Reinvestment Act (CARA), but without a Senate vote CARA was not enacted into law. Instead, temporary funding in the form of State Wildlife Grants (SWG) to address basic CARA concerns was authorized, including \$100 million for state wildlife conservation. In addition, Congress charged each state and territory with developing a statewide WAP.

## Eight Required Elements Addressed in the Nevada Wildlife Action Plan

This WAP sets a strategic vision for wildlife conservation in Nevada. To fully elucidate the vision, Congress requires addressing these eight elements in the WAP:

1. Information about wildlife species numbers and distribution,
2. Descriptions of key habitats and locations,
3. Descriptions of problems that may affect identified species and research needed to improve the situations,
4. Descriptions of proposed actions for conservation of the identified wildlife and their habitats,
5. Descriptions of how the species and results of the actions will be monitored,
6. Descriptions of how the strategy will be reviewed and updated on a periodic basis,
7. Coordination with federal, state, local agencies and Indian tribes if the plan impacts land managed by these groups, and,
8. Public participation to identify their priorities.

The objectives and actions defined in the Nevada Wildlife Action Plan, when approved by Congress, will be supported by Federal funds, matched with support from other sources to ensure their implementation. As the Nevada strategy was being developed, individual state strategies were being developed in all states and territories to address the nation's diversity of wildlife and habitats in their entirety. This collective effort will create the first-ever nationwide approach to wildlife conservation.



# An Overview of Nevada

## Physical and Natural Setting

### Biophysical Regions and Major Habitat Types

Although Nevada is defined on the map by its political boundary, its interconnected landscapes are a subset of four *ecoregions* of the western United States. Ecoregions are based on biotic and environmental factors that include climate, physiography, water, soils, air, hydrology, and potential natural vegetation communities (Bailey 1995). Dinerstein et al. (2000) defined ecoregions as “relatively large areas of land and water that contain geographically distinct assemblages of natural communities.” The four ecoregions that overlap Nevada include the Columbia Plateau, Great Basin, Sierra Nevada, and Mojave Desert.

The Columbia Plateau is a broad expanse of sagebrush-covered volcanic plains and valleys in the semi-arid Intermountain West that is crossed by the large riverine systems of the Columbia, Snake, Boise, and Owyhee. The ecoregion covers over 301,000 square kilometers (116,220 square miles) of land – of which 97 percent is located in Oregon, Idaho, Washington, and Nevada, and the remainder in California, Utah, and Wyoming.

The Columbia Plateau is bordered to the south by the Great Basin ecoregion which encompasses more than 29,137,365 hectares (72 million acres) of semidesert from the east slope of the Sierra Nevada across much of Nevada to the Wasatch Mountains of the western Rocky Mountains in central Utah. Nevada is the most mountainous state in the U.S. with over 300 mountain ranges separated by long, broad valleys. The Great Basin is characterized by salt desert scrub and sagebrush shrublands in the valleys and the lower slopes, and by piñon-juniper woodlands, mountain sagebrush, open conifer forests, and alpine areas in the mountain ranges. Remote mountain tops, isolated aquatic habitats in valley bottoms, weathered badlands, and sand dunes highlight the Great Basin’s unique biological diversity.

Desert slopes on the east side of the Sierra Nevada ecoregion partially descend upon Nevada along the western Great Basin border. Vegetation in this part of the ecoregion is characterized by conifer communities mixed with sagebrush and piñon-juniper in the lower elevations and an alpine zone characterized by bare rock, permanent snow fields, and a few grass or forb species.

Finally, the Mojave Desert characterizes much of southern Nevada. The Mojave Desert extends from southwestern Utah to southeastern California over to western and northwestern Arizona. Creosote scrub, succulents, and yucca-blackbrush community types dominate the ecoregion. Upper elevation community types, atypical of a desert ecoregion, do occur in the sky island mountains and mountain ranges of the Mojave Desert which contain some of the ecoregion’s most isolated communities and species.

### Climate

Nevada contains portions of two great deserts, the Great Basin Desert and the northern extent of the Mojave Desert. The Great Basin Desert is a cold desert; the Mojave is the smallest of America’s hot deserts. These two

physiographic provinces dominate the Nevada landscape. While the Sierra Nevada barely make a physical incursion into Nevada, its physical presence dominates the entire state by dictating rainfall patterns and vegetation patterns, which in turn strongly influence the distribution of wildlife in the state. The Sierra Nevada reaches an elevation of 4,265 m (14,000 ft). Rising in a relatively short distance from the Pacific Ocean, the principal source of moisture for the region, the mountains force westward-moving and moisture-laden air masses upward at a dramatic rate. The rising air masses cool, water condenses and forms droplets, and then precipitates as either snow or rain. Thus, the Sierra Nevada effectively rake the moisture out of storm fronts, collecting the moisture on their own granitic shoulders and growing impressive forests of fir, pine, and cedar. The rain shadow created by the Sierra Nevada is recognizable across the state, but is most pronounced in a belt from Tonopah to Lovelock (Trimble 1989).

Average annual precipitation in Nevada is 23 cm (9 inches), making it the driest state in the nation. Precipitation falls primarily as snow in the Great Basin and Columbia Plateau and as rain in the Mojave Desert, one of the principal factors distinguishing these two regions. The Mojave region is also far more likely to receive summer rains as it lies at the northern limit of the region of the American Southwest that consistently receives monsoonal rains generated from weather systems originating in the Gulf of Mexico. Within Nevada's Great Basin, only White Pine County receives about a month's worth of monsoonal weather (Trimble 1989).

The average precipitation figure is misleading in that it masks a tremendous amount of variation across the state. The climate of the Great Basin-Mojave Desert region is one of the most varied and extreme in the world (Hidy and Klieforth 1990). Individual mountain ranges can lift air masses, wringing out whatever moisture escaped the Sierra Nevada and creating precipitation at higher elevations. This local orographic effect creates a rainfall gradient, with mountains receiving noticeably more precipitation than adjacent basins.

Much of the precipitation that falls in the Great Basin arrives outside of the growing season, a problem that

vexed settlers and established an evolutionary challenge for plants. Because snowfall occurs outside of the growing season, Great Basin plants must rely largely on water stored in the soil as snow melts. Summer rains in the state are often gully-washers, brief torrents that run off before much moisture can soak into the soil and benefit plants.

While winters in the Great Basin are cold, summers are conversely hot and dry. A temperature range between winter lows and summer highs of 150 degrees has been recorded in Elko (Trimble 1989). A temperature swing of 40 degrees in any given summer day is not unusual. In the hot, dry, and usually cloudless summers, evaporation far exceeds precipitation. For example, at Pyramid Lake, evaporation exceeds precipitation by a factor of eight. Water evaporates from the surface of Lake Mead, in the Mojave Desert outside of Las Vegas, at the rate of 2.25 m (88 inches) per year—well above the 0.10 m (4 inches) of rain that falls in an average year in that region of the state.

The Mojave Desert is hotter and drier than the Great Basin. Precipitation here falls more typically as rain, though even more unpredictably than in the Great Basin, and it is just as likely to fall torrentially and run off rapidly. There is also considerable variation in the Mojave region. As with the Great Basin, higher ranges receive more precipitation, and the Spring Mountains outside of Las Vegas are often cloaked in snow during winter months—reliably enough to sustain a small ski resort.

Both the form and timing of precipitation in the Mojave, coupled with warmer temperatures, sustains its markedly different natural communities. Across the state, cold winters, hot summers, and scant and unpredictable rainfall have required a variety of adaptations on behalf of animals in order to survive in Nevada's environment. These climatic forces, along with the influences of geography, have created a fascinating array of wildlife in an often harsh and beautiful setting of North America.

## Geology

With 314 mountain ranges, Nevada's dominant topographic feature is its basin and range topography. Many writers, including John McPhee (1980), have found a poetry in the rhythm of this landscape:

Each range here is like a warship standing on its own, and the Great Basin is an ocean of loose sediment with these mountain ranges standing in it as if they were members of a fleet without precedent, assembled at Guam to assault Japan. Some of the ranges are forty miles long, others a hundred, a hundred and fifty. They point generally north. The basins that separate them—ten and fifteen miles wide—will run on for fifty, a hundred, two hundred and fifty miles with lone, daisy-petalled windmills standing over sage and wild rye.

The mountains of the Great Basin are geologically recent—less than 17 million years old—and a product of crustal stretching between the Sierra Nevada to the west and the Wasatch Range of the Rocky Mountains to the east (Wuerthner 1992). In the intervening millennia, erosion has steadily chipped away at the higher elevations, filling the basins between the ranges with rock and sediment that typically are thousands of meters thick and, in some valleys, more than 6,100 m (20,000 ft) thick. Crustal stretching and faulting are not uniform, and extensive sections of northwestern and southern Nevada are lower than the central part of the state. These regional differences in elevation, on the order of thousands of feet, have strongly influenced the flora and fauna communities that now occupy these areas.

While the mechanism of this mountain building is consistent across the Great Basin, the underlying bedrock and the resulting composition of the mountains vary. Many granite ranges occur in the west, basalt ranges in the northwest, rhyolite mountains in the center, and limestone and sandstone in the east and southwest (Stewart 1980). In general, then, the bedrock in the west and in a central band across the state is igneous in origin, and most of the rest of the state's bedrock is sedimentary in origin (Fiero 1986). A small fraction of Nevada's bedrock is metamorphic. This variation in bedrock likewise produces variations in soils, which in turn influence plant communities and ultimately, faunal communities.

The area that is now the state of Nevada experienced other past forces that shaped the geological landscape. Several periods of volcanic activity deposited extensive lava flows and ash. The Owyhee Uplands of the

Columbia Plateau in northern Nevada are one of the landscapes shaped by this activity. The presence of the landform is significant because that high plateau country drains north into the Owyhee River, and from there into the Snake River. Scattered across the state is evidence of calderas, lava flows, tuff or welded ash, and other reminders of the land's genesis in molten rock.

At various times in its geologic history, extensive parts of the state have either been ocean or lake front property. Until half a billion years ago, most of Nevada did not exist and instead an ocean stretched westward from what was the edge of the North American continent. A broad carbonate reef began to form along the margin of the continent, extending west into the ocean. In a series of events over the next 300 million years, tectonic plates collided with the edge of the continent and progressively added land mass to western North America. At first, oceans receded during the collisions and then advanced, but oceanic sedimentation finally ceased about 200 million years ago.

More recently, Pleistocene Lake Lahontan was the largest of several primarily freshwater lakes that covered significant parts of the state. All of these events—whether marine or freshwater in origin—were extensive enough and sustained long enough to leave sedimentary deposits that are now visible in various parts of the state. Remnants of Lake Lahontan's presence can also be seen in shoreline terraces, now parched and high above valley floors and supporting desert shrubs instead of bulrushes and sedges. The limestones that formed beneath the oceans now form a major regional aquifer beneath much of northeaster, eastern, and southeastern Nevada, and springs flowing from this aquifer are important water sources for plants and animals.

Also during the Pleistocene and related to the formation of Lake Lahontan, Nevada experienced periods of glaciation that altered several mountain landscapes. Over millennia, the sheer mass of glaciers, aided by the abrasive quality of rocks and debris entrained in their ice, acts to erode the bedrock beneath them. When the glaciers retreated, they left behind cirques in their headwaters and classic U-shaped valleys that reveal the paths of the ice masses. These distinctive landscapes are evident in the Sierra

Nevada, but also in other mountains, including the Ruby, Humboldt, and Snake Ranges. Other Nevada ranges with evidence of glaciation include the Spring Mountains, Toiyabe Range, Carson Range, Toquima Range, Jarbidge Mountains, Santa Rosa Range, Independence Mountains, and the Schell Creek Range (Wuerthner 1992).

The high Sierra Nevada range, which only began its rapid rise 3-5 million years ago, efficiently strips water from east-moving storms and creates the pronounced rain shadow that has produced the characteristically dry climate in Nevada. Yet, to a visitor surveying this arid landscape, it may come as a surprise that water is the dominant force shaping the land. By watching an arroyo following a downpour as it discharges a viscous sludge that is half earth and half water, one receives an effective demonstration of the power of water to episodically but rapidly shape the landscape.

Unique geological conditions, usually in the form of soils, occur in isolated pockets scattered across the state. These conditions have given rise to regionally adapted plants and, at least in some locations, unique species of invertebrates with extremely restricted ranges. There are two conditions which have supported these unique plant-invertebrate associations. Edaphic communities are, by definition, determined by soil conditions. One example of this is the 140 patches of altered andesite scattered across the west-central Great Basin (Billings 1950, 1990; DeLucia et al. 1988; all in Brussard et al. 1998). These sites, in contrast to the surrounding sagebrush-dominated landscape, are characterized by the presence of Jeffrey or ponderosa pine, and many of them harbor an endemic species of buckwheat. Another example is the gypsum-derived soils of the Mojave Desert in southern Nevada that support endemic plant communities adapted to this soil type. Some of these plants, such as the Las Vegas bearpoppy, are associated with endemic species of bees.

Another specialized soil condition occurs in the network of Holocene era sand dunes scattered across the state. Extraordinary specialization and speciation has occurred in plants and animals at many of these 32 sites. Beetles are the best studied invertebrate group in Nevada's sand dunes, and many new species have been described from these locales. Butterflies, crickets, and a

species of weevil are also unique to these habitats. Many of these species are highly endemic and confined to one or a few small dunes (Brussard et al. 1998). As a whole, the invertebrates of Nevada are poorly studied and it is likely that the occurrence of endemism is far more widespread in these groups than is currently documented.

## **Fish and Wildlife Resources**

Among the 50 states, Nevada ranks eleventh in overall biological diversity (Stein 2002). Unfortunately, the state follows only Hawaii and California in terms of threats to its species, and Nevada is ranked eleventh in the number of species extinctions. From a biological point of view, the Great Basin and Mojave Deserts are landscapes of enormous subtlety. The vast and apparently monotonous expanses of sagebrush actually represent a dozen different species, and many more subspecies. Most of the animals accomplished at life in these deserts are colored to blend in with the rocks and vegetation to avoid detection in a land that holds few hiding places. Explorer John C. Frémont declared the region to be "deserving the full examination of a thorough exploration." Nevada does not reveal its nuances to a car traveling 70 miles per hour across Highway 50.

Nevada's tremendous diversity of life is derived from its geography. The many mountain ranges with winter snow pack, trees, meadows, and tumbling streams are effectively isolated from one another by the arid and treeless basins. This juxtaposition of landscapes has effectively created isolated islands of habitat, dubbed sky islands. For the less mobile species of small mammals, reptiles, and some insects, populations have likewise become isolated from one another on these montane islands. Over time, this isolation has led to the evolution of new subspecies and species.

The principles of island biogeography explain other aspects of the state's diversity and the pattern of species across the landscape. Two of the tenets of this branch of ecology state that the number of species on an island will decrease with distance from the mainland (the source of species to populate the island); and the smaller the island, the fewer species the island can sustain. The "mainlands" for the Great Basin province are the Sierra Nevada and the Rocky Mountains. Moving eastward from the tree-rich Sierra Nevada, the

number of tree species declines until, in Central Nevada, ranges such as the Toiyabes and Monitors harbor only a few species (Wuerthner 1992). A similar pattern occurs in Eastern Nevada, where, moving through ranges from east to west, the trees decline in both diversity and in their affinity with the Rocky Mountains. A similar pattern has been documented in mammal populations in Nevada.

While mobile species like birds might be expected to be unaffected by the effects of distance and island size, such is not the case. The reduced number of plant species in the interior mountain ranges translates to lower habitat diversity, which in turn, offers fewer niches for birds to occupy, and thus fewer species overall.

One other characteristic of the Nevada landscape and subsequently its wildlife worth noting is that, resources, principally food and water, occur in abundance in only a few noteworthy places. Across the remainder of the state, such resources are widely scattered at a low density. The distribution of wildlife tends to reflect the distribution of food and water resources, and therefore with few exceptions, wildlife species are not found in high densities within their Nevada ranges. This factor does not reduce the value of wildlife to the health of the natural environment, or the value it brings aesthetically or economically to the state.

With the exception of the Colorado River along the southeastern border of the state and a few tributaries of the Snake River in the north, all of Nevada's watersheds are isolated systems (Wuerthner 1992). In general, they originate at springs on the flanks of mountains, descend through desert shrubs, and vanish into sinks and playas. Accordingly, the pattern of isolation and divergence has been even more extreme for Nevada's aquatic species. During the Pleistocene, this region of the globe was considerably wetter than it is today, and lakes covered significant parts of the state. As the Pleistocene waned and the Earth entered a drier, warmer period, the lakes receded and vanished, sometimes completely, sometimes leaving behind only isolated wetlands and remnant springs. Organisms such as springsnails and pupfish that once resided in enormous lakes now persist in tiny seeps and springs, each population cut off from its nearest neighbor, often by miles of desert. Over time, these populations have evolved into species, each uniquely adapted to

their tiny corner of the world.

Nevada has 67 endemic species of fishes – species occurring nowhere else in the world. With the human reliance on water, nearly all rivers, springs and aquifers are tapped and at some point dewatered, and this natural competition for water has left the state with more endangered fish species than any other state (Wuerthner 1992). At least seven Nevada fish species are known to have become extinct, while four other species no longer occur in Nevada although other populations persist beyond the state borders.

One famous example of endemism occurs in southern Nevada, not far from the California border and Death Valley. Devil's Hole is a spring perched on a desolate ledge of black rock, creosote, and cactus. The spring itself is actually at the bottom of a hole, a defile in the rock, wherein resides the world's entire natural population of the Devil's Hole pupfish. Below Devils Hole and 20,000 years ago, a lake once covered the Amargosa Valley floor, and the pupfish swam freely through hundreds of square miles of water. Now, their entire population is confined to a crack in the bedrock, amidst some of the most inhospitable desert found anywhere. This is one of the state's nuances, and a profound experience for those who visit Devil's Hole.

## Land and Resource Management

Nevada's borders encompass about 28,732,680 hectares (71 million acres), making it the seventh largest state. The federal government manages approximately 24,685,825 hectares (61 million acres), or 86 percent of the land base. Of the remaining 14 percent (approximately 4,046,855 hectares; 10 million acres), 11.5 percent is private, 1.6 percent tribal, and the remaining 0.8 percent is under state or local government ownership. On a percentage basis, Nevada has more federal land than any other state in the Lower 48. Land status is illustrated in Figure 1. At least 90 percent of the land in Esmeralda, Lander, Lincoln, Nye, and White Pine counties is federally managed, while overall, 50 percent or more of the land in each county is federally managed, except the two smallest counties (i.e., Storey and Carson City).

The majority of BLM and USFS land in Nevada is managed under multiple use and sustained yield policies mandated by federal statutes. Multiple use requires federal agencies to manage the public lands

# Nevada Stewardship Map

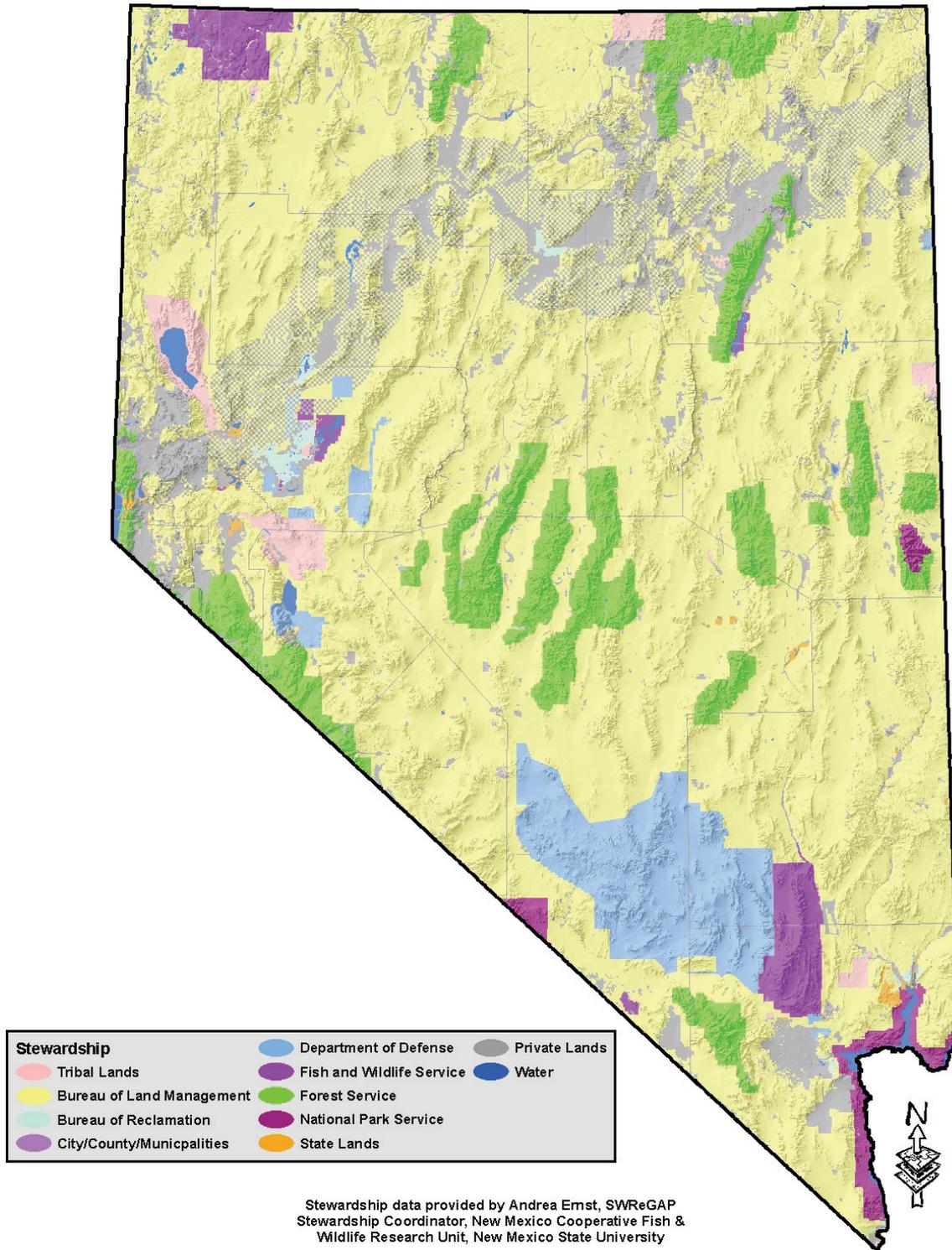


Figure 5. Map of Nevada indicating land ownership/land management patterns.

and natural resources for a combination of diverse uses while balancing long-term needs for renewable and non-renewable resources. The BLM and USFS manage multiple use lands for grazing, mining, outdoor recreation, scientific study, and ecological function. Resources currently receiving considerable attention in USFS Forest Plans and BLM Resource Management Plans include wetland and riparian resources, wild horses, biological diversity, forage production, forest health, watershed conditions, wildlife habitat, motorized recreation, and noxious and invasive weeds.

State land management agencies are similarly mandated to manage resources according to multiple use and sustained yield principles, as defined by state law. State lands include 11 wildlife management areas, 24 state parks, and 500 parcels (91 hectares; 225 acres) of other state lands. There are approximately 3,237,485 hectares (8 million acres) of private land in Nevada. Land uses of private lands are predominantly urban and suburban development and agriculture.

## Human Demographics and Impacts

In terms of human population, Nevada is the fastest growing state in the nation, with three of its most populous cities in the top 20 for growth nationwide. Each month, 6,400 new residents move to Las Vegas, and each month additional roads, housing developments, power lines, and shopping centers spring up, often in areas where wildlife once roamed. Nevada is the most urbanized state in the nation, with nearly  $\frac{3}{4}$  of its human population associated with the cities of Las Vegas, Henderson, and Reno.

Even the once-remote rural areas of the state are impacted by population growth. Rural communities strain to keep up with the influx of urban dwellers fleeing the cities; out-of-state manufacturers move into a low tax environment; energy developers pursue new technology to develop new resources. From Laughlin at the south end of the state, all the way to Elko in the north, the state is experiencing exponential growth.

Survey data recently reported as part of Colorado State University's "Wildlife Values in the West 2004" (Teel and Dayer 2005) survey project provides a baseline for residents' attitudes about wildlife and threatened species. The survey of 633 residents identified 15 activities that Nevada Department of Wildlife may

focus on in the coming years, and asked participants to rank their level of importance. "Protecting fish and wildlife in Nevada that are endangered or at risk of becoming endangered," ranked third overall, after apprehension of wildlife violators (first priority) and promotion of boating safety (second priority). In a survey question where agency fiscal constraints were identified as a limiting factor, and participants were asked to identify which 3 of the 15 activities should be chosen, "Protecting fish and wildlife in Nevada that are endangered or at risk of becoming endangered," rose to the top, with 197 respondents supporting this activity as one of their top three priorities.

In that same survey question, it is worthy to note that the second and third priorities overall were for "Managing for adequate populations of all fish and wildlife in Nevada," (second priority) and "Protecting, restoring or acquiring lands to support many different types of fish and wildlife," (third priority). From these responses, it is clear that not only do Nevadans feel strongly about managing all fish and wildlife species, but that they understand that protection and restoration of lands is an essential part of this process.

## Challenges in Wildlife Conservation

Nevada is uniquely challenged in approaching effective wildlife conservation, in part because of its generally arid climate, geography, and relative scarcity of water resources, which has created a unique endemic biota easily subject to threats and stressors. Beyond these inherent conditions, however, human factors including a long history of land use activities altering natural habitats, recent intense urban development, and the widespread occurrence of invasive plant and animal species must be addressed to ensure the effectiveness of conservation actions and the maintenance of wildlife and their habitats into the future. When coupled with natural stressors such as periodic, but unpredictable, drought conditions from short-term climatic variation, human-related stressors can create a compounding effect which significantly influences the ability of habitats to maintain wildlife diversity on a landscape scale. Although some of these anthropogenic stressors, such as urban development and large-scale modification of hydrologic systems for water supply and flood control, may not be reversible and are necessary costs associated with human settlement and needs, others can be managed or corrected in ways that reduce negative

effects or positively assist in implementing conservation.

Although Nevada's unique landforms and natural history are important elements in understanding and addressing the challenges inherent in developing this strategy to comprehensively conserve our wildlife resources, it must be understood that challenges for species and habitats across Nevada are closely tied to anthropogenic land use activities. Any strategy for addressing these challenges and effective conservation must include a definition and attempt to understand the stress on species and their habitats. In the broad sense, the sources of stress can be categorized into actions related to agriculture, hydrology, recreation, natural resources extraction, development, military activities and a few additional actions which do not fall into these general areas.

Although organized agricultural activities are not a significant broad-scale stressor in Nevada, where they do occur, land-use actions such as agricultural and pasture conversion can influence wildlife through loss of native vegetation communities and species diversity, changes in vegetative structure characteristics, and increased disturbance to wildlife. Improper agricultural practices have the potential for significant local impacts; water and soil pollution can occur from improper waste management in intensive agriculture operations such as feedlots; and improper application of pesticides and herbicides can cause incidental mortality of non-target sensitive species and disruption of physiological processes, including reproduction. Improper soil conservation practices cause soil erosion and sedimentation of streams and floodplains, and the improper application of fertilizers can result in nutrient loading of streams and contamination of animal tissues.

Livestock grazing on Nevada range has a long history and is one of the state's most important industries. Proper livestock grazing and wildlife conservation are compatible on the landscape, but problems have arisen in areas where improper grazing practices occurred historically or currently persist. Stresses to wildlife and their habitats related to improper livestock grazing include alteration of vegetation composition, decrease in structure and cover through the removal of vegetation, selective removal of preferred forage

species, soil compaction inhibiting plant recruitment and inducing erosion, and dispersal of undesirable invasive species. Improperly managed grazing impacts aquatic systems through erosion, sedimentation, nutrient loading, and degraded water quality, and can result in the loss of nesting cover, escape cover, and wildlife food sources in associated terrestrial habitats. Depending on the specific aquatic system characteristics, in-stream watering can cause negative substrate modification and direct mortality from trampling to endemic fishes and early life stages of endemic amphibians. Infrastructure associated with grazing management, particularly the construction of fences, results in the interruption of wildlife movements across landscapes and also causes or contributes to the direct mortality of wildlife.

Throughout Nevada, water is a scarce and valuable resource essential for both human needs and the maintenance of wildlife and their habitats, thus the development and alteration of hydrologic resources is a significant source of stress to wildlife resources. The development and operation of dams and impoundments at all scales, ranging from major reservoirs on the Colorado River to small-scale impoundments for water storage and flood control throughout the state, is an obvious human induced change to the landscape. These structures modify hydrologic regimes and interrupt natural flow dynamics that result in modified channel and floodplain processes both up- and downstream from dams and their impoundments. Dams play a key role in the fragmentation of aquatic habitats and modify the nature of both aquatic and terrestrial habitats through inundation upstream and de-watering downstream, frequently creating conditions more favorable to nonnative plant and animal species.

Channel modification to lotic (flowing water) aquatic systems, through ditching, diking and diversion is another significant source of stress to wildlife resources. The effect of these activities on aquatic and associated riparian habitats may include loss or modification of substrate diversity and structure, loss of streambank vegetation and increasing risk of erosion, loss of connectivity between channel and floodplain and within lotic systems by creating barriers to later movement by aquatic species; and actual dewatering and desiccation of aquatic habitats, which can cause direct mortality,

reductions in habitat availability, and fragmentation or loss of connectivity within or between aquatic systems.

The development of springs and seeps, a common historic practice for livestock watering, domestic water supply and other purposes, is of concern, given the critical importance of spring resources widely distributed across Nevada's landscape as sources of surface water for terrestrial wildlife, and also because many springs and seeps of all sizes support unique endemic aquatic biota. The development and modification of spring sources and source pools directly alters or removes important aquatic habitats; modifications can limit access to remaining surface water by wildlife; and the diversion of water away from outflow channels can modify, reduce, or destroy associated riparian and wetland habitat, as well as limit or eliminate flowing water habitats for endemic species associated with springbrooks.

Although not directly related to the development and alteration of spring systems, groundwater development has been a historic source of stress for Nevada wildlife and habitats and continues to represent a significant ongoing problem. As demonstrated in areas such as Ash Meadows and Pahrump Valley in southern Nevada, excessive groundwater withdrawal can alter groundwater flow and recharge patterns, resulting in loss of connectivity between groundwater and surface water habitats and concurrent impacts to plant communities and surface flow of groundwater from springs and seeps. These effects are often not well understood and can vary considerably depending on local geology, the characteristics of groundwater development actions, and the nature of the groundwater resources being accessed.

The characteristics and extent of recreational activities vary tremendously across the spectrum of Nevada's wildlife habitats, dictated by factors such as access and proximity to urban development as well as the aesthetic appeal of individual habitat types to recreationists. Stresses include wildlife displacement, altered movements, decreased reproductive success, erosion, and direct habitat alteration and destruction. Recreational participants can act unknowingly as conduits for weed invasion. Motorized recreation, including off-highway vehicles, snowmobiles, watercraft, and other devices can result in noise disturbance to wildlife, thus affecting movements,

behavior and reproductive success. Improperly operated, these vehicles can accelerate erosion, and accelerate the invasion of weeds. In particular, improper operation in sensitive areas at sensitive times of year (e.g., during the snowmelt season), or in desert washes, have potential to cause significant damage. Even non-motorized recreation, activities such as trail development, hiking, mountain biking, horse riding, cross-country skiing, rock-climbing, and spelunking, can cause habitat fragmentation and disturbance to wildlife. Although physical recreation development, for projects such as ski areas, snow parks, developed campgrounds and day-use areas, boat access, and organized event staging areas are likely not a large-scale source of stress across Nevada, these types of actions can cause localized disturbance from human activity and result in soil compaction and vegetation loss.

Wildland fire is a natural process, and plays an important role in the creation and maintenance of Nevada's terrestrial habitats and vegetative communities. Fire plays an important role in the restoration and management of those communities and habitats; however, fire management must be implemented with full consideration of all of its aspects and consequences. Improperly applied, fire suppression has altered natural ecological processes through the build-up of fuels; increased risk of catastrophic wildfire resulting in permanent loss of habitat values; accelerated conversion to alien plant communities; increased erosion and sedimentation; and increased fire frequency and spread of self-sustaining non-native communities. Further community-level effects can include the disruption of successional cycles; the unnatural maintenance of successional stages and vegetation structure and condition; and tree community encroachment into shrub and grasslands habitats. Improper fire restoration policy can compound the effects of fires and fire suppression, through exotic plant introductions from seed mixes, improper early grazing access to restored areas, and inadequate response to post-fire restoration needs, including "no action" after a fire. Finally, while the application of prescribed fire to maintain habitat health is appropriate and necessary in certain situations, this land management technique must be applied with irrefutable knowledge of the fire history of the habitat type, its response mechanisms and fire return interval. Misapplication of prescribed fire in habitats where these

characteristics are misinterpreted or not well-understood can have irrevocable impacts on the landscape. All in all, the discussion of applying prescribed fire to the landscape is a sensitive topic in Nevada and it is important that management theory, design, and implementation be carried forward by consensus with full participation of all stakeholders.

Resource extraction for minerals and non-minerals has a rich history in Nevada and remains one of Nevada's premier industries. Historic mining predominantly involved the excavation of subterranean shafts, adits, and tunnels that left minimum impact on surface habitats, but opened up extensive new habitats underground. Dating as far back as the 1850's, these underground areas have been populated by wildlife, most notably used as roosts, maternity areas, and hibernacula for many of Nevada's bat species. Since their abandonment, the openings of these underground workings pose significant risk to human safety if left unprotected. To relieve the concerns of public safety, many mine openings have been closed with earthen fill. When this permanent closure technique is implemented without an assessment of the value of the underground wildlife resource, serious losses can occur.

Today's open-pit mining techniques leave a much more significant footprint on the surface landscape. The habitat present before a mine pit is excavated is lost temporarily or permanently and wildlife that lived on the site are temporarily or permanently displaced. Mining companies strive to implement the latest, most aggressive reclamation techniques, but even under the best of circumstances are often only able to stabilize the site in a permanently altered state. There remains considerable opportunity for collaboration between biologists and reclamation engineers to incorporate innovative, yet realistic wildlife goals and objectives into reclamation design based on each site's reclamation potential.

Until recently, the search for oil and gas resources has not had a significant impact in Nevada, but new techniques and theories are currently extending the search into northeastern Nevada where much of the state's most significant Greater Sage-Grouse populations reside. While the individual drill pads themselves are often of insignificant size, the

cumulative effects of drill pad location and the infrastructure of roads connecting them (and servicing active wells) can contribute significantly to the fragmentation of habitats and a subsequent decline in habitat quality and productivity.

Nevada is one of the fastest growing states in the nation in human population, and both the Reno and Las Vegas metropolitan areas far exceed average values for population growth, creating a concurrent need for additional development into existing open space and supporting urban infrastructure. Urban and suburban development, even when well controlled and regulated, cause permanent habitat loss and conversion; direct mortality of wildlife attributed to construction; habitat fragmentation and increased erosion; and sedimentation and nutrient or toxin loading associated with urban runoff. Right-of-way fences associated with roads interrupt wildlife movements and contribute to direct wildlife mortality. Important secondary effects of the urban/wildland interface can include increased local recreation from motorized and non-motorized sources, negative interactions between pets and wildlife, and increased potential for the spread of exotic species and illegal woodcutting. Existing landfills subject to the burdens of increased urban populations can result in local soil and groundwater contamination and unnatural support for generalist predators (e.g., corvids, gulls). Largely associated with urban and suburban development, industrial development creates many of the same potential stresses, including habitat loss and fragmentation, and soil or groundwater contamination from improper disposal and discharge of toxins and hazardous materials. To the degree that such impacts cannot be adequately regulated, airborne pollutants and nutrients can reduce habitat structure, composition, and quality.

Outside of areas of significant urban or suburban development and their wildland interfaces, effects associated with development have been and will continue to be problems for wildlife and habitats. Utility rights-of-way and associated developments such as wind energy farms can cause mortality through collisions and electrocutions. Habitat alteration follows facility and road construction, operation, and maintenance. Direct effects to wildlife may occur through disturbance and alteration of behavior and movement patterns. Infrastructure also provides more

perch sites for avian predators in sensitive areas (e.g., desert tortoise habitat and sage grouse strutting grounds). Rights-of-way can serve as conduits for invasive species.

Road development, both in association with development projects and as a stand-alone independent effect, can cause habitat fragmentation, direct mortality and disturbance of wildlife, and impacts from runoff including erosion, sedimentation and contamination. The improper placement of road developments in riparian corridors and meadows can compound the core effects of this activity, and roads of any kind serve as conduits for invasive species.

Nevada's forest resources are not extensive and must be managed carefully to achieve the many objectives expected of them. Improper forestry practices and management can create significant stress from actions such as tractor logging on steep slopes, resulting in accelerated erosion and sedimentation; the alteration of wildlife habitat including insufficient habitat structure left after timber harvest (e.g., old growth stand characteristics, snags, dead and down woody material); loss of species and stand age diversity; increased vulnerability to insect outbreaks creating self-sustaining second-growth stand characteristics; inappropriate timber harvest in stream environment zones (subjecting these zones to modification processes); and unauthorized or excessive wood cutting.

Nevada has a lengthy history of assistance to the nation's military and its mission, in particular because of the availability and access to broad areas of public lands for military training, maneuvers, and testing. Military installations in Nevada are closed to most non-defense related land uses (that have resulted in conservation of key habitats elsewhere), and thus serve as potential reference areas for ecological studies (e.g., Mt. Grant on the Hawthorne Army Depot, reptile studies on the Nevada Test Site). Defense-related activities, however, also come with an associated cost and are potential sources of stress to wildlife habitats that may include habitat alteration at target sites and military training areas, habitat modification from facilities construction and maintenance, and soil or groundwater contamination from mission and infrastructure by-products.

Another anthropogenic effect and source of stress is

direct negative human interaction with wildlife, specifically, overexploitation of species through illegal activities such as poaching, illegal collection or killing, excessive harvest of species for commercial or scientific research purposes, and habitat destruction associated with collection activities. Although difficult to demonstrate in a quantitative sense, such activities have the potential to present significant threats at a local level, particularly for rare and geographically isolated Species of Conservation Priority.

A number of other sources of stress for wildlife and habitats exist and are not well connected to land use per se, but are primarily of human origin. Invasive, exotic, and feral species are one of the most significant and difficult problems facing both terrestrial and aquatic species and habitats in Nevada. These non-native species, through their invasive natures can outcompete native species and decrease the complexity of the native ecological communities, thus contributing to localized loss of species and overall reductions in wildlife diversity. They can also alter natural ecological processes through changes in fire regime, resulting in self-sustaining exotic communities with little prospect of restoration back to natural communities or stability in naturally dynamic and changeable aquatic habitat substrates. The presence of exotic animal species can disrupt natural community dynamics through competition for resources, and can cause direct conflict and predation resulting in displacement, mortality and extirpation of native species. Invasive and exotic species can introduce alien diseases into non-resistant native populations. Significant evidence also exists of negative aquatic and terrestrial habitat modification as a result of overstocked populations of wild horses and burros.

Global climate change is a potentially significant source of stress which should be considered in threat assessment and strategy development. Potential effects of global climate change include large-scale conversion of habitats and plant communities, changes in temperature regime resulting in changes in species distribution (e.g., movement of warm-climate species northward and/or upward in elevation), changes in the nature or extent of epidemic insect (e.g., bark beetles, Mormon crickets) and or fungal pathogen (e.g., blister rust) outbreaks; and in extreme cases, species extirpations at local or regional scale. While such changes can be expected to occur over long temporal scales and may be difficult to detect and assess,

anthropogenic landscape and habitat stressors have the potential to compound the more subtle effects of climate change by creating a standing level of stress to existing ecosystems and natural communities, thereby reducing the ability of species and their habitats to adapt and evolve to long-term natural stressors.

## Management of Wildlife Resources in Nevada

### Nevada Department of Wildlife

The Mission of the Nevada Department of Wildlife (NDOW) is to protect, preserve, manage and restore wildlife and its habitat for their aesthetic, scientific, educational, recreational and economic benefits to citizens of Nevada and the United States, and to promote the safety of persons using vessels on the waters of this state. The Department of Wildlife is commissioned in NRS 501.331 to "...administer the wildlife laws of this state and chapter 488 of NRS (boating law)." A director is appointed by the governor to carry out the policies and regulations of the Commission, and direct the activities and programs of the Department. NDOW facilities include a headquarters office, 3 regional offices and 27 field offices that house the functions of agency management, information and education, public service, air operations and radio dispatch communications. The total staff consists of 223 full time personnel.

### Wildlife Management Areas

There are 11 Wildlife Management Areas (WMAs) in Nevada, encompassing approximately 48,560 hectares (120,000 acres) of wildlife habitat. These areas are home to many resident and migratory birds, mammals, fish and amphibians. Located throughout the state, the public can generally drive to a WMA in less than two hours from the major population centers and find great access to wildlife viewing. The primary management emphasis on WMAs is the protection of wetlands and migratory birds including the use of the areas as public hunting grounds. Hunting opportunities on WMAs include migratory game bird, upland game bird, furbearer, and big game hunting.

**The Alkali Lake WMA**, located in Lyon County about 16 km (10 miles) southwest of Yerington,

encompasses 1,395 hectares (3,450 acres) and lies in and adjacent to a small natural sink at the south end of Smith Valley. The WMA can provide 1,215 hectares (3,000 acres) of wetland habitat during wet years, however during most years, the area is dry. Waterfowl are the most common wildlife on the area, but those numbers fluctuate dramatically in response to water availability. Waterfowl hunting and wildlife viewing are popular activities.

**Bruneau River WMA** is located in Elko County about 130 km (80 miles) north of Elko and 13 km (10 miles) south of the Idaho border. The WMA totals 1,930 hectares (4,770 acres) and includes the Bruneau River and Meadow Creek drainages. Numerous wildlife species including Greater Sage-Grouse, Blue Grouse, redband trout, mule deer and a wide variety of raptors, passerines, and reptiles benefit from the mosaic of habitats in the area. Primary recreational uses of the WMA are hunting, fishing, camping and wildlife viewing.

**Fernley WMA** is located in Lyon County, about 5 km (3 miles) east of the city of Fernley. The area consists of 5,270 hectares (13,020 acres) including seasonally flooded alkali flats, wet meadow and desert riparian habitats, and desert shrublands of greasewood and shadscale. During wet years, this area provides habitat for migratory and nesting waterfowl and other wetland-dependent wildlife. Waterfowl hunting is the primary recreational use of the area.

**Franklin Lake WMA**, located 105 km (65 miles) southeast of Elko in Elko County, includes 1,305 hectares (3,230 acres) of wetlands within the Ruby Lake-Franklin Lake ecosystem. The Franklin Lake wetlands are a natural, unaltered ecosystem fed by over 25 small streams flowing out of the Ruby Mountains. Water levels are dependent on snow pack in the Rubies and annual rainfall in the Ruby Valley. Franklin Lake provides important migratory and breeding habitat for waterfowl, shorebirds, wading birds, Sandhill Cranes and numerous other species. Waterfowl hunting and wildlife viewing are the most common recreational pursuits in the area.

**Humboldt WMA** located in Pershing and Churchill counties, totals 15,030 hectares (37,140 acres) and is about 30 km (20 miles) southwest of Lovelock and 130 km (80 miles) east of Reno. The WMA lies at the

terminus of the Humboldt River, which serves as the major source of water for the area. Wetlands and aquatic habitats comprise 11,290 hectares (27,900 acres) of the area. During wet years, the area contains very large expanses of water which attracts a vast array of waterfowl, shorebirds and wading birds to the shallow water habitat. Waterfowl hunting and wildlife viewing are the major recreational uses of the area.

The **Key Pittman WMA** is located in Lincoln County at the north end of the Pahranaagat Valley, about 220 km (135 miles) south of Ely. Nesbitt and Frenchy lakes, totaling about 200 hectares (500 acres), are located on the WMA. Adjacent to the lakes are marshes and agricultural cropland surrounded by uplands. The fish and wildlife resources of the area are very diverse due to the mosaic of habitat types found on the WMA. Waterfowl, wading birds, shorebirds, passerines and numerous other wildlife species benefit from the project. Waterfowl hunting, fishing and wildlife viewing are popular recreational uses of the area.

The **Mason Valley WMA** in Lyon County consists of approximately 5,415 hectares (13,375 acres) of desert shrub lands and wet meadows supporting an abundance of fish and wildlife. The Walker River floodplain meanders through Mason Valley WMA, providing food, cover and water for a vast array of wildlife. Numerous wet meadows and ponds dot the landscape, attracting ducks, geese, swans, songbirds and wading birds. The deep-water habitat of the newly constructed North Pond reservoir is home to fish, Osprey and American White Pelicans. Alkali desert scrub, an upland plant community, covers an extensive area of Mason Valley WMA and provides shelter to many mammals including raccoon and mule deer. A wide variety of hunting, fishing and wildlife viewing opportunities occur in the Mason Valley WMA.

**Overton WMA** lies in the lower extremes of the Moapa and Virgin River valleys in Clark County, where they flow into the north end of the Overton Arm of Lake Mead. Located in the Mojave Desert, Overton WMA supports an abundance of fish and wildlife. Desert riparian habitat, associated with the floodplain of the Muddy and Virgin rivers, is extremely important to wildlife populations. The dense shrubbery of desert wash habitat provides food and shelter for small mammals and many species of birds.

Numerous wet meadows and ponds dot the landscape, providing food, cover, and water for birds, mammals, reptiles, and amphibians. The deep water of Lake Mead provides habitat for fish, cormorants, and diving ducks, while shallow littoral zones provide feeding areas for puddle ducks and shorebirds.

**Scripps WMA** in Washoe County consists of about 965 hectares (2,380 acres) and includes the north end of Big Washoe Lake and the marshes south of Little Washoe Lake in Washoe Valley. The uplands surrounding the wetland areas are primarily sagebrush and desert shrub lands. Waterfowl hunting, fishing and wildlife viewing are popular recreational pastimes of the area. The WMA provides an important opportunity for residents of Reno, Sparks and Carson City to enjoy wetland-associated wildlife within close proximity to their homes.

**Steptoe Valley WMA** located just south of Ely in White Pine County consists of 2,600 hectares (6,425 acres), plus an additional 11,050 hectares (27,305 acres) of grazing allotments associated with the base property. From wet meadows and riparian corridors to sagebrush and piñon-juniper uplands, the habitats of Steptoe Valley WMA support an abundance of fish and wildlife. Sagebrush is important habitat for mule deer, pronghorn, sage grouse and a multitude of nongame species. Piñon-juniper habitats are present on the uplands surrounding the Steptoe Creek drainage. The riparian habitats of Steptoe Valley include cottonwood, willow, and aspen. Various ponds and wet meadows dot the landscape, providing food, cover, and water for numerous species of waterfowl, wading birds, and mammals. The deep water of Comins Lake provides habitat for fish and diving ducks.

**Wayne E. Kirch WMA** is located in the White River Valley in northeastern Nye County. From sagebrush to wet meadows and grasslands, the Kirch WMA supports an abundance of fish and wildlife. The White River bisects the area and provides wetlands and deep water habitats. Uplands in Kirch WMA include sagebrush, alkali desert scrub, annual grassland and desert wash. Sagebrush provides important habitat for mule deer, pronghorn, sage grouse and nongame species. The desert wash habitat is found in narrow corridors around intermittent streams carrying runoff from the Egan Range into the White River Valley. The reservoirs on Kirch WMA provide deep and shallow water habitats

for fish and diving ducks, puddle ducks, and shorebirds.

### Hatcheries

The mission of the NDOW hatchery program is to rear and stock fish into Nevada waters for their scientific, educational, recreational, and economic benefits to the citizens of Nevada.

NDOW administers three fish hatcheries and one rearing station that annually raise 2.2 million fish for stocking into 36 streams and rivers, and 61 lakes, reservoirs and ponds.

Located on the Ruby Valley National Wildlife Refuge, **Gallagher Hatchery** produces approximately 100,000 pounds of trout each year. The most common trout raised at Gallagher is rainbow, but brown, brook and occasionally hybrid trout are also reared there. Operations at Gallagher are unique to the rest of Nevada's hatchery system in that rainbow and brown trout broodstock are maintained to assist in annual egg production needs.

**Spring Creek Rearing Station**, located near the town of Baker, receives predominantly rainbow trout at a fingerling size and raises them to a catchable length for planting. Originally constructed in 1949, Spring Creek Rearing Station produces about 35,000 pounds of trout annually.

Constructed in 1990, **Mason Valley Hatchery** is located within the Mason Valley WMA, near Yerington, Nevada. This facility raises a variety of trout, including brook, brown, cutthroat, tiger and several strains of rainbow. Total production from this hatchery is approximately 150,000 pounds of trout per year.

The reconstruction of **Lake Mead Hatchery**, on the western shore of Lake Mead, should be completed in 2005. NDOW's newest hatchery will incorporate modern fish culture methods and a state-of-the-art visitor's center. Rainbow trout is predominantly the fish of choice for this facility and for stocking into the southern portions of Nevada. Around 180,000 pounds of trout are stocked from Lake Mead Hatchery each year. Additional funding is provided by native fish programs to dedicate a separate room for the raising of Nevada's native fish species, such as razorback

suckers and bonytail.

### Funding for Wildlife Conservation on Private Lands

**NDOW Landowner Incentives Program (LIP).** The primary objective of this program is to protect and restore habitats on private lands to benefit Species of Conservation Priority; those species which are Federally listed, proposed, or candidate species as well as other species determined to be at risk. The LIP program provides technical and financial assistance to private landowners for habitat protection and restoration.

**Question 1 – Nevada's Conservation Bond.** In 2002, Nevadans voted and passed the \$200 million Question 1 Bond Initiative, authorizing the state to issue bonds for projects to protect and preserve natural resources in Nevada. NDOW received \$27.5 million for the acquisition of property to enhance, protect, and manage wildlife and wildlife habitat or enhance recreational opportunities related to wildlife, for the development and renovation of facilities and the improvement of existing habitats for fish and other wildlife.

### Nevada's Wildlife Conservation Partners

The following list of agencies and organizations represents our best attempt to inventory all the entities that have participated in the mission of wildlife conservation in Nevada, currently maintain responsibility for or interest in wildlife conservation, and are expected to continue to do so.

#### Federal Agencies

The **U.S. Fish and Wildlife Service (USFWS)** is the principal Federal agency responsible for conserving, protecting and enhancing fish, wildlife and plants and their habitats for the continuing benefit of the American people. In Nevada, the Fish and Wildlife Service focuses its efforts in three primary program areas: Ecological Services, Fisheries, and National Wildlife Refuges. Nevada also receives technical assistance from their regional office programs, most notably the Office of Migratory Bird Management.

The **Ecological Services** program provides technical assistance and project funding in three basic subject areas – endangered species, habitat conservation, and environmental contaminants. The staff assess species and habitat status, threats, and conservation needs; and

work in partnership with others to develop species management and recovery plans, conservation strategies and agreements, species listing packages and petition responses. The Fish and Wildlife Service also offers a variety of private landowner conservation tools and funding opportunities. **Safe Harbor Agreements** provide benefits for listed species while also providing regulatory assurances to landowners. **Candidate Conservation Agreements with Assurances** provide incentives for non-Federal landowners to conserve species that are candidates for listing under the Endangered Species Act. The **Partners for Fish and Wildlife** program offers cost-share grant funding to landowners for managing and restoring habitats on their private lands.

**Fisheries.** This program maintains partnerships with States, Tribes, Federal agencies, other USFWS programs, and private interests in a larger effort to conserve fish and other aquatic resources in Nevada. The **Lahontan National Fish Hatchery Complex** is an integrated fishery program that includes the **Nevada Fishery Resource Office, Lahontan National Fish Hatchery (NFH), and Marble Bluff Fish Passage Facility.** The program encompasses nearly all fishery program activities including fish passage, production and tagging programs, instream flow management, strain evaluation, and habitat restoration. Lahontan NFH houses an important broodstock of the original Pyramid Lake strain of Lahontan cutthroat trout that will be critical for re-establishing wild populations of Lahontan cutthroat trout to the Pyramid/Truckee River and Walker Lake basins.

**National Wildlife Refuges (NWRs).** The Fish and Wildlife Service administers about 890,310 hectares (2.2 million acres) of land on nine wildlife refuges in Nevada. These lands are managed primarily for their fish, wildlife, and habitat values although other compatible uses may also occur there.

**Desert National Wildlife Refuge Complex** includes four refuges in southern Nevada – Ash Meadows, Desert Range, Moapa Valley, and Pahrnatagat.

**Ash Meadows NWR,** located in the Amargosa Valley of southern Nye County, consists of over 9,310 hectares (23,000 acres) of spring-fed wetlands and alkaline desert uplands providing habitat for at least 24 plants and animals found nowhere else in the world.

Ash Meadows has a greater concentration of endemic species than any other local area in the United States and the second greatest in all of North America.

**Desert National Wildlife Range,** the largest National Wildlife Refuge in the lower 48 states, encompasses 607,000 hectares (1.5 million acres) of Mojave Desert habitats and ecological communities in southern Nevada. The Refuge contains six major mountain ranges, the highest rising from 750 m (2,500-foot) valleys to nearly 3,050 m (10,000 ft). Management of desert bighorn sheep and their habitat is the most important objective of the range, although the refuge also provides habitat for the diversity of Mojave Desert wildlife.

**Moapa Valley NWR,** located in northeastern Clark County, was established to protect the endangered Moapa dace, a small endemic fish present only in the headwaters of the Muddy River system. Dace habitat on the refuge consists of stream channels supported by six thermal springs.

**Pahrnatagat NWR** is located in Lincoln County. The Refuge provides habitat for migratory birds, especially waterfowl. Pahrnatagat's water originates from large springs to the north of the refuge. The wetland habitats of Pahrnatagat support a variety of plant species favored as food by over 230 species of migratory birds and other resident wildlife. The refuge has four main water impoundments.

**Ruby Lake NWR,** located in extreme southeastern Elko County and northern White Pine County, consists of 15,230 hectares (37,630 acres) of marsh, meadow, and sagebrush habitat. It lies in a closed drainage basin along the eastern flank of the rugged and scenic Ruby Mountains. Ruby Lake NWR is an important nesting area for a variety of ducks and water birds.

**Sheldon NWR,** located in the extreme northwest corner of Nevada in Washoe and Humboldt Counties, protects more than 202,345 hectares (500,000 acres) of high desert habitat for large herds of pronghorn antelope, flocks of Greater Sage-Grouse, and a rich assortment of other wildlife. The landscape is vast, rugged, and punctuated with waterfalls, narrow gorges, and lush springs among rolling hills and expansive tablelands of sagebrush and mountain-mahogany.

The **Stillwater National Wildlife Refuge Complex** includes three northern Nevada refuges – Stillwater and

Fallon near the town of Fallon, and Anaho Island in Pyramid Lake.

**Stillwater NWR** is located in the Lahontan Valley, near the community of Fallon, 100 km (60 miles) east of Reno. The Stillwater wetlands are well-known to birders, as this area has been designated a site of international importance by the Western Hemispheric Shorebird Reserve Network because of the hundreds of thousands of shorebirds passing through during migration. Also listed as a 'Globally Important Bird Area' by the American Bird Conservancy, more than 280 species have been sighted in the area. These tremendously rich and diverse wetlands attract more than 250,000 waterfowl each year, as well as over 20,000 other water birds.

**Fallon NWR**, located in the Lahontan Valley near the town of Fernley, includes gently rolling to flat desert shrublands consisting of greasewood and saltbush. A system of both active and stable dunes also accentuates the topography in this area. The terminus of a branch of the Carson River occurs on the Fallon NWR, providing habitat for both waterfowl and upland game.

**Anaho Island NWR** is located near the eastern shoreline of Pyramid Lake. The refuge is a sanctuary for colonial nesting birds, primarily American White Pelicans. Anaho Island is isolated within the **Pyramid Lake Paiute Indian Reservation**, but is managed by the Fish and Wildlife Service as part of the National Wildlife Refuge System under an agreement with the **Pyramid Lake Paiute Tribe**.

The **Office of Migratory Bird Management** of the Fish and Wildlife Service is dedicated to conserving migratory bird populations and their habitats in sufficient quantities to prevent them from being considered as threatened or endangered; and to ensure the citizens of the United States continued opportunities to enjoy both consumptive and nonconsumptive uses of migratory birds and their habitats.

**Bureau of Land Management (BLM).**

Approximately 68 percent of the State of Nevada's land base is under multiple use management by BLM. Resource Management Plans provide management guidance for individual BLM districts, including

standards and guidelines for maintaining or improving the various resources that occur within that district. BLM programs must consider wildlife, habitats, and sensitive species issues in their decision-making processes. In addition, the individual districts have responsibility for proactively managing critical wildlife resources such as endangered species, and riparian and wetland habitats, and regularly participate in various partner-based efforts such as the Governor's sage grouse team, species recovery implementation teams, and game projects.

The BLM also manages the public landscape under regionally focused efforts such as the **Great Basin Restoration Initiative**, or on a more local scale, under guidance provided in area plans. For example, there are three National Conservation Areas and several designated wilderness areas managed by BLM in Nevada, as well as numerous Wilderness Study Areas that are managed for their natural character. In collaboration with the University of Nevada, BLM initiated a **Great Basin Cooperative Ecosystem Studies Unit** with a mission of providing research, technical assistance and education to address resource issues and assist inter-disciplinary problem-solving in an ecosystem context.

**National Park Service (NPS)** lands in Nevada include Great Basin National Park in White Pine County, a portion of Lake Mead National Recreation Area in Clark County, and a small corner of Death Valley National Park in Nye and Esmeralda counties. The mission of the NPS is to preserve, protect, and manage biological resources and related ecosystem processes in the National Park System. Accordingly, the individual parks take a proactive ecosystem-based approach to management, and maintain active programs devoted to management of park resources for the protection of wildlife, endangered species, and habitats.

The **U.S. Forest Service (USFS)** administers approximately eight percent of the land base in the state, primarily as the Humboldt-Toiyabe National Forest, the largest National Forest in the lower 48 states. A small portion of the Forest Service lands in Nevada are managed by the Inyo National Forest and the Lake Tahoe Basin Management Unit. The Humboldt-Toiyabe is comprised of 10 Ranger Districts, each geographically separated by a vast landscape of

public lands. The Forest Service manages their landscape under the direction of Forest Plans that provide standards and guidelines for managing natural resources. The Humboldt-Toiyabe Forest Plan is currently being revised.

**Department of Defense (DOD).** In Nevada, DOD manages more than 2,023,428 hectares (5 million acres) of lands, including the Nellis Air Force Range, Fallon Naval Air Station, and Hawthorne Army Munitions Depot. DOD lands are typically closed to public and multiple uses. As a result, many portions of these installations are relatively unfragmented and undisturbed. In 1990, Congress passed legislation establishing the Legacy Resource Management Program to provide financial assistance to DOD efforts to preserve natural and cultural heritage. The program assists DOD in protecting and enhancing resources while also supporting military readiness. The Nature Conservancy partners with DOD on the Legacy Program, and with partners, has developed conservation area plans for both the Hawthorne installation and Fallon NAS.

**Department of Energy (DOE).** The DOE's only significant land base in the State is the Nevada Test Site (NTS) located in Nye County, in southcentral Nevada. The NTS is one of the largest restricted access areas in the United States. The remote site is surrounded by thousands of additional acres of land withdrawn from the public domain by Nellis Air Force Range and the Desert National Wildlife Range. All together, these lands comprise an unpopulated land area of approximately 14,165 square kilometers (5,470 square miles). Public access to the Nevada Test Site is strictly controlled, therefore the wildlife habitats are generally in good condition. Habitat types include various desert scrub and lower montane woodland systems.

The **U.S. Bureau of Reclamation (USBR)** maintains active environmental programs at both ends of the State. The Lahontan Basin Area Office provides management and oversight for Reclamation activities and interests in the three river basins which make up the Lahontan Basin Area. The area managed includes the Carson, Truckee, and Humboldt River basins. The major programs of the Lahontan Basin Area Office are primarily related to water rights on the Truckee River and the operation of the Newlands Project. The

water right issues are complicated by the endangered cui-ui and the threatened Lahontan cutthroat trout in Pyramid Lake, the trust responsibility of the Secretary to both the Pyramid Lake Paiute Tribe and the Fallon Paiute-Shoshone Indian Tribe, and their obligation to provide water for the Lahontan Valley wetlands.

The Lower Colorado Region office of USBR manages the Colorado River to meet water and power delivery obligations, enhance outdoor recreation opportunities, and provide flood control. Associated with these activities, the USBR has programs focused on protection of endangered species and enhancement of native habitats for Colorado River fishes and riparian birds.

**Natural Resources Conservation Service (NRCS).**

The NRCS works through partnerships to conserve, maintain, and improve natural resources. NRCS's natural resources conservation programs are designed to reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. The NRCS administers various programs and conservation provisions authorized under the **Farm Security and Rural Investment Act of 2002 (Farm Bill)**, designed to assist farmers and ranchers meet environmental challenges on their lands.

**The Wetlands Reserve Program (WRP)** offers landowners assistance to protect, restore, and enhance wetlands on their property. The NRCS provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS' goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program.

**The Wildlife Habitat Incentives Program (WHIP)** provides assistance for developing and improving wildlife habitat, primarily on private land. Under this program, NRCS provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat.

**The Environmental Quality Incentives Program (EQIP)** provides a conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and

management practices on eligible agricultural land.

**U.S. Environmental Protection Agency (EPA).**

The EPA develops and enforces regulations that implement environmental laws passed by Congress, including the Clean Water Act. Research grants are available through this agency to answer a broad range of questions associated with environmental quality. Nevada is situated in EPA Region 9 which maintains its regional office in San Francisco, California. Current areas of focus in Nevada include Lake Tahoe and the Carson River, SW ReGAP, and the Declining Amphibian Population Task Force (especially declining amphibians in southern Nevada).

**USDA APHIS Wildlife Services.** The Wildlife Services division of the U.S. Department of Agriculture’s Animal and Plant Health Inspection Service (APHIS) provides assistance in resolving conflicts between wildlife and people. Wildlife Services personnel address issues of wildlife depredations on agricultural crops, livestock, and property as well as respond to wildlife-related issues of public safety. In Nevada, offices are maintained in Reno and Las Vegas and field agents are stationed in several rural areas around the state.

**Desert Terminal Lakes.** Provides \$200 million to the Department of Interior to find ways to provide water to at-risk natural desert terminal lakes.

**U.S. Geological Survey – Biological Research Division (BRD).** The mission of BRD is to provide science expertise to support sound management and conservation of the Nation’s biological resources. In Nevada, BRD research is focused in on population biology and species-habitat relationships of desert fishes; ecology and physiology of desert tortoise and other Mojave Desert reptiles; and fire ecology of Mojave Desert ecological systems.

**U.S. Army Corps of Engineers (COE)** provides engineering services for designing, building and operating water resources and other civil works projects. In Nevada, the COE is a partner in various habitat management efforts, including restoration of the Truckee River through Reno and Sparks, and mitigation programs for aquatic species in water streams, rivers, and lakes throughout the state.

## State Agencies

**Nevada Natural Heritage Program (NNHP).** The mission of the NNHP is to help coordinate the resource needs of Nevada’s diverse biological heritage with human activities. This is primarily achieved through the maintenance of an inventory and current databases on the locations, biology, and conservation status of all threatened, endangered, and sensitive species and biological communities in the state. Heritage also participates in and contributes to various species conservation strategies, mostly notably, the Nevada **Bat Conservation Plan**, amphibian conservation strategies, and aquatic species recovery implementation teams.

The NNHP uses the best available biological data to evaluate conservation priorities for over 700 kinds of native animals, plants, vegetation types, and their habitats—those at greatest risk of extinction or serious decline—and supplies information and technical services to meet diverse conservation, planning, development, land management, and research needs. NNHP provides the citizens of Nevada with a cost-effective early warning system, designed to minimize future resource conflicts, and to help prevent species from becoming threatened or endangered by encouraging less costly, less burdensome, and more proactive conservation measures. The NNHP is a contributing member of NatureServe, a network connecting science with conservation, consisting of natural heritage programs and conservation data centers found across the United States, Canada, and Latin America. It is also part of the National Biological Information Infrastructure.

The NNHP is the lead state resource agency for development of the **Nevada Wetland Information System and Geographic Information System** and the preparation of the **Nevada Wetland Priority Conservation Plan**. The purpose of these projects is to create, maintain and update a biological, technical, and institutional information base and make it available for preparation of a comprehensive state conservation strategy; as a supporting element for various agency and collaborative plans involving wetlands, aquatic habitats, watershed, wildlife, sensitive species, outdoor recreation and other natural resources; and, for projects to conserve, restore, or develop wetland resources.

**Nevada Division of Forestry (NDF)** manages

forestry, nursery, endangered plant species, and watershed resource activities on certain public and private lands; and provides fire protection for natural resources through fire suppression and prevention, post-fire rehabilitation, and prescribed burning. NDF resource programs that provide assistance to private landowners for proper management of forests and piñon-juniper woodlands also can result in conservation and enhancement of wildlife habitat on privately-owned land.

The **Forest Stewardship Program** and **Stewardship Incentives Program (SIP)** offer cost shares and grants to assist landowners with implementation of conservation projects such as reforestation, wildlife habitat improvement, and soil and water conservation.

The **Nursery and Seedbank Program** provides native and adapted plant materials, seedlings and seed, for post-burn rehabilitation, riparian restoration, and other conservation projects on federal, state, and private lands.

NDF, in conjunction with the Department of Corrections, operates the **Conservation Camp Program** that provides trained and equipped inmate crews to fight fires and assist on resource conservation projects. The program provides a statewide labor force for vegetation management and other worthwhile conservation projects.

**Nevada Division of State Parks (NDSP)** manages 24 State Parks across the state with three primary purposes – historical preservation, resource protection, and outdoor recreation. Several State Park properties contain key habitats for some of Nevada’s Species of Conservation Priority, including California Spotted Owl, Northern Goshawk, Yellow-billed Cuckoo, and Yuma Clapper Rail. Each State Park operates under a Master Plan that identifies resource values such as important wildlife species and habitats. Park operations are designed to meet stewardship responsibility for the management of these natural resources with minimum impacts. Several properties have “backcountry” designations with specific backcountry management goals and objectives that focus on resource maintenance and protection.

**Nevada Division of Environmental Protection (NDEP)**. As the lead agency for the protection of water quality and achievement of standards, NDEP

implements programs to address nonpoint source pollution. The Division’s Bureau of Water Quality Planning annually awards federal Clean Water Act Section 319 funds through the Nonpoint Source Program for projects that reduce, eliminate, or prevent Non-point source pollution. With an emphasis on the watershed approach, many types of water quality improvement projects also enhance habitat conditions for wildlife. Funded projects include seeding eroding upland slopes with native and adapted grasses, forbs, and shrubs; stabilizing eroding channel banks; rehabilitating riparian areas; and constructing fences and livestock watering systems to control livestock access to riparian areas.

The Department of Environmental Protection’s **Bureau of Mining Regulation and Reclamation** regulates mining activities in Nevada to ensure that Nevada’s waters are not degraded by mining operations and that the lands disturbed by mining operations are reclaimed to ensure a productive post-mining land use. The Reclamation Branch regulates exploration and mining operations in Nevada on private and public lands. An operator must obtain a reclamation permit prior to construction of any exploration, mining, or milling activity that will disturb over 2 hectares (5 acres) or remove in excess of 37,085 metric tons (36,500 tons) of earth materials. In coordination with NDOW, the Bureau of Mining Regulation and Reclamation can help ensure that permitted mining related activities minimize impacts on wildlife and their habitats; including the conservation of subterranean habitats for bat roosting, reproduction, and hibernation.

The **Nevada Division of Minerals** conducts a program to identify inactive mines in the State, rank their degree of hazard and carry out activities to secure the sites, through owners or division staff. Through a cooperative agreement between the division and the BLM, abandoned mines scheduled for closure can be assessed for their values as wildlife habitats and measures may be taken to retain their habitat values.

The **Nevada Division of Conservation Districts (NDCD)** is the State’s administrative lead for 28 Conservation Districts in Nevada. Conservation Districts work closely with NRCS to promote agricultural and urban development practices that conserve renewable resources (i.e., soil, water, wildlife, and vegetation), primarily on private land. The NDCCD

can lend support through dissemination of information to the commission, districts, and rural communities on the WAP and subsequent implementation plans constructed at the local level. The state grants \$5,000 per year to each conservation district in good standing for projects to better manage, conserve, or enhance renewable resources. These projects represent opportunities to enhance ecosystems and habitats in addition to their primary purpose.

The **Nevada Division of State Lands (NDSL)** offers planning assistance to local governments in preparation of master plans and public land policy plans. The NDSL also conducts community planning training workshops for local government officials and residents. These are opportunities to coordinate planning activities that influence wildlife habitat. The Division of State Lands also represents state and local interests, including those related to wildlife and habitat management, on federal land management projects.

Two other projects in which the NDSL is involved present opportunities to increase public awareness of the importance of wildlife conservation efforts, and perhaps could lead to added support for local wildlife planning. The NDSL is assisting the Governor's office with implementation of the **Western Governors Association (WGA) Enlibra Program**. Case studies of local collaborative planning projects, such as were recently convened for sage grouse, are being developed for a western U.S. Enlibra Summit. Lessons learned from the case studies and at the Summit may lead to a WGA effort to obtain resources to assist local collaborative planning groups. The Governor's office and the NDSL are also updating Nevada's Public Land Policy Plan. Related action items are being identified that might benefit wildlife in conservation need along with other public land resources and nearby communities.

The **Nevada Department of Agriculture (NDOA)** encourages the advancement and protection of agriculture and related industries for the benefit of Nevada citizens. NDOA works in a voluntary manner with interested landowners to address issues involving production agriculture. Because a large portion of the agricultural production in Nevada is dependent on access to and use of natural resources located on

public lands, the department is often involved in the resource issues associated with these activities. The NDOA Natural Resource Program is involved in all aspects of natural resource management or environmental regulation that affects, or is affected by, agriculture in Nevada. Due to staffing and budgetary limitations, this program usually focuses on broad programmatic issues, as opposed to specific issues or situations affecting individuals.

NDOA has primary responsibility for the enforcement of noxious weed laws, and for control of noxious weeds for the protection of agricultural and natural resources. The agency is also responsible for Nevada's **Coordinated Invasive Weed Strategy**, which works from a platform of collaborative, linked efforts to prevent, control, and manage invasive weed species. NDOA, in conjunction with the University of Nevada's Cooperative Extension, the USDA Agricultural Research Service, and the NRCS, helps to build awareness of economically acceptable farming and ranching practices that aid in the conservation of wildlife and their habitats.

Other program activities include maintenance of the Department's public land grazing trend data base and economic analysis; administration of the Nevada Agricultural Mediation Service – a state program funded by a USDA grant. NDOA administers Section 8 Review process (Pesticide Registration Improvement Act)—a program designed to provide conflict resolution among BLM, USFS and permittees at the allotment level. NDOA works with the Board of Agriculture and other state agencies to develop state policies and comments on natural resource and public land issues and participates in the Executive Coordinated Resource Management (CRM) process and other similar processes in the state. The agency provides input into various land and resource planning processes throughout the state, and organizes and supports the Department's Environmental Action Committee.

### **Tribal Lands and Governments**

Nevada includes 19 federally recognized Native American tribes comprised of 28 separate tribes, bands, and community councils. The estimated land area that they collectively own and manage is approximately 485,625 hectares (1.2 million acres). Tribal lands include colonies, reservations, allotments, ranches, tribal fee

land, federal land, government-owned land, and trust lease lands. Wildlife resources on these lands are typically managed through established wildlife and fisheries management programs, sometimes in partnership with Federal and State resource agencies. For example, the **Pyramid Lake Tribe** actively manages their cui-ui and Lahontan cutthroat trout resources and maintain working partnerships with the U.S. Fish and Wildlife Service and Nevada Department of Wildlife.

A few other ongoing and active tribal wildlife efforts include the **Duckwater Tribe**'s cooperative relationship with the USFWS to manage for Railroad Valley springfish, and the partnership between the **Moapa Band of Paiutes** and various others to manage for riparian and aquatic wildlife on the upper Muddy River.

The **Nevada Indian Commission** is a state agency created to study matters affecting the social and economic welfare and well-being of American Indians residing in Nevada. Commission activities are aimed at developing and improving cooperation and communications among the Tribes, State, local governments, and related public agencies. The Commission serves as liaison between the State and the 19 federally recognized tribes. The Commission has assisted state agencies and Tribes with issues affecting Nevada's American Indian constituency and serves as a forum in which Indian needs and issues are considered. The Commission is a conduit by which concerns involving Native American Indians or Tribal interests are channeled through the appropriate network and serves as the point of access for Tribes to learn about state government programs and policies.

### **Nevada's Local Government Agencies and Programs**

The **Nevada Association of Counties (NACO)** is a nonpartisan, nonprofit corporation, owned, organized, and operated by Nevada's county governments. The membership is composed of Nevada's county governments and represents all 17 Nevada counties. The mission of NACO is to "encourage county government to adopt and maintain a spirit of local, regional, state, and national cooperation which will result in public policy that optimizes the management of county personnel, financial, and natural resources;

to provide courteous and effective services that will earn and maintain the public trust in county government."

Nevada's counties are integral partners in any wildlife management plans and programs. County roles will vary widely, depending on individual project goals, but may include the participation of parks and recreation departments, animal control divisions, or urban redevelopment committees. Many counties were closely involved with the local sage grouse working groups in developing the local area plans that were incorporated into the Governor's sage grouse effort.

Several counties have incorporated wildlife standards and guidelines directly into their planning efforts. For example, Churchill County developed wildlife standards for their Quality of Life plan, while Clark County convened the Environmentally Sensitive Lands Committee to identify sideboards for future development.

A variety of other local entities guide wildlife management activities in Nevada.

**Conservation Districts** coordinate assistance from public and private, local, state and federal entities, in an effort to develop locally driven solutions to natural resource concerns. In Nevada, there are currently 28 conservation districts. Similarly, Town Advisory Boards can play a role in monitoring and advising the effects of agency programs on their local communities.

Water Authorities, Water Districts, and Irrigation Districts may also participate in wildlife management activities. The **Southern Nevada Water Authority (SNWA)** mission is to manage the region's water resources and develop solutions that will ensure adequate future water supplies for the Las Vegas Valley. The SNWA develops and manages a "flexible portfolio of diverse water resources." This portfolio includes a variety of Colorado River and in-state resources, including both surface water and groundwater rights and groundwater applications. As a matter of course, the SNWA evaluates the potential impacts of its actions on the environment and strives to balance resource needs with the preservation of wildlife habitat. Accordingly, their environmental research division coordinates with agencies and other entities to use science to inform their decision making process. The **Truckee Meadows Water Authority (TMWA)** was

formed in 2000 as a collaboration among the Cities of Reno and Sparks, and Washoe County, as a means of efficiently managing water resources. Other bodies that may play a role in wildlife management include local irrigation or water districts.

**Tahoe Regional Planning Agency (TRPA)** is a bi-state agency charged with protecting Lake Tahoe through maintenance of a clean, healthy and sustainable lake environment. The TRPA sets goals and standards for Environmental Thresholds carrying capacities for fish and wildlife habitat (and other resources), and enforces implementing ordinances to achieve and maintain such capacities while providing opportunities for orderly growth and development consistent with such capacities. The **Lake Tahoe Environmental Improvement Program (EIP)** is a multi-partner cooperative effort to define restoration needs for achieving the thresholds.

### Conservation Organizations

The Mission of **The Nature Conservancy (TNC)** is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. TNC has developed a strategic, science-based planning process, called Conservation by Design, which helps identify the highest-priority places—landscapes that, if conserved, promise to ensure biodiversity over the long term. Taken together, these landscapes form a vision of conservation success and a roadmap for getting there—the Conservation Blueprint. TNC has five priority conservation initiatives to address the principal threats to conservation at the sites where they work, focusing on fire, climate change, freshwater, marine, and invasive species. TNC works to preserve lands and waters for future generations by working with communities, businesses, governments, partner organizations, indigenous people and communities.

The Nature Conservancy's Nevada program is focused on protecting a suite of high priority conservation areas through stewardship and partnership. Current programs are addressing conservation needs on the Truckee, Carson, Amargosa, and Muddy rivers, in eastern Nevada's sagebrush and piñon-juniper habitats, and in high biodiversity areas throughout the state with a current emphasis on those dependent

upon reliable water supplies.

**American Land Conservancy (ALC)** is a national organization that protects land for the benefit of people and wildlife. ALC works in partnership with communities, private landowners, local land trusts, and public land agencies to find effective conservation solutions for threatened natural resources. ALC uses techniques such as land acquisition, conservation easements, and the acquisition of water rights, grazing leases or other interests in land. ALC's projects in Nevada lie primarily in the vicinity of the Carson Range.

**The Nevada Land Conservancy** is a Nevada-based land trust working with landowners and communities to protect and preserve open space for an enhanced quality of life. With the help of members, volunteers, land owners, businesses and government agencies, the Nevada Land Conservancy protects special places through acquisition, easement, open space planning, outreach and environmental restoration.

**The Trust for Public Land (TPL)** is a national land conservation organization that conserves land for people to enjoy as parks, community gardens, historic sites, rural lands, and other natural places, ensuring livable communities for generations to come. TPL's conservation work focuses on protection strategies for parklands, working landscapes, natural areas, and sites of cultural, historic, and aesthetic significance. TPL also offers conservation planning services for agencies and communities. TPL has active projects across the state.

**The Conservation Fund** works through partnerships to preserve wildlife habitat, working landscapes and community open-spaces. Since 1996 the Fund has worked with local ranchers, the BLM, U.S. Fish and Wildlife Service, and Clark County to purchase willing sellers' grazing allotments on public lands and open space in Las Vegas Valley and Washoe Valley.

The **Desert Fishes Council (DFC)** preserves the biological integrity of desert aquatic ecosystems and their associated life forms, holds symposia to report related research and management endeavors, and effects rapid dissemination of information concerning activities of the Council and its members. Although DFC's main focus is desert fishes, other aquatic species associated with desert ecosystems (e.g. amphibians) are also included under its umbrella.

DFC was formed in response to impacts to habitats of the endemic fishes of Ash Meadows and nearby Death Valley from groundwater pumping for agricultural development. Concerned biologists and management agency officials convened a symposium to address the threats and protection and preservation of this unique fauna, and it was at this symposium, in November 1969, that the Desert Fishes Council was born.

**Lahontan Audubon Society** serves northern Nevada, representing 1,000 conservation-minded members, to help restore, preserve, and improve habitat for birds and other wildlife and to provide education about birds and their habitats in Nevada and adjacent areas of California. Members help protect and preserve the environment by participating in activities such as site clean-ups and improvements. They volunteer their time helping to educate the public about birds and bird habitat through birding classes, field trips, and school presentations, so the public may gain an appreciation for the environment and become good stewards of the land.

Lahontan Audubon's **Important Bird Areas (IBA) Program** is designed to identify areas that provide exceptional habitat for birds at various times in their life history and to seek opportunities to help steward these areas. These IBAs embody interagency cooperation and public participation and contribute not only to a state and regional level understanding of bird habitat requirements, but to a national and global effort to protect birds and their habitat.

**Red Rock Audubon Society** is the Las Vegas chapter of the National Audubon Society. Their mission is to protect, restore and improve the natural ecosystems, focusing on birds and other wildlife, and to educate the public about our unique Nevada environment. Red Rock Audubon sponsors various meetings, educational programs, field trips, and volunteer events to facilitate bird conservation in southern Nevada.

As America's oldest, largest, and most influential grassroots environmental organization, the **Sierra Club's** mission includes exploring, enjoying and protecting the wild places of the earth; practicing and promoting the responsible use of the earth's ecosystems and resources; educating and enlisting humanity to protect and restore the quality of the natural and human environment; and using all lawful

means to carry out these objectives. The Sierra Club has two chapters in Nevada.

**Truckee River Yacht Club** works for the betterment of the Truckee River from its source in Lake Tahoe to its terminus at Pyramid Lake. The Truckee River Yacht Club works on a variety of issues including water quality and maintaining minimum flows, improving dams to allow fish movements through the watershed, improving access for recreational users, minimizing human impacts in the river's floodplain, and volunteer based river clean-up efforts.

The task of the **Walker Lake Working Group** is to prevent the collapse of the Walker Lake ecosystem and improve the health of the lake. The Group works to build public support for a long-term solution to protect the lake without jeopardizing the upstream community. The group has three specific goals: the reestablishment of spawning runs of the Lahontan cutthroat trout; delivery of sufficient water to the lake so that Total Dissolved Solids (salt) levels are low enough to support the Walker Lake ecosystem; and, to acquire and transfer water rights for environmental and recreational purposes.

The **Declining Amphibian Population Task Force (DAPTF)** was established in 1991 by the Species Survival Commission of the World Conservation Union (IUCN), in response to an emerging pattern of global amphibian declines. Its mission is to determine the nature, extent, and causes of declines of amphibians throughout the world, and to promote means by which declines can be halted or reversed. DAPTF includes approximately 90 Regional Working Groups that focus on collecting data on amphibian declines and their causes. Other issue-based working groups include Disease and Pathology, Monitoring Techniques, Chemical Contaminants, Climatic and Atmospheric Change, and Captive Breeding. The California/Nevada Chapter meets approximately annually, focusing on these issues as they apply to California and Nevada populations.

**Partners in Amphibian and Reptile Conservation (PARC)** is an inclusive partnership dedicated to the conservation of the herpetofauna (reptiles and amphibians) and their habitats. Membership includes individuals from state and federal agencies, conservation organizations, museums, pet trade industry, nature centers, zoos, industries, herpetological

organizations, research laboratories, forest industries, and environmental consultants. PARC focuses on habitat, endangered and threatened species, and keeping common native species common.

**Wildlife and Habitat Improvement of Nevada (WHIN)** is a sportsman and conservation organization devoted to the maintenance and betterment of Nevada's wildlife populations and their habitat. Many of the members devote countless hours to carry out work projects and to plan and execute the annual banquet, picnic and other social activities. Funds raised by WHIN are used to purchase materials for field projects, for contributions to government agencies such as NDOW for specific purposes, such as wildlife research and habitat improvement; or, to make donations to, or pool resources with, other non-profit organizations for wildlife management projects in Nevada.

**Nevada Wilderness Coalition** is an affiliation of various wilderness advocacy organizations, including Friends of Nevada Wilderness, the Nevada Wilderness Project, The Wilderness Society, Campaign for America's Wilderness, Nevada Outdoor Recreation Association, and Red Rock Audubon Society. Collectively these organizations represent more than 7,000 Nevadans.

**Great Basin Land and Water (GBLW)** is a non-profit Nevada corporation established to acquire water rights for conservation, in order to benefit the long-term ecological health of the Truckee River and Pyramid Lake. GBLW works with the Pyramid Lake Paiute Tribe and local governments to improve water quality in the Truckee River.

**Lahontan Wetlands Coalition** is an informal group of representatives from the Sierra Club, Lahontan Audubon Society, Nevada Waterfowl Association, and other interested people and organizations focused on obtaining water for wetlands in the Lahontan Valley, transferring Carson Lake to the State of Nevada, encouraging cooperative management of water between the state of Nevada and federal agencies to sustain wetland dependent birds, and assisting with habitat improvements.

The mission of **HawkWatch International (HWI)** is to monitor and protect hawks, eagles, other birds of

prey and their environments through research, education, and conservation. HWI and its organizational precursors have been studying the fall raptor migration in the Goshute Mountains of northeastern Nevada since 1980. In addition to gathering important scientific data, the Goshute project provides opportunities for the public to learn about the ecology and conservation needs of raptors through on-site environmental education and interpretation conducted by full-time volunteer educators.

**League to Save Lake Tahoe** has advocated for the protection and restoration of Lake Tahoe since 1957. The League is supported by more than 5,000 individuals and families. The League was instrumental in the creation of the TRPA and the development of a regional plan for the area. The League has developed a history of building public support for conservation of the Tahoe Basin, bringing science into public decision-making, winning litigation when necessary to enforce the law, and building consensus among business and government leaders in support of protecting and restoring Lake Tahoe.

**Nevada Wildlife Federation** is dedicated to sustaining Nevada's natural resources for wildlife through conservation and education. The Federation is one of the oldest and largest conservation organizations in Nevada, founded in 1951 by sportsmen with an interest in wildlife. Today their membership is diversified and is involved not only in wildlife conservation, but related natural resource conservation issues. The Federation has 20 Affiliate member organizations in Nevada with more than 5,000 members. Its programs emphasize youth conservation education, installing stream structures to improve native trout habitat, fencing springs to prevent trampling by livestock and wild horses, developing educational materials for sage grouse, and counting sage grouse on leks each spring.

### **Sportsman's Groups**

**Coalition for Nevada's Wildlife** is a sportsmen conservationist group that provides a unified voice for sportsmen in the legislature. The Coalition represents all types of sportsmen, including big game, waterfowl, upland game, fishing, trapping, houndsmen, rod and gun clubs and general conservationists. During legislative sessions, the Coalition allows rapid dissemination of information to each Coalition member

group pertaining to relevant wildlife issues.

**Fraternity of the Desert Bighorn** is a non-profit organization dedicated since 1964 to the utilization, conservation, and welfare of the desert bighorn sheep in Nevada. The organization offers support to various government agencies associated with the care and protection of the desert bighorn. In addition, the organization strives to inform the public as to many of the problems involving the desert bighorn sheep and our advancing civilization.

**Mule Deer Foundation (MDF)** and its corps of volunteers work to ensure the conservation of mule deer and blacktail deer and their habitats. MDF is headquartered in Reno and has over 10,000 members and approximately 65 chapters nationwide. MDF volunteers raise thousands of dollars to help fund habitat and conservation projects throughout the West. MDF's goals center on restoring, improving and protecting mule deer habitat, which results in self-sustaining, healthy, free-ranging, and huntable mule deer populations. MDF supports scientific research and is a co-founder of the Chronic Wasting Disease (CWD) Alliance. MDF also implements conservation education programs.

**Nevada Bighorns Unlimited (NBU)** was founded in 1981 by a small group of Nevada sportsmen and conservationists. Since its beginning, NBU has grown into a successful, action-oriented, non-profit organization with a membership base of over 3,500. NBU is an organization concerned with the conservation and management of not only bighorn sheep, but all of Nevada's wildlife. The organization's mission is to promote and enhance increasing populations of wildlife in Nevada, to fund programs for professional management and habitat improvements, and to protect the heritage of sportsmen and hunters. NBU has chapters in Midas, Elko, Fallon, and Reno.

**Nevada Sportsman Coalition (NSC)** is dedicated to promoting the charitable works of conservation organizations to the general public and educating Nevada's population on issues facing sportsmen. Through their efforts, NSC encourages Nevada's youth to enroll in conservation education programs. Nevada sportsmen have contributed millions of dollars and thousands of hours to habitat and wildlife restoration. NSC recognizes that the survival of the

sportsmen and their charitable efforts is tied to the public's continued interest in their works.

**Nevada Trappers' Association** promotes sound and sensible policies and opposes bad policies pertaining to furbearer management. The Association promotes the education of young trappers and the public, the latter regarding the consumptive use of wild animals as a necessary wildlife management tool. The Association also promotes the continuation of an annual fur harvest using the best tools presently available for that purpose.

**Ducks Unlimited (DU)** conserves, restores, and manages wetlands and associated habitats for North America's waterfowl. Currently there are 26 active chapters in Nevada that raise funds for wildlife habitat projects through the sponsorship of local banquets and other events. DU provides representation to the Nevada Steering Committee of the Intermountain West Joint Venture. Recent habitat improvement project collaborations in Nevada include Steptoe Valley WMA and Pahranaagat NWR.

**Nevada Waterfowl Association's** mission is to protect, restore and enhance Nevada's wetlands and the wildlife dependent upon them, especially waterfowl and shorebirds. Nevada Waterfowl Association is a family-oriented conservation organization that was created in 1987 by a group of individuals who were alarmed at the rate of loss of Nevada's unique desert wetlands. The organization works closely with agencies and other organizations, including the USFWS, NDOW, Lahontan Wetlands Coalition, DU, Canvasback Gun Club, Greenhead Hunting Club, and others to preserve Nevada's unique desert wetlands for future generations.

The **Rocky Mountain Elk Foundation's (RMEF)** mission is to ensure the future of elk, other wildlife, and their habitat. The RMEF is committed to conserving, restoring and enhancing natural habitats; promoting the sound management of wild, free-ranging elk; fostering cooperation among federal, state and private organizations and individuals in wildlife management and habitat conservation; educating members and the public about habitat conservation, the value of hunting, hunting ethics and wildlife management. The RMEF meets its mission by funding habitat enhancement projects such as prescribed burns and water developments; wildlife management projects such as elk transplants and cooperative initiatives among elk and livestock interests; research on elk and their habitat to

provide wildlife managers with information needed to manage elk; conservation education programs to increase the awareness of the importance of wildlife and their habitat with people of all ages; land conservation projects such as acquisitions and conservation easements; and hunting heritage projects to promote ethical hunting and ensure future hunting opportunities.

**Safari Club International** is committed to providing value to members by shaping policies and legislation that protect the freedom to hunt locally, nationally and internationally; keeping members informed regarding issues that impact hunting while educating and entertaining members with engaging articles about the rich heritage of hunting in all forms of media; providing a community for hunters worldwide where camaraderie is enjoyed and expert information is exchanged, and where members are able to participate in a market for quality hunting goods and services; promoting a positive image of hunters and portraying them as responsible citizens who fund wildlife conservation, education and other programs which benefit the community.

**Trout Unlimited (TU)** is dedicated to conserving, protecting, and restoring North America's trout and salmon fisheries and their watersheds. TU accomplishes this mission on local, state and national levels with an extensive and dedicated volunteer network. TU's national and regional offices employ professionals who testify before Congress, publish a quarterly magazine, intervene in federal legal proceedings, and work with the organization's 125,000 volunteers in 500 chapters nationwide to keep them active and involved in conservation issues. TU has four chapters in Nevada.

**Truckee River Fly Fishers** is a conservation and fly fishing club headquartered in Reno. They are dedicated to improving and promoting the sport of fly fishing in Nevada by promoting and encouraging the conservation of game fish, especially wild trout, through the betterment of the streams and lakes in Nevada and the Eastern Sierra. They also encourage and assist youth to become fly fishermen and sportsmen. The group developed the Trout in the Classroom program now administered by NDOW in over 100 schools in Nevada. The group conducts river

cleanups on the Truckee River and wraps trees to protect them from beaver damage and has also sponsored interpretive displays at the Verdi Nature Center.

### Other Key Partners

The **Eastern Nevada Landscape Coalition (ENLC)** is a community-based partnership of about 50 non-governmental partners including agricultural, conservation, cultural, environmental, private enterprise, and other interests. The mission of the ENLC is to restore the dynamic and diverse landscapes of the Great Basin for present and future generations through collaborative efforts. The Coalition's function is to assist in implementing the Eastern Nevada Landscape Restoration Project, a strategy for implementing the **Great Basin Restoration Initiative**. The ENLC's function is to build partnerships, conduct fundraising, establish goals and objectives, determine the process, and provide science and technical assistance in landscape restoration.

**Muddy River Regional Environmental Impact Alleviation Committee (MRREIAC)** is a local group dedicated to enhancement of the riparian area along the Muddy River in Clark County through an ongoing saltcedar removal and native vegetation replanting project. Its goals are to revegetate the river, and clear areas to provide recreational opportunities and improve water quality and quantity. MRREIAC currently focuses on saltcedar removal and revegetation with native species on an approximately 5-mile reach near the town of Moapa. MRREIAC is funded largely through the Clark County Desert Conservation Program and the conservation activities they carry out support the County's mitigation requirements.

The mission of the **Intermountain West Joint Venture (IWJV)** is to facilitate the long-term conservation of key avian habitat including planning, funding, and developing habitat projects that benefit all biological components of Intermountain ecosystems. The IWJV achieves the mission by developing partnerships with private and public landowners who support habitat conservation, promoting the restoration and maintenance of all bird populations; and fostering the protection, restoration, and enhancement of wetlands, riparian habitats, and the widely diverse uplands characteristic of the region. Each state in the

IWJV area has developed a Coordinated State Bird Plan to advance the mission of the IWJV.

**Great Basin Bird Observatory (GBBO)** was formed in 1997 as a non-profit organization dedicated to the conservation and understanding of bird populations in the Great Basin and northern Mojave Desert. GBBO considers its role to be a catalyst for bringing together partners in bird monitoring, inventory, and bird habitat conservation planning, as well as for helping advance the skills of volunteers in bird conservation and knowledge of the interested public about Nevada's birds. GBBO emphasizes partnerships, applied research, building a volunteer community, and public education. Current projects include the Nevada Bird Count and the Aquatic Bird Count, statewide efforts to monitor and track trends in bird populations.

The **Nevada Mining Association** promotes modern mining conducted with environmental sensitivity and careful regard to the environment, assisting Nevada's mining industry in assigning high priority operating in an environmentally responsible manner, to protect wildlife, reclaim mined land, and employ new technologies to make operations environmentally safer.

**University of Nevada, Reno (UNR)**, and **University of Nevada, Las Vegas (UNLV)** maintain active teaching and research programs focused on wildlife ecology and conservation biology.

At UNR, the **Biological Resources Research Center (BRRC)** conducts scientific research and planning efforts necessary to preserve the distinct biotic diversity of Nevada while simultaneously providing for economic viability and other needs of its citizens. The BRRC is a member of the **Nevada Biodiversity Research and Conservation Initiative**, a collaborative effort among local, state, and federal agencies to incorporate biotic diversity conservation in public land management. The BRRC is part of the Department of Biology at UNR and supports educational programs for students, professionals and the community.

Faculty and students in UNR's **Department of Natural Resources and Environmental Sciences** are studying mammal behavior, habitat use by hawks, waterfowl, and shorebirds, grazing and riparian

ecosystem function, forest processes, fire ecology, and nutrient cycling.

The **University of Nevada Cooperative Extension Program** is also housed at UNR. Its Natural Resources and other programs address a variety of topics related to management of Nevada's wildlife, including riparian habitat, sage grouse management, and invasive weeds.

UNLV's **Department of Biological Sciences** maintains an active research program, focused in part on ecology, biogeography, systematics, physiology, and genetics. UNLV scientists have conducted a variety of studies on local wildlife, including southern Nevada bats, reptiles, amphibians, and mammals.

### **Partnership-based Plans and Programs**

**Conservation Plans, Agreements, and Strategies** typically involve a partnership among various public and private partners. These documents generally outline specific conservation measures to identify and reduce or eliminate threats to species, enhance their habitat, and maintain properly functioning ecosystems. Early conservation efforts preserve management options, minimize the cost of recovery, and reduce the potential for restrictive land use policies in the future. Effective conservation may reverse a species' decline, ultimately eliminating the need for protection under the Endangered Species Act. There are a number of existing multi-partner conservation plans, agreements, and strategies in place in Nevada.

**Sage Grouse Conservation Plan for Nevada And Portions of Eastern California (Governor's Sage Grouse Conservation Team** and local Sage Grouse working groups). In 2000, Governor Guinn appointed a team of approximately 25 people from diverse backgrounds and interests to his Sage Grouse Conservation Team. The mission of the team, as defined by Governor Guinn, is "To conserve and protect Nevada's sage grouse and their habitat." To address both regional and statewide conservation concerns, the sage grouse conservation planning effort was broken down into seven different planning teams that included state and federal agency personnel, non-government partners and private stakeholders representing a wide variety of interests. Each team drafted a plan identifying local risks to sage grouse populations and identified actions to mitigate these risks. The Governor's Sage Grouse Conservation Team

incorporated the local plans and completed the Sage Grouse Conservation Plan for Nevada and Portions of Eastern California in 2004. With the submittal of the state plan to the USFWS, the State provided valuable information regarding the status and conservation needs of the Greater Sage-Grouse in Nevada.

**The Nevada Wetland Priority Conservation Plan (NvWP)** was prepared by the Nevada Natural Heritage Program in association with the Nevada Division of State Parks and NDOW. It is a required element of the **Nevada Statewide Comprehensive Outdoor Recreation Plan (SCORP)**, which was updated by the NDSP in 2003. Section 303 of the Emergency Wetlands Resources Act of 1986 (EWRA) directs states to prepare or update a wetland conservation plan as part of its SCORP every five years to maintain eligibility to receive federal Land and Water Conservation Fund (L&WCF) grants. In recent years, the NDSP received over \$1 million annually from the L&WCF. The NDSP applies the funds to acquire or develop land, water, or structures for outdoor recreation, including natural and cultural resources. Half of the state's L&WCF allocation is shared with counties and municipalities for local projects.

The EWRA specifies the NvWP must 1) be consistent with the National Wetlands Priority Conservation Plan, prepared by the USFWS; 2) provide evidence of consultation with NDOW, the state agency responsible for fish and wildlife resources; and, 3) identify the state's wetland conservation priorities based on a comparative evaluation of losses and gains, threats, and functions and values, and the alternative strategies for conservation of priority wetlands. The key outputs are an assessment of the conservation status of wetlands in Nevada; the state's list of priority (vulnerable and valuable) wetlands; and, strategies state agencies can employ to conserve priority wetlands.

**Spring Mountains National Recreation Area Conservation Agreement.** The Spring Mountains ecosystem in Clark and Nye Counties has long been recognized as an island of endemism, harboring 25 plant and wildlife species found nowhere else in the world. A conservation agreement for the Spring Mountains National Recreation Area was established in 1998 and in 2000, was incorporated into the Clark

County Multiple Species Habitat Conservation Plan (MSHCP). Successful implementation of this conservation agreement and conservation activities under the MSHCP are necessary to ensure the long-term survival of the rare species that occur there.

**Amargosa Toad.** The agreement and strategy for the Amargosa toad and co-occurring sensitive species in the Oasis Valley of Nye County, Nevada was executed by the partners in September 2000 and has been in the implementation phase since that time.

**Columbia Spotted Frog.** Conservation agreements and strategies were developed in 2003 for the Toiyabe and Northeast subpopulations of the Great Basin population of the Columbia spotted frog. The agreements and strategies were designed to expedite implementation of conservation measures for the respective subpopulations of the species as a collaborative and cooperative effort among resource agencies, governments, and land owners.

**Relict Leopard Frog.** The National Park Service is the lead agency for preparing a Conservation Agreement for the species with cooperation from State, County, and Federal partners. Implementation of the conservation agreement and strategy is intended to protect the species and its habitat, implement necessary conservation actions, and preclude listing of this candidate species.

**Townsend's Big-eared Bat.** In an effort to identify and implement conservation measures for the Townsend's big-eared bat, the Idaho Conservation Effort convened 19 professionals from 10 western states within the native range of the species. The result of this three-year effort was the publication and implementation of Species Conservation Assessment and Conservation Strategy for the Townsend's Big-eared Bat (Pierson et al 1999). Nevada participated in all aspects of preparation and is currently in the implementation phase of the conservation strategy.

### **Recovery Implementation Teams**

Although the majority of aquatic species of conservation need in Nevada which are listed under the Endangered Species Act (ESA) are included under existing Recovery Plans, these documents are in many cases outdated, do not describe needed actions at a level suitable to direct on-the-ground conservation efforts, or

are focused only on recovery needs for the listed species and do not adequately address conservation for the full assemblage of aquatic species which occur in the included habitats. For that reason NDOW and the USFWS, in coordination with other partners, have focused on the development of Recovery Implementation Team (RIT) working groups to more effectively implement conservation and recovery for a number of species and aquatic systems.

The RIT teams are voluntary working groups that meet periodically to assess the status of included species and conservation efforts, review, develop and adaptively modify on-ground conservation actions, and coordinate field efforts. Composed of state and federal agency partners, and also tribes, local entities and non-governmental organizations (NGOs) as appropriate, these implementation level teams have proven to be an effective approach to insure that conservation efforts for the included species (many of which have no formal “recovery team” organized by USFWS) are progressing effectively. In particular, the RIT approach in many cases has allowed managers to take a more ecosystem-based view for all species of concern in included aquatic habitats, rather than the single-species focus common to formal recovery team processes. Key RIT and related teams in Nevada are listed below.

**Lahontan Cutthroat Trout Distinct Population Segment Teams.** BLM, USFS, USFWS and NDOW participate in the Lahontan Cutthroat Trout Interagency Management Team and Distinct Population Segment teams. Each year members of these teams meet to review accomplishment of the previous year and schedule recovery activities for the current year. These teams are the focal point for decision making on all critical activities concerning the management of Lahontan Cutthroat Trout. Team participation by agency management personnel is essential to the continued success of the process.

**White River RIT** directs conservation efforts for aquatic species in the upper White River system in White Pine and Nye Counties, including White River spinedace, Preston and Moorman White River springfish, White River speckled dace and White River desert sucker.

**Railroad Valley Fishes RIT** directs conservation efforts for aquatic species in Railroad Valley, Nye

County, including habitats on Duckwater tribal lands. Included species are Railroad Valley springfish and Railroad Valley tui chub.

**Big Spring Spinedace RIT** directs conservation efforts for Big Spring spinedace in Condor Canyon (upper Meadow Valley Wash), Lincoln County. Unlike some other RIT efforts, this team has a single-species focus for recovery of the spinedace.

**Pahranagat Valley Native Fishes RIT** directs conservation efforts for aquatic species in Pahranagat Valley, Lincoln County, including Pahranagat roundtail chub, White River and Hiko White River springfish, and Pahranagat speckled dace.

**Muddy River RIT** directs conservation efforts for aquatic species in the upper Muddy River system, Clark County, including Moapa dace, Moapa White River springfish, Moapa speckled dace, and Virgin River chub.

**Lower Virgin River RIT** directs conservation efforts for aquatic species in the Virgin River in Clark County, Nevada and Mohave County, Arizona. Included species are Virgin River chub, woundfin, flannelmouth sucker, and desert sucker. The Virgin River RIT was formed to address the need to coordinate conservation efforts in the lower Virgin River basin. This team works closely with the **Virgin River Resource Management and Recovery Program** which directs conservation efforts for these fishes in the upper Virgin River basin in Washington County Utah, and also the range-wide Virgin River Fishes Recovery Team, to develop and coordinate implementation of conservation efforts within this watershed for endemic aquatic species.

**Colorado River.** Several RIT-like processes have been developed to supplement the range-wide **Colorado River Fishes Recovery Team** and coordinate local conservation efforts for endemic fishes in the main-stem Colorado River in Nevada, which includes Lakes Mead and Mohave, and the Colorado River below Davis Dam. The principal working group effort has been the **Lake Mohave Native Fish Work Group**. Under the leadership of the USBR, this group coordinates interagency cooperative efforts to restore and maintain the adult razorback sucker population in Lake Mohave through collection and rearing to sub-adult size, for repatriation, of wild-spawned larvae from Lake Mohave. The recently organized **Colorado River**

**Native Fish Work Group** is developing a larger role in coordination partnership efforts in other areas of the lower Colorado River basin, including Lake Mead and areas downstream of Lake Mohave in Nevada, Arizona and California.

**Devils Hole Pupfish Recovery Team.** Although more of a formal Recovery Team process under the lead of the USFWS, this recently formed team directs conservation efforts for the Devils Hole pupfish at Devil's Hole, Nye County, and also the two extant refuges for this species.

**Habitat Conservation Plans (HCPs)** are prepared to address the loss of or disturbance to endangered species on non-Federal lands. These plans typically describe a conservation program with measures to minimize, mitigate, and avoid impacts to species and their habitats. The USFWS approves the HCPs and issues a take permit under the Endangered Species Act to the non-federal entities responsible for implementing the plan. Many HCPs are regionally or watershed based, and thus involve a suite of partners that work with the HCP applicant to carry out the conservation and mitigation measures included within the plan. In Nevada, there are several existing HCPs and several more under development, all in the southern portion of the state.

**Clark County Multiple Species Habitat Conservation Plan (MSHCP)** and **Clark County Desert Conservation Program (DCP).** The DCP is a multi-partner effort that was initially focused on desert tortoise, but has been expanded to include conservation actions for many other species and habitats. The permit issued by the USFWS for the Clark County MSHCP allows for the loss of 58,680 hectares (145,000 acres) of habitat on non-federal lands over a 30-year period in return for conservation and mitigation measures for desert tortoise and a host of other species, primarily on Federal lands. This MSHCP and DCP are major funding sources for wildlife conservation in Clark County. The DCP devotes some of their focus on development and implementation of conservation management strategies for species covered under the MSHCP and their habitats. The **Southern Nevada Mesquite Woodland Habitat Management Plan** and **Meadow Valley Wash Ecological Assessment**

(under development) are examples of two such efforts.

**Colorado River Multi-Species Conservation Program (MSCP).** The Lower Colorado River MSCP is a multi-agency effort to conserve and recover endangered species, and protect and maintain endangered species and wildlife habitat on the lower Colorado River while ensuring the certainty of existing river water and power operations. The MSCP covers areas up to and including the full-pool elevations of Lakes Mead, Mohave and Havasu and the historical floodplain of the Colorado River from Lake Mead to the United States-Mexico Southerly International Boundary, a distance of about 645 km (400 miles).

**Southeast Lincoln County Multi-Species Habitat Conservation Plan.** This HCP, when complete will mitigate primarily for the loss of desert scrub (desert tortoise habitat) on approximately 6,070 hectares (15,000 acres) that will be developed just over the county line in the vicinity of the City of Mesquite.

**Virgin River Habitat Conservation Plan.** The Virgin River HCP will address the effects of development in and around the City of Mesquite on endangered fishes and birds inhabiting the lower Virgin River. The Virgin River HCP is currently in its initial stages of development.

### **Other Key Plans and Programs**

**LANDFIRE** is a five-year, multi-partner wildland fire, ecosystem, and fuel mapping project. This project will generate consistent, comprehensive maps and data describing vegetation, fire, and fuel characteristics across the United States. These maps are produced at scales fine enough to assist in prioritizing and planning specific hazardous fuel reduction and ecosystem restoration projects. The consistency of LANDFIRE methods ensures that data will be nationally relevant, while the 30-meter grid resolution assures that data can be locally applicable. LANDFIRE meets agency and partner needs for data to support landscape fire management planning, prioritization of fuel treatments, collaboration, community and firefighter protection, and effective resource allocation. LANDFIRE map and data products for much of Nevada should be completed and available to the land management agencies and partners in 2006.

**Partners In Flight -- North American Land Bird**

**Conservation Plan.** The Partners in Flight (PIF) North American Landbird Conservation Plan provides a continental synthesis of priorities and objectives to guide landbird conservation actions at national and international scales. The scope for this Plan is the 448 species of native landbirds that regularly breed in the U.S. and Canada. Fully 100 of these species warrant inclusion on the PIF Watch List, due to a combination of threats to their habitats, declining populations, small population sizes, or limited distributions. Of these, 28 species require immediate action to protect small remaining populations, and 44 more are in need of management to reverse long-term declines.

This Plan also highlights the need for stewardship of the species and landscapes characteristic of each portion of the continent, identifying 158 species (including 66 on the Watch List) that are particularly representative of large avifaunal biomes, and whose needs should be considered in conservation planning. Taken together, the pool of Watch List and Stewardship Species represent the landbirds of greatest continental importance for conservation action.

#### **Nevada Partners In Flight Bird Conservation**

**Plan.** Nevada Partners in Flight is a group of conservation organizations, state and federal agencies, and research institutions. The Nevada Bird Conservation Plan developed by the Nevada Partners in Flight group identifies bird species in Nevada that are declining, and objectives and suggested actions for their conservation. One of the goals identified in the Nevada Bird Conservation Plan is to work with private landowners to reverse the decline of these “priority species” by protecting and conserving their habitat.

**U.S. Shorebird Conservation Plan.** Partners from state and federal agencies and non-governmental organizations from across the country pooled their resources and expertise to develop a conservation strategy for migratory shorebirds and the habitats upon which they depend. The plan provides a scientific framework to determine species, sites, and habitats that most urgently need conservation action. The primary goals of the plan are to ensure that adequate quantity and quality of shorebird habitat is maintained at the local level and to maintain or restore shorebird populations at the continental and hemispheric levels. Shorebird conservation strategies

for Nevada are found in the Intermountain West Regional Report (Oring et al. 1999).

**North American Waterbird Conservation Plan.** This plan provides an overarching framework and guide for conserving waterbirds. The Plan sets forth goals and priorities and advocates continent-wide monitoring; provides an impetus for regional conservation planning; proposes national, provincial, state and other local conservation planning and action; and creates a larger context for local habitat conservation. Taken together, these activities should assure healthy populations and habitats for the waterbirds of the Americas. Waterbird conservation strategies for Nevada are found in the Intermountain West Waterbird Conservation Plan (Ivey and Herziger 2005).

**North American Hemispheric Shorebird Reserve Network.** In 1988, the Lahontan Valley Wetlands were incorporated into the Western Hemisphere Shorebird Reserve Network. This network provides an international system of linked reserves to protect important sites required by birds throughout their ranges.

**North American Waterfowl Management Plan.** The North American Waterfowl Management Plan is an international action plan to conserve migratory birds throughout the continent. The Plan’s goal is to return waterfowl populations to their 1970s levels by conserving wetland and upland habitat. The Plan is a partnership of federal, provincial/state and municipal governments, non-governmental organizations, private companies and many individuals, all working towards achieving better wetland habitat for the benefit of migratory birds, other wetland-associated species and people. Plan projects are international in scope, but implemented at regional levels.

**Swan Lake Nature Study Area.** Various public agencies and non-profit organizations established the nature study area on 728 hectares (1,800 acres) of wetlands in Washoe County that provides birdwatching opportunities and also serves as an outdoor educational facility for school children and others.

**Carson Lake Transfer.** The Carson Lake property in Churchill County is about 12,140 hectares (30,000 acres) in size with a seasonal wetland of about 3,238 hectares (8,000 acres). It supports thousands of waterfowl during fall migration, and is home to a large

variety of shorebirds. Historically, Carson Lake served as the terminus of the Carson River, and is one of the last remnants of ancient Lake Lahontan. After development of the Newlands Project for agricultural irrigation in the Lahontan Valley, the wetland was reduced to about 345 hectares (850 acres). In the years that followed, and until a water rights acquisition program was set into effect, the wetland relied on drain flows from irrigation practices for sustenance. Following transfer of Carson Lake to the state, the property will be managed by NDOW as a state wildlife management area. NDOW's management objectives for the area are to preserve and enhance up to 4,130 hectares (10,200 acres) of the shallow wetlands and wet meadows that are unique to the area to benefit all wetland-dependent wildlife species; provide nesting, feeding and resting habitat to meet the needs for a maximum number and variety of migratory and nonmigratory wildlife; and to provide for waterfowl hunting, bird watching, and other forms of public recreation in a manner which is compatible with the area's wildlife and wetland resources.

**Bat Conservation.** The **Nevada Bat Working Group** and **Western Bat Working Group** are comprised of agencies, organizations and individuals interested in bat research, management, and conservation. These groups coordinate with other organizations such as Bat Conservation International, which is devoted to conservation, education, and research initiatives involving bats and the ecosystems they inhabit. The **Nevada Bat Conservation Plan** was developed by the Nevada Bat Working Group to provide strategic and proactive guidance for managing bat populations and habitats in Nevada.

Three non-profit organizations, **Northeastern Nevada Wildlife Rehabilitation Clinic**, **Wild Animal Infirmary for Nevada** and **Wild Wings** provide rehabilitation services for birds of prey and other native species.

### **Partner-based Restoration Programs**

Finally, many noteworthy partner-based habitat restoration efforts are in progress in Nevada. Several examples of these efforts are presented here.

**Rosaschi Ranch (Walker River).** River oxbows will be reestablished and a sub-irrigated wetland will be

created by the USFES to restore waterfowl and shorebird habitat over 160 hectares (400 acres) along a 4 km (2.5 mile) stretch of the East Walker River. In addition, approximately 30 hectares (70 acres) will be reseeded with native grasses and forbs.

**Argenta Marsh restoration project (Humboldt River).** Argenta Marsh is situated on the Humboldt floodplain immediately adjacent to the small community of Battle Mountain. Nearly 2,028 hectares (5,000 acres) of land and water rights are being acquired by NDOW to restore degraded marsh lands. Waterfowl, migratory, and other birds as well as mule deer will benefit from this restoration project.

**Lower Truckee River.** A \$60 million effort to eventually restore more than 100 km (60 miles) of floodplain and riparian habitat along the lower Truckee River is being assisted by a public-private partnership focused on restoration of water quality, flood control, habitat recovery, and recreational opportunity. The Nature Conservancy's McCarran Ranch is the site of a pilot effort to demonstrate geomorphically-based river restoration techniques.

**Carson River.** The Nature Conservancy's River Fork Ranch on the Carson River is among the first of several wetland and riparian habitat restoration projects to emerge from a partner-based effort to restore ecological and hydrological function to the Carson River. Another key area managed for its wildlife habitat values through partnerships is the Silver Saddle Ranch.

**Amargosa River.** Several sites in the Oasis Valley, including The Nature Conservancy's Parker and Torrance ranches are the focus of riparian, wetland, and spring system restoration to advance the conservation of the Amargosa toad. **The Beatty Habitat Committee** and the **Amargosa Toad Working Group** work together to identify opportunities and seek funding.

**Gleason Creek watershed restoration.** The Eastern Nevada Landscape Coalition is working to restore the ecological health of sagebrush habitat in the 38,000 acre Gleason Creek watershed in White Pine County, by returning the area to its historic mosaic of diverse, native plant communities through a program of mechanical and prescribed fire vegetation treatments.

## **Approach and Methods**

### **Organizational Structure**

Nevada Department of Wildlife identified its Wildlife Action Plan Development Team in August, 2004 through the application for a conservation planning grant from the State of Nevada's Question One Conservation Bond and Resource Protection Grant Program. The partnership to develop the Nevada WAP included The Nature Conservancy's Nevada Chapter, the Lahontan Audubon Society, and the Nevada Natural Heritage Program. The Q1 grant was awarded by Nevada Division of State Lands in October, 2004, and the team commenced work on the deliverables for Phase I of the WAP. The primary objective of Phase I was assembling Nevada's WAP. Phase II will extend into spring of 2007, and partnership teams will focus on implementation of the WAP. The Nevada Natural Heritage Program received support to complete the Nevada Wetland Priority Conservation Plan and provided technical support to the WAP in aquatic conservation approaches, bat conservation approaches, and species assemblage analysis. The Nature Conservancy provided conservation planning and design support for the data analysis and public review process, and assisted in writing and editing the plan. The Lahontan Audubon Society provided writing, editing, and draft layout design leadership through its Director of Bird Conservation, Important Bird Areas Program. LAS personnel also provided conservation planning and design support as well as performing a major role in the public review. The NDOW internal team assigned to the WAP consisted of staff from the Wildlife Diversity, Fisheries, and Conservation Education Bureaus, with significant support from various Game Bureau and Habitat Bureau staff as needed.

### **Public Involvement and Partnerships**

A series of public scoping meetings were held throughout the state in February, 2003. Presentations were made in Reno, Las Vegas, and Elko to introduce Nevadans to the concept and opportunity of the WAP. Over 100 invitations were sent out to agencies, NGOs, and, hunting, fishing, and environmental groups. Attendance to these initial presentations was very light, but the themes that emerged from the discussions were very useful in guiding the WAP development strategy. Attendees were supportive of an inclusive, collaborative approach to developing the Strategy, they advocated the integration of existing and ongoing planning efforts into the WAP, and they advocated the sharing and consolidation of data into comprehensive databases.

The next step in collaborative planning for the WAP was taken in August, 2003 when NDOW commissioned a working group of active individuals from the conservation community to work on alternative funding for the Wildlife Diversity program. This working group met several times in the next two years and provided input and guidance into the process.

WAP Development Team members attended a Rural Planning Conference on January 20, 2005, to introduce the Strategy to county planners and solicit their attendance and participation in the upcoming round of open houses across the state. Following the development of a series of draft analytical products, the WAP Development Team took the draft analysis on the road for a seven-city tour of Nevada to receive a second round of input. The

meetings were held in open-house format in Reno, Carson City, Las Vegas, Tonopah, Ely, Elko, and Winnemucca between March 16 and 31, 2005. The open house meetings were held between 1 p.m. and 7 p.m. in cities where the maximum access to federal land management agency district offices could be most efficiently achieved. The WAP tour was advertised in the media and invitations were sent out to hundreds of contacts representing all possible conservation partners that could be identified, including federal and state resource agencies, county governments, tribes, sportsmen's groups, agricultural and mining industry representatives, environmental groups, conservation organizations, recreation groups, university personnel, and others.

In addition to the eight open houses, invitations were sent to 27 sportsmen's and environmental organizations offering a special appointment presentation of the WAP to their organization. As a result of the focus group invitations, eight meetings were held with specific focus groups comprised of organization members (Lahontan Audubon Society, the Fallon Chapter of Nevada Bighorns Unlimited, the Reno Chapter of the Mule Deer Foundation, University of Nevada Natural Resources and Environmental Sciences Department) or representatives from several organizations (Coalition For Nevada's Wildlife, a southern Nevada Sportsman's Caucus, and a waterfowl hunter focus group). In addition, Eureka County personnel invited the WAP team to make a two-hour evening presentation to Eureka residents on April 27, 2005.

In all, attendance to all the WAP open houses and workshops exceeded 150 individuals representing over 60 organizations. Attendees viewed a PowerPoint presentation outlining the rationale and approach of the WAP, inspected a series of draft analytical products, including the Species of Conservation Priority lists, the proposed ecological frameworks for both terrestrial and aquatic species, the proposed "key habitat strategy groups" developed from Southwest ReGAP, and responded to a short series of inventory questions, including the following five:

- Are these the right Species of Conservation Priority?
- Does this habitat classification system and

geographic framework make sense to you?

- What are the most serious conservation challenges facing us over the next ten years?
- What are your organization's top priorities for the next ten years?
- What are the opportunities to work together to achieve significant wildlife conservation in the next ten years?

Input received during this draft analytical review was not only incorporated into the strategies of the Draft Plan, but also influenced future data analysis and organizational structure of the Draft Plan.

A final partnership group was convened May 3-4, 2005, consisting of implementation partners from the Governor's Sage Grouse Conservation Team. This group included representatives from the Nevada Farm Bureau, Nevada Department of Agriculture, U.S. Fish and Wildlife Service, U.S. Forest Service, Bureau of Land Management, Nevada Mining Association, and Nevada Cooperative Extension. The group focused on developing a set of "guiding principles" for the WAP writing team to consider while preparing the Draft Plan. These guiding principles were designed to set up a partnership environment in which the collaborative process so vital to the success of the WAP could grow and mature into conservation delivery despite differing philosophies and land use objectives among partners. The guiding principles decided upon included the following eight elements:

1. The WAP is a guidance document for enhanced conservation, not a de facto regulatory document
2. The WAP will function as a usable document incorporating adaptive management theory (specifically, inventory, research, treatment, measuring, adjustment)
3. The WAP is a road map linking existing plans into common effort
4. The WAP is primarily focused on the conservation of wildlife (i.e., wildlife management with defined expectations and established accountabilities)
5. The WAP operates under a collaborative process
6. The WAP recognizes all authorities, jurisdictions, and citizen rights, including property rights
7. The WAP is primarily designed to address the needs of species before they become imperiled through the creation and implementation of

incentives, services, and benefits

8. Regulation is recognized as a sometimes necessary mechanism when voluntary processes fail; regulation should be developed as an open collaborative, citizen-based process.

## Coordination with Agencies and Tribes

The Nevada WAP Development Team stayed in close contact with agency personnel throughout development of the Draft Plan. Coordination was maintained with the USFWS offices in Reno and Las Vegas, the BLM State Office, and the Humboldt-Toiyabe National Forest's Supervisor's Office. Multi-agency and non-governmental organization feedback was received through several Nevada Partners In Flight meetings dating back to 2002. Nevada PIF provided expert assistance in the development of bird species assemblages at their Spring, 2005 meeting. Another expert committee was convened to receive assistance in the development of mammal and reptile species assemblages, and that workshop was also well-attended.

Because of the short review interval, limited personnel availability, and budget constraints, it was impossible for the WAP Development Team to hold individual workshops with all the district offices of BLM, USFWS, USFS, USBR, state agencies, and others. This is why the expanded-format open house in strategically selected cities across the state was selected as the method of draft product review and inventory. The desired outcome of the open houses was to provide agency employees and private citizens with adequate opportunity to visit the open house sometime during the afternoon or early evening. The open house strategy was fairly successful – BLM employees attended all seven; USFS employees attended six of seven; USFWS employees attended three of seven; and Nevada Division of Forestry, Natural Heritage Program, Department of Agriculture, Division of State Lands employees, Naval Air Station Fallon, and USBR employees each attended one open house.

One of the primary strategies of the WAP is to integrate its objectives and actions with other agency planning processes to foster synergistic achievement of wildlife management objectives at a statewide scale.

Currently in Nevada, the BLM Resource Management Plan process is in a renewal cycle and both the Humboldt-Toiyabe and Lake Tahoe Basin Management Unit Forest Plans are in revision. The involvement of The Nature Conservancy members of the WAP Development Team in the conservation design of the Humboldt-Toiyabe Forest Plan has resulted in a particularly tight integration between the two planning efforts – one that is expected to make each effort stronger and more effective. Similar opportunities to provide WAP products and services to the Lake Tahoe Basin Management Unit Forest Plan revision and the ongoing round of BLM Resource Management Plan revisions will be sought as major deliverables of the WAP.

Other opportunities to integrate into resource planning efforts include the NRCS Nevada WHIP Plan and the various Habitat Conservation Plans in place or being developed (Clark County, Lincoln County, Colorado River, Virgin River, and Nye County). During Phase II of WAP implementation, the Development Team anticipates partnering with Nevada Division of State Lands to build integration products and services for other county planning efforts, including resource plans, open space plans, recreation plans, and Quality of Life evaluations.

The coordination of the Nevada WAP with tribal lands management strategies is particularly important now with the advent of the federal Tribal Wildlife Grant (TWG) program. Tribal coordination will be facilitated through the Nevada Indian Commission, which maintains liaison with all the Native American tribes in Nevada. An introductory meeting was held in July 2005 during which the WAP program was presented to tribal representatives and a strategy for proceeding with a WAP/TWG partnership was commissioned. The WAP Development Team will extend its planning experience to tribes wishing to access TWG funds to assist them in identifying priorities, program and project design and development, and provide grant application training and start-up assistance, with the objective of integrating tribal wildlife priorities and management approaches into the Nevada WAP to achieve synergy between the two sister Federal Aid programs.



## Nevada's Wildlife Heritage

### Mammals

The Nevada Natural Heritage Program recognizes 136 species of mammals that occur or historically occurred in Nevada. Of those species, American bison, gray wolf, North American lynx, Arizona cotton rat, and grizzly bear are considered to be extirpated (i.e., they no longer occur) in Nevada. Of these, only the Arizona cotton rat was confirmed in *Mammals of Nevada* (Hall 1946). Details of the historical occurrences of the other four species are vague to nearly non-existent. One species and one subspecies, wolverine and southwestern otter, have not been confirmed in the state since 1936 and are most likely extirpated, although occasional unconfirmed reports persist. Five species (burro, wild horse, Norway rat, black rat, and house mouse) have been introduced into the state through their domestic associations with humans. The Rocky Mountain goat was not native to Nevada, but was introduced into the Ruby Mountains by NDOW in the 1960s as a game animal, and persists in small numbers today in the Ruby Mountains and the East Humboldt Range. One species, the nutria, was reported to have been brought in by fur farmers in the 1930s and released after the fur farming venture failed, however, if a wild population was temporarily established, no populations are known to occur today (J. Curran, NDOW (retired), pers. comm., 2005). The total number of mammal species present in the wild in Nevada today is generally regarded to be 126.

Nevada's native mammals belong to one of six orders – Insectivora (shrews and moles), Chiroptera (bats), Rodentia (squirrels, rats, mice, etc.), Lagomorpha (rabbits, hares, pikas), Carnivora (dogs, cats, weasels), and Artiodactyla (even-toed hoofed mammals or ungulates). Nearly half of Nevada's mammal species are rodents (61 species), followed in number by 23 bats, 22 carnivores, 9 insectivores, 7 lagomorphs, and 4 native ungulates.

The nature of Nevada's current mammalian fauna has been significantly influenced by the past climate of the Basin and Range and Mojave Desert provinces, dating back 11,000 years to the Pleistocene Epoch. During the Pleistocene, the holarctic ice cap was much closer and ice occurred on the top of many of Nevada's mountain ranges (Grayson 1993). This created a cooler, wetter climate that shifted habitat types downslope and southward, with mammals associated with those habitats moving with them (Brown 1973). With the advent of our current epoch, the Holocene, the recession of the ice cap has left hotter, drier conditions that have driven habitat types northward and back upslope, leaving the valley bottoms to species better adapted for the conditions except in those cases where remnant wetlands were left behind (e.g., Pahrnagat Valley and Ash Meadows). This directly explains the existence of isolated subspecies of montane vole in the two valleys mentioned above, and with more investigation, could easily contribute to the explanation of the existence of several of Nevada's other isolated mammal subspecies, including Humboldt yellow-pine chipmunk, Hidden Forest chipmunk, and the San Antonio and Fish Springs pocket gophers. The Palmer's chipmunk, native only to the Spring Mountains, is Nevada's only truly endemic mammal recognized at the separate species level.

Nevada's basin and range topography in concert with climatic fluctuation also contributes to the isolation of several species of mammals, including an impressive fragmentation of chipmunk species and subspecies, pikas, golden-mantled ground squirrels, yellow-bellied marmot, bushy-tailed woodrat, long-tailed vole, and western jumping mouse (Brussard et al. 1998). These island populations were once connected during the Pleistocene (Grayson 1987), but are now reduced in size and many populations have become extinct. Brussard et al. (1998) states, "If extirpated, relict mammal populations that are isolated on montane islands probably could not re-colonize under current climatic conditions." These extirpations may also eliminate genetically unique populations (Grayson 1987).

Historic numbers and distribution of Nevada's 23 bat species are not known, but it is certain that the introduction of thousands of adits, shafts, and other subterranean mine workings during the historic mining era of the latter half of the 1800s significantly shifted bat distribution away from historic sites to these man-made cataracts. Today, Nevada's subterranean roosting bat species are heavily dependent on historic mine workings to support certain aspects of their life history needs. Nevada represents the northernmost extension of the range of several bat species with much more extensive Pan American ranges – including Allen's big-eared bat, big free-tailed bat, cave myotis, California leaf-nosed bat, and western mastiff bat.

Nevada's largest carnivore is the black bear, present in the thin margin of the Sierra Nevada occurring on the east shore of Lake Tahoe. Mountain lions were not particularly numerous in Nevada prior to the 1940s, but significant ingress into the state occurred concomitant with the mule deer population boom of that period. Today mountain lions occur throughout the state and are thriving. Other carnivores include coyote, kit fox, gray fox, and bobcat. The red fox is making serious incursions into previously unoccupied range in eastern Nevada with its distribution generally on the move from northeast to southwest, but very little is known about the status of the Sierra Nevada red fox, a California subspecies that may or may not exist on the Nevada side of Lake Tahoe. Mustelid carnivores include northern river otter, mink, long-tailed weasel, ermine, American badger, striped skunk,

spotted skunk, and American marten. Of these, the American marten has experienced the most habitat loss and is now known only from isolated sites in the Sierra Nevada east of Lake Tahoe. Raccoons and ringtails round out Nevada's fairly rich carnivore community.

Mule deer were much less numerous in Nevada until the period between the 1920s and the 1950s, when federal land management agencies were created and a significant release from livestock grazing, mostly sheep, effected a massive montane shrub regeneration event resulting in a mule deer population boom (Wasley 2004). Today, after a second population peak event in the mid-1980s, mule deer have been on the decline as wildfire has significantly impacted winter ranges throughout the state, taking out native vegetation and facilitating the invasion of exotic grasses and weeds. Bighorn sheep have been returned to much of their pre-settlement range throughout Nevada with significant assistance from an NDOW-sportsmen's organization partnership that has implemented a highly successful transplant program since the 1980s, utilizing capture/relocation techniques supported by an aggressive water development program. Pronghorn are currently enjoying a population boom in positive response to changes in range condition that are shifting from overall shrub dominance to more grass/forb-dominated vegetative communities. Rocky Mountain elk are also currently expanding their range across the state in response to improved range conditions with more significant grass components.

## **Birds**

About 467 species of birds have been recorded in Nevada. Of these, about 129 species occur irregularly in the state as accidentals or vagrants (i.e., birds that are well out of the recognized range of the rest of their species). Of the remaining 338 species, 241 are known to have a portion of their breeding population in the state (E. Ammon, Great Basin Bird Observatory, pers. comm. 2005) and a small percentage of our total bird species are year-round residents of the state. The balance migrate through Nevada in spring or fall or use the state as their wintering area.

The 467 species on Nevada's checklist of birds represent 49 Families in 17 Orders; considerable diversity within the Class Aves for the driest state in the Union.

- Waterbirds are well represented here and include members of the Order Gaviformes (loons), Podicipediformes (grebes), Pelecaniformes (pelicans and cormorants), Ciconiiformes (herons, egrets) and Anseriformes (ducks and geese).
- Sixteen species of hawks and falcons of the Order Falconiformes regularly occur in the state.
- Representative of the Galliformes (grouse and quail) can be found almost everywhere in Nevada.
- Wading birds, shorebirds, gulls, and terns are well represented by Gruiformes and Charadriiformes, though the vast majority of the diversity in shorebirds occurs in the state during spring and fall migration.
- Columbiformes include the doves, which range from the Mojave Desert to the higher elevations of the numerous mountain ranges. One recent invader, the Eurasian Collared Dove, may be the newest bird species on Nevada's list. The Collared Dove began its incursion into the state in Clark County where it is now seen regularly. The species also appeared recently in Washoe and Elko counties.
- The Cuculiformes include the (Western) Yellow-billed Cuckoo, a candidate for listing under the Endangered Species Act, which was probably once fairly well represented in the state, and the Greater Roadrunner, which remains fairly common in the Mojave Desert.
- Owls of the Order Strigiformes are broadly distributed across Nevada. The Great Horned Owl is probably the most common species in this Order.
- The Caprimulgiformes are also abroad at night, and these include the goatsuckers and nighthawks.
- In the Order Apodiformes, the hummingbirds are surprisingly diverse in Nevada. This order also includes swifts.
- The Belted Kingfisher, found state-wide along streams and rivers in the state, is the single representative of Coraciiformes.
- Piciformes (woodpeckers) are found in Joshua trees and riparian stringers in the Mojave Desert, to the montane forests of the state's higher

elevations.

- Finally, the Order Passeriformes includes all of the songbirds, a huge Order. In this Order in Nevada there are numerous species of flycatchers, jays, vireos, swallows, wrens, thrushes, warblers, tanagers, towhees, sparrows, blackbirds, and finches.

No species of bird can be classified as endemic to Nevada—a native occurring here and nowhere else. One species—the Himalayan Snowcock, occurs only in the Ruby Mountains of Nevada and nowhere else in North America. However, that species was introduced from Asia and is managed as a game bird, and because it is not native to the state it is not considered an endemic.

Avifaunal diversity in Nevada is linked to a variety of factors, the most dominant of which is the state's geography. With 314 mountain ranges, an elevation range of 150 - 4,000 m (480 - 13,140 ft), 2 deserts, portions of 4 ecoregions, 7 major habitat types, and 27 "key habitats," the state offers considerable habitat diversity for birds. Other factors affecting bird diversity and linked to geography to varying degrees include precipitation patterns, continental bird migration patterns, and the dominant Basin and Range topography of the state.

With a few noteworthy exceptions, birds in Nevada tend to be distributed at low densities across the landscape. This distribution is probably a reflection of food resources, which likewise tend to be rather widely dispersed in the Great Basin and Mojave Deserts. The exception to this generality usually occurs in the few locations in the state where water also occurs in abundance. In high water years, places like the Lahontan Valley and Franklin Lake Wildlife Management Areas, can teem with remarkable numbers of waterbirds. Ruby Lake National Wildlife Refuge, which has a fairly reliable water supply, supports good numbers of birds throughout the year. A few locales across the state regularly support large numbers of colonial breeding birds. Pinyon Jays, a noisy, conspicuous, and gregarious bird, concentrate in large flocks where piñon pine nut crops are abundant and constitute an exception to the rule of water as the attraction for concentrations of birds.

The Great Basin Desert occupies much of Nevada and Utah, and extends into portions of Oregon, Idaho,

Washington, Arizona, Colorado, and Wyoming. Basin and range topography is the dominant land form in the Nevada and Utah portions of the desert, and a significant influence on the composition and distribution of the state's avifauna. Nevada's basins tend to be arid expanses of low desert shrub-dominated landscapes. Some basins hold winter runoff for short periods of time, offering valuable stop-over sites for waterbirds in spring migration. Fewer still are the basins that have permanent water sources, and these places offer habitat to birds in value that far exceeds the small extent of the watered lands.

These arid basins separate the north-south trending mountain ranges, which due to effects of elevation and aspect, tend to be better watered and support forests of piñon-juniper, pine, fir, spruce, oak, and aspen. For less motile species of mammals and reptiles, the basins constitute a significant barrier to movement and can lead to isolated populations and the rise of endemism. But for birds the basins may offer a deterrent to movement on a short term basis, although these landscapes are readily traversed during migration or after juvenile birds disperse from their nests.

Moving from the low-elevation basins to the ridge lines of adjacent mountain ranges it is possible to cross through eight elevationally defined vegetation zones. Each of these zones—Absolute Desert, Lower Mojavean, Blackbrush, Saltbush, Sagebrush, Pygmy Conifer, Montane, and Alpine—have their own characteristic suite of birds. Even the driest and apparently inhospitable landscapes have birds, at least during some portion of the year. Many species of desert birds are adapted to life without access to water. These species meet their water needs through their solid diets of seeds, insects, fruit, reptiles, or small mammals, and also through behavioral and physiological adaptations that help to conserve water.

The Mojave Desert intrudes into southern Nevada and brings with it a bird community that is distinctly different from the Great Basin Desert bird community. The Mojave Desert extends well south from southern Nevada into California and Arizona, and so the birds have a greater affinity with those landscapes than with the rest of Nevada. The Greater Roadrunner, Vermilion Flycatcher, Gambel's Quail, Inca Dove, Ladder-backed Woodpecker, and Verdin are a few of

the species characteristic of this landscape. Likewise, species like Greater Sage-Grouse and Bobolink that typify parts of the Great Basin landscape are absent from the Mojave. The altitudinal influences on vegetation, and accordingly, bird communities, still holds true for the Mojave.

Two major cordilleras flank the Great Basin and also influence the bird communities. On the western edge of the Great Basin lies the Sierra Nevada Range. Because of their altitude, rainfall, and proximity to the markedly different climate of the Pacific coast states, the Sierras also have their own bird community. This community barely intrudes into Nevada, and the more arid climate of the state probably discourages significant eastward incursions of Sierran birds into the state. Nonetheless, the Sierra Nevada Ecoregion is the only place in the state where birds such as Mountain Quail, Red-breasted Sapsucker, White-headed Woodpecker, and Pygmy Nuthatch occur reliably. It is also the locale for even rarer incursions of species such as the Pileated Woodpecker and the Great Grey Owl.

On the eastern flank of the Great Basin lie the Rocky Mountains. Positioned as they are in eastern Utah, their influence on Nevada's avifauna is moderated by distance. Nonetheless, species in eastern Nevada certainly show a greater affinity with this extensive mountain range. Species such as Red Crossbill, Black Rosy-Finch, and the Greater Sandhill Crane are a part of the northeastern and east-central Nevada landscape, but have their population centers in the Rocky Mountain states.

### **Pacific Flyway**

Nevada lies within the Pacific Flyway, the primary seasonal movement corridor for waterbirds migrating west of the Rocky Mountains. The majority of waterbird migration in this flyway takes place west of the Sierra Nevada, with another concentration of birds following the Rocky Mountains. However, some ducks, geese, shorebirds, and wading birds in this river of migration do cross Nevada.

This particular component of the great migration phenomenon adds significantly to the diversity of species in the state. Birds which breed thousands of miles away in the high arctic or in the bays and coves of the Pacific Coast stop each year at wetlands in

Nevada. These migration stop-overs provide foraging and resting opportunities and critical fuel for the extraordinary journeys required of migrants. Positioned as it is in the flyway, Nevada has significant responsibility for the maintenance of these populations.

### **Raptor and Passerine Migration**

Migrating raptors rely on upwelling air currents generated by air rising up mountain slopes. Raptors save critical energy in migration by utilizing this rising air to gain altitude. With 314 mountain ranges, this orographic effect is widespread in the state. Most mountain ranges in Nevada probably support a raptor migration, although the migration appears to be diffuse across the landscape, in part because mountain ranges are so abundant. The one noteworthy exception to this diffuse pattern of movement is the Goshute Mountains. Here several mountain ranges converge from the north and concentrate raptor movements along the Goshutes, which act like the throat of a funnel. As many as 20,000 raptors of at least 13 species have been recorded passing over the Goshute Mountains by HawkWatch International (Smith and Vekasy 2001).

Little research has been conducted on migration of the Passeriformes through Nevada. Because the Great Basin is a hostile setting for most songbirds, migration through the Great Basin is probably weak, with most birds pursuing routes along the Sierra Nevada and Rocky Mountain ranges. Though the majority of birds probably circumvent our landscape, some passerines do cross Nevada. Springs, seeps, streams, and lakes, however few, are probably critical to sustaining these birds as they cross the desert. North-south trending valleys with surface water, such as Oasis Valley, Meadow Valley Wash, Pahranaagat Valley, and the White River Valley probably concentrate migrating songbirds. The evidence for this phenomenon is strong in Oasis Valley (McIvor 2005), but poorly researched elsewhere.

### **Bird Species of Concern**

Appendix C contains a list of Bird Species of Concern selected as the focus of the Nevada Wildlife Action Plan. The list is divided into two sections. The first 64 birds comprise the first-tier species of concern identified as being of highest priority for informing

management planning. The remaining 50 birds are regarded as "Stewardship Species." The list of species was prioritized by evaluating 10 ranking variables for each species.

The species populating Appendix C were identified through a series of ongoing conservation efforts and by soliciting the input of biologists working in Nevada's landscapes. Sources of bird species of concern include the Continental Partners in Flight conservation plan (Rich et al. 2004), the Nevada Partners in Flight conservation plan (Neel 1999), the North American Waterfowl Management Plan (2004), and the U.S. Shorebird Conservation Plan (Brown et al. 2001).

### **Reptiles**

Currently, 54 reptile species are recognized in Nevada, consisting of 15 families and 39 genera. The Nevada Natural Heritage Program recognizes one additional species, the Mexican garter snake, based on a historical occurrence, however, it is presumed extinct in Nevada. One lizard, the Mediterranean house gecko, and 5 turtles are introduced species, while the remaining 53 reptiles are native Nevada taxa.

Nevada's native reptiles can be categorized in 3 major groups: turtles (4 species), snakes (26 species), and lizards (24 species). Several species, including the desert horned lizard, western whiptail lizard, longnose leopard lizard, gopher snake and striped whipsnake are quite common, utilize a variety of habitats, and are found essentially throughout the entire state; while others have restricted habitat requirements or are found in small isolated populations in Nevada, such as the northern alligator lizard, Gilbert's skink, Sonoran mountain kingsnake, and the western diamondback rattlesnake.

Many of Nevada's native reptile species can be categorized as either Great Basin or Mojave Desert species. Typical Great Basin reptile species include the western rattlesnake, rubber boa, and the greater and pygmy short-horned lizards. The warmer year-round temperatures associated with the Mojave Desert provide habitat for a diversity of numerous heat-tolerant reptile species such as desert tortoise, chuckwalla, desert iguana, western banded gecko, southwestern black-headed snake, glossy snake, and the sidewinder rattlesnake.

The nature of Nevada's current reptilian fauna may have been influenced by the historical climatology of the Basin and Range and Mojave Desert provinces dating back 14,000 years to the last Ice Age. During that time, cooler, wetter conditions prevailed, which shifted habitats down-slope. With the advent of our current epoch, the Holocene, the overall climatic trend for much of the current Nevada region is characterized by increasing temperature and decreasing precipitation, resulting in hotter, drier conditions, especially in the basins. As a result, once abundant forest ecosystems are retreating up-slope to cooler, wetter conditions. One result of this trend is a pattern of isolated forested mountain ranges. These changes left the valley bottoms to species better adapted to warmer, drier conditions, and other species, such as the Sonoran mountain kingsnake and northern alligator lizard, isolated in smaller populations, generally at higher elevations associated with wetter conditions. Nevada's interior Basin and Range topography also contributes to the isolation of some species.

Many of Nevada's reptile species possess unique and varied characteristics and habits. Several lizard species, including the chuckwalla and desert iguana, are chiefly herbivorous, while most other lizard species are omnivorous, and all snakes are carnivorous. Nevada is home to three horned lizard species. The greater and pygmy short-horned lizards occur in the Great Basin and Columbia Plateau, are viviparous, and give birth to live young. The desert horned lizard occurs in the Mojave Desert is oviparous, laying eggs which then produce the next generation of lizards.

Most reptile species can be categorized as either diurnal (active during daylight hours) or nocturnal (active at night). The desert night lizard, night snake, and spotted leaf-nosed snake are all nocturnal, while the coachwhip, western yellow-bellied racer, desert spiny lizard, and the Mojave black collared lizard are all examples of diurnal species. The lyre snake, which occurs in the Mojave region, is unique in that it immobilizes its prey via venom directed along grooved teeth. Although venom is usually exclusively associated with rattlesnakes, in addition to the lyre snake, the banded Gila monster, one of only two venomous lizards in the world, also use this adaptation in their pursuit of food. Fortunately, only one Nevada reptile species, the desert tortoise, is currently on the federal List of Threatened

and Endangered Species. This is due primarily to habitat loss and disease.

One subspecies of aquatic reptile, the northwestern pond turtle may be a Nevada native. The pond turtles' origin remains undetermined as genetic tests have not shown significant differences among the widely distributed populations (Washington State to Baja California). Records do show that pond turtles were present in Nevada near the beginning of the 20<sup>th</sup> century. More sensitive testing is needed to gain a clear understanding of the genetic affiliation of the Nevada populations.

The body of published literature pertaining to Nevada's reptiles is small. Much work is needed to fill the knowledge gaps for many species.

## Aquatics

A list of all known extant aquatic wildlife (fish, amphibians, mollusks, and crustaceans) is included in Appendix H. More detailed information by species for Species of Conservation Priority is included in the Species Accounts, and is included for all aquatic taxa in Appendices B through E.

## Amphibians

Amphibians are typically found associated with other aquatic resources in Nevada and are considered important indicators of ecological health in areas where they would normally be expected to occur. Much like other aquatic-dependent biota, their distribution is sporadic in association with the distribution of water resources in this arid environment, and isolation of amphibian species and sub-populations has resulted in a high level of endemism and metapopulation uniqueness in proportion to the small number of amphibian species statewide. This metapopulation isolation and relative scarcity across the landscape also makes Nevada amphibian populations particularly susceptible to localized habitat alterations and short-term climatic changes such as extended drought. Their life history (an aquatic and a terrestrial phase) and very permeable skin also make them particularly susceptible to ecological changes. There are documented worldwide declines of amphibians, with the causes being as yet largely undetermined, but some of the hypothesized causes are increased UV radiation,

environmental contaminants, introduced species, and disease.

Seventeen species of amphibians have been found in the wild in Nevada. Of these, 16 are in the order Anura (7 frogs, 8 toads, and 1 spadefoot toad), and 1 species of the order Caudata (salamanders). One of the frog species, the Las Vegas Valley leopard frog is believed to be extinct, and another, the mountain yellow-legged frog, is thought to be extirpated from Nevada. The relict leopard frog was once believed to be extirpated from Nevada, but was rediscovered near Lake Mead in the 1990s. Two of the amphibian species found in Nevada are introduced – the tiger salamander and the bullfrog.

Relatively good amphibian distribution data is limited to a few species (Columbia spotted frog, Amargosa toad, and the relict leopard frog), derived largely from scientific collection permit reporting, which includes a significant amount of survey data from federal and state surveys, and university studies. Anecdotal information for some species, such as Pacific chorus frogs and western toads, indicates that their populations are relatively stable, but there is little official documentation. Other species, such as the northern leopard frog appear to be on the decline in some areas, but again, documentation is limited. Although worldwide amphibian population declines and extinctions are cause for concern, there is some evidence that detected declines in most Nevada species can be attributed largely to local identifiable factors such as short-term climate cycles and alterations to habitat quality and availability. However, the absence of good data, particularly for widespread and patchily distributed species such as the northern leopard frog and chorus frog, makes accurate determination of status and trend for many amphibians difficult at best, and limits the ability to develop and implement proactive conservation actions if required.

## Fishes

More so than terrestrial wildlife species, the taxonomic diversity and distribution of Nevada's fishes are influenced by our state's geologic and hydrographic history (Hubbs and Miller 1948; Hubbs et al. 1974). Throughout the Great Basin ecoregion, glacial and postglacial changes in climate and hydrology have alternately connected and isolated hydrologic systems

and their associated biota, creating a globally unique endemic aquatic fauna surprising in its diversity and much at odds with current climatic conditions.

Conversely, significant parts of Nevada's land area fall within the larger Colorado River, Snake River, and Bonneville drainages, and supports endemic fauna specifically representative of those systems, although frequently also with unique adaptations as a result of isolation from climatic and geologic change.

With settlement and development of Nevada, its endemic aquatic fauna has been augmented with a wide variety of introduced fish species, many from the Mississippi River drainage and associated systems. Dominating many of Nevada's lakes and reservoirs, introduced centrarchid fishes represent challenges for managing endemic species, but support diverse and important sport fisheries. Stream and river systems, particularly in central and northern Nevada, support primarily salmonid fisheries with both native and introduced trout species. Beginning in the early 20<sup>th</sup> century, aggressive introduction programs established nonnative trout species, including brook, brown and rainbow trout, in many stream and river systems statewide, and the majority of those waters still maintain important recreational fisheries to this day. More recent sport fish management efforts have focused on the conservation and expansion of remaining populations of endemic salmonids such as cutthroat, redband and bull trout, while maintaining sport fishing opportunities through the stocking of nonnative trout species in appropriate locations.

Although approximately 151 species or subspecies of fishes have been found in the wild in Nevada, at least 37 of these are nuisance introductions of species that have no commercial or recreational value, or are incidental observations of nonnative species which may not persist in the wild as viable populations. Twenty species of nonnative game fishes, the majority of them occurring from intentional introductions, support a significant part of Nevada's recreational sport fisheries.

Nevada's endemic fish fauna consists of at least 87 described species and subspecies, although the precise number is hard to determine. Taxonomic and systematic description of this diverse resource is ongoing with a number of potential endemic fish subspecies still poorly defined. The heritage of Nevada's complex geological and hydrographic history

is reflected in the systematic and genetic relationships within its native fishes.

Because of the isolated and biologically unique nature of many endemic fish populations, and alterations to aquatic habitats which have occurred over time, a significant proportion of Nevada's endemic fish species are afforded protection under state statutes or the federal Endangered Species Act. Twenty-five Nevada fishes are listed under the ESA (19 as endangered and 6 as threatened), and an additional 21 species or subspecies are listed under Nevada Administrative Code (NAC) as sensitive or protected. These 46 species or subspecies represent 53 percent of Nevada's endemic fish biota as currently defined. Active conservation programs are in place for a majority of these fishes to varying degrees, ranging from a few federally sponsored recovery programs to cooperative working groups and conservation implementation processes under state and partnership leadership. In all cases, significant challenges exist to effective fish conservation, principally from intentionally or illegally introduced aquatic species and the difficulty of addressing and correcting alterations to the landscape and aquatic habitat systems which have occurred over the past 140 years.

In the context of the WAP planning process, the 41 fish species or subspecies identified as Species of Conservation Priority in this plan largely parallel those already afforded some level of protection, although exceptions of inclusion or exclusion occur. This is logical given the process used and the need to evaluate the most current information available on species status and conservation needs, and the different time frame to be expected from the administrative processes required to provide or alter legal species protections. Other endemic fishes with lower conservation need rankings remain as important elements of Nevada's native biota and diversity, and active conservation is essential for all these species to ensure their persistence for future generations.

## **Aquatic mollusks**

### **Bivalves**

Freshwater mussels are among the most endangered organisms in North America. Some of the major threats nationally are siltation, pollution, impoundment

(damming of rivers and streams), mining of river gravel, and loss of hosts. Before the advent of plastics, the interior of freshwater mussel shells were often used for making buttons. A widespread fishery in the eastern United States led to steep declines in populations.

Five species of true freshwater mussels (order Unionida) have been reported in Nevada and are assumed to be native. The majority are in the family Unionidae (California Floater, Oregon Floater, Winged Floater, Western Ridged Mussel). The Western Pearlshell belongs to the family Margaritiferidae. Freshwater mussels are found in various aquatic habitats, and have an interesting life history. Some are known to live over 100 years, and many have a unique mechanism for larval dispersal. Freshwater mussels need a fish or uncommonly, an amphibian host, during their early developmental stage. This behavior is unique among bivalve mollusks, and also links the health of their populations to that of their fish hosts. When appropriate hosts are lost from a system, freshwater mussels are unable to reproduce. The majority of NDOW's freshwater mussel records (which are very few in number) are occurrences of the California Floater in the Humboldt River system. The Western Ridged Mussel has also been documented recently at a limited number of sites. Discussions with numerous field staff from NDOW, other agencies, and researchers indicate a much wider distribution of freshwater mussels in Nevada, but limited to the northern half of the state. Also, shells have been found at numerous locations, indicating at least historical presence. Since live freshwater mussels are imbedded in the substrate they are not casually detected unless there are mortalities.

Fingernail clams and pea clams, small bivalves usually only a millimeter or so in size, are not technically freshwater mussels. They belong to the order Veneroida, family Sphaeriidae, and are not dependent on a host. They appear to be widely distributed throughout the state, and hundreds of records are available for them, primarily through scientific collection activity reports supplied to NDOW.

No Nevada mollusks are either federally or state listed. However, the California floater is ranked in Nevada as critically imperiled by the Natural Heritage Program,

and has been included on the list of Aquatic Species of Conservation Priority. Little is known about Nevada bivalves, especially historic and current distributions and population trends. Hosts have been identified for relatively few species of freshwater mussels. Genetics of the California Floater and other western mussels are currently being studied to assess whether distinct populations occur. Some key questions regarding bivalve mollusks in Nevada are distribution, genetics, and host species.

### **Gastropods**

Freshwater, gill-breathing mollusks occur throughout North America, primarily in springs. In Nevada, many species specialize in extreme habitats including springs with temperatures ranging from 3° C (37° F) to 44° C (111° F). More species of *Pyrgulopsis*, the largest genus of springsnails, occur in the Great Basin than anywhere else in the United States. Most springsnail populations are highly isolated because springs and seeps are widely dispersed and disconnected. Indeed, many species' entire range is in just one small spring. A number of springsnail populations are declining, almost faster than we can learn about them. Their aquatic habitats are rare and sensitive to drought and to the manner in which water resources are used.

Much remains to be learned about the diversity of Nevada's invertebrate populations, their distribution, conservation status, and special ecological functions. Over 100 species of freshwater snails have been documented in Nevada. One species of *Pyrgulopsis* was recently added to the federal candidate list (the Elongate mud meadows Pyrg – *P. notidicola*) but none are currently afforded state protection. As scientists continue to monitor and survey populations, new species will likely be described and more will be learned about Nevada's exceptional gastropod diversity.

### **Crustaceans**

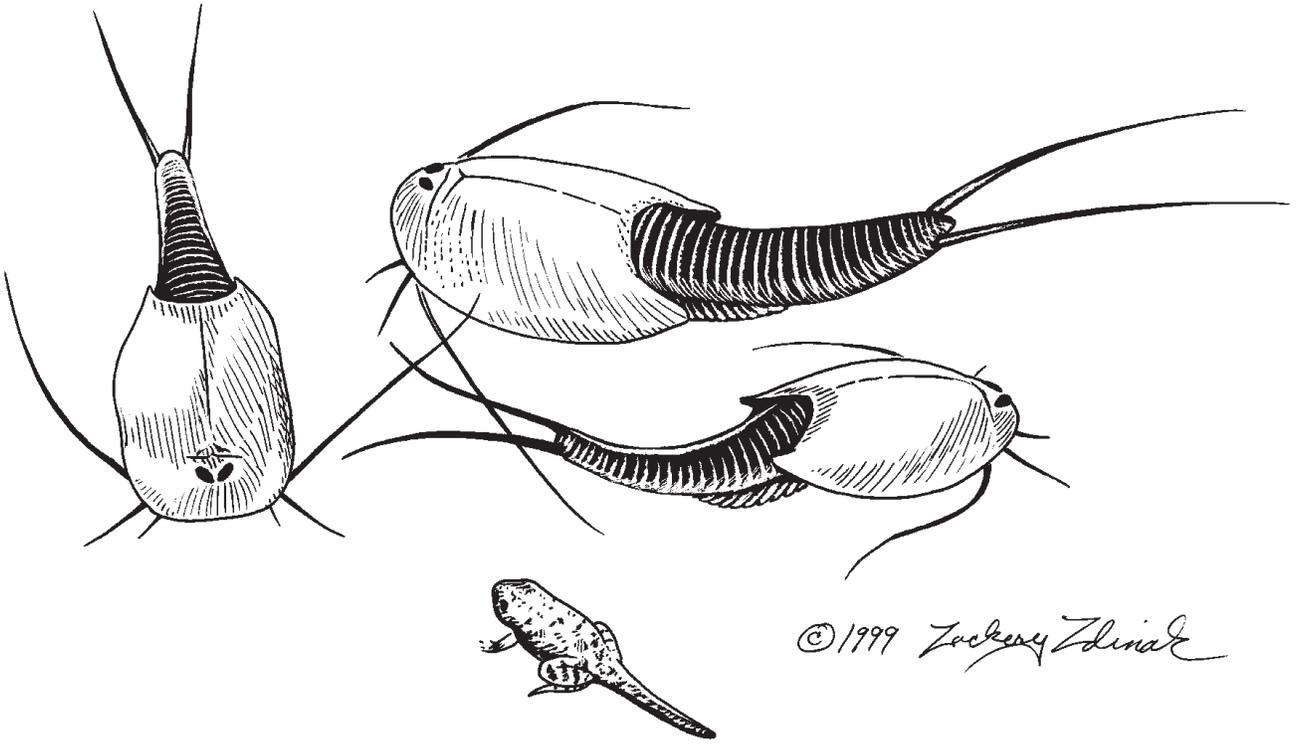
There are approximately 30 identified crustacean species in Nevada, falling into three classes: Malacostraca (crayfish, amphipods, scuds, and others), Ostracoda (ostracods), and Branchiopoda (fairy, clam, and tadpole shrimp). Most crayfish species found in

Nevada have been introduced and exist outside their native range; these introduced crayfish are one of the major problems facing many of Nevada's Aquatic Species of Conservation Priority. Some of the main impacts of non-indigenous crayfish to warm water fauna include predation upon early life stages of fish and amphibians, and also on adult life stages of small-bodied fish (most of the ESA-listed fish in Nevada fall into this category). The emphasis is therefore to prevent the spread of non-native crayfish into areas where they do not yet exist, and control or eradicate introduced crayfish where they threaten other aquatic species that are at risk. Most of the crayfish introductions probably occurred through the release of live bait. Introduced crayfish can be very destructive to native aquatics through predation and/or competition. Actions have been identified in various conservation plans to reduce or eliminate introductions that have proved detrimental to important native aquatics. State regulations are in place to prevent spread of crayfish through release of live bait, and a public program should soon be in place targeting the release of pets.

There is little documentation of Nevada's macroinvertebrate crustacea species, many of which are ephemeral pool specialists (e.g., fairy shrimp and tadpole shrimp). In order to survive the temporary, often harsh environments they inhabit, part of their life cycle includes an encysted egg that can survive long periods of desiccation and temperature extremes. These species are not included on the WAP Species of Conservation Priority list because so little is known about them in Nevada.

### **Aquatic Insects**

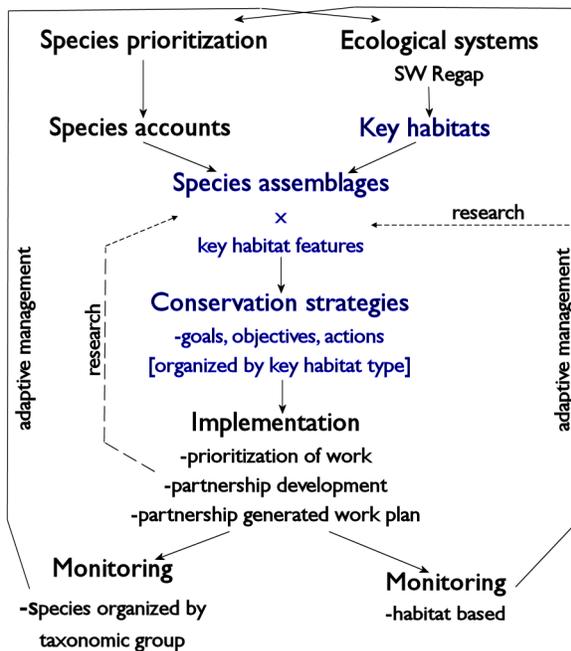
The Nevada Department of Agriculture has jurisdiction over insects. Their mission is to encourage the advancement and protection of agriculture and related industries for the benefit of Nevada citizens. Their focus, therefore, is on insects detrimental to agriculture. The Nevada Natural Heritage Program tracks sensitive species, including insects. Nevada's sensitive aquatic insects are listed in Appendix H. Further information can be found on NatureServe ([www.NatureServe.org](http://www.NatureServe.org)).



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## Identification of Species of Conservation Priority

The Species of Conservation Priority identification process for nongame terrestrial vertebrates (birds, mammals, and reptiles) began in July, 2002. After initially gathering input from partner land management agency personnel at the field level, a Species Priority Matrix (see Appendix A.) was developed using standard species conservation prioritization methodology (Natural Heritage Scorecard; Panjabi et al. 2001). A separate prioritization process was developed for fish, amphibians, and mollusks by the NDOW Fisheries Bureau in December, 2004, and the NDOW Game Bureau designed and executed the Game Animals prioritization process in early 2005. For a complete description of all the prioritization processes, their ranking criteria, and results, please refer to Appendix A, “Identification of Species of Conservation Priority.”



### Birds

The species priority processes identified 72 bird species as Species of Conservation Priority, including 4 upland game birds and four hunted waterfowl species (Table 1.) Of the total, there are 25 species of water birds, 8 birds of prey, and 39 other land birds. Two species, Yuma Clapper Rail and Southwestern Willow Flycatcher are listed as Endangered under the Federal Endangered Species Act, the Bald Eagle is federally listed as Threatened, and the Yellow-billed Cuckoo is federally listed as a Candidate Species and is also listed as a Sensitive Species in Nevada. Three species are listed as State Sensitive – Northern Goshawk, Loggerhead Shrike, and Brewer’s Sparrow. The availability and productivity of water, wetlands and riparian areas loom large as influential in the prioritization of species in Nevada. Twenty-five priority species are associated with open water or wetlands, while another 20 land birds are predominantly associated with riparian habitats. Twelve priority species are primarily found in the Mojave Desert, which translates toward higher area responsibility for Nevada since it shares the Mojave

Desert with only three other states. Six species are coniferous forest dwellers – a habitat type of restricted distribution in the state.

## Stewardship Birds

In addition to the 72 bird Species of Conservation Priority, there are 44 species that are identified as priority species in one or more of the regional or continental bird conservation plans (see “Other Key Plans and Programs,” p. 39) that did not “make the cut” in the Nevada ranking process. By recognizing these species in the WAP, Nevada is acknowledging its stewardship responsibility for these species, but with an assumption that if we are successful in our conservation strategies for the 72 Species of Conservation Priority, we expect the Stewardship Species to be adequately provided for. Adaptive management and regular review of the comprehensive species list will allow us to adjust our approach for Stewardship Species that are found to be inadequately covered. An additional 7 species ranked “above the

cut” in the Species Priority Matrix, but were not listed as priority species in any of the supporting bird conservation plans, and upon further analysis, were not considered to be particularly acute to Nevada’s conservation responsibility.

## Mammals

Forty-two mammals were originally identified as Species of Conservation Priority by the Species Priority Matrix process, and 3 mammals were added by the Game Bureau Priority Matrix (Table 2.). Two species (pygmy rabbit and American marten) were identified in both processes. Stakeholder review resulted in the addition of 4 more species (long-eared myotis, hoary bat, desert kangaroo rat, and Wyoming ground squirrel), to bring the total priority mammals to 49.

**Table 1. Nevada Species of Conservation Priority - Birds**

Common Name	Scientific Name	Common Name	Scientific Name
Common Loon	<i>Gavia immer</i>	California Spotted Owl	<i>Strix occidentalis</i>
Eared Grebe	<i>Podiceps nigricollis</i>	Short-eared Owl	<i>Asio flammeus</i>
Western Grebe	<i>Aechmophorus occidentalis</i>	White-throated Swift	<i>Aeronautes saxatalis</i>
Clark's Grebe	<i>Aechmophorus clarkii</i>	Costa's Hummingbird	<i>Calypte costae</i>
American White Pelican	<i>Pelecanus erythrorhynchos</i>	Rufous Hummingbird	<i>Selasphorus rufus</i>
Western Least Bittern	<i>Ixobrychus exilis</i>	Lewis' Woodpecker	<i>Melanerpes lewis</i>
Snowy Egret	<i>Egretta thula</i>	Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>
White-faced Ibis	<i>Plegadis chibi</i>	White-headed Woodpecker	<i>Picoides albolarvatus</i>
Northern Pintail	<i>Anas acuta</i>	Olive-sided Flycatcher	<i>Contopus borealis</i>
Cinnamon Teal	<i>Anas cyanoptera</i>	Willow Flycatcher	<i>Empidonax traillii</i> <i>adastus</i>
Canvasback	<i>Aythya valisineria</i>	Mountain Willow Flycatcher	<i>Empidonax traillii</i> <i>brewsteri</i>
Redhead	<i>Aythya americana</i>	Southwestern Willow Flycatcher	<i>Empidonax traillii</i> <i>extimus</i>
Bald Eagle (contiguous U.S. pop)	<i>Haliaeetus leucocephalus</i>	Black Phoebe	<i>Sayornis nigricans</i>
Northern Goshawk	<i>Accipiter gentilis</i>	Loggerhead Shrike	<i>Lanius ludovicianus</i>
Swainson's Hawk	<i>Buteo swainsoni</i>	Arizona Bell's Vireo	<i>Vireo bellii arizonae</i>
Ferruginous Hawk	<i>Buteo regalis</i>	Gray Vireo	<i>Vireo vicinior</i>
Peregrine Falcon	<i>Falco peregrinus</i>	Pinyon Jay	<i>Gymnorhinus</i> <i>cyancephalus</i>
Mountain Quail	<i>Oreortyx pictus</i>	Verdin	<i>Auriparus flaviceps</i>
Blue Grouse	<i>Dendragapus obscurus</i>	Bendire's Thrasher	<i>Toxostoma bendirei</i>
Columbian Sharp-tailed Grouse	<i>Tympanuchus phasianellus</i> <i>columbianus</i>	Crissal Thrasher	<i>Toxostoma crissale</i>
Greater Sage-Grouse	<i>Centrocercus urophasianus</i>	Le Conte's Thrasher	<i>Toxostoma lecontei</i>

Yuma Clapper Rail	<i>Rallus longirostris yumanensis</i>	Phainopepla	<i>Phainopepla nitens</i>
Greater Sandhill Crane	<i>Grus canadensis</i>	Virginia's Warbler	<i>Vermivora virginiae</i>
Western Snowy Plover	<i>Charadrius alexandrinus</i>	Lucy's Warbler	<i>Vermivora luciae</i>
Black-necked Stilt	<i>Himantopus mexicanus</i>	Hermit Warbler	<i>Dendroica occidentalis</i>
American Avocet	<i>Recurvirostra americana</i>	Grace's Warbler	<i>Dendroica graciae</i>
Willet	<i>Catoptrophorus semipalmatus</i>	Abert's Towhee	<i>Pipilo aberti</i>
Long-billed Curlew	<i>Numenius americanus</i>	Brewer's Sparrow	<i>Spizella breweri</i>
Least Sandpiper	<i>Calidris minutilla</i>	Black-chinned Sparrow	<i>Spizella atrogularis</i>
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	Sage Sparrow	<i>Amphispiza belli</i>
Red-necked Phalarope	<i>Phalaropus lobatus</i>	Bobolink	<i>Dolichonyx oryzivorus</i>
Franklin's Gull	<i>Larus pipixcan</i>	Tricolored Blackbird	<i>Agelaius tricolor</i>
Forster's Tern	<i>Sterna forsteri</i>	Scott's Oriole	<i>Icterus parisorum</i>
Black Tern	<i>Chlidonias niger</i>	Gray-crowned Rosy-Finch	<i>Leucosticte tephrocotis</i>
Western Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Black Rosy-Finch	<i>Leucosticte atrata</i>
Western Burrowing Owl	<i>Athene cunicularia</i>	Cassin's Finch	<i>Carpodacus cassinii</i>

**Table 2. Nevada Stewardship Bird Species**

Common Name	Scientific Name	Common Name	Scientific Name
Great Blue Heron	<i>Ardea herodias</i>	Clark's Nutcracker	<i>Nucifraga columbiana</i>
Black-crowned Night- Heron	<i>Nycticorax nycticorax</i>	Bank Swallow	<i>Riparia riparia</i>
Cooper's Hawk	<i>Accipiter cooperii</i>	Juniper Titmouse	<i>Baeolophus ridgwayi</i>
Prairie Falcon	<i>Falco mexicanus</i>	Cactus Wren	<i>Campylorhynchus brunneicapillus</i>
Black-bellied Plover	<i>Pluvialis squatarola</i>	Black-tailed Gnatcatcher	<i>Poliophtila melanura</i>
Greater Yellowlegs	<i>Tringa melanolenca</i>	Mountain Bluebird	<i>Sialia currucoides</i>
Spotted Sandpiper	<i>Tringa macularia</i>	Western Bluebird	<i>Sialia mexicana</i>
Marbled Godwit	<i>Limosa fedoa</i>	Swainson's Thrush	<i>Catharus ustulatus</i>
Western Sandpiper	<i>Calidris mauri</i>	Sage Thrasher	<i>Oreoscoptes montanus</i>
Dunlin	<i>Calidris alpina</i>	Orange-crowned Warbler	<i>Vermivora celata</i>
Bonaparte's Gull	<i>Larus philadelphia</i>	Nashville Warbler	<i>Vermivora ruficapilla</i>
California Gull	<i>Larus californicus</i>	Black-throated Gray Warbler	<i>Dendroica nigrescens</i>
Flammulated Owl	<i>Otus flammeolus</i>	Macgillivray's Warbler	<i>Oporornis tolmiei</i>
Northern Pygmy-owl	<i>Glaucidium californicum</i>	Wilson's Warbler	<i>Wilsonia pusilla</i>
Lesser Nighthawk	<i>Chordeiles acutipennis</i>	Yellow-breasted Chat	<i>Icteria virens</i>
Calliope Hummingbird	<i>Stellula calliope</i>	Summer Tanager	<i>Piranga rubra</i>
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	Green-tailed Towhee	<i>Pipilo chlorurus</i>
Williamson's Sapsucker	<i>Sphyrapicus thyroideus</i>	Vesper Sparrow	<i>Poocetes gramineus</i>
Red-naped Sapsucker	<i>Sphyrapicus nuchalis</i>	Black-throated Sparrow	<i>Amphispiza bilineata</i>
Three-toed Woodpecker	<i>Picoides tridactylus</i>	Grasshopper Sparrow	<i>Ammodramus savannarum</i>
Gray Flycatcher	<i>Empidonax wrightii</i>	Fox Sparrow	<i>Passerella iliaca</i>
Dusky Flycatcher	<i>Empidonax oberholseri</i>	Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	Blue Grosbeak	<i>Guiraca caerulea</i>
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>	Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>

Steller's Jay	<i>Cyanocitta stelleri</i>	Hooded Oriole	<i>Icterus cucullatus</i>
Western Scrub Jay	<i>Apelocoma californica</i>		

**Table 3. Nevada Species of Conservation Priority – Mammals**

Species	Scientific Name	Species	Scientific Name
Merriam's shrew	<i>Sorex merriami</i>	San Antonio pocket gopher	<i>Thomomys bottae curtatus</i>
Trowbridge's shrew	<i>Sorex trowbridgii</i>	desert pocket mouse	<i>Chaetodipus pencillatus</i>
vagrant shrew	<i>Sorex vagrans</i>	Fletcher dark kangaroo mouse	<i>Microdipidops megacephalus albiventer</i>
montane shrew	<i>Sorex monticolus</i>	Desert Valley kangaroo mouse	<i>Microdipidops megacephalus nasutus</i>
Inyo shrew	<i>Sorex tenellus</i>	pale kangaroo mouse	<i>Microdipidops pallidus</i>
water shrew	<i>Sorex palustris</i>	California kangaroo rat	<i>Dipodomys californicus</i>
Preble's shrew	<i>Sorex preblei</i>	desert kangaroo rat	<i>Dipodomys deserti</i>
broad-footed mole	<i>Scapanus latimanus</i>	brush mouse	<i>Peromyscus boylei</i>
California leaf-nosed bat	<i>Macrotus californicus</i>	Ash Meadows montane vole	<i>Microtus montanus nevadensis</i>
little brown myotis	<i>Myotis lucifragus</i>	Pahrnagat Valley montane vole	<i>Microtus montanus fuscus</i>
fringed myotis	<i>Myotis thysanodes</i>	sagebrush vole	<i>Lemmyscus curtatus</i>
western small-footed myotis	<i>Myotis ciliolabrum</i>	Wyoming ground squirrel	<i>Spermophilus elegans nevadensis</i>
long-eared myotis	<i>Myotis evotis</i>	Allen's chipmunk	<i>Tamias senex</i>
cave myotis	<i>Myotis velifer</i>	Humboldt yellow-pine chipmunk	<i>Tamias amoenus celeris</i>
Allen's big-eared bat	<i>Idionycteris phyllotis</i>	Hidden Forest Uinta chipmunk	<i>Tamias umbrinus nevadensis</i>
western red bat	<i>Lasiurus blossevillii</i>	Palmer's chipmunk	<i>Tamias palmeri</i>
hoary bat	<i>Lasiurus cinereus</i>	northern flying squirrel	<i>Glaucomys sabrinus</i>
western yellow bat	<i>Lasiurus xanthinus</i>	western jumping mouse	<i>Zapus princeps</i>
spotted bat	<i>Euderma maculatum</i>	Sierra Nevada red fox	<i>Vulpes vulpes necator</i>
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	kit fox	<i>Vulpes macrotis</i>
big free-tailed bat	<i>Nyctinomops macrotis</i>	ringtail	<i>Bassariscus astutus</i>
American pika	<i>Ochotona princeps</i>	American marten	<i>Martes americana</i>
pygmy rabbit	<i>Brachylagus idahoensis</i>	northwestern river otter	<i>Lontra canadensis</i>
Aplodontia	<i>Aplodontia rufa</i>	mule deer	<i>Odocoileus hemionus</i>
mountain pocket gopher	<i>Thomomys monticola</i>	Nelson bighorn sheep	<i>Ovis canadensis nelsoni</i>
Fish Spring pocket gopher	<i>Thomomys bottae abstrusus</i>	California bighorn sheep	<i>Ovis canadensis canadensis</i>

Sixteen priority mammal species have “protected” status in Nevada. Of those, eight species are further listed as “Sensitive,” and one species (spotted bat) is further listed as “Threatened” under Nevada Administrative Code. Three species (Ash Meadows montane vole, Hidden Forest Uinta chipmunk, and Sierra Nevada red fox) may be extinct in Nevada.

Thirteen of Nevada’s 23 bat species made the priority list, reflecting a recent intensity of focus associated with the drafting of the Nevada Bat Conservation Plan. Seven species of shrews made the list because so little is known about their status and distribution in the state. Sixteen priority rodent species exist in Nevada in fragmented populations, and as such may require local

conservation action to maintain them.

## Reptiles

Eighteen reptiles were identified as priority species through the Species Priority Matrix process. Two more species, western diamondback rattlesnake and Panamint alligator lizard, were added during stakeholder review, bringing the priority reptile total to 20 (Table 3). The desert tortoise is listed as Threatened under the Endangered Species Act. The banded Gila monster is protected in Nevada under NAC 503. Although its origin cannot be absolutely determined, the northwestern pond turtle may be Nevada's only

native aquatic turtle, and it now persists only in small populations in the Truckee and Carson Rivers. The Sonoran mountain kingsnake occurs in what are thought to be very small fragmented populations in east-central Nevada. These populations appear not to be connected to the species' larger range in central Utah.

Little is known about the population dynamics of the remaining priority reptiles, arousing concerns over various population pressures from excessive specimen collection to habitat loss.

**Table 4. Nevada Species of Conservation Priority – Reptiles**

Species	Scientific Name	Species	Scientific Name
northwestern pond turtle	<i>Clemmys marmorata</i>	desert night lizard	<i>Xantusia vigilis</i>
desert tortoise	<i>Gopherus agassizii</i>	long-tailed brush lizard	<i>Urosaurus graciosus</i>
western banded gecko	<i>Coleonyx variegatus</i>	Gilbert's skink	<i>Eumeces gilberti</i>
common chuckwalla	<i>Sauromalus obesus</i>	Sierra alligator lizard	<i>Elgaria coerulea shastensis</i>
desert iguana	<i>Dipsosaurus dorsalis</i>	Shasta alligator lizard	<i>Elgaria coerulea palmeri</i>
Great Basin collared lizard	<i>Crotaphytus bicinctores</i>	Panamint alligator lizard	<i>Elgaria panamintina</i>
Long-nosed leopard lizard	<i>Gambelia wislizenii</i>	banded Gila monster	<i>Heloderma suspectum cinctum</i>
desert horned lizard	<i>Phrynosoma platyrhinos</i>	Sonoran mountain kingsnake	<i>Lampropeltis pyromelana</i>
greater short-horned lizard	<i>Phrynosoma hernandesi</i>	Sonoran lyre snake	<i>Trimorphodon biscutatus</i>
pygmy short-horned lizard	<i>Phrynosoma douglasii</i>	western diamondback rattlesnake	<i>Crotalis atrox</i>

## Fishes

The species priority process identified 40 fish species and subspecies as Species of Conservation Priority, including 23 minnows and carp, 7 splitfins (springfishes and poolfishes), 5 suckers, 3 pupfishes and 2 salmonids. Of these, 32 are listed as Sensitive Species in Nevada; 25 are also listed as Endangered (19) or Threatened (6) under the Endangered Species Act. More so than terrestrial wildlife species, the taxonomic diversity and distribution of Nevada's fishes are influenced by our state's geologic and hydrographic history (Hubbs and Miller 1948; Hubbs et al. 1974). Throughout the Great Basin ecoregion, glacial and postglacial changes in climate and hydrology have alternately connected and isolated hydrologic systems

and their associated biota, creating a globally unique endemic aquatic fauna of surprising diversity. Of the 41 fish Species of Conservation Priority, 32 are endemic to Nevada. The state plays a critical role in species conservation for another 6 fish, though the species' ranges extend beyond Nevada's borders. Most fish populations in Nevada are isolated geographically; and 32 of the Species of Conservation Priority have disjunct or fragmented habitat (no significant connection between multiple locations, or only one location) and another 3 have a fair degree of habitat fragmentation. Other endemic fishes with lower conservation need rankings remain important elements of Nevada's native biota and diversity, and active conservation is essential for all of these species to ensure their persistence for future generations. Table 5

**Table 5. Nevada Species of Conservation Priority – Fishes**

**Common Name**

Ash Meadows Amargosa pupfish  
 Ash Meadows speckled dace  
 Big Smokey Valley speckled dace  
 Big Smokey Valley tui chub  
 Big Spring spinedace  
 Bonytail  
 Bull trout  
 Clover Valley speckled dace  
 Cui-ui  
 Desert dace  
 Devils Hole pupfish  
 Diamond Valley speckled dace  
 Fish Lake Valley tui chub  
 Flannelmouth sucker  
 Hiko White River springfish  
 Independence Valley speckled dace  
 Independence Valley tui chub  
 Lahontan Cutthroat Trout - Quinn/BlackRock and Upper Humboldt  
 Distinct Population Segment  
 Lahontan Cutthroat Trout - Western Distinct Population Segment  
 Moapa dace  
 Moapa speckled dace  
 Moapa White River springfish  
 Monitor Valley speckled dace  
 Moorman White River springfish  
 Oasis Valley speckled dace  
 Pahrnagat roundtail chub  
 Pahrnagat speckled dace  
 Pahrump poolfish  
 Preston White River springfish  
 Railroad Valley springfish  
 Railroad Valley tui chub  
 Razorback sucker  
 Virgin River chub  
 Virgin spinedace  
 Wall Canyon sucker  
 Warm Springs pupfish  
 White River desert sucker  
 White River speckled dace  
 White River spinedace  
 White River springfish  
 Woundfin

**Scientific Name**

*Cyprinodon nevadensis mionectes*  
*Rhinichthys osculus nevadensis*  
*Rhinichthys osculus lariversi*  
*Gila bicolor* ssp. (unnamed)  
*Lepidomeda mollispinis pratensis*  
*Gila elegans*  
*Salvelinus confluentus*  
*Rhinichthys osculus oligoporus*  
*Chasmistes cujus*  
*Eremichthys acros*  
*Cyprinodon diabolis*  
*Rhinichthys osculus* ssp. (unnamed)  
*Gila bicolor* ssp. (unnamed)  
*Catostomus latipinnis*  
*Crenichthys baileyi grandis*  
*Rhinichthys osculus lethoporus*  
*Gila bicolor isolata*  
  
*Oncorhynchus clarkii henshawi*  
  
*Oncorhynchus clarkii henshawi*  
*Moapa coriacea*  
*Rhinichthys osculus moapae*  
*Crenichthys baileyi moapae*  
*Rhinichthys osculus* ssp. (unnamed)  
*Crenichthys baileyi thermophilus*  
*Rhinichthys osculus* ssp. (unnamed)  
*Gila robusta jordani*  
*Rhinichthys osculus velifer*  
*Empetrichthys latos latos*  
*Crenichthys baileyi albivallis*  
*Crenichthys nevadae*  
*Gila bicolor* ssp. (unnamed)  
*Xyrauchen texanus*  
*Gila seminuda*  
*Lepidomeda mollispinis mollispinis*  
*Catostomus* sp.  
*Cyprinodon nevadensis pectoralis*  
*Catostomus clarkii intermedius*  
*Rhinichthys osculus* ssp. (unnamed)  
*Lepidomeda albivallis*  
*Crenichthys baileyi baileyi*  
*Plagopterus argentissimus*

contains only those fish species deemed of greatest conservation priority (Species of Conservation Priority); a complete list of fish species is found in Appendix H (Comprehensive Nevada Species List), and information about conservation actions for those with lower rankings can be found in the Implementation, Effectiveness Monitoring, and Adaptive Management Section, Aquatics Sub-section

**Stewardship Fishes**

As noted above, the majority of the species that fell

into the aquatic species of greatest conservation priority are already federally listed. Some species with other legal protections and ongoing conservation efforts fell below the matrix cutoff, but were noted by reviewers as worthy of special attention. These species are noted as Stewardship Species. The conservation efforts already in place for these species needs to continue in order to maintain a lower conservation priority status than those on the Species of Conservation Priority list.

**Table 6. Nevada Stewardship Species – Fish**

Common Name	Scientific Name
Bonneville Cutthroat Trout	<i>Oncorhynchus clarkii utah</i>
Fish Creek Springs tui chub	<i>Gila bicolor euchila</i>
Inland Columbia Basin Redband Trout	<i>Oncorhynchus mykiss gairdneri</i>
Meadow Valley speckled dace	<i>Rhinichthys osculus</i> ssp. (unnamed)
Meadow Valley Wash desert sucker	<i>Catostomus clarkii</i> ssp. (unnamed)
Newark Valley tui chub	<i>Gila bicolor newarkensis</i>
Relict dace	<i>Relictus solitarius</i>
Tui chub (Dixie Valley)	<i>Gila bicolor</i> ssp. (unnamed)
Warner sucker	<i>Catostomus warnerensis</i>
Warner Valley Redband Trout	<i>Oncobryncbus mykiss</i> pop 4
Yellowstone Cutthroat Trout	<i>Oncorhynchus clarkii bowieri</i>

## Amphibians

Seven amphibian species were designated Species of Conservation Priority, including four frogs and three toads. Of these, three are Candidates for ESA listing. The main factors are urban development, water diversions, and introduced species, especially bullfrogs. Habitat connectivity is especially important for amphibians since they need both aquatic habitats (at a

minimum for breeding) and terrestrial habitats to complete their life cycle. Aquatic habitats are often in a state of flux (e.g. beaver dam complex successional processes) and may disappear for a variety of reasons. In order for a population to survive, there must be the ability to move to a new site; habitat fragmentation prevents this necessary movement.

**Table 7. Nevada Species of Conservation Priority – Amphibians**

Common Name	Scientific Name
Amargosa Toad	<i>Bufo nelsoni</i>
Great Basin Columbia Spotted Frog - NE sub-population	<i>Rana luteiventris</i> pop. 3
Great Basin Columbia Spotted Frog - Toiyabe sub-population	<i>Rana luteiventris</i> pop. 3
Great Plains Toad	<i>Bufo cognatus</i>
Mountain Yellow-Legged Frog	<i>Rana muscosa</i>
Northern Leopard Frog	<i>Rana pipiens</i>
Relict Leopard Frog	<i>Rana onca</i>
Southwestern Toad (aka Arizona Toad)	<i>Bufo microscaphus</i>

## Bivalves

There are two scientific orders of bivalves in Nevada, the Unionoida (freshwater mussels) and the Veneroida (fingernail clams). The latter do not need a host and appear to be relatively ubiquitous in Nevada. Only one species of freshwater mussels (the California floater) was selected as a Species of Conservation Priority, although all the native freshwater mussel species in

Nevada face the same threats, and others are even more sensitive to a decrease in water quality. An example is the Western Ridged Mussel, which has been extirpated elsewhere in its native range. Species of freshwater mussels that occur (or have occurred) in Nevada have been eliminated from portions of rivers and even entire watersheds in their western United States range through the combined effects of habitat loss, pollution, blockage of anadromous fish, and

introduced species. Nearly three-quarters of all 297 native freshwater mussel species in North America are imperiled and nearly 35 went extinct in the last century. They are one of the most endangered groups of animals on Earth, yet little is known about their life history, habitat needs, or even how to distinguish different species - especially in western North America. Their lifecycle is closely linked to fish species, so impacts to fish also impact these bivalves. Without

adequate knowledge of their current and historic distributions, most of the Nevada bivalves remain unranked. Information about conservation actions for the 4 freshwater mussel species not listed as Species of Conservation Priority (see Appendix H for a complete list) can be found in the Implementation, Effectiveness Monitoring, and Adaptive Management Section, Aquatics Sub-section.

**Table 8. Nevada Species of Conservation Priority – Bivalves**

Common Name	Scientific Name
California Floater	<i>Anodonta californiensis</i>

### Gastropods

There are 74 gastropods (snails) on the list of Species of Conservation Priority, the vast majority of which are springsnails, and one, the Elongate mud meadows Pyrg – *Pyrgulopsis notidicola*) which is an ESA Candidate species. None are currently on NDOW’s protected list . Most springsnail populations are highly isolated because springs and seeps are widely dispersed and disconnected. Indeed, many species’ entire range is in just one small spring. A number of springsnail populations are declining, almost faster than we can learn about them. Their aquatic habitats are rare and sensitive to drought and to the manner in which water resources are used.

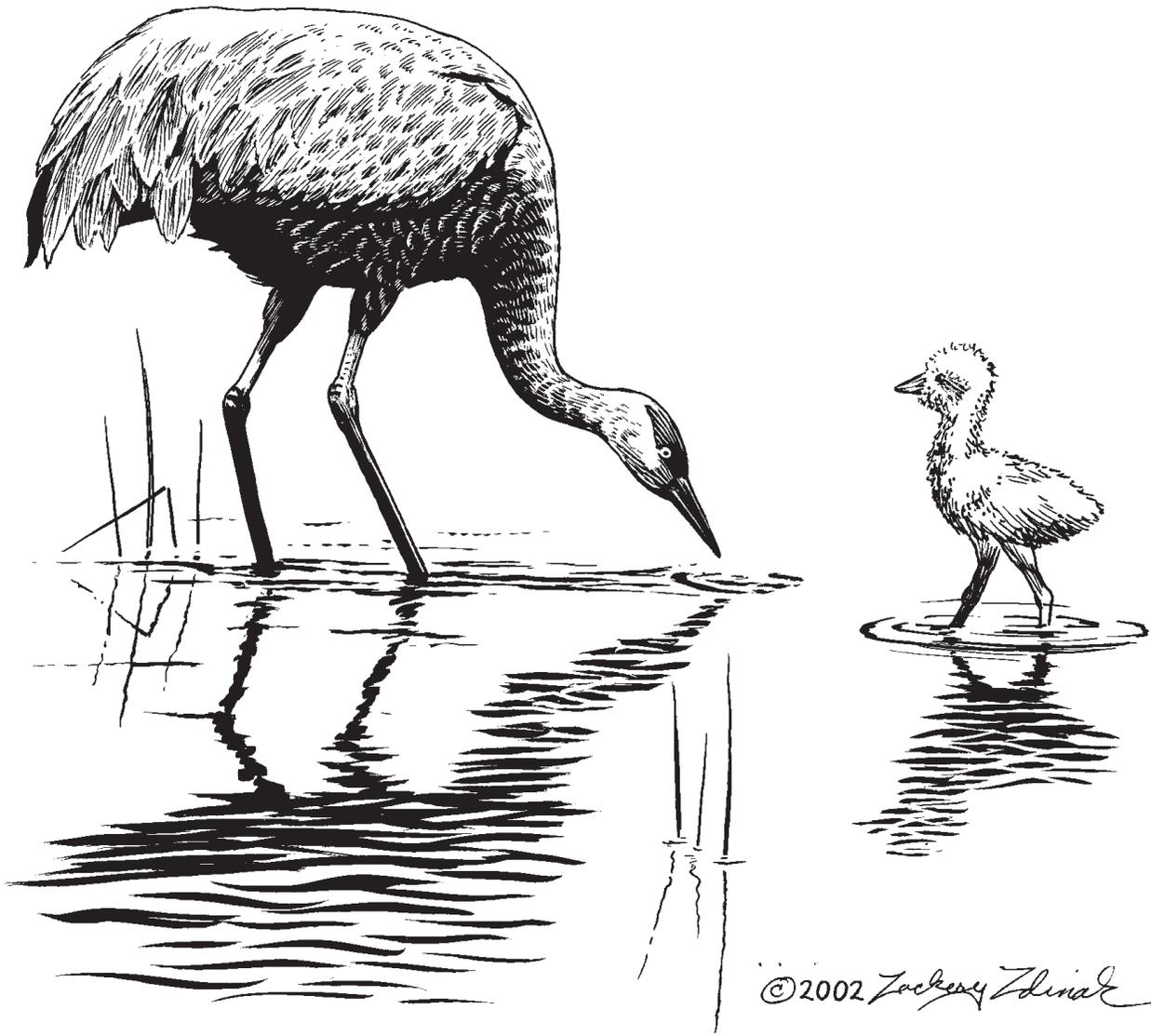
Terrestrial mollusks and crustaceans, arachnids, and insects were not included in the species prioritization process for the initial round of planning. NDOW has statutory management responsibility for mammals, birds, reptiles, amphibians, fishes, mollusks and crustaceans, but does not have statutory management

responsibility for other invertebrate families, including arachnids and insects. Statutory management responsibility for the management of insects in Nevada belongs to the NDOA, but to date, there has been very little state focus on the conservation of rare insects beyond participation in management strategy development for endangered butterflies which as a result of their federal listing have become the primary responsibility of the USFWS. The Nevada WAP Development Team contacted its key conservation partners in the management of terrestrial invertebrates with the intent of developing a conservation strategy, but the supporting biological information was insufficient to support moving forward before the WAP deadline. The WAP Team will convene an expert working group to construct a conservation strategy as a priority task in a future phase of WAP development and implementation. Key conservation partners will include the Biological Resources Research Center of the University of Nevada, Reno, Great Basin College, and the USFWS.

**Table 9. Nevada Species of Conservation Priority – Gastropods**

Common Name	Scientific Name	Common Name	Scientific Name
Hydrobe, Steptoe	<i>Eremopyrgus eganensis</i>	Springsnail, Lake Valley	<i>Pyrgulopsis sublata</i>
Juga, smooth	<i>Juga interioris</i>	Springsnail, Landyes	<i>Pyrgulopsis landeyi</i>
Pebblesnail, Ash Meadows	<i>Pyrgulopsis erythropoma</i>	Springsnail, large gland Carico	<i>Pyrgulopsis basiglans</i>
Pebblesnail, Moapa	<i>Pyrgulopsis avernalis</i>	Springsnail, Lockes	<i>Pyrgulopsis lockensis</i>
Pebblesnail, Pahrangat	<i>Pyrgulopsis merriami</i>	Springsnail, longitudinal gland	<i>Pyrgulopsis anguina</i>
Pebblesnail, Pyramid Lake	<i>Fluminicola dalli</i>	Springsnail, median-gland	<i>Pyrgulopsis pisteri</i>

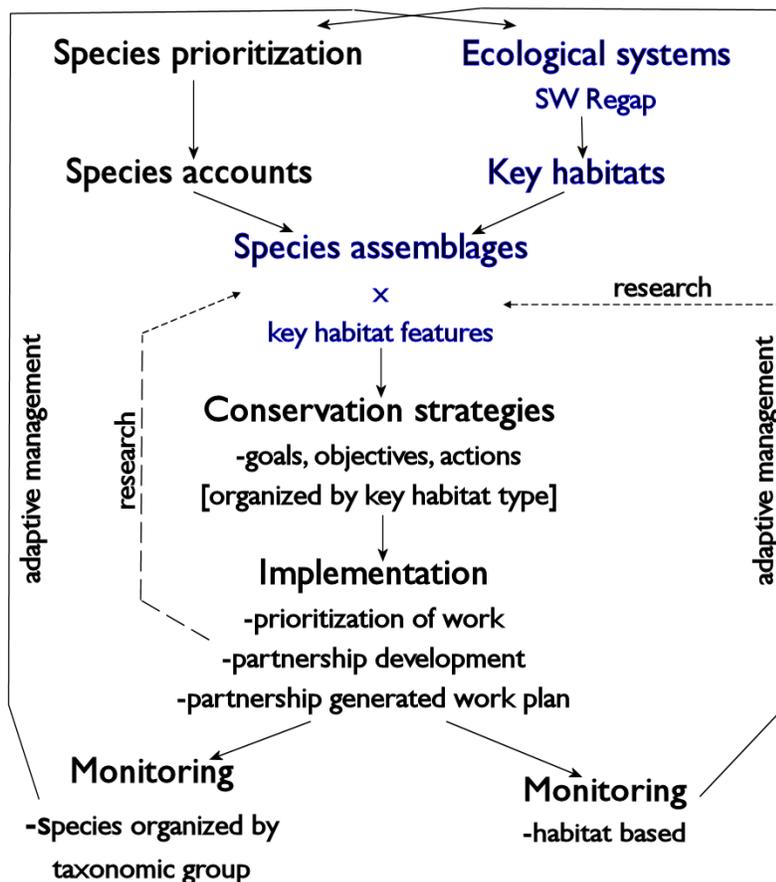
Common Name	Scientific Name	Common Name	Scientific Name
Pebblesnail, Turban	<i>Fluminicola turbiniformis</i>	Springsnail, Moapa Valley	<i>Pyrgulopsis carinifera</i>
Pebblesnail, Virginia Mountains	<i>Fluminicola virginicus</i>	Springsnail, neritiform Steptoe Ranch	<i>Pyrgulopsis neritella</i>
Snail, Badwater	<i>Assiminea infima</i>	Springsnail, northern Soldier Meadow	<i>Pyrgulopsis militaris</i>
Springsnail, Antelope Valley	<i>Pyrgulopsis pellita</i>	Springsnail, northern Steptoe	<i>Pyrgulopsis serrata</i>
Springsnail, bifid duct	<i>Pyrgulopsis peculiaris</i>	Springsnail, northwest Bonneville	<i>Pyrgulopsis variegata</i>
Springsnail, Big Warm Spring	<i>Pyrgulopsis papillata</i>	Springsnail, Oasis Valley springsnail	<i>Pyrgulopsis micrococcus</i>
Springsnail, Butterfield	<i>Pyrgulopsis lata</i>	Springsnail, ovate Cain Spring	<i>Pyrgulopsis pictilis</i>
Springsnail, Camp Valley	<i>Pyrgulopsis montana</i>	Springsnail, Pleasant Valley	<i>Pyrgulopsis aurata</i>
Springsnail, carinate Duckwater	<i>Pyrgulopsis carinata</i>	Springsnail, Sada's	<i>Pyrgulopsis sadai</i>
Springsnail, Carlin	<i>Pyrgulopsis bryantwalkeri</i>	Springsnail, small gland Carico	<i>Pyrgulopsis bifurcata</i>
Springsnail, Corn Creek	<i>Pyrgulopsis fausta</i>	Springsnail, southeast Nevada	<i>Pyrgulopsis turbatrix</i>
Springsnail, Crittenden	<i>Pyrgulopsis lentiglans</i>	Springsnail, southern Duckwater	<i>Pyrgulopsis anatina</i>
Springsnail, Crystal Spring	<i>Pyrgulopsis crystalis</i>	Springsnail, southern Soldier Meadow	<i>Pyrgulopsis umbilicata</i>
Springsnail, distal-gland	<i>Pyrgulopsis nanus</i>	Springsnail, southern Steptoe	<i>Pyrgulopsis sulcata</i>
Springsnail, Dixie Valley	<i>Pyrgulopsis dixensis</i>	Springsnail, Spring Mountains	<i>Pyrgulopsis deaconi</i>
Springsnail, Duckwater	<i>Pyrgulopsis aloba</i>	Springsnail, squat Mud Meadows	<i>Pyrgulopsis limaria</i>
Springsnail, Duckwater warm springs	<i>Pyrgulopsis villacampae</i>	Springsnail, sterile basin	<i>Pyrgulopsis sterilis</i>
Springsnail, Elko	<i>Pyrgulopsis leporina</i>	Springsnail, sub-globose Steptoe Ranch	<i>Pyrgulopsis orbiculata</i>
Springsnail, elongate Cain Spring	<i>Pyrgulopsis augustae</i>	Springsnail, transverse gland	<i>Pyrgulopsis cruciglans</i>
Springsnail, elongate Mud Meadows	<i>Pyrgulopsis notidicola</i>	Springsnail, Twentyone Mile	<i>Pyrgulopsis millenaria</i>
Springsnail, elongate-gland	<i>Pyrgulopsis isolata</i>	Springsnail, upper Thousand Spring	<i>Pyrgulopsis hovinghi</i>
Springsnail, Emigrant	<i>Pyrgulopsis gracilis</i>	Springsnail, Vinyard's	<i>Pyrgulopsis vinyardi</i>
Springsnail, Fairbanks	<i>Pyrgulopsis fairbanksensis</i>	Springsnail, White River Valley	<i>Pyrgulopsis sathos</i>
Springsnail, Fish Lake	<i>Pyrgulopsis ruinosa</i>	Springsnail, Wong's	<i>Pyrgulopsis wongi</i>
Springsnail, Flag	<i>Pyrgulopsis breviloba</i>	Tryonia, Amargosa	<i>Tryonia variegata</i>
Springsnail, flat-topped Steptoe	<i>Pyrgulopsis planulata</i>	Tryonia, desert	<i>Tryonia porrecta</i>
Springsnail, Fly Ranch	<i>Pyrgulopsis bruesi</i>	Tryonia, grated	<i>Tryonia clathrata</i>
Springsnail, Hardy	<i>Pyrgulopsis marcida</i>	Tryonia, minute	<i>Tryonia ericae</i>
Springsnail, Hubbs	<i>Pyrgulopsis hubbsi</i>	Tryonia, Monitor	<i>Tryonia monitorae</i>
Springsnail, Humboldt	<i>Pyrgulopsis humboldtensis</i>	Tryonia, Point of Rocks	<i>Tryonia elata</i>
Springsnail, Kings River	<i>Pyrgulopsis imperialis</i>	Tryonia, sportinggoods	<i>Tryonia angulata</i>



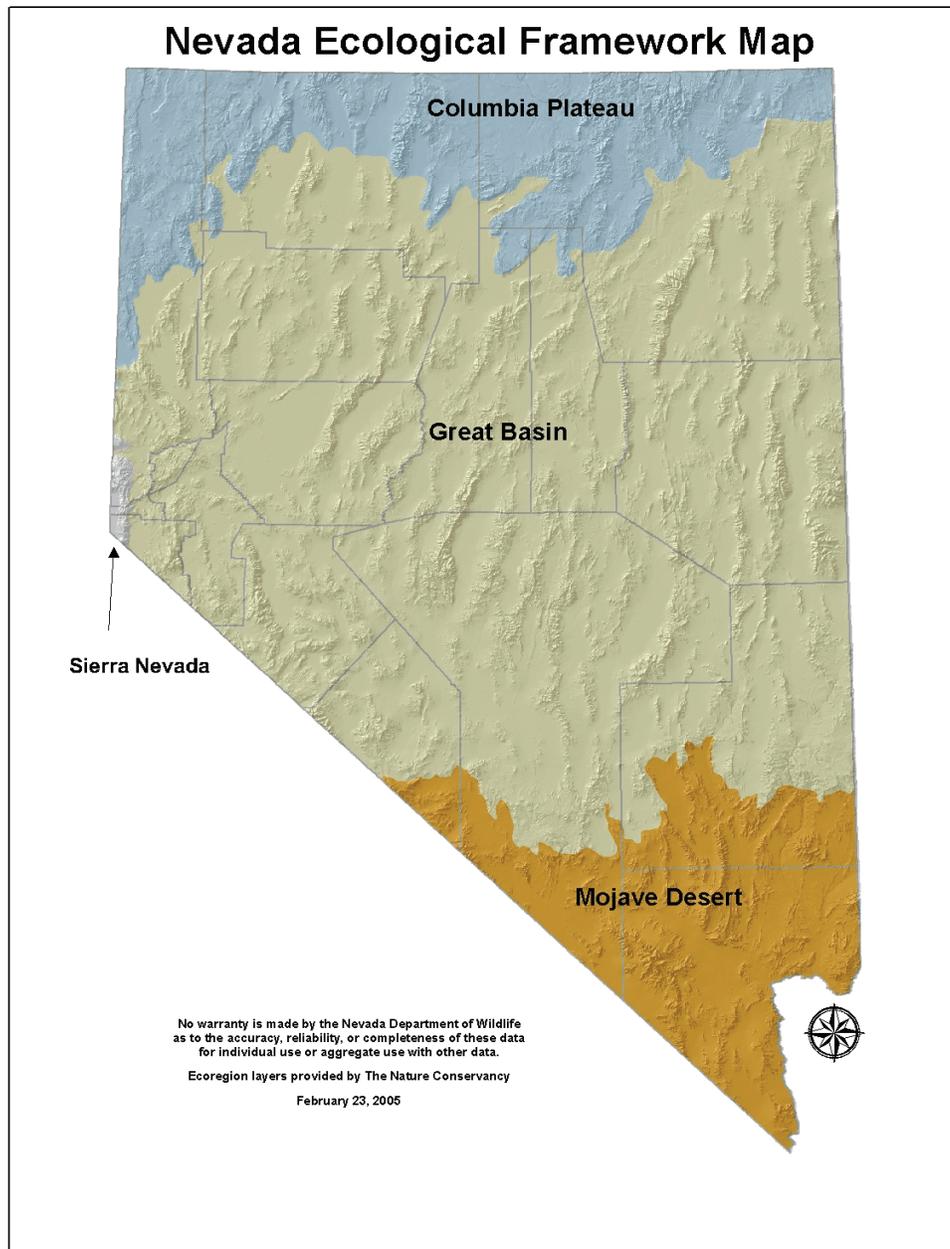
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## Defining Nevada's Landscape for Wildlife

To develop the Nevada Wildlife Action Plan, an ecological framework for strategy development was devised for initial analyses using ecoregions and modified Bailey's sections. Four ecoregions and 10 modified Bailey's sections overlap Nevada (Figure 5) (CPET 1999, MDEPT 2001, Nachlinger et al. 2001). Modified Bailey's sections are divisions within an ecoregion that are defined by similarities of geomorphic process, surface geology, soils, drainage networks, and regional climate patterns.



Although there are several different ecoregional classifications in use in the United States, there is a great deal of overlap in all of the maps and scrutiny reveals more similarities than differences (Groves 2003). Ecoregional boundaries should not be taken too literally because there is typically a gradual transition from one major ecosystem type to another and only rarely are ecoregional boundaries represented by distinct edges. In addition, most ecoregions contain patches of habitats that are more representative of adjacent ecoregions. We also recognize that ecological classification is not a panacea for categorizing all taxa or biological features. As the Nevada WAP evolved, the complexity and often redundant nature of attempting to create a strategic plan using modified Bailey's sections as our units of planning became evident. Specifically, key habitat types for wildlife occur across multiple sections and ecoregions. The complexity of forcing aquatic species and their habitats into a mostly terrestrial-based system was also problematic.



**Figure 11.** Nevada’s ecoregions.

Aquatic species and their habitats are more easily categorized into a system defined by hydrologic factors. The aquatic framework is more appropriately defined by ecological drainage units which are aggregations of fourth level hydrologic unit codes (HUCs). Ecological drainage units can be subdivided into fifth and sixth level HUCs (subbasin or watershed scale) which refines the aquatic framework to a more focused, smaller scale and is particularly important for

the discussion and planning for many of the isolated aquatic species found throughout Nevada. Currently, HUCs defined at the eighth level are easily available for Nevada. However, since most Nevada Aquatic Species of Conservation Priority are geographically isolated populations, it became evident that developing a finer-level system would be a very useful tool for identifying and managing key populations.

For hydrologic analysis and water planning and

management purposes, the U.S. Geological Survey (USGS) and the Nevada Division of Water Resources (NDWR), Department of Conservation and Natural Resources, have divided the State of Nevada into 256 Hydrographic Areas and Sub-Areas. This smaller hydrologic unit typically comprises a valley, a portion of a valley, or terminal basin. It would be beneficial to aquatic species conservation for NDOW to partner with NDWR, USGS, the Nevada Department of Environmental Protection, universities, conservation groups, and other aquatic resource planning bodies to develop and incorporate a standardized hydrologic unit system at this scale that would aid in exchange of information.

While the four major ecoregions in Nevada are readily recognizable to most partners, Bailey sections were not an intuitive framework for the development of aquatic species conservation strategies. For aquatic species, much of the structure for conservation delivery is already in place in the form of county or multi-county species conservation working groups. In this context, partner feedback indicated that framing objectives and actions by key habitat type would offer an effective approach.

As a result, the Nevada WAP provides a user-friendly format to the multiple partners that will be involved in its implementation. A framework based on modified Bailey's sections will likely be useful in the terrestrial ecological linkage for future partnership development with California, Oregon, Idaho, Utah, and Arizona. The use of HUCs, that by their nature overlap state boundaries will be useful in linking aquatic conservation efforts among neighboring states. Multi-state implementation of WAPs will facilitate the identification of common priorities. Collaboration among western states will also promote cooperative studies for wildlife and their key habitats that will address objectives across ecologically based units rather than geopolitical boundaries.

## Key Habitats

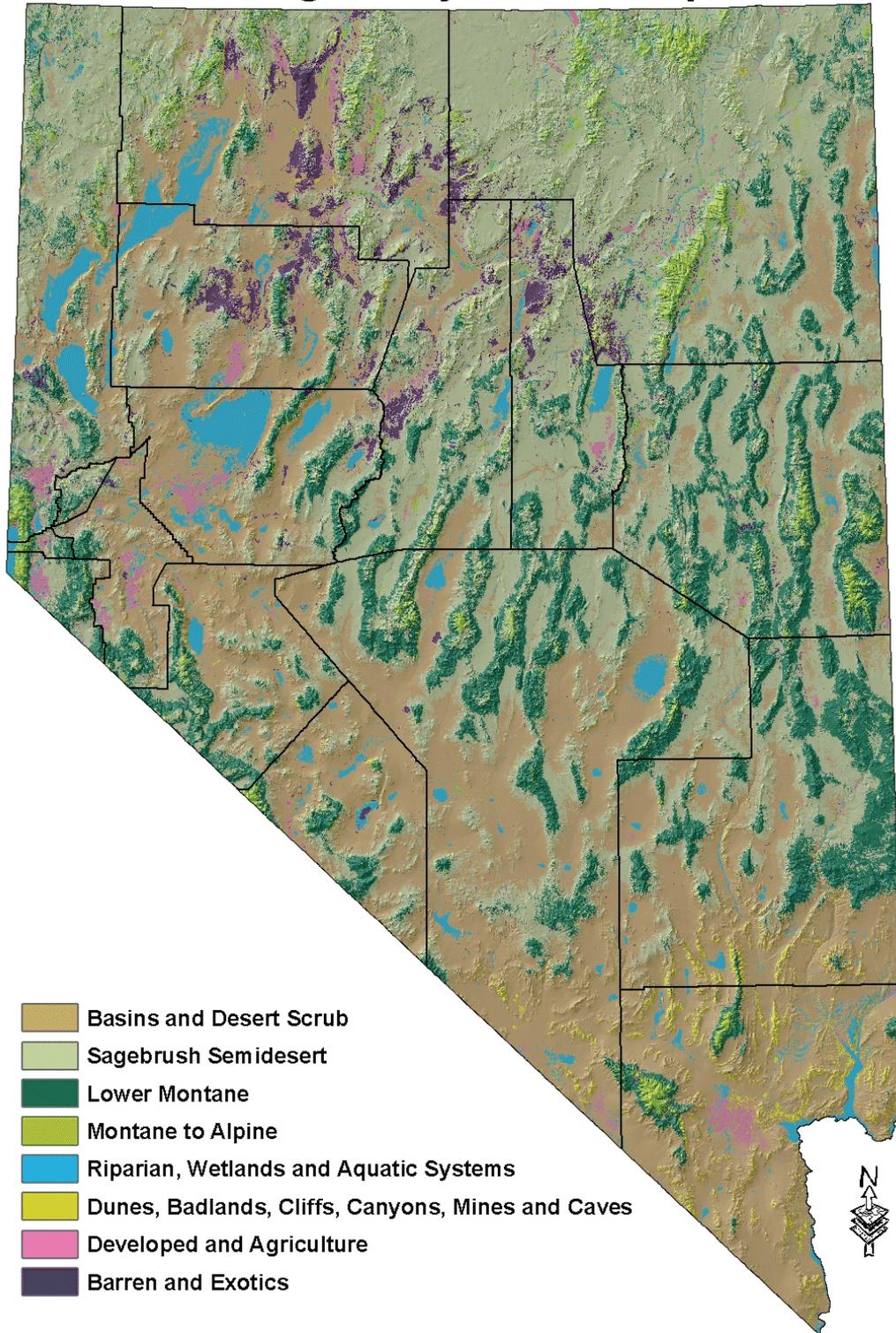
To more readily organize and present conservation strategies in Nevada's WAP, ecological systems (Figure 6) were aggregated into 27 key habitat types (Table 10). The resulting 27 key habitats can be further rolled up into 8 major habitat groups. From lowest to highest elevations, the first four habitat groups are the basins and desert scrub, sagebrush semidesert, lower

montane, and montane-to-alpine. The remaining four habitat groups are smaller types and are not limited to any specific elevation zone because their occurrences are tied to driving factors other than elevation and climate. Although they cover a smaller portion of Nevada, they are critical to the unique character of the state's biodiversity. The sand dunes and badlands system group includes sparsely vegetated terrestrial habitat types that are controlled by substrate factors. The riparian, wetlands, and aquatics group takes in ecological systems that are controlled by hydrologic characteristics and occur at the important interface of terrestrial-aquatic systems or encompass Nevada's aquatic biodiversity.

The Southwest Regional Gap Analysis Project mapped land cover in Nevada as well as Arizona, New Mexico, Colorado, and Utah (Southwest ReGAP 2004). Previous GAP efforts mapped land cover at the vegetation alliance-association level while the Southwest ReGAP maps land cover (i.e., vegetation) at the ecological system classification level. Ecological systems are groups of vegetation alliances-associations and are at a coarser scale than previous GAP land cover maps, but the investigators in the project felt it was a necessary step in improving mapping accuracy. Where other mapping efforts are available (e.g., USFS vegetation maps), they may be useful for implementation or monitoring of specific projects at a more local scale.

Nevada's WAP incorporates the Southwest ReGAP land cover map because it encompasses the entire state as well as two neighboring states, Utah and Arizona. Southwest ReGAP is the most up-to-date land cover map currently available, but new information and accuracy uncertainties have not all been discovered or addressed. It is difficult to address the comprehensive distribution of all wildlife species on a landscape and statewide basis using the Southwest ReGAP land cover data, because it does not include an adequate definition of the majority of aquatic habitat types, particularly for relatively arid landscapes such as Nevada. With the exception of large lakes and reservoirs, open water habitats simply are not definable at a useable scale through the use of Southwest ReGAP land cover types. However, certain Southwest ReGAP land covers, which are incorporated into associated key habitat types in this analysis, are generally associated with lotic or lentic water features and can provide

## Ecological System Groups



**Figure 12.** Ecological Systems Groups incorporated into the Nevada WAP.

some definition of the location of those aquatic habitat types across the landscape.

Another benefit of using the Southwest ReGap is that the new inter-agency LANDFIRE ([www.landfire.gov](http://www.landfire.gov)) Biophysical Settings are based on the same ecological systems from NatureServe and describe the pre-settlement condition of these systems (biophysical gradient, vegetation composition, disturbance processes, and scale), the historic range of variability for vegetation development classes, and the fire regime and intervals. LANDFIRE Biophysical Settings descriptions are just becoming available for the Great Basin and will be mapped by 2006. This will give science-supported working groups increased analytical power with which to make landscape management decisions.

Because of the absence of an easily definable aquatic habitat geospatial data layer which fit into the developed structure of this process, the WAP team chose a hybrid approach to incorporating aquatic habitat information. Rather than develop an entirely separate, HUC based, aquatic habitat definition structure, which would have been duplicative of much of the information contained in associated terrestrial habitat definitions, aquatic habitats have been incorporated into their associated terrestrial key habitat groups. This applies primarily to flowing water (stream or lotic) habitats, and also to smaller standing water (lentic) aquatic habitats such as montane pools and marshes. Where the ability exists to more clearly define aquatic features on the landscape, these have been presented as the unique key habitat groups, Lakes and Reservoirs and Spring and Springbrook aquatic habitats. This structure has the benefit of closely linking aquatic and terrestrial habitat strategies for those key habitats, such as stream systems, where conservation and management approaches must integrate aquatic and terrestrial components to ensure these systems are fully functional and supporting diverse species assemblages at their full potential.

## Linking Nevada's Species of Conservation Priority to 27 Key Habitats

After identifying the Species of Conservation Priority and describing the habitat framework for which the conservation strategies will be developed, the next step

was to link the priority species to the habitat framework so that the strategies will be relevant to species conservation. The assumption in effecting the species-habitat linkage is that species occur in habitats based on the availability of key structural elements that satisfy a species' most basic needs for food, cover, and reproductive needs (nesting, denning, etc.). Enough is known about the basic life history needs of most vertebrate species in Nevada that they can be roughly characterized and categorized by the key habitat elements to which they respond. For example, birds that feed on insects in the canopies of cottonwood trees are characterized as "overstory/canopy" species; while many reptiles respond positively to the rocky landscape features in their habitats ("rocks/canyons"). Species that respond to the same set of habitat features were grouped together in **species assemblages** – literally, species assembled together by similar habitat needs.

Conservation strategies for habitat management were written toward the needs of these species assemblages by addressing the conservation issues associated with the maintenance of the key habitat features. For example, one of the 27 Key Habitats is Intermountain Conifer Forests and Woodlands. Goals and objectives for this habitat address natural processes to maintain the structure but they also incorporate the value of this habitat to Nevada's WAP Species of Conservation Priority. Structural attributes of intermountain conifer forests and woodlands important to wildlife such as a mature overstory or the presence of snags and cavities were identified and species were grouped within these features ("species assemblages"). Some species have broad ranges and respond to their prey populations more than particular habitat features (e.g., kit fox), so these species were grouped accordingly. For aquatic species, cold versus hot springs or ephemeral versus permanent water sources are important distinctions for setting conservation objectives. However, for many key habitat types incorporating aquatic species, assemblages of those species are driven as much by the isolation and local endemism of those species as they are by specific structural characteristics of individual aquatic habitats within the key type. Species assemblages are identified for each of the 27 Key Habitats and were formulated through a series of workshops and interviews with species experts in Nevada, supplemented by information available in the

literature describing species requirements.

In addition to habitat-based strategies addressing the needs of species assemblages, actions for individual species are identified. This was necessary when the required action is not habitat-based, or when it involves species-based research or monitoring. Even though the species in question might have broad habitat use patterns, an attempt was made to attach the species-based action to the Key Habitat strategy where it was most likely to have relevance. This was purely an organizational decision that was made to avoid the need to write a separate section for species-based action.

Many of the species-based conservation actions call for the development of **species/habitat relationships models**. These studies and the resultant models basically describe the species-habitat linkage through key habitat features that are used to inform conservation strategy development in this plan. The refinement of knowledge of these relationships will allow better understanding of the habitat features influencing species' distribution on the landscape, create better-informed species assemblages, and develop a more critically-focused conservation strategy with better prospects for success.

## The WAP Conservation Landscape and Focus Areas

The second required element for Nevada's WAP includes describing the locations of key areas essential to the conservation of fish and wildlife species of concern (see section IV. C. Discussion of the Eight Elements for more information). Addressing this element began with a landscape analysis that identified areas in Nevada that represented the highest biodiversity of WAP Species of Conservation Priority.

A Geographic Information System (GIS) was used to calculate the number of documented occurrences of terrestrial wildlife species within Nevada's landscapes (BRRC 2002). The species analyzed included the WAP Species of Conservation Priority described above (see section VII. D. Species Prioritization for details). Terrestrial species identified in the priority matrix have been documented in 600 of the 829 basins and ranges (i.e., landscapes) of Nevada. It is impossible and likely unnecessary to work in all areas to meet conservation

goals for all species. The next step was to refine the analysis and identify the landscapes that are most important for Nevada's fish and wildlife in order to focus conservation efforts to maximize conservation for Species of Conservation Priority. The number of Species of Conservation Priority occurrences for each landscape (i.e., species richness) was calculated, and this process identified 30 landscapes encapsulating 91 percent of the terrestrial species in the analysis. The number of terrestrial species of concern documented within each of these landscapes ranges from 24 to 60. The species that were not captured by the species richness assessment occur in localized areas (i.e., local endemics), and their key landscape was added to the conservation landscapes list. Recognizing that conserving each Species of Conservation Priority once on the landscape does not constitute effective statewide conservation, the 30 landscapes that emerged from this preliminary analysis were supplemented with additional priority areas that were generated from previous conservation efforts (see Appendix G), including priority sage grouse population management units (PMUs), Audubon Important Bird Areas, Intermountain West Joint Venture Bird Habitat Conservation Areas, and important landscapes for game species.

The identification of biologically important areas for aquatic Species of Conservation Priority was based on the same concepts employed for terrestrial wildlife species, but landscape units more meaningful to aquatic species distribution were used. An initial analysis was conducted to identify hydrologic unit codes (HUCs) with aquatic Species of Conservation Priority and their respective species richness values. Out of 72 HUCs in Nevada, 54 contain aquatic Species of Conservation Priority. Twenty-nine of these HUCs represent occurrences of 94 percent of the species from our analysis with 3 to 18 aquatic Species of Conservation Priority present in the HUC. HUCs cover very large areas but aquatic species are not typically widely distributed across the HUC because they are restricted to aquatic habitats. To further refine key areas for aquatic species, a 2-km<sup>2</sup> grid was overlaid on Nevada using GIS and species richness was calculated for the individual cells. This information, combined with expert opinion on important areas for individual Species of Conservation Priority (e.g., Lahontan cutthroat trout), was used to identify

biologically important areas for aquatic Species of Conservation Priority at the watershed scale.

The landscape analysis permitted us to compile a map we refer to as the conservation landscape (Figure 7). The conservation landscape provides information about the location of biologically diverse areas in Nevada, highlights landscapes containing endemic species, and recognizes important areas identified in prior conservation planning efforts. The map does not provide a prioritization of individual landscapes but is intended as an informational resource for strategy development and implementation.

Each key habitat strategy in the Nevada WAP includes

a list of preliminary focal areas derived from the conservation landscape assessment. Preliminary focal areas provide a general overview of key areas for fish and wildlife but by no means are intended to imply that conservation action should be restricted to these areas. Prioritization of key areas in the conservation landscape will be carried out by local working groups during WAP implementation. The conservation landscape provides a framework for evaluating Nevada's WAP in a statewide context to help determine the extent to which conservation actions identified in the 27 key habitat strategies are benefiting the WAP Species of Conservation Priority.

**Table 10. Nevada's Ecological Systems, Key Habitats, and Ecological System Groups**

<b>Ecological System Group</b>	<b>Key Habitat</b>	<b>Ecological System</b>
Basins and Desert Scrub	Intermountain (cold desert) scrub	Inter-mountain Basins Greasewood Flat
		Inter-mountain Basins Mixed Salt Desert Scrub
		Inter-mountain Basins Semi-desert Shrub Steppe
		Inter-mountain Basins Wash
	Mojave mid-elevation mixed desert scrub	Colorado Plateau Blackbrush-Mormon tea Shrubland
		Mojave Mid-elevation Mixed Desert Scrub
Mojave/Sonoran (warm desert) scrub	Mojave/Sonoran (warm desert) scrub	Sonora-Mojave Creosotebush-White Bursage Desert Scrub
		Sonora-Mojave Mixed Salt Desert Scrub
		Sonora-Mojave-Baja Semi-Desert Chaparral
Developed Lands and Agriculture	Agricultural lands	Agriculture
	Developed landscapes	Developed, Medium - High Density
		Developed, Open Space - Low Intensity
Lower Montane	Lower montane chaparral	Great Basin Semi-Desert Chaparral
		Mogollon Chaparral
	Lower montane woodlands	Great Basin Piñon-Juniper Woodland
		Inter-Mountain Basins Juniper Savanna
		Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland
		Rocky Mountain Gambel Oak-Mixed Montane Shrubland
Riparian and Wetlands	Desert playas and ephemeral pools	Inter-Mountain Basins Playa
		North American Warm Desert Playa
	Intermountain rivers and streams	Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland

**Ecological System Group**

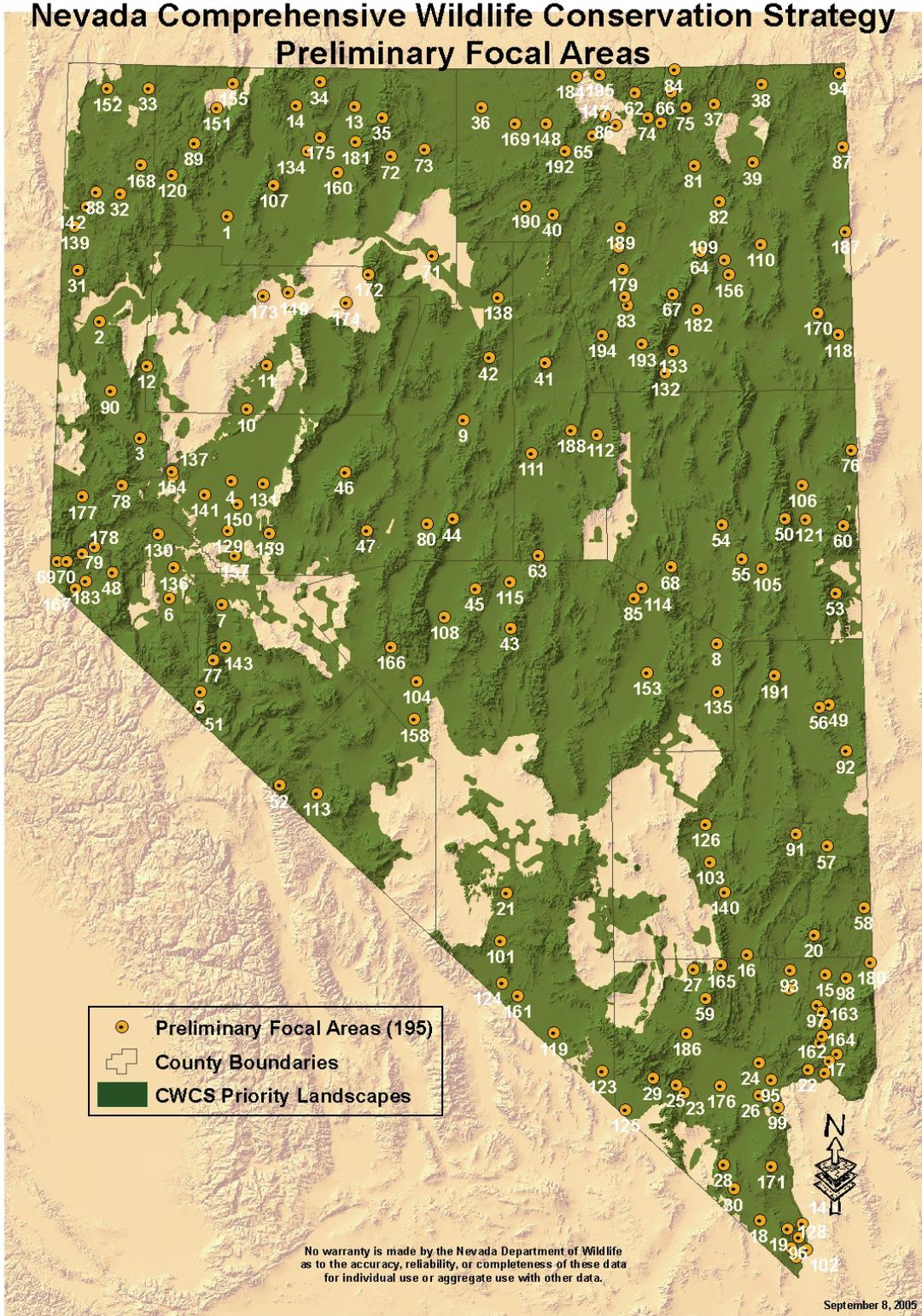
**Key Habitat**

**Ecological System**

		Rocky Mountain Subalpine-Montane Riparian Shrubland
		Rocky Mountain Subalpine-Montane Riparian Woodland
	Lakes and Reservoirs	Open Water
	Marshes	North American Aid West Emergent Marsh
	Mesquite bosques and desert washes	North American Warm Desert Riparian Mesquite Bosque
		North American Warm Desert Wash
	Mojave rivers and streams	Invasive Southwest Riparian Woodland and Shrubland
		North American Warm Desert Lower Montane Riparian Woodland and Shrubland
		North American Warm Desert Riparian Woodland and Shrubland
	Wet Meadows	Mediterranean California Subalpine-Montane Fen
		Rocky Mountain Alpine-Montane Wet Meadow
		Temperate Pacific Montane Wet Meadow
Sagebrush Semidesert	Sagebrush	Great Basin Xeric Mixed Sagebrush Shrubland
		Inter-Mountain Basins Big Sagebrush Shrubland
		Inter-Mountain Basins Big Sagebrush Steppe
		Inter-Mountain Basins Montane Sagebrush Steppe
Sand Dunes and Badlands	Cliffs and Canyon	Colorado Plateau Mixed Bedrock Canyon and Tableland
		Inter-Mountain Basins Cliff and Canyon
		North American Warm Desert Bedrock Cliff and Outcrop
		North American Warm Desert Volcanic Rockland
		Sierra Nevada Cliff and Canyon
	Sand dunes and badlands	Inter-mountain Basins Active and Stabilized Dune
		North American Warm Desert Active and Stabilized Dune
		North American Warm Desert Badland
		North American Warm Desert Pavement
Montane to Alpine	Alpine and tundra	Mediterranean California Alpine Bedrock and Scree
		Rocky Mountain Alpine Bedrock and Scree
		Rocky Mountain Dry Tundra
	Aspen woodland	Inter-Mountain West Aspen-Mixed Conifer Forest and Woodland Complex
		Rocky Mountain Aspen Forest and Woodland
	Grasslands and meadows	Inter-Mountain Basins Semi-Desert Grassland
		North Pacific Montane Grassland
		Rocky Mountain Subalpine Mesic Meadow

Ecological System Group	Key Habitat	Ecological System
		Southern Rocky Mountain Montane-Subalpine Grassland
	Intermountain conifer forests and woodlands	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland Rocky Mountain Bigtooth Maple Ravine Woodland Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland Rocky Mountain Ponderosa Pine Woodland Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland
	Sierra conifer forests and woodlands	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland Mediterranean California Ponderosa-Jeffrey Pine Forest and Woodland Mediterranean California Red Fir Forest and Woodland Northern Pacific Mesic Subalpine Woodland Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland
Other	Barren landscapes	Barren Lands, non-specific Recently Burned Recently Mined or Quarried
	Invasive grasslands and forblands	Invasive Annual and Biennial Forbland Invasive Annual Grassland Invasive Perennial Grassland

ID	Preliminary Focal Area	Tuscarora	Reese River	Soldier Meadows	Silver State Sand Dunes
1	Black Rock Desert	40	80	120	160
2	Smoke Creek desert	41	81	121	161
3	Pyramid Lake Valley	42	82	122	162
4	Lahontan Valley	43	83	123	River Drainage
5	Fletcher	44	84	124	163
6	Mason Valley	45	85	125	164
7	Walker River	46	86	126	165
8	White River Valley	47	87	127	166
9	Carico Lake Valley	48	88	128	167
10	Humboldt Sink	49	89	129	168
11	Lovelock Valley	50	90	130	Creek Drainage
12	Winnemucca Lake Valley	51	91	131	169
13	Quinn River Valley	52	92	133	Owyhee Drainage
14	Kings River Valley	53	94	132	170
15	Mormon Mesa	54	93	134	171
16	Coyote Springs Valley	55	95	135	172
17	Gold Butte-Pakoon	56	96	136	173
18	Piute-El Dorado Valleys	57	97	137	174
19	Newberry Mountains	58	98	138	175
20	Mormon Mountains	59	99	139	176
21	Pahute Mesa	60	100	141	177
22	Black Mountains	61	103	142	178
23	Blue Diamond Hills	62	101	143	179
24	Upper Las Vegas Wash	63	102	144	180
25	Red Rock Canyon	64	104	140	181
28	McCullough Range	65	105	145	182
27	Desert National Wildlife Range	66	106	146	183
26	River Mountains	67	107	147	184
29	Spring Mountains	68	108	148	185
30	Wee-Thump Joshua Tree	69	109	149	186
Wilderness		70	110	150	187
31	Buffalo/Skedaddle	71	111	151	188
32	Massacre	72	112	152	189
33	Sheldon NWR	73	113	153	190
34	Montana Mountains	74	114	154	191
36	Owyhee Desert	75	115	155	192
35	Santa Rosa Range	76	116	156	193
37	O'Neil Basin	77	117	157	Valley
38	Salmon Falls Creek	78	118	158	194
39	Thousand Springs Valley	79	119	159	195



**Figure 13.** Preliminary Focal Areas identified to guide the application of the Nevada WAP.