Open Space and Natural Resource Plan
Natural Resource Inventory and Assessment

Prepared for

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ACRONYMS

ACEC	Area of Critical Environmental Concern
BLM	Bureau of Land Management
GIS	Geographic Information System
NDOW	Nevada Department of Wildlife
NWI	National Wetland Inventory
PMU	Sage Grouse Population Management Unit
ROSP	Reno Open Space Plan
SRT	Science Review Team
SWReGAP	Southwest Regional Gap Analysis Project
USFS	United States Forest Service
WAPT	Wildlife Action Plan Team

1. INTRODUCTION AND BACKGROUND

1.1 BACKGROUND FOR THE PLANNING EFFORT

Open spaces and natural resources are an integral part of life in Washoe County, both today and in the past. From the early history of the region and the promise of a new life in the West, to the captivating beauty of the canyons and mountains, Washoe County has been defined by what the natural world has provided here. For this reason, the Southern Washoe County Regional Open Space and Natural Resource Management planning effort started at the beginning of 2007 to assess and plan for how to manage these resources. It is at once an effort to update the 1994 Washoe County Regional Open Space Plan and create a new Natural Resource Management Plan for the southern portion of Washoe County. The study area in this report includes all of Washoe County south of the northern shores of Pyramid Lake (See figure 1) and south to Carson City. This planning effort represents phase one of a long-term effort to create open space and natural resource management plans for the entire county.

The study area includes the county's urban areas, private lands, public lands, and in some areas a mix of public and private ownership. The region includes extensive tribal lands as well. This assortment of land ownership and uses has created an increase in competition for resource and open space use. From expanding urban centers and communities, to increased water consumption, and outdoor activities – the region's open space and natural resources are experiencing more pressure and use than before. This plan strives to both create a way to best share the experiences and values from the landscape, and conserve them for future use. For everyone in the county, the wide open spaces, striking natural skylines, rich natural and cultural history, and unique ecosystems all make Washoe County a special place for those who call it home.

Preserving this natural value is not without challenges and choices. This plan is not meant to serve as a static inventory of resources and tools– it is a plan for action to maintain, conserve and restore the open spaces and natural resources of the region. To do so the project team assessed the existing state of open space and natural resources, and developed a future vision and set of principles to guide current and future efforts to plan for and manage these resources. Using an extensive technical and public involvement process, development and analysis of scenarios for achieving this vision led to choices about how to manage these resources. Finally, an implementation strategy was prepared with the County and its planning partners within the region to provide the necessary support and tools to ensure the plan achieves its stated vision over time.

1.2 INTRODUCTION: PURPOSE AND ROLE OF THE REPORT

Three inventory and assessment reports were prepared for the plan.

- Natural Resources
- Open Space
- Parks and Recreation

These reports are based on the best available science and studies at this time. No new data was collected, but local resource managers, academic researchers, and local stakeholders and user groups were consulted to bring the best information to the plan. The reports are crafted to be stand-alone documents that support decision-making and planning on the topics they

covered. They provide the framework for the plan and, by including the detailed assessments here; the plan itself is more reader friendly. Because these three reports are meant to be read independently, some overlap occurs between them. Open space, natural resources, and park and recreation all share some components that are addressed in each, though often from different perspectives.

These reports also stop short of recommendations or conclusions. Those are left for the plan itself. Rather, these reports helped the project team develop scenarios for testing local values. These scenarios in turn provided the basis for policy decisions and the final implementation strategy.

It is the project team's intent that these reports will serve future planning and decision-making efforts in the county by serving as a starting point for assessing resources and issues in the region for other planning efforts. Finally, the reports serve as a platform for revisiting the Open Space and Natural Resource Plan as it is reevaluated and updated periodically in the future.

2. RESOURCE SCAN

Natural areas within Washoe County are highly diverse; they encompass a wide variety of habitat types and perform a wide array of functions. This inventory attempts to capture the variety and richness of the Washoe County landscape to the greatest extent possible. The resources considered in this inventory include:

- Biodiversity
- Water quality
- Air quality
- Natural hazards

Each of these resource topics addresses multiple issues associated with the broad resource topic. The scope and range of each of these topics is discussed below.

Biodiversity: This topic is organized around the 23 habitat types located within Washoe County (as identified by the Nevada Department of Wildlife [NDOW]). The section provides a summary of the species supported by the habitat (with a focus on federally listed species and species of identified concern), as well as some of the important functions associated with the habitat type.

Water quality: The water quality section includes discussion of surface water issues associated with water quality (of necessity also touching on water quantity issues). The section also addresses ground water issues, including ground water recharge issues touching on both quality and quantity.

Air quality: The discussion of air quality centers on the factors contributing to the County's difficulties achieving compliance with National Ambient Air Quality Standards (NAAQS) (including the parameters of carbon monoxide, ozone, and particulate matter), as well as the factors contributing to the significant successes in air pollution reduction and how natural resource areas can be contribute to the effort.

Natural hazards: The natural hazards section looks at natural resources from the perspective of the ecosystem services associated with hazard mitigation, as well as opportunities to minimize human/wildlife conflicts. The topics covered include: wildfire; floods; wildlife hazards (focusing on road crossing and aviation issues); and landslide/subsidence.

Each of these sections attempts to set up future discussions about the resources at issue by addressing the following four basic questions:

- Why is the resource import?
- Where is the resource located within the County?
- What are the threats or risks either from or to the resource?
- What are the opportunities, priorities, and existing projects associated with the resource?

The answers to these questions and the data presented will provide the basis for moving into discussions about how to prioritize competing goals and objectives. In addition, this information will help leverage and build off past and currently ongoing opportunities so that the County can maximize its ability to meet natural resource and open space goals. Finally, the questions are also structured to lay the foundation for a discussion of building market opportunities into the plan implementation. Use of market opportunities to fund desired projects will make implementation of the plan both more likely and more efficient.

The data available for the inventory included a wide range of planning documents and GIS mapping. Although some of the data is somewhat dated and some of the GIS data is missing metadata, in general the available information for the County is quite good. In particular, some of the recent planning documents are excellent sources of information on current conditions. The Nevada Wildlife Action Plan was a particularly useful and well-crafted document. The following is a partial list of the data evaluated.

- 2003 Nevada Traffic Crashes, Nevada Department of Transportation, 2003
- 2004-2025 Washoe County Comprehensive Regional Water Management Plan (http://www.co.washoe.nv.us/water/rwmp/index)
- 2007 Nevada Standard Hazard Mitigation Plan, State of Nevada, 2007
- Assessment of Riverine Restoration Potential – Truckee Meadows Flood Control Project, US Army Corps of Engineers, Sacramento District, 2003
- BLM Southern Washoe County Urban Interface Plan Amendment (http://www.nv.blm.gov/carson/Planning_Env_Coord/S_Washoe/s_washoe_plan_ea_final.htm)
- City of Reno Open Space and Greenways Plan (http://www.cityofreno.com/res/comdev/open/)
- Geologic and Natural History Tours in the Reno Area, Special Publication 19, J.V. Tingley, 2005
- Greater Sage-Grouse Conservation Plan for Nevada and Eastern California. First Edition, June 30, 2004. (http://www.ndow.org/wild/conservation/sg/plan/SGPlan063004.pdf)
- Lahontan Audubon Society (http://www.nevadaaudubon.org/)
- Mule Deer Population Dynamics: Issues and Influences. (http://ndow.org/about/pubs/pdf/md_report/muledeer.pdf)
- National Audubon Society – Important Bird Areas (http://iba.audubon.org/iba/stateIndex.do?state=US-NV)
- Natural Resources Portion of TMRPA (Regional Plan) (http://tmrpa.org/regional_plan_16.html)
- The Nature Conservancy Truckee River Project (http://www.nature.org/wherewework/northamerica/states/nevada/preserves/art11312.html)
- Nevada Bat Conservation Plan. Nevada Bat Working Group. Reno, Nevada.
- Reno Master Plan. 2001. City of Reno.
- Revised Nevada Bat Conservation Plan. (http://www.ndow.org/about/pubs/plans/batplan2006-06.pdf)
- State of Nevada Natural Resources Status Report (http://dcnr.nv.gov/nrp01/content.htm)
- The Steamboat Creek Restoration Plan (http://www.des.state.nh.us/WMB/Was/ICMA/documents/SteamboatCreekRestoration.pdf)
- Pyramid Paiute Tribe website (http://www.plpt.nsn.us/environmental/index.htm)

- State of Nevada Standard Multi-Hazard Mitigation Plan, State of Nevada, 2004
- Truckee River Flood Damage Reduction and Ecosystem Restoration Project, Engineering Appendix, Attachment F, US Army Corps of Engineers, 2004
- Truckee River Flood Management Project (http://truckeeflood.us/54/about_trfp.html)
- Washoe County Conservation Element (current) (http://www.washoecounty.us/comdev_files/cp/conservation_element.pdf)
- WAPT (Wildlife Action Plan Team). 2006. Nevada Wildlife Action Plan. Nevada Department of Wildlife, Reno.
- Washoe County Fire Plan, Resource Concepts, Inc, 2007
- Wildlife Hazard Management at Airports: A Manual for Airport Personnel, University of Nebraska, 2005
- Xerces Society – Carson Wandering Skipper information (http://www.xerces.org/Endangered/Carsonwanderingskipper.htm)
- Nevada Wetlands Priority Conservation Plan Technical Review Draft, January 2006
- Nevada Natural Heritage Program Edited by Ed Skudlarek
- Survival Arts of the Primitive Pauite-Margaret "Peg" Wheat
- Nevada Natural Heritage Program (TES plants & animals)

  www.heritage.nv.gov

Although the planning documents available were well crafted and useful, it will be necessary to conduct follow up coordination with resource professionals throughout the County before the document is finalized. In particular, identification of existing restoration projects or the status of previously proposed projects can be difficult to determine from the documents available. The next step – coordination with resource professionals – will complete the picture of natural resource opportunities in Washoe County. This document will be updated based on that coordination.

3. INVENTORY

3.1 Biodiversity Support

3.1.1 Introduction and Description

The biodiversity portion of the Natural Resource Inventory has been structured around ecoregions and the specific habitat types found within them. There are several reasons this organizational approach was selected, including:

- The best existing information and planning on Washoe County wildlife issues is provided by NDOW's Wildlife Action Plan, which is structured around ecoregions and habitats.
- Identification of needs and opportunities will need to be addressed with a geographical component, which is ultimately driven by habitat.
- Any creation of markets for ecosystem services will ultimately need to be organized around wildlife habitats and the ecosystem services they perform.

Accordingly, this section considers the specific habitats found in southern Washoe County (the study area) and evaluates these habitats for the biodiversity support they provide (with a focus on threatened and endangered species – and species of critical concern). The ability of each habitat to perform critical ecosystem services beyond biodiversity support is also considered.

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. Four ecoregions are present within Nevada: Columbia Plateau, Great Basin, Sierra Nevada, and Mojave Desert (WAPT 2006). Of these, the Columbia Plateau, Great Basin, and Sierra Nevada ecoregions overlap into Washoe County. The Great Basin ecoregion comprises a majority of the study area with the Columbia Plateau bordering the northern portion, and the Sierra Nevada ecoregion covering the southwestern portion of the study area.

To address more specific habitat types, eight ecological groups were developed by the Wildlife Action Plan Team. These eight ecological groups were formed based on 27 key habitat types found throughout the state. Because southern Washoe County has a very diverse landscape, 23 of the 27 habitat types are present within the study area, and are addressed in this document. These habitat types include:

- Intermountain Cold Desert Scrub
- Lower Montane Chaparral
- Lower Montane Woodlands
- Desert Playas and Ephemeral Pools
- Intermountain Rivers and Streams
- Lakes and Reservoirs
- Springs and Springbrooks
- Marshes
- Wet Meadows
- Sierran Rivers and Streams

- Sagebrush
- Cliffs and Canyons
- Sand Dunes and Badlands
- Caves and Mines
- Grasslands and Meadows
- Aspen Woodland
- Intermountain Conifer Forests and Woodlands
- Sierra Conifer Forests and Woodlands
- Alpine – Tundra
- Barren Landscapes
- Exotic Grasslands and Forblands
- Developed Landscapes
- Agricultural Lands

Of the 27 key habitats, the following four are not found within southern Washoe County and are not addressed in this document:

- Mojave/Sonoran Warm Desert Scrub
- Mojave Mid-Elevation Mixed Desert Scrub
- Mojave Rivers and Streams
- Mesquite Bosques and Desert Washes

3.1.2 Key Habitats

A discussion of each habitat type's importance (e.g., species support, ecosystem services performed, etc.), its location within the study area, opportunities and constraints, and priorities and projects relating to each habitat type are summarized below.

3.1.3 Basins and Desert Scrubs

3.1.3.1 Intermountain (Cold Desert) Scrub

Why is it important? – The Intermountain (Cold Desert) Scrub habitat is defined by wide temperature extremes (minus 20 degrees Fahrenheit [°F] to 110°F) and little precipitation (less than 10 inches per year) (WAPT 2006). Distribution of the habitat type generally follows the valley bottoms found within the study area. Plant community composition is largely influenced by soil salinity and drainage characteristics, and generally dominated by the presence of a variety of salt-tolerant shrubs such as shadescale *(Atriplex confertifolia)*, greasewood *(Sarcobatus vermiculatus)*, and/or winterfat *(Krascheninnikovia lanata)*.

Examples of the vegetation composition within this habitat type include (species in italics are currently listed on the Washoe County Rare Species List):

- *Oryctes*
- Shadscale
- Quailbush

- Fourwing saltbush
- Greasewood
- Winterfat
- Iodinebush
- Indian ricegrass

Invasion of exotic plant species within this habitat type include:

- Cheatgrass
- Halogeton
- Russian thistle
- Saltcedar

A summary of functions performed and the species supported by this habitat is provided below:

- The Intermountain Cold Desert Scrub habitat contains soils that tend to be loose and either sandy or gravelly and are easily excavated by denning or burrowing animals. The habitat also supports ricegrass and shadscale seeds, two important sources of forage for wildlife such as scorpions, bats, rabbits, falcons, squirrels, and passerine birds (WAPT 2006).
- Intermountain Cold Desert Scrub habitat types also function as conduits for surface runoff and subsoil moisture, thus, contain unique attributes that support particular terrestrial species, such as endemic amphibians (WAPT 2006). By retaining higher soil moisture than surrounding upland areas, the habitat can serve as movement pathways for migrating species, facilitating species distribution across the landscape, and serving an important role in amphibian metapopulation maintenance (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Intermountain (Cold Desert) Scrub habitat type and which require conservation to prevent becoming threatened or endangered (species in italics are currently listed on the Washoe County Rare Species List).

- *Ferruginous hawk*
- Loggerhead shrike
- Sage sparrow
- Brewer's sparrow
- Burrowing owl
- Pale kangaroo mouse
- Dark kangaroo mouse
- Long-Nosed leopard lizard
- Kit fox
- Great Basin collared lizard
- Bald eagle

- Pallid bat
- Desert Horned lizard

Where does it occur? – The Intermountain (Cold Desert) Scrub key habitat type is found primarily within the valley bottoms of the northern and eastern boundaries of southern Washoe County, within areas of little precipitation (Map Figure 2).

What are threats, risks? – Various uses, including motorized vehicle activity, have resulted in the reduction or removal of important native seed-bearing grasses and forbs, structural damage to shrubs, and soil disturbance leading to erosion (WAPT 2006). These impacts have, and if not managed, will, cause a reduction of native understory vegetation, a loss of cover, nesting/denning, and forage habitat for wildlife, and lead to an increase in non-native invasive species. The replacement of native vegetation with invasive species often reduces the areas resistance to fire. Localized areas are also vulnerable to over-harvest of reptiles, such as the Great Basin collared lizard (*Crotaphytus bicinctores*), for commercial trade (WAPT 2006).

Disturbances, such as encroachment of urban/suburban areas, results in a loss of habitat area and functions that help support the key species listed above. Development within this habitat will reduce the ability of the landscape to act as natural washes, potentially leading to increased surface runoff and flooding. Furthermore, activities associated with development provide conduits for invasive species, resulting in a loss of vegetation diversity. The loss of natural vegetation structures diminishes the quality of the habitat as well as the aesthetic aspect of the landscape.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- Acquisition of lands in Spanish Springs, Warm Springs north to the Pyramid Lake Indian Reservation, and along the eastern portion of Washoe County in the low valleys.

3.1.4 Lower Montane

3.1.4.1 Lower Montane Chaparral

Why is it important? – Chaparral habitat occupies side slope regions between low-elevation desert landscapes and piñon-juniper woodlands (WAPT 2006). The habitat is characterized by hot dry summers and cool moist winters and is dominated by small-leaved evergreen shrubs (WAPT 2006).

Examples of the vegetation composition within this habitat type include:

- Utah and western juniper
- Single leaf pinon
- Greenleaf manzanita
- Ceanothus or snow brush
- Curl-leaf mountain mahogany

A summary of functions performed and the species supported by this habitat is provided below:

- Chaparral habitat supports thickets of vegetation that provides abundant cover and forage for birds and small mammals. Many of the plant species, including curl-leaf mountain mahogany (*Cercocarpus ledifolius*),which the Chaparral habitat supports, provide seeds and fruits for a wide variety of wildlife and particularly serve as an important winter food source for mule deer *(Odocoileus hemionus)* (mule deer range is shown on Map Figure 3).
- Most Chaparral species are fire-adapted, thus, after a burn, Chaparral stands provide habitat within previously montane woodland areas until the climax montane woodland species regain dominance (WAPT 2006). Fire is an agent that can cause dramatic and undesirable shifts in vegetation and community health; however, chaparral is resilient and fire is an important element of regeneration and perpetuation of this habitat (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Lower Montane Chaparral habitat type and which require conservation to prevent becoming threatened or endangered (species in italics are currently listed on the Washoe County Rare Species List).

- *Mountain quail*
- California bighorn sheep
- Mule deer
- Brush mouse
- Desert horned lizard

Where does it occur? – The Lower Montane Chaparral key habitat type is found primarily within the south/central portion of southern Washoe County, including the upper portions of Peavine Mountain, the Virginia Range and the slopes of the Carson Range (Map Figure 4).

What are threats, risks? – Located within typically rocky areas and containing a small grass and forb component, Lower montane chaparral habitat types tend to be less conducive to land uses that can lead to habitat degradation; thus, most areas of Lower Montane Chaparral is undisturbed (WAPT 2006). However, areas located in a less rocky environment can be utilized for various purposes, such as development, rendering the habitat vulnerable to disturbance (WAPT 2006).

A loss of Lower Montane Chaparral reduces important winter forage areas and disrupts connectivity between key habitat areas used by species such as mule deer and mountain quail (*Oreortyx pictus*).

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? - Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- Acquisition of lands on the southern side of Peavine and the foothills of the Carson Range

3.1.4.2 Lower Montane Woodlands

Why is it important? – Lower Montane Woodlands habitats are dominated by piñon-junipers (single leaf pinon pine (*Pinus monophylla*) and Utah Juniper (*Juniperous osteosperma*)). Lower Montane Woodlands habitat is generally found between 5,000 and 8,000 feet in elevation and, because of its ability to survive in dry landscapes, often occurs in pure stands. However, physical features can vary between habitat areas depending on local precipitation and temperature patterns.

Examples of the vegetation composition within this habitat type include:

- Utah, western, Rocky Mountain, and/or California juniper
- Single leaf pinon
- Ponderosa and Jeffrey pine
- White fir
- Rabbitbrush
- Sagebrush
- Curl-leaf mountain mahogany
- Greenleaf manzanita
- Bitterbrush
- Indian paintbrush
- Serviceberry

Invasion of exotic plant species within this habitat type include:

- Cheatgrass

A summary of functions performed and the species supported by this habitat is provided below:

- Lower Montane Woodlands provide a variety of functions for wildlife, including cover, areas for nesting, and forage. As this habitat type is dominated by an evergreen cover, the forests provide important thermal protection for wildlife during winter and shelter from summer's intense sun (WAPT 2006).
- Besides providing cover, roosting, and nest sites for birds, bats, and small mammals, an important function provided by piñon-juniper woodlands is the production of piñon nut crop, which is used both by humans (including a Native American tradition that dates back for millennia) and wildlife (WAPT 2006).
- The juniper berry crop is an important food resource for birds and small mammals, and serviceberry provides food for deer and black bears (*Ursus americanus*) (Map Figure 5). For birds and bats in particular, the piñon-juniper woodland provides habitat that would otherwise be missing from shrub dominated mid-elevation cold desert habitats (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Lower Montane Woodlands habitat type and which require conservation to avoid becoming threatened or endangered (species in italics are currently listed on the Washoe County Rare Species List).

- *Ferruginous hawk*

- *Fringed myotis*
- *Spotted bat*
- *Townsend's big-eared bat*
- *Western small-footed myotis*
- Long eared owl

Where does it occur? – The Lower Montane Woodlands key habitat type is found throughout southern Washoe County, primarily between the elevations of 5,000 and 8,000 feet in elevation (Map Figure 6).

What are threats, risks? - Within pinyon-juniper woodlands, a threat of significant change in vegetation structure has occurred, and may continue to be a threat, because of fire management activities which have caused the absence of small non-replacement fires over long intervals and the spread of crowning fires to woodlands from adjacent shrub types.

Also, recreational activities within the habitat type can cause a disturbance to wildlife movements, behavior, and reproductive success, as well as the introduction of invasive species such as cheatgrass (*Bromus tectorum*) (WAPT 2006). Another threat to this habitat type are certain land management practices "type conversions" to reduce the encroachment of the pinyon-juniper community into the sagebrush-steppe community.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- Acquisition of lands in the Virginia Range
- Acquisition of lands within the southern side of Peavine

3.1.5 Riparian and Wetlands

3.1.5.1 Desert Playas and Ephemeral Pools

Why is it important? – Desert playas and ephemeral pool key habitats are typically found on the valley bottoms in the intermountain and warm desert regions. Desert playas are lakes which seasonally transition from wet to dry, or almost dry, from season to season. Within southern Washoe County, Swan, White, and Silver Lakes are examples of playas. Playas are formed by intermittent flooding and evaporation that precipitates fine soils and mineral salts to form an impermeable layer within flat depressions (WAPT 2006).

Ephemeral pools are bodies of water that only exists for a few days following precipitation or snowmelt. Ephemeral pools range in size from small rock basins to large vernal lakes (WAPT 2006).

Examples of the vegetation composition within this habitat type include (species in italics are currently listed on the Washoe County Rare Species List):

- *Williams combleaf*
- *Playa phacelia*

- Saltgrass
- Iodinebush
- Greasewood
- Baltic rush
- Smartweed
- Sedges
- Spikerush
- Cattails
- Hardstem and alkali bulrush
- Pondweed
- Arrowhead

A summary of functions performed and the species supported by this habitat is provided below:

- Most playas and ephemeral pools do not have permanent sources of water; therefore, the value of playas to wildlife is largely ephemeral in nature and support primarily an invertebrate-shorebird system (WAPT 2006). When playas are inundated for an extended period of time, they can produce a diversity of vegetation and large volumes of aquatic invertebrates; these features provide migration, nesting, and foraging habitat for a myriad of waterfowl, shorebirds, and small water birds (WAPT 2006).
- Ephemeral pools play a critical role in desert systems for maintaining populations of aquatic invertebrates such as brine, fairy, clam, and tadpole shrimp, and also provide an important function to certain amphibian species. As temporary surface water features within arid regions, ephemeral pools provide connectivity between core habitat areas of more permanent water features (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Desert Playas and Ephemeral Pools habitat type and which require conservation to avoid becoming threatened or endangered (species in italics are currently listed on the Washoe County Rare Species List).

- *Black tern*
- American avocet
- Black-necked stilt
- Cinnamon teal
- Eared grebe
- Forster's tern
- Long-billed curlew
- Northern pintail
- Snowy egret
- Snowy plover

- Willet
- Franklin's gull
- Least sandpiper
- Long-billed dowitcher
- Red-necked phalarope
- Northern leopard frog
- Tundra swan

Where does it occur? – The Desert Playas and Ephemeral Pools key habitat type are scattered in small pockets throughout the study area. The most significant playa lakes are Swan and Silver Lakes, found within the central portion of southern Washoe County (Map Figure 7).

What are threats, risks? – Threats to playas and ephemeral pools exist when land uses, including mining and recreation, alter their normal hydrologic function. Ephemeral pools have a higher potential for alteration because of their limited size, undocumented diversity, and a poor understanding of their importance to maintenance of arid land ecosystem function. However, their characteristics as natural sinks for capture of runoff and surface water somewhat limits their potential for disturbance, particularly from development, because of drainage issues and higher soil moisture (WAPT 2006).

A loss of this habitat type would impact numerous bird and amphibian species, many of them species of conservation concern, which rely on playas and ephemeral pools. Also, species composition within pools can vary significantly with some systems supporting endemic species. These endemic species, including undocumented species, may be lost if disturbance to the pools occurs (WAPT 2006).

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- (None identified within documents reviewed – additional research being conducted)

3.1.5.2 Intermountain Rivers and Streams

Why is it important? – Intermountain Streams and Rivers habitat within southern Washoe County consists primarily of the Truckee River and its tributaries, especially Steamboat Creek. The Truckee River is one of only a few terminal rivers in the United States, beginning and ending in a lake (City of Reno 2001). The Truckee River flows approximately 100 miles from Lake Tahoe to Pyramid Lake, running through the towns of Reno and Sparks along the way. The Truckee River is a major source of water for the study area. Within the study area, the Truckee River is considered the most significant natural resource and is viewed as "a natural catalyst and theme for public and private investment/reinvestment in parks, cultural facilities and downtown" (City of Reno 2001).

Examples of the vegetation composition within this habitat type include:

- Fremont cottonwood

- Aspen
- Mountain alder
- Birch
- Sandbar, arroyo, yellow, and Pacific willows
- Wild Rose
- Red-osier dogwood
- Buffaloberry
- Chokecherry
- Saltgrass
- Greasewood
- Sagebrush
- Creeping wildrye
- Wildrye
- Western needlegrass

Invasion of exotic plant species within this habitat type include:

- Saltcedar
- Russian olive
- Perennial pepperweed

A summary of functions performed and the species supported by this habitat is provided below:

- The Truckee River and its tributaries not only provide critical year-round water for wildlife, but also support riparian communities which are limited throughout the state, as well as the study area. The riparian communities associated with intermountain streams and rivers are the most productive habitats in the study area and are critical centers of wildlife diversity. More than 75 percent of the species in Nevada are strongly associated with riparian vegetation, including 80 percent of the birds (WAPT 2006). Streams, rivers, and their associated riparian areas provide the production of food and food sources, nest and den sites, refugia from predators, thermal cover, and migration corridors.
- Intermountain streams and rivers provide important migration corridors for big game within habitats that have been fragmented.
- The Truckee River is also an important resource to the Pyramid Lake Pauite Tribe, the Washoe, and RSIC, as a resource for fishing, and gathering of material for baskets and food/medicine.
- Wetland and backwater areas along the Truckee River function as filters to improve water quality and provide flood control and ground water recharge.

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Intermountain Rivers and Streams habitat type and which require conservation to prevent becoming threatened or endangered (species in bold are currently federally listed as

threatened or endangered, species in italics are listed on the Washoe County Rare Species List).

- **Lahontan cutthroat trout (T)**
- **Cui-ui (E)**
- *Mountain quail*
- *Northern goshawk*
- *Swainson's hawk*
- *Yellow billed cuckoo*
- *California floater*
- Rufous hummingbird
- Virginia's warbler
- Willow flycatcher
- Cassin's finch
- Bald eagle
- Lewis's woodpecker
- Snowy plover
- Vagrant shrew
- Water shrew
- Western jumping mouse

Where does it occur? – The Truckee River and its tributaries are the main instances of the Intermountain Rivers and Streams key habitat type. The Truckee River flows east from Lake Tahoe, through Reno and Sparks, and then turns north to its terminus at Pyramid Lake (Map Figure 8).

What are threats, risks? - All aquatic habitat systems in Intermountain rivers and streams have been altered or modified to some degree from historic conditions through actions such as channelization, construction of dams, regulation of flows or diversion of flows for agriculture, grazing, recreational and urban development, and the introduction of nonnative aquatic species, as well as invasive/noxious weeds such as saltcedar *(Tamarix ramosissima)*, Russian olive *(Elaeagnus angustifolius)* and perennial pepperweed *(Lepidium latifolium)*. The levels of these alterations range from severe, on the lower Truckee River where river flows are highly regulated and substantially diverted for agriculture (at times leaving the Truckee River completely dry), to relatively minor in some montane stream drainage systems (WAPT 2006).

The following threats/risks are associated with Intermountain Rivers and Streams habitats:

- A decrease in water due to allocation, which has an adverse effect on fish, wildlife, water quality, water quantity, and riverine ecosystems.
- Construction of diversions and dams, which modify hydrologic regimes, interrupt natural flow dynamics that result in modified channel and floodplain processes, fragments aquatic habitats, and creates barriers to fish movement and migration.

- A decrease in quantity and quality of riparian areas caused by development, which has an adverse effect on flood control, water quality, and fish and wildlife habitat.
- Displacement of native species by invasive species.
- Reduction in riverine wetlands, which has an adverse effect on water quality, water quantity, flood control, and fish and wildlife habitat.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- Truckee River Flood Management Restoration Projects.
- Steamboat Creek Restoration Plan.
- The Nature Conservancys(TNC) McCarran Ranch Restoration Project.
- TNC, Washoe County, BLM, City of Reno restoration projects at Lockwood, Mustang and 102 Ranch.
- Additional acquisitions along the Truckee River and it's tributaries.

3.1.5.3 Lakes and Reservoirs

Why is it important? – The Lakes and reservoirs key habitat includes areas of open water, generally with less than 25 percent cover of vegetation or soil, including natural lakes, impoundments, and montane pools (WAPT 2006). Only a handful of water bodies within Nevada are large in size; these include Lake Tahoe, Pyramid Lake, Walker Lake, Lake Mead, and Lake Mohave. Pyramid Lake and Walker Lake, which are terminal lakes, are the only two remnants of the ancient Pleistocene Lake Lahonton. Of these, Pyramid Lake, which is recognized as a preliminary focal area by the Wildlife Action Plan Team, and Lake Tahoe are both partially located within southern Washoe County. Numerous smaller water bodies are located within the study area, including Washoe Lake, Swan Lake, and Silver Lake. Swan and Silver Lakes are playa lakes and are described below as their own habitat type.

Examples of the vegetation composition within this habitat type include (species in italics are currently listed on the Washoe County Rare Species List):

- *Tahoe yellowcress* (found at Lake Tahoe)
- Cattails
- Hardstem and alkali bulrush
- Pondweed
- Arrowhead

Invasion of exotic plant species within this habitat type include:

- Eurasian watermilfoil (found in Lake Tahoe)

A summary of functions performed and the species supported by this habitat is provided below:

- Open areas of water such as lakes and reservoirs provide many functions for multiple species, including: connectivity between habitat types, areas for breeding, forage habitat, and refugia habitat. Lakes and reservoirs also contain shorelines which provide emergent vegetation and transitional areas between aquatic and terrestrial habitat types.
- Terminal lakes are unique to arid landscapes characterized by basin and range topography creating closed hydrographic drainage basins. These conditions provide functions which result in unique vegetation and species assemblages (WAPT 2006). Playa lakes are generally dry in the summer months, but inundated during the winter months. While the playa itself may lack vegetation, they are commonly ringed by adaptive vegetation that provides forage material for wildlife.
- Open bodies of waters such as montane pools provide an important role for wildlife by providing permanent or seasonal open water and shoreline emergent habitat types in areas otherwise devoid of aquatic habitats or dominated by flowing water systems (WAPT 2006).
- Also, these lakes are within the Pacific flyway, providing a resting site for migrating birds.

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Lakes and Reservoirs habitat type and which require conservation to prevent becoming threatened or endangered (species in bold are currently federally listed as threatened or endangered, species in italics are currently listed on the Washoe County Rare Species List).

- **Lahontan cutthroat trout (T)**
- **Cui-ui (E)**
- *Black tern*
- *Common loon*
- American white pelican
- Clark's grebe
- Eared grebe
- Forster's tern
- Western grebe
- Bald eagle
- Peregrine falcon
- American avocet
- Black-necked stilt
- Long-billed curlew
- Snowy plover
- Northern leopard frog

This list does not include species found within man-made reservoirs/impoundments.

Where does it occur? – Major lakes within southern Washoe County include Pyramid Lake, which is located in the northern portion of the study area, and Lake Tahoe and Washoe Lake, both of which are located within the southern portions of the study area. Map Figure 9 depicts locations of lakes and reservoirs within southern Washoe County.

What are threats, risks? – Threats to open water habitat include, but are not limited to, encroachment of urban/suburban development, groundwater development, irrigation diversion, industrial discharge, groundwater contaminants, invasive species such as Quagga mussel *(Dreissena bugensis)* and Eurasian watermilfoil (*Myriophyllum spicatum*) (found in Lake Tahoe), and recreation development.

The growing demand for water for municipal water supply, recreation, etc. within the study area is threatening the health, and potential loss, of open water habitat (WAPT 2006). Impacts to water resources interrupt natural flow regimes, groundwater recharge and maintenance, water quality and chemistry, and near-shore and shoreline habitat. Loss of habitat quality indirectly leads to disturbance to wildlife movements, behavior, reproductive success, or displacement (WAPT 2006).

Degradation of open water habitats results in the loss of its ability to maintain native aquatic species, support unique endemic vertebrate and invertebrate species assemblages, as well as waterfowl and other wildlife species that depend on this habitat for forage and refuge (WAPT 2006).

A loss of this habitat type also reduces areas of recreation, power generation, and water for human use, all of which are important to the population of the study area but also causes disturbance that lead to the disturbance of the habitat type. A loss, or degradation, of open water areas also diminishes the aesthetic value of the habitat.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- The Truckee River Operating Agreement is aimed at increasing the instream flow of the Truckee River and increasing the water level in Pyramid Lake.
- Wetland Restoration projects at Lake Tahoe to reduce sediment and runoff and protect against loss of lake clarity.
- Restoration projects along the upper and lower sections of the Truckee River.
- Weed Eradication projects along the Truckee River and its tributaries.

3.1.5.4 Springs and Springbrooks

Why is it important? – A spring occurs where deep or shallow groundwater flows from bedrock or natural fill onto the land surface and forms surface flow or a body of water. Springbrooks are the areas of flowing water linked to the spring source. Springs are generally divided into three main categories: cold springs (springs near or below mean annual air temperature), warm or thermal springs (springs 5 to 10°C (41 to 50°F) above mean annual air temperature), and hot springs (springs more than 10°C (50°F) above mean annual air temperature) (WAPT 2006).

Examples of the vegetation composition within this habitat type include (species in bold are currently federally listed as threatened or endangered, species in italics are listed on the Washoe County Rare Species List):

- **Steamboat buckwheat**
- *Steamboat monkeyflower*
- Hardstem bulrush
- Sedge
- Spikerush

A summary of functions performed and the species supported by this habitat is provided below:

- Springs and springbrooks, although relatively small in size, can support important populations of endemic gastropods and other aquatic invertebrates and provide important habitat for wildlife species (WAPT 2006). The characteristics of individual spring and spring brook systems can vary greatly in terms of thermal, flow, and water chemistry, thus provide a diversity of habitat types for terrestrial and aquatic wildlife species (WAPT 2006).
- A key role of thermal aquatic systems, such as springs, is that fish are able to move within the system to meet their temperature needs; utilizing warmer water near the spring source during winter months, while using cooler outflow systems during the summer (WAPT 2006).
- Springs also play an important role in the distribution or morphology of underground flow systems and surface water availability (WAPT 2006). Springs provide a vital water source between infrequent surface waters and during times of drought, for a wide variety of resident and migratory wildlife species such as bighorn sheep *(Ovis canadensis*, Map Figure 10) pronghorn antelope (*Antilocapra Americana*, Map Figure 11), deer, birds and bats (WAPT 2006).
- Springs provide crucial habitat to many federally-listed and state protected aquatic species. Also, many unique fishes are endemic to spring and springbrook habitats, as well as a number of endemic spring-dwelling plants and macroinvertebrates (primarily gastropods and aquatic insects). An example is the Steamboat buckwheat (*Eriogonum ovalifolium* var. *williamsiae*), which is a federally listed endangered plant species that occupies a single site in the Steamboat Springs geothermal area of southern Washoe County. Another example is the Steamboat monkeyflower, which occupies barren/geothermal landscapes.
- Another example of a listed species closely associated to spring habitat (within grassland), and the presence of saltgrass (*Distichlis spicata)*, is the endangered Carson's wandering skipper (*Pseudocopaeodes eunus obscurus*). The Carson wandering skipper is a small butterfly of which at the time of listing (2002), only two extant populations were known, one of which occurs in northern portion of the study area (Warm Springs Valley) (USFWS 2005). Five individuals were found in an approximately 30 acre area owned primarily by the BLM (USFWS 2005).

Because each spring, or spring system, is unique, over 50 different species of gastropods potentially could be supported by one type of spring or another, and each of which could require conservation as to not become threatened or endangered. For a complete list of species please see the Nevada Wildlife Action Plan, 2006.

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Spring and Springbrook habitat type and which listed on the Washoe County Rare Species List.

- *Pyramid Lake pebblesnail*
- *Virginia Mountains pebblesnail*
- *Fly Ranch pyrg*
- *Western Lahontan springsnail*

Where does it occur? – Numerous springs and springbrooks are scattered in small pockets throughout the study area, mostly within the northern portion (Map Figure 12).

What are threats, risks? – Similar to the above mentioned water-associated habitats, dewatering activities, urban/suburban development, recreation, and livestock grazing have altered spring and springbrook habitats (WAPT 2006). These impacts have resulted in the introduction of nonnative aquatic organisms which have significantly impacted resident endemic species through competition and predation and represent the single greatest threat to a number of species of high conservation need (WAPT 2006).

Groundwater pumping and dewatering activities can, and have, caused temporary and/or permanent degradation to habitat conditions, resulting in declines in sensitive plants and animal populations, and possibly species extinctions (WAPT 2006). 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 vegetative communities, resulting in degradation and/or loss of wildlife habitat (WAPT 2006).

Recreational activities and improper grazing practices can also cause significant damage to spring habitats by eliminating vegetation and trampling of the substrate, which leads to topsoil loss (erosion) and to "sealing" of the spring in areas of high clay content (WAPT 2006). Also, because springs are often supplied by shallow aquifers, they are susceptible to pollution caused by recreation and or development activities.

A loss of spring habitat is a significant concern because of the critical importance of spring resources as a source of surface water for terrestrial wildlife and also because many springs and seeps of all sizes support unique endemic aquatic biota (WAPT 2006). Also many spring sites are also important cultural resource sites and should be maintained or acquired based on cultural significance.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? - Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- An MOU for recreational and interpretive development of Steamboat ACEC exists between the BLM Carson City District and Washoe County Regional Parks and Open Space Department.
- Acquisition of springs in the Warm Springs and the Winnemucca Ranch areas.

3.1.5.5 Marshes

Why is it important? – A marsh is a type of wetland featuring predominantly herbaceous plant species and possibly low-growing woody plants. The length and extent of soil saturation, depth and seasonality of standing surface water, and degree of water salinity influences the type of vegetation a marsh will contain. A single site often carries the seed and root stocks to exhibit very different plant communities depending on the extent and duration of water available at the site (WAPT 2006).

Examples of the vegetation composition within this habitat type include:

- Alkali and hardstem bulrush
- Sago pondweed
- Baltic rush
- Smartweeds
- Sedges
- Spikerush
- Cattail

A summary of functions performed and the species supported by this habitat is provided below:

- Marshes are among the most significant wetland types found within the study area (WAPT 2006). Marshes potentially provide free-standing water for wildlife, vegetation for game and bird species, habitat for insects, which in turn supports bats and insectivorous birds; and habitat relied upon by amphibians to meet their life history requirements. Wetlands, such as marshes, also provide flood control and act as sediment traps and pollution filtration systems, such as in the Southeast Truckee Meadows area.
- The presence of marshes is critical to both breeding and migratory needs of many species of birds. Marshes produce abundant populations of macro invertebrates that are the basis of food chains upon which hundreds of thousands of migrating shorebirds are dependent to restore the fat reserves critical to reaching their breeding and wintering destinations (WAPT 2006).
- Marshes that contain standing water year-round, or for a majority of the year, have a particular importance for endemic fish species (WAPT 2006). Also, permanent and ephemeral marshes are a critical landscape feature providing habitat for all life stages of amphibian species (WAPT 2006).
- Very important for cultural resources and practices, gathering of cattail and tule for duck decoys, tule boats, hunting, fishing, gathering of plant material.

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Marsh habitat type and which require conservation to prevent becoming threatened or endangered (species in italics are currently listed on the Washoe County Rare Species List).

- *Ferruginous hawk*
- *White faced Ibis*

- *Black tern*
- American avocet
- Black-necked stilt
- Cinnamon teal
- Eared grebe
- Western grebe
- Clark's grebe
- Canvasback
- Forster's tern
- Long-billed curlew
- Northern pintail
- Snowy egret
- Snowy plover
- Willet
- Franklin's gull
- Least sandpiper
- Short eared owl
- Bald eagle
- Peregrine falcon
- Long-billed dowitcher
- Red-necked phalarope
- Northern leopard frog

Marshes, depending on the depth and seasonality of standing surface water, and degree of water salinity of the marsh, also may provide habitat for a number of fish species that are considered as conservation species, such as chub, pupfish, dace, and springfish.

Where does it occur? – Marshes are scattered throughout the study area and can mainly be found in the Washoe Lake area, southern Spanish Springs Valley (Lazy Five and Kiley Ranch) portions of the Southeast Truckee Meadows along Steamboat Creek, the Truckee River Delta at Pyramid Lake, and portions of Swan Lake (Map Figure 13).

What are threats, risks? – Marshes within the study area are a limited resource; and as a result of anthropogenic disturbance, including urban/suburban development, the modification or development of water sources, motorized recreational activity, and livestock grazing and watering, marshes are facing permanent or temporary modification to the point of compromising habitat value for wildlife (WAPT 2006).

A loss or degradation of these sites will result in reduced vegetation composition and structure, a loss of forage, nesting, and refugia habitat for wildlife, altered groundwater flow and recharge patterns, a negative impact on water quality, and an increase of invasive weeds (WAPT 2006).

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- In some limited locations, the abandonment or reversion of lands historically converted for agriculture has allowed restoration of former wetland and marsh habitats, although significant challenges remain because of alterations to flow and drainage patterns and loss of mesic soil types.
- Where water rights have been successfully secured to maintain wetlands, habitat quality is high and a variety of wetland management objectives can be met on a cyclic basis in concert with natural regional climatic cycles.
- Southern Washoe Lake wetland mitigation site.
- The donation and/or acquisition of the Kiley Ranch Wetlands.
- Restoration of Steamboat Creek starting at the headwaters in Little Washoe Lake.
- Designation of Swan Lake as a jurisdictional water, thus available to receive in-lieu funding for wetland restoration.

3.1.5.6 Wet Meadows

Why is it important? – Wet meadow ecological systems include a variety of subtly different pocket grasslands, depending on the soils and hydrological regimes (WAPT 2006). Wet meadows can occur in open saturated depressions, in basins and flats among montane and subalpine forests, and at or above the tree-line in the alpine zone (WAPT 2006).

Examples of the vegetation composition within this habitat type include (species in italics are currently listed on the Washoe County Rare Species List):

- *Lemmon milkvetch*
- Camassia
- Various sedges and rushes
- Shooting star
- False hellbore
- Lodgepole pine
- Cottonwoods, willows and/or birch

A summary of functions performed and the species supported by this habitat is provided below:

- Though small in extent throughout the study area, wet meadows add significantly to the diversity of landscapes where they do occur (WAPT 2006). Wet meadows, along with freshwater marshes, are the most significant wetland types found within the study area. Wet meadows potentially provide free-standing water for wildlife, vegetation for game species such as deer, antelope, and birds, habitat for insects, which in turn support bats and insectivorous birds, and habitat relied upon by

amphibians to meet their life history requirements. Wet meadows also provide flood control and serve as sediment traps and pollution filtration systems.

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Wet Meadow habitat type and which require conservation to prevent becoming threatened or endangered (species in bold are currently federally listed as threatened or endangered).

- Greater sandhill crane
- Willow flycatcher
- Cinnamon teal
- Long-billed curlew
- Northern pintail
- Willet
- Short eared owl
- Northern leopard frog
- Broad-footed mole
- Inyo shrew
- Merriam's shrew
- Montane shrew
- Vagrant shrew
- Western jumping mouse

Where does it occur? – Wet meadows are scattered throughout the study area and can mainly be found in the Washoe Lake area, southern Spanish Springs Valley, portions of the Southeast Truckee Meadows along Steamboat Creek, the Truckee River Delta at Pyramid Lake, and throughout the Lake Tahoe Basin (Map Figure 14).

What are threats, risks? – As a result of anthropogenic disturbance, including urban/suburban development, the modification or development of water sources, motorized recreational activity, and livestock grazing and watering, wet meadows are facing permanent or temporary modification to the point of compromising habitat value for wildlife (WAPT 2006).

Wet meadows within the study area are a limited resource. A loss of these sites will lead to reduced vegetation composition and structure, a loss of forage, nesting, and refugia habitat for wildlife, altered groundwater flow and recharge patterns, erosion, a negative impact on water quality, and an increase of invasive weeds (WAPT 2006).

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- Where water rights have been successfully secured to maintain wetlands, habitat quality is high and a variety of wetland management objectives can be met on a cyclic basis in concert with natural regional climatic cycles.
- Kiley Ranch Wetlands and meadows for wandering skipper habitat.
- Steamboat Creek Restoration Project.
- Winnemucca Ranch wet meadows.
- Wet meadows in the Lake Tahoe Basin.

3.1.5.7 Sierran Rivers and Streams

Why is it important? – The Sierran Rivers and Streams habitat type contain perennial streams that form the headwaters of all three of Nevada's western rivers (Truckee, Carson, and Walker), of which, the Truckee River flows through the middle of the study area (WAPT 2006).

Examples of the vegetation composition within this habitat type include:

- Black cottonwood
- Lodgepole and Jeffrey pine
- Mountain alder
- Dogwood
- Chokecherry
- Wild Rose
- Bittercherry
- Red elderberry
- Sierra currant

A summary of functions performed and the species supported by this habitat is provided below:

- The Sierra Nevada Ecoregion receives the greatest precipitation of any landscape in the state, predominantly in the form of snow (WAPT 2006). With significant moisture, the ecoregion sustains perennial streams, which in turn provides riparian communities that support a diversity of wildlife (WAPT 2006). Because of a perennial water source, Sierran streams and rivers contain some of the most productive habitats in the study area. Functions provided by the Sierran Rivers and Streams habitat type includes the production of abundant food sources for wildlife, as well as a diverse strata of vegetation that can be used by wildlife for nest and den sites, refugia, and thermal cover (WAPT 2006).
- The Sierran rivers and streams provide a migration corridor for fish and birds as well as deer, mountain lion (*Puma concolor*), bear and bobcats (*Lynx rufus*).
- The backwater areas of the streams and rivers, as well as the riparian areas help in sustaining good water quality and act as flood control.

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Sierran Rivers and Streams habitat type and which require conservation to prevent becoming threatened or endangered (species in bold are currently federally listed as

threatened or endangered, species in italics are listed on the Washoe County Rare Species List).

- **Lahontan cutthroat trout (T)**
- *Mountain quail*
- *Mountain yellow-legged frog*
- Rufous hummingbird
- Virginia's warbler
- Willow flycatcher
- Inyo shrew
- Montane shrew
- Brush mouse
- Vagrant shrew
- Water shrew
- Trowbridge's shrew
- Broad-footed Mole
- Western jumping mouse

Where does it occur? – Sierran Nevada Rivers and Streams are located within the southwest corner of the study area. Map Figure 15 generally depicts locations of these rivers and streams.

What are threats, risks? – Aquatic and riparian systems are the most altered and impaired habitats of the Sierra Nevada (WAPT 2006). Anthropogenic activities have altered characteristics of the streams, such as volume of water, flood peaks, duration of low flows, seasonal timing, sediment supply, amounts of nutrients and organic matter, and water temperature (WAPT 2006). Also, fire suppression in mid- to high-elevation areas has altered vegetative community structure and subsequently impacted the hydrology of many Sierran streams (WAPT 2006).

Threats to the Sierran River and Stream habitat type include, but are not limited to, encroachment of urban/suburban development, groundwater development, livestock grazing, recreation development, and resource extraction.

A loss in this habitat type or a reduction in its ability to function properly may result, and already has resulted in simplified and impaired aquatic ecosystems, which leads to the decline of native species (i.e., yellow-legged frog (*Rana muscosa*), Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*)) as well as a loss of overall wildlife diversity and aesthetics. The following threats/risks are associated with Sierran Rivers and Streams habitats:

- A decrease in water due to allocation, which has an adverse effect on fish, wildlife, water quality, water quantity, and riverine ecosystems.
- Construction of diversions and dams, which modify hydrologic regimes, interrupt natural flow dynamics that result in modified channel and floodplain processes, fragments aquatic habitats, and creates barriers to fish movement and migration.

- A decrease in quantity and quality of riparian areas caused by development, which has an adverse effect on flood control, water quality, and fish and wildlife habitat.
- Displacement of native species by invasive species.
- Reduction in riverine wetlands, which has an adverse effect on water quality, water quantity, flood control, and fish and wildlife habitat.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? - Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- Truckee River Flood Management Restoration Projects.
- Weed Eradication along the Truckee River and it's headwaters.
- Identify additional tributaries to the Truckee River for restoration and/or in-lieu fee program.
- Lake Tahoe Restoration Projects.

3.1.6 Sagebrush Semi-desert

3.1.6.1 Sagebrush

Why is it important? – Sagebrush is the most common habitat type within the study area. Sagebrush habitat occurs between 4,500 feet to 10,000 feet and can be found within valley, foothill, and mountain environments. Sagebrush generally occurs within a mosaic with other habitat types but can occur as large monotypic expanses (WAPT 2006).

Examples of the vegetation composition within this habitat type include (species in italics are currently listed on the Washoe County Rare Species List):

- *Ames milkvetch*
- *Sierra Valley mousetails*
- *Webber ivesia*
- Utah and western juniper
- Single leaf pinon
- Basin, mountain, Wyoming, low, and black sagebrush
- Bitterbrush
- Snowberry
- Rabbitbrush
- Winterfat
- Bluebunch wheatgrass
- Bluegrass
- Indian ricegrass

- Needle and thread grass
- Idaho fescue
- Great Basin wildrye
- Globemallow
- Penstemon

Invasion of exotic plant species within this habitat type include:

- Cheatgrass
- Medusahead

A summary of functions performed and the species supported by this habitat is provided below:

- Many species are dependent upon sagebrush habitat for most, or part, of their life history, including mule deer, antelope, pygmy rabbit *(Brachylagus idahoensis*), and greater sage grouse *(Centrocercus urophasianus)* (greater sage grouse range is shown on Map Figure 16). Sagebrush habitat provides undergrowth of shrubs, grasses, and forbs used by wildlife for nesting, cover, and forage.

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Sagebrush habitat type and which require conservation to prevent becoming threatened or endangered (species in italics are currently listed on the Washoe County Rare Species List).

- *Ferruginous hawk*
- *Greater sage grouse*
- *Pygmy rabbit*
- Loggerhead shrike
- Sage sparrow
- Brewer's sparrow
- Burrowing owl
- Pale kangaroo mouse
- Dark kangaroo mouse
- Sagebrush vole
- Merriam's shrew
- Kit fox
- Great Basin collared lizard
- Bald eagle
- Desert horned lizard
- Mule deer

Where does it occur? – The Sagebrush key habitat type is the most prevalent habitat type found within southern Washoe County (Map Figure 17).

What are threats, risks? – Urban development and infrastructure (i.e., utility right-of-ways) as well as frequent human caused fires and uncontrolled off-road vehicle use are the main threat to sagebrush habitat. Anthropogenic disturbances decrease nesting, forage, and cover habitat, result in displacement of wildlife and fragmentation of the habitat, and act as a conduit for invasive species.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? - Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- Acquisition of holdings in warm springs for sage grouse breeding and nesting.
- Acquisition of sage grouse habitat in the Winnemucca Ranch and Bedell flat areas.
- Acquisition of buffer lands to protect Pah Rah ACEC & Wandering Skipper ACEC.
- Identifying big game migration corridors.
- Identifying sage grouse nesting & breeding range.

3.1.7 Sand Dunes and Badlands

3.1.7.1 Cliffs and Canyons

Why is it important? – Cliff and canyon habitats are scattered throughout the study area. These are generally barren and sparsely vegetated areas (less than 10 percent plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock (WAPT 2006). Cliffs can range from 20 feet to over 4,000 feet high and occupy areas from a few acres to thousands of acres, however, because of the linear nature of cliff and canyon habitats, they comprise a relatively small fraction of total land area (WAPT 2006). Since cliffs can be found at variable elevations and experience a broad range of climatic conditions, dominant plant species can differ among these habitats and may include various associations of vegetation types (WAPT 2006).

Examples of the vegetation composition within this habitat type include various types of:

- Conifers
- Shrubs
- Succulents
- Lichens
- Herbaceous species

A summary of functions performed and the species supported by this habitat is provided below:

- Cliff and canyon habitats are variable and often possess unique biodiversity (WAPT 2006). Cliff and canyon habitats are important to wildlife because they provide structure for nesting, roosting/denning, protection from predators, and thermal cover (WAPT 2006). Species such as falcons and passerine birds depend on cliff ledges and crevices for nest locations, while reptiles use rocks and crevices in cliff and canyon habitat for burrowing and protective cover.

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Cliffs and Canyons habitat type and which require conservation to prevent becoming threatened or endangered (species in italics are currently found on the Washoe County Rare Species List).

- *Ferruginous hawk*
- *Spotted bat*
- Great Basin collared lizard
- Peregrine falcon
- Gray-crowned rosey-finch
- White-throated swift
- Long-eared myotis
- Pallid bat
- Pika

Where does it occur? – The Cliffs and Canyons key habitat type is found throughout the study area (Map Figure 18).

What are threats, risks? - Gold mining, rock (mineral) extraction, spring development, and to a lesser extent, recreational rock climbing, are activities that impact cliff and canyon habitats. Because of the harsh physical features associated with cliffs and canyons, development is not a threat to the habitat.

Impacts to cliff and canyon habitats would result not only in decreased habitat for wildlife but would also impact the aesthetic quality that cliffs and canyons provide.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? - Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- (None identified within documents reviewed – additional research being conducted)

3.1.7.2 Sand Dunes and Badlands

Why is it important? – Sand dunes and badlands include ecological systems defined by substrate characteristics which include relict bedrock outcrops, weathered soil patches, aeolian deposits (dunes), and areas dominated by substrate rather than by vegetative cover (WAPT 2006). Sand dunes occur between 1,000 feet and 6,500 feet in elevation, on young alluvium-colluvium deposits or aeolian sand (WAPT 2006).

Examples of the vegetation composition within this habitat type include (species in italics are currently found on the Washoe County Rare Species List):

- *Altered andesite buckwheat*
- *Altered andesite popcornflower*
- Desert sand-verbena

- Greasewood
- Dalea
- Ricegrass
- Fourwing saltbush
- Ponderosa & Jeffrey Pine

A summary of functions performed and the species supported by this habitat is provided below:

- Badlands are found most commonly on low and moderate elevations, on steep bedrock outcroppings, ridgetops, windswept barrens, or alluvial and colluvial deposits (WAPT 2006). Vegetation on badlands is often dominated by unique plant assemblages or by non-vascular lichens and cryptogamic species. Altered andesite soils are a special case of hydrothermally altered badlands in the western Great Basin, with vegetation dominated by conifer species. The conifers are able to maintain dominance over typical Great Basin shrublands and woodlands because of their competitive advantage on the nutrient poor and acidic soils (WAPT 2006).
- Altered andesite soils described above provide habitat for two rare endemic plant species, the altered andesite buckwheat (*Eriogonum robustum)* and the altered andesite popcornflower (*Plagiobothrys glomeratus*).
- Sand dunes and badlands often support endemic plants and animals, as well as provide habitat for generalist species (WAPT 2006). Many sand dune systems have a high diversity of invertebrates, including beetles, solitary bees, crickets and ants, some of which are sand dune obligates (WAPT 2006). These invertebrates, in turn, provide food for rats, lizards and small mammals. Also, in some sand dune/badland areas, water is held for long periods of time just under the surface, allowing shrubs to successfully root and provide forage material through long droughts (Nachlinger et al. 2001).
- Functions provided by badland systems also include serving as natural barriers to weed invasion and fire since they have little vegetation to burn (WAPT 2006).

Conservation of these areas is important because unlike many soils in desert basins, sand dunes are well-drained and non-saline. As a result, their vegetation differs considerably from the surrounding habitat areas (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Sand Dunes and Badlands habitat type and which require conservation to prevent becoming threatened or endangered.

- Desert kangaroo rat
- Pallid kangaroo mouse
- Dark kangaroo mouse
- Kit fox
- Desert horned lizard

Where does it occur? – The Sand Dunes and Badlands key habitat type is very limited within southern Washoe County and may be found primarily within the north-eastern portion of the study area (Map Figure 19).

What are threats, risks? – Impacts to sand dune and badland habitats occur primarily from the use of off-road vehicles, which contributes to the loss of vegetation, vertebrate and invertebrate species richness, soil disturbance, and potential transport of noxious weeds (WAPT 2006).

Because sand dune and badland habitats are generally small and isolated, impacts to these habitats would be magnified.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? - Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- Additional acquisition of altered andesite areas (currently only Red Hill is in public ownership).

3.1.7.3 Caves and Mines

Why is it important? – Most natural caves can be found in sedimentary deposits (limestone), with some found in igneous deposits (volcanic deposits), and fewer in metamorphic parent rock types (WAPT 2006). Historical mine distribution does not mirror natural cave distribution and occurs in almost all rock types. As compared to the surrounding landscape, caves and mines are the rarest of all wildlife habitat types and comprise less than one percent of the total habitat available (WAPT 2006). Plant communities generally do not occur in this habitat type.

Examples of the vegetation composition within this habitat type include:

- Algae

A summary of functions performed and the species supported by this habitat is provided below:

- Cave and mines range from the simple to the complex in terms of their structure and the variety of habitats they offer to wildlife (WAPT 2006). Particularly, caves and mines provide potential roosting sites for a variety of bat species. Because caves and mines are not widely distributed across the landscape, the roosting areas they provide for bats are particularly valuable (WAPT 2006).
- Bats are not the only species that utilize and caves and mines. These habitats are also used by species such as the gray-crowned rosey-finch, swallows, and barn owls for nesting and roosting. Caves and mines may also provide cover from the weather by being cooler during the summer and warmer during the winter (WAPT 2006).
- Cave systems also provide habitat for several obligate invertebrate cave dwellers that are restricted to these environments throughout their life cycle (WAPT 2006). These obligate species include the harvestman and pseudoscorpion, which are on the Nevada Natural Heritage Program's at-risk species list. Because of the extreme isolation, uniqueness, and harsh conditions of the cave environment, many of the species that occur there are rare (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Caves and Mines habitat type and which require conservation to prevent becoming

threatened or endangered (species in italics are currently found on the Washoe County Rare Species List).

- *Fringed myotis*
- *Little brown myotis*
- *Spotted bat*
- *Townsend's big-eared bat*
- *Western small-footed myotis*

Where does it occur? – The Caves and Mines key habitat type is scattered throughout southern Washoe County, mostly found within the south-eastern portion of the study area.

What are the threats, risks? – Threats to caves and mines include human exploration, which creates disturbance in the form of non-natural light sources, elevated noise levels, soil and structure disturbance, and vandalism (WAPT 2006).

Because a majority of the mines are unstable, the Abandoned Mine Lands program has been working to prevent human injuries or fatalities related to abandoned mine hazards. However, the indiscrimate closure of abandoned mines destroys the existing habitat and associated species within the mines and permanently eliminates access to the habitat the mines were providing (Bradley et al. 2006).

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? - Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- (None identified within documents reviewed – additional research being conducted)

3.1.8 Montane to Alpine

3.1.8.1 Grassland and Meadows

Why is it important? – This key habitat type can be found at most elevations and encompasses a wide range of grassland types. Grassland and meadows are distinguished from wet meadow types by a lack of wetland hydrology indicators or occurring on xeric sites. This habitat type can be found within riparian areas, xeric slopes, montane meadows dominated by grasses, and subalpine meadows dominated by forbs (WAPT 2006).

Examples of the vegetation composition within this habitat type include:

- Rabbitfoot grass
- Great Basin and creeping wildrye
- Various bluegrasses
- Needle-and-thread
- Antelope bitterbrush
- Sand dropseed
- Idaho fescue

- Aster
- Western yarrow
- Tufted hairgrass
- Cinquefoil

A summary of functions performed and the species supported by this habitat is provided below:

- Wildlife values of grassland and meadow habitats vary significantly among the different ecological systems, and can vary significantly among plant communities within a single ecological system (WAPT 2006). Grasslands and meadows contain habitat features that are important to nesting and brooding birds and rodent populations, which in turn provide food for hawks and owls, and provide forbs on which Mule deer feed. Several wildlife species are restricted to the grasslands and meadows of the Sierra Nevada, including mountain beaver *(Aplodontia rufa)*, mountain pocket gopher *(Thomomys monticola)*, and broad-footed mole *(Scapanus latimanus)* (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Grasslands and Meadows habitat type and which require conservation to prevent listing as threatened or endangered (species in italics are currently listed as on the Washoe County Rare Species List).

- *Greater sage grouse*
- *Ferruginous hawk*
- *Swainson's hawk*
- Loggerhead shrike
- Cinnamon teal
- Long-billed curlew
- Northern pintail
- Willet
- Short eared owl
- Burrowing owl
- Rufous hummingbird
- Long-nosed leopard lizard
- Broad-footed mole
- Desert horned lizard
- Merriam's ground squirrel
- Montane shrew
- Vagrant shrew
- Western jumping mouse
- Kit fox

- Mountain pocket gopher
- Pale kangaroo mouse
- Dark kangaroo mouse
- American pika

Where does it occur? – Grasslands and meadows are widely scattered and uncommon throughout the study area (Map Figure 20).

What are the threats and risks? - Livestock grazing, unauthorized off-road vehicle use and ungulate utilization of grasslands and meadows are the main impacts that results in a reduction of the necessary life history elements to species that rely predominantly on grasslands and meadows for sustenance (WAPT 2006). Changes in forb composition from palatable food species to less desirable species, and a reduction of cover caused by trampling and grazing, reduces meadow suitability for wildlife such as greater sage-grouse and rodents. Without rodents as a food source, grasslands and meadows no longer provide hunting areas for hawks and small mammals.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? - Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- (None identified within documents reviewed – additional research being conducted)

3.1.8.2 Aspen Woodland

Why is it important? – Aspen communities generally occur on mountains and high plateaus. Aspen can form extensive stands, form linearly within riparian areas, or occur in small, isolated patches. Aspen communities are found on all aspects and grow where soil moisture is not a limiting factor; they also can be found within various climatic conditions (WAPT 2006).

Examples of the vegetation composition within this habitat type include:

- Snowberry
- Currant
- Fendler meadow rue
- Western yarrow
- Columbine
- Lupine
- Larkspur

A summary of functions performed and the species supported by this habitat is provided below:

- Aspen habitats contain high biodiversity, second only to riparian areas. Aspen produce forage for both wildlife and domestic livestock and consist of multi-age structures that provide benefits to wildlife dependent upon the diverse nature of these communities (WAPT 2006).

- Aspen communities are particularly important to cavity nesting species because broadleaved woodlands within the study area are limited. Also, birds and small mammals utilize the mid-story structure and herbaceous/shrub understory, for forage, nesting, and protective cover that stands of aspen communities provide (WAPT 2006).
- Within riparian areas, downed aspen trees can create slow moving water conditions, and refugia, favorable for fish and amphibians.
- In addition to its value to wildlife, aspen habitat provides aesthetic value and local human communities benefit economically from the associated tourism (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Aspen Woodland habitat type and which require conservation to prevent listing as threatened or endangered (species in italics are currently listed on the Washoe County Rare Species List).

- *Mountain quail*
- *Fringed myotis*
- *Little brown myotis*
- *Western small-footed myotis*
- Cassin's finch
- Blue grouse
- Lewis's woodpecker
- Mule deer
- Montane shrew
- Vagrant shrew
- Western jumping mouse
- Long-eared myotis

Also, habitats such as Aspen forests and woodlands are important because they absorb carbon dioxide from the atmosphere and release oxygen, partially off-setting the increase in greenhouse gases which cause global warming.

Where does it occur? – Aspen Woodland habitat occurs in small areas within the Peterson and Peavine Mountains of the east-central portion of the study area and occurs in extensive stands within the Carson Range, generally between the elevations of 6,000 feet and 8,000 feet (Map Figure 21).

What are the threats and risks? – Threats to the Aspen Woodland habitat type include fire suppression, improper livestock grazing, and browsing by ungulate herbivores (WAPT 2006). Conifer encroachment also poses a risk to aspen communities, and could eventually result in the elimination of aspen clones in these areas if disturbance is not allowed to occur or is not introduced into these communities (WAPT 2006).

Aspen stands are popular areas for camping and hiking, which contributes to soil compaction, vandalism, and potential disturbance to wildlife (WAPT 2006). Also, spring development within and upslope of aspen woodlands is also a threat because of aspen communities need for water to remain healthy and provide wildlife habitat to its full potential (WAPT 2006).

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife. However, forests can act as carbon sinks and help reduce the threat of global warming.

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- (None identified within documents reviewed – additional research being conducted)

3.1.8.3 Intermountain Conifer Forests and Woodlands

Why is it important? – Intermountain conifer forests and woodlands are comprised of diverse forested communities that occur in the mountains above the lower montane woodland and shrubland habitats (WAPT 2006). Montane conifer forests are dominated by a variety of conifers with the composition and structure of the overstory dependent upon the temperature and moisture conditions of the site, and the successional status of the conifer community (WAPT 2006).

Examples of the vegetation composition within this habitat type include (species in italics are listed on the Washoe County Rare Species List):

- Ponderosa, Jeffrey, and lodgepole pine
- White fir
- Quaking aspen
- Common juniper
- Greenleaf manzanita
- Snowberry
- Curl-leaf mountain mahogany
- Mountain sagebrush
- Bluebunch wheatgrass
- Western yarrow
- Englemann aster
- Larkspur
- Sticky geranium
- Lupine
- Bracken fern
- Northern mule's ear

A summary of functions performed and the species supported by this habitat is provided below:

- Wildlife depend on a variety of features for foraging and nesting provided by conifer forests and woodlands, including mesic microsites, mid-story structure, and mature canopy (WAPT 2006). Young, early successional conifer forests provide dense

foliage and vegetation, used by small mammals as forage and cover from predators. Old growth spruce–fir forests can also provide these functions since they contain, large downed logs, rotting woody material, and tree seedling establishment on logs or on mineral soils unearthed in root balls (WAPT 2006). Mature or old growth conifer forests also provide dead or dying trees, which can be used as nesting, or denning habitat. Dead and dying trees also contain an insect prey base for foraging.

- Although higher elevation conifer woodlands do not provide large, intact areas of habitat for wildlife, they still provide forage for wildlife in the form of limber and bristlecone pine seeds, and the trees provide structure in an otherwise sparsely vegetated environment (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Intermountain Conifer Forests and Woodlands habitat type and which require conservation to prevent listing as threatened or endangered (species in italics are listed on the Washoe County Rare Species List).

- *Mountain quail*
- *Northern goshawk*
- Blue grouse
- Cassin's finch
- Grace's warbler
- Lewis's woodpecker
- Olive-sided flycatcher
- Hoary bat
- Long-eared myotis
- Inyo shrew
- Montane shrew
- Vagrant shrew

Also, forest habitats such as Intermountain forests and woodlands are important because they absorb carbon dioxide from the atmosphere and release oxygen, partially off-setting the increase in greenhouse gases which cause global warming.

Where does it occur? – The Intermountain Conifer Forests and Woodlands key habitat type is found within the mid- to upper-elevation range levels, generally between 4,000 feet and 10,000 feet (the top of Mt. Rose is 10,776 and approximately the top 776 feet does not contain trees) of the study area (Map Figure 22).

What are threats, risks? – Natural processes that have shaped the development of Intermountain conifer forests have been inhibited by modern forestry practices, including fire suppression, salvage logging (cutting of burned trees), suppression logging (cutting of insect infested trees), and alteration of natural fire intensity (WAPT 2006). Pest control within this habitat type has reduced the amount of insects used by birds and small mammals as a food source. Also, ungulate/livestock grazing has reduced the herbaceous understory, upon which small mammals depend on for food, thermal cover, and protection from predators. A reduction of small mammals in previously suitable habitat will have cascading unfavorable effects to species that rely upon these prey populations (WAPT 2006).

A threat to Conifer forests and woodlands also include urban/suburban development, which would replace this habitat type resulting in the displacement of many wildlife species and reduce aesthetics value of the forest and the forests ability to act as a carbon sink.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife. However, forests can act as carbon sinks and help reduce the threat of global warming.

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- (None identified within documents reviewed – additional research being conducted)

3.1.8.4 Sierra Conifer Forests and Woodlands

Why is it important? – Sierra conifer forests and woodlands are comprised of a diverse assemblage of ecological systems that range from the Sierra Nevada foothills up to ridges and rocky slopes around timberline, approximately 8,000 feet (WAPT 2006).

Examples of the vegetation composition within this habitat type include (species in italics are listed on the Washoe County Rare Species List):

- *Washoe tall rockcress*
- *Galena Creek rockcress*
- *Washoe pine*
- *Tiehm rockcress* (Mt. Rose sub-alpine)
- *Tahoe draba* (sub-alpine)
- Ponderosa, Jeffrey, lodgepole and sugar pine
- White fir
- Incense cedar
- Red fir
- Antelope bitterbrush
- Rabbitbrush
- Sagebrush
- Squaw currant
- Snowberry
- Greenleaf manzanita
- Squirreltail
- Blue wildrye
- Slender hairgrass
- Western needlegrass
- Woolly wyethia

- Pennyroyal

Invasion of exotic plant species include:

- Cheatgrass

A summary of functions performed and the species supported by this habitat is provided below:

- Wildlife depend on the diversity of features provided by the Sierra Conifer Forest and Woodlands, including mesic microsites, mid-story structure, and mature canopy habitats for foraging, roosting, nesting, cover and migration (WAPT 2006).
- The Sierra Conifer Forests and Woodlands provide hollow trees, insect infested trees, downed logs and rotting woody material, edge habitat, dense foliage understories, high canopy closures, ground litter/organic layers, and seed production, all of which combine to support a wide variety of species including species uniquely adapted to live in old growth habitats and are found nowhere else in Nevada (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Sierra Conifer Forests and Woodlands habitat type and which require conservation to prevent listing as threatened or endangered (species in italics are listed on the Washoe County Rare Species List).

- *Mountain quail*
- *Northern goshawk*
- *California spotted owl*
- *White-headed woodpecker*
- *Sierra alligator lizard*
- *American marten*
- Blue grouse
- Cassin's finch
- Lewis's woodpecker
- Olive-sided flycatcher
- Hermit warbler
- Red-breasted sapsucker
- Bald eagle
- Long-eared myotis
- Inyo shrew
- Montane shrew
- Vagrant shrew
- Trowbridge shrew
- Mule deer
- Northern flying squirrel
- Sierra Nevada red fox

- Mountain pocket gopher

Also, forest habitats such as the Sierra forests and woodlands are important because they absorb carbon dioxide from the atmosphere and release oxygen, partially off-setting the increase in greenhouse gases which cause global warming.

Where does it occur? – The Sierra Conifer Forests and Woodlands key habitat type is found within the Sierra Nevada Range of the south-western portion of the study area beginning from the foothills and extending to an elevation of approximately 8,000 feet (Map Figure 23).

What are threats, risks? – The altered fire regime of Sierra Nevada conifer forests and woodlands is a main threat to the Sierra Conifer Forests and Woodlands habitat type (WAPT 2006). Years of fire suppression, and an increase in the highly flammable invasive cheatgrass, have resulted in abnormally high fuel levels.

Also, Sierra Nevada conifer forests and woodlands experience significant pressure from urban and suburban development. Development has, and will continue to, result in permanent habitat loss or conversion, inflict direct mortality to wildlife (i.e., vehicle collision mortalities), create a conduit for invasive species, fragment wildlife habitat, and decrease genetic variability of populations.

The Sierra Nevada provides multiple recreation opportunities, including non-motorized and motorized recreational pursuits that are sources of vegetation loss, soil compaction, and stress for wildlife. Off-road vehicle use within this habitat type and study area is mostly concentrated on Peavine Mountain. Ski areas, snow parks, and developed day-use areas and campgrounds also facilitate increased disturbance to wildlife and alter the habitat through the removal of vegetation and soil compaction (WAPT 2006).

Although Sierra Nevada conifer forests and woodlands comprise only a small portion of the study area, they are valuable for wildlife and play an essential role in conservation planning (WAPT 2006).

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife. However, forests can act as carbon sinks and help reduce the threat of global warming.

What are opportunities, priorities and projects? - Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- (None identified within documents reviewed – additional research being conducted)

3.1.8.5 Alpine - Tundra

Why is it important? – Alpine and tundra habitat occurs at the highest elevations of the study area, ranging from approximately 10,500 feet to the top of Mt. Rose, the highest point in the study area, at 10,776 feet. Alpine-tundra habitats are exposed to desiccating winds and are defined by barren, sparsely vegetated, unstable rocky substrates which typically include both bedrock outcrop and scree slopes with nonvascular plant-dominated communities (WAPT 2006).

Examples of the vegetation composition within this habitat type include:

- Shrubby cinquefoil
- Tufted hairgrass

- Sedges
- Alpine timothy
- Alpine avens
- Cushion phlox

A summary of functions performed and the species supported by this habitat is provided below:

- Thin biological "cryptogamic" crusts which cover the ground within areas of the alpine-tundra contain lichens, mosses, cyanobacteria, and fungi. These crusts enhance the nutrient status of the soil, retard erosion by wind and water, help retain soil moisture, and enhance seedling establishment (WAPT 2006). The cryptogamic crusts provide a base for seeds, insects, and emergent vegetation, which turn are important food sources for wildlife.
- These habitats can provide wildlife foraging microhabitats for resident and migratory species (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Alpine-Tundra habitat type and which require conservation to prevent listing as threatened or endangered (species in italics are listed on the Washoe County Rare Species List).

- *American marten*
- Blue grouse
- California bighorn sheep
- Gray-crowned rosey-finch
- Rufous hummingbird
- American pika
- Sierra Nevada red fox

Where does it occur? – The Alpine and Tundra key habitat type is primarily found within the Sierra Nevada Range of the study area between the elevations of approximately 10,500 and the top of Mt. Rose at 10,776 feet in elevation. Because the habitat type is restricted to the highest elevations it is scarce within southern Washoe County (Map Figure 24).

What are threats, risks? - Global climate change and recreation have been identified as the primary problems facing alpine and tundra habitats (WAPT 2006). Warmer temperatures resulting from climate change may have long-term impacts on alpine habitats and their species through the fragmentation and loss of habitat (WAPT 2006). Ski area development and operation has localized effects on alpine habitat and the associated species in the Carson Range. Also, the development of communication sites on mountain tops results in habitat loss, fragmentation, and disturbance to wildlife. Further, off-road vehicle use occurs in some areas of the alpine-tundra and can disturb wildlife or damage alpine vegetation which is sparse and slow to recover (WAPT 2006).

Some mammal species that rely on alpine-tundra habitats have limited to no capability of dispersal between mountain ranges because of the isolating nature of the intervening valleys. As a result, these populations may be genetically unique and specially adapted to local conditions.

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- Since the passage of the Nevada Wilderness Protection Act of 1989, many alpine and tundra areas have received special designations that restrict certain uses and this largely benefits alpine and tundra habitats and wildlife species.
- (No additional opportunities identified within documents reviewed – additional research being conducted)

3.1.9 Other

3.1.9.1 Barren Landscapes

Why is it important? – This habitat type is defined by areas in which vegetation accounts for less than 15 percent of total ground cover and includes lands that are either barren in their natural state or, for one reason or another, have become barren (WAPT 2006). Areas classified as barren lands include areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, mine pits, gravel pits and other accumulations of earthen material (WAPT 2006).

Examples of the vegetation composition within this habitat type include:

- Cheatgrass (non-native)

A summary of functions performed and the species supported by this habitat is provided below:

- Because these areas do not contain forage, nesting, or cover habitat, these sites are not utilized by wildlife except for brief periods of time during daily or seasonal movements. Much of the value of these sites lies in their potential for reclamation to meet wildlife habitat needs (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Barren Landscape habitat type and which require conservation to prevent listing as threatened or endangered.

- Great Basin collared lizard
- Long-nosed leopard lizard

Where does it occur? – The Barren Landscape key habitat type is scattered throughout the study area (Map Figure 25).

What are threats, risks? – Most barren landscapes are disturbed areas, which can be conduits for non-native weed invasion into surrounding habitats. Barren landscapes may also be susceptible to erosion, caused by wind and rain or by off-road vehicle use.

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- (None identified within documents reviewed – additional research being conducted)

3.1.9.2 Exotic Grasslands and Forblands

Why is it important? – Three non-native ecological systems are included in this key habitat: exotic perennial grassland, which is defined by range seedlings, which predominantly consist

of crested wheatgrass *(Agropyron desertorum)* or intermediate wheatgrass *(Elytrigia intermedia)*; invasive annual grassland, which is defined by cheatgrass-dominated sites and medusahead; and invasive annual and biennial forbland, which is defined by lowland burned sites dominated by Russian thistle *(Salsola tragus)*, halogeton *(Halogeton glomeratus)* and tansy mustard (*Descurainia* spp.).

Examples of the vegetation composition within this habitat type include:

- Crested cheatgrass
- Medusa head
- Intermediate wheatgrass
- Cheatgrass
- Russian thistle
- Halogeton
- Tansy mustard

A summary of functions performed and the species supported by this habitat is provided below:

- Historically, a majority of the plants associated with this habitat type were deliberately introduced to enhance the forage productivity for livestock; more recently, exotic perennial grasses are being used for range restoration, especially after a fire to prevent erosion and the establishment of more invasive weed species.
- Exotic grasslands and forblands are not considered high-quality wildlife habitats, especially compared to the native systems they replace; however, this habitat type often develops ground squirrel colonies (several species) that can grow to large sizes. Ground squirrel colonies provide food for species such as Swainson's Hawk *(Buteo swainsoni)*, Ferruginous Hawk *(Buteo regalis)*, and kit fox *(Vulpes macrotis)*. Also, ground squirrel burrows are used by burrowing owls.

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Exotic Grasslands and Forblands habitat type and which require conservation to prevent listing as threatened or endangered (species in italics are currently listed on the Washoe County Rare Species List).

- *Ferruginous hawk*
- *Swainson's hawk*
- Burrowing owl
- Long-nosed leopard lizard
- Broad-footed mole
- Desert horned lizard
- Kit fox

Where does it occur? – Exotic Grasslands and Forblands are widely scattered and uncommon but primarily found near the northern border of the study area (Map Figure 26).

What are threats, risks? – Cheatgrass was first introduced to western rangelands in 1889, and it has not stopped spreading over the western landscape to this day. Cheatgrass out-competes native vegetation by modifying a site's fire return interval such that native grasses

and shrubs cannot recover quickly enough. The result is more frequent fires burning greater expanses, until an entire landscape is finally dominated by cheatgrass. The converted landscape has little value to native wildlife and is significantly degraded in livestock value as well.

Threats include the spread of the exotic species associated with this habitat type, which reduces habitat quality and diversity, and increases the chances for fire. Not only do invasive habitats reduce the diversity of native species, they also offer reduced range carrying capacity for mule deer and sage-grouse.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? - Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- Mapping of invasive species.
- Weed Management Plans.
- Coordination with Sierra Fire Protection District on fire suppression staging areas and fire rehabilitation.
- Form a county BAER team (Burn Area Emergency Response Team) to assess wildland fire damage.

3.1.10 Developed Lands and Agriculture

3.1.10.1 Developed Landscapes

Why is it important? – Developed lands generally fall into two categories: open space-low density development areas and medium-high density development areas (WAPT 2006). Open space-low development areas are suburban in nature and consist primarily of single-family residential lots of varying size, school grounds, athletic fields, and parks (WAPT 2006). Medium-high density development is generally urban or industrial in nature and is characterized by large buildings and mostly impervious areas such as pavement, concrete, or asphalt (WAPT 2006).

Examples of the vegetation composition within this habitat type include:

- Manicured lawns
- Ornamental shrubs and trees

A summary of functions performed and the species supported by this habitat is provided below:

- Developed areas, although unnatural, still have the ability to provide habitats for a variety of species. Planted yards and open spaces, even with ornamental vegetation, contain areas for cover, sources of food, and nesting sites for birds and small mammals. Golf courses, parks, and yards with ponds are often utilized by water fowl, water birds, and amphibians. Even tall buildings and bridges provide habitat for species such as bats and falcons.

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Developed Lands habitat type and which require conservation to prevent listing as threatened or endangered (species in italics are listed on the Nevada Rare Species List).

- *White-faced ibis*
- *Little brown myotis*
- Cinnamon teal
- Clark's grebe
- Eared grebe
- Northern pintail
- Snowy egret
- Western grebe
- Burrowing owl
- Peregrine falcon
- Pallid bat
- Mule deer
- Kit fox
- Desert horned lizard
- Mountain pocket gopher
- Water shrew
- Northwestern pond turtle

Where does it occur? – Developed Lands are mainly congregated within the southern portion of the study area surrounding the cities of Reno and Sparks (Map Figure 27).

What are threats, risks? – Increased development results in the continued degradation and loss of natural habitats and wildlife diversity. Impacts to wildlife and wildlife habitat caused by wildlife/urban interface include an increase risk of disease; vehicle caused mortality, as well as the potential for wildlife to wander into residential areas looking for food, which could put pets, humans, and the wildlife species itself, in danger.

Although habitat conditions in developed landscapes do not provide the quantity or quality of functions that of natural areas, suburban habitats can be enhanced by the implementation of wildlife-friendly landscaping, including a variety of natural plantings and the creation, restoration, or enhancement of water features. Parks and open areas created within developed areas can increase connectivity between more natural habitat types. Also, in desert areas where water availability is becoming of increasing concern, the pattern of planting yards to lawn is being discouraged in favor of landscaping with rock and desert vegetation requiring little or no water (WAPT 2006).

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- (None identified within documents reviewed – additional research being conducted)

3.1.10.2 Agricultural Lands

Why is it important? – Most agricultural crops within the study area are grown in valley bottoms and on alluvial deposits. Hay, either alfalfa or grass, is the primary harvested crop (76 percent of Nevada's agricultural acreage), while wheat, barley, potatoes, onions and garlic are also grown, but in lesser amounts (WAPT 2006).

Examples of the vegetation composition within this habitat type include:

- Hay
- Alfalfa
- Grass
- Wheat
- Barley
- Potatoes
- Onions
- Garlic

Invasion of exotic plant species include:

- Invasive weeds

A summary of functions performed and the species supported by this habitat is provided below:

Activities related to agricultural activities, such as flooded and fallow fields and unharvested hay (i.e., grass, alfalfa), provide forage and nesting habitat for mainly bird species, but also is a source of food for mule deer. Flooded fields are utilized by multiple bird species that feed on displaced, or drowned, organisms by the flooding, and areas of unharvested hay are used as nest sites (WAPT 2006). Fallow fields provide habitat preferred by rodents and ground squirrel colonies that provides food for raptors, including prairie falcon *(Falco mexicanus)*, Ferruginous hawk, and short-eared owls *(Asio flammeus)* (WAPT 2006). Agricultural districts have become the primary breeding habitat for species such as the Swainson's Hawk.

- The associated cottonwood trees that are planted for shade, or windbreaks, within agricultural areas provide additional wildlife habitat (WAPT 2006).

Below is a list of wildlife species found within southern Washoe County that are dependent upon the Agricultural Lands habitat type and which require conservation to prevent listing as threatened or endangered (species in italics are currently listed on the Washoe County Rare Species List).

- *Greater-sage grouse*
- *White-faced ibis*
- *Swainson's hawk*
- Greater sandhill crane
- Long-billed curlew
- Loggerhead shrike
- Snowy egret

- Lewis's woodpecker
- Burrowing owl
- Mule deer

Where does it occur? – Agricultural Lands are generally located running north to south throughout the middle portion of the study area (Map Figure 28).

What are threats, risks? – Active agricultural lands are relatively stable in the wildlife habitat values they provide, although these values may vary cyclically with season and climatic variation (WAPT 2006). However, the increase use of drip and circular pivot irrigation systems as opposed to flood irrigation and hay operations provide less habitat value for bird species (WAPT 2006).

Threats to wildlife species from agricultural practices include losses of natural habitat areas, reduction in water quantity and quality from irrigation, and the decline in the health and numbers of species caused by the use of pesticides.

The main threat to agricultural lands includes increased encroachment from residential and commercial development. Farmers are finding it difficult to farm lands adjacent to areas of expanding development, as land prices increase beyond the relative viability of agricultural operations (WAPT 2006). The replacement of agricultural lands with urban/suburban and/or commercial development reduces areas of functional habitat further.

Global climate change also represents a threat to this habitat type. Potential effects of global climate change include a shift in habitat type locations, conversions of plant communities within habitat types, a loss of habitat types, increased occurrences of disease to plant and wildlife species, changes in wildlife distribution, and extirpation of plants and wildlife.

What are opportunities, priorities and projects? – Restoration opportunities and projects previously identified and potentially appropriate for special attention during open space planning efforts include:

- Examine the possibilities of conservation easements on existing ranches for habitat protection.

For a more detailed description of each habitat type, please refer to the 2006 Nevada Wildlife Action Plan. Also, a table listing federally and state-listed species is available in Appendix A.

3.1.11 Summary

The information provided above outlines southern Washoe County's natural resources, the functions they provide, and level of impacts based on area and sensitivity each resource has the potential to sustain if not properly managed, or conserved. Below is a summary which highlights the main issues identified within the biodiversity section of this report.

- Of all the diverse habitat types within southern Washoe County, Intermountain and Sierran river and stream habitats are the most diverse, most impacted, and most at risk for future impacts, but also have the most potential for restoration and enhancement.
- Habitat types that are limited within the study area but provide a wide array of important functions are wet meadow and marsh habitats.
- The most common habitat type within the study area is sagebrush.
- The least common habitat type within the study area is Aspen woodlands.

- Alpine-tundra is a limited habitat type within the study area that is most at risk from climate change.
- And, the most unique habitat type within the study area is the spring-springbrook habitat type, which is capable of supporting a variety of endemic species that sometimes can be found in only one spring system.

Of the 23 habitat types present within the study area, four supports threatened and endangered species:

- Intermountain Rivers and Streams –Lahontan cutthroat trout, Cui-ui.
- Lakes and Reservoirs –Lahontan cutthroat trout, Cui-ui.
- Springs and Springbrooks – Steamboat buckwheat, as well as species only found within particular spring system systems.
- Sierran Rivers and Streams – Lahontan cutthroat trout.

These highlights provide a starting point for discussion and prioritizations of natural resources during open space and natural resource planning.

3.2 WATER RESOURCES

Why is it Important?

Surface Water

Pristine water quality in Washoe County streams can positively affect human health, the environment, and economic development. Poor water quality can threaten these things and also trigger costly regulatory compliance programs. The hydrographic basins in the study area are depicted in Map Figure 29.

The Truckee River, the main surface water source of drinking water for Southern Washoe County, is a primary water quality concern. The Truckee River (within the study area) provides drinking water for the majority of residents in the Truckee Meadows.[1] Truckee River water quality is very good for municipal and industrial (M&I) purposes. Concentrations of regulated constituents including metals, inorganics, organics, and pesticides are significantly below the allowable standards. Aesthetically, the water quality is also very good, with low concentrations of Total Dissolved Solids (TDS) and Hardness. However the river is susceptible to naturally occurring and human caused microbiological contamination, including coliform bacteria, giardia and cryptosporidium. Rapid fluctuations in river turbidity from spring runoff and summer thundershowers also pose treatment challenges. Total Maximum Daily Loads (TMDLs) have been established for the Truckee River and include Total Nitrogen (TN), Total Phosphorus (TP), and (TDS). Levels of phosphorus in the Truckee River have violated State standards at the Vista gage, and levels of nitrogen have violated State standards at most of the gage monitoring stations.[2] Much of this contamination comes from Truckee River tributaries.

The high nutrient content in the Truckee River results largely from the discharge of treated sewage effluent, agricultural runoff, and urban stormwater runoff to the Truckee River and its tributaries, primarily Alum Creek, Chalk Creek, Steamboat Creek, and the North Truckee

[1] Nevada Natural Resources Status Report, DCNR 2002.

[2] 2002 Truckee Meadows Regional Plan (Appendix 1).

Drain. Related water quality impacts include increased water temperatures, increased concentrations of total dissolved solids, and reduced dissolved oxygen levels. Other sources of pollution include septic system discharge, industrial discharge, and chemical spills. Removal of riparian vegetation, construction activities, and stormwater discharges introduce sediment and other materials into the Truckee River and its tributaries.

Surface water resources in southern Washoe County are over-tapped in the summer months, and efforts are currently underway to acquire instream water rights in order to support water quality and habitat functions.

Ground Water

For basins outside the central Truckee Meadows, groundwater is the primary water resource. Most of the groundwater basins in the study area are over allocated with respect to the estimated groundwater resource. In some areas, withdrawals already exceed annual recharge rates.

Most of the groundwater recharge in southern Washoe County results from mountain front recharge, surface water infiltration into streambeds, alluvial fans, or porous land surfaces into groundwater aquifers.[3] Additional recharge results from infiltration of water through irrigation ditches, landscape watering, and secondary recharge from septic systems and from engineered structures such as detention basins.

The groundwater aquifers in southern Washoe County support development in basins outside of the metropolitan area, and large portions of the population rely solely on groundwater sources for daily life. However, groundwater contamination and availability is becoming problematic in certain parts of the County. Because of demand pressures, surface water may need to be used to offset groundwater quality and quantity problems because the impervious surfaces associated with residential development are eliminating natural groundwater recharge areas.[4]

Surface Water

As mentioned, surface water quality concerns are greatest in the Truckee River and its tributaries. Water quantity concerns are also significant, and reduced water quantity supplies exacerbate water quality problems. Specific tributaries that contribute contamination are described below:

- Steamboat Creek contributes significant TN, TP, TDS, and TSS pollution to the Truckee River; sources of pollution include farming and livestock, poor quality groundwater, geothermal discharges to the creek, and discharges from Rio Poco, Boynton, and Yori drains. Streamboat tributaries Galena Creek, Whites Creek, and Thomas Creek contribute TN, TP, TDS, and TSS loads to Steamboat Creek.
- The North Truckee Drain is used to drain tailwater from the Orr Ditch and stormwater discharges from Sparks. The drain contributes TN, TP, and TDS contamination to the Truckee River.
- The information on other Truckee River tributaries is limited. These tributaries include Lower Dog, Lower Hunter, Lower Alum, Lower Chalk, Dry-Boynton, Lower Thomas, and Lower Whites. Alum Creek and Chalk Creek are known to add relatively high concentrations of TDS to the Truckee River.

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[3] 2004-2005 Washoe County Comprehensive Regional Water Management Plan.

[4] 2004-2005 Washoe County Comprehensive Regional Water Management Plan.

Ground Water

The use of septic tanks in East Lemmon Valley and New Washoe City has become problematic because of limited groundwater recharge opportunities and the potential to contaminate domestic wells. Contamination from septic tanks has already occurred in Spanish Springs, Cold Springs, Mogul and the South Truckee Meadows.

Insufficient groundwater supply and over-pumping concerns are prevalent in various parts of the County (Figure 1). Unsustainable withdrawals are either already occurring or are anticipated to occur in the East Lemmon Valley, Spanish Springs, Warm Springs and Cold Springs basins. (See Map Figure 30).

What are the Threats/Risks?

Surface Water

Polluted streams and rivers can negatively influence human health, the health of terrestrial and aquatic species that utilize river water, and economic development opportunities (e.g. tourism). Specific examples of threats posed by water pollution include:

- Pollution in White's Creek and Thomas Creek is of particular concern because, in response to population growth, these streams are anticipated to become drinking water supplies.
- Financial impacts can be expected if Steamboat Creek, the North Truckee Drain, or other streams become subject to TMDLs.

Excessive water withdrawal from streams can result in concentration of pollutants, warmer water temperatures, and an overall decrease in wildlife habitat conditions.

Ground Water

Primary threats to groundwater quality in southern Washoe County are attributable to nutrients discharged from septic tanks. However, in addition to nutrients, TCE and PCE solvents have affected 10 wells in central Truckee Meadows. VOCs have also contaminated groundwater and could negatively influence the supply available to the Silver Lake Water Company.[5] In the future, depending upon groundwater recharge and pumping rates, naturally occurring minerals could migrate and further degrade existing water sources.

Over-pumping of groundwater aquifers has the potential to deplete supplies, concentrate contamination, and draw additional contaminants into the well supply. In addition, overpumping can lead to soil subsidence, which is problematic for existing and future development. Continued over-pumping of groundwater wells will lead to a net loss situation that requires the identification of new water sources. Depending upon the alternative sources available, this could result in the need for costly treatment technologies or transmission infrastructure.

What are the Opportunities, Priorities, and Projects? ***Surface Water***

If performed in conjunction with local agency representatives, open space planning can contribute to restoration and protection of surface water quality. Open space properties can be selected and managed to minimize erosion and perform important water quality filtering functions, including filtering water coming from adjacent lands. Implementation of passive water quality improvement projects on open space lands can help minimize the need for costly engineering solutions. The design of open space areas should seek to maximize potential benefits to both surface water quality and quantity.

Ground Water

In order to address the growing groundwater contamination problem resulting from septic tanks, it may become necessary to implement expensive engineering solutions and connect existing and future dischargers to sanitary sewers. Centralized wastewater treatment facilities may become necessary.[6] Other treatment needs may include denitrifying septic tank designs and well-head treatment.

Open space planning, if performed in conjunction with local agency staff, can create cost effective opportunities and alternatives for preservation and improvement of groundwater resources. Examples of potential projects include acquisition of key aquifer recharge areas and management of those lands for wildlife habitat or passive recreational uses that do not require impervious surfaces. In addition, there are opportunities to take advantage of new

[5]

[6] 2002 Truckee Meadows Regional Plan (Appendix 1).

approaches for capturing ecosystem service benefits through market mechanisms. For example, Deschutes County, Oregon instituted a ground water protection program using Tradable Development Credits and Pollution Reduction Credits. These types of actions can help improve both groundwater quality and groundwater quantity conditions.

In order to identify the best opportunities for multiple benefits, hydrologists should be consulted to identify whether or not there are sites that should be prioritized for acquisition or open space management because of their ability to perform groundwater recharge functions.

3.3 AIR QUALITY

Why is it important? – In the late 1980s air quality in the County was recognized as a serious concern and, over the following years, it frequently did not meet the National Ambient Air Quality Standards (NAAQS) for carbon monoxide, ozone, or particulate matter. Several factors combined to create this situation: the shape of the valley, land use practices, and weather conditions. As the population in the valley grew, emissions from automobiles, wood-burning stoves, etc. increased to the point where unsafe levels of air pollutants were routinely trapped by the winter temperature inversions that settle in the valley.

Since that time, however, Washoe County has made remarkable air quality improvements. Through a combination of implementing local regulations and educating the public, the frequency of nonattainment concentrations has been drastically reduced (Figure 2).[7] However, as of October 2006, the Truckee Meadows Hydrographic Basin is still designated as being in non-compliance with the NAAQS for carbon monoxide and PM_{10} particulate matter.[8] Redesignation Requests (to attainment) and/or Maintenance Plans have been submitted to EPA for the 8-hr carbon monoxide and 8-hr ozone NAAQS. Additionally, a Redesignation Request (to attainment) and Maintenance Plan will be submitted for the PM_{10} NAAQS by the end of 2007. Despite this progress, constant vigilance will be required by Washoe County as continued population growth challenges its ability to maintain compliance with the NAAQS.

[7] http://www.washoecounty.us/health/aqm/home.html.

[8] Washoe County Comprehensive Plan, Conservation Element, October 2006.

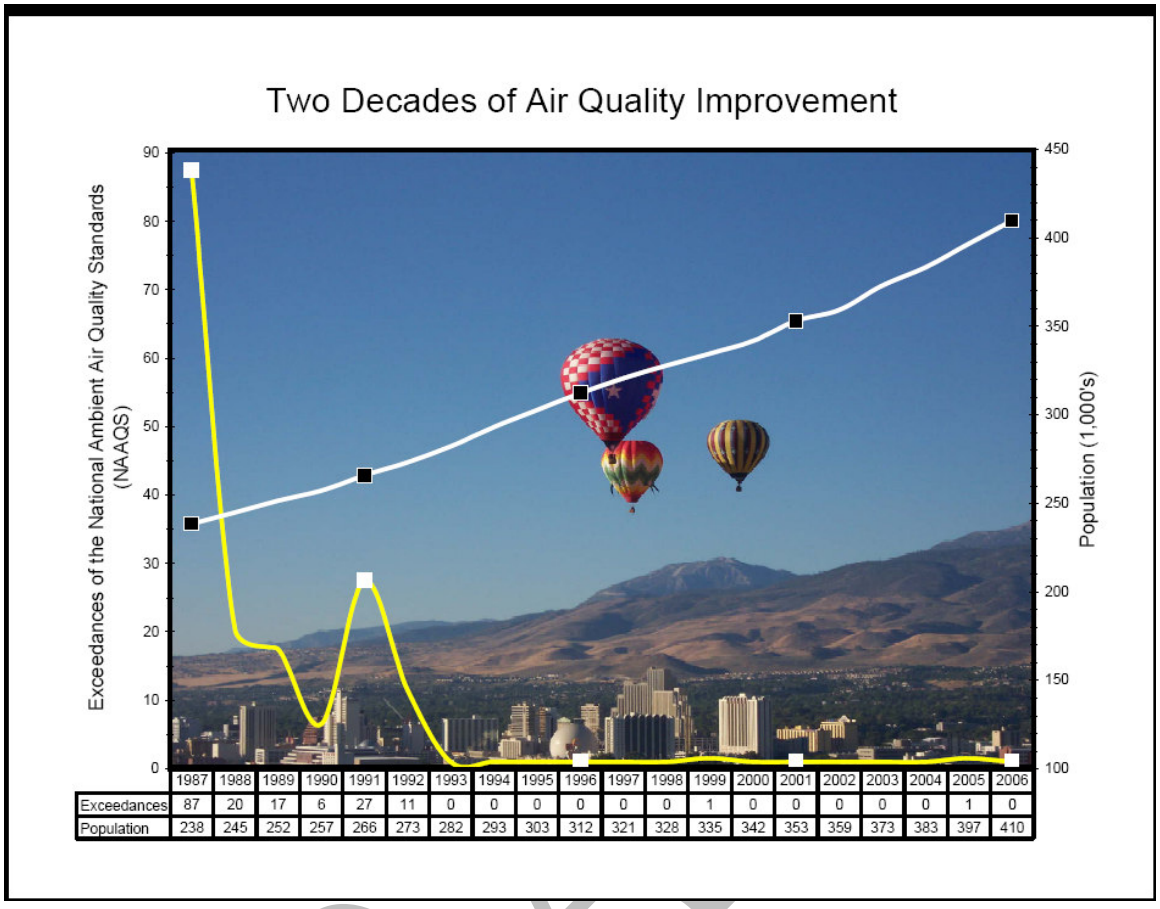


Figure 2. Washoe County Growth and Air Quality Trends

Where does it Occur? – Air quality concerns are important in all of Washoe County, but are of particular concern in the Truckee Meadows Valley. The primary sources for this contamination originate in the urban centers, such as Reno and Sparks. Contaminants from these centers are distributed throughout the Truckee Meadows and their levels are exacerbated when temperature inversions or other weather conditions trap the pollutants on the Truckee Meadows Valley floor. In such cases, pollution levels in the valley can quickly rise above healthy levels.

What are the Threats/Risks? – Poor air quality negatively affects the health of local residents, diminishes the County's aesthetic values, causes undue health care expenses, and has the ability to reduce tourism-based revenue. The three primary contaminants in Washoe County exacerbate asthma, bronchitis, and emphysema in the very old, very young, and chronically ill.

What are the Opportunities, Priorities, and Projects? – Open space planning efforts should be coordinated with the 2006 Washoe County Comprehensive Plan, the 2006 Truckee Meadows Regional Plan, and other guidance generated by local jurisdictions. Strategies identified in the 2006 Truckee Meadows Regional Plan include:

- Reducing the rate of increase in vehicle miles traveled per capita through the implementation of smart growth planning practices and the development of a more efficient transportation infrastructure.

- Increasing the use of alternative fuels in motor vehicles and/or the uses of alternative mode transportation.
- Developing standards and programs for the management of solid fuel-burning devices.
- Implementing road, street, and parking area sanding, sweeping and/or cleaning programs.
- Prohibiting the use of diesel oil-fueled, internal combustion power generation units synchronized with the regional electric grid within the Truckee Meadow Service Areas, except for during emergency situations.
- Encouraging development practices that promote energy-efficient building technology in terms of site location, building materials, building technology, and other elements.

Specific actions needed to implement these strategies are identified in the Conservation Element of the Washoe County Comprehensive Plan. In addition to integrating these strategies into open space planning efforts, the County should also consider opportunities for using open space to actively improve air quality. For example, open space can be used to generate carbon sequestration benefits provided by plant and tree growth.

3.4 NATURAL HAZARDS

3.4.1 Wildfire

Why is it Important? – Fire is an important, natural event that helps to sustain and regenerate habitats found in southern Washoe County. In general, fire management strategies can include everything from allowing a fire burn out to implementing complete fire suppression measures. The strategy selected is usually based, at least partially, upon the proximity of the fire to human habitation structures and activity areas. The past five years of wildfire history are documented in Figure 4 below.

In the Humboldt-Toiyabe National Forest and along the Eastern slope in general, the severity of forest fires has increased over time. This is due to a number of factors, including encroachment of non-native invasive species and pinyon and juniper trees into areas previously dominated by sagebrush and the accumulation of fuels (i.e., woody material) in areas that would otherwise burn if fires were not suppressed.

The increasing development in fire-prone areas creates safety concerns for local residents and firefighters. Severe fires are also very costly in terms of property damage, resources needed to actually fight the fire, loss of important habitats, and lost opportunities for tourism-based revenue, etc.

Where does it Occur? – Significant current growth in the urban-rural interface creates increased opportunities for fire hazards.[9] Fire hazards are a particular concern in southern Washoe County, due to the prevalence of large tracts of forestland located in close proximity to urbanizing areas (Table 1). It should be noted that local fire officials are of the opinion that some of the areas classified as “low” risk are in fact “moderate” to “high” risk.

[9] http://www.rci-nv.com/reports/washoe/section04.html.

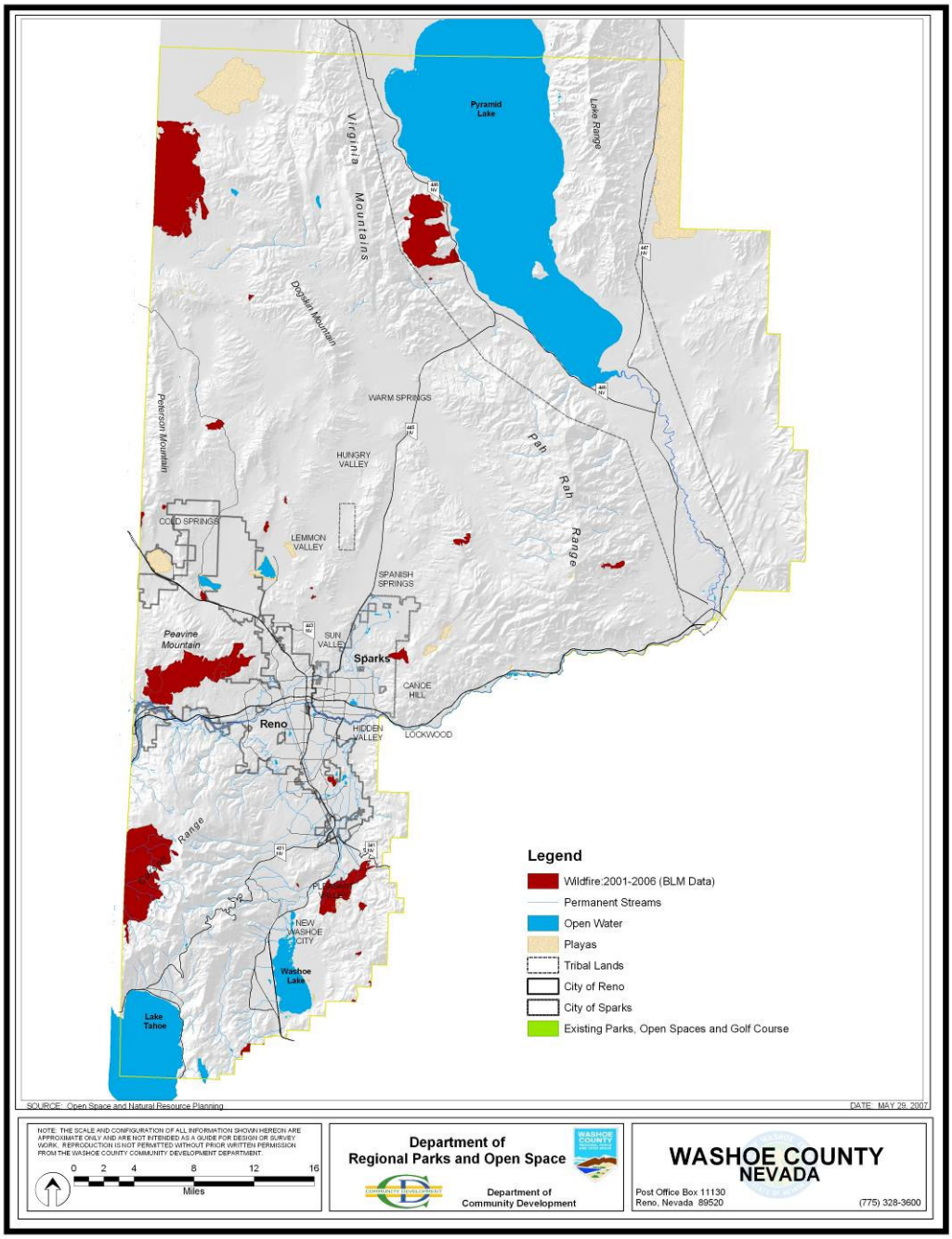


Figure 4. History of wildfires in study area, 2001-2006

Table 1. Community Risk and Hazard Assessment Results

Community	Interface Condition	Interface Fuel Hazard Condition	Ignition Risk Rating	Community Hazard Rating
High and Extreme Hazard Communities				
Antelope Valley	Intermix	Low to High	High	High
Mount Rose Corridor	Intermix	Moderate to Extreme	High	High
Rancho Haven	Intermix	Moderate to Extreme	High	High
Red Rock	Intermix	Low to High	High	High
Warm Springs Valley	Intermix	Low to High	High	High
Washoe Valley – West	Intermix	Low to Extreme	High	High
Moderate Hazard Communities				
Anderson Acres	Intermix	Moderate	High	Moderate
Cold Springs	Classic	Moderate	High	Moderate
Galena	Intermix	High to Extreme	High	Moderate
Gerlach	Intermix	Low to Moderate	Moderate	Moderate
Golden Valley	Intermix	Moderate	High	Moderate
Lemmon Valley	Intermix	Moderate	High	Moderate
Mogul (I-80 Corridor West)	Classic	Moderate	High	Moderate
Nixon	Intermix	Low to High	High	Moderate
Palomino Valley	Intermix	Low to High	High	Moderate
Pleasant Valley	Classic	Moderate to High	High	Moderate
Reno-Northwest	Classic	Moderate to High	High	Moderate
Reno-Southeast	Intermix	Moderate to High	High	Moderate
Silver Knolls	Intermix	Moderate	High	Moderate
Spanish Springs	Intermix	Moderate to High	Moderate	Moderate
Steamboat	Intermix	Low to High	High	Moderate
Sun Valley	Intermix	Low to Extreme	Moderate	Moderate
Sutcliffe	Classic	High	High	Moderate (High)
Verdi	Intermix	Moderate to Extreme	High	Moderate
Washoe City	Classic and Intermix	High	High	Moderate
Washoe Valley – East	Intermix	Moderate to High	High	Moderate
Low Hazard Communities				
Empire	Intermix	Low to Moderate	Moderate	Low
Reno-Southwest	Classic	Low to High	High	Low
Sparks	Classic	Low to Moderate	Low	Low
Stead	Classic	Moderate	Moderate	Low
Wadsworth	Classic	Low to Moderate	Moderate	Low

What are the Threats/Risks? –Throughout Washoe County, homes constructed at the edge of urban/suburban areas are often adjacent to USFS or BLM land. The proximity of these structures to wildfire prone areas creates safety risks for residents and firefighters alike. Areas that previously may have been allowed to burn are transformed into urban fire-fighting environments that pose significant hazards for firefighters endeavoring to protect structures. Aggressive, expensive, and dangerous fire fighting techniques are almost always required in the urban-rural interface.

What are the Opportunities, Priorities, and Projects? – Open space planning creates potential opportunities for a community to help manage wildfire risks. When developed in conjunction with local foresters, land use considerations can include the strategic location of open space and recreational resources to help reduce fire risks. Open spaces can be managed for fire resistive vegetation, control of invasive species, and be conditioned with the provision of fire breaks between fuel-laden natural areas, open space and population centers. In addition, open space design considerations can include concentrating recreational uses in areas where the risk of unintentional fire starting is minimized. Open spaces in the urban-rural interface can also serve educational purposes by hosting educational information, such as kiosks, in key viewing areas, etc. Additional fire hazard mitigation opportunities can be achieved through leveraging other programs:

- Round 8 So. NV Public Land Management Act application for $2.3 million in Fuels reduction funding for Washoe County;
- Round 9 So. NV. Public Land Management Act application for Fuels reduction in Washoe County including City of Reno Open Space;
- Integrated Planning effort with U.S. Forest Service, Bureau of Land Management, City of Reno, City of Sparks, Washoe County, Sierra Fire Protection District, NV. Fire Safe Chapters, and other partners for collaborative projects and funding;
- Use of Sierra Fire Protection District seasonal fire crews for fuels reduction, weed removal and defensible space projects in open space;
- Collaboration with local Fire Safe Chapters; and
- Possible funding through a No. Nevada Lands Bill.

3.4.2 Flood

Why is it Important? – The primary flooding concerns in southern Washoe County are located in the Truckee River watershed. Streams in the northern portion of the planning area also flood; however, the more natural state of those areas and the lack of significant settlement make flood events there less of an immediate hazard.

The Truckee Meadows Regional Plan estimates that the chance of Truckee River flooding in a given year is 1 in 60 for Reno and 1 in 10 for Sparks. It also estimates that about 6,000 structures and $3 billion in property are located in Washoe County floodplains. The latest major flood, estimated to be a 100-150 [117] year event, occurred in January of 1997. The flood resulted in the death of two citizens. In addition to the federally recognized damages to more than 1,420 buildings and $450 million in damages to physical property and products,

other economic impacts resulting from the flood included loss of income and business, increased insurance rates, and a reduction in tourism.[10]

Historically, Truckee River flood flows were attenuated as they moved downstream. However, as a result of modifications to the natural system, flow rates stay the same and sometimes increase as they move downstream, thus creating greater risks to communities located in lower parts of the watershed.

Where does it Occur? – Flood conditions for each of the hydrographic basins are outlined below:

- Flooding is an issue on the Truckee River from Tahoe City to Pyramid Lake. Currently the area with the most potential for flood damage, in terms of dollars, is in the Tracy Hydrographic Basin - particularly from the West McCarran Bridge to Rainbow Bend. As more development occurs along the river, the area of potential flood damage increases and expands to include more developed properties. Efforts are currently underway in this basin to implement floodplain restoration projects to help address the problem.
- Growth in the Spanish Springs Valley Hydrographic Basin is increasing the potential for significant flooding; new development projects are required to comply with the basin-wide master plan.
- Drainage improvements recommended in the 1990 storm water master plan are anticipated to be sufficient to manage flood hazards in the Sun Valley Hydrographic Basin.
- Several flood hazards exist within the Washoe Valley Hydrographic Basin, including alluvial fan flooding, lake flooding, and riverine flooding.
- Truckee Canyon Hydrographic Basin (Verdi) flooding may become an issue if significant land use changes occur.
- The Stead/Lemmon Valley and Cold Springs Valley Hydrographic Basins are topographically closed basins. Future changes to flood peaks and flood storage volumes will need to be monitored so that flood hazard prevention measures can be implemented as needed. In closed basins such as these, increased runoff (caused by land use changes and increased amounts of impermeable surfaces) causes the water level in the lower areas of the closed basin to increase. This can cause flooding in the area surrounding the lake at the lower end of the basin.
- The Antelope Valley, Bedell Flat, Dry Valley, Warm Springs Valley, and Red Rock Valley Hydrographic Basins have limited development potential and flood hazard risks will be identified on a project level basis.

What are the Threats/Risks? – If development-related impacts (e.g., creation of new impervious surfaces and construction in floodplains) are not properly managed, flood hazards will continue to increase in conjunction with development pressure. As a result, more lives will be put at risk, more property will be lost, and negative financial impacts to local communities will increase in scale.

[10] 2002 Truckee Meadows Regional Plan, Appendix 1).

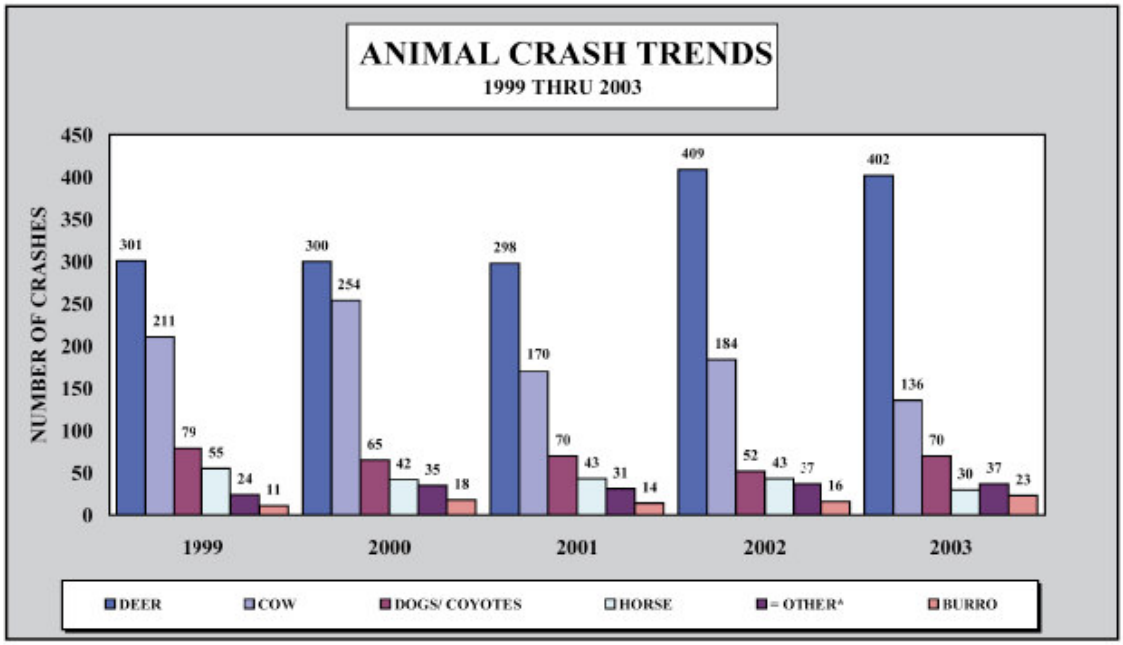
What are the Opportunities, Priorities, and Projects? – Several opportunities exist to address flood hazard issues through the open space planning process:

- Open space planning should focus on those areas where floodplain function is still intact and where riparian corridors and floodplains can be protected from future development.
- Open space planning efforts should occur in coordination with knowledgeable citizen groups and city, county, and state water resource professionals in order to leverage and build upon existing knowledge, efforts, investments, and momentum.[11] Opportunities to support the goals of these organizations may come through either site management decisions or site acquisition priorities.
- The flood prevention and flood control projects previously identified by others may be appropriate for acquisition and open space management, or they may be located such that they will influence other properties to the point that they become more or less valuable in the open space context. The ripple effect of proposed restoration and/or structural flood control projects should be evaluated during the open space planning process to identify future opportunities—or potential constraints—that may otherwise go unnoticed.

[11] For example, the 1991 food control master plan prepared for Washoe County identified 35 problem sites and potential projects. This type of information should be evaluated to determine whether floodplain restoration projects can accomplish project goals through non-structural solutions and how open space planning may help to accomplish the dual objectives of flood hazard prevention and open space use.

3.4.3 Wildlife/Vehicle Conflicts

Why is it Important? – Accidents involving vehicular collisions with wildlife can result in significant property damage and the injury or death of both the driver and wildlife species involved. Species commonly hit in Nevada include mule deer, elk, big horn sheep, rabbits, coyotes, raccoons and snakes (Figure 3).[12]



^OTHER INCLUDES BIG HORN SHEEP, ANTELOPE AND ELK

Figure 3. 2003 Nevada Traffic Crashes (Nevada Department of Transportation)

Where does it Occur? – Four common locations for wildlife accidents include sections of road that cross or are near to water sources (springs, wetlands, streams, rivers, and lakes), roads that have good wildlife habitat and forage opportunities near roadsides (grassy shoulders, forested buffers, etc.), roads located in current or historic migratory routes, and wide, long stretches of road where drivers become over-confident and accelerate to speeds that drastically shorten reaction times.[13] The top three highways with animal-vehicle crashes that resulted in property damage and injuries are depicted in Map Figure 31.

What are the Threats/Risks? – Conflicts between vehicles and wildlife occur primarily when animals attempt to cross roadways that carry moderate to high speed traffic. In addition to collisions, evasive maneuvers made by drivers also result in accidents when drivers swerve into oncoming traffic or fixed objects, or accidentally leave the roadway. Many of these accidents are entirely preventable and are the result of high driving speeds. The Nevada

[12] http://www.ndow.org/about/news/pr/111506_road_animals.shtm.

[13] http://www.wildlifeaccidents.ca/where.htm. Wildlife Collision Prevention Program, British Columbia Conservation Foundation.

Department of Transportation's accident records show that in 1999, 301 deer collisions were reported and by 2003, the number had risen to 402.[14] This increase is likely due to growth in urban and rural areas. In addition to habitat encroachment, an increase in the number of vehicles on the road results in more opportunities for strikes to occur.

What are the Opportunities, Priorities, and Projects? – It is imperative that open space planning avoid or minimize the potential for exacerbating the problem. Transportation planners should be consulted in the open space planning process to help avoid accidents and minimize situations where wildlife cross the road to see what's on the other side. Installation of properly designed wildlife crossing structures can greatly reduce this risk.

3.4.4 Wildlife/Aviation Conflicts

Why is it Important? – Airports located near wetlands, streams, ponds, agricultural areas, and certain types of open spaces present special challenges related to airline safety. Specific types of land cover and land uses are prone to draw potentially hazardous wildlife into airport operating areas. Wildlife such as birds, deer, coyotes, and other small mammals are hazardous in the airport environment because of the potential for aircraft to strike either the animal itself or other animals (e.g., it's predators) that it draws to the area (Table 2). Modern planes are surprisingly susceptible to collisions with relatively small creatures—most planes can withstand collisions with 2-pound birds, but the current industry airframe and engine certification standard for wildlife strikes is limited to 4 pounds.[15] Given that ducks, for example, commonly weigh between 1–4 pounds and geese, swans and cranes can range from 3.5–25 pounds, the vulnerability of planes is obvious.

[14] Many more collisions are thought to go unreported. Nevada Department of Transportation, NDOT News, Spring 2003.

[15] http://www.tc.gc.ca/civilaviation/AerodromeAirNav/Standards/WildlifeControl/BirdAvoidance.htm .

Table 2. Reported Strikes by Wildlife Type

Table 2-5. Number of reported strikes, strikes with damage, and strikes having a negative effect-on-flight (EOF) for the five most commonly struck bird species groups and two most commonly struck mammal groups, USA, 1990–2003.

	Reported strikes		Strikes with damage		Strikes with EOF	
Species group	14-year total	% of total known	14-year total	% of total known	14-year total	% of total known
Birds						
Gulls	5,323	25	891	28	710	30
Doves/pigeons	2,966	14	245	8	264	11
Raptors	2,666	12	537	17	351	15
Waterfowl	2,217	10	1,023	32	477	20
Blackbirds/starlings	2,210	10	131	4	156	7
All other known	6,302	29	390	12	406	17
Total known	21,684	100	3,217	100	2,364	100
Unknown	29,470		3,483		1,952	
Total birds	51,154		6,700		4,316	
Mammals						
Artiodactyls[1]	643	51	524	94	339	85
Carnivores[2]	312	25	23	4	48	12
All other known	305	24	11	2	10	3
Total known	1,260	100	558	100	397	100
Unknown	12		6		6	
Total mammals	1,272		564		403	

[1] Deer and elk, respectively, comprised 614 and 8 of the 643 strikes with artiodactyls.
[2] Coyotes and foxes, respectively, comprised 150 and 59 of the 312 strikes with carnivores.

Where does it Occur? – Land cover (habitat) and land use in the vicinity of an airport are two primary factors that determine whether or not potentially hazardous species will be attracted to the airport environment. The type of animal, the size of its population, and its behavior patterns dictate the level of threat posed by species lured into the airport's area of operations. The FAA (through Advisory Circular 150/5200-33A, Hazardous Wildlife Attractants on or Near Airports) provides guidance on locating certain land uses that have the potential to attract hazardous wildlife on or near public-use airports. The FAA recommends a minimum distance of 5 statute miles between the edge of an airport's area of operations and known attractants that may encourage wildlife to enter the airspace. It is especially important that wildlife attractants minimize or avoid encouraging bird presence in take off and landing areas. Most bird strikes occur below 2,500 ft in elevation, which tends to be the upper limit for bird flight (Table 3).

Table 3. Common Flight Phases Where Strikes Occur

Table 2-8. Reported phase of flight at time of wildlife strikes to civil aircraft, USA, 1990–2003.

	Birds		Mammals	
Phase of flight	14-year total	% of total known	14-year total	% of total known
Parked	24	<1	0	0
Taxi	161	<1	24	3
Takeoff run	7,810	20	318	33
Climb	7,327	19	26	2
En route	1,148	3	1	<1
Descent	1,463	4	4	<1
Approach	15,065	38	82	8
Landing roll	6,461	16	498	52
Total known	39,459	100	953	100
Unknown	11,695		319	
Total[1]	51,154		1,272	

[1] In addition, 67 strikes with reptiles were reported.

What are the Threats/Risks? – Wildlife strikes are potentially very dangerous, resulting in equipment damage, delays, and sometimes serious injury or death. In the US, wildlife strikes cost the civil aviation industry at least $500 million annually in direct damage and associated costs—not to mention the revenue lost from a total of over 500,000 hours of aircraft down time.[16] During the timeframe of 1990-2003, Nevada reported a total of 251 wildlife strikes, which places it 37th on the list of states with the highest number of aircraft/wildlife conflicts.

What are the Opportunities, Priorities, and Projects? – In most urban areas, it is simply impossible or undesirable to eliminate all existing wildlife attractants in the vicinity of the airport. However, there is an opportunity to avoid exacerbating current conditions by coordinating land use planning efforts with airport officials. Open space planning efforts have the potential to either detrimentally or positively affect aviation, depending upon the land management decisions made. For example, incorporating wetlands located adjacent to an airport into an open space plan that calls for preservation or restoration of the resource may conflict with airport operations. Open space planning should involve early coordination with airport officials in order to avoid exacerbating hazardous wildlife situations and, where possible, to help identify opportunities for collaboration. Open space planning can, for example, complement an airport's operational needs by drawing species to more appropriate

[16] These figures assume only a 20% reporting rate, many strikes go unreported.

locations. In addition, open space has the potential to provide off-site habitat mitigation opportunities for hazard prevention activities that result in habitat loss.

3.4.5 Landslides and Land Subsidence

Why is it Important? – Landslides involve the movement of the ground down a slope. Landslides occur for a variety of reasons, most commonly involving a combination of overly steep slopes coupled with earthquake activity, excessive moisture, or disturbances caused by human activity. Poor water management, removal of stabilizing vegetation, and vibrations caused by machinery and traffic are factors that may trigger landslide and rockslide activity. Land subsidence is also a potential problem in southern Washoe County. Land subsidence occurs when groundwater withdrawal occurs more rapidly than aquifer recharge and sediments and soils begin to shift in response to decreased water pressure. As growth continues to occur and water demand increases, the potential for land subsidence is likely to increase.

Where does it Occur? – Although relatively rare in Nevada, a prominent example of active landslide activity can be found in southern Washoe County at Mogul. Here, on the slopes south of the Truckee River, multiple landslides have occurred over the past 100,000 years.[17] The most recent landslide here was caused by the construction and operation of the Steamboat Ditch. Leaks from ditch tunnels and a flume saturated the soils over time, and finally the slope gave way. In order to prevent a re-occurrence, the ditch was rerouted to flow behind the hill, through a leak-proof tunnel.

Land subsidence can become problematic in areas of Washoe County that experience aquifer depletion. In the vicinity of Truckee Meadows, the State Engineer has designated all of the groundwater basins as being over appropriated or "in need of additional administration."[18] The East Lemmon Valley, Golden Valley, Spanish Springs, Warm Springs, and Cold Springs basins are either over-pumped or are anticipated to be so in the future.

What are the Threats/Risks? – Threats to property and life resulting from landslides and land subsidence were ranked as low priorities for the State of Nevada.[19] However, Washoe County does have an old, yet still significant, active landslide (Mogul) and groundwater aquifer recharge is known to be problematic in the study area.

What are the Opportunities, Priorities, and Projects? – Open space planning creates opportunities to strategically protect areas vulnerable to geologic hazards. In addition, areas likely to become unusable for construction and other development may be suitable for open space use and for the provision of ecosystem services. For example, areas with land subsidence potential may be suitable for passive recreation and wildlife habitat. Areas thought to be undevelopable due to current or potential future geologic conditions should be considered for other, more appropriate uses that avoid potentially hazardous and expensive situations.

[17] Regional Slope Stability of the Truckee River Canyon from Tahoe City, California to Reno, Nevada (Gates, 1994).

[18] 2002 Truckee Meadows Regional Plan.

[19] State of Nevada Standard Multi-Hazard Mitigation Plan (October 2004).

3.4.6 Avalanche

Why is it Important?

An avalanche is a large snow slide that travels downhill with remarkable speed and force, burying everything in its path. Lives are lost every year when skiers, snowmobile riders, and others accidentally trigger avalanches or unwittingly pass into avalanche prone areas during unstable snow conditions. The primary measures that can be taken to minimize avalanche danger include ensuring compatible land uses in risk prone areas and providing public education programs.

Where does it Occur?

Avalanches occur when three primary factors exist: steep terrain (typically between 35-45 degree slopes), unstable snow pack, and quickly changing weather. In addition to these elements, slope orientation, wind direction, and the presence/absence of trees or other anchoring vegetation are variables that affect avalanche potential and can combine to trigger an event. In southern Washoe County, areas with slopes greater than 35 degrees can be found primarily on public lands and Tribal lands, especially in the Carson Range (Figure 5).

What are the Threats/Risks?

In the planning area, avalanche potential is greatest on public lands in undeveloped areas. Currently, avalanche hazards are not considered to pose significant risks to populations, homes or buildings, however impacts to transportation infrastructure are possible. Individual exposure risks are largely dependant upon the knowledge and behavior of those who travel or recreate in avalanche prone areas. In particular, outdoor enthusiasts have the potential to trigger avalanches that put them at serious risk of harm.

What are the Opportunities, Priorities, and Projects?

Open space planning creates opportunities to improve public safety in areas where public access to avalanche prone areas exists. Open space management techniques can be used to draw people away from unsafe areas and toward areas where hazards can be avoided or mitigated. Coordination with local technical resources, such as the County's Hasty Team, should occur if priority planning areas are located in or near areas with avalanche potential.

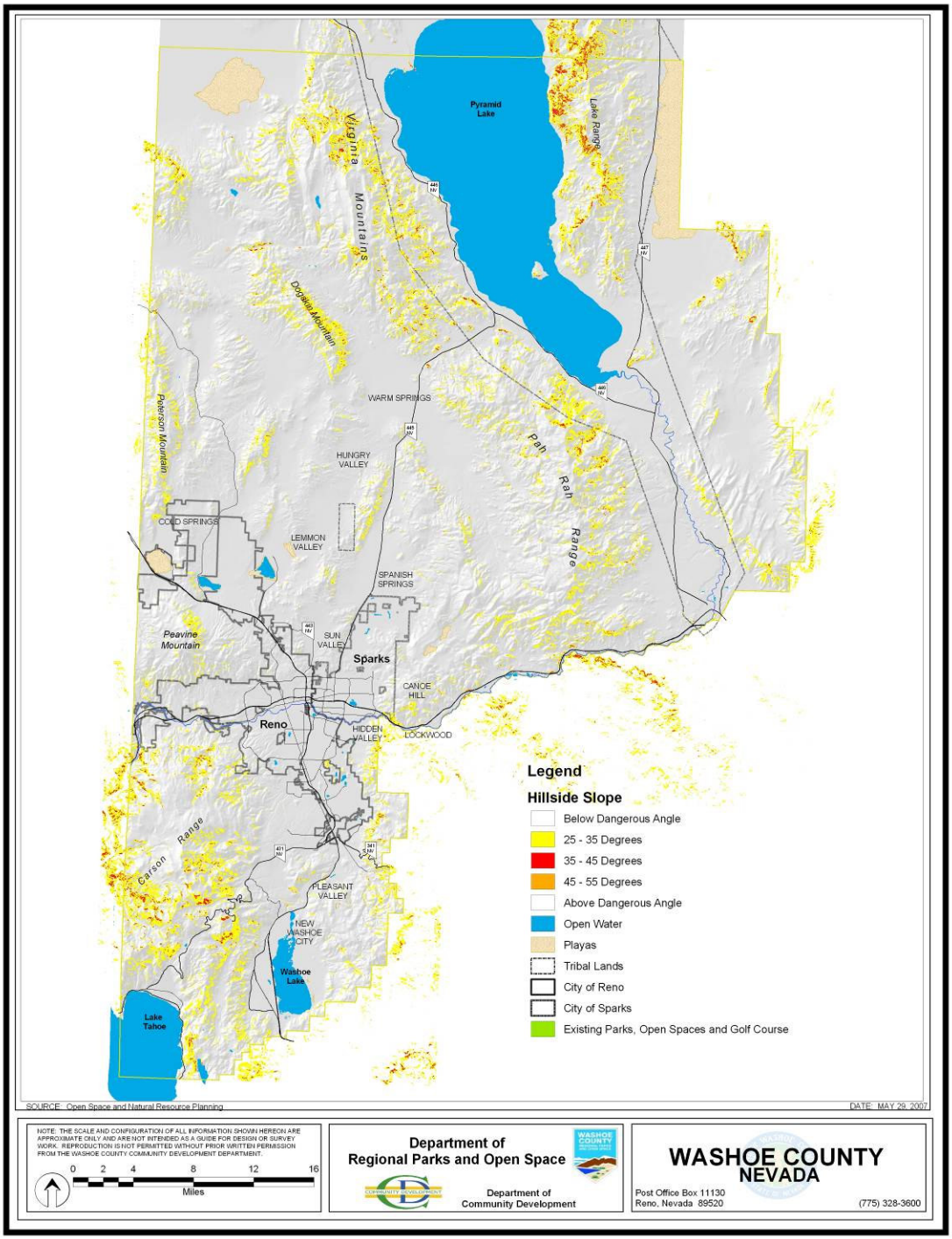


Figure 5. Slopes at risk for avalanches

4. CONCLUSION AND RECOMMENDATIONS

Southern Washoe County is home to a diverse array of natural resources. Fish, wildlife, habitat for listed species, streams, wetlands, and rivers are only a few of the significant resources found in relatively close proximity to large population centers. This investigation indicates that there is a growing potential for land use conflicts between natural resources and development needs as community development begins encroaching into existing natural areas.

Local planning documents set the stage for a development of a comprehensive resource management approach. Many local policies and goals targeted toward sustainable growth and natural resource management have been developed and accepted by the community. These requirements and guidance identify project development standards and mitigation or offset requirements for things such as impacts to water quality, groundwater use, etc. These local requirements, in addition to requirements established at the state and federal levels, create opportunities for development of an ecosystem marketplace.

Ecosystem marketplaces basically function as a network of mitigation solutions. Developers and others with offset and mitigation obligations need effective and efficient mitigation solutions. Land managers with either existing natural resources or potential natural resources, can actually sell "credits" to those needing to provide mitigation for impacts. Once regulatory structures are in place, the marketplace functions as a trading forum for those who have natural resources and those who need to provide environmental benefits. For most of the resource types and issues evaluated in this report, incentives appear to exist for development of a trading system for both "cap and trade" and "offset" markets, as a way to balance economic growth and management of natural areas for conservation outcomes. In the end, land managers are paid to manage their lands for natural resource benefits through preservation, restoration, and conservation.

Washoe County is in a unique position to be able to help address natural resource needs, while also enabling growth and community development. As the County engages in its open space and recreation planning processes, mechanisms for balancing economic growth and management of natural areas for conservation outcomes can be identified and implemented. The County can develop its open space plan with the concept of "natural resource portfolios" in mind. Management objectives for existing natural areas and acquisition of new areas can, in part, be prioritized based on the ability of a certain parcel to provide the natural resource benefits, commonly called "ecosystem services" that are most needed in the community to conserve existing resources and restore those impaired by development. Examples of ecosystem services include the ability of a wetland to filter stormwater, help recharge an aquifer, and attenuate flood flows, the ability of trees to sequester carbon, and the ability of a given habitat to support a species of particular significance or value.

As the County proceeds with open space planning, coordination with other local, state, and federal agencies, developers, the agricultural community, etc. can help to identify the types of natural resource impacts anticipated to occur in the next 20 years. Thus informed, the County can proceed by identifying opportunities to provide mitigation or offsets for those impacts – in advance of the impact actually occurring. Examples of this approach include:

- Addition of new impervious surfaces and the need to prevent water quality and water quantity impacts to a Truckee River tributary create an opportunity. If the County is able to manage a parcel of land located downstream of the anticipated development (which will still need to meet County design criteria) in such a way as to address stormwater runoff in a natural way – while also providing wildlife habitat, benefits to

the ecosystem can occur and the need for costly engineering solutions can be minimized.

- If the Nevada Department of Transportation identifies that development is anticipated to cause a change in wildlife behavior that may result in more conflicts between wildlife and motorists, the open space planning process can include and examination of surrounding land uses and available resources to determine if the County can implement land management strategies (or acquire key parcels for open space and habitat purposes) that can either resolve an existing problem – or prevent development of another.

A key factor in development of a marketplace is the provision of *high* quality mitigation. If the open space planning process leverages existing projects and planned restoration opportunities – and supports or builds upon those efforts – the County will be able to add value to its own land, as well as surrounding natural areas. The County can fund acquisition of new properties and implementation of specific management strategies by selling "credits" to those who need to provide mitigation.[20] This basic market function provides the link between "supply" and "demand".

A thorough review of market opportunities needs to be performed to ensure that sufficient demand exists to support the market. Examples of the types of ecosystem services that should be further investigated include:

- Wetlands and Streams
- Unique habitats and habitats that support important species
- Air quality
- Water quality (nutrients, temperature, etc)
- Water quantity and aquifer recharge
- Stormwater management/flood prevention
- Fire hazard prevention
- Wildlife conflict prevention, etc.

This report recommends that Washoe County assess market drivers and demand to determine if sufficient need for mitigation exists. If so, the County should inventory its existing holdings for the potential to provide ecosystem services for trade in an ecosystem marketplace – this will provide the portfolio needed to make strategic land use investment decisions. Moving forward, the County should evaluate potential property acquisition sites based, in part, on their ability to perform *multiple* ecosystem service functions. Not only will this approach help protect and improve the most valuable resource types in the County, but it will also provide a funding mechanism for implementation of restoration plans and management activities.

[20] The County could establish a multi-resource "banking" program or partner with a local entrepreneur to do so.

APPENDIX A

Federally and State-Listed Species within Washoe County

Species Common Name (Scientific Name)	Federal Listing	State Listing	Endemic to County?
FLORA			
Washoe pine (*Pinus washoensis*)	N/A	CY	Y
Sand cholla (*Opuntia pulchella*)	N/A	CY	N
Williams combleaf (*Polyctenium williamsiae*)	N/A	CE	N
Tiehm rockcress (*Arabis tiehmii*)	SOC	N/A	Y
Rams Horn Spring milkvetch (*Astragalus pulsiferae* var. *coronensis*)	SOC	N/A	Y
Tiehm milkvetch (*Astragalus tiehmii*)	SOC	N/A	N
Schoolcraft catseye (*Cryptantha schoolcraftii*)	SOC	N/A	N
Crosby buckwheat (*Eriogonum crosbyae*)	SOC	N/A	N
Steamboat buckwheat (*Eriogonum ovalifolium* var. *williamsiae*)	LE	CE	Y
Prostrate buckwheat (*Eriogonum prociduum*)	SOC	N/A	N
Sierra Valley mousetails (*Ivesia aperta* var. *aperta*)	SOC	N/A	N
Grimy mousetails (*Ivesia rhypara* var. *rhypara*)	SOC	N/A	N
Webber ivesia (*Ivesia webberi*)	C	CE	N
Oryctes (*Oryctes nevadensis*)	SOC	N/A	N
Tahoe yellowcress (*Rorippa subumbellata*)	C	CE	N
FAUNA			
California floater (*Anodonta californiensis*)	SOC	N/A	N
Mono checkerspot (*Euphydryas editha monoensis*)	SOC	N/A	N
Nevada viceroy (*Limenitis archippus lahontani*)	SOC	N/A	N
Carson wandering skipper (*Pseudocopaeodes eunus obscurus*)	LE	N/A	N
Carson Valley silverspot (*Speyeria nokomis carsonensis*)	SOC	N/A	N
Wall Canyon sucker (*Catostomus* sp.)	SOC	N/A	Y
Warner sucker (*Catostomus warnerensis*)	LT	N/A	Y
Cui-ui (*Chasmistes cujus*)	LE	N/A1	Y
Sheldon tui chub (*Gila bicolor eurysoma*)	SOC	N/A	Y
Cowhead Lake tui chub (*Gila bicolor vaccaceps*)	PE	N/A	Y
Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*)	LT	N/A1	N
Warner Valley redband trout (*Oncorhynchus mykiss pop*)	SOC	N/A1	Y
Mountain yellow-legged frog (*Rana muscosa*)	C	N/A	N
Mono Basin mountain beaver (*Aplodontia rufa californica*)	SOC	N/A1	N
Pygmy rabbit (*Brachylagus idahoensis*)	SOC	N/A1	N
Spotted bat (*Euderma maculatum*)	SOC	N/A1	N
Western small-footed myotis (*Myotis ciliolabrum*)	SOC	N/A	N
Fringed myotis (*Myotis thysanodes*)	SOC	N/A	N
Preble's shrew (*Sorex preblei*)	SOC	N/A	N
Northern Goshawk (*Accipiter gentilis*)	SOC	N/A1	N
Western Burrowing Owl (*Athene cunicularia hypugaea*)	SOC	N/A1	N
Ferruginous Hawk (*Buteo regalis*)	SOC	N/A1	N
Black Tern (*Chlidonias niger*)	SOC	N/A1	N
Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)	C	N/A1	N

Species Common Name (Scientific Name)	Federal Listing	State Listing	Endemic to County?
White-faced Ibis (*Plegadis chihi*)	SOC	N/A1	N
California Spotted Owl (*Strix occidentalis occidentalis*)	SOC	N/A1	N
Northwestern pond turtle (*Emys marmorata marmorata*)	SOC	N/A	N
Sierra Nevada snowshoe hare (*Lepus americanus tahoensis*)	SOC	N/A1	N
Long-eared myotis (*Myotis evotis*)	SOC	N/A	N
Long-legged myotis (*Myotis volans*)	SOC	N/A	N
Yuma myotis (*Myotis yumanensis*)	SOC	N/A	N
Tricolored Blackbird (*Agelaius tricolor*)	SOC	N/A1	N
Harlequin Duck (*Histrionicus histrionicus*)	SOC	N/A1	N
Loggerhead Shrike (*Lanius ludovicianus*)	SOC	N/A1	N

Federal Listing Key:

C Candidate Species

LE Listed Endangered

LT Listed Threatened

PE Proposed Endangered

SOC Species of Concern

State Listing Key:

CE Critically Endangered – species threatened with extinction

CY Protected as a cactus, yucca, or Christmas tree

N/A Not Applicable

APPENDIX B

Species List: Taxonomic Groups

Species List:
Taxonomic Groups

FISH

Common Name	Scientific Name
Cui-ui	*Chasmistes cujus*
Lahontan Cutthroat Trout	*Oncorhynchus clarkii henshawi*

AMPHIBIANS

Common Name	Scientific Name
Mountain Yellow-Legged Frog	*Rana muscosa*
Northern Leopard Frog	*Rana pipiens*

REPTILES

Common Name	Scientific Name
Desert horned lizard	*Phrynosoma platyrhinos*
Great Basin collared lizard	*Crotaphytus bicinctores*
Long-nosed leopard lizard	*Gambelia wislizenii*
Northwestern pond turtle	*Emys marmorata marmorata*
Sierra alligator lizard	*Elgaria coerulea palmeri*

MAMMALS

Common Name	Scientific Name
American marten	*Martes americana*
American pika	*Ochotona princeps*
Bighorn sheep	*Ovis canadensis*
Black Bear	*Ursus americanus*
Bobcat	*Lynx rufus*
Broad-footed mole	*Scapanus latimanus*
Brush mouse	*Peromyscus boylii*
Desert kangaroo rat	*Dipodomys deserti*
Fletcher dark kangaroo mouse	*Microdipodops megacephalus nasutus*
Fringed myotis	*Myotis thysanodes*
Hoary bat	*Lasiurus cinereus*
Inyo shrew	*Sorex tenellus*

Kit fox	*Vulpes macrotis*
Little brown myotis	*Myotis lucifugus*
Long-eared myotis	*Myotis evotis*
Merriam's shrew	*Sorex merriami leucogenys*
Montane shrew	*Sorex monticolus*
Mountain beaver (Aplodontia)	*Aplodontia rufa*
Mountain lion	*Puma concolor*
Mountain pocket gopher	*Thomomys monticola*
Mule deer	*Odocoileus hemionus*
Northern flying squirrel	*Glaucomys sabrinus*
Pale kangaroo mouse	*Microdipodops pallidus*
Pallid bat	*Antrozous pallidus*
Pronghorn antelope	*Antilocapra americana*
Pygmy rabbit	*Brachylagus idahoensis*
Sagebrush vole	*Lemmiscus curtatus*
Sierra Nevada red fox	*Vulpes vulpes necator*
Spotted bat	*Euderma maculatum*
Townsend's big-eared bat	*Corynorhinus townsendii*
Trowbridge's shrew	*Sorex trowbridgii*
Vagrant shrew	*Sorex vagrans*
Water shrew	*Sorex palustris*
Western jumping mouse	*Zapus princeps oregonus*
Western small-footed myotis	*Myotis ciliolabrum*

BIRDS

Common Name	**Scientific Name**
American avocet	*Recurvirostra americana*
American white pelican	*Pelecanus erythrorhynchos*
Bald eagle	*Haliaeetus leucocephalus*
Black-necked stilt	*Himantopus mexicanus*
Black tern	*Chlidonias niger*
Blue grouse	*Dendragapus obscurus*
Brewer's sparrow	*Spizella breweri*
Burrowing owl	*Athene cunicularia*

California spotted owl	*Strix occidentalis occidentalis*
Canvasback	*Aythya valisineria*
Cassin's finch	*Carpodacus cassinii*
Cinnamon teal	*Anas cyanoptera*
Clark's grebe	*Aechmophorus clarkii*
Common loon	*Gavia immer*
Eared grebe	*Podiceps nigricollis*
Ferruginous hawk	*Buteo regalis*
Forster's tern	*Sterna forsteri*
Franklin's gull	*Larus pipixcan*
Grace's warbler	*Dendroica graciae*
Greater sandhill crane	*Grus canadensis tabida*
Hermit warbler	*Dendroica occidentalis*
Least sandpiper	*Calidris minutilla*
Lewis' woodpecker	*Melanerpes lewis*
Loggerhead shrike	*Lanius ludovicianus*
Long-billed curlew	*Numenius americanus*
Long-billed dowitcher	*Limnodromus scolopaceus*
Long-eared owl	*Asio otus*
Mountain quail	*Oreortyx pictus*
Northern goshawk	*Accipiter gentilis*
Northern pintail	*Anas acuta*
Olive-sided flycatcher	*Contopus cooperi*
Peregrine falcon	*Falco peregrinus*
Prairie falcon	*Falco mexicanus*
Red-breasted sapsucker	*Sphyrapicus ruber*
Red-necked phalarope	*Phalaropus lobatus*
Rufous hummingbird	*Selasphorus rufus*
Sage grouse	*Centrocercus urophasianus*
Sage sparrow	*Amphispiza belli*
Short-eared owl	*Asio flammeus*
Snowy egret	*Egretta thula*
Snowy plover	*Charadrius alexandrinus*
Swainson's hawk	*Buteo swainsoni*

Tundra swan	*Cygnus columbianus*
Virginia's warbler	*Vermivora virginiae*
Western grebe	*Aechmophorus occidentalis*
White-faced ibis	*Plegadis chihi*
White-headed woodpecker	*Picoides albolarvatus*
White-throated swift	*Aeronautes saxatalis*
Willet	*Catoptrophorus semipalmatus*
Willow flycatcher	*Empidonax traillii*
Yellow-billed cuckoo	*Coccyzus americanus*

Mollusks

Common Name	Scientific Name
California floater	*Anodonta californiensis*
Fly Ranch pyrg	*Pyrgulopsis bruesi*
Pyramid Lake pebblesnail	*Fluminicola dalli*
Virginia Mountains pebblesnail	*Fluminicola virginius*
Western Lahontan springsnail	*Pyrgulopsis longiglans*

PLANTS

Common Name	Scientific Name
Alder sp.	*Alnus* spp.
Alkali bulrush	*Scirpus maritimus*
Alpine avens	*Geum rossii*
Alpine timothy	*Phleum alpinum*
Altered andesite buckwheat	*Eriogonum robustum*
Altered andesite popcornflower	*Plagiobothrys glomeratus*
Ames milkvetch	*Astragalus pulsiferae* var. *pulsiferae*
Antelope bitterbrush	*Purshia tridentata*
Arrowhead	*Sagittaria cuneata*
Arroyo willow	*Salix lasiolepis*
Aspen	*Populus tremuloides*
Aster	*Aster* spp.
Baltic rush	*Juncus balticus*
Basin (big) sagebrush	*Artemisia tridentata* spp. *tridentata*

Birch	*Betula* spp.
Bitterbrush	*Purshia tridentata*
Bittercherry	*Prunus emarginata*
Black cottonwood	*Populus trichocarpa*
Black sagebrush	*Artemisia nova*
Bluebunch wheatgrass	*Pseudoroegneria spicata*
Bluegrass	*Poa* spp.
Blue wildrye	*Elymus glaucus*
Bracken fern	*Pteridium aquilinum*
Buffaloberry	*Shepherdia argentea*
California juniper	*Juniperus californica*
Camassia	*Camassia quamash*
Cattails	*Typha* spp.
Ceanothus	*Ceanothus* spp.
Chokecherry	*Prunus virginiana*
Cinquefoil	*Potentilla* spp.
Columbine	*Aquilegia*
Common juniper	*Juniperus communis*
Creeping wildrye	*Leymus triticoides*
Curl-leaf mountain mahogany	*Cercocarpus ledifolius*
Currant	*Ribes* spp.
Cushion phlox	*Phlox pulvinata*
Dalea	*Psorothamnus* spp.
Desert sand-verbena	*Abronia villosa*
Dogwood	*Cornus* spp.
Englemann aster	*Eucephalus engelmannii*
False hellebore	*Veratrum californicum*
Fendler meadow rue	*Thalictrum fendleri*
Fourwing saltbush	*Atriplex canescens*
Fremont cottonwood	*Populus deltoides* var. *fremontii*
Galena Creek rockcress	*Arabis rigidissima* var. *demota*
Globemallow	*Sphaeralcea* spp.
Greasewood	*Sarcobatus vermiculatus*
Great Basin wildrye	*Leymus cinereus*

Greenleaf manzanita	*Arctostaphylos patula*
Hardstem bulrush	*Scirpus acutus*
Idaho fescue	*Festuca idahoensis*
Incense cedar	*Calocedrus decurrens*
Indian paintbrush	*Castilleja* spp.
Indian ricegrass	*Achnatherum hymenoides*
Iodinebush	*Allenrolfea occidentalis*
Jeffrey pine	*Pinus jeffreyi*
Larkspur	*Delphinium* spp.
Lemmon milkvetch	*Astragalus lemmonii*
Littleleaf (mountain-mahogany)	*Cercocarpus intricatus*
Lodgepole pine	*Pinus contorta*
Low sagebrush	*Artemisia arbuscula*
Lupine	*Lupinus* spp.
Manzanita	*Arctostaphylos* spp.
Mountain alder	*Alnus incana*
Mountain sagebrush	*Artemisia tridentata* spp. *vaseyana*
Needle and thread	*Hesperostipa comata*
Northern mule's ear	*Wyethia amplexicaulis*
Oryctes	*Oryctes nevadensis*
Pacific willow	*Salix lasiandra*
Pennyroyal	*Monardella* spp.
Penstemon	*Penstemon spp.*
Playa phacelia	*Phacelia inundata*
Ponderosa pine	*Pinus ponderosa*
Pondweed	*Potamogeton* spp.
Quailbush	*Atriplex lentiformis*
Quaking aspen	*Populus tremuloides*
Rabbitbrush	*Chrysothamnus* spp.
Rabbitfoot grass	*Polypogon monspeliensis*
Red elderberry	*Sambucus racemosa*
Red fir	*Abies magnifica*
Red-osier dogwood	*Cornus sericea*
Rocky Mountain pinon	*Pinus edulis*

Sagebrush	*Artemisia* spp.
Sago pondweed	*Potamogeton pectinatus*
Saltgrass	*Distichlis spicata*
Sand dropseed	*Sporobolus cryptandrus*
Sandbar (coyote) willow	*Salix exigua*
Serviceberry	*Amelanchier* spp.
Shadscale	*Atriplex confertifolia*
Shooting star	*Dodecatheon jeffreyi*
Shrubby cinquefoil	*Pentaphylloides fruticosa*
Sierra currant	*Ribes nevadense*
Sierra Valley mousetails	*Ivesia aperta* var. *aperta*
Single leaf pinon	*Pinus monophylla*
Slender hairgrass	*Deschampsia elongata*
Smartweed	*Polygonum* spp.
Snowberry	*Symphoricarpos* spp.
Spikerush	*Eleocharis* spp.
Squaw currant	*Ribes cereum*
Squirreltail	*Elymus elymoides*
Steamboat buckwheat	*Eriogonum ovalifolium* var. *williamsiae*
Steamboat monkeyflower	*Mimulus ovatus*
Sticky geranium	*Geranium viscosissimum*
Sugar pine	*Pinus lambertiana*
Tahoe draba	*Draba asterophora* var. *asterophora*
Tahoe yellowcress	*Rorippa subumbellata*
Tiehm rockcress	*Arabis tiehmii*
Tufted hairgrass	*Deschampsia cespitosa*
Utah juniper	*Juniperus osteosperma*
Washoe pine	*Pinus washoensis*
Washoe tall rockcress	*Arabis rectissima* var. *simulans*
Weber ivesia	*Ivesia webberi*
Western juniper	*Juniperus occidentalis*
Western needlegrass	*Achnatherum occidentalis*
Western (common) yarrow	*Achillea millefolium*
White fir	*Abies concolor*

Wild Rose	*Rosa woodsii* var. *ultramontana*
Williams combleaf	*Polyctenium williamsiae*
Winterfat	*Krascheninnikovia lanata*
Woolly wyethia (mule ears)	*Wyethia mollis*
Wyoming sagebrush	*Artemisia tridentata* ssp. *Wyomingensis*
Yellow willow	*Salix lutea*

NON-NATIVE PLANTS

Common Name	**Scientific Name**
Cheatgrass	*Bromus tectorum*
Crested wheatgrass	*Agropyron desertorum*
Eurasian water milfoil	*Myriophyllum spicatum*
Halogeton	*Halogeton glomeratus*
Intermediate wheatgrass	*Elytrigia intermedia*
Medusahead	*Taeniatherum caput-medusae*
Perennial pepperweed	*Lepidium latifolium*
Russian olive	*Elaeagnus angustifolius*
Russian thistle	*Salsola tragus*
Saltcedar	*Tamarix ramosissima*
Tansy mustard	*Descurainia* spp.