

The Social Health of Nevada

Leading Indicators and Quality of Life in the Silver State

Environment and Sustainability in Nevada

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When the inaugural Earth Day launched the first environmental decade in the U.S. more than forty years ago, protecting our air, water, land and other natural resources seemed a relatively straightforward task. Environmental polluters and exploiters would be brought to heel by tough laws. The U.S. and other industrialized nations responded to quality of life concerns associated with environmental degradation by adopting dozens of major environmental and resource policies and creating new institutions such as the U.S. Environmental Protection Agency to manage environmental programs. Following these national developments, states and local communities began systematic efforts to address environmental problems.

What appeared to be a relatively straightforward job of controlling a few key pollutants and other development trends has become a far larger and more complicated task involving major changes in human behavior.

Public opinion favoring greater environmental protection has continued to grow as social values change and mounting scientific evidence reveals threats to our local, regional, and global life support systems. People perceive the environment as more endangered now than it was 30 years ago. Yet, despite some successes, comprehensive solutions have not been easy to find.

Highlights

- In the last four decades, Nevada has been the country's fastest growing state, with its population climbing 66.3% during the 1990s.
- The Las Vegas metropolitan area is located in a valley with one of the world's harshest climates.
- Hydrologists estimate that there is a 50% chance Lake Mead will be dry by 2021 if drought conditions persist.
- Vehicle exhaust accounts for some 85% of carbon monoxide air pollution in Clark County.

How to Cite this Report

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In 1987, the United Nation's Report of the Brundtland Commission, *Our Common Future*, highlighted "sustainability" as the primary challenge of the 21st century. The report's well-known and oft-cited minimalist definition says: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations World Commission on Environment and Development (WCED), 1987). Sustainability requires communities to evaluate how they can most efficiently use resources and create infrastructures that protect and enhance life for human and biotic systems now and in the future. Sustainability requires comprehensive, long-term thinking and planning to account for environmental impacts, emphasizing ways to mitigate impacts that damage environmental resources on which we rely. This report offers an overview of key environmental sustainability issues we face in Nevada, identifies steps we need to take to improve the situation, and lists community resources available to those interested in helping with the environmental concerns of the Silver State. We review four key sustainability issues – air, water, land, and energy.

Historical Overview

Environmental health and safety are central to the environmental sustainability and quality of life in Nevada – an enormous state whose inhabitants are mainly clustered in just a few urban areas. Environmental problems facing Nevadans are closely linked to the extraordinary population growth and urban development in the Silver State. Consider the following statistics:

- Since World War II, Nevada's population has climbed from less than 100,000 to 2.55 million (U.S. Census Bureau American Community Survey Estimate, 2010).
- From 1950 to 1990 the state's population increased 650%.
- During the past four decades, Nevada has been the country's fastest-growing state, with its population climbing 66.3% during the 1990s alone.
- According to the U.S. Census Bureau's first post-2000 population count, the state continued to outpace the nation by growing at a rate five times the national average.
- Between 2000 and 2007, roughly half a million people arrived in Las Vegas alone.
- According to 2010 census data, almost 2 million Nevada citizens are clustered in Clark County's Las Vegas metropolitan area, while more than 400,000 live in the Reno-Sparks-Tahoe area.
- In Clark County alone, population has grown by more than 120% since 1990 – an increase of more than 1 million people.

- Demographers estimate that Nevada's current population will nearly double to 4.3 million by 2040, with most immigrants to the state settling in a few major population centers (Lang et. al, 2008).

Not surprisingly, the most prominent environmental issues facing the state are also centered in these urban areas and are directly related to the rapid urban population growth.

Both Las Vegas and the Reno-Sparks-Tahoe area are home to unique geographic and climatological conditions. The Las Vegas metropolitan area is located in a valley with one of the world's harshest climates. Summer temperatures average well over 100 degrees Fahrenheit and the valley's average annual rainfall barely tops 4 inches. The Las Vegas Valley is situated within the eastern Mojave Desert, an extremely rich area in terms of biological diversity. The Reno/Tahoe region, located on the interface of the eastern Sierra Nevada and western Great Basin, enjoys a more temperate climate, and it hosts one the world's most unique natural ecosystems, notably in the Lake Tahoe area, as well as sensitive mountainous and meadowland regions. The glacially-formed Lake Tahoe area is famous for its astonishingly clear waters, and the unique plant, and microbotic and animal species inhabiting the Tahoe basin. The serious ecological stresses plaguing these areas can be traced to the human causes that undermine future sustainability.

Nevada's Key Environmental Concerns

Four areas are central to understanding environmental quality of life issues in Nevada: (a) air, (b) water, (c) land, and (d) energy.

Air Quality

Air quality is perhaps the most acute problem in the Las Vegas Valley. Stemming from motor vehicles, incessant construction, and commercial and industrial enterprises, air pollution challenges have grown in proportion to the population and economic growth in the valley. The rapid influx of people and businesses into Southern Nevada during the 1990s and early 2000s exacerbated already severe air quality problems. Like many urban areas throughout the U.S., Las Vegas faces air quality problems from several pollutants:

- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO₂)
- Ozone (O₃)
- Particulate matter (PM)
- and Sulfur Dioxide (SO₂)

Effort to control CO emissions in Las Vegas have been largely successful. The U.S. Environmental Protection Agency, designated Las Vegas as a CO nonattainment area in 1978. In response to this nonattainment status, Clark County and the

State of Nevada adopted and implemented new air quality plans and control measures, including state and local wintertime gasoline fuel requirements. These measures helped reduce the number of exceedances of the CO standard from more than 40 each year in the mid-1980s to less than 5 by the mid-1990s. The last recorded exceedances of the CO air quality standard occurred in 1998. On September 16, 2010, the U.S. Environmental Protection Agency finalized the rule to redesignate the Las Vegas Valley to attainment for the National Ambient Air Quality Standard (NAAQS) for Carbon Monoxide (CO) and approved the plan showing maintenance of the CO standard through 2020 (U.S. Environmental Protection Agency, 2011).

Carbon Monoxide and Nitrogen Dioxide

The major source of both carbon monoxide and nitrogen dioxide is auto emissions producing pollutants that aggravate asthmatic conditions and, after interacting with the oxygen, release ozone in the air. Another major source of CO combustion includes coal-fired power plants.

- According to the Clark County Department of Air Quality Management, vehicle exhaust accounts for approximately 85% of carbon monoxide air pollution in Clark County.
- In the late 1990s, the Las Vegas Valley failed to meet federal standards for carbon monoxide levels and, in November 1997, was designated by the Environmental Protection Agency (EPA) as a major nonattainment area.
- In August 2000, the Clark County Department of Air Quality and Environmental Management submitted a plan to the EPA to control carbon monoxide.
- Southern Nevada has not violated national carbon monoxide standards since 1999, but nonattainment remains a risk given the growth of automobile traffic in the valley.

State and county officials have taken several measures to limit CO, including (a) vehicle inspection and maintenance programs, (b) the state-wide smog hotline, (c) seasonal oxygenated and cleaner-burning gasoline programs, (d) increased mass transit options, and (e) an alternative fuel vehicle program and voluntary rideshare programs. Also, numerous pollution reduction measures are in place for industrial and commercial sources.

Ozone

Ozone is a gas that occurs naturally in the Earth's upper atmosphere and provides protection from the sun's harmful ultraviolet rays. However, ground-level ozone is a pollutant which, inhaled by a human, irritates the lungs and causes coughing, burning sensations, and shortness of breath. Ozone is of particular concern to the elderly, children, and people with heart and respiratory problems like asthma and bronchitis.

Ground-level ozone is a component of smog generated largely by motor vehicle emissions and industrial operations. It forms during hot, summer days from a chemical reaction between sunlight, heat, and nitrogen oxides (NO_x) and volatile organic compounds (VOCs) produced from the burning of fossil fuels, gasoline vapors, dry cleaning products, chemical solvents, and other products. Seasonal weather and traffic congestions during the hottest months of the year (May to October in Clark County) are principle factors in ground-level ozone concentration.

- In April 2004, the EPA designated Clark County as a nonattainment area for failing to meet the new federal eight hour federal standards which designate levels (85 parts per billion of ground-level ozone) that cannot be exceeded over an eight hour period.

This development has prompted the **Clark County Department of Air Quality**, and Environmental Management to develop plans for reducing emissions that cause ground-level ozone.

- In March 2011, the U.S. EPA determined that Clark County had met the federal eight hour standards for ground-level ozone and suspended the county's non-attainment status (U.S. Environmental Protection Agency, 2011).

Particulate Matter

Particulate matter (PM) is a complex mixture of very tiny solid or liquid particles, composed of chemicals, soot, and dust. PM is caused when tiny particles of dust or matter become airborne. This dust is not a natural phenomenon of desert living. Native desert soils around Las Vegas are crusted by years of wind, sun, and rain. Sustained winds of 25 mph are required to disturb this soil. Dust is raised when the soil's crust is broken and the winds fan it throughout the valley. Under those conditions, the airborne dust contributes to the valley's particulate matter pollution.

Particulate matter is typically grouped into two sizes:

- PM₁₀ refers to particulate matter measuring 10 microns or less – thinner than the width of a human hair.
- PM_{2.5} refers to particulates smaller than 2.5 micrometers. These particles can stay airborne several days and make up as much as half the haze visible around the Las Vegas Valley.
- Research suggests that PM_{2.5} particles may be more hazardous to human health than PM₁₀ particles because they can travel deeper into your lungs.

- Clark County's Department of Air Quality Management has collected data on PM2.5 since 1996, and it shows that the valley meets the federal standards with the PM2.5 national air pollution mark set by the U.S. Environmental Protection Agency (EPA).
- Though less hazardous, PM10 is of immediate concern in the Las Vegas Valley, which was designated by the EPA as a serious nonattainment area for PM10 on Jan. 8, 1993.
- Since then, air quality officials in Nevada have been working to reduce PM10 levels by creating awareness about the health problems associated with dust in the valley, better regulating construction activities, and limiting other sources of PM10 (e.g., off-highway driving).
- In 2010 the Environmental Protection Agency determined that the Las Vegas Valley is in attainment with the PM10 National Ambient Air Quality Standards (NAAQS). The area will be redesignated as an attainment area upon approval of the pending maintenance plan and request for redesignation.

Air pollution affects everyone's health. Symptoms include watery eyes, coughing, and wheezing. Small children breathe at a faster rate than adults do, and their developing lungs make them more susceptible to pollutants. People with emphysema or asthma – a sizable population group in the area – are facing the greatest risks.

- Recent research conducted by the Center for Disease Control and Prevention (CDC 2009) shows that more than 9% of Nevada adults suffer from asthma. Nevada is currently not funded under CDC's National Asthma Control Program. Nationally the number of people diagnosed with asthma grew by 4.3 million from 2001 to 2009 (one in 12 people, about 25 million, or 8% of the population compared with 1 in 14, about 20 million, or 7% in 2001). The Nevada Behavioral Risk Factor Surveillance System 2008 Annual Report indicates that 13.6% of Nevada residents self-reported that they had been informed they had asthma by a healthcare professional. In 2007 the Kids Count Data Center found that 9% of children (children under age 18) in Nevada suffer from asthma (National Kids Count Center, 2007).

Valley Fever

Coccidioidomycosis, more commonly known as Valley fever, is a fungal infection most commonly seen in the desert regions of the southwestern United States, and in Central and South America (U.S.A. Government, 2011). *Coccidioides immitis*, the fungus that causes valley fever, lies dormant in dry, alkaline soil (especially during long droughts); but when it rains, it blooms, and becomes airborne when soil is disturbed by wind, construction, farming, etc. A person gets valley fever by

breathing in fungal particles from soil. Valley fever is spread through the air. People can breathe in the spores and get valley fever developing symptoms similar to the common cold or flu and asthma. The disease is not spread from person to person. In 2007, Arizona reported nearly 5,000 cases of Valley Fever to the CDC, and California 3,000. Nevada's 72 cases ranked a distant third, with fewer than 9,000 cases reported nationwide (Harsaim, 2009).

Water

Water scarcity tops the list of environmental, economic, and political problems facing residents of the U.S. Southwest. Water supply and water quality are at risk in both Southern Nevada and the Reno-Sparks-Tahoe area. Water scarcity is particularly critical in southern Nevada, which due to the numerous compacts, federal laws, court decrees and regulatory guidelines known collectively as “The Law of the River,” receives, by far the smallest allotment of Colorado River water among all lower basin states that rely on the river for their water needs.¹

Anticipated population growth in Southern Nevada and other southwest states will mean even more demands on the water infrastructure in an arid region already pressed to its limits under present drought conditions and climate change. Although the river is replenished to some extent each year through rain and snowfall in the watershed of the Colorado Rockies, river flow is subject to great variations due to unpredictable precipitation patterns in the Colorado Plateau. Since 2000, the lower basin states have been facing the effects of the worst drought on record in the Colorado Plateau. Changing flow rates have raised concerns about the current use levels and underscored the need for conservation.

Despite an aggressive water conservation program in the Las Vegas metropolitan area that has reduced per capita water demands by more than 29 percent (Southern Nevada Water Authority 2009), hydrologists estimate that there is a 50 percent chance Lake Mead will be dry by 2021 if drought conditions persist, climate changes as expected, and future water usage is not further curtailed (Scripps Institution, 2008). Water managers in the Las Vegas metropolitan area estimate that more aggressive conservation outreach and education, incentive programs, and rate increases, are needed to meet sustainable water consumption goals.

Drought has also affected water supplies in the Reno-Sparks-Tahoe area. The Truckee River system, which flows out of the Sierra Nevada in California, provides most of the water for Reno-Sparks-Tahoe residents. The Truckee River system is sensitive to the precipitation patterns and snow pack thawing in the surrounding mountains. Drought, in conjunction with rising water consumption produced by development along the complex **Truckee River System**, makes for less dependable water supply. The problem is further exacerbated by the

¹ Lower Basin states defined by the Colorado River Compact include: Nevada, Arizona, and California. Nevada receives only four percent of the total Lower Basin allotment of Colorado River water, while Arizona receives 37.30% and California receives 58.70%. Las Vegas, Nevada's two million residents receive 90% of their water from the Colorado River.

inadequate management of the Lake Tahoe basin that has plagued the area since about 1960 and led to a significant loss of water clarity. More than one quarter of a mile deep, the lake is world-renowned for its blue color and transparent waters. Yet, the lake's clarity has been decreasing at an alarming rate of nearly one foot per year. According to UC Davis scientists who have monitored the lake for more than 40 years, Lake Tahoe clarity dropped in 2010, but the rate of decline in clarity over the past decade remains slower compared with previous decades (UC Davis Tahoe Environmental Research Center, 2011). Several factors have contributed to declining clarity of Lake Tahoe's waters in recent years: (a) storm water runoff, (b) urban development, (c) air quality, and (d) erosion. Such adverse developments have put the question of growth limits onto political agendas. The same trends have underscored the importance of enforcing present laws and passing new pollution regulations.

Southern Nevada

The water situation in Southern Nevada is complicated by the lack of diversity in its supply sources. Southern Nevada currently receives nearly 90% of its water from the Colorado River, with the other 10% being drawn from groundwater pumped out through wells in Clark County. Water allotments from the river are governed by the 1922 Colorado River Compact and a series of subsequent compacts, laws, and court-mandated ordinances collectively known as the Law of the River. When Nevada received its allotment of 300,000 acre feet in 1922, it seemed like a lot of water. In fact, the Las Vegas Valley did not begin using its allocation until 1955. As population grew, this allotment has had to be supplemented with large groundwater draws. Now the Southern Nevada Water Authority is looking toward three in-state water resources – Three Lakes Valley Groundwater Development, Virgin and Muddy Rivers Surface Water Development, and Clark, Lincoln and White Pine Counties Groundwater Development – to supplement the Colorado River supply.

While development of in-state water resources would supplement southern Nevada's municipal water supplies, and reduce its dependence upon the Colorado River, there are many environmental and socio-political concerns associated with these projects. An unlikely alliance of environmentalists, ranchers, and other rural citizens has recently formed to consider the potential large-scale impacts to surface water resources in southern and eastern Nevada that may result from both surface flow diversions and groundwater pumping and exportation of these resources through pipelines to the Las Vegas Valley. These water resources, including the Virgin, Muddy river systems in Clark County, the Amargosa River system in Nye County, and the Pahrangat and White river systems in Lincoln and White Pine counties, are critical sources for rural domestic water supply, agriculture, wildlife, riparian and wetland habitats, and endangered species.

The push to increase access to water resources is stretching the limits of water availability. Water is a limited natural resource in Southern Nevada. While renewable, it is also finite. Since the water cycle makes available only so much each year in any given location, supplies per person drop as population grows.

Sooner or later water demand approaches the natural limits of the water supply, and when it hits those limits, signs of trouble begin to multiply – falling water tables, dried up rivers, shrinking lakes and wetlands. Some of those signs are already visible in Southern Nevada. Thus, the area's artesian wells have long overextended groundwater supplies found in the large aquifer beneath Las Vegas. This has led to increased draws on the Colorado, which threatens to turn it into what hydrologists call a “deficit river” where more water is allotted for its users and is used each year than is annually replenished through the natural cycle. Moreover, drought conditions in the Colorado Plateau, which serves as the watershed for the Colorado River, threaten future supplies if climatological trends continue and future water usage is not curtailed.

Southern Nevada's future water supply can be extended by aggressive conservation efforts and the development of additional water resources. The Southern Nevada Water Authority is vigorously pursuing plans to tap groundwater supplies in Clark, Lincoln, and White Pine Counties and surface water from the Virgin and Muddy rivers. However, a number of political obstacles and environmental considerations may slow these plans. Meanwhile, economic and population growth relies on a secure water supply that, over the long term, is questionable.

Water quality in Lake Mead and the valley's groundwater is also critically important. Potential sources of contamination include urban chemicals such as fertilizers, pesticides, and industry. Presently, the Southern Nevada Water System is in compliance with federal safe drinking water standards. Health standards are monitored and maintained in the Lake Mead area, but the quality of the recreational setting, such as water clarity and water odor, is rapidly deteriorating. These negative factors are likely to multiply in the future as lake use continues to increase.

Water Conservation

The main challenge facing the Silver State is how to manage effectively water conservation efforts to support existing and future water supply needs. A water resource plan created for Southern Nevada in 1996 by the Southern Nevada Water Authority (SNWA) identified several successful preliminary management strategies that gradually reduced water consumption by more than 5% between 1996 and 2000. But between 2000 and 2003, consumption rates grew and conservation measures began to falter. The plan was updated in 2002, and once again, in 2004, when the SNWA released a Five-Year Conservation Plan: 2004-2009 which established a number of rebate incentive programs that focus on xeric landscapes, irrigation clocks, and water efficient technologies. Regulatory programs like water use ordinances, development codes, and drought watering policies aimed at curbing water misuse were also put forward, as were several public education and outreach programs designed to teach the public the virtues of watersmart desert culture.

The key to conservation is reducing demand. Some of the SNWA's conservation approaches have been used to good effect as the severe drought became apparent. In 2003, the community achieved an almost 7% increase in water conservation. The SNWA's goal is to achieve a community-wide water conservation goal of 25% by 2010 (calculated from a baseline of zero in 1990) and a per-capita conservation goal of 199 gallons per capita per day (GPCD) by 2035. Since 2002, SNWA indicates that Southern Nevada reduced its GPCD demand 29 percent from 314 GPCD to 223 GPCD in 2010. With outdoor water use related to landscaping accounting for 60-90% of water used in the valley, the Authority focuses on conserving water outdoors. Xeriscape conversions of turf lawns are critical to this approach as are more efficient uses of water in construction projects. The economic recession beginning in 2008 may also be a factor in the GPCD reduction

Reno-Sparks-Tahoe

The Reno-Sparks-Tahoe region also faces long-term possibilities of drought affecting water supplies. However, regional water plans predict that sufficient water supplies exist to serve the more than half million people projected to live in the area within the next two decades.

- According to the Regional Water Planning Commission, a surplus of water will continue until 2030 when the population of the Reno-Sparks metropolitan area is expected to reach about 600,000.

In fact, the Truckee Meadows Water Authority (TMWA) reports that the 2010-2011 winter months brought the seventh largest snowpack in more than 100 years to the Sierra Nevada range, which serves as the Truckee River watershed. All reservoirs and Lake Tahoe filled almost to capacity during summer 2011. However, some environmental experts express concern about long term water availability economic and population growth continues apace.

- An alternative assessment holds that water will remain in the surplus column only until 2015. Attempts to tap additional water supplies, possibly imported from points north of the region, are likely.

The Truckee Meadows Water Authority does not foresee water shortage problems as a result of growth in the *near* future. In the greater Reno-Sparks area, water rights are allocated differently than in Southern Nevada because developers in the Reno-Sparks region must purchase water rights before they can build. The water rights are similar to real property and are sold on the open market. Historically, a set number of water rights were dedicated to the Truckee River – a number that can't change. The result is that when housing developers buy the rights, they turn them over to TMWA once the houses are sold. Since there are a finite number of water rights, they can't be resold. So, if ten people are to cut their water use in half, their rights cannot be sold to develop five new homes. The time is coming when water rights will be sold on the open market, and then a new

supply will have to be found.

Lake Tahoe

A major study known as the **Lake Tahoe Watershed Assessment** was carried out in 2000 by a consortium of universities and federal agencies. Researchers identified several factors that spurred the adverse environmental changes in the Lake area: (a) urbanization, (b) habitat loss, (c) air pollution, and (d) soil erosion.

- The assessment estimated that Lake Tahoe will lose about 30 feet of water clarity by 2030 at current rates of change. Lake color would transform from cobalt blue to green because of estimated algae growth of 5% a year.

This projected rate of change is based on phosphorous and nitrogen runoff, which along with other pollutants, contribute to algae blooms. Unless the trend is stopped in time, the damage may become irreversible. This would be a hard blow for Reno-Tahoe residents and their tourism trade.

The problems defy easy solutions, as the loss of water clarity is traceable to an array of sources:

- Water that runs off the roads each spring carry road salt and other fine materials into streams that empty into the lake.
- Building in the Tahoe watershed goes on, disturbing soils and adding to the natural runoff of clay.
- Fire suppression prevents natural small-scale fires from clearing brush and downed timber, which ignites more damaging catastrophic fires and breeds sick forests.

Several multiagency plans are in place to stem the tide of environmental pressures on Lake Tahoe's waters. Still, there are fears that the efforts will not be enough and that the lake waters will succumb to human intrusion. The UC Davis Tahoe Environmental Research Center, which has monitored the lake for more than 40 years, found that Lake Tahoe clarity dropped in 2010, but the rate of decline remained slower compared with previous decades.

Water Conservation

The **Truckee Meadows Water Authority** and **Tahoe Carson Irrigation District**, which oversee water management for the Reno-Tahoe area, also have water conservation plans in place. However they appear much less comprehensive than those of the SNWA. Many water users are not metered, which encourages irresponsible water use. Measuring water use and controlling sound water allocation are complicated by the non-metered water consumption (non-metered users are generally charged a flat rate). Enforceable ordinances covering water misuse are fewer in number, and rebate programs for converting

high-intensity water use landscapes are nonexistent. The area does have a tiered conservation plan based on flows of the Truckee River during drought periods. Similar to Southern Nevada, water use is managed by a system that designates various levels of drought conditions, starting with “no drought,” moving to “drought watch,” and as the situation worsens, to “drought alert” and “drought emergency.” Each step introduces water restrictions for residents to follow. It should be noted, though, that enforcement mechanisms remain unclear.

Groundwater Contamination

Many Nevadans draw water from artesian wells that tap underground aquifers. The urban development boom has created contamination problems for some groundwater sources. A substantial number of wells in urban areas contain low levels of nitrates and volatile organic compounds. Some urban shallow wells show nitrate levels exceeding the safe drinking water standard.

The incidence of elevated nitrate levels in aquifers underlying suburban and rural subdivisions has increased. New homes and businesses built outside urban areas often use individual septic systems, which at the time of construction appear to be a cost effective alternative to community wastewater treatment systems. In some valleys, septic systems have become concentrated, especially where piecemeal housing development is allowed. Housing developments using septic systems that rely on local groundwater sources for domestic or community drinking water supply are of special concern. Septic system seepage appears to be a major source of groundwater recharge and contributes to elevated nitrate levels.

Land and its Inhabitants

Nevada has the driest climate, the most mountains, and the largest percentage of federal public lands of all lower 48 states.

- Eighty-six percent of Nevada land is federally-owned.

Part of Nevada’s draw is the immense recreational opportunities found on the state’s public and private lands. These include: hiking, camping, climbing, biking, motorized off-road vehicle use, skiing, golf, boating, and hunting. These activities are enhanced by and must coexist with Nevada’s unique natural environment.

From the standpoint of biological diversity (the number and type of species occurring in a given area), the State of Nevada, with 3,800 plant and animal species, ranks fourth in the nation, after California, Florida, and Hawaii. Nevada is also home to a large number of species (309) found nowhere else in the world. The considerable species diversity in Nevada is attributable to the large variety of habitat types, ranging from arid shrublands to riparian and wetland communities, from low elevation desert playas to alpine habitats at the highest elevations in the many mountain ranges of this basin and range-dominated landscape.

Wildlife Habitats and Conservation

These habitats are found across 4 distinct eco-regions. According to the Nevada Department of Wildlife's "Action Plan," ecoregions are "relatively large areas of land and water that contain geographically distinct assemblages of natural communities." Nevada's ecoregions include:

- The Columbia Plateau consisting of broad volcanic plains and valleys of the Intermountain West which comprises north central Nevada.
- The Great Basin, a semidesert area extending from the east slope of the Sierra Nevada range across much of Nevada to the Wasatch range in central Utah. It consists of salt desert scrub and sagebrush, conifer forests, and alpine areas near the mountains with isolated aquatic habitats in each area.
- The Sierra Nevada ecoregion is located on the western edge of the Great Basin and is characterized by conifer forests mixed with sagebrush, piñon-juniper stands and alpine areas at high elevations.
- The Mojave Desert eco-region is located in Southern Nevada and is inhabited by creosote scrub, succulents, and yucca-blackbrush species. There are also upper elevation habitats atypical for desert ecoregions.

Nevada's tremendous wildlife diversity derives from its varied geography and climatological conditions. For instance, the numerous mountain ranges are relatively isolated from one another by the arid, treeless basins that divide them. As the Nevada Department of Wildlife explains, this has created isolated islands of habitat, called sky islands. These isolated islands have produced the evolution of new species and subspecies of flora and fauna.

Food and water to sustain wildlife occur in abundance in only a relatively few places. Across much of Nevada, these resources are widely scattered at relatively low density. The distribution of wildlife closely reflects this pattern of resource distribution and, so, wildlife is generally not found in high densities across Nevada's ranges. The pattern of isolation and divergence has been even more extreme for Nevada's aquatic species. The state is home to 67 aquatic species found nowhere else in the world. Many of these species are traceable to the Pleistocene period with large lakes covered much of the state. As the climate changed, the lakes dried up, leaving isolated pockets of wetlands and springs. Many organisms that thrived in the lakes, now persist in these isolated areas, evolving and adapting to ongoing ecological change.

Wildlife conservation on Nevada lands is a unique challenge. The generally arid climate, geography, and water scarcity means that wildlife is easily subject to ecological stressors such as droughts. Also, human factors such as ecologically damaging land uses that alter or destroy habitats are critical. Some of the most influential include:

- Urban Sprawl (discussed below)
- Agricultural impacts leading to water and soil pollution, soil erosion, and chemical buildup of pesticides and herbicides
- Hydrologic changes produced by damming waterways or excessive groundwater pumping
- Mining operations, particularly open-pit techniques
- Characteristics and extent of recreational activities, particularly motorized forms such as off-road vehicles, snowmobiles, watercraft, and other devices that produce noise pollution, erosion, habitat fragmentation, wildlife displacement, vegetation loss, and soil compaction.
- Invasive plant and animal species

Urban Development and Sprawl

Population growth and urban development is transforming Nevada lands. While urban and rural population centers remain widely distributed despite a doubling of the state's population in last 20 years, the exuberant pace of urban development in the Las Vegas and Reno-Tahoe areas has raised the awareness of resource issues associated with urban sprawl.

Sprawl is a development cycle that begins with housing developments outside urban boundaries and ends up with a blanket of residential and commercial buildings. Conserving open space for important ecological functions, aesthetic considerations, and socioeconomic values may be only an afterthought for planners in rapidly growing areas. While floodplain, wildlife habitat, and forest areas are sometimes retained as parks or other recreation areas, piecemeal land management does not bode well for maximizing the natural appeal of open environmental spaces. Sprawl is also an inefficient consumption of land that raises costs of municipal and utility services. Sprawling development is known to leave in its wake a host of problems. In particular, it

- Extends road and utility corridor construction
- Expands disturbance in native plant communities and fragments wildlife habitat
- Spurs soil disturbance and erosion
- Compromises water quality
- Increases noxious weed invasions

Subdivisions built outside urban boundaries often resort to using individual septic systems that diminish groundwater quality, as seen presently in several areas throughout the state with high densities of septic systems.

Uncontrolled sprawl development increases pressures on state and local governments to tackle problems with air and water quality, deterioration of plant and animal habitat, over development of floodplains, and loss of public land. Regional air quality deterioration is due, in part, to increasing amounts of pollution produced by the growth in vehicle miles traveled and traffic congestion that accompanies sprawl.

Las Vegas development reveals some of the ways that rapid growth patterns are transforming the Southern Nevada lands, especially regarding use of natural resources and destruction of natural habitats. The Las Vegas Valley was once an area with an abundance of springs fed by three major aquifer zones generally located from 300 to 1,500 feet below the land surface. These springs provided life-sustaining water for wildlife, plants, and the Pueblo Peoples, Patayan (ancestors of the Yuma groups), and Numa (Paiute) before Anglo-Europeans arrived. As Las Vegas developed from a small Mormon outpost into the sprawling metropolis of today, the aquifer was tapped through well-drilling and the groundwater began to be depleted. Geologists have “estimated that about 25,000 to 35,000 acre-feet of water naturally recharge the aquifer every year (one acre-foot, about 325,000 gallons, can sustain a family of four for one year, according to the Colorado River Commission). By 1968, Las Vegas residents pumped an average 88,000 acre-feet every year. Surveyors also began to notice that the city was sinking” (Bartlett, 2002). Subsidence (i.e., collapse of land) is an outcome of over-pumping groundwater and can be seen in a number of fissures in the land across the valley. Today, the aquifer is “recharged” with water pumped from Lake Mead for use by residents and businesses who own water rights through artesian wells on their land. Thus, while these springs were the life-blood of the valley for humans, wildlife, and plants, today they are taxed past sustainable levels.

Uncontrolled sprawl increases pressures on state and local governments. Regional air quality deterioration is due, in part, to increasing amounts of pollution produced by the growth in vehicle miles traveled and traffic congestion that accompanies sprawl. In the 1990's, local residents responded with calls for the conservation of open space for both human and wildlife use. In Southern Nevada, community efforts are focused on protecting natural stream courses, floodplains and wetlands, improving access to outdoor recreation resources, sensitive species habitats, agricultural greenbelts, cultural sites, scenic views, and wildfire prone forest and shrub lands. In the Reno-Sparks-Tahoe area, communities are assessing open space conservation programs and weighing the merits of bond and tax initiatives for the purchase and conservation of open space.

In October 1998, the **Southern Nevada Public Land Management Act** was

passed. The purpose of the act is to direct the BLM to auction approximately 27,000 acres of federally-owned land in Clark County, mostly principally in and around the Las Vegas valley, which in turn provides funding for projects in Southern Nevada that enhance outdoor recreation opportunities and contribute to development of the Clark County **Multiple Species Habitat Conservation Plan**. This plan permits urban development of Las Vegas Valley that currently provide habitat for the desert tortoise, a species listed as threatened under the Endangered Species Act, as well as other sensitive species of plants and wildlife, in return for funding of mitigation measures that conserve these species and their habitats on public lands elsewhere in Clark County. Because the federal government owns nearly 87% of the lands in Clark County, the Act effectively drew a tight ring around the Las Vegas valley. While the BLM lands inside the ring will be sold to private parties, the land outside the ring will remain under Federal management, limiting the extent to which development can spread.

Urban Green Space and Environmental Amenities

Urban green spaces serve important ecological and social functions. Urban green space refers to attractive parks, urban squares, green corridors, and recreational areas that make an essential contribution to the quality of life of urban residents. Green spaces provide a recreational resource, places for reflection and relaxation, a space for public gathering and social interaction, safe and exciting play areas for children, habitat for animals and plants, attractive backdrops to the built environment, and microclimate buffer zones that moderate the heat of dense urban development.

The “heat island effect” is of crucial concern, especially in the desert. This phenomenon describes urban and suburban temperatures that are 2 to 10°F hotter than nearby non-urbanized areas. The Las Vegas metropolitan area is heated by concrete, asphalt, brick, and other materials that absorb the sun’s energy. As the valley floor heats up, it then re-radiates the heat to the ambient air, creating an urban heat island. Elevated temperatures can impact communities by increasing peak energy demand, air conditioning costs, air pollution levels, and heat-related illness and mortality (U.S. Environmental Protection Agency, 2011).

Green spaces are critical for mitigating the heat island effect. Increasing the cover of trees and vegetation in cities decreases overall temperatures as well as making homes and buildings significantly more energy efficient. Scientists estimate that strategically planting trees and vegetation reduces cooling energy consumption by up to 25%. For many, this research comes as no surprise—trees have been used to cool homes for hundreds of years.

Rooftops can also be converted to green space. On a hot, sunny, summer day, traditional roofing materials may reach summertime peak temperatures of up to 190°F (88°C). By comparison, green “cool roofs” only reach peak temperatures of 120°F (49°C). When installed widely in a city, green cool roofs contribute to heat island reduction by replacing heat-absorbing surfaces with plants, shrubs, and

small trees that cool the air through evapotranspiration (or evaporation of water from leaves). Planted rooftops remain significantly cooler than a rooftop constructed from traditional heat-absorbing materials. Further, green roofs reduce summertime air conditioning demand by lowering heat gain to the building. It is presently unclear whether or not green roofs are appropriate for the intense desert climate of Las Vegas. Phoenix, Arizona developers are beginning to test green roofs adapted to arid environments and Arizona State University researchers are incorporating green roofs into a multidisciplinary study of the urban heat island in the Phoenix metro area. The City of Las Vegas began exploring the idea with a special symposium in spring 2008 by facilitated by Green Roofs for Healthy Cities with the aim of educating city politicians, planners, businesses, and building and design professionals on the sustainable potentials of green roofs and green walls in Las Vegas (see Green Roofs for Healthy Cities, 2008).

Installation of solar panels on and around homes and businesses could also better mitigate the heat island effect by absorbing the heat and light to help prevent rising temperatures while simultaneously putting the solar energy to use.

Resident Health and Community Well-Being

Green spaces in urban communities also serve crucial social functions that enhance individual and social well-being. A key social function is mitigating the psychological demands of urban living. City life appears to stimulate a desire for contact with nature (van den Berg, Hartig, and Staats, 2007). The urban experience is replete with stressors such as noise from traffic, fear of crime, overcrowding, and the like. Several studies have shown that urban green space is highly appreciated by residents and an important factor contributing to residential satisfaction (Bonaiuto et al., 1999). Contact with nature serves an important adaptive function environmental psychologists call “psychological restoration” (van den Berg, Hartig, and Staats, 2007). Psychological restoration is enhanced in green spaces because they provide an experience of “being away” from daily routines, offer esthetically pleasing stimuli, encourage processes of exploration and mindfulness of stimuli that attract and hold attention with little effort (van den Berg, Hartig, and Staats 2007). Moreover, there are some indications that urban residents who live in neighborhoods with abundant green space report fewer health problems (van den Berg, Hartig, and Staats 2007).

Green space may be especially crucial in Las Vegas, where more than two-thirds of Nevada’s population resides. Green spaces are urban amenities encourage active behavior that is good for physical and mental well being, such as walking or resting. Green spaces also act as community gathering spaces for the Las Vegas community. However, deciding on who benefits from these public areas can be controversial as common trends in growing cities show that parks and public space are developed more in newer areas. As a result, older areas of urban cities are neglected of new landscaping and green spaces.

One of the major issues that the City of Las Vegas Planning and Development

Department expect to address is the unequal distribution of environmental amenities in the Las Vegas Valley. One of their goals is to create a needs-based model to environmentally improve lower income areas first and then move to middle and higher income areas. They plan to plant more trees in areas in need of green space and provide other environmental amenities.

Military Lands

Nevada is sometimes called a “wasteland” because of its stark high desert landscape that seems so inhospitable to life. This common misperception is used to rationalize the use of Nevada lands for military operations and nuclear research. It has also helped to justify the location of Yucca Mountain, the nation’s proposed repository for spent nuclear fuel and high-level radioactive waste.

The large federal facilities in Nevada have caused significant environmental degradation. A large portion of the Nevada Test Site will remain restricted “in perpetuity” due to radiological and toxic contamination stemming from 40 years of above and below ground nuclear tests. Underground testing has contaminated groundwater over vast areas.

- State officials now estimate that an area more than 300 square miles is contaminated beneath the site.
- Surface soils at NTS are also contaminated with various radionuclide. At least 30,000 acres will remain permanently restricted for all uses at the site.

Environmental damage at the Hawthorne Army Depot, Nellis Air Force Base, and Fallon Naval Air Station stems from industrial contamination, such as solvents and aviation fuels in shallow aquifers. It is unlikely that contamination of bombing and testing ranges will ever be remediated, the chief reason being the high costs of cleanup. Contamination in such areas resulting from live ordnance use is a significant safety hazard and potential long-term environmental risk.

The U.S. government has funded studies of groundwater and surface contamination at some of the military facilities, but such programs are inevitably limited, for the facilities remain in active use. At military bases, federal funds are allocated each year to address site-specific cleanup and closure active. Groundwater contamination at the Nevada Test Site is perhaps the most troublesome because certain contaminants remain mobile in water (e.g., tritium). Radionuclide also pose a tangible threat, as they have decay periods measured in thousands of years.

Energy

Achieving sustainable urban environments requires that energy be developed from renewable and biological resources, be produced by cleaner and more

efficient technologies, and be used more efficiently and with greater conservation. Fossil fuels – such as coal, natural gas, and oil – provide most of the energy used across the United States and impact the environment in several ways across geographical scales. Electricity from renewable resources such as solar, geothermal, and wind technologies generally does not contribute to climate change or local air pollution since no fuels are combusted in these processes. Other benefits include lower consumer energy bills, enhanced state and local economic development and job creation, and improved reliability and security of our energy system.

At present, less than ten percent of Nevada's electricity generation comes from renewable forms such as solar, geothermal, biomass, and hydrological sources. Geothermal (4.46%) and hydroelectric (3.66%) sources account for the bulk of renewable energy consumption. Solar, wind, and biomass combined account for less than one percent of state energy consumption. The bulk of Nevada's energy supply comes from natural gas (60.71%) delivered from Utah and the Rocky Mountain states and coal (29.9%) imported from Arizona, Utah, and elsewhere (Nevada State Office of Energy, 2010). Hydroelectricity accounts for approximately 10 percent of the state's electricity.

Nevada holds great potential to develop renewable energy. Our climatic conditions are ideal for exploiting solar and wind energy resources. Nevada has the highest solar energy potential in the nation and is already the number one state in per capita solar energy production. The U.S. Department of Energy estimates that 100 square miles of Nevada land could supply all U.S. electricity needs with current commercial efficiency rates. Wind is also a viable power source in Nevada. More than 24 million acres of Nevada land is within 10 miles of an existing transmission line and considered good to outstanding for wind energy development. According to the University of Nevada, Reno, Nevada has the potential to generate 63 million megawatt hours or 280% of the state's current consumption. Nevada is also replete with geothermal energy sources. The Western Governors Association identified that 1500 megawatts of geothermal energy could come online by 2015, which could establish Nevada as a world leader in geothermal energy output. According to NV Energy, Nevada ranks first in the nation in installed geothermal energy production.

State leaders are pushing for the growth of renewable energy development. State legislation presently enforces the use of renewable energy with laws requiring renewable energy generation in Nevada to increase 13 percent by 2011, culminating in a 15 percent increase by 2013. The impact of developing such resources would greatly impact the economy generating with an estimated 850 additional jobs.

State government officials, political leaders, and researchers are pushing for Nevada leadership in renewable energy production, energy efficiency and conservation, and exportation (Nevada State Office of Energy 2011). The University of Nevada-Las Vegas hosts several events, which bring together these

supporters in an effort to engage them in a dialogue surrounding the issue of energy production and sustainability. These events include four National Clean Energy Summits (sponsored by the Center for American Progress, U.S. Senator Harry Reid, UNLV, MGM Resorts, and the Clean Energy Project), North American Energy-Water Nexus Roundtable, UNLV Clean Energy Forum, and several UNLV Urban Sustainability Initiative Conferences. In Fall 2011, UNLV and the City of Henderson, Nevada will host the Global Solar Summit bringing together the largest solar developers in the western United States, more than 200 C-level executives representing global solar sub-suppliers, and government leaders from the U.S. Department of Energy to discuss solar panel manufacturing and the major utilities in Nevada and California.

The Nevada State Office of Energy presently lists 72 renewable energy projects in Nevada (a figure that does not include projects in their initial phases of exploration). Among the 72 projects are 35 geothermal energy projects, 20 solar energy projects, 5 wind energy projects, 4 transmission projects, 4 hydro-electric energy projects, 2 biomass energy projects, 1 methane energy project, and 1 landfill gas energy project. Specific to the Southern Nevada Solar Zone there are 4 completed large scale solar projects which generate a combined 480 MW. Currently under construction is a 392 MW generated large scale project. There are also 7 proposed plants in the works, which will generate a combined 3,460 MW. The Nevada Solar Demonstration Zone has also been established in a 25-mile area of the Nevada Test Site (Global Solar Summit 2011 Southern Nevada Solar Project Worksheet).

Energy in Southern Nevada

NV Energy, Nevada's primary energy provider, claims more than 40 renewable energy sources in their portfolio including geothermal, solar, hydrological, and bio fuel resources. In 2011 NV Energy surpassed 1 gigawatt (1,000,000,000 watts) of renewable energy. NV Energy's renewable portfolio standard requires that at least 25 percent of the company's retail energy sales be derived from renewable resources by 2025.

Solar: Solar power generation uses the sun as a source to heat oil, fluids, salt and others to generate electricity. Southern Nevada has great potential to generate solar power, with an estimate of 7,000 to 7,500 whm². This range is the highest amount of watts per square meter in the nation. The solar thermal plant, Nevada Solar One, located just outside Las Vegas, is one of the largest solar generating plants in the world.

Geothermal: Geothermal technology uses the heat from the earth's surface or deep hot water or steam reservoirs. Nevada is ranked first nationally in installed geothermal energy capacity on a per capita basis with more than 315 megawatts of capacity. NV Energy oversees 22 geothermal projects in Nevada. According to Renewable Energy World, "if Nevada were a country, it would be the 9th largest producer of geothermal in the world today," and could become the leading producer if the 86 projects currently planned are built and begin to operate.

These projects “have the potential to add up to 3,686.4 Megawatts of geothermal power to Nevada’s energy portfolio, power for 2.6 million homes – enough to meet the electricity needs of 100% of the homes in the Las Vegas metropolitan area” (see Renewable Energy World.com, 2010).

Hydro Electric: Hydro electric power is electricity generated by water flowing through turbines located in reservoir dams. Nevada has two major dams which produce electric power: Hoover Dam (once known as Boulder Dam) and Davis Dam. Hoover Dam generates, on average, about 4 billion kilowatt-hours of hydroelectric power each year for use in Nevada, Arizona, and California – enough to serve 1.3 million people. From 1939 to 1949, Hoover Powerplant was the world's largest hydroelectric installation; today, it is still one of the country's largest (Bureau of Reclamation: Lower Colorado Region – Hoover Dam). The Davis Dam Power Plant is located on the Arizona side of the dam.

Biomass: NV Energy is exploring the idea of using landfill gas (methane fumes from landfills) and Waste Heat Recovery. The use of Methane gas, Biomass, and Landfill gas is already being used in other renewable energy projects in Nevada.

Energy Sources in the Reno-Carson-Sparks Area

Renewable energy development is also occurring in Central and Northern Nevada. The bulk of geothermal energy sources and projects are located in central and northern Nevada areas. Solar energy projects are also in the works for locations north of Reno. In 2010, Vidler Water Company proposed to build the largest “solar farm” in the country, producing enough energy to power over 20,000 homes (see CarsonNow.org, 2010).

ElectraTherm is a heat-to-energy company in northern Nevada that builds “Green Machines” designed to capture waste heat from various heat sources: Internal Combustion Engines, Biomass Boilers, Industrial Boilers/Process Heat, etc. The company has received grants from the federal Department of Energy and was recently praised by President Barack Obama as a model of future energy production (see CarsonNow.org, 2011). According to the ElectraTherm website, their “Green Machine converts low temperature water flows into fuel-free, emission free power.” The Green Machine output range is from 30-65KW, based on temperatures and flows.

Energy Conservation

Energy conservation and efficiency strategies are crucial for energy security and sustainability. The U.S. Environmental Protection agency recommends using energy more efficiently through more efficient products, such as ENERGY STAR qualified appliances or light bulbs. If every American home replaced their 5 most frequently used light fixtures or the bulbs in them with ENERGY STAR qualified lighting, we would save close to \$8 billion each year in energy costs, and prevent greenhouse gases equivalent to the emissions from nearly 10 million cars. Sealing and insulating homes and offices improves comfort and reduces heating and cooling costs. The EPA recommends Home Sealing to improve your home’s

“envelope” or the outer walls, ceiling, windows, and floors by adding insulation, sealing air-leaks, and choosing ENERGY STAR labeled windows.

NV Energy offers several Incentives for energy conservation and renewable generation through their RenewableGenerations program focused on solar, wind, and hydro projects. Currently there are over 1,200 projects totaling more than 19 megawatts installed at homes, businesses, public buildings, and schools. RenewableGenerations is an incentive program from NV Energy that helps customers offset the installation costs of renewable energy systems and includes:

- Weatherization Assistance: Helps low-income people by installing energy conservation measures at their homes.
- NV Energy pays \$50.00 in cash and picks up old refrigerators and freezers which consume more energy than newer ones.
- The Cool Share Program is designed to keep prices low during the summer by installing a thermostat in the AC unit.
- NV Energy offers rebates when people buy newer Pool Pumps, providing an instant rebate for energy efficient two-speed pumps replacing people's existing single-speed pumps.
- NV Energy will install a Time of Use meters and charge different rates according to time periods. Prices are higher, during the summer (June 1-Sep.30) from 1-7 p.m. This helps customers who agree to reduce consumption during peak times.
- New air conditioning units may qualify for cash rebates. This program is available for homeowners replacing old units in Southern Nevada.

The Nevada State Office of Energy also promotes its Nevada Home Energy Fitness Campaign, Revolving Loans project, and Building Energy Codes. The Nevada Home Energy Fitness Campaign provides a \$1,000 rebate to residents who make their home 20% more energy efficient. The Revolving Loans project provides developers of renewable energy projects in Nevada with a short-term, low cost loan to help fund various startup costs associated with these projects. The Building Energy Codes is a project that adopted the 2009 International Energy Conservation Code (IECC) in cities and counties within Nevada. The IECC is a code has already been adopted by several state and municipal governments in the United States for the establishment of minimum design and construction requirements for energy efficiency.

LEED Building Projects

According to the U.S. Green Building Council, Nevada leaders are focused on increasing the state's green building to improve performance in water efficiency,

energy saving metrics, reduction of CO2 emissions, and improve indoor environmental quality of a design. Specifically, Nevada leaders are focused on developing several Leadership in Energy and Environmental Design (LEED) projects throughout the state.

Leadership in Energy and Environmental Design (LEED) is an internationally recognized green building certification system developed by the U.S. Green Building Council (USGBC) in March 2000 (refer to U.S. Green Building Council, 2011). “LEED provides building owners and operators a framework for identifying and implementing practical and measurable green building design, construction, operations, and maintenance solutions.” In 2000, USGBC established benchmarks (based on a point system) for the LEED Green Building Rating System, which are flexible enough to apply to all building types (including commercial and residential buildings). Buildings can qualify for four levels of certification: Certified (40-49 points), Silver (50-59 points), Gold (60-79 points), and Platinum (80 points and above). There are five overarching categories available under the LEED Accredited Professional Program which can qualify for certification: (1) Green Building & Construction; (2) Green Interior Design & Construction; (3) Green Building Operations & Maintenance; (4) Green Neighborhood Development; (5) Green Home Design and Construction.

Nevada is home to several LEED-certified green building projects. In 2010, Nevada topped the list of states for LEED certification (10.92 per square feet per person) (refer to U.S. Green Building Council - Nevada, 2011). Currently, Nevada includes 5 Platinum-certified projects, 30 Gold-certified projects, 23 Silver-certified projects, and 11 other certified projects. The Las Vegas Springs Preserve campus alone has a total of seven Platinum buildings. Future projects are underway to increase the number of the state's LEED projects.

Prospects for the Future and Work Ahead

Development patterns prior to the economic recession suggest that, should the Nevada economy turn around, the pressures on Nevada environment will continue to grow in years to come. Currently, there are few state legislative initiatives or executive order actions that address environmental issues. Most of the responsibility for the issues addressed in this report is handled at the city and county levels.

Several broad measures must be taken to address the environmental issues facing Nevada.

- We need to raise the awareness among Nevada citizens about the causes and consequences of environmental damage and the urgently needed conservation measures.
- There should be increased advocacy from public officials at state and local levels, community leaders, planning and environmental management

professionals, and the media to support ongoing efforts of concerned citizens groups and community organizations in this task.

- Sustained effort should be made by Nevada legislators at federal and state levels to secure federal and state government funding to tackle ongoing issues, such as air quality, water resource management, and remediation of the environmental damages.
- Sustained effort should be made to advance the renewable energy sector in Nevada.
- Sorely needed for effective short- and long-term planning is independent research that explores the effects of Nevada's economic and urban development on the local environment.

What Nevada Citizens Can Do

Air Quality can be addressed through strict programs targeting emission sources such as motor vehicles, gasoline stations, and industrial operations. According to the Clark County Department of Environmental Air Quality, the following are the most effective measures for controlling emissions:

- Refuel motor vehicles after sunset to prevent gasoline fumes from interacting with sunlight.
- Keep vehicle engines finely tuned.
- Limit the use of solvents and aerosol sprays for painting and dry cleaning.
- Use electric-powered lawn equipment instead of mowers with gasoline motors.
- Enhance programs to boost ridership on mass transit and increase ride-sharing in private cars and trucks.

Citizens can increase water conservation efforts in the following way:

- Convert grass lawns and other heavy water use landscaping to water efficient xeriscapes. Also install and use an efficient irrigation clock for both sprinkler and drip systems.
- Use commercial car washes that recycle water on-site or send it to a water treatment facility, where it is cleaned and returned to the water cycle.
- Inspect and repairing leaking plumbing and install low-flow shower heads and faucet aerators.

- Cover and maintain swimming pools

Citizens should encourage land use planners in Southern and Northern Nevada to focus on:

- Conserving areas for their value as open spaces
- Withdrawing designated areas from development where land use conflicts may arise
- Retaining or acquiring public recreation access to public lands
- Designating areas closed or open to off-highway vehicle use
- Identifying and protecting environmentally sensitive areas
- Controlling urban sprawl
- Developing more green spaces for residential well-being

Citizens can get involved in local, state, and national environmental organizations such as:

- Sierra Club
- The Nature Conservancy
- Friends of Nevada Wilderness
- Lahontan Audubon Society (Reno)
- Red Rock Audubon Society (Las Vegas)
- Nevada Wildlife Federation
- Nevada Wilderness Project

There are also opportunities to participate in public hearings and evaluation programs organized by local, state, and federal environmental and natural resource management agencies.

Conclusion

A safe, healthy, and sustainable environment is crucial to secure healthy lives for Nevadans. The problems identified in this report are tied primarily to population growth and urbanization. Nevada's two main urban areas – Las Vegas and Reno-Sparks-Tahoe – retain the potential as powerful growth engines attracting people and businesses at unprecedented rates during the last decade. The fact that growth has been relatively under-regulated contributes to the environmental woes confronting the regions. In the coming years, Nevadans will need to take a hard look at the ecological stresses in the key areas of the region and make hard decisions about the environmental policies affecting the quality of life in the Silver State.

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Community Resources

Federal Resources

U.S. Bureau of Reclamation – Lower Colorado Region manages the last 688 miles of the Colorado River within the United States which includes overseeing water and power delivery, protecting endangered species and native habitat, accounting for water use, and maintaining the river channel and protective levees, <http://www.usbr.gov/lc/>.

U.S. Bureau of Land Management – In Nevada, the BLM manages approximately 47.5 million acres of public lands for multiple uses including wildlife habitat, grazing, mining, and recreation, <http://blm.gov>.

U.S. Center for Disease Control and Prevention works to protect public health and safety by providing information to enhance health decisions throughout state health departments, <http://www.cdc.gov/>

U.S. Department of Energy is concerned with U.S. policies regarding energy and safety in handling nuclear energy, <http://energy.gov/>

U.S. Environmental Protection Agency develops and enforces federal environmental regulations and performs environmental research, <http://www.epa.gov/>.

U.S. Fish and Wildlife Service conserves, protects and enhances fish, wildlife, and plants and their habitats through management of National Wildlife Refuges and regulation of the Endangered Species Act, the Migratory Bird Treaty Act, and other federal laws and regulations, <http://www.fws.gov/>.

U.S. Forest Service – The Humboldt-Toiyabe National Forest in Nevada and a small portion of eastern California, at 6.3 million acres, is the largest National Forest in the lower 48 states. The Humboldt-Toiyabe National Forest includes 10 ranger districts primarily in the higher elevation mountain ranges scattered throughout the state, <http://www.fs.fed.us/r4/htnf/>.

U.S. Green Building Council established the international certification system LEED which is a rating of green building, <http://www.usgbc.org/DisplayPage.aspx?CategoryID=19>

State of Nevada Resources

Colorado River Commission of Nevada (CRC) is responsible for acquiring and managing Nevada's share of water and hydropower resources from the Colorado River, <http://crc.nv.gov/index.asp>

LEED in Nevada shows the current report of LEED projects throughout Nevada, <http://www.usgbcnv.org/leed-in-nevada>

Southern Nevada Public Land Management Act (SNPLMA) is a law that allows the Bureau of Land Management to sell public land within a specific boundary around Las Vegas, Nevada, <http://www.blm.gov/nv/st/en/snplma.html>

State of Nevada Department of Conservation & Natural Resources (DCNR) is responsible for the establishment and administration of goals, objectives and priorities for the preservation of the State's natural resources, <http://dcnr.nv.gov/>.

State of Nevada Department of Wildlife (NDOW) is the state agency responsible for the restoration and management of fish and wildlife resources, <http://ndow.org/>.

Nevada State Health Division promotes and protects the health of Nevadans through public health and the enforcement of laws regarding public health, <http://health.nv.gov/>

Nevada State Office of Energy is the state office, which ensures the wise development of Nevada's energy resources, <http://energy.state.nv.us/>

NV Energy serves the citizens of Nevada with energy in the form of electricity, <http://www.nvenergy.com/company/>

Las Vegas/Clark County Resources

Clark County Department of Air Quality and Environmental Management is responsible for monitoring air, developing proper control measures, and educating the citizens of Clark County, Nevada, <http://www.clarkcountynv.gov/depts/daqem/Pages/default.aspx>.

Clark County Water Reclamation District is responsible for treating, disinfecting, and reclaiming wastewater before returning to the environment, <http://www.cleanwaterteam.com/home.html>.

City of Las Vegas Department of Planning and Development oversees zoning and land use in the city, <http://www.lasvegasnevada.gov/Government/departments.asp#>.

Las Vegas Farmers Market provides information on markets in the Las Vegas area, <http://www.lasvegasfarmersmarket.com/>.

Las Vegas Tonopah Community Garden is the first public community garden in Las Vegas, <http://www.tonopahcommunitygarden.org/>.

University of Nevada-Las Vegas Urban Sustainability Initiative finds workable solutions to the challenges facing the Las Vegas metro area through sustainability research and outreach among faculty, professional staff, and community leaders, <http://urban21.unlv.edu/>.

Southern Nevada Water Authority is regional agency that manages the Las Vegas Valley's water supply and other water resources, <http://www.snwa.com/html/index.html>.

Reno-Sparks-Tahoe Resources

City of Reno Department of Community Development oversees land use through planning and zoning mechanisms. <http://www.cityofreno.com/res/comdev/>.

City of Sparks Department of Community Development is responsible for land use planning, http://www.ci.sparks.nv.us/business/planning_dev/.

Lake Tahoe Watershed Assessment provides scientific information in subject areas pertinent to policy development and land and resource management in the Lake Tahoe basin, <http://www.fs.fed.us/psw/publications/documents/gtr-175/>.

Northern Nevada Water Planning Commission ensures quality of life for Northern Nevadans through efficient total water management, <http://www.nnwpc.us/>.

Truckee Carson Irrigation District (TCID) acquires, constructs, operates, and controls facilities and structures relating to the distribution of irrigation waters, <http://www.tcid.org/index.htm>.

Truckee Meadows Water Authority is a collaborative unit of the Cities of Reno and Sparks and Washoe County that manages water resources for the region, <http://www.tmh2o.com/>.

USDA Forest Service – Lake Tahoe Basin Management Unit protects Lake Tahoe and its water quality by managing a diverse range of resources, particularly the complex watershed systems that form the basin surrounding the lake, <http://www.fs.fed.us/r5/ltbmu/>.

Environmental and Conservation Organizations

The Nature Conservancy (Nevada Chapter) is a leading international, nonprofit environmental conservation organization. Their mission in Nevada is to preserve the plants, animals and natural communities in Nevada by protecting the lands and waters they need to survive, <http://nature.org/wherework/northamerica/states/nevada/>.

Sierra Club of Nevada is a chapter of the national organization dedicated to wilderness preservation, <http://nevada.sierraclub.org/>.

The Wilderness Society is a national conservation group with the goal of protecting America's Wilderness through the combination of science, advocacy and education, <http://www.wilderness.org/WhereWeWork/Nevada/index.cfm>.

Citizen Alert is a Nevada-based grassroots environmental group providing education, advocacy, and empowerment to citizens on matters of environmental policy and environmental justice, <http://www.citizenalert.org/>.

Friends of Nevada Wilderness is a wilderness education and advocacy group that strives to keep Nevada's wild places wild, <http://www.nevadawilderness.org/>.

Lahontan Audubon Society is a Reno-based group dedicated preserving wildlife habitat in Northern Nevada, <http://www.nevadaaudubon.org/>.

Red Rock Audubon Society educates the public and protects and restores delicate Southern Nevada ecosystems.

Nevada Wildlife Federation is state's oldest nonprofit, conservation organization, <http://www.nvwf.org/>.

Nevada Wilderness Project seeks to protect public lands through grassroots education and activism, <http://www.wildnevada.org/>.