

CHAPTER 10

Water & Natural Resources



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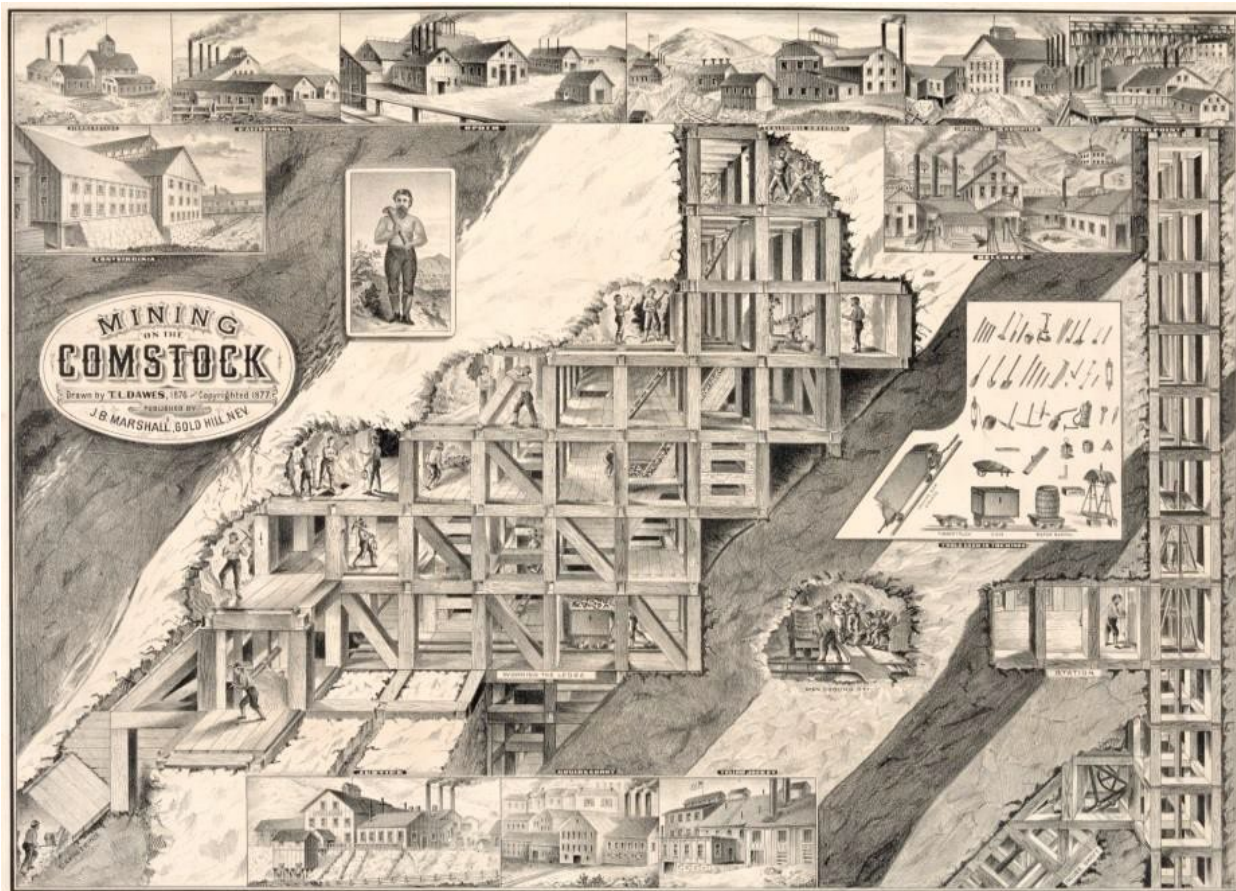
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10.1 Chapter Introduction

There are approximately 169,221 acres of land in Storey County. The county area spreads across two drainage basins: about 75 percent of the county's land area is located in the Truckee River Basin (about 75 percent of the area) and Carson River Basin (25 percent of the area).

Storey County contains many notable natural features and resources. Above Virginia City, Mount Davidson stands 7,868 feet tall, the highest point in the county. Below Virginia City was the famous Comstock Lode, which produced over 6.9 million tons of ore and many technological advancements which helped Nevada become a state and gave Nevada the "Silver State" name. Figure 10.1-1 depicts aspects of mining on the Comstock.



Source: T.L. Dawes 1977, U.S. Library of Congress

Figure 10.1-1: Drawing depicting aspects of "Mining on the Comstock" (T.L. Dawes, 1877, U.S. Library of Congress)

In addition to mining history, remnants from times long before the mining boom are visible in the landscape, such as at the petroglyphs in Lagomarsino Canyon (see Chapter 11 – Cultural & Historic Resources for more discussion of Storey County history). Agriculture including ranching is a historically important land use in the county. Natural open-space areas are now mostly used for outdoor recreation (see Chapter 4 – Public Lands for more discussion of open space resources in the county).

Today, land in Storey County is largely used for development rather than natural resource extraction. Over half of the land area in the county (roughly 107,000 acres) has been designated for industrial development as part of the Tahoe-Reno Industrial Center. Residential estates also take up a significant portion of land in the county. Otherwise, residential subdivisions and towns are mostly concentrated along the county's border areas, including Virginia City/Gold Hill, the "River District" (south of the Truckee River along the northern boundary of the county), Mark Twain, Lockwood/Mustang, and planned future development at Painted Rock. (See Chapter 3 – Land Use for more details on development areas.)

Storey County historically places a high value on its open space. As undeveloped areas of the county are developed, protecting the county's environmental and natural resources is important. This chapter discusses goals, policies, and objectives regarding the protection of water and natural resources.

10.2 Geological Setting and Hazards

10.2.1 Slope

Storey County is mostly comprised of steeply sloped, mountainous terrain. There is some flat land in the River District, in the interior of the northeast part of the county (where the Tahoe-Reno Industrial Center is developing), and around some residential areas such as Mark Twain and parts of the Highlands. Virginia City was built on steep slopes, but the environment constraints of the land make it undesirable to follow this precedent.

Figure 10.2-1 depicts the topography of the county. Terrain with 0 to 10 percent slope (green or yellow on the map), or up to 15 percent slope (orange on the map) with more significant engineering, is considered the most suitable for development. Any part of the map highlighted in red has a slope over 15 percent. As shown in Figure 10.2-1, much of the land in Storey County is over 15 percent slope and may pose challenges to future site development.

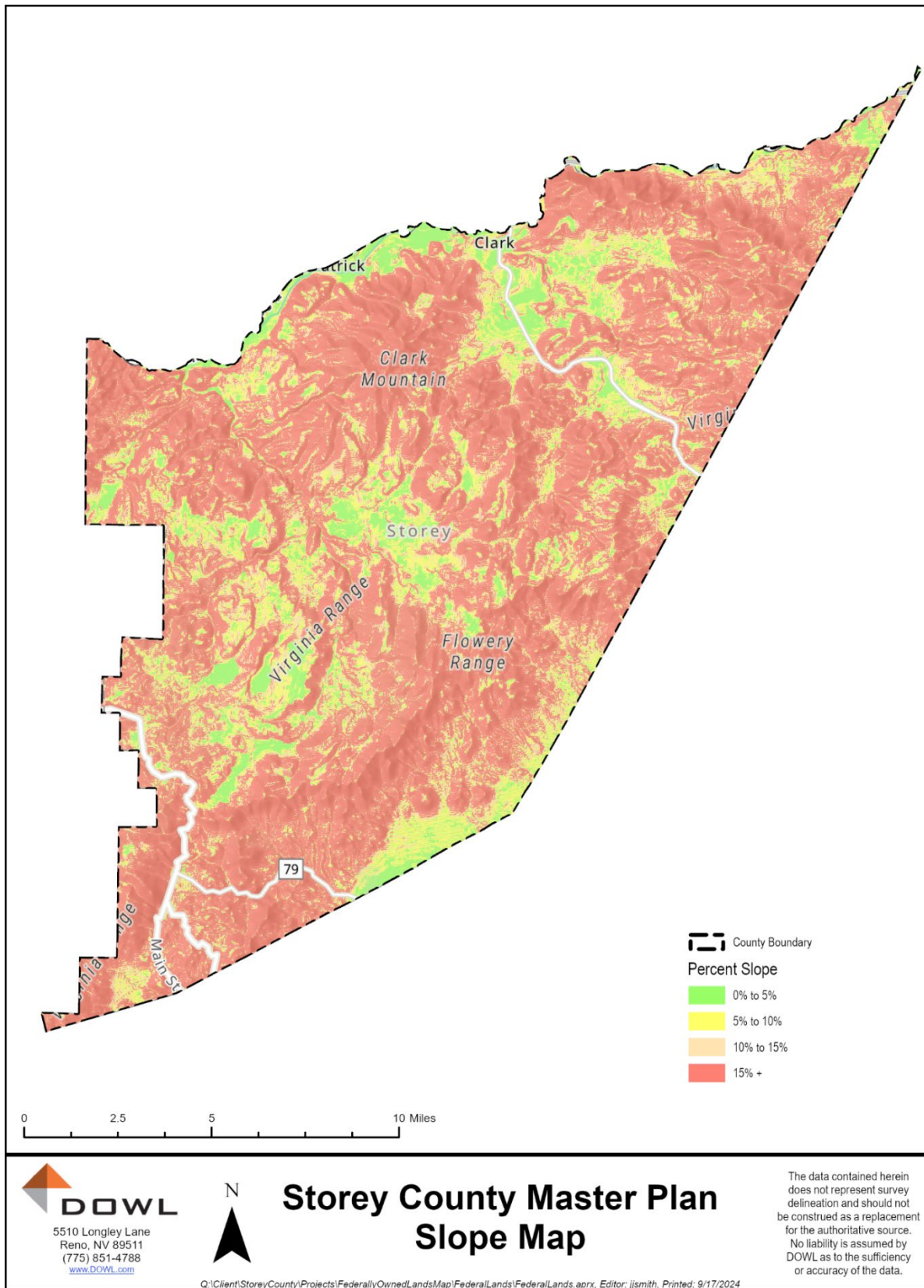


Figure 10.2-1: Topography in Storey County

10.2.2 Geology

The geology of Storey County has greatly dictated its development. A wealth of mineral deposits shaped the county's early development, while poor quality groundwater throughout the county has restricted some development activities.

Based on the 1990 soil survey of Storey County Area Nevada (USDA 1990), the general geology of much of the county is comprised of volcanic rocks with layers of sedimentary rock (conglomerate, sandstone, shale and diatomaceous sediment) overlain by thin surficial deposits of alluvium comprised of gravel and sand.¹

10.2.3 Seismology

Storey County is in western Nevada, which has relatively high seismic activity compared to many areas in the United States. Figure 10.2-2 depicts the chance of potentially damaging ground shaking in Storey County as well as Nevada and surrounding states. The southwestern portion of Storey County around Virginia City is expected to have the highest frequency of potentially damaging seismic activity within the county (shown in darker red). Seismic risk is a major consideration for Storey County land use planning, and particular construction requirements are necessary.

¹ U.S. Department of Agriculture, Soil Conservation Service. 1990. Soil Survey of Storey County Area, Nevada

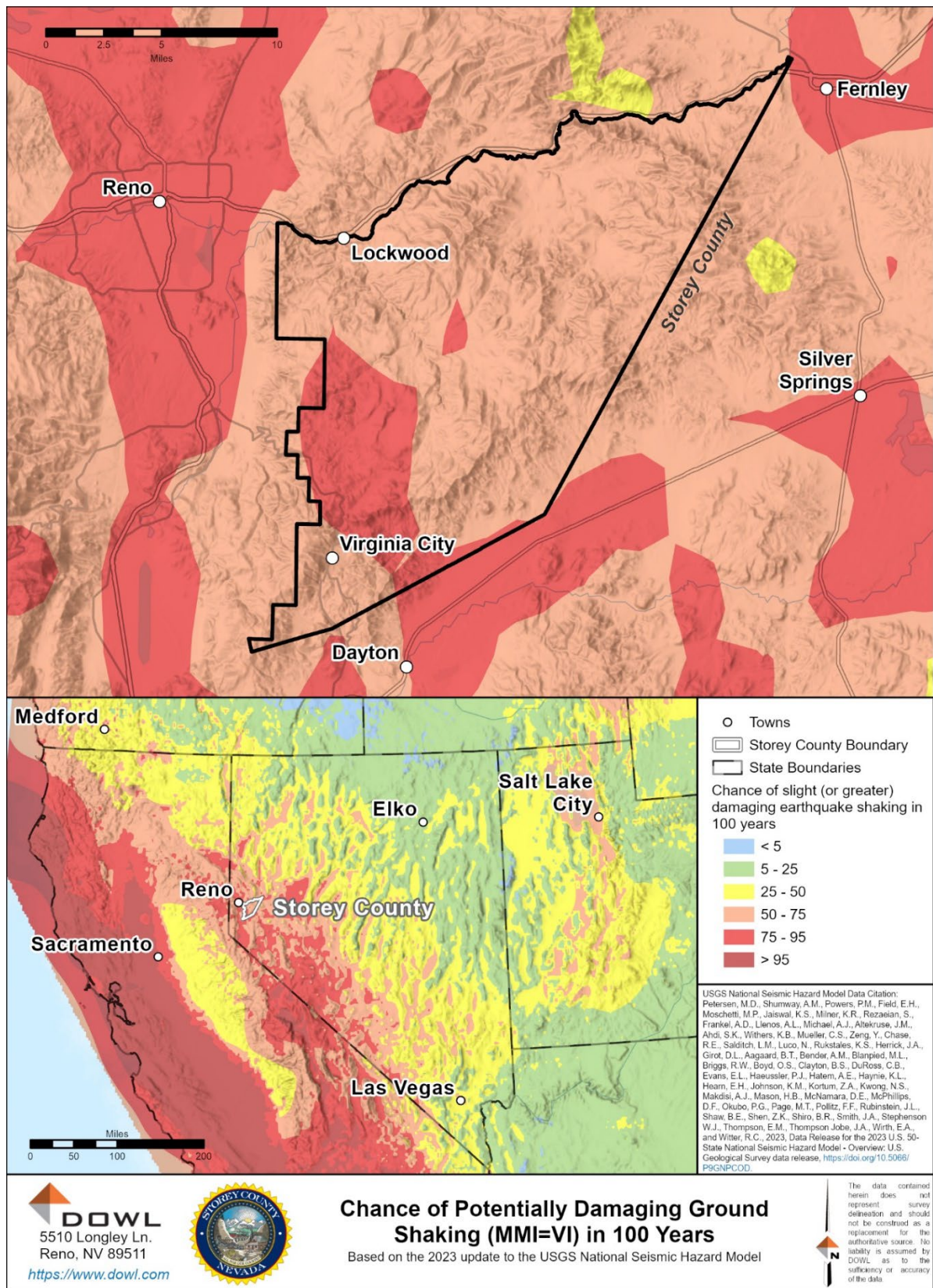


Figure 10.2-2: Chance of damaging seismological activity in Storey County, Nevada, and Surrounding States

10.2.4 Soils and Erosion Risk

In 1990, the U.S. Natural Resources Conservation Service generated a comprehensive soil survey for Storey County to describe soil characteristics which affect the County's development potential.

Of concern to Storey County is its marginal ability of the land to capture and hold what little precipitation it receives. All but a small portion of the county has been classified by the U.S. Natural Resources Conservation Services as exhibiting poor infiltration capability. Because of this condition, most of the county's water runoff occurs as surface flow and leaves the county. Only a small portion occurs as groundwater yield.

Water runoff causes erosion, and most of the county's soils exhibit a moderate to severe erosion hazard. Any disturbance to natural conditions will greatly increase erosion. Most of the county also exhibits a moderate to severe wind erosion hazard. Likewise, any disturbance to natural conditions, such as blading to create roads, will cause earthen materials to be loosened and greatly increase wind-borne erosion.

Efforts should be made to slow the water runoff to encourage greater infiltration. The County might consider infrastructure projects to slow the flow of larger drainage canyons as well. Site development recommendations and requirements should continue to consider water availability, soil permeability for septic systems, drainage issues, and slowing the flow to reduce erosion risk.

10.2.5 Flood Planning

Planning for flood hazards has garnered increased attention in Storey County. Most of the Lockwood community is within a designated Federal Emergency Management Agency 100-year floodplain (locally designated as special flood hazard areas) along the Truckee River. The Mark Twain area is also subject to flash flooding events. The County has been collaborating with neighboring counties, the Truckee Meadows Flood Management Authority, the Federal Emergency Management Agency, and the Nevada Department of Emergency Management to develop flood models, establish mitigation plans, and identify funding opportunities for improvements.² Additional information regarding floodplain land use management is provided in Chapter 3 – Land Use.

The County has been enrolled in the National Flood Insurance Program since 1978. The County also participates in the Community Rating System, which assigns ratings from Class 1 to Class 10 based on a participating community's flood protection activities. Communities with better ratings (closer to Class 1 than 10) have taken more flood protection measures and therefore receive greater discounts on National Flood Insurance Program insurance premiums for property owners – the discount can be up to 45 percent in a Class 1 community. The purpose of this program is to: “provide an incentive for communities to implement additional flood protection activities that can help save lives and property when a flood occurs.”³

Storey County is currently rated at Class 9, earning property owners in the county a five percent discount on National Flood Insurance Program premiums. Improving the Community Rating System rating would

² Regional Economic Impact Report, 2023.

³ https://www.fema.gov/sites/default/files/documents/fema_crs-brochure_032023.pdf

require the County to change its codes to raise the base floor elevation, but that would make Storey County's existing floodplain communities all non-conforming and potentially add significant cost for residents making changes to their properties, therefore, this is not a goal of the County at this time. Instead, Storey County has decided to invest more into addressing flood risk as a community and doing community projects that help make the area safer.

No 100-year flood events have occurred since the 2016 Master Plan, although there have been several significant storm events. Aside from risks associated with flood events, fast-moving runoff may fail to infiltrate into the soil and instead flow overland out of the county, representing missed opportunity for much needed recharge of local aquifers in Storey County. The County could pursue infrastructure projects to assist in the capture of precipitation and runoff alongside flood mitigation efforts.

10.3 Water

Water is essential to any land use and availability of water should be the primary consideration in determining if development is appropriate for any given area. Given Storey County's limited water supply and lack of larger municipalities with independent water systems, the County is responsible for managing sustainable water resources for its residents.

10.3.1 Groundwater Availability

Like most of western Nevada, Storey County lies in the rain shadows created by the Sierra Nevada Mountain Range and a portion of the Virginia Range. Average annual precipitation in Virginia City is approximately 11.7 inches per year.⁴ Higher elevations within the county receive more annual precipitation, while the area's lower elevations may receive up to several inches less annual precipitation. The county has areas of snow accumulation, especially at higher elevations, but average annual snowfall has been declining in recent years.

Annual recharge is a challenging condition in the county for a variety of reasons. Because the topography is generally steep, soil permeability low, and vegetation sparse, it is difficult to retain water within the county, except for the alluvial fans located at the base of various drainage networks. Storey County is subject to climatic conditions characteristic of a high-mountain desert. During summer, sporadic convection storms deliver about 25 percent of the region's annual precipitation in large amounts over small areas. Winter storms are the primary source of upslope recharge.

The Highlands, Mark Twain, and American Flat areas are currently served by domestic groundwater wells and not the County water system. According to the 2023 Storey County Water Resource Plan (included as Appendix B of this master plan), it is estimated that 588 acre-feet is annually pumped in the Highlands, 333 acre-feet in Mark Twain, and 15 acre-feet in the American Flat area (using a consumption rate of 1 acre-foot per domestic well). The Highlands and Mark Twain areas, and possibly other areas, have experienced water availability problems and observed the water table falling during extended dry periods. Also, according to the 2023 Water Resource Plan, it is not feasible to develop a single groundwater well to serve the communities due to aquifer performance concerns.

⁴ According to National Weather Service Regional Climate Centers data.

A 2018 United States Geological Survey – Nevada Water Science Center study found that water levels appear to be falling in the Highlands, at an average rate of 5.7 feet per year in two monitoring wells between 1997 and 2016. In 2018, the study reported, “analysis of the State of Nevada Division of Water Resources well log database indicates 103 of 623 domestic wells (17 percent) [had] been deepened or replaced since the development of the VC [Virginia City] Highlands, indicating that water-level declines are widespread and represent a significant cost burden to homeowners in the area.”

The 2018 Nevada Water Science Center study continued through 2022 and evaluated “water-level decline and aquifer properties in the VC Highlands and Highland Ranches Volcanic Rock aquifer system.” In 2023, the County and the United States Geological Survey modified an existing joint funding agreement to continue supporting groundwater monitoring work in the Virginia City Highlands and the Highland Ranches for the following five years. As of a 2024 update, approximately 114 of the 728 domestic wells in the Highlands (16 percent) had either been deepened or replaced. From 2019 through 2023 during a period of drought, average groundwater levels dropped significantly. After above-average precipitation in winter 2023, most water levels were observed to increase. However, large changes in water levels occurred during the 2018 to 2024 period, which generally indicates limited aquifer storage. Groundwater monitoring is scheduled to continue through 2028 as part of the current project.

As a result of groundwater supply concerns, the 2023 Water Resource Plan includes an analysis of water rights, projects, and funding that would be needed to provide water to areas of the county that are currently relying solely on domestic wells.

10.3.2 Surface Water Systems in the County

Currently, the only source of domestic water for the Virginia City/Gold Hill area comes from the State-owned Marlette Lake Water System, which serves approximately 803 metered customers as of 2023. The local system is served by the State-owned system under a contract, which also defines payment rates. As of 2023, Storey County, Carson City, and Truckee Meadows Water Authority were preparing to negotiate an updated agreement for future delivery of water through this system. The 2023 Water Resource Plan (and future updates every five to ten years) can help inform County priorities in this new agreement. The water system is discussed further in Chapter 9 – Public Services & Facilities and in Appendix B of this master plan.

The County does not own the water rights to what is currently its only water supply (the State-owned Marlette Lake Water System). However, each of the water rights owned by the State defines the place of use as Virginia City, Gold Hill, Silver City, and Carson City. Prior to the State being able to deliver water to locations not currently included as the place of use, such as expanded development areas in Storey County, a temporary or permanent change to the water right would have to be approved by the Nevada State Engineer.

According to the 2023 Water Resource Plan, the Marlette Water System source is very reliable and of high quality, but the volume of water available is restricted by transmission pipeline capacity. Annual snowpack, fishery management at Marlette Lake, and operating agreement limits also have a potential to limit the amount of water available from this source. The annual volume of water available under the Franktown Decree to the Nevada Public Works Division is approximately 7,200 acre-feet annually. Per the previous operating agreement, the County has reserved up to approximately 500 acre-feet of that

annual total. Additional detail regarding water system infrastructure and potential future investments is discussed in Chapter 9 – Public Services & Facilities.

The Tahoe-Reno Industrial Center is serviced by its own water system managed by the TRI General Improvement District. The district has capacity for additional growth, and the area’s grey water management system adds to their conservation efforts. The planning and funding that contributed to this infrastructure project is discussed further in Chapter 9 – Public Services & Facilities.

The Canyon General Improvement District provides water services to the Lockwood area, and it may have capability to expand into parts of Mustang to its immediate east.

10.3.3 Water Quality

In addition to restricted groundwater availability, Storey County groundwater has been found to be poor in quality. Potable groundwater is in short supply in Storey County due to low precipitation, low recharge, and a soil mantle naturally high in sulfates, iron, and numerous other elements which become dissolved in groundwater.

A water quality study for the 1994 Master Plan found that about 60 percent of water at sites studied around the county did not meet water quality standards for domestic consumption. Substandard water was found in Storey County at approximately three times the rate it was found on average in the five other western Nevada counties. According to the 2023 Water Resource Plan, water quality continues to be an issue in county groundwater, and private wells must be outfitted to filter out contamination.

More recently, nationwide water quality discussions have focused on increasingly common reports of per- and poly-fluoroalkyl substances contaminating water resources and leading to harmful health impacts. A paper published in 2021 documented per- and poly-fluoroalkyl substances in some surface water and sediment samples collected around the state, including eight sites along the Truckee River, Lake Tahoe, and Pyramid Lake.⁵ In response to the growing issue, in 2024 the U.S. Environmental Protection Agency passed the Safe Drinking Water Act, which mandates monitoring every five years for priority contaminants that may be present in drinking water but are not yet subject to Environmental Protection Agency drinking water regulations. Under the Unregulated Contaminant Monitoring Rule, the Environmental Protection Agency collects nationally representative drinking water data to support future regulatory actions and, as appropriate, develops national primary drinking water regulations. Additionally, the Nevada Division of Environmental Protection has executed a per- and poly-fluoroalkyl substances sampling and analysis contract to look for these contaminants in Nevada.

In 2023, the Storey County Board of Commissioners, the Canyon General Improvement District, and the TRI General Improvement District authorized participation in the Integrated Source Water Protection Program, which is administered by the Nevada Division of Environmental Protection Bureau of Safe Drinking Water. In 2024, the County Board of Commissioners adopted a new Community Source Water Protection Plan for the Storey County water system, and the General Improvement Districts also adopted the plan for their systems. The Community Source Water Protection Plan: “aims to identify and manage potential risks to source water (groundwater, lakes, rivers, streams, or springs)” and creates a plan to

⁵ <https://ndep.nv.gov/water/pfas-in-nevada>

protect against contamination and preserve the quality of source water in different areas across the county.

The vision of the Community Source Water Protection Plan is to: “ensure safe and sustainable drinking water for all residents and businesses.” The Community Source Water Protection Plan includes detailed Action Plans for each improvement district or area within the county, and Goal 4, Policy 1 in of this chapter of the master plan addresses that the County should support the intent, policies, and implementation actions in the Action Plans of the Community Source Water Protection Plan.

10.3.4 Implications for Future Development

Future development in Storey County should follow a cautious approach regarding planning for water availability. There is some debate on the accuracy of wet water (physical water that can be pumped from the ground) versus paper water (a water right), so a conservative approach is needed. This can help ensure the success of new developments and protect against unwise investments or possible County burdens in the future. Existing development areas should continue to be monitored for water supply to inform future development density allowed.

County zoning and allowed development density should consider the land necessary for recharge in order to provide water for new proposed uses. Any further subdivision or development outside of the available water systems in the county must show water rights ownership (coordinated with the Nevada State Engineer) to accompany the subdivision application. Land use considerations based on water availability are discussed further in Chapter 3 – Land Use.

10.3.5 Water Summary

Future land use densities should be based on water availability from basin-wide inventories. This should result in development densities that will not lead to the mining of water or taking more water out of the ground than is naturally recharged.

The generally accepted standard is one acre-foot available for each single-family dwelling. This encompasses not only the actual water use of the residents but also the numerous demands created by subdivision development (e.g., firefighting, recreational use, water loss). County aquifers should be monitored through well log data, a groundwater monitoring system, or a joint study/effort to monitor sensitive areas where well water is the primary source. Water resources considerations for development density are discussed further in Chapter 3 – Land Use.

Especially given that climate change is expected to alter current conditions in Storey County and likely exacerbate existing water resources and other environmental challenges, it is critical that the County work towards goals, policies, and objectives established in this chapter to protect the future of local natural resources for future generations of residents.

10.4 Weather and Climate

10.4.1 Weather

Virginia City and the nearby Highlands are at an elevation of over 6,000 feet. This is considerably higher than the rest of Storey County's populated areas. The Mark Twain and River Districts are more representative of the temperatures experienced in the Reno and Carson City areas, which tend to be hotter and drier on average. Typical temperature and precipitation data for Virginia City is provided in Table 10.4-1 as reported by the National Weather Service Regional Climate Centers data.

The county's high mountainous locations are conducive to greater precipitation, which average slightly under 12 inches a year in Virginia City, and about an inch less in lower-lying areas. Much of this precipitation comes as snow during the winter. According to National Weather Service data, total snowfall averages 46 inches a year, which is down 10 inches from average annual snowfall of 56 inches reported in the 2016 Master Plan.

Summer daytime average temperatures are in the 70s and low 80s (degrees Fahrenheit). The nighttime temperatures drop down to the mid- to high-50s. During the winter, daytime high temperatures average 40 to 50 degrees and nighttime temperatures range from 25 to 32 degrees.

Despite the high elevation of Virginia City, Gold Hill, and the Highlands, the growing season is relatively long, averaging 107 days per year. Relative humidity is slightly higher than the regional average. Humidity averages 30 to 50 percent over the year but varies from about 70 percent during the winter to approximately 20 percent during mid-summer. Thunderstorms average about 10 to 15 storms per year and are usually accompanied by lightning.

Wind information is relatively sparse. The higher, exposed location of Virginia City – especially in the Divide area between Virginia City and Gold Hill – leads to higher wind velocities than other areas of the county. The Virginia Range also has an effect on the prevailing winds, which generally are from north to south and west to east. However, “Washoe Zephyr” upslope and downslope valley winds are dominant throughout the day. Occasionally wind speed has been known to reach over 100 miles per hour.

Table 10.4-1: Virginia City Average Precipitation and Temperature (1991-2020)

Month	Average Precipitation (inches)	Mean Maximum Temperature (°F)	Mean Minimum Temperature (°F)	Mean Average Temperature (°F)
January	1.82	40.9	27.0	33.9
February	2.06	43.1	28.6	35.9
March	1.60	49.0	32.9	40.9
April	0.54	54.6	35.7	45.2
May	0.74	63.9	44.0	53.9
June	0.55	74.3	52.8	63.5
July	0.19	83.8	61.5	72.6
August	0.24	82.4	60.1	71.2
September	0.29	73.9	53.1	63.5
October	0.65	61.3	42.5	51.9
November	1.07	48.8	32.7	40.8
December	1.95	40.3	26.4	33.4
Annual	11.70	59.7	41.4	50.6

°F = degrees Fahrenheit

Source: Weather.gov (National Oceanic and Atmospheric Administration Regional Climate Centers)

10.4.2 Climate

Many areas in the western U.S. have observed trends toward hotter and drier conditions over the past few decades. The Desert Research Institute, located in Reno, is a non-profit research institute that publishes data, analysis, and other resources specific to Nevada. Figure 10.4-1 and Figure 10.4-2 depict changes in precipitation and mean temperatures between 1900 and 2018 using the Desert Research Institute and Western Regional Climate Center WestMap Climate Analysis & Mapping Toolbox. Average annual precipitation has been variable – see the red line in Figure 10.4-1 spiking with higher “highs” and lower “lows” in the time since 1980, as compared to the fluctuations between 1900 and 1980. The running mean (blue line) shows a general downward trend in average annual precipitation since around 1980. For Storey County’s mean temperatures in Figure 10.4-2, the running mean shows annual mean temperatures have been on a steady rise from around 48.5 degrees Fahrenheit around 1900 to 1940, up to 51 degrees Fahrenheit since 2000.

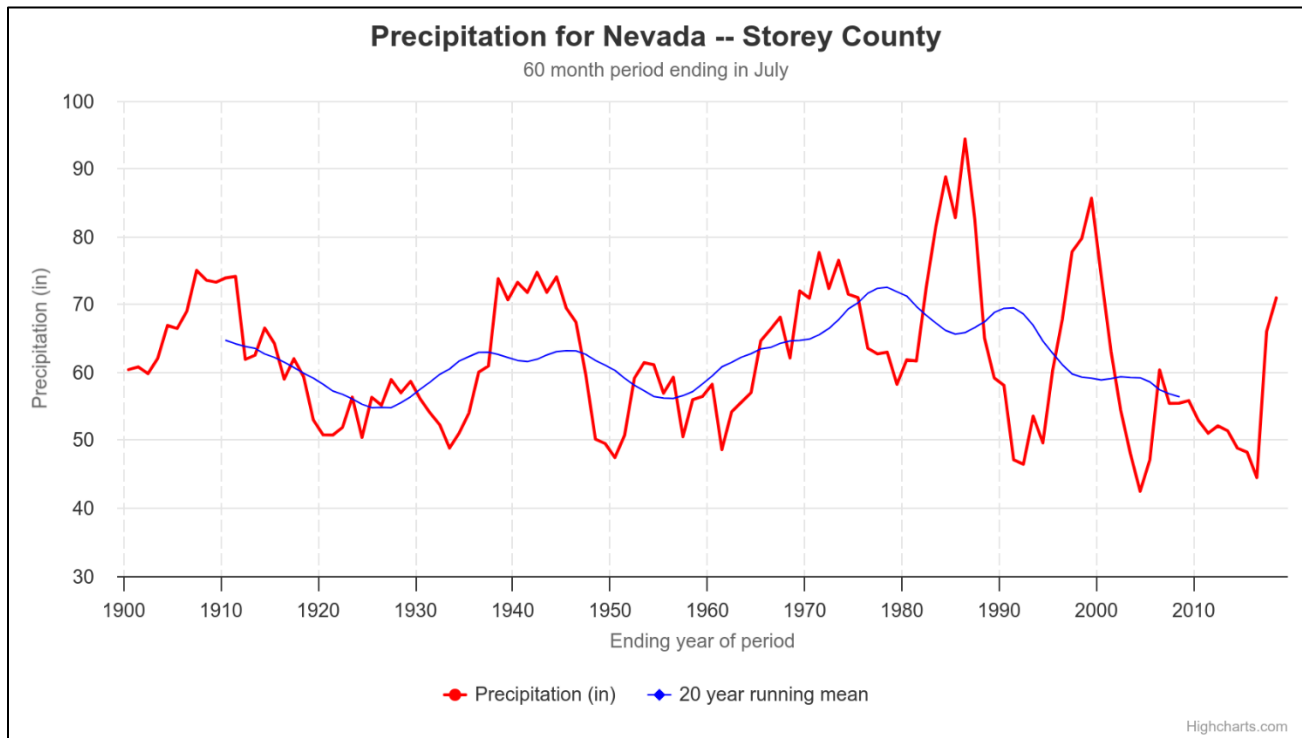


Figure 10.4-1: Annual Precipitation Trend in Storey County (1900 – 2018 Data)

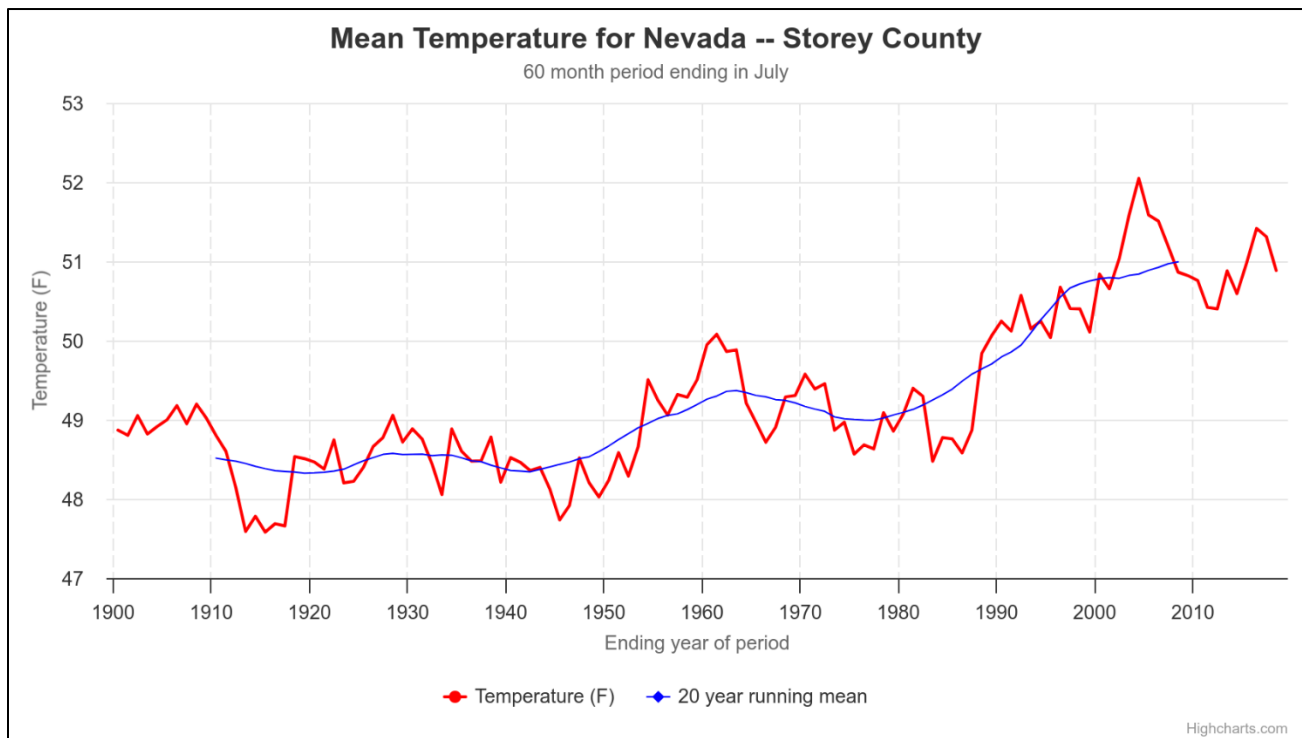


Figure 10.4-2: Annual Mean Temperature Trend in Storey County (1900 - 2018 Data)

According to the 2023 Water Resource Plan (see Appendix B), water resources and other natural resources within Storey County are anticipated to experience lasting impacts due to climate change if current trends continue. Key climate vulnerabilities may be as follows:

- Increased air and water temperatures would place additional stress on sensitive ecosystems and species
- Loss of snowpack storage may reduce reliability of surface water supplies and result in greater demand on groundwater resources
- Magnitude and frequency of extreme precipitation events may increase, resulting in greater flood risk
- High temperature and longer dry seasons would increase wildfire risk.

10.4.3 Air Quality

Air movement through Storey County normally helps to maintain good air quality. Generally speaking, Virginia City and the Virginia Highlands do not experience the stagnating air which normally occurs on many valley floors of Nevada caused by temperature inversions and other phenomena (particularly during winter). As noted above, climate change could impact weather and temperature patterns in the county, which could exacerbate air quality issues that may arise.

There are three Nevada Division of Environmental Protection air quality monitoring stations in the county, in Lockwood, Virginia City, and the Highlands. The data from these monitoring stations track several pollutants including wildfire smoke, and the data is converted into Air Quality Index values.

The county can experience drier, less stable soils that are more likely to contribute to dust, and dry vegetation can also act as fuel contributing to wildfire risk. The Nevada Fire Board published a Landscape-Scale Wildland Fire Risk/Hazard/Value Assessment for Storey County in 2009; conclusions include that:

“[A] “normal fire year” is becoming a thing of the past. Fire season—once considered to run from May or June to September or October—is being replaced by a year-round season, marked by late winter and early spring fires that can destroy homes and other improvements and impact grazing lands and important wildlife habitat. A large part of this change is due to the loss of native vegetative communities that have been replaced by invasive, fire-prone species such as cheatgrass and red brome. Areas that at one time experienced a wildland fire reoccurrence interval of approximately 35 years are now experiencing wildland fires with return intervals as short as every 2–3 years.”

Fires ranging from small brush fires to larger wildfires are a regular occurrence in recent years. Smoke from wildfires can have a significant negative impact on air quality, which in turn can have negative impacts on human and environmental health. Also as discussed above, hotter and drier conditions can contribute to wildfire risk and the smoke can subsequently harm air quality. Wildland fire management is discussed further in Chapter 4 – Public Lands and Chapter 9 – Public Services & Facilities.

Other factors impacting air quality include greenhouse gas emissions and dust from transportation, development, industrial activities, and energy generation projects can all detract from air quality in the

county. Policies and objectives for monitoring baseline air quality and impacts that may result from these activities are provided later in this chapter. Efficient and low-emission operations should be encouraged and/or required going forward, and the County may wish to pursue additional alternative energy generation opportunities to further reduce greenhouse gas emissions and protect air quality.

Because air quality is an important factor influencing local quality of life, it is the policy of Storey County to protect air quality. This effort will include a variety of strategies including protecting against wildfires and monitoring and regulating air pollution from dust, greenhouse gases, and other factors.

10.5 Flora and Fauna

10.5.1 Flora

Vegetation within the county is mainly restricted to three communities: the Pinion-Juniper, the Big Sagebrush-Grass, and the Low Sagebrush-Grass. The Pinion-Juniper, located in the upper elevations of Storey County, is accompanied with an understory of big sagebrush and antelope bitterbrush. Frequently lying above the Pinion-Juniper is the Low Sagebrush-Grass community. Associated with low sage are grasses and forbs such as needlegrass and balsamroot. Below the Pinion-Juniper lie the Big Sagebrush-Grass community. Big sagebrush is accompanied by a host of grasses, forbs and shrubs.

These vegetal communities are typical of the region and exist in a very harsh climate. Recovery from disturbance is slow. Disturbance to vegetation leads to a host of environmental problems such as dislocation of native fauna (permanent or seasonal), increased erosional hazards and a deterioration of the local watershed. Maintaining native vegetation should be encouraged to maintain the topsoil of the county. See Appendix I of this master plan for a comprehensive list.

10.5.1.1 Noxious Weeds and Invasive Species

Invasive and other noxious weeds in Storey County are currently displacing diverse native plant communities and greatly impacting Nevada's natural and economic resources. Weeds currently identified at measurable levels include Russian knapweed, tamarack, Russian thistle, and whitetop. Noxious weeds can have significant negative impacts on property value, fish and wildlife habitats, soil stability, water quality, recreation opportunities, human and animal health, and forage production for agriculture producers; generally, they disrupt and harm local ecosystems. Per a 2009 Nevada Fire Board study on wildland fire risk, invasive vegetation such as fire-prone cheatgrass and red brome is also known to contribute to wildfire risk.⁶

Noxious weed infestation in Storey County requires constant attention to keep weed populations under control. Due to the county's broad range of land management and ownership, a comprehensive and cooperative approach to noxious weed management across all jurisdictional boundaries is essential. The County has regularly worked with the Bureau of Land Management and regional conservation organizations (including the Dayton Valley Conservation District, Washoe-Storey Conservation District, Carson-Truckee Conservancy District, and Carson Water Subconservancy District) to manage invasive

⁶ <https://forestry.nv.gov/uploads/missions/Storey-Assessment-Final.pdf>

weeds on both private and public land.

The cooperating agencies conduct noxious weed monitoring and mapping, herbicide treatment, and community education and outreach. The spirit of cooperation has been the cornerstone for controlling noxious weeds in Storey County, yielding measurable success in abating noxious weed infestations and enhancing ecosystems and wildlife habitats. Continued collaboration is essential to keeping the county's noxious weed problem under control and protecting against broader potential impacts like providing fuel for wildfires, especially as hotter and drier conditions associated with climate change may also contribute to an increase in wildfire risk.

10.5.2 Fauna

Wetlands, riparian habitat, and Waters of the United States⁷ are key habitats supporting the diverse populations of waterfowl, fisheries, wildlife, and plant communities within the county. The Truckee River is important to the region's fishery and provides spawning grounds for the Lahontan Cutthroat Trout and the cui-ui.

Within the interior of Storey County exists the usual array of wildlife found in western Nevada. Game birds such as the mountain- and California valley quail, dove, and chucker partridge are found around the county's inland springs and seeps. Cottontail rabbits also dwell close to natural water supplies. It is possible that sage grouse are in the county, although none have been identified.

The county hosts one of Nevada's larger herds of wild horses (Figure 10.5-1). The Bureau of Land Management estimates the Nevada population of wild horses at over 27,000 animals, and several hundred live throughout the county. The wild horse is the primary grazing animal in some areas including the Highlands area and Tahoe-Reno Industrial Center. These herds can drastically impact vegetation. The County supports land management strategies that balance the needs of wild horses against potential negative impacts if their population expands beyond the carrying capacity of the land.

Storey County provides a habitat for both a resident population of mule deer as well as a wintering ground for some deer that summer around the Tahoe Basin. The Flowery Range-Upper Long Valley Creek area is a key deer wintering site, as is the western face of the Virginia Mountains in Washoe County. Regular seasonal migration routes include the Five Mile Flat area as well as the canyons between Gold Hill and Silver City.

Other notable large animals in the county include black bears, cougars, bobcats, and big horn sheep. A range of other non-game species live in Storey County including chipmunks, eagles, coyotes, and western diamondback rattlesnakes. See Appendix I of this master plan for a comprehensive list of fauna.

All of the county's fauna survive within a delicate framework of available water and food; the fauna are a critical piece of the county's fragile environment.

⁷ As defined in 40 CFR 230.3(s)



Figure 10.5-1: Wild Horses in Storey County

10.6 Goals, Policies, and Objectives

Goal 1: Decrease erosion and flooding risk and encourage water infiltration.

Policy	
Policy 1.1	Only slopes of less than 10 percent should be developed, unless engineered properly.

Policy	
Policy 1.2	Site development recommendations and requirements should consider slowing runoff flow to decrease erosion, minimize flooding, and encourage greater infiltration to recharge aquifers.

Policy	
Policy 1.3	Encourage landscaping to minimize erosion and increase infiltration.

Policy	
Policy 1.4:	Support large-scale planning and infrastructure projects to study, mitigate impacts, and respond to flooding events.

Objectives	
Objective 1.4-1	Consider County-led infrastructure projects to slow the flow of larger drainage canyons.
Objective 1.4-2	Continue to work with the Truckee Meadows Flood Management Authority, Federal Emergency Management Agency, State of Nevada Department of Emergency Management, and the Carson Water Subconservancy District on planning and funding flood modeling and mitigation projects.

Goal 2: Study and plan for the county’s existing water resources.

Policy	
Policy 2.1	Promote the intent and policies of the 2023 Storey County Water Resources Plan (Appendix B of this master plan).
Objectives	
Objective 2.1-1	Request the Nevada State Engineer continue to conduct hydraulic studies of the county’s water basins / aquifers (including in Mark Twain, the Highlands, and undeveloped areas in the northeast of the county) to determine quantity and quality of aquifers and assure aquifers are not being depleted beyond their recharging capabilities.
Objective 2.1-2	With local residents and development firms, investigate the feasibility of developing a unified water and sewer district for the River District.
Objective 2.1-3	Pursue a comprehensive water loss analysis or audit to confirm the primary contributor(s) to system non-revenue water and reduce this volume below 15 percent of all water purchased from the Marlette Water System.
Objective 2.1-4	Update the Water Resource Plan every 5 to 10 years.
Objective 2.1-5	Monitor the development of new regulations and determine whether they directly impact the county’s current water supply.

Policy	
Policy 2.2	Recognizing that groundwater resources are decreasing and groundwater and surface water are connected and both impacted by increased usage and potential climate change impacts, work towards incorporating currently unserved population centers into Storey County’s water system.
Objectives	
Objective 2.2-1	Pursue coordinated / conjunctive planning of use and management of surface water and groundwater resources to maximize the availability and reliability of water supplies.
Objective 2.2-2	Develop a water rights dedication rate system as discussed in the 2023 Water Resource Plan (see Appendix B).
Objective 2.2-3	Consider requiring a proposed fixture unit count for all non-residential developments be provided at the time of parcel map approval and/or building permit

	in order to evaluate available system capacity.
Objective 2.2-4	Provide education and guidance to private landowners that production from existing domestic wells in the Virginia Highlands is not sustainable and deepening of domestic wells is a cyclic, never-ending process.
Objective 2.2-5	Allocate annual budget and staff time to continue to participate in regional planning groups, like the Carson Water Subconservancy District and Truckee Meadows Water Authority Advisory Committee meetings or planning sessions to monitor best management practices for existing water rights.
Objective 2.2-6	Informed by the 2023 Water Resource Plan, develop and maintain additional infrastructure for storage, treatment, and delivery of water resources as needed to meet Storey County needs.

Goal 3: Protect Storey County’s water rights.

Policy	
Policy 3.1	Protect and maintain existing water rights / resources and related infrastructure.
Objectives	
Objective 3.1-1	Maintain the primacy of the Virginia City/Gold Hill water allotment allocated in the Franktown Water Decree.
Objective 3.1-2	Continue to maintain, replace, and upgrade segments of the Marlette Water System pipeline, as necessary (the system is discussed further in Chapter 9 – Public Services & Facilities).
Objective 3.1-3	Coordinate with the State Marlette Water System the return of American Flat to the Marlette/Virginia City Water System service area.
Objective 3.1-4	Plan for and preserve water right availability in the Marlette Water System for the buildout of existing parcels, potential expansion of new parcels, and land for Virginia City, Gold Hill, Silver City, and American Flat.
Objective 3.1-5	Regularly review and maintain conformance with the Storey County Water Resource Plan.

Policy	
Policy 3.2	Discourage exporting or selling off water rights from Storey County.
Objectives	

Objective 3.2-1	Actively participate on regional governmental water agencies to ensure the water rights of all owners and residents are protected.
Objective 3.2-2	Work with Lyon County to enter into an agreement which clearly defines Storey County’s responsibility to provide water service to future development in Silver City.
Objective 3.2-3	Request legislation, both at the county and state levels, to allow restriction or prevent water or water rights exportation to areas outside the county.

Policy

Policy 3.3	Require new development, including planned unit developments and land divisions, to obtain and provide proof of owned water rights meeting safe drinking standards before land use or building permits are considered or approved.
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Objectives

Objective 3.3-1	Actively protest the granting of water rights or land development proposals which will have a negative impact on the quantity and/or quality of Storey County residents’ water supply.
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Policy

Policy 3.4	Establish a plan for the use of County-owned water rights in the River District emphasizing long-term benefits to the Lockwood and/or Mustang communities.
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Goal 4: Protect the quality of water resources.

Policy

Policy 4.1:	Follow the intent, policies, and implementation actions of the 2024 Community Source Water Protection Plan for the Storey County Water System.
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Policy

Policy 4.2:	Refuse special use permitting of industries which cannot guarantee the quality of effluent produced by their activity.
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Policy	
Policy 4.3:	Require users of toxic or hazardous materials to provide monitoring capabilities to assure protection from surface and groundwater contamination.

Policy	
Policy 4.4	Promote the improvement of Storey County watersheds.
Objectives	
Objective 4.4-1	Regularly monitor water quality throughout the Marlette System (to the best of the Public Works department’s ability) by encouraging private well owners to send the County any water quality data to develop a database and monitor trends.
Objective 4.4-2	Engage in collaborative efforts with surrounding water quality and land conservation entities to implement watershed improvement programs within Long Valley Creek, Six Mile Canyon Seven Mile Canyon, Gold Canyon, American Flat, and area tributaries.

Goal 5: Protect wetlands, riparian habitat, and Waters of the United States.

Policy	
Policy 5.1	Wetlands, riparian habitat, and Waters of the United States should be protected from undue degradation. Undue degradation may result from over pumping of groundwater, destruction of vegetation for over-development or misplacement of recreational facilities, poorly planned land dispositions, unintentional misuse of riparian resources by public and private users, and other actions.

Policy	
Policy 5.2	Support a coordinated effort to protect wellhead protection areas and municipal watersheds from undue degradation through proactive zoning and development controls, pursuant to Storey County ordinances.

Goal 6: Encourage responsible and sustainable water use and conservation practices.

Policy	
Policy 6.1	Encourage area mining operations, agricultural operations, residences, and other land uses to implement water conservation practices.
Objectives	
Objective 6.1-1	Enhance local water conservation awareness.
Objective 6.1-2	Investigate County ordinance changes to require water conservation based on the 2021 Water Conservation Plan.

Policy	
Policy 6.2	Continue to encourage and require, when feasible, the use of recycled, treated effluent water for agricultural and recreational uses.
Objectives	
Objective 6.2-1	Establish the County's priority of right to the use of this water.

Policy	
Policy 6.3	Monitor and manage private groundwater use.
Objectives	
Objective 6.3-1	Continue development of the County's groundwater management plan.
Objective 6.3-2	Consider adoption of policy recommended in the 2023 Water Resource Plan, such as: "any new domestic well created through a land use change or parcel map process will be equipped with a meter to measure all water produced by the well." <ul style="list-style-type: none"> • The meter must comply with County specifications and provide electronic direct read transfer of data to County Public Works equipment. • The meters are to be used for quantifying the capacity of the limited aquifers in the county.

- The County may also use the meter data to enforce state limitations for the production of groundwater (2 acre-feet annually maximum) or any future restrictions to domestic groundwater production.

Goal 7: Encourage sustainable landscaping practices that conserve water and support native plant and animal life.

Policy	
Policy 7.1	Encourage xeriscaping techniques on landscaped public right-of-way areas, around public buildings, and in other public areas.

Policy	
Policy 7.2	In private developments, discourage landscaping which requires large amounts of water and encourage xeriscaping techniques.

Policy	
Policy 7.3	Encourage new developments to design with native animal and plant interests in mind to encourage their growth and leverage their benefits.

Goal 8: Prevent and manage the spread of invasive or noxious weeds in Storey County.

Policy	
Policy 8.1:	Combat the spread of noxious weeds by participating in collaborative noxious weed mitigation and management efforts.

Objectives	
Objective 8.1-1	Continue annual (and/or more frequent) coordination between the County, regional conservation organizations, and the Bureau of Land Management to share information, develop strategies, and plan implementation for noxious weed management.
Objective 8.1-2	Continue to collaborate with the Carson Water Subconservancy District and

	Washoe-Storey Conservation District to participate and provide funding for annual noxious weed management mitigation programs.
Objective 8.1-2	With the local and regional coordination group, identify other opportunities to fund noxious weed management as needed, including local funding and lobbying for additional federal and state funding.
Objective 8.1-3	Establish, implement, and enforce county codes and/or ordinances for noxious weed prevention and management.
Objective 8.1-4	Establish cooperative weed management areas to control invasive species.

Policy	
Policy 8.2	Treat invasive species as soon as they are detected in the county and revegetate treated areas quickly, as proactive treatment costs much less than treatment of established populations.
Objectives	
Objective 8.2-1	Coordinate with federal and state agencies to also treat invasive species upon detection.
Objective 8.2-2	Institute a revegetation program to coordinate quick revegetation of: <ul style="list-style-type: none"> • Areas that have been treated for invasive or noxious weeds • Areas or corridors where the ground and vegetation have been disturbed for underground utility or pipeline projects • Other areas of surface disturbance

Policy	
Policy 8.3	Support the Nevada Weed Free Certification program ⁸ for certified weed free forage, mulch, and gravel.
Objectives	
Objective 8.3-1	Consider requiring weed-free materials on all public lands in the county and ways to encourage their use for all producers and consumers.

⁸ https://agri.nv.gov/Plant/Noxious_Weeds/Program_Noxious_Weed_Seed_Free_Certification_Program_Overview/

Policy	
Policy 8.4	Promote public awareness to prevent additional spread of invasive or noxious weeds.
Objectives	
Objective 8.4-1	Support the education of off-highway-vehicle operators, hikers, and other recreationists about the hazard of transporting weeds from infested to non-infested areas.

Goal 9: Regulate use of open-range and watershed areas to minimize fire danger and prevent degradation.

Policy	
Policy 9.1	Preserve open space within Storey County.
Objectives	
Objective 9.1-1	Assist property owners and interested groups in controlling grazing and public use of critical watershed and riparian areas.
Objective 9.1-2	Maintain grazing animals in numbers which will not exceed capacity of the land.
Objective 9.1-3	As of 2023, the Department of Wildlife is included in subdivision reviews. Work with the Department to require open space integration into planned unit developments and other new development areas when practical and feasible.

Goal 10: Monitor and protect a diversity of wildlife species in Storey County.

Policy	
Policy 10.1	Monitor the condition of wildlife populations and their habitats in Storey County.
Objectives	
Objective 10.1-1	Request that federal and state agencies provide periodic updates to the County Board of Commissioners regarding current and potential threatened and endangered species in the county area.
Objective 10.1-2	Identify habitat needs for wildlife species (e.g., adequate forage, water, cover) and ways for relevant agencies to support the provision of those needs, such as through habitat restoration, to help restore and maintain appropriate wildlife population levels.

Policy	
Policy 10.2	Support hunting and fishing as recreational resources on public lands, such as through the State’s programs to provide sustained levels of game animals.

Policy	
Policy 10.3	Migratory corridor integration is to be considered for the purposes of protecting the diversity of wildlife, reducing wildlife conflicts in developed areas, and reducing the prevalence of vehicle-wildlife collisions. The County should coordinate with the Department of Wildlife on this issue.
Objectives	
Objective 10.3-1	In coordination with the Department of Wildlife, align open space corridors in planned unit developments, and other developments where possible, with known migratory corridors.

Goal 11: Support Bureau of Land Management and State management of wild horses at population levels that protect the county’s diverse ecosystems and avoid potential harmful impacts such as overgrazing.

Policy	
Policy 11.1	Storey County supports a strict policy of wild horse population control to ensure the species does not interfere with other wildlife, the economic viability of private enterprise such as ranching, other multiple uses, and the safety of those who must travel on routes through open-range.
Objectives	
Objective 11.1-1	Coordinate with the Bureau of Land Management and the State agencies to work cooperatively on wild horse management issues including establishing and maintaining Appropriate Management Levels for wild horse herds, in coordination with the Bureau of Land Management Resource Advisory Council, the County, and public involvement.
Objective 11.1-2	Request that the Bureau of Land Management take advantage of good forage years by emphasizing maintenance level captures on horse management areas that have established Appropriate Management Levels.

Policy	
Policy 11.2	Support resource enhancement where needed to correct damage caused by wild horses.

Policy	
Policy 11.3	Support programs to attract wild horses away from populated areas, highways, and other hazardous areas and toward wildlands.

Policy
Policy 11.4: Support visitor interest in and safe viewing of wild horses.
Objectives
Objective 11.4-1 Publicize and encourage areas where the public can view wild horses.
Objective 11.4-2 Educate the public and visitors about not feeding, watering, interacting with, or harassing wild horses.

Goal 12: Maintain good air quality in Storey County.

Policy
Policy 12.1 Air quality shall be maintained with a balanced approach that allows some commercial and population growth without a detriment to the social, aesthetic, cultural, economic, and ecological values of the County.
Objectives
Objective 12.1-1 Encourage the Nevada Division of Environmental Protection to continue air quality monitoring at its stations in the county.
Objective 12.1-2 Work with the Nevada Division of Environmental Protection and other relevant agencies to regulate air quality based on best available measurement and control methods.

Policy
Policy 12.2 Energy generation proposals, including renewable and non-renewable, shall be subject to state and federal emissions regulations: <ul style="list-style-type: none"> • All non-renewable energy generation proposals shall attain the lowest feasible emissions, the highest feasible efficiencies, and the highest possible ratings using Best Available Control Technology as required by the Nevada Division of Environmental Protection. • Any renewable energy generation proposal, such as biomass, that could affect air quality shall also have the lowest feasible emissions and highest possible ratings using Best Available Control Technology as required by the Nevada Division of Environmental Protection.

Policy

Policy 12.3 Renewable energy generation through solar or wind are encouraged due to their minimal negative impact to air quality as required by the applicable State or Federal regulatory agency

Policy

Policy 12.4 New industrial or other potential large-scale sources of greenhouse gases or other air pollutants shall be evaluated for impacts on air quality according to state and federal regulations. This is applicable to uses including:

- Factories or other industrial uses
- Large-scale commercial uses
- Large-scale agricultural uses with potential negative impacts air quality.

Policy

Policy 12.5 Proposed new construction projects that require access to public land, including but not limited to energy transmission line corridors, communication line corridors, or water rights applications associated with any pipeline projects, should require comprehensive air quality measuring and monitoring programs in accordance with state and federal requirements.

Policy

Policy 12.6 If PM10 (≤ 10 -micron particle size) levels significantly increase above historical levels or allowable limits, an immediate re-vegetation project is necessary to stabilize the surface of any areas (excluding service roads) where vegetation was changed because of the project.

Policy

Policy 12.7 When practical, significant land disturbance areas shall be revegetated with native species to reduce wind erosion and/or fugitive dust, including:

- Significant areas of land disturbances associated with projects that are abandoned.
- Agricultural fields that are to be abandoned.