

# State of Nevada Wetland Program Plan

2023 – 2028



Ginny Lake Fen, Tahoe Basin, Nevada. © Chantal Iosso

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for the

U. S. Environmental Protection Agency, Region 9

May 9, 2023



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— DIVISION OF —  
**NATURAL HERITAGE**

**STATE OF NEVADA**  
Department of Conservation & Natural Resources

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**State of Nevada Wetland Program Plan  
2023-2028**

**Nevada Division of Natural Heritage**

**Wetland Program Plan preparation**

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May 30, 2023

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## Executive Summary

It is estimated that Nevada has lost (i.e., converted to another type of land cover or use) approximately 52% of its historic wetland acreage. The State of Nevada has no formal or informal goal regarding wetland loss or gain and does not regulate or promote wetland or stream buffer protections. Although numerous research projects, mapping and assessment/inventories, and voluntary restoration projects have been conducted across the state by various universities, state and federal agencies, and non-profit organizations, no single agency or group exists to keep track of the locations and types of wetland projects that are underway. The decentralization of such data has made it difficult for wetland researchers and land managers to quantify and integrate knowledge related to succession, climate change, and human alteration. Moreover, the vast majority (>85%) of Nevada's 27,000+ springs and many wetland habitats have never been surveyed regularly or at all (Appendix 1, Jenness 2021). This has led to significant information gaps regarding the regional distribution and trends of wetland habitats across the state. In 2002, 2008, 2011, 2017, 2019, and 2021, the Nevada Division of Natural Heritage (NDNH) was awarded a U. S. Environmental Protection Agency (EPA) Region 9 Wetland Program Development Grant (WPDG) to formulate strategies for improving the effectiveness of protecting and restoring Nevada's wetland resources, create a wetland plan, and pursue other activities to promote wetland conservation. In January of 2016, NDNH staff sent a WPP survey to a wide variety of wetland stakeholders. Based on the results of this survey and additional stakeholder conversations in the following years, the WPP's focus is on four core program elements: **Monitoring and Assessment; Voluntary Restoration and Protection; Partnerships, Outreach, and Education; and Sustainable Financing.** Since the first WPP, NDNH and partners have monitored and assessed hundreds of wetland habitats, improved databases for storing and sharing wetland data, produced tools for level 1 and level 2 wetland analysis, and engaged stakeholders and facilitated data sharing. However, much additional work is necessary. The goal of this WPP is to identify how resources and planning activities will be prioritized over the next six years to best achieve positive outcomes for Nevada's wetlands. Specifically, this WPP seeks to integrate wetland research, monitoring and assessment, management, protection, and restoration projects occurring across the state to ensure programs are complimentary, inform resource investments, and allow managers to understand and weigh tradeoffs among potential actions. In order to ensure this plan represents statewide goals, stakeholder input and engagement is an overarching goal of this WPP.

## Partner list and contributions

Many partners throughout Nevada directly worked with the Wetland Program or indirectly supported the program through other wetland inventorying and restoration activities, data sharing with the Nevada Division of Natural Heritage, or consultation on the WPPs. The list below is not exhaustive but identifies some major wetland contributors in Nevada.

Nevada Division of Natural Heritage (NDNH) – Funding procurement; Wetland Program development and management; Wetland Program Plan revisions; springs and wetland surveys; springsnail surveys; springsnail genetics and taxonomy

Desert Research Institute (DRI) – Creation and ongoing development of WetBar, GIS-based level 1 assessment tool; production of a wetland map of Nevada; update of the Nevada Priority Wetlands Inventory

Springs Stewardship Institute (SSI) – Springs inventorying; maintenance and QAQC of their online database, Springs Online; coordination of the Nevada Springs Symposium

The Nature Conservancy (TNC) – Development of the Draft Nevada Rapid Assessment Method (NVRAM); literature review and data mining on wetland-dependent sensitive species in Nevada; report on statewide groundwater dependent ecosystem stressors and threats; participation in the Springsnail Conservation Team

Nevada Department of Wildlife (NDOW) – Creation of the Nevada and Utah Springsnail Conservation Agreement and Strategy; participation in the Springsnail Conservation Team; spring and riparian restoration to improve habitat; management of wetland habitat in Wildlife Management Areas

Bureau of Land Management (BLM) – Development and application of the Wetland Assessment, Inventory, and Monitoring program throughout the west, including Nevada; participation in the Springsnail Conservation Team; restoration of wetland habitat on BLM land

Forest Service (FS) – Riparian and groundwater dependent ecosystem surveys throughout the west, including Nevada; data sharing with NDNH; participation in the Springsnail Conservation Team; restoration of wetland habitat on FS land

Fish and Wildlife Service (FWS) – Surveys of wetland-dependent sensitive species; participation in the Springsnail Conservation Team; management of critical wetlands such as Ruby Marsh, Stillwater Marsh, and others

Nevada Division of Environmental Protection (NDEP) – Completion of EPA wetland surveys throughout Nevada; production of reports on the condition of Nevada's waters; permitting of discharges and dredge/fill to wetlands through the Clean Water Act; riparian restoration through the Nonpoint Source Pollution Management Program

United State Geological Survey (USGS) – Collection and storage of surface and groundwater data throughout Nevada

Pyramid Lake Paiute Tribe (PLPT) – Wetland assessments on the Pyramid Lake Reservation; Field testing of NVRAM

Riparian Creeks and Communities Team (RCCT) – Providing training and resources on PFC (Proper Functioning Condition, a survey technique to assess the health of wetlands); collaboration with landowners on riparian management practices

Nevada Conservation Districts – Coordination, support, and funding of voluntary wetland restoration projects on private property, especially agricultural and rangelands

Nevada State Parks – Management and protection of wetland habitats within state parks such as Walker River State Park, Washoe Lake State Park, and others

National Resource Conservation Service (NRCS) – Management of the Conservation Easement Program, which provides funding for wetland restoration and protection on private property

Nevada Division of Water Resources (NDWR) – Allocation and management of state water rights; creation of the Nevada Water Plan

## Overview

Nevada is the driest state in the nation and contains few discharges to surface waters of the state. Although wetlands and riparian areas cover a relatively small amount of land in Nevada, the benefits of these ecosystems are indispensable. For example, wetlands and springs provide critical habitat for the state's wildlife and aquatic species, many of which are wetland or spring dependent. Wetlands also provide numerous ecosystem services to Nevada's citizens including water supply and purification; regulation of floods, drought, and land degradation; ground water recharge; stream flow maintenance; soil formation and nutrient cycling; carbon sequestration; and recreational opportunities and tourism.

It is estimated that Nevada has lost (i.e., converted to another type of land cover or use) approximately 52% of its historic wetland acreage between 1780 to 1980 (Dahl 1990). This number is likely an underestimate of the wetland loss to date, as more recent studies from California and Utah estimate losses of 95% and 90%, respectively (Wildlife Action Plan Team 2012). Losses are primarily attributed to the diversion of streamflow for agricultural, municipal, and industrial uses; filling and draining wetlands for development; and stream channel erosion and modification. Nevada's remaining wetlands are threatened by continued surface water diversions and channel modification; discharges from irrigated farmland, abandoned mines, and urban stormwater containing high levels of salts and metallic compounds; excessive ground water withdrawal; incompatible grazing practices (both domestic livestock and feral horses and burros); non-native plant and aquatic animal invasions; incompatible recreation use (e.g., introduction of non-native bait species via fishing); overallocation of water rights in groundwater and surface water basins throughout Nevada; and prolonged drought and other climate-related factors. The most recent NDEP report has found that 37% of 699 streams, lakes, and other wetlands tested statewide do not meet water quality standards, due to many of the aforementioned threats (NDEP 2022). Wetlands that do meet water quality standards or do not have assigned standards may still have diminished water quality and ecosystem services.

Different criteria are used by agencies to classify wetlands to reflect variation in statutory protection and management objectives. Here, the term wetland is intended to encompass all wet areas in Nevada that provide ecosystem services and habitat for plants, wildlife, and aquatic species, including: wet meadows, seeps and springs, playas, riparian areas, perennial streams, and intermittent and ephemeral washes. As such, the U. S. Fish and Wildlife Service definition of a wetland represents the range of wetland types applied by resource managers familiar with Nevada's wildlife, water, and water influenced vegetation resources.

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes, (2) the substrate is predominantly undrained hydric soil, and (3) the substrate is nonsoil and is

saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al. 1979).

Currently, Nevada's main mechanism to regulate impacts to wetlands, such as dredge and fill and other activities, is through §401 certification under the Clean Water Act administered by NDEP's Bureau of Water Quality Planning (see appendix 3 for an overview of current wetland regulations in Nevada). Although projects requiring a federal permit must comply with the U. S. Army Corps of Engineers' (ACOE) mandate of no-net-loss of wetlands, the state has no formal or informal goal regarding wetland loss or gain (NAWM 2015). Moreover, small wetlands around springs that do not flow into larger protected waterbodies receive no protection through §401. Nevada does not regulate or promote wetland or stream buffer protections (NAWM 2015). In addition, the state relies solely on the ACOE for all wetland mitigation actions and lacks any formal wetland monitoring plan or centralized mapping and inventory database (NAWM 2015).

Numerous research projects, mapping and assessment/inventories, and voluntary restoration projects have been conducted across the state by various universities, state and federal agencies, and non-profit organizations. Unfortunately, no single agency or group exists to keep track of the locations and types of wetland projects that are underway. The decentralization of such data has made it difficult for wetland researchers and land managers to quantify and integrate knowledge related to succession, climate change, and human alteration. This has led to significant information gaps regarding the regional distribution and trends of wetland habitats across the state. The WPP brings together wetland stakeholders statewide to identify joint wetland opportunities, challenges, and goals, bridging the existing communication gaps to better conserve wetlands.



## Wetlands in Nevada

### Geology, Climate, and Wetlands

The characteristics of Nevada's wetlands are dictated first by geology. Colliding tectonic plates have built the prominent Sierra Nevada Mountain range along Nevada's western border. Simultaneously, this tectonic activity stretches Nevada, resulting in more than 300 north/south trending mountain ranges separated by internally drained basins and crisscrossed by faults. The complex geology of the state includes regions of igneous, metamorphic, and sedimentary rocks, from broad lava flows which created the plateaus and tablelands of northern Nevada to limestones formed under an ancient ocean that now can be found on some of the highest peaks (Mt. Charleston, for example) in the south. The geological preconditions dictate where water precipitates, where it collects, and where it emerges at the surface today to feed wetlands.

The mountains to the west block much of the Pacific's moisture from reaching Nevada. Consequently, Nevada is the driest state in the United States, receiving an average of around nine inches per year of precipitation. The distribution of this scarce water is highly variable both spatially and temporally. Northern portions of the state (largely in the Great Basin ecoregion, a cool desert) receive far more precipitation than the Mojave (a warm desert) to the south. Four to five times the precipitation falls on mountain ranges compared to their surrounding valleys. Most precipitation comes in the winter as snow above the lowlands. The snowpack is the primary contributor to groundwater recharge and surface water supply. It also changes dramatically from year to year, cycling in and out of droughts, with droughts dominating over the last 20 years. Throughout most of the state, the sunny days and long dry season result in evaporation that far exceeds precipitation. Because of the high evaporation rate, only about 10% of the annual precipitation that falls in Nevada is available to replenish state water supplies (NDNH 2006).

Wetlands are a critically important resource because they help bridge the gaps in the variability of water supplied through precipitation by retaining water (even during dry periods) and assisting with groundwater recharge.

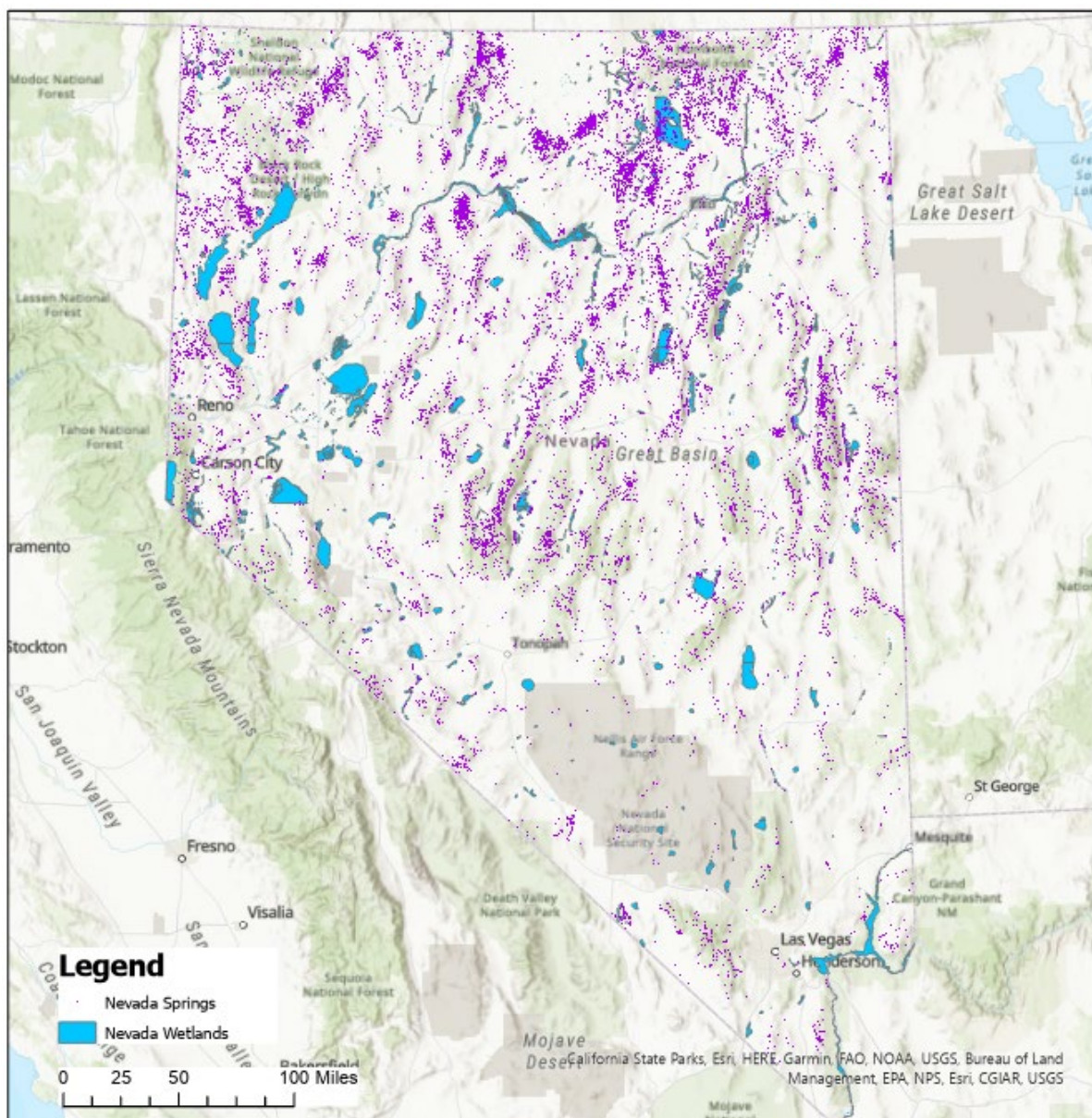
### Wetland Types and Distribution

Wetlands in Nevada include marshes, wet meadows, springs, riparian areas, intermittent and perennial streams, lakes, vernal pools, and playas. There is immense variety in hydrology, soils, vegetation, and site characteristics between (and within) wetland types. Some sites are very enduring and resilient to disturbance, while other sites are more sensitive and may disappear in drier years. Similarly, different wetland types provide different ecosystem functions, but each serve important roles in the ecosystem.

In the 1980s, early versions of the National Wetland Inventory (NWI) estimated that Nevada had approximately 236,350 acres of wetlands (Dahl 1990). However, the coarse spatial resolution of this initial analysis meant that smaller wetlands were not counted. Thanks to improved, higher

resolution satellite imagery and remote sensing techniques, current estimates suggest there are around 2.9 million acres of wetlands (Saito et al. 2022), covering a little under 5% of the state by area. Even though this is a much larger number, wetlands in Nevada have been lost between the first NWI estimate and more recent assessments. Modern analysis relied upon 30m pixels, so some small patch wetlands are not included in this total. There are also more than 27,000 springs (figure 1) and around 142,000 linear miles of riparian corridor along perennial, ephemeral, and intermittent streams (NDEP 2022).

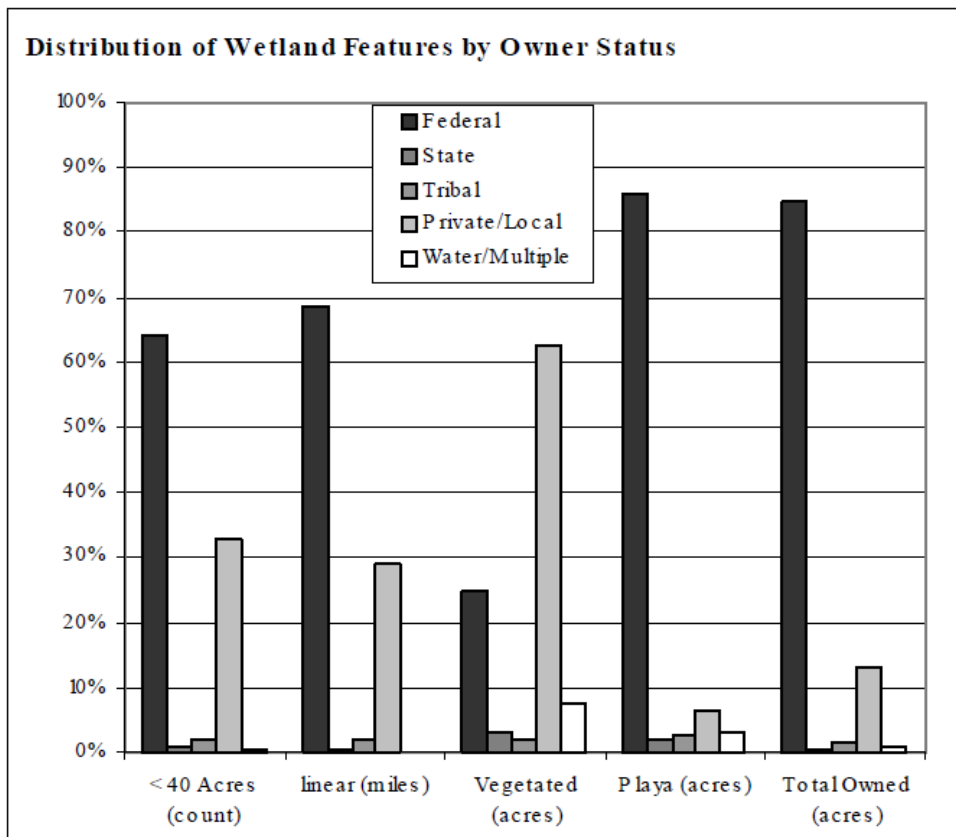
Figure 1. A map of known springs (courtesy of the Springs Stewardship Institute; points not scaled) and wetlands (courtesy of the Desert Research Institute) in Nevada. Note that smaller wetlands abound but are not visible at this scale.



Wetlands associated with springs, vernal pools, and wet meadows are often small, isolated patches. At the opposite end of the spectrum, playas account for the largest portion of wetland acreage but are generally only seasonally saturated. There are also thousands of miles of riparian wetlands. Many are around major rivers like the Humboldt, Truckee, Carson, Walker, and Colorado rivers, although riparian zones can be found along many other perennial, intermittent, and ephemeral streams. Wetland acreage is concentrated in the northern portion of the state (NDNH 2006).

About 80% of Nevada is federally owned, and so too are many of Nevada’s wetlands. However, a disproportionate amount of vegetated wetlands (and to a lesser extent, small wetlands and riparian area) is privately owned (NDNH 2006; figure 2).

Figure 2. Distributions of NWI wetland types by land ownership (NDNH 2006)



### Wetland Ecosystem Functions

Wetlands in Nevada are critically important, both for humans and the environment. As described above, precipitation in Nevada is scarce and inconsistent. Wetlands bridge the extreme spatial and temporal variability in precipitation by storing and releasing water slowly. In times of drought, they can continue to provide reliable water sources, especially when groundwater-fed. In floods, wetlands absorb and slow the flows, reducing flood damage, minimizing erosion, and

controlling sediment transport. Wetlands act as natural water purification systems, improving water quality by filtering out sediment, processing excess nutrients, and removing pollutants and heavy metals.

The role wetlands play in storing and managing water resources is just the tip of the iceberg. Wetlands are also essential habitats and hotspots of biodiversity. Although wetlands cover less than 5% of Nevada by area, they are used by more than 75% of the species for at least one portion of their lives (Wildlife Action Plan Team 2012). At least 35 of Nevada’s 48 Threatened and Endangered plant and animal species are wetland dependent (<http://species.heritage.nv.gov/>). Additionally, many Nevada endemics (species that do not exist anywhere else), like several springsnail, frog, and desert fish species, rely on a single wetland complex. Wetland loss and degradation can therefore have dire consequences for individual species and the entire ecosystem.

Finally, humans value wetlands for a wide variety of recreational activities (e.g., birdwatching, hunting, fishing, hiking), economic uses like ranching, partaking in traditional cultural practices (e.g., gathering tule), and more. Replacing the many functions wetlands perform naturally (see table 1 for an incomplete list) is costly, if not impossible. The ecosystem functions provided by specific wetlands vary based on their type, condition, and location, but all of Nevada’s wetlands serve some essential functions. Therefore, protecting wetland resources is of tantamount importance.

Table 1. Wetland Ecosystem Functions (NDNH 2006)
<ul style="list-style-type: none"><li>• Hydrology and water resource maintenance</li><li>• Erosion and sediment control</li><li>• Flood control</li><li>• Water quality maintenance and improvement</li><li>• Wildlife habitat and biodiversity</li><li>• Wetland compatible economic uses</li><li>• Outdoor recreation, research, and education</li><li>• Support of traditional cultural practices</li></ul>

### **Wetland Threats**

Wetlands in Nevada face a multitude of threats that can degrade or eliminate them. Over the last 200 years, these threats have already resulted in the loss of at least 52%, but perhaps more than 90%, of Nevada’s wetland acreage (Dahl 1990; Wildlife Action Plan Team 2012). Without statewide wetland conservation efforts, this trend could continue. Some of the most significant threats to wetlands in Nevada are listed below.

- Water withdrawals:

All sources of water within the boundaries of Nevada, above or below ground, belong to the public (NRS 533.025), and a right to use water may be obtained by individuals or entities. As the driest state in the nation, water is scarce in Nevada; most surface water and groundwater are already appropriated or over-appropriated through water rights. Appropriated waters must be put to “beneficial uses” such as irrigation, mining, municipal, and recreational uses, among others.

Maintaining water for ecosystems was not prioritized when Nevada Water Law was developed. For example, the water rights system often disincentivizes water conservation; if a water right holder does not fully use their water for the designated beneficial use, then the right to use the water may be lost. Additionally, many surface waters were fully appropriated without water left for the ecosystem (NDWP 1999).

More recently, the benefits of maintaining healthy ecosystems have been recognized. Agencies and organizations have obtained “wildlife” water rights for instream purposes related to wetlands, fish and waterfowl habitat, survival of imperiled species, and water quality. There are 860 active “wildlife” water rights in Nevada, largely held by the FWS, FS, BLM, NDOW, PLPT, and Truckee Meadows Water Authority (TMWA). Nonetheless, these efforts are inconsistent and insufficient. Some of these are junior (newer) water rights, so they have lower priority than senior water rights and may not receive their full allocation during times of shortage (e.g., drought). Even in places where wildlife water rights have been secured, they may only represent a small portion of the water that would have historically supported wetland habitat.

Both surface and groundwater withdrawals, managed through the existing water rights system, divert water from wetlands. Surface withdrawals leave less water for terminal wetlands, riparian corridors, and other wetland habitats. Groundwater withdrawals can result in the lowering of the water table, drying springs and their accompanying wetlands. For example, groundwater pumping in Pahrump and Amargosa valleys resulted in complete drying or reduced flow of springs in Ash Meadows, an area of exceptionally high biodiversity (Parker et al. 2021). Without sufficient water, wetland habitat cannot persist. Wetland vegetation will ultimately be replaced with dry upland species or noxious weeds, and animals that rely on the water are forced to find other sources or die. Therefore, water withdrawals are perhaps the largest threat to wetlands.

- Hydrologic modification:

Hydrologic modifications, such as irrigation ditches, stream channelization, and dams, significantly impact wetlands by changing the hydrologic regime. Ditches or channelization structures divert water from wetland habitats, dewatering wet meadows and riparian areas. Dams have broad impacts, including submerging existing wetland habitats and changing the flood regime. Throughout the west, altered flood regimes on dammed rivers like the Colorado have resulted in major changes to riparian plant community assemblages. One major impact is the loss of dominance of willows and cottonwood, which rely on regular flooding to disperse their seeds,

in riparian corridors (Reynolds et al. 2012). In some places riparian wetlands have been completely replaced by tamarisk and other invasives. Very little intact cottonwood gallery or healthy multistory riparian area (essential habitat for many animals, such as the endangered Southwestern Willow Flycatcher) remains (Wildlife Action Plan Team 2012).

- Excessive grazing:

Wetland areas contain far more nutritious forage, water, and sometimes shade than the surrounding uplands. As a result, cows and feral horses and burros preferentially use wetlands, particularly throughout the dry, hot summers. This intensive use degrades wetland areas in multiple ways. Grazing impacts plant community composition and structure (as some plants or age classes may be preferred forage) and decreases vegetation cover. Repeated trampling through wetlands creates pedestals, facilitates erosion, and compacts soil, changing soil infiltration rates and reducing channel stability (Burdick et al. 2021). Devegetated, eroding soils lead to sedimentation in the water and ultimately reduced water quality. These impacts degrade the habitat for other wetland wildlife (NDNH 2006).

In Nevada, feral horses (and to a lesser extent burros) have significant negative impacts on wetlands due to their large population. Feral horses and burros are not native to Nevada. They are nonetheless protected by the Wild Horse and Burro Act, which also mandates that the Bureau of Land Management determine and maintain sustainable herd sizes for areas of the state. The number of horses a given area can support without degradation of the range is called the Appropriate Management Level (AML). The rate of horse reproduction far exceeds the BLM's ability to manage the population through the methods currently at their disposal. In 2020, the BLM estimated that feral horse numbers are more than four times the determined AML in Nevada. As a result, wetlands throughout the state have been severely degraded in the ways described previously due to horse overuse (Burdick et al. 2021).

Ranching (cows and sheep) without responsible grazing practices can have a similar impact on wetland areas as feral ungulates. However, there have been many examples of successful cooperation between land managers and ranchers to allow wetland areas to recover or even thrive with appropriate grazing. By adjusting stocking rate, providing upland water sources, and preventing summer-long grazing in wetlands, sustainable ranching can be compatible with healthy wetlands (Burdick et al. 2021).

- Mining:

Nevada is rich in valuable minerals (gold, lithium, barite, etc.) and earth materials. As a result, mining for these resources plays a major role in Nevada's history and current economy. This legacy continues to leave its mark on wetlands (NDNH 2006).

Mining has high potential to impact wetlands. Mining generally involves major land disturbances during exploration, removing earth and vegetation, piling of tailings, and building roads and

facilities associated with the mine. This is particularly true for open pit mining, a technique used in most of Nevada’s modern mines. Newly exposed soil and loose materials can result in inflows of sediment pollution, acid mine drainage, and leached heavy metals (arsenic, mercury, lead, and others) into ground and surface water. Additionally, some mining requires significant amounts of groundwater pumping or impact deep groundwater tables, resulting in reduced water in surrounding wetland-supporting springs and streams (NDNH 2006).

NDEP closely monitors the impacts of modern mines to the surrounding environment, particularly water resources. Since the passage of environmental regulations for mining in 1989, mines are held to higher standards to avoid and mitigate impacts when possible (DCNR 2021). Nonetheless, there are thousands of older abandoned mine sites near wetlands (NDNH 2006). NDEP is aware of around 200 abandoned mines that have ongoing environmental impacts, but there are likely many more. Restoration of these sites can be costly and time consuming, and staff time and funding is limited (DCNR 2021), making mitigating impacts of abandoned mines challenging.

- Development:

Development—for residential or urban areas, roads, utility corridors, and energy—has major impacts on wetlands. Wetland habitat may be fragmented or replaced by development, and the additional associated disturbance can allow invasive species to spread. Development in Reno, one of the largest metropolitan areas in Nevada and often referred to as the “Truckee Meadows,” resulted in draining and eliminating many of the natural wetlands in the valley. This trend is evident to a lesser extent in other parts of the state. Development also encroaches upon remaining wetland areas, like riparian zones and floodplains. Wetlands that are surrounded by impermeable developed surfaces may experience worsened water quality (NDNH 2006).

- Agriculture:

As of 2017, around 6 million acres or about 9% of Nevada is used for farming (NASS 2017). Many farms are in or around natural wetlands since wetland sites provide reliable water access and more productive soils (particularly in the case of floodplains) (NDNH 2006).

Agriculture impacts on wetlands can be significant. Traditional farming involves clearing native vegetation, tilling and/or leveling the ground, draining and/or diverting water, and sometimes application of fertilizers, pesticides, or herbicides. Depending on the site, nearby natural wetlands may be eliminated entirely or negatively impacted by increased erosion, changed hydrologic regimes, and degraded water quality from sediment and chemical runoff (NDNH 2006).

- Outdoor recreation:

Outdoor recreation is a major draw in Nevada, and the number of recreationists continues to grow (NDSP 2022). Some of the most popular activities like kayaking and fishing necessarily occur in and around wetlands; hiking, birdwatching, and off-roading may bring recreationists near wetlands as well. Recreating around wetlands can be enjoyable and sustainable, but irresponsible recreationists can also damage these sensitive sites.

Excessive visitation and careless recreationists can accidentally or intentionally facilitate the spread of invasive species. Shoes and tires can transport non-native organisms from other sites. Sometimes recreationists intentionally release non-natives species like goldfish in natural wetlands, which can have dire consequences for native organisms.

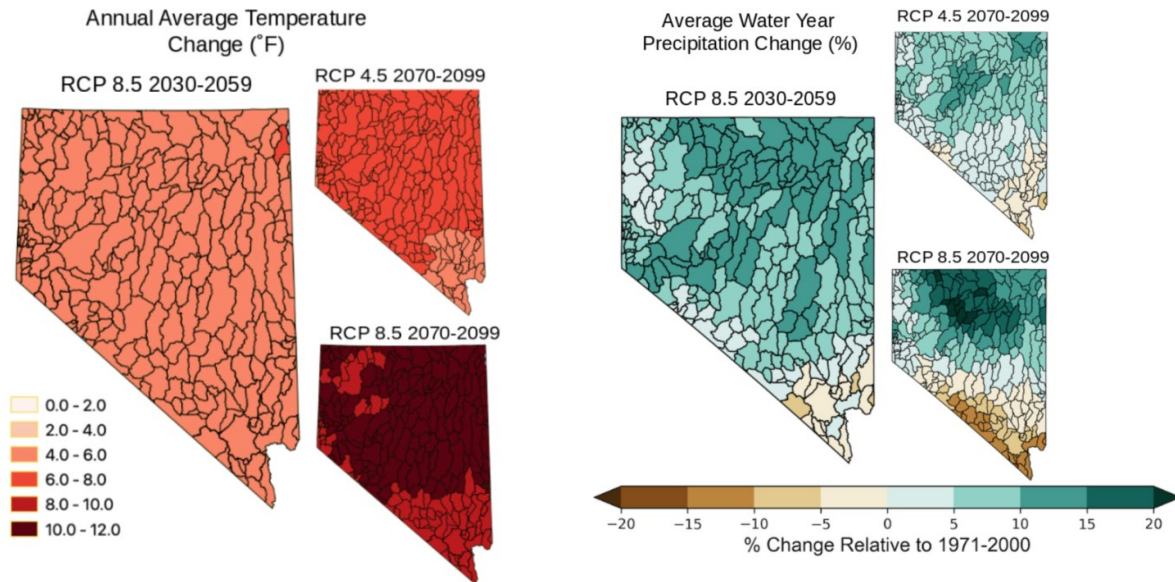
Trampling that is concentrated in a single area can kill native plants and reduce vegetation cover. Additionally, wildlife that would typically visit wetlands may change their behavior in response to high human visitation. Staying on established roads and trails and avoiding driving through wetlands is the best way to minimize recreation impacts on wetland habitats.

- Global warming:

The impact of global warming on wetlands in Nevada is likely to be broad-reaching and multifaceted. Current predictions suggest that Nevada will become hotter, but the impact on precipitation is less clear. Some areas of Nevada could get more precipitation, but the seasonality and type of precipitation may shift from falling largely as snow in the winter to rain at other times of the year (see figure 3; Nevada Climate Initiative). Precipitation as rain results in flashier discharge patterns, increases flooding risks, shortens the length of time water stays on the landscape, and does not infiltrate into the groundwater aquifer as effectively as slowly melting snow. Increased evaporative demand from hotter weather could also negate any additional precipitation that falls, resulting in a continuation of the aridification trend that is already apparent in Nevada. As a result, some wetlands may dry up at least for some portion of the year or be converted to upland habitat.



Figure 3. Projected changes in average annual temperature and precipitation in Nevada by midcentury and end of century, under high (RCP 8.5) or low (RCP 4.5) carbon dioxide emissions scenarios (Nevada Climate Initiative).



- Invasive species:

Invasive species are a major threat to wetlands in Nevada. There are many invasive plants and animals that can be found at Nevada wetlands; some of the most widespread and impactful ones include tamarisk (*Tamarix ramosissima*, also known as salt cedar), tall whitetop (*Lepidium latifolium*), cheatgrass (*Bromus tectorum*), and Russian olive (*Elaeagnus angustifolia*). Global warming, development, grazing, and other land disturbances can facilitate their spread, so invasive species compound the threats listed above (NDNH 2006).

Invasive plants tend to be generalist species with fast growing times, allowing them to outcompete more highly adapted native species. Some, especially tamarisk and tall whitetop, can create monocultures that completely overtake wetland habitats, resulting in loss of habitat diversity. They may alter the fire frequency, soil composition, water and nutrient availability, and/or shading of a wetland, sometimes in nearly irreversible ways. Changes in the plant assemblage can result in changes to the entire wetland food web (NDNH 2006).

Invasive animals also pose threats, particularly to wetland endemics. Crayfish introduced to springs can predate upon endemic springsnails (Stevens et al. 2022). Introduced bullfrogs, common carp, and other fish are implicated in the extinction of Pahrnagat spinedace (*Lepidomeda altivelis*), Pahrump Ranch poolfish (*Empetrichthys latos Pahrump*), and Raycraft Ranch poolfish (*Empetrichthys latos concavus*). In 37% of Nevada springs experiencing severe

decline or extinction of springs-dependent species, non-native species were a primary driver (Saito et al. 2022).



Wetlands along the Carson River at River Fork Ranch. © Kristin Szabo

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*The importance of wetlands in Nevada, combined with the multifaceted threats they face, emphasizes the need for wetland planning.*

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## Plan Development

The purpose of a WPP is to develop and implement effective and efficient broad-based actions for wetland conservation, restoration, and management, including assessment and monitoring (NAWM 2013). The development of a statewide WPP promotes stronger partnerships among stakeholders by identifying shared goals and preventing duplication of efforts, reducing competition for limited resources, leveraging funding and increasing spending efficiency, building new alliances, and encouraging creative problem solving (NAWM 2013). In 2011, the Nevada Division of Natural Heritage (NDNH) was awarded a U. S. Environmental Protection Agency (EPA) Region 9 Wetland Program Development Grant (WPDG) to formulate strategies for improving the effectiveness of protecting and restoring Nevada's wetland resources.

The complexity of wetland management and protection within the state necessitates close collaboration between state and federal agencies, local governments, non-profit organizations, and other public and private stakeholders. In January of 2016, NDNH staff sent a WPP stakeholder survey to 77 individuals known to have experience and knowledge of wetland resources in Nevada. Survey recipients represented 16 state and federal agencies, three local government or tribal agencies, two universities, 10 non-profit organizations, three consulting firms and one mining corporation, as well as private stakeholders. NDNH also distributed the survey to interested attendees at statewide symposiums.

The purpose of the survey was to preliminarily: 1) identify current wetland projects; 2) evaluate both the short-term and long-term funding and informational needs; and 3) to establish priorities in developing a long-term plan and help define the sequence for development of program elements. Because the structure of this WPP is based on the EPA's Core Elements Framework, a prioritization process was used to identify the most important elements for initial focus. Survey respondents were asked to rank the following four EPA Core Elements:

- Assessment and Monitoring (including classification, mapping, and inventory)
- Regulation
- Water Quality Standards for Wetlands
- Voluntary Restoration and Protection (including management, maintenance, enhancement, creation, and water quality improvement)

The results of this survey supported a focus on Assessment and Monitoring, followed by Voluntary Restoration and Protection. Sustainable Financing was added as an additional core element because continuous funding is essential for the success of the program and most respondents expressed challenges to source enough funding for wetland projects they wished to pursue. Additionally, most respondents were interested in a statewide wetland database for Nevada and wished to continue to be involved in the Wetland Program Plan development

process (see Appendix beginning on page 12 for full survey results). This survey provided the basis for the preceding Wetland Program Plan for the period 2017-2022 (NDNH 2016).

The current plan builds on the same core elements but draws from additional, more in-depth conversations with stakeholders. NDNH staff conducted many individual and small group meetings with survey respondents and other federal, state, and nonprofit partners to refine the current plan in 2022 and 2023. As a result of these conversations, a fourth core element, Partnerships, Outreach, and Education, was added. Stakeholders expressed a wide range of desires for the Wetland Program, but some common elements included a desire to broadly share information about wetland restoration statewide and to identify reference wetlands of high conservation value. Several were interested in training opportunities and statewide survey protocols that would allow them to better monitor wetland resources. Stakeholders also frequently cited challenges in finding funding and match for wetland projects. These and other common interests of stakeholders have strongly influenced the objectives described below.

Equally important for the creation of a strong, adoptable WPP is that it integrates or builds off of existing plans and reports related to wetland and riparian habitats. This WPP seeks to integrate with existing plans and reports including:

- Wetland Program Plan 2017-2022 (NDNH 2016)
- Nevada Wildlife Action Plan (Wildlife Action Plan Team 2012)
- Nevada Greater Sage-Grouse Conservation Plan (SETT 2014)
- Nevada Wetlands Priority Conservation Plan (NDNH 2006)
- Nevada Priority Wetlands Inventory 2007 (NDNH 2008)
- Nevada Springs Conservation Plan (Abele 2011)
- Coordinated Implementation Plan for Bird Conservation in Nevada (IWJV 2005)
- Nevada Comprehensive Bird Conservation Plan v.1 (GBBO 2010)
- Nevada 2020-2022 Water Quality Integrated Report (NDEP 2022)
- Conservation Strategy for Springsnails in Nevada and Utah (Springsnail Conservation Team 2020)
- Nevada State Water Plan (NDWP 1999)

## Plan Focus and Goal

Based on stakeholder involvement, as well as the recognition that sustainable funding is imperative to the creation of long-term objectives and actions, this WPP will focus on four core program elements: **Monitoring and Assessment; Voluntary Restoration and Protection; Partnerships, Outreach, and Education;** and **Sustainable Financing.** The goal of this WPP is to identify how resources and planning activities will be prioritized over the next six years. Specifically, this WPP seeks to integrate wetland research and management, monitoring and assessment, and protection and restoration projects occurring across the state to ensure programs are complimentary, inform resource investments, and allow managers to understand and weigh tradeoffs among potential actions. As such, this WPP will evolve continuously as the community of stakeholders is fully engaged. Additional program core elements may be added as needed in future WPPs.

Foundational to the implementation of this WPP will be the creation of a wetland technical working group made up of stakeholders from across the state. The purpose of the group will be to identify and refine objectives that are most important to achieving the long-term goals of future state WPPs. The technical group will define a suite of research and management actions for each objective wherein each significant action is measurable, monitored, and subject to further refinement.

The strategic directions outlined below address each of three core program elements and are subject to refinement via the creation of a wetland technical working group. These action items will be pursued during the period covered by this plan (2023-2028). An annual review with the EPA will take place to discuss the progress of the WPPs actions and activities, determine the need for any assistance from the EPA, and discuss any adjustments that the WPP may need.

## Core Element 1: Monitoring and Assessment

Wetland monitoring and assessment is a cornerstone of an effective wetland program, providing data that can be used to evaluate wetland conditions over time, in response to management practices, and in the face of stressors like climate change and land use. The EPA's three-tier framework provides guidance on assessment at the landscape scale, using GIS and remote sensing (level 1), rapidly at the site, using a suite of field-based biological, chemical, and physical data (level 2), and intensively at the site, capturing detailed quantitative data to address site-specific questions (level 3) (EPA 2023).

**Existing Monitoring and Assessment Efforts:** Over the course of the previous Wetland Program Plan (NDNH 2016), the Wetland Program developed statewide level 1 and 2 assessment techniques and increased inventory efforts.

DRI worked closely with NDNH to create WetBar<sup>1</sup>, a GIS-based level 1 wetland toolbar. WetBar seamlessly integrates satellite imagery and web-based data (soils, land ownership, USGS surface water data, groundwater well data, climate, drought index, etc.) to rapidly describe the site, visualize wetland trends (such as vegetation vigor and waterbody extent), and compare those trends to external stressors (drought, groundwater level declines, etc.). WetBar is currently based in ArcMap and a web application is in development.

NDNH and TNC developed the Draft Nevada Rapid Assessment Method<sup>2</sup> (NVRAM). This is a standardized, statewide level 2 protocol for wetlands designed to take a team of two professionals about two hours to complete. The NVRAM describes the protocol to collect georeferencing information, photos, botanical data, water chemistry, soil descriptions, and other site data at each wetland site. Additional verification and field testing is required to finalize the NVRAM protocol.

NDNH and SSI inventoried hundreds of springs statewide, focusing on areas of existing data gaps. Data on groundwater-dependent ecosystems collected by SSI and other partners is stored in Springs Online<sup>3</sup>, a secure, international, publicly accessible database.

This list does not include wetland monitoring efforts undertaken by other state, federal, and nonprofit partners that were not funded through the Wetland Program (e.g., BLM AIM on riparian and lotic systems, FS Great Basin meadow surveys, and NDEP statewide water quality monitoring). The Wetland Program hopes to more closely collaborate with and integrate data from other wetland monitoring groups in the future.

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<sup>1</sup> [dri.edu/project/wetland-mapnvnew/](http://dri.edu/project/wetland-mapnvnew/)

<sup>2</sup> <https://heritage.nv.gov/documents/epa-level-ii-rapid-assessment-method-for-nevada-wetlands>

<sup>3</sup> [springsdata.org](http://springsdata.org)

**Goal:** Finalize and implement a multi-level monitoring and assessment strategy consistent with the *Elements of a State Water Monitoring and Assessment Program for Wetlands* (EPA 2006) to characterize existing and historic wetlands in the state and provide an understanding of the function and condition of those wetlands to enable stakeholders to make informed management decisions. Increase inventorying efforts statewide and ensure wetland data is shareable amongst stakeholders and managers.

**Objective 1:** Increase assessment, inventory, and monitoring of wetlands throughout the state.

**Action 1a:** Develop a consistent wetland assessment methodology.

**Action initiated:** 2018

**Activities:**

- Work with stakeholders to define wetland monitoring objectives consistent with the needs of researchers, resource managers, and other groups.
- Meet with stakeholders to solicit feedback on draft Nevada Rapid Assessment Method (NVRAM 2019). Continue verification (Stage 4) and the last two stages of development (according to Sutula et al. 2006).
- Develop a standardized and scientifically defensible wetland condition scoring system (similar to the California Rapid Assessment Method ecological condition scores, CRAM 2019) to incorporate in NVRAM.
- Provide trainings in NVRAM and/or other accepted wetland assessment techniques to interested parties statewide.
- Work with wetland surveying stakeholders to identify core wetland data that will be collected at every wetland, regardless of protocol. Streamline process for collecting and storing the core data, such as with a Survey123 tool.

**Action 1b:** Support and expand inventory and monitoring efforts of springs, streams, and other wetlands.

**Action initiated:** 2006

**Activities:**

- Survey wetlands following established protocols, particularly in understudied areas (Appendix 1).
- Ensure collected data are quality controlled and stored in an accessible and usable format.

- Seek funding to expand surveying efforts, including updating the Nevada NWI.

**Objective 2:** Create a current statewide wetland database which tracks both monitoring and restoration projects (similar to California’s EcoAtlas<sup>4</sup> and the University of Arizona’s Desert Flows Database<sup>5</sup>) to provide resource managers and researchers with relevant information to assess the condition of wetland resources and apply appropriate management, restoration efforts, and funding to maintain and enhance aquatic ecosystems in Nevada.

**Action 2a:** Share wetland data in a statewide geodatabase.

**Action initiated:** 2018

**Activities:**

- Create a repository for statewide wetland data submission and storage.
- Convert and incorporate legacy wetlands data into a geo-spatial database.
- Develop statewide data sharing agreements among stakeholders to maintain the aggregation and sharing of wetland data.

**Action 2b:** Facilitate statewide analysis of spatial and temporal changes in wetlands.

**Action initiated:** 2018

**Activities:**

- Use WetBar to evaluate spatial and temporal changes to wetlands, such as trends in wetland loss or gain, cumulative impacts of regional land-use, restoration and conservation success or failure, and other global changes over time.
- Pursue opportunities to fund statewide LIDAR.
- Broadly share findings of statewide wetland analysis.

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<sup>4</sup> <http://www.ecoatlas.org/>

<sup>5</sup> <http://wrrc.arizona.edu/desertflowsdata>



## Core Element 2: Voluntary Restoration and Protection

Nevada lacks state wetland regulations, so wetland restoration and protection are largely accomplished voluntarily. This core element includes activities such as land trusts purchasing wetland areas, conservation easement programs, removal of invasive species at wetlands, planting of native vegetation, management of livestock grazing for wetland objectives, or fencing ungulates out of wetland sites.

**Existing Voluntary Restoration and Protection Efforts:** Voluntary restoration and protection efforts occurred throughout the state but were mostly done through agencies or by landowners that are not directly involved with the Wetland Program. For example, the NRCS and conservation districts work with landowners to help cost-share wetland habitat improvements. NDOW, the BLM, and the FS also conduct wetland restoration projects to improve habitat for wetland dependent species such as the Lahontan Cutthroat Trout or springsnails (*Pyrgulopsis* spp.). The decentralized nature of existing wetland restoration and protection work makes it challenging to track or evaluate the effectiveness of existing efforts towards this core element.

**Goal:** Maintain and increase healthy wetland ecosystems in Nevada through voluntary restoration and protection.

**Objective 1:** Clearly define Nevada's wetland restoration and protection goals.

**Action 1a:** Establish goals that are consistent or compatible across relevant agencies and stakeholders.

**Action initiated:** 2019

**Activities:**

- Work with stakeholders to determine shared restoration needs and objectives.
- Set wetland restoration and protection goals based on previous state plans which identify priority wetlands and springs.

**Action 1b:** Consider watershed planning, climate change impacts, plant and wildlife habitat, and other objectives when defining goals and selecting restoration/protection sites.

**Action initiated:** 2019

**Activities:**

- Identify rare, vulnerable, or important wetlands in Nevada that should be priorities for restoration or protection.

- Assign ecosystem conservation ranks in Biotics to wetlands in Nevada to assist with prioritization of restoration or protection work.
- Integrate restoration/protection efforts on a watershed or landscape scale with existing modeling efforts which predict potential changes in wetland/springs distribution and condition based on climate-driven variation in temperature and precipitation patterns.
- Share priorities and data with other organizations involved in wetland protection and restoration or water quality planning.

**Action 1c:** Provide guidance on: 1) recommended restoration approaches and management techniques based on different scenarios, 2) consistent ways to measure performance for each wetland type, and 3) a monitoring format that ensures statewide consistency and ease of project data entry and analysis.

**Action initiated:** 2020

**Activities:**

- Research relevant quantitative approaches to develop spatially explicit support tools for the planning of restoration and protection of Nevada’s wetlands.
- Develop information about the different threats and restoration techniques by wetland ecosystem type and location in Nevada.
- Inform restoration partners about relevant quantitative approaches that may be used to inform the creation of guidance techniques.
- Establish consistent ways to measure restoration success (e.g., functional and/or condition indicators), including performance standards based on reference wetlands.
- Encourage restoration outcomes that recreate natural self-sustaining systems and reduce the need for ongoing management, and consider overarching topics such as drought, climate change, and environmental justice.
- Train restoration partners to use guidance techniques to ensure statewide consistency.
- Leverage funding to support testing new restoration techniques and sharing findings of their efficacy.

**Objective 2:** Centralized tracking of all wetland restoration and protection sites/projects.

**Action 2a:** Develop a statewide entity and mechanism to track wetland restoration and protection sites/projects.

**Action initiated:** 2018

**Activities:**

- Engage stakeholders to assist in wetland database planning.
- Research and evaluate existing tracking tools.
- Conduct outreach to gather restoration and protection site data, including location, purpose, before and after photos, successes, challenges, and funding source.
- Maintain location privacy for restoration projects when necessary due to private ownership, sensitive species, or other reasons expressed by stakeholders.

## Core Element 3: Partnerships, Outreach, and Education

In Nevada, management of and work in wetlands is divided amongst many different groups (state and federal agencies, nonprofits, and private landowners). Communication and collaboration between these diverse entities is critical to leverage limited funding and capacity available for wetland conservation. This can take the form of regular meetings, formal and informal partnerships, and sharing of information through trainings, reference materials, and more. Education and outreach targeted at the public builds buy-in and develops the next generation of wetland stewards. Therefore, effective partnerships, outreach, and education can support all other core elements.

**Existing Partnerships, Outreach, and Education Efforts:** Many organizations, both directly involved with the Wetland Program and otherwise, have been actively engaged in this core element.

The Wetland Program has always prioritized partnerships and has existing partnerships with many agencies and organizations. For example, the Program is an active partner in the Springsnail Conservation Team, a partner group representing many organizations across four states to protect wetland-dependent springsnails. The Wetland Program also directly worked with dozens of wetland stakeholders in the process of updating this WPP.

The 2021 EPA Wetland Program Development Grant funded the Springs Stewardship Institute, a direct partner of the Wetland Program, to develop educational tools for children about springsnails and other wetland-dependent species in Nevada. SSI also periodically leads trainings and webinars for wetland professionals on spring surveying.

Although not directly involved with the Wetland Program, organizations like the Nevada Conservation Districts Program, the FWS, and the NRCS regularly partner with and outreach to private landowners about wetlands. Many nonprofits, like TNC and Friends of Nevada Wilderness, do outreach to the public related to wetlands. The Wetland Program hopes to support external efforts toward this core element whenever possible.

The addition of the first full-time staff person to the Wetland Program in 2022 (the Wetland Program Coordinator) will allow the Program to further pursue this core element going forward. Among other things, the Coordinator will work to strengthen communication, build partnerships, outreach to broad groups, and develop needed resources for stakeholders.

**Goal:** Strengthen partnerships, support wetland work, and increase wetland literacy.

**Objective 1:** Regularly engage with partners involved in wetland work in Nevada.

**Action 1a:** Convene a wetland technical working group comprised of interested stakeholders and relevant partners.

**Action initiated:** 2017

**Activities:**

- Hold regular meetings with stakeholders to:
  - Maximize wetland data compatibility and data sharing amongst all groups surveying wetlands.
  - Compile known sources of wetland-related data. Establish a data management and storage protocol.
  - Identify shared goals and priorities for wetland restoration.
  - Find opportunities for collaboration, leveraging limited funding and capacity.
  - Periodically evaluate the WPP and update it as needed.

**Objective 2:** Increase understanding and appreciation of wetlands among Nevada's public.

**Action 2a:** Develop educational tools and conduct outreach to reach a broad audience about Nevada's wetlands.

**Action initiated:** 2019

**Activities:**

- Create educational materials and field trips that will introduce young Nevadans to wetlands.
- Produce digestible content (such as short videos) about wetlands for broad distribution on the internet.
- Outreach with willing landowners, Conservation Districts, and other groups involved in privately owned wetlands.

**Objective 3:** Expand technical resources for those that work in or manage Nevada's wetlands.

**Action 3a:** Provide trainings, reference guides, and reports to support the efforts of professionals working in or managing wetlands.

**Action initiated:** 2006 (see NDNH 2006)

**Activities:**

- Conduct outreach to wetland professionals and land managers to determine need(s).
- Produce reference materials that provide insight on wetland restoration techniques, characteristics, surveying strategies, and other key wetland management needs.
- Provide trainings in wetland surveying and other necessary skills for wetland professionals.
- Report on statewide wetland trends.

## Core Element 4: Sustainable Financing

Many of the threats wetlands throughout Nevada face are long term and have already resulted in major losses of wetland acreage and function (NDNH 2006). Understanding, preparing for, and mitigating these threats where possible requires consistent effort, driven by a strong Wetland Program. Without reliable funding for the Wetland Program, activities can become piecemeal and subject to inevitable changes in agency priorities or staffing. Therefore, seeking and attaining regular funding for the Wetland Program is paramount to its success in protecting wetlands in the face of threats that do not disappear when funding does.

**Existing Sustainable Financing Efforts:** NDNH has secured several years of EPA funding to support the wetland program, including receiving multiple Wetland Program Development Grants (WPDGs) since 2002 and Multipurpose Grants (via NDEP) in fiscal years 2019 and 2020. The 2021 WPDG supported hiring a full-time Wetland Program Coordinator at NDNH to lead the Wetland Program and seek additional funding opportunities.

**Goal:** Provide stable funding sources to support program long-term.

**Objective 1:** Identify and pursue opportunities for program funding.

**Action 1a:** Pursue new grants and partnerships that expand and diversify program funding.

**Action initiated:** 2017

### **Activities:**

- Identify current and proposed wetland projects that can be funded by WPDGs, North American Wetlands Conservation Act Grants, and other funding sources.
- Maintain funding to support full-time staff that focus on the Wetland Program.
- Identify funding sources that will support and house a centralized wetland database for the state.
- Coordinate with stakeholders to maximize outputs of existing funding.

## Overview of Objectives of the Wetland Plan

Objectives, actions, and activities	Years, or year initiated (if ongoing)	Partners	Notes and funding sources
<b>Inventory, Assessment, and Monitoring</b>			
<b>Objective 1: Increase inventory of wetlands throughout the state.</b>			
<b>Action 1a:</b> Develop a consistent wetland assessment methodology.	2020	NDNH, TNC	FY20 EPA Multipurpose Grant Stakeholder input and field testing underway to finalize NVRAM.
<b>Action 1b:</b> Support and expand inventory and monitoring efforts of springs, streams, and other wetlands.	2006	All	FY19 and FY21 EPA WPDG
<b>Objective 2:</b> Create a current statewide wetland database which tracks both monitoring and restoration projects to provide resource managers and researchers with relevant information to assess the condition of wetland resources and apply appropriate management, restoration efforts, and funding to maintain and enhance aquatic ecosystems in Nevada.			
<b>Action 2a:</b> Share wetland data in a statewide geodatabase.	2022	NDNH	FY21 EPA WPDG
<b>Action 2b:</b> Facilitate statewide analysis of spatial and temporal changes in wetlands.	2018	NDNH, DRI	FY19 and FY20 EPA Multipurpose Grant
<b>Voluntary Restoration and Protection</b>			
<b>Objective 1:</b> Clearly define Nevada’s wetland restoration and protection goals.			
<b>Action 1a:</b> Establish goals that are consistent or compatible across relevant agencies and stakeholders.	2016	All	FY19 and FY21 EPA WPDG
<b>Action 1b:</b> Consider watershed planning, climate change impacts, plant and wildlife habitat, and other objectives when defining goals and selecting restoration/protection sites.	2006	All	



<b>Action 1c:</b> Provide guidance on: 1) recommended restoration approaches and management techniques based on different scenarios, 2) consistent ways to measure performance for each wetland type, and 3) a monitoring format that ensures statewide consistency and ease of project data entry and analysis.	2022	NDNH	
<b>Objective 2:</b> Centralized tracking of all wetland restoration and protection sites/projects.			
<b>Action 2a:</b> Develop a statewide entity and mechanism to track wetland restoration and protection sites/projects.	2022	NDNH	
<b>Partnerships, Outreach, and Education</b>			
<b>Objective 1:</b> Regularly engage with partners involved in wetland work in Nevada.			
<b>Action 1a:</b> Convene a wetland technical working group comprised of interested stakeholders and relevant partners.	2017	All	FY19 and FY21 EPA WPDG
<b>Objective 2:</b> Increase understanding and appreciation of wetlands among Nevada's public.			
<b>Action 2a:</b> Develop educational tools and conduct outreach to reach a broad audience about Nevada's wetlands.	2019	All	FY21 EPA WPDG
<b>Objective 3:</b> Expand technical resources for those that work in or manage Nevada's wetlands.			
<b>Action 3a:</b> Provide trainings, reference guides, and reports to support the efforts of professionals working in or managing wetlands.	2006	All	FY19 and FY21 EPA WPDG
<b>Sustainable Financing</b>			
<b>Objective 1:</b> Identify and pursue opportunities for program funding.			
<b>Action 1a:</b> Pursue new grants and partnerships that expand and diversify program funding.	2017	NDNH	

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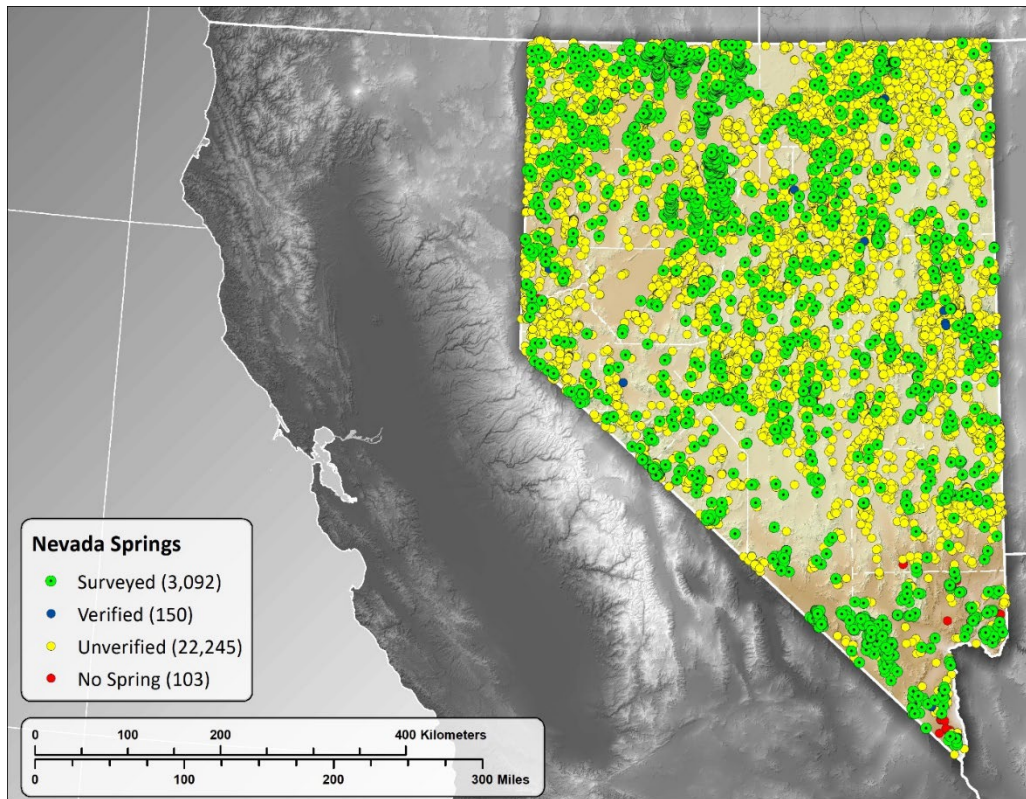
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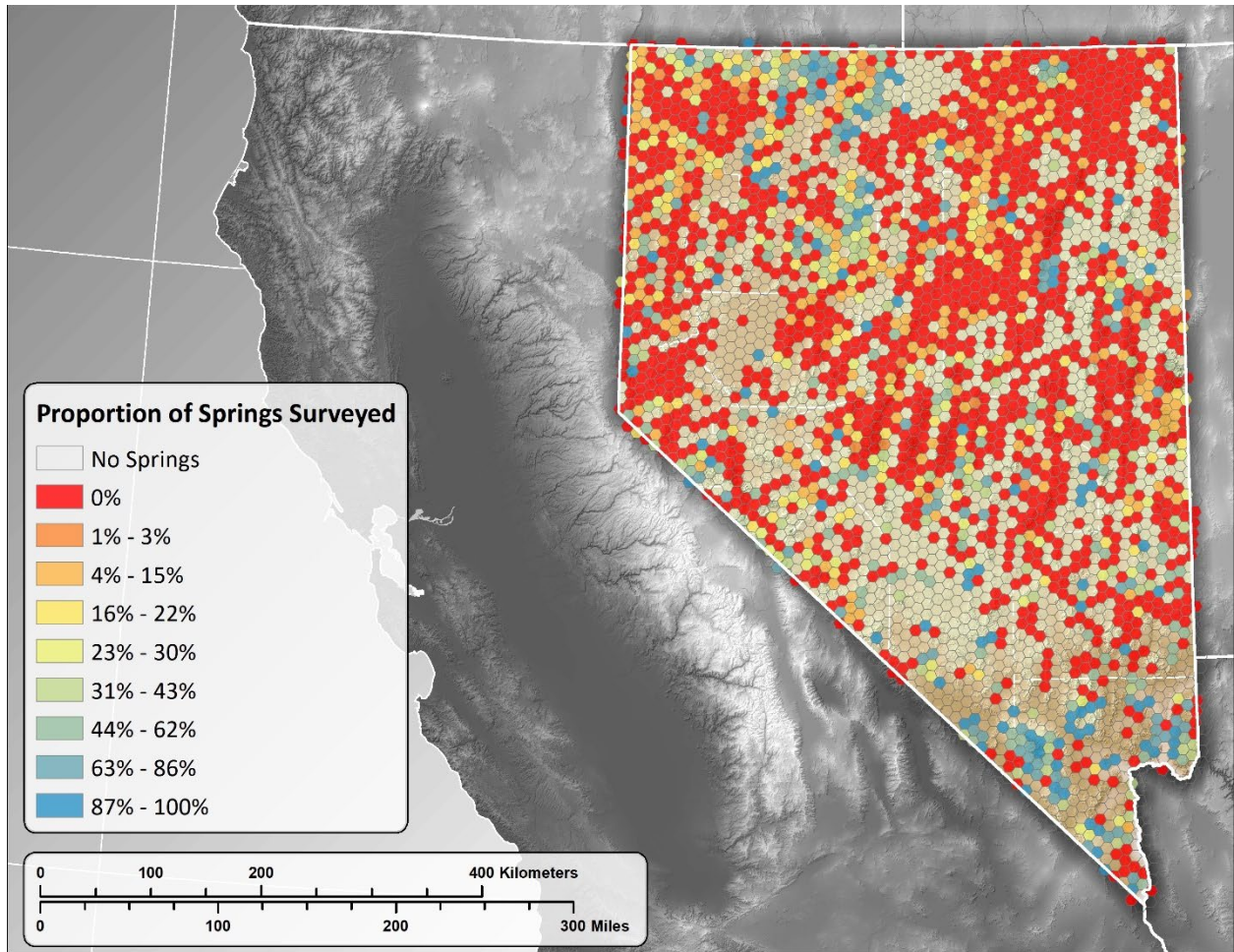
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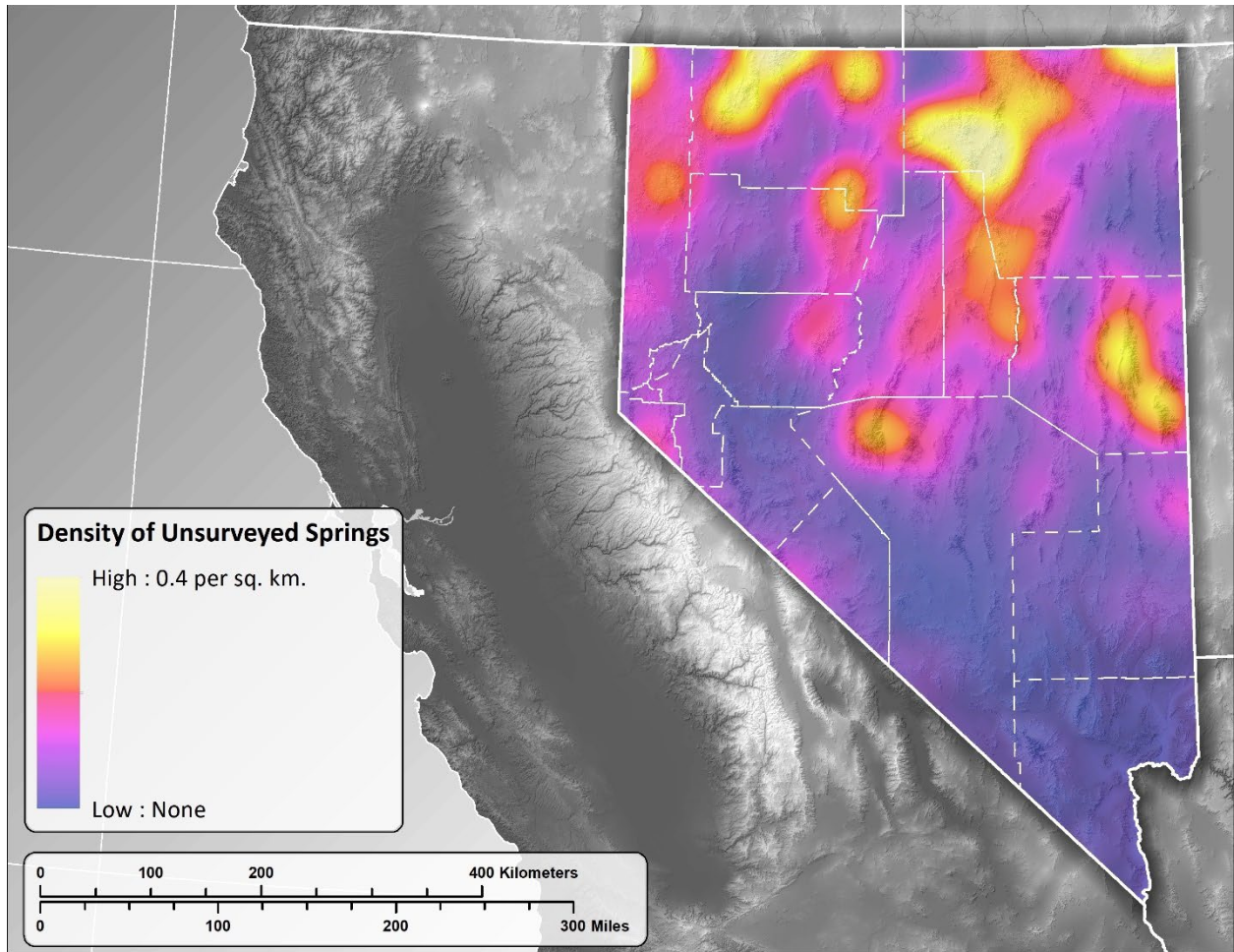
## Appendix 1: Selected 2021 State of Nevada Springs Symposium Maps



Distribution of known springs in Nevada by survey status, as of September 15, 2021. Jeff Jenness, Spring Stewardship Institute.



Percentage of springs surveyed by hexagon, as of September 15, 2021. Jeff Jenness, Spring Stewardship Institute.

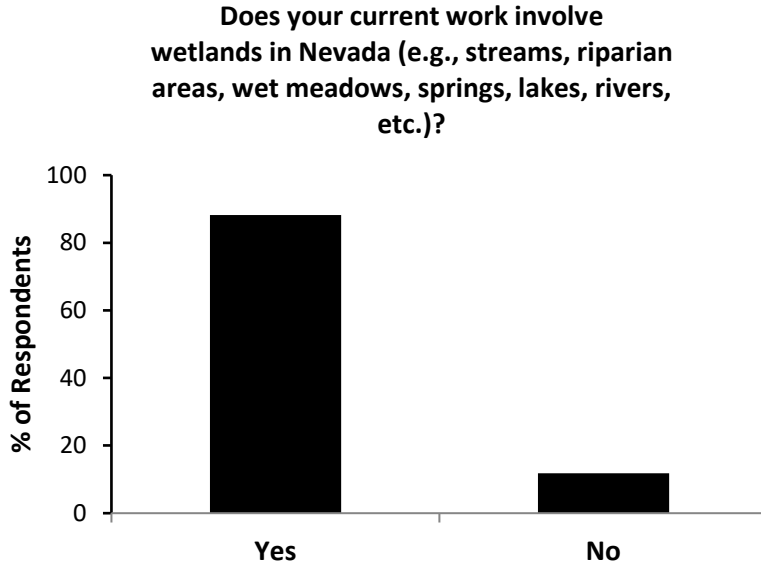


Heat map of areas with high densities of unsurveyed springs, as of September 15, 2021. These areas are optimal to target for efficient surveying. Jeff Jenness, Spring Stewardship Institute.

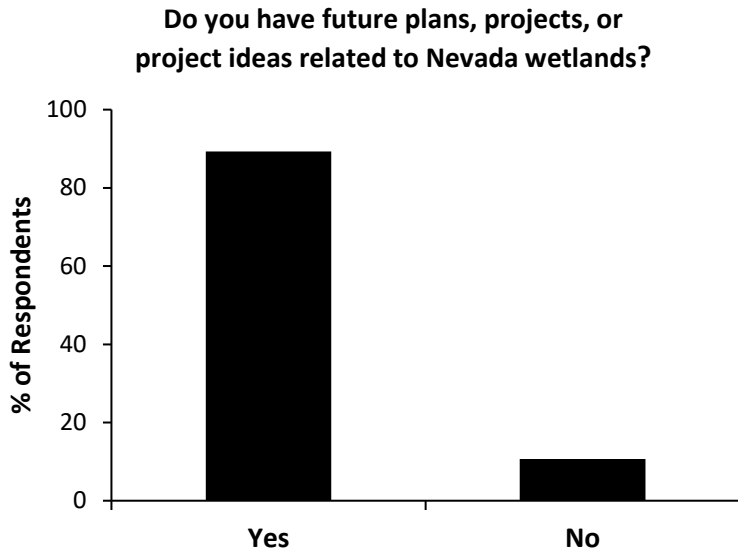


## Appendix 2: 2016 Wetland Program Plan Survey Questions and Responses

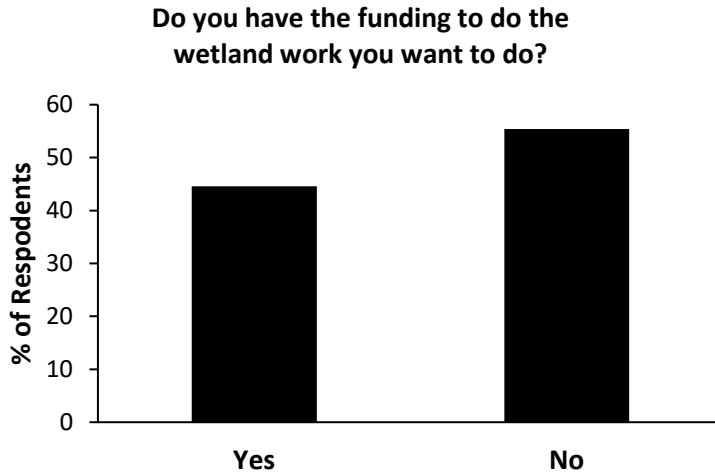
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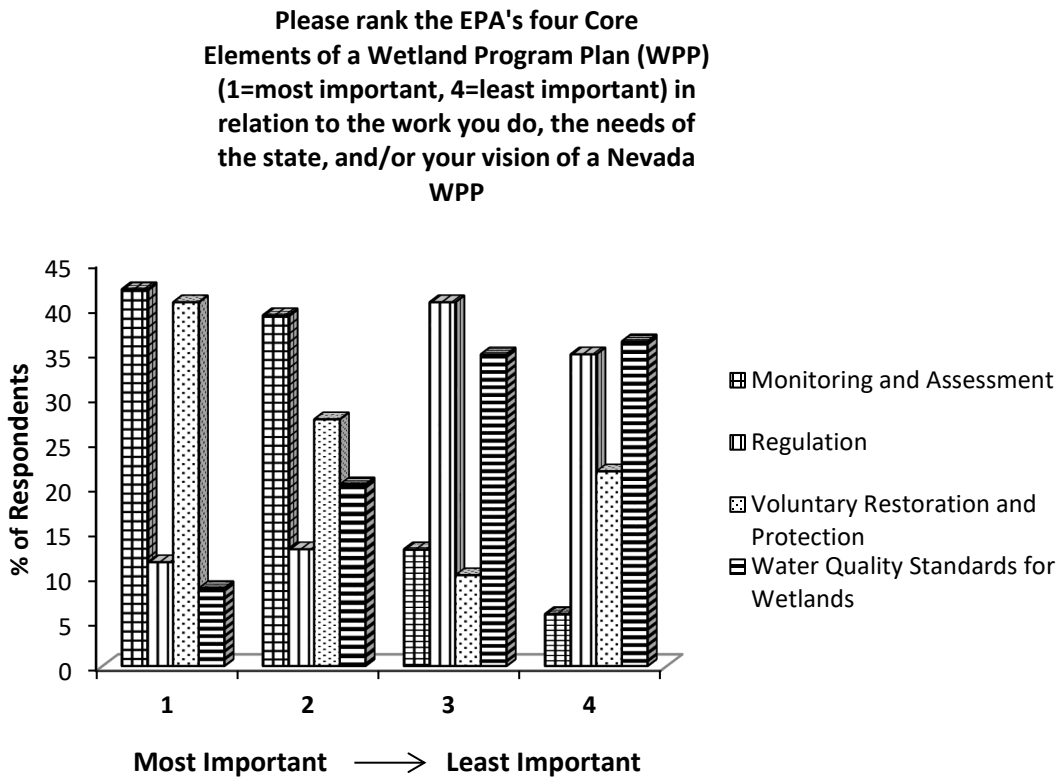
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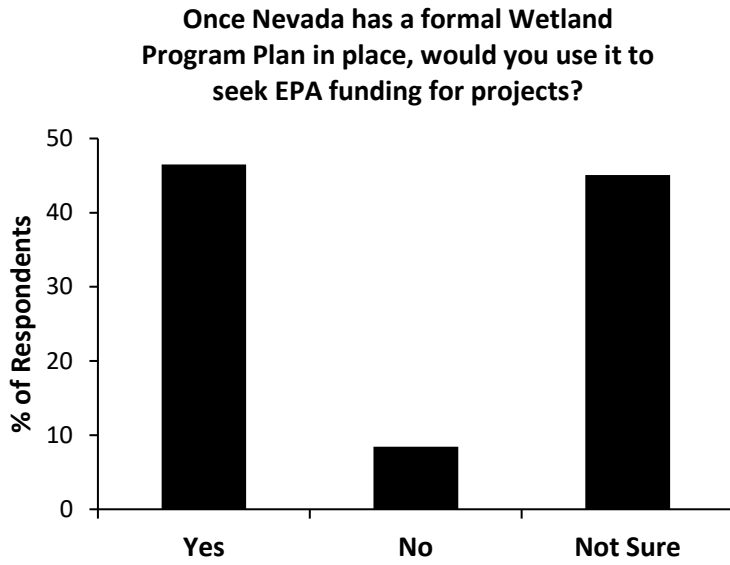
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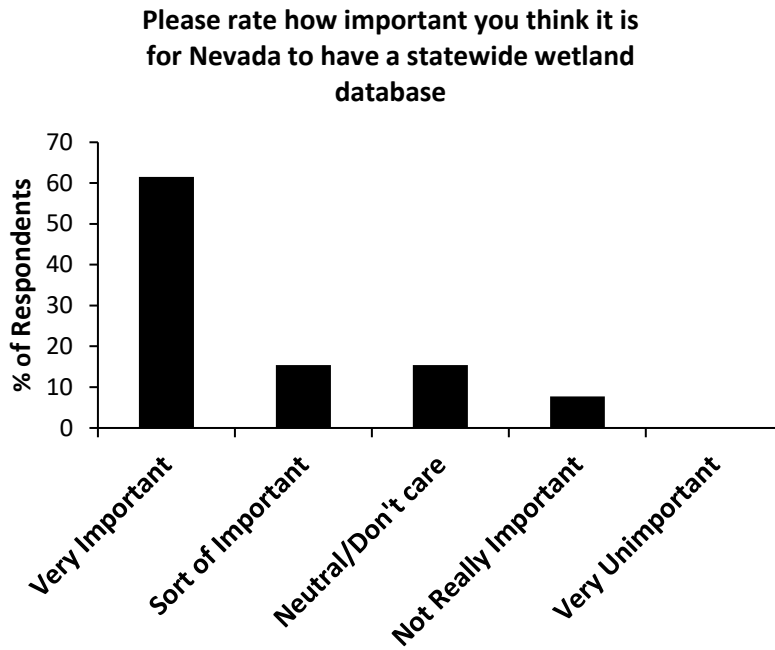
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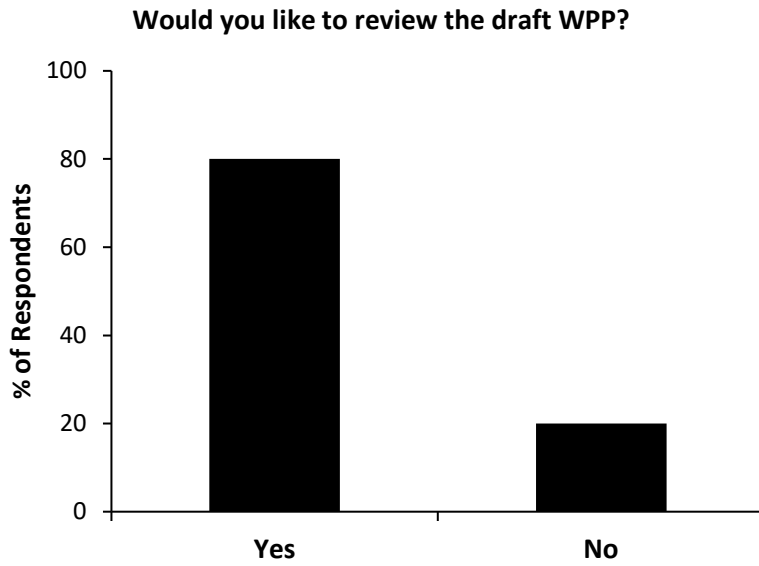
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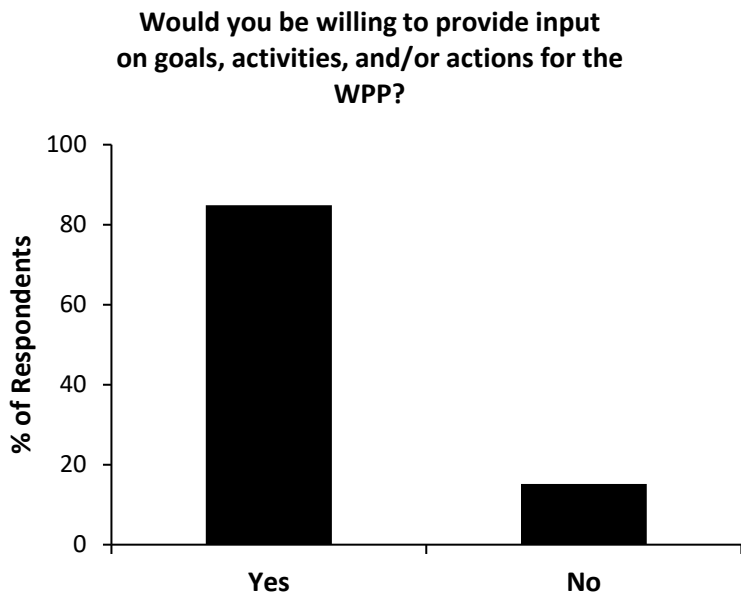
Question 6:



Question 7:



Question 8:



## Appendix 3: Wetland Regulation and Water Quality Standards in Nevada

The 2016 wetland stakeholder survey (Appendix 2) indicated there is little statewide appetite for additional wetland regulations or water quality standards for wetlands in comparison to the other core elements. Moreover, NDEP currently lacks the personnel and funding to develop or enforce additional regulations. Nonetheless, these core elements are important for wetland conservation and worth discussing in further detail.

All wetlands in Nevada are considered Waters of the State (WOTS), a broad classification defined in Nevada Revised Statutes (NRS) 445A.415 as:

“All waters situated wholly or partly within or bordering upon this State, including but not limited to:

1. All streams, lakes, ponds, impounding reservoirs, marshes, water courses, waterways, wells, springs, irrigation systems and drainage systems; and
2. All bodies or accumulations of water, surface and underground, natural or artificial.”

A subset of Nevada’s wetlands are also Waters of the United States (WOTUS), which will be described further in the Clean Water Act section below. The status of a wetland as a WOTUS and/or WOTS dictates which regulations it is subject to.

In Nevada, wetlands are primarily regulated by federal rules like the Clean Water Act, the Endangered Species Act, and several other federal acts and orders. Wetlands owned or managed by the state or federal agencies (primarily the FS, BLM, and FWS) have some additional protections which will not be fully described here, but wetlands are disproportionately privately owned as these areas are desirable for agriculture and other private enterprises (NDNH 2006). The protections provided by these policies are incomplete in scope, but they are still powerful tools for wetland conservation.

### **Clean Water Act**

The Clean Water Act (CWA) is the primary regulation controlling water quality and integrity of the WOTUS. Among other things, the CWA requires permits for point-source pollutant discharges to WOTUS or dredge and fill activities within federally jurisdictional wetlands (wetlands meeting the definition of WOTUS). The definition of WOTUS has changed many times through extensive litigation and different administrations in the last 20 years which impacts the aquatic features protected under the Clean Water Act. WOTUS in Nevada per the current 2023 rule includes interstate and traditionally navigable waters (streams, lakes, and wetlands). Impoundments of a WOTUS, its tributaries, and adjacent wetlands may also be

WOTUS if they are relatively permanent bodies of water or significantly affect the chemical, physical, or biological integrity of the WOTUS (i.e. the “significant nexus” standard) (EPA 2023).

The U.S. Army Corps of Engineers (USACE) adheres to the 1987 Wetland Delineation Manual and regional supplements to determine whether the area in question is a wetland and if so, whether it is jurisdictional as a WOTUS using a combination of satellite imagery and field visits, as necessary. For a positive wetland determination, the USACE requires the site have majority wetland vegetation (i.e., hydrophytes), hydric soil indicators, and evidence of wetland hydrology (unlike the Cowardin rule used by the FWS, which requires only one of the three). Seasonal wetlands in Nevada such as ephemeral streams, playas, and vernal pools may or may not meet this standard; the USACE evaluates each site on a case-by-case basis. These sites may be saturated irregularly (once a year or even once every few years), and hydrophytes may be essentially undetectable most of the time. In the desert, even highly irregular wetlands provide important habitat for wildlife and species specially adapted to those conditions. Additionally, riparian areas—some of the most ecologically important, yet heavily threatened habitat in the state—are not always considered wetlands by the USACE standard (Fischer et al. 2000). The USACE wetland determination therefore results in some false negatives, leaving important habitat unprotected.

“Jurisdictional” requirements for wetlands whittle down the scope of CWA protections even further. Nevada is largely part of the Great Basin, where hundreds of mountain ranges are split by internally drained basins and the average precipitation is only nine inches per year. As a result, most water never reaches a “navigable” waterway. Jurisdictional status of waters is determined piecemeal as needed, but traditionally navigable or interstate waterways only cover the Truckee, Carson, and Colorado Rivers, Lake Tahoe, and Pyramid and Walker Lakes<sup>6</sup>. Few wetlands in Nevada drain into, or could be considered in significant nexus to, these waterbodies. Most wetlands in Nevada are isolated, like many of the 27,000 springs, vernal pools, and sizeable wetlands like Ruby and Stillwater marshes.

The CWA regulates dredging and filling of jurisdictional wetlands. The USACE promotes that dredging and filling of WOTUS should first be avoided, and if that is not possible, minimized. Projects that require dredge and fill need to compensate by building, restoring, improving, or protecting wetlands of at least equivalent size and ecosystem functions (but often at a 2:1 or 3:1 ratio to the lost wetland acreage). In Nevada, permits for dredge and fill projects that impact WOTUS are administered by the USACE through CWA Section 404. The use of a federal permit or license that may result in a discharge to WOTUS also requires a CWA Section 401 Water Quality Certification from the appropriate agency responsible for certifying compliance with

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<sup>6</sup> This determination is made by the USACE and the most recent list can be found at <https://www.spk.usace.army.mil/Missions/Regulatory/Jurisdiction/Navigable-Waters-of-the-US/>

applicable water quality requirements. Depending on the project location, the Certifying Authority may be the NDEP Bureau of Water Quality Planning, the EPA, or tribal authority.

Discharges of pollutants to WOTUS in Nevada are permitted under the National Pollution Discharge Elimination System, created by the CWA (WOTS are permitted similarly through the state's Water Pollution Control Law) (NDEP 2022). NDEP will verify that the proposed discharge will not violate the water quality standards (see Water Quality Standards section below) of the waterbody before issuing a permit.

The antidegradation clause of the Clean Water Act calls upon states to establish additional protections for surface waters with exceptional water quality, unique water quality characteristics, or important aesthetic, ecological, or recreational values. Nevada does not currently have any protection in this vein. NDEP began developing a process to designate Ecological and Aesthetic Waters (EAW) in 2021, but the program is still undergoing review at the time of this writing and has not yet been adopted.

## **Water Quality Standards**

Statewide water quality standards are defined to support different beneficial uses, such as irrigation, livestock watering, recreation, wildlife, aquatic life, municipal, etc. Each beneficial use has accompanying ranges of measurable water quality parameters that represent necessary conditions to sustain that use. Parameters include temperature, pH, dissolved oxygen, turbidity, concentration of dissolved molecules (nitrates, nitrites, phosphorous, ammonia, chloride, sulfate, metals, etc.), amount of *E. coli*, and more. Waterbodies may have one or more designated beneficial uses and would need to meet the strictest standard for each parameter (NDEP 2022)<sup>7</sup>.

Some waters exceed the minimum standard for water quality parameters. In that case, they are subject to the antidegradation clause in Nevada statute, which stipulates that the water be maintained at its higher standard unless doing so would compromise significant economic or social considerations. On the other end of the spectrum, a site-specific total maximum daily load (TMDL) of pollutants is developed for waters that fail to meet water quality standards (NDEP 2022).

The Water Quality Standards Program at NDEP also designates site-specific water quality standards for many waters in Nevada. Currently, standards and TMDLs have been developed for major waterways, lakes, and reservoirs (which also apply to the tributaries of those waterbodies), but not many wetlands. Nonetheless, riparian and terminal wetlands benefit from water quality standards on the waterbody that flows adjacent to or feeds into them. NDEP may develop additional water quality standards for wetlands in the future.

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<sup>7</sup> Nevada's water quality standards are promulgated in Nevada Administrative Code; the most current standards can be found in [\(NAC\) 445A.11704 through 445A.2234](#).

## Endangered Species Act

The federal Endangered Species Act (ESA) is designed to protect at-risk species from extinction. Species can be listed as endangered or threatened under the ESA if the FWS deems that they have experienced major declines in their populations throughout their range and face existential threats which leave them vulnerable to extinction without changes in management. Among other things, federal agencies must then protect critical habitat for a listed species.

In Nevada, 35 of 48 ESA listed species are wetland dependent (table 2). Some are restricted to a single wetland complex, and the wetlands they live in may be designated as critical habitat. Under the ESA, those wetlands would need to be protected and remain in good condition to support recovery of the listed species. It can block nearby development or activities that might adversely impact the wetland habitat. For example, the ESA has been used to protect springs in Ash Meadows from a potential housing development and Dixie Valley wetlands from operation of a geothermal power plant nearby (FWS 2022).

Table 2. Wetland Dependent Endangered Species in Nevada (NDNH explore species tool, <http://species.heritage.nv.gov/>)

Group	Species scientific name	Common name	ESA status
Plants	<i>Centaurium namophilum</i>	Spring-loving centaury	Threatened
	<i>Grindelia fraxinoprattensis</i>	Ash Meadows gumplant	Endangered
	<i>Ivesia kingii var. eremica</i>	Ash Meadows mousetails	Threatened
	<i>Nitrophila mohavensis</i>	Amargosa niterwort	Endangered
	<i>Spiranthes diluvialis</i>	Ute Ladies'-tresses	Threatened
Invertebrates	<i>Ambrysus Amargosa</i>	Ash Meadows naucorid	Threatened
Fish	<i>Catostomus warnerensis</i>	Warner sucker	Threatened
	<i>Chasmistes cujus</i>	Cui-ui	Endangered
	<i>Crenichthys baileyi baileyi</i>	White River springfish	Endangered
	<i>Crenichthys baileyi grandis</i>	Hiko White River springfish	Endangered
	<i>Crenichthys nevadae</i>	Railroad Valley springfish	Threatened
	<i>Cyprinodon diabolis</i>	Devil's Hole pupfish	Endangered
	<i>Cyprinodon nevadensis mionectes</i>	Ash Meadows Amargosa pupfish	Endangered
	<i>Cyprinodon nevadensis pectoralis</i>	Warm Springs Amargosa pupfish	Endangered
	<i>Empetrichthys latos</i>	Pahrump poolfish	Endangered
	<i>Eremichthys acros</i>	Desert dace	Threatened
	<i>Gila cypha</i>	Humpback chub	Threatened
	<i>Gila elegans</i>	Bonytail chub	Endangered



Fish (cont.)	<i>Gila robusta jordani</i>	Pahranangat roundtail chub	Endangered
	<i>Gila seminuda</i>	Virgin River chub	Endangered
	<i>Lepidomeda albivallis</i>	White River spinedace	Endangered
	<i>Lepidomeda mollispinis pratensis</i>	Big Spring spinedace	Threatened
	<i>Moapa coriacea</i>	Moapa dace	Endangered
	<i>Oncorhynchus clarkii henshawi</i>	Lahontan cutthroat trout	Threatened
	<i>Palgopterus argentissimus</i>	Woundfin	Endangered
	<i>Rhinichthys osculus lethoporus</i>	Independence Valley speckled dace	Endangered
	<i>Rhinichthys osculus nevadensis</i>	Ash Meadows speckled dace	Endangered
	<i>Rhinichthys osculus oligoporus</i>	Clover Valley speckled dace	Endangered
	<i>Salvelinus confluentus pop.4</i>	Bull trout (Jarbidge River basin pop)	Threatened
	<i>Xyrauchen texanus</i>	Razorback sucker	Endangered
Amphibians	<i>Anaxyrus williamsi</i>	Dixie Valley Toad	Endangered
	<i>Rana sierrae</i>	Sierra Nevada yellow-legged frog	Endangered
Birds	<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	Threatened
	<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher	Endangered
	<i>Rallus obsoletus yumanensis</i>	Yuma Ridgway's Rail	Endangered

### Other Federal Wetland Laws and Executive Orders

In the late 20<sup>th</sup> century, the government increasingly became aware of the importance of wetlands, which were being lost and converted throughout the US. Several acts and executive orders attempted to address this issue; some of the most relevant are briefly described below.

#### *Executive Order 11990: Protection of Wetlands*

This 1977 order required federal agencies to minimize the destruction, loss, or degradation of wetlands. The order encouraged them to preserve wetland ecosystem functions when undertaking agency activities. It also ended federal assistance for wetland conversion, including channelization and drainage (NDNH 2006).

*“Swampbuster” provision of the Food Security Act of 1985*

This act removed federal incentives for the conversion of wetlands to agricultural lands. It also made farmers who converted wetlands after 1985 ineligible for federal financial support (NDNH 2006).

*"No Net Loss" Policy (Water Resources Development Act, 1988)*

This policy required federal agencies to develop action plans to achieve the goal of no net wetland loss (NDNH 2006).

Many thousands of acres of wetlands have been lost since the implementation of these policies, but they indicate increased national recognition of the importance of wetlands (NDNH 2006).

## **Conclusion**

In summary, the Clean Water Act, the Endangered Species Act, and other policies provide important protections for Nevada wetlands, but still leave many essential habitats vulnerable. Additionally, the frequent changes in federal wetland protections due to changing WOTUS definitions underscore the importance of effective state regulations to bridge the gap.

Regardless of whether Nevada revisits EAWs or pursues other state wetland protection approaches, the Wetland Program will work to collect and curate wetland information to support regulators in decision making with the best available science. Although not an explicit objective of the 2023-2028 Wetland Program Plan, over the upcoming plan period we intend to work with stakeholders and partners to explore ways to safeguard the most essential wetlands without unnecessarily burdening regulators and landowners.