

STATE OF KNOWLEDGE SYMPOSIUM ON NEVADA SPRINGS AND WETLAND ECOLOGY

Tuesday, October 5, 2021

9am to 4 pm PDT (NV/ AZ time zone)

This one-day online symposium is part of an EPA-funded collaboration lead by the Nevada Division of Natural Heritage and involving the Desert Research Institute, the Nature Conservancy, and the Museum of Northern Arizona Springs Stewardship Institute. We will address the state of knowledge on Nevada's springs and wetlands ecosystems, and associated species. General introductory talks will be followed by technical sessions on the state's springs, wetlands, species, socio-cultural significance, and ecological integrity. The symposium will conclude with a panel discussion summarizing the findings and evaluating the effectiveness of the symposium.

To register, please visit <https://springstewardshipinstitute.org/upcoming-webinars>

AGENDA

- 9:00 am **Lawrence E Stevens**, Director, Springs Stewardship Institute
Welcome and Housekeeping; Background on Nevada Springs and Wetlands
- 9:25 am **Kristin Szabo**, Administrator, Nevada Division of Natural Heritage
Nevada Wetland Program: History and Current Efforts
- 9:50 am **Jeff Jenness**, GIS Analyst, Springs Stewardship Institute
Geography of Nevada Springs, and Spatial Patterns of Springs Discharge Rates and Water Quality Characteristics
- 10:15 am **Ken McGwire**, Associate Research Professor of Geography, Desert Research Institute
Challenges and Opportunities for Remote Sensing of Springs in Nevada
- 10:40 am *Ten Minute Break*

- 10:50 am **Jeanne Chambers**, Emeritus Senior Scientist, USDA Forest Service, Rocky Mountain Research Station
Geomorphic Sensitivity of Streams and Ecological Resilience of Riparian and Meadow Ecosystems in the Great Basin — Concepts and Tools for Assessment
- 11:15 am **Lee Turner**, Ecologist/ Botanist, Turner Ecological Services
National Wetland Condition Assessment in Nevada
- 11:40 am **Jeri Ledbetter**, Program Manager, Springs Stewardship Institute
Pitfalls, Potholes, and Re-invented Wheels on the Road to Springs Information Management
- 12:05 pm *Break for Lunch*
- 1:00 pm **Lawrence E Stevens**, Director, Springs Stewardship Institute
Diversity, Biogeography, and Conservation Status of Springs-dependent Taxa in Nevada
- 1:25 pm **Janel Johnson**, Botanist/ Webmaster, Nevada Division of Natural Heritage
Spring Dependent Rare Plants of Nevada
- 1:50 pm **James Hurja**, Soil Scientist, Humboldt-Toiyabe National Forest
Spring Stewardship in Southern Nevada
- 2:15 pm **Boris Poff**, District Hydrologist, and **JJ Smith**, Natural Resource Specialist/
Project Manager, BLM Southern Nevada District
Springs and the Restoration thereof in Southern Nevada
- 2:35 pm **Chantal Iosso**, Southern Nevada Springs Monitoring Coordinator, Friends of Nevada Wilderness
Engaging Community Scientists to Monitor Springs
- 3:00 pm *Fifteen Minute Break*
- 3:15 pm **Panel Discussion**- The Future of Nevada Springs and Wetlands
- 4:00 pm *End of Webinar*

PRESENTATION ABSTRACTS

9:00 am

Welcome and Housekeeping; Background on Nevada Springs and Wetlands

Lawrence E Stevens

Director

Springs Stewardship Institute

Museum of Northern Arizona

Flagstaff, AZ

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9:25 am

Nevada Wetland Program: History and Current Efforts

Kristin Szabo

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Through a combination of state and federal funding, Nevada's wetland program has been in the works for nearly two decades. Due to funding restrictions and limited staff capacity, however, it has been more project-based rather than program-based. Several important and useful deliverables have been produced over the years including the Nevada Priority Wetlands Conservation Plan, Nevada Priority Wetlands Inventory, and Nevada Springs Conservation Plan. More recently, a six-year Wetland Program Plan was produced and approved by the EPA setting forth recommended goals and objectives for Nevada's Wetland Program. Since 2017, a collaborative team of state agencies and NGOs have been working to inventory springs and springs-dependent species in the state and improve wetland assessments through a Level 1 (landscape level) tool and a Level 2 (rapid assessment) field manual and protocol. A Nevada-Utah Springsnail Conservation Team was also assembled consisting of 13 partners committed to conserving springsnails and their associated habitats in Nevada and Utah through implementation of the Springsnail Conservation Strategy. Current efforts include ongoing springs inventory and assessments and springsnail surveys, increasing the functionality of the Level 1 wetland analysis tool, and a concerted effort to increased partner outreach and engagement.

9:50 am

Geography of Nevada Springs, and Spatial Patterns of Springs Discharge Rates and Water Quality Characteristics

Jeff Jenness

GIS Analyst

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We show the general spatial distribution of springs across Nevada, including heat maps of survey effort and regions that may be undersurveyed. We count 25,583 springs in Nevada as of September 15, 2021. Of these, 22,604 came from original NHD data and 2,979 have since been added by SSI and other Springs Online users. Nevada springs tend to occur at higher elevations than the state as a whole ($\bar{x} = 1,947\text{m}$ vs. $1,688\text{m}$). The most common spring type in Nevada were rheocrenes, followed by helocrenes and hillslopes. Certain spring types tended toward different elevational ranges, with hillslope springs occurring at higher elevations than most other types and mound-form springs lower, but statistical analysis does not show a strong pattern. Specific conductance, water temperature, and pH tended to decrease with elevation. Alkalinity and spring flow showed no elevational patterns.

10:15 am

Challenges and Opportunities for Remote Sensing of Springs in Nevada

Ken McGwire

Associate Research Professor of Geography

Division of Earth and Ecosystem Sciences

Desert Research Institute

Reno, NV

Remote sensing technology provides environmental information across a range of spatial and temporal scales. This presentation will explore benefits and limitations of the long archive of Landsat imagery and more recent higher resolution satellite systems for mapping and monitoring springs in Nevada. The ability to correlate spring locations from the extensive Springs Stewardship Institute database to dry-season anomalies of vegetative vigor in Landsat data will be discussed. Multi-decadal trends for selected larger spring systems on the Nevada

Priority Wetlands inventory will be explored. Higher resolution commercial satellite imagery would be more useful in many situations, though cost can be an issue and there may be challenges with the variable viewing geometry of those satellites in multi-temporal analyses. Finally, a NASA program for subsidizing certain types of high-resolution commercial satellite data purchases will be described.

10:40 am *Ten minute break*

10:50 am

Geomorphic Sensitivity of Streams and Ecological Resilience of Riparian and Meadow Ecosystems in the Great Basin – Concepts and Tools for Assessment

Jeanne Chambers

Emeritus Senior Scientist

USDA Forest Service

Rocky Mountain Research Station

A multiscale approach for assessing the geomorphic sensitivity of streams and ecological resilience of riparian ecosystems, including meadows, to disturbances and management actions has been developed for upland watersheds of the Great Basin. Two General Technical Reports describe the key elements. (1) A database of the characteristics of Great Basin upland watersheds that delineates the mountain ranges that support perennial streams and the watersheds within them, and provides data on the topography, climate, geology, hydrology, and vegetation of the watersheds (<https://www.fs.usda.gov/treearch/pubs/61573>). (2) A description of key concepts, information on the factors that influence sensitivity and resilience, and an assessment protocol for characterizing watersheds, riparian ecosystems, and meadow ecosystems according to their sensitivity and resilience (in press). The information and assessments of watershed sensitivity and resilience are intended to provide the basis for prioritizing areas for conservation and restoration activities and determining the most effective management strategies. The target audience is managers and stakeholders interested in assessing and adaptively managing Great Basin stream systems and riparian and meadow ecosystems.

11:15 am

National Wetland Condition Assessment in Nevada

Lee Turner

Ecologist/ Botanist

Turner Ecological Services

Reno, NV

The Environmental Protection Agency's 2021 National Wetland Condition Assessment (NWCA) was conducted across all 50 states. In Nevada, Dr. Lee Turner was lead botanist. Presented here are a sampling of the data collection sites visited in summer 2021. Sites ranged from privately owned riparian areas to formerly rich wetlands such as Winnemucca Lake near Pyramid Lake to seasonally flooded wetlands.

Wetland plant species represent diverse adaptations, ecological tolerances, and life history strategies; effectively integrating environmental conditions, species integrations, and human caused disturbance. Data describing plant species composition and abundance and vegetation structure are powerful, robust, and relatively easy to collect.

11:40 am

Pitfalls, Potholes, and Re-invented Wheels on the Road to Springs Information Management

Jeri Ledbetter

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Springs ecosystems, among the most biologically diverse of habitats, are poorly understood and afforded little protection. Increased recognition of these fragile resources has led to growing interest among agencies, NGOs, and independent researchers who have begun to develop protocols, and collect and compile data. Database management systems (DBMS) have primarily included Microsoft Excel and Access, and GIS. Over several years, the Springs Stewardship Institute has imported many of these datasets into Springs Online, a collaborative online database in an effort to serve data that cross political and managing agency boundaries. This process is challenging due to the wide variety of data collection methods, ranging from standardized, published protocols to non-standardized or poorly considered methods. This

presentation will address the most common challenges that SSI has encountered with managing Nevada springs datasets, and offers solutions to assure that investment in field data collection results in accurate and meaningful information.

12:05 pm *Break for Lunch*

1:00 pm

Diversity, Biogeography, and Conservation Status of Springs-dependent Taxa in Nevada

Lawrence E Stevens

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The springs of Nevada support a host of plant, macroinvertebrate, and vertebrate taxa, including many that are unusual, endemic, rare, listed, and narrowly adapted, as well as others that are widespread and facultative or that are non-native. I define springs-dependent taxa (SDT) as those that require occupation of a springs ecosystem (aquatic, wetland, or riparian) for at least one phase of their life cycle, or those for which more than half the population is found in springs-supported habitats. Here we describe our efforts to document the array of SDT at Nevada springs. We compiled SDT distribution and population data from the literature, communication with experts, and from four years of field surveys of nearly 500 springs throughout the state through the EPA-supported Nevada wetlands program. We use those data to re-examine SDT biogeography in relation to Neogene hydrological connectivity, as well as elevation, latitudinal, and water quality gradients. The species richness of SDT vascular plants is relatively low: only 19 (5.1%) of 376 Nevada sensitive taxa are springs-dependent. Most SDT plants occur in high elevation spring-supported wetlands or riparian habitats (e.g., *Bothrychium crenulata*, *Angelica scabrida* in the Spring Mountains), or in harsh, unproductive, alkaline habitats, such as playa soils. Among non-native SDT, watercress (*Nasturtium officinale*) is widely distributed at springs, and is tightly associated with endemic *Pyrgulopsis* springsnails and other wetland gastropods. In contrast, Nevada SDT macroinvertebrates are highly species rich, with many examples among Mollusca, particularly truncatelloidean springsnails (>80 species of *Pyrgulopsis*, *Tryonia*, others), but with much uncertainty about the SDT and conservation status of other aquatic and wetland families (e.g., Physidae, Succineidae, Sphaeriidae), and several abundant and widespread non-native taxa (e.g., *Melanoides tuberculata*). Among the many SDT

insects, Plecoptera and some aquatic Hemiptera (e.g., Naucoridae) are widely recognized, but the taxonomic, biogeographic, and conservation status of many aquatic and wetland Ephemeroptera, Odonata, Coleoptera (e.g., *Stenelmis moapa* riffle beetle), and Diptera taxa require more information. Similar information is generally lacking for Annelida, Platyhelminthes, and Amphipoda, Isopoda, and micro-crustaceans. Widely introduced *Procambarus clarkii* crayfish likely predate upon many SDT invertebrates and fish, but its distribution is poorly mapped. Native cyprinid, cyprinodontid, and goodeid SDT fish are threatened by predation or competition from non-native game, aquarium, and other introduced fish (e.g., *Gambusia affinis*). Several of Nevada's 13 amphibian taxa are SDT (e.g., *Rana onca*), and *Microtus* and likely other mammal species are SDT species of concern. Conservation of the high diversity, limited population size and distribution, and sensitivity of Nevada SDT requires protection and rehabilitation of the ecological integrity of springs. Such attention also will improve the sustainability not only of these remarkable water sources, but also that of adjacent uplands.

1:25 pm

Spring Dependent Rare Plants of Nevada

Janel Johnson

Botanist/ Webmaster

Nevada Division of Natural Heritage

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Despite being the driest state in the US, Nevada is home to several rare plants that depend on spring habitats. Our tour includes Steamboat buckwheat, Sulphur Springs buckwheat, Monte Neva paintbrush, Ute ladies' tresses, and a suite of plants endemic to Ash Meadows National Wildlife refuge, plus a newly described sunflower that is endemic to springs in the Red Rocks area near Las Vegas. We will also touch on a couple of plants that are common in other states but survive only near springs in Nevada.

1:50 pm

Spring Stewardship in Southern Nevada

James Hurja

Soil Scientist

U.S. Forest Service

Humboldt-Toiyabe National Forest

Las Vegas, Nevada

Southern Nevada is home to over 500 springs. Many of which are in remote locations and have not been recently surveyed. Many springs are only known from old water right records whose location is from a point on a map using section lines. Budget and a shortage of staffing has limited assessments to just the ecologically significant and accessible springs. The Forest Service, Bureau of Land Management, Fish and Wildlife Service, and National Park Service were able to secure funding through the Southern Nevada Public Lands Management Act to accurately map and survey all the springs on the federal land management agency lands through; 1. The development a comprehensive inventory of spring conditions to prioritize restoration and habitat enhancement needs through the development and implementation of a citizen science based spring monitoring program, and conducting intensive spring surveys on selected springs, 2. Restore degraded springs, enhance wildlife and aquatic habitat, and treat or control invasive species, and 3. Compiling spring surveys and restoration data from all agencies onto on central location.

2:15 pm

Springs and the restoration thereof in Southern Nevada

Boris Poff and JJ Smith

Bureau of Land Management

Southern Nevada District

Springs in the Eastern Mojave Desert and in Southern Nevada have been used and altered first by native American Indians and later by European pioneers, miners, settlers and are still being impacted by modern residents. When springs are located on public managed lands, the Bureau of Land Management (BLM) has the mandate to improve riparian areas, prioritizing those that are degraded the most. Further, BLM has direction to maintain a certain level of functioning conditions at all springs. Besides maintaining water rights at these springs in a good standing with the Nevada Division of Water Resources, this task often involves active restoration. Because resources for such activities are limited, BLM prioritizes springs that important to wildlife, especially Threatened and Endangered and special status

species. Other considerations including management control, accessibility and the risk of unforeseen consequences influence the likelihood of restoration success.

2:35 pm

Engaging community scientists to monitor springs

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Nevada is home to thousands of springs that are often the only reliable water source for animals, but many have not been surveyed for decades or more. Due to the high number of springs and logistical challenges and cost associated with visiting every one, an exhaustive survey with staff is impractical. However, a volunteer community science program can be an effective way to minimize data gaps while engaging volunteers in meaningful work. Friends of Nevada Wilderness, a conservation nonprofit dedicated to preserving Nevada's wild lands, has successfully implemented an independent volunteering program that trains community members to collect data at springs. This talk will cover how Friends created and maintains their community science volunteer program, early successes of the program, and challenges that should be considered by other groups seeking to start a similar program.

3:00 pm *15 minute break*

3:15 pm

Panel discussion: The Future of Nevada Springs and Wetlands

Participation by all presenters