



Selected Large Springs



Monitoring Travertine Spring in Death Valley National Park, March 2021. Note the greener, more dense vegetation that grows along the spring compared to the drier areas nearby. (NPS / Jennette Jurado).

Background

Springs are natural water sources that form where groundwater reaches the land surface. They can range in size from seasonal seeps that go dry in the summer to perennial streams that flow all year long and support large wetland environments. In the Mojave Desert Network (MOJN) parks, springs are important but relatively isolated habitats.

Compared to the surrounding desert, spring and wetland environments in the Mojave and Great Basin regions support a greater abundance and diversity of plant and animal life. Large mammals, like bighorn sheep, depend on springs to survive the harsh summer months. Many birds also depend on springs during their migratory seasons, and bats frequent them when foraging for insects. Reliable water sources are scarce, so springs are often vital to the distribution and connectivity of wildlife habitat.

In the spatial isolation of Mojave Desert springs, some species of aquatic invertebrates, fishes, and amphibians have evolved to live in only one to a few springs in MOJN parks. Several species of springsnails, naucorid bugs, and belostomatid bugs and a few species of pupfish, such as the Saratoga Springs pupfish, are endemic to certain springs. Until the early 1990s, the relict leopard frog was assumed extinct, but a handful of populations have been rediscovered in MOJN park springs. These rare, and sometimes threatened, species rely on year-round water and require stable water quality conditions.

What are the threats to desert springs?

Climate change is a serious threat, as the southwestern U.S. has already experienced higher daily temperatures, more frequent drought, and reduced snowpack. Higher air temperatures lead to increased water temperatures, increased water use by vegetation, and changes in the vegetation communities and wildlife use at springs.

Drought leads to lower springflow and reduced aquatic habitat.

Aquifers store groundwater for springs and are sometimes targeted for groundwater extraction for agriculture, municipal, and industrial water supply. Demand for water is increasing as the human population continues to grow in the southwestern U.S.

Monitoring Large Springs

Guided by park input on management priorities, the springs selected for this protocol include those with the highest and most reliable discharge. They were also identified as being important habitat for fish, amphibians, and aquatic invertebrates as well as important sources of water for wildlife.



The MOJN hydrology crew sorts a sample of aquatic insects for identification at Saratoga Spring. NPS photo / Jennifer Bailard.

While our Desert Springs protocol involves rapid surveys at a large number of randomly-selected springs, our Selected Large Springs protocol focuses on more frequent and intensive monitoring at a small number of targeted springs and wells.

Objectives

The goal of this monitoring protocol is to collect information that will help assess, conserve, and restore water resources across MOJN parks. Our primary monitoring questions are:

- 1) Is the hydrology of any of the selected large springs in the MOJN parks changing?

- 2) Is the overall ecological condition of any of the selected large springs in the MOJN parks changing?



A relict leopard frog (*Lithobates onca*) observed at a spring in Lake Mead National Recreation Area. NPS photo / Jennifer Bailard.

To answer these questions, our hydrology staff collect data every year that will allow us to detect changes in the health of these springs in the long term. These data help us determine the status and trends of the following resource conditions:

- 1) Discharge, water level, or surface water area.
- 2) Water quality (water temperature, pH, specific conductance, and dissolved oxygen) and water chemistry (nutrients and common ions).
- 3) Benthic macroinvertebrate communities (small, bottom-dwelling aquatic organisms that include insects, arachnids, crustaceans, mollusks, and worms).

Sample Design

We monitor 15 springs across Death Valley, Great Basin, and Joshua Tree National Parks, and in Lake Mead National Recreation Area, Mojave National Preserve, and Grand Canyon-Parashant National Monument.

Management Applications

Selected Large Spring monitoring will provide park managers with data that:

- Provide better understanding of the dynamic nature of spring ecosystems.
- Detect spring responses to climate change, drought, groundwater withdrawal, and other stressors.
- Identify habitat degradation that could threaten endemic and endangered species.
- Assess the long-term success of spring rehabilitation.
- Support legal and management decisions related to natural resource protection and visitor enjoyment.

More Information:

The protocol [narrative](#) and [standard operating procedures](#) (SOPs) for spring vegetation monitoring were published in 2018 (SOPs were updated in 2020).

Jennifer Bailard, Project Lead
Email: jennifer_bailard@nps.gov; Phone: 702-293-8677

Allen Calvert, MOJN I&M Program Manager
Email: allen_calvert@nps.gov; Phone: 702-293-8856

To learn more about the Mojave Desert Network Inventory and Monitoring Program, please visit our website at: <https://www.nps.gov/im/mojn/index.htm>

