Monitoring Vital Signs in the Mojave Desert Network

Hydrology Field Lead monitoring desert springs in Death Valley National Park. NPS Photo / Logan Combs

Mojave Desert Network parks provide habitat to a diversity of plants and animals in three deserts: the Mojave, Great Basin, and Colorado Plateau. As park boundaries do not protect parks from threats like air pollution, climate change, invasive exotic species, and altered fire regimes, it is important to monitor changes in natural resource condition over time. The Mojave Desert Network Inventory & Monitoring Program (MOJN I&M) monitors vital signs (indicators of park health), such as water quantity and quality and plant communities across seven park units. They include: Death Valley National Park (DEVA), Great Basin National Park (GRBA), Joshua Tree National Park (JOTR), Lake Mead National Recreation Area (LAKE), Manzanar National Historic Site (MANZ), Mojave National Preserve (MOJA), and Parashant National Monument (PARA). The monitoring data we collect can help park managers make science-based decisions.

What are we monitoring?

Desert Springs and Selected Large Springs

Grapevine Spring, Lake Mead NRA. NPS Photo / Nicole Hupp

Springs are sparse in these desert parks, but they can be critical water resources for native species. Larger springs often provide important habitat for riparian plants and aquatic animals including fish, invertebrates, and amphibians. Some of these animals are endemic and found only at one spring or a small cluster of springs. Our Desert Springs protocol monitors water availability and quality at 245 springs across five parks (DEVA, JOTR, LAKE, MOJA, PARA). Our Selected Large Springs protocol additionally monitors water chemistry and benthic macroinvertebrate assemblages at 15 springs in these five parks and GRBA.

Spring Vegetation

Spring riparian areas are important habitats for maintaining biodiversity and are also some of the most threatened areas in the Mojave Desert. Various land-use practices (such as livestock grazing, water diversion, and invasive species) have altered these habitats. We monitor riparian plant communities to understand how they change over time in response to natural and human-caused disturbance. We monitor many features of springs including presence of invasive species, frequency of disturbance (such as burro tracks or boot prints), and plant community species composition. Monitoring occurs in DEVA, JOTR, LAKE, MOJA, and PARA.

Stretching a meter tape to monitor desert spring vegetation in Lake Mead NRA. NPS photo / Joseph Ladd

Integrated Uplands

Collecting plant data in a vegetation plot, Lake Mead NRA. NPS photo / Joseph Ladd.

Both vegetation and its associated soils are good indicators of environmental change in MOJN parks. This project targets specific upland shrub communities. Shrub communities represent a large proportion of each park, and they capture several focal communities such as Joshua tree, creosote bush, and sagebrush. We monitor: shrub species and life form composition, structure, and relative abundance; erosion/surface disturbance; biological soil crust composition and function; and targeted invasive plant species distribution and abundance. Monitoring occurs in DEVA, GRBA, JOTR, LAKE, MANZ, MOJA, and PARA.

Invasive Plants

In the Mojave Desert Network, invasive plants are one of the single largest threats to the integrity of our desert ecosystem and cultural resources. MOJN I&M developed a cost-effective approach for early detection and monitoring of invasive plants. This method targets a priority list of both newly encroaching and established species, and integrates information from other park programs and network-sponsored vegetation monitoring work. We monitor targeted invasive plant species incipient populations, abundance and frequency, and relationship with pest management practices. Monitoring occurs in: DEVA, GRBA, JOTR, LAKE, MANZ, MOJA, and PARA.

Invasive Plant Guide for Mojave Desert Network Parks.

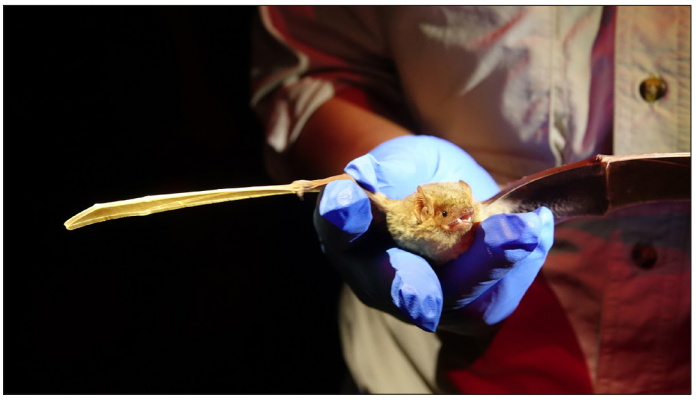
Aspen

Quaking Aspen stand in Parashant NM. NPS photo / Nicole Hupp

Quaking aspen (*Populus tremuloides*) stands provide forage for wildlife and domestic livestock and are keystone species upon which many others depend. However, they are declining rapidly due to Sudden Aspen Decline (SAD), a phenomenon caused by habitat loss, drought, climate change, ungulate overbrowsing, and disease. MOJN I&M monitors aspen clone regeneration, density of dead and live stems, conifer density within aspen stands, and variability of regeneration within a stand and among different stands. Monitoring occurs in GRBA and PARA.

Bats

Most North American bat species are insectivorous, serve as the primary predators of nocturnal insects, and can consume up to one-third of their weight in insects per night. Thus, bats play a role in regulating insect populations and nutrient redistribution and cycling. Bats face threats from wind energy development, habitat loss, climate change, and white-nose syndrome (WNS - a fatal disease caused by a non-native fungus). Bat monitoring is focused on early detection of WNS, and uses three approaches: acoustic surveys, surveillance surveys (bats captured to detect fungus), and bat blitzes (coordinated surveys to sample the bat community in a specific area). Monitoring occurs in DEVA, GRBA, JOTR, LAKE, MOJA, and PARA.



Western Yellow Bat prior to being released after mist-net capture and measurements completed. NPS photo

Streams and Lakes

Lakes and streams in Great Basin National Park provide habitat for aquatic and terrestrial organisms, contribute to local water supplies, and are popular visitor destinations. Because GRBA is so remote, its air and water resources are relatively pristine. Our Streams and Lakes protocol monitors six subalpine lakes and nine streams in the park. Lake monitoring comprises water levels and clarity, water quality and chemistry, and length of the ice-free season. Stream monitoring comprises seasonal patterns of discharge and water quality along with water chemistry and benthic macroinvertebrate assemblages. Potential threats to these water resources include groundwater pumping in local watersheds, acid deposition, eutrophication, and climate change effects on precipitation and snowmelt.

Calibrating sondes to measure stream water quality parameters, Great Basin NP. NPS photo

White Pines

Bristlecone pine stand in Great Basin NP. NPS photo

Great Basin National Park contains over 10,000 acres of Great Basin bristlecone pine (*Pinus longaeva*) and limber pine (*P. flexilis*) forest. Classified as "white pines", these trees influence key ecosystem processes and community dynamics, such as regulating snowmelt and streamflow and providing habitat and food for birds and mammals. Threats include an invasive pathogen that causes the disease white pine blister rust (WPBR), mountain pine beetle, and projected increased temperature and changes in type and timing of precipitation. MOJN I&M monitors: forest structure and species composition; rates of mortality, seedling establishment, and recruitment from seedling to tree class; and incidence and severity of WPBR, mountain pine beetle, and dwarf mistletoe in GRBA white pine forests.

Weather and Climate

In the semi-arid desert landscape where temperatures are extreme and water is scarce, the physical and biological components of ecosystems are especially sensitive to climatic variability. Monitoring climate is important for understanding changes we detect in other vital signs, and for guiding us in the protection of sensitive habitats and endangered species. For the southwest U.S., increased temperatures and less precipitation are predicted for all seasons. Using existing meteorological stations in or near parks, MOJN I&M monitors seasonal and annual status and trends in climate conditions and evaluates how other vital signs vary with local and regional trends in climate at all seven network park units.

Joshua trees with cloudy skies and rainbow. NPS photo

Explore the Mojave Desert Network website: *www.nps.gov/im/mojavedesert*

Mojave Desert Network Inventory&Monitoring

Learn more about inventory and monitoring projects in MOJN park units and:

- Download briefs, newsletters, and reports
- Check out the Climate Analyzer, a visualization tool for exploring climate data

For more information, contact Allen Calvert, Program Manager (allen_calvert@nps.gov, 702-293-8856).