Mojave Desert Network
Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior

The Oasis

Spring/Summer 2017

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Continuing Research on the Paleohydrology of Mojave Desert Wetlands

Putting more pieces of the story together...

Jeff Pigati and Kathleen Springer, along with their colleague Jeff Honke of the U.S. Geological Survey (USGS) are continuing their research on ancient desert wetlands in the southwestern U.S. – most recently at Death Valley National Park (DEVA) and Mojave National Preserve (MOJA). Working in cooperation with the NPS, the USGS team is looking at geologic deposits associated with springs and wetlands in the Mojave Network parks in order to determine how these systems responded to climate change in the past.

Most of their work has focused on geologic deposits that span the late Pleistocene (130,000-11,600 years ago) when conditions were wetter than today. Recently, the team has begun looking at Holocene deposits dating to the past 10,000 years or so, to determine what the landscape in the desert looked like in the more recent past. The primary goals of their research are to determine how quickly desert wetland ecosystems respond to climate change, and to quantify how much of an increase in temperature they can withstand before disappearing from the landscape altogether.

The team started their Holocene studies by seeking out active spring areas within the parks (Saratoga Spring at DEVA and Soda Lake in MOJA) to allow them to get a better idea of the expanding and contracting behaviors of the spring. They collect deposits by drilling "cores" into the earth near these active springs

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"It is important for park management to have a longer temporal scale and historic context for understanding changes in modern desert wetlands."

—Kathleen Springer, USGS

(figure 1), and analyze the sediments for a variety of physical and chemical properties. When climate is cool and wet, groundwater levels rise, and wetlands expand; when climate heats up and conditions dry out, groundwater levels fall, and wetlands contract. Such cycles are preserved in the geologic record (figure 2 and figure 3) and are dated using radiocarbon techniques to tell the full story.

By comparing the wetland record to independent climate data, the team can determine how responsive desert wetlands were to changes in climate in the past. What they have found so far is that desert wetlands are extremely responsive to climate change, meaning that even small increases in temperature or decreases in precipitation can dramatically affect them. Under present day conditions, wetlands exhibit drastic responsiveness to these same types of small fluctuations.

The combination of Pleistocene and Holocene data collected by the USGS and modern data collected by the MOJN I&M through its Desert Springs and Selected Large Springs Monitoring Protocols will allow us to distinguish normal expanding and contracting of the springs from fluctuations that are drastic and warrant concern.

With the added pressure of increased temperatures and groundwater withdrawal from outside the parks, it is important for park management to have a longer temporal scale and historic context for understanding current desert wetland shifts. Being able to answer the question "Are the changes we are observing today part of the natural cycle of things, or are they the result of something else?" is critical for successfully managing these fragile desert ecosystems.

Photo credits for this article:
Figure 1 - USGS. Figures 2 and 3 - Jeff Honke, USGS.

Figure 1. The USGS team collects Holocene deposits by drilling "cores" into the earth These cores contain layers of sediment that show the condition of the environment throughout time. Each layer is then dated using radiocarbon dating to reconstruct what the landscape looked like in the recent past. Saratoga Spring, DEVA.

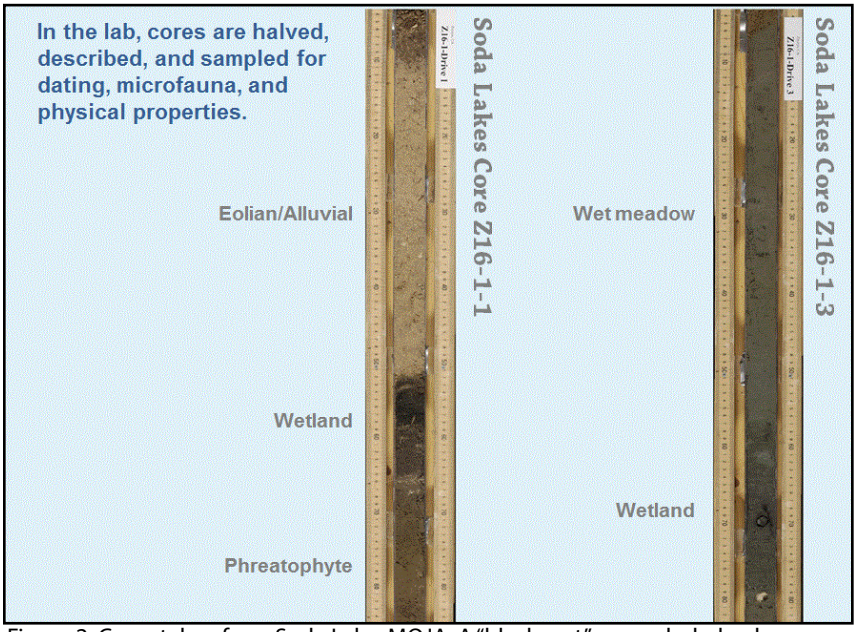


Figure 2. Cores taken from Soda Lake, MOJA. A "black mat" or much darker layer found in the core indicates that the environment was marshy and wet during that period of time. Wet periods ("wetland" layer on figure) appear darker than dryer layers ("Eolian/Alluvial" layer on figure) because there was lush vegetation present.

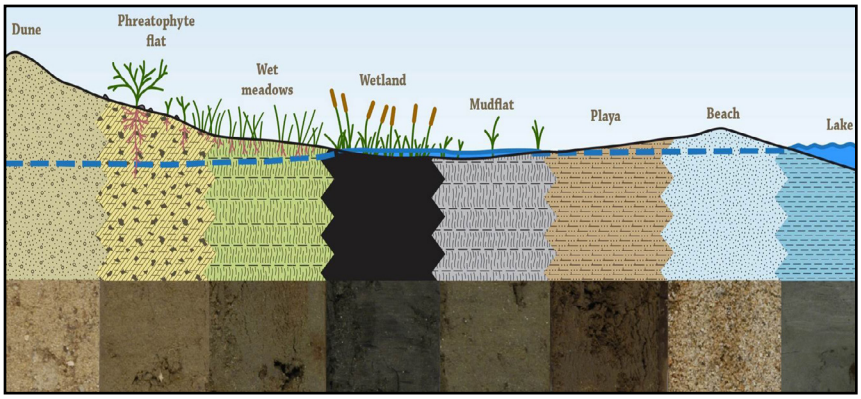


Figure 3. Comparing various types of cores to their corresponding environment.

Searching for Springsnails at National Jr. Ranger Day

MOJN I&M was excited to be a part of Lake Mead National Recreation Area's celebration of National Junior Ranger Day this past April. This event was an excellent opportunity for the Network to discuss with park visitors the importance of protecting and preserving park resources and to provide a hands-on interactive experience of science and water monitoring being done in the network parks.

Janel Brackin, MOJN I&M Science Communicator, along with the help of two Network Physical Science Technicians, Carissa Wilkerson and Michael Steiner, spent the day assisting soon-to-be Junior Rangers in searching water samples for springsnails and other aquatic insects and viewing them under a microscope. Visitors were shown various tools needed for spring monitoring and how they are used, and MOJN answered questions about native and invasive species and their impact on fragile desert springs, water quality, and park resource protection. Visitors to the MOJN I&M table also received an informational flyer about the Network, which included a coloring page featuring some iconic plant and animal species native to the Mojave Desert.

Network Program Manager, Allen Calvert, also hosted a table to show visitors bat monitoring equipment and bat specimens. Demonstrations of the echolocation software used for bat identification were also provided.

Carissa Wilkerson shows visitors native springsnails endemic to Blue Point Spring, LAKE.

Junior Rangers sift through silt to find springsnails and bottom-dwelling insects that call Blue Point Spring home.

Allen Calvert discusses bats and bat monitoring equipment with a group of Junior Rangers and their parents.

Michael Steiner and Janel Brackin help a Junior Ranger get a closer look at some invasive springsnails under the microscope.

Staffing Changes: Welcome to MOJN

Carolyn Mills

Carolyn comes to the Mojave Desert Network from San Clemente Island, off the coast of southern California, where she worked as a botanist for a year and a half, surveying for rare plants, restoring degraded habitat, controlling invasive weeds, and specializing in seed collection and propagation. As a seasonal GBI employee with MOJN, Carolyn will be bringing her botanical expertise to Great Basin National Park, where she will be implementing the Integrated Upland Monitoring in the sagebrush steppe community this summer and assisting with plant identification for other projects as well. She received her B.A. in Philosophy from Point Loma Nazarene University before realizing her passion for glorious grasses and wonderful wildflowers and pursuing a career in botany. She brings several seasons of field experience working across the Great Basin for the USGS and the Eastern Nevada Landscape Coalition, and can't wait to return to the sagebrush ocean! In her spare time, Carolyn enjoys exploring the desert, searching for good tacos, and cats.

Logan Combs

Logan began working with MOJN I&M this February as an intern through the Conservation Legacy's Environmental Stewards program. He has been assisting with desert springs monitoring in Parashant National Monument, including measuring water quality, identifying spring vegetation, creating maps and scouting routes. He also has been performing data analysis on water quality and discharge data from streams in Great Basin National Park. This summer, he will be assisting with upland vegetation monitoring in the sagebrush communities of Great Basin National Park. Before coming to MOJN, Logan was a graduate student pursuing a M.S. in Geoscience from the University of Nevada, Las Vegas. His Master's research involves the study of a group of martian meteorites called shergottites. His goal is to connect a recently discovered martian meteorite to this group, gain insight into their formation, and further our understanding of magmatic processes on Mars. Logan will return to his studies in Fall 2017.

Desert Springs Monitoring Video - Coming Soon

This past February, videographer Michael Durham, on contract with the Pacific West Regional I&M Program, visited several of the MOJN I&M parks to collect interview and B roll footage. This short film will highlight the desert springs monitoring being done by MOJN I&M and the value and importance of this data in park management decisions.

The film is expected to be released early 2018.

Keep an eye out for it!

Michael Durham films the collection of benthic macroinvertebrates from Saratoga Spring, DEVA. Jennifer Bailard, MOJN I&M Physical Science Tech, holds a sample taken during the visit as part of our Selected Large Springs monitoring activities.

Michael Durham films Carissa Wilkerson, MOJN I&M Physical Science Tech, using a handheld multi-probe water quality measurement device at 49 Palms Oasis in JOTR.

Nicole Hupp, MOJN I&M Vegetation Ecologist, being interviewed at Blue Point Spring in LAKE for informative sound bites about natural resource monitoring being conducted by the Network.

MOJN's Network Bat Blitz - June 2017

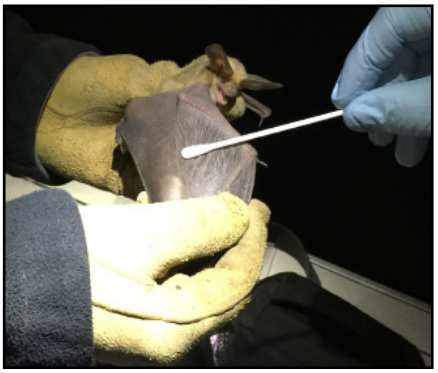
In mid-June, MOJN I&M staff and representatives from five network parks (DEVA, GRBA, LAKE, MOJA, PARA) and staff from Grand Canyon National Park gathered to discuss the possibility of a Network-wide bat monitoring plan. During the three day event held in a remote area of Grand Canyon - Parashant National Monument (PARA), the group discussed current threats to bat populations across the MOJN parks and current bat monitoring going on within each of the participating parks, as well as what is desired by each of the parks that is not currently being done. Other topics included White Nose Syndrome and Chytrid decontamination procedures, and how the NABat monitoring plan could be used for a network-wide plan.

The group set out mist nets and were trained in bat detector deployment in order to practice monitoring procedures. The leads for the Bat Blitz included Allen Calvert, Eathan McIntyre (PARA Physical Scientist), Jennifer Fox (PARA Ecologist), Bryan Hamilton (GRBA Wildlife Biologist), and Bryan Moore (LAKE Physical Scientist). Angie McIntyre of the Arizona Game & Fish Department (AZGFD) was also in attendance to present lessons learned from the pilot monitoring effort of NABat in Arizona.

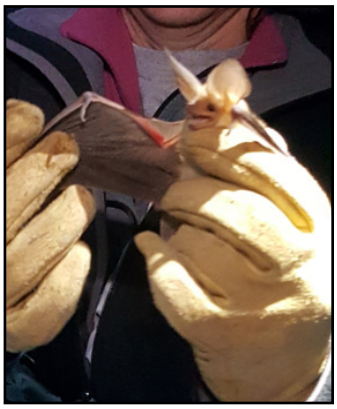
Alex Whalen, MOJN Field Logistics Lead, recently completed an eight day bat management workshop through a scholarship provided by the Pacific West Region (PWR) White Nose Syndrome Coordination Team. The workshop provided intensive training in surveying bats using both capture and acoustic methods. This will enable Alex to assist parks with bat monitoring projects, especially if a network wide monitoring plan is implemented.

Allen Calvert has also been hard at work applying for several grants to acquire bat monitoring equipment that can be used in the MOJN parks. MOJN I&M has received a Petterson D500X bat detector through an award from the Western Bat Working Group and from this same award we will also receive the new Sonobat 4 bat acoustic call analysis software. In addition, the PWR White Nose team has provided MOJN with an additional D500X detector as well as a triple high bat netting system in support of the bat blitz. MOJN would like say thank you to everyone involved for making this Blitz a success. ***MOJN I&M is excited about the prospect of working with the parks on this new monitoring effort!***

Crews set up mist nets at their monitoring locations before the sun set

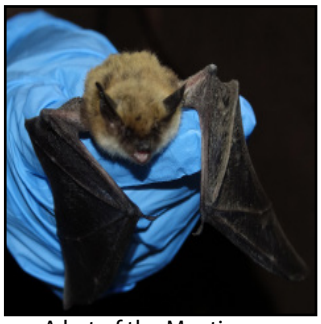


Arizona Game & Fish Department swabs a Pallid bat to determine if the fungus that causes White Nose Syndrome is present



Checking the wing span of a Pallid Bat

Western Mastiff Bat



A bat of the Myotis spp.

Bats get caught in the mist nets as they swoop down to drink. We carefully remove them from the net, collect and record data, and safely release them. Here Troy Maikis, MOJA Biological Technician, removes a bat from a mist net.

Fall 2017 Monitoring Schedule

	July	Aug	Sept	Oct	Nov	Dec	Jan
Integrated Uplands Vegetation monitoring	GRBA *(First IU GRBA field season)*						
Streams & Lakes monitoring	*GRBA *(Streams)*	*GRBA *(Streams)*	GRBA *(**Lakes & (*Streams)*	*GRBA *(Streams)*			
Desert Springs monitoring					DEVA LAKE	DEVA JOTR	DEVA MOJA
Selected Large Springs quarterly monitoring	MOJA LAKE JOTR			MOJA LAKE JOTR			MOJA LAKE JOTR
Riparian & Spring Vegetation monitoring	*Methods testing at various parks throughout Summer and Fall 2017*						
Pine Monitoring (in collaboration with UCBN)	*Pilot testing* GRBA						

* GRBA Staff does biweekly stream monitoring July - September. They also do annual stream sampling in late August - early September.

** GRBA annual lakes sampling is carried out jointly by park and MOJN I&M staff each September.

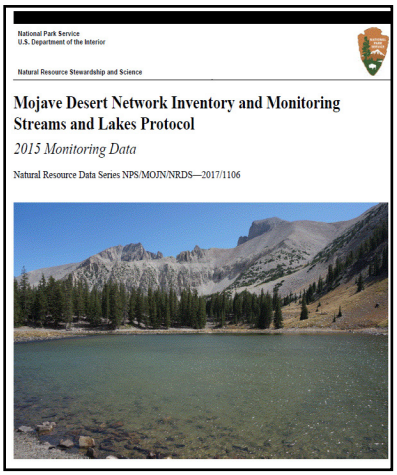
Recent Publications

For the most up-to-date information about MOJN I&M efforts and all the latest publications and products, visit our homepage and scroll to the bottom under the "Featured Information" section.


Mojave Desert Network
Inventory & Monitoring Program

Desert Springs Monitoring Brief for Joshua Tree National Park

Click here to read the 2017 Joshua Tree National Park Desert Springs Monitoring Brief.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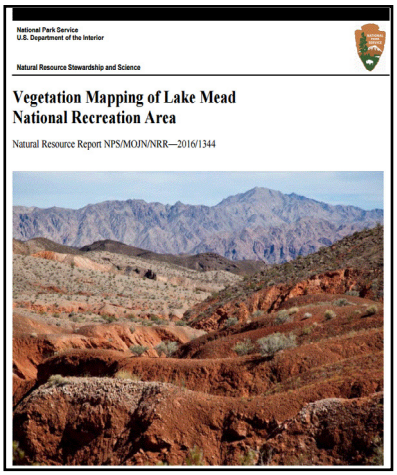
Natural Resource Stewardship and Science

Mojave Desert Network Inventory and Monitoring Streams and Lakes Protocol

2015 Monitoring Data

Natural Resource Data Series NPS/MOJN/NRDS—2017/1106

The 2015 Great Basin Streams and Lakes Data Report is now published! Click here to read.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Natural Resource Stewardship and Science

Vegetation Mapping of Lake Mead National Recreation Area

Natural Resource Report NPS/MOJN/NRR—2016/1344

Click here to read the Lake Mead Vegetation Map and Report

The Oasis Recognizes...

Michael Steiner

MOJN I&M Physical Science Tech!

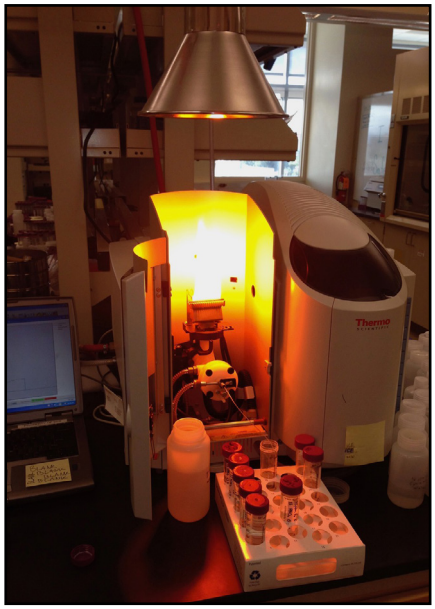
MOJN I&M would like to give a shout-out to Michael Steiner, who recently won the "Outstanding Thesis Award" at University of Nevada, Las Vegas (UNLV) for his thesis titled "Dissolution of Nontronite in Low Water Activity Brines and Implications for Aqueous History of Mars". He was selected by the UNLV Graduate Student Awards Committee, from whom this award is given to only one UNLV Master's student each year.

"Since we cannot go to Mars, we have to find alternative ways to study our closest neighbor. We can send rovers and orbiters but they are often limited to a specific location or specific set of instruments. One really great way to study Mars is to study Earth. Since there are many of the same rocks and minerals on Earth as there are on Mars, we can use samples from Earth as an analog for studying Mars.

The specific mineral I studied is called nontronite, a clay mineral that has been detected at numerous locations on Mars and is also found all over Earth. Clay minerals are important to Mars because they form when rocks are exposed to water, so they represent Mars from a time when it was wet and have been exposed for billions of years. In order for scientists to figure out past conditions on Mars they set up complicated models to calculate how things have changed over time. The results of my thesis can be used to fine tune those models to account for changing water chemistry as Mars went from wet to dry.

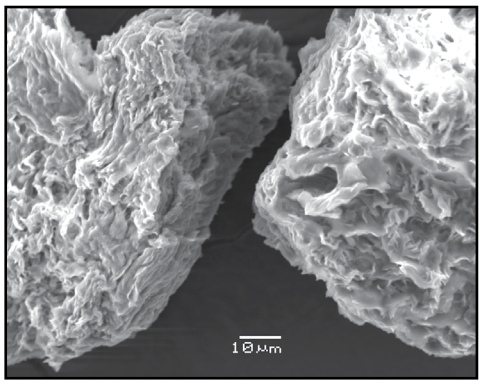
By knowing how nontronite reacts to fresh water vs salt water vs brines (very salty water), we can get an idea for what type of water interacted with nontronite on Mars when rovers are able to investigate it closely. Life on Earth is more abundant in fresh water and sea water but there are some extreme organisms that thrive in brines. Using nontronite to determine past conditions on Mars can give us an idea of if life could have existed on Mars."

- Michael Steiner



Flame Atomic Absorption Spectrometer used to measure silicon released from dissolving nontronite.

Nontronite sample used for dissolution experiments. Collected in Southern Australia by the Clay Mineral Society.



Scanning Electron Microscope image of nontronite.

The Mojave Desert Network Inventory and Monitoring (I&M) Program is one of 32 networks of parks established under the National Park Service I&M Division to implement long-term ecological monitoring across multiple park units that share relatively similar ecological attributes. Data collected through this program will help inform park resource management decisions.

Click here for MOJN I&M staff contact information.

MOJN I&M monitors natural resources at 9 national park units:

CAMO: Castle Mountains National Monument

DEVA: Death Valley National Park

GRBA: Great Basin National Park

JOTR: Joshua Tree National Park

LAKE: Lake Mead National Recreation Area

MANZ: Manzanar National Historic Site

MOJA: Mojave National Preserve

PARA: Grand Canyon-Parashant National Monument

TUSK: Tule Springs Fossil Beds National Monument

(Click on the hyperlinks to learn more about each park)

The Oasis newsletter is published twice a year for Mojave Desert Network park staff and anyone else interested in resource management in the Mojave Desert Network parks.

Mojave Desert Network Inventory&Monitoring