Desert springs in Death Valley and the Panamint Range: A discussion of the chemistry and biology of Mojave springs and how they contribute to a healthy desert ecosystem

September 15th, 2018 11am-3pm
Tecopa Community Center
400 Tecopa Hot Springs Road
Tecopa, CA 92389

Event Schedule

Note: All presentation times will include a 5-minute question and answer period

11-11:30am: Welcome Reception (light refreshments provided)
11:30-11:50am: An Introduction to Desert Springs
11:50-12:10pm: The Essential Ingredients of Groundwater
12:10-12:30pm: Microbial Diversity of Desert Springs in the Mojave Desert
12:30-12:40pm: Break
12:40-1pm: Spring Ecology in the Mojave Desert: Using Macroinvertebrates to Describe Ecological Diversity
1pm-1:20pm: Understanding Groundwater Flow to Spring Ecosystems in the Panamint Range, Death Valley, CA
1:20-2pm: Lunch (provided)
2-3pm: Poster Session and Open Discussion

Presentation Descriptions

An Introduction to Desert Springs

Presented by Zachary P. Meyers,
Department of Earth, Atmospheric, and Planetary Sciences, Purdue University, West Lafayette, IN 47907

Springs are important water resources. This is especially true in arid environments where they have special importance ecologically, domestically, recreationally, and even spiritually. In the Mojave Desert there exists an incredible diversity of springs ranging from high elevation cold springs to low elevation, regional warm springs and basin brines. This diversity is a product of the climate (and paleoclimate), the tectonically driven topography, and the regional geology. This talk will give a primer on the following questions: 1) What are springs? 2) Where do springs come from? 3) What are the ways in which we seek to monitor springs? & 4) What are the factors that influence springflow?

The Essential Ingredients of Groundwater

Presented by Dr. Laura Rademacher,
Department of Geological and Environmental Sciences, University of the Pacific, Stockton, CA 95211

As water moves through the subsurface, it acquires a chemical “fingerprint”, which reflects various factors that influence the water as it flows from the recharge area (where it enters the ground) to the springs (where this water is discharged). These fingerprints depend on recharge conditions, subsurface rock types, and how long the water is flowing through the ground. This talk will consider the following questions: 1) How does the chemistry of groundwater develop? 2) How long does water take to flow from where it enters the ground to the springs? 3) How can the chemistry and residence time inform understanding springflow processes?

Microbial Diversity of Desert Springs in the Mojave Desert

Presented by Ariel D. Friel,
School of Life Sciences, University of Nevada Las Vegas, Las Vegas, NV 89154

The Mojave Desert has many naturally occurring springs and is an oasis of aquatic biological diversity. Despite this, little research has been conducted to explore the potentially unique microbial communities in these springs or to assess their relationship to environmental parameters. Planktonic and benthic microbial community samples were collected from >70 springs and coordinated with detailed environmental measurements. This microbial census has revealed a staggering diversity of microorganisms, with 107,789 unique DNA sequences, representing over 70 bacterial and archaeal phyla, being recovered across the entire study region. High-elevation springs, regardless of host rock (carbonate or granite), demonstrate greater similarity in microbial community structure to each other than to low-elevation springs. These results demonstrate that springs in the Mojave Desert contain diverse microbial assemblages and that elevation is an influencing factor on microbial community structure.

Spring Ecology in the Mojave Desert: Using Macroinvertebrates to Describe Ecological Diversity

Presented by Khaled Pordal,
Natural Resource and Environmental Science, University of Nevada Reno, 1664 N. Virginia Street, Fleischmann Agriculture, Room 217, Reno, NV 89557

The Mojave Desert is one of the most arid regions in the Northern Hemisphere. Tectonic development in this area has played a major role in aquatic habitats isolation and aquatic organism speciation. Springs occur throughout the region and support aquatic life whose ancestors arrived before the spring became isolated thousands of years ago. As the climate dried and the hydrological connectivity between basins ceased, isolated springs became the most persistent aquatic habitats in the region. As with other aquatic systems, physicochemical characteristics of the environment strongly influence the structure of benthic communities in spring systems. Previous studies found that environmental harshness has been a leading factor influencing the structure of BMI communities. Harshness can be a function of natural (drought, flood, and climate change) and anthropogenic (surface diversion, groundwater pumping, livestock use, etc.) disturbances. However, in undisturbed springs, hydrogeology structures the aquatic habitat in the region. The diversity of geology and water-rock interaction in the Panamint Range and Death Valley area provide a wide range of physicochemical conditions for aquatic organisms. In this study, we are testing the hypothesis that spring water chemistry is the product of geology, and structure of BMI community is a function of spring environment. This hypothesis will be examined by biological (structure of BMI communities) and hydrogeological sampling (isotope hydrology and geochemistry).

Understanding Groundwater Flow to Spring Ecosystems in the Panamint Range, Death Valley, CA

Presented by Carolyn L. Gleason,
Department of Earth, Atmospheric, and Planetary Sciences, Purdue University, West Lafayette, IN 47907

Despite its location in the rain shadow of the southern Sierra Nevada, the Panamint Range within Death Valley National Park, CA hosts a complex aquifer system that supports numerous freshwater springs. These springs support unique groundwater-dependent ecological communities. We collected waters from representative Panamint Range springs and analyzed their environmental isotopes and geochemical tracers to address the following questions: 1) What is the primary source of recharge to these springs? 2) What groundwater flowpaths support the generation of these springs? and 3) How long does it take water to emerge in these springs from the time it is deposited as rain or snow?