Feb 2nd, 9:30 AM - 3:30 PM

Research poster: Climate change impacts to groundwater, springs hydrology and aquatic communities Amargosa Desert and Death Valley National Park, Nevada and California

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INTRODUCTION

Springs are created where groundwater reaches the surface through natural processes. They provide much of the aquatic wetland environment in arid lands as well as a substantial portion of regional aquatic and riparian biodiversity. Arid land springs are distinct from springs in more humid regions because they are typically isolated, more susceptible to climate change, and are strongly influenced by aquifer characteristics. However, insight into how aquatic and riparian communities will respond to climate change is currently limited to speculation.

At least nine distinct springs in the Furnace Creek province of Death Valley National Park, including Travertine Springs, historically flowed onto the floor of Death Valley. These springs are the terminal discharge points for the lower carbonate aquifer, a regional aquifer of approximately 100,000 km² and spanning much of southern Nevada. The National Park Service has recently changed the delivery systems for Furnace Creek water so that direct diversion from Travertine Springs has ceased. Instead, domestic water is pumped from wells immediately downgradient from Travertine Springs and irrigation water will be collected from downstream ditches and galleries. This change provides an ideal study platform for research into spring ecology and the effects of changing flow regimes - analogous to conditions that may be in aridic regions of climate change.

Climate Impacts

The southwest U.S. faces general temperature increases with largest warming in the summer months, and a likely decrease in precipitation. Due to the aridity of southern Nevada and Death Valley, small changes in water availability may translate into significant alterations in evapotranspiration, recharge, and runoff. Projections for changes in recharge (and also temperature, evapotranspiration, and precipitation) will modify boundary conditions of the groundwater and ecological models, described below.

METHODS

Groundwater Modeling

A groundwater flow model will be developed for portions of the Amargosa Desert and Travertine Springs area to evaluate affects on the groundwater flow system resulting from climate change. The model will be based on the U.S. Geological Survey Death Valley Regional Groundwater Flow System model. Simulations will be conducted to evaluate how changes in climate, expressed primarily as changes in recharge, affect spring discharge. In addition, response of the aquifer and Travertine Springs to pumping from production wells located upgradient from Travertine Springs will be simulated as an analog for potential future reduction in spring discharge caused by climate change.

Ecological Modeling

Changes in the aquatic environment affecting benthic macroinvertebrate abundance and community structure will be examined by quantifying physical characteristics of the spring brook environment during full discharge and at several lower discharge rates. We will utilize a physical habitat model to determine discharge rates that sustain habitats that support the existing benthic macroinvertebrate assemblage structure. We will integrate field experiments and habitat modeling to quantify thresholds where decreases in discharge affect the abundance and distribution of benthic macroinvertebrates and the structure of this community.

FUTURE WORK

The specific model domain remains to be selected, as well as how the local model will be embedded within the existing U.S. Geological Survey model. Options include (1) a very localized model focusing on the Travertine Springs/Furnace Creek area of Death Valley, and (2) a domain encompassing the southern portion of the Amargosa Desert, including Ash Meadows and Devils Hole.

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