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

Research poster: Water source partitioning for shrubland transpiration using innovative field methods

Amanda Wagner  
*University of Nevada, Las Vegas*

Dale A. Devitt  
*University of Nevada, Las Vegas, dadevitt@unlv.nevada.edu*

Michael Young  
*Desert Research Institute*

Matthew S. Lachniet  
*University of Nevada, Las Vegas, matthew.lachniet@unlv.edu*

Jeremy Koonce  
*University of Nevada, Las Vegas*

*See next page for additional authors*

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Presenters
Amanda Wagner, Dale A. Devitt, Michael Young, Matthew S. Lachniet, Jeremy Koonce, and Brian M. Bird

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Water source partitioning for shrubland transpiration using innovative field methods

Amanda Wagner – Graduate Assistant, Water Resources Management, UNLV
Dale Devitt – Professor of Soil and Water, School of Life Sciences, UNLV
Michael Young – Associate Professor of Soil Physics, Desert Research Institute
Mark Lachniet – Assistant Professor, Geosciences, UNLV
Jeremy Koonce – Graduate Assistant, Geosciences, UNLV
Brian Bird – Staff Research Associate, School of Life Sciences, UNLV

INTRODUCTION

Groundwater recharge reduction in the Great Basin Desert, NV due to a decline in annual precipitation and groundwater pumping could intensify the reliance of phreatophytes on groundwater. A reduction in groundwater due to climate variability and pumping could lead to a stronger coupling of phreatophytes to groundwater resources. Some climate models predict a reduction in annual precipitation over the next 20-30 years throughout much of the western United States (Barnett and Pierce, 2007). Therefore, extensive research is needed to gain a stronger understanding of the coupling of phreatophytes to groundwater prior to pumping and climate change.

Beginning in March 2010, we will initiate field research to gain a better understanding of the relationship between phreatophytes and their environment. In order to gain a comprehensive understanding of the coupling and decoupling of phreatophytes with groundwater resources, we will measure the fractional evapotranspiration (ET) associated with the phreatophyte Greasewood (Sarcobatus vermiculatus). We will utilize eddy covariance (EC) data, which integrates ET from an entire canopy, groundwater oscillations patterns, and Granier’s thermal dissipation probes (TDP) to measure transpiration as a fractional component of ET.

MATERIAL AND METHODS

Sapflow

Sapflow measurements will be conducted using Granier’s thermal dissipation probes (TDP). A sensor which consists of two cylindrical probes either 10mm or 30mm in length are inserted radially into the sapwood of the trunk (Granier 1985). The top probe consists of a heating element and both probes contain a copper-constantan thermocouple which allows the system to measure the difference in temperature between the two probes. A datalogger will collect data in thirty minute intervals. During pre-study trials, we installed six 10mm and six 30mm sensors in three oak trees. Each oak contained two 30mm and two 10mm sensors. Initial data showed well defined peaks and troughs throughout the 10 day trial period with clear responses to an irrigation event, precipitation event and cloud cover.

Dye Study

In order to stain the conductive vascular tissue of the stems we dissolved 1g of safranin in 40mL ETOH then added water to a volume of 1000mL. We affixed airtight tubing to each end of the stem and pulled dye through the bottom of the stem using suction. This resulted in staining of only the conductive tissue, as can be seen in the above photos. We performed this technique on four stems of each species. All stems were cut in a 4°C cold room, however two were cut on a bench and two were cut underwater to prevent cavitation. We will use this data to derive an average percent of conductive tissue for each species and to guide the sensor installation in the field.

LOCATION

SV6 coordinates:
Northing: 4324555.44
Easting: 717823.99
Elevation: 1,755.71 meters

UTM Zone 11, Map datum WGS84

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