Nevada EPSCoR Research Highlights
March 2011
Experimental Program to Stimulate Competitive Research

National Science Foundation

Nevada Infrastructure for Climate Change Science, Education, and Outreach

Tree species could be affected by groundwater changes

Tree distributions at Ash Meadows National Wildlife Refuge, a springs complex in the Mojave Desert, are spatially structured along groundwater and salinity gradients. Climate change and associated changes in groundwater pumping for human use will change the availability and spatial distribution of groundwater in the next century, likely leading to a change in tree species composition and distribution. Climate change will also affect fire regimes and human land use, which also affect tree distributions.

Sarah Karam in the research field

The overall objective of this research is to quantify historical and current relationships among climate, hydrology, land use, and tree populations and model their dynamics under projected climate change over the next century. Sarah Karam, a National Science Foundation EPSCoR fellowship recipient, and her team are using aerial photographs from 1948 to 2005 and time series data to quantify historical relationships among tree cover, land use, disturbance, climate, and groundwater level.

Photo taken from Ash Meadows National Wildlife Refuge (Crystal Spring)

Preliminary results indicate tree cover decreased from 1948 to 1980 and has increased since. Tree cover is negatively correlated with agricultural land use and droughtiness and positively correlated with groundwater level. Droughtiness is expected to increase and groundwater to decrease over the next century. We hypothesize that seedling establishment has a greater influence on tree populations than mortality does. Testing this hypothesis is being done by using a point process model of current tree distributions and greenhouse and field experiments for seedling establishment. Experimental results demonstrate that the relationship of seedling establishment to water availability is species-dependent, suggesting changes in tree cover over time are partially due to shifts in species distributions concurrent with climate change.

National Science Foundation Provides Research Opportunities to Graduate Students in Nevada

Sarah Karam
University of Nevada, Reno
Ecology, Evolution, and Conservation Biology

Sarah Karam is a Ph.D. candidate who will complete her current research in ecology, evolution and conservation biology in the spring of 2012.

Her postdoctoral advisor is Dr. Peter Weisberg at University of Nevada, Reno. Karam is conducting her fellowship research with both Dr. Weisberg and Dr. Elizabeth Leger who is at the Natural Resources and Environmental Science Center at University of Nevada, Reno.

The Nevada System of Higher Education received an award of $15 million from NSF EPSCoR in September 2008. The five-year award is funding science, education, and outreach infrastructure at UNR, UNLV, DRI, NSC, and NSHE's community colleges for the study of climate change and its effects on Nevada.

The project has created a statewide interdisciplinary program that stimulates transformative research, education, and outreach on the effects of regional climate change on ecosystem services (especially water resources) and communicates the research results to decision makers, stakeholders and the public.

About Nevada EPSCoR

EPSCoR builds the scientific research capacity in states that receive less than one percent of federal research funds.

Nevada qualifies as one of 27 states plus Puerto Rico and the U.S. Virgin Islands that benefits from EPSCoR support. State initiatives focus on faculty, students and national laboratory collaborations.

Federal agencies currently funding Nevada EPSCoR programs include: National Science Foundation and National Aeronautics and Space Administration with six programs statewide.

www.nevada.edu/epscor
702.522.7070 for more information

Researchers from the Nevada System of Higher Education were awarded a $750,000 grant from NASA EPSCoR in September 2010 to increase Nevada's ability to participate in NASA research on satellite remote sensing of aerosols and their influence on climate change. This project is funded for three years and will focus on measuring optical properties of aerosols to determine how much incoming solar radiation they scatter back into space and how much they absorb, thereby affecting global and regional climate.

Two other NASA EPSCoR programs began their funding in 2008-2009 for $750,000 each and are finalizing their research findings for the fall of 2011. The team from the project, Nevada Astrophysics, focuses on studies relevant to astrophysics and fusion research lead by Dr. Stephen Lepp at University of Nevada, Las Vegas.

The team from the project, Exploring Planetary Surfaces: Earth, Moon, and Mars, is lead by Dr. Wendy Calvin at University of Nevada, Reno has developed terrestrial and planetary sites (Leviathan Mine, Atacama and Mojave Desert, and Lunar Crater) where surface processes can be explored both virtually and in the field. Multiple remote sensing data products as well as in situ sampling have occurred at these sites.

National Aeronautics and Space Administration

Building Research and Educational Capacity for Satellite Remote Sensing of Aerosols and their Radiative and Climate Change Impacts

Direct radiative forcing by aerosols is second in importance for climate change only to that of greenhouse gases, however with much larger uncertainties due to lack of knowledge of aerosol optical properties and their inhomogeneous distribution.

Dr. Hans Moosmüller, Desert Research Institute, leads the Nevada NASA EPSCoR project by leveraging existing research strength in aerosol optics into the area of aerosol satellite remote sensing. Moosmüller's team is currently building research and educational capacities by: 1. Utilizing and expanding the existing research capacity for in situ measurement and numerical modeling of aerosol optical properties to improve aerosol retrieval in satellite remote sensing with a focus on highly climate-relevant biomass burning and mineral dust aerosols; 2. Connecting the existing NASA ground-based remote sensing network (AERONET) with first-principle-based in situ measurements of aerosol optical properties to establish a direct, traceable connection with satellite retrievals; 3. Establishing a visitor program where NASA-related scientists visit with Nevada scientists, educators, and students and present technical and public lectures; and 4. Developing and teaching a course on satellite remote sensing of the atmosphere contributing to development of Nevada's STEM workforce.

Dr. Moosmüller and graduate research students working on an inverted methane diffusion flame for the generation of black carbon aerosols

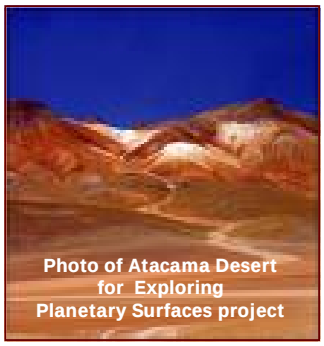
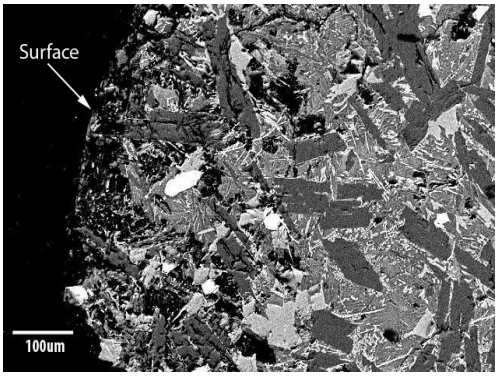


Photo of Atacama Desert for Exploring Planetary Surfaces project

NASA EPSCoR Research Infrastructure Development Project Receives National NASA Funding

Libby Hausrath, Ph.D., an assistant professor at University of Nevada, Las Vegas received a seed grant from the Nevada Space Grant Consortium and Nevada NASA EPSCoR to study phosphate mobility at Craters of the Moon National Monument. The phosphate-rich flows at Craters of the Moon have been documented as a terrestrial analog for phosphate-rich rocks on Mars. The funding allowed her and two of her students, Chris Adcock and Jason Cornell, to begin studies of phosphate mobility, documenting apatite dissolution and the formation of secondary aluminum and iron-rich phosphates in the weathered surfaces of the flows.



Backscattered electron micrograph of the weathered surface of a phosphate-rich flow at Craters of the Moon. Increased porosity and secondary aluminum and iron phosphates may help shed light on the behavior of phosphate on Mars

This work was presented at the Lunar and Planetary Science Conference in 2010, and Hausrath received competitive funding from NASA for a multi-year project to study phosphate mobility on Mars.