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Research poster: Building infrastructure: Climate monitoring transects in Nevada

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Building Infrastructure: Climate Monitoring Transects in Nevada

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INTRODUCTION
Part of the EPSCoR effort to establish cutting-edge scientific infrastructures in Nevada is the placement of permanent environmental monitoring systems in remote locations representative of crucial eco-hydro-climatic zones.

Accordingly, an interdisciplinary team from the Ecological Change and Water Resources project components has been pursuing the goal of identifying suitable locations, partnering with landowners, designing monitoring systems, and acquiring funding systems.

The permanent nature and climate mission of supporting decades of future research experiments makes these instrumental transects a component of Nevada’s EPSCoR program. Each of the transect field sites has been selected to help test or explore the parameters that control and drive eco-hydro-climatic conditions. Here we provide the results of these pursuits, and all of the fantastic research possibilities that they offer.

SITE LOCATIONS
Location, location, location. With the power of geographic coverage in mind, EPSCoR Climate Monitoring Stations have been organized into two separate “transsects,” each one traversing a significant Great Basin mountain range. In eastern Nevada, the lofty Snake Range will be fitted with seven individual stations. To the south, the rugged Sheep Range is set to receive five stations.

Each station will be located in a distinct eco-hydro-climatic zone, using both elevation and the vegetative species mix as indicators of likely differences in mesoclimatic and hydro-climatic drivers. This transect approach to monitoring typical of Great Basals environment types lends Tranlosures’ value to assessing time-series data in relation to climate variability.

By providing instrumentally unique study sites in both north and south regions, the EPSCoR infrastructure allows ecological, hydrological, meteorological, and climatological research to be conducted comparing equivalent observation zones at differing latitudes, along with observations of long-term implications of variable resource-climate interactions.

Initially, team members evaluated several mountain ranges and dozens of potential site locations. Gradually, as partnerships were formed with relevant landowners and managers, the potential sites list was reduced to the seven study transect sites.

EPSCoR stations now harbor agreements with a diverse group of landowners, both private and public. In the Snake Range, all stations (Reno, Sheep Range, and the Las Vegas Transsect) are located on land owned by the Long Family Foundation (transmission). One site located by the Nevada Land Conservation and Survey (ncland.org), with the other three measuring prevailing by the Bureau of Land Management and the National Park Service.

SITE INSTRUMENTATION
Initial instrumentation packages are being deployed in scope, and will allow scientists from a wide range of disciplines to apply themselves with success to critical research questions regarding changes in climate and impacts to various environmental systems.

Monitoring hardware includes a standard meso-ecological complement - wind speed/direction, air temperature, precipitation, net radiation, soil moisture, and snow depth. Further ecological and biological data will also be observed, and water content, soil infiltration rate, soil and temperature, and soil heat flux, with applicable locations logging runoff, shallow subsurface flow, water level, tree stop flow, and tree radial growth.

In addition to the sensor packages, we will also be utilizing various remote conditions such as plant cover, soil ph, glass production, and leaf death data, etc. System design has incorporated flexibility in power supply, data storage, and communications capabilities to support a range of future research activities in addition to the initial installations.

TECHNOLOGY
In order to provide years of reliable service, the transect equipment design is being kept as robust and as simple as possible, while still being able to facilitate stable access and data research (transit costs within the Project Proposals). Case equipment for data logging and remote storage is sourced from Campbell Scientific, as are many of the basic sensors. Infrared analyzers include Taranis and SILT models. Infrastructure design allows deployment and removal of transect data in 30 days. The equipment is designed to be cost-effective and to provide reliable data generation and storage capacity for the present as well as the future.

A communications system is truly the backbone of any remote installation; the amount and type of data delivery directly affects the capabilities of any monitoring system. In order to facilitate the deployment of the EPSCoR installations to a wide range of scientific investigations, communications systems being considered that utilize as much modern technology as possible, while still providing reliable delivery of data.

While the ultimate goal would be to have high-speed wireless internet connections at each tower, it is clear that some sites will allow the same infrastructure. Factors that influence wireless planning are water access, annual weather extremes, on power capacity, distance to internet access points, and costs. Initially, some sites will for minimal communications capacity, and multiple telecommunication technologies will likely be evaluated at the more remote locations over the life of the project for effectiveness and durability.

Dr. Frances Brandt contemplates wide view climate in the shadow of Peter Engle (Great Basin Biological Float) near the Las Vegas daughter site.

National Park Service Ecologist Dr. Dale Bird and David Simeral near the Nevada Land Conservancy approach site.

Dr. Michael Young delivers with Brian Bird and Dr. David Simeral at Sheep Range 2, a Joshua Tree and Blackbrush community.

Google Earth view of the Sheep Range transect locations already permitted (looking north from Stovepipe Wells).