Reaching Nevada's Students Through The Education Component Climate Change Institute

2012 Nevada EPSCoR Annual State Meeting

Aubrey M. Bonde

Poster abstract

The Education Component (Clark County contingent) is going into its 4th year of involvement in the EPSCoR program. Our focus is to instruct southern Nevada's educators on climate change in the southwest through various class activities, field trips, guest lecturers, reading topics, and in-class discussions. We have successfully run three summer institutes with a total of fourteen teacher participants from the Clark County School District System (CCSD). This figure is taking into account that five of our teachers participated in the program for two summers. We expect another five teachers to join the program for 2012. Nearly all teachers come from different middle and high schools around Las Vegas and Boulder City therefore allowing the climate change content to reach the highest amount of distribution throughout the school district as possible (given the limited numbers of teacher enrollment allowable by budget). Each teacher instructs approximately 140 students per day (accounting for an average classroom size of 28 students per teaching period and five class periods in a day). This means we have witnessed a total of 2660 students throughout CCSD that have already been reached with the climate change content available through this grant. This year an additional 980 students will be instructed on climate change when we have a total of seven teachers during the 2012 summer institute. (Important note - These figures do not take into account the maximum capacity of students reached. If we consider that the teachers who were in the program from 2009 and 2010 have taught the content to all their classes in subsequent years (6 teachers in 2009, 6 new teachers in 2010, and 2 new teachers in 2011, this would nearly double this figure for a total of 4480 students reached!)

The goal is to disseminate climate change information, activities, and lesson plans to as many schools, teachers, and students as possible. We are not only reaching these people first-hand but are making the content available to schools not enrolled in the program via the data portal. This means that any teacher from across the state could access the climate change materials we use in the summer institute thereby maximizing the number of students receiving climate change science information through this grant.

Title: The role of areas of endemism, transitional areas, and Pleistocene climate change in the formation of North American Desert biodiversity.

Authors: Mallory E. Eckstut and Brett R. Riddle

Presenting author is a graduate student

Abstract: Exacerbated rates of climate change have made it vital to understand how changing climates alter regional floral and faunal distributions in order to prescribe effective conservation strategies. Areas of endemism (areas that generate and maintain unique lineages through time) may be an improved approach to regional biodiversity conservation. Alternatively, regions between areas of endemism ("transitional areas") tend to have the highest species richness as the result of the intermixture of species dispersing out of two or more areas of endemism. Thus, these regions are often the focus of conservation efforts. However, conserving transitional areas may be inadvisable for conservation efforts because these regions are often only ephemerally rich during periods of environmental change, such as glacial of interglacial cycles. In order to gain an enhanced understanding of the evolutionary dynamics of areas of endemism and identify areas that may be most stable through climate change events in the North American deserts, we conducted a multi-organism evolutionary biogeographic analysis (Phylogenetic Analysis for Comparing Trees; PACT). This analysis allows us to further investigate the impacts of climate change on the evolutionary and distributional dynamics of North American desert biodiversity and provide more information for prescribing effective regional conservation strategies. Preliminary results suggest that areas of endemism in the North American warm deserts have more stably retained biodiversity through historical climate change than transitional areas; however, the Sonoran Desert acts as both an area of endemism for some organisms and a transitional area for other organisms during Pleistocene climate change. Expanding this analysis to include the Great Basin Desert (a cold desert) will provide an enhanced understanding of desert response across environmental gradients and may reveal more stability in Mojave biodiversity than previously observed.

Leadership Diversity and Innovation Capacity for Sustainability

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There is a collective absence of leadership diversity on the board of directors for many publicly traded corporations around the world. Throughout history men have dominated the business sector and through experience and seniority, men typically oversee company leadership positions as well. Within the past few decades women have begun entering the business sector and have worked their way into leadership roles, but are still underrepresented. Women have been directly correlated to positive company behavior and performance and feel they bring about unique sensitivities along with general board-related competence and experience. Therefore, leadership diversity on a board of directors is an important element for businesses.

Recently, there has been an increase of sustainability initiatives on business agenda's around the world, and the board of directors strongly influences decisions regarding sustainability. The purpose of this study is to identify if the proportion of women on a board of directors influences the success of a company's sustainability outlook and performance. This was done by analyzing the relationship between leadership diversity on board of directors and a corporation's innovation capacity of the top 100 most sustainable corporations in the world in 2011. Data points were based off a list put together by The Corporate Knights, a magazine for clean capitalism, and each year they generate a list called, The Global 100: Most Sustainable Corporations in the World. The data was statistically analyzed using the Linear Regression Model, Pearson Correlation Coefficient, and a one-way ANOVA Procedure.

Utilizing this data set I predict that companies with greater leadership diversity on board of directors will have a higher innovation capacity. The results of this study show that there is a negative relationship between leadership diversity and innovation capacity, however it is an extremely weak relationship due other contributing factors and missing data points.

Intermittency in dust deposition rates around the world: the story of hiatuses affecting rates

Noah Fraser

Abstract

Deposition rates for intermittent processes tend to depend on temporal measurement interval. This age interval bias can be used as a tool in evaluating the intermittency of dust deposition. Dust deposition is an intermittent process controlled by dust creation (erosion) and transport (dry winds). During glacial periods it is more likely that cold, dry winds will transport dust regionally and sometimes globally than during the warmer, wetter interglacial periods As deposition rates are estimated in loess cores over longer and longer time spans, it is more likely that large non-depositional or erosional periods may be incorporated into the average rate. Since loess cores are sampled by depth and material profile, the reported analysis rarely have equally space time intervals which causes age interval bias. 50 loess core profiles from Central Asia, New Zealand, North America, and Europe show the presence of power-law distributed hiatuses within the dust deposition record. Regional and global analysis of these 50 loess cores showed that dust deposition rates are equally affected by age interval bias no matter the scale. The rate versus age bias is used to scale away the hiatuses and recalculate average instantaneous dust deposition rates from loess cores. We find that over the last 3 million years, worldwide dust deposition rates varied from 0.004-5 cm/year.

Lauren Fossile

Abstract for NV State Climate Change Meeting 2012

Energy Purveyors and Climate Change in Nevada: Knowledge, Needs and Perspectives

Due to a large volume of greenhouse gas emissions coming from the generation of electricity, energy providers are in a unique position to work towards climate change mitigation. A multi-method survey was created for our NSF-funded study in order to discover the knowledge-base, needs and perspectives of energy purveyors in Nevada. There are five major sections to the survey. The first section focuses mainly on categorizing the type of organization being surveyed (i.e. size, public or private). The second focuses on organizational plans regarding mitigation and adaptation practices. The third section contains questions focusing on the type of data the organization uses in its planning, and the types of modeling utilized. The fourth section focuses on the beliefs of the purveyors (i.e. regarding the origin of climate change). The final section contains questions focusing on demographic information, so that the data collected in the survey can more easily be compared to other stakeholder surveys. Organizations were given the choice of taking the survey over the phone, online, or in a hard copy version mailed to them with a prepaid return envelope enclosed. The results are intended to inform researchers, purveyors, and those in the political arena. NSF EPSCoR Grant # EPS0814372.

Annual Nevada EPSCoR meeting abstract.

"*Untangling the Development of An Extreme Urban Heat Island Signal for the Arid, Complex Terrain City of Reno, Nevada"*

***Benjamin J. Hatchett**, DRI, Reno, NV; and J. F. Mejia and D. R. Koracin*

The urban heat island (UHI) is a well-studied phenonmenon in many large cities and its magnitude can generally be estimated by log of population (Oke, 1973). Reno, Nevada presents an interesting case in that this method underpredicts the observed (UHI) by nearly an order of magnitude. The presence of a severe summertime (JJA) Reno UHI has been speculated by Billings (2006) and Menne et al. (2009). A further complicating factor is the lack of nearby rural stations to calculate the classic UHI indicator delta T(u-r). Here we present a detailed analysis of driving forces in the Reno UHI using hyperspectral Landsat TM data, long-term data (1950-present) from 20 surface stations, 27 years of NWS upper air data, population data and parcel-scale GIS maps of landuse type. The local temperature change is isolated by removing the JJA regional climate signal (derived from the Western Regional Climate Center) from the Reno timeseries. We develop a standardized anomaly procedure for identifying UHI events in Reno and compare these events to nocturnal boundary layer heights to understand how the UHI causes perturbations to the boundary layer. Spectral analysis is performed on annual and seasonal scales to understand the role of larger scale phenomenons in forcing UHI signals at these timescales. Finally, we attempt to develop historical relationships between temperature perturbations and landuse changes as well as landuse trends based on population changes. We then apply future population estimates to these relationships to derive future UHI perturbations which are applied to statistically downscaled IPCC climate scenarios for Reno. Climatologies of extremes will be presented under various scenarios of future climate and growth projections. These future urban climate scenarios can be used by policymakers and resource managers at local and state levels to adapt policies and strategies designed to mitigate negative effects on public health and infrastructure as well as realize potential vulnerabilities in urban infrastructure.

Plant Response to Climate and Hydrologic Factors: The Importance of Vegetative Microclimate and Elevation in the Successful Germination and Establishment of *Abies magnifica* Seedlings

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Abstract:

Microclimates created by mature vegetation can strongly influence the establishment patterns and survival success of conifer seedlings by altering local temperature, soil moisture, and solar radiation levels. *Abies magnifica* (California red fir) trees grow in a narrow band on the eastern slope of the Carson Range in western Nevada, nearly exclusively on north-facing slopes. While abundant on the western slopes of the Sierra Nevada, this distribution of *A.magnifica* on eastern slopes is likely limited by drier climate conditions, and microclimate refugia may aid in species persistence. Understanding the establishment and survival patterns of *A.magnifica* seedlings based on microclimatic and topographic factors may help predict spatial patterns of future regeneration. This study compares *A.magnifica* seedling establishment in a range of vegetative microclimates over an altitudinal gradient. Seedlings were sampled in replicate watersheds on the eastern slope of the Carson Range and associated abiotic data were monitored over the summer of 2011. Soil surface temperature, below soil temperature, and soil moisture in open and shrub-shaded microclimates differed significantly across all elevation classes. Elevation significantly influenced the occurrence of seedlings in vegetative microclimates. *Abies magnifica* seedling occurrence was significantly greater in open microclimates at high elevations than in shrub-shaded microclimates, while at low and intermediate elevations occurrence was significantly greater in shrub-shaded microclimates. These preliminary results suggest that preferred establishment microclimates change across an altitudinal gradient, possibility due to changes in abiotic stress. These differences may be a significant factor in determining seedling establishment success and consequent mature stands of *A.magnifica*. Understanding the importance of microclimate refugia to *A.magnifica* seedlings is vital for determining future watershed vegetative cover, which in turn, aids hydrologic modeling activities where vegetation composition influences water infiltration and run-off patterns. This research contributes to investigations of the role of climate change and the distribution of coniferous trees throughout the western US.

Presenting author is a graduate student.

Occupancy patterns of a small mammal (*Neotoma cinerea*) in the Great Basin through late Quaternary climate changes: assessing the assumption of local adaptation

Angela D. Hornsby and Marjorie D. Matocq

EPSCoR Graduate Fellow

Program in Ecology, Evolution, and Conservation Biology; Department of Natural Resources and Environmental Science; University of Nevada, Reno

It is often assumed that low-vagility montane organisms such as the bushy-tailed woodrat (*Neotoma cinerea*) underwent demographic declines in the Great Basin following the last glacial maximum due to warming climate and upslope retraction of suitable habitat. A common way to assess this hypothesis is to compare the amounts of suitable habitat using species distribution models projected to paleoclimate reconstructions, which assume temporal niche stability. We may make these models more regionally-specific by using subsets of occurrence data to represent localized clades or ecotypes; however, this introduces the additional assumption of regional adaptation or that localized clades are unable to occupy the full range of the species' realized niche if given the opportunity. Our goal was to assess whether this assumption was fair in *N. cinerea*, an organism known to change phenotype (body size) and thus thermal niche in localized areas over time. We first established *N. cinerea* late Quaternary demographic trends using primary paleomidden data and genetic coalescent and Bayesian skyline analyses, which confirmed the expected demographic declines through the Pleistocene-Holocene transition. We then built both regional and wide-scale distribution models projected to paleoclimate reconstructions for comparison. The wide-scale model agrees with the paleorecord and genetic patterns in suggesting declines of suitable habitat since the last glacial maximum, and the regional model challenges them by suggesting that *N. cinerea* specific to the Great Basin saw expansion of suitable habitat since the last glacial maximum. In this instance, the model that does not assume regional adaptation was more consistent with the independently inferred demographic trends. Overall, these analyses demonstrate that the biological assumptions behind distribution models must be explicit to avoid misinterpretations when projected to climate models across time.

Title: Precipitation extremes in the western United states: its spatiotemporal changes under natural climate variability and human-induced climate change

Presenter: Peng Jiang

Authors: Peng Jiang, Zhongbo Yu, Department of Geoscience, University of Nevada, Las Vegas; Thomas C. Piechota, Department of Civil and Environmental Engineering, University of Nevada, Las Vegas; Mahesh R. Gautam, Division of Hydrologic Sciences, Desert Research Institute, Reno

Changes in the frequency or intensity of extreme precipitation events would have profound impacts on both human society and the natural environment. Previous studies suggested that both the human-induced global warming and natural climate variability are important contributors to the recent high extreme precipitation values. In this study, we strive to offer a comprehensive analysis of spatiotemporal changes in precipitation extremes in the western United States. We seek to: (1) identify spatial and multi-scale temporal variability in precipitation extremes (1948-2009) using wavelet analysis; and (2) determine the spatial characterization of the ENSO-extreme precipitation response pattern by calculating the correlation coefficient between Jun-Nov average Southern Oscillation Index (SOI) and five selected indices for precipitation extremes during the winter period (Oct-Mar). Preliminary results indicated that ENSO-extreme precipitation relationship displays a bipolar pattern between Northwest and Southwest, although the boundaries of the dipole center are not the same for ENSO and different extreme indices. The western United States are undergoing rapidly changing social dynamics and pressure including increasing population and a greater risk of water shortage. Better Understanding of spatial correlation between large scale climate pattern and precipitation extremes and the multi-scale temporal variability of different extreme precipitation indices due to the natural climate variability and human-induced climate change will benefit water resource management and climate forecasting in this area.

Distributional responses of desert trees to climate change: factoring in disturbance legacies and dispersal limitations

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Spatial distributions of trees develop from complex interactions between population processes, environmental conditions, and disturbance over long time periods, frequently resulting in a disparity between the potential and actual distributions of a species. These disparities reduce our ability to predict shifts in distribution in response to climate change. We used object-based classification of LiDAR and QuickBird data to develop maps of individual trees for velvet ash (*Fraxinus velutina*), honey mesquite (*Prosopis glandulosa*), and screwbean mesquite (*P. pubescens*) at Ash Meadows National Wildlife Refuge, a desert springs complex in southern Nevada. Maps representing the potential distribution of each species were developed from greenhouse and field experiments identifying the probability of seedling establishment in relation to water availability and salinity. We found discrepancies between the actual and potential distributions, reflecting unidentified effects of population processes, environmental conditions, and disturbances. We focused on seed dispersal, fire, and human land use as potential explanations for these discrepancies. We used our tree distribution maps to develop seed dispersal probability response surfaces for wind-dispersed velvet ash using measured seed dispersal distances, and for gravity- and animal-dispersed mesquite species, using locational data for coyote scat. A map of fire probability was based on recent fire occurrences and site environment. Roads, agriculture, hydrological alterations, and mining were extracted from aerial photos. Based on the spatial location of discrepancies between the actual and potential distributions, land use appears to have the greatest effect on the distribution of velvet ash, while seed dispersal has the greatest effect on honey and screwbean mesquite distributions. These results suggest how even similar species may respond idiosyncratically to climate change due to differing responses to changing water availability, affecting their potential distributions, and changing land use and fire regimes, which affect their realized distributions.

Northern Nevada EPSCoR Science Teachers Bring Climate Change to the Classroom

Timothy Kiley, University of Nevada, Reno, College of Education, Graduate Student

Jacque Ewing-Taylor, Director, Raggio Research Center for STEM Education, UNR

Abstract

This poster will highlight four to six exemplary climate change lessons designed by our K-12 teachers who participated in the EPSCoR Summer Institutes at UNR.

A four to six part poster sectioned with photographs of the teachers and a summary of the lessons will be prepared for presentation. This will show the tangible and applicable results of the training the EPSCoR Summer Institutes have provided to Washoe County School District science educators.

The goals of the presentation are to introduce the work of the participating teachers to the NSF EPSCoR general community and to highlight the work the teachers are doing to bring climate change science into the K-12 classroom. An outgrowth of this project will be a data base of climate science lessons, organized into a laboratory manual and distributed to all EPSCoR science educator participants.

The EPSCoR GRA is the Education Coordinator for northern Nevada, and in that capacity, he helps to organize and run the Summer Institutes for participating teachers, runs the two follow-up meetings and observes the teachers implementing their lessons in the classroom. All participants provide detailed copies of the lessons they prepared, either in a usable “lab book” format or with permission to structure their lessons as such based on the papers they wrote for the course credit (UNR GEOG 691). Field notes from classroom observations of lessons taught, and the lab/activity write-ups done by the teachers, will be used to design and structure the poster.

The poster presentation will be useful for NSF EPSCoR Nevada State Climate Change Meeting attendees as it presents the actual, tangible results of the teacher training. The poster information will be made available to participant teachers via the EPSCoR portal as a precursor to the planned laboratory manual. This will also allow all past participants to benefit from useful lessons and activities for the future and give the 2012 participants ideas for the lessons they will design as part of their Summer Institute required output.

Evaluation of Regional Downscaling Predictions of Future Drought Probabilities in the Western United States

K.C. King, Graduate Student, Desert Research Institute/University of Nevada, Reno, NV; J. F. Mejia, D. McEvoy, and D. Koracin

In order to investigate regional predictions of future climate for the Western United States, a number of different regional statistically and dynamically downscaled products were compared to determine how each method represents current and future drought probabilities. Each downscaled product was forced with Coupled Global Climate Model output from the WCRP CMIP3 multi-model dataset for the SRES- A2 emissions scenario. The analysis focused on comparison of the dynamically downscaled simulations using the Desert Research Institute's Regional Climate Model (DRI-RCM) based on the Weather and Research Forecasting Model (WRFV3.2.1) with other downscaling products. DRI-RCM output consists of 36 and 12 km resolution products for the periods 1971-2000 and 2041-2070. In order to determine the skill and uncertainty of these simulations, DRI-RCM simulated data were compared to the Global Climate Model projections (Scenario SRES-A2) and previous statistical and downscaled results from the Bureau of Reclamation Bias Corrected and Spatially Downscaled Climate Projections (BoR), the University of Idaho's modified Bias Corrected and Spatially Downscaled Climate Products (ID-BCSD), and the North American Regional Climate Change Assessment Program (NARCCAP) dynamically downscaled projections. BoR projections provide 1/8th degree (12 km) resolution and the ID-BCSD provides 1/32nd degree (4 km) resolution statistically downscaled climate variables through 2099 for the United States. NARCCAP dynamically downscaled predictions provide 50 km resolution products (both surface and upper air) using four different GCMs and a number of regional climate models (RCMs) driven with the emissions scenario SRES-A2 over most of North America. Using the Standardized Precipitation-Evapotranspiration Index (SPEI), the probability of drought was analyzed for specific regions of the Western United States over the period 2040-2070 for each downscaling method described above. Statistical tools were then applied to compare the results.

Using runoff collectors to understand surface runoff in remote Nevada catchments

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Dr. Laurel Saito, Graduate Program of Hydrologic Sciences and Department of Natural

Population growth in Nevada and climate change are placing greater demands on water resources in an already arid region. Future water demands in Nevada will increasingly rely on groundwater, yet data to estimate groundwater recharge are extremely limited in most areas of the state. Surface water contributions to groundwater recharge from ephemeral, remote catchments are difficult and expensive to measure, and are often estimated using modeling techniques based on limited or no actual measured runoff or precipitation data. Understanding runoff is important because if runoff exists, it can move the location of recharge, affect the distribution of plant and wildlife communities, as well as impact the water balance of surface water resources.

In this study, runoff collectors have been installed at 12 sites in the Snake and Sheep Ranges in Nevada to quantify runoff over time. The collectors were deployed at monitoring transect sites in the Snake and Sheep Ranges that are part of the Nevada NSF EPSCoR Climate Change Project. Thus, temperature, precipitation, soil moisture, and other data will also be collected in the vicinity of the runoff collectors. Rainfall simulation experiments were completed at one of the Sheep Range sites to simulate different sizes of storms and their impacts on surface runoff. Data from the runoff collectors and rainfall simulation experiments will be used to understand the storm characteristics and conditions that result in runoff and test the hypothesis that predicted changes in climate will result in more surface runoff in Nevada.

Research Title: Investigating Rural Nevadan Perspectives on Climate Change Solutions

Author: Tricia Mynster, Doctoral Candidate

This research addresses the problem of science information, communication, skepticism, and the climate change crisis. Despite the scientific agreement that anthropogenic climate change is occurring and a threat (*IPCC, 2007*), there is a growing number of climate skeptics in America that do not support policies aimed at stabilizing the climate (Leiserowitz, Maibach, & Roser-Renouf, 2009). My research offers a case study approach to understanding some of the pitfalls and potentials of the climate communication process. I focus my analysis on the rural ranching area of Churchill County Nevada, whose residents rely on scarce hydrological resources that are particularly vulnerable to climate change (Safi, 2011). Using ethnographic field methods, such as interviews and, possibly, participant observation, I will investigate their attitudes, perceptions, and knowledge about climate change solutions and energy issues, the sources of their climate change information, and how they use climate change information to construct their beliefs and direct their actions toward climate change problems.

Previous studies have shown the region of the case study I have chosen to be almost uniformly conservative and skeptical about climate change, although the majority of them do support cleaner renewable energy, a primary technology to address climate change problems (Safi, 2011). In fact, Nevadans generally show far more support for renewables than conservative skeptics nationwide (Safi, 2011; Leiserowitz, Maibach, & Roser-Renouf, 2009). To gain stronger analytic purchase on climate change attitudes and perceptions, my research will delve deeper into Nevadans' support for renewable energy as a climate change mitigation strategy.

Political Orientation and Climate Change at the University: A Look at Professors' Political Views and Beliefs Concerning Climate Change

Marissa C. Owens and E. Michael Nussbaum, University of Nevada, Las Vegas

There is overwhelming evidence that political orientation has an effect on a person's climate change beliefs (McCright, 2011). This idea is particularly interesting when it is investigated within higher education. This research follows up on the results of a climate change survey that was administered to professors at UNLV and UNR. The goal was to determine what beliefs professors have concerning climate change, their level of acceptance of climate change, and their beliefs concerning what their students know about climate change. In addition to determining this goal, the following research questions were asked: In what way does political orientation frame the climate change beliefs of professors? Does political orientation also have a moderating effect on professors' beliefs concerning educating their students about climate change? Results of the survey determined the following: 63% of professors consider themselves somewhat to very liberal; 81% of professors believe that they personally do things that might contribute to climate change; but surprisingly enough, since the majority of professors consider themselves liberal, 34% of professors somewhat to strongly agree with the statement that they do not believe in climate change. Not so surprisingly, the moderating effect of political orientation was present in that the more liberal professors believed that we are in a period of climate change and human activity is playing a role. There was no correlation between political orientation and whether professors felt it was their responsibility to educate students on the topic of climate change.

Cognitive Congestion Control for Data Portal

Ershad Sharifahmadian, Shahram Latifi
University of Nevada, Las Vegas

Network congestion is one of challenging tasks in communication networks and leads to queuing delay, packet loss or the blocking of new connections. Here, a data portal is considered as an application-based network, and a cognitive method is proposed to deal with congestion in this kind of network. The cognitive method is proposed to improve bandwidth sharing, and deal with congestion in a data portal. When the data portal is about climate change data, congestion control is more emphasized, because the scientific climate data is voluminous and there is a high traffic to/from data portal by the scientific community, research groups, and general readers. In fact, this study is performed to improve congestion control in data portals like climate change portal.

Unlike previous methods for congestion control, the proposed method is an effective approach for congestion control when the link capacity and information inquiries are unknown or variable. The variation of link capacity has an influence on the queue. Here, the controllable parameter α dynamically changes over the time and helps the queue to have a smoother behavior while guaranteeing that is set based on pre-defined operating conditions.

The learning phase is a key step in the cognitive method. During this step, the cognitive node exploits the collected information in the observation phase using the Bayesian network model to build a probabilistic structure which connects desired parameters.

To build the DAG representing the probabilistic relation between the variables, the scoring approach and the constraint approach are utilized. The Bayesian information criterion is selected for scoring, and is based on the maximum likelihood criterion. The Maximum Likelihood Estimation (MLE) technique is used to build a predictive model and estimate the appropriate set of the parameters describing the conditional dependencies among the variables.

The cognitive method was tested under different situations such as unexpected variations of link capacity, oscillatory behavior of the bandwidth. Based on simulation results, the proposed method is capable of adjusting the available bandwidth by tuning the queue length, and providing a stable queue in the network.

Title: Status & Design of the NV-EPSCoR Remote Environmental Monitoring Transect Stations, Snake and Sheep Ranges, Nevada

Authors: Scotty Strachan (University of Nevada, Reno), Brad Lyles (Desert Research Institute), Brian Bird (University of Nevada, Las Vegas), Greg McCurdy (Desert Research Institute)

Abstract:
Over the past three years, a team of specialists from the Desert Research Institute, University of Nevada, Las Vegas, and University of Nevada, Reno, has been architecting a system of remote monitoring stations designed to assess baseline climatic, ecologic, and hydrologic conditions in two critical regions of Nevada. These stations have been engineered to not only produce data of immediate use to a wide range of environmental sciences, but also to provide a sustainable platform of experimental and observational expandability. In order to minimize costly down-time, field inspection, servicing, and maintenance events, key support infrastructure such as real-time communications, system health monitoring, and on-site power generation are being implemented in ways that attenuate up-front costs but provide long-term efficiency and redundancy. Best-practices design in electrical systems with a focus on simplicity and fault-protection increases system reliability at high elevations where site access is limited to 4 months per year. Leveraging modern technologies in the form of IP (Internet Protocol) networking allows for real-time high-speed data transfer to project servers, remote device control and configuration, on-site internet access, and remote troubleshooting. Scientific sensory deployments are held to uniform, established protocols to ensure comparability and compatibility with legacy datasets. Out of 12 stations planned, 11 have been constructed and are currently experiencing their first full winter season. Data on system performance is being gathered which will allow adjustment of hardware configurations to increase future reliability. Successful operation of complex, remote, and limited-budget stations will provide environmental scientists with a valuable resource to advance critical climate, water supply, and ecological research in Nevada.

Remote Snow Data Collection

Benjamin Trustman- Undergraduate, University of Nevada Reno , Laurel Saito-Project Mentor, University of Nevada Reno, Mark Walker-Project Mentor, University of Nevada Reno

Abstract

The recent increase in climate change research has emphasized the need for precipitation data, but such data are often limited in remote areas in Nevada. In Nevada's snow dominated basins it is even more challenging to obtain snow data. Snow measurements, especially those made by automated weather stations, are expensive (about $25,000 for installation of a SNOTEL site), so snow data are sparse. In 2009 a project demonstrated that wildlife guzzlers, an inexpensive storage structure to augment water supplies for wildlife, can be equipped with simple, low cost precipitation measurement devices. Another project used sonar devices and manual snow water equivalence measurements with prototype wireless sensors to estimate snow depth (SD) and snow water content in the Sierra Mountains. This project will build on findings from both projects to examine the feasibility of measuring **(**SD) and snow water equivalence (SWE) at a low cost in remote catchments. The student on this project recently received an NSF EPSCoR Undergraduate Research Scholarship. At this stage the equipment has been installed and the project will collect data from the current winter season.

Future Projections and Uncertainty Assessment of Extreme Rainfall Intensity for Las Vegas Region

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Abstract: Changes in climate are expected to lead to changes in the characteristics of rainfall events, such as extreme rainfall frequency and intensity in many regions. In this study, we explore potential change and associated uncertainty in extreme precipitation from possible future climate scenarios. In particular, we investigate possible changes in intensity-duration-frequency (IDF) relationships for the Las Vegas region. IDF relationships are often used for planning and design studies aimed at flood mitigation, runoff conveyance, and channel restoration projects etc. An integrated approach is presented that incorporates uncertainties due to both the short simulation periods of regional climate models (RCMs) in representing rare long return-period rainfall intensities, and differences in IDF curves derived from different RCMs in the North American Regional Climate Change Assessment Program (NARCCAP). The approach combines the likelihood of individual RCMs according to the goodness of fit between the extreme rainfall intensities from the RCMs' historic runs and those from the National Centers for Environmental Prediction (NCEP) North American Regional Reanalysis (NARR) data set and Bayesian model averaging (BMA) to assess uncertainty in IDF predictions for the Las Vegas region. We also partition overall uncertainties into within-model uncertainty and among-model uncertainty. Results illustrate that among-model uncertainty is the dominant source of the overall uncertainty in simulating extreme rainfall, pointing to the difficulty of predicting future climate, especially extreme rainfall regimes. For Las Vegas region, the calculated change of extreme rainfall intensity from future scenario runs compared to historic runs ranges from -3.4% to 34.3% with increase mostly in the short-duration high-intensity regimes.