Research Mentors for NSF-REU 2012 Summer Program

From Tahoe to Pyramid Lake: Natural Resource Issues in the Sierra Nevada and Great Basin Region

University of Nevada, Reno Academy for the Environment and Great Basin Institute

Scott Bassett – Geography Department, UNR

A research and teaching faculty member, Dr. Bassett’s current research focus involves the role of climate in shaping human and natural systems. He is evaluating how land use change may evolve as climate patterns are altered. Additionally, he is attempting to understand how past, present and future climate interactions influence vegetation pattern. His research with REU students will focus on field assessments of vegetation patterns in a high elevation mountain environment located on the east slopes of the Sierras.

Sudeep Chandra – Natural Resources and Environmental Science Department, UNR

Past recipient of Teacher of the Year for his college, Dr. Chandra has had extensive experience teaching undergraduates in the field. He has classical training in limnology evaluating the impact of land use change on freshwater ecosystems. Taking an ecosystem-based approach, he has evaluated the impact of historical nonnative species introductions and nutrient loading on the food web structure of the lake. An advocate of the conservation of freshwater resources, Dr. Chandra became an advisor to the Paiute tribe of Pyramid Lake (USA) as they try to restore the cutthroat trout and the endangered Cuiui. Dr. Chandra has been studying the Lake Tahoe-Truckee watershed for the last 5 years. His research with REU students will focus on understanding aquatic invasive species in Lake Tahoe and the role they play in controlling native organisms.

Chuck Coronella – Department of Chemical & Materials Engineering, UNR

The overarching theme of Dr. Coronella’s research is conversion of low-value or negative-value waste products to high-value products of use to society. Recent work includes research in the areas of upgrading and conversion of biomass to biofuels, and conversion of wastewater sludge to energy. This work is primarily experimental, and involves some modeling as well. Dr. Coronella has worked with many undergraduate researchers in chemical engineering over the past 15 years, and enjoys sharing his experience and enthusiasm with energetic and ambitious students.
Peter Goin – Art Department, UNR

As a research artist, Professor Goin is involved in many book publications and projects. He is author of Tracing the Line: A Photographic Survey of the Mexican-American Border, Nuclear Landscapes, Stopping Time: A Rephotographic Survey of Lake Tahoe, Humanature and Lake Tahoe. Peter’s photographs have been exhibited in more than 50 museums nationally and internationally, and he is the recipient of two National Endowment for the Arts Fellowships. REU students will participate in rephotography of fire affected landscapes, a continuing visual analysis of the Angora Fire region in South Lake Tahoe. This project involves archive research and image management across the spectrum of historical landscape photographs and also producing contemporary views of spectacular Lake Tahoe.

Kim Rollins – Department of Resource Economics, UNR

The conceptual basis of the work of Dr. Rollins involves economic problems associated with allocation of public goods, incentive mechanisms for optimal conservation and use of environmental amenities, and valuation of environmental amenities. The diverse applications of her research program provide opportunities to continue to learn more about how society depends upon the natural environment. Dr. Rollins will involve REU students in field surveys of the ecological goods and services provided by, and at risk, in the Lake Tahoe Basin.

Peter Weisberg – Department of Resource Economics, UNR

Dr. Weisberg is a landscape ecologist whose research focuses on natural disturbances such as fire and floods, invasive plant species, and plant community response to climate change, disturbance, and resource management practices. He has been studying the ecology of the Great Basin, Mojave Desert and Sierra Nevada regions for the past eight years. His research with REU students will explore the environmental controls on tree distribution at their lower altitudinal limit in the context of landscape connectivity, emerging threats to biodiversity, and global change processes.
Overview of Research Projects for the NSF-REU 2012 Summer Program

From Tahoe to Pyramid Lake: Natural Resource Issues in the Sierra Nevada and Great Basin Region

Sponsored by the University of Nevada, Reno Academy for the Environment and Great Basin Institute

The REU program of the Academy for the Environment and the Great Basin Institute links nationally recruited undergraduate students with accomplished academic scientists to further our scientific understanding of the Lake Tahoe-Truckee River-Pyramid Lake watershed within the eastern Sierra Nevada bioregion. This program encompasses a wide range of research experiences in socioeconomic and natural resource science. Participants will be exposed to diverse scientific inquiries and technologies to gain insight into the manner in which science informs land use policy, management and conservation initiatives. The overarching goal of this program is to explore the interdisciplinary intersections of the various subfields in the sciences that are required for adaptively managing watersheds. Our research projects are situated within a biologically diverse watershed, a unique ecological system that provides varied and compelling research opportunities in mountain, desert, and riparian communities. The desired outcome of our collaborative research will bridge students, faculty, and natural resource managers in a collective effort towards enhancing our scientific understanding of regional conservation issues in an applied context.

Research Projects

Research on the impacts of past and possible future climate change on the hydrology, energy budget, and vegetation in a high elevation mountain environment near Lake Tahoe. This project will involve the collection and analysis of field data in support of an effort to develop a climate change field station in the Galena Creek watershed located between Reno and Lake Tahoe. The REU student will have an opportunity to use computers to perform a variety of analysis and comparisons of the field observations with long-term climate observations and Global Climate Model (GCM) estimates. (Scott D. Bassett, Department of Geography).

The Great Basin Institute, in partnership with the US Forest Service and Washoe County Parks and Open Spaces, seeks students to conduct recreation assessments and provide analysis of historic and existing interpretative programs and visitor service efforts along the Mount Rose Scenic Byway corridor. As a major conduit to Lake Tahoe, the Mount Rose Scenic Byway provides a wealth of recreational and educational opportunities to local communities and visitors. Students will collect data on visitor usage trends, inventory agency resources, and examine the viability of public/private partnerships as a means toward sustaining natural resource management of this unique resource area. Those interested in travel management, resource economics, and multiagency collaborations will benefit greatly by having gained experiential knowledge of current programs, including public outreach and science education programs. At the conclusion of the field work, participants will have a broad understanding of trends and strategies for managing the wildland urban interface. (Jerry Keir, Great Basin Institute)

Research investigating the influence of warm water fishes on the ecology of Lake Tahoe, and determining the feeding strategies of crayfish and shrimp in Lake Tahoe and surrounding lakes. Specifically, the student will assist in field collections and, possibly, experiments to determine the impacts of invasive species on Lake Tahoe's ecology. (Sudeep Chandra, Department of Natural Resources & Environmental Science)
Rephotography of fire affected landscapes and historical views: A continuing visual analysis of the Angora Fire region in South Lake Tahoe, photographing historical images of fire affected areas within the Tahoe Basin, and establishing new visual reference points for future landscape change analysis. This project involves archive research and image management across the spectrum of historical landscape photographs and also producing contemporary views of spectacular Lake Tahoe (Peter Goin, Department of Art).

Water demand in the Truckee Meadows. Survey analysis of (1) estimated ecosystem values that change with invasive species encroachment on landscapes, and (2) members of the public’s perceptions of wildfire risk for homes in the Urban Wildland Interface in the region. (Kim Rollins & Michael Taylor, Department of Economics; Shawn Stoddard, Truckee Meadows Water Association Economist)

Research on arid plant biofuels. Life cycle analysis (LCA) is a tool for evaluating environmental and societal impacts of a new technology, product, or process. The LCA has three phases. First the goal of the LCA is defined, and the scope of the project is established. Next, an inventory analysis is conducted, in which energy and material inputs and outputs (products, as well as pollutants) are evaluated. Next is impact assessment, in which the data collected are interpreted in terms of appropriate impacts, such as water use, air pollution, greenhouse gas emissions, economic development, etc. The REU student will develop an LCA of a specific biomass-to-fuels proposal. We will evaluate the impacts of growing arid plants (rabbit brush, gumweed or canola) for the specific purpose of extracting oils to produce biofuels. Arid plant biofuels in the Great Basin is the scope of the LCA, and the REU student will be heavily involved in all stages of completing the analysis during the summer experience. (Chuck Coronella, Department of Chemical Engineering)

Tree islands in the Great Basin desert: mechanisms of persistence in a global change context. In the desert mountains surrounding Reno, scattered “islands” of Sierran conifer species float in a sea of predominantly Great Basin vegetation (sagebrush, pinyon pine, cheatgrass). These tree islands, where tree species occur at lower elevations and in drier conditions than expected, are associated with outcrops of altered andesite soils that are highly acidic and low in nutrients. Student researchers will help investigate the mechanisms that maintain these tree islands (or perhaps put them at risk) in the context of global change factors (climate change, recreational use of the mountains, and the cheatgrass-fire cycle). Also of interest are several rare plant species that occur primarily on altered andesite soils. A better understanding of these influences that contribute to ecosystem stability of the tree islands will contribute to our ability to conserve ecologically important areas at the rural-urban interface. Field work will involve frequent hiking and backcountry travel in the hills surrounding the city of Reno in the Tahoe-Truckee-Pyramid watershed. (Peter Weisberg, Department of Natural Resources and Environmental Science)

Energy efficiency is the here and now. The technologies already exist and are well-proven. Implementing energy efficiency measures helps residential and commercial building owners achieve cost savings while the reduced energy consumption means fewer pollutants, particularly greenhouse gas emissions, at the power plants. But how do we get home and buildings owners to more aggressively invest in energy efficiency? This research project will focus on barriers to more widespread adoption of energy efficiency in commercial and residential buildings and look at potential financing mechanisms that help owners overcome upfront cost barriers. This project will review policy and make suggestions for improvements. The research prepared will help inform a variety of programs working to improve the adoption of energy efficiency in Northern Nevada’s housing and commercial building stock. (Christopher Lynch, Small Business Development Center, UNR).