



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

2009 REU Poster Abstracts

A Study of Best Management Practices and the Private Landowner

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Best Management Practices (BMPs) are programs designed to reduce runoff from private parcels. They can include infiltrating storm water runoff from impervious surfaces, paving dirt driveways and roads, and stabilizing or retaining steep slopes and loose roads. The Tahoe Regional Planning Authority (TRPA) mandates that all landowners in the Lake Tahoe basin retrofit their homes with BMPs. Rates of compliance, however, are only 24%. Our research addresses what barriers exist for increasing program compliance by identifying characteristics of the home and landowner that are correlated with compliance. A mail survey was administered to approximately 2,600 private home owners, with a 20% response rate. Questions included general information about environmental conditions and processes at Lake Tahoe, socioeconomic and political attitudes, perceptions about environmental agencies active in the basin and program specific information on BMPs. We then ran three logit models and found that recent renovation, meeting a TRPA official, and being moderately active in the community were the most significant factors for determining compliance with BMPs. Moderately active landowners were found to be those who had lived in the Tahoe basin for some time, contributed time or money to a political party and had visited a local government office at some point. We assume that these people were generally involved and informed about policies and chose to comply, as opposed to inactive landowners who may be badly informed, or very active landowners who might be opposed to regulation. Since moderately active landowners complied more often, more research should go into identifying those who are very active or inactive so that outreach can be created to target them.

Testing the Effects of Soil Erosion in Central Nevada

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Soil erosion is a global problem, impacting soil quality, health, productivity and the environment (NRCS, 2003). According to the USDA, understanding and managing processes such as erosion have important long term implications for cropland sustainability, natural resource condition and health, and environmental quality (CEAP, 2009). As sediment becomes detached from the parent material, the runoff becomes enriched with finer particles along with nutrients from the soil. This depletes the soil, leading to a net impoverishment of the soil (FAO, 1996). Preliminary experiments at Smith Creek Ranch

in central Nevada were carried out to study the sediment enrichment ratio under two different discharge volumes. We found that eroded soil has a higher silt:sand ratio than baseline soil and that higher intensity events move larger particles.

Lahontan Redside and Speckled Dace Diets in Lake Tahoe: Then and Now

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Lahontan redbreast shiner (*Richardsonius egregius*) and Lahontan speckled dace (*Rhinichthys osculus robustus*) have not been studied in Lake Tahoe since 1969. Because of the many changes that have occurred in the Lake, specifically introduction of nonnative species, we assumed a change in the diets of these fishes would be seen. In present diets of both fishes, there was an increase in surface invertebrate intake and a decrease in bottom invertebrate intake. These changes were not as significant in the redbreast diet. In the present dace diet, intake of zooplankton also decreased, but still contributed to a significant percentage of the diet. More specifically, cladocerans composed a smaller percentage of the dace diet. Conversely, the present redbreast diet was composed of about the same percentage of zooplankton and a slightly larger percentage of its diet was composed of cladocerans. This may indicate the recovery of cladoceran populations in Lake Tahoe.

Climate Change and Recreation Choices at Tahoe: Preliminary Results

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As temperatures rise due to global climate change, people will likely change their recreation choices and recreational time use patterns throughout the country. This potential effect has not yet been examined in a rigorous fashion. Our study uses hourly recreation choice data from a 2004 visitor survey administered in the Lake Tahoe area to assess the effect that climate change will have on Tahoe visitors' recreation activities. We found that higher temperatures will have the effect of decreasing time spent indoors, and increasing time spent at the beach and participating in outdoor water sports. With increased demand for beach and boat ramp access, crowding issues will be exacerbated and policies should be constructed with consideration given to this eventual change.

Evaluating the Efficiency of a Modified Runoff Collector Design

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Surface runoff is an important aspect of the hydrology of remote Nevada basins, although it is rarely measured due to difficulties in access and the high cost of instrumentation. A runoff collector design modified from Miller et al. (2005) is a relatively inexpensive way to quantify runoff. A limitation of using this runoff collector design is the lack of information regarding its efficiency. Some surface runoff bypasses the collector, but the actual amount is unknown. This project quantified the amount of runoff

that bypasses the modified runoff collector under different combinations of soil types, soil covers, rainfall intensities, and slopes. The results were analyzed statistically to develop predicted bypass amounts. Slope was found not be a significant predictor of bypass.

Asian Clam Distribution in Sediment and its Impacts on Algae in Lake Tahoe

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Research has shown the Asian clam, *Corbicula fluminea*, can impact essential ecosystem processes such as nutrient cycling and primary production. Asian Clams are aggressive invaders that are actively reproducing in Lake Tahoe. However, no studies have addressed the impacts of clams on algal biomass by filtration in Tahoe. This study obtained filtration rates for two size classes of clams using laboratory experiments. Algal biomass was measured over 48 hours. Sediment hand cores were processed to obtain the clam distribution within the sediment, analyze nutrient levels of pore water, and to conduct clam fatty acid analysis to examine feeding behavior of clams. Current data suggest a mid-range filtration rate relative to current literature, (2.5 gal/24 hr) for large clams (mean=17.9 mm). Also, clams concentrate in the first 6 cm of sediment but are found to a depth of 16 cm.

Modeling Homeowners' Risk Perception and Wildfire Prevention Efforts

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Due to externality problems, private homeowners tend to underinvest in fire mitigation efforts on their properties. In order to come up with effective policies to motivate homeowners to engage in optimal mitigation efforts, we must understand what factors influence homeowners' decision to take mitigation actions. This study involved the comparison between Tahoe communities and non-Tahoe communities ranked as "extreme risk" of wildfire in Nevada, creation of a linear regression model to predict the homeowners' subjective perception of risk, and creation of a linear regression model to predict the homeowners' engagement in fire mitigation effort. The comparison identified some key differences between Tahoe and non-Tahoe communities. The regression models demonstrated which factors were important in determining a homeowner's subjective risk perception and engagement in mitigation actions.

Studying Visual Change in Lake Tahoe: A Rephotographic Analysis

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This study investigated and documented the historical and current uses of land resources and environment around South Lake Tahoe. Historical images were collected and then rephotographed in a series of perspectives from land, water and air. The resulting sets of images provided visual evidence of the changes in the Tahoe landscape as a result of urbanization, environmental changes and cultural shifts creating a visual database for future research in the Lake Tahoe region.

A Comparison of Woody Species on the Carson, Truckee and Walker Rivers

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The Carson, Truckee and Walker Rivers in western Nevada share similar physical characteristics, but as a result of differing river management history, have varied riparian forest structures. During June-July 2009, we conducted seedling establishment surveys and age class studies at 40 point bars on the three rivers. The Truckee River had the highest frequency of cottonwood establishment. Coyote willow and tree willows were more common on the Walker. Age analyses of trees from cottonwood forest stands revealed that the Carson River population is fairly young, while the Walker River population is aging.

Expanding Urban Environment brings Change, New Species to Riparian Areas

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Riparian areas attract a myriad of organisms. The available water and increased productivity creates a haven for many bird species, especially in semi-arid climates. The Truckee River is no exception. Human population and urbanization have increased since the area was first settled by white pioneers. Aerial photography can show some of the changes in riparian habitat in response to urban expansion. Patch and class metrics show an increase in available habitat for riparian birds like the Black-headed Grosbeak (*Pheucticus melanocephalus*). There were more large patches in 2006 than in both 1939 and 1966. Patches also tended to be closer in 2006. It is likely that the tendency for humans to plant trees has increased riparian-type habitat along with the growth of urban areas. This unintentional growth coupled with restoration efforts seems to have increased the amount of riparian habitat available to the Black-headed Grosbeak.