Greetings! I’m proud to introduce our first annual issue of Nevada Water News, the Nevada Water Resources Research Institute newsletter. It has been an exciting year. In addition to launching this newsletter, we have also awarded grants to three new research projects and a new water sciences educational outreach project for 2015.

Dr. Kumud Acharya’s project “Testing the Mortality and Settlement of Quagga Mussel Veliger under Various Chemical Treatments” will analyze methods to deplete the number of quagga mussels in Lake Mead. Quagga mussels disrupt the reservoir’s aquatic food chain, threaten its drinking water quality, and damage its infrastructure. Containing and depleting these mussels in Lake Mead is critical to preserving this valuable water resource. The project will investigate different methods to prevent mussel settlement and identify treatment methods that lead to mussel mortality.

Dr. Li Chen’s project “Impact of Climate Change on Low-probability, High-risk Flooding Events in the Southwestern United States” will estimate how climate change affects future flood frequencies. Flooding poses significant risks to human life and property in Nevada and other arid and semiarid states. This project will use historical and projected precipitation statistical properties to evaluate future flood frequencies. These results will provide water resources managers with better insights into how climate change will affect flooding so that they can develop improved methods for future flood control.

Dr. Rina Schumer’s project “Geologic and Seismic Effects of Large Scale Groundwater Withdrawal from Northeastern Nevada Basins” will analyze how surface deformation and subsidence from excessive groundwater withdrawal can affect fault slip rates and induce seismicity. Groundwater from alluvial aquifers is an important water source throughout Nevada, but groundwater withdrawal has led to cracks near preexisting faults and surface deformation and subsidence in the Las Vegas Valley. These surface changes have recently been shown to affect regional fault motion and seismicity. This project will use analytical and numerical water models to assess how groundwater withdrawal...
causes changes in the regional lithospheric stress fields and leads to fault failure.

The Division of Hydrologic Sciences (DHS) is also working with the GreenPower program to develop NIWR/Maki Water Green Boxes. The GreenPower program is Desert Research Institute’s educational outreach program. Green Boxes are hands-on science education kits that cover a variety of environmental science curricula for K-12 students. For the NIWR/Maki Water Green Boxes, DHS faculty will review water-related Green Boxes and participate in classroom instruction and teacher training.

Upcoming issues of Nevada Water News will highlight these new projects and the researchers and students who are conducting this important research and include updates and events that pertain to the program. I look forward to sharing our research over the coming year!

Sincerely,
Jim Thomas

Project Spotlight: Nutrient and mercury deposition and storage in an alpine snowpack of the Sierra Nevada, USA

The beauty and natural resources of the Lake Tahoe watershed generate tourism that contributes significantly to Nevada’s economy. However, the water clarity of Lake Tahoe has declined over the last 40 years because of eutrophication from atmospheric and terrestrial nitrogen (N), phosphorus (P), and mercury (Hg), as well as an increase in light-scattering particulates. Most of the current atmospheric-deposition estimates for N, P, and Hg in the Lake Tahoe Basin only consider direct deposition loads to the lake surface but not the terrestrial areas around the lake in assessments of the basin’s nutrient balance. Measurements of nutrient deposition from precipitation in the basin are limited and studies that have addressed nutrient loads in snowpack and snow deposition, which account for over 70 percent of the precipitation in the Lake Tahoe Basin, are even more limited. “The goal of this project was to estimate wintertime deposition of nutrients and pollutants throughout the Lake Tahoe watershed,” says Dr. Rina Schumer, the principal investigator for the project, which also included Dr. Daniel Obrist and graduate student Chris Pearson.

The majority of precipitation in the eastern Sierra Nevada falls as snow during the winter and spring, which washes pollutants out of the atmosphere that are then stored in the snowpack. “During spring runoff, pollutants stored in mountain snowpack can make their way into lakes and streams, which affects water clarity and health,” Schumer explains. “Estimating spatial and temporal deposition patterns of these pollutants through snowpack sampling increases our understanding of the sources of these pollutants and improves estimations of the pollutant load stored within the snowpack each year.” Identifying the degree to which pollutants are mobilized within the watershed also helps develop successful mitigation strategies.

The project researchers took biweekly measurements of the wet deposition loads of N, P, and Hg in the snowpack to estimate their accumulation in the watershed. They also took basin-wide, peak-snowpack samples to assess the N, P, and Hg loads available in the basin prior to the onset of snowmelt. They then used modeling
to generate spatial extrapolations of wet deposition and snowpack loads for the entire watershed area. The researchers quantified the wet deposition loads using wet deposition samplers, which were deployed at two sites in the basin for two full years. The wet deposition sampling was then compared to the biweekly snowpack core sampling performed at seven sites in the basin. Peak snowpack loads of nutrients in the entire basin were further constrained by using high-resolution assessments (50 sampling locations) of snowpack N, P, and Hg concentrations prior to snowmelt to calculate the total loads of nutrients and pollutants available for runoff. “During the past year, our project added a third year of sample collection, including real-time precipitation collection and vertical snow pit profile sampling,” Schumer explains. “The addition of this data allowed us to analyze the in-snowpack chemical processes and conversions. The results from our study are currently in review with the scientific journal, *Biogeosciences*.”

The results from this study can be used as chemical-transport modeling inputs for future research projects to assess how atmospheric deposition is connected to water quality in lakes and streams in the Sierra Nevada. The research conducted for this project also helped develop an EPSCoR project to build an infrastructure for snow science in Nevada. When asked what she enjoys most about her NIWR research, Schumer answers, “It gives me the opportunity to expand my areas of expertise while contributing to Nevada science.”

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(Projec Spotlight continued)

We asked graduate student Chris Pearson about his current research and his plans for the future. Here’s what he had to say:

**What field are you currently studying and what sparked your interest in that field?**

I am currently studying hydrology with an emphasis on water quality and snowpack loading in the eastern Sierra Nevada. I grew up fishing and taking vacations to lakes throughout North America, so studying hydrology has allowed me to combine my scientific background and my hobbies, which keeps me motivated.

**Which NIWR project are you working on and what research are you doing?**

My thesis research focused on quantifying nutrient and mercury deposition and storage in snowpack throughout the Lake Tahoe watershed ("Nutrient and mercury deposition and storage in an alpine snowpack of the Sierra Nevada, USA"). We directly measured snowpack nitrogen, phosphorus, and mercury concentrations through integrated snowpack sampling and wet deposition collection. With these measurements, we spatially mapped and quantified the snowpack pollutant loading, which gave us an improved understanding of how wintertime atmospheric deposition relates to the water quality of lakes and streams.

**What have you learned from working on this project?**

While working on this project, I learned how hydrology projects often overlap with other research fields, such as soil and atmospheric sciences.
What have you enjoyed most about working on this project?

Snow sampling around Lake Tahoe during the past three years has been an incredible experience. I like being able to connect field observations with scientific research and results. It is important for me to visualize and connect with the system that I am researching.

What are your goals for the next step in your career?

I am currently applying for jobs that focus on hydrology and environmental science in the private sector.

If you had six months with no obligations or financial constraints, what would you do with the time?

If I had six months with no obligations, I would travel. I have always wanted to visit eastern Europe and New Zealand.

Cake or Pie?

Brownies and ice cream.
Success and the dedication to quality research have established the Division of Hydrologic Sciences (DHS) as the Nevada Water Resources Research Institute (NWRRI) under the Water Resources Research Act of 1984 (as amended). As the NWRRI, the continuing goals of DHS are to develop the water sciences knowledge and expertise that support Nevada’s water needs, encourage our nation to manage water more responsibly, and train students to become productive professionals.

Desert Research Institute, the nonprofit research campus of the Nevada System of Higher Education, strives to be the world leader in environmental sciences through the application of knowledge and technologies to improve people’s lives throughout Nevada and the world.

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Banner photo: Lake Mead, courtesy of the U.S. Geological Survey
Director’s Letter, page 2: Quagga mussels ©DRI Science
Events, page 4: Henderson Demonstration Wetland, courtesy of the U.S. Geological Survey