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NWRI - Desert Research Institute



Newsletter written and compiled by  
Nicole Damon

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#### RFPs

If you have questions about submitting a NWRI proposal, e-mail Amy Russell (Amy.Russell@dri.edu).

For current RFP information, visit the NWRI website ([www.dri.edu/nwri](http://www.dri.edu/nwri)).

## Director's Letter

Greetings! We've had a great year of Nevada Water Resources Research Institute projects and the new grants that have been awarded will continue to take our water research projects in exciting new directions.

Drs. Xuelian Bai and Kumud Acharya's project "Uptake of Pharmaceutical and Steroidal Compounds by Quagga Mussels in Lake Mead" will explore the effects of wastewater contaminants on aquatic species in Lake Mead. The project will evaluate the uptake rates of selected trace contaminants from pharmaceutical and personal care products in quagga mussels to understand the exposure of aquatic organisms to these contaminants. The project will also provide insight into the exposure pathways of these chemicals and their effects on nontarget species to help develop ecological risk assessments.

Dr. Dale Devitt's project "Assessing Tree to Grass Water-use Ratios: Significance to Urban Water Conservation" will measure tree and grass water-use rates to evaluate the two landscape coverings. With extended droughts and potential climate changes, meeting water demands in the arid West is challenging. Research into these



water-use rates will allow water managers, landscape architects, horticulturists, and golf course managers to find tree and grass combinations that create attractive, water-saving landscapes.

Dr. Clay Cooper's project "Theoretical Analysis of Optimal Groundwater Basin Development" will develop a scaling analysis to estimate water table conditions for potential basin-wide water development. Natural recharge and discharge are often not sufficient assessments of the hydrologic budget of a groundwater basin. This project will determine the conditions under which drastic drops in the water table can occur.

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*(Director's Letter continued)*

Drs. Steven Bacon and Rina Schumer's project "An 8,000-Year Paleo Perspective of Hydroclimate Variability in the Southern Sierra Nevada" will develop an 8,000-year record of hydroclimate data for the southern Sierra Nevada region. The region's hydrologic budget will then be estimated and used to model historical monthly temperature and precipitation data using PRISM.

This data will be used to reconstruct the hydrologic system, which can then be applied to snowmelt-dominated watersheds in Nevada and California that do not have gaged streamflow records.

We will also continue to develop Green Boxes with activities that teach PreK-12 students about different aspects for water science,

such as the activities highlighted in this issue. I look forward to sharing more about all of our new projects in the upcoming issues of *Nevada Water News*!

Sincerely,

Jim Thomas ■

## Upcoming Events

112th GSA Annual Meeting, Cordilleran Section  
April 4-6  
Ontario, CA  
[www.geosociety.org/sections/cord/2016mtg/](http://www.geosociety.org/sections/cord/2016mtg/)

UNR/NWRA Spring Dinner Forum  
April 5  
Reno, NV  
[www.nvwra.org/2016unr-nwradinnerforum](http://www.nvwra.org/2016unr-nwradinnerforum)

2016 NGWA Groundwater Summit  
April 24-27  
Denver, CO  
[www.groundwatersummit.org/](http://www.groundwatersummit.org/)

2016 AWRA Spring Conference: Water, Energy, Environment  
April 25-27  
Anchorage, AK  
[www.awra.org/meetings/Anchorage2016/](http://www.awra.org/meetings/Anchorage2016/)

14th Annual Truckee River Field Study Course  
May 5-6  
Reno, NV  
[www.nvwra.org/truckee-river-tour](http://www.nvwra.org/truckee-river-tour)

AGU Chapman Conference: Emerging Issues in Tropical Ecohydrology  
June 5-9  
Cuenca, Ecuador  
[chapman.agu.org/ecohydrology/](http://chapman.agu.org/ecohydrology/)



Groundwater from the Mountains to the Sea in the Central Atlantic Region  
June 6-7  
Virginia Beach, VA  
[www.ngwa.org/Events-Education/conferences/Pages/5056jun16.aspx](http://www.ngwa.org/Events-Education/conferences/Pages/5056jun16.aspx)

2016 UCOWR/NIWR Annual Conference  
June 21-23  
Pensacola Beach, FL  
[ucowr.org/conferences/2016-ucowr-conference](http://ucowr.org/conferences/2016-ucowr-conference)

2016 AWRA Summer Conference: GIS and Water Resources IX  
July 11-13  
Sacramento, CA  
[www.awra.org/meetings/Sacramento2016/](http://www.awra.org/meetings/Sacramento2016/)

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## Project Spotlight: NIWR/Maki Green Boxes

The new NIWR/Maki Water Green Boxes were developed by the GreenPower program, Desert Research Institute's (DRI) educational outreach program, and the Division of Hydrologic Sciences (DHS), which houses the Nevada Water Resources Research Institute. Green Boxes are self-contained science education kits that cover a variety of environmental science curricula for PreK-12 students. "Green Boxes are customized to encompass a wide range of STEM (science, technology, engineering, and math) topics that highlight applied science and twenty-first century technology," says Mackenzie Peterson, the Green Box administrator for GreenPower. "All of our curricula is designed to be hands-on, inquiry based, and student driven."



Students at Sandy Searles Miller Elementary School in Las Vegas, Nevada, conducting a Green Box experiment in their classroom.



The projects in each Green Box, such as the Water in the Natural & Built Environment box above, require students to use critical thinking and problem solving skills. This box is geared toward Grade 3 students and the activities focus on how water is used and transported.

The NIWR/Maki Water Green Boxes focus on projects that teach middle and high school students about water resources in southern Nevada. The Water Quality Green Box is tailored to middle school students and it includes activities such as measuring the salinity of multiple water samples and mapping changes in water quality as water travels through the Colorado

River system. The students also evaluate how differing levels of salinity affect the humans and biota that rely on the river for survival.

The Watersheds Green Box is tailored to high school students and it includes activities such as creating a model of local watersheds, simulating streamflow, and measuring the turbidity and dissolved oxygen content of various water samples. The box primarily focuses on water resources in southern Nevada, specifically the Colorado River watershed. Students learn about the effects of channel morphology on flow and sediment transport and how topographic features affect runoff and ponding. The students also learn how to measure nutrients in water and how nutrient levels affect algae growth.

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*(Project Spotlight continued)*

The NIWR/Maki Water Green Boxes give students a chance to learn first-hand about the different scientific disciplines that are used in water resources research. “Each box includes active learning materials, which engage students in hands-on projects that foster critical thinking and problem solving skills,” Peterson says. “The kits are designed to encourage student inquiry and excitement for STEM by exposing them to content and specialized equipment they might not have access to otherwise. And the best part is that the activities are fun!”

GreenPower makes sure that all Green Boxes are aligned with Nevada State, Common Core, and Next Generation Science Standards. The program also gives DRI faculty the opportunity to directly contribute to enhancing science literacy in Nevada. “Our Green Boxes allow faculty to translate complex subject matter into tangible resources that educators can use in the classroom,” Peterson says. “Dr. Alex Lutz and Brian Fitzgerald have each integrated their research into a cohesive series of labs and activities that nearly 200 students are projected to use over the next year.”

In addition to curriculum development, GreenPower also provides other opportunities for faculty to participate in the



Each Green Box, such as the Properties of Water box above, is a self-contained science education kit. The curriculum in this box is geared toward high school students and allows them to examine water throughout the hydrologic cycle.

program, such as showcasing an existing Green Box activity in classrooms or at teacher-training workshops. “Brian Fitzgerald will be giving a keynote presentation at the summer installment of our professional development series, which is a three-day teaching intensive that will focus on the water/energy/climate nexus,” Peterson adds. “This training will allow teachers to deepen their own understanding of watershed and water quality issues in Nevada and, in turn, confidently share what they have learned with their students.”

The NIWR/Maki Water Green Boxes are a valuable addition to the Green Box program because they expand students’ understanding of regional water resource issues. “Students are the next generation of decision makers and community leaders,” Peterson says. “Establishing a foundational understanding of Nevada’s water resources is key to accurately evaluating place-based issues, such as drought and the pervasiveness of invasive aquatic species.” ■

*“Establishing a foundational understanding of Nevada’s water resources is key to accurately evaluating place-based issues, such as drought and the pervasiveness of invasive aquatic species.” – Mackenzie Peterson*



## NIWR/Maki Green Box Highlights

The NIWR/Maki Water Green Boxes are activity-based instruction units that allow students to learn the fundamentals of water science. Desert Research Institute faculty help develop the activities in the boxes, which are approved by the Green Box Advisory Committee to ensure that they meet Nevada State, Common Core, and Next Generation Science Standards. Green Boxes can be checked out online and are delivered to schools with the necessary supplies to teach the unit.

### NIWR/Maki Water Quality Green Box (Middle School)

The Water Quality box outlines a sequence of labs devised to highlight how the salinity of the Colorado River system acts as an indicator of water quality. Throughout the unit, students will learn how to test water samples using an electrical conductivity (EC) meter and evaluate the effects that various point/nonpoint pollution sources have on water quality.

#### Learning Objectives

- Identify, graph, and map changes in salinity as water is diverted and returned to the river by various users.
- Determine how varying levels of salinity affect the life forms that rely on the river (people, plants, and animals).

### NIWR/Maki Watersheds Green Box (High School)

The Watersheds unit provides a series of broad-based experiments designed to help students understand the relationships between human impacts and local hydrology. Covering a range of disciplines—including geology, chemistry, Earth science, botany, and biology—these lessons are intended to provide a thorough snapshot of the Colorado River watershed.

#### Learning Objectives

- Identify trees and common plant species found in the watershed using a dichotomous key.
- Determine how the shape of a river channel affects the flow of water and the transportation of sediment.
- Classify common macroinvertebrates that live in the Clark County Wetlands and learn how these species can be indicators of water quality. ■

### Events continued

USGS Technical Conference –  
Groundwater and Surface Water:  
A Single Resource  
August 29-September 2  
Reno, NV  
[www.nvwra.org/2016-usgs-conference](http://www.nvwra.org/2016-usgs-conference)

Connecting the Dots: Groundwater,  
Surface Water, and Climate  
Connections  
September 8-9  
Portland, OR  
[www.ngwa.org/Events-Education/conferences/Pages/5029sep16.aspx](http://www.ngwa.org/Events-Education/conferences/Pages/5029sep16.aspx)

2016 GSA Annual Meeting  
September 25-28  
Denver, CO  
[www.geosociety.org/meetings/2016/](http://www.geosociety.org/meetings/2016/)

ASA, CSSA, and SSSA: Resilience  
Emerging from Scarcity and  
Abundance  
November 6-9  
Phoenix, AZ  
[www.acsmeetings.org/meetings](http://www.acsmeetings.org/meetings)

Emerging Leaders Alliance  
Conference  
November 9-12  
Falls Church, VA  
[www.ngwa.org/Events-Education/conferences/Pages/elanov16.aspx](http://www.ngwa.org/Events-Education/conferences/Pages/elanov16.aspx)

2016 AWRA Annual Conference  
November 13-17  
Orlando, FL  
[www.awra.org/meetings/Orlando2016/](http://www.awra.org/meetings/Orlando2016/)

Groundwater Week  
December 6-8  
Las Vegas, NV  
[groundwaterweek.com/](http://groundwaterweek.com/)

AGU Fall Meeting 2016  
December 12-16  
San Francisco, CA  
[sites.agu.org/meetings-events/#meeting](http://sites.agu.org/meetings-events/#meeting)

## Postdoc Interview: Peng Jiang

We asked Maki Postdoctoral Fellow Dr. Peng Jiang about his current research and his continuing research plans. Here's what he had to say:

### 1) What sparked your interest in water resources research?

I chose hydrology for my undergraduate major and I became even more interested in water resources research when I worked on a reservoir project, which taught me that good water management is important for maintaining this important resource.

### 2) What do you find most interesting about water resources research, particularly working in an arid/semiarid environment such as Nevada?

What most fascinates me is how climate change could affect the redistribution of water. Whether there are changes in total precipitation or the precipitation pattern, the effects are critical to the hydrological cycle of arid environments such as Nevada.

### 3) What kinds of research are you currently working on and what have you learned so far from this research?

One focus of my research is to investigate how precipitation, particularly at the event scale, could be affected by anthropogenic activities and natural oscillations and how these changes could further affect water redistribution (such as changes in the soil moisture

component, snow pack, and surface runoff) in the arid Southwest. The study indicates that precipitation in the Las Vegas Valley will exhibit changes in precipitation patterns with shorter storm durations, longer interstorm periods, and higher storm intensities even if total precipitation decreases. These

changes in storm properties may have profound effects on surface water fluxes and solute transport.

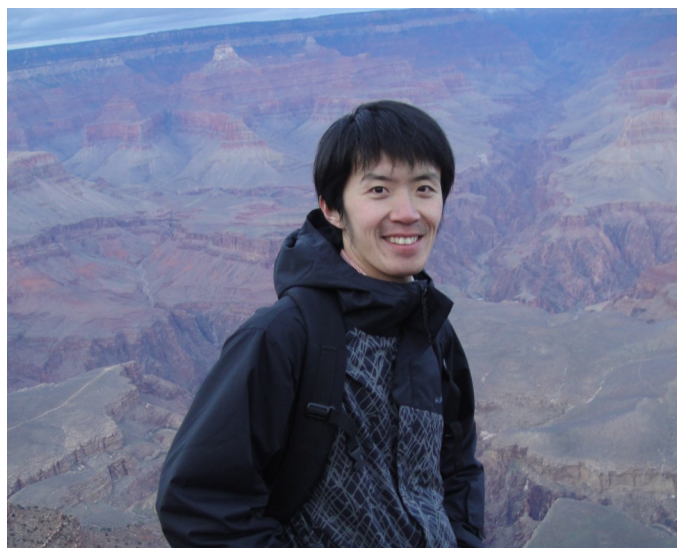
### 4) What do you hope to learn more about from the research you are doing?

I would like to gain a better understanding of the physical theories of hydrology and be able to reduce the uncertainties of hydrological evaluations based on these theories.

### 5) Do you have a preference for lab work or field work, and if so, why?

I like field work, but most of my research is done in the lab because my work centers on program writing and modeling. I would prefer a good combination of both field and lab work.

### 6) What are some of your other research interests? Do you have any goals for incorporating those interests into your work as you continue in your career?



Changes in environment, ecology, and hydrology are connected, so one of my future research interest is to see how changes in hydrological processes could affect the ecology of our surrounding environment.

### 7) What is one of your favorite movies and why?

My favorite movie is *Forest Gump*: "Life is like a box of chocolates. You never know what you're gonna get." So, stick to what you want to do and try to do your best.

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

I would travel around the world and just enjoy new and beautiful natural environments without anything else on my mind. ■

*"Changes in environment, ecology, and hydrology are connected, so one of my future research interest is to see how changes in hydrological processes could affect the ecology of our surrounding environment."*

*– Peng Jiang*

## NWRRI - Desert Research Institute

*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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[www.dri.edu/nwrri](http://www.dri.edu/nwrri)

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For more information about the NWRRI, contact:

*Amy Russell, Business Manager*  
702-862-5471  
[Amy.Russell@dri.edu](mailto:Amy.Russell@dri.edu)

*Jim Thomas, Director*  
775-673-7305  
[Jim.Thomas@dri.edu](mailto:Jim.Thomas@dri.edu)

Banner photo: Wildflowers in Copper Basin, Nevada, by Famartin  
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Events, page 2: Paradise Valley wildflowers, Nevada, by Zack Sheppard from San Francisco, USA (Flickr Uploaded by PDTillman) [CC BY-SA 2.0 (<http://creativecommons.org/licenses/by-sa/2.0/>)], via Wikimedia Commons