



The Water bLog

a newsletter of the
Utah Center for Water Resources Research
 at Utah State University

Welcome!

The Water bLog is the semi-annual newsletter of the Utah Center for Water Resources Research (UCWRR), housed at the Utah Water Research Laboratory at Utah State University. The center supports the development of applied research related to water resources problems in Utah and promotes instructional programs that will further the training of water resource scientists and engineers. Each issue of **The Water bLog** reports on a small selection of the current or recently completed research projects conducted at the center. More information is available online at:

<http://uwrl.usu.edu/partnerships/ucwrr/>

Message from the Director



Mac McKee, Director

Ongoing water resources research is resulting in rapid technological improvements in the ways we acquire scientific data, including remote sensing and real-time field-based technologies. These innovations give us increased quantities of high-quality data for water resources management, but that information has no value if it is not accessible. The UCWRR is investing heavily in new techniques for disseminating information through

education and data management to meet the needs of the scientific research community, as well as the general public.

In this edition of the **Water bLog**, we focus on creative research projects currently underway at the UCWRR that bring water resources data and information to those who would benefit from it, including a digital image screen saver to encourage responsible water use and a sophisticated watershed information system to provide data resources to water researchers and management agencies. These projects represent only a fraction of the active research at the UCWRR that is designed to find practical solutions to natural resources challenges throughout the state. ■

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Far Afield

UtahStateUniversity



RESEARCH HIGHLIGHT

Utah Water Education Project

The Utah Water Education project is a screensaver that contains high quality digital pictures from Utah's 29 counties along with informative water-related captions to provide incremental education about water use and conservation in Utah

Utah is one of the fastest growing states in the nation, and although it is one of the driest, it is second only to Nevada in gallons of water used per person. As the population increases, the demand on water resources will continue to increase.

In a focused effort to educate the public about the water supply and what it takes to provide water to Utah citizens, as well as to suggest ways to conserve water, UCWRR researchers have created a screensaver with over 800 high-quality, water-related digital photographs that include images from each of Utah's 29



Glen Canyon National Recreation Area, San Juan County, Utah: Rainbow Bridge was created when the stream in Bridge Canyon cut through the rock fin, then enlarging the opening over time through erosive processes. Photo courtesy of Utah Office of Tourism

One of the water-related digital photos included in the screen saver



Unknown Location, Utah, 1911: Irrigated Fields. Photo courtesy of LDS Church History Library



Salt Lake County, Utah: A leaking faucet that drips just once each second loses up to 4 gallons of water a day. Photo by Hannah Galli

counties. An additional 200 pre-1940 historical photos are also included to provide a broader understanding of water use in Utah.

Research

The purpose of this project is to incrementally educate a diverse public about

- ◆ The many ways water is used in Utah.
- ◆ Specific suggestions for conserving water.
- ◆ Utah's streams, rivers, and lakes and the animals and people that rely on them.

Each photograph includes some aspect of Utah's water resources, water infrastructure, or water use. The captions are short and concise to provide accurate information and instruction in a small amount of text.

The high quality, interesting, and beautiful photographs will naturally encourage the viewers to read the captions.

Benefits to the State

Few Utahns would argue against the need to conserve water; however, most people will not change their water-use behaviors unless they understand the importance of conservation and the need to be better stewards of the resource. This project encourages viewers to change personal water use behaviors through incremental education.

The end benefits to the State of Utah include:

- ◆ Reduction in per capita water use.
- ◆ Preservation of valuable water resources.

Looking to the Future

The Utah Department of Natural Resources intends this to be a dynamic project where photos can be requested or submitted on an ongoing basis.

The computer screen saver will be widely distributed to school districts, colleges and universities, and government agencies. It is available to the general public at:

<http://uwrl.usu.edu/utahwatereducation/>

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Morgan County, Utah: Beavers work as a keystone species in an ecosystem by creating wetlands that are used by many other species. Next to humans, no other animal appears to do more to shape its landscape. Photo courtesy of Utah Division of Wildlife Resources



Lake Powell, Garfield County, Utah: The floating misery around Lake Powell attracts about 2 million people every year. Photo by Delta Smith



Clearfield, Berks County, Utah: Turning off the water while brushing your teeth can save up to 3 gallons of water. Photo by Robert Christensen

Other examples of screen saver digital photos and captions



The Bear River Watershed Information System

The Bear River Watershed Information System is a central location where users can get data and information related to water quality and other watershed related issues in the Bear River Basin

The Bear River Basin covers parts of Utah, Idaho, and Wyoming and provides water for agriculture, power generation, recreation, and municipal and industrial uses. Water management in this multi-state basin can be complicated, requiring innovative and cost-effective water quality and quantity solutions, a common source of merged datasets and planning tools, and a means to identify impacts and predict responses to management decisions on a basin-wide basis.

Research

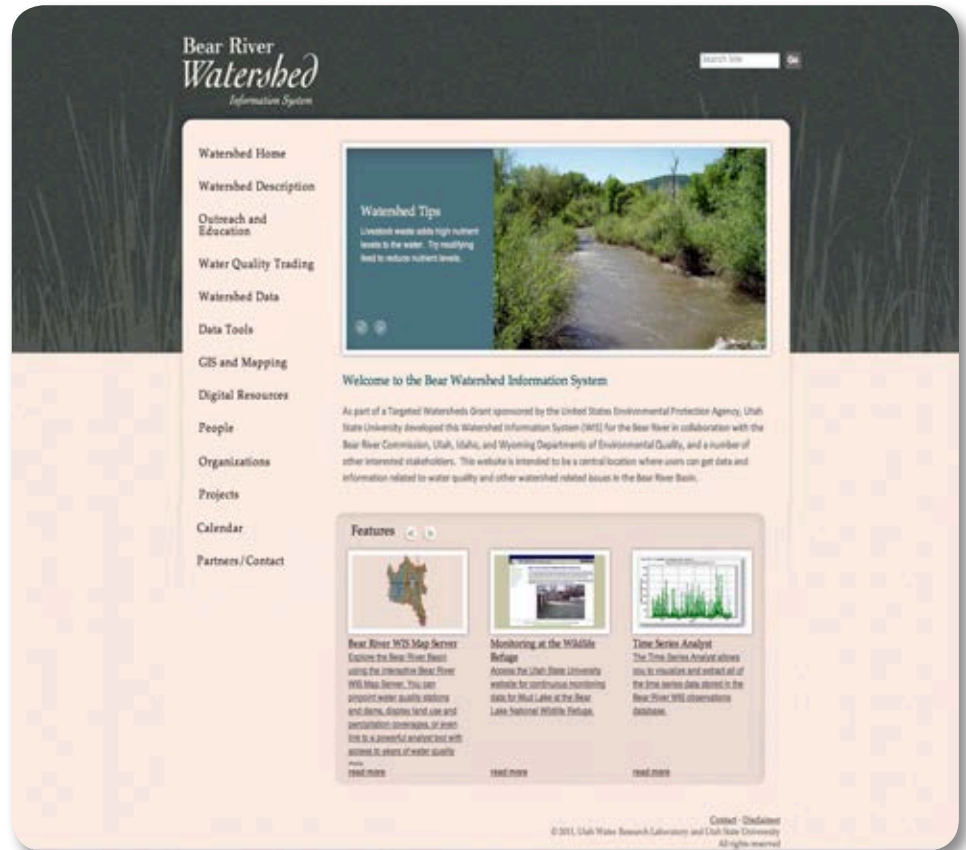
As part of a USEPA Targeted Watersheds Grant, UCWRR researchers are collaborating with other stake-holders in the development of the Bear River Watershed Information System (WIS). (<http://www.bearriverinfo.org>).

The Bear River WIS is a central, Internet-based data repository where users can get information related to water quality and other watershed-related issues in the Bear River Basin, including:

- Detailed watershed profiles.
- GIS, water quality, hydrology, weather, and climate monitoring datasets.
- Tools for data visualization and analysis.
- Details of people, organizations, and projects in the watershed.



Bear River Interactive Map Viewer



Screenshot of the Bear River Watershed Information System website

- A calendar of water quality related events and news.

Benefits to the State

The Bear River WIS has been an important outlet for water quality related outreach and education materials that are available to teachers, students, and researchers throughout the State of Utah and has been the development platform for many tools that are supporting efforts such as:

- Establishing an environmental observatory in the Great Salt Lake Basin, including a new information system for the Great Salt Lake that was created based on the Bear River WIS. (<http://www.greatsaltlakeinfo.org>).
- Improving data management to support hydrologic science.

- Establishing a national cyber-infrastructure for environmental observatories.

Looking to the Future

The current content management system format will simplify maintenance and ensure the sustainability of the WIS. Additional information and data sets will continue to be added to the Bear River WIS as they become available. ■

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UCWRR USGS 104b Funded Research Projects for 2013

The following UCWRR research projects were granted USGS 104b funding in 2013.

Quantification of Water Quality Improvements through Two Renovation Projects

Dr. R. Ryan Dupont

A crude oil spill in Red Butte Creek in June 2010 released contaminants into a significant portion of Salt Lake City's watershed as the creek discharged into the Lower Jordan River, which is identified as water quality impaired due to low dissolved oxygen, excessive

coliform contamination and elevated temperatures. This project will augment two of the many environmental restoration enhancement projects that have been initiated on the river by determining baseline loadings of nutrients, metals, coliform, and particulates discharged, as well as the reduction in pollutant loadings following restoration and renovation activities. The project will also predict the long-term pollutant reduction potential from the renovation and restoration efforts that can be extended throughout the Jordan River drainage area. ■



A San Rafael River beaver dam with temperature probes

resolution multispectral aerial imagery, including RGB, NIR, and thermal imagery, from along the San Rafael River using unmanned aerial vehicles (UAVs) from the AggieAir flying Circus, a service center at the Utah Water Research Laboratory. This platform may provide such data at a much lower cost than more conventional approaches. In this project, we will investigate the influence of beaver dams and their role in providing complex habitat and thermal refugia for fish species. Temperature probes will also be placed near these structures to provide the data to investigate thermal distribution and calibrate thermal imagery. ■

UAV Aerial Imagery on the San Rafael River, Utah, as Part of Ongoing Restoration Efforts

Dr. Bethany Neilson and Ian Gowing

The San Rafael River in south-central Utah is on the 303(d) list of degraded waters due to low abundance of native fish species, poor fish habitat quality, limited native riparian vegetation recruitment, and abundant stands of non-native tamarisk. As part of a large-scale multi-agency restoration plan, this project will collect high-



9th South stormwater channel to be upgraded to a treatment wetland

Spotlight on Student Excellence

USU Graduate students working with UCWRR faculty members are receiving national and international recognition for their excellence in water resources research.



Todd Wetzel, MS student in Civil and Environmental Engineering received the FMC Env. Solutions/ARCADIS-US Award for Best Student Platform Presentation at the 23rd Annual International Conference on Soil, Water, Energy, and Air, March 2013, for his presentation titled, "Use of Plants as Passive Samplers for Volatile Organic Compounds in Indoor Environments."



Sanyogita Andriyas, PhD student in Civil & Environmental Engineering, was a recent recipient of AGU's Outstanding

Student Paper Award for her research presentation titled: "Bayesian Belief Networks Approach for Modeling Irrigation Behavior" at the 2012 AGU Fall Meeting December 2012.



Malgorzata (Margie) Rycewicz-Borecki, PhD student in Environmental Engineering, received several awards this year for

her research on vegetative effects on stormwater pollutant removal, including finalist in the Women Tech Academic Excellence Awards, 3rd place at the AWWA Intermountain Annual Conference, and Outstanding Communications Award at the Council of Educators in Landscape Architecture conference in February 2012.

Christel Olsen, MS student in Environmental Engineering, was awarded second place at the AWWA



Intermountain Annual Conference for her poster titled: "Hexavalent Chromium: A profile analysis of conventional

treatment plants." She has also been awarded the Intermountain Section AWWA Diversity Scholarship.



Allia Abu-Ramaileh, MS student in Environmental Engineering, has received several awards for her research on arsenic

in groundwater at the AWWA – Intermountain Section Annual Conference, September 2012, the Water Environment Association of Utah meeting, October 2012, the International meeting of the American Agronomy Society and the International meetings of the Soil Science Society of America. ■



Nearly 40 Years of Service: Dr. Darwin Sorensen Retires



Dr. Darwin Sorensen and UCWRR Director, Mac McKee, January 29, 2013

Dr. Darwin Sorensen, UCWRR faculty member and a Research Professor of Biological Engineering at the Utah Water Research Laboratory, retired on January 29, 2013. Dr. Sorensen's research

interests have focused on the microbial ecology of biodegradation and bioremediation. Recent projects have included: biodegradation of polynuclear aromatic hydrocarbons in land-based treatment systems, reductive dehalogenation of trichloroethene in contaminated aquifers, source water protection assessments, and nitrate contamination susceptibility assessments for shallow aquifers.

Dr. Sorensen has spent the past nearly 40 years as a tireless researcher on a wide array of water-related scientific problems, and his efforts have benefitted our understanding of water quality problems all across Utah. The impact of his dedication to training the next generation of environmental engineers is visible in the number of his past students who are engaged and active in the field. Thank you, Darwin! We wish you well! ■

Future Issues: Research Highlights:

"Improving Water Resources Management in Moldova"

(UCWRR researcher Gary Merkley is returning after leading an international project related to agricultural water management and irrigation)

"New Remote Sensing Techniques for Precision Agriculture"

(UCWRR researchers are using remote sensing techniques, including AggieAir unmanned aerial vehicles, to develop new methodologies in precision agriculture)

FAR AFIELD

In recent months, international visitors to the UCWRR have included a delegation of visitors from Mali for a tour of the facility and a group of engineers and project managers from Australia and Malaysia as part of an ongoing model study. UCWRR faculty members and researchers have also traveled to various locations around the globe conducting and presenting their research and enhancing and sharing their extensive water resources expertise.

Recent Travels

- Aachen, Germany
- Amman, Jordan
- Aurangabad, India
- Bari, Italy
- Glasgow, Scotland
- Luassane, Switzerland
- Salzberg, Austria
- Sao Paulo, Brazil
- Abu Dhabi, UAE

International delegation from Australia and Malaysia join UCWRR team during a test run of the Susu dam model study



A Susu dam model study at the UCWRR



Visitors from SMEC International, a construction consulting firm in Australia, and Tanaga Nasional Berhad, the largest electricity utility in Malaysia, recently traveled to the Utah Water Research Laboratory in Logan, Utah to witness the testing of spillway and bottom outlet physical models for a new Malaysian dam under construction (Susu Dam).

Susu dam is being constructed on the Bertram River in Pahang, Malaysia. However, the physical model studies conducted by UCWRR faculty member, Blake P. Tullis, are helping to identify and eliminate potential problems, improve hydraulic design alternatives, potentially reduce costs, and increase dam safety. ■

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