RECLAMATION *Managing Water in the West*

Winter 2013/2014
Research and
Development Office
Newsletter 2014-02

The Knowledge Stream

Year in Review, Research Awards, and Jam Issue

Reclamation Research Jam 2014

February 3 - 28, 2014

The Research and Development Office will host their third annual Reclamation Research Jam, an internal online crowdsourcing event to gather innovative ideas.

The ideas gathered will be shared with Reclamation researchers for possible submission as research project proposals during the upcoming FY 2015 funding cycle. (See Reclamation Research Jam on pages 12 and 13.)

https://reclamation-research.ideascale. com.

Use your@usbr.gov email to join the Jam.

R&D Office Contact

Jake Akervik
Communication and Information Systems Coordinator
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Director's Message

In planning for the 2014 fiscal year (FY), our Science and Technology Program needed to accommodate the significant budget uncertainties being felt throughout the Federal Government. In spite of these constraints, we believe that our FY 2014 portfolio of projects remains a diverse and robust set of investigations. This issue summarizes key accomplishments from the past year's activities and lists the research projects funded for FY 2014. We also introduce the research coordinators for each of these domains.

Two notable firsts are occurring this year. This is the first year that we set aside funds to address a high priority issue or problem identified by each of our Regional Directors and their staff. Those research projects are highlighted on pages 14 and 15. This is also the first year that we will be sponsoring technology challenges—competitions that award prizes as an incentive to promote solutions to hard problems. (The X-Prize Foundation has already awarded prizes for privately developed space systems and for cars that get more than 100 miles per gallon of gas.) Some of the challenges we are considering include:

- Small-scale, inexpensive desalination technology to treat brackish groundwater.
- An environmentally safe, corrosion-resistant coating for Reclamation infrastructure to replace the very durable and long-lived, but hazardous, coal-tar coating, which is reaching its service life on many of our structures.

Watch for more on these new approaches to problem solving in future issues.

In addition, we are announcing our third annual Reclamation Research Jam, a crowdsourcing event that invites all Reclamation staff to identify issues or opportunities they believe should be a focus of research and development. Last year's top vote getter—exploring the use of mobile devices to support field data gathering—is the subject of a FY 2014 research project.

Curt Brown, Director, Research and Development

The FY 2014 Science and Technology Program Review Committee:
Left to right: Rod Wittler, Mid-Pacific Region (MP Region)/Research and Development Office (R&D Office); Kevin Price, R&D Office; Collins Balcombe, Great Plains Region; Lisa Krosley, Dam Safety Office; Jennifer Johnson, Pacific Northwest Region (PN Region); Darrel Krause, Policy and Administration; Julia Pierko, PN Region; Miguel Rocha, R&D Office; Jobaid Kabir, MP Region; Yuliana Porras-Mendoza, R&D Office; Chuck Hennig, R&D Office; Nathaniel Gee, Lower Colorado Region; Travis Bauer, Technical Service Center; Mark McKinstry, Upper Colorado Region; Jake Akervik, R&D Office; and Curt Brown, R&D Office. *(See page 14.)*

Print Options and Instructions

This document is designed to be read either electronically via PDF or printed in color or black-and-white. Please forward it to your colleagues and friends.

You have three options for printing parts or all of this document:

1. Print individual Research Updates on one sheet of paper, double-sided.

2. Print the whole document double-sided, corner stapled on 8.5 x 11-inch paper.

3. For magazine-style, instruct your print professional to print the document double-sided, head-to-head, saddle-stitched on 11 x 17-inch paper.

Your suggestions for improvements are always welcome. Please email them to jakervik@usbr.gov.

Thanks,

Jake Akervik
Communication and Information Systems Coordinator
Research and Development Office

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Chemical Analysis Work Sheet for: Sample source / Sample identification

FEED WATER COMPOSITION

Na^+	93.00	mg/L	=	4.05	meq/L	0.00405	m/kg water
K^+	8.00	mg/L	=	0.23	meq/L	0.00023	m/kg water
Ca^{++}	195.30	mg/L	=	9.80	meq/L	0.00491	m/kg water
Mg^{++}	120.40	mg/L	=	9.90	meq/L	0.00496	m/kg water
Ba^{++}	142.50	ug/L	=	0.002	meq/L	0.00000	m/kg water
Sr^{++}	120.00	ug/L	=	0.003	meq/L	0.00000	m/kg water
Sum of Cations				23.98	meq/L		
Cl^-	1.90	mg/L	=	0.05	meq/L	0.00005	m/kg water
F^-	0.50	mg/L	=	0.03	meq/L	0.00003	m/kg water
HCO_3^-	169.20	mg/L	=	2.77	meq/L	0.00278	m/kg water
SO_4^{--}	953.00	mg/L	=	19.84	meq/L	0.00994	m/kg water
NO_3^-	10.00	mg/L	=	0.16	meq/L	0.00016	m/kg water
Sum of Anions				22.88	meq/L		
Cation/Anion Difference			2.601%	Balance is acceptable			
Silica	13.09	mg/L					
Sum of Ions	1553.56	mg/L					
TDS by calc.	1506.56	mg/L					
TDS by evap.	1483.00	mg/L					
pH	7.50						
Temp.	15.00	deg. C	=	59.00	deg. F		
Ionic Strength	0.0433	m/kg water					

Ksp $CaSO_4$	1.80E-04	IP $CaSO_4$	4.88E-05	IP/Ksp	0.27
Ksp $BaSO_4$	4.92E-10	IP $BaSO_4$	1.03E-08	IP/Ksp	20.94
Ksp $SrSO_4$	1.18E-06	IP $SrSO_4$	1.38E-08	IP/Ksp	0.01
IP CaF_2 max.	4.00E-11	IP CaF_2	3.30E-12	IP/IP max	0.08

Langelier Saturation Index	0.18
Ryzner Index	7.14
Stiff and Davis Index	0.12
Larson-Skold Index	7.17

Notes:
To use this sheet, replace red items with appropriate data
If concentration is unknown, insert 0. If temperature is unknown, insert 25
If TDS by evaporation has been measured, it can be compared to the calculated TDS.

Chemical Analysis Spreadsheet.

View looking downstream toward the lateral gates from the mid-point of the new fish weir. The lateral (saloon-type) gates allow the water to be checked up so that the water in the canal is high enough to go over the weir.

View looking upstream of the new fish weir after completion. Approximately 6 inches of water is passing over the top of the weir.

Water Chemistry Analysis for Water Conveyance, Storage, and Desalination Projects

Designs for water treatment systems or appurtenant equipment depend on understanding the chemical and physical properties of water being conveyed, stored, or treated. Katie Guerra and Frank Leitz in the Water Treatment Group in Reclamation's Technical Service Center developed a *Chemical Analysis Spreadsheet* that can be used to analyze the chemical composition of a water source. This spreadsheet is used to:

- Identify whether the water analysis is satisfactory in terms of ion balance
- Indicate the probability of aggressive attack of water on adjacent metal surfaces or the generation of scaling layers on adjacent surfaces
- Characterize the likelihood of scale formation from sparingly soluble salts
- Calculate the values of the most commonly used calcium carbonate scaling potential indices

The results of the spreadsheet can be used to:

- Identify whether or not new or additional water quality analysis should be conducted
- Determine whether pH adjustment or anti-scalant addition is needed to reduce the likelihood of scaling or corrosion of pipes and equipment

The Chemical Analysis Spreadsheet was designed as a screening tool that requires relatively few inputs and provides a quick assessment of standard water quality parameters and sparingly soluble salt-scaling potential. The accompanying users' manual describes basic principles of water chemistry that are necessary to make use of the spreadsheet. Both the spreadsheet and the Manuals and Standards Program users' manual are available at: www.usbr.gov/pmts/water/publications/wqspreadsheet.html.

Contact: Katie Guerra, 303-445-2013, kguerra@usbr.gov.

Construction of New Fish Weir on the Hogback Diversion Canal

In March 2013, an experimental weir was installed in the Hogback Canal, an irrigation canal that diverts approximately 300 cubic feet per second of the San Juan River near Shiprock, New Mexico. The weir was designed to deflect all fish away from the canal and route them back into the river before they are entrained, but specifically to keep two species of endangered fish out of the canal—the Colorado pikeminnow and razorback sucker.

The weir design was a result of a Value Engineering Study conducted by Reclamation in an attempt to create a fish-exclusion device in the highly turbid and debris-laden river. The typical solution for preventing fish entrainment is to construct fish screens on diversions, but these often become clogged with debris, especially during high-flow events in the spring when fish are moving for spawning. Clogged fish screens require sustained maintenance and are often raised into a non-functioning position when debris loads in the rivers are high.

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The principle of the lateral weir is to check the water up along a lengthy weir wall, with only 6 inches of water passing over the top of the weir and into the canal. The rest of the water along the bottom of the wall is gradually funneled into a return channel that leads back to the San Juan River. Because the endangered species fish are bottom dwellers, they avoid going over the weir and are sent back to the river in the sluice flow return channel. The water returning back to the river also carries the bulk of the debris, since it will not likely go over the weir. A series of Passive Integrated Transponder (PIT) tag antennas are currently being installed in various locations around the facility to document entrainment and fish passage. If this weir is successful, Reclamation is planning to use it in other areas, especially areas where screening is problematic.

Contact: Robert (Bob) Norman, 970-248-0634, rnorman@usbr.gov.

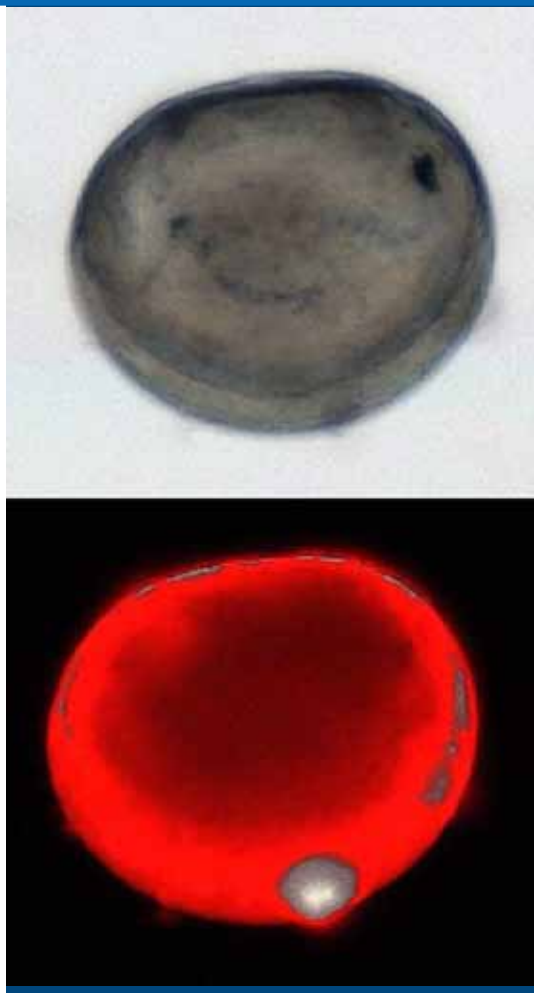
Improved Detection of Invasive Quagga Mussel Larvae

Development of antibodies to improve microscopic detection of veligers

Researchers in the Environmental Applications and Research Group in Reclamation's Technical Service Center, in collaboration with the Metropolitan Water District of Southern California, have developed two polyclonal antibodies that aid in the detection and identification of Dreissenid mussel veligers.

These antibodies bind to quagga mussel larval stages, allowing faster detection by fluorescence microscopy and confirmation of identity. The antibodies are also useful for separating veligers from other organisms and sample debris by magnetic capture. Additional work is underway to develop monoclonal antibodies, which should have greater specificity compared to the polyclonal antibodies. Watch for a Research Update, in its entirety, in a future issue of *The Knowledge Stream*.

Contact: Kevin Kelly, 720-663-7944, kkelly@usbr.gov.



A quagga mussel veliger observed by light microscopy (top) and fluorescence microscopy (bottom) after staining with a polyclonal antibody tagged with a fluorescent dye. Grey/white areas in the fluorescence image are "photo-bleached," due to the high level of fluorescence.

U.S. Department of the Interior Unmanned Aircraft Systems Mission Survey and Strategic Roadmap

Using research and development funding, Reclamation is currently participating in the U.S. Department of the Interior Unmanned Aircraft Systems Working Group to develop a path forward for the implementation of unmanned aerial systems (UAS) in the various bureaus. In December 2013, an electronic needs assessment survey was distributed across the bureaus. The first round of submissions closed on January 16, 2014. More than 400 respondents completed surveys. The second round of the survey (Unmanned Aircraft Mission Survey) is now going forward. Reclamation personnel can participate in this survey at: http://amdtrainingdivision.qualtrics.com/SE/?SID=SV_1YM8IWxtEzAlr49.

Reclamation is also participating in a parallel effort to develop an updated UAS Roadmap being produced by the U.S. Geological Survey at the National Unmanned Aircraft Systems Project Office in Denver, Colorado (http://rmgsc.cr.usgs.gov/UAS). This roadmap will provide the technical baseline for a broader, strategic roadmap planned above.

Contact: Douglas Clark, 303-445-2271, drclark@usbr.gov.

The "T-Hawk" unmanned aerial vehicle.

Recent Events

The list of events below is intended for informational purposes only and does not necessarily constitute an endorsement by Reclamation. These events may be of interest to the science, research, and related communities and are not necessarily hosted by Reclamation.

Find our most recent list of events at: www.usbr.gov/research/events.

American Indian Science and Engineering Society (AISES)—35th AISES National Conference

October 31 - November 2, 2013, Denver, Colorado.
Katie Guerra in Reclamation's Technical Service Center presented a workshop session, "Engineering Sustainable Solutions to Increase Fresh Water Resources in Rural and Tribal Communities." Co-presenters for the workshop were Rebecca Redhorse in Reclamation's Technical Service Center and Andres Guerra, Adjunct Faculty and SHPE Faculty Advisor, Colorado School of Mines. The session's target audience was pre-college students, college students, and recent graduates, with an overarching session goal demonstrating how science and engineering skills can be used to combine desalination and renewable energy to develop new water resources in arid regions in the Western United States to improve public health and promote environmental stewardship. Materials provided included a fact sheet summarizing Reclamation desalination projects and research on or near Tribal lands.

Contact and additional conference information: Katie Guerra, 303-445-2013, kguerra@usbr.gov; www.aises.org/nationalconference.

CEATI International—Hydropower Operations & Planning Workshop, "Renewable Energy Supply Reliability: Forecasting Uncertainties of Water, Wind and Solar"

November 14 - 15, 2013, San Diego, California.

See www.ceati.com/Meetings/HOPIG2013/index.html.

OMICS Group—159th OMICS Group Conference: World Congress on Petrochemistry and Chemical Engineering

November 18 - 20, 2013, San Antonio, Texas.
Katie Guerra in Reclamation's Technical Service Center presented, "Sustainable Water Management in the Oil and Gas Industry to Increase Water Supplies." The conference brings together wide array of leading engineers, academic scientists, chemical industries, and universities.

Contact and additional conference information:
Katie Guerra, 303-445-2013, kguerra@usbr.gov;
www.omicsgroup.com/conferences/petrochemistry-chemical-engineering-2013/.

Oxnard City Corp Wetland Monitoring Training

December 2 - 5, 2013, Oxnard Saline Treatment Wetland, Oxnard, California.
Katharine Dahm, Andrew Tiffenbach, Valerie-Batista Garcia, and Mark Nelson in Reclamation's Technical Service Center and U.S. Geological Survey's wetland expert, Joan Daniels, worked with the City of Oxnard and the Oxnard City Corp to monitor

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the Oxnard Saline Demonstration Wetland. This research project was funded through Reclamation's Science and Technology Program to monitor the use of constructed wetlands to treat concentrate from the city's water reuse facility known as the Oxnard Advanced Water Purification Facility (AWPF). This research project has been ongoing since 2011 in collaboration with Amy Witherall and Doug McPherson in Reclamation's Lower Colorado Region.

Contact: Katharine Dahm, 303-445-2495, kdahm@usbr.gov.

Joan Daniels (U.S. Geological Survey) on the left with Olivia Cancino (Oxnard City Corp) on the right. Joan is teaching Olivia how to measure plant density to understand vegetation health at the AWPF Oxnard Saline Demonstration Wetland. Photograph courtesy of Oxnard City Corp.

Oxnard AWPF Demonstration Wetland, Oxnard, California.

American Geophysical Union (AGU)—AGU Fall Meeting

December 9 - 13, 2013, San Francisco, California.

Reclamation's David Gaeuman presented, "A Flume Experiment to Constrain Bedload Adaptation Lengths" (www.usbr.gov/research/projects/detail.cfm?id=3054) in the session, "Morphodynamic characteristics of non-normal flow conditions."

Contact and additional meeting information: David Gaeuman, 530-623-1813, dgaeuman@usbr.gov; http://fallmeeting.agu.org/2013.

Climate Change and Water Working Group—2nd Annual Progress Meeting on Reclamation Climate and Hydrology Research

January 29 - 30, 2014, Denver, Colorado.

A progress meeting focused on collaborative Climate Change and Water Working Group (CCAWWG) projects addressing climate change impacts on hydrology, with special focus on flood hydrology and extreme storm events. Last year's progress meeting participants represented 18 Federal, State, and local organizations; more than half of them participated remotely via webinar.

Contact and additional progress meeting information: Levi Brekke, 303-445-2494, lbrekke@usbr.gov; www.ccawwg.us/index.php/annual-progress-meeting-on-reclamation-climate-and-hydrology-research.

Upcoming Events

American Meteorological Society (AMS)—94th/2014 AMS Annual Meeting, "Extreme Weather—Climate and the Built Environment: New Perspectives Opportunities, and Tools"

February 2 - 6, 2014, Atlanta, Georgia.

See http://annual.ametsoc.org/2014.

Webinar: Testing Cathodic Protection Systems Training

February 27, 2014, Denver, Colorado.
This Reclamation-hosted webinar training will consist of a 40-minute presentation followed by 20 minutes of questions, answers, and comments. Jessica Torrey in Reclamation's Technical Service Center will present a tutorial on testing these systems including identifying structure versus anode cables, potential and current measurements, basic repair at test stations, and ideal testing schedule and reporting practices. This webinar will also introduce a research project to design a tablet app for cathodic protection testing, funded by the Research and Development Office for FY 2014 (www.usbr.gov/research/projects/detail.cfm?id=6816).

Test station for a galvanic anode cathodic protection system.

Contact and additional webinar training information:
Jessica Torrey, 303-445-2376, jtorrey@usbr.gov
or Daryl Little, 303-445-2384, dlittle@usbr.gov;
https://www4.gotomeeting.com/register/508872367.

American Water Works Association—Sustainable Water Management Conference

March 30 - April 2, 2014, Denver, Colorado.
Presenting solutions for balancing the benefits of conservation with the costs, managing infrastructure, developing robust supply models and watershed management plans, water reuse, resource management, green infrastructure, and more.

See www.awwa.org/conferences-education/conferences/sustainable-water-management.aspx.

national ground water association®

National Ground Water Association (NGWA)—NGWA Groundwater Summit

May 4 - 7, 2014, Denver, Colorado.

See https://ngwa.confex.com/ngwa/2014gws/cfp.cgi.

Safety Evaluation of Existing Dams International Technical Seminar and Study Tour

June 10 - 19, 2014, Denver, Colorado.

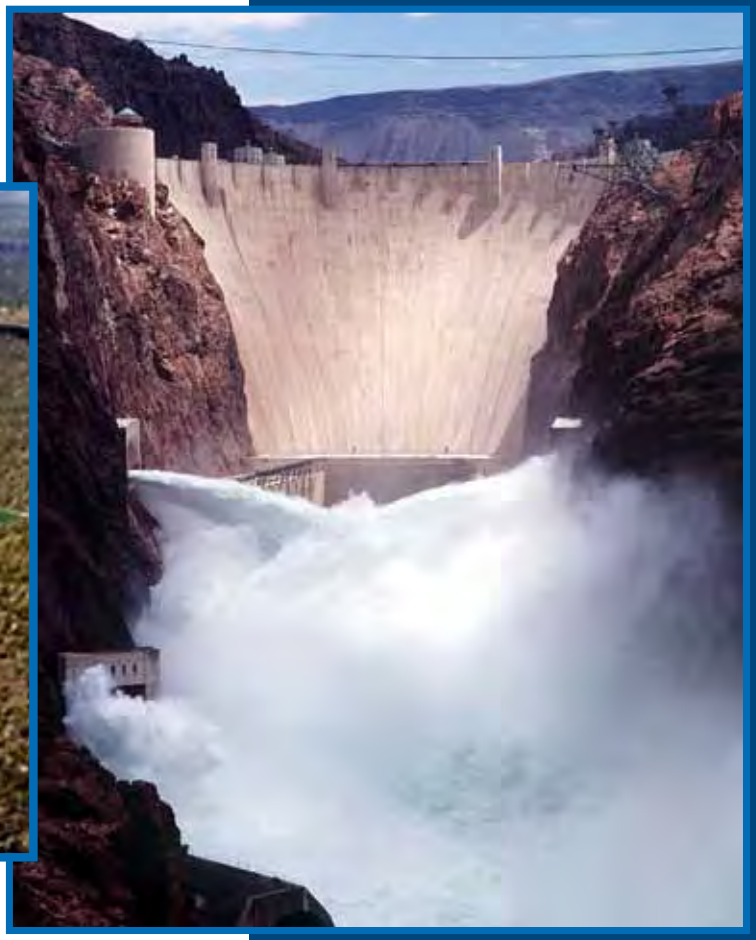
Reclamation officials will provide the training for this seminar. The first portion of this seminar will take place in Denver, Colorado, and will consist primarily of classroom presentations and discussions. A tour of the Reclamation Research Laboratories will also be featured. Lectures, case histories, and structured discussions covering all aspects of a dam safety examination program will be led by Reclamation engineers and geologists with extensive experience and knowledge in the areas of design, construction, operation, maintenance, and dam safety. The training outlines the hydrologic, seismic, geotechnical, electrical, mechanical, and structural considerations of dam safety as well as operations, maintenance, surveillance, and emergency preparedness. Presentations, case histories, and a walk-through abbreviated examination will be used to present the multidiscipline approach to an effective dam safety program. The second portion of this seminar will take participants to the States of Nevada and Oregon and will consist of four damsite visits (see photographs). Participants will also enjoy a "free" day in Las Vegas, Nevada.

Contact and additional seminar and study tour information:
Leanna Principe, 303-445-2127, lprincipe@usbr.gov or
Angela Medina, 303-445-2139, amedina@usbr.gov;
www.usbr.gov/international/seed_2014seminar.html.

Ochoco Dam in Oregon.

Scoggins Dam in Oregon.

Arthur R. Bowman Dam in Oregon.



Hoover Dam in Arizona/Nevada.

Featured Faces

Research and Development Office Staff

Rod Wittler, Ph.D., P.E.

Rod Wittler is the Mid-Pacific Region Science Liaison to Reclamation's Research and Development Office. Rod served as the Senior Scientist of the Trinity River Restoration Program from 2004 - 2008. For 15 years prior, Rod was a Research Hydraulic Engineer in the Water Resources Research Laboratory in Reclamation's Technical Service Center. He has 29 years of general and research engineering experience in hydraulic models, river mechanics, flow measurement, sediment analysis, temperature modeling, and river restoration. He earned a Bachelors of Science, Masters of Science, and Doctor of Philosophy degrees from Colorado State University and is a registered professional civil engineer in the State of Colorado.

Mid-Pacific Region Science Liaison Research Coordinator

Rod Wittler
530-623-1801
rjwittler@usbr.gov

Janet Montano

Janet Montano started working for Reclamation in April 2001 in the Technical Service Center's Remote Sensing Office; Michael (Mike) Pucherelli was the Group Manager. In 2007, she transferred to the Research and Development Office.

Janet's work consists of helping to schedule the multitude of meetings that transpire with the office, while trying to keep up to speed with all of the new programs that are currently being implemented, such as the Data Tracking System, Concur Travel System, Purchase Request SharePoint site, and the Financial and Business Management System.

Janet also helps with proofreading the layout and articles for *The Knowledge Stream* newsletter. In addition, she works with the office's PropC and SharePoint sites to update contact information of retires and individuals that request to be added to the newsletter's electronic distribution, as well as coordinating with the Printing and Duplication Office to obtain physical copies for hardcopy distribution. Within PropC, Janet reviews and accepts research articles and reports that are submitted by Reclamation researchers and then compiles those that are accepted for inclusion in the newsletter.

Research and Development Office Administrative Assistant

Janet Montano
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jmontano@usbr.gov

The Faces Behind The Knowledge Stream Newsletter

In August 2011, the Research and Development Office, in cooperation with Reclamation's Technical Service Center, created *The Knowledge Stream* newsletter. The newsletter focuses on high-priority research areas, various research and development programs, and upcoming research opportunities. It also shares information about researchers across Reclamation along with our research coordinators and partners. In addition, it highlights administration priorities and critical agency needs. The newsletter provides a lot of information in a succinct, compact form. It is distributed quarterly to approximately 2,000 recipients in government, private sector, academia, and nonprofit organizations, as well as Reclamation stakeholders, managers, scientists, and engineers from all offices.

The Technical Communications Group in Reclamation's Technical Service Center has helped produce *The Knowledge Stream* newsletter since its inception. Cindy Gray, Deena Larsen, Teri Manross, and Tyna Petersen are communications specialists

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with expertise designing, creating, writing, editing, and desktop publishing a variety of technical and nontechnical documents and visual graphics materials. These communications specialists have a combined 87 years of Reclamation service.

Cindy Gray, a Visual Information Specialist with 14 years of experience working for Reclamation, is the graphic designer/production artist who formats *The Knowledge Stream* newsletter in Section 508 Accessible Adobe InDesign layouts. She also designs, creates, manipulates, and artist renders the array of graphics and photographs included in the newsletters, along with many other visual outreach requests by the Research and Development Office.

Deena Larsen, with 22 years of experience working for Reclamation, is the Technical Writer for research and development bulletins and updates, a large component of *The Knowledge Stream* newsletter. These bulletins and updates are also a component of the publications located on the Research and Development website, which she maintains. In addition, Deena has been involved in article and report writing for the Science and Technology Program and other researchers since she came onboard.

Teri Manross, with 26 years of experience working for Reclamation, is the most recent addition to the team. Teri is the Technical Writer-Editor who helps write the "Featured Faces" articles for *The Knowledge Stream* newsletter. In addition, she assists Deena Larsen with research and development bulletins and updates. Teri also helped Levi Brekke, Research and Development Office Climate Change and Variability Research Coordinator, prepare the final version of the Downscaled CMIP3 and CMIP5 Climate Projections.

Tyna Petersen, a Technical Editor with 25 years of experience working for Reclamation, is the Project Manager (a.k.a. "Cat Herder") for *The Knowledge Stream* newsletter. She also performs the technical editing on the newsletter, at times rewriting for clarity or adding content that is not originally provided. In addition, Tyna edits and desktop publishes other research and development documents and reports, along with being involved in other project manager/liaison-type duties for the Research and Development Office's outreach program.

The Technical Communications Group has expertise that spans several decades and includes work on nearly every form of document Reclamation produces, including engineering and geology reports, safety of dams documents, congressional presentation projects, public involvement materials, operation and maintenance manuals, feasibility studies, and environmental reports, just to name a few.

"The Research and Development Office is like a fine-tuned vehicle. Each of us is an intricate component to the smooth-running of the office. Each of us has a special talent that we provide, and the office accomplishments are a product of this."

Janet Montano
Research and Development Office Administrative Assistant

Left to right: Cindy Gray, Teri Manross, and Tyna Petersen.

Deena Larsen.

Reclamation Research Jam

Reclamation Research Jam 2013 Participation by the Numbers

- **1,071 Reclamation employees from all five regions, including Washington, D.C., and Denver, Colorado**
- **925 total votes—847 up votes and 78 down votes**
- **181 comments**
- **57 ideas**

Jessica Torrey in Reclamation's Technical Service Center with the People's Choice Award for most votes for her idea (using tablet computers for field and laboratory work) in last year's Reclamation Research Jam 2013.

FY 2013 Year in Review

The second annual research and science idea gathering event saw more votes, increased discussion, and comments

The Research and Development Office hosted their second annual Reclamation Research Jam, an internal online crowdsourcing event to gather innovative ideas from February 25 through March 15, 2013.

The ideas gathered were shared with Reclamation researchers for possible submission as research project proposals during the upcoming FY 2014 funding cycle.

The Top 10 2013 Reclamation Research Jam Ideas

Net Votes	Title
43	Use of Tablet Computers for Field and Laboratory Work
41	Material Compatibility Issues for Concrete Repair Materials
31	Mitigate Hard Mineral Scaling in Reclamation Facilities
31	Share Research Results—Don't Re-Invent the Wheel
30	Develop Methods to Seal Leaking Contraction Joints in Dams
29	Off-Grid Power Sources for Cathodic Protection
28	Building Information Modeling (BIM)
27	Novel Electrodes for Soil Characterization
26	Impacts From Operational Releases to Populations at Risk
26	Mussels to Fuel

FY 2014 Preview

The Research and Development Office will host their third annual Reclamation Research Jam, which will run February 3, through February 28, 2014

For the third year in a row, the Reclamation Research Jam will be the unofficial kickoff of our annual project selection and funding cycle. The official kickoff begins in April with our pre-proposal cycle, and then in earnest in June when we begin taking all proposals via our online proposal management system, PropC (www.usbr.gov/research/propc).

The Reclamation Research Jam gives Reclamation employees an opportunity to submit, vote on, review, and discuss research needs and ideas using the General Services Administration's approved IdeaScale software tool -(www.ideascale.com), the same software which is used annually for the President's SAVE Award (www.whitehouse.gov/save-award).

Why Participate?

- **Get Your Ideas Funded.** Every year at least one top Reclamation Research Jam idea (more than one in the first 2 years) is selected to be turned into a funded scoping level (up to $15,000) project.

- **Collaboration:** Share and discuss your ideas with the Research and Development Office, Reclamation researchers, and other employees.

- **Innovation:** We want your ideas for finding ways to make things better, faster, and cheaper through research and development.

- **Competition:** Vote up the ideas you like. Vote down the ideas you do not like. Sometimes the best ideas are the most popular ones. Sometimes they are not. The Reclamation Research Jam offers the potential to have your idea turned into a funded research project based not just on popularity, but also on other subjective factors such as quality, support, peer-review, timeliness, proactivity, applicability, available funding, etc.

Join the Reclamation Research Jam at https://reclamation-research.ideascale.com. Reclamation employees can join by using their "…@usbr.gov" email address; however, anyone can submit research ideas or questions to research@usbr.gov anytime.

R&D Office Contact: Jake Akervik, Communication and Information Systems Coordinator, 303-445-2136, jakervik@usbr.gov.

Collaborative Innovation™

"In a world where innovation is global, multidisciplinary and open, you need to bring different minds and different perspectives together to discover new solutions to long-standing problems. Therein lies the essence of collaborative innovation."

—IBM Corporation, who originated the Jam concept starting in 2001

www.collaborationjam.com

Curt Brown, Director, Research and Development presents Tim Randle in Reclamation's Technical Service Center with the People's Choice Award for his top-vote getting idea (to study sediment impacts in reservoirs) in the Inaugural 2012 Reclamation Research Jam.

FY 2014 Research Awards

FY 2013 Year in Review

For FY 2013, Reclamation's Science and Technology Program awarded $10.5 million for 125 research projects, focusing on priority areas:

- **Advanced Water Treatment**
- **Renewable Energy**
- **Climate Change and Variability**
- **Invasive Zebra and Quagga Mussels**
- **Other Mission-Related Research**

Over $13.5 million was requested from the Program for FY 2013. However, because of the number of proposals and total amount of funding, 32 percent of the proposals (comprising of $5.2 million) could not be funded.

Reclamation Regional Director's Science Issues Research

"We are excited to kick off this new activity under Reclamation's Science and Technology Program, because we see great benefit to Reclamation and water managers in the West when we can identify and develop research projects directly tied to the issues that Reclamation's Regional Directors deal with on a daily basis."

Miguel Rocha
Science and Technology Program Research Coordinator

Reclamation's Science and Technology Program Research Awards and Portfolio

Reclamation's Science and Technology Program is managed by the Research and Development Office. The program is focused on providing innovative solutions for Reclamation water and facility managers, and our western stakeholders. The program includes competed research submitted by Reclamation employees and directed research performed by both Reclamation employees and outside experts. This fiscal year, we have awarded 115 competitive and 28 directed projects. The competitive proposals are reviewed by a Reclamation team that includes representatives from all five Regional Offices, the Technical Service Center, Dam Safety Office, and Policy and Administration.

Thus, a total of 143 ongoing and new research projects have been or will be funded this fiscal year. Technology transfer, collaboration, workshops, and other outreach efforts are also funded to help ensure our innovative ideas and solutions reach Reclamation managers; other Federal, state, local, tribal, and non-governmental entities; and the public. The table below shows the complete spending plan for Reclamation's Science and Technology Program. This table includes staff time, directed activities, and U.S. Department of the Interior assessments.

FY 2014 Science and Technology Program Research Portfolio Summary

Activity	Budget
Challenge: Water and Power Technology Solutions	$2,000,000
Mussels: Pulse Pressure Technology Accelerated Evaluation	$1,500,000
Advanced Water Treatment	$874,700
Climate Change and Variability	$1,500,000
Invasive Zebra and Quagga Mussels	$1,500,000
Renewable Energy and Energy Conservation	$1,200,000
Water Operations and Decision Support	$756,665
Environmental Issues in Water Delivery and Management	$691,000
Water and Power Infrastructure Reliability	$597,400
Conserving or Expanding Water Supplies	$156,410
Regional Director's Science Issues Research Needs	$500,000
Unsolicited Research Proposals	$403,825
Accelerating Technology Transfer and Commercialization	$500,000
Knowledge Transfer, Outreach, Collaboration, and Implementation	$335,000
Science and Technology Program Coordination	$750,000
Total	**$13,265,000**

Reclamation Regional Director's Science Issues Research

In FY 2014, the Research and Development Office initiated a new area of research directed at addressing science issues on the mind of Reclamation's premier water managers—our five Regional Directors. Reclamation's five Regional Directors were asked to identify issues that could benefit from research and development projects. A number of issues were submitted, and the Research and Development Office worked with others to develop research proposals and to pull together a team to plan research for each of the identified science issues. Below are the research questions that will be examined over the next year.

- Can we develop meaningful aquatic ecosystem health indicators that will allow us to effectively and affordably measure aquatic health?
  Contact: Joseph (Gary) Davis, 406-247-7717, jgdavis@usbr.gov.

- Can we identify non-point source pollution to Grand Lake in Grand Lake, Colorado? What operational options are available to manage the clarity in the lake?
  Contact: Joseph (Gary) Davis, 406-247-7717, jgdavis@usbr.gov.

- Can Reclamation identify methods to understand the stakeholders' perception of Reclamation's responsibilities and how can we measure Reclamation's performance?
  Contact: Jeannette (Rose) Davis, 702-293-8421, jdavis@usbr.gov.

- What is the effectiveness of a graduated field fish barrier, installed near Dead Horse Island, California, at minimizing straying adult salmon through the Delta Cross Channel into the Sacramento River?
  Contact: Nicole Johnson, 916-978-7139, njohnson@usbr.gov.

- What non-structural abatement alternatives are available to reduce the total dissolved gas production below Reclamation facilities?
  Contact: Clyde Lay, 208-685-6926, clay@usbr.gov.

- How can Reclamation prevent, and recover from, devastating wildfires in the West in partnership with the U.S. Forest Service and the Bureau of Land Management?
  Contact: Chris Beardsley, 208-383-2275, cbeardsley@usbr.gov.

- What techniques can be identified and evaluated to locate canal voids and seepage?
  Contact: Julia Pierko, 208-383-2284, jpierko@usbr.gov.

Research and Development Office Science and Technology Program Research Coordinator

Miguel Rocha
303-445-2841
mrocha@usbr.gov

Miguel Rocha is the Science and Technology Program Research Coordinator for the Research and Development Office. In this position, he manages the selection process, develops policy, and coordinates over 100 research projects annually.

With over 15 years working for Reclamation, Miguel has developed broad water resource experience in water recycling, water operations, water conservation, civil design, and safety of dams. During this tenure he has worked in Oklahoma, Montana, New Mexico, Texas, and now Colorado. He is a graduate of New Mexico State University and is a registered professional engineer in the State of New Mexico.

San Luis National Wildlife Refuge located near Los Banos, California.

San Luis National Wildlife Refuge located near Los Banos, California.

Group meeting at Grassland Water District Los Banos, California. Jun Wang, Model Developer is demonstrating his Real-Time Management Visualization Tool. The tool provides real-time data for electrical conductivity and flow, and calculates salt load from sensor readings within the wetland areas. The water masters are able to use this tool to blend and manage waters prior to discharge.

Left to right: Roberta Tassey, Reclamation; Jim Brownell, Central Valley Regional Water Quality Control Board; Nigel Quinn, Reclamation and Lawrence Berkeley National Lab; Ric Ortega, Grassland Water District; and Lisa Rainger, Reclamation.

Science and Technology Program Research—Decision Support

This research area is focused on developing solutions and tools to help Reclamation water managers make effective reservoir and river system operational and planning decisions through better integration, evaluation, understanding, and presentation of critical data and information. Improvements and technological advances are pursued in managing hydrologic events, water supply forecasting, water operations models and decisions support systems, and water resource data analysis.

FY 2013 Highlights

Hydro-Economic Model Completion and Technology Transfer

Reclamation planners and decisionmakers need a comprehensive, minimally biased method to calculate the net benefit of various water management alternatives. The HydroCents Model does just that by observing potential basin-wide changes to a hydrologic system and then placing a market-based (positive or negative) value on those proposed changes. This tool allows Reclamation planners and decisionmakers to better inform management decisions by having quantitative benefit information available when comparing alternatives. The HydroCents Model can also take into account ecosystem water demands either as fixed requirements or (when demand-price data are available) as market-based demands. Contact: Jennifer Johnson, 208-378-5225, jmjohnson@usbr.gov.

GIS-Based Decision Support for Wetland Drainage Salinity Management

This project provided science-based tools for the long-term management of salinity in drainage discharges from wetlands to the San Joaquin River (SJR). The results of the project are being used to develop best management practices and a decision support system to assist wetland managers adjust the timing of salt loads delivered to the SJR during spring drawdown. Adaptive drainage management scheduling can allow the water master to time discharges to meet the salinity water quality objectives in the lower SJR at Vernalis, California. The paired approach to project implementation, whereby adaptively managed and traditional practices are monitored side-by-side, has provided a quantitative measure of the impacts of the project on the timing of salt loading to the SJR. The most significant accomplishment of the project has been the technology transfer to wetland biologists, ditch tenders, and water managers within the Grasslands Ecological Area. This "learning-by-doing" has built local community interest within the Grassland Water District and California Department of Fish and Wildlife, providing these institutions with new ways to assess and effectively manage salinity within their wetlands while simultaneously providing benefits to salinity management of the SJR. Contact: Nigel Quinn, 916-978-5079, nquinn@usbr.gov or Roberta Tassey, 916-978-5078, rtassey@usbr.gov.

FY 2014 Initiatives

Data Stewardship

Reclamation is exploring data management needs within Reclamation's river restoration activities. The key to successful data stewardship is planning for every stage of the data lifecycle. Successful planning requires collaboration not only amongst Reclamation personnel, but with partner agencies and stakeholders. In addition, information technology is essential for the massive data sets that river restoration projects generate. For FY 2014, pilots are being identified within river restoration activities to improve the methods and technology used to manage Reclamation's data. Contact: Curt Brown, 303-445-2098, cbrown@usbr.gov.

Science and Technology Program Research—Water Supply

Research under this focus area develops solutions and tools that enhance water supplies for Reclamation stakeholders with new technologies, solutions, and practices that expand, liberate, or conserve water supplies. Improvement and technological advances are pursued in the following areas: conjunctive groundwater storage and use, agriculture water efficiency, institutional approaches to water solutions, helping irrigation districts cope with change, reducing system water losses, and other conservation practices.

FY 2013 Highlights and FY 2014 Initiatives

Canal Lining Technical Alternatives

The Research and Development Office is sponsoring directed research to evaluate canal lining technologies intended to conserve water. This information will help Reclamation and Reclamation stakeholders select the best canal lining alternatives for their application. This effort is an update of a previous effort completed in November 2002 by Reclamation's Technical Service Center, Canal-Lining Demonstration Project Year 10 Final Report. The current effort will look at new technology and materials and will evaluate the life and effectiveness of the previous case studies that were included in the 2002 report. Contact: John (Jay) Swihart, 303-445-2397, jswihart@usbr.gov.

Broad Area Irrigation Scheduling Mobile App

The Research and Development Office is supporting the development of mobile apps that will benefit Reclamation and Reclamation stakeholders. One example is a mobile app being developed by Jama Hamel in Reclamation's Pacific Northwest Region, which will provide a mobile version of an irrigation scheduler. The irrigation scheduler is currently online, but the online sites are heavily used. This effort will make the app available on iOS (previously iPhone OS) and Android platforms, thus improving the usability of irrigation schedulers for farmers, irrigation districts, and Reclamation staff. Contact: Jama Hamel, 208-473-8257, jhamel@usbr.gov.

Use of Aqualastic to Encapsulate Degraded Roller Compacted Concrete Lining in Canals

The current method of repairing an Roller Compacted Concrete (RCC) Roller Compacted Concrete (RCC) and shotcrete-lined canal is to patch the deteriorated section with more concrete. This patch is 3 to 4 inches thick and over time will reduce the available canal cross section for water transmission. This process is also labor intensive and costly. A recent material that is being used to provide a cost-effective way to encapsulate degraded sections of RCC and shotcrete lining is "Aqualastic." This material is being tested to seal degraded portions of the canal lining to stop further degradation, erosion, and to reduce or eliminate seepage.

Aqualastic is a polyurea elastomeric coating that is sprayed onto a prepared surface. This product is similar to spray on bedliners commonly used in pickup trucks. Aqualastic is currently applied to concrete canal linings as a crack sealer. Applying Aqualastic over a section of canal approximately 75 feet long by 36 feet wide to measure its ability to achieve seepage reductions and its ability to protect degraded or eroded sections of the lining is being proposed. The tests will also determine how well the product will adhere to the RCC and shotcrete substrate over time over a large area. As a secondary benefit, it is believed the product will also result in increased transmission efficiency as a result of reducing the channel roughness due to a smoother surface area. Contact: Allen Skaja, 303-445-2396, askaja@usbr.gov or Katherine Kihara, 541-389-6541x229, kkihara@usbr.gov.

Test Site No. 3. Aqualastic applied on an area of severely degraded RCC. The surface preparation was done using a rotary brush attached to a Bobcat to remove the large amounts of debris.

Research Test Site No. 9. Evaluation of different surface preparation techniques. Left half heavy sandblasted (which is the normal degree of cleanliness); right half sweep blast (which is not typical application conditions).

Test Sites No. 3 (in the background) and No. 5 (in the foreground). Aqualastic test patches.

Test Site No. 9. Aqualastic test patch.

Science and Technology Program Research—Infrastructure Reliability

Research under this focus area improves the reliability of Reclamation water storage and delivery facilities by producing or advancing effective solutions, tools, and practices that Reclamation facility managers use to maintain, modernize, and extend the life of Reclamation's aging infrastructure. Improvements and technological advances range from structural condition assessment and performance monitoring, to repair, maintenance, and public and employee safety.

Direct pullout testing of rope access anchor bolts, shown here under a load of 5,000 pounds.

FY 2013 Highlights

Life Safety of Rope Anchors

Through this research activity, Reclamation is evaluating rope anchors used for climbing inspections to continue development of safe practices and protocols for rope access maintenance and inspection of inaccessible features on Reclamation structures. This research study evaluated how Reclamation should test and evaluate existing anchor installation, the most effective anchors for certain situations, potential installation defects, the relationship of concrete and anchor strength, and how loading and load testing may affect anchor strength.

The testing is complete and a report is scheduled for publishing in FY 2014. The findings are expected to result in changes to Reclamation's Rope Access Safe Practices.

Contact: Shaun Reed, 303-445-2873, sreed@usbr.gov.

Intelligent Compaction

Reclamation continued the evaluation of Intelligent Compaction and how it may benefit dam construction. Specifically, how reliable is this methodology when soils contain high proportion of clay materials? Dams, levees, and other earthen structures typically constructed by Reclamation contain clay materials to reduce water moving through the structure. Intelligent Compaction can benefit Reclamation by measuring soil compaction in real time and recording compaction data. This should improve Reclamation's construction techniques to improve quality and increase efficiency. This study is laying the foundation to help Reclamation prove the concept and could lead to wide-scale changes in Reclamation construction methods and compaction measurement.

Contact: Robert Rinehart, 303-445-2395, rrinehart@usbr.gov.

FY 2014 Initiatives

Aging Infrastructure Research Roadmap

This project has been designed to use the collective experience of Reclamation's Technical Service Center and Policy and Administration, as well as regional, area, and facility personnel to prepare a research roadmap for aging infrastructure. The roadmap will identify knowledge and technology gaps related to long-term maintenance of Reclamation's infrastructure and will drive future research investments. The team is organizing steering committees to represent Reclamation's most experienced employees in each of the respective infrastructure categories. Surveys and meetings capture the technology and maintenance needs, or gaps, within the steering committee. A second research stage validates the results via Reclamation employees involved in performing infrastructure maintenance. The effort over the next 2 years will focus on documenting and analyzing these needs for pipelines, canals, dams, and pumping plants.

Contact: Bobbi Jo Merten, 303-445-2380, bmerten@usbr.gov.

The "Raven" unmanned aerial vehicle.

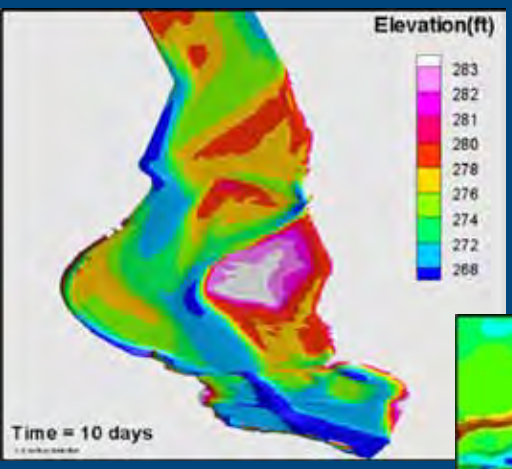
Unmanned Aerial Systems

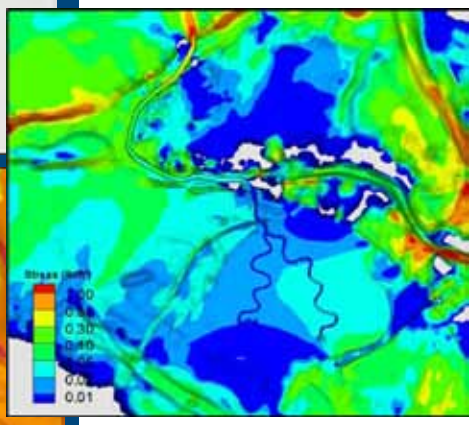
Douglas Clark and Kristen Swoboda in Reclamation's Technical Service Center are studying the ability of how Unmanned Aerial Systems (UAS) (or Unmanned Aerial Vehicles) can help Reclamation efficiently and effectively collect data for Reclamation activities. Reclamation has successfully used UAS to collect photographs and videos. Reclamation is now working to identify sensors that will provide information that is collected through other methods. One such technology is photogrammetry to develop remotely sensed imagery that provides contours and survey-type information. Reclamation has also developed a community of practice to educateemployees about the technology. Reclamation will continue to identify useful technology and applications for UAS.

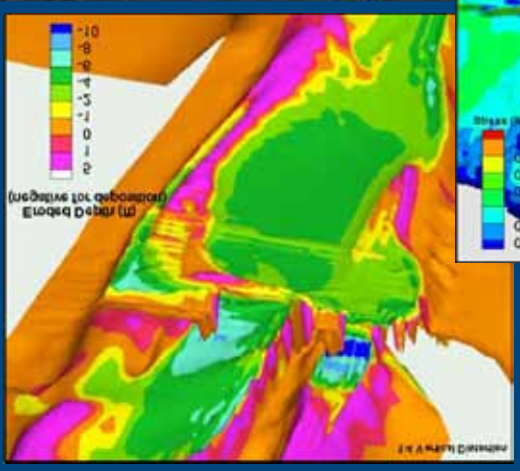
Contact: Douglas Clark, 303-445-2271, drclark@usbr.gov.

Kristin Swoboda handling, and preparing to gather data with, the "Raven" unmanned aerial vehicle.

Science & Technology Program







SRH-2D river flow modeling.

Science and Technology Program Research—Environmental Management

Research under this focus area seeks to improve the reliability of Reclamation water deliveries by producing effective solutions, tools, and practices that Reclamation water managers can use to prevent water conflicts with the environmental demands on water supplies. Improvements and technological advances are pursued in the following areas: fish passage and entrainments, ecosystem needs, aquatic and riparian invasive species, river and reservoir restoration, and sediment management.

FY 2013 Highlights

Sedimentation and River Hydraulics–Two-Dimensional Model

The Sedimentation and River Hydraulics–Two-Dimensional Model (SRH-2D), a two-dimensional flow and sediment transport model developed at Reclamation and partially funded by Reclamation's Science and Technology Program, has recently been adopted by the Federal Highway Administration (FHWA) as one of their agency models. The decision was based on an evaluation of a number of popular models in use; SRH-2D was found to be the most stable and accurate. Yong Lai in Reclamation's Technical Service Center is currently working on adding additional capabilities into SRH-2D as requested and funded by FHWA.
Contact: Yong Lai, 303-445-2560, ylai@usbr.gov or Blair Greimann, 303-445-2563, bgreimann@usbr.gov.

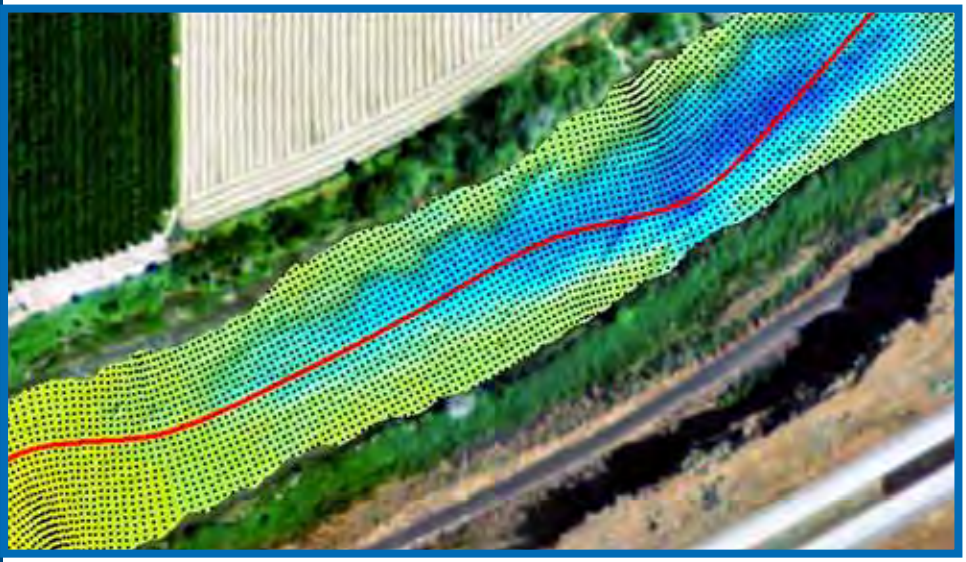


Illustration of predictive bathymetric output points oriented to the direction of river flow and a continuous surface model constructed from predictive output points.

Interpolate Bathymetry

In FY 2013, Kurt Wille in Reclamation's Technical Service Center developed a custom tool that produces a predictive bathymetric surface in the form of interpolated points. The interpolation uses the river flow direction to increase the accuracy. The tool functions inside ESRI ArcGIS ArcMap 10.x software and is designed for use by non-Geographic Information System professional engineers and scientists.
Contact: Kurt Wille, 303-445-2285, kwille@usbr.gov.

FY 2014 Initiatives

Log Jam Design

Reclamation initiated an effort in FY 2013 to develop design standards for a Log Jam Design. The need for these standards was identified in FY 2012 during the Woody Debris Workshop sponsored by Reclamation. The standards will be developed over the next few years. Contact: David Bandrowski, 530-623-1811, dbandrowski@usbr.gov.

Acoustic Measurement of Bedload Using Impact Plates

Reclamation (through Rob Hilldale in Reclamation's Technical Service Center), in partnership with the University of Mississippi, is working to develop acoustic-based methods to measure bedload movement in river channels. These systems will be able to "hear" sediment moving along the river channel and are based on successful installations in Europe. The team has installed the system on the Elwha River in Washington and has collected data to calibrate the hydrophones.
Contact: Robert Hilldale, 303-445-3135, rhilldale@usbr.gov.

Participation in Federal Interagency Sedimentation Project

Reclamation is a charter member of the Federal Interagency Sedimentation Project (FISP), created in 1939. The interagency committee was created to address inconsistencies among Federal agencies in the methods for quantifying sediment transport measurements. Through roughly the first 60 years of the FISP, committee members researched, designed, and built samplers for measuring fluvial sediment being carried by moving water. Along with the samplers created over many years, the FISP also developed standard procedures for collecting and processing sediment data. Over the past decade or so, the FISP has transitioned from building sediment sampling devices to developing surrogate methods for collecting sediment transport data. Surrogate methods consist of optic, acoustic, magnetic, and radioactive tracer methods, to name a few. Surrogate methods are gaining acceptance in the scientific community and are likely to supplant older methods, as they will be more cost effective and can be deployed for long periods of time collecting continuous data. Continuous sediment transport data will be critical to advancing the knowledge of sediment transport, as current methods can only collect data at discrete intervals and can be dangerous during high flow events when a vast majority of sediment is transported.

Channel spanning log jam in the Deschutes River of central Oregon providing complex range of habitat conditions and cover. Photograph by Tim Abbe, March 2013; courtesy of David Bandrowski.

Currently, the FISP is funded by partner agencies consisting of the U.S. Department of the Interior's Reclamation, U.S. Geological Survey (USGS), and Bureau of Land Management; the U.S. Department of Agriculture's Forest Service and Agricultural Research Service; the U.S. Department of Defense's U.S. Army Corps of Engineers; and the U.S. Environmental Protection Agency. Each agency has a single representative on the committee. The FISP Chief is a full-time position within USGS, which covers the salary for that position. Funds from contributing agencies are used to sponsor research toward advancing the state of the science of sediment measurement technology, particularly geared toward surrogate sediment measurement. A Request for Proposals is sent out annually and each year committee members vote on the proposals to be funded. The FISP committee decides which instrumentation and methodologies are approved for use by Federal agencies for sediment data collection. Additionally, the FISP is responsible for quality assurance, sales, and support of physical samplers.
Contact: Robert Hilldale, 303-445-3135, rhilldale@usbr.gov.

FISP Sponsors: USGS science for a changing world; HIF; USDA; U.S. Department of the Interior Bureau of Reclamation

Advanced Water Treatment

Research and Development Office Advanced Water Treatment Research Coordinator

Yuliana Porras-Mendoza
303-445-2265
yporrasmendoza@usbr.gov

Yuliana Porras-Mendoza is the Research and Development Office's new Research Coordinator for Advanced Water Treatment, replacing Kevin Price who served as Reclamation's lead for several years until his recent retirement.

Yuliana has been with Reclamation for over 12 years. She has a Bachelors of Science in Chemical Engineering and a Masters of Science in Environmental Science and Engineering from the Colorado School of Mines, as well as a Masters of Science in Technology Commercialization from the University of Texas.

Yuliana also serves on the Board of Directors of the Society of Hispanic Professional Engineers.

FY 2013 Year in Review and FY 2014 Preview

FY 2013 Highlights

This past year Reclamation continued working on programs and research projects to promote innovation and adoption of advanced water treatment (AWT) technologies. The areas of focus included:

- Increasing water supplies
- Reducing cost of treatment
- Reducing environmental impacts
- Identifying institutional barriers

Major research projects this year were:

- Chlorine resistant membrane development
- Wetlands design and restoration
- Coupling solar power with novel treatment technologies
- Development of tools for planning temporary water supplies for drought emergencies

Investments made in AWT research lead to new usable water supplies, new tools for water reuse and conservation, and aid in ecosystem restoration efforts that help ensure water supplies for the future. Reclamation recognizes the growing importance of these unconventional water sources. The high-level research conducted in FY 2013 could not have been possible without our collaborators. A few of them for FY 2013 research were:

- CH2M Hill
- City of Goodyear, Arizona
- City of Phoenix, Arizona
- Department of Energy (DOE)
- Environmental Protection Agency (EPA)
- Oil and Gas Industry Energy Producers
- Reclamation's Oklahoma-Texas Area Office
- Reclamation's Nebraska-Kansas Area Office
- Sanitation District of Los Angeles County
- Southmost Regional Water Authority, Brownsville, Texas
- State Oil and Gas Commissions
- Texas Water Development Board

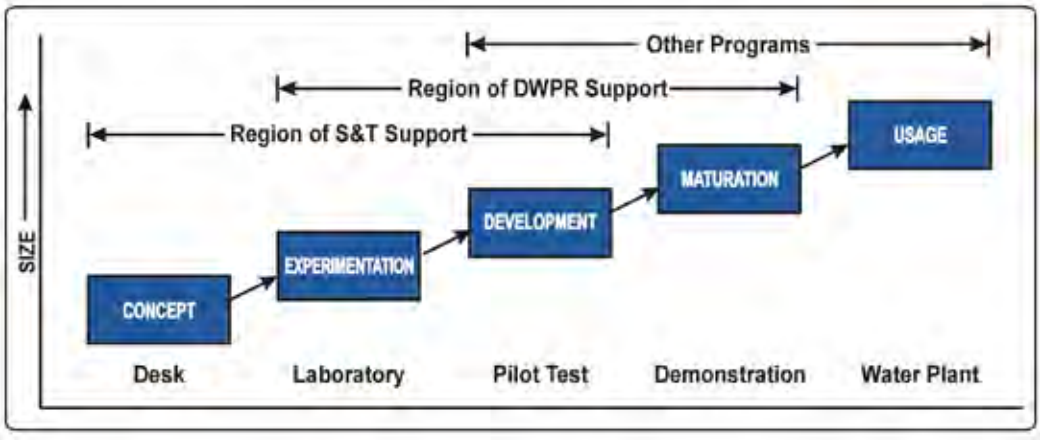
— continued

— continued

- Texas Division of Emergency Management
- Texas Commission on Environmental Quality
- University of Colorado
- U.S. Geological Survey (USGS)
- Water Replenishment District of Southern California

FY 2014 Initiatives

- Issue a Funding Opportunity Announcement for Desalination and Water Purification Research (DWPR) for FY 2015. (See the DWPR section on pages 30 and 31 for the FY 2013 award highlights and FY 2014 award preview.)
- Continue internal research program to focus on increasing water supplies, reducing cost of treatment and environmental impacts, and identifying institutional barriers.
- Continue researching integrating renewable energy in desalination technologies.
- Continue working with Reclamation's three research facilities: Denver Water Treatment Engineering and Research Laboratory, Brackish Groundwater National Desalination Research Facility, and the Water Quality Improvement Center (see right sidebar).
- Continue and enhance Reclamation's AWT community of practice through web-based activities and resources.
- Provide support for attendance to conferences and major venues to more rapidly commercialize and apply research results.
- Facilitate improved coordination between Federal agencies and non-governmental research organizations to address long-term research needs.
- Continue to work and partner with others to develop and implement AWT technologies in all stages: concept, experimentation, development, maturation, and usage.



Concept to usage.

"My goal in my new position is to continue with the efforts Reclamation has done to develop and help mature novel advanced water treatment technologies to augment water in the West."

Yuliana Porras-Mendoza, Advanced Water Treatment Research Coordinator

Reclamation Research Facilities

Denver Water Treatment Engineering and Research Laboratory, Colorado.

Brackish Groundwater National Desalination Research Facility, New Mexico.

Water Quality Improvement Center, Arizona.

Water and Climate

Research and Development Office Climate Change and Variabiilty Research Coordinator

Levi Brekke
303-445-2494
lbrekke@usbr.gov

Prior to joining the Research and Development Office in March 2011, Levi spent 6 years in Reclamation's Technical Service Center and 2 years in Reclamation's Mid-Pacific Region, focusing on technical coordination and implementation of reservoir systems analyses and hydroclimate studies.

Levi's education includes a B.S.E. degree in Civil Engineering from the University of Iowa, an M.S. degree in Environmental Science and Engineering from Stanford University, and a Ph.D. in Water Resources.

Levi serves as the Research and Development Office's water and climate liaison to various science organizations, including the U.S. Department of the Interior's Climate Science Centers and NOAA's Regional Integrated Science and Assessment Centers.

Prior to joining Reclamation, Levi spent time in the private sector, working in the areas of wastewater and water treatment engineering.

FY 2013 Year in Review and FY 2014 Preview

FY 2013 Highlights

Reclamation's Science and Technology Program supported numerous advancements, including updates to climate information supporting adaptation, characterizing strengths and weaknesses of current tools, and initiating various tool improvement efforts. Highlights include (see "Partnerships" for acronym definitions):

- Partnered with collaborators (see figure) to release updated future climate projections issued through the World Climate Research Programme's Coupled Model Intercomparison Project Phase 5 (CMIP5), downscaled to locally relevant resolution necessary for planning.
- Worked with NCAR and USACE to evaluate current methods in climate projection downscaling and hydrologic projection, informing research to improve methods.
- Engaged with NASA/JPL and Reclamation's Upper Colorado Region to begin understanding the value of information from the Airborne Snow Observatory in the context of Reclamation water management.
- Co-authored a user needs assessment with USACE and NOAA's NWS for improved monitoring and prediction information in short-term water management (www.ccawwg.us).

CMIP5 partnered collaborators.

Partnerships

Reclamation's Science and Technology Program actively partners with Federal and non-Federal groups to conduct research on addressing climate change and variability impacts in water management. Current partners include:

- California Energy Commission – Public Interest Energy Research Program
- Climate Change and Water Working Group (CCAWWG)
- Cooperative Ecosystem Study Unit Member Universities
- Cooperative Institute for Research in Environmental Sciences (CIRES)
- National Aeronautics and Space Administration's (NASA) Jet Propulsion Laboratory (JPL)
- National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS)
- NOAA's Regional Integrated Science and Assessment Centers
- RAND Corporation

— continued in right sidebar

FY 2014 Initiatives

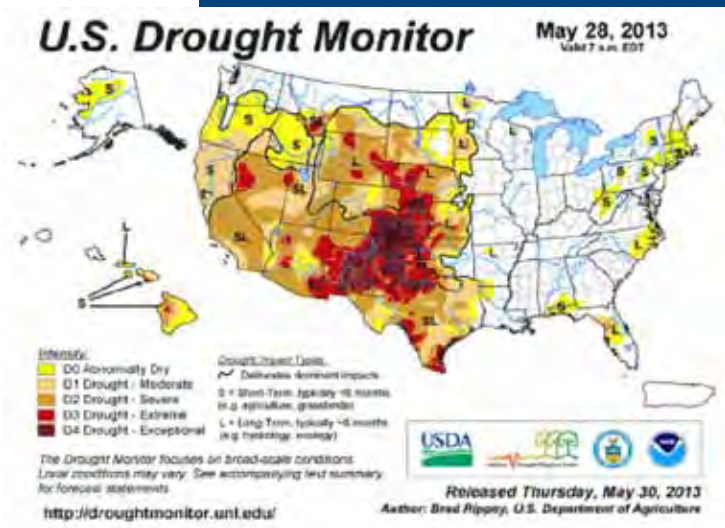
Prepare for Drought and Climate Variability: Support research leading to improved short-term hydroclimate information and prediction tools, both to assist present-day water management and to improve our ability to future climate change and extremes (partnering with NCAR and University of Idaho).

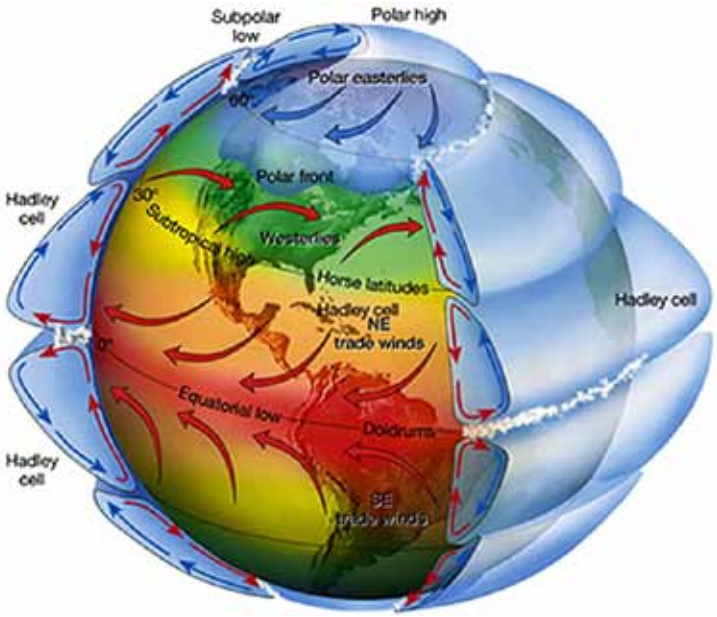
Advance Knowledge on Wet Weather Extremes: Develop improved tools for assessing present-day extreme precipitation event possibilities in the intermountain West and their implications on water management and dam safety (partnering with NOAA, CIRES, and University of Colorado).

Inform Climate Change Adaptation Planning: Develop and release CMIP5 hydrologic projections (NCAR and USACE) and finer resolution CMIP5 daily downscaled climate projections using the new technique, "Localized Constructed Analogs" (Scripps, California Energy Commission, CIRES, and USACE). Engage in efforts to increase access and utility of these datasets (USGS and Brigham Young University).

Develop Climate Technical Skills: Continue collaboration with UCAR's COMET Program and CCAWWG members to develop and pilot offer climate change training focused on impacts assessment skills.

Improve Climate Change Impacts Decision Support: Partner with Federal and non-Federal teams to develop and demonstrate advanced methods for developing downscaled climate and hydrologic projections (NCAR, USACE, and USDA's ARS), assessing aquatic impacts (USGS, USDA's USFS, and University of California, Davis), and evaluating the strengths and weaknesses of various decisionmaking frameworks under climate change uncertainty (RAND Corporation).





Atmospheric general circulation and its global to regional features that affect climate in the Western United States.

—Partnerships continued

- **Scripps Institution of Oceanography**
- **U.S. Army Corps of Engineers (USACE)**
- **U.S. Department of Agriculture's (USDA) Agriculture Research Service (ARS)**
- **USDA's Forest Service (USFS)**
- **U.S. Department of the Interior's Climate Science Centers**
- **U.S. Geological Survey's (USGS) National Climate Change and Wildlife Science Center**
- **University Corporation for Atmospheric Research's (UCAR) COMET Program**
- **UCAR's National Center for Atmospheric Research (NCAR)**

Renewable Energy

Research and Development Office Renewable Energy Research Coordinator

Erin Foraker
303-445-2125
eforaker@usbr.gov

Erin Foraker joined the Research and Development Office in October 2012 as the Renewable Energy Research Coordinator. In this position, Erin directs the Research and Development Office's renewable energy research program, which focuses on improving maintenance practices of hydropower systems, improving reliability and efficiency for hydropower generation, and researching opportunities for other renewable energy generation within Reclamation.

Erin holds a Bachelors of Science in Mechanical Engineering from the University of Memphis and a Masters in Business Administration from the University of Denver, with over 19 years of power industry experience. Prior to joining Reclamation in June 1999, she worked at the Tennessee Valley Authority in the Hydro Modernization Program and Fossil Power Engineering at the Allen Fossil Plant.

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FY 2013 Year in Review and FY 2014 Preview

FY 2013 Highlights

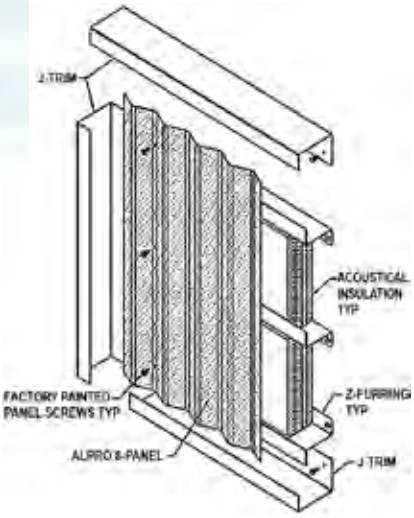
Elephant Butte shear pin with acoustic emission sensor attached.

- Lab testing of aluminum shear pins from the Elephant Butte Powerplant in New Mexico and Estes Powerplant in Colorado was conducted. These shear pins were tested with the assistance of the Materials Engineering and Research Laboratory Group in Reclamation's Technical Service Center. The group's 120,000-pound-capacity Instron Universal Test Machine was used to break the shear pins, and acoustic emissions data were taken during the breaking of the pins. This will aid in the future design of a shear pin break detection system.
- Detailed designs for engineering noise controls were made for the Green Springs Powerplant in Oregon and Roza and Chandler Powerplants in Washington. Then, the noise controls were installed at the Green Springs Powerplant with noise reduction of up to 15 decibels (dB). These noise controls were very well received by a powerplant that was very skeptical.

Location	Before Implementing Controls dBA	After Implementing Controls dBA	Difference dB
Control Room Levels	80.8	70.4	10
Cooling Water Area	86.9	78.3	8
Penstock Area (8' from turbine door)	90.3	74.4	15
Turbine Pit	101.4	98.6	3

Noise Control Reduction at Green Springs Powerplant, Oregon.

Cavitation damage to the turbine runner blade of J.F. Carr Unit 2.



Design of sound absorption treatment.

- A thesis paper by Samuel J. Dyas, *Condition Health Monitoring and Its Application to Cavitation Detection/Characterization Within Hydroelectric Turbines,* was published. This paper is related to cavitation research that was performed using Reclamation's hydraulics laboratory.
- A cavitation detection monitor was designed and used to obtain data at the Judge Francis Carr (J.F. Carr) Powerplant in California. The monitor worked well at detecting suction side inlet cavitation and the data collected were used to set operating limits. These studies slow the eventual destruction of the new $7 million runners by allowing proper operating zones to be established.

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- Reports on non-hydroelectric renewable energy were issued: *Renewable Energy Assessment of Bureau of Reclamation Land and Facilities Using Geographic Information Systems*, www.nrel.gov/docs/fy13osti/57124.pdf and *Case Studies of Potential Facility-Scale and Utility-Scale Non-Hydro Renewable Energy Projects Across Reclamation*, www.nrel.gov/docs/fy13osti/57123.pdf.
- The Research and Development Office and the Lower Colorado Region partnered to provide training on non-hydroelectric renewable energy to over 60 individuals across Reclamation.
- A 25-kilowatt (kW) BAE Systems hydrokinetic device was installed by InStream Energy Systems in the Roza Canal in Washington. Initial testing was performed to measure the impacts that this system may have on canal operations.

The 25-kW hydrokinetic device designed by BAE Systems in Yakima, Washington.

FY 2014 Initiatives

- Improve reliability, improve diagnostic testing, and reduce maintenance costs through developing and demonstrating new technologies at Grand Coulee Powerplant in Washington and J.F. Carr and Folsom Powerplants in California.
- Develop new cavitation detection technology.
- Demonstrate new partial discharge detection technology.
- Develop new shear pin cracking technology/failure prediction.
- Improve safety through testing and demonstrating noise reduction systems and developing and testing new technologies to detect arc flash.
- Test, demonstrate, and implement noise controls at a Reclamation facility.
- Demonstrate and test hydrokinetic technologies under varying conditions in Reclamation's Roza Canal in Washington to understand impacts to canal infrastructure and systems in partnership with the Sandia National Laboratories and InStream Energy Systems.
- Incorporate non-hydroelectric renewable energy geographic information system data into Tessel.

"This Voodoo noise control stuff really works."

Robert Hotze
Green Springs Powerplant Foreman, Reclamation's Pacific Northwest Region

"We are really excited about the results at Green Springs and look forward to more positive and successful results for Roza and Chandler. Not only are noise levels decreasing, which protects hearing, but it is a calmer environment and less stressful for Reclamation employees. Our FY 2014 project targets a larger Reclamation Powerplant, Flaming Gorge, and the Black Canyon Powerplant has also partnered with us during the design phase. We are really optimistic and appreciate all of the support this project has received so far."

Theresa Gallagher
Industrial Hygienist, Reclamation's Security, Safety and Law Enforcement

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Prior to joining the Research and Development Office, Erin worked in both Reclamation's Hydroelectrical Research and Technical Services Group and the Power Resources Office.

She has also served as chairperson and as a representative on several power industry committees.

Invasive Mussels

Invasive Mussels Contact Information

- **Invasive Mussels Research Coordinator, Joseph Kubitschek, 303-445-2148, jkubitschek@usbr.gov**
- **Monitoring and Detection, Denise Hosler, 303-445-2195, dhosler@usbr.gov**
- **Coatings Research, Allen Skaja, 303-445-2396, askaja@usbr.gov**
- **Ultraviolet Treatment, Leonard Willett, 702-494-2216, lwillett@usbr.gov**
- **Copper-ion Generators, Leonard Willett, 702-494-2216, lwillett@usbr.gov**
- **Turbulence Research, Joshua Mortensen, 303-445-2156, jmortensen@usbr.gov and Sherri Pucherelli, 303-445-2015, spucherelli@usbr.gov**
- **Fish Predation, Catherine Karp, 303-445-2226, ckarp@usbr.gov**
- **Fish Screening, Catherine Karp, 303-445-2226, ckarp@usbr.gov**
- **Ecological Assessments/Impacts, Scott O'Meara, 303-445-2216, someara@usbr.gov and George (Chris) Holdren, 303-445-2178, gholdren@usbr.gov**
- **Pulsed Pressure, Joseph Kubitschek, 303-445-2148, jkubitschek@usbr.gov and Sherri Pucherelli, 303-445-2015, spucherelli@usbr.gov**

FY 2013 Year in Review and FY 2014 Preview

FY 2013 Highlights

Since 2008, Reclamation's Science and Technology Program has given high priority to research efforts to improve monitoring and detection methods; identify, develop, demonstrate, and implement facilities protection technologies and strategies; and assess ecological impacts. Through collaborative activities between the Research and Development Office, Technical Service Center, Lower Colorado Region, other agencies, and private industry, researchers are engaged in a number of mussel-related research activities to address impacts of invasive mussels on water resources.

Monitoring and Detection

At the beginning of FY 2013, Reclamation's Detection Laboratory for Invasive and Native Species in Denver, Colorado, received the CO-Labs 2012 Governor's Award for High Impact Research in early detection testing. To date, the laboratory has analyzed over 13,097 water samples representing over 400 water bodies. Intensive laboratory research on sample handling and preservation resulted in three publications, improving the understanding of the relationship between microscopic and molecular testing and the accuracy of results. Additionally, evaluation of the environmental parameters of a reservoir also collected at the time of sampling is contributing to a knowledge base for evaluating the potential for mussel infestations in a specific water body.

Facilities Protection Technologies

Cooling water system treatment using ultraviolet (UV) light has been demonstrated as promising for mussel control. Testing of unique UV treatment technology for reducing mussel settlement in a 4,000-gallon-per-minute cooling water subsystem at Reclamation's Davis Dam in Arizona/Nevada indicates it is performing well. Final results are expected to be available in FY 2014.

Long-term testing of silicone foul-release coatings continues to show good performance in preventing mussel attachment. However, durability of systems that perform well in reducing settlement remains low. Initial investigations to address these limitations were initiated in FY 2013.

Initial research into the effects of turbulence on mussel survival and settlement in cooling water systems has shown a 50-percent reduction in mussel settlement. Such findings suggest promise for this method and warrant further refinement and testing.

The effectiveness of copper-ion (Cu-ion) generators to control mussels in very low doses remains to be demonstrated. Field testing was initiated in FY 2013 to determine Cu-ion technology efficacy at doses of 10 parts per billion or less. Final results are expected to be available in FY 2014.

Field testing of two commonly used fish screen systems, including a cylindrical stainless steel wedgewire screen and a vertical traveling nylon screen, was initiated at Lake Mead. The preliminary results indicate these systems have some favorable characteristics in resisting fouling by quagga mussels.

Ecological Assessment

Mussel populations were monitored at Davis Dam, Imperial Dam, and seven points along the river in between the dams, as well as several backwaters. Data were collected monthly at each site on larval mussel densities, adult mussel settlement, and over 50 water quality parameters. A report on the relationship between these variables and population densities will be available in February 2014.

FY 2014 Initiatives

Monitoring and Detection

- In FY 2014, members of the Reclamation Detection Laboratory for Invasive and Native Species assisted CETEC-SENAI in Belo Horizonte, Brazil, to develop an early detection testing program for the invasive mussels found there.
- Laboratory technicians will continue research efforts to develop flow cell cytometry for larval enumeration and evaluation of control technologies, as well as advancement in the baseline data for zooplankton populations in western reservoirs.

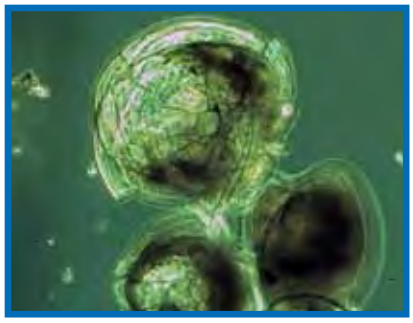
Facilities Protection Technologies

- Testing of pulsed pressure technology for control of mussel settlement on intake structures and within piped systems is planned for FY 2014.
- Additional research, with emphasis on developing coatings that have improved durability and service life, will continue in FY 2014.
- Further UV testing is planned and expected to identify treatment mode-of-action characteristics to provide additional information toward development of performance specifications for future implementation.

Ecological Impacts

- The remaining profile data for physical variables (temperature, dissolved oxygen, pH, and conductivity) from the early detection testing program will be integrated into the project database so that the relationships between presence of veligers and environmental conditions can be more thoroughly evaluated.

Ongoing coatings testing at Parker Dam, Arizona/California. (See back page.)



Pediveliger damage observed during turbulence testing.

Ultraviolet unit installed on 4,000-gallon-per-minute cooling water subsystem at Hoover Dam, Nevada/Arizona.

Environmental Applications and Research Group Botanist, Reclamation's Technical Service Center

Denise M. Hosler, MBS
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Denise Hosler graduated with a Masters in Plant Science, with an emphasis on chemistry and herbaceous plant science from the University of Colorado in 1989. From 1989 to 1998, she worked on environmental issues with private industry bridging chemistry, biology, and compliance under Super Fund and SARA Programs.

Denise joined the Environmental Applications and Research Group in Reclamation's Technical Service Center in 1998, primarily working with Integrated Pest Management (IPM), participating in IPM research to control several aquatic nuisance species such as giant salvinia, salt cedar, and Dreissenid mussels. Since 2006, she has worked on the early detection of Dreissenid mussels in the Western United States. In addition to extensive field work of integrated pest management and invasive species control, she continues laboratory work to resolve biofouling issues and identify key species using taxonomic and molecular methods.

Desalination & Water Purification Research

FY 2013 Year in Review and FY 2014 Preview

FY 2013 Award Highlights

The Desalination and Water Purification Research (DWPR) Program has three goals: augment the supply of usable water in the United States, understand the environmental impacts of desalination and develop approaches to minimize these impacts relative to other water supply alternatives, and develop approaches to lower the financial costs of desalination so that it is an attractive option relative to other alternatives in locations where traditional sources of water are inadequate.

For FY 2013, Reclamation awarded $209,891 under the DWPR Program for one new project and the continuance of two others. Non-Federal cost-sharing funding provided an additional $104,600 for this research also.

Kamalesh K. Sirkar, Ph.D., is a Distinguished Professor of Chemical Engineering and the Foundation Professor in Membrane Separations at the New Jersey Institute of Technology (NJIT). His grant from Reclamation for DWPR is for the new project "Novel Cylindrical Crossflow Hollow Fiber Membrane Module for Direct Contact Membrane Distillation (DCMD)-Based Desalination."

This new project is testing a more compact DCMD module, which will save energy and lower costs. Current DCMD modules have large footprints. This new compact module, being developed in partnership between the NJIT and Applied Membrane Technology, Inc., in Minnesota, will make it easier to design larger plants with smaller footprints.

The two other projects that were continued are at Reclamation's Brackish Groundwater National Desalination Research Facility in Alamogordo, New Mexico—"Zero Discharge Desalination Demonstration" in partnership with the University of Texas, El Paso, and the "Installation and Operation of a Full Solar Distillation Desalination Unit" (Suns River Solar Still) in partnership with Suns River, Many, Louisiana.

Kamalesh K. Sirkar, Ph.D.
Photograph courtesy of NJIT.

FY 2014 Award Preview

Nine Projects Selected to Share $1.1 Million for Desalination and Water Purification Research

More cost-effective and efficient water desalination methods envisioned.

Reclamation Commissioner Michael L. Connor announced that nine entities will share more than $1.1 million in awards in support of laboratory and pilot-scale research studies in the field of water desalination and purification. Through required cost shares of up to 75 percent, Reclamation's funding will be leveraged to support a total of $3 million in research.

"Desalination and other advanced water treatment technologies have the potential to provide new water sources for communities," Commissioner Connor said. "This research effort will examine innovative technologies that have the potential to reduce the cost of treating brackish water–helping to create new tools for addressing future water challenges."

The funding was provided through Reclamation's Desalination and Water Purification Research (DWPR) Program. Through this program, Reclamation works in partnership with entities to develop more cost-effective and efficient ways to desalinate water.

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R&D Office Contact
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Advanced Water Treatment Research Coordinator
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FY 2014 Award Preview

See this Reclamation News Release at:

www.usbr.gov/newsroom/newsrelease/detail.cfm?RecordID=44425

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The laboratory-scale projects selected for funding for FY 2014 are:

- **Membrane Structural and Transport Fundamentals for Augmenting Traditional Water Supplies; Pennsylvania State University, $95,467—** Pennsylvania State University will look at developing detailed metrics to learn how current membranes could be improved for inland water treatment challenges. This will demonstrate the feasibility of using low-energy membranes for inland water treatment applications and augmenting usable water supplies for inland states.
- **Evaluation of a Small Rural Community Zero Liquid Discharge Desalination System; Trussell Technologies, Inc., $149,446—**Trussell Technologies, Inc., of Pasadena, California, will perform a process evaluation study on a unique, zero liquid discharge desalination system specifically being used for a small, rural community. This research will help develop a zero liquid discharge water treatment system for small rural communities at a reasonable cost and with a realistic operation strategy.
- **Energy-Efficient and Sustainable, Microbial Electrolysis-Deionization System for Salt and Organics Removal; University of Tennessee, $150,000—**The University of Tennessee will investigate the capability of combining microbes and electrolysis to treat wastewater and produced water to augment water resources and water reuse for various uses. This combination of treatments can provide a sustainable treatment option while recovering energy and nutrients.
- **Barometric Evaporator Desalination Project; Sephton Water Technology, $29,836—**Sephton Water Technology, Inc., of Kensington, California, will test a prototype barometric evaporator at the existing pilot facility in Imperial County, California, which is currently testing the vertical tube evaporator technology. The goal of this project is to test the barometric evaporator prototype and apply the technology to provide steam generation for a vertical tube evaporator to treat water at the Salton Sea.
- **Autonomous Low Energy Consumption Cyclic Desalination Systems; University of California Los Angeles, $150,000—**The University of California, Los Angeles has proposed a new technology concept of cyclic reverse osmosis to obtain a smaller and mobile unit to treat impaired and underused water sources. It is expected that the operational and configuration flexibilities of this technology will enable a wide variety of water sources over a wider range of salinities while optimizing energy use.
- **Operation of Commercial-Sized Solar Desalination Still; Suns River, $45,022—** Suns River, located in Many, Louisiana, will continue its research and work on a solar desalination still that has been small-scale tested at Reclamation's Brackish Groundwater National Desalination Facility last year. A larger-scale solar still will be constructed to help further research already conducted and identify the feasibility of the solar still to treat brackish groundwater in small rural areas.
- **Evaluation and Development of a New Type of Polymer-Based Water Desalination Membrane; University of Colorado, $134,544—**The University of Colorado will investigate two aspects of a new thin film composite lyotropic liquid crystal polymer membrane system: scaling up the preparation of the new membrane material and designing more economical and easily synthesized monomers. This new membrane is focused to work as a nanofiltration and reverse osmosis-type polyamide membrane.

The pilot-scale projects selected for funding for FY 2014 are:

- **City of Corpus Christi Desalination Pilot Study; City of Corpus Christi, Texas, $200,000—**The city of Corpus Christi has been dealing with drastic drought conditions over the last decade and this pilot project will aid in exploring a variety of options to optimize the pre-treatment process. The results will form the basis of design for a full-scale facility including operating parameters, cost information, and product water quality to assess feasibility of a seawater and/or brackish groundwater supply.
- **Reverse Osmosis Concentrate Management through Halophyte Farming; University of Arizona, $148,053—**The University of Arizona will continue building on some previous research done in concentrate management via halophyte farming and using this salt-resistant crop to manage concentrate produced from water desalination. The pilot project will be conducted at Reclamation's Brackish Groundwater National Desalination Facility, and will enable the construction of the agricultural research testing area at the facility.

Successful applicants were chosen through a competitive, merit-reviewed process. Entities that were eligible include individuals, institutions of higher education, commercial or industrial organizations, private entities, public entities or Indian Tribal governments. Entities, except institutions of higher learning, must cost-share at least 75 percent of the project cost.

Research and Development Office Deputy Director/ Technology Transfer Manager

Chuck Hennig
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Chuck Hennig graduated from Colorado State University in 1978 with a Bachelors of Science in Civil Engineering. Between 1979 and 1991, Chuck served as a design engineer on many major dam construction and rehabilitation projects.

From 1991 to 2000, he became a Dam Safety Program Manager and, later, the Deputy Chief of Reclamation's Dam Safety Office. In 2000, he became the Science and Technology Program Research Coordinator for the Research and Development Office and, ultimately, the Deputy Director.

FY 2013 Year in Review and FY 2014 Preview

Technology Transfer Overview

The Technology Transfer Program helps ensure that Reclamation's scientific and technical information and technologies reaches users in the most effective way possible, via publishing or protecting information. Federal technology transfer laws enable technical collaborations with non-Federal organizations to solve problems faster, cheaper, and better than either party can do on their own. Reclamation uses two technology transfer agreements authorized under the Federal Technology Transfer Act to collaborate with non-Federal organizations: (1) Cooperative Research and Development Agreements (CRADA) and derivatives of a CRADA such as Facility Use and Material Transfer Agreements, and (2) License Agreements.

FY 2013 Highlights

CRADA to Develop a New Desalination Membrane.
Membranes allow purified water to pass while capturing contaminants, but the impaired source water must be chlorinated to prevent membrane biofouling. In addition, impaired waters generally contain residual amounts of chlorine from other sources. Unfortunately, current membranes typically degrade when exposed to chlorine.

Reclamation recently entered into a CRADA with a United States (U.S.) manufacturer of desalination membranes to jointly develop a chlorine-resistant membrane for desalination and other advanced water treatment applications. The CRADA will focus on evaluating, maturing, and commercializing Reclamation's patented chlorine-resistant membrane technologies, and other technologies under development. Under the agreement, Reclamation and the membrane manufacturer will combine their research expertise, intellectual property, laboratory and pilot plant facilities, and manufacturing know-how.

A chlorine-resistant membrane is a long-sought improvement to current membrane technologies. The ability to have membranes that do not degrade when exposed to chlorine could significantly reduce the life-cycle cost of membranes, as well as reduce water treatment plant capital investment and process costs. Lowering the cost and increasing the reliability of desalination helps western water stakeholders have more opportunities to convert brackish and other impaired water sources into useable water supplies for multiple uses.

A pipe clogged with quagga mussels.

CRADA to Develop New Coatings Technology to Protect Water Infrastructures
Reclamation also began pursuing a CRADA with a U.S. coating manufacturer to jointly develop a durable, foul-release coating to protect metal water infrastructure exposed to water such as trashracks, gates, fish screens, pipelines, and penstocks. The objective is to develop a coating that is durable enough to protect the infrastructure with foul-release properties that prevent mussel attachment.

FY 2014 Initiatives

Early Stage Research Collaboration Across Federal Agencies and Non-Federal Organizations

Managing water resources is a shared responsibility across Federal, state, and local agencies; universities; and other water user organizations. Collaborative endeavors across these organizations play a key part to Reclamation research and development activities. Reclamation is undertaking an effort to help create and implement research collaborations of similar research interests in areas that are critical to Reclamation's mission in advanced water treatment, hydropower/renewable energy, water infrastructure, and water conservation.

Currently, Reclamation is developing a community of similar research interests in the area of advanced water treatment. The approach envisioned is to start by organizing a core nucleus of key Federal agencies and United States industry representatives, and designing the community to include other Federal and non-Federal organizations with a stake in advanced water treatment technologies. As the community matures and demonstrates value, Reclamation will explore collaborations in other research areas.

Updates on Department Manual and Delegation of Authority

The U.S. Department of the Interior (DOI), with support from the Research and Development Office and the U.S. Geological Survey, have developed general technology transfer policies and procedures, which are currently going through the surnaming process in DOI and all its bureaus. DOI and the bureaus are also developing a technology transfer website that contains best practices related to technology transfer agreements and other activities from other government agencies, and elsewhere. This website will also attempt to improve public access to information or technologies owned by the bureaus.

DOI delegated authority for signing technology transfer agreements to Bureau Directors on August 2008. In October 2013, the authority within Reclamation was re-delegated from the Commissioner to the Director, Research and Development.

Technology Transfer Definition

The process of disseminating scientific and technical information, technologies, and other resources so that they are available for use.

Technology Transfer Resources and Training

Federal Networking and Training:

- Federal Laboratory Consortium (FLC) for Technology Transfer, www.federallabs.org.
- Federal Technology Transfer Legislation and Policy, The Green Book, www.federallabs.org/flc/store/greenbook.
- National Institutes of Health (NIH) Online Technology Transfer Training, http://tttraining.od.nih.gov.

Non-Federal Networking and Training:

- Association of University Technology Managers (AUTM), www.autm.net.
- Licensing Executives Society (LES), www.lesusacanada.org.

Research and Development Office Technology Transfer Research Coordinator

Samantha Zhang
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Samantha Zhang is the Technology Transfer Research Coordinator for the Research and Development Office. Prior to working at Reclamation, Samantha was at the Office of the Inspector General, Department of Justice in 2004 until 2006.

She was born in the Guangdong Province of China and immigrated with her family to Denver, Colorado, in 1985. She received a Chancellor Scholarship to the Daniels College of Business at the University of Denver and graduated with honors with a Bachelors of Science in Business Administration.

Communication & Information Systems

Research and Development Office Communication and Information Systems Coordinator

Jake Akervik, PMP
303-445-2136
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Jake Akervik joined Reclamation in June 2011. Jake manages the information systems and communication and outreach programs for the Research and Development Office and Science and Technology Program. His duties include:

- **Designing and administrating several research management information systems, including the internal PropC and SharePoint web applications.**
- **Managing and implementing the annual Reclamation Research Jam science need and innovation crowdsourcing event.**
- **Managing communication and outreach strategy and products, including the Research and Development website and *The Knowledge Stream* newsletter.**
- **Reviewing and approving annual Science and Technology Program research project management plans.**

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FY 2013 Year in Review and FY 2014 Preview

FY 2013 Highlights

Screenshot of the new and improved website, which can be found at www.usbr.gov/research.

- The new and improved Research and Development website was launched in January 2013.
- Four quarterly issues of *The Knowledge Stream* newsletter were produced, which are available via the new and improved website: www.usbr.gov/research/publications/newsletters.cfm.
- Numerous Research Bulletins and Updates can be found on our new website: www.usbr.gov/research/publications/updates.cfm.
- The second annual Reclamation Research Jam 2013, an internal online crowdsourcing event to gather innovative ideas, was completed in March 2013. A recap can be found in the April 2013 issue of *The Knowledge Stream* at: www.usbr.gov/research/docs/ks/2013-03-ks.pdf.

FY 2014 Initiatives

- The Reclamation Research Jam 2014, our third annual internal online crowdsourcing event to gather innovative ideas, is occurring in February! Read more about it on pages 12 and 13.

- Two video projects will debut in 2014. Frank Leitz from the Water Treatment Group in Reclamation's Technical Service Center will discuss some history behind desalination and water treatment at Reclamation, and Subhrendu Gangopadhyay from the Water Resources Planning and Operations Support Group in Reclamation's Technical Service Center will lead a tutorial on how to use the new Downscaled CMIP3 and CMIP5 Climate and Hydrology Projections website, which can be found at: http://gdodcp.ucllnl.org/downscaled_cmip_projections/dcpInterface.html. Look for both videos, and more, on Reclamation's YouTube channel at: www.youtube.com/reclamation.

Frank Leitz, Reclamation Senior Chemical Engineer, from a draft edit of one of his upcoming videos discussing some history of advanced water treatment and desalination efforts at Reclamation.

- Using of the new U.S. Department of the Interior Cloud Services Contract (www.doi.gov/news/blog/interior-to-expedite-its-move-to-the-cloud.cfm). The Research and Development Office will replace its dated, custom research proposal and project information management system, PropC (www.usbr.gov/research/propc), with a newer, better Commercial Off-The-Shelf (COTS) Software as a Service (SaaS) solution in order to reduce costs and save staff time, while improving program and project management and technology transfer capabilities.

Instead of another boring picture, here is a picture of Jake and some other Research and Development Office staff testing a high-speed camera setting—otherwise known as "applied research."

"I have an awesome vertical."
—Jake Akervik

"Innovation is simple. Pursue solutions that are better, faster, and cheaper than before—whether it is something new, something old that is new again, or just something new to you or your organization. Research and science are catalysts for new ideas and positive risks, which are crucial to encouraging innovation and innovative culture."
Jake Akervik
Communication and Information Systems Coordinator

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» **Improving efficiencies and collaboration through the application of project management principles and web 2.0 technologies.**

Prior to joining Reclamation, Jake worked for the Minnesota Department of Transportation's Office of Policy Analysis, Research, and Innovation where he served as the Communication Coordinator, and then as a Flagship Initiative Project Manager for enterprise IT, social media, crowdsourcing and collaboration policy, and technology implementation efforts.

Jake graduated from the University of Minnesota in 2006 with a Bachelors of Science in Scientific and Technical Communication. He also holds an Associate's Certificate in Project Management from the George Washington University School of Business, and a Project Management Professional Certification from the Project Management Institute. He is currently pursuing a Masters in Technology Management degree at the University of Denver.

FY 2013 Research Products

To get the information generated by research quickly into the hands of end users and the broader public, our researchers and partners publish their results in peer-reviewed journals, technical memoranda, research reports, and other venues.

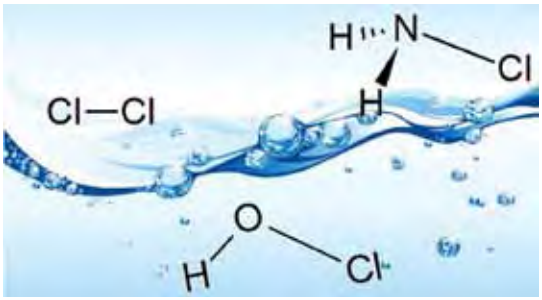
The following publications were completed and/or published in FY 2013. Other documents may exist, but have not yet been published. Contact the authors/principal investigators for information about these documents or research projects. Use the Science and Technology Program research project ID number to access further contact information or the documents themselves at: www.usbr.gov/research/projects/search.cfm.

Aerial Missions With Small Unmanned Aircraft Systems to Monitor Sediment Flow and Changing Topography Resulting from the Removal of Dams on the Elwha River
By Douglas Clark, Alan Bell, Jeff Sloan, Mark Bauer, and Susan Goplen, drclark@usbr.gov
Project ID 4926
Published on 11-14-2013

Concrete Sealers Scoping Study
By Kurt Von Fay and Richard Pepin, kvonfay@usbr.gov
Project ID 8232
Published on 11-14-2013

Survey of the Reclamation Research Community Concerning Data Stewardship Practices
By Douglas Clark, Dr. Curtis Brown, Art Coykendall, and Jim Nagode, drclark@usbr.gov
Project ID 3789
Published on 11-14-2013

Survey of River Restoration Programs Concerning Data Stewardship Successes and Challenges
By Douglas Clark, Dr. Curtis Brown, Jim Nagode, and Art Coykendall, drclark@usbr.gov
Project ID 3760
Published on 11-14-2013



Effect of Chlorine vs. Chloramine Treatment Techniques on Materials Degradation in Reclamation Infrastructure
By Jessica Torrey, jtorrey@usbr.gov
Project ID 6871
Published on 10-23-2013

Ephemeral Tributary Sediment Loads
By David Varyu, dvaryu@usbr.gov
Project ID 2180
Published on 10-23-2013

Improving Public Safety of Large Wood Installations
By Christopher Cuhaciyan, Sean Kimbrel, and Connie Svoboda, csvoboda@usbr.gov
Project ID 689
Published on 10-23-2013

Preliminary Chemical Shrinkage Analysis of Nano Silica Cementitious Binders
By John Bret Robertson, kbartojay@usbr.gov
Project ID 4967
Published on 10-23-2013

Reservoir Sediment Accumulation Modeling Report
By John Carlson, jcarlson@usbr.gov
Project ID 9353
Published on 10-23-2013

Review of Mussel Adhesion Mechanism and Scoping Study
By Bobbi Jo Merten, bmerten@usbr.gov
Project ID 7419
Published on 10-23-2013

Scoping Paper: Investigation of Fish Refugia Concepts at Hydraulic Structures
By Connie Svoboda, csvoboda@usbr.gov
Project ID 1134
Published on 10-23-2013

Oxnard Saline Treatment Wetlands: Monitoring Plan, Baseline Monitoring Results, and Supplemental Research Topics
By Dr. Katharine Dahm, Joan Daniels, Amy Witherall, and Doug McPherson, kdahm@usbr.gov
Project ID 9424
Published on 09-30-2013

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By Dr. Katharine Dahm and Dr. Katie Guerra, kdahm@usbr.gov
Project ID 3259
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By Kurt Wille, kwille@usbr.gov
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By David Bandrowski, Jennifer Bountry, Connie Svoboda, Michael Sixta, Kendra Russell, Zac Corum, and Jock Conyngham, jbountry@usbr.gov
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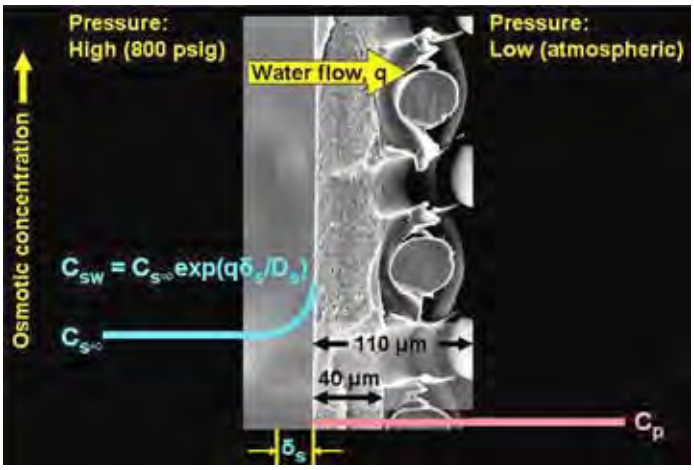

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By Fred Nibling and Mark Nelson, snelson@usbr.gov
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By David Gaeuman, dgaeuman@usbr.gov
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Literature Review of Selective Filtering of LiDAR Data Processing Techniques
By Dale Lindeman, mpaquin@usbr.gov
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Signal Processing Techniques for Determining Powerplant Characteristics
By Kyle Clair and Jeff Stenberg, kwclair@usbr.gov
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Published on 10-11-2012

Underwater Curtain Technology for Enhancing Downstream Fish Passage in Storage Reservoirs
By Dale Lentz, dlentz@usbr.gov
Project ID 6884
Published on 10-03-2012

View of quagga mussel encrusted trashrack.

Test of mussel-resistant coatings at Parker Dam, Arizona/California. A section of trashrack—which the Materials Engineering and Research Laboratory in Reclamation's Technical Service Center has coated with several types of mussel-resistant coatings—is lowered into place as part of the dam's trashrack system. This starts a long-term field test of the coatings and their ability to withstand abrasion from floating debris and the trashrack cleaning system. *(See pages 28 and 29.)*