

The Knowledge Stream Awards and Updates Issue

Science and Technology Program

Reclamation staff submit proposals for internal research to address Reclamation's research needs. The program is competitive, with research proposals funded based on internal reviews of relevancy and external reviews of technical soundness.



Desalination and Water Purification Research Program

The program funds research by industry, universities, and research organizations to develop more cost-effective, environmentally sound ways to desalinate water.

Director's Message

This issue announces the Research Office's fiscal year (FY) 2013 research awards for our two main research programs (see sidebar) and highlights some of our FY 2012 research and technology transfer accomplishments. High priorities in FY 2013 for our Science and Technology Program include:

- Increasing hydropower generation efficiency
- Extending the useful life of all Reclamation's infrastructure
- Combating invasive mussels
- Improving weather and climate information for near-term water operations planning
- Reducing costs and improving effectiveness of advanced water treatment technologies
- Improving tools to meet environmental goals

We awarded 125 projects for FY 2013 based on program priorities, Reclamation regions' assessment of relevance to their missions, and technical review by external experts. All of these reviews are coordinated by our Science and Technology Program Review Committee, who then make recommendations for funding. The FY 2013 review committee is shown below.

Curt Brown, Director, Research and Development



The FY 2013 Science and Technology Program Review Committee:

Left to right: Levi Brekke—Research and Development Office (R&D), Jennifer Johnson—Pacific Northwest Region, Rod Wittler—Mid-Pacific Region (MP)/R&D, Gary Davis—Great Plains Region, Travis Bauer—Technical Service Center, Lisa Krosley—Dam Safety Office, Darrel Krause—Maintenance Services Office, Erin Foraker—R&D, Amy Porter—Lower Colorado (LC) Region, Chuck Hennig—R&D, Miguel Rocha—R&D, Jake Akervik—R&D, Jobaid Kabir—MP, Mark McKinstry—Upper Colorado Region, Curt Brown—R&D.

This issue is dedicated to the memory of Amy Porter, who served as the Lower Colorado Liaison on the Science and Technology Program Review Committee for several years.

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, print double-sided for the two-page updates.
2. Print the whole document double-sided, corner stapled on 8.5" x 11" paper.
3. For magazine-style, instruct your print professional to print the document double-sided, head-to-head, saddle-stitched on 11" x 17" 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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Please contact our office for more information about these products.

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Funding Opportunity Announcement for 2014

Desalination and Water Purification Research Program

“The DWPR Program facilitates partnerships to develop more effective, environmentally sensitive ways to increase water supplies.”

**Kevin Price,
Advanced Water Treatment
Research Coordinator**



Many DWPR projects are conducted at BGNDRE.

R&D Office Contact

**Kevin Price
Advanced Water Treatment
Research Coordinator
mprice@usbr.gov
303-445-2260**

Website

www.usbr.gov/research/AWT/DWPR

About the Program

Under the Desalination and Water Purification Research (DWPR) Program, Reclamation cost-shares research and studies with non-Federal entities. A competitive, merit-based process is used to make awards with a recommended cost-share of 25 to 50 percent Federal contribution.

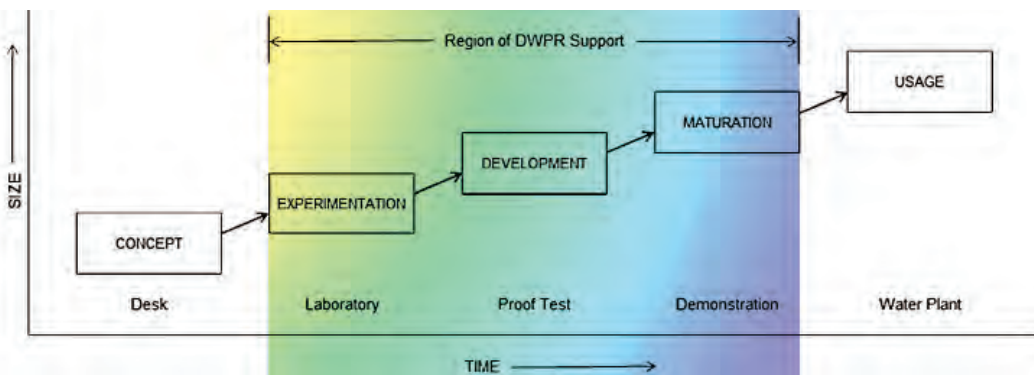
The program has three major goals:

1. Augment the supply of usable water in the United States
2. Understand the environmental impacts of desalination and develop approaches to minimize these impacts relative to other water supply alternatives
3. 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

Funding Opportunity Announcement for 2014

The DWPR Program is issuing a Funding Opportunity Announcement (No. R13SF80007) on www.grants.gov, with proposals due April 2013. For FY 2013, our research priorities are to integrate renewable power sources into desalination processes in creative ways and to develop technology suitable for rural or isolated communities. Reclamation intends to fund a renewable power desalination project at the Brackish Groundwater National Desalination Research Facility (BGNDRE). Research and laboratory studies are needed to:

- Reduce environmental impacts
- Integrate renewable energy
- Reduce costs of desalination
- Expand the scientific understanding of desalination processes
- Improve the quality and suitability of treated water for reuse
- Develop pilot-scale systems demonstrating these technologies



The DWPR Program supports projects from the laboratory to demonstration.

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Previous DWPR Projects



Suns River, a DWPR-funded project, is improving on a classic solar still that uses sunlight to evaporate salty water, and then collects the pure water that condenses on the surface. This pilot project still has several novel features: a tilted surface and a continuous shallow waterfall of salty water (only the depth of a coat of paint) for better evaporation, and coils and a modified surface to improve condensation.

Texas Tech University is testing and developing a small-scale system (about 2,000 gallons per day or less).



The University of Nevada at Reno uses the concentrated brine from one desalination process to power another desalination process (Jeri Priante, Master's Student, University of Nevada, Reno).

“Less than one percent of our earth’s water is fresh water, our conventional source of water.

To meet our future water needs, we must use unconventional sources of water—which is nearly all of the earth’s water.

Reclamation’s Brackish Groundwater National Desalination Research Facility has several sources of impaired water and provides an unparalleled location for testing new ways to treat these unconventional sources.”

**Kevin Price,
Advanced Water Treatment
Research Coordinator**

Research Labs

Reclamation’s state-of-the-art water treatment laboratory and pilot-scale facilities may be available for use on a reimbursable cost basis: the Technical Service Center in Denver, Colorado, the Water Quality Improvement Center (WQIC) in Yuma, Arizona, and the BGNDRF in Alamogordo, New Mexico.

FY 2013 Research Awards

Science and Technology Program Research

This fiscal year was a banner year for proposals to the Science and Technology Program, with over \$13.5 million requested from the program. Because of this, 32 percent of proposals (comprising \$5.2 million) could not be funded.

This fall we will fund 125 ongoing and new research projects. We also fund technology transfer, collaboration, workshops, and other outreach efforts to help ensure our innovative solutions reach Reclamation managers; other Federal, state, local, tribal, and non-governmental entities; and the public. The table shows Science and Technology Program funding (rounded to the nearest \$5,000).

Activity	Budget
Advanced Water Treatment	\$ 1,130,000
Renewable Energy	\$ 985,000
Climate Change and Variability	\$ 1,750,000
Invasive Zebra and Quagga Mussels	\$ 1,600,000
Water Operations and Decision Support	\$ 635,000
Environmental Issues in Water Delivery and Management	\$ 1,190,000
Water and Power Infrastructure Reliability	\$ 680,000
Conserving or Expanding Water Supplies	\$ 310,000
Accelerating Technology Transfer and Commercialization	\$ 575,000
Knowledge Transfer, Outreach, Collaboration, and Implementation	\$ 645,000
Science and Technology Program Coordination	\$ 550,000
Total	\$ 10,050,000

Advanced Water Treatment Research

Angela Adams (aadams@usbr.gov): Evaluating Thin-Film Nanocomposite Membranes to Treat Brackish Waters Through Reverse Osmosis

Michelle Chapman (mchapman@usbr.gov): Investigating an Innovative Constructed Wetland Design for Removing Endocrine Disrupting Compounds From Reclaimed Wastewater

Michelle Chapman: Renewable Energy Evaluation for Zero Liquid Discharge Processes

Michelle Chapman: Strategies for Treating Variable Source Water

Katharine Dahm (kdahm@usbr.gov): Produced Water Treatment Primer for Oil and Gas Operations Award

Katharine Dahm: Projected Impacts of Climate Change-Induced Water Quality Trends on Reclamation Operations

Katharine Dahm: Developing a Deterministic Model for Predicting Cleaning Frequency Due to Inorganic Scaling on Reverse Osmosis Membranes

Katharine Dahm: Oxnard Saline Treatment Wetlands

Saied Delagah (sdelagah@usbr.gov): Cellulose Acetate Membrane

Saied Delagah: Concentrate Minimization Via Pellet Softening—Process Evaluation and Pilot Study

Steve Dundorf (sdundorf@usbr.gov): Demonstration Forward Osmosis Treatment System

Katherine Guerra (kguerra@usbr.gov): Investigation of Benefit and Application of Desalination Fuel Cells to Meet Reclamation's Rural Water Needs

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FY 2013 Research Awards

Advanced Water Treatment Research - *continued*

Mitchell Haws (mhaws@usbr.gov): Solar Photovoltaic Desalination

Chuck Moody (cmoody@usbr.gov): Forward Osmosis Water Purification

Jessica Torrey (jtorrey@usbr.gov): Effect of Chlorine Versus Chloramine Treatment Techniques on Materials Degradation in Reclamation Infrastructure

Yuliana Porras
(yporras@usbr.gov): Cost of Desalinated Water—Current Costs, Trends, and Methodologies

Yuliana Porras: Developing the Next Generation Chlorine-Resistant, High Flux, and High-Salt Rejection Polyamide Desalting Membrane to Increase Water Supply

Testing a solar photovoltaic desalination system in the Navajo Nation, Arizona.



Renewable Energy Research

Merlynn Bender (mbender@usbr.gov): Increasing Hydrogeneration While Improving Environmental Conditions

Eric Eastment (eeastment@usbr.gov): Power System Diagnostics

Eric Eastment: Power System Safety

John Germann (jgermann@usbr.gov): Effective Cavitation Detection Techniques for Hydraulic Turbines

Tom Gill (tgill@usbr.gov): Affordable Self-Cleaning Trashrack

David Harpman (dharpman@usbr.gov): Phase 2: Advanced Optimization Algorithms for Hydropower Dispatch

Joshua Mortensen (jmortensen@usbr.gov): Feasibility of Integrating Low-Head Hydropower With Effective Canal Management

Nathan Myers (nmyers@usbr.gov): Reduced Cost Hydropower Maintenance

Nathan Myers: Renewable Integration and Small Hydropower Projects

Mike Norris (mnorris@usbr.gov): Guidelines for Legal and Policy Considerations Associated With Solar Development on Reclamation Land

Jeffrey Stenberg (jstenberg@usbr.gov): Design Standardized Control System Platform



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FY 2013 Research Awards

Climate Change and Variability Research

Levi Brekke (lbrekke@usbr.gov): Centre for Energy Advancement Through Technological Innovation (CEATI) Project: Risk-Informed Decision-Making Framework for Hydropower Generation Planning (with project costs shared by CEATI's Hydropower Operations and Planning Interest Group (HOPIG) members: BC Hydro, Hydro-Québec, Reclamation, Sacramento Municipal Utility District, Tennessee Valley Authority, TransAlta, and Vattenfall)

Levi Brekke and Martyn Clark, National Center for Atmospheric Research's (NCAR) Research Applications Laboratory (RAL) (mclark@ucar.edu): The Predictability of Streamflow Across the Contiguous United States

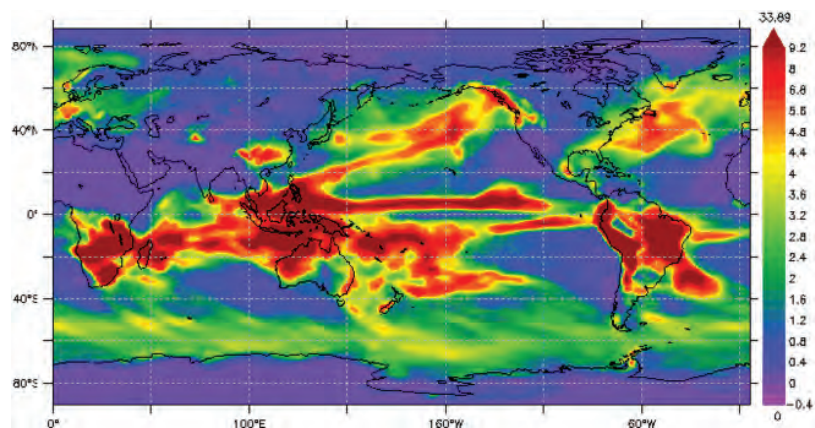
Levi Brekke and Thomas Painter, NASA Jet Propulsion Laboratory (JPL), (thomas.painter@jpl.nasa.gov) Airborne Snow Observatory: Assessing the Value of Information to Support Reclamation Snowmelt Management

Levi Brekke and Jorge Ramirez, Colorado State University (ramirez@engr.colostate.edu): Vulnerability Analysis of Western Water Resources to Climate Variability and Change

Jennifer Bountry (jbountry@usbr.gov): Evaluating Climate-Induced Runoff and Temperature Change on Stream Habitat Metrics for Endangered or Threatened Fish

Raymond Caldwell (rcaldwell@usbr.gov): Ingredients-Based Climatology and Future Projections of Extreme Precipitation Events Using a Numerical Weather Prediction (NWP) Framework

Raymond Caldwell and Kelly Mahoney, National Oceanic and Atmospheric Administration (NOAA) Cooperative Institute for Research in Environmental Sciences (CIRES) (kelly.mahoney@noaa.gov): Improving Extreme Precipitation Estimation and Climate Change Projections Using Regional and High-Resolution Model Simulations



Earth system grid derived from CMIP5 data from NOAA.

John England (jengland@usbr.gov): Methodology and Data for Quantifying Extreme Precipitation Events in a Changing Climate

John England and Michael Alexander, NOAA Earth System Research Laboratory (ESRL), (michael.alexander@noaa.gov): Diagnosing the Moisture Sources for Extreme Precipitation Events in the Intermountain West

Ian Ferguson (iferguson@usbr.gov) and Jamie Scott, NOAA CIRES (james.d.scott@noaa.gov): Evaluating the Relevance, Trustworthiness, and Applicability of CMIP5 Climate Projections for Water Resources and Environmental Planning

Subhrendu Gangopadhyay (sgangopadhyay@usbr.gov): Flood Frequency Variability on Seasonal to Multidecadal Time Scales in the Western U.S. and Implications for Infrastructure Planning

Subhrendu Gangopadhyay and Wendy Abshire, University Corporation for Atmospheric Research's (UCAR) COMET (abshire@comet.ucar.edu): Climate Science and Water Resources Distance Learning Efforts and Customized Workshops

Todd Gaston (tgaston@usbr.gov): Adaptation of Western U.S. Agriculture to Climate Change-Induced Water Scarcity

Greg Gault (ggault@usbr.gov): Design and Development of a Prototype Tool for Integrated Climate Downscaling and Streamflow Prediction Using Open Source Geographic Information System (GIS) Software

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FY 2013 Research Awards

Climate Change and Variability Research - *continued*

Fred Liljegren (fliljegren@usbr.gov): Back to the Future, Part 2

Tom Pruitt (tp Pruitt@usbr.gov): Sensitivity of Hydrologic Impacts Assessment to Downscaling Methodology and Spatial Resolution

Tom Pruitt: Climate Change Downscaling (working in collaboration with Climate Central, Department of Energy [DOE] Lawrence Livermore National Laboratory [LLNL] Green Data Oasis, Santa Clara University, Scripps Institution of Oceanography, U.S. Army Corps of Engineers, and U.S. Geological Survey)

Tom Pruitt and Roy Rasmussen, NCAR-RAL (rasmus@ucar.edu): Sensitivity of Hydrologic Impacts Assessment to Downscaling Methodology and Spatial Resolution

Mark Spears (jspears@usbr.gov): Literature Synthesis on Climate Change Implications for Reclamation's Water Resources

Michael Tansey (mtansey@usbr.gov): A Comparison of Methods for Simulating Watershed Evapotranspiration and Runoff Under Changing Climatic Conditions

Toni Turner (tturner@usbr.gov): Evaluate the Impacts of Climate Change on Effectiveness of Habitat Restoration Structures and Restoration Activities

Invasive Zebra and Quagga Mussel Research

Bryan Heiner (bheiner@usbr.gov): Modernization of Trashrack Raking Systems to Manage Quagga Mussel Settlement

Chris Holdren (gholdren@usbr.gov): Ecological Impacts and Possible Environmental Controls of Zebra/Quagga Mussels on Reclamation Reservoirs

Denise Hosler (dhosler@usbr.gov): Dreissenid Mussel Monitoring and Detection Program

Douglas Hurcomb (dhurcomb@usbr.gov): Scanning Electron Microscope (SEM) Characterization of Drain Biofouling for Dreissenid Mussels

Cathy Karp (ckarp@usbr.gov): Zebra and Quagga Mussels: Fish Predation on Quagga Mussels

Cathy Karp: Testing Ability of Widely Used Fish Screens to Resist Quagga Mussel Fouling

Kevin Kelly (kkelly@usbr.gov): Alternate Control Strategy for Dreissenids Using Carbon Dioxide

Kevin Kelly: Production and Testing of Antibodies for Dreissena Mussels

Scott O'Meara (someara@usbr.gov): Habitat Suitability Parameters for Invasive Mussels at Reclamation-Managed Facilities and Waters

Allen Skaja (askaja@usbr.gov): Antifouling Coatings for Invasive Mussel Control

Allen Skaja: Research and Development of Durable Foul Release Coatings

David Tordonato (dtordonato@usbr.gov): Field Scale-Up Testing of Foul Release Coatings

Joshua Mortensen (jmortensen@usbr.gov): Creating Turbulence to Prevent Mussel Colonization in Pipelines



Working with invasive mussels in the laboratory.



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FY 2013 Research Awards

Water Operations and Decision Support Research

David Bandrowski (dbandrowski@usbr.gov): Large Wood Design Guidelines—National Manual

Douglas Clark (drclark@usbr.gov): Case Studies of Disputes Over Science in Reclamation

Douglas Clark: Examining the Utility of Unmanned Vehicle Technology to Map Topography

Douglas Clark: Exploring Potential Uses of Near Remote Sensing and Unmanned Aerial Vehicle (UAV): Technologies in Reclamation: Science, Engineering, and Operations to Reduce Costs and Add Capabilities

Douglas Clark: Pilot Testing Data Stewardship Processes on River Restoration and Hydrologic Datasets

Daniel Dombroski (ddombroski@usbr.gov): Development of Software Tools for Efficient Processing of Bathymetry and Discharge Data

Ian Ferguson (iferguson@usbr.gov): Continued Field Measurement of Riparian Evapotranspiration, Lower Colorado River Basin

Michael Fitzmaurice (mfitzmaurice@usbr.gov): Near Real-Time Visualization of Salt Loading to Meet Water Quality Objectives

Jennifer Johnson (jmjohnson@usbr.gov): Investigating the Impact of River Regulation on Ground Water Supplies in the Western U.S.

Jennifer Johnson: Hydro-Economic Model Completion and Technology Transfer

Patrick McGrane (pmcgrane@usbr.gov): Application of a Physically-Based Distributed Snowmelt Model in Support of Reservoir Operations and Water Management

Nigel Quinn (nquinn@usbr.gov): Geographic Information System-Based Decision Support for Wetland Drainage, Salinity Management

Mark Spears (jspears@usbr.gov): Improved Estimation of Reservoir Evaporation

Kristin Swoboda (kswoboda@usbr.gov): Inform Reclamation Programs About Unmanned Aerial Vehicles (UAVs) and Identify Opportunities for Future Applied Research

Kurt Wille (kwille@usbr.gov): Optimizing Surface Model Techniques for Digital Representation of River Channels



Water conflict management session held in Boulder City, Nevada, in July 2012.

Environmental Issues in Water Delivery and Management Research

Jennifer Bountry (jbountry@usbr.gov): Predicting Vertical and Lateral Sediment Erosion in River and Reservoir Settings

John Carlson (jcarlson@usbr.gov): Sediment Accumulation in Reservoirs: Comparison of Watershed Sediment Yield Models With Measured Sedimentation Volumes

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FY 2013 Research Awards

Environmental Issues in Water Delivery and Management Research - *continued*

Kent Collins (kcollins@usbr.gov): Developing Guidelines for Formulating Reservoir Sustainability Plans

Christopher Cuhaciyan (ccuhaciyan@usbr.gov): Mobility and Stability of Large Woody Material

Michael Eacock (meacock@usbr.gov): Investigation of Transient Total Dissolved Solids/Electrical Conductivity (TDS/EC) Conversion Ratios in the San Joaquin River Basin

David Gaeuman (dgaeuman@usbr.gov): Assessment of Habitat Complexity and Ecological Functions Provided by Gravel Bars Resulting From Gravel Augmentation and Channel Rehabilitation

David Gaeuman: Bedload Adaptation Length for Modeling Bed Evolution in Gravel-Bed Rivers

James Gjerde (jgjerde@usbr.gov): Valuing Flow and Water Dependent Ecological Resiliency Under the Secure Water Act

Blair Greimann (bgreimann@usbr.gov): Predicting the Interactions Between Flow, Sediment, and Riparian Vegetation

Blair Greimann: Assessing and Reducing the Uncertainty of Predictions From Hydraulic and Hydrologic Models

Leslie Hanna (lhanna@usbr.gov): Cone Screen Riverine Baffle Design



Gravel bars in the Trinity River, California.

Robert Hilldale (rhilldale@usbr.gov): Federal Interagency Sedimentation Project

Robert Hilldale: Calibration of Bed Load Impact Sensors for Surrogate Sediment Measurement

Robert Hilldale: Passive Acoustic (Hydrophone): Measurement of Coarse Bed Load

Cathy Karp (ckarp@uabr.gov): Evaluation of Salmonid Smolt Survival at Roza Diversion Dam and the Downstream 11-Mile Reach

Sean Kimbrel (skimbrel@usbr.gov): Bathymetric Data Collection Techniques Around Large Wood

Yong Lai (ylai@usbr.gov): Quantitative Modeling Tools of Scour and Morphological Impact Due to Large Wood Debris and Other In-Stream Structures

Dale Lentz (dlentz@usbr.gov): Researching a Concept for a Self-Regulating Articulated Fishway

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FY 2013 Research Awards

Environmental Issues in Water Delivery and Management Research - *continued*

Joshua Mortensen (jmortensen@usbr.gov): Fish Predator Reduction Using Fish Traps With Bait Attraction

James Nagode (jbnagode@usbr.gov): A Business Intelligence and Knowledge Stewardship Methodology Focused on Data and Information Within the River Restoration Community

Mark Nelson (snelson@usbr.gov): Ecological Costs of Streamflow Regulation

Mark Nelson: Streamflow and Nutrient Constraints on the Productivity and Habitat Quality of Desert Riparian Ecosystems in the West

Julian Pierko (jpierko@usbr.gov): EcoHydraulics Roadmap

Kendra Russell (krussell@usbr.gov): Scour Depth Relations for Large Wood Structures

Mike Sixta (msixta@usbr.gov): Representation of Large Wood Structures in a Two-Dimensional Static Bed Numerical Model Understanding Effects of Recharge and Dissolved Nitrate on Selenium and Salinity Mobilization

Terry Stroh (tstroh@usbr.gov): Using Geochemical Modeling and Laboratory Testing

Zak Sutphin (zsutphin@usbr.gov): The Efficiency of SandWand Technology as a Habitat Restoration Tool for Native Salmonids in Small Tributaries

Connie Svoboda (csvoboda@usbr.gov): Improving Public Safety of Large Wood Installations

David Varyu (dvaryu@usbr.gov): Ephemeral Tributary Sediment Loads in the Arid West

Dmitri Vidergar (dvidergar@usbr.gov): Application of an Ecological Health Assessment for Reclamation Managed Reservoirs

Dmitri Vidergar: Fish Tags—The Old/New Tool for Assessing Impacts of Reservoir Operations on Migratory Fish and Critical Habitat

Nick Williams (nwilliams@usbr.gov): Modeling Changes in Water Quality Resulting From Sediment Delta Interactions

Water and Power Infrastructure Reliability Research

Christopher Andrews (candrews@usbr.gov): Research, Develop, and Implement Sandblasting Noise Controls and Strategies to Reduce Reclamation High Noise Processes

Katie Bartojay (kbartojay@usbr.gov): Chemical Shrinkage Analysis of Nano Silica Cementitious Binders

Alexander Belous (abelous@usbr.gov): Evaluating Methods to Manage Alluvial Material Prior to its Introduction Into River Systems

Theresa Gallagher (tgallagher@usbr.gov): Identify Primary Noise Sources in the Powerplant and Implement Noise Engineering Controls to Reduce Exposures to Employees

John Germann (jgermann@usbr.gov): Shear Pin Failure Prediction Through the Use of Acoustic Emission Sensing and Analysis

Jennifer Huang (jhuang@usbr.gov): The Application of Light Detection and Ranging (LiDAR): Technology to Improve the Management and Protection of Heritage Assets in the American Falls Archaeological District, Idaho

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FY 2013 Research Awards

Water and Power Infrastructure Reliability Research - *continued*

Kathy Kihara (kkihara@usbr.gov): Use of Aqualastic to Encapsulate Degraded Roller Compacted Concrete Lining in Canals

Daryl Little (dlittle@usbr.gov): Composition and Environmental Exposure Effects of Controlled Low-Strength Materials on Pipeline Degradation

Bobbi Jo Merten (bmerten@usbr.gov): Evaluation of Structural Health Monitoring (SHM): Techniques for Reclamation Infrastructures

Bobbi Jo Merten: Mussel Adhesive as a Corrosion-Resistant Coating

Bobbi Jo Merten: Evaluating Coating Service Lifetime With Electrochemical Impedance Spectroscopy (EIS)

Julia Pierko (jpierko@usbr.gov): Evaluation and Standardization of Seepage Repair Methodologies

Shaun Reed (sreed@usbr.gov): Testing/Verification of Rope Access Anchors

Robert Rinehart (rrinehart@usbr.gov): Evaluation of Intelligent Compaction at the Echo Dam Seismic Modification Project Evaluation of Non-Nuclear Moisture Meters and Moisture-Density Gages for Reclamation Construction Quality Control/Quality Assurance

Allen Skaja (askaja@usbr.gov): Pipeline Coatings

Allen Skaja: Asbestos in Epoxy Coatings



Wind and water erosion in the American Falls Archaeological District, Idaho.

Grant Sorensen
(gsorensen@usbr.gov): Incident Command System Doctrine for Dam Owners

Tony Wahl
(twahl@usbr.gov): Measuring Erodibility of Embankment Soils Containing Gravel

Janet White (jwhite@usbr.gov): Verification That Type V Cement is Required for Controlled Low Strength (CLSM) Material With High Sulfate Native Soils

Janet White: Native Soils for CLSM

Kurt Von Fay
(kvonfay@usbr.gov): Moisture Content Requirements for Effective Concrete Repairs

Kurt Von Fay: Coatings and Sealers to Treat Concrete Deterioration



FY 2013 Research Awards

Conserving or Expanding Water Supplies Research

Chuck Hennig (chennig@usbr.gov): Canal Lining Alternatives Evaluation

Tom Gill (tgill@usbr.gov): Database for Field Performance of Electronic Water Level Sensors

Tom Gill: Wireless Automated Control of Surface Irrigation Systems for Improved Irrigation Efficiency

Tom Gill: Design Refinement and Construction Drawings for Overshot Gates That Irrigation Districts Can Construct Themselves

Steven Piper (spiper@usbr.gov): Effectiveness of Conservation Pricing in Reducing Water Demand, Evidence From Increasing Block Rate Structures

Steve Robertson (srobertson@usbr.gov): Reinforced Concrete Pressure Pipe Stress Distribution



Overshot gate at South Platte Ditch Company, Colorado.

Desalination and Water Purification Research

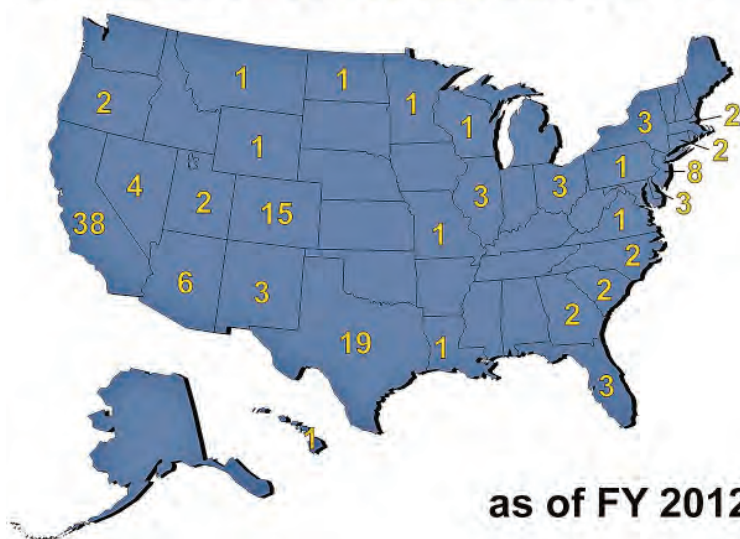
For FY 2013, Reclamation awarded \$209,891 under the Desalination and Water Purification Research Program (DWPR) for one new project and to continue two others. Non-Federal cost-sharing funding provides an additional \$104,600 for this research.

The new project is under the direction of Kamalesh Sirkar (sirkar@adm.njit.edu): Novel Cylindrical Crossflow Hollow Fiber Membrane Module for Direct Contact Membrane Distillation-Based (DCMD) Desalination. This 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 will make it easier to design larger plants with smaller footprints. New Jersey Institute of Technology is partnering with Applied Membrane Technology, Inc., in Minnesota.

Two other projects were continued at the Brackish Groundwater National Desalination Research Facility at Alamogordo, New Mexico:

- Zero Discharge Desalination Demonstration, University of Texas, El Paso
- Installation and Operation of a Full Solar Distillation Desalination Unit, Suns River Still

Number of DWPR Projects by State



as of FY 2012

DWPR projects occur throughout the nation. This map shows the number of DWPR projects as of FY 2012.



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FY 2012 Year in Review

Summary

For FY 2012, the Science and Technology Program awarded \$9.7 million for 134 research projects, focusing on our priority areas:

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

For FY 2012, the Desalination and Water Purification Program awarded \$1.5 million for further research advanced water treatment technologies. This funding was leveraged to support more than \$2.7 million in research activities in FY 2012.

Research Highlights

Providing Climate Analysis Training for Water Planning Professionals

Reclamation helped develop a pilot training program that includes both an online course for self-paced training and a set of subsequent residence courses where students will apply what they learned through the online training. Reclamation is working with the Climate Change and Water Working Group agencies (including the U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration, Environmental Protection Agency [EPA], and U.S. Geological Survey) and the University Corporation for Atmospheric Research (UCAR) COMET Program and Western Water Assessment. This collaborative effort has announced the first product: Preparing Hydro-Climate Inputs for Climate Change in Water Resource Planning, an online course focused on preparing hydro-climate model inputs to water resources planning. The online course is posted at the COMET MetEd website, www.meted.ucar.edu/training_module.php?id=959.

Using Zequanox™, an Organic Biocide for Invasive Mussels

Starting in 2009, Reclamation partnered with Marrone Bio Innovations (MBI) to test and improve Marrone's Zequanox™ product for control of adult zebra and quagga mussel infestations. This product, derived from a very common bacteria found in soil, is lethal only to zebra and quagga mussels, thus offering an environmentally friendly alternative to many conventional molluscicides. Zequanox™ has now been approved by the EPA for commercial use. Marrone funded Reclamation to help test multiple formulations of Zequanox™ in closed water systems at Davis Dam, Nevada, to fine-tune delivery systems and application rates. Tests on a generator unit in June, September, and November 2011 showed the potential for high mussel mortality at proper concentrations. Repeated treatments are expected to be necessary to clear out an infested system and then keep it free of mussels.

"This online course provides a very good introduction in climate modeling, even for laypeople."

Online review of COMET course

Preparing Hydro-climate Inputs for Climate Change in Water Resource Planning



Zequanox™ study conclusions:

- Large-scale application can achieve high mussel mortality.
- This product can be used at higher concentrations to eradicate mussels from a pipe system or at a lower dose to prevent settlement in such a system.
- Treatments caused no impact on Colorado River water quality.



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NREL and Reclamation staff determining the suitability of Reclamation facility sites for renewable energy at Hassayampa, Arizona.

“Reclamation’s Technology Transfer Program is dedicated to ensuring that our advancements in technology are available to the public and industry. This agreement with Dow Chemical highlights ways Reclamation can collaborate with the private sector so that the American people benefit and the U.S. can compete in a global economy.”

*Chuck Hennig,
Deputy Director,
Research and Development*

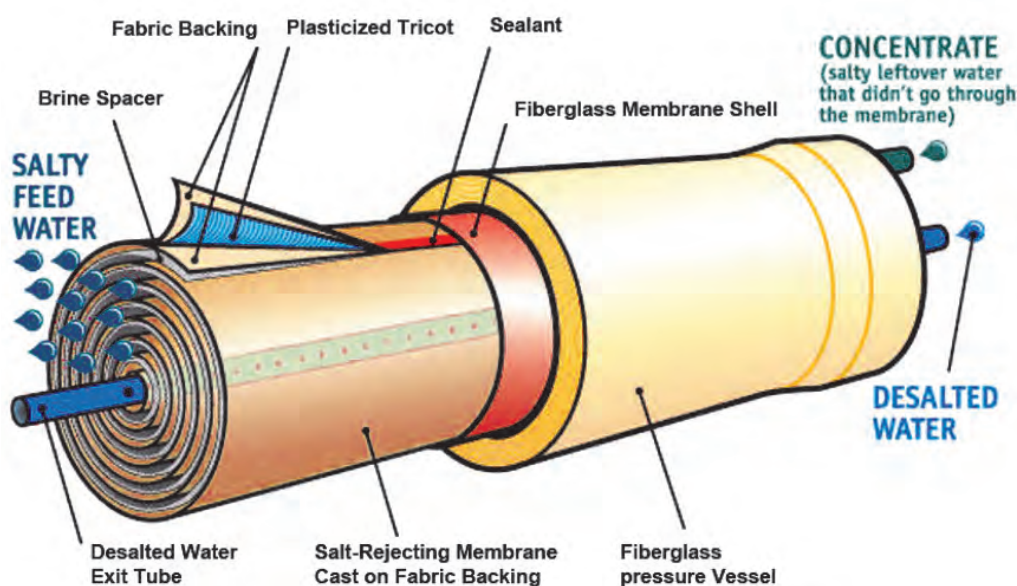
Developing Wind and Solar Power for Reclamation’s Facilities and Offices

Reclamation’s Research Office and the National Renewable Energy Lab (NREL) have been evaluating the potential for using Reclamation lands and facilities to generate wind and solar energy for powering our facilities and for the electric grid. Adding renewable power generation can reduce greenhouse gas emissions and help Reclamation meet both legislated and administration objectives for producing and using renewable energy. A Reclamation-wide screening assessment, along with several site-specific assessments at some of our offices and facilities, were finished and published in 2012. These assessments can help Reclamation formulate both policy and good business practices regarding wind and solar energy development. Contact the Research Office for the latest report.

Testing a Patented Chlorine-Resistant Polyamide Membrane

Reverse osmosis (RO) membranes can purify a wide range of salty and impaired waters. Chlorine helps prevent biofouling on the membrane, but it can rapidly degrade polyamide membranes. Reclamation has recently patented a desalination membrane to effectively purify water while resisting chlorine degradation.

Dow Chemical is working with Reclamation, providing their manufacturing know-how and capability to scale up the Reclamation formulation into the full-size membranes. Initial tests at Reclamation’s Water Quality Improvement Center (WQIC) in Yuma, Arizona, indicated that the membrane performed well, but did not exceed Dow Chemical’s industry standards for performance. Reclamation has since improved the membrane and filed patents on these new variations. Reclamation and Dow are now considering an expanded collaborative agreement to jointly evaluate and test a broader spectrum of Reclamation’s formulations to mature the best candidate(s) into commercially available membranes that better resist chlorine degradation.



Reverse osmosis membrane element inside a pressure vessel.



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Getting Ideas From the New Water New Energy Conference

This conference brought attention to the important links between renewable energy sources and desalinating brackish ground water. Sponsored by Reclamation and the New Mexico Water Resources Research Institute (WRRI), it was held in December 2011 at Reclamation's Brackish Groundwater National Desalination Research Facility (BGNDRF) in Alamogordo, New Mexico. Experts identified two top research and development needs: (1) solar powered systems to serve water and energy needs of remote and rural communities, and (2) a better understanding of the impacts of trace contaminants on desalination.

To address these and other research objectives identified in the conference, our Research Office's Desalination and Water Purification Program (DWPR) funded a solar distillation project with a small private company, Suns River Still, at BGNDRF during the summer 2012. The FY 2013 DWPR Funding Opportunity Announcement and some of the FY 2013 Science and Technology Program research projects also address these research needs.

"The New Water, New Energy Conference brought researchers closer to providing people in remote locations reliable access to subsurface water resources now unavailable."

**Sam Fernald,
WRRI Director**

Using Large Woody Debris in River Restoration

Woody debris (fallen trees and branches) is crucial for healthy rivers and wetlands, creating pools for fish to rest and hide in, controlling channels, stabilizing streambanks, and much more. Yet guidance is lacking on how to design and install woody debris structures that can improve river habitat, resist destruction from flood events, and not pose unreasonable safety hazards.

The Technical Workshop on Large Wood Applications and Research Needs in River Restoration, held in Seattle, Washington, February 14-16, 2012, identified research and monitoring needs for using large woody debris in river restoration projects.

This workshop resulted in a research roadmap for large wood applications, which identified several high priority research areas. One outcome was to fund development of technical guidelines to design, implement/construct, and monitor constructed wood features. These guidelines will help restoration practitioners plan, design, place, and maintain large wood in streams with an emphasis of restoring river process and function.



Demonstrating a river reconstruction using large woody debris in Seattle, Washington.

Crowdsourcing With Our Research Jam

The inaugural Research Jam held in February 2012 was a resounding success. For 2 weeks in February 2012, Reclamation employees used an internal website to quickly and easily submit ideas, view other's suggestions, and vote and comment on all ideas. The process used the same IdeaScale web service recently used by the White House to gather thousands of cost-saving ideas from Federal employees. The Research Office worked with the submitters of the top ideas to determine the best way to research or implement their suggestions. We followed up with other Reclamation offices to address some of these suggestions that did not involve research, for example, improving how Reclamation contracts for hydropower maintenance. The Research Office's Technology Transfer Program is pursuing other ideas that may need to be patented.

"This is a great example of getting experts in the field together in a workshop setting to collaboratively identify research needs and follow up with the Research Office to help address some of those needs."

**Jennifer Bountry,
Project Lead,
Large Woody Debris Conference**



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Denise Hosler with Colorado Governor Hickenlooper

“Early detection gives reservoir managers enough notice to budget and plan for possible infestations and put programs such as additional public education and boat inspection and cleaning into place to prevent further spread in western waters.”

**Denise Hosler,
Invasive Mussel Research
Laboratory Manager**

Reclamation's Invasive Mussel Research Laboratory Awarded Colorado Governor's Award for High Impact Research

Reclamation's Invasive Mussel Research Laboratory in Denver, Colorado, has received the CO-Labs 2012 Governor's Award for High Impact Research. It was recognized for its advances in the early detection of zebra and quagga mussels and evaluation of potential control methods. Colorado Governor Hickenlooper presented the award at a ceremony on October 25, 2012, to Denise Hosler, the laboratory manager.

Reclamation began the early detection program at our reservoirs soon after adult mussels were detected in Lake Mead and the lower Colorado River system. The laboratory and our regional and state partners have drawn water samples on a regular schedule from more than 400 reservoirs throughout the Western United States. The samples are tested at the laboratory using cross-polarized light microscopy, scanning electron microscopy, polymerase chain reaction DNA testing, and gene sequencing. The laboratory is funded through the Science and Technology Program, with regional offices providing support for sampling Reclamation reservoirs.



Reclamation's Mussel Research laboratory was presented with the CO-Labs 2012 award.

*From left:
Jeremiah Root,
Kevin Bloom,
Kyle Rulli,
Ben Roske,
Chris Holdren,
Denise Hosler,
Craig Albertsen,
Sherri Pucherelli,
Jacque Keel,
Tanna George,
and Curt Brown.*



BGNDRF Facility Manager, Randy Shaw (right) and Facility Electronics Technician, Steve Holland (left).

Brackish Groundwater National Desalination Research Facility Awarded Better Buildings Federal Award

Reclamation offers a state-of-the-art facility to explore new technologies to extend water resources. The Brackish Groundwater National Desalination Research Facility (BGNDRF) in Alamogordo, New Mexico, hosts a wide range of projects to make treatment and use of brackish and other degraded waters more economical and environmentally sound. This addresses water needs in the Western United States by improving technologies, including projects that address the priorities identified in the New Water New Energy Workshop (see page 17).

BGNDRF won the 2012 Better Buildings Federal Award competition, with an impressive 53.6 percent reduction in building energy intensity over its September 2011 baseline. The U.S. Department of Energy holds an annual competition to recognize Federal buildings that reduce their energy use the most. What is even more impressive about BGNDRF's win is that they spent less than \$500 to achieve these savings. Simple operational changes, better management, and best practices made a huge difference in energy use.



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Recent Reclamation Products

To get 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. We also present our results at conferences and workshops. Below is a list of reports published since the previous edition of the Knowledge Stream Newsletter.

Carlisle, Daren M., Dr. Ken Eng, and S. Mark Nelson. Macroinvertebrate Community Condition Associated With the Severity of Streamflow Alteration (interim). snelson@usbr.gov.

Clair, Kyle and Jeff Stenberg. Signal Processing Techniques for Determining Powerplant Characteristics (interim). kwclair@usbr.gov.

Clark, Doug. Reclamation Annual Unmanned Aerial Systems (UAS)Report: Fiscal Year 2012 (interim). drclark@usbr.gov.

Couture, Ryan. Oregon Hatchery Research Center Testing of Swim-Thru Fishway (interim). smontague@usbr.gov.

Dahm, Dr. Katharine and Dr. Katie Guerra. International Petroleum Environment Conference Paper Presentation 2012 (interim). kdahm@usbr.gov.

Dahm, Dr. Katharine, Joan Daniels, Amy Witherall, and Doug McPherson. Oxnard Saline Treatment Wetlands: Monitoring Plan, Baseline Monitoring Results, and Supplemental Research Topics (interim). kdahm@usbr.gov.

Daniels, Joan, Dr. Katharine Dahm, Stephanie Keefe, Dr. Bryan Brooks, and Dr. Larry Barber. Hydrological, Chemical, and Biological Monitoring Plan (interim). jdaniels@usbr.gov.

Hoag, Anna, Collins Balcombe, and Michelle Chapman. Demonstration Project Alternatives Analysis (interim). mchapman@usbr.gov.

Kubly, Dennis and Douglas Clark. An Adaptive Management Workshop Manual to Assist in the Prevention, Management, and Resolution of Water Resource Conflicts (final). drclark@usbr.gov.

Lentz, Dale. Underwater Curtain Technology for Enhancing Downstream Fish Passage in Storage Reservoirs (final). dlentz@usbr.gov.

Lindeman, Dale. Change Detection Methodology for the Application of Light Detection and Ranging (LiDAR) Technology to Improve the Management and Protection of Heritage Assets in the American Falls Archaeological District, Idaho (interim). dlindeman@usbr.gov.

Lindeman, Dale. Literature Review of Selective Filtering of LiDAR Data Processing Techniques (final). dlindeman@usbr.gov.

Mansell, Bruce. Ground Water Reliability Improvement Program: Evaluation of a High Recovery Nano-Filtration and Reverse Osmosis (NF-RO) Integrated Treatment System. gkrzys@usbr.gov.

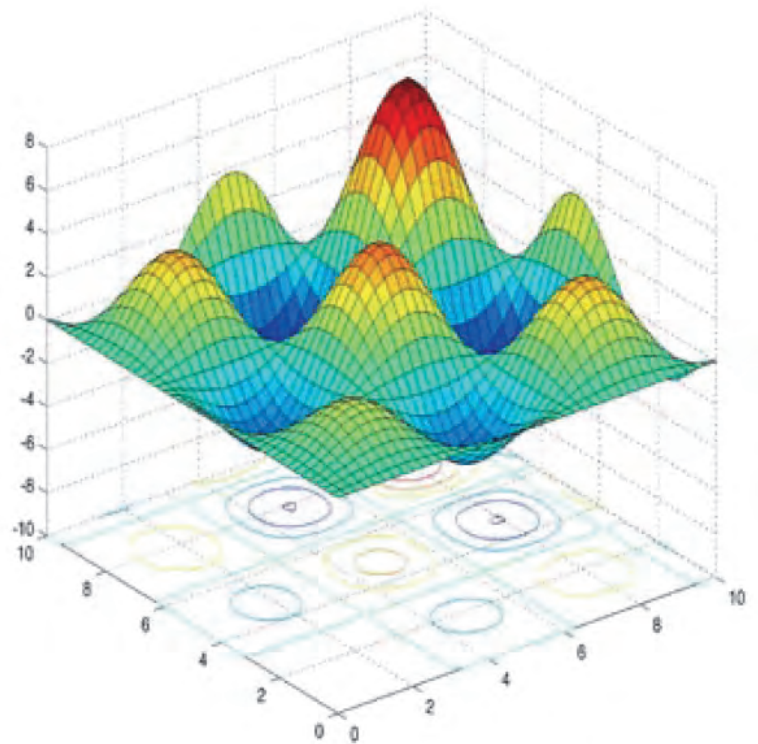
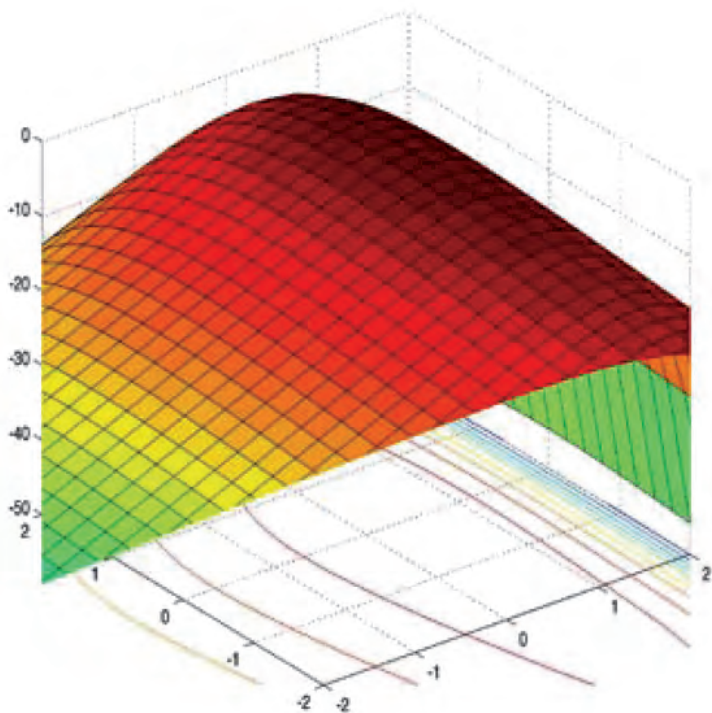
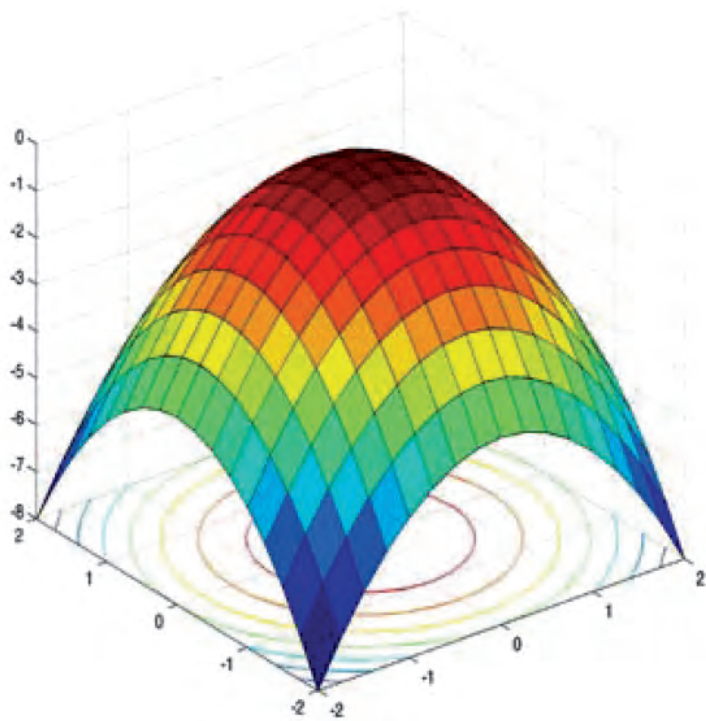
Pellegrino, John. Investigation of Low Pressure Membrane Performance, Cleaning, and Economics Using a Techno-Economic Model (interim). kguerra@usbr.gov.

Robertson John. Scoping Study on Leaching Lithium (interim). jrobertson@usbr.gov.



Creating wetlands to treat brine concentrate in Oxnard, California.





3-D views of functions to determine the optimal release of water for effective hydropower plant operations. Dr. David Harpman (dharpman@usbr.gov) Advanced Optimization Algorithms for Hydropower Dispatch (Phase 1).