May 2003

Research Highlights

Science & Technology

Science for today
Solutions for tomorrow

Director's Office (Washington, DC and Denver, Colorado)

The Bureau of Reclamation's (Reclamation) research program was selected for the Office of Management and Budget's (OMB) Program Assessment Rating Tool review this year. Reclamation personnel met twice with OMB to discuss the scope and timing of the review and to go over the revised forms' questions. Draft submission is due to OMB the first week of June. Program management work this month has addressed refinement of program performance measures in preparation for this review and preparation of the forms for submittal to OMB. (Chuck Hennig, 303-445-2134; Shannon Cunniff 202-513-0682)

The Bureau of Reclamation's research budget was presented to the National Research Council's committee established to undertake a review of the nation's investment and needs for water resources research. The committee subsequently asked Reclamation and the Corps of Engineers to gather information about research conducted in association with projects. Reclamation agreed to sample a few large projects, such as **Platte River, and Klamath**. (Shannon Cunniff, 202-513-0682)

The Desalination Research Roadmap was presented to the National Research Council's committee established for its review. An interim letter of report (approximately 10 pages) is expected in June. (Shannon Cunniff, 202-513-0286; Kevin Price, 303-445-2260)

The challenges facing water resources management in the West during the next century and what the S&T Program is striving to do to help Reclamation managers and stakeholders meet these challenges were presented at the Department of the Interior Environmental Conference in Phoenix, AZ. (Chuck Hennig, 303-445-2314)

Reclamation participated in the National Research Council's standing Hydrologic Subcommittee. The committee's recent focus has been climate change and hydrological cycle issues; however, it is returning to its broader scope. The meeting focused on agency presentations of current issues and research subject needs. (Shannon Cunniff, 202-513-0682)

Reclamation participated in the semi-annual meeting of Reclamation participated in the semi-annual meeting of the National Water Research Institute's Research Advisory Board, and reviewed progress for ongoing research projects and for new proposals. Focus areas continue to be research related to membranes, water reuse and purification issues, and urban runoff. (Shannon Cunniff, 202-513-0682)

Reclamation is participating on the Department's newly established peer review committee. The committee is tasked with identifying issues and needs and developing Departmental policy and/or guidelines related to peer review. (Shannon Cunniff, 202-513-0682)

Meetings with the Department on planning and implementing the 2004 Tamarisk Initiative continue. Agencies have been asked to identify projects that meet the Department's stated performance objectives. Reclamation's proposals need to be further developed to meet ambitious acreage treatment goals. (Shannon Cunniff, 202-513-0682)

Congressional interest continues in desalination research. Briefings occurred with Senator Reid's and Senator Domenici's offices. Reclamation personnel participated in the Office of Naval Research's two-day meeting on desalination research and military needs. (Shannon Cunniff, 202-513-0682)

Upcoming Events

June	
26	Proposals and Progress Reports due
26-27	Science and Technology Steering Team Meeting, Ft. Collins, Colorado

Improving Infrastructure Reliability

The U.S. Patent and Trademark Office has granted Patent No. 6565644 to William F. Kepler and Kurt F. von Fay for Micro Encapsulted Crack Resistant Cement. (Bill Kepler, 303-445-2386)

Personnel from the Materials Engineering and Research Group, traveled to Edmonton, Canada, to discuss an innovative emerging technology, electrochemical impedance spectroscopy (EIS), with representatives of KTA-Tator, Inc. EIS shows potential for assessing aged coating systems (for corrosion protection and coating degradation) with more accuracy and better life-cycle estimates than the visual methods now employed. Discussions focused on methods to test and develop the technology for use on Reclamation facilities. The technique is rapid, quantitative, and nondestructive. The method has been shown to work well for field testing of organic coatings in immersion service but not with extra thick films. (Tom Bortak, 303-445-2376)

The Bureau of Reclamation was represented at the *4th International Concrete Repair Workshop*, held in **San Diego, California**. Reclamation's participation in the workshop and on the steering committee was funded through the Science and Technology Program. The workshop brings together prominent industry leaders from around the world to discuss key issues affecting the performance of concrete repairs. Attendance at the workshop was by invitation only. Reclamation accepted a request to host the *5th International Concrete Repair Workshop*, to be held in **Sedona, Arizona**, in 2005. These workshops are an excellent forum for Reclamation to exchange information and ideas concerning important issues that affect our concrete structures. (Kurt von Fay, 303-445-2399)

For power system stability, an independent needle and deflector control algorithm for Pelton turbines with digital governors was developed and implemented at **Lower Molina Powerplant**. This algorithm significantly increases the efficiency of the powerplant by positioning the deflector entirely out of the water stream, as opposed to the old controller that used a mechanical cam, and could not keep the deflector out of the stream for all loads. (J.C. Agee, 303-445-2309)

For research on operational and environmental constraints and their impact on ancillary services, a basic prototype was developed that performs hour-ahead scheduling. The prototype considers the water releases hourly and modifies future regulation limits to maintain a total daily release. The prototype will be expanded to provide the 24-hour scheduled limits. Work will be initiated to develop a display system that can be used for demonstration purposes. (Steve Stitt, 303-445-2316)

For research on optimization improvements to increase energy production and extend equipment life, the prototype performance monitoring scheme laboratory testing was completed. **Hoover Powerplant** was to be the first demonstration site; however, installation at Hoover will not be possible until September 2003. Installation at **Shasta Dam** (or another **Mid-Pacific** site) will be investigated. Initial efforts were made to develop tools that will automate the performance model development process. Work will continue to develop and document a process that can be used to automate performance model development. (Steve Stitt, 303-445-2316)

For hydroplant condition monitoring (battery cell equalizing module), a patent application entitled "Method and Device for Equalizing the Float Voltage of a Battery Cell" was completed and should be filed with the patent office soon. This patent provides an electronic circuit that equalizes the cell voltages of large, multicell

batteries like those used in Reclamation facilities. Powerplant batteries are the most critical system in a powerplant and are the sole source of power and control in emergency situations. (Jim DeHaan, 303-445-2305)

For hydroplant condition monitoring (fuel cell replacement of 48-volt battery systems), following an extensive search into the technology and manufacturers of fuel cells, a commercial system was identified that could replace a 48-volt backup battery system that runs at 1 kilowatt or less. Initial cost comparisons show that a fuel cell system requires less maintenance than a battery system, with a resulting saving per installation of about $30,000 over a 10-year period. Reclamation has hundreds of battery installations. Presently, the **Technical Service Center** is working with the **Eastern Colorado Area Office** to identify a demonstration site with the goal of having a system installed by the end of September. (Jim DeHaan, 303-445-2305)

Parts have been ordered for the rotor turning gear to be installed at **Green Mountain Powerplant**. Assembly of the turning gear will begin in July. The rotor turning gear provides a safe alternative to the potentially dangerous manual method of rotating a generator rotor used by many facilities, and brings Reclamation into compliance with hazardous-energy-related safety regulations. (Roger Cline, 303-445-2293)

The proposal to be submitted by Alstom Power for a high-voltage generator (Powerformer™) has been delayed at least until spring 2004, due to changes in the manufacturer's design. Therefore, the current solicitation will soon be canceled. **Folsom** Unit 1 will be kept available as a potential high-voltage generation application for at least one or two more years. Research activities will be delayed until installation of the Powerformer™ is imminent. High-voltage generation promises to reduce maintenance costs and environmental risks, while improving efficiency and reliability. (George Girgis, 303-445-2310)

Improving Decision Support

Reclamation scientists met with the Cold Land Process Experiment (CPLX) science and engineering team of over 50 experts from the National Aeronautics and Space Administration's (NASA) Goddard Space Flight Center and Jet Propulsion Lab; the National Oceanic and Atmospheric Administration's National Operational Hydrologic Remote Sensing Center, Environmental Technologies Lab, and the National Snow and Ice Data Center; the U.S. Army Cold Regions Research and Engineering Lab, and several university partners to discuss data collected from the 2002 and 2003 field experiments in **Colorado** and plan the next phase of this 10-year effort. CLPX is part of NASA's Earth Sciences Enterprise, which focuses on meeting needs for improved snow water equivalent analysis and prediction using space platforms and integrated data assimilation systems and models. The photo below shows several representatives of the key organizations behind CLPX. (Dave Matthews, 303 445-2470)

The interagency CLPX team met to review the 10-yr CLP strategic plan.

The Reclamation Hydrologic Data Base Technical Team of water managers, and engineers from the **Mid-Pacific (MP), Pacific Northwest (PN), Upper Colorado (UC), and Lower Colorado (LC) Regions** met at the University of Colorado in Boulder to agree on priorities and completion schedules for the enhanced HDB2 data base. The Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) hosted the meeting. The new data base technology will benefit managers, decisionmakers and technical specialists throughout the **Upper and Lower Colorado Regions and in the Upper Columbia Area Office**. (Don Frevert, 303-445-2473)

Meeting on the enhanced HDB2 data base. From left to right, Warren Sharp, **Upper Columbia Area Office**, Don Frevert, **TSC**, Tom Scott, **Lahontan Basin Area Office (LBAO)**, Edie Zagona, CADSWES, University of Colorado, Kenneth Parr, **LBAO**, and Dave King, **TSC**.

Meteorologists and engineers developed a set of five Letters of Intent to submit proposals to the jointly funded NOAA/NASA Global Energy and Water Cycle Experiment Americas Prediction Project. These Letters of Intent are designed to improve water supply and demand forecasting using several newly emerging technologies in satellite and data assimilation and land surface modeling, numerical weather prediction, and radar estimation of precipitation to verify precipitation and improve streamflow runoff forecasts. Reclamation projects that are participating in this effort include the **Yakima and Columbia Basin Projects** with Pacific Northwest National Lab; the **LBAO** with the Desert Research Institute in the **Truckee, Carson, and, Walker Basins; the Upper Missouri Basin**; and examining climate change scenarios for water management in the West. (Dave Matthews 303 445-2470)

Upcoming Events

June 18-19	Members of the Reclamation WaRSMP team will participate in the annual RiverWare users group meeting at the University of Colorado in Boulder. CADSWES will host the meeting. In addition to Reclamation, RiverWare users from the Tennessee Valley Authority, the U.S. Army Corps of Engineers, State water resources agencies, water utilities, and the private sector will participate. This serves as a major technolgy transfer forum each year, allowing Reclamation and CADSWES to chare their accomplishments and also benefit from those of others. (Don Frevert, 303-445-2473)

Improving Water Supply Technologies

The San Xavier District Recharge Water Quality Study will help Reclamation evaluate water quality impacts of opportunities to store surface water underground in aquifers for later recovery and use. The project coordination has been accomplished and work is being accomplished by all. The field person for the Tohono O'odham is collecting water samples from the wells and providing the data to the TSC. Reclamation has the core from monitoring well RIPZ-11 adjacent to where the recharge basin is

being constructed. The core will be used in the leaching studies. **Central Arizona Project** water is available to use as leachate to interact with the core in the leaching columns. The leaching will be set up and started in June. (Keith Eggleston, 303-445-2464)

Improving Water Delivery Technologies

Low-cost bioassessment techniques for use in determining biological needs in conjunction with project operations were developed. This information was recently published in *Ecological Indicators* and should be useful in reducing conflicts between environmental needs and project use. Studies of co-occurring stressors on aquatic insects identified organisms associated specifically with dams and metal impacts below **Turquoise Reservoir**. Information collected on the Viceroy butterfly identified this insect as a suitable indicator for determining the success of revegetation projects along the lower **Colorado River**. (S. Mark Nelson, 303-445-2225)

For contributions to delisting the Rio Grande silvery minnow, preliminary data collected by biologists indicates that microhabitat inlets create suitable conditions for retaining Rio Grande silvery minnow eggs. The accumulation of organic materials suggests that the microhabitats are suitable nursery areas for larval minnows. This study will provide Reclamation with essential information that minimizes impacts to stakeholders for areas to create nursery habitat. (Michael Porter, 505-462-3596; Tamara Massong, 505-462-3613)