

Attachments

Attachment A: Science and Technology Program Activities

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Attachment A

Science and Technology Program Activities

Many of our investments are partnered with or applied to Reclamation regional projects to maximize the use of Reclamation's extensive facilities as prototype field, testing, and investigation laboratories. This facilitates a prompt return on the investment in the form of cost effective, modern technological solutions tested and integrated with real projects. This allows our projects and customers to begin reaping benefits in the form of lower cost, more reliable, or more effective practices as soon as possible and also facilitates a rapid, "on-the-job" transfer of technology and capabilities to our customers and Reclamation field managers. Although these activities are tested or applied at specific Reclamation projects, the technology and capability advancements achieved become part of Reclamation's core capability for Reclamation-wide use.

These tables summarize most of the ongoing or recently completed Science and Technology program activities. The first table summarizes activities that have generic application across Reclamation and activities that may not require field facilities for the development or testing stages of the research. The following tables sort our activities by the region hosting development, application, or testing. The map shows activity location with a key number corresponding to the regional table. Further information about these activities and executive summaries for studies are at <http://www.usbr.gov/research/>.

Table 1: Reclamation-wide Science and Technology Program Activities

| Project Title | Description/Benefits | Research Contact |
|--|---|---|
| Improving Water and Power Facility Reliability and Cost-Effective Maintenance | | |
| Improvements in Prediction of Earthquake Liquefaction | Developing reliable methods for predicting earthquake-induced ground liquefaction in unusual soil types. These studies can reduce costs of dam rehabilitation projects, many of which are now designed very conservatively to compensate for the lack of more certain information on ground liquefaction potential. | Jeff Farrar (303) 445-2333 |
| Stilling Basin Abrasion Damage | Developed flow deflectors to stop stilling basin erosion (a costly maintenance problem at many Reclamation facilities). Demonstration planned at Mason Dam. | Leslie Hanna (303) 445-2146 |
| Cathodic Protection | Evaluating cost-effective, reliable practices and products to prevent corrosion. | Tom Johnson (303) 445-2383 |
| Power System Diagnostics | Completed a research project that improved safety for personal protective grounding cables for Reclamation electrical crews. | Bert Milano (303) 445-2300 Phil Atwater (303) 445-2304 |
| Non-Destructive Testing Continuous Monitoring | Researching continuous monitoring of metal structures to aid in early detection of structural degradation. | Fred Travers (303) 445-2398 |
| Repair of Existing Structures | Developing cost-effective methods to repair concrete and extend the life of structures. | Kurt VonFay (303) 445-2399 |
| Improved Determination of Generator Controller Performance | Commercializing digital governors for powerplants to enhance reliability, lower maintenance costs, and reduce purchase price. Available for all hydropower installations. | J. Agee (303) 445-2309 |
| Life Extension | Developing a Reclamation-wide research program to address life extension needs in powerplants. | Bert Milano (303) 445-2300 Gary Osburn (303) 445-2297 |
| Pipe Assessment and Repair | Developing methods to detect deterioration in prestressed concrete pipe and assessing techniques to retrofit and protect deteriorated pipe sections. | Mike Peabody (303) 445-2390 |
| New Applications for Geosynthetics | Developing innovative, cost-effective canal lining techniques to conserve water and extend the infrastructure's life in partnership with the Deschutes canal lining demonstration project. | Jay Swihart (303) 445-2397 |
| Non-Destructive Techniques to Assess On-Site Condition of Structures | Developing noninvasive methods to assess the internal condition of structures to prevent failures and better plan maintenance. | Bill Kepler (303) 445-2386 |
| Modern Materials to Enhance Infrastructure Life Cycle | Improving our understanding of structural aging processes for effective facility inspections and maintenance planning. | Dave Harris (303) 445-2375 |

Table 1: Reclamation-wide Science and Technology Program Activities

| Project Title | Description/Benefits | Research Contact |
|--|--|---|
| Precipitation Frequency — Upper Midwest | Developing precipitation-frequency values for Southwest and upper Midwest to improve safety evaluations and design data for small and large water-control structures. Cooperative research program with the U.S. Army Corps of Engineers, National Weather Service, National Resource Conservation Service, Federal Emergency Management Agency, Federal Energy Regulatory Commission, Department of Transportation, and various state agencies. | Louis Schreiner (303) 445-2546 |
| Reservoir Sedimentation | Taking the first step to identify the short- and long-term problems associated with reservoir sedimentation. Current practices to reduce reservoir sedimentation problems will be evaluated. | Christi Young (303) 445-2561 |
| Clogging of Perforations in Plastic Drain Pipe | Investigating replacements for original toe drains on dams, dikes, and large canals with design or construction deficiencies to meet present-day standards. | Glenn Sanders (303) 445-2514 Jack Cunningham (303) 445-2510 |
| Directional Drilling for Water Collection Facilities | Summarizing the current use of directional drilling to install underground utilities, identifying deficiencies regarding ground water collection facilities, and exploring adaptations that will produce acceptable water collection facilities. | Jack Cunningham (303) 445-2510 |
| Pipe Assessment and Repair | Using a mobile acoustic monitoring system to monitor, detect, and locate transient activity related to prestressing wire failure of prestressed concrete pipe (PCP). Unanticipated problems with PCP on Reclamation projects have interrupted service and required costly repairs. PCP failures have threatened lives, destroyed property, and precipitated litigation. | Michael Peabody (303) 445-2390 |
| Repair of Existing Structures | Evaluating new maintenance and repair systems and materials that would address problems with older, deteriorated materials on Reclamation facilities and comply with newer environmental regulations. | Kurt von Fay (303) 445-2399 |
| Cathodic Protection | Verifying that cathodic protection systems for prestressed concrete pipelines on Reclamation projects are preventing corrosion-related failures and not inducing hydrogen embrittlement failures of the prestressing wire. | Tom Johnson (303) 445-2383 |
| Hydraulic Modeling Response Team | Investigating newly available, remotely sensed data such as Light Detection and Ranging (LIDAR) data and high spatial resolution digital imagery, which could provide enhanced water modeling and downstream flood plain characterization. | Ron Miller (303) 445-2279 |
| Water Quality | Determining the usefulness of hyperspectral imagery for mapping surface water quality on Reclamation reservoirs. | Dave Eckhardt (303) 445-2273 |
| Hydroelectric Infrastructure Protection | Investigating new methods to evaluate the performance of generator controllers (voltage regulators, power system stabilizers, and speed governors) as a part of electric power systems. | J. Agee (303) 445-2309 |

Table 1: Reclamation-wide Science and Technology Program Activities

| Project Title | Description/Benefits | Research Contact |
|--|--|---|
| Jet Properties of Dam Foundation Erosion | Investigating the mechanics of the “jet” or flow cascade produced by flows that overtop dams. These mechanics are needed to assess the erosion potential at the toe of a dam. This information, combined with site-specific geology, will determine if overtopping is a viable (minimal risk or risk-free) alternative and the acceptable degree of overtopping. | Joseph Kubitschek (303) 445-2148 |
| Stretching Water Supplies and Improving Water Management and Water Delivery Reliability | | |
| Watershed and River Systems Management | Enhancing RiverWare (a decision support model) to improve surface water-ground water management and to limit ground water pumping based on aquifer levels. | Don Frevert (303) 445-2473 Terry Fulp (303) 492-8572 Dave Matthews (303) 445- 2470 |
| Laser Mapping Techniques with Airborne Global Positioning System (GPS) Control | Using LIDAR aerial imaging data to greatly enhance the ability to manage the downstream effects of flooding events. Also offers potential to accurately estimate low flow inundations, which is critical to understand and manage various downstream river and riparian operational issues. | Jeff Millikin (916) 978-5267 |
| <ol style="list-style-type: none"> 1. Water Measurement Methods 2. Water Systems Automation 3. Development of an Improved Algorithm for Canal Control 4. Developing Prototype Water Measurement and Monitoring | Developing and advancing canal automation, water measurement techniques, and remote operations to conserve water and increase crop production through targeted water deliveries. | Cliff Pugh (303) 445-2151 |
| Fish Passage | Investigating designs for natural style fishways to improve fish passage for non-salmonids, especially threatened and endangered species. | Brent Mefford (303) 445-2149 |
| Assessment of In-Situ Fish Counters | Assessing in situ fish counting devices. A commercially available fish counter will be installed on the fish ladder at Easton Dam, and its output will be analyzed to determine whether this type of instrument yields useful information for monitoring fish types and abundances at other Reclamation facilities. | Steve Hiebert (303) 445-2206 |
| Advanced Water Treatment Research | Investigating ways to lower energy use and costs in freeze desalination of seawater. | Harry Remmers (303) 445-2261 |
| Monitoring and Management of Invasive Species — Development of Management Methods for Invasive Weeds | Decisionmaking model to prioritize treatment options for controlling invasive species. | Fred Nibling (303) 445-2202 |

Table 1: Reclamation-wide Science and Technology Program Activities

| Project Title | Description/Benefits | Research Contact |
|--|---|----------------------------------|
| Development of Management Methods for Salt Cedar and Knapweed | Evaluating and monitoring new salt cedar biocontrol technology and reviewing literature on salt cedar, resulting in Reclamation-wide database. | Fred Nibling (303) 445-2202 |
| Advanced Water Treatment Research | Developed an innovative, low-cost dewvaporation desalting system with low-cost materials. | Harry Remmers (303) 445-2261 |
| Advanced Water Treatment Research | Researching to reduce membrane fouling and improve membrane performance, which will lower desalting cost and increase performance. | Frank Leitz (303) 445-2255 |
| Management Practice Study II — County Land Use Impacts on Irrigation Districts | Analyzing management practices and water conservation by working directly with 36 cooperating districts in the Pacific Northwest, Great Plains, and Upper Colorado Regions. Provided workshops, a website < http://waterlab.colostate.edu >, and professional papers. Principal investigator, Dr. John Wilkins-Wells, was awarded the Four States Irrigation Council Headgate Award. Current investigation focuses on urbanization and growth impacts on irrigation, as well as municipal and industrial water customers. | Thayne Coulter (303) 445-2706 |
| Economic Modeling of Water Management Impacts | Enhancing existing agricultural, power, and regional economic models and, more importantly, developing necessary linkages with existing hydrology models to provide Reclamation with a single, integrated water management tool. | Rob Davis (303) 445-2730 |
| Stream and River Ecology | Studying aquatic organisms and organisms associated with water resources for use as bio-indicators. Using bio-indicators can help evaluate water project operation and ecosystem functioning. | Mark Nelson (303) 445-2225 |

Table 2: Science and Technology Program Activities Applied or Partnered in the Great Plains Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|--|---|---|---|---|
| Improving Water and Power Facility Reliability and Cost-Effective Maintenance | | | | |
| GP1 | Improved Determination of Generator Controller Performance | Commercializing digital governors for powerplants to enhance reliability, lower maintenance costs, and reduce purchase price. Installed in Mt. Elbert. Available for all hydropower installations. | J. Agee (303) 445-2309 | Mike Baumgarten |
| GP2 | Hydro Plant Condition Monitoring | Completed machine conditioning monitoring research effort to diagnose online generators. Installed at Yellowtail Powerplant. Developed and installed special cavitation monitor at Yellowtail Powerplant. Initial feedback indicates great success. | Jim DeHaan (303) 445-2305 | Mike Ferguson |
| GP3 | Non-Destructive Testing Continuous Monitoring | Research on continuous monitoring of metal structures to aid in early detection of structural degradation at Yellowtail Dam. | Fred Travers (303) 445-2398 | Dennis Redden |
| GP4 | Properties of Aged Materials | Developing new accelerated concrete tests to estimate the maximum potential for deterioration due to Alkali Silica Re-action using core from Seminole Dam. | Erin Gleason (303) 445-2382 | Robert Price |
| GP5 | Clogging of Perforations in Plastic Drain Pipe | Identifying potential clogging problems in gravel envelopes around underground plastic pipe to improve our subsurface drain design criteria. | Glen Sanders (303) 445-2514 | Mike Kube Arden Frietak Ken Randolph |
| GP6 | Reliability Centered Maintenance | Researching potential benefits in adopting reliability centered maintenance. Science and Technology and Power Program seeded efforts in Eastern Colorado Area Office. | Pete Tolen (303) 445-2295 | Gregg Ruff |
| GP7 | Advanced Water Treatment Research | Developed methods to remove heavy metals from Leadville Mine Drainage Tunnel effluent. | Bob Jurenka (303) 445-2254 | Brad Littlepage |
| GP8 | Advanced Water Treatment Research | Optimizing disinfection to minimize byproduct formation at Mni Wiconi Treatment Plant. | Michelle Chapman (303) 445-2264 | Jeff Williamson |
| GP9 | Agricultural Water Resources Decision Support (AWARDS) System | Developed an AWARDS System for managing watersheds in the Northern Plains. | Dave Matthews (303) 445-2470 Curt Hartzell (303) 445-2482 Al Brower (303) 445-2507 | Fred Ore Mike Kube Richard La Fond Bill Harlan |

Table 2: Science and Technology Program Activities Applied or Partnered in the Great Plains Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|--|--|--|--|--|
| Stretching Water Supplies and Improving Water Management and Water Delivery Reliability | | | | |
| GP10 | Development of Management Methods for Salt Cedar and Knapweed | Evaluating and monitoring new salt cedar biocontrol technologies at test sites in Pueblo, Colorado. | Fred Nibling (303) 445-2202 | Anthony Lopez Gene Price |
| GP11 | Aquatic Weed Control Methodology Lower Rio Grande | Developing biocontrol methods to remove hydrilla and water hyacinth that clog the Rio Grande. | Fred Nibling (303) 445-2202 | Carlos Lopez Larry Rossow |
| GP12 | 1 Water Measurement Methods 2 Water Systems Automation 3 Development of an Improved Algorithm for Canal Control 4 Developing Prototype Water Measurement and Monitoring | Developing and advancing canal automation, water measurement techniques, and remote operations to conserve water and increase crop production through targeted water deliveries. | Cliff Pugh (303) 445-2151 | Lenny Duberstein Brent Esplin Brenton Johnson Jack Wiggin |
| GP13 | Fish Passage | Investigating designs for natural style fishways to improve fish passage for nonsalmonids, especially threatened and endangered species. | Brent Mefford (303) 445-2149 | Susan Camp |
| GP14 | Platte River Basin Water Management Support System | Develop an AWARDS system for a cooperative water management project along portions of the Platte River. | Steffen Meyer (303) 445-2475 Dave Matthews (303) 445-2470 Curt Hartzell (303) 445-2482 Al Brower (303) 445-2507 | Fred Ore Mike Kube Richard La Fond Bill Harlan |
| GP15 | Great Plains Applied Reservoir Research | Planning an intensive water sampling and analysis program for five reservoirs to understand water quality issues and trends to improve management options (specifically, Pactola, Pueblo, Clark Canyon, Merritt, and Foss Reservoirs). | Dan Lechefsky (406) 247-7638 | Larry Rossow |
| GP16 | Development of Management Methods for Salt Cedar and Knapweed | Conducting a multiagency study of salt cedar biocontrol in the Canadian River Basin and in eastern Colorado. | Fred Nibling (303) 445-2202 | Carlos Lopez |

Table 2: Science and Technology Program Activities Applied or Partnered in the Great Plains Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|---------------|--|--|--|---|
| GP17 | Assessment of Grassland Birds | Evaluating presence, abundance, and habitat use of grassland bird species around Choke Canyon Reservoir, Texas. | Jeff Baumberger (406) 247-7330 | Larry Rossow |
| GP18 | Improve Streamflow Forecasts | Evaluating various improvements to streamflow forecasts for more informed and faster operation decisions in the upper Missouri Basin in Montana. | Curt Hartzell (303) 445-2482 Gordon Aycock (406) 247-7715 Tim Felchle (406) 247-7756 | Larry Rossow |
| GP19 | Impacts of Organic Contaminants on the Water Quality of Reservoirs | Studying limnology of Canyon Ferry Reservoir in Montana to determine impacts of low dissolved oxygen releases. | Rick Roline (303) 445-2213 | Rick Blaskovich Jeff Lucero Dan Lechefskey |
| GP20 | Water Conservation | Sponsored a real-time decision support website: < http://www.usbr.gov/rsmg/nexrad > to provide AWARDS system for irrigation districts in Oklahoma. | Dave Matthews (303) 445-2470 Curt Hartzell (303) 445-2482 Al Brower (303) 445-2507 | Larry Walkoviak |
| GP21 | NEXRAD Radar Snow Estimation | Upgrading the Snow Accumulation Algorithm (SAA) to improve estimates of snow water equivalents for more accurate streamflow data. | Ed Holroyd (303) 445-2276 Dave Matthews (303) 445-2470 Steve Hunter (303) 445-2478 Curt Hartzell (303) 445-2482 | Gordon Aycock Larry Rossow Tim Felchle Rick Nelson |
| GP22 | Aquatic Weed Control Methodology: Lower Rio Grande | Developing management methods and practices to increase water delivery efficiencies and minimize water losses resulting from aquatic weed infestation in irrigation districts. | Carlos Lopez (512) 916-5647 | Carlos Lopez |

Table 3: Science and Technology Program Activities Applied or Partnered in the Lower Colorado Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|--|--|--|---|---|
| Improving Water and Power Facility Reliability and Cost-Effective Maintenance | | | | |
| LC1 | Insulation Delamination | Completing research, development, and demonstration for modular Supervisory Control and Data Acquisition (SCADA). Installed at Hoover. | Steve Stitt (303) 445-2316 | Mike Eaker |
| LC2 | Pipe Assessment and Repair | Developing methods to detect deterioration in prestressed concrete pipe and assessing techniques to retrofit and protect deteriorated pipe sections. | Mike Peabody (303) 445-2390 | David Johnson |
| LC3 | Open Access Hydro | Conducted initial studies into potential value of ancillary power services at Hoover. Showed up to \$800 million value in current market. Research will be used to assist policy office in developing policy to protect Reclamation's investments and resources. | Steve Stitt (303) 445-2316 Lee Matuszczak (303) 445-2319 | Mike Baker |
| LC4 | Hydroplant Condition Monitoring | Completed machine conditioning monitoring research effort to diagnose online generators. Installed at Davis Powerplant. | Jim DeHaan (303) 445-2305 | George Kraft |
| LC5 | Pollination of Rare Plants | Investigating pollination requirements of rare plants influenced by operations associated with All-American Canal, Colorado River, and canal lining projects. | William Wiesenborn (702) 293-8699 | John Johnson |
| LC6 | Rock Art Dating | Investigating rapid, portable, onsite techniques to date petroglyphs affected by Colorado River operations. | Patricia Hicks (702)293-8705 | Patricia Hicks |
| Stretching Water Supplies and Improving Water Management and Water Delivery Reliability | | | | |
| LC7 | Development of Management Methods for Salt Cedar and Knapweed | Developing methods to control Giant Salvinia in Palo Verde Irrigation District, Arizona, and biological methods to control salt cedar along Colorado River. Improves water deliveries and reduces salinity. | Fred Nibling (303) 445-2202 | Don Young Billy Solomon Theresa Olson John Johnson |
| LC8 | 1 Water Measurement Methods 2 Water Systems Automation 3 Development of an Improved Algorithm for Canal Control 4 Developing Prototype Water Measurement and Monitoring | Developing and advancing canal automation, water measurement techniques, and remote operations to conserve water and increase crop production through targeted water deliveries. | Cliff Pugh (303) 445-2151 | Mark Niblack |

Table 3: Science and Technology Program Activities Applied or Partnered in the Lower Colorado Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|---------------|--|---|---|--|
| LC9 | Economic Modeling of Water Management Impacts | Modeling economic impacts of water management. Integrating an economic model into RiverWare to evaluate impacts associated with changed operations in the Lower Colorado River Basin. | Robert Hamilton (303) 445-2724 | Alan Kleinman |
| LC10 | Watershed and River Systems Management | Enhancing RiverWare (a decision support model) to improve surface water-ground water management and to limit ground water pumping based on aquifer levels. | Dave Matthews (303) 445-2470 | Terry Fulp |
| LC11 | Water Quality | Evaluating surface-based hyperspectral data on Lake Mead to improve predictions of water quality parameters from various current and future imaging sensors. | David Eckhardt (303) 445-2273 | Mike Horn Steve Muth |
| LC12 | Advanced Water Treatment Research | Helping to remedy methyl tertiary butyl ether (MTBE) in ground water at the Moenkopi Reservation. | Michelle Chapman (303) 445-2264 | Terry Edwards |
| LC13 | Constructed Wetlands and Wetland Ecology | Studied wetland demonstration to improve Las Vegas Wash water quality and develop waterfowl and wildlife habitat. | Rick Roline (303) 445-2213 | John Johnson |
| LC14 | Development of Methods to Reestablish Desirable Plant Communities in Concert with Invasive Species Control | Improving survey of cottonwood/willow restoration in Arizona, which will be needed after salt cedar is removed. | Fred Nibling (303) 445-2202 | Billy Solomon |
| LC15 | Water Quality Research Component of RiverWare | Integrating evaluation of several water quality parameters into reservoir water quality decision support models (e.g., RiverWare). | Stan Conway (303) 445-2453 Merlynn Bender (303) 445-2460 | Terry Fulp |
| LC17 | Impacts of Organic Contaminants on the Water Quality of Reservoirs | Improving understanding and management of Lake Mead water quality issues associated with Las Vegas Wash and perchlorate contamination. | Rick Roline (303) 445-2213 | Steve Muth |
| LC18 | Water Measurement Methods | Evaluating effectiveness of an Acoustic Doppler Profiler to measure currents and track density currents flowing into Lake Mead from Las Vegas Wash. | Tracy Vermeyen (303) 445-2154 | John Johnson Kris Mills Paul Matsuka |
| LC19 | Constructed Wetlands and Wetland Ecology | Improving water quality sampling related to Brawley and New River demonstration wetlands in Imperial Valley, California. | Rick Roline (303) 445-2213 | Steve Muth |

Table 3: Science and Technology Program Activities Applied or Partnered in the Lower Colorado Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|---------------|--|---|---|---|
| LC20 | Advanced Water Treatment Research | Reducing volume of reverse osmosis concentrate to lower costs and reduce environmental concerns. | Michelle Chapman (303) 445-2264 | Mike Norris |
| LC21 | Advanced Water Treatment Research | Evaluating reverse osmosis treatment of the Central Arizona Project (CAP) water for Tucson and slow sand filtration of CAP water at Marana, Arizona. | Michelle Chapman (303) 445-2264 | Eric Holler |
| LC22 | Advanced Water Treatment Research | Evaluated two concentrate disposal alternatives for treating CAP water for the Phoenix metropolitan area. | Scott Irvine (303) 445-2253 | Tom Poulson |
| LC23 | Advanced Water Treatment Research | Participated and cofunded the Southern Arizona Regional Water Management Study to expand regional cooperation and to transfer technology related to water resource management issues. | Chuck Moody (303) 445-2258 | Eric Holler |
| LC24 | Watershed and River Systems Management Program | Developed stochastic hydrology modeling capability for Colorado River Basin. (Also includes Upper Colorado.) | Dave Matthews (303) 445-2470 Don Frevert (303) 445-2473 | Terry Fulp |
| LC25 | Watershed Precipitation and Runoff Enhancements for AWARDS: Yuma Project | Focuses on providing improved estimates of sidewash flows along the Lower Colorado River from Lake Mead to Yuma. Information will improve (1) scheduling of releases from Hoover Dam and (2) the water balance accounting for the Lower Colorado River Accounting System (LCRAS). | Steven Hunter (303) 445-2478 Curt Hartzell (303) 445-2482 Dave Matthews (303) 445-2470 | Bruce Williams Paul Matsuka Bob Adams |
| LC26 | Evaluation of Contaminants in Reclamation Reservoirs | Identifying and characterizing the distribution of various chemicals in Lake Mead and Las Vegas Wash and correlating them with changing lake conditions and the toxicological impacts of ammonium perchlorate on fish. | Kevin Kelly 1-800-659-3656 then ask for (303) 445-6328 | Steve Muth John Johnson |
| LC27 | Pollination of Rare Plants | Examining the flowering and pollination of sand food, a sensitive plant species found in the Algodones Dunes near the All-American Canal, Imperial County, California. | William Wiesenborn (702) 293-8699 | William Wiesenborn |

Table 4: Science and Technology Program Activities Applied or Partnered in the Mid-Pacific Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|--|--|---|---|--------------------------------|
| Improving Water and Power Facility Reliability and Cost-Effective Maintenance | | | | |
| MP1 | Physical Modeling of Hyporheic Flow Effects on Anadromous Salmonid Eggs in Redds | Conducting laboratory and field research to better understand the influence of hyporheic flow on the egg survival of anadromous salmon. A better understanding would provide the opportunity to improve egg survival through adaptive management for regulated river systems. | Joseph Kubitschek (303) 445-2148 Mark Bowen (303) 445-2222 | Buford Holt Sandy Forthwick |
| MP2 | Reliability Centered Maintenance | Researching potential benefits in adopting reliability centered maintenance. Science and Technology and Power Programs seeded efforts in Folsom. | Peter Tolen (303) 445-2295 | Martin Bauer |
| MP3 | Insulation Delamination | Completing research, development, and demonstration for modular SCADA. Installed at the Central Valley Project. | Steve Stitt (303) 445-2316 Lee Matuszczak (303) 445-2319 | Jeri Domingo Brewer |
| MP4 | Predicting Prehistoric Site Densities | Developing remote sensing methods for identifying cultural resource sites. | Michael Tansey (916) 978-5197 Jim West (916) 978-5041 | Michael Tansey |
| MP5 | Conjunctive Use Water Management: Decision Support System (DSS) | Developing a DSS for conjunctive use water management in California's Central Valley. A DSS consists of a user interface that links a suite of computer programs for data management, process simulation, and visualization. In conjunctive use water management, existing surface reservoirs would release water that would normally be stored in the conservation pool and store it in subsurface reservoirs. | Michael Tansey (916) 978-5197 | Michael Tansey |
| Stretching Water Supplies and Improving Water Management and Water Delivery Reliability | | | | |
| MP6 | Evaluating Fish Lift Technology at Tracy Fish Facility | Testing new Archimedes-type water lifts to help recover many fish now being lost below the Tracy Fish Test Facility. Enhanced resource protection may translate into more dependable water deliveries. | Brent Mefford (303) 445-2149 | Charlie Liston |
| MP7 | Evaluating Light Traps at Tracy Fish Facility | Developing system to recover larval and juvenile stages of sensitive fish species at diversion intakes. May allow intakes to operate faster, even when endangered species are locally abundant. | Cathy Karp (303) 445-2226 Diana Weigmann (303) 445-2112 | Charlie Liston |

Table 4: Science and Technology Program Activities Applied or Partnered in the Mid-Pacific Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|---------------|--|--|---|---------------------------------|
| MP8 | Conjunctive Use Management | Developing a decision support system to provide hydrologic and economic data to stakeholders for use during negotiations over conjunctive use projects. | Michael Tansey (916) 978-5197 | Michael Tansey |
| MP9 | Fish Passage | Investigating designs for natural style fishways to improve fish passage for nonsalmonids, especially threatened and endangered species. | Brent Mefford (303) 445-2149 | Locke Hanne Mark Buettner |
| MP10 | Simulation Central Valley Project Improvement Act (b) (2) Actions | Developing methods to simulate and effectively manage operations to meet state and federal fish flow requirements under the Central Valley Project Improvement Act (b) (2). Developing a computer model to simulate operational decisions regarding Central Valley Project Improvement Act (b) (2) reservoir releases to protect endangered fish populations. | Lloyd Peterson (916) 978-5075 | Lloyd Peterson |
| MP11 | Water Systems Management Program | Enhancing RiverWare (a decision support model) to improve surface water-ground water management and to limit ground water pumping based on aquifer levels. | Dave Matthews (303) 445-2470 | Tom Scott |
| MP12 | Water Quality | Evaluating surface-based hyperspectral data on reservoirs (Klamath Lake, Lake Shasta) to improve predictions of water quality parameters from various current and future imaging sensors. | David Eckhardt (303) 445-2273 | Mark Buettner Diane Wisnewsk |
| MP13 | Kit Fox Artificial Den Study | Evaluating success of various artificial den designs to mitigate for impacts to the San Joaquin kit fox habitat from Reclamation's water delivery facilities. Artificial dens are frequently used to mitigate loss of natural habitat and dens. Cost sharing with the Fish and Wildlife Service, California Department of Fish and Game, and California State University at Bakersfield, California. | Rosalie Faubion (559) 487-5138 | Michael Tansey |
| MP14 | Major Mechanisms of Phosphorus Release | Evaluating mechanisms of phosphorous release in Klamath Lake, assessing effects of various physical and chemical controls on occurrence of algal blooms. | Mark Buettner (541) 883-6935 | Michael Tansey |
| MP15 | Impacts of Organic Contaminants on the Water Quality of Reservoirs | Studying discharge and water quality effects on salmon redds to improve spawning in Deer Creek, tributary of Sacramento River. | Rick Roline (303) 445-2213 Diana Weigmann (303) 445-2112 | Sandy Borthwick |

Table 4: Science and Technology Program Activities Applied or Partnered in the Mid-Pacific Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|---------------|---|--|--|--|
| MP16 | Monitoring and Management of Invasive Species— Development of Management Methods for Invasive Weeds | Improving hydrilla control in irrigation canals (Central Valley Project) and biocontrol of yellow starthistle (Red Bluff). | Fred Nibling (303) 445-2202 | Jim Scullin |
| MP17 | Geochemistry, Fate, and Transport of Selenium From Irrigation Lands to Drain Outlet | Improving our understanding and control of selenium loading from agricultural drainage water. | Samuel Schaefer (303) 445-2515 Joseph Brummer (303) 445-2457 Juli Fahy (303) 445-2187 | Michael Tansey |
| MP18 | Ground Water Surface Model | Improving the Integrated Ground Water Surface Model used in many Central Valley Project studies. | Michael Tansey (916) 978-5197 | Michael Tansey |
| MP19 | Water Quality Research Component of RiverWare | Integrating evaluation of several water quality parameters into reservoir water quality decision support models (e.g., RiverWare). | Stan Conway (303) 445-2453 Merlynn Bender (303) 445-2460 | Carol Boughton Tom Scott Mike Tansey |
| MP20 | Ecology of Reclamation Western Reservoirs | Understanding Shasta Reservoir aquatic ecology and water quality influences related to temperature control device operations. | Rick Roline (303) 445-2213 | Michele Simpson |
| MP21 | Advanced Water Treatment Research | Improving methods to remedy arsenic in ground water at Fallon, Nevada. | Michelle Chapman (303) 445-2264 | Carol Boughton |
| MP22 | Folsom Dam Penstock Shutters | Investigating facility operations data to improve water temperature control and reliability of hydropower production at Folsom Dam. | Tracy Vermeyen (303) 445-2154 | Michael Tansey |
| MP23 | Advanced Water Treatment Research | Pilot tested desalination treatment options at the San Jose/Santa Clara Water Pollution Control Plant. | Bob Jurenka (303) 445-2254 | Michael Tansey |
| MP24 | Verification of Integrated Ground Water and Surface Water Model (IGSM) | Formally reviewing and verifying Integrated Groundwater and Surface Water Model, which is being used to make important management decisions related to planning and analysis of water resource systems in California's Central Valley. | George Matanga (916) 978-5084 | Michael Tansey |

Table 4: Science and Technology Program Activities Applied or Partnered in the Mid-Pacific Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|---------------|--|---|----------------------------------|-------------------------|
| MP25 | Folsom Dam Selective Withdrawal Structure Evaluation | Conducting computer modeling; collecting and analyzing field data to better understand the flow net and selective withdrawal characteristics in front of the temperature control shutters on the Folsom Dam penstocks; and estimating "leakage" around the shutter guides. | Tracy Vermeyen (303) 445-2154 | Michael Tansey |
| MP26 | Predicting Prehistoric Site Densities | Using geographic information systems techniques to define the relationship between prehistoric site densities and geomorphic and other variables in the greater American-Cosumnes River watersheds and downstream Sacramento-San Joaquin Delta areas. The information will be useful for early planning studies in the Central Valley Project and will benefit Reclamation by reducing time and cost associated with archeological clearance for future projects. | Jim West (916) 978-5041 | Jim West |
| MP27 | Major Mechanisms of Phosphorus Release | Conducting research to understand the relative importance of pH and resuspension on release of phosphorus in Upper Klamath Lake, Oregon. Reclamation could manage the lake at higher water levels to reduce internal loading of phosphorus, possibly leading to lower algae blooms, better water quality, and higher survival of the lake's endangered suckers. | Mark Buettner (541) 883-6935 | Mark Buettner |

Table 5: Science and Technology Program Activities Applied or Partnered in the Pacific Northwest Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|--|---|---|---|-------------------------|
| Improving Water and Power Facility Reliability and Cost-Effective Maintenance | | | | |
| PN1 | Reservoir Sedimentation | Developing methods to manage sediment transport and reservoir sediment accumulation at Black Canyon Dam, Boise Project. | Christi Young (303) 445-2561 | Steve Jarsky |
| PN2 | New Applications for Geosynthetics | Developing innovative, cost-effective canal lining techniques to conserve water and extend the infrastructure's life. Partnering with the Deschutes Canal Lining Demonstration Project. | Jack Haynes (208) 378-5225 | Jay Swihart |
| PN3 | Stilling Basin Abrasion Damage | Demonstrating a flow deflector to stop erosion at Mason Dam's stilling basin in the Boise Project. Stilling basin erosion is a costly maintenance activity at many Reclamation dams. | Leslie Hanna (303) 445-2146 | Steve Jarsky |
| PN4 | Improvements in Prediction of Earthquake Liquefaction | Developing reliable methods for predicting earthquake-induced ground liquefaction in unusual soil types. These studies can reduce costs of dam rehabilitation projects, many of which are now designed very conservatively to compensate for the lack of more certain information on ground liquefaction potential. | Jeff Farrar (303) 445-2333 | Brent Carter |
| PN5 | Clogging of Perforations in Plastic Drain Pipe | Identifying potential clogging problems in gravel envelopes around underground plastic pipe to improve our subsurface drain design criteria. | Glen Sanders (303) 445-2514 | Dan Hubbs |
| PN6 | Hydro Plant Condition Monitoring | Entering a joint research agreement with Tennessee Valley Authority, Bonneville Power Administration, and Grand Coulee to evaluate the possibility of tracking amount of metal loss during cavitation while the generator unit is running. | Bert Milano (303) 445-2300 Jim DeHaan (303) 445-2295 | Dennis Philman |
| PN7 | Hydro Plant Condition Monitoring | Completed machine conditioning monitoring research effort to diagnose online generators. Installed at Grand Coulee. | Bert Milano (303) 445-2300 Jim DeHaan (303) 445-2305 | Dennis Philman |
| PN8 | Advanced Water Treatment Research | Researching water recycling opportunities for industries affected by removal of Elwha Dam. | Michelle Chapman (303) 445-2264 | Bob Hamilton |

Table 5: Science and Technology Program Activities Applied or Partnered in the Pacific Northwest Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|--|--|---|--|--|
| Stretching Water Supplies and Improving Water Management and Water Delivery Reliability | | | | |
| PN9, PN10 | Monitoring and Managing Invasive Species | Demonstrated successful biocontrol of 20,000 acres of purple loosestrife to unclog waterways along Winchester Wasteway. Developing low-rate applications of aquatic herbicides in irrigation canals. | Fred Nibling (303) 445-2202 | Craig Conley Wes Green |
| PN11 | Biology and Behavior of Native Species | Studying the distribution, abundance, and habitat use of fish species in the Yakima River below the Roza, Sunnyside, and Chandler Dams. | Diana Weigmann (303) 445-2112 | Walt Larrick |
| PN12 | Assessment of Agriculture Return Flows for Salmon Spawning | Evaluating habitat in portions of the Columbia River Project that are suitable for anadromous salmonids but not accessible to them. Study compares physical habitat of areas now used by these species to the habitats in inaccessible areas. | Diana Weigmann (303) 445-2112 | Bill Gray |
| PN13 | Bull Trout Habitat Research | Characterizing the limnologic characteristics of five reservoirs in the Yakima Basin that host populations of the endangered bull trout to better understand desirable habitat characteristics. | Diana Weigmann (303) 445-2112 | Walt Larrick Norbert Ries |
| PN14 | Relationships between Reclamation River Operations and Chinook Salmon Spawning Success | Identifying relationship between discharge and hyporheic flow in a spring chinook spawning area. Involves both field studies below Cle Elum Dam and a physical model to be constructed in the Denver laboratory. Also supports Yakama Nation. | Diana Weigmann (303) 445-2112 | Walt Larrick Norbert Ries |
| PN15 | 1 Water Measurement Methods 2 Water Systems Automation 3 Development of an Improved Algorithm for Canal Control 4 Developing Prototype Water Measurement and Monitoring | Developing and advancing canal automation, water measurement techniques, and remote operations to conserve water and increase crop production through targeted water deliveries. | Cliff Pugh (303) 445-2151 | Brian Saur Brian Hamilton Allen Powers |
| PN16 | Environmental Contaminants | Improving hyperspectral remote sensing technology to map source areas for mercury that makes its way into the Owyhee Reservoir and to map chlorophyll and suspended sediment concentrations in the reservoir. | David Eckhardt (303) 445-2273 Doug Craft (303) 445-2182 | Dave Zimmer |

Table 5: Science and Technology Program Activities Applied or Partnered in the Pacific Northwest Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|---------------|--|--|---|--|
| PN17 | Assessment of In-Situ Fish Counters | Assessing in-situ fish counting devices. A commercially available fish counter was installed on the fish ladder at Easton Dam, and its output will be analyzed to determine usefulness for monitoring fish types and abundances at other Reclamation facilities. | Steve Hiebert (303) 445-2206 | Walt Larrick Norbert Ries |
| PN18 | Fish Screening | Investigating experimental horizontal plate fish screen designs, conducting physical and numerical simulations, and evaluating use for bull trout. | Brent Mefford (303) 445-2149 | Brian Hamilton |
| PN19 | Underwater Strobe Light Effects on Fish Behavior | Investigating the effectiveness of strobe lights in preventing fish entrainment at Grand Coulee. | Diana Weigmann (303) 445-2112 | Monte McClendon |
| PN20 | Impacts of Organic Contaminants on the Water Quality of Reservoirs | Conducting Yakima River water quality and fishery studies related to salmon and endangered fish issues. | Rick Roline (303) 445-2213 Diana Weigmann (303) 445-2112 | Steve Grabowski Kate Puckett Walt Larrick |
| PN21 | Watershed and River Systems Management | Enhancing RiverWare (a decision support model) to improve surface water-ground water management and to limit ground water pumping based on aquifer levels in the Yakima and Columbia River Basins. | Dave Matthews (303) 445-2470 | Warren Sharp |
| PN22 | Watershed and River Systems Management | Developed joint application of RiverWare-Hydraulic Database and Modular Modeling Systems in the Yakima River Basin. | Dave Matthews (303) 445-2470 | Warren Sharp Chris Lynch |
| PN23 | Yakima Project AWARDS System and Evapo-transpiration (ET) Toolbox | Developed and implemented an Agricultural Water Resources Decision Support (AWARDS) system for the Upper Columbia area and Yakima-Epharata-Umatilla system. This project is to improve water supply and demand calculations and forecasts. | Dave Matthews (303) 445-2470 Curt Hartzell (303) 445-2482 Al Brower (303) 445-2507 | Warren Sharp Chris Lynch Peter Palmer |
| PN24 | Tualatin Project AWARDS System | Developed AWARDS system for the Tualatin Project. Provides 24-hour water volume estimates over selected watersheds, precipitation, and crop ET forecasts. Developed partnership with AgriMet to share technology. | Curt Hartzell (303) 445-2482 Al Brower (303) 445-2507 | Leo Busch Kathy Kihara Eric Glover Peter Palmer |
| PN25 | Reservoir Selective Withdrawal | Evaluating the potential of the selective withdrawal structure at Hungry Horse Dam to control levels of dissolved gas. | Tracy Vermeyen (303) 445-2154 | Dave Zimmer Ralph Carter |

Table 5: Science and Technology Program Activities Applied or Partnered in the Pacific Northwest Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|---------------|--|--|---|---|
| PN26 | NEXRAD Precipitation Algorithm | Modified the Snow Accumulation Algorithm (SAA) for use with NEXt generation RADar (NEXRAD) (WSR-88D) radars in the Pacific Northwest during the cool season (October-May) for improved estimates of precipitation (snow and/or rain) over watersheds that feed Reclamation reservoirs and managed river systems. | Curt Hartzell (303) 445-2482 Steve Hunter (303) 445-2478 | Leo Busch Kathy Kihara Warren Sharp |
| PN27 | Stochastic Event-based Flood Hydrology Model | Expanding the capabilities of the stochastic event flood model (SEFM) to allow distributed runoff modeling and simulations of reservoir inflows resulting from thunderstorms. | Bob Swain (303) 445-2547 | Jim Mumford |

Table 6: Science and Technology Program Activities Applied or Partnered in the Upper Colorado Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|--|---|---|--|---|
| Improving Water and Power Facility Reliability and Cost-Effective Maintenance | | | | |
| UC1 | Hydroplant Condition Monitoring | Completed machine conditioning monitoring research effort to diagnose online generators. Installed at Glen Canyon. | Jim DeHaan (303) 445-2305 | Rusty Gattis |
| UC2 | Improved Determination of Generator Controller Performance | Commercializing digital governors for powerplants to enhance reliability, lower maintenance costs, and reduce purchase price. Installed in Blue Mesa. Available for all hydro installations. | J. Agee (303) 445-2309 | Bob Brummond |
| UC3 | Iron Bacteria in Hydraulic Structures | Tested iron bacteria rehabilitation treatments for Closed Basin wells and completed literature review. Reclamation's Closed Basin Project in Colorado relies on a well field to supply water to the Rio Grande to meet flows required by interstate compacts when flows are low. However, the iron and manganese bacteria in these wells have clogged the wells and severely reduced production. The Science and Technology Program is finding ways to clean and rehabilitate the wells and to come up with new design criteria to solve this problem before it starts. | Sarah Wynn (303) 445-2216 Fred Nibling (303) 445-2202 | Nancy Umbreit Mark Trevino Deborah Lawler |
| UC4 | Economic Optimization of Water Project Uses | Evaluating economic values for recreation at many reservoir sites in New Mexico, working with New Mexico State University. | Robert Hamilton (303) 445-2724 | Clay McDermeit |
| UC5 | Operating Water Projects in Real Time to Enhance Water Quality | Operating water projects in real time to enhance water quality and improve water management. | Roger Hansen (801) 379-1170 | Deborah Lawler |
| UC6 | Geochemistry, Fate, and Transport of Selenium From Irrigation Lands to Drain Outlet | Improving our understanding and control of selenium loading from agricultural drainage water. | Samuel Schaefer (303) 445-2515 Joseph Brummer (303) 445-2457 Juli Fahy (303) 445-2187 | Jerry Miller Mike Baker |

Table 6: Science and Technology Program Activities Applied or Partnered in the Upper Colorado Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|--|--|---|---|--|
| Stretching Water Supplies and Improving Water Management and Water Delivery Reliability | | | | |
| UC7 | Monitoring and Management of Invasive Species | Research and evaluation of environmentally safe ways to control aquatic weeds that clog waterways. | Fred Nibling (303) 445-2202 | Nancy Umbreit |
| UC8 | 1 Water Measurement Methods 2 Water Systems Automation 3 Development of an Improved Algorithm for Canal Control 4 Developing Prototype Water Measurement and Monitoring | Developing and advancing canal automation, water measurement techniques, and remote operations to conserve water and increase crop production through targeted water deliveries. | Cliff Pugh (303) 445-2151 | Roger Hansen Mark Cody Leann Towne |
| UC9 | Economic Optimization of Water Project Uses | Optimizing economic benefits of water project uses. This research will be used to improve the economic analysis of the Upper Rio Grande Water Operations Review Environmental Impact Statement (EIS) and can apply to other regions of New Mexico, such as the Pecos River Reoperation EIS. | Robert Hamilton (303) 445-2724 | Leann Towne |
| UC10 | Watershed and River Systems Management Program | Improved water accounting methods to support Upper Rio Grande Water Operations and Management Study. | Dave Matthews (303) 445-2470 Don Frevert (303) 445-2473 | Mark Yuska Steve Hansen |
| UC11 | Biological Filter/Constructed Wetlands | Investigating constructed wetlands and biological filters to treat selenium. | Mike Baker (970) 248-0637 | Deborah Lawler |
| UC12 | Fish Passage | Investigating designs for natural style fishways to improve fish passage for nonsalmonids, especially threatened and endangered species. | Brent Mefford (303) 445-2149 | Chris Gorbach |
| UC13 | AWARDS System Enhancements | Improving quantitative precipitation estimates and making data available in real time through the AWARDS and ET Toolbox system. | Curt Hartzell (303) 445-2482 Dave Matthews (303) 445-2470 Al Brower (303) 445-2507 | Steve Hansen Steve Bowser Jaci Gould |
| UC14 | Watershed and River Systems Management Program | Enhancing RiverWare (a decision support model) to improve surface water-ground water management and to limit ground water pumping based on aquifer levels. | Dave Matthews (303) 445-2470 | Paul Davidson |

Table 6: Science and Technology Program Activities Applied or Partnered in the Upper Colorado Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|---------------|---|---|---|---|
| UC15 | Stream and River Ecology | Comparing impact of regulated flows on the riparian vegetation of the Green River to unregulated flows on the Yampa River. | Rick Roline (303) 445-2213 | Chris Karas |
| UC16 | Advanced Water Treatment Research | Evaluating treatment of agricultural return flows and stormwater runoff. | Michelle Chapman (303) 445-2264 | Olga Boberg |
| UC17 | Southwestern Willow Flycatcher Surveys and Habitat Identification; Brown-headed Cowbird Movement and Distribution | Understanding habitat requirements and operational influences on endangered willow flycatcher. | Darrell Ahlers (303) 445-2233 | Deborah Lawler |
| UC18 | ET LIDAR Water Consumptive Use Measurements | ET and LIDAR riparian water consumptive use studies and subsequent improvement to ET Toolbox water use estimates. | Curt Hartzell 303-445-2482 Al Brower 303-445-2507 | Steve Hansen Steve Bowser |
| UC19 | Riparian and Agriculture ET Demand Study | Developing ET Toolbox to use in RiverWare and the Upper Rio Grande Water Operations Model. This posts near real-time water use data, rainfall information, and forecasts to support water management decisions. | Al Brower (303) 445-2507 Curt Hartzell (303) 445-2482 Dave Matthews (303) 445-2470 | Steve Hansen Steve Bowser Jaci Gould Filiberto Cortez Mike Landis |
| UC20 | Reservoir Selective Withdrawal | Supporting investigations that will improve design capabilities for a proposed selective withdrawal structure at Glen Canyon Dam. | Tracy Vermeyen (303) 445-2154 | Dennis Kubly |
| UC21 | Impacts of Organic Contaminants on the Water Quality of Reservoirs | Conducting fisheries and limnology study of the San Juan inflow into Lake Powell to better determine desirable habitat requirements. | Rick Roline (303) 445-2213 | Jerry Miller |
| UC22 | Microhabitat Needs of Kanab Ambersnails | Understanding microhabitat needs of the Kanab ambersnail to better determine how the operations of the Glen Canyon Dam affect the endangered snails. | Christain Karas (801) 524-3679 | Deborah Lawler |
| UC23 | Advanced Water Treatment Research | Conducting dissolved gas treatment studies to address operational impacts on fish. | Michelle Chapman (303) 445-2264 | Don Mangan |
| UC24 | Watershed and River Systems Management Program | Developed joint application of RiverWare-Hydrologic Database and Modular Modeling Systems on Gunnison Basin. | Dave Matthews (303) 445-2470 Dave King (303) 445-2471 | John Ozga Paul Davidson |

Table 6: Science and Technology Program Activities Applied or Partnered in the Upper Colorado Region

| Map ID | Project Title | Description/Benefits | Research Contact | Regional Contact |
|---------------|---|--|-----------------------------------|-------------------------|
| UC25 | Economic Non-use Value Associated with Wildlife Habitat | Evaluating economic non-use values associated with habitat for migrating birds in New Mexico. Coordinating with the University of New Mexico. | Robert Hamilton (303) 445-2724 | Clay McDermeit |
| UC26 | Advanced Water Treatment Research | Developed a solar desalting system with lower power requirements. This is a cost-effective and reliable solution for providing water to Native American and rural communities. | Harry Remmers (303) 445-2261 | Darrell Ewing |
| UC27 | Septic Tank Leach Field Contamination | This research has successfully located buried, historic and cultural artifacts using non-destructive prospecting technologies. These technologies can prevent the cost of inadvertent damage to artifacts during construction which can easily exceed \$100,000. | Jerry Miller (801) 524-3700 | Deborah Lawler |
| UC28 | Archeological Remote Sensing at Ft. McRae and Leasburg | This research has successfully located buried, historic and cultural artifacts using non-destructive prospecting technologies. These technologies can prevent the cost of inadvertent damage to artifacts during construction which can easily exceed \$10,000 per incident as well as save the cost of prospecting with a backhoe and archeological crew. | Signa Larralde (505) 248-5363 | Deborah Lawler |

Attachment B: Publications Associated with the Science and Technology Program

- Abart, E., R. Eisenhauer, S. Hunt, H. Jong, F. Leitz, S. Nelson, and R. Roline, 1995. Leadville Mine Drainage Tunnel Effluent Effects on the Arkansas River, 1965-92. Technical Report No. R-95-10, Technical Service Center, Denver, Colorado.
- Ames, D., 1998. Seasonal to Interannual Streamflow Forecasts Using Non-linear Time Series Methods and Climate Information. Utah State University.
- Andersen, D., and S. Nelson, 1997. Vegetation Characteristics and Butterfly Use of Unlined and PVC-Lined Reaches of an Irrigation Delivery Canal, Government Highline Canal, Colorado, in U.S.A. *Journal of Arid Environments* 35:747-764.
- Atwater, P., and J. DeHaan, 2000. Staged Fault Test Evaluation of Safety Grounding for High-Voltage Equipment. 2000 International Conference of Doble Clients.
- _____, 2000. Staged Fault Test Evaluation of Safety Grounding for High-Voltage Equipment and Transmission Lines. T&D World Expo 2000.
- Atwater, P., J. DeHaan, and M. Jacobs, 1999. Fiber-Optic Linked Current Transformer, Patent application No. 09/443,452. Filed November 19, 1999.
- Bartholow J., B. Hanna, L. Saito, and D. Lieberman, 1999. Simulated Effects of a Temperature Control Device on Shasta Lake. 19th Annual Symposium, North American Lake Management Society, Reno, Nevada (paper).
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- Bendall, C., S. Hiebert, and G. Mueller, 1999. Experiments in In-Situ Fish Recognition Systems Using Fish Spectral and Spatial Signatures. U.S. Department of the Interior open file report No. 99-104.
- Bestgen, K., J. Bundy, K. Zelasko, and T. Wahl, 2000. Exclusion and Survival Rates of Early Life Stages of Fathead Minnows Released Over Coanda-Effect Wedge Wire Screens. Draft report submitted to Metro Wastewater Reclamation District, Denver, Colorado. July 27, 2000.
- Blossey, B., and D. Eberts, 2000. Artificial Diet and Method Using an Artificial Diet, for Mass Rearing of Insects. Patent, filing date: 5/19/2000, application number: 09/573,886.
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- Bortak, T. Coatings Inspection Guide, draft.
- Brower, L., C. Hartzell, and S. Meyer, 2000. Evapo-transpiration (ET) Toolbox for the Upper Rio Grande Water Operations Model. American Meteorological Society Annual Convention, January 2000.

- _____, 2000. Agricultural Water Resources Decision Support (AWARDS) ET Toolbox Applications. Abstract prepared for presentation at the New Mexico Environmental Health Conference 2000, October 23-25, 2000.
- _____, 2000. AWARDS System and ET Toolbox. Abstract prepared for a poster presentation at the American Society of Agricultural Engineers Decennial National Irrigation Symposium. November 14-16, 2000.
- _____, 2000. Evapo-transpiration Toolbox for the Upper Rio Grande Water Operations Model, preprints. 2nd Conference on Environmental Applications, 80th American Meteorological Society Annual Meeting, Long Beach, California. January 9-14, 2000, pp. 106-112.
- Carron, J., E. Zagona, and T. Fulp, 2000. Uncertainty Modeling in RiverWare. Abstract accepted for presentation at the American Society of Civil Engineers Watershed Management 2000 Conference. June 2000.
- Craft, D., and J. Miller, 2001 (in press). Reservoir Sediment-Water Simulation Using Microcosms: PreImpoundment Prediction versus Observed Water Quality at Ridgeway Reservoir, Ridgeway, Colorado. Technical Service Center, Denver, Colorado, and Upper Colorado Regional Office, Salt Lake City, Utah.
- Craft, D., L. Mao, J. Fields, and B. Moore, 2000. Chemistry and Water Quality at the Tracy Fish Collection Facility, Tracy, California, in Vol. 9, Tracy Fish Collection Studies, California. Bureau of Reclamation, Mid-Pacific Region and Technical Service Center, Denver, Colorado.
- Craft, D., N. Cannon, D. Zimmer, K. Krill, and L. Mattia, 2000. Water Quality and Mercury in Lake Owyhee, Southeastern Oregon. Technical Report, Bureau of Reclamation, Technical Service Center, Denver, Colorado.
- David M., C. Hartzell, and S. Meyer, 2000. Environmental Applications of Decision Support Systems for River Systems Management: Examples from the Colorado and Rio Grande Basins. American Society of Civil Engineers Watershed Management 2000 Conference. June 2000.
- Davidson, P., D. King, J. Ozga, and J. Simons, 1998. Watershed and River Systems Planning Model in the San Juan River Basin, Colorado. Proceedings of the First Federal Interagency Hydrologic Modeling Conference. April 1998.
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- _____, 2000. Overtopping Protection Methods. 2000 SEED Seminar. May 2000.
- Frizell, K., J. Matos, and A. Pinheiro, 2000. Design of Concrete Stepped Overlay Protection for Embankment Dams. Proceedings of the International Workshop on Hydraulics of Stepped Spillways. A.A. Balkema Publishers. March 2000.
- Fulp, T., and D. Frevert, 1998. Watershed and River Systems Management Program—Current and Future Applications in the Bureau of Reclamation. Proceedings of the First Federal Interagency Hydrologic Modeling Conference. April 1998.
- Fulp T., and E. Zagona, 1997. Development of RiverWare—A Generic River and Reservoir Modeling Tool. Proceedings of the Reclamation River Systems Management Workshop. September 1997.
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- Fulp, T., W. Vickers, B. Williams, and D. King, 1995. Decision Support for Water Resources Management in the Colorado River Regions. Proceedings of the Workshop on Computer Applications in Water Management, Great Plains Agricultural Council. May 1995.
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- _____, 1998. Limnology of Five Upper Yakima Basin Reservoirs. A preliminary comparison of 1998 data, presented at the annual Yakima Area Office Research Progress Meeting. January 1998.
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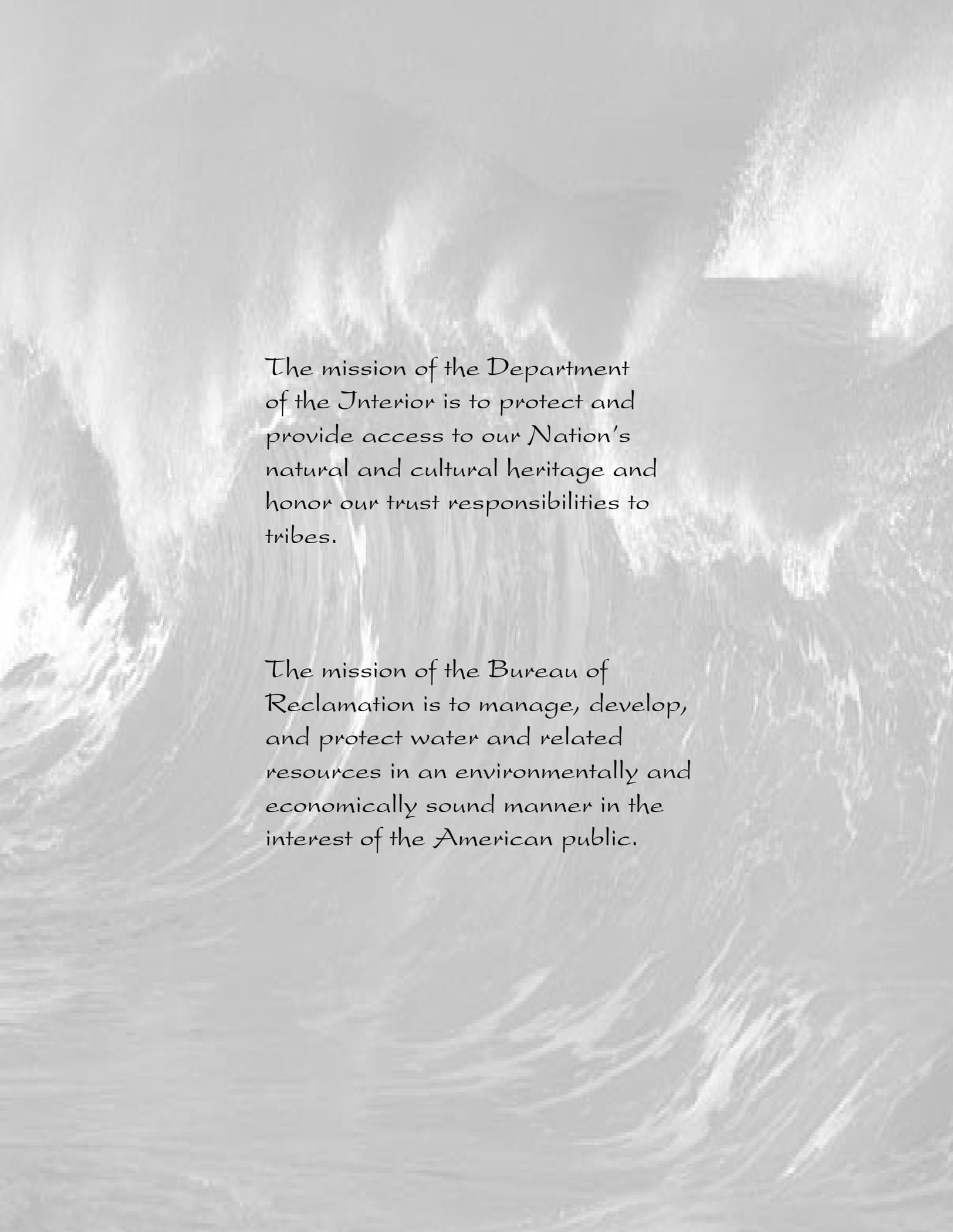
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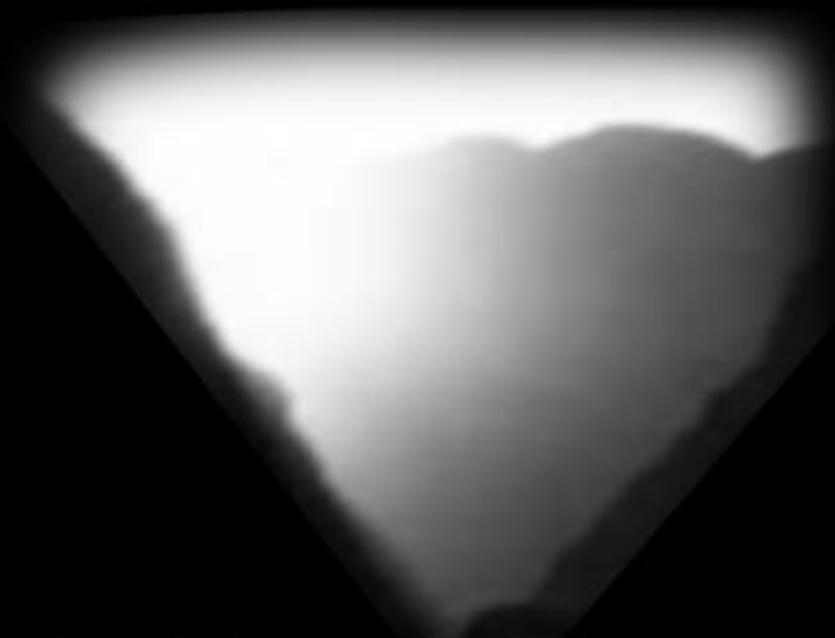


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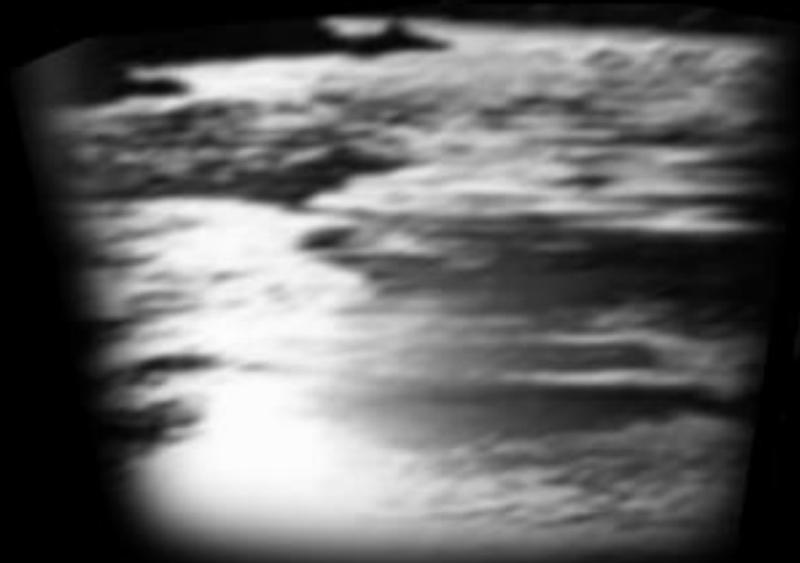
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