



2019 and 2020 WaterSMART Applied Science Grants

Arizona

City of Sierra Vista, Web-based Hydrologic Information Portal for the Upper San Pedro Basin

Reclamation Funding: \$99,000

Total Project Cost: \$208,850

The City of Sierra Vista, located in Southeast Arizona, will develop an interactive hydrologic information portal for the Upper San Pedro Basin. The Upper San Pedro Basin is solely dependent on groundwater and is currently experiencing an estimated overdraft of 5,000 acre-feet per year. The project will provide readily accessible hydrologic information to water managers, decision makers, researchers, and the public to improve spatial and temporal understanding of the groundwater system so that it can be adaptively managed. The City is partnering with multiple entities to conduct this project, including the 21-member Upper San Pedro Partnership, The Nature Conservancy, Cochise County, and the Arizona Department of Water Resources.

California

Rancho California Water District, Groundwater Modeling Enhancement for the Murrieta-Temecula Groundwater Basin

Reclamation Funding: \$195,000

Total Project Cost: \$409,050

The Rancho California Water District, located in Temecula, California, will implement a Groundwater Modeling Enhancement Project for the Murrieta-Temecula Groundwater Basin. The project will enhance an existing groundwater model through updates, refinements, and recalibrations to gain a more accurate representation of the groundwater basin's physical system and better information about current local groundwater availability and production capabilities. Additionally, the project will allow the District to determine the potential for the Murrieta-Temecula Groundwater Basin to be operated conjunctively as a groundwater bank/storage reservoir. This project meets an objective identified in the District's 2005 Integrated Resources Plan.

University of California Agriculture and Natural Resources, A California Crop Coefficient Database to Enhance Agricultural Water Demand Estimations and Irrigation Scheduling

Reclamation Funding: \$299,627

Total Project Cost: \$732,213

Through this project, the University of California Agriculture and Natural Resources, in collaboration with the California Department of Water Resources, will update crop coefficients to improve estimates of the amount of water consumed by the major water-demanding crops in California. Many of the crop coefficients currently used in California to determine the amount of water consumed by specific crops were developed in the 1950's and 1960's and were based on farming and irrigation practices that have since

changed. Accurate estimates of agricultural water demands are crucial for water budgets, water allocation, storage and delivery, and on farm irrigation practices. This project will build prior work to improve crop coefficient information with broad, industry-wide participation and consensus, and will develop a web repository of the updated crop coefficient information and hold trainings and workshops to support its application.

University of California - Merced, Defining the Rain-Snow Transition Zone in the Northern Sierra Nevada

Reclamation Funding: \$299,976

Total Project Cost: \$599,957

The University of California in Merced, in collaboration with the California Department of Water Resources, will develop an online dashboard to provide accurate, real-time, information about rain-snow data in the Northern Sierra-Nevada to improve flood management and reservoir operations. Recent and large atmospheric river and more intense runoff events in this part of the Sacramento River Basin have demonstrated an immediate need for better on-the-ground information during storms. This project will help provide timely information for scheduling reservoir releases to optimize storage, while providing capacity to accept storm runoff, and will also enable better coordination of releases from multiple reservoirs in area. The system will initially be employed in the Feather and American River Basins, where the Department of Water Resources and other agencies have invested in an on-the-ground network of sensors that provide highly detailed hydrologic information. This will serve as a prototype that can eventually be used in other headwater basins.

Point Blue Conservation Science, California Central Valley Wetlands Water Budget Tool Development

Reclamation Funding: \$150,000

Total Project Cost: \$300,000

The Point Blue Conservation Science, located in Sonoma County, California, will partner with Audubon California and the Grasslands Groundwater Sustainability Agency to generate relevant wetland water use and management data to use in a wetlands water budget tool. To comply with California's Sustainable Groundwater Management Act, Groundwater Sustainability Agencies are required to design and implement Groundwater Sustainability Plans (GSP) to ensure that groundwater pumping and recharge are balanced. Wetlands have not been included in GSP in the past because of a lack of relevant hydrologic data for wetlands, and a lack of technical expertise, resulting in unknown quantifications of the impacts of groundwater pumping in wetlands. The project will remedy data gaps to allow water managers across the state to have accurate, robust estimates of wetlands water use. Point Blue will use the water budget tool to provide monthly estimates of wetland water use and recharge, which will facilitate more accurate groundwater management planning. The water budget tool will also facilitate compliance with the annual reporting and 5-year plan updates mandated by the Sustainable Groundwater Management Act.

Mojave Water Agency, Integrated Model Development and Alternatives Evaluation

Reclamation Funding: \$150,000

Total Project Cost: \$300,000

Mojave Water Agency, located in Apple Valley, California, will partner with the San Bernardino County Flood Control District to develop an integrated groundwater and surface water computer model and to expand and refine MWA's existing groundwater model by including critical regional surface water features. The Agency relies on conjunctive water management where surface water available from the State Water Project and from local rivers and streams are used to recharge the aquifers that are the primary source of

supply for this area. The model will enhance the Agency's ability to conjunctively manage its water resources, as well as improve the integration of operation of the Mojave River Dam for flood control with potential water banking and pumped storage initiatives.

Pala Band of Mission Indians, Pala Tribe Innovative Practices in Hydrologic Data Acquisition and Use for Water Management

Reclamation Funding: \$55,120

Total Project Cost: \$111,011

The Pala Band of Mission Indians, located in San Diego County, California, will use remote sensing technology and satellite imagery to acquire high-resolution hydrologic data and information related to land use and vegetation health conditions on the Reservation. This information will allow the Tribe to quantitatively assign a scale of drought and vegetation conditions which will allow resource managers to identify areas at risk for wildfire and allow the Tribe to compare historical data providing managers an early warning for drought. The project supports the Tribe's participation in San Diego's Groundwater Sustainability Agency.

Colorado

Colorado Water Conservation Board, Arkansas River Colors of Water and Forecasting Tool

Reclamation Funding: \$150,000

Total Project Cost: \$300,000

The Colorado Water Conservation Board, located in Denver, Colorado, will partner with the Colorado Division of Water Resources to increase functionality of an existing web-based forecasting tool that assists water users in making informed decisions related to water use and management. The enhanced forecasting tool will include modeling capabilities and will serve as a communications tool that will portray a "color of water" which will describe the destination, use, type, or purpose of water for the Arkansas River. The enhanced capabilities will allow for a more accurate capture of reservoir releases, increased efficiency, and a reduced potential injury to other users in the basin. The forecasting tool will be generically built to allow for adoption in other basins in Colorado.

Idaho

The Henry's Fork Foundation, Inc., Predictive Hydrologic Modeling and Real-Time Data Access to Support Water Resources Management

Reclamation Funding: \$273,211

Total Project Cost: \$561,282

The Henry's Fork Foundation will partner with the Fremont-Madison Irrigation District to develop hydrologic models and a web-based platform to improve access to hydrologic information within the Henry's Fork of the Snake River watershed, located in eastern Idaho and western Wyoming. In addition to competing water demands for irrigation and fisheries, new concerns about declining aquifer levels in the Eastern Snake Plains Aquifer have added to water management challenges in this watershed. This project builds on a WaterSMART basin study completed in 2015, identifying unmet water needs in the basin that total 350,000 acre-feet per year in dry years, based on the most recent calculations. This project will provide modeling tools and hydrologic data to enhance water management efforts to address the projected shortfalls, including demand-reduction, water marketing, and increasing reservoir carryover.

Idaho Power Company, Precipitation Modeling Tools to Improve Water Supply Reliability
Reclamation Funding: \$750,000 **Total Project Cost: \$2,890,000**

The Idaho Power Company (IPC), located in Boise, Idaho will partner with the National Center for Atmospheric Research (NCAR) to improve modeling capabilities to forecast winter precipitation and quantify the impact of cloud seeding. IPC uses cloud seeding as a tool to augment winter precipitation and subsequent water supplies as a source of water for hydropower generation. IPC serves more than 560,000 customers in southern Idaho and eastern Oregon and relies on hydropower for approximately half of the power supplied. Through this project, IPC and NCAR will build on a recently developed Weather Research and Forecasting model to improve capabilities to forecast winter precipitation and to better quantify the benefit of cloud seeding to increase water supply reliability. To date, program benefits have been difficult to quantify at a level that satisfies stakeholder, who would prefer benefit estimates by year instead of the multi-year average estimates currently provided. This project is supported by the Idaho Water Resources Board, which has included weather modification as a strategy in the State Water Plan and is partnering with IPC on a cloud-seeding program in the Upper Snake Basin and other parts of Idaho.

New Mexico

New Mexico Institute of Mining and Technology, New Mexico Water Data Initiative and Regional Pilot Project for Improved Data Management and Decision Support
Reclamation Funding: \$300,000 **Total Project Cost: \$600,000**

New Mexico Bureau of Geology and Mineral Resources at New Mexico Institute of Mining and Technology will continue developing a water data delivery service known as the Water Data Initiative (WDI) in response to the passage of the Water Data Act. The goal of the WDI is to build a functional water data service that centralizes numerous water datasets, making them easier to find, more accessible, and with improved interoperability. The project will develop a pilot water-data decision support toolset that will link to a statewide Water Data Service which will enhance short- and long-term water management for irrigation, river flow for endangered species, interstate compact compliance, and other potential water management benefits in the lower Pecos Valley. The pilot project will then become a model for regional data integration and tool development for other regions of New Mexico for improved water resources management and decision making.

Office of the State Engineer/Interstate Stream Commission, Developing a Projection Tool for Otowi Index Supply and Elephant Butte Effective Index Supply
Reclamation Funding: \$141,272 **Total Project Cost: \$288,310**

The New Mexico Interstate Stream Commission, located in Santa Fe, New Mexico will explore new modeling approaches to develop improved long-range forecasting and streamflow projection tools to inform water managers in complying with the Rio Grande Compact. The Rio Grande is shared by Colorado, New Mexico, and Texas, as well as Mexico, and allocation within the United States is governed by the Rio Grande Compact. Increased temperatures and population growth have led to less predictable streamflows and increased water demands in this basin. This project will generate improved long-range forecasting approaches and a streamflow projection tool to assist water managers in the basin make informed water management decisions and to support Compact compliance.

Nevada

Desert Research Institute, Quantifying Environmental Water Requirements for Groundwater Dependent Ecosystems

Reclamation Funding: \$296,740

Total Project Cost: \$593,728

The Desert Research Institute, The Nature Conservancy, and the University of Wisconsin, in partnership with the Carson Water Sub-conservancy District, will use remote sensing, field data, and hydrologic modeling to generate scientifically defensible estimates of water requirements for groundwater dependent ecosystems in Nevada. Understanding the groundwater needs for ecosystem-dependent vegetation is critical in Nevada, where 20 federally protected species are reliant on such vegetation. This project will result in an interactive web application that can be used by resource managers to support decisions regarding endangered species requirements, maintenance of watershed health, and water rights administration. This project is broadly supported by 11 Federal, state, and local agencies with responsibility for water rights allocation, water and energy delivery, and species and habitat management.

Oklahoma

Oklahoma State University, Improving Seasonal Streamflow Forecasts for Irrigation Districts by Incorporating Soil Moisture Information Derived from Remote Sensing

Reclamation Funding: \$88,476

Total Project Cost: \$176,964

Oklahoma State University, with the support of the Lugert-Altus Irrigation District, the Kansas-Bostwick Irrigation District No. 2, and the Frenchman Cambridge Irrigation District, will incorporate remotely sensed soil moisture data with proven statistical techniques to create seasonal forecasts for rainfall-dominated regions of the Great Plains. The project will utilize remote-sensed soil moisture data, North American Land Data Assimilation System, and NASA's Soil Moisture Active-Passive Satellite. The seasonal forecast tools will inform surface water managers, support improved irrigation water supply management, and enhance the ability of reservoir operators to anticipate and respond to extreme events such as droughts and floods.

Oklahoma State University, Applying Unmanned Systems for Water Quality Monitoring

Reclamation Funding: \$150,000

Total Project Cost: \$300,000

Oklahoma State University, in partnership with the Grand River Dam Authority, will develop a monitoring system that will provide high-spatial resolution datasets of nutrients, sediments, and harmful algae blooms levels in Grand Lake using a variety of unmanned systems for improved decision support. The project will implement unmanned surface vessels for in-situ monitoring of bathymetry, nutrient and algal levels in surface waters, and measure the formation of harmful algae blooms and sedimentation; and interpret observed nutrient and sediment loadings using a watershed model. Upon completion of the project, an established system to identify, forecast, and respond to harmful algae blooms will be in place which will improve water supply reliability, drought management, endangered species requirements, and watershed health.

Texas

Gulf Coast Water Authority, Enhancement of Water Availability Models of the Lower Brazos Basin

Reclamation Funding: \$30,000

Total Project Cost: \$60,000

The Gulf Coast Water Authority is a wholesale water provider for customers in Galveston, Fort Bend, and Brazoria Counties in Texas, including petro-chemical industries in the region. Supply from the Brazos River, the Authority's primary water source, is impacted by both natural streamflow variations and water usage by upstream entities. Through this project, the Authority will enhance their existing water availability model to simulate Brazos streamflow losses, drought curtailment triggers, Brazos Water Master operation methods, and water accounting for upstream junior priority reservoir operations. This project builds on recommendations in the Authority's WaterSMART drought contingency plan by improving the Authority's access to hydrologic information critical to water management, which will allow them to improve drought management activities and water supply reliability.

Texas Water Trade, Modeling Aquifer Properties in the Contributing Zone of Comanche Springs Reclamation Funding: \$150,000

Total Project Cost: \$300,000

The Texas Water Trade, in partnership with the Middle Pecos Groundwater Conservation District, located in Fort Stockton, Texas will develop a groundwater flow model to increase the District's understanding of the impacts of seasonal groundwater pumping in the Edwards-Trinity Aquifer to spring flows at Comanche Springs in the City of Fort Stockton. This area has experienced conflicts and litigation between surface and groundwater users since the 1950's. Currently, rising demand for water for oil and gas extraction activities and demands from nearby municipalities are adding to these tensions. The District is evaluating the potential for restoration of perennial spring flows at Comanche Springs, exploring pumping in deeper zones in the Edwards aquifer, and developing a water marketing strategy to meet competing demands. This project will provide the District with critical information to further develop these strategies and to make water management decisions that optimize available water resources.

Utah

Utah State University, A Platform Toward an Early Warning System for Shortages in Colorado River Water Supply

Reclamation Funding: \$91,078

Total Project Cost: \$91,080

Utah State University, in partnership with Salt Lake Department of Public Utilities, Utah Division of Water Resources, and Utah Farm Bureau, will build a new platform for monitoring and forecasting Colorado River water supplies. Currently, early drought warning systems can be used to evaluate water supplies several years ahead, but few platforms monitor outlooks of water scarcity for the upcoming year. Using a decadal climate prediction system, the University will build on research showing that multi-year droughts in the basin originate from a specific ocean temperature pattern to develop a monitoring system for this type of precursor that can serve as an early warning for significant shortages in upcoming years. The project products will be made available to water managers through the project website on Utah Climate Center at Utah State University.

Washington

Washington State University, Quantifying the State of Groundwater in the Columbia Basin with Stakeholder-Driven Monitoring

Reclamation Funding: \$299,940

Total Project Cost: \$673,247

Washington State University will partner with the Department of Ecology's Office of the Columbia River to establish a long-term, stakeholder-driven groundwater monitoring network in Eastern Washington. Groundwater provides up to 35% of the region's irrigation water and provides drinking water for more than 1.3 million people. Over the life of the project, a minimum of 50 groundwater wells will be identified in areas with known or suspected groundwater decline and a groundwater monitoring program will be developed that includes field data collection and long-term data management. This information will help the Department understand how groundwater supplies have been changing over time and the connectivity of ground and surface water. Additionally, Department of Ecology staff will train local and interested stakeholders on how to collect groundwater level measurements and will supply users with the appropriate equipment to measure groundwater beyond the life of the project. The project will also establish baseline information and monitoring techniques for tracking groundwater levels. Results from this project, which will be made available to the public upon completion of the project, include GIS layers of aquifer extent and depth. The project is within Reclamation's Columbia Basin Project.