



## **Biden-Harris Administration provides \$13.3M in grants to enhance water management and forecast tools in the West as part of Investing in America agenda**

*\$5.1 million of the funding provided through President Biden's Bipartisan Infrastructure Law*

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**WASHINGTON** – The Bureau of Reclamation is investing \$13.3 million in grants for 51 applied science projects in 12 states for the development of tools and information to support water management for multiple uses as part of President Biden's Investing in America agenda. The projects selected include the development of modeling and forecasting tools, hydrologic data platforms and new data sets to inform decision-making.



— BUREAU OF —  
RECLAMATION

## FY 2023 Applied Science Grants

### California

#### **Arvin-Edison Water Storage District, Groundwater Flow Model and Decision Support Tool Updates and Upgrades**

**Reclamation Funding: \$95,000**

**Total Project Cost: \$190,000**

The Arvin-Edison Water Storage District (AEWSD), located in Kern County, California, will update and upgrade an existing groundwater flow model and decision support tool. This project will enhance AEWSD's abilities to predict groundwater levels and land subsidence conditions, support design and implementation of adaptive water supply projects, and assist in management decisions under future hydrologic and water supply uncertainties. Kern County has experienced three long-term droughts over the last 20 years with 2021 being the driest year on record. This project will improve drought resiliency by enabling AEWSD to forecast the impacts of water supply shortages in real-time. The project is supported by the Arvin Community Services District.

#### **California State University, Fresno Foundation, Development of an Intelligent Framework for Leak Detection and Localization in Water Distribution Systems**

**Reclamation Funding: \$83,824**

**Total Project Cost: \$167,933**

California State University at Fresno, in partnership with the City of Lakewood California, will develop a leak detection framework for the city's water distribution systems. The proposed project will determine optimal sensor placement for the City's distribution systems and apply a deep learning methodology to improve the detection of water leakage. It is estimated that the detection of water leaks using this methodology could result in a 35% reduction in water losses and improve resilience to increased shortages expected into the future.

#### **Marin Municipal Water District, Climate Adaptation Strategies for Marin Water: A Water Supply Modeling Initiative**

**Reclamation Funding: \$150,628**

**Total Project Cost: \$301,256**

The Marin Municipal Water District (District), located in the San Francisco Bay Area in California, will incorporate software upgrades and analyze algorithm-based strategies to inform near-term operation decisions for its water managers. The District faced a serious risk of running dry following an upstream wildfire and two successive dry winters with significantly below-average rainfall. This created concerns not only for human health and safety, but for sensitive aquatic environments that support threatened and endangered species. By implementing the upgrades, the District can improve its climate-change resilience and improve the accuracy of water

forecasting and real-time operational decisions. This project is supported by the Cities of Petaluma, Santa Rosa, and Rohnert Park, and the North Marin Water District.

**Metropolitan Water District of Southern California, Interoperable Flow and Temperature Data for Salmonid Restoration Scenarios**

**Reclamation Funding: \$390,000                      Total Project Cost: \$520,000**

The Metropolitan Water District of Southern California will expand surface water flow and temperature modeling capabilities for California’s Central Valley through the collection and management of data and the development of new models to support salmonid restoration planning. California’s Central Valley ecosystem and salmonid management processes are currently driven by several existing models and datasets; however, because of the framework of these existing models, flow and temperature data are not readily accessible. The lack of accessible data adversely impacts the efficiency of salmonid management processes. The new modeling tools will inform decisions related to salmonid restoration, including creation of new habitat, restoration of existing habitat, and implementation of flow actions to improve salmonid habitat and survival. This project is supported by 27 public water agencies The Nature Conservancy, 108 Reclamation District, Trout Unlimited, and State of California Department of Water Resources.

**Mojave Water Agency Public Facilities Corp, Runoff and Groundwater Recharge Evaluations of Ephemeral Washes**

**Reclamation Funding: \$400,000      Total Project Cost: \$897,408**

Mojave Water Agency (MWA), located in eastern San Bernardino County, California, will collect data to use in existing models to evaluate groundwater recharge in five previously identified reaches. There is a need to better understand natural runoff and recharge from numerous springs and ephemeral washes within the MWA’s service area as the water source for the area is almost entirely from pumped groundwater. The Agency will conduct surface geophysical surveys at washes to assess subsurface conditions for groundwater recharge, install monitoring wells, stream gages, and rain gages, and develop stream-rating curves, calculations and estimates of basin contributions from the ephemeral washes. The project will assist water managers in prioritizing opportunities for selecting ephemeral-wash recharge areas and provide recharge and runoff estimates for inclusion in groundwater modeling.

**Mojave Water Agency Public Facilities Corp, The Mojave River Basin Integrated Groundwater/Surface Water Model Development**

**Reclamation Funding: \$203,704      Total Project Cost: \$407,408**

The Mojave Water Agency (MWA), in Apple Valley, California, will update its existing groundwater conceptual model. The existing regional model has not been updated since 2000 and MWA is facing increasingly difficult management decisions amid a 20-year drought. The model will include current data from climate change models, and demand projections, water rates, and will incorporate a surface water component and artificial intelligence. The project will provide MWA with a comprehensive decision-making tool for planning and optimizing the use of water resources during droughts.

### **Monterey County, Enhancing Predictive Tools and Operational Strategies for the Nacimiento and San Antonio Dams and Reservoirs**

**Reclamation Funding: \$400,000    Total Project Cost: \$545,605**

Monterey County Water Resources Agency, located in Salinas, California, will develop Forecast Informed Reservoir Operations (FIRO) decision support tools to improve flood control operations at Nacimiento and San Antonio Dams and Reservoirs. MCWRA currently has limitations on forecasting capabilities and decision-making processes for balancing reservoir storage for flood risks and releases for groundwater recharge. This project will evaluate existing reservoir inflow and outflow forecasting models to determine alternative management strategies and tools for operational decision making. Results from the evaluation will be used to design and develop a set of operational guidelines and supporting tools for improving the storage and release of winter inflows at both reservoirs. This project will improve MCWRA's operational decisions to maximize reservoir storage while also minimizing downstream flood risk.

### **Reclamation District 108, RD108 CCWD and DWD Groundwater Recharge Data Sharing and Modeling Improvements**

**Reclamation Funding: \$400,000    Total Project Cost: \$1,145,950**

Reclamation District 108, located in Colusa County, California, will improve access to and use of water resource data and improve modeling capabilities to inform regional groundwater recharge and conjunctive use programs. Droughts in California have impacted surface water availability, resulting in severe economic loss for the region. By enhancing water resource data and modeling capabilities, this project will improve the evaluation of the water table to sustain and reestablish available water supply and to allow for sustainable groundwater extraction. This project is supported by Colusa County Water District and Dunnigan Water District.

### **San Bernardino Valley Water Conservation District, Integrated Santa Ana River Model Enhancements**

**Reclamation Funding: \$361,117                      Total Project Cost: \$814,242**

The San Bernardino Valley Water Conservation District, in collaboration with California State University, Sacramento, will make improvements to the existing Integrated Santa Ana River Model. The model is a combined groundwater and surface water model that is a foundational tool for water management in the Upper Santa Ana River Watershed and the San Bernardino Basin. Groundwater levels in the area continue to decline at alarming rates due to droughts and demands, therefore water managers need a comprehensive tool to make sound decisions for future investments. Model enhancements include additional historical recharge data, integrate data related to new or modified recharge facilities, and an evaluation of climate change scenarios. The updated model will quantify and show groundwater recharge trends over the last century, improve current and future forecasting capabilities, inform accurate cost benefit analyses for proposed projects, and optimize facility operations. This project is supported by the San Bernardino Valley Conservation Trust, San Bernardino Valley Municipal Water District, and the City of San Bernardino Municipal Water Department.

### **Santa Clarita Valley Water Agency, Groundwater Model Refinement and Calibration Project**

**Reclamation Funding: \$363,374**

**Total Project Cost: \$726,748**

The Santa Clarita Valley Water Agency, located in Santa Clarita California, will update their groundwater flow model to better describe the recharge and storage paths in key aquifers in the Upper Santa Clara River Valley Groundwater Basin. Droughts continue to strain water supplies therefore there is a critical need to determine the future reliability of the aquifers and recharging needs in order to improve water management. The updated model will be used to conduct sensitivity testing of potential operational alternatives for groundwater pumping and performance measures to assess future climate change impacts. The improved understanding of the groundwater within the basin will allow for water managers to identify strategies to offset the expected future declines in available groundwater supplies.

### **Social and Environmental Entrepreneurs, Open Analytics for Advanced Metering Infrastructure**

**Reclamation Funding: \$400,000**

**Total Project Cost: \$838,445**

The Social and Environmental Entrepreneurs, in partnership with the California Data Collaborative Coalition, will develop an open-source library of tools for storing and analyzing real-time water consumption data from the advanced metering tools of water supply agencies across California. The library will include reports and tools to access the quickly growing network of data from advanced metering infrastructures to aid water supply agencies in decisions. Access to long-term data storage, tools, and workflow is needed to assist agencies in quickly identifying system leaks and to target excessive usage to conserve water supplies in the face of increasing swings of extreme climate in California. The member agencies of the California Data Collaborative Coalition support the project, including Alameda County Water District, the City of Thousand Oaks, Coachella Valley Water District, Inland Empire Utilities Agency, and several other California agencies.

### **Three Valleys Municipal Water District, Water Use Efficiency Dashboard**

**Reclamation Funding: \$84,390**

**Total Project Cost: \$168,781**

The Three Valleys Municipal Water District, a wholesale water agency of eastern Los Angeles County, California, will develop a geospatial Water Use Efficiency Dashboard that will provide its member agencies and water managers with information to effectively allocate and manage water use within their respective service areas. In an area of substantial recurring drought cycles, this Dashboard data will enhance the accuracy of calculations used to estimate water usage, water-budget allocations, and demand forecasting at a scale and level of specificity not currently available. The project is supported by the district's thirteen member agencies which collectively serve over 500,000 people.

### **Tulare Irrigation District, Geographical Information System Water Dashboard - Hydrologic Data Management and Forecasting Tool Project**

**Reclamation Funding: \$260,000    Total Project Cost: \$520,000**

The Tulare Irrigation District, located in Tulare, California, will develop an advanced online Geographic Information System data management, modeling, and forecasting tool that will elevate the efficiency of surface and groundwater operations and improve water resource management. In recent years the district has seen vast reductions in surface water that have led to increased usage of groundwater supplies, causing social and economic stress in the region. By gathering and utilizing the needed data to establish decision support tools through the development of a new Data Management System, the district will be better equipped to make forecasts and water management decisions in real-time to support the ongoing need to manage surface water and groundwater conjunctively to meet the region's water demands. This project is supported by groundwater sustainability agencies and water authorities, the cities of Tulare and Visalia, and various conservation and irrigation districts.

### **Tuolumne County, Advancing Nature-Based Solutions for Building Watershed Health and Water Supply Reliability in the Tuolumne River Basin**

**Reclamation Funding: \$397,993    Total Project Cost: \$530,657**

Tuolumne County, in collaboration with the Yosemite Stanislaus Solutions, a collaborative comprised of federal, state, tribal and local districts and stakeholders, will develop information to improve watershed restoration treatments in the Stanislaus and Tuolumne River Basins in California. This work builds on an existing project to advance Social and Ecological Resilience Across the Landscape (SERAL), within a 260,000-acre area. This project will leverage the SERAL work to better understand the interactions between nature-based climate solutions that can be used to build landscape resilience, achieve wildfire risk reduction goals, and improve water security. The project will quantify and analyze impacts of climate, watershed management, and wildfire on watershed health and perform strategic ground-based monitoring and numerical modeling for filling data gaps, verification, and scaling. The project outcomes will provide a scientific basis for advancing nature-based climate solutions for wildfire risk reduction, provide data for refining fire management decisions, while continuing to strengthen and build partnerships.

### **University of California Davis, Modeling Impact of Stream Inflows on Water Quality under a Changing Climate**

**Reclamation Funding: \$400,000    Total Project Cost: \$547,077**

The University of California Davis (UC Davis), in partnership with the Incline Village General Improvement District, will develop an improved modeling tool for the evaluation of changes in lake water quality due to stream-lake interactions under future climate change scenarios. Potential future conditions to be modeled include climate-altered hydrology, earlier lake warming, wildfire contaminants in stream water, and extreme low lake levels. Water concerns in the project area, Lake Tahoe in California and Nevada, include the impacts of nutrients, contaminants, and fine sediments transported to the lake by streams, all of which can influence water quality, trigger algal blooms, impact water clarity, and affect drinking water supply.

**Western Municipal Water District, Data Warehouse Phase 1 - Data Management Software and Sharing Module**

**Reclamation Funding: \$149,850    Total Project Cost: \$299,700**

Western Municipal Water District (Western Water) is a water utility serving retail customers in Riverside County in southern California. Western Water's project will allow for timely and convenient collection and analysis of and access to water system usage data. In the face of climate change and increasing uncertainty regarding water supplies, this project will reduce water loss, maximize use of local water supplies over imported water, ensure proper potable water delivery, and better inform future water plans.

**Western Municipal Water District, GIS Data Acquisition and Leak Mapping**

**Reclamation Funding: \$242,900    Total Project Cost: \$485,800**

The Western Municipal Water District, located in Riverside, California, will improve GIS infrastructure for the Murietta Service area for sewer and potable water facilities. The applicant will field, verify, and collect GPS data to correct spatial inaccuracies in the existing database, add new data for sewer and potable water assets that are currently not in the database, and develop GIS application dashboards for users. Currently, assets are missing or the actual location has been incorrectly placed. The project will resolve this, allowing planners to better model systems for further growth, assisting field crews to locate assets more easily in an emergency, helping reduce water loss and related property damage, and assisting GIS staff in providing more accurate GIS tools to decision makers.

**Yolo Subbasin Groundwater Agency, Modeling Adaptive Strategies for Sustainability**

**Reclamation Funding: \$400,000    Total Project Cost: \$893,000**

The Yolo Subbasin Groundwater Agency (YSGA), a wholesale water agency in Yolo County, California, will enhance their surface water and groundwater availability model to develop demand management strategies to support groundwater sustainability. Yolo County has experienced severe and extreme drought in the past several years. The development of management strategies will allow the YSGA to help its 26 member agencies and affiliated parties reduce the impacts of future droughts in the Yolo Subbasin on households and agriculture. This project is supported by the County of Yolo Department of Community Services, Dunnigan Water District, Reclamation District 108, Westside Sacramento Integrated Regional Water Management Coordinating Committee, and the Community Alliance with Family Farmers.

## Colorado

### **Aspen Global Change Institute, Roaring Fork Watershed: Improving Soil Moisture Data Validation and Access**

**Reclamation Funding: \$123,609**

**Total Project Cost: \$247,217**

The Aspen Global Change Institute, in partnership with the Ruedi Water and Power Authority, will develop a process for standardizing quality assurance measures and automated data uploads as well as build data dashboards and tools to improve the accessibility and use of the Roaring Fork Observation Network of soil moisture measurements in the Roaring Fork Watershed, Colorado. Soil moisture measurements are vital for understanding runoff efficiency in a watershed, which affects the accuracy of runoff forecasting models that inform reservoir storage and releases. The Roaring Fork Observation Network has been collecting data from ten stations across the watershed since 2012 but has not been used to its full potential because of inconsistencies in data quality assurance, storage, formatting, and availability. The project is supported by the National Weather Service's Colorado Basin River Forecast Center, the Roaring Fork Conservancy, and several other interested parties.

### **Upper Yampa Water Conservancy District, Water Resources Operations Forecasting Tool for the Yampa River Basin**

**Reclamation Funding: \$249,625**

**Total Project Cost: \$504,071**

The Upper Yampa Water Conservancy District, located in Steamboat Springs, Colorado, will create a forecasting tool for the Yampa River Basin that will produce streamflow estimates, reservoir yields, impacts to environmental flows, and water rights availability. The tool will integrate a robust streamflow forecasting framework with a well-established water resources allocation systems model and will provide model results through a publicly accessible web-based dashboard. In 2022, the Colorado Division of Water Resources declared most of the Yampa River basin as over-appropriated for the first time. This situation has raised concerns among stakeholders who anticipate increased water rights administration and usage restrictions. This project will address these challenges by leveraging the State of Colorado's water rights modeling framework to produce project water availability on a by-reach scale throughout the basin, and by delivering useful forecast metrics, and associated uncertainties, in a dashboard format so local stakeholders who lack resources to run their own forecast tools can be aided in their decision making. The project is supported by the American Whitewater, the Colorado Water Conservation Board, and local entities representing municipal and agricultural interests.

## Idaho

### **Henry's Fork Foundation, Optimizing Data Collection, Availability and Streamflow Forecasting to Enhance Fisheries in the Snake River Watershed**

**Reclamation Funding: \$400,000**

**Total Project Cost: \$602,740**

The Henry's Fork Foundation, in partnership with the Fremont-Madison Irrigation District (FMID) will improve the fisheries in the Snake River basin by developing real-time data infrastructure and expanding a hydrologic model. Through previous WaterSMART Applied Science Grants, Henry's Fork identified substantial fisheries and water quality benefits associated with reduced reservoir drawdown and increased winter flows at Island Park Reservoir. The HFF will use the lessons learned and hydrologic modeling on Henry's Fork and apply it to other streams and reservoirs within the Snake River basin. This project will provide stakeholders and managers with the data, models, and short-term streamflow forecasts needed to manage storage reservoirs more precisely within the basin. The project is supported by Boise State University, Friends of the Teton River, Idaho Power Company, Idaho Water Resource Board, Legacy Works group, and Trout Unlimited.

### **Water District 63, Treasure Valley Water Supply Project Surface Water Modeling and Dashboard**

**Reclamation Funding: \$400,000**

**Total Project Cost: \$871,430**

Water District 63, located in Ada and Canyon counties in Idaho, will expand data monitoring and collection to improve water management within the Boise River basin. The monitoring data will be made available to water managers and the public on a real-time basis through an online dashboard, along with the development of a hydrologic model used for evaluating impacts from hydrologic changes. Recent changes in irrigation distribution system, land use, practices, and drain flow operations have led to declining flows in tributary drains to the Boise River. This project will inform needs for changes in practice and additional infrastructure to support sustainable delivery of water in the changing watershed. With improved monitoring data, analytics, and forecasting on tributary flows to the Boise River, Water District 63 will be able to manage the supply and decrease water supply shortages and associated conflicts. The project is supported by the water user's associations, the Watershed Council, counties, cities, and state agencies, as well as surrounding irrigation districts.

## Montana

### **Clark Fork Coalition, Integrating Water Data to Enhance Ecological Flows in the Upper Clark Fork River Basin**

**Reclamation Funding: \$112,884**

**Total Project Cost: \$157,734**

The Clark Fork Coalition, in partnership with the Montana Department of Natural Resources and Conservation located in Missoula County, Montana, will develop a web-based decision support tool for water managers and conservation project planners that integrates the abundance of water data on key variables influencing instream flow and water quality. Over 120 miles of the

Upper Clark Fork (UCF) river have been designated as a part of the largest Superfund complex in the United States. Additionally, over 87 miles of the UCF mainstem has been classified as severely dewatered by Montana Fish, Wildlife, and Parks. The decision support tool will inform and expedite water management and conservation decisions to help natural resource agencies, key stakeholders, and cooperative watershed groups address critical instream flow and ecological restoration needs in the UCF basin. This project is supported by the Confederated Salish and Kootenai Tribes of the Flathead Nation, Trout Unlimited, the Watershed Restoration Coalition, and the University of Montana.

#### **Four Corners Foundation, Creating and Implementing an Improved Process for Stream Permit Management and Data Collection in Montana**

**Reclamation Funding: \$400,000**

**Total Project Cost: \$800,000**

Four Corners Community Foundation, in partnership with the Gallatin Conservation District, located in Bozeman, Montana, created a non-profit software solution called Gilly to capture and easily share the data contained in 310 Law permit applications. In Montana, Conservation Districts (CD's) are charged with water enforcement authority as it applies to the Natural Streambed and Land Conservation Act, commonly known as the 310 Law. All construction on or near a perennial stream or river in Montana requires the filing and approval of a 310 permit application from a CD. The ability of CD's to access quality assured, quality controlled hydrologic data is critical to inform water management and enforcement decisions. The Foundation will expand Gilly to include 310 permit applications from CD's across the State of Montana. Without easy access to 310 permit data, it is prohibitively difficult to evaluate the impact of permitting individual projects within the context of previously permitted projects. Once the expansion is complete, Gilly will allow resource managers across Montana to make more informed and appropriate permitting decisions to protect and preserve the streams, rivers, and adjacent lands.

#### **Sun River Watershed, Quantifying Water Conservation and Water Quality Improvements for Muddy Creek**

**Reclamation Funding: \$109,805**

**Total Project Cost: \$146,407**

The Sun River Watershed Group, in partnership with Greenfields Irrigation District located in Teton County, Montana, will quantify options in the Muddy Creek Master Plan. The master plan outlines nature-based strategies to restore natural processes on Muddy Creek and describes the anticipated benefits of implementing those strategies. Muddy Creek has experienced degradation of many ecosystem values due to high stream flows from natural runoff and irrigation returns and there is a need to restore the water quality, water availability, and habitat along this river. Quantifying the anticipated benefits through modeling and forecasting will allow the SRWG and partners to further prioritize strategies suggested in the MCMP. This project is supported by Montana Department of Environmental Quality, Montana, Fish Wildlife and Parks, and Muddy Creek landowners.

**University of Texas at Arlington, Nature Based Climate Solutions in Tribal Nations via Efficient Mapping and Modeling of Wetlands and Small Waterbodies**

**Reclamation Funding: \$317,665**

**Total Project Cost: \$640,559**

The University of Texas at Arlington, in partnership with the Blackfeet Indian Reservation in Montana, will create a tool to digitally map and model all locations and estimate potential surface-area and water-storage capacities of natural land features throughout the Reservation. These features include wetlands, wetland-like lands, depression surface features, potholes, and other small waterbodies, otherwise overlooked by coarse-scale satellite imagery. This effort will inform water managers of potential surface waterbodies that could be used as an effective and sustained nature-based climate solution against impending drought projections. The project is supported by the U.S. Fish and Wildlife Service's National Wetland Inventory division.

## **Nebraska**

**Tri-Basin Natural Resources Department, Development of a Net Groundwater Recharge Management Tool**

**Reclamation Funding: \$300,000    Total Project Cost: \$ 400,000**

The Tri-Basin Natural Resources District, located in central Nebraska, is responsible for management of groundwater resources in Gosper, Phelps, and Kearney counties, including portions of the Platte, Republican and Little Blue River basins. The district will create a single platform for compiling groundwater data and identifying the most effective nature-based solution alternatives for natural groundwater recharge. There is need for an improved decision-making tool to understand groundwater dynamics due to the heavy reliance on the declining groundwater levels. The Net Recharge Management Tool platform will be calibrated using historical groundwater data and will estimate the net balance of groundwater contributions and withdrawals down to a township level. The project is supported by the Nebraska Department of Natural Resources, Platte River Recovery and Implementation Program and the Central Nebraska Public Power and Irrigation District.

## **Nevada**

**Nevada System of Higher Education, Decision Support for Planning of Rain on Snow Events in the Mokelumne Watershed**

**Reclamation Funding: \$287,451    Total Project Cost: \$574,902**

The Desert Research Institute, in partnership with East Bay Municipal Utility District and Pacific Gas & Electric located in Calaveras, Amador, and Alpine Counties in California, will integrate a suite of tools to develop a decision support framework that communicates the potential of significant, midwinter, rain-on-snow runoff events to help optimize water resource management throughout the Mokelumne River watershed. Rain-on-snow events can produce 85% higher peak flows than spring snowmelt and have resulted in catastrophic flooding in the region. The improved framework will ensure the safe conveyance and storage of runoff and mitigate

flooding while also enabling the availability of water for future beneficial use. This project is supported by the National Oceanic and Atmospheric Administration.

### **Nye County Water District, Pahrump Valley Basin Groundwater Model and Forecasting Improvements**

**Reclamation Funding: \$225,000                      Total Project Cost: \$300,000**

The Nye County Water District, in partnership with Desert Utilities Inc., Pahrump Utilities Company Inc., and Nye County Natural Resources, will incorporate new and recently available hydrologic data into the Pahrump Valley Basin 162 Groundwater Model and develop a predictive model to forecast how the water resources will be impacted by planned future groundwater development and climate change. The Pahrump Valley Hydrographic Basin is one of Nevada's most over appropriated basins. If the water management challenges are not addressed, the groundwater rights can exceed the perennial yield and thus evacuate the available water supply within the basin. This project will assist water managers in investment and water allocation decisions and identifying nature-based solutions for water quality enhancements. The project is supported by the Town of Pahrump, University of Nevada Reno College of Agriculture, Biotechnology & Natural Resources Southern Nye County Extension, and U.S. Fish & Wildlife Service.

### **Southern Nevada Water Authority, Applying Backcasting to Identify Potential Future Water Quality Changes in the Colorado River Basin**

**Reclamation Funding: \$307,955                      Total Project Cost: \$713,795**

The Southern Nevada Water Authority will utilize backcasting to identify future water quality changes in the Colorado River basin. Backcasting is a method that focuses on how desirable futures can be attained and involves working backward from the desirable future to the present to determine the viability of a concept. Instead of looking to potential future conditions, backcasting will be used to create challenge tests. In these tests, scenarios considered likely to cause problems for water managers and water supplies will be rigorously defined with backcasting. The result from backcasting will support water managers to better identify ways to prevent or mitigate water quality concerns into the future. The project is supported by Reclamation Clark County Water Reclamation District, National Park Service, City of North Las Vegas, Clean Colorado River Sustainability Coalition, Clark County Regional Flood Control District, Met, and University of Nevada, Las Vegas.

## **New Mexico**

### **New Mexico Institute of Mining and Technology, Enhanced Data Integration: Water Data Initiative and Decision Support Tools**

**Reclamation Funding: \$196,386                      Total Project Cost: \$392,772**

The New Mexico Institute of Mining and Technology, in partnership with the Pecos Valley Artesian Conservancy District, will enhance existing water and data management tools to continue improving access to water resources data for the Roswell Artesian Basin. The quantity

of groundwater available is poorly understood in the Basin and due to recent droughts shortages, has created conflicts between irrigation districts, states, and interstate compacts. Water managers must respond to groundwater level changes quickly but don't have the data readily available. The tools to be enhanced include a groundwater dashboard showing current groundwater level trends, a meter manager application to support the maintenance of water meters and facilitate data communication, and a data sharing platform. This project is supported by the New Mexico Office of the State Engineer and the New Mexico Interstate Stream Commission.

**New Mexico Institute of Mining and Technology, Collecting Data to Improve Operational Integrated Modeling of the Middle Rio Grande**

**Reclamation Funding: \$196,862                      Total Project Cost: \$393,724**

New Mexico Tech, in partnership with the New Mexico Interstate Stream Commission and the Middle Rio Grande Conservation District, will conduct a series of surveys in the San Acacia reach of the middle Rio Grande to define groundwater and surface-water system interactions within a hydrologic model. The surveys will partition groundwater discharge into its different sources (return flows from irrigation, regional groundwater flow, and deep axial flows), and to provide aquifer flux boundary conditions and aquifer geometry constraints. The New Mexico Interstate Stream Commission's integrated hydrological model will be updated with this data and will be used for water management decisions in a region of severe drought and diminishing flow. It is critical in the face of climate change induced irregular streamflows along the Rio Grande to have correct parameterizations of the model. Currently, the model does not have defined constraints related to discharge boundary conditions and aquifer geometry and this project fills that gap. The project is supported by agricultural and residential water users of New Mexico, and the state of Texas.

**New Mexico Office of the State Engineer, Developing a Map-Based Analytical Interface for Water Rights Administration in New Mexico**

**Reclamation Funding: \$249,743                      Total Project Cost: \$509,679**

The New Mexico Office of the State Engineer, located in Santa Fe, New Mexico, will develop a web-based interface for streamlining water rights administration. Current water management challenges posed by variable surface water supplies, declining groundwater levels, and increasing demands require the ability to respond quickly to hydrologic changes to manage water resources and protect existing water rights. Utilizing a map-based analytical model interface that predicts hydrologic changes associated with proposed water transfers will improve the speed and consistency with which water rights are administered as well as support regional water planning efforts by enabling communities to better understand their water management options. This project is supported by the U.S. Geological Survey, the New Mexico Interstate Stream Commission, and the New Mexico Bureau of Geology & Mineral Resources.

**World Wildlife Fund, Prioritizing Nature-Based Solutions for Water Management:  
Assessing Evapotranspiration Reductions through Riparian Restoration  
Reclamation Funding: \$398,999                      Total Project Cost: \$531,999**

The World Wildlife Fund, in partnership with the New Mexico Interstate Stream Commission and the Middle Rio Grande Conservancy District, will analyze the potential for replacing invasive riparian vegetation species with native plant communities as a strategy for reducing water consumed by evapotranspiration on the Rio Grande. The project partners will collaborate to map extant stands of exotic vegetation, estimate potential water savings through replacement with native species, and prioritize stands for restoration using decision support tools based on a suite of ecosystem and water-saving benefits. The project will help the state of New Mexico meet its water delivery obligations under the Rio Grande Compact while enhancing river flows for ecosystem benefits and increasing water supply reliability for farming.

## **North Dakota**

**University of North Dakota, Water Supply Forecasting of the Cannonball River Watershed  
Reclamation Funding: \$351,345                      Total Project Cost: \$469,681**

The University of North Dakota, in partnership with the Standing Rock Sioux Tribe, will use field-based hydrologic and climatic data and hydrologic modeling to create seasonal forecasts of streamflow and predict future hydrology for the Cannonball River Watershed. The work will address tribal concerns regarding the security of municipal water supply in the context of climate change, particularly during drought conditions. The project results will also be available to other watersheds to enhance the scientific understanding of regional hydrologic outcomes of climate change.

## **Oklahoma**

**Oklahoma State University, Improving Groundwater Withdrawal Data in a Water-Scarce  
Agricultural Region Facing Irrigation Expansion  
Reclamation Funding: \$200,640                      Total Project Cost: \$401,282**

Oklahoma State University, in partnership with the Lugert-Altus Irrigation District, will generate agricultural groundwater withdrawal data across the Upper Red River Basin (Upper Red River Basin). This project integrates remote sensing data, groundwater management and operations data, and spatial water balance analysis to generate agricultural groundwater withdrawal data and determine the extent of potential over-pumping across the Upper Red River Basin. The project will develop a data set of active water wells and groundwater use for irrigation to mitigate the unintended consequences of aquifer overdraft due to new water resource development for irrigation. The URRB experienced a substantial expansion of irrigated croplands that rely on groundwater for irrigation with critical ramifications for the reliability of downstream agricultural water supply and ecosystem services. This project will continue to build ongoing efforts to evaluate and better manage the effect of changes in water deliveries on water-

dependent economic benefits to different water use sectors. The project is supported by OSU Extension offices and the Bureau of Reclamation.

## Oregon

### **East Valley Water District, Drift Creek Hydrological Monitoring and Analysis**

**Reclamation Funding: \$24,000**

**Total Project Cost: \$48,000**

The East Valley Water District, located near Silverton, Oregon, will collect hydrological and hydraulic data on Drift Creek and nearby streams. The data collected will be used to better determine water supply parameters including proposed reservoir inflow, release requirements, irrigation needs, and alternative water supply methods to inform the irrigation district's development of a water supply. This data will allow for better decision-making regarding water supply reliability, watershed health, evaluation of natural features to inform nature-based design elements of proposed projects, and better allow the District to make decisions that protect agriculture while also addressing the needs for environment.

### **North Unit Irrigation District, Deschutes Basin Cloud Seeding**

**Reclamation Funding: \$76,000**

**Total Project Cost: \$152,000**

The North Unit Irrigation District (District), near Madras, Oregon, will investigate the practicability of cloud seeding to balance climate variability and water management in the region. The District serves nearly 60,000 acres of diverse irrigated agricultural lands, however, the area suffers from perennial water supply shortages and extreme and exceptional drought that threaten industry, community, ecology, and economy. In 2022, 60 percent of lands sat fallow due to irrigation water supply shortages. The project will create a model that would produce 3-D clouds, temperature, and wind data which will be used to quantify the number of seedable hours and cloud altitudes over the mountain areas. Cloud seeding could increase the production of precipitation during the winter therefore increasing the snowpack and water supply for the area.

## South Dakota

### **West Dakota Water Development, Watershed Modeling for Deerfield and Pactola Reservoirs to Evaluate Environmental and Water User Benefits of Operations in Future Changing Conditions.**

**Reclamation Funding: \$262,291**

**Total Project Cost: \$349,721**

West Dakota Water Development, in partnership with the City of Rapid City, South Dakota, will build a RiverWare model to develop operational strategies under varying hydrologic conditions for the Pactola and Deerfield Reservoirs. The model will expand on preliminary modeling work that estimated an additional 3,000 acre-feet per year could be supplied from the system for municipal and environmental beneficial uses. The model will be calibrated by collecting field data for validation and used in consultation with the Bureau of Reclamation to produce

recommendations for operating the reservoirs under different scenarios for the protection of endangered species downstream and flood hazard mitigation. The project is supported by the South Dakota Department of Game, Fish, and Parks, Black Hills Fly Fishers, and several other local organizations.

## **Texas**

### **Lost Pines Groundwater Conservation District, A Local Scale Groundwater Availability and Flow Model to Enhance Water Resource Sustainability in Central Texas**

**Reclamation Funding: \$150,000**

**Total Project Cost: \$300,000**

The Lost Pines Groundwater Conservation District (District), located in Smithville, Texas, will develop a local scale groundwater availability and flow model to analyze impacts to groundwater levels and evaluate possible outcomes resulting from different management, policy, and permitting decisions. Rapid population growth within the District combined with its existing permits for groundwater production and proximity to several of the fastest growing counties in Texas highlights the need for the District to develop science to support its policy and management decisions. This project will predict the impacts of nearby production on local groundwater levels and therefore develop management methods and policies to both improve the sustainability of groundwater within the District and manage the impacts of both internal and external groundwater production on the existing groundwater users.

### **Southwest Research Institute, Characterizing Surface Water and Groundwater Regimes in a Semi-Arid Landscape**

**Reclamation Funding: \$200,000**

**Total Project Cost: \$400,000**

Southwest Research Institute, in partnership with Crockett County Groundwater Conservation District and Middle Pecos Groundwater Conservation District, will characterize salinity in the Pecos River by portraying the quality and quantity of inflows and outflows. There is a need to better define how flows and water quality vary throughout the lower Pecos River and whether flow and water quality changes are naturally occurring or if anthropogenic activities contribute to these changes. The project will produce a robust dataset and provide a refined water budget of the lower Pecos River. The data will allow water resource managers to make better informed decisions to ensure the water resources are sustainable into the future while also protecting the health of the lower Pecos River.

### **Texas A&M Corpus Christi, Development of a Reservoir Storage Forecasting System for Integrated Water Resources Management in the Nueces River Basin**

**Reclamation Funding: \$399,986**

**Total Project Cost: \$533,315**

Texas A&M Corpus Christi, in partnership with is the Nueces River Authority located in Nueces County, Texas, will develop medium and long range predictions of storage levels in the Nueces reservoir system. The project will use a combination of hydrologic modeling, remote sensing, geographical information system, and publicly available datasets. A WebGIS interface will also be developed for the visualization and distribution of forecasts and data products and transform the project outputs into a decision support system. This project will allow decision makers,

stakeholders, and the public to assess data through interactive online maps and generate recommendations on estuary inflow management, municipal drought contingency plans, and other related water resources management strategies in the Nueces River Basin.

### **University of Texas at Arlington, A Tracer Tool to Map Stormwater in Tap Water under Extreme Weather Events**

**Reclamation Funding: \$194,685**

**Total Project Cost: \$398,019**

The University of Texas at Arlington, in partnership with Tarrant Regional Water District (TRWD) in north central Texas, will develop a tracer tool to ensure drinking water reliability and security of the water distribution system under extreme weather events. There is a need to examine blending ratios, water travel times and impacts of recycled storm water within the tap water distribution system of TRWD as drinking water quality can be adversely affected by extreme weather events such as droughts and rainstorms. This tool will be used by TRWD's water managers to improve drinking water treatment strategies and assist in understanding the net effects of large convective rainfall events in the urban water cycle.

## **Utah**

### **Utah Department of Natural Resources, Soil Water Balance Model for Water Budget and Irrigation Optimization**

**Reclamation Funding: \$135,633**

**Total Project Cost: \$271,266**

The Utah Geological Service, a division of Utah Department of Natural Resources, will make two existing soil water balance models compatible with Google Earth Engine (GEE) to improve water budget estimates in Milford, Castle, and Sanpete Valleys, and the Great Salt Lake Watershed. This integration will allow for rapid and updatable estimates of groundwater infiltration and calculations, runoff quantities, evapotranspiration, consumptive use, irrigation needs and water savings. The current models are time consuming and can take years to complete a water budget. By integrating into GEE, quick calculations of water budgets and information will be available to water managers and will reduce delays in reacting to water shortages. This project is supported by the Colorado River Authority of Utah, the Utah Division of Water Rights and rural water users.

### **Utah State University, Enhancing Multi-Year-to-Decadal Forecasting for the Colorado River Water Supply and Reservoirs**

**Reclamation Funding: \$191,219**

**Total Project Cost: \$382,843**

Utah State University, in partnership with Utah state agencies, will enhance an existing platform from the current two-year timescale to multi-year-to-decadal timescale forecasting tools for the Colorado River water supply. The tools will provide a future perspective on the persistent drought threats and support development of a management and strategic plan for the next several years to a decade. The project has support of NOAA Colorado Basin River Forecast Center, Salt Lake City Department of Public Utilities, Central Utah Water Conservancy District, Southern Nevada Water Authority, Institute of Land, Water, and Air, and the Utah Climate Center.

### **Washington County Water Conservancy District, Gunlock Groundwater Study for Water Supply Optimization**

**Reclamation Funding: \$300,188**

**Total Project Cost: \$400,251**

The Washington County Water Conservancy District (WCWCD) will conduct a groundwater study around the Gunlock Reservoir of Washington County, Utah to characterize the aquifer recharge and determine the actual sustainable yield. The WCWCD 2022 Master Plan identified that the District will not have enough water to meet the demands of the area's growing population without immediate action. The groundwater study will involve compiling and reviewing available information and previous studies, characterizing groundwater and surface water, identifying trends, and creating a groundwater model. The tools and data collected will inform water managers and local conservation groups and support the WCWCD's 20-Year Plan in addressing the projected water imbalance due to growth, droughts, and floods. The project is supported by the Virgin River Program and the United States Geological Survey.

### **Western States Water Council, Developing a Westwide Tool to Support Water Conservation and Marketing Measures**

**Reclamation Funding: \$400,000**

**Total Project Cost: \$800,000**

The Western States Water Council will develop a web-based water conservation tool for west-wide use that streamlines applications for voluntary compensated water conservation measures. The Western U.S. needs to adapt its increased water use to reduced supplies through adaptive strategies such as water conservation and marketing, but there are data gaps that make these efforts difficult to accomplish effectively. This project integrates WestDAAT with OpenET that will support and streamline voluntary, temporary, in-state conservation applications and related compensation, promote water conservation and efficiency, facilitate state water rights administration, enhance water budgeting, promote in-state water marketing, improve drought management, and enhance environmental streamflow. The project is supported by the Upper Colorado River Commission, state entities, and other local stakeholders.

## **Washington**

### **Grant County Conservation District, Columbia Basin Groundwater Cooperative Interactive Web Application**

**Reclamation Funding: \$98,324**

**Total Project Cost: \$198,495**

The Grant County Conservation District will create a website dashboard to compile and make accessible existing information that is not otherwise easily available from the Columbia Basin Groundwater Management Area (CBGMA). Data for the CBGMA was collected between 1998 and 2014 and has since become almost inaccessible. This project will centralize the historical CBGWMA data and more recent data on the state of the groundwater resources in the Columbia Basin. The website will allow entities and organizations in the region to utilize data to better inform water resource management and conservation practices and policies. The project is supported by the Lincoln County Conservation District and Franklin Conservation District.

## **Snoqualmie Indian Tribe, Snoqualmie Tribe Ancestral Forest-Data Driven Headwaters Management**

**Reclamation Funding: \$400,000**

**Total Project Cost: \$400,000**

The Snoqualmie Indian Tribe will collect data and create analytical tools to inform management decisions in the Snoqualmie Tribe Ancestral Forest, located in King County, Washington. Flow, temperature, and water quality data will be collected on the Tolt River, a tributary to the Snoqualmie River, where no data collection effort currently exists. The data will be used to produce databases, detailed GIS mapping, and models intended to inform the Snoqualmie Indian Tribe's forest management decisions to actively promote healthy watersheds. Long-term watershed degradation due to historical logging activities and reduced flows because of increasing temperatures pose a threat to endangered species, including Chinook salmon and steelhead trout, and water supply reliability downstream. The project is supported by the Snoqualmie Watershed Forum, a coalition that supports salmon recovery and ecological health in the area.

## **Washington State University, Analysis of Seasonal Groundwater Dynamics for Improved Decision-Support**

**Reclamation Funding: \$388,093**

**Total Project Cost: \$776,185**

Washington State University, in partnership with the Columbia Basin Conservation District, will make improvements to an existing United States Geological Survey developed model for the Columbia Plateau Regional Aquifer System in the Pacific Northwest. Model improvements will allow the model to run on a monthly time step, instead of annually, and include irrigation demand estimates and climate scenarios that influence groundwater availability throughout the year. The project will create and manage 47 new monitoring sites with co-located groundwater, soil moisture, and weather sensors that collect data on a sub-daily time step. The improved model will enable assessments of historical hydrology and prediction of future seasonal groundwater dynamics related to summer pumping for irrigation. The project is supported by the State of Washington Department of Ecology and the Lincoln County Conservation District.

## **Wyoming**

### **Northern Arapahoe Tribe, Remote Sensing Imagery and Paleo Reconstruction Data to Define Aquifer Characteristics**

**Reclamation Funding: \$109,200**

**Total Project Cost: \$218,400**

The Northern Arapaho Tribe will determine the quality, quantity, and recharge rates to plan a sustainable water system in the Owl Creek Drainage, on the Wind River Reservation in Hot Springs County, Wyoming. The study consists of a geophysical examination of Riley Flat to determine the geologic structures, porosity, and permeability state of the groundwater. This work will indicate the size and shape of the aquifer and the morphology of structures holding and feeding the aquifer. The project recharge areas will produce water chemical characterization to produce water fingerprints to confirm the recharge pathway and area to predict the chemistry of the well before opening and casing the well. This combination of data will be increasingly relevant as municipalities and watersheds seek new water sources. At the same time, these data

will prevent the draining of historical aquifers and derive baseline data to support plans for a sustainable water supply to support wildlife habitat, livestock range, and clean drinking water for the underserved population of the Wind River Indian Reservation.



## Reclamation provides \$1.2 million in grants to improve water modeling and forecasting to support water management

For Release: Aug 25, 2022

WASHINGTON – The Bureau of Reclamation is investing \$1.2 million in eight external applied science projects that will develop tools and information to support water management. The projects selected include the development of modeling and forecasting tools, hydrologic data platforms and new data sets to inform decision-making.

"Having the accurate data and quality information is essential for water managers to make critical and timely decisions. We must ensure that we are supply smart," said **Deputy Commissioner David Palumbo**. "Applied science grants support improving water management tools so water managers can make informed decisions and improve their management of water, especially in times of prolonged drought and climate change."

Projects selected include \$55,000 for the Agua Caliente Band of the Cahuilla Indians to develop a geospatial data platform to assess and manage Tribal resources. The Coachella Valley Water District will also receive \$200,000 to update the Coachella Valley Salt and Nutrient Management Plan in partnership with seven other agencies by developing water management tools to model and forecast nitrate and total dissolved solids.

To view a complete description of all the selected projects, please visit <https://www.usbr.gov/watersmart/appliedscience>.

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For more than 100 years, Reclamation and its partners have developed sustainable water and power solutions for the West. These grants are part of the Department of the Interior's [WaterSMART Program](#), which focuses on collaborative efforts to plan for and implement actions to increase water supply reliability.

Please visit the [Applied Science Grant website](#) for more information about the program.



## FY 2022 Applied Science Grants

### Arizona

**The Nature Conservancy, Verde River Basin Integrated Hydrologic Modeling Project**  
**Reclamation Funding: \$64,273** **Total Project Cost: \$128,546**

The Nature Conservancy, in conjunction with the Yavapai-Apache Nation, will collaborate with watershed stakeholders to refine and improve an existing hydrologic modeling tool for the Upper and Middle Verde River Basins in Yavapai County, Arizona. The river faces tremendous threats from groundwater pumping, climate change, water policy, and agricultural water use. Without continued monitoring and management, the Verde River will not be able to sustainably support the biodiversity and people that depend on it. The project partners will develop and run modeling scenarios in the Verde River Watershed to promote comprehensive management and collaboration, simulating the cumulative impacts of land and water management choices and conservation strategies to better understand better the impacts of these management choices and changing conditions in the watershed.

### California

**Agua Caliente Band of Cahuilla Indians, Geospatial Data Platform to Assess and Manage Tribal Water Resources**  
**Reclamation Funding: \$55,000** **Total Project Cost: \$110,000**

The Agua Caliente Band of Cahuilla Indians (Tribe), located in Riverside County, California, in conjunction with the Agua Caliente Water Authority, will develop an online Geospatial Data Platform (GDP) to store and display geospatial and time-dependent datasets including climate, groundwater, surface water, and water quality data for the Agua Caliente Indian Reservation. The Tribe will use the GDP to integrate the datasets with the Hydrogeologic Conceptual Model (HCM) to support 3-dimensional visualization and assessment based on available well logs, geophysical data, pump tests, and other related hydrogeologic datasets. The GDP tool will allow users to examine changes in the occurrence and movement of groundwater and water quality over time, thereby helping water managers make informed management decisions and promote sustainable groundwater resources.

## **City of Long Beach, Well Asset and Groundwater Management and Forecasting Tool Project**

**Reclamation Funding: \$200,000**

**Total Project Cost: \$579,848**

Long Beach Water Department (Department), located in Long Beach, California, will develop and utilize tools and technology to maximize groundwater withdrawal sustainably and reliably. The project includes the development of the tools and procedures necessary to monitor wellfield operations effectively, assess critical factors affecting current and future groundwater production, and provide the foundations for proactive decision-making. Through completion of the project, the Department will improve access and use of water resources data, develop a digital water management tool to help provide short and long-term estimates of groundwater pumping to improve modeling and forecasting capabilities, and perform real-time analytics. Improved knowledge about groundwater will increase and improve the utilization of local water resources, maximizing allowable pumping rates from the aquifer, reducing water imports, and assisting in the sustainable management of groundwater resources.

## **Coachella Valley Water District, Mission Creek Subbasin Water Quality Model**

**Reclamation Funding: \$200,000**

**Total Project Cost: \$402,000**

The Coachella Valley Water District (District), located in Palm Desert, California, will partner with seven other agencies in southern California's Mission Creek Subbasin (MCSB) to update the Coachella Valley Salt and Nutrient Management Plan by developing water management tools to model and forecast Nitrate and Total Dissolved Solids (N/TDS). The district's objective is to sustainably manage salt and nutrient loading in the basin to protect its beneficial uses. As part of this project, the district will characterize the N/TDS loading and current groundwater quality, delineate management zones and metrics to characterize beneficial use protection, develop a technical approach and tools to forecast N/TDS concentrations, and establish baseline scenario forecasts of groundwater quality conditions in the future. Upon completion of the project, the model and baseline scenario will be available for use by the partnering agencies to run future scenarios, quantify the relative effectiveness of future mitigation strategies, and ultimately manage water quality in the subbasin to support decision-making and resiliency. Partnering agencies include City of Coachella, City of Palm Springs, Desert Water Agency, Indio Water Authority, Mission Springs Water District, Myoma Dunes Mutual Water Company, and Valley Sanitary District.

## **Rancho California Water District, Integrated Groundwater Wellfield System**

**Reclamation Funding: \$200,000**

**Total Project Cost: \$421,119**

Rancho California Water District (District), located in Temecula, California, will create better hydrologic data for the Murrieta-Temecula Groundwater Basin by developing a new water management tool for improving basin management efficiency. Through this project, the district will install new remote sensing equipment on the District's 26 wells within the Pauba Valley in southern California to generate more accurate and frequently available groundwater levels and

well-pumping efficiency data. This information will then be integrated into a new water management tool to assist Rancho Water staff in making decisions on maximizing the efficiency of basin management operations in terms of water production and maintaining the basin's health.

### **Santa Ana Watershed Project Authority, Cloud Seeding Technology Validation Protocol**

**Reclamation Funding: \$100,000**

**Total Project Cost: \$200,000**

The Santa Ana Watershed Project Authority (SAWPA), a joint power authority with the support of the Inland Empire Utilities Agency, San Bernardino Valley Municipal Water District, Orange County Water District, and other local public agencies, in collaboration with the Desert Research Institute, will develop a standard protocol for evaluation of cloud seeding benefit to complement a planned pilot-scale program for weather modification (cloud seeding). This effort is expected to provide water agencies standard guidelines and procedures to be undertaken to ensure the benefits of increased precipitation from weather modification programs can be effectively quantified based on the weight of evidence approach. Once the project is complete, water resource agencies across the western United States will be able to use the protocol and validation tool to quantify the benefits of increased precipitation from weather modification, support increased water supply, and enhance stormwater capture.

## **Nevada**

### **Southern Nevada Water Authority, Robust Updates to Advanced Lake Models to Inform Future Drinking Water Treatment Needs**

**Reclamation Funding: \$193,085**

**Total Project Cost: \$540,365**

The Southern Nevada Water Authority will expand forecasting functionality in an existing water quality model for Lakes Mead and Mohave. As the drought continues, drinking water intakes may withdraw epilimnetic water, which may be warmer, higher in nutrients, and consequently more difficult to treat, threatening the water supply for over 2.2 million residents and 43 million annual tourists. The model will be used with future planning tools to understand potential changes to water quality before they occur, allowing water managers to take appropriate action to mitigate changes in water quality and maintain treatment and delivery efforts. The project will allow for improved long-term drought resilience in the Lower Colorado River Basin by expanding modeling capabilities leading to more robust projections.

## Texas

### **Post Oak Savannah Groundwater Conservation District, Operations and Management Model to Enhance Sustainability and Climate Resiliency in Central Texas**

**Reclamation Funding: \$200,000**

**Total Project Cost: \$550,080**

The Post Oak Savannah Groundwater Conservation District, located in central Texas, in collaboration with The Meadows Center for Water and the Environment at Texas State University (Meadows Center), will develop an operations and management model to be used by the district to help establish a comprehensive and consistent set of rules, policies, and strategies to address water resource management challenges in central Texas. Through application of the model, the district expects to enhance its existing capacity to balance conservation of groundwater resources, development of resources to meet growing needs and demands of the State, and protection of private property water rights. The district will generate model simulations to help inform management decisions related to issues including evaluation of permit renewals, long-term aquifer sustainability, improved climate resiliency, development of desired future conditions, curtailment of permits and/or production, and drought management.



## **Reclamation awards \$3.1 million in grants to develop water data, modeling and forecasting tools and information for water managers**

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For Release: Sep 2, 2021

WASHINGTON - The Bureau of Reclamation selected 20 projects to share \$3.1 million in applied science grants to develop tools and information to support water management decisions. These projects in 11 western states include improved water data, modeling and forecasting capabilities.

"Water managers today need more accurate and reliable information to make the best water management decisions in a changing climate," said **Chief Engineer David Raff**. "Applied Science Grants are an important tool to assist water managers getting the information they need so they can make those informed decisions."

Projects selected range from \$48,000 for the Big Bend Conservation Alliance in Texas to develop a common data management platform for shared aquifers to several receiving the maximum of \$200,000. Texas A&M University-Kingsville is receiving \$107,497 to develop a web-based tool to simulate post-wildfire hydrologic changes in Northwest Montana.

To view a complete description of all the selected projects, please visit <https://www.usbr.gov/watersmart/appliedscience>.

Applied Science Grants are for non-federal entities to develop tools and information to support water management for multiple uses. Selected projects must provide at least a 50% non-federal cost-share. Project types include:

- Enhancing modeling capabilities to improve water supply reliability and increase flexibility in water operations.
- Improving or adapting forecasting tools and technologies to enhance management of water supplies and reservoir operations.
- Improving access to and use of water resources data or developing new data types to inform water management decisions.

For more than 100 years, Reclamation and its partners have developed sustainable water and power future for the West. This program is part of the Department of the Interior's

WaterSMART Program, which focuses on improving water conservation and reliability while helping water resource managers make sound decisions about water use. To find out more information about Reclamation's WaterSMART program, visit <https://www.usbr.gov/watersmart>.

[Applied Science Grant Project Descriptions](#)



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## Fiscal Year 2021 WaterSMART Applied Science Grants

### Arizona

**Salt River Project Agricultural Improvement and Power District, Continuous Predictive Hydrologic Model to Inform Salt River Project's Reservoir Operations within the Salt and Verde Watersheds**

**Reclamation Funding: \$155,015**

**Total Project Cost: \$310,030**

The Salt River Project Agricultural Improvement and Power District in Arizona will develop a real-time reservoir operations model for the Salt and Verde rivers. The model will be used to predict changes to lake levels based on a continuous runoff simulation, enhancing the Salt River Project's ability to analyze and react to forecasted hydrological events in the watersheds that impact operations and infrastructure. The model will forecast streamflow at specified locations that directly impact reservoir operations, informing operations decisions and facilitating early responses to flooding caused by storm events or landscape changes created by wildfire. The Salt River Project is carrying out the project with the support of the Arizona Municipal Water Users Association and the cities of Tempe, Chandler, and Scottsdale.

### California

**California Water Data Consortium, Advancing an Open-Source Water Accounting and Scenario Planning Platform to Support the Successful Implementation of California's Sustainable Groundwater Management Act**

**Reclamation Funding: \$200,000**

**Total Project Cost: \$544,031**

California Water Data Consortium, located in Sacramento, California, will partner with the California Natural Resources Agency, Environmental Defense Fund, California Department of Water Resources, State Water Resources Control Board, Sonoma County Water Agency, Pajaro Valley Water Management Agency, and multiple local water authorities and districts, to enhance and expand an open-source Water Accounting Platform to serve as a baseline groundwater accounting and tracking tool available to Groundwater Sustainability Agencies across California. Because California groundwater resources remained largely unregulated until the Sustainable Groundwater Management Act was passed in 2014, most local groundwater management agencies have limited data management infrastructure. This project will facilitate effective accounting and management of available water resources by integrating two established, open-source software tools to improve access to water elevation and extraction data, water

accounting systems, and scenario planning and visualization tools critical for effective groundwater management.

### **Lawrence Livermore National Security, Improved Recharge Monitoring for Enhanced Conjunctive Management of Ground and Surface Water**

**Reclamation Funding: \$200,000**

**Total Project Cost: \$400,000**

Lawrence Livermore National Laboratory, located east of Oakland, California, will partner with the Omochumne-Hartnell Water District (OHWD) to improve monitoring of infiltration and groundwater recharge and provide real-time data accessibility to inform water management decisions at OHWD recharge project sites. The District will use conjunctive use of ground and surface water on agricultural lands to help address reduced summer flows that have limited the use of surface water diversions. The project partners will develop a model to simulate groundwater conditions, perform geophysical surveys, install new monitoring wells, incorporate electrical conductivity and soil moisture sensors into an online dashboard for data sharing, and improve estimates for river recharge potential. This new information will directly aid OHWD in the coordinated management of both surface and groundwater systems and guide the expansion of on-farm recharge infrastructure projects.

### **Social and Environmental Entrepreneurs, Inc., A Data Platform for Urban Water Efficiency in California**

**Reclamation Funding: \$199,977**

**Total Project Cost: \$399,977**

Social and Environmental Entrepreneurs, a nonprofit organization that sponsors the California Data Collaborative, will develop the California Urban Water Efficiency Data Platform in collaboration with its member agencies, which include local and regional municipal water suppliers. The project location spans across California, with a primary focus on areas served by Urban Retail Water Suppliers, entities providing potable municipal water to more than 3,000 end users, or that supply more than 3,000 acre-feet of water per year. The 2012-2016 drought in California highlighted the need for a single data system to provide timely, accurate information about water production and demand to enable informed water demand management. The data platform will assist local water suppliers with tracking, quality controlling, and analyzing their water production and demand data. The platform will help agencies evaluate their current efficiency levels, identify opportunities for improvement, share data for regional collaboration, and report their data for compliance with California's water efficiency legislation. The software will be made accessible online using technologies common in modern consumer software.

### **Stockton East Water District, Eastside Groundwater Use Measurement Project**

**Reclamation Funding: \$58,000**

**Total Project Cost: \$117,080**

Stockton East Water District, with the support of Eastern San Joaquin Groundwater Authority, North San Joaquin Water Conservation District, and Central San Joaquin Water Conservation District, will develop groundwater pumping and recharge volumes using proven, remote sensing techniques, based on evapotranspiration (ET) estimation from NASA's Landsat satellite imagery.

The agencies involved are part of the Groundwater Sustainability Agency responsible for implementing California's Sustainable Groundwater Management Act in the Eastern San Joaquin Groundwater Sub Basin. The Eastern San Joaquin Groundwater Basin is a high priority, critically over-drafted groundwater basin by the California Department of Water Resources. This project will implement the Geospatial Resources of Water Management for Agricultural Systems, an automated portal that uses Landsat imagery and weather data to produce daily, monthly, and annual ET data. The project will help the groundwater sub-basin account for groundwater demand, manage available surface and groundwater resources, allocate costs and document benefits of proposed groundwater banking, storage and conjunctive use projects.

## Colorado

### Grand Mesa Water Users' Association, Grand Mesa Water Users' Association Efficiency Project

**Reclamation Funding: \$200,000**

**Total Project Cost: \$440,000**

The Grand Mesa Water Users Association, located on the Grand Mesa in Delta County, Colorado, will produce digitized capacity surveys for 50 reservoirs. The reservoirs on the Grand Mesa were built to capture and conserve available water from snowpack for irrigation and municipal use. This project includes conducting reservoir capacity surveys using drone technology, installing water measuring sensors at each reservoir to monitor water level heights, and developing a water distribution control system with multiple functions such as an interactive map of the reservoirs, a database with data on the reservoirs, a dashboard showing water administration activity, and a forecasting tool. These tools will enhance the management of water supplies and reservoir operations.

## Kansas

### University of Kansas Center for Research, Inc., Incorporating Climate Uncertainty into Water Allocations in Kansas

**Reclamation Funding: \$97,822**

**Total Project Cost: \$195,648**

The University of Kansas, located in Lawrence, Kansas, will work with the Kansas Water Office (KWO) to include climate uncertainty in the water supply allocation procedure in the State of Kansas. KWO uses a water balance model across the system based 1950's climate, which was an extreme drought period in the state of Kansas, for determining water allocations. This project will develop a procedure for incorporating climate uncertainty into the water allocation process. The process will include quantifying climate uncertainty using historical climate and climate projections, using a hydrologic modeling framework to estimate the uncertainty in streamflow and evaporation, modifying the existing KWO water allocation model to use an ensemble of streamflow and evaporation inputs, and quantifying the uncertainty in future water allocations due to climate based on a Bayesian probabilistic framework. A more robust system accounting for climate uncertainty will allow the state to conduct long-term water supply planning and better anticipate the range of future resource conditions.

## Montana

### Montana Department of Natural Resources & Conservation, Enhancing Hydrologic Modeling and Water Supply Forecasting in Montana's Upper Yellowstone Basin

Reclamation Funding: \$119,009

Total Project Cost: \$405,135

The Montana Department of Natural Resources and Conservation will develop a water balance, precipitation-runoff hydrologic model, and water supply forecasting tool for the Upper Yellowstone Watershed in south-central Montana. Stakeholders and managers in the watershed are increasingly forced to balance growing demands for water with uncertainty in water supply, driven by climatic shifts towards earlier season snowmelt runoff, warmer temperatures, and persistent drought conditions. This complexity in water management has created tension throughout the community in recent years. This project will develop a modern hydrologic toolset to forecast water supply conditions, enhance water management decision-making, and inform drought planning efforts. Water supply forecasting will be enhanced by incorporating a physical precipitation-runoff technique, which will complement the existing statistical method. Evapotranspiration and crop consumption estimates will also be improved through the use of remote sensing data and existing modeling software. This method has been shown to improve modeling and forecasting accuracy, reduce error, and contribute to a better understanding of watershed hydrology.

## Nebraska

### Nebraska Department of Natural Resources, Application for Platte River Decision Support System (DSS) of Excess Flow in Nebraska Phase 4 - Water Management Tools and Stakeholder Outreach

Reclamation Funding: \$200,000

Total Project Cost: \$400,000

The Nebraska Department of Natural Resources (NeDNR), the primary surface water permitting agency in Nebraska, will implement the fourth phase of the Decision Support System (DSS) development for the Platte River to better utilize unappropriated water on the Platte River in the wake of increasing climate variability and its impact on water resources. A systematic approach for water allocation decisions during excess flow events increases efficiency, transparency, and accountability while simplifying the process and reducing the regulatory burden on customers applying for excess water use. The DSS will provide a vital tool to Nebraska's water managers to leverage opportunities to re-time water supplies through storage and groundwater recharge to support planning efforts to maintain a balance between water uses and supplies. NeDNR initiated DSS development in 2018 and will complete the Water Management Tools and Stakeholder Outreach Phase (Phase 4) during this project. This phase of the project will increase water supply reliability through forecasting within the Platte River Basin, support NeDNR water administration to avoid water allocation conflicts, and help support the management of the river, including the administration of water rights in periods of surplus water availability.

## Nevada

### **Southern Nevada Water Authority, A Three-Part Modeling Effort to Quantify and Reduce Pathogen Concentration in the Las Vegas Valley Water Supply: Study Case in Las Vegas, Nevada**

**Reclamation Funding: \$199,985**

**Total Project Cost: \$496,650**

The Southern Nevada Water Authority (SNWA), located in Las Vegas, Nevada, will create a Quantitative Microbial Risk Assessment (QMRA) model that characterizes risk from pathogen exposure in municipal drinking water. Some pathogens of concern for drinking water, including norovirus, adenovirus, and Cryptosporidium, are often present in such low concentrations that they are difficult to measure in finished drinking water, yet still pose a significant risk to public health. This project will use mathematical models to quantify and minimize risks from pathogen contamination in the drinking water system maintained by SNWA. The QMRA will be developed using the Monte Carlo model that samples pathogen concentrations and uses operational scenarios to quantify risk. This project will use an existing water quality model developed for Lake Mead to create distributions for travel time (i.e., pathogen die-off) and recycled water contribution (i.e., blending and dilution) as inputs for the QMRA. The output from the coupled Lake Mead Model and QMRA will inform training data for a machine learning model, increasing the model's ability to recognize and address impacts from potential risk events.

## New Mexico

### **New Mexico Institute of Mining and Technology, NM Water Data Initiative: Improving Water Data Access for Modeling in The Middle Rio Grande**

**Reclamation Funding: \$195,050**

**Total Project Cost: \$391,710**

The New Mexico Bureau of Geology and Mineral Resources (located at the New Mexico Institute of Mining and Technology), in partnership with the New Mexico Interstate Stream Commission (NMISC), will improve water data access in the middle Rio Grande region of New Mexico. The project will focus data on the area Otowi gage to the Elephant Butte reservoir, particularly related to data associated with Rio Grande flow and irrigation management. Management and operations of water in this region is one of the most challenging endeavors, as it impacts some of the largest population centers of the state, a large irrigation district, several tribal partners, municipalities, and an increasingly fragile river ecosystem. The project will enhance modeling capabilities for the NMISC and provide more reliable and direct access to real-time, near real-time, and historical water data. This project will improve access to and use of water resources data by connecting information from numerous federal, state, and local agencies. The project will produce a robust water data Application Programming Interfaces, with additional descriptive metadata. This project will benefit the 2019 WaterSmart Applied Science Project titled "Developing a Projection Tool for Otowi Index Supply and Elephant Butte Effective Index Supply."

## Oklahoma

### **Norman Utilities Authority, Lake Thunderbird Predictive Lake Level Optimization Tool**

**Reclamation Funding: \$154,781**

**Total Project Cost: \$309,563**

The Norman Utilities Authority, located in Norman, Oklahoma, will collaborate with the National Water Research Institute to develop a Predictive Lake Level Optimization Tool (PLOT) for the Lake Thunderbird watershed in Central Oklahoma. This new water-balance tool help water managers implement the planned lake augmentation system by providing support for the timing and duration of pumping. Effective management of a reservoir's conservation pool is critical to the survival of any surface water body during prolonged drought periods. The new forecasting tool for lake water-level will play an important role during these periods. The project will seek to establish proof-of-concept for a model that, in subsequent work, can link to real-time data collection, make forecasts of the lake's water balance and the augmentation needed. The PLOT forecasts will consider both near-term precipitation projections and statistical climatological trends to identify the preferred augmentation flows to optimize lake yield, conjunctive groundwater use, drought risk mitigation, and augmentation volumes. The project will further the regional goal of a sustainable, shared water reservoir by constructing a cloud-based tool to allow for transparent, smart augmentation flow pumping to Lake Thunderbird.

### **Oklahoma State University, Quantifying the Amount and Impact of Agricultural Water Use in the Upper Red River Basin**

**Reclamation Funding: \$135,469**

**Total Project Cost: \$271,192**

Oklahoma State University, with the support of the Lugert-Altus Irrigation District, will quantify agricultural water use across the Upper Red River Basin, located in southwestern Oklahoma and the Texas panhandle, by combining geospatial analyses, remote sensing techniques, and ground-truthing. This basin has experienced significant drought impacts. During the 2011-2015 drought, water levels in Lake Altus dropped below the intake level of the main canal, halting water deliveries to irrigated farms for several years and devastating the local economy. The University will estimate the acreage of irrigated agricultural lands and identify the types of crops being grown, and apply and evaluate remotely sensed energy balance models to quantify actual crop water use and irrigation application on a distributed basis. This project will benefit water supply reliability by supporting robust water accounting.

## Texas

### **Big Bend Conservation Alliance, Far West Texas Groundwater Districts Adopt Data Management Software and Develop a Data-Sharing Module to See the Bigger Picture of Shared Aquifer Health**

**Reclamation Funding: \$48,000**

**Total Project Cost: \$96,000**

Big Bend Conservation Alliance, in partnership with Presidio County Underground Water Conservation District, Brewster County Groundwater Conservation District, and Culberson County Groundwater Conservation District, located in west Texas, will establish a common data management software platform in the region enabling them to share data on shared aquifers and to provide for better coordination of region-wide water management goals. The proximity of these counties to the Permian Basin, which is experiencing an explosion of growth in unconventional oil exploration, puts this region at substantial risk for groundwater depletion. The adoption of this software and data sharing module will provide an efficient way to monitor the aquifer levels, groundwater management models, and desired future conditions over time at the district and regional level and facilitate sharing this data with state agencies and other stakeholders.

### **Southwest Research Institute, Application of a geochemical framework for water resource management in a semi-arid landscape: Trans Pecos Texas, USA**

**Reclamation Funding: \$200,000**

**Total Project Cost: \$319,998**

Southwest Research Institute, located in San Antonio, Texas, will work with the Middle Pecos Groundwater Conservation District and Reeves County Groundwater Conservation District to conduct a geochemical and statistical analysis to improve understanding of the hydrology of two interconnected spring systems in west Texas, the San Solomon Springs in Balmorhea, and Comanche Springs in Fort Stockton. The analysis and resulting database will be used to identify relative amounts of recharge from different source areas, potential changes in spring hydrochemistry resulting from land use practices, and recharge and discharge rates. Spring systems in arid and semi-arid environments are threatened by changes in land use and development, including irrigation practices and pumping for oil and gas development, as well as changes to recharge from precipitation. This project will help inform several ongoing efforts in the area, including efforts to reduce groundwater extraction to increase spring discharge and restore perennial flows.

## **Texas A&M University-Kingsville, Making Post-wildfire Hydrologic Change Assessments Efficient by Developing A Web-based Remote Sensing-integrated Hydrologic Modeling Tool**

**Reclamation Funding: \$107,497**

**Total Project Cost: \$215,220**

Texas A&M University at Kingsville, Texas, in partnership with the City of Missoula, Missoula Valley Water Quality District, Clark Fork Coalition, the Nature Conservancy of Montana, Oak Ridge National Laboratory, USGS, and the US Army Corp of Engineers, will develop an intuitive web-based tool for efficient simulation of post-wildfire hydrologic changes by integrating remotely sensed data in a hydrologic model. Understanding the compound hydrologic effects of recurring fire, drought, and climate projections and their immediate and long-term implications on water management has become time-sensitive for communities across the western United States. This project will use the Clark Fork Basin in western Montana and northern Idaho as a testbed as wildfire is a major disturbance, making it an ideal study area for this project. This project will equip watershed managers and stakeholders with a user-friendly workflow to quickly post-process variables associated with fire and drought, integrate remotely sensed data into a hydrologic model, simulate and analyze the hydrologic flow and sediment transport across a large river network, and visualize input-output data through an interactive map interface.

## **The University of Texas at Arlington, Adapting Ensemble Inflow Forecasts to Inform Operations of a System of Reservoirs along the Brazos River in Central Texas**

**Reclamation Funding: \$199,656**

**Total Project Cost: \$399,316**

The University of Texas at Arlington will partner with the Texas Water Development Board and the Brazos River Authority (BRA) to adapt and assess ensemble forecast products from the National Weather Service to support operational decisions at a system of reservoirs in the Brazos River Basin. The project will produce adapted forecasts that can be immediately implemented at National Weather Service (NWS) West Gulf River Forecast Center and climate index-constrained inflow traces to be delivered to BRA to assist with operational planning. The project will also yield operation-specific decision support tools for partnering agencies, including a forecast-based guide on periodic use of a portion of the flood pools for water supply storage and associated changes in flooding risk, a forecast-based planning tool for BRA's planning and operations, and a forecast-driven scenario tool for drought contingency planning. This project is being implemented in coordination with the US Army Corps of Engineers and the NWS West Gulf River Forecast Center.

## Utah

### Utah Geological Survey, Supplementing Estimates of Evapotranspiration - The Utah Flux Network

**Reclamation Funding: \$134,518**

**Total Project Cost: \$280,035**

Utah Geological Survey, located in Salt Lake City, Utah, with support from the Utah Division of Water Rights, the Utah Division of Water Resources, and the Central Utah Water Conservancy District, will establish a network of high-quality eddy covariance flux stations in Utah, including new and existing stations to provide ground-based evapotranspiration estimates. Water scarcity in Utah and the western United States requires effective management of this resource, which in turn requires reliable information describing and quantifying water availability, diversions, returns, and consumptive use. Allocations under the Upper Colorado River Compact are based on consumptive use, the portion of a water diversion that does not return to any surface stream or groundwater aquifer, including evapotranspiration. The evapotranspiration measurements and resulting model grids will be applied to measure consumptive water use by crops to facilitate water conservation efforts and depletion-based water rights management. Improved consumptive use measurements will also support water banking strategies for more efficient irrigation practices and preservation of instream flows, and will can be used in the development of watershed water budgets to improve watershed management.

### Utah State University, WaterSMART: A platform for drought forecast in Intermountain West with the optimized multi-model ensemble approach

**Reclamation Funding: \$129,675**

**Total Project Cost: \$259,370**

Utah State University, located in Logan, Utah, will work with Bear River Association of Governments, the Salt Lake City Department of Public Utilities, and the Utah Division of Water Resources to develop an improved seasonal forecast that will be disseminated via a web interface supported by the Utah Climate Center. Reliable forecasts of drought conditions allow water resource managers, planners, and decision-makers to take proactive actions in mitigating drought impacts. The improved forecast will build on the North American Multi-Model Ensemble (NAMME) outputs, which provides climate forecasts up to 12 months ahead, but at a coarse spatial resolution. The project team will downscale the spatial resolution of the NAMME forecasts to a more useful geographic scale, and create a user-friendly web-based platform for disseminating drought forecast products through the Utah Climate Center for water resources managers and planners across the intermountain west. This project builds on several previous Reclamation WaterSMART grants that focus on predicting droughts and water shortages.

### Western States Water Council, Western Water Rights and Aggregate Water Use Data Access and Analysis Tool

**Reclamation Funding: \$200,000**

**Total Project Cost: \$836,581**

The Western States Water Council, whose members include 17 western States and Alaska, will continue developing Western Water Rights and Aggregate Water Use Data Access and Analysis

Tool (WestDAAT), moving it from prototype to full functionality. WestDAAT will enable users to obtain consistent water rights data within its member states to support water resources planning and management. The WestDAAT Team will also work closely with Reclamation to coordinate and enhance its existing water rights database. Making water rights and aggregate water use information easily available will lead to more innovative applications that stretch scarce water supplies, improve drought management, facilitate state water rights administration, raise recognition of federal water right reservations, promote conservation and water marketing, highlight conjunctive ground and surface water use opportunities, and focus initiatives for watersheds, fish and wildlife habitat, and endangered aquatic species protection.



## **Reclamation invests \$3.3 million for internal applied science projects to improve modeling, forecasting and data tools**

For Release: September 11, 2020

Understanding and estimating sedimentation in rivers and reservoirs is one of the applied science tools that Reclamation will fund with this announcement. WASHINGTON - The Bureau of Reclamation Commissioner Brenda Burman announced that Reclamation will invest \$3.3 million in 21 projects for WaterSMART Internal Applied Science Tools that build technical capacity within Reclamation.

"Information gained from these applied science tools will allow Reclamation and our partners to use best-available science for optimal water management under variable hydrologic conditions," Commissioner Burman said. "The projects announced today will help inform specific water management decisions throughout the West."

This program supports the Department of the Interior's commitment to meeting the [President's Memorandum on Promoting the Reliable Supply and Delivery of Water in the West](#).

A project will assist New Mexico and reservoirs throughout the West. It will receive \$199,764 to implement a known model to simulate regional climate and physical processes to estimate daily, monthly and annual evaporation across Elephant Butte Reservoir. These estimates will be compared to alternative estimates. The results will be used by the Albuquerque Area Office to support operations, to facilitate method comparison and identify future planning, operational and research needs on the topic. It will help with the development of alternative evaporation estimation techniques, production of daily evaporation time series at a reservoir and a broadening of weather prediction modeling capabilities.

Another project in Arizona will receive \$200,000 to enhance precipitation and soil monitoring information in the Aravaipa watershed northeast of Tucson. Currently, there are only two weather stations within the watershed. The project includes the installation of two stations to monitor precipitation and soil moisture, which will better inform the Natural Resources Conservation Service forecasting models and United States Geological Survey surface water models. The work proposed in this project will help Reclamation and local partners predict flood risk, drought, erosion, and water quality concerns and better plan mitigation of these water management issues.

A third project will receive \$120,000 to do predictive modeling to generate maps of invasive quagga and zebra mussel risk. The results will allow Reclamation to dedicate limited resources to high-risk locations and prepare facilities for potential control costs.

To view a complete list of projects, please visit [www.usbr.gov/watersmart/appliedscience](http://www.usbr.gov/watersmart/appliedscience).

Applied Science Tools are part of the WaterSMART Program. Through WaterSMART, Reclamation works cooperatively with states, tribes and local entities as they plan for and implement actions to increase water supply reliability through investments to modernize existing infrastructure and attention to local water conflicts. Visit [www.usbr.gov/watersmart](http://www.usbr.gov/watersmart) to learn more.



## Reclamation awards \$3.5 million for 19 projects that will inform water management decisions

*Projects in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oklahoma, Texas, Utah and Washington selected*

For Release: February 11, 2020

WASHINGTON – The Bureau of Reclamation selected 19 projects to receive \$3.5 million in WaterSMART Applied Science Grants to develop tools and information that will inform and support water management decisions. These projects will be matched by more than \$4.5 million, non-federal cost-match, supporting a total project cost of \$8 million.

The projects selected are as follows:

- City of Sierra Vista (Arizona), Web-based Hydrologic Information Portal for the Upper San Pedro Basin, \$99,000
- Mojave Water Agency (California), Integrated Model Development and Alternatives Evaluation, \$150,000
- Pala Band of Mission Indians (California), Pala Tribe Innovative Practices in Hydrologic Data Acquisition and Use for Water Management, \$55,120
- Point Blue Conservation Science (California), California Central Valley Wetlands Water Budget Tool Development, \$150,000
- Rancho California Water District (California), Groundwater Modeling Enhancement for the Murrietta-Temecula Groundwater Basin, \$195,000
- University of California Agriculture and Natural Resources (California), A California Crop Coefficient Database to Enhance Agricultural Water Demand Estimations and Irrigation Scheduling, \$299,627
- University of California, Merced (California), Defining the Rain-Snow Transition Zone in the Northern Sierra Nevada, \$299,976
- Colorado Water Conservation Board (Colorado), Arkansas River Colors of Water and Forecasting Tool, \$150,000
- The Henry's Fork Foundation (Idaho), Predictive Hydrologic Modeling and Real-Time Data Access to Support Water Resources Management, \$273,211
- Idaho Power Company (Idaho), Precipitation Modeling Tools to Improve Water Supply Reliability, \$300,000
- Desert Research Institute (Nevada), Quantifying Environmental Water Requirements for Groundwater Dependent Ecosystems, \$296,740
- New Mexico Institute of Mining and Technology, New Mexico Water Data Initiative and Regional Pilot Project for Improved Data Management and Decision Support Tool in the Lower Pecos Valley, \$300,000



## 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, Developing a Projection Tool for Otowi Index Supply and Elephant Butte Effective Index Supply**  
**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 Rio Grande Compact Compliance**  
**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.