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 lessoned 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, depressional 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 identifing 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 baskcasting 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.