FY 2022 Science and Technology Research Projects

Evaluate and model economical, safe and effective methods to mitigate and remove debris from dam intake structures, Year 1 Funding: $95,376

The purpose of this research project is to investigate existing, new, and emerging technologies that may be used to mitigate and/or remove debris at dam intake structures.

Potential impacts of phosphorous loading from wildfire-fighting retardants related to the East Troublesome fire on surface water quality in Willow Creek and Willow Creek Reservoir, Year 1 Funding: $97,747

This project will evaluate the fate and transport of phosphorous post-wildfire in the Willow Creek drainage and Willow Creek Reservoir through water quality and sediment sampling.

Evaluating watershed response and increases in sediment loading to Willow Creek and Willow Creek Reservoir due to East Troublesome fire, Year 1 Funding: $59,228

Monitoring sediment deposition in the Willow Creek Reservoir over multiple years is needed to determine and possibly predict the watershed and reservoir response to large-scale wildfires.

Enhancing Reclamation's Watershed Model to Predict Post-Fire Sediment Delivery to Reservoirs and Assess Management Actions., Year 1 Funding: $91,520

An interagency team proposes to extend SRH-W's capability to include wildfire impact prediction and evaluation of related management efforts. Project goals are to incorporate wildfire-related physical processes (land cover/soil property changes) into SRH-W by adopting state-of-the-art research; and to validate and demonstrate the benefits of the enhanced SRH-W model in the Willow and North Inlet Creek watersheds, CO, recently affected by the East Troublesome wildfire.

Favorably Stabilizing the Flow, Supply and Quality of Water from Public Lands During Forest Management, Year 1 Funding: $96,000

In collaboration with the Bureau of Land Management, the project proponents will use remote sensing data, state-of-the-science wildfire and watershed models and targeted monitoring efforts to study land based management practices and their impact on water supply and quality. This project will produce a planning process that will aid Reclamation, other reservoir owners and state and federal land management agencies to better secure water supply in wildfire-prone regions of the West.

Post-wildfire forecasting improvements using non-Newtonian flow processes with a high-resolution, integrated hydrologic model, Year 1 Funding: $110,000

This effort will build an interagency model and model construction workflow to support post-wildfire water management. Reclamation will leverage the USACE ERDC investment into post-wildfire flow processes by incorporating their post-wildfire computational libraries into the ADHydro model.

Integration of Renewable Energy Sources - Determining Hydro Generation Start/Stop and Cycling Costs, Year 1 Funding: $35,000

The purpose of this research is to establish a defendable cost calculation methodology to support the growing industry consensus that there are significant costs being incurred due to hydropower generator (hydro) starts/stops and cycling operations.

Robotic Non-Destructive Inspection of Hydraulic Streel Structures, Year 1 Funding: $70,672

New technology allows for robotics to collect a large sampling of data on a structure to provide greater insight into the structure's overall condition. While the current robotic technology likely has some limitations, it may be possible to supplement Reclamation's current approach to condition assessment in penstocks, outlet works, steel lined siphons, and other steel structures with robotics to yield more useful information on the structure's overall condition.

Evaluation of Plunger Valves as a New Technology for Improved Water Delivery at Reclamation Dams and Hydropower Facilities, Year 1 Funding: $115,500

Plunger valves are a new flow control technology used for high pressure applications such as dam outlet pipes, diversion facilities, pipelines, and hydropower plants. There are approximately 270 valves and gates in Reclamation's inventory that will need to be replaced which represents a significant cost, most of them in the next few years. The strategy of this research is to first review plunger valve operational data and experience from end users, then conduct focused testing in the field on recent plunger valve installations, and finally extend test results with lab-scale testing of various plunger valve configurations at Reclamation's Hydraulics Lab. Expected outcomes from this study include well-defined flow performance characteristics of plunger valve designs, hydraulic operating limitations, and clear recommendations for their application relevant to Reclamation facilities.

Development of an Engineered Disseminated Neoplasia to Control Invasive Mussels in Reservoirs, Year 1 Funding: $205,378

The goal of this project is to utilize genetic engineering tools to create disseminated neoplasia cells that can be used to transmit and foster a lethal, self-spreading cancer into invasive zebra and quagga mussel populations in reservoirs to achieve population control.

Survey of 'Cousin' Dreissenid Species in Eurasia for Potential Biocontrol Agents to Control Invasive Quagga and Zebra Mussels in North America, Year 1 Funding: $423,178

The proposed research project is designed to identify potential biological controls agents from 'cousin' mussels and seek evidence of lethality/debilitation to the QM/ZM from their 'cousins' will be monitored.

Inferring the provenance of invasive dreissenid mussel veliger shells through trace element analysis, Year 1 Funding: $101,850

The goal of this project is to identify chemical "fingerprints" for the shells of invasive quagga and zebra mussels. This project will build confidence among natural resource managers that newly detected veligers are derived from a breeding population at the site of discovery, rather than having been transported from another location.

Optimization of Sample Analysis Methods for the Early Detection of Invasive Dreissenid Mussels in Reclamation Reservoirs, Year 1 Funding: $87,000

The objective of this proposed project is to optimize analysis of early detection and population monitoring samples to increase sensitivity of current methods and investigate new methods that can overcome challenges associated with samples that contain high total suspended solids (TSS) and large numbers of veligers.

Collection and Analysis of Invasive Mussel Samples to Prevent the Spread and Impacts at Reclamation Reservoirs and Facilities, Year 1 Funding: $508,562

The objective of this project is to collect and analyze invasive quagga and zebra mussel early detection samples from reservoirs across Reclamation. Samples will be collected from approximately 280 Reclamation reservoirs that have been determined to be most at risk for mussel infestation based on habitat suitability and recreational boating use.

Development of a Production and Transport Vector for a Chimeric Biopesticide in the Treatment of Zebra and Quagga Mussels, Year 1 Funding: $40,250

Based on previous success with immunotoxins, it is expected that the biopesticide produced by the approach proposed here will exhibit direct cell kill efficiency values (EC50) in the low pM concentration range.

Investigating the potential of cloud seeding to enhance precipitation in the East River Basin of Colorado, Year 1 Funding: $14,678

The expected outcomes of this work are a model-based quantification of cloud seeding opportunities across the Colorado Headwaters region and the potential impacts of cloud seeding on precipitation in the East River Basin, as well as a demonstration of a model-based framework designed to be transferable to study the local impacts of cloud seeding in other river basins.

Characterizing Historical and Future Snowfall Events across the Western US to Inform Water Resources Management, Year 1 Funding: $105,096

This project will improve the understanding of synoptic weather conditions that result in heavy snowfall across four watersheds in the western US, knowledge that could help increase adaptive management and flexibility in the planning, design and operations of Reclamation's facilities in a variable and changing climate, including improved management during droughts and floods.

Development of an integrated hydrologic model with high-resolution snow processes for water supply forecasting and forecast-based operations, Year 1 Funding: $75,000

This effort expands the Adaptive Hydrology (ADHydro) model – a high-resolution, physics based, HPC capable hydrologic model – to include snow processes in collaboration with NOAA NWS Office of Water Prediction and the USACE Engineer Research and Development Center.

Optimization of Water Management within the Colorado River Indian Reservation in Arizona, Year 1 Funding: $133,795

The intent of this project is to investigate methods to better integrate and simplify current processes to improve water ordering, accounting, and end user experience in terms of accuracy, transparency, accessibility and reliability. The main objectives are to develop a common operating picture across the participating organizations (CRIT, BIA, and Reclamation), simplify procedures for diversion management/water ordering, and build federal and Tribal confidence in water management systems and related decision-making, within the existing authorities and scope of responsibility for each agency.

Rotor Installed Corona Probe with Near Field Communication Antennas: Further Refinement Toward a Final Product, Year 1 Funding: $115,000

A prototypical system has been field tested and shown to reliably detect and map partial discharge throughout a service-aged generator with minimal disassembly of the asset. In the research project the prototype will be refined for initial internal use for the greatest impact as fast as possible within Reclamation's fleet.

Improved Adhesion of Polyurethane Coatings with Phosphating, Year 1 Funding: $70,500

This proposal scales up the number of test coupon replicates to produce statistically significant results to fully understand the effects of phosphating on polyurethane adhesion. This project will also involve performing a comprehensive analysis of the effects of phosphating on polyurethane including evaluation of undercutting resistance, electrochemical impedance spectroscopy (EIS), knife adhesion, impact testing, and a new test method that evaluates adhesion strength under "real-life" hydraulic conditions in the high-velocity tunnel.

Determining compatibility of Zinc Anodes for Cathodic Protection in Various Waters Specific to Reclamation and US Army Corps of Engineers Facilities: Phase II., Year 1 Funding: $60,064

This research will benefit Reclamation and the USACE by providing qualitative results about which facilities can use zinc anodes and by providing a predictable model for future implementation of zinc anodes in a given water chemistry. The ability to use more anode options for CP system design on immersed steel structures will allow for greater flexibility and capability to meet facility needs for corrosion mitigation.

Learning from the Past, Inspection of Historic Penstock Lining Field Trials; Shasta Penstocks and Collbran Siphon, Year 1 Funding: $71,864

Scientists at Reclamation conducted field trials of linings, at Shasta Dam in 1949 and at Collbran Siphon in 1959 to evaluate the linings for corrosion protection and erosion due to sediment loading. The Shasta Dam Penstocks were lined with 26 different coatings across a 160 ft section. In 1959, Collbran Project Salt Creek Siphon in western Colorado was lined with 36 different lining systems across a 280 ft test area. The goal of this research is to inspect the Collbran siphon to collect corrosion resistance data, via EIS and thickness measurements from these 60-year-old linings and write a report. Both historic test sites are likely the oldest linings field trial in the United States and understanding how linings provide long-term corrosion protection is vital in infrastructure sustainability.

Engineering and Maintenance for Cathodic Protection Systems Combined with Vinyl Coatings, Year 1 Funding: $56,500

The proposed research will investigate interactions between the vinyl coating and CP at typical field polarization levels. Immediate benefits of the research will be greater understanding of interaction between CP and vinyl coatings, which will improve TSC design best practices and maintenance and repair recommendations to Reclamation facilities in all regions.

Boundary Layer and Aerated Flow Effects on Hydraulic Jacking in Spillway Chutes, Year 1 Funding: $74,112

This research project will use an existing high-speed open-channel flume in the Denver hydraulics laboratory to develop relationships for predicting uplift pressures and flow rates through joints and cracks in spillway chutes. The expected outcome is a procedure for estimating the magnitude of uplift pressures and the quantity of flow that can pass through an open joint or crack, considering the geometry and condition of the joint and the flow conditions in the chute.

Evaluation of file formats for storage and transfer of large datasets in the RISE platform, Year 1 Funding: $30,000

The proposed effort is intended to examine large datasets produced by Reclamation and explore how they can be published through RISE.

Improved Processing and Analysis of Test and Operating Data from Rotating Machines, Year 1 Funding: $70,000

This research strives to aid in the development of condition-based maintenance (CBM) and predictive maintenance (PdM) tools for Hydroelectric Facilities (Generators and Pumps) by exploring, testing, and developing software tools to process data collected from rotating machines.

Evaluating Water Temperature Modeling and Prediction in the Sacramento River Basin, Year 1 Funding: $88,851

This proposal supports the development of new meteorological datasets and inflow temperature predictions that can potentially improve Reclamation capabilities for stream temperature management in California's Sacramento River basin and communication with stakeholders.

The use of a multi-sensory behavioral barrier as a fish deterrent to reduce entrainment at the St. Mary Diversion Dam, Milk River Project, Montana, Year 1 Funding: $107,835

The purpose of this project is to evaluate a multi-sensory barrier would span 58-feet across the total width of the headgates to reduce entrainment of bull trout.

The development of a temperature and dissolved oxygen water quality model to inform water management options to benefit Yakima River salmon migration, Year 1 Funding: $120,256

The goal of this project is to develop a predictive water quality model that can advise water managers when flow management options can be used to change or maintain water quality conditions downstream and enhance salmon migration and survival.

Development of Facility Corrosion Inspection Templates & Planning for a Central Database, Year 1 Funding: $48,000

The research investigates approaches to standardized corrosion condition assessments at Reclamation facilities. The primary objective is to develop templates to make data collection easier, which helps to ensure the needed information is being collected.

Modular Anode Sled Development and Testing for Cathodic Protection of Immersed Steel Structures, Year 1 Funding: $52,500

This project aims to design and install anode sleds with multiple anode configurations at a Reclamation facility and study the effectiveness of the systems relative to more traditional approaches.

Investigating the physical processes that impact reservoir delta fish passage and evaluating potential solutions, Year 1 Funding: $83,134

Two main research objectives are proposed to address fish passage problems on reservoir deltas: 1) develop a conceptual understanding of geomorphic processes of reservoir delta evolution focusing on how channel flow depth, sedimentation patterns, and inundation dynamics impact fish passage, and 2) use the conceptual model to formulate and evaluate solutions that promote sustainable fish passage across reservoir deltas.

Recent Advances in Selenium Treatment Technologies, Application to Emerging Wetlands, and Pilot Project Implementation Plan in the Salton Sea, California, Year 1 Funding: $42,000

Given the projected growth of playa wetlands around the Sea and potential selenium hazards to fish and wildlife using them, this effort can help Reclamation and its partners plan for Se risk reduction as the region evolves.

Evaluation of Shallow Acoustic Sub-Bottom Profiling Technologies for Measuring Reservoir Sedimentation Thickness and Stratigraphy – Englebright Lake, California, Year 1 Funding: $185,271

The proposed study will determine the effectiveness of different sub-bottom profiling instruments in characterizing deposited sediments and determining pre-impoundment surfaces at a reservoir with well-studied geomorphic conditions.   Chirp systems utilize high-powered acoustic pulses over a range of relatively low frequencies to penetrate up to tens of meters into sediments for remote characterization of stratigraphy.

Scoping Project for Salton Sea Windblown Playa Dust Modeling, Year 1 Funding: $25,000

This scoping proposal will allow the team to further develop the approach and methodology for the modeling project and seek partnerships from other agencies and stakeholders at the Sea.

PyForecast continued development – expanding PyForecast's reach and capabilities, Year 1 Funding: $106,000

This projrct will continue development and validation of the PyForecast statistical modeling software to incorporate additional modeling and analysis methods, and to allow the tool to satisfy more water supply forecasting use-cases within Reclamation.

Utilization of Trained Canines to Detect Leaks in Water Pipelines, Year 1 Funding: $100,120

A winning solution from the Detecting Leaks and Flaws in Water Pipelines prize competition conducted in 2018 proposed using trained canines, with ATV-mounted handlers, for detecting tracer chemicals (e.g., chlorine) in water that has leaked from a pipe into the surrounding soil

and percolated to the soil surface. This research proposal aims to demonstrate the use of trained leak-detection canines on Reclamation infrastructure.

Evaluation of Acoustic Emission Sensing Technologies for Pressurized Buried Water Pipeline Leak Detection, Year 1 Funding: $100,000

The expected outcomes of this research include development of in-house capabilities and expertise on the limitations and implementation of Acoustic Emission (AE) leak detection/locating and monitoring services for a variety of Reclamation's pipelines; deployment of AE sensor arrays for use on existing problematic pipeline segments that are currently in-service; significant cost savings for existing problematic pipeline segments and for future issues; education of Reclamation's pipeline designers and engineers on the benefits for direct integration of pipeline leak detection/locating sensors during future repair efforts or construction of new pipeline segments (application to common practice).

Leveraging the results of an invasive saltcedar leaf beetle impact monitoring study to create a risk assessment and restoration prioritization tool on the Middle Rio Grande, NM, Year 1 Funding: $63,680

This project will integrate the results of ongoing Diorhabda impact assessment research, 25 years of Southwestern Willow Flycatcher (SWFL) population monitoring, and detailed habitat maps to develop an actionable tool that can be used to prevent SWFL population decline, rather than taking less effective and more costly reactionary steps to recover the population after severe loss has already occurred.

Evaluation of Mercury Release from Sediment and Dredging to Lahontan Reservoir Waters, Year 1 Funding: $207,910

The potential impact of mercury release during dredging is of high concern and this study proposes the collection of sediment cores from Lahontan Reservoir and benchtop experiments evaluating the possible extent of mercury release from excavated reservoir sediment.

Alternative methods for collecting data for photogrammetric crack mapping of interior cavities of buttress dams: Development of methodology and demonstration at Stony Gorge Dam, Year 1 Funding: $71,379

The primary objective of this research is to design and demonstrate an alternative method for inspecting buttress dams.

Long-Term Arid Region Reservoir Usability Evaluation due to Salinity Induced Degradation of Water Quality, Year 1 Funding: $95,000

This research will provide a comprehensive characterization of the sources of water quality degradation in Lake Meredith with respect to salinity and provide an outlook for water quality conditions in the reservoir to support water supply planning for the region.

Increasing the effectiveness and simplicity of potable water reuse with a multi-benefit ferrate treatment process, Year 1 Funding: $143,043

The objective of this study is to answer several important questions about the use of ferrate, a powerful water treatment chemical that is not currently widely used, in a potable reuse (PR) context to increase its technical readiness level for this application.

Integrating water reuse and stormwater management into constructed wetland designs to enhance water supply and multi-purpose project benefits, Year 1 Funding: $209,824

This research aims to evaluate the role that a constructed wetland could play in treating the effluent prior to discharge into Lake Thunderbird.

Nuisance Aquatic Vegetation (NAV) Control in Water Delivery Systems: An Automated Metering System for Accurate and Consistent Herbicide Application, Year 1 Funding: $53,166

This project proposes four major goals - modernizing the prototype, testing of the system in laboratory and field trials, measurements of important metrics such as cost savings, and field trial demonstrations to a wider audience including Reclamation stakeholders.