

Statement of Interest

W912HZ-19-SOI-0027

Project to be initiated in 2019

Project Title: Research to Continue Investigation of Atmospheric Rivers (AR) and the Application of Using AR Forecast Capabilities to Inform Reservoir Operations within the USACE

Responses to this Request for Statements of Interest will be used to identify potential investigators for a research and development project to be funded by the U.S Army Corps of Engineers (USACE) Engineer and Research and Development Center's Coastal and Hydraulics Laboratory, Vicksburg, MS (ERDC/CHL). This project is expected to last five (5) years. Approximately \$1.75M is expected to be available to support this project in the first year. Funding for future years (4 option periods) may also be available at an estimated amount of \$4.0M/year for an anticipated total of \$17.75M for this project including base and option years.

Background:

The U.S. Army Corps of Engineers (USACE) has been engaged in a research and development effort called Forecast-Informed Reservoir Operations (FIRO) to conduct research into atmospheric rivers to improve weather forecast skill and to develop a better understanding of the balance between water supply, flood risk management and ecosystem benefits at multi-purpose reservoirs. Given reduced supplies, changed hydrologic conditions, and technological advances, some adjustments to the current reservoir operating procedures may be possible to optimize the goals of maintaining flood control while bolstering water supply reliability for downstream users and the environment (e.g., to support recovery of endangered and threatened fish). Modern observation and prediction technology could be used to reduce flood risk by supporting decisions of greater reservoir level drawdown in advance of storms. Or, such technology might be used to improve supply reliability by permitting more storm runoff to be retained for water supply while preserving and enhancing flood risk reduction objectives.

Recent scientific research has yielded improvements in understanding the processes which affect the formation, intensification and duration of significant rainfall events in the Western U.S., which are predominantly atmospheric river (AR) events. This research includes atmospheric reconnaissance missions using U.S. Air Force Hurricane Hunter aircraft as well as National Oceanic and Atmospheric Administration aviation resources. Data collected from these missions has led to meaningful gains in forecast skill for the global weather modeling community, as well as for specialized models that have been developed for the Western U.S.

Since August of 2014, the USACE has actively participated in a multi-agency, multi-discipline research and development effort to investigate how FIRO approaches might be safely and appropriately applied at the pilot reservoir, Lake Mendocino, in the Russian River watershed in northern California. This initial FIRO investigation is now in its fifth and final year and is scheduled to complete the full viability assessment of FIRO at Lake Mendocino.

A new effort is underway to investigate the expansion of FIRO to other locations, as appropriate. The USACE has developed a plan for conducting an expanded effort over five years to investigate the transferability of FIRO tools and approaches at three additional reservoirs that will be chosen based on objective selection criteria that provide opportunity to fully test FIRO across a wide range of hydrologic and water management contexts. Prado Dam on the Santa Ana River in southern California has been selected by USACE as the second FIRO demonstration site. A steering committee for Prado Dam has been formed, comprised of federal, state and local agencies, stakeholders and academia, to conduct the viability assessment.

Additionally, the USACE plans to develop guidelines for conducting screening-level assessments of FIRO applicability for reservoirs across the region and the rest of the United States. These guidelines will assist water management agencies in deciding where and how FIRO principles and tools can be incorporated into water management practice.

Brief Description of Research:

FIRO is a management strategy that uses data from watershed monitoring and modern weather and water forecasting to help water managers selectively retain or release water from reservoirs in a manner that reflects current and forecasted conditions. FIRO's utilization of modern technology can optimize the use of limited resources and represents a viable climate change adaptation strategy. The proposed research effort will consist of a series of viability assessments to determine if Forecast-Informed Reservoir Operations (FIRO) at selected reservoirs can improve water supply, flood risk reduction, and achieve additional ecosystem benefits.

ERDC and the USACE have extensive capabilities in meteorological, hydrologic and hydraulic science and modeling that will be necessary to the success of this project. However, the USACE lacks expertise and understanding of the factors affecting successful identification and prediction of the phenomenon known as Atmospheric Rivers (AR). Therefore, a collaborative research partner is sought to engage with ERDC and the USACE to conduct this research project. A strong collaboration between ERDC-CHL and the proposers is desired. This collaboration is desired in two main areas: continued research and development in improving understanding of atmospheric processes that impact water management decisions, and conducting viability assessments at specific reservoirs which includes incorporation of advanced modeling and observation data together with water management, stakeholder, and ecological priorities to produce beneficial outcomes.

It is anticipated that this effort will require both basic and applied research in execution. Improving understanding of AR formation, intensity, duration, and forecasting through the use of field data collection and assimilation of observations into atmospheric modeling and the improvement of hydrologic routing models and atmospheric/hydrologic model coupling all result in fundamental expansion of the knowledge base in these areas. Applied efforts include developing the FIRO screening and viability assessment processes, administering these to selected demonstration sites, and advancing the coordination of various interests for reservoir operation.

Public Benefit:

The FIRO efforts serve the public of the United States by maximizing the utility of both public infrastructure (i.e., the flood risk management function of reservoir systems) and water resource management. Increased understanding of AR systems will allow dam operators to better anticipate future flows to avoid over-releasing water before a drought state or under-releasing in advance of extreme precipitation. This allows more water availability for public use, including consumption, irrigation, recreation, and sustainment of environmental ecosystems. Additionally, increased forecast skill as a result of research done within the FIRO research effort will lead to better weather forecasts available to the general public. This has positive repercussions for public safety and the protection of property.

Objectives:

The goal of FIRO is to develop tools and capabilities to enhance standard flood control guidelines in order to improve water supply, flood risk reduction and environmental outcomes without diminishing dam safety, thereby providing significant benefit to the public. It is anticipated that FIRO-developed capabilities that have proven to be of benefit to operations at Lake Mendocino will have transferability potential throughout the western U.S. The project has two main objectives:

Improve Supply Reliability for Downstream Uses - When storms cause moderate-to-high reservoir levels, normal operation is to release water to re-establish flood control space. With FIRO, some of that water could be retained for future supply as long as no major precipitation is predicted for several days and it can be demonstrated that the retained water can be released past downstream flood prone areas before the arrival of the next storm. This strategy will permit earlier supply capture in some years, improving summer season supply reliability for downstream water users and improving the timing and volume of releases to protect water quality and provide flows needed for recovery of fish populations.

Enhance Flood Risk Reduction - When a storm is predicted to cause flooding, normal operations call for release of reservoir water and drawdown of water levels. With FIRO, release decisions would consider weather observations and predictions, which, in some cases, would indicate greater drawdown for flood risk reduction so long as there is confidence that the amount of precipitation and runoff will restore reservoir levels for water supply after the storm.

Tasks by Year:

Base Year

- Conduct viability assessment for Prado Dam
 - Develop work plan
 - Conduct preliminary and final viability assessments
- Assist in selection of additional FIRO demonstration sites
- Conduct research to continue improving forecasting skill, particularly with regard to ARs and their impact on western water management

- Work collaboratively with USACE in improving hydrologic modeling capability and coupling with atmospheric models and observations to inform water management decisions
- Project planning & coordination

Option Year 1

- Continue viability assessment for Prado Dam
- Begin viability assessments for second & third FIRO demonstration sites
- Begin development of FIRO screening level assessment guidelines
- Continue research to improve forecasting skill, particularly with regard to atmospheric rivers and their impact on western water management
- Continue collaborative efforts with USACE in improving hydrologic modeling capability and coupling with atmospheric models and observations to inform water management decisions
- Project planning & coordination

Option Year 2

- Continue viability assessment for Prado Dam
- Conduct viability assessments for second & third FIRO demonstration sites
- Continue development of FIRO screening level assessment guidelines
- Continue research to improve forecasting skill, particularly with regard to atmospheric rivers and their impact on western water management
- Continue collaborative efforts with USACE in improving hydrologic modeling capability and coupling with atmospheric models and observations to inform water management decisions
- Project planning & coordination

Option Year 3

- Continue viability assessment for Prado Dam
- Continue viability assessments for second & third FIRO demonstration sites
- Apply FIRO screening level assessment guidelines to additional sites
- Continue research to improve forecasting skill, particularly with regard to atmospheric rivers and their impact on western water management
- Continue collaborative efforts with USACE in improving hydrologic modeling capability and coupling with atmospheric models and observations to inform water management decisions
- Project planning & coordination

Option Year 4

- Conclude viability assessments
- Conclude screening level assessments
- Develop technical recommendations
 - Publish findings
 - Collect stakeholder comment

Requirements:

Successful applicants should have expert knowledge and experience investigating and predicting atmospheric rivers and their impact to watersheds along the west coast of the United States. They should also have technical expertise in the fields of water management, hydrologic data collection, data evaluation, QA/QC, statistical analysis, higher order analysis skills, data archiving systems and dissemination of the data to the public in usable form.

Government Furnished Property and Services:

The Government will collaborate with the investigator to research the phenomenon of atmospheric rivers and the feasibility of using state-of-the-art forecast information to inform reservoir operations in the USACE. The Government will also collaborate with the investigator to identify and develop appropriate predictive atmospheric, hydrologic and hydraulic tools required for successful FIRO execution.

Materials Requested for Statement of Interest/Qualifications:

Please provide the following via e-mail to:

Stacy.D.Thurman@usace.army.mil (maximum length 2 pages, single spaced 12 pt. font)

- 1) Name, Organization and Contact Information
- 2) Brief Statement of Qualifications including:
 - a. Biographical Sketch
 - b. Relevant past projects and clients with brief description of project
 - c. Staff, faculty and students available including area of expertise
 - d. Brief description of capabilities to successfully complete this project

Note: a proposed budget is NOT requested at this time.

Review of Statements Received: Based on a review of the Statements of Interest received, an investigator or investigators will be invited to prepare a full study proposal. Statements of Interest will be evaluated based on investigators specific experience and capabilities in areas related to the study requirements. Additionally, the evaluation method and selection criteria for research and development awards must be: 1) The technical merits of the proposed research and development; and 2) Potential relationship of the proposed research and development to the USACE missions.

Please send responses or direct questions to:

Stacy D. Thurman

CEERD-CT-V

U.S. Army Engineer Research and Development Center (ERDC)

ERDC Contracting Office (ECO)

3909 Halls Ferry Rd.

Vicksburg, MS 39180

Stacy.D.Thurman@usace.army.mil

Timeline for Review of Statements of Interest: Review of Statements of Interest will begin after the SOI has been posted on the Californian CESU website for 10 working days.