

# RECLAMATION

*Managing Water in the West*

## Projected Impacts of Climate Induced Water Quality Trends on Reclamation Operations

**Reclamation Science and Technology Program**

**PI: Katharine Dahm**

**Proposal ID: 4311, Scoping Study**



U.S. Department of the Interior  
Bureau of Reclamation

# Research Question

*How will changes in water quality due to natural climate variability and climate change impact Reclamation operations in the western United States?*

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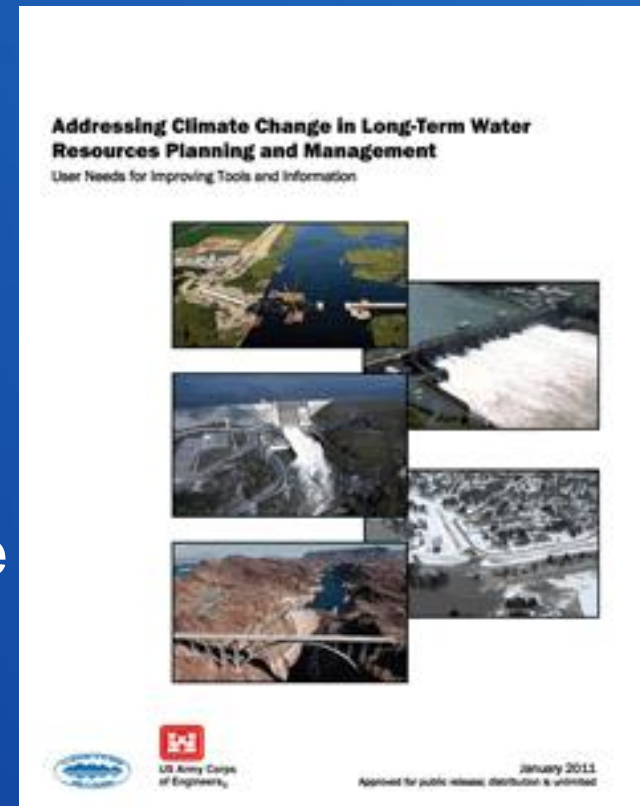
# Research Objective

- A broad amount of research and information currently exists with respect to modeling and projecting climate change.
- The objective of this study is to identify water quality trends and future water quality management needs due climate variations.
- This project proposes the evaluation of existing information to examine general water quality trends in western water resources that influence the operation of reclamation facilities and strategize needs for water quality research in response to climate change.

# Research Needs

General knowledge gaps regarding climate change projections were evaluated in the January 2011 Bureau of Reclamation and Army Corps of Engineers report Addressing Climate Change in Long-Term Water Resource Planning and Management: User Needs for Improving Tools and Information.

Reclamation placed a high priority on assessing natural systems responses to climate change, specifically, understanding how water quality characteristics depend on climatic variables.



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# Mission and Responsibility

Climate change will affect Reclamation's future water budget and the types of source waters that are utilized for municipal and agricultural applications in the Western US. The purpose of this proposed study is to provide a strategic planning document to suggest water treatment plant modifications based on projected changes in source water due to climate change.

The types of water resources resistant to climate change or, alternatively, highly susceptible to climate changes dictate the types of water supplies that will be used to meet future needs. This proposal is structured to meet Reclamation's research goals to understand the future environmental impacts to water resources due to climate change and develop a planning document identifying future research needs.

# Mission and Responsibility (cont.)

There is also a need to evaluate current Reclamation operations with regard to future water quality changes to determine the types of operations that will continue to be relevant in future water management. This proposal aims to meet Reclamation's research strategy to provide technical assistance to states and water organizations so that they may take better advantage of research targeted to meet their future needs in a changing climate.

Reclamation is seeking to understand how climate change will impact western water resources and provide solutions for temporal water variability. This adaptation research not only improves our ability to understand and define climate change impacts on western water resources, but it also develops a portfolio of tools for adapting water management as the climate changes. Assessing water quality changes and operation requirements in this proposal provides a foundation assessment for research on this topic area.

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# Research Strategy

This research is subdivided into the following tasks:

Task 1.  
Literature Review

Task 2.  
Research  
Documentation

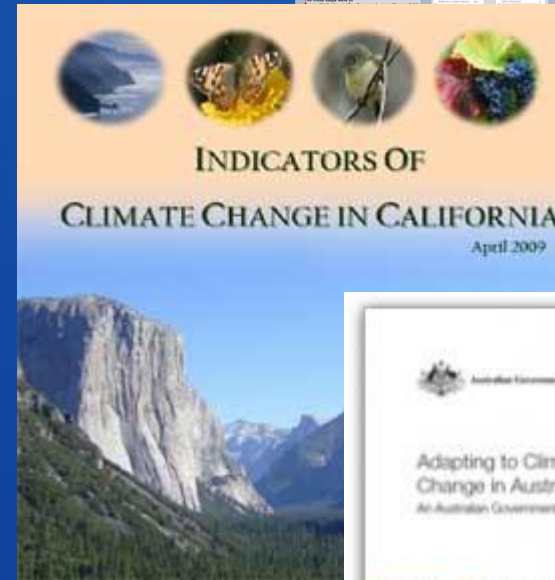
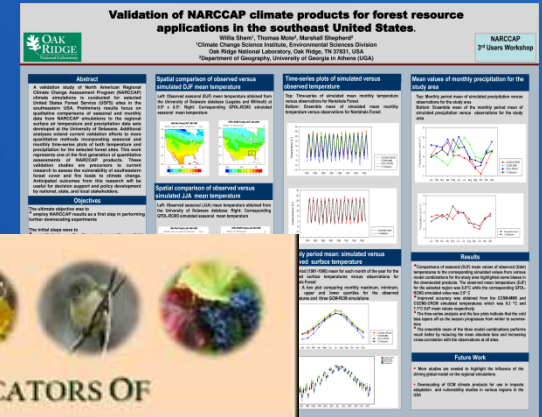
Task 3.  
Research Review  
Solicitation and Full  
Project Proposal

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# Task 1. Literature Review

Literature review and assessment of available climate change information

- Task 1 will focus on reviewing relevant literature and synthesizing previous research on regional climate change and impacts on regional water resources.



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# Task 1. Literature Review

The goal is to assess general trends in water quality related to natural system responses to climate change.

These responses may include natural variations such as:

- Increases in temperature/evapotranspiration causing increased salt loading.
- Increased magnitude of precipitation events in flood prone areas resulting in increased sediment loading.
- Climate driven ecosystem changes in water quantity/quality resulting in limnetic alterations affecting organic or biological loading

This literature information is used to examine general water quality trends projected for western water resources due to climate variations.

# Task 2. Research Documentation

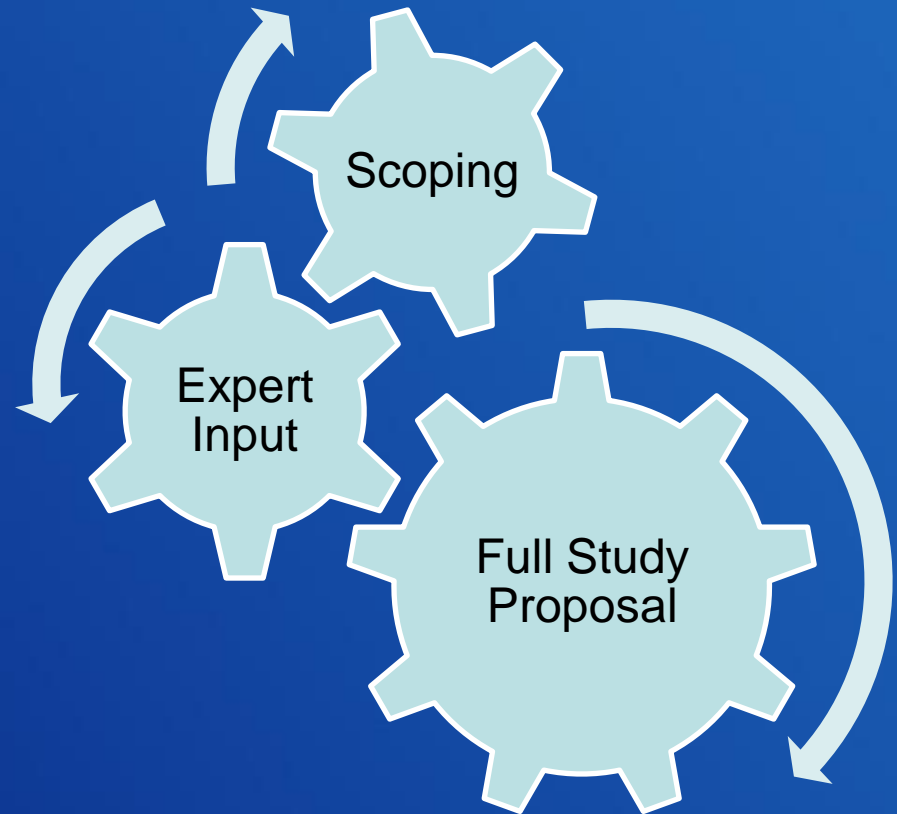
Create a reference presentation to solicit interest for a full proposal to review literature projecting climate change impacts on water quality.

This study will focus on the potential implications of water quality trends on Reclamation operations by connecting operational considerations with specific water quality trends.

This presentation will focus on highlighting and identifying research needs in water quality for areas within Reclamation due to climate change.

# Task 3. Research Review Solicitation and Full Project Proposal

Technical experts, each representing an area identified in Tasks 1 and 2, will review all relevant research to each task. Task 3 will consist of review by committee, comments for documentation, and revisions.



# Focus Areas Identified

Changes to water quality have the potential to influence a broad range of reclamation operations. These areas may include, but are not limited to:

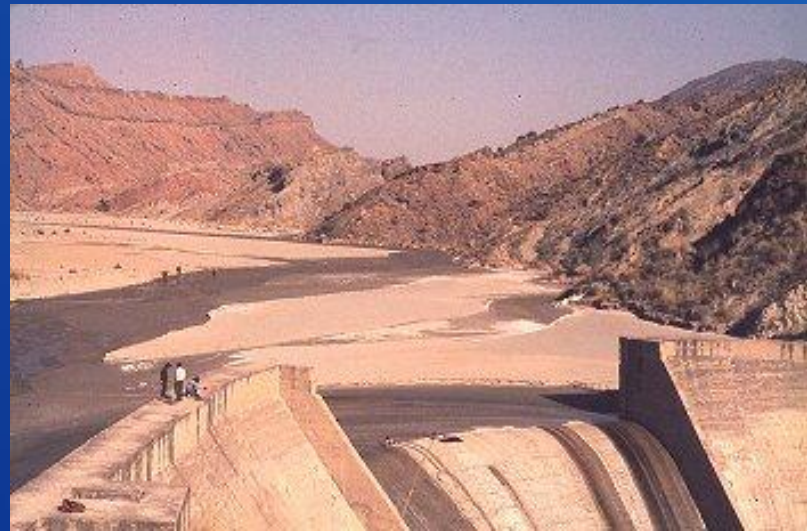
1. Agricultural Water Supply: Trends involving increased evaporation and salinity impairments to agricultural waters may limit suitable source waters for agricultural purposes.



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# Focus Areas Identified

2. Water Storage: Dam storage holding water volumes may be impacted by increased water temperature due to higher ambient conditions. Additionally, sediment loading behind dam structures may increase due to increased likelihood of wildfires causing high turbidity runoff and long term decrease in dam storage capacity.



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# Focus Areas Identified

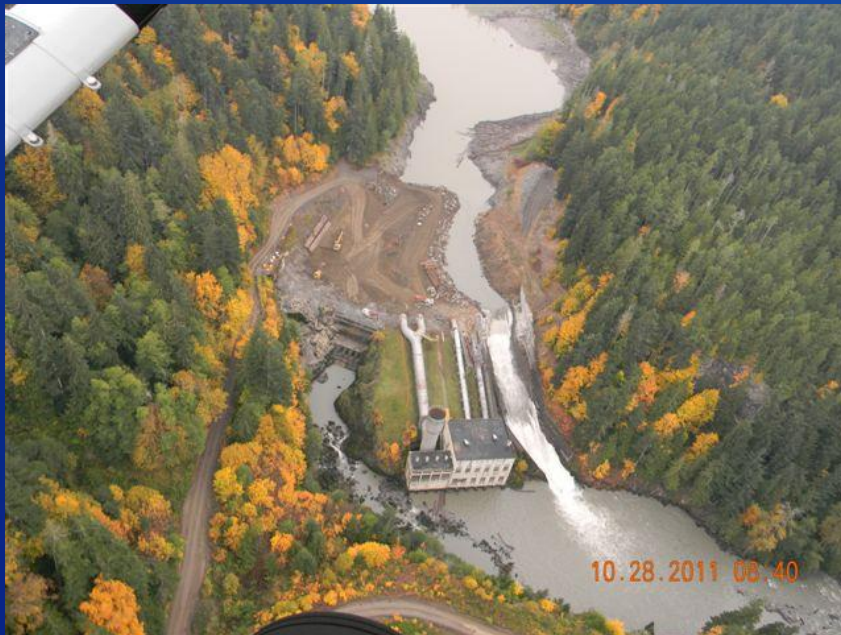
3. Invasive Species: Changing water conditions (e.g. water temperature, salinity) may become more conducive for invasive species and limit native species habitat in and around aquatic systems. Species such as Salt Cedar or Russian Olive also require more water than native species and can reduce overall water volume in impacted areas.



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# Focus Areas Identified

4. Restoration: Aquatic ecosystem restoration may have to consider increased sediment loading, water temperature and salinity when evaluating dam removal project influences on the environment.



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# Focus Areas Identified

5. Municipal Water Supply: Snowmelt storage may decrease based on certain projections and anthropogenic compound concentrations may increase in fresh water supplies due to reliance on higher mixing ratios from municipal wastewater discharge locations to supplement lower summer and fall water levels.



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# Focus Areas Identified

6. Water Treatment/Desalination: Water treatment systems are designed to facilitate treatment of specific water constituents. Water quality changes directly impact the capability of current water treatment infrastructure to successfully treat water resources and the design of future treatment plants to meet end user requirements.



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# Contact Information

Interested?

Please contact:

Katharine Dahm

Civil Engineer

Bureau of Reclamation

303.445.2495

[kdahm@usbr.gov](mailto:kdahm@usbr.gov)

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