

**BRIEF DESCRIPTION OF MOKELUMNE RIVER
SALMONID RESEARCH ACTIONS:**

- (1) Six-Year Interim Trap-and-Barge Study**
- (2) Ten-Year Monitoring Study**

- (1) Six-year interim trap-and-barge of natural and hatchery origin juvenile Mokelumne River Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*) to address potential operational changes to the Delta Cross Channel and the South Delta Facilities related to the California WaterFix project**

Overview

This study's purpose is to determine whether a trap-and-barge program is a feasible means to improve survival rates and offset potential WaterFix impacts to outmigrating Mokelumne salmonids. With the uncertainty surrounding the changes to operations and physical habitat that may result from the implementation of the WaterFix project, an alternative means is warranted to support population level survival for juvenile natural and hatchery origin Chinook salmon (*Oncorhynchus tshawytscha*) and federally-threatened steelhead (*O. mykiss*) from the Lower Mokelumne River (LMR) through the Delta.

Barging provides an alternative that protects fish from Delta water quality and predation issues, thereby improving survival. Barging also provides a clear migration path, unimpeded by physical structures and false attraction, or entrainment, due to pumping while allowing fish to imprint on the chemical signatures of the water from their basin of origin.

This program should be further developed using a collaborative process that is initiated and led by East Bay Municipal Utility District (EBMUD), CDFW and the California Department of Water Resources. This collaborative will coordinate with similar efforts being undertaken by other entities, including data mining, equipment design and operations plans, etc. to maximize the benefit of program to address Mokelumne River juvenile salmonids issues.

The proposed project includes three elements:

- 1) Construction and operation of two barge platforms.
 - a) One would be designed for hatchery produced fish. A lightweight aluminum work barge would be converted into a fish transportation barge and equipped with a capacity to transport smolt salmonids. The barge would be equipped with aerated fish transport tanks and a recirculating pump system to continuously exchange water as the barge is transporting fish downstream. Hatchery fish will be trucked from the Mokelumne hatchery to the barge site using standard hatchery trucking protocols, then pumped into the barge tanks for transport.
 - b) The second barge would be scaled down to accommodate natural production of wild salmonids on the LMR.
- 2) Design and deployment of a Juvenile surface collection facility to be operated in the vicinity of Lake Lodi and Woodbridge Irrigation District Dam. Location of deployment would be considered in the design criteria to optimize operations and maximize catch rate. Fish will be held either in in-channel live cars upstream of the barrier fence, or in surplus hatchery space until a minimum number is compiled, or a satisfactory size is obtained.
- 3) Staffing resources to operate the barge and surface collector for the six-year interim study period.

This interim trap-and-barge proposal should be implemented in coordination with the Monitoring Proposal described below in this document, which provides an evaluation of juvenile Mokelumne River Chinook salmon and steelhead migratory patterns in relation to water delivery rates, and pumping rates over six-year period of WaterFix operations.

Objectives

The objectives of the proposed trap-and-barge plan are:

- 1) to develop scientific and practical information needed to further improve management of Mokelumne River Chinook and steelhead fisheries, and specifically, to determine whether a trap-and-barge program is a feasible means to improve survival rates and offset potential WaterFix impacts to outmigrating juvenile Mokelumne salmonids;

- 2) to improve survival rates and reduce straying rates of Mokelumne juvenile anadromous fish during the study period to support the naturally producing population as well as maintain a native broodstock for the hatchery populations to reduce any impacts that may occur on these species related to the implementation of the WaterFix;
- 3) to fabricate and operate a barge system to transport hatchery produced juvenile salmon and steelhead from an appropriate location upstream of the confluence of the Mokelumne River and the Cosumnes River through the North Fork Mokelumne to Sherman Island;
- 4) to fabricate a robust collection facility or facilities to capture naturally produced juvenile salmonids at an appropriate location upstream of Lake Lodi, and transport these naturally produced salmon and potentially steelhead, depending on ESA permitting, through the same pathway; and
- 5) to fund the resources needed to maintain the system for the six-year interim study period in all water year types.

EBMUD technical staff will be included in all aspects of study design, analysis and interpretation.

Draft Budget

Total estimated cost of equipment, design and construction is approximately \$1.8 million, plus additional cost of small-dam application of a juvenile surface collector. Operation budget for the six-year interim study period is estimated at \$2.1 million.

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(2) Ten-year monitoring study to assess impacts to juvenile Mokelumne salmonids from potential operational changes to the South Delta Facilities related to the California WaterFix project

Overview

The purpose of this proposed monitoring project is to provide an assessment of changes to Delta operations under the WaterFix project, and specifically how these operational changes may affect Mokelumne River salmonids' downstream migration route selection and success, survival, and ability to meet production goals in the Mokelumne River without impacting neighboring watersheds due to excess straying. The study will assess presence, migration route, migration rate (travel time), and survival of juvenile Mokelumne River salmonids in relation to the WaterFix project. It includes pre-WaterFix and post-WaterFix monitoring and assessment, with the understanding that impacts incurred on Mokelumne River salmonids will be addressed and mitigated once study findings are concluded.

Evaluation of both Mokelumne River Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*) are necessary. Evaluation of juvenile salmonid downstream migration through the Central Delta, and success to the ocean, in relation to water delivery to the south Delta pumps will also be necessary. In order to provide a robust look at the wide range in variability in water-year type, Delta operations scenarios, climatology, and annual salmonid abundance, a minimum of three years' pre-project and three years' post-project are mandatory, but a five-year pre-and post- project is recommended as optimal.

This ongoing monitoring program should be further developed using a collaborative process that is initiated and led by East Bay Municipal Utility District (EBMUD) and the California Department of Water Resources. This collaborative will coordinate with monitoring presently being undertaken by other entities, data mining, equipment sharing, etc. to maximize benefit of the monitoring program to address juvenile Mokelumne River salmonids issues. The study will be coordinated with other tagging and monitoring efforts occurring in the Mokelumne River and the Delta to maximize data sharing while focusing on Mokelumne River salmonids.

Objectives

The objective of the proposed monitoring plan is to determine how outmigration of tagged juvenile salmonids through the Delta are affected by water deliveries to

the south Delta pumps under the existing condition, and under WaterFix operations. This question will be addressed in terms of fish presence, migration route, migration rate (travel time), and survival, through use of a combination of coded wire tag (CWT), acoustic and PIT tag technology on hatchery and wild juvenile Chinook salmon and yearling steelhead to determine movement through the Delta in relation to WaterFix operations.

Upon completion of this monitoring protocol, the collaborative developed through this process will develop an appropriate mitigation plan to alleviate any impacts related to the WaterFix that are determined based on the data collected and analyzed. EBMUD technical staff will be included in all aspects of study design, analysis and interpretation to determine impacts and mitigating actions.

Draft Budget

Total estimated cost for this study including study design and permitting, project management, equipment, and staffing is approximately \$4.5 million.

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