

# **Interagency Fish Passage Steering Committee 2014 Annual Report Focusing on the Shasta Dam Fish Passage Evaluation**

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## Attachments

1. Habitat Assessment
2. River Prioritization Matrix (page 355 of pdf document)
3. Fish passage technology matrix (page 358 of pdf document)
4. Pilot Plan Questions and Fish needed (page 360 of pdf document)
5. Stakeholder Communication and Engagement Plan (page 368 of pdf document)

## Background

The Shasta Dam Fish Passage Evaluation (SDFPE) is an effort to evaluate the feasibility of reintroducing Chinook salmon and steelhead to tributaries above Shasta Lake. A Fish Passage Pilot Implementation Plan is being developed with representatives from U.S. Bureau of Reclamation (Reclamation), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS), California Department of Water Resources (DWR), California Department of Fish and Wildlife (DFW), California State Water Board (Water Board), and the University of California Davis.

The SDFPE is part of Reclamation’s implementation of the June 4, 2009, Biological Opinion (BO) on the Long-Term Operation of the Central Valley Project (CVP) and State Water Project (SWP) by NMFS. The NMFS BO concluded that, as proposed, CVP and SWP operations were likely to jeopardize the continued existence of four federally-listed anadromous fish species: Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, California Central Valley steelhead, and the Southern

distinct population segment of the North American green sturgeon. The BO set forth a Reasonable and Prudent Alternative (RPA) that allows continued operation of the CVP and SWP in compliance with the federal Endangered Species Act (ESA).

The NMFS RPA includes a Fish Passage Program (Action V) to evaluate the reintroduction of winter-run and spring-run Chinook salmon and steelhead. Action V of the RPA applies to three dams operated by Reclamation: Shasta, Folsom, and New Melones. Action V specifies a Fish Passage Pilot Program for Shasta and Folsom and an evaluation of the potential for a pilot program in New Melones. The near-term goal for Action V, as stated in the RPA, is to increase the geographic distribution and abundance of the listed fish. The long-term goal is to increase abundance, productivity, and spatial distribution, and to improve the life history, health, and genetic diversity of the target species. Initial activities by the steering committee worked towards implementing pilot fish passage programs at at Shasta and Folsom dams. Due to the interagency resource coordination needs, complexity of the project, and similar technological aspects of the pilot evaluations between watersheds, the agencies decided to focus the initial pilot evaluations on Shasta Dam. Lessons learned from pilot evaluations at Shasta will be applied to evaluating passage at Folsom and New Melones.

## Steering Committee

The Interagency Fish Passage Steering Committee was formed in 2010 to focus on all three fish passage watersheds. The committee has evolved into the Shasta Fish Passage Steering Committee to reflect the focus on the fish passage pilot at Shasta. The agencies are devoting resources to Shasta initially before embarking on passage investigations on the multiple systems included in the RPA simultaneously. The following table lists Steering Committee membership.

### Interagency Fish Passage Steering Committee Members

Agency	Members
US Bureau of Reclamation	John Hannon, David van Rijn
National Marine Fisheries Service	Jeff McLain, Alice Berg
US Fish and Wildlife Service	Jim Smith, Donnie Ratcliff
CA Department of Fish and Wildlife	Tom Schroyer, Jason Roberts, Andrew Jensen
CA Department of Water Resources	Randy Beckwith, Ted Frink, Marc Commandatore
US Forest Service	Bill Brock, Michael Kellett
Academic member	Lisa Thompson
Water Board	Amber Villalobos

## Steering Committee Activities

During 2014 the steering committee focused on completing a pilot plan so that pilot studies to evaluate the feasibility of salmonid reintroduction above Shasta can begin as soon as possible. The group determined that winter-run Chinook should be the species used in the initial pilot studies. Therefore, Reclamation requested that NMFS promulgate a rule designating a non-essential experimental

population of Sacramento winter-run Chinook salmon in in the watershed upstream of Shasta Dam, pursuant to Section 10(j) of the Endangered Species Act for the purpose of completing the feasibility studies. The 10(j) designation will help address public concerns regarding listed species used for the feasibility studies. Designating an experimental population will allow for management of the population in furtherance of conservation, while providing for the continuance of otherwise lawful activities.

## Focus Areas

To guide the SDFPE effort, the participating agencies have identified six focus areas. Additional staff from the Steering Committee agencies participate in subcommittees developed to address technical items related to each of these focus areas:

- **Habitat:** Conduct habitat-related work including surveys, data collection, habitat maps, Habitat Assessment report, and related habitat issues and decisions.
- **Fish Passage Technology:** Develop and assess fish passage technology and passage efficacy, design, reservoir hydrodynamics, screen criteria, operations.
- **Fish Health and Genetics:** Assess the health of existing fish populations above Shasta Lake, and identify broodstock selection, and the health and genetics of the potential broodstock.
- **Pilot Planning:** Compile information from the Habitat, Fish Passage Technology, Fish Health and Genetics, and Policy and Regulation focus areas, as well as identifying other management activities and monitoring programs to successfully implement a pilot implementation program for fish reintroduction.
- **Policy and Regulations:** Define and comply with the National Environmental Policy Act, National Historic Preservation Act, Wild and Scenic Rivers System, and ESA permits and regulations as they relate to reintroduced salmon.
- **Public Outreach:** Coordinate and foster broad awareness and transparency of the SDFPE among the public, agencies, landowners, organizations, elected officials, and other interested parties.

## Habitat

A framework was devised for assessing spawning and rearing habitat upstream of Shasta Dam, focused on the McCloud and upper Sacramento rivers. The habitat assessment is intended to describe habitat availability and condition relative to the requirements for the freshwater life stages of salmon species being considered for reintroduction rather than quantitatively predict the potential production of salmon above Shasta Dam. This approach will provide sufficient information to estimate the potential number of salmon spawners that could be released and supported by the existing habitat conditions for purposes of a pilot reintroduction study. The analytical tools consist of a spatially-explicit stream classification procedure; a set of habitat suitability criteria derived from the literature; use of existing regionally relevant data and information, augmented with aerial videography and limited field verification surveys to fill data gaps; and assumptions concerning the potential distribution and use of habitat by salmon in portions of the watershed to which they have not had access for over 70 years.

The framework was developed by North State Resources under subcontract with MWH and in consultation with the habitat subcommittee of the IFPSC. The framework was completed in the fall of 2013 and habitat assessment work began in November 2013. Because of the large area to be covered by the assessment aerial video taken in November 2013 was used to document conditions in the

mainstem rivers. Aerial video was also taken in the tributaries with sufficient visibility from the air but most tributaries had extensive canopy cover preventing adequate video to be collected for data interpretations. Following the video data collection, ground truth surveys were conducted in 14 reaches to verify the interpretations of habitat features visible on the aerial video.

The habitat assessment is included as an appendix to this document. The results of the habitat assessment indicate that both the Upper Sacramento and McCloud rivers include habitats that could support winter-run Chinook spawning, egg incubation, and rearing. Considering that the primary reason for evaluating reintroduction potential for winter-run is the expected reduction in cold water below Keswick Dam with climate change, the following are key differences between the two rivers relative to a long-term reintroduction program for winter-run Chinook:

- The McCloud has approximately 11.6 miles and the Upper Sacramento has 9 miles (Figure 1) of habitat within the 56 F egg incubation temperature used as the criteria for optimal egg incubation below Keswick Dam.
- The McCloud has an estimated capacity for approximately 3,000 spawning female Chinook and the Upper Sacramento has estimated capacity for approximately 200 females within the thermally suitable zone for winter-run. This estimate used a spawning territory size of six square meters per female.

Results of the habitat assessment are being used along with outreach activities and logistical information to determine where to begin with fish releases for the initial pilot studies. A matrix was devised to compare aspects of the Upper Sacramento and McCloud river watersheds to consider in deciding where to start with the study.

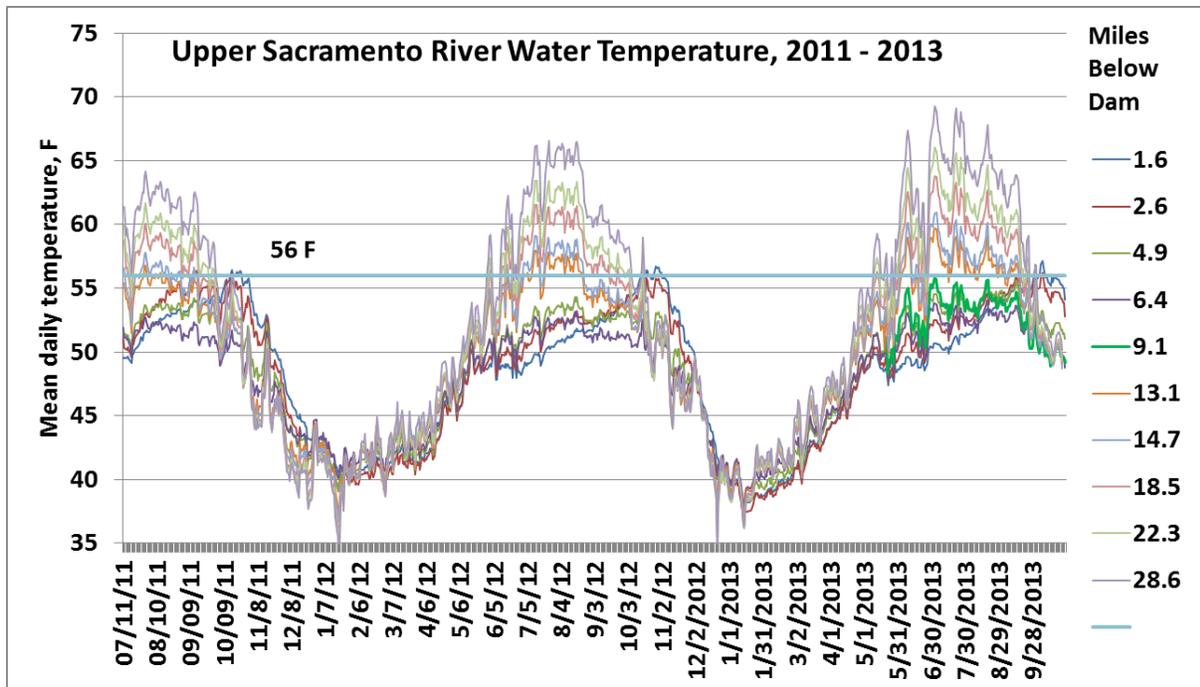


Figure 1. Upper Sacramento River mean daily water temperatures at stations established for the fish passage evaluation, 2011 - 2013. Locations are identified by miles below Box Canyon Dam. The 9.1 mile location was added in 2013.

### Fish Passage Technology

The Shasta Fish Passage Technology Subcommittee is a multi-agency group supporting the Shasta Fish Passage Steering Committee with members from Reclamation, NMFS, CDFW, and CDWR. The purpose of the Subcommittee is to identify potential fish juvenile and adult passage methods at a preliminary level and determine which methods are preferred. The Subcommittee will identify precedents where passage over high dams is accomplished in the U.S. and world. The group will examine non-biological implementation issues specific to Shasta Dam (e.g. reservoir complexity/size, storage fluctuation, thermal stratification, temperature control device operations, sport fishery, recreational use, haul distance, access, Keswick Dam operations, potential dam raise), examine impacts to dam operation, and identify risk factors to implementation.

Specific activities accomplished by the Fish Passage Technology Subcommittee include:

- Created matrix of upstream and downstream fish passage alternatives including a description, pros and cons, and recommendations as to whether the concept is worth further evaluation for a temporary pilot program or long-term implementation.
- Organized a kick-off meeting with researchers at University of Nevada-Reno to discuss model set-up and goals for the hydrodynamic and thermal CE-QUAL-W2 modeling of head-of-reservoir locations in the Sacramento and McCloud arms. Committee members are providing continued guidance and support to the modeling effort.

- Coordinated with Reclamation's Water Treatment Group (Technical Service Center, Denver, CO) on identifying costs associated with installing an ozone or ultraviolet treatment system at Livingston Stone National Fish Hatchery.
- Interacted with other subcommittees and MWH contractor

## **Fish Health and Genetics**

The fish health group is working to address fish health concerns related to the capture, transport, and release of lifestages of Chinook between habitats below Keswick Dam, Livingston Stone National Fish Hatchery (NFH), and habitats upstream of Shasta Dam. The project is focusing on winter-run Chinook as the test run for the initial pilot studies with the source of fish coming from the Livingston Stone NFH.

The USFWS and CDFW are conducting a cooperative disease study to determine prevalence of fish diseases in resident fish populations above Shasta Dam. The study is focusing on rainbow trout sampled initially in the lower reaches of the Upper Sacramento and McCloud rivers above Shasta Lake. The study will help to address concerns over potential disease effects related to transmission of pathogens between Chinook salmon, resident species, and other pathogen hosts.

There is concern that using adult Chinook salmon from below Shasta and releasing them upstream of Shasta may transfer diseases (infectious hematopoietic necrosis primarily) into waters that feed Livingston Stone NFH and result in reduced survival in the hatchery fish. A cost estimate for a water treatment system to treat the source water for Livingston Stone NFH is being devised. Indications from the pathology group are that adults cannot be moved until hatchery source water is treated so initial pilot studies will likely need to rely on introducing eggs and/or juveniles into habitats upstream of Shasta.

## **Pilot Plan**

The pilot plan is being formulated based on questions that need to be answered to make an informed decision regarding whether to proceed with a long term fish passage program at Shasta Dam. The plan will involve obtaining adult winter-run from the Keswick trap, spawning the fish at Livingston Stone NFH, hatching eggs at the hatchery and also transporting eggs to habitats in the McCloud and/or Upper Sacramento rivers for incubation. The fry and/or juveniles from the eggs incubated at the hatchery would be transported to upstream habitats for studies in the habitat. The upstream studies would include egg incubation success, juvenile survival, emigration timing and sizes, within lake survival, and fish behavior in the vicinity of potential juvenile long-term juvenile collection locations.

The request for fish from Livingston Stone NFH will need to go in to the USFWS hatchery operators in February so that additional fish can be held for spawning. The initial fish request is estimated at 120 adults (60 females and 60 males) or the offspring of 120 adults. This is based on an estimation of minimum numbers of winter-run individuals needed to determine whether adequate survival through

the system upstream of Shasta Dam can be realized in order to justify construction of a more elaborate juvenile collection system.

## **Pilot Plan Outline**

### 1.0 Introduction

- 1.1 Project Background
- 1.2 Purpose and Need
- 1.3 Pilot Study Objectives (RPA)
- 1.4 Other Goals and Objectives
- 1.5 Pilot Study Project Area
- 1.6 Regulatory and Management Issues

### 2.0 Salmonid Habitat Above Shasta Dam

- 2.1 Watershed Characteristics
- 2.2 Spawning Capacities
- 2.3 Rearing Habitat and Potential Smolt Production Capacities
- 2.4 Synthesis of Habitat Inventory Results
- 2.5 Potential Resilience to Climate Change

### 3.0 Stock Selection and Genetic Management for Pilot Study

- 3.1 Reintroduction Strategy
- 3.2 Recovery Priorities for Winter-run Chinook Salmon
- 3.3 Viable Salmonid Populations
- 3.4 Project Benefits and Opportunities
- 3.5 Project Constraints
- 3.6 Project Risks
- 3.7 Stock Selection Considerations
- 3.8 Criteria Used by Others for Reintroduction Efforts
- 3.9 Genetics
- 3.10 Potential Sources of Donor Stock for Reintroduction above Shasta Dam
- 3.11 Winter Run Chinook Salmon Life History
- 3.12 Winter-run Chinook Salmon Hatchery Production/Stocks

### 4.0 Adaptive Management of the Pilot Study

- 4.1 Pilot Study Overview
- 4.2 Phased Approach to Reintroduction
- 4.3 Key Milestones and Decision Points
- 4.4 Use of Pilot Study Information

### 5.0 Fish Passage Options

- 5.1 Upstream Passage
- 5.2 Downstream Passage

### 6.0 Pilot Studies

- 6.1 Metrics and Measures of Success
- 6.2 Adults

- 6.2.1 Prespawn Survival Rate
  - 6.2.1.1 Existing Information
  - 6.2.1.2 Life Stage Key Question
  - 6.2.1.3 Metric
    - 6.2.1.3.1 Evaluation options
- 6.2.2 Adult Distribution
  - 6.2.2.1 Existing Information
  - 6.2.2.2 Life Stage Key Question
  - 6.2.2.3 Metric
    - 6.2.2.3.1 Evaluation options
- 6.2.3 Monitoring and Study Plans
  - 6.2.3.1 Movement
  - 6.2.3.2 Habitat Use
  - 6.2.3.3 Survival
- 6.3 Eggs
  - 6.3.1 Egg-to-Fry Survival
    - 6.3.1.1 Existing Information
    - 6.3.1.2 Life Stage Key Question
    - 6.3.1.3 Metric
      - 6.3.1.3.1 Evaluation options
  - 6.3.2 Monitoring and Study Plans
    - 6.3.2.1 Egg-to-Fry Survival
    - 6.3.2.2 Habitat
- 6.4 Juveniles
  - 6.4.1 Juvenile Transport
    - 6.4.1.1 Existing Information
    - 6.4.1.2 Life Stage Key Question
    - 6.4.1.3 Metric
      - 6.4.1.3.1 Evaluation options
  - 6.4.2 Juvenile Production
    - 6.4.2.1 Existing Information
    - 6.4.2.2 Life Stage Key Question
    - 6.4.2.3 Metric
      - 6.4.2.3.1 Evaluation options
  - 6.4.3 Juvenile Distribution and Migration
    - 6.4.3.1 Existing Information
    - 6.4.3.2 Life Stage Key Question
    - 6.4.3.3 Metric
      - 6.4.3.3.1 Evaluation options
  - 6.4.4 Monitoring and Study Plans
    - 6.4.4.1 Movement
    - 6.4.4.2 Habitat Use

- 6.4.4.3 Survival
- 6.5 Ecological Interactions with Resident Fish
  - 6.5.1 Resident Trout (Rainbow and Brown)
    - 6.5.1.1 Existing Information
    - 6.5.1.2 Life Stage Key Question
    - 6.5.1.3 Metric
      - 6.5.1.3.1 Evaluation options
  - 6.5.2 Predator Interactions
    - 6.5.2.1 Existing Information
    - 6.5.2.2 Life Stage Key Question
    - 6.5.2.3 Metric
      - 6.5.2.3.1 Evaluation options
  - 6.5.3 Monitoring and Study Plans
    - 6.5.3.1 Movement/Timing
    - 6.5.3.2 Ecological Interactions
- 6.6 Pilot Reintroduction Schedule

## Policy and Regulatory

The policy and regulatory group has been addressing issues related to acquiring any needed Federal and state permits or approvals to implement pilot study activities using ESA listed species. In addition the group has been determining how the addition of a listed fish into the waters upstream of Shasta will affect currently occurring activities and how to protect compatible uses. An issue identified by landowners during outreach activities concerns the potential change in timber harvest regulations with the listed fish presence. The Anadromous Salmonid Protection (ASP) regulations apply to watersheds where an anadromous salmonid that is listed as threatened, endangered, or a candidate under State or Federal ESAs are “currently present or can be restored.” Watersheds covered by the rules are defined in maps adopted with the ASP rules. These maps exclude watersheds above permanent dams which “attenuate the transport of fine sediments to downstream water courses with listed anadromous salmonids.” The current maps – as effective on January 1, 2010 – exclude watersheds above Shasta Dam from ASP rules. Absent changes to the maps by the Board of Forestry, there is no mechanism for ASP rules to be applied to the SDFPE.

## Outreach

Outreach activities occurred throughout the year to provide information to the public regarding the Project and to gather public opinion regarding the project.

A Stakeholder Communication and Engagement Plan (Plan) was developed to provide strategic guidance, an organizational structure, and a generalized task outline to engage local, regional and statewide landowners, stakeholders, project influencers, interested organizations, and the public in the

Project. This Plan contains near-term activities primarily focused on local and regional engagements to foster participation and input to technical studies. Long-term communication and engagement actions will be incorporated to the Plan over time based on feasibility study results.

The Plan details the approach, methodology and activities for communication and engagement actions for the Project process in a way that provides the Project Team critical information needed to understand the needs and opportunities to improve the Project.

The outreach and engagement approach for the Project has four landowner and stakeholder participation goals:

- Inform the public regarding the process and progress for the Project; including development and distribution of background and technical information, availability for information interviews and briefings, and timely updates to the program Web site.
- Support meaningful and sustainable stakeholder engagement in the Project process with primary stakeholders through regular and efficient communication, common-sense scheduling of meetings within the project area, and tailoring presentations and communication methods to the unique needs of each stakeholder group.
- Document stakeholder insights, recommendations, and concerns for incorporation into the planning process by creating open and reliable communication channels, recording detailed meeting minutes, and by making staff time available to stakeholders. Consideration of disadvantaged community issues, environmental justice, and engagement with both federally –recognized and non-federally recognized tribes.
- Set the foundation for successful future collaborative partnerships between the Project Team and primary stakeholders beyond pilot reintroduction of fish.

#### Landowner and Stakeholder Analysis

An early implementation step of the Project – and a major contributor to inform the development of the Plan – is the Landowner and Stakeholder Analysis (LSA). The LSA is a summary of results from anonymous interviews conducted by MWH with Project stakeholders on a variety of topics salient to the Project and initial actions for fish reintroduction. These 1-hour, one-on-one interviews measured initial awareness of the Project goals and objectives, served as a vehicle to identify additional stakeholders, assisted in determining preferred communication channels of stakeholder groups, and collected advice for possible communication and engagement activities, tactics and approaches. The LSA is included as an appendix to the attached communication plan.

Outreach is an ongoing part of the Project and has includes public meetings, meetings with watershed and landowner specific groups, public presentations, and posting of materials on the project website.

## Schedule

The current timeline for implementation of the pilot studies starting with the release of test fish (eggs and/or juveniles) in a tributary to Shasta Lake has a goal of fish releases in 2015. Based on the winter-run lifecycle adult collections will need to be worked out to begin in February 2015 at the Keswick trap and Livingston Stone NFH facilities. Eggs for studies in the river would need to be placed in the June to July 2015 timeframe and fry or juveniles starting in September 2015. Activities to be completed prior to the fish releases include the completion of the pilot plan, environmental assessment, and experimental population designation.

## **American River - Precursor Study to the Fish Passage Evaluation at Folsom**

The target species for fish passage at Folsom, as specified in the RPA, is Central Valley steelhead. RPA Action II.6.1(2) prescribes a study evaluating the potential for replacement of the Nimbus Hatchery (American River) steelhead broodstock with a genetically more appropriate source. The current broodstock was derived from the Eel River and not considered to be a part of the California Central Valley steelhead DPS. Replacing the current broodstock would enable the American River to more effectively contribute to recovery of California Central Valley steelhead. The current stock consists of large individuals which support a popular sports fishery in the American River.

The broodstock replacement study, contracted by Reclamation with Cramer Fish Sciences, is being conducted in cooperation with the Nimbus Hatchery Coordination team. This interagency team provides technical advice on hatchery operations and is following up on the California hatchery review recommendations. To date the broodstock replacement study has collected nearly 600 resident rainbow trout genetic samples from the American River tributaries upstream of Folsom Reservoir at 15 sites below and above historic barriers to anadromy. The samples will be analyzed to help determine which fish could qualify genetically as appropriate stock for replacement of the broodstock. The study will then collect eggs from study fish (upstream of Folsom and potentially from other Central Valley steelhead broodstocks such as Feather River). The test stocks will be raised to determine their ability to survive and grow in the Nimbus Hatchery environment and their tendency towards anadromy. Following the tests in the hatchery environment the fish would be released into the American River to look at survival and anadromy in the wild. The final study plans are being worked out with a goal to collect eggs from test stocks early in 2015.

The results of this study would then feed into the fish passage studies in the American River using an appropriate stock that could meet the goals of the RPA.