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Shasta Reintroduction and Water Supply Benefit
Prepared by NMFS West Coast Region

Executive Summary

A successfully reintroduced population of Sacramento River winter-run Chinook salmon above Shasta Reservoir in California is anticipated to have a water supply benefit and mitigate risks to the species that currently exists below Shasta reservoir. A successfully reintroduced population of winter-run Chinook salmon above Shasta also could beneficially affect outcomes of future Endangered Species Act (ESA) consultations on long-term operations of the Central Valley Project (CVP) and State Water Project (SWP), including consideration of how the Shasta reasonable and prudent alternative (RPA) is structured.

Status of Winter-run Chinook Salmon

Historically, the upper Sacramento River watershed supported four populations of winter-run Chinook salmon. Following the completion of Shasta and Keswick Dams, and hydroelectric development on Battle Creek, only a single population persisted. This single remaining population, the ESA-listed endangered Sacramento River winter-run Chinook salmon (winter-run Chinook salmon) evolutionarily significant unit (ESU), survives downstream of Keswick Dam and is reliant on cold-water releases from Shasta reservoir to provide necessary habitat conditions in the Sacramento River for adult pre-spawn holding and for egg and fry incubation.

Recognizing the imperiled state of the winter-run Chinook salmon population, NOAA's National Marine Fisheries Service' (NMFS') 2014 Recovery Plan for winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and California Central Valley steelhead[1] indicates that three viable populations are necessary for recovery (i.e., delisting) of the species. Though it would still be far from recovered, securing a second winter-run Chinook salmon population above Shasta Reservoir would notably improve this species' current status and viability.

Background on Shasta Operations for Winter-run Chinook Salmon Protection

On June 9, 2009, NMFS issued a biological opinion and RPA on the long-term operation of the CVP and SWP.[2] The RPA contains 72 individual actions that, when combined and taken as a whole, is the ***minimum*** needed to avoid jeopardizing the continued existence of winter-run Chinook salmon (and other ESA-listed anadromous fish species). The Shasta RPA measure (Suite 1.2) contains ten sub-actions that include: performance measures; fall actions related to storage and releases; spring actions related to forecasting spring and summer operations and related releases; storage volumes and temperatures; summer actions related to temperature management; and drought contingency plans.

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[1] http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/california_central_valley/california_central_valley_recovery_plan_documents.html

[2] The RPA was later amended in 2011, and can be found at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

CVP and SWP operational decisions in 2014 and 2015 highlighted the constraints between water supply and species protection, particularly with respect to operations at Shasta Reservoir. With low storage due to drought conditions, and only one population of winter-run Chinook salmon below the dam, U.S. Bureau of Reclamation (Reclamation) and NMFS sought to protect storage and cold water availability in spring and summer. With models showing only marginally protective water temperatures for winter-run Chinook salmon spawning and rearing, NMFS, along with the California Department of Fish and Wildlife (DFW) and the US Fish and Wildlife Service (FWS), took emergency contingency measures to protect the species, including enhanced conservation hatchery operations, real-time monitoring, and fish rescues. These operational decisions had far-reaching water supply effects, including contributing to Reclamation's decision to fulfill exchange contract supplies with Friant Division water, which had subsequent effects for Friant Division water allocations. In addition, due to multiple factors, the operations at Shasta were unfortunately not successful enough in protecting winter-run Chinook salmon, and the 2014 and 2015 wild year classes experienced approximately 95% mortality in the upper river.

This decline in the status of winter-run Chinook salmon and lack of effective performance of the Shasta RPA in drought years are the subject of current scientific review and analysis. In August 2016, Reclamation reinitiated consultation on the long-term operations of the CVP and SWP to address changes in the status of the winter-run Chinook salmon population and to further evaluate the effectiveness of the existing Shasta RPA. In January 2017, NMFS proposed an amendment to the Shasta RPA to improve temperature management for evaluation and study prior to the full reinitiation of consultation on CVP and SWP operations. NMFS and Reclamation held four stakeholder workshops in 2017 and 2018 to share the results of this study. These studies continue to inform ongoing discussions regarding the nature and extent of adjustments to the Shasta RPA in the larger CVP and SWP reconsultation.

Benefit of Reintroduction Effort to Shasta Operational Flexibility

Having an additional population of winter-run Chinook salmon above Shasta Dam in the McCloud River could provide more operational flexibility for Shasta Reservoir operations. For example, with at least two winter-run Chinook salmon populations, the status of winter-run Chinook would not be as dire, and NMFS' emphasis on protecting the current population downstream of Shasta would not be as risk averse, particularly during future droughts when management of Shasta Reservoir operations is most challenging. A second winter-run Chinook salmon population would buffer the species' extinction risk if catastrophic losses to the downstream Sacramento River population occurred, as they did when 95% of the wild year classes were lost in 2014 and 2015. This buffering could allow managers more flexibility to balance other critical water supply and water quality demands.

A second successful winter-run Chinook salmon population in the McCloud River above Shasta Dam also creates options for fisheries managers during future droughts, climate change, or similar challenging water-resource conditions. For example, during periods of elevated temperatures, NMFS, DFW and FWS could consider strategies for removing/rescuing fish from the current population below Keswick Dam to the location of the second population (e.g., the McCloud River) if cooler habitat conditions on the McCloud River are more conducive to species survival.

Without this reintroduction effort, management of Shasta Reservoir operations is likely to remain tightly constrained to ensure enough cold water is available to protect the single remaining population of winter-run Chinook salmon that spawns below Shasta Dam. Once a second population is established in its native, cold-water habitat of the McCloud River, NMFS will be able to evaluate Reclamation's proposed Shasta Reservoir water operations and balance risk across the populations. This analysis will allow for the effects of the same proposed operations distributed over multiple populations, which is expected to result in more flexible water supply operations than would occur with only one population.

NMFS Tools to Support Evaluation of Shasta Reservoir Water Operations Scenarios

NMFS' Southwest Fisheries Science Center's winter-run Chinook salmon life cycle model could be used to evaluate Shasta Reservoir water operations scenarios with and without the winter-run Chinook salmon reintroduction program. This tool could also be further developed to provide some quantitative estimates to accompany the reintroduction program. NMFS recommends that this modelling and scenario analysis be included in the reinitiation of consultation on CVP and SWP operations.