BUREAU OF RECLAMATION

Assessment for CVP and SWP Delta Operations on ESA and CESA-listed Species

April 21, 2025

CVP and SWP export modifications more positive than -5,000 are unlikely to reduce loss or change the population level effect of exports on Central Valley Steelhead.

Executive Summary

Operational Conditions

Section 3.13.3.4.1 of the Proposed Action and Section 8.1.4. of the Incidental Take Permit provide that during Old and Middle River (OMR) Management, the California Department of Water Resources, in coordination with Reclamation, shall provide State Water Project (SWP) and Central Valley Project (CVP) operational outlooks and assessments on a weekly basis to Water Operations Management Team (WOMT).

- The steelhead annual and weekly distribution loss thresholds have not been exceeded.
- The Delta is in excess condition with restrictions for Old and Middle River flow.
- As of April 3, 7-day average Qwest was 6,387 cfs. Modeling shows the zone of influence by exports of -5,000 is restricted to the South Delta.

Central Valley Steelhead

Loss of natural-origin steelhead has occurred in the past week. Over the next week, loss of steelhead is likely based on historical data, but unlikely to exceed the annual or weekly distributed loss threshold at current rates. The steelhead incidental take limit will not be exceeded by any loss that may occur.

Operational and Regulatory Conditions

See current Weekly Fish and Water Operation Outlook document.

Biology, Distribution, and Evaluation of Central Valley Steelhead Winter-run Chinook Salmon

- Delta Life Stages
    - Juveniles, Adults
- Brood Year 2025 Information
    - Adult steelhead are migrating through the Bay-Delta.
- Brood Year 2024 Information
    - Catch of steelhead at Red Bluff Diversion Dam has slowed. Mean cumulative weekly passage of steelhead during calendar year 2025 through April 20 at Red Bluff Diversion Dam (RBDD) for the last 20 years of passage data is 8.1%. A majority of this brood year passed RBDD in 2024.
    - Delta entry sampling (i.e. Knights Landing RST, Sacramento Trawl) have observed no steelhead in the past week suggesting that few steelhead are still migrating into the Delta. Historically, on average 81.8% of steelhead have been captured at the delta entry Sacramento Trawl and over 71%, on average, have been captured exiting the delta at Chipps Island as of March 31 (see Table 1).
    - The STARS model estimates of steelhead through-Delta survival across all routes during March of AN water year types was 0.64, respectively, from the LTO Biological Assessment (USBR 2024). This model used acoustically tagged later fall Chinook released during the winter and early spring. From April 1 to April 26, the STARS model estimated overall survival between 0.57 and 0.63. Overall survival is expected to stay consistent in the next five days (Figure 1).
    - Historically, on average 75% of steelhead have been lost at the facilities by April 20 (Table 1). If historical loss trends continue during water year 2025, cumulative loss of juvenile steelhead is expected to continue, but not reach the annual loss threshold (Figure 2).
    - Cumulative loss of juvenile steelhead has peaked, based on historical trends, and has been low this water year (Figures 3 & 4). Overall, seasonal loss (n=553) has been less than predicted for steelhead (Figure 5) and is 18.4% of the steelhead annual loss threshold. In the last 7 days, steelhead have been salvaged leading to a weekly 7-day running loss of 24.48 as of April 20 (Table 2).

Delta Hydrodynamics

Based on forecasted Sacramento and San Joaquin River inflows in the weekly fish and water operations outlook, the Delta hydrodynamics approximate those in HiMed and HiLo categories (USBR 2024). In the HiMed condition, when the modeled proportion of the total DSM2 channel length experiencing medium hydrologic influence at -5,000 and -3,500 is measured, we see the proportion of channel length experiencing hydrologic influence is approximately twice as large at -5,000 from 188,818 feet to 392,039 feet. (USBR 2024 Figure I.3-121). When this is considered

spatially, areas that reflect medium and high hydrologic alteration (0.0-0.75 proportional overlap of estimated velocities) at DSM2 nodes retreats from Rock Slough south to Railroad Cut when OMR are modified from -5,000 to -3,500 (USBR 2024 Figure I.3-107). This zone of influence extends east along Grant Line Canal to the Head of Middle River, but does not go further east to Head of Old River.

In the HiLo condition, when the modeled proportion of the total DSM2 channel length experiencing medium hydrologic influence at -5,000 and -3,500 is measured, we see the proportion of channel length experiencing hydrologic influence is approximately 60% larger at -5,000 from 153,086 feet to 242,315 feet (USBR 2024 Figure I.3-121). When this is considered spatially, areas that reflect medium and high hydrologic alteration (0.0-0.75 proportional overlap of estimated velocities) at DSM2 nodes retreats from Rock Slough south to Railroad Cut when OMR are modified from -5,000 to -3,500 (USBR 2024 Figure I.3-107). This zone of influence extends east along Grant Line Canal to the Head of Middle River, but does not go further east to Head of Old River.

Evaluation

Last week, natural-origin steelhead loss was observed and is likely to continue based on historic trends, modeling and this year's observations (Table 1, Figures 3, 4, & 5). Median predicted loss is expected to occur at similar rates in the –5000 OMRI scenario than the more positive OMRI scenarios (Figures 6 & 7; Table 3a, 3b) using the Tillotson et. al. model (2022) with a high amount of uncertainty in the predictions.

Hydrodynamics in the Delta suggest the export footprint does not extend into the Interior Delta and remains south of Frank's Tract. These conditions suggest a small risk on entrainment for migrating juvenile steelhead from the Sacramento River and San Joaquin rivers.

Table 1. Historic migration and salvage patterns for steelhead. Average percentage and 95% confidence intervals in parentheses. Last updated 4/21/2025.

Species	Red Bluff Diversion Dam	Knights Landing RST	Sac Trawl	Chipps Island Trawl	Salvage
Steelhead, Unclipped (January-December)	8% (4%,13%) BY: 2015 - 2024	64% (42%,87%) BY: 2015 - 2024	82% (67%,96%) BY: 2015 - 2024	71% (58%,84%) BY: 2015 – 2024	N/A
Steelhead, Unclipped (Water Year)	N/A	N/A	N/A	N/A	74% (65%,84%) WY: 2015 – 2024

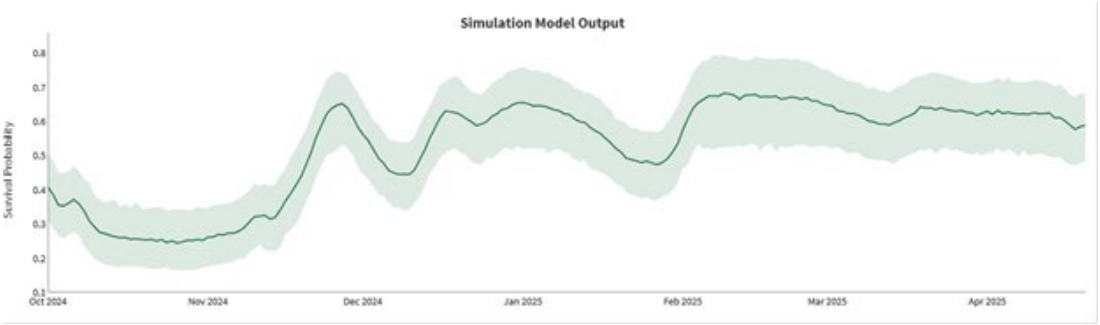

Figure 1. Simulation Model Output

Figure 1 is a line graph depicting Temporal variation in overall survival estimates for outmigrating juvenile late fall run Chinook Salmon in the Delta with 80% credible intervals (shaded region) from October 1 to April 26.

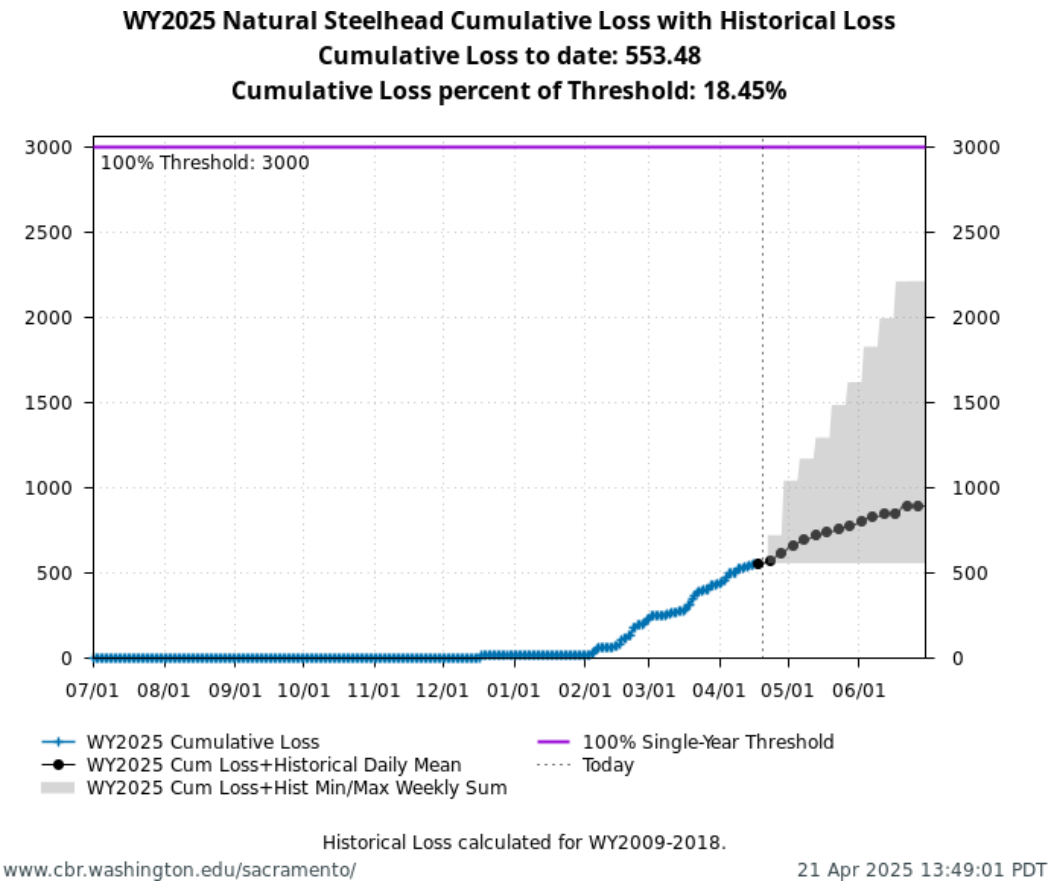

Figure 2. WY2025 Natural Steelhead Cumulative Loss with Historical Loss.

Figure 2 is a line graph depicting cumulative steelhead loss and historical minimum and maximum trends in loss. Cumulative loss to date is 553.48, and cumulative loss percent of threshold is 18.45%.

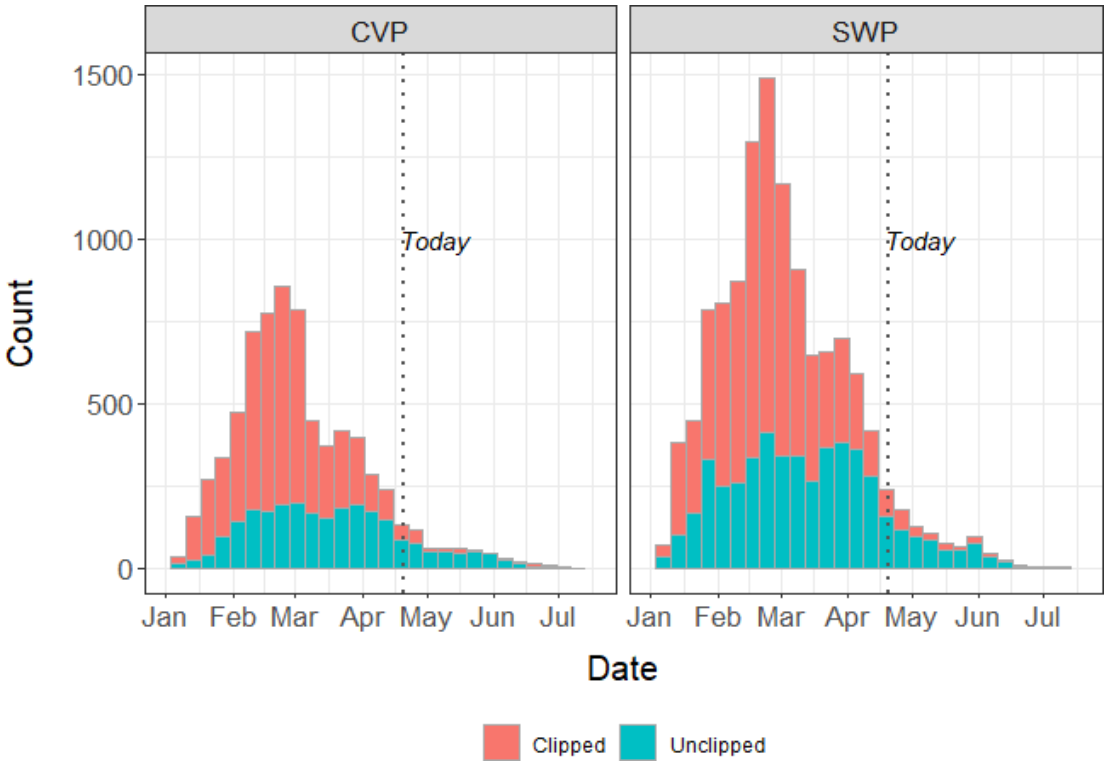

Figure 3. Distribution of natural and hatchery steelhead salvaged at the Central Valley Project (CVP) and State water project (SWP) from 1994-2024.

Figure 3 is two bar graphs depicting Count (0-1,500) over months January-July. Clipped steelhead are shown in orange, and unclipped steelhead are shown in turquoise. A vertical dotted line represents the most current date (April 21).

Table 2. Summary of daily loss of steelhead to inform weekly distributed loss thresholds. Steelhead weekly distributed loss thresholds are triggered when 7-day rolling sum of estimated loss 120 fish.

Date	Steelhead Daily Salvage	Steelhead 7-day rolling sum loss	Steelhead Daily Trigger
Apr 15	2.72	39.08	No
Apr 16	8.16	27.20	No
Apr 17	5.44	32.64	No
Apr 18	0.00	32.64	No
Apr 19	0.00	24.48	No
Apr 20	2.72	24.48	No
Apr 21	0.00	19.04	No

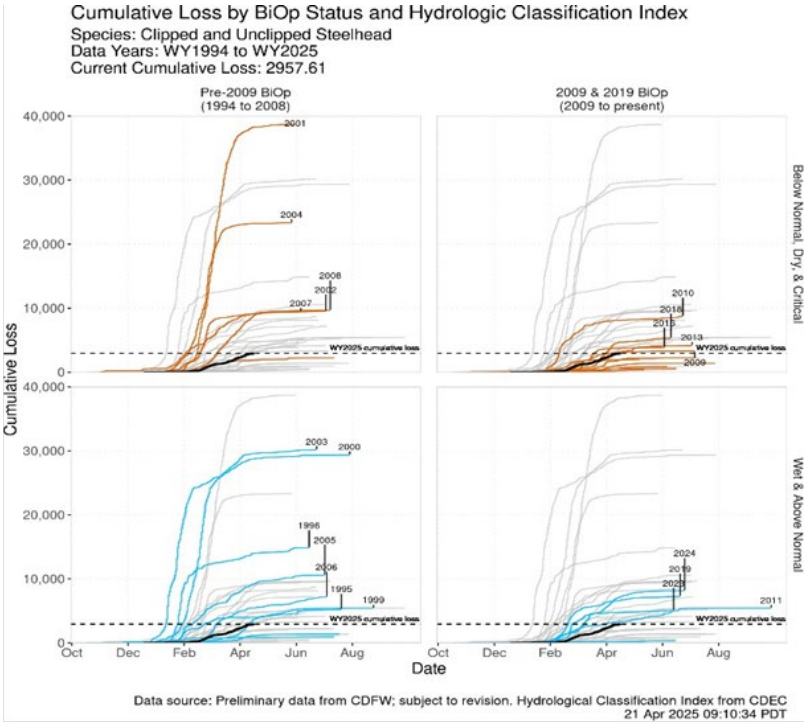

Figure 4. Cumulative Loss by BiOp Status and Hydrologic Classification Index (HCI)

Figure 4 is a plot of 4 line graphs. Each quadrant of the faceted plot includes grey lines for historical years, colored lines (blue for wet years, red for dry years) for years within the BiOp status and HCI type, a black line for the current year, and a dashed horizontal line indicating the current cumulative loss maximum.

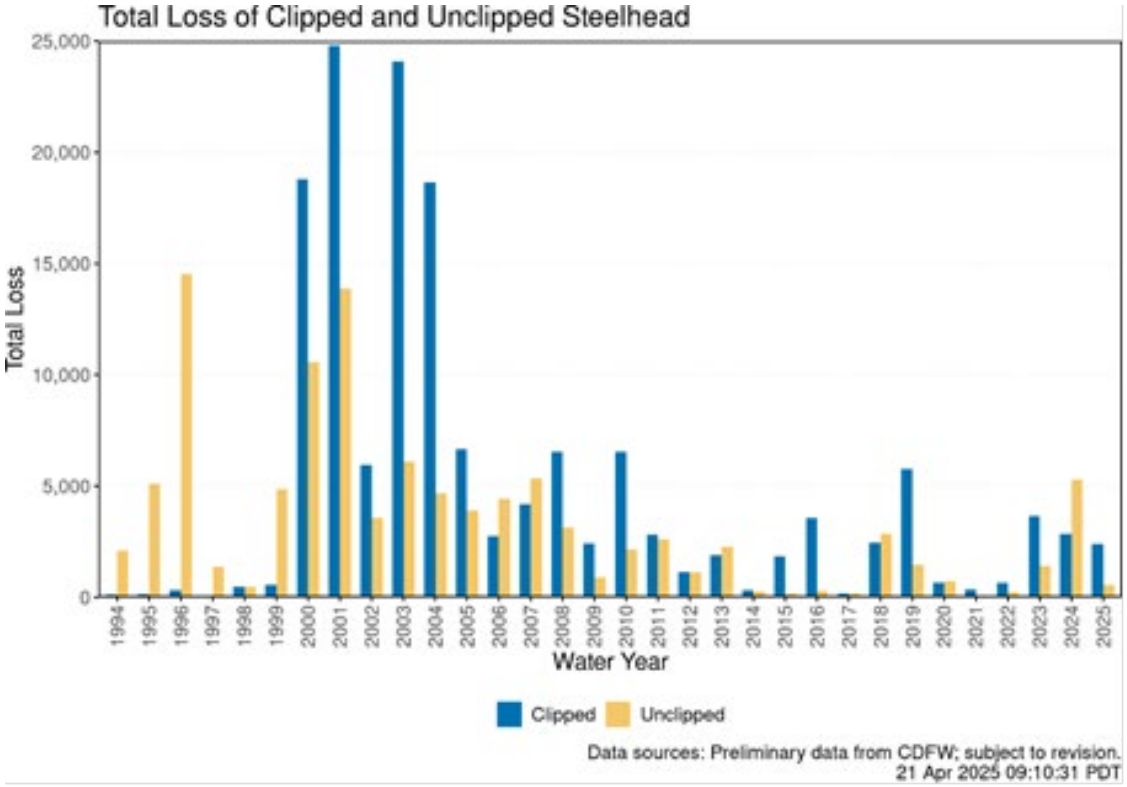

Figure 5. Total Loss of Clipped and Unclipped Steelhead

Figure 5 depicts total loss by year of clipped and unclipped steelhead. The y-axis is Total Loss (0-25,000) and the x-axis is years 1994-2025. Clipped steelhead are shown in blue, and unclipped steelhead are shown in yellow.

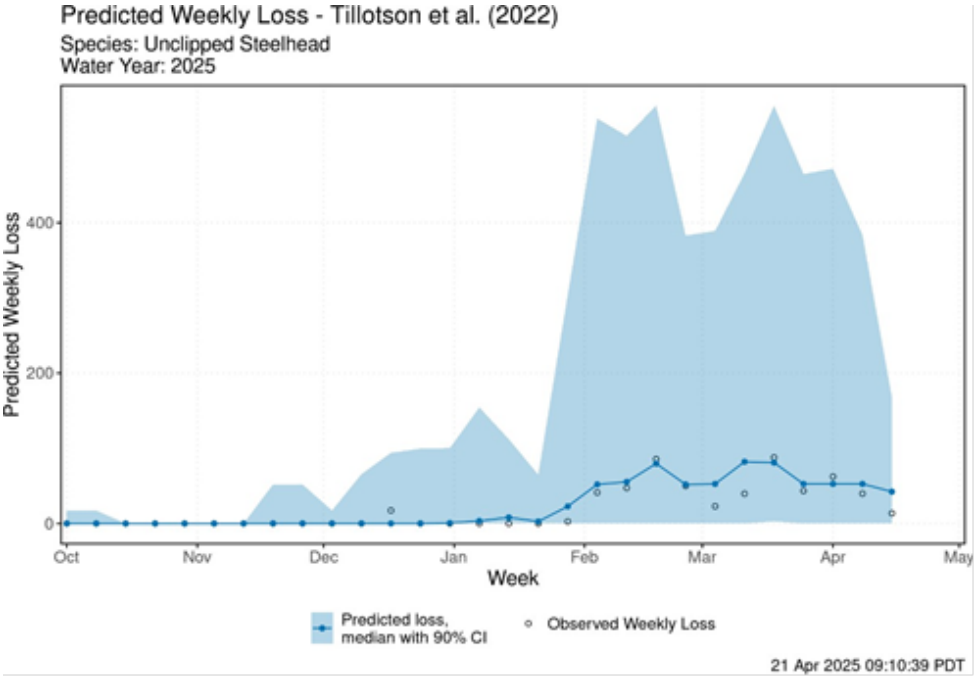

Figure 6. Predicted Weekly Loss – Tillotson et al. (2022)

Figure 6 is a line graph depicting Predicted weekly Loss (0-400) over Week (months October to May). A blue shaded area represents predicted loss, median with 90% CI, and hollow circles depict the observed weekly loss. The observed median loss is lower than the predicted median loss.

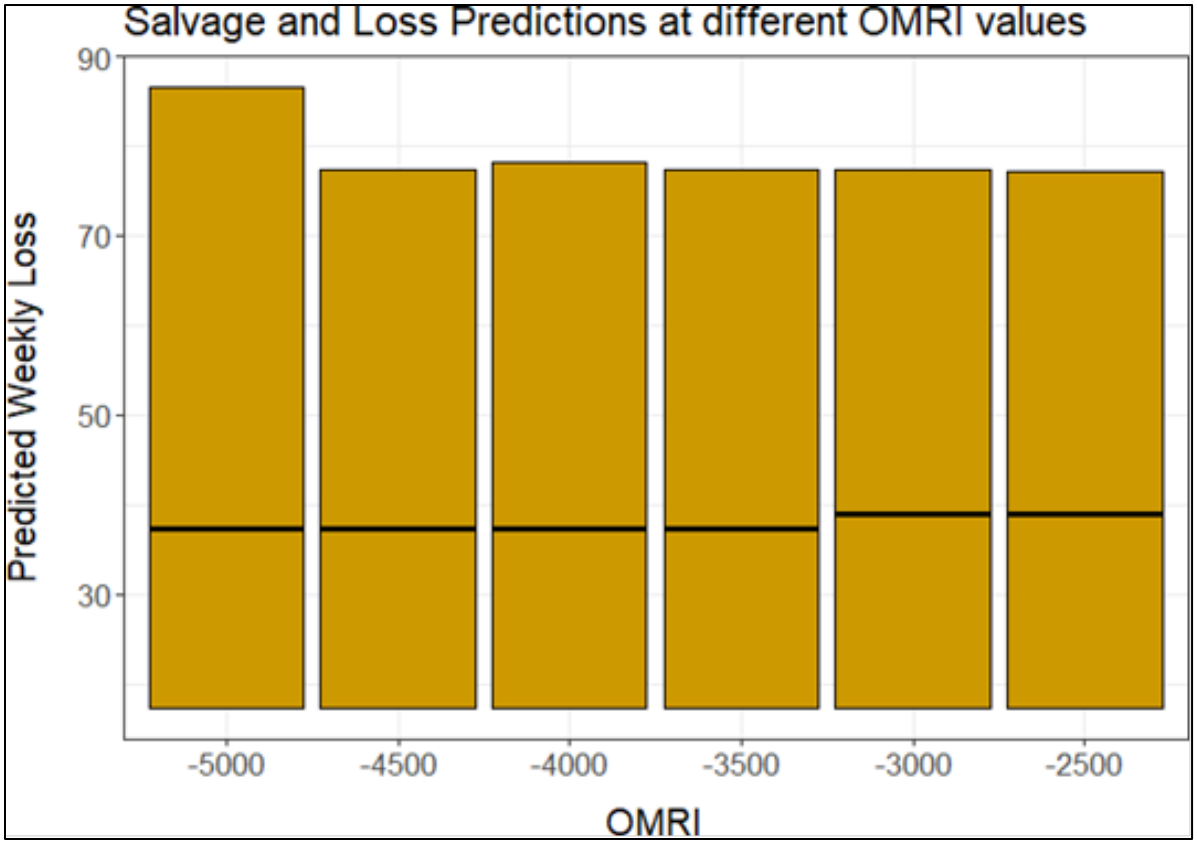

Figure 7. Salvage and Loss Predictions at different OMRI values.

Figure 7 is a bar graph depicting predicted weekly loss of Central Valley steelhead at different OMRI values using the Tiillotson et al model (2022). Bar extents represent 25th and 75th percentile of predicted weekly loss and a horizontal solid line represents median predicted weekly loss. Updated 4/21/25.

Table 3a. WY 2025 loss and salvage predictor data: Predicted weekly loss of Central Valley steelhead at CVP and SWP facilities. Updated 4/21/25.

Output	Modeled Current Week	Projected -5000 OMRI	Projected -3500 OMRI
Predicted Chinook Winter Run, Median %	48	43	43
Predicted Chinook Winter Run, High %	167	165	147

Table 3b. Environmental and operational details for current, projected -5000, and -3500 scenarios. Only OMR flows were changed to evaluate potential changes in loss.

Parameter	Current Condition (~-5000 OMRI)	Projected -3500
Temperature (Mallard Island, C)	15.7	15.7
Precipitation (5-d running sum, inches)	0	0
Old and Middle River Flows (cfs)	-5397	-3500
Sacramento River Flow (Freeport, cfs)	44931	44931
DCC Gates	closed	closed
San Joaquin River Flow (Vernalis, cfs)	2106	2106
Export	4584	4584

References

U.S. Bureau of Reclamation. 2024. Attachment 1.5 Survival, Travel Time, and Routing Simulation Model. Environmental Impact Statement for the Long-term Operation of Central Valley Project and State Water Project. 33 p.

Attachment A: Relevant Proposed Action and Incidental Take Permit Sections

3.7.4.5.5 Steelhead Annual Threshold

In each year, Reclamation and DWR will manage exports to reduce loss at the CVP and SWP salvage facilities. To support survival and decrease entrainment loss, Reclamation and DWR will manage OMR to avoid exceeding the following annual loss threshold at CVP and SWP salvage facilities through the weekly distributed loss threshold described below.

- Unclipped juvenile California Central Valley steelhead loss = 3,000

Annual loss of unclipped juvenile CCV steelhead at the CVP and SWP salvage facilities will be counted cumulatively for each Brood Year, starting July 1st of the calendar year through June 30th of the following calendar year. Loss will be calculated for the South Delta Export Facilities using CDFW's steelhead loss multiplier until a loss method for steelhead (see Section 3.11.1 is approved by CDFW and NMFS. This loss threshold will be used until a new loss threshold is developed through the steelhead JPE Special Study (See Section 3.11.1).

3.7.4.5.6 Steelhead Weekly Distributed Loss Threshold

To minimize the potential for a disproportionate impact of entrainment of steelhead present in the Delta on any single week, Reclamation and DWR will manage OMR based on a weekly distributed loss threshold. The weekly loss threshold is the annual loss threshold distributed over the period of observed steelhead salvage between January 1 and June 30 using the 7-day weekly periods identified in the weekly distributed loss table for winter-run Chinook salmon, extended through June 30. DWR and Reclamation will reduce exports to achieve a 7-day average OMR value no more negative than -3,500 cfs for seven consecutive days when the 7-day rolling sum of steelhead salvage, calculated daily, exceeds the weekly loss threshold of 120 fish.