

# FINAL State Water Project Incidental Take Permit Risk Assessment for Winter-run and Spring-run Chinook Salmon

## Section 1: Overview

Date: 1/24/2023

### Life Stages Present:

Winter-run Chinook salmon (adults)

Winter-run Chinook salmon (juvenile)

Spring-run Chinook salmon (juvenile)

### Advice to the Water Operations Management Team (WOMT):

No advice is warranted.

For the week beginning 1/24/23, SWP and CVP Facility Capacity is controlling exports at the Central Valley Project (CVP) and the State Water Project (SWP). Combined exports on 1/24/23 are 13,600 cfs resulting in an Old and Middle River Index (OMRI) of -2,800 cfs and 9.4% of inflow diverted (14-day average). The Delta Cross Channel (DCC) gates are projected to remain closed for seasonal requirement. The SWP is exporting this week and no outages are planned.

SaMT estimates an overall low risk of entrainment into the central Delta for juvenile natural-origin winter-run Chinook salmon (WR). Flows at Freeport are expected to remain high, the DCC gates are closed, and entrainment into Georgiana and Threemile Slough is unlikely with Sacramento River flows expected to remain high due to the storm events. WR are expected to continue to move into the Delta with the projected storms. SaMT also estimates an overall low entrainment risk of juvenile Young-of-Year (YOY) natural-origin spring-run Chinook salmon (SR) into the central Delta. Current hydrological conditions have a decreased routing risk for any salmonids present in the Delta and STARS modeling predicts a low entrainment risk into Georgiana Slough. Therefore, entrainment into the central Delta is estimated as low this week.

SaMT estimates an overall medium risk of entrainment of juvenile WR into the export facilities this week. Salvage of WR is likely to occur over the upcoming week due to 1 natural-origin LAD WR salvaged at the SWP facility on 1/17/2023; however, the LAD WR salvaged was genetically confirmed as a natural-origin fall-run Chinook salmon (FR). SaMT anticipates that COA 8.6.3 may be triggered over the upcoming week due to the low final JPE thresholds for COA 8.6.3; however, OMRI is expected to be more negative than -2,000 cfs which may increase the risk of entrainment into the salvage facilities. Therefore, entrainment risk remains at medium this week. SaMT estimates an overall low risk of entrainment of juvenile YOY SR into the export facilities due to OMRI projected to be no more negative than -5,000 cfs and no natural-origin YOY SR have been detected in salvage so far this WY.

The SWP ITP was amended on 1/20/2023 with the following language:

*In water year 2023, Permittee shall restrict exports in response to the initial length-at-date identification of natural older juvenile Chinook salmon and the thresholds described above. If genetic analysis of an individual natural older juvenile Chinook salmon observed in salvage at the SWP or CVP indicates that it is not CHNWR, that individual shall not count toward the daily loss threshold and continued export restrictions under this Condition of Approval are not required if the daily loss threshold*

*has consequently not been met. All genetic analyses shall be conducted using CDFW-approved genetic methods.*

This amendment was in response to an unexpected error in adipose fin clipping and coded-wire tagging of hatchery produced late-fall run Chinook salmon from the Coleman National Fish Hatchery released in Battle Creek in December 2022. Because these fish are expected to fall within the older juvenile size classification, they could be mistakenly identified as natural origin older juvenile Chinook salmon if observed in salvage. CDFW concurs that genetic analyses are the most appropriate tool to identify natural origin CHNWR in water year 2023, given this unexpected error in hatchery operations.

## Section 2-A: Operations and Fish Distribution Table

### Risk Assessment:

COA 8.6.3 Mid- and Late-season Natural WR Chinook Salmon Daily Loss Threshold is currently in effect. SaMT received the final JPE numbers for COA 8.6.3 Mid- and Late-season Natural WR Chinook Salmon Daily Loss Threshold on 1/20/2022. The finalized JPE number was distributed on 1/20/2023. COA 8.6.3 will operate to the final JPE threshold for January (loss > 3.17).

COA 8.6.3 Mid- and Late- season Natural WR Chinook Salmon Daily Loss Threshold was exceeded on 1/17/2023. 1 unclipped, length-at-date winter-run Chinook salmon was observed in salvage at the Skinner Fish Facility (SWP) on 1/17/2023 with loss expanded to 5.33, which exceeds our daily loss threshold of 3.17 for the month of January. Due to COA 8.6.3 being triggered, OMRI was restricted to no more negative than -3,500 cfs on a 5-day average; however, OMRI was currently restricted by COA 8.5.1 Turbidity Bridge Avoidance which was triggered on 1/17/2023 and maintained a 5-day average OMRI no more negative than -2,000 cfs.

Yearling SR have been caught in salvage this WY and genetically confirmed with a total loss of 36.06.

*Table 1: Current Juvenile Fish Distribution. The SaMT group agreed to provide distribution estimates in five percent increments when feasible.*

Location	Yet to Enter Delta	In the Delta	Exited the Delta
YOY winter-run Chinook salmon	Current 38-60% Last week 49-65%	Current 40-60% Last Week 35-50%	Current 0-2% Last Week 0-1%
YOY spring-run Chinook salmon	Current 70-85% Last week 75-90%	Current 15-30% Last Week 10-25%	Current 0% Last Week 0%
Hatchery origin winter-run Chinook salmon	Current NA Last week NA	Current NA Last Week NA	Current NA Last Week NA

## Section 2-B: Sacramento River and Confluence

### Assessment of risk of entrainment into the central Delta for WR and SR in the Sacramento River: (8.1.5.1 C ii, iii, iv and 8.1.5.1 B iii)

- Exposure Risk:
  - WR: Medium
  - SR: Medium
- Routing Risk:
  - WR: Low
  - SR: Low
- Overall Entrainment Risk:
  - WR: Low
  - SR: Low
- Change in risk of entrainment into the central Delta (increased/decreased risk compared to last week):
  - WR: Similar to previous week
    - Exposure Risk is estimated at medium this week. SaMT estimates WR presence in the Delta is 40-60%. Routing Risk remains at low this week based on hydrological conditions. Freeport flows are at 50,000 cfs, DCC gates are closed, and the STARS model predicts low entrainment into Georgiana Slough. Therefore, the overall entrainment into the central Delta is estimated to be low this week.

- SR: Similar to previous week
  - Exposure Risk is estimated as medium this week due to 15-30% of YOY SR estimated in the Delta. Routing Risk remains at low this week based on hydrologic conditions. Freeport flows remain to 50,000 cfs, the DCC gates are closed, and the STARS model is estimating 18% entrainment into Georgiana Slough. Therefore, the overall entrainment into the central Delta is low.

#### Section 2-C: Facilities Risk

#### **Central Valley Project/State Water Project (CVP/SWP) facilities entrainment risk for WR and SR in the central Delta over the next week (8.1.5.1 D iii, iv, v)**

- Exposure Risk:
  - WR: Low
  - SR: Low
- Reporting OMR/Export Risk:
  - Baseline OMR (-2,800 cfs)
    - WR: Low
    - SR: Low
  - Scenario 1 OMR: (-3,000 cfs)
    - WR: Low
    - SR: Low
  - Scenario 2 OMR: (-5,000 cfs)
    - WR: Medium
    - SR: Medium
- Overall Entrainment Risk:
  - WR: Medium
  - SR: Low
- Change in risk of entrainment into the facilities (increased/decreased risk compared to last week):
  - WR: Similar to previous week
    - Exposure Risk has decreased to low this week due to no natural-origin LAD WR being salvaged over the previous week. Reporting OMR/Export Risk remains low this week but increasing to more negative than -2,000 cfs. The likelihood of more exceedances to occur in the upcoming week is possible due to the low thresholds for COA 8.6.3 and OMR becoming more negative than the previous week. Therefore, the overall entrainment risk into the export facilities has decreased to low.
  - SR: Similar to previous week
    - Exposure Risk remains low this week. Natural-origin YOY SR have not been observed at the export facilities for WY 2023. Reporting OMR/Export Risk remains low this week but increasing to become more negative than -2,000 cfs, which has the likelihood to increase SR entrainment. However, due to the absence of SR in salvage for WY 2023, the overall entrainment risk into the facilities is estimated to be low.

#### Section 2-D: Annual Loss Threshold Risk

- Annual loss threshold risk and Alternative Actions
  - Loss at the SWP and CVP facilities compared to the estimated remaining population in the Delta and upstream of the Delta: Salvage of California Endangered Species Act (CESA)-listed Chinook salmon has occurred.

- COA 8.6.1 Winter-run Single year Loss Threshold:
  - Natural-origin WR: 584.11 [1.17% of the natural-origin WR Juvenile Production Estimate (JPE)]
    - Current Annual Loss: 47.31
    - 50% Threshold based on natural-origin WR JPE: 292.06
      - Risk of exceeding threshold: Low
    - 75% Threshold based on natural-origin WR JPE: 438.08
      - Risk of exceeding threshold: Low
    - 100% Threshold based on natural-origin WR JPE: 584.11
      - Risk of exceeding threshold: Low
  - Hatchery-origin WR: 229.15 [0.12% of the Livingston Stone National Fish Hatchery (LSNFH) hatchery release JPE]
    - Current Annual Loss: N/A
    - 50% Threshold based on hatchery WR JPE: 114.58
      - Risk of exceeding threshold: N/A
    - 75% Threshold based on hatchery WR JPE: 171.86
      - Risk of exceeding threshold: N/A
    - 100% Threshold based on hatchery WR JPE: 229.15
      - Risk of exceeding threshold: N/A

#### Section 2-E: Daily Loss Threshold Risk

- Daily loss threshold risk and Alternative Actions
  - Loss at the SWP and CVP facilities compared to estimated remaining population in Delta and upstream of the Delta:
    - Daily loss thresholds and subsequent loss and associated operations:
      - COA 8.6.3 Mid and Late Season Natural WR Chinook Salmon Daily Loss Threshold:
        - January 1 – January 31:  $0.0000635 * 49,924 = 3.17$
        - February 1 – February 28:  $0.0000991 * 49,924 = 4.95$
        - March 1 – March 31:  $0.000146 * 49,924 = 7.29$
        - April 1 – April 30:  $0.0000507 * 49,924 = 2.53$
        - May 1 – May 31:  $0.000077 * 49,924 = 3.84$
        - Highest Daily Loss: 32.33
          - Risk of exceeding threshold: High

#### Section 3: Basis for Advice

The 2020 [Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento-San Joaquin Delta 2081-2019-066-00](#) (SWP ITP) states that advice to Water Operations Management Team (WOMT) shall be consistent with the Project Description, COA in the ITP, and the applicable ESA authorizations. This week's advice is based on the following COAs which are currently applicable:

*List relevant COA number and title based on species/life stage, time of year, etc.:*

*8.1.4 Collaborative Approach to Real-time Risk Assessment. Beginning no later than October 1 through the end of OMR Management (see Condition of Approval 8.8) the Smelt and Salmon Monitoring Teams shall meet*

*weekly, or more often as required, to consider survey data, salvage data, and other pertinent biotic and abiotic factors and prepare risk assessments as described in Conditions of Approval 8.1.1, 8.1.2, 8.1.5.1 and 8.1.5.2.*

*The Smelt and Salmon Monitoring Teams shall prepare operations advice for the WOMT as required by Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, 8.7, and 8.8, including advice on operations. The Smelt and Salmon Monitoring Teams shall each prepare risk assessments and operations advice. Within each team, staff jointly develop the risk assessment and supporting documentation to accompany operations advice (see Conditions of Approval 8.1.5.1 and 8.1.5.2). DWR and CDFW Smelt and Salmon Monitoring Team staff may conclude different operations advice is warranted, in which case the difference shall be noted and elevated as described in this Condition of Approval.*

*The Smelt and Salmon Monitoring Teams shall communicate their advice to WOMT. The WOMT shall then confer and attempt to reach a resolution and agreed-upon Project operations. If a resolution is reached, Permittee shall operate consistent with the decision regarding Project operations from WOMT. If the WOMT does not reach a resolution, the CDFW Director may require Permittee to implement an operational recommendation provided by CDFW. CDFW will provide its operational decision to Permittee in writing. Permittee shall implement the operational decision required by CDFW. Permittee shall ensure that its proportional share (see Condition of Approval 8.10) of the OMR flow requirement as a part of the operational decision is satisfied.*

*8.1.5 Real-time Risk Assessments. The Smelt and Salmon Monitoring Teams (Conditions of Approval 8.1.1 and 8.1.2) shall prepare weekly risk assessments, or more often as required, and operations advice (as required by Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, and 8.7) during their discussions and analyses. The Smelt and Salmon Monitoring Teams shall provide the risk assessments and pertinent supporting information to the WOMT (Condition of Approval 8.1.3) within one business day of each meeting.*

*8.3.2 Salmonid Presence. After January 1 each year, if Conditions of Approval 8.3.1 or 8.3.3 have not already been triggered, the OMR Management season shall begin when the Salmon Monitoring Team first estimates that 5% of the CHNWR or CHNSR population is in the Delta whichever is sooner. Upon initiation of the OMR Management season, Permittee shall reduce exports to achieve, and shall maintain a 14-day average OMR index no more negative than -5,000 cfs, until the OMR Management season ends (see Condition of Approval 8.8). In the event that a salmon daily or single-year loss threshold is exceeded (Conditions of Approval 8.6.1, 8.6.2, 8.6.3, or 8.6.4) prior to the start of OMR Management season the requirements in those Conditions shall control operations.*

*8.6.1 Winter-run Single-year Loss Threshold. In each year, Permittee shall, in coordination with Reclamation, operate the Project to avoid exceeding the following single-year loss thresholds:*

- Natural WR (loss = 1.17% of natural WR JPE)*
- Hatchery WR (loss = 0.12% of hatchery WR JPE)*

*The loss threshold and loss tracking for hatchery WR does not include releases into Battle Creek.*

*Loss of WR at the CVP and SWP salvage facilities shall be calculated based on LAD criteria for run assignment.*

*Annual loss of natural and hatchery WR at the CVP and SWP salvage facilities shall be counted cumulatively beginning November 1 each calendar year through June 30 the following calendar year.*

*WR shall be identified based on the Delta Model LAD criteria. Loss shall be calculated for the South Delta Export Facilities using the 2018 CDFW loss equation (Attachment 6).*

*During the water year, if cumulative loss of natural or hatchery WR exceeds 50% of the annual loss threshold, Permittee shall restrict south Delta exports to maintain a 14-day average OMR index no more negative than -3,500 cfs through the end of OMR Management (see Condition of Approval 8.8). After 14 days of operations to maintain an OMR index no more negative than -3,500 cfs, Permittee may convene the Salmon Monitoring Team to conduct a risk assessment (Condition of Approval 8.1.5.1) and determine whether the risk of entrainment and loss of natural and hatchery WR is no longer present. Risks shall be measured against the potential to exceed the next single-year loss threshold. The results of this risk assessment and associated OMR advice shall be provided to WOMT according to Condition of Approval 8.1.3 and the decision-making process shall follow the process described in Condition of Approval 8.1.4.*

*The -3,500 cfs OMR flow operational criteria, adjusted and informed by this risk assessment, shall remain in effect until the end of OMR Management (Condition of Approval 8.8).*

*During the water year, if cumulative loss of natural or hatchery WR at the CVP and SWP salvage facilities exceeds 75% of the single-year loss threshold, Permittee shall restrict OMR to a 14-day moving average OMR flow index that is no more negative than -2,500 cfs through the end of OMR Management (Condition of Approval 8.7). After 14 days Permittee may convene the Salmon Monitoring Team to conduct a risk assessment (Condition of Approval 8.1.5.1) and determine whether the risk of entrainment and take of natural and hatchery WR is no longer present. The results of this risk assessment and associated OMR advice shall be provided to WOMT according to Condition of Approval 8.1.3 and the decision-making process shall follow the process described in Condition of Approval 8.1.4.*

*The -2,500 cfs OMR flow operational criteria adjusted and informed by this risk assessment shall remain in effect until the end of OMR Management (Condition of Approval 8.8).*

*During the water year, if natural or hatchery WR cumulative loss at the CVP and SWP salvage facilities exceeds the single-year loss threshold, Permittee shall immediately convene the Salmon Monitoring Team to review recent fish distribution information and operations and provide advice regarding future planned Project operations to minimize subsequent loss during that year. The Salmon Monitoring Team shall report the results of this review and advice to the WOMT (see Condition of Approval 8.1.3). Operational decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment).*

*If the single-year loss threshold is exceeded, Permittee and Reclamation shall also convene an independent panel to review Project operations and the single-year loss threshold prior to November 1, as described in Condition of Approval 8.2. The purpose of the independent panel is to review the actions and decisions contributing to the loss trajectory that lead to an exceedance of the single-year loss threshold, and make recommendations on modifications to Project implementation, or additional actions to be conducted to stay within the single-year loss threshold in subsequent years.*

*Permittee shall, in coordination with Reclamation, continue monitoring and reporting salvage at the CVP and SWP salvage facilities. Permittee and Reclamation shall continue the release and monitoring of yearling Coleman National Fish Hatchery (NFH) late fall-run and yearling SR surrogates. The Salmon Monitoring Team shall use reported real-time salvage counts along with qualitative and quantitative tools to inform risk assessments (see Condition of Approval 8.1.5.1).*

*8.3.2 Salmonid Presence. After January 1 each year, if Conditions of Approval 8.3.1 or 8.3.3 have not already been triggered, the OMR Management season shall begin when the Salmon Monitoring Team first estimates that 5% of the CHNWR or CHNSR population is in the Delta whichever is sooner. Upon initiation of the OMR Management season, Permittee shall reduce exports to achieve, and shall maintain a 14-day average OMR index no more negative than -5,000 cfs, until the OMR Management season ends (see Condition of Approval 8.8). In the event that a salmon daily or single-year loss threshold is exceeded (Conditions of Approval 8.6.1, 8.6.2, 8.6.3, or 8.6.4) prior to the start of OMR Management season the requirements in those Conditions shall control operations.*

*8.6.3 Mid- and Late-season Natural Winter-run Chinook Salmon Daily Loss Threshold. To minimize entrainment, salvage, and take of natural CHNWR during the peak and end of their migration through the Delta. Permittee shall restrict south Delta exports for five days to achieve a five-day average OMR index no more negative than - 3,500 cfs when daily loss of natural older juveniles at the SWP and CVP salvage facilities exceeds the following thresholds based on the JPE reported in January of the same calendar year:*

- January 1 – January 31: 0.00635 % of the CHNWR JPE*
- February 1 – February 28: 0.00991 % of the CHNWR JPE*
- March 1 – March 31: 0.0146 % of the CHNWR JPE*
- April 1 – April 30: 0.00507 % of the CHNWR JPE*
- May 1 – May 31: 0.0077 % of the CHNWR JPE*

*All natural older juvenile Chinook salmon juveniles shall be identified based on the Delta Model length-at-date criteria. Loss shall be calculated for the South Delta Export Facilities using the equation provided in CDFW 2018 (Attachment 6). This Condition of Approval may be modified through the process described in Condition of Approval 8.6.6 and an amendment to this ITP.*

*Amendment to COA 8.6.3 in effect as of 1/20/2023: In water year 2023, Permittee shall restrict exports in response to the initial length-at-date identification of natural older juvenile Chinook salmon and the thresholds described above. If genetic analysis of an individual natural older juvenile Chinook salmon observed in salvage at the SWP or CVP indicates that it is not CHNWR, that individual shall not count toward the daily loss threshold and continued export restrictions under this Condition of Approval are not required if the daily loss threshold has consequently not been met. All genetic analyses shall be conducted using CDFW-approved genetic methods.*



## Section 4: Hydrology and Operations

Assessment of hydrologic, operational, and meteorological information. 8.1.5.1 A

Section 4-A: Water Operations, Water Operations Outlook, and Projected Conditions C 8.1.5.1 A. i, ii, iii:

- Antecedent Actions: (e.g., Actions such as integrated early winter pulse protection, etc.)
  - COA 8.5.1 Turbidity Bridge Avoidance was triggered on 1/17/2023, which limits OMR to no more negative than -2,000 cfs until the daily average turbidity at OBI is less than 12 FNU. Daily average turbidity is still above 12 FNU and DWR is operating to OMR no more negative than -3,500 cfs until 1/26/2023 or until daily average turbidity at OBI is less than 12 FNU.
- Water Temperature (ITP COA 8.8 threshold: daily average water temperature exceeds 22.2° C for 7 non-consecutive days in June):
  - Mossdale (MSD): [Mossdale - CDEC](#)
    - Number of days threshold exceeded: Not applicable until June.
    - Days exceeded: Not applicable at this time.
  - Prisoners Point (PPT): [Prisoners Point - CDEC](#)
    - Number of days threshold exceeded: Not applicable until June.
    - Days exceeded: Not applicable at this time.
- Tidal Cycle: (*Spring/Neap. Note if tidal cycle has potential to affect south Delta hydrology or X2*)
  - Transitioning from a spring/king tidal cycle into a neap tidal cycle on 1/28/2023. This neap tidal cycle will push the transitional zone downstream of the DCC gates and Georgiana Slough.
- Turbidity: Not discussed
- Salinity (X2): 56.0 km on 1/24/2023
  - Hydraulic Footprint (*Provide brief description of hydrologic footprint and summary of relevant DSM2 results*): DSM2 results were not discussed during SaMT this week. SaMT discussed excluding them from the assessment altogether but a final decision has not been made.
- Outages:
  - SWP: None projected
  - CVP: None projected
- Exports: 1/24/2023 – 1/30/2023
  - SWP: 6,000 to 9,500 cfs
  - CVP: 3,500 to 4,200 cfs
- Meteorological Forecast:
  - *“Extended period of dry weather with sunny days and cool overnight temperatures this week. Possible pattern changes this weekend into next week.”*
  - [NOAA - National Weather Service Forecast](#)
- Weather/Storm Event Projection:
  - No storms are expected in the next 6-7 days that would provide conditions for COA 8.7 Storm Flexibility.
- DCC Gates position:
  - DCC gates closed on 11/28/2022 and will remain closed for seasonal requirements.
- Sacramento River flow at Freeport: 56,000 cfs
  - Flows are expected to decrease to 40,000 cfs later in the week.
  - [Sacramento River Flows - CDEC](#)
- San Joaquin River flow at Vernalis: 19,700 cfs

- Flows are expected to decrease later in the week.
- [San Joaquin River Flows - CDEC](#)
- [San Joaquin River Guidance Plots - CDEC](#)
- QWEST: +26,000 cfs.
  - QWEST is expected to decrease to +14,000 cfs this week.
- Future export modifications: *Describe anticipated or potential changes to exports*
  - Exports are expected to remain high due to the increased flows on the San Joaquin River. COA 8.5.1 Turbidity Bridge Avoidance was triggered on 1/17/2023, which limits OMR to no more negative than -2,000 cfs until the daily average turbidity at OBI is less than 12 FNU. Daily average turbidity is still above 12 FNU and DWR is operating to OMR no more negative than -3,500 cfs until 1/26/2023 This will be in effect until 1/22/2023 or until daily average turbidity at OBI is less than 12 FNU.

Table 2: Comparison of USGS Tidally Filtered OMR and OMR Index data.

Date	Averaging Period	USGS gauges (cfs)	OMR Index (cfs)
1/21/23	Daily	-2,100	-200
1/21/23	5-day	-800	-400
1/21/23	14-day	-1,400	-1,400
1/23/23	Daily	Not Applicable	-2,400
1/23/23	5-day	Not Applicable	-600
1/23/23	14-day	Not Applicable	-1,400

## Section 5: Distribution and Biology

### Assessment of biological information for WR and SR. 8.1.5.1.B

#### Section 5-A: WR Population Status 8.1.5.1.B i

- Adult escapement estimate:
  - Final spawning escapement for WR adults contributing to brood year (BY) 2022 is 5,927
  - Hatchery proportion was 10.8% of the total run (641 hatchery-origin WR)
  - Total number of in-river WR females: 2,663
  - Total number of WR redds: 2,607
  - WR adults contributing to BY 2022 had a pre-spawn mortality rate of 2.1%
- Redd distribution and fry emergence timing:
  - Juvenile WR are beginning to redistribute downstream in the upper Sacramento River. Real-time monitoring stations in the Delta saw an increase in WR this week. WR are anticipated to continue to distribute downstream and into the Delta due to the storm events.
  - CDFW conducted snorkel surveys on the upper Sacramento River. In December, CDFW observed juvenile WR holding near Redding above the Red Bluff Diversion Dam (RBDD).
  - Estimated juvenile WR passage at RBDD for 12/31/22 is 214,667 fish. Average historic passage (2010-2021) as of 12/31/22 indicates 97.0% with one standard deviation of 3.1% have passed Red Bluff Diversion Dam.
- Juvenile Production Estimate (JPE):
  - The final JPE was 49,942 fish and was distributed on 1/20/2023. COA 8.6.3 thresholds are updated and will be monitored closely for exceedances.
- Livingston Stone National Fish Hatchery releases:
  - Releases of juvenile WR have not occurred.
  - See Appendix 4
- Distribution of natural WR:
  - See Table 1
- Distribution of Livingston Stone National Fish Hatchery Sacramento River WR and Battle Creek WR:
  - No releases have occurred at this time.
  - [CalFishTrack - Central Valley Enhanced Acoustic Tagging Project](#)

#### Section 5-B: SR Population Status 8.1.5.1.B ii

- Adult escapement estimate:
  - SR carcass counts not available.
  - Adult SR have completed their spawning.
- Redd distribution and fry emergence timing:
  - SR eggs are incubating in the gravel and fry are emerging. SR on the Sacramento River are beginning their downstream migration and have been seen in many of the real-time monitoring stations in the Delta the past few weeks.
- Hatchery release (in-river and downstream):
  - A SR surrogate group was released on 12/5/2022 into Battle Creek. This group consisted of 71,057 late fall-run Chinook salmon with both a CWT and ad-clip mark. These fish will be tracked for OMR Storm Flex in order to protect SR yearlings. As of 1/17/2023, many of these fish have been observed in salvage. Loss is estimated at 127.5 fish for this surrogate group which is .18% of the release group.
  - A second SR surrogate group was released on 12/23/2022 into Battle Creek. This group consisted of 66,735 late fall-run Chinook salmon with both a CWT and ad-clip mark. These fish will also be tracked for OMR Storm Flex in order to protect SR yearlings. As of 1/17/2023, many

of these fish have been observed in salvage but loss has not been calculated yet because of limited staff at the salvage facilities due to the holidays. Loss is estimated at 141.3 fish for this surrogate group which is .21% of the release group.

- See Appendix 4 for more details.
- Distribution of natural SR:
  - See Table 1.
- Distribution of Feather River Fish Hatchery SR:
  - Not applicable at this time.

#### Section 5-C: Additional Data Sources to Assess Sensitivity to Entrainment into the Central and South Delta 8.1.5.1.C & D

- Acoustic telemetry: *Summary of acoustic telemetry tracking*
  - Not applicable at this time.
  - [CalFishTrack - Central Valley Enhanced Acoustic Tagging Project](#)
- Trawls: See Appendix 1
  - Sacramento Trawl: SR were caught between 1/17/2023 – 1/20/2023.
  - Mossdale Trawl: No listed species were caught this week.
  - Chipps Island Trawl: No listed species were caught this week.
- Rotary Screw Traps:
  - Knights Landing, Tisdale and Lower Sacramento Rotary Screw Trap Data: WR and SR were caught between 1/17/2023 – 1/23/2023 at the Tisdale and Knights Landing RST.
    - [Middle Sacramento River Salmon and Steelhead Monitoring](#)
  - Yuba River Rotary Screw Trap Data: SR were caught between 1/17/2023 – 1/23/2023.
  - Redd Bluff Diversion Dam Rotary Screw Trap Data: Total passage estimates 221,452 juvenile WR have passed RBDD. Last updated on 1/14/2023.
  - GCID Rotary Screw Trap Data: No trapping occurred this week.
    - [GCID RST Live Data](#)
  - Lower Feather River Rotary Screw Trap: WR and SR were caught between 1/17/2023 – 1/23/2023.
    - [Middle Sacramento River Salmon and Steelhead Monitoring](#)
  - Upper Feather Rotary Screw Trap: SR were caught between 1/17/2023 – 1/23/2023.
  - Butte Creek Rotary Screw Trap Data: SR were caught between 1/18/2023 – 1/21/2023
    - [Butte Creek Monitoring Programs](#)
- Seines:
  - Sacramento River Beach Seines: No listed species were caught this week.
- Carcass Survey Data:
  - Lower American River Carcass Survey Data (See Table 5):
    - [Middle Sacramento River Salmon and Steelhead Monitoring](#)
    - Fall-run (FR) Carcass Surveys ended as of 12/29/2022.
    - CDFW Redd Surveys ended as of 12/29/2022.
- Additional hatchery release notifications: *List all relevant hatchery release notifications.*
  - Coleman National Fish Hatchery (CNFH) released steelhead and late fall-run Chinook salmon into Battle Creek on 12/1/2022 and 12/2/2022 (See Appendix 4).
  - San Joaquin River Restoration Program released SR yearlings on 12/8/2022 (See Appendix 4).
  - CNFH is releasing 673,132 fall-run Chinook salmon into the Sacramento River at Caldwell Park Boat Ramp to evaluate the survival of CNFH fall-run Chinook salmon released at the fry stage (See Appendix 4).

- There is uncertainty in the identification of some untagged salmonids potentially due to either tag loss or poor-quality adipose clipping from hatchery releases made in the South Delta. Lower rates of tagging success were confirmed for by hatchery staff for some releases. Confirmation of origin of these fish will be through genetic identification.
- New monitoring (as required by Condition of Approval 7.5.1, 7.5.2, and 7.5.3): *Upstream monitoring results during transfer window, additional rotary screw trap monitoring updates, additional acoustic tag study results, genetic identification results, trap capture efficiency trial results, and pathology results if available and relevant.*
  - Genetic confirmation of natural-origin LAD winter-run was distributed on 1/17/2023. So far for WY 2023, there has been no genetically confirmed winter-run in salvage.
- Anticipated emigration to continue into the Delta:
  - WR have been seen in a couple real-time monitoring sites in the Delta. Hydrological and meteorological environmental cues are redistributing juvenile WR and SR downstream. YOY SR fry are starting to emerge and move downstream. SR are being seen in real-time monitoring sites in the Delta which indicates that SR have started their downstream migration.
  - [SacPAS - Migration Timing and Conditions by Cohort](#)
  - [SacPAS - Salvage Timing](#)
- Routing and Survival Analysis:
  - Delta STARS Model: See Table 6 in Appendix 1
    - [CalFishTrack - Central Valley Enhanced Acoustic Tagging Project](#)
- Tillotson entrainment model or other entrainment models as they become available:
  - The entrainment tool estimates a median of 0 WR and maximum loss of 48 WR this week. (SacPAS last updated on 1/24/2023).
  - [SacPAS - Loss and Salvage Predictor](#)
- Salvage trends in relation to OMRI: *Provide overview of salvage data and insert salvage table as attachment at end of document:* See Appendix 2.
  - [USFWS - Fish Salvage Monitoring](#)

## Appendix 1: SaMT Monitoring and Modeling Data

Table 3: Fish monitoring data for the 1/24/23 SaMT meeting. The following table presents fish monitoring data summarized over the past week. Unless otherwise noted, reported sizes are fork length. FR = fall-run, WR = winter-run, SR = spring-run, LFR = late-fall-run, N/A= Not Available.

Location	GCID RST	Butte Creek RST	Tisdale RST	Knights Landing RST	Lower Sac RST	Beach Seines	Sacramento Trawl
Sample Date	N/A	1/18/23-1/21/23	1/16/23-1/22/23	1/14/23 – 1/20/23	N/A	1/17/23 – 1/20/23	1/17/23 – 1/20/23
Chinook Adults	N/A	0	0	0	N/A	0	0
FR Chinook	N/A	0	1,686	2,232	N/A	17	9
SR Chinook	N/A	95	13	41	N/A	0	1
WR Chinook	N/A	0	4	13	N/A	0	0
LFR Chinook	N/A	0	0	0	N/A	0	0
Chinook (ad-clip)	N/A	0	0	1 FR 1 LFR	N/A	0	1
Steelhead (wild)	N/A	0	2	8	N/A	0	0
Steelhead (ad-clip)	N/A	0	6	11	N/A	0	1
Green Sturgeon	N/A	0	0	0	N/A	0	0
Flows (avg. cfs)	N/A	864.5	33,037	26,329	N/A	N/A	N/A
W. Temp. (avg. °F/°C)	N/A	42.8 °F	47.7 °F	48.6 °C	N/A	N/A	N/A
Turbidity (avg. NTU)	N/A	1.95	199.7	192.8	N/A	N/A	N/A

Table 3 Continued: Fish monitoring data for the 1/24/23 SaMT meeting. The following table presents fish monitoring data summarized over the past week. Unless otherwise noted, reported sizes are fork length. FR = fall-run, WR = winter-run, SR = spring-run, LFR = late-fall-run, N/A=Not Available.

Location	Chippis Is. Midwater Trawl	Mosssdale Kodiak Trawl	Lower Feather RST	Feather at Herringer RST	Feather at Eye-Side RST	Yuba RST
Sample Date	1/18/23 – 1/20/23	1/17/23 – 1/20/23	1/17/23 – 1/20/23	1/17/23 – 1/23/23	1/17/23 – 1/23/23	1/17/23 – 1/23/23
Chinook Adults	0	0	0	0	0	0
FR Chinook	1	5	164	4,043	9,750	212
SR Chinook	0	0	41	11	21	53
WR Chinook	0	0	3	0	0	0
LFR Chinook	0	0	0	0	1	0
Chinook (ad-clip)	0	4	0	0	0	0
Steelhead (wild)	0	0	0	1	0	0
Steelhead (ad-clip)	0	0	0	0	0	0
Green Sturgeon	0	0	0	0	0	0
Flows (avg. cfs)	N/A	N/A	11,900	950	650	5,487
W. Temp. (avg. °F/°C)	N/A	N/A	46.9 °F	47.8 °F	47.5 °F	5.7°C
Turbidity (avg. NTU)	N/A	N/A	17.7	3.8	5.2	11.9

Table 4: Delta sturgeon tagging and monitoring.

Date	Comments
1/23/23	<ul style="list-style-type: none"> <li>No new sturgeon tagged this week.</li> <li>1 WS was tagged on 11/15/2022 at Marsh Island on the Sacramento River.</li> <li>3 juvenile GS were detected in the Sacramento River at Marsh Island</li> </ul>

GS = green sturgeon, WS = white sturgeon

Table 5: CDFW adult monitoring surveys. Most of the table will be 'Not Applicable' due to Carcass Surveys ending on the American and Stanislaus River.

Location	American River Carcass Survey	Stanislaus River Carcass Survey
Sample Dates	12/27/22 – 12/29/22	1/6/23 – 1/9/23
Live Fish	Not Available	Not Applicable
Redds	Not Available	Not Applicable
Carcasses	Not Applicable	Not Applicable
Ad-clipped	Not Applicable	Not Applicable
Spawn Condition	Not Applicable	Not Available
Flows (avg. cfs)	Not Applicable	Not Applicable
Water Temp (avg. °F)	Not Applicable	Not Available

Table 6: STARS Modeling. [CalFishTrack - Central Valley Enhanced Acoustic Tagging Project](#)

Date: (1/23/23)	DCC	<u>Georgiana Slough/Interior Delta</u>	<u>Sacramento River</u>	<u>Sutter/ Steamboat Slough</u>	<u>Yolo Bypass</u>
Late Fall-Run Proportion of Entrainment	0	0.18	0.47	0.35	Not Applicable
Late Fall-Run Survival	Not Applicable	0.36	0.71	0.70	Not Applicable
Winter-Run Proportion of Entrainment	Not Applicable	0.11	0.65	0.23	0
Winter-Run Survival	Not Applicable	0.41	0.69	0.55/0.70	Not Applicable



## Appendix 2: Salvage Data

Table 7: SWP and CVP SaMT update (1/16/23 – 1/22/23). Trend is the current value compared to the previous week. These are preliminary results and are subject to revision. Prepared by Kyle Griffiths on 1/23/23.

Criteria	16-Jan	17-Jan	18-Jan	19-Jan	20-Jan	21-Jan	22-Jan	Trend	Weekly Summary
Wild older juvenile CHN Loss	0	5.33	0	0	0	0	0	↗	0
Wild Steelhead Loss	0	0	25.98	0	0	0	0	↗	25.98
SWP daily export (acre-feet)	9,519	17,028	18,539	18,183	18,927	18,547	18,820	↗	17,080
CVP daily export (acre-feet)	7,305	6,957	6,120	8,134	8,183	7,153	8,138	→	7,427
SWP reduced counts	None	None	Yes	Yes	None	None	Yes	N/A	N/A
CVP reduced counts	None	None	None	None	None	Yes	None	N/A	N/A

*Table 8: Chinook salmon weekly salvage and loss combined for both the SWP and the CVP fish collection facilities between 1/16/23 – 1/22/23. Race is determined by LAD on the date of capture. Hatchery origin fish are determined by the lack of adipose fin. Salvage is equal to the estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time. SWP loss is equal to salvage multiplied by 4.33. CVP loss is equal to salvage multiplied by 0.68. Prepared by Kyle Griffiths on 1/22/23. These are preliminary results and are subject to revision.*

Category	Salvage	Loss	Trend
Wild winter-run	0	0	→
Wild spring-run	0	0	→
Wild late Fall-run	0	0	→
Wild fall-run	100	60	↗
Weekly Total	100	60	Not Applicable
Hatchery winter-run	29	124	↗
Hatchery spring-run	21	47	↘
Hatchery late Fall-run	16	54	↘
Hatchery fall-run	0	0	→
Weekly Total	66	226	Not Applicable

*Table 9: Chinook salmon cumulative salvage and loss combined for both the SWP and the CVP fish collection facilities across WY 2023. Race is determined by LAD on the date of capture. Hatchery origin fish are determined by the lack of adipose fin. Salvage is equal to the estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time. SWP loss is equal to salvage multiplied by 4.33. CVP loss is equal to salvage multiplied by 0.68. Prepared by Kyle Griffiths on 1/22/23. These are preliminary results and are subject to revision.*

Category	Cumulative Salvage	Cumulative Loss	Trend
Wild winter-run	16	42	→
Wild spring-run	0	0	→
Wild late Fall-run	48	94	→
Wild fall-run	208	128	→
Season Total	4	18	Not Applicable
Hatchery winter-run	51	206	↗
Hatchery spring-run	379	393	↘
Hatchery late Fall-run	738	1,877	↘
Hatchery fall-run	36	44	→
Season Total	1,204	2,521	Not Applicable

*Table 10: Steelhead weekly salvage and loss combined for both the SWP and the CVP fish collection facilities for 1/16/23 – 1/22/23. Hatchery origin fish are determined by the lack of adipose fin. Salvage is equal to the estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time. SWP loss is equal to salvage multiplied by 4.33. CVP loss is equal to salvage multiplied by 0.68. Prepared by Kyle Griffiths on 1/22/23. These are preliminary results and are subject to revision.*

Category	Salvage	Loss	Trend
Wild steelhead	6	26	→
Hatchery steelhead	8	20	→
Weekly Total	14	46	Not Applicable

*Table 11: Steelhead cumulative salvage and loss combined for both the SWP and the CVP fish collection facilities across WY 2023. Hatchery origin fish are determined by the lack of adipose fin. Salvage is equal to the estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time. SWP loss is equal to salvage multiplied by 4.33. CVP loss is equal to salvage multiplied by 0.68. Prepared by Kyle Griffiths on 1/22/23. These are preliminary results and are subject to revision.*

Category	Cumulative Salvage	Cumulative Loss	Trend
Wild steelhead	30	72	→
Hatchery steelhead	71	147	→
Season Total	101	218	Not Applicable

## Appendix 3: Relevant Actions

Table 12. Relevant WY 2023 Criteria and Status for Listed Chinook Salmon under the SWP Long-Term Incidental Take Permit.

<u>Action</u>	<u>Timeframe</u>	<u>Current Action Status</u>	<u>Threshold(s)</u>	<u>Current Relevant Data</u>	<u>Weekly Trend</u>	<u>Last Updated</u>	<u>Comments</u>
Onset of OMR Mgmt. Salmonid Presence (8.3.2)	Jan. 1 - Jun. 30 <i>(when ≥ 5% of winter-run or spring-run are in the Delta)</i>	In effect	5% of the winter-run or spring-run population are present in the Delta	Winter-run = 40-60% estimated in the Delta  Spring-run = 15-30% estimated in the Delta	Not Applicable	<b>1/23/2023</b>	No additional comments
Winter-run yearly loss (8.6.1)	Nov. 1 - Jun. 30	In effect	Natural CHNWR (loss = 1.17% of JPE) 50% of 1.17% of JPE = 584.11  Hatchery CHNWR (loss = 0.12% of JPE) 50% of 0.12% of JPE = 229.15	Current yearly WR loss (natural LAD) = 47.31  Current yearly WR loss (hatchery) = N/A	Salvage is likely to occur over the next week.	<b>1/23/2023</b>	Based on final JPE (JPE was finalized on 1/20/2023)
Winter-run discrete daily loss (8.6.2)	Nov. 1 - Dec. 31	Not in effect	11/1-11/30: loss of 6/day unclipped older juv. Chinook salmon  12/1-12/31: loss of 26/day unclipped older juv. Chinook salmon	Max single daily loss from previous week = N/A	Not Applicable	<b>1/3/2023</b>	No additional comments

Mid- and Late-season Natural WR Daily Loss Threshold defined as natural origin juvenile Chinook salmon (8.6.3)	Jan 1 – May 31	In effect	<p><u>January 1 – 31:</u> <u>0.00635% of the CHNWR JPE</u></p> <p>February 1 – 28: 0.00991% of the CHNWR JPE</p> <p>March 1 – 31: 0.0146% of the CHNWR JPE</p> <p>April 1 – 30: 0.00507% of the CHNWR JPE</p> <p>May 1 – 31: 0.0077% of the CHNWR JPE</p>	<p><u>January 1 – 31:</u> <u>0.0000635 * 49,942 = 3.17</u></p> <p>February 1 – February 28: 0.0000991 * 49,924 = 4.95</p> <p>March 1 – March 31: 0.000146 * 49,924 = 7.29</p> <p>April 1 – April 30: 0.0000507 * 49,924 = 2.53</p> <p>May 1 – May 31: 0.000077 * 49,924 = 3.84</p>	<p>Salvage is likely to occur over the next week.</p> <p>-Loss of 5.33 occurred on 1/17/2023 of older juvenile Chinook salmon exceeding the January threshold.</p> <p>Exports will be restricted in response to the initial LAD identification of natural older juvenile Chinook salmon. If genetic analysis indicates that the older juvenile is not WR, then that individual shall not count toward the daily loss threshold continued export restrictions under this COA are not required if the daily loss threshold has consequently not been met.</p>	<b>1/23/2023</b>	Based on final JPE (JPE finalized on 1/20/2023)
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<u>Action</u>	<u>Timeframe</u>	<u>Current Action Status</u>	<u>Threshold(s)</u>	<u>Current Relevant Data</u>	<u>Weekly Trend</u>	<u>Last Updated</u>	<u>Comments</u>
Spring-run surrogate protection (8.6.4)	Feb. 1 - Jun. 30	Not in effect	<p>Coleman National Fish Hatchery (CNFH)</p> <p>Group 1: 0.25% of total in-river CWT fall-run release (total of 7 CWT #s)</p> <p>Group 2: 0.25% of total in-river CWT fall-run release (total of 7 CWT #s)</p> <p>Group 3: 0.25% of total in-river CWT fall-run release (total of 10 CWT #s)</p> <p>Group 4: 0.25% of total in-river CWT fall-run release (total of 4 CWT #s)</p> <p>Feather River Fish Hatchery (FRFH)</p> <p>Group 1: 0.25% of total in-river CWT spring-run release (total of 2 CWT #s)</p>	Not Applicable	Not Applicable	<b>1/3/2023</b>	No Additional Comments

<u>Action</u>	<u>Timeframe</u>	<u>Current Action Status</u>	<u>Threshold(s)</u>	<u>Current Relevant Data</u>	<u>Weekly Trend</u>	<u>Last Updated</u>	<u>Comments</u>
OMR Storm Flexibility (8.7)	Jan 1 – Jun 30	Not in effect	<ul style="list-style-type: none"> <li>-Delta is in excess</li> <li>-QWEST is &gt; 0</li> <li>-Measurable amount of precipitation has occurred</li> <li>-None of COA's are controlling operations (8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4)</li> <li>-Cumulative salvage at CVP and SWP of yearling CNFH LFR Chinook salmon (as yearling CHNSR surrogates) is &lt; 0.5% with any of the release groups</li> <li>-Risk Assessments conducted by the SaMT/SMT determines no changes in spawning, rearing, foraging, sheltering, or migration behavior as a result of OMR Flex operations beyond those are likely to occur.</li> </ul>	<ul style="list-style-type: none"> <li>-Spring-run Surrogate Release Group #1 Loss: 127.5 (0.18% of the 0.50% threshold)</li> <li>-Spring-run Surrogate Release Group #2 Loss: 141.3 (0.21% of the 0.50% threshold)</li> <li>-Spring-run Surrogate Release Group #3 Loss: 0 (0% of the 0.50% threshold)</li> </ul>	Not Applicable	<b>1/23/2023</b>	Based on storm conditions.

<u>Action</u>	<u>Timeframe</u>	<u>Current Action Status</u>	<u>Threshold(s)</u>	<u>Current Relevant Data</u>	<u>Weekly Trend</u>	<u>Last Updated</u>	<u>Comments</u>
End of OMR Management (8.8)	Jan – Jun. 30	Not in effect	More than 95% of WR and SR have migrated past Chipps Island as determined by SaMT, <b>AND</b> Daily average water temperature at Mossdale exceeds 22.2°C (71.96°F) for 7 non-consecutive days in June, <b>AND</b> Daily average water temperature at Prisoner’s Point exceeds 22.2°C (71.96°F) for 7 non-consecutive days in June	Not Applicable	Not Applicable	<b>1/3/2023</b>	No Additional Comments
Export Curtailments for Spring Outflow (8.17)	Apr 1 – May 31	Not in effect	<u>Dry:</u> Vernalis flow and CVP/SWP combined exports are 2:1  <u>Below Normal:</u> Vernalis flow and CVP/SWP combined exports are 3:1  <u>Above Normal/Wet:</u> Vernalis flow and CVP/SWP combined exports are 4:1	Not Applicable	Not Applicable	<b>1/3/2023</b>	No Additional Comments



## Appendix 4: Hatchery Releases

Table 13. Hatchery salmon release data for BY 2022 and WY 2023.

Release Date	Hatchery	Race	CWT	Marked Release Number	Total Release	Percent Marked	Release Location	Mark	Agency	Release Type
12/1/2022	CNFH	Late Fall	05-64-84	61,399	61,399	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-85	57,217	57,217	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-86	73,060	73,060	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-87	74,344	74,344	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-90	49,664	49,664	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-91	62,246	62,246	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-92	61,939	61,939	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-94	64,648	64,648	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-95	57,334	57,334	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-96	60,582	60,582	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-97	58,530	58,530	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/5/2022	CNFH	Late Fall	05-64-88	71,057	71,057	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Experimental
12/8/2022	SCARF	Spring	06-29-44	3,666	3,666	100%	San Joaquin at Hwy 140	PIT, CWT and Ad-Clip	CDFW	SJRRP
12/8/2022	SCARF	Spring	06-19-68	911	911	100%	San Joaquin at Hwy 140	PIT, CWT and Ad-Clip	CDFW	SJRRP
12/23/2022	CNFH	Late Fall	05-64-89	66,735	66,735	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Experimental
1/3/2023	CNFH	Fall	None	605,539	605,539	0%	Caldwell Park Boat Ramp	None	USFWS	Experimental
1/13/2023	CNFH	Late Fall	05-64-93	60,712	60,712	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Experimental
1/17/2023	CNFH	Fall	None	673,132	673,132	0%	Balls Ferry Boat Ramp	None	USFWS	Experimental

Table 14. Hatchery steelhead release data for BY 2022 and WY 2023.

Release Date	Hatchery	CWT	Marked Release Number	Total Release	Percent Marked	Release Location	Mark	Agency	Release Type
12/2/2022	CNFH	None	614,702	614,702	100%	Battle Creek at CNFH	Ad-Clip	USFWS	Production
1/17/23 – 1/20/23	NIM	None	447,000	447,000	100%	Sunrise Boat Ramp	Ad-Clip	CDFW	Production



