



# Weekly Assessment of CVP and SWP Delta Operations on ESA-listed Species

January 31, 2023

## Executive Summary

### Operational Conditions

See Weekly Fish and Water Operation Outlook document for –January 31 - February 6 which includes the initial CVP and SWP operational intent and biological justification for the next seven days. Any recommended changes or alternatives to those operations made by either monitoring team is captured herein.

### Winter-run Chinook Salmon

Loss of natural winter-run Chinook Salmon (by length at date, LAD) has occurred in the past week at the State and Federal fish salvage facilities (WY 2023 total loss = 50.91 fish, as of 1/30/2023). Loss of natural winter-run Chinook Salmon at the Central Valley Project (CVP) and State Water Project (SWP) fish collection facilities is likely to occur over the next week. 50-70% of juvenile natural winter-run Chinook Salmon from brood year (BY) 2022 are estimated to be present in the Delta. The Delta Cross Channel (DCC) gates closure for the season reduces exposure of winter-run Chinook Salmon juveniles that are present in the Sacramento River near the DCC gates into the interior Delta.

### Spring-run Chinook salmon

No loss of natural spring-run Chinook Salmon (by length at date, LAD) has occurred in the past week at the State or Federal fish salvage facilities. Loss of spring-run Chinook salmon at the CVP and SWP fish collection facilities may occur over the next week. 20-35 % of juvenile natural spring-run Chinook Salmon from brood year (BY) 2022 are estimated to be present in the Delta. The DCC gates closure for the season reduces exposure of spring-run Chinook Salmon juveniles that are present in the Sacramento River near the DCC gates into the interior Delta.

### Central Valley Steelhead

Loss of natural California Central Valley (CCV) steelhead has occurred in the past week at the State and Federal fish salvage facilities (WY 2023 December 1 - March 31 total loss = 74.22 fish, as of 1/30/2023). Loss of Central Valley steelhead at the CVP and SWP fish collection facilities may occur over the next week. 15-20% of juvenile natural CCV Steelhead from brood year (BY) 2022 are estimated to be present in the Delta. DCC closure for the season reduces exposure to Central Valley steelhead juveniles that are potentially present in the Sacramento River near the DCC gates.

## **Green Sturgeon**

Loss of green sturgeon has not occurred in the past week at the State and Federal fish salvage facilities (WY 2023 total loss = 0 fish, as of 1/30/2023). Loss of green sturgeon is unlikely to occur over the next week due to their rare presence in the South Delta.

## **Delta Smelt**

Based on recent detection data, distribution patterns over the past decade, and widespread turbidity in the Delta, Delta Smelt are likely starting to complete migration and are distributed throughout the Delta. Seven marked Delta Smelt were detected by EDSM in Suisun Bay, the Lower Sacramento River, and Liberty Island between 1/24/23 and 1/31/2023. One preliminary unmarked Delta Smelt was detected by EDSM in the lower San Joaquin River near Antioch on 1/31/2023. Earlier detections include one Delta Smelt at Chipps on 1/19/2023, one Delta Smelt on 1/17/2023 in the South Delta near Franks Tract, and one Delta Smelt on 1/7/2023 at the CVP (salvage). The Turbidity Bridge Avoidance Action began on 1/17/2023 and continues to be triggered; however, it is not controlling OMRI. OMRI was limited to -3500 cfs through 1/26/2023. A turbidity bridge persists but has started to weaken compared to last week; however, recent winds and forecasted precipitation may influence turbidity. Overall risk for entrainment is low for Delta Smelt outside of the OMR corridor and risk is moderate for fish within the OMR corridor.

## **Delta Cross Channel Gates**

The DCC gates were closed on 11/28/2022 to meet LTO Proposed Action and are expected to remain closed until May. DCC gates may only be opened to maintain water quality under D-1641 between November and January.

## **Monitoring Teams summary**

There were no non-consensus issues to report from the Salmon Monitoring Team or the Smelt Monitoring Team. CDFW, USFWS, DWR, and USBR reached consensus that no OMR recommendation was needed.

## **Operational and Regulatory Conditions**

See current Weekly Fish and Water Operation Outlook document.

## **Biology, Distribution, and Evaluation Winter-run Chinook salmon, Spring-run Chinook salmon, Central Valley Steelhead**

### **Population Status**

#### ***Winter-run Chinook Salmon***

- Delta Life Stages:

- Juveniles, Adults
- Brood Year 2022 Productivity:
  - Natural winter-run Chinook salmon: Draft Juvenile production estimate (JPE) calculations have been established for brood year (BY) 2022 winter-run Chinook salmon. The final BY 2022 JPE is 49,924 natural origin juvenile winter run Chinook salmon.
  - Mean cumulative weekly passage of winter-run Chinook salmon through 1/28/2023 at Red Bluff Diversion Dam (RBDD) for the last 20 years of passage data is 98.5% (one SD of 1.9%). By 1/28/2023, 231,075 winter-run Chinook salmon were estimated to have passed RBDD compared to the cumulative passage last year of 572,568 winter-run Chinook salmon.
  - Hatchery winter-run Chinook salmon:
    - Approximately 432,458 Livingston Stone NFH brood year 2022 winter Chinook salmon were released at dusk on 1/26-1/27/2023 into the Sacramento River at John F. Reginato River Access boat ramp, Redding, CA. This is the first release of LSNFH brood year 2022 hatchery winter Chinook salmon comprising of approximately 58% of the total hatchery production for the Sacramento River supplementation program. The release group is 100% marked (adipose-fin clip and CWT) with an overall estimated average fork length of 85mm. There has been no loss so far this water year with this release group.

### *Spring-run Chinook Salmon*

- Delta Life Stages:
  - Young-of-year (YOY) and Yearlings
- Brood Year 2022 Productivity:
  - Natural spring-run Chinook salmon: No JPE has been established for spring-run Chinook salmon.
  - Hatchery spring-run Chinook salmon surrogates associated with the Proposed Action (PA 4.10.5.10.2 Additional Real-Time OMR Restrictions and Performance Objectives):
    - Approximately 71,057 late-fall Chinook salmon from Coleman National Fish Hatchery were released at Battle Creek on 12/5/2022. This group is 100% marked with adipose-fin clip and CWT and have an estimated average fork length of 145mm. This is the first spring-run Chinook salmon surrogates release group associated with the Proposed Action. There has

been no loss this water year of fish associated with the first surrogate release group.

- Approximately 66,735 late-fall Chinook salmon from Coleman National Fish Hatchery were released at Battle Creek on 12/23/2022. This group is 100% marked with adipose-fin clip and CWT and have an estimated average fork length of 145mm.
- Approximately 60,712 Coleman NFH brood year 2022 late-fall Chinook Salmon on January 13, 2023 into Battle Creek at Coleman NFH. This group is 100% marked (with an adipose-fin clip and CWT) and has an overall estimated average fork length of 145 mm.
- There has been loss this water year of fish associated with the first and second surrogate release groups.
- The agencies in the SaMT discussed the thiamine vitamin deficiency that was observed in winter run Chinook salmon broodstock at the Livingston Stone National Fish Hatchery (LSNFH) in BY 2021. Last year the thiamine deficiency appeared to negatively affect survival of juvenile fish as they migrate downstream towards the Delta. The thiamine deficiency issue is also likely impacting spring-run Chinook salmon. Although the egg take goals have been met at the Feather River Fish Hatchery, they are still experiencing fertility issues that are impacting production.

### ***Central Valley Steelhead***

- Delta Life Stages:
  - Spawning Adults, Kelts, Juveniles
- Brood Year 2022 Productivity:
  - Spawner abundance: There is limited information about the adult steelhead population. It is estimated to be small, contributing to the limited productivity of the population.
  - Natural steelhead: No JPE has been established for steelhead. Data are limited.
  - Hatchery steelhead: Reclamation's Proposed Action has no hatchery steelhead triggers.

### **Distribution**

#### ***Winter-run Chinook Salmon***

### **Current Distribution:**

- For Winter-run Chinook Salmon observations reported to SaMT since previous meeting, see Table 1.
- For SaMT distribution estimates, see Table 2.
- 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.
- 1 LAD Winter-run Chinook Salmon was observed in salvage on 1/29/2023.
- No fish observed in salvage and genetically analyzed through 1/17/2023 has been genetically identified as Winter-run Chinook Salmon (see attachment A).

### **Historic Trends**

- For historical winter-run Chinook salmon trends in salvage, see Table 3. Loss of natural winter-run Chinook salmon at the CVP and SWP fish collection facilities is likely to occur over the next week based on life history and detections in real-time monitoring locations in the Delta. If historic trends in salvage were to continue, winter-run Chinook salmon loss is expected to increase over the next week.

### **Forecasted Distribution within Central Valley and Delta regions**

- Movement of winter-run Chinook salmon juveniles into the lower reaches of the Sacramento River and upper Delta may continue over the next week.
- The STARS model projects route-specific proportion of entrainment, survival, and travel times (Table 5). This model does not estimate entrainment into the lower Sacramento River sloughs (i.e., Three-Mile Slough). The DCC gates were closed 11/28/22 and are expected to remain closed through mid-May 2023. If little precipitation is forecasted there may be a need to open the DCC gates to meet D-1641 water quality standards.

### ***Spring-run Chinook salmon***

#### **Current Distribution**

- For Spring-run Chinook salmon observations reported to SaMT since previous meeting, see Table 1.
- For SaMT distribution estimates, see Table 2.
- Young of year Spring-run Chinook Salmon have been observed by the Fish Restoration Program (FRP) west of Chipps Island but are still potentially rearing and may not have exited the estuary. These observations were used in developing the distribution estimate for exiting the Delta.

- 1 YOY Spring-run LAD Chinook Salmon has been observed in salvage on 1/27/2023.

### Historical Trends

- For historical spring-run Chinook salmon trends in salvage, see Table 3. If historic trends in salvage were to continue YOY spring-run Chinook salmon loss is unlikely to increase over the next week.

### Forecasted Distribution within Central Valley and Delta regions

- Mill and Deer creek flows exceeded 95 cfs indicating yearling spring-run Chinook salmon have begun to migrate into mainstem Sacramento River.

### Central Valley Steelhead

#### Current Distribution

- For CCV Steelhead observations reported to SaMT since previous meeting, see Table 1.
- For SaMT distribution estimates, see Table 2.

#### Historical Trends

- For historical CCV steelhead trends in salvage, see Table 2. If historic trends in salvage were to continue, juvenile CCV steelhead loss may occur over the next week.

### Forecasted Distribution within Central Valley and Delta regions

- The entrainment tool estimates of CCV steelhead loss remain low (Table 6, Fig. 1).
- Closure of the DCC gates for the season will reduce exposure and possible entrainment of juvenile CCV steelhead from the Sacramento River into the interior Delta via the DCC gates.

Table 1. Fish observation reported since the previous SaMT meeting. NAs represent no data reported. See Operations Outlook for notes on interruptions in any surveys.

Locations	Reporting Period	SR Chinook	WR Chinook	LFR Chinook	Steelhead (Wild)	Green Sturgeon
GCID RST	N/A	N/A	N/A	N/A	N/A	N/A
Butte Creek RST	N/A	N/A	N/A	N/A	N/A	N/A
Tisdale RST	1/24-1/30	26	7	1	5	0
Knights Landing RST	1/23-1/28	1	1	0	0	0
Lower Sacramento RST	N/A	N/A	N/A	N/A	N/A	N/A
Beach Seines	1/22-1/28	2	0	0	0	0
Sac. Trawl	1/22-1/28	0	0	0	2	0
Chipps Island Midwater Trawl	1/22-1/28	0	0	1	1	0
Mossdale Kodiak Trawl	1/22-1/28	0	0	0	0	0

Locations	Reporting Period	SR Chinook	WR Chinook	LFR Chinook	Steelhead (Wild)	Green Sturgeon
EDSM	1/22-1/28	0	0	0	6	0
Feather River Herrerger RST	1/17-1/23	6	0	0	0	0
Feather River Eye Side RST	1/17-1/23	10	0	0	1	0
Lower Feather River	N/A	N/A	N/A	N/A	N/A	N/A

Table 2. Salmonid distribution estimates

Location	Yet to Enter Delta (%)	In the Delta (%)	Exited Delta past Chipps Island (%)
Young-of-year (YOY) winter-run Chinook salmon	Current: 25-50% Last Week: 38-60%	Current: 50-70% Last Week: 40-60%	Current: 0-5% Last Week: 0-2%
YOY spring-run Chinook salmon	Current: 63-79 % Last Week: 70-85 %	Current: 20-35% Last Week: 15-30%	Current: 1-2 %* Last Week: 0 %
YOY hatchery winter-run Chinook salmon	Current: 100 % Last Week: NA	Current: 0 % Last Week: NA	Current: 0 % Last Week: NA
Natural origin steelhead	Current: 75-84% Last Week: 83-89%	Current: 15-20% Last Week: 10-15%	Current: 1-5% Last Week: 1-2%

\*Young of year Spring-run Chinook Salmon have been observed by the Fish Restoration Program (FRP) west of Chipps Island but are still potentially rearing and may not have exited the estuary.

Table 3. Historic migration and salvage patterns. Last updated 01/23/2023.

Species	Red Bluff Diversion Dam	Tisdale Rst	Knights Landing Rst	SacTrawl Sherwood Catch Index	Chipps Island Trawl Catch Index	Salvage
Chinook, Winter-run, Unclipped	98.0%(96.2%,99.9%) BY: 2013 - 2021	77.8%(53.0%,102.6%) BY: 2013 - 2021	75.3%(48.8%,101.8%) BY: 2013 - 2021	37.8%(9.3%,66.2%) BY: 2013 - 2021	6.1%(-1.7%,13.8%) BY: 2013 - 2021	28.8%(6.3%,51.3%) WY: 2013 - 2022
Chinook, Spring-run, Unclipped	15.3%(4.4%,26.2%) BY: 2013 - 2021	17.7%(1.4%,34.0%) BY: 2013 - 2021	26.7%(2.8%,50.5%) BY: 2013 - 2021	5.8%(-2.9%,14.5%) BY: 2013 - 2021	0.0%(0.0%,0.0%) BY: 2013 - 2021	0.0%(0.0%,0.0%) WY: 2013 - 2022

Species	Red Bluff Diversion Dam	Tisdale Rst	Knights Landing Rst	SacTrawl Sherwood Catch Index	Chippis Island Trawl Catch Index	Salvage
Steelhead, Unclipped (January-December)	1.0%(-0.3%,2.2%) BY: 2013 - 2022	18.8%(4.2%,33.4%) BY: 2014 - 2022	22.7%(3.1%,42.3%) BY: 2014 - 2022	10.0%(-6.1%,26.1%) BY: 2013 - 2022	4.7%(-1.3%,10.6%) BY: 2013 - 2022	N/A
Steelhead, Unclipped (December-March)	N/A	N/A	N/A	N/A	N/A	15.4%(-0.5%,31.2%) WY: 2013 - 2022
Steelhead, Unclipped (April-June)	N/A	N/A	N/A	N/A	N/A	0.0%(0.0%,0.0%) WY: 2013 - 2022

Table 4. Mean daily flow and percent change (Wilkins Slough, Deer Creek, Mill Creek; cfs from CDEC) and temperature and percent change (Knights Landing; °F from RST).

Date	Mill Creek (MLM): mean daily flow (cfs)	Mill Creek (MLM): flow percent change	Mill Creek (MLM): Alert	Deer Creek (DCV): mean daily flow (cfs)	Deer Creek (DCV): flow percent change	Deer Creek (DCV): Alert	Wilkins Slough (WLK): mean daily flow (cfs)	Knights Landing RST: water temp. (f)	Alert Triggered
1/29/2023	210.0	2.7%	Flow>95cfs	253.7	-3.0%	Flow>95cfs	2,599.8	N/A	N/A
1/28/2023	204.6	-2.9%	Flow>95cfs	261.7	-4.2%	Flow>95cfs	9,275.4	N/A	N/A
1/27/2023	210.7	-3.8%	Flow>95cfs	273.1	-5.2%	Flow>95cfs	12,764.2	N/A	N/A
1/26/2023	219.1	-5.5%	Flow>95cfs	288.2	-6.8%	Flow>95cfs	13,731.9	N/A	N/A
1/25/2023	232.0	-6.3%	Flow>95cfs	309.2	-7.7%	Flow>95cfs	14,734.5	N/A	N/A
1/24/2023	247.7	-8.0%	Flow>95cfs	335.1	-9.4%	Flow>95cfs	16,082.0	N/A	N/A
1/23/2023	269.2	-9.3%	Flow>95cfs	369.9	-9.8%	Flow>95cfs	18,103.9	N/A	N/A

Table 5. STARS model simulations for route-specific entrainment, travel times, and survival. Travel time is calculated in days.

Stock	Date	Route	Median Travel Time	Survival	Routing Probability
Winter Chinook	2023-01-28	Overall	5.65	0.48	N/A
Winter Chinook	2023-01-28	Sacramento River	5.19	0.52	0.62
Winter Chinook	2023-01-28	Yolo Bypass	9.65	0.55	0.00



Stock	Date	Route	Median Travel Time	Survival	Routing Probability
Winter Chinook	2023-01-28	Sutter Slough	5.60	0.41	0.13
Winter Chinook	2023-01-28	Steamboat Slough	5.08	0.56	0.13
Winter Chinook	2023-01-28	Interior Delta	8.54	0.21	0.12
Late-fall Chinook	2023-01-28	Overall	7.91	0.56	N/A
Late-fall Chinook	2023-01-28	Delta Cross Channel	N/A	N/A	0.00
Late-fall Chinook	2023-01-28	Georgiana Slough	11.86	0.28	0.21
Late-fall Chinook	2023-01-28	Sacramento River	6.75	0.65	0.47
Late-fall Chinook	2023-01-28	Sutter and Steamboat Slough	7.62	0.60	0.32

The entrainment tool estimates a median and maximum loss of winter-run Chinook Salmon and juvenile CCV Steelhead each week (Table 6a).

Table 6a-b. WY 2023 loss and salvage predictor data: Environmental details, current and forecast.

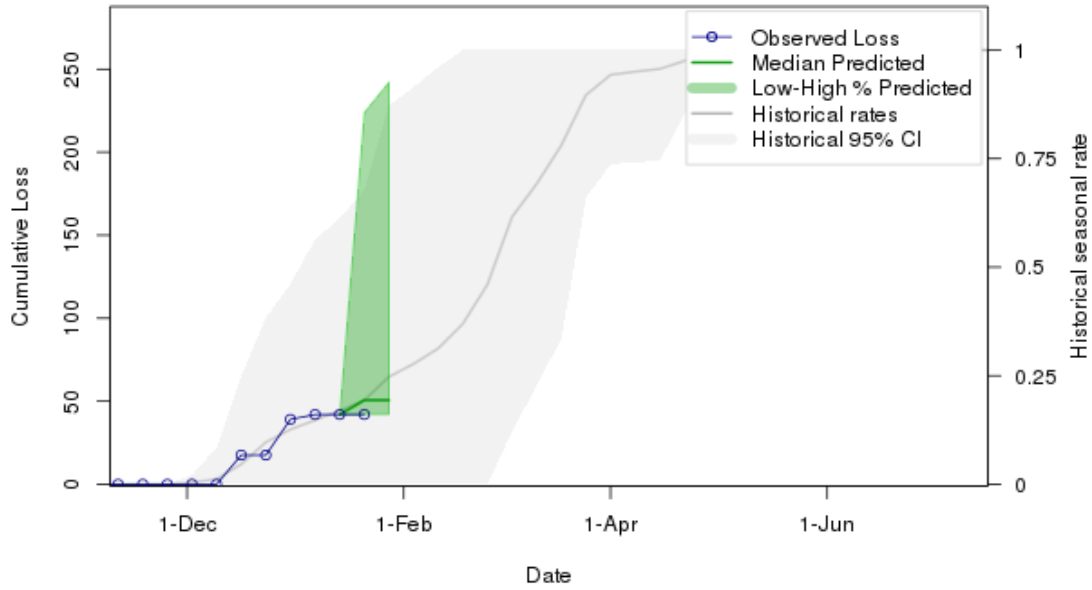
- a) WY 2022 loss and salvage predictor data: Predicted weekly loss of winter-run Chinook salmon and steelhead at CVP and SWP facilities.

Parameter	Modeled Current Week	Modeled Next Week
Predicted Steelhead, Median %	20	2
Predicted Steelhead, High %	160	65
Predicted Chinook Winter Run, Median %	9	0
Predicted Chinook Winter Run, High %	182	18

- b) Environmental details, current and forecast.

Parameter	Data	Forecast
Temperature (Mallard Island, C)	9.1	20
Precipitation (5-d running sum, inches)	0	0
Old and Middle River Flows (cfs)	-3949	-3039
Sacramento River Flow (Freeport, cfs)	50103	6993
DCC Gates	closed	closed
San Joaquin River Flow (Vernalis, cfs)	18602	262
Export	13407	1887

**Winter Run Loss 2023-01-27 Water Year: 2023 & WY.week 17**



**Steelhead Loss 2023-01-27 Water Year: 2023 & WY.week 17**

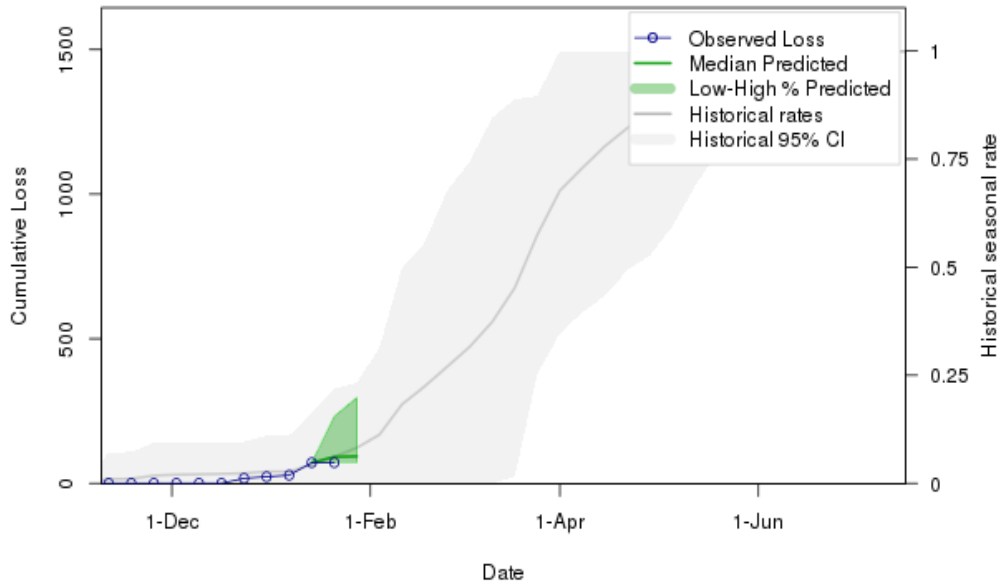


Figure 1. Predicted weekly loss of steelhead and winter-run Chinook salmon at the CVP and SWP facilities

## Evaluation

1. After January 1, are more than 5% of juveniles from one or more salmonid species present in the Delta?

Greater than 5% of all juvenile salmonids are present in the Delta.

2. Does the operational outlook's ranges impact fish movement and change the potential distribution of fish?

Potential effects within the 7 days (near-term) in the operations outlook.

OMR flow is expected to remain at or more positive than -5,000 cfs this upcoming week. OMR flows more positive than -5,000 cfs are hypothesized to have minimal impact on movement and distribution of salmonids in the South Delta.

Potential effects longer than the 7 days (longer-term) in the operations outlook.

Not applicable, see response above to (2) (i).

3. What is the likelihood of increased loss exceeding the next annual loss threshold (50%, 75% or 90% of threshold) resulting in OMR management actions based on population distribution, abundance, and behavior of fish in the Delta?

### Winter-run Chinook salmon

Total juvenile natural winter-run Chinook salmon (LAD) loss is 50.91 fish (as of 01/31/2023). Loss of juvenile winter-run Chinook salmon has occurred in the past week at the CVP and SWP fish salvage facilities. Final JPE calculations have been established for brood year (BY) 2022 winter-run Chinook salmon. The agencies in the SaMT assessed the likelihood of exceeding the next annual loss threshold and believe that loss occurring in the next week is unlikely to lead to exceedance of the 50% single-year loss threshold.

### Spring-run Chinook salmon

Total natural juvenile spring-run Chinook salmon (LAD) loss is 2.54 fish (as of 01/31/2023). No loss of natural juvenile spring-run Chinook salmon has occurred in the past week at the CVP and SWP fish salvage facilities. The agencies in the SaMT assessed the likelihood of exceeding the next annual loss threshold and believes that loss occurring in the next week is unlikely to lead to exceedance of the 50% single-year loss threshold.

### Central Valley Steelhead

Total natural juvenile steelhead loss (December 1 through March 31) is 74.22 fish (as of 1/31/2023). Loss of natural juvenile has occurred in the past week at the CVP and SWP fish salvage facilities. The agencies in the SaMT assessed the likelihood of exceeding the next annual loss threshold and believe that loss occurring in the next week is unlikely to lead to exceedance of the 50% single-year loss threshold.

4. If an annual loss threshold has been exceeded, do continued OMR restrictions benefit fish movement and survival based on real-time information?

### Winter-run Chinook salmon

The annual loss threshold for winter-run Chinook salmon has not been exceeded in WY 2023.

### Spring-run Chinook salmon

The annual loss threshold for spring-run Chinook salmon has not been exceeded in WY 2023.

### Central Valley Steelhead

The annual loss threshold for steelhead (December 1 – March 31) has not been exceeded in WY 2023.

5. If OMR is more negative than -5,000 cfs are there changes in spawning, rearing, foraging, sheltering, or migration behavior beyond those anticipated to occur under OMR management at -5,000 cfs?

Expected OMR flows are no more negative than -3,500 to -5,000 cfs for the next week. Under OMR flows more negative than -5,000 cfs the SaMT expects impacts to rearing, foraging, sheltering, or migration of salmonids present in the south Delta. Salmonid presence in the south Delta is difficult to assess because of limited observations and there is uncertainty in how much of the population might be impacted.

## **Biology Distribution and Evaluation of Green Sturgeon**

### **Population Status**

- Delta Life Stages:
  - Adults and Juveniles

## Distribution

### *Current Distribution*

- Adults: Most abundant during spring spawning migration period of March through May, and post spawning out-migration periods May through June; October through January depending on first winter storm event resulting in significant Sacramento River flow increases. Adult presence year-round to a lesser extent mainly in San Pablo Bay.
- Juveniles: Age-1 through Age-3 juveniles present year-round and widely distributed. Juveniles tagged with acoustic tags in the main channel Sacramento River near Sherman Island detected in the Sacramento River as far upstream as the Cache Slough complex, in the San Joaquin River at the Antioch Bridge, in Threemile, Horseshoe Bend, and Montezuma Sloughs. Seasonal abundance at the primary sampling site (near Sherman Island) appears to be highest during summer in based on capture and telemetry data. Residence time at the primary sampling site for individual fish ranges from one day to over one year but telemetry data show outmigration from the primary sampling site to the Pacific Ocean ranges from 27 to 552 days. Recent capture data shows diurnal depth preference in the main channel of the Sacramento River. No recent documentation of shallow water habitat presence or foraging but likely.

### *Historical Trends*

- Juvenile and adult green sturgeon are historically present in the San Joaquin and Sacramento rivers and Delta

### *Forecasted Distribution within Central Valley and Delta regions*

- Juvenile and adult green sturgeon are present in the San Joaquin and Sacramento rivers and Delta during the next week.

## Evaluation

1. Is there likely to be salvage that may exceed the annual loss limit?

Green sturgeon salvage is 0 fish (as of 1/31/2023). The agencies in the SaMT assessed the likelihood of salvage occurring in the next week is unlikely to occur.

## Biology, Distribution, and Evaluation of Delta Smelt

### Population Status

- Delta Smelt Life Stages:
  - Adults and subadults
- Brood Year 2022:

- Abundance estimate:
  - The abundance estimate as of January 27, 2023, was 6,884 (95% CI: 1,651-19,352).
- Biological Conditions:
  - Adult and subadult Delta Smelt are expected to be present in Suisun Bay, the Lower Sacramento River, Liberty Island, the Lower San Joaquin River, and the Southern Delta based on the most recent survey detections. Delta Smelt are likely completing migration and distributed widely in the Delta and downstream due to spawning migration (Sommer et al. 2011). The Smelt Monitoring Team discussed the most recent monitoring data (Table 4) and considered published literature and professional judgement on the historical trends in regional distribution.

## Distribution

### *Current Distribution*

- Real time detection data is currently limited to EDSM, Chipps Island Trawl and SLS; Bay Study and SKT provide data as available.
- Since there are few recent detections of Delta Smelt, the Smelt Monitoring Team's capacity to estimate where they are within the Delta is limited.
- One preliminarily unmarked Delta Smelt was detected by EDSM in the Lower San Joaquin near Antioch on 1/31/23, and seven marked adult Delta Smelt were reported captured by EDSM in Suisun Bay, the Lower Sacramento River and Liberty Island between 1/24/2023 and 1/31/2023. One marked adult was caught by DJFMP at Chipps on 1/19/2023, one unmarked Delta Smelt was caught by EDSM in the Southern Delta near Franks Tract on 1/17/2023 and one marked adult Delta Smelt was salvaged at the CVP on 1/7/2023.
- Experimental release of hatchery Delta Smelt occurred at Rio Vista on November 30, 2022, and January 18-19, 2023, and in the Deepwater Shipping Channel on January 25-26, 2023. Ten fish from the experimental release have been caught on 12/14/22, 1/7/23, and 1/19/23, 1/24/23, 1/26/23, 1/27/23, 1/30/23, and 1/31/23.
- Larval sampling at the Skinner Fish Facility (SFF) and the Tracy Fish Collection Facility (TFCF) will be initiated by the SMT in February.
- COA 8.5.2: No larval or juvenile Delta Smelt have been salvaged at the SFF or TFCF as of 1/3/2023 (Table 7).

Table 7. Summary of newly reported detections of Delta Smelt by Region and Salvage Facilities since the last assessment. Regions are those defined by EDSM sampling. Delta Smelt >58mm FL are considered adults. Subadult fish are considered by the SMT to be

fish from the previous year’s cohort based on size and timing of collection. Young of year are considered juveniles and larvae.

Life Stage	North	South	West	Far West	Salvage
Adult	3	0	3	1	0
Subadult	0	0	0	0	0
Larvae/Juvenile	0	0	0	0	0

Table 8. Summary of recent Delta Smelt detections reported since last assessment and the total detections for the current water year. Notes reflect latest information on reported detections or completion of survey for the water year and include both larval and adult detections. Total Fish counts do not distinguish between hatchery origin and wild Delta Smelt. Table indicates detections that have undergone preliminary ID, QA/QC, and genetic confirmation. Numbers are updated as QA/QC and genetic confirmation become available.

Sampling Method	Frequency	New Preliminary Detections	Preliminary to Date	QA/QC to Date	Genetically Confirmed to Date	Total WY2023	Notes
EDSM	Weekly	5	N/A	5	1	11	Phase 1 began 12/5/22
SKT	Monthly	0	N/A	N/A	N/A	0	Began 1/9/23
SLS	Biweekly	0	N/A	N/A	N/A	0	Ongoing
20-mm	Biweekly	0	N/A	N/A	N/A	0	Begins: 3/13/23
Summer Townet	Biweekly	0	N/A	N/A	N/A	0	Begins:
Bay Study	Monthly	0	N/A	N/A	N/A	0	Ongoing
FMWT	Monthly	0	N/A	N/A	N/A	0	Complete
Chippis Island Trawl	Weekly	0	N/A	1	N/A	1	Ongoing
FCCL Brood Stock Collections	Weekly	N/A	N/A	2	N/A	2	Ongoing
LEPS	As available	0	N/A	N/A	N/A	0	Ongoing
TFCF	Daily	0	N/A	N/A	N/A	1	Ongoing

Sampling Method	Frequency	New Preliminary Detections	Preliminary to Date	QA/QC to Date	Genetically Confirmed to Date	Total WY2023	Notes
FRP	Daily	0	N/A	N/A	N/A	0	Ongoing
Skinner Fish Facility	Daily	0	N/A	N/A	N/A	0	Ongoing
Total	N/A	N/A	N/A	N/A	N/A	15	Sum of all Delta Smelt observed during the OMR Management Season

### ***Cultured Delta Smelt Experimental Releases***

- Experimental releases included:
  - 13,140 fish on November 30, 2022,
  - 17,570 fish on January 18-19, 2023, both at Rio Vista,
  - 12,995 in the Sacramento Deep Water Ship Channel.
- Experimental releases are complete.
- Details of Delta Smelt releases are available at: [SacPAS: Central Valley Prediction & Assessment of Salmon](#)

Table 9. Weekly summary of the origin of Delta Smelt. These identifications are considered tentative and additional genetic testing will confirm the identity of individuals. Individuals with no tags are provided alive to the FCCL as potential additions to the FCCL Broodstock.

Date	Survey	Stratum/Station	Total Caught	Ad. Clipped	VIE	No Tag
1/26/2023	EDSM	Cache Slough / Liberty Island	1	N/A	X	N/A
1/27/2023	EDSM	Lower Sacramento	1	N/A	X	N/A
1/30/2023	EDSM	Lower Sacramento	1	N/A	X	N/A
1/30/2023	EDSM	Suisun Bay	1	N/A	X	N/A



Date	Survey	Stratum/Station	Total Caught	Ad. Clipped	VIE	No Tag
1/30/2023	EDSM	Suisun Bay	1	N/A	X	N/A
1/31/2023	EDSM	Lower Sacramento	1	N/A	X	N/A
1/31/2023	EDSM	Lower San Joaquin	1	N/A	N/A	X*

\* based on field observation

### ***Historical Trends***

- Upstream migration for Delta Smelt occurs between September and December and in response to “first flush” conditions (Sommer et al. 2011, Grimaldo et al. 2009). Migration typically ranges one to four weeks after flow and turbidity increases, based on salvage data (Sommer et al. 2011).
- Historically, the highest peak in salvage is in May and the second highest is in June (Grimaldo et al 2009; figure 5).

### ***Forecasted Distribution within Central Valley and Delta regions***

- Predicting the distribution of Delta Smelt is currently difficult because detection data is limited to a few individuals and historic patterns may not be representative of the low population levels.
- The SMT uses turbidity as a surrogate for Delta Smelt presence and in making assessments of the likelihood of entrainment for larval Delta Smelt after spawning begins.
- The potential of experimentally released Delta Smelt to distribute from their release site is unknown at this time and SMT cannot predict their distribution beyond the original release site and subsequent recaptures. There is a high degree of uncertainty regarding the response of cultured fish to environmental cues typically applied to wild Delta Smelt.

### **Abiotic Conditions**

#### ***Turbidity***

- Turbidity continues to be high throughout the Delta and is expected to decrease as flows decrease. Forecast for this week includes below normal temperatures. Chance of showers Thursday, Saturday and Sunday. Precipitation up to half an inch possible on Thursday. Light winds.
- Turbidity is greater than 12 FNU at OBI and at other central and south Delta stations and is expected to decrease over the next week.

Table 10. Relevant Environmental Factors to the current management actions for Delta Smelt.

Date Reported	OBI Daily Average Turbidity (FNU)
1/30/2023	16.63

***X2 Conditions***

- As of 1/31/2023, X2 is estimated to be between Martinez and Port Chicago (<65km).
- When X2 is above 81 km, the SMT uses the X2\_EC\_Graph.xlsx tool to estimate the position of X2 for both the Sacramento and San Joaquin Rivers and assumes the average of the two is representative of an approximate X2 position.

***Other Environmental Conditions***

- The Fish and Water Operation Outlook OMR Index values are expected to range between -3500 to -5000 cfs from 1/31/2023 to 2/6/2023.
- QWEST was estimated at 11,000 cfs on 1/30/2023 and is expected to remain above 5,000 cfs this week.
- Water temperature at Rio Vista was 8.73°C and at Antioch 8.94°C on 1/30/2023.
- Real time tracking of environmental conditions, relevant thresholds and Delta Smelt catch data are updated daily at:  
[http://www.cbr.washington.edu/sacramento/workgroups/delta\\_smelt.html](http://www.cbr.washington.edu/sacramento/workgroups/delta_smelt.html).

**Evaluation**

Proposed Operations: Reservoir releases stay at or ramp down to base levels; Exports scheduled so that the 5-day average OMR is less negative or equal to -5,000 cfs.

1. Between December 1 and January 31, has any first flush condition been exceeded?

First flush conditions based on running 3-day average flow and running 3-day average turbidity at Freeport were met on December 31, 2022, triggering IEWPP regulations. The CVP and SWP reduced exports beginning on 1/3/2023 through 1/16/2023.

2. Do DSM have a high risk of migration and dispersal into areas at high risk of future entrainment? (December 1- January 31)

While there is a possibility for Delta Smelt to become entrained into the OMR Corridor from the lower San Joaquin River, this risk is low. While historical data suggests that migration is likely starting to end (Sommer et al. 2011), the extent of

and variability in migration under the current flow and turbidity conditions is highly uncertain. Additionally, some of the observed distribution of recently detected released fish could be in response to disorientation or stress from release. See number 6 for additional justification.

3. Has a spent female been collected?

A spent female has not been collected.

4. If OMR of -2000 cfs does not reduce OBI turbidity below 12NTU/FNU, what OMR target is deemed protective between -2000 and -5000 cfs?

We deem -5000 cfs to be protective. A turbidity bridge is still in place, but turbidity is expected to decrease over the next 7 days. While there is a possibility for Delta Smelt to become entrained into the OMR Corridor from the lower San Joaquin River, this risk is low as the population is likely starting to complete migration and are unlikely to move around once migration has completed (Sommer et al. 2011, Polansky et al. 2017). See number 6 for additional justification.

5. If OBI is 12 NTU/FNU, what do other station locations show?

OBI turbidity is currently above 12 FNU (Average of 16.6 FNU on 1/30/2023). The daily average turbidities on 1/30/2023 at Prisoners Point (16.8 NTU), Holland Cut (39.9 FNU) and Victoria Canal (14.1 NTU) are likely to decrease over the next seven days.

6. If OBI is 12 NTU/FNU, is a turbidity bridge avoidance action not warranted? What is the supporting information?

- a. Recent operations: The Turbidity Bridge Avoidance Action has been in effect from 1/17/2023 – present as warranted by turbidity conditions (OBI Daily Average > 12 FNU). The Projects operated at -2000 cfs for 19 consecutive days (starting 1/3/2023, first flush for 14 days, then turbidity bridge avoidance for 5 days), at OMR no more negative than -3500 cfs for an additional 5 days, through 1/26/2023, and at OMR no more negative than -5000 cfs thereafter.
- b. Environmental Information: Turbidity values at OBI remain above 12 FNU (16.6 FNU on 1/30/2023) and may decrease over the next week. A turbidity bridge persists but has started to weaken compared to last week; however, recent winds and forecast precipitation may influence this.
- c. Biological Information: One unmarked adult Delta Smelt was detected in the Lower San Joaquin River near Antioch on 1/31/23 and one unmarked adult Delta Smelt was detected in the South Delta on 1/17/2023 near Franks

Tract. While historical data suggests that migration is likely starting to end (Sommer et al. 2011), the extent of and variability in migration under the current flow and turbidity conditions is highly uncertain. Once Delta Smelt move upstream, they have limited movements (Polansky et al. 2017). Additionally, some of the observed distribution of recently detected released fish could be in response to disorientation or stress from release. Fish released last week are likely distributing now.

- d. Hydrologic Information:
    - i. Based on the DSM2 results discussed last week, an OMR of -5000 cfs is thought to be sufficiently protective.
  - e. Summary: DWR and Reclamation propose that the Projects operating to -5000 cfs OMR will not create conditions that result in additional movement of Delta Smelt into the interior Delta. The intent of first flush and turbidity bridge was never to expect zero salvage or zero fish movement into the interior Delta as Delta Smelt are capable of swimming to upstream locations under high outflows (Gross et al. 2021). The intent was to severely reduce a large proportion of the Delta Smelt from moving into the entrainment zone which historically (pre-2009 FWS BiOP) led to relatively high proportional population losses (Kimmerer 2008). Given turbidity is decreasing across the Delta and Delta Smelt are towards the end of migration and unlikely to be moving greater distances, risk of additional Delta Smelt moving into the interior Delta or getting entrained is low. Risk of entrainment at the Projects for Delta Smelt in the OMR Corridor is moderate.
7. After March 15 and if QWEST is negative, are larval or juvenile DSM within the entrainment zone of the CVP and SWP pumps based on surveys?

This question is not applicable until March 15th.

8. Based on real-time spatial distribution of Delta Smelt and currently available turbidity information, should OMR be managed to no more negative than -3,500?

This question is not applicable until March 15th.

9. What do hydrodynamic models, informed by EDSM or other relevant data, suggest the estimated percentage of larval and juvenile DSM that could be entrained may be?

This question is not applicable until March 15th.

## Delta Smelt References

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- Sommer, T., F. Mejia, M. Nobriga, and L. Grimaldo. 2011. The Spawning Migration of Delta Smelt in the Upper San Francisco Estuary. *San Francisco Estuary and Watershed Science* 9(2).

## Attachment A.

Table 11. Salmonid Genetic testing results for WY 2023 as of this assessment. Genetic identification of salmon is not used in calculating loss.

ID	Sample Date	FL	Julian	ots28	sexid	Assignment	PosProb1	Group	PosProb2	Model	Facility	Orig. ID
C220127CVP	12/17/2022 22:00	185	171	late	male	Non-winter	1.000	Spring	1.000	Fall	CVP	C220127CVP
C220098SWP	12/18/2022 13:00	137	172	late	female	Non-winter	1.000	Spring	1.000	Winter	SWP	C220098SWP
C220099SWP	12/28/2022 5:00	154	181	late	male	Non-winter	1.000	Spring	0.607	Late Fall	SWP	C220099SWP
C220128CVP	12/30/2022 23:59	163	184	late	female	Non-winter	1.000	Fall	0.981	Late Fall	CVP	C220128CVP
C220180SWP	12/31/2022 3:00	180	184	late	male	Non-winter	1.000	Fall	1.000	Late Fall	SWP	C220180SWP
C230082SWP	1/1/2023 10:00	150	185	late	male	Non-winter	1.000	Fall	0.982	Winter	SWP	C230082SWP
C230083SWP	1/1/2023 11:00	113	185	late	female	Non-winter	1.000	Fall	0.988	Winter	SWP	C230083SWP
C230082CVP	1/2/2023 14:00	212	187	early	male	Non-winter	1.000	Fall	0.988	Fall	CVP	C230082CVP
C230001CVP	1/3/2023 10:00	35	187	late	female	Non-winter	1.000	Fall	0.982	Fall	CVP	C230001CVP
C230002CVP	1/3/2023 10:00	34	187	late	male	Non-winter	1.000	Fall	0.769	Fall	CVP	C230002CVP
C230003CVP	1/3/2023 10:00	33	187	late	female	Non-winter	1.000	Fall	0.930	Fall	CVP	C230003CVP
C230004CVP	1/3/2023 10:00	34	187	late	male	Non-winter	1.000	Fall	0.984	Fall	CVP	C230004CVP
C230005CVP	1/3/2023 12:00	35	188	late	male	Non-winter	1.000	Unassigned	0.627	Fall	CVP	C230005CVP
C230006CVP	1/4/2023 8:00	38	188	late	female	Non-winter	1.000	Fall	0.996	Fall	CVP	C230006CVP
C230007CVP	1/4/2023 12:00	36	189	late	female	Non-winter	1.000	Fall	0.922	Fall	CVP	C230007CVP
C230008CVP	1/4/2023 12:00	38	189	late	female	Non-winter	1.000	Fall	0.999	Fall	CVP	C230008CVP
C230009CVP	1/4/2023 12:00	36	189	late	female	Non-winter	1.000	Spring	0.661	Fall	CVP	C230009CVP
C230010CVP	1/4/2023 14:00	38	189	late	male	Non-winter	1.000	Fall	0.645	Fall	CVP	C230010CVP
C230084SWP	1/4/2023 15:00	162	189	late	male	Non-winter	1.000	Fall	0.877	Late Fall	SWP	C230084SWP
C230012CVP	1/4/2023 22:00	148	189	late	male	Non-winter	1.000	Spring	0.836	Winter	CVP	C230012CVP
C230011CVP	1/5/2023 10:00	37	189	late	female	Non-winter	1.000	Fall	0.696	Fall	CVP	C230011CVP
C230013CVP	1/5/2023 14:00	163	190	late	female	Non-winter	1.000	Fall	1.000	Late Fall	CVP	C230013CVP
C230015CVP	1/11/2023 6:00	38	195	late	male	Non-winter	1.000	Fall	0.970	Fall	CVP	C230015CVP

ID	Sample Date	FL	Julian	ots28	sexid	Assignment	PosProb1	Group	PosProb2	Model	Facility	Orig. ID
C230016CVP	1/12/2023 8:00	166	196	late	female	Non-winter	1.000	Spring	0.870	Winter	CVP	C230016CVP
C230019CVP	1/12/2023 10:00	42	196	late	male	Non-winter	1.000	Spring	0.870	Fall	CVP	C230019CVP
C230018CVP	1/12/2023 12:00	34	197	late	female	Non-winter	1.000	Fall	0.986	Fall	CVP	C230018CVP
C230020CVP	1/12/2023 23:59	31	197	late	male	Non-winter	1.000	Fall	0.998	Fall	CVP	C230020CVP
C230021CVP	1/13/2023 6:00	35	197	late	male	Non-winter	1.000	Fall	0.981	Fall	CVP	C230021CVP
C230022CVP	1/13/2023 10:00	35	197	late	male	Non-winter	1.000	Spring	0.917	Fall	CVP	C230022CVP
C230023CVP	1/13/2023 23:59	38	198	late	male	Non-winter	1.000	Fall	0.966	Fall	CVP	C230023CVP
C230024CVP	1/14/2023 2:00	38	198	late	female	Non-winter	1.000	Fall	0.999	Fall	CVP	C230024CVP
C230025CVP	1/14/2023 6:00	35	198	late	male	Non-winter	1.000	Fall	0.994	Fall	CVP	C230025CVP
C230026CVP	1/14/2023 6:00	195	198	late	male	Non-winter	1.000	Fall	1.000	Late Fall	CVP	C230026CVP
C230027CVP	1/14/2023 14:00	36	199	late	female	Non-winter	1.000	Fall	0.991	Fall	CVP	C230027CVP
C230086SWP	1/17/2023 7:45	149	201	late	female	Non-winter	1.000	Fall	0.950	Winter	SWP	C230086SWP
C230029CVP	1/17/2023 8:00	36	201	late	female	Non-winter	1.000	Fall	0.998	Fall	CVP	C230029CVP