BUREAU OF RECLAMATION

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

February 2, 2025

Executive Summary

Operational Conditions

During the Old and Middle River (OMR) management season, Reclamation and DWR, through WOMT, may prepare an assessment to evaluate operating to an OMR index (OMRI) no more negative than -6,250 cfs during conditions anticipated this week.

- The larval and juvenile Delta Smelt Protection Action has not been on ramped.
- The Delta will be in excess conditions while Reclamation and DWR operate under the Storm Flex action.
- QWEST is projected to be greater than +1,500 cfs on February 3.
- X2 is less than 81km.
- Daily average turbidity is less than 12FNU at Holland Cut, Old River at Bacon Island, and Old River at Frank's Tract.
- A measurable precipitation event is occurring in the Central Valley.
- Net Delta outflow index is at a higher level of outflow available for diversion due to peak storm flows.
- No additional real-time OMR protections control project operations.
- Cumulative loss of and yearling spring run Chinook salmon surrogate release groups are less than 0.5%.

PTM modeling (Attachment A) compares a -6250 OMRI scenario, representative of the projected Storm Flex action, to a -5000 OMRI scenario. This modeling shows that after 3 weeks, there is no difference in the number of particles passing Chipps at station 809, while there is a 1% reduction in particles exiting at Chipps when injected at station 812. Second, the proportion of particles lost to the project increases by 1% when injected at station 809 or 812 in the -6250 OMRI scenario, and that loss occurs faster (after 2 weeks, instead of after 3 weeks) from injection at station 812. Thus, a -6250 OMRI Storm Flex, similar to the modeled conditions, may increase facility entrainment by 1%, and shows less of a change in fish passing Chipps from the Lower San Joaquin River (e.g. station 809 and 812) compared to the modeled -5,000 OMRI scenario.

Winter-run Chinook Salmon

No loss of natural-origin winter-run Chinook Salmon has in the past week at the Federal fish salvage facility, but loss of LAD winter-run occurred at the State fish salvage facility. A majority of winter-run are in the delta and loss of natural winter-run Chinook Salmon at the Central Valley Project (CVP) and State Water Project (SWP) fish collection facilities is possible to occur over the next week. With the proposed more negative OMRI in accordance with Storm Flex, loss of natural-origin winter-run may be expected to follow historical trends. Exceedance of the annual threshold is unlikely over the next week, but weekly distributed loss threshold exceedance is possible with one or more days of salvage.

Spring-run Chinook salmon

No loss of natural-origin spring-run Chinook Salmon (LAD) has occurred in the past week at the State or Federal fish salvage facilities. A majority of spring-run Chinook salmon have yet to enter the delta, yet it is likely that juvenile natural-origin yearling spring-run Chinook Salmon are present near the Central Valley Project and State Water Project collection facilities due to loss of hatchery spring-run surrogates. With the proposed more negative OMRI in accordance with Storm Flex, cumulative loss of hatchery spring-run surrogates may be expected to increase.

There is low probability of exceeding of hatchery yearling spring-run surrogate thresholds over the next week.

Steelhead

No loss of natural-origin steelhead has occurred in the past week at the State or Federal fish salvage facilities. A majority of steelhead have yet to enter the delta. With the proposed more negative OMRI in accordance with Storm Flex, cumulative loss of steelhead may increase and possibly exceed the historical weekly trend. There is low probability of exceeding of steelhead salvage thresholds over the next week.

Delta Smelt

One adult was observed on 1/17 by the CVP, bringing the cumulative salvage to 5. Delta smelt have been observed broadly across the western, northern, and southern Delta. The Adult Delta Smelt Entrainment Protection was implemented from 1/15/2025-1/17/2025. Turbidity is close to concern levels outside of lower value regions including the OMR corridor, in the lower San Joaquin and Confluence area. With the proposed more negative OMRI in accordance with Storm Flex, turbidity may increase in the Delta and OMR corridor, increasing the chance of exceeding the turbidity threshold in the OMR corridor for the Adult Delta Smelt Entrainment Protection ("Turbidity Bridge Avoidance").

Longfin Smelt

Two adult longfin smelt were observed in December at the CVP, bring the cumulative salvage to 8. Adult and larval longfin smelt have been observed broadly from the Bay through the confluence area, and limited observations of larvae have been in the interior and south Delta. The Larval and Juvenile Longfin Smelt Entrainment Protection Action (LJLFSEPA) was implemented January 20-26 and off ramped on January 29. QWEST has bee variable over the

winter and is expected to be greater than +1,500 with the current storm conditions, which will offramp further LJLFSEPA exceedances during the Storm Flex.

Green Sturgeon

Loss of green sturgeon has not occurred in the past week at the State and Federal fish salvage facilities. Loss of green sturgeon is unlikely to occur over the next week due to their rare winter presence in the South Delta.

White Sturgeon

Loss of white sturgeon has not occurred in the past week at the State and Federal fish salvage facilities. Loss of juvenile white sturgeon is unlikely to occur over the next week due to their uncommon winter presence in the South Delta.

Operational and Regulatory Conditions

See current Weekly Fish and Water Operation Outlook document.

Relevant Proposed Action and Incidental Take Permit Sections

Proposed Action, 3.7.4.6 Storm-Flex

During the OMR management season, Reclamation and DWR, through WOMT, may prepare an assessment to evaluate operating to an OMR index no more negative than -6,250 cfs between the start of OMR management season and the larval and juvenile Delta Smelt Protection Action onramp, or the last day of February, whichever occurs first, to capture peak flows during storm-related events when:

1. The Delta is in excess conditions as defined in the 1986 Coordinated Operations Agreement, as amended in 2018; and
2. QWEST is greater than +1,500 cfs; and
3. X2 is <81km; and
4. The daily average turbidity at the Holland Cut, Old River at Bacon Island, and Old River at Frank's Tract sensors are < 12 FNU at each station; and
5. A measurable precipitation event has occurred in the Central Valley; and
6. Reclamation and DWR determine that the net Delta outflow index indicates a higher level of outflow available for diversion due to peak storm flows; and
7. None of the additional real-time OMR protections are controlling Project operations; and
8. Cumulative loss of the CVP and SWP export facilities of yearling Coleman National Fish Hatchery late-fall run chinook salmon (yearling spring run chinook salmon surrogate) is less than 0.5% within any of the release groups.

If the criteria above are met, WOMT will decide whether to request that DWR and Reclamation use estimates of the real-time distribution of listed-species from SMT and SaMT, as well as

Particle Track Model (PTM) and prediction tool output to assess potential listed-species entrainment risk differences using OMR inputs of -5000 and –6250 cfs. If the assessment indicates that no additional real-time OMR protections for the upcoming week are likely to be triggered, Reclamation and DWR will bring a request back to WOMT for approval to operate to OMR no more negative than -6,250 cfs and will update the assessment no less than weekly.

If conditions indicate an additional real-time OMR protection is likely to trigger, Reclamation and DWR will adjust south Delta exports to achieve a 14-day average of the OMR index no more negative than -5,000 cfs, unless a further reduction in exports is required. If an entrainment protection condition is triggered, Reclamation and DWR will cease storm-flex and implement the entrainment protection condition. Storm-flex decisions will be re-evaluated weekly by WOMT.

Incidental Take Permit, 8.5. Storm Flex.

During OMR Management, Permittee may, in coordination with Reclamation, through WOMT, prepare an assessment to evaluate operating to a daily average OMR index no more negative than -6,250 cfs, to capture peak flows during storm-related events. Such operations may be requested to occur between the start of OMR Management, and either the Larval and Juvenile Delta Smelt Protection Action onramp (Condition of Approval 8.4.1) or the last day of February, whichever occurs first, to capture peak flows during storm-related events when:

1. The Delta is in excess conditions as defined in the COA; and
2. QWEST is greater than +1,500 cfs; and
3. X2 is < 81 km; and
4. The daily average turbidity at OSJ, HOL, and OBI sensors are < 12 FNU at each station; and
5. A measurable precipitation event has occurred in the Central Valley; and
6. Permittee, in coordination with Reclamation, determines that the net Delta outflow index indicates a higher level of outflow available for diversion due to peak storm flows; and
7. None of the following Conditions or Approval are controlling SWP and CVP operations: Conditions of Approval 8.2.1, 8.3.1, 8.3.2, 8.3.3, 8.4.2, 8.4.3, 8.4.4, 8.4.5, and 8.4.7; and
8. Cumulative loss at the SWP and CVP export facilities of yearling Coleman National Fish Hatchery late fall-run Chinook Salmon (as yearling CHNSR surrogates under Condition of Approval 8.4.5) is less than 0.5% within any of the release groups.

If the criteria above are met, WOMT shall decide whether to request that Permittee and Reclamation use estimates of the real-time distribution of Covered Species from SMT, SaMT, and WSMT, as well as particle tracking modeling and prediction tool outputs to assess potential Covered Species entrainment risk differences under OMR index scenarios of -5,000 and -6,250 cfs. If the assessment indicates that no additional Conditions of Approval for the upcoming week are likely to be triggered, Permittee may, in coordination with Reclamation, bring a request back

to WOMT for approval to operate to an OMR index no more negative than -6,250 cfs. Permittee, in coordination with Reclamation, shall update the assessment no less than weekly.

If, during approved operations of Storm Flex, conditions indicate a Condition of Approval is likely to be triggered, Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve a 14-day average of the OMR index no more negative than -5,000 cfs, unless a further reduction in exports is required by another Condition of Approval. If a Condition of Approval is triggered, Permittee shall, in coordination with Reclamation, cease Storm Flex operations and implement the controlling Condition of Approval within 48 hours. WOMT shall re-evaluate Storm Flex decisions weekly.

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

Winter-run Chinook Salmon

- Delta Life Stages:
    - Juveniles, Adults
- Brood Year 2024 Information:
    - Catch of juvenile winter-run Chinook Salmon at Red Bluff Diversion Dam continues and juveniles are migrating towards the Delta. Lower Sacramento and Knights Landing rotary screw traps as well as the, EDSM Trawls, Sacramento Trawls, and Sacramento Seines have observed winter-run Chinook Salmon which further confirms that winter-run Chinook salmon are migrating into the Delta.
    - Mean cumulative weekly passage of winter-run Chinook Salmon through January 30 at Red Bluff Diversion Dam (RBDD) for the last 20 years of passage data is 98.6% (one SD of 2.3%). The biweekly estimate (90% CI) as of December 31, 2024, was 422,554 (310,893- 534,214) compared to an estimate of 894,452 on a comparable date in BY 2023.
    - Historically, over 80% of winter-run have been captured at delta entry rotary screw traps and less than 5% have been captured exiting the delta at Chipps Island as of the end of January (see Table 1).
- Hatchery-origin winter-run Chinook salmon: Livingston Stone National Fish Hatchery has planned the release of approximately 240,404 brood year 2024 winter Chinook Salmon into the Sacramento River on February 1, 2025.
- Natural winter-run Chinook salmon: The final winter-run Chinook salmon Juvenile Production Estimate, which estimates the abundance of fish entering the Delta, for Brood Year 2024 is 98,893.

Evaluation

One natural winter-run salmon was salvaged January 16 at the CVP fish collection facility. Predicted cumulative salvage is expected to continue at a similar rate and stay within the

historical range in the next week (Figure 1) in both a projected -5000 OMRI and -6250 OMRI scenario (Table 2a, 2b) using the Tillotson et al model (2022).

Table 1. Historic migration and salvage patterns for salmonids. Average percentage and 95% confidence intervals in parentheses. Last updated 1/31/2024

Species	Red Bluff rotary screw trap	Tisdale rotary screw trap	Knights Landing rotary screw trap	Delta entry trawls and seines	Delta exit Chipps Trawl	Salvage Facilities
Chinook, LAD Winter-run, Unclipped	98.7% (97.8,99.6) BY: 2015 - 2023	88.2% (75.3,101.1) BY: 2015 - 2023	83.8% (67.0,100.6) BY: 2015 – 2023	40.2% (13.5,66.9) BY: 2015 - 2023	3.5% (-1.5,8.5) BY: 2015 – 2023	31.3% (10.6,52.0) WY: 2015 – 2024
Chinook, LAD Spring-run, Unclipped	15.6% (4.4,26.9) BY: 2015 - 2023	16.5% (6.6, 26.4) BY: 2015 - 2023	26.5% (6.1,46.9) BY: 2015 - 2023	2.5% (-0.4,5.5) BY: 2015 - 2023	0.0% (0.0,0.0) BY: 2015 – 2023	0.0% (-0.0,0.0) WY: 2015 - 2024
Steelhead, Unclipped (January-December)	1.1% (-0.1,2.4) BY: 2015 - 2024	29.0% (10.9,47.1) BY: 2015 - 2024	26.9% (10.5,43.3) BY: 2015 - 2024	16.1% (-0.6,32.9) BY: 2015 - 2024	5.9% (-0.7,12.5) BY: 2015 - 2024	N/A
Chinook, DNA Winter-run, Unclipped (Water Year)	N/A	N/A	N/A	N/A	N/A	25.6% (-10.9,62.1) WY: 2020 - 2024
Steelhead, Unclipped (Water Year)	N/A	N/A	N/A	N/A	N/A	9.0% (1.3%,16.6%) WY: 2015 - 2024

Table 2a. WY 2025 loss and salvage predictor data: Predicted weekly loss of winter-run Chinook salmon and steelhead at CVP and SWP facilities.

Output	Modeled Current Week	Projected -5000 OMRI	Projected -6250 OMRI
Predicted Chinook Winter Run, Median %	7	6	7
Predicted Chinook Winter Run, High %	27	36	36
Predicted Steelhead, Median %	0	1	1
Predicted Steelhead, High %	26	42	52

Table 2b. Environmental and operational details for current, projected -5000, and -6250 scenarios. Only OMR flows were changed to evaluate potential changes in loss.

Parameter	Current Condition	Projected -5000	Projected -6250
Temperature (Mallard Island, C)	9.7	9.7	10.0
Precipitation (5-d running sum, inches)	0	0	0
Old and Middle River Flows (cfs)	-4400	-5000	-6250
Sacramento River Flow (Freeport, cfs)	19981	19981	19981
DCC Gates	Closed	Closed	Closed
San Joaquin River Flow (Vernalis, cfs)	1188	1188	1188
Export	4389	4389	4389

Spring-run Chinook Salmon

- Delta Life Stages:
    - Young-of-year (YOY) and Yearlings
- Brood Year 2024 Information:
    - Catch of juvenile spring-run Chinook Salmon in lower Sacramento River and Feather River monitoring surveys indicates fish migrated earlier in the winter. Delta entry surveys have observed spring-run Chinook Salmon which further confirms that spring-run Chinook salmon are in the Delta.
    - Historically, around 25% of spring-run young-of-year (yoy) have been captured at delta entry rotary screw traps and 0% have been captured exiting the delta at Chipps Island (see Table 1), indicating the majority of yoy spring-run have yet to enter the delta.
    - Natural spring-run Chinook salmon: No estimate is available.
    - No natural spring-run Chinook have been salvaged at salvage facilities this season.
- Hatchery-origin spring-run Chinook Salmon: The San Joaquin SCARF released 5201 spring-run Chinook salmon into the San Joaquin River at Highway 140 and loss of this release is estimates to be 25 fishes (0.488%).
- Spring-run Chinook surrogate releases: Hatchery-origin Late-fall run Chinook salmon have been released in the upper Sacramento acting as surrogates for spring-run Chinook salmon. Loss from multiple releases has occurred (Table 3).

Evaluation

Current and projected environmental conditions, including flows and temperatures (Table 4) are amenable to juvenile spring-run Chinook salmon migration from tributaries into the Delta.

Loss of late fall run Chinook surrogate groups, representing spring-run Chinook salmon, is likely to continue but it is unlikely any group's loss criteria will be exceeded.

Table 3: Release information for hatchery late fall-run Chinook groups that are surrogates for spring-run Chinook salmon.

Release Group and Date	Release Number	Estimated loss	% Loss of the Group	% of 0.25% criteria
#1, November 20-21	698,892	989	0.141	56.6
#2, December 13, 2024	77,355	73	0.094	37.5
#3, January 17, 2025	74,425	0	0.000	0.0

Table 4. Mean website 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	Deer Creek (DCV): mean daily flow (cfs)	Deer Creek (DCV): flow percent change	Wilkins Slough (WLK): mean daily flow (cfs)	Knights Landing RST: water temp (f)
1/30/2025	207.4	-1.2%	190.3	-1.2%	9,522.6	N/A
1/29/2025	209.9	-1.6%	192.6	-0.5%	9,719.3	N/A
1/28/2025	213.3	0.5%	193.7	-1.1%	10,002.3	N/A
1/27/2025	212.3	-2.4%	195.9	-3.9%	10,332.0	N/A
1/26/2025	217.5	-4.5%	203.8	-3.6%	10,659.7	41.0
1/25/2025	227.9	-0.5%	211.4	-1.0%	10,904.3	41.0
1/24/2025	229.1	0.3%	213.6	-0.9%	11,196.0	40.9
1/30/2025	207.4	-1.2%	190.3	-1.2%	9,522.6	N/A

California Central Valley Steelhead

- Delta Life Stages:
    - Spawning Adults, Kelts, Juveniles
- Brood Year 2024 Information
    - Natural CCV juvenile steelhead have been observed at several Delta monitoring locations including the Sacramento Trawl and Chipps Island Trawl.
    - One natural steelhead was salvaged January 16 at the CVP fish collection facility and estimated loss is 17 fish.

    - 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.
- Hatchery steelhead: Steelhead have been salvaged at the CVP and SWP fish collection facilities between December 17 and January 29. Loss of hatchery steelhead is estimated to be 48 fish.

Evaluation

Predicted cumulative loss in expected to continue (Figure 1) and the projected -6250 OMRI scenario has greater loss than the -5000 OMRI scenario (Table 2a,2b) using the Tillotson et al model (2022). Under both scenarios, loss may exceed the historical 95% confidence interval of loss.

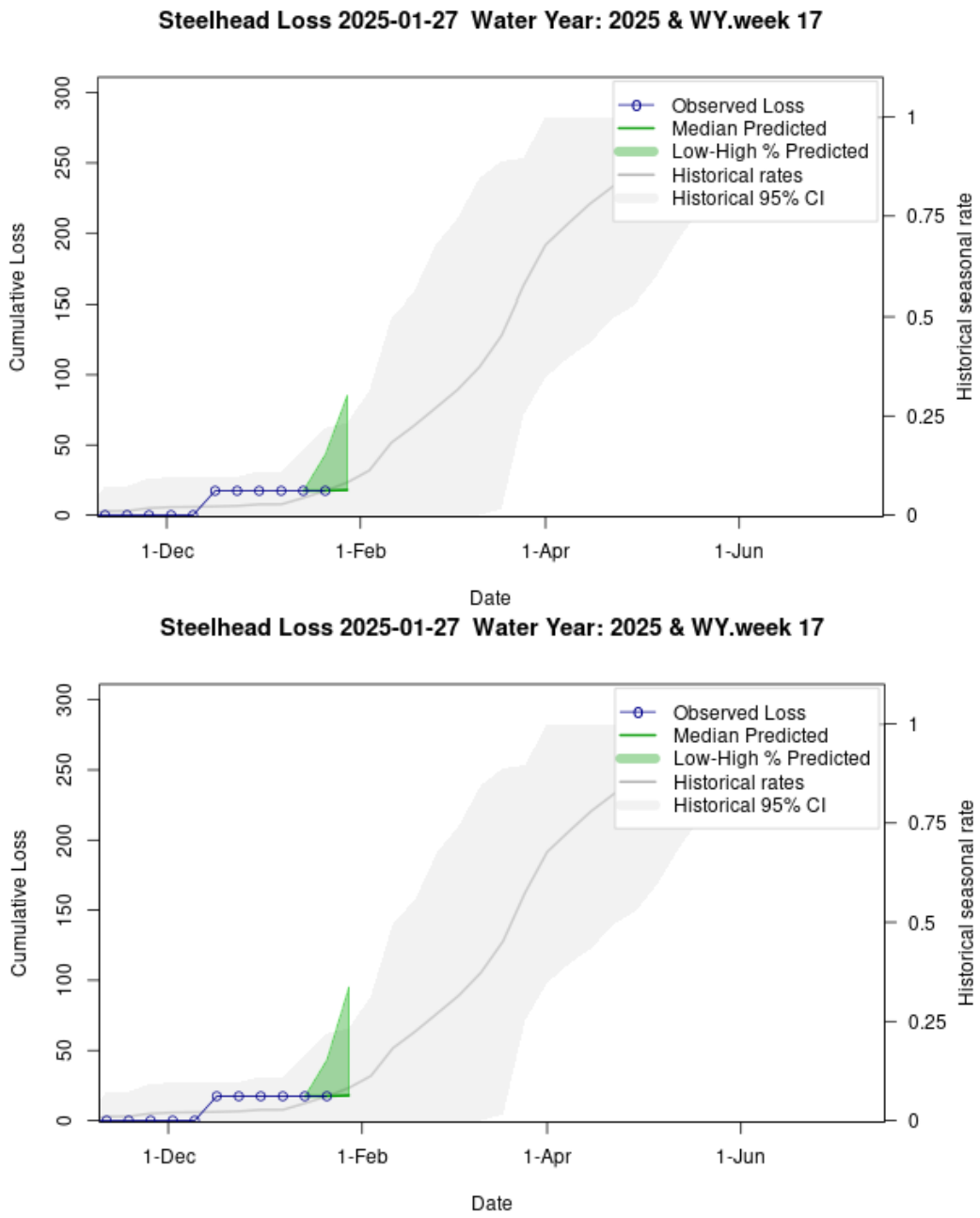

Figure 1. Predicted weekly loss of steelhead at the CVP and SWP facilities for the projected -5000 OMRI (top panel) and -6250 OMRI (lower panel) scenarios. From SacPAS.:

Figure 1 is two-line graphs of the predicted weekly loss of steelhead for water year 2025 beginning on December 1, 2024. The first line graph shows the cumulative loss of steelhead salmon for the projected -5000 OMRI and the second line graph shows the cumulative loss of steelhead at -6250 OMRI.

Biology, Distribution, and Evaluation of Delta Smelt

- Delta Smelt Life Stages:
    - Adults
- Brood Year 2024 Information:
    - The abundance estimates as of the week of 1/27/24 was 4,517 (95% CI: 883 to 14,045).
    - In the last four weeks, adult Delta Smelt have been detected in Suisun Marsh, Suisun Bay, Cache Slough/Liberty Island, the Sacramento Deepwater Ship Channel, the Lower Sacramento, and the Lower San Joaquin. The most recent Delta Smelt detection from surveys was 1 unmarked adult on 1/30/2025 in the Sacramento Deepwater Ship Channel (Table 5). Thirty-eight Delta Smelt (36 marked, 2 unmarked) have been detected this water year (Table 6).
    - Over 100,000 hatchery Delta Smelt are expected to be released for Water Year 2025 (Table 7).
    - One marked (ad-clipped) adult Delta Smelt was detected in Salvage at the TFCF on 1/17/2025 and one (VIE-LOA) adult Delta smelt was detected at the TFCF on 12/17/24. Cumulative seasonal salvage is 5. Historical salvage trends indicate adult Delta Smelt salvage reaches the 50th percentile between February and the beginning of March (see Delta Smelt Adult query).
    - Historically, detections of ripe Delta Smelt began in January and peaked in February and March and the majority of Delta Smelt spawning occurs within a temperature range of 9-18˚C (Damon et al. 2016).
- Based on historical monitoring data from the past few years,, first detection of larvae in the Central and South Delta has typically occurred by mid to late March.
- Larval sampling at the Skinner Fish Facility (SFF) and the Tracy Fish Collection Facility (TFCF) has not yet been initiated this year.

Environmental Surrogates

Turbidity in the Delta is used as a surrogate for Delta Smelt migration behavior in the winter.

A series of atmospheric river is predicted through next week. In Stockton, precipitation is predicted until next Thursday, with a flood watch in effect when the majority of the precipitation is predicted to occur. Winds on Saturday will be southeast around 9 mph, with gusts up to 21 mph. In Antioch, precipitation is predicted from until Thursday, with a flood watch in effect. In the Delta, weekend precipitation will total 0.75-1.0". Winds are southeast, with strong winds (18-21 mph, gust up to 26 mph) on Saturday night and Sunday.

Turbidity is currently low (5-7 FNU/NTU) in the OMR corridor and South Delta (Table 8) but is expected to increase with storm conditions.

Table 5. Summary of newly reported detections of Delta Smelt since the last assessment. 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. 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. Regions are those defined by EDSM sampling. Salvage values reflect pre-expansion salvage.

Date	Survey	Life Stage	Catch	Tag Type	Stratum/Station	Region
1/21/2025	EDSM	Adult	1	AdClipped	Suisun Marsh	West
1/21/2025	EDSM	Juvenile	1	VIE-RBP	SDWSC	North
1/23/2025	EDSM	Juvenile	1	VIE-RRP	Cache Slough/Liberty Island	North
1/23/2025	EDSM	Adult	1	VIE-RRP	Cache Slough/Liberty Island	North
1/27/2025	EDSM	Adult	1	VIE-LOA	Lower Sacramento	West
1/30/2025	EDSM	Adult	1	None	SDWSC	North

Table 6. 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

Survey	Frequency	New Detections	QA/QC Detections	Genetically Confirmed Detections	Total WY 2025	Notes
EDSM	Weekly	6	24	N/A	30	Phase 1 began 12/2/2024
DJFMP Beach Seines	Biweekly	0	0	N/A	6	Ongoing
SLS	Biweekly	0	N/A	N/A	0	Began 12/2/24
20-mm	Biweekly	0	N/A	N/A	0	Begins: 3/10/25
Summer Townet	Biweekly	0	N/A	N/A	0	Begins: 6/9/25
Bay Study	Monthly	0	N/A	N/A	0	Ongoing

Survey	Frequency	New Detections	QA/QC Detections	Genetically Confirmed Detections	Total WY 2025	Notes
FMWT	Monthly	0	N/A	N/A	0	Ongoing
Chipps	Weekly	0	N/A	N/A	0	Ongoing
FCCL Brood Stock Collections	Weekly	0	N/A	N/A	0	Began 11/19/2024
LEPS	As available	0	N/A	N/A	0	Begins: 1/6/25
Skinner Fish Facility	Daily	0	N/A	N/A	0	Ongoing
Total	N/A	N/A	N/A	N/A	38	Sum of all Delta Smelt observed during the OMR Management Season

Table 7. Release information for hatchery Delta smelt.

Release Date	Release Number	Release Location
November 18, 2024	13,573	Lookout Slough
December 9, 2024,	14,880	Lookout Slough
December 18, 2024	20,219	Rio Vista
January 8, 2025	10,024	Lookout Slough
January 22, 2025	25,226	Lookout Slough
January 27, 2025	24,504	Rio Vista
(Expected) February 3, 2025	~20,000	Rio Vista

Table 8. Relevant Environmental Factors to the current management actions for Delta Smelt

Date Reported	OBI Turbidity (FNU)	OSJ Turbidity (NTU)	HOL Turbidity (FNU)
1/30/2025	5.92	7.09	6.78

Evaluation

Adult Delta Smelt are expected to be present in Cache Slough/Liberty Island, Sacramento Deepwater Ship Channel, the Lower Sacramento River, the Lower San Joaquin River, Suisun Bay, Suisun Marsh, and the South Delta.

Historical patterns in salvage may continue to occur since this has been observed this winter, but the majority of Delta smelt observations will continue to be outside of the CVP and SWP fish collection facilities.

Environmental surrogates of entrainment risk will increase with this storm and there is an increased likelihood that OBI, OSJ, and HOL turbidity criteria will be exceeded. Daily average Vernalis flows are not expected to be greater than 10,000 cfs, and it is unlikely there will be a high flow offramp of the Old and Middle River Management action for Adult Delta Smelt Entrainment Protection.

Biology, Distribution and Evaluation of Longfin Smelt

- Longfin Smelt Life Stages:
    - Adults, larvae, and juveniles
- Brood Year 2023 Information:
    - The longfin smelt adult index for WY2025 is 3,604. The index is the highest it has been the past 23 years (2001 index was 4,486) and the third highest index since 1996, well before the Pelagic Organism Decline (POD, Figure 2). Since this index includes catch data throughout the range of LFS in the fall, including San Francisco Bay and San Pablo Bay, it represents a geographically robust, age-specific abundance metric designed to specifically inform real-time export operations. The elevated index observed in 2001 is notable here since it was followed by the highest juvenile LFS salvage year since records on smelt salvage began in the early 1990s (Figures 2 and 8).
    - Smelt Larvae Survey (SLS) stations 809, 812, 902, 915, and 918 (Figure 3) have been selected for sampling by the Larval Entrainment Study to try to better quantify LFS abundance in the vicinity of the fish facilities. Stations 809 and 812 were chosen since historically larval and juvenile LFS have been caught more reliably in the lower San Joaquin River than in the South Delta. SLS #2 and #3 caught 60 and 69 larval LFS smelt, respectively, at stations 809 and 812 (Figure 4). The South Delta stations 902, 915, and 918 are all directly upstream of the fish facilities, with station 918 closest to the fish facilities (Figure 3). Catch at the three 900 stations has been low since the inception of SLS in 2009. Total annual catch at 902, 915, and 918 has been fewer than ten LFS since 2015. So far this year, SLS #2 caught four larval LFS across 902, 915, and 918, including the first LFS larva since 2020 at 918, no LFS were caught at the 900 stations during SLS #1. The remainder of the SLS stations show a broad distribution of longfin smelt larvae. The survey's observations suggest limited entrainment effects over the water year, with a very limited portion of the larval distribution in the central and lower San Joaquin regions.
    - The larval and juvenile longfin smelt entrainment protection action was implemented between January 20-26. A second iteration of this action was offramped on January 29 based on the high value of the longfin smelt index, low turbidity within the interior delta reducing longfin smelt habitat associations, and newly published data on larval entrainment effects to subsequent life stages (Gross et al 2022, Kimmerer and Gross 2022)

- Spawning and distribution of LFS in the lower San Joaquin River and the southern Delta is 7-day partially related to antecedent flows (CDFW Smelt Effects Analysis, Attachment 5 of the 2024 ITP), wherein adult LFS tend to travel and spawn further upstream when their winter spawning season overlaps with reduced flow and drier hydrology.
- Historical estimates of larval longfin smelt population size and losses have been published. Kimmerer and Gross (2022) estimated larval LFS population size and losses at the CVP and SWP export facilities using larval trawl data. Their analysis focused on 2009-2020, so was not inclusive of the last time the index was greater than 3,604 (2001) but is inclusive of 2011 when the index was 2,807 and 2012 when the index was 1,125 (2011 and 2012 were the only years in the 2009-present period where the index was greater than 1,000). For 2011 and 2012, Kimmerer and Gross (2022) estimated entrainment losses at 1.5% and 1.7%, respectively (13-day cumulative loss period). Over the entire period analyzed, Kimmerer and Gross (2022) estimated the proportional losses at the export facilities to be 1.5%. Additionally, Gross et al (2022) used
- Particle Tracking Models and larval trawl data to estimate proportional losses at the export facilities in a dry and wet year (2013 and 2017, respectively). Dry year losses, most relevant to the hydrologic pattern for January 2025, were estimated at 1.95%. Gross et al later expanded their analysis to include water years 2021 and 2022, estimating proportional losses to entrainment at 0.99% and 1.29%, respectively (unpublished report). Among the years analyzed using this methodology, 2021 had the highest index at 869.

Environmental Surrogates

QWEST values have been decreasing and have become negative (Figure 4). The atmospheric rivers anticipated over the next week is predicted to increase QWest to greater than +1,500 cfs as early as February 3 and may exceed 10,000 cfs around February 6.

Evaluation

Strong storms in November and December 2024 gave WY2025 a promising start, but January has been mostly dry, though rain is forecasted for late this week, going into February. The peak of LFS spawning is ongoing, and larval catch continues to increase in SLS due to the strong spawning age-class indicated by the high Age 1+ 2024 index. This means an increasing presence of larval LFS upstream of the confluence, which is detectable at stations 809 and 812 in the lower San Joaquin River (Figure 5, Table 9).

To evaluate the potential for future longfin smelt entrainment and loss in WY2025, the cumulative salvage trajectories for WY2014 and WY2022 is plotted (Figures 6 and 7). In January of 2014 and 2022, hydrology was relatively dry and larval LFS detections were elevated, similar to current conditions. In WY2014, larval LFS catch at 809 and 812 was elevated mid-January through February (Figure 6). More recently, WY2022 had elevated LFS salvage and drier hydrology (Figure 7). These two years were dramatically different, 40 juvenile LFS were detected in salvage in WY2014, while WY2022 saw a total of 7,448 LFS in salvage. WY2022 was the highest total annual salvage since WY2002 (97,473 fish). Given the 2001 Age 1+ 2001 index of 4,486, the elevated salvage of their resultant offspring in the spring of 2002 is notable. However, OMRIs during the spring of WY2002 had substantial periods more negative than -5,000 cfs,

which likely contributed heavily to the salvage patterns observed that year (Figure 8). Based on these previous observations, WY2025 larval salvage patterns are likely to fall between WY2022 and WY2002, due to a large Age 1+ index, a dry January, and negative OMRI.

Catch from SLS in WYs 2014 and 2022 are illustrated in Figures 9 and 10. In WY 2014, SLS caught 24 LFS in Survey 1, 130 in Survey 2, and 94 in Survey 3 (248 total). For WY 2022, catch was 47, 30, and 10 respectively for the first three surveys (87 total). This puts WY 2025 squarely between the two water years, with a total catch of 147 larval LFS in SLS Surveys 1-3. Overall catch for SLS in WY2025 is already higher than in WY2014 or WY2022. Total confirmed larval LFS catch from SLS 1 and 2 this year is 1,890, compared to 1,295 larval LFS in the first two surveys of WY2014, and 481 larval LFS in surveys 1 and 2 in WY2022. Continued catch of larval LFS in SLS should be expected, as water temperatures in the lower San Joaquin River at Antioch remain at levels conducive to LFS spawning and embryo hatching (~8-14°C, Wang 2007), indicating continued spawning and hatching (Figure 11). In the current cool conditions, LFS may remain catchable by SLS larval gear for longer periods of time as larval LFS growth rates at 9°C have been shown to be reduced compared to 12°C (Yanagitsuru et al. 2021).

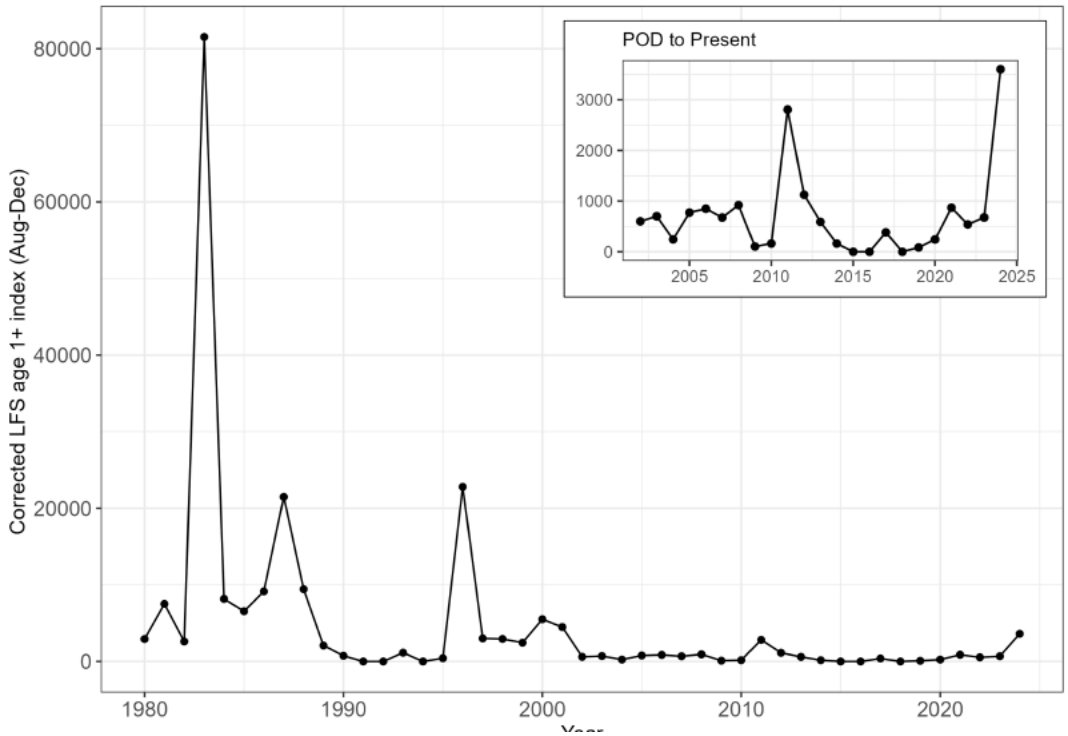

Figure 2: SF Bay Study corrected age 1+ LFS index (Aug-Dec) from 1980-2024 with an inset plot of indices from the Pelagic Organism Decline to present.

Figure 2 is two-line graph showing the corrected LFS age 1+ index for years from 1980 – 2020. The second line graph shows the POD to Present from 2005 to 2025.

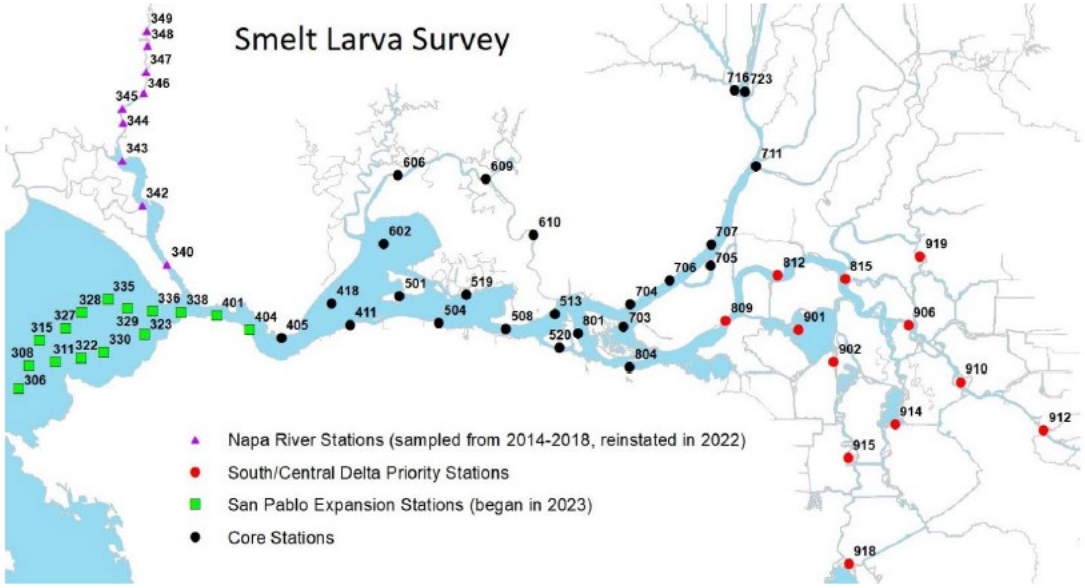

Figure 3. Map of Smelt Larva Survey stations. The 20mm survey uses the same stations. Clifton Court Forebay is at bottom right, below station 918.

Figure 3 is a map of the Smelt Larva Survey stations where Core Stations are represented by a black dot in the central portion of the map, South/Central Delta Priority Stations are represented by a red dot on the right side of the map, San Pablo Expansion Stations are represented by a green square on the left side of the map, and lastly, the Napa River Stations are represented by a purple triangle in the upper left section of the map.

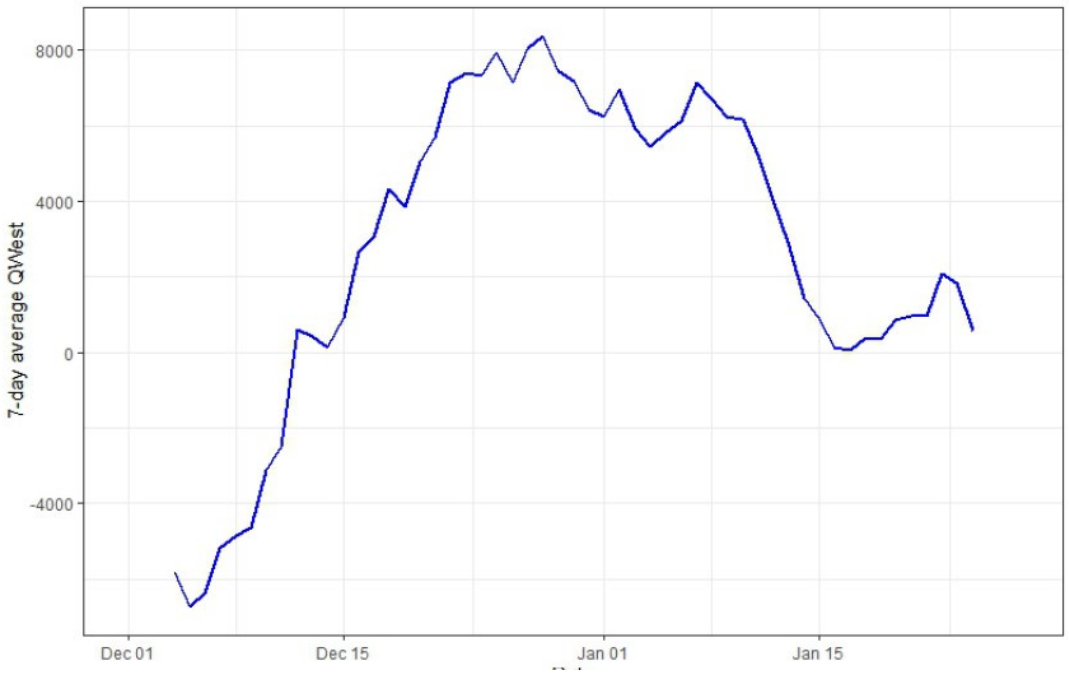

Figure 4. Running 7-day average QWest for December 2024 and January 2025.

Figure 4 is a line graph showing the 7-day average QWest from December 1, 2024 to January 15, 2025. The graph shows a spike from December 15, 2024 and begins to decline as it approaches January 15, 2025.

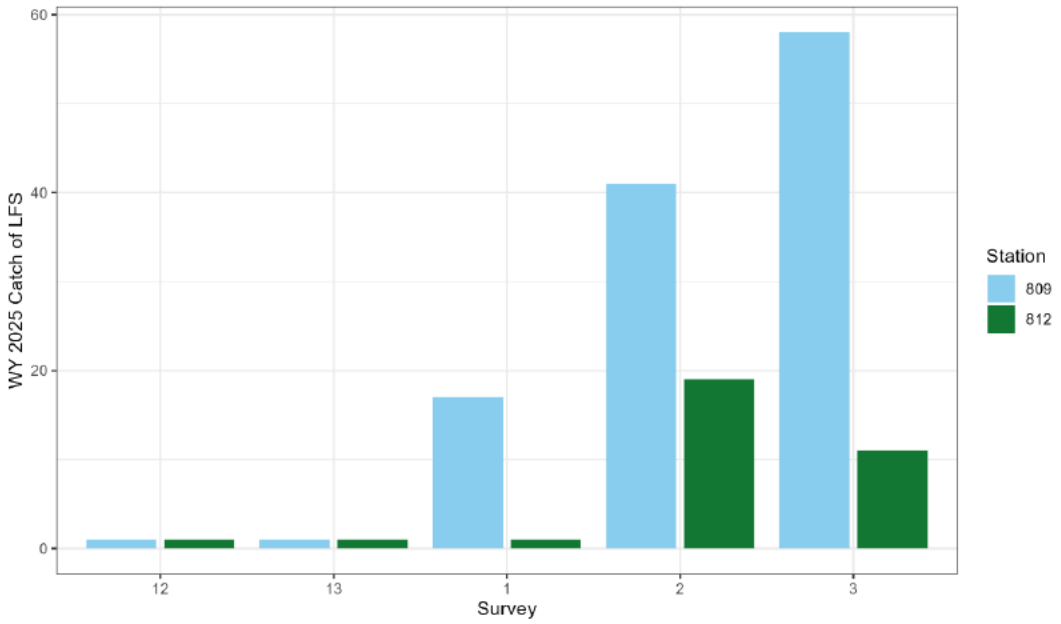

Figure 5. SLS catch of LFS at Stations 809 and 812 during WY2025 regularly scheduled sampling.

Figure 5 is a bar graph showing the SLS catches for Water Year 2025 comparatively at stations 809 and 812 during each survey period. The stations have relatively similar catches for survey period 12 and 13. For survey periods 1, 2, and 3, station 809 is significantly higher than station 812.

Table 9. SLS catch of LFS at Stations 809 and 812 during supplemental sampling one week after SLS 2.

SLS Station	Date	Species	Smelt Catch	Min Length	Max Length	Mean Length	Yolk Sac (# of Individuals)
809	1/21/2025	Longfin Smelt	42	6	8	6.8	38
812	1/21/2025	Longfin Smelt	30	6	8	6.8	24

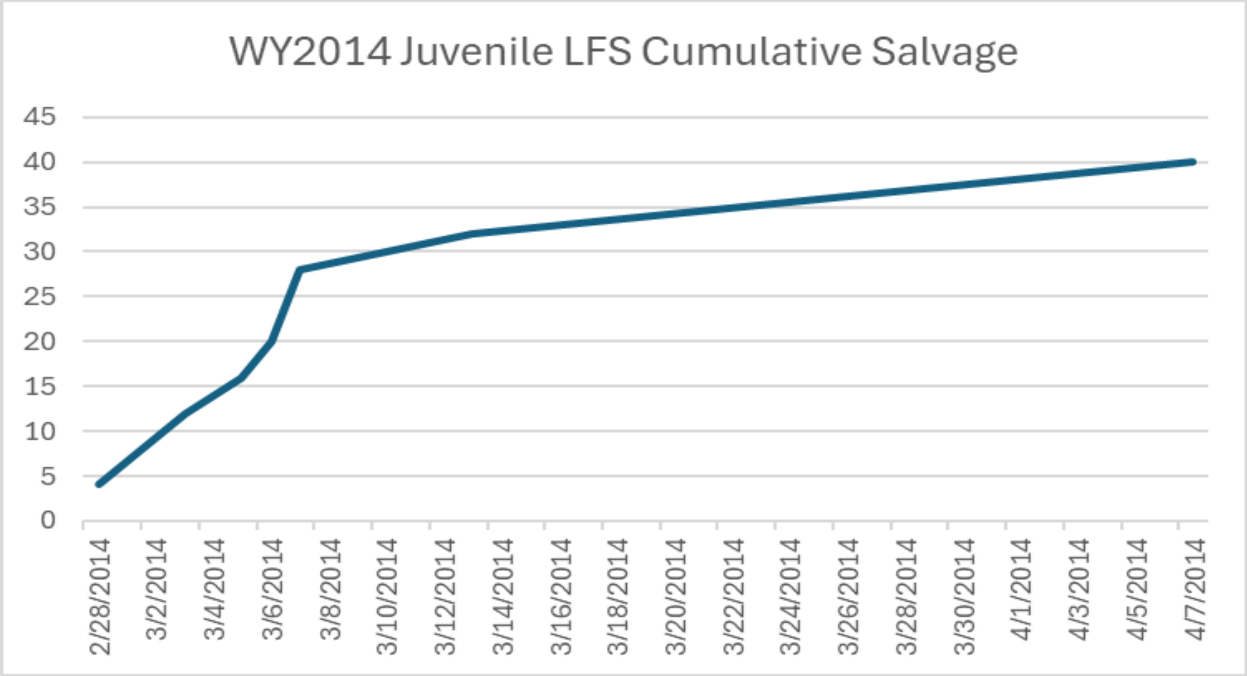

Figure 6. Cumulative salvage of juvenile LFS in WY214.

Figure 6 is a line graph showing the Water Year 2014 Juvenile LFS Cumulative Salvage from February 28, 2014 to April 7, 2014. The line shows an increasing slope beginning on March 6, 2014, to April 7, 2014.

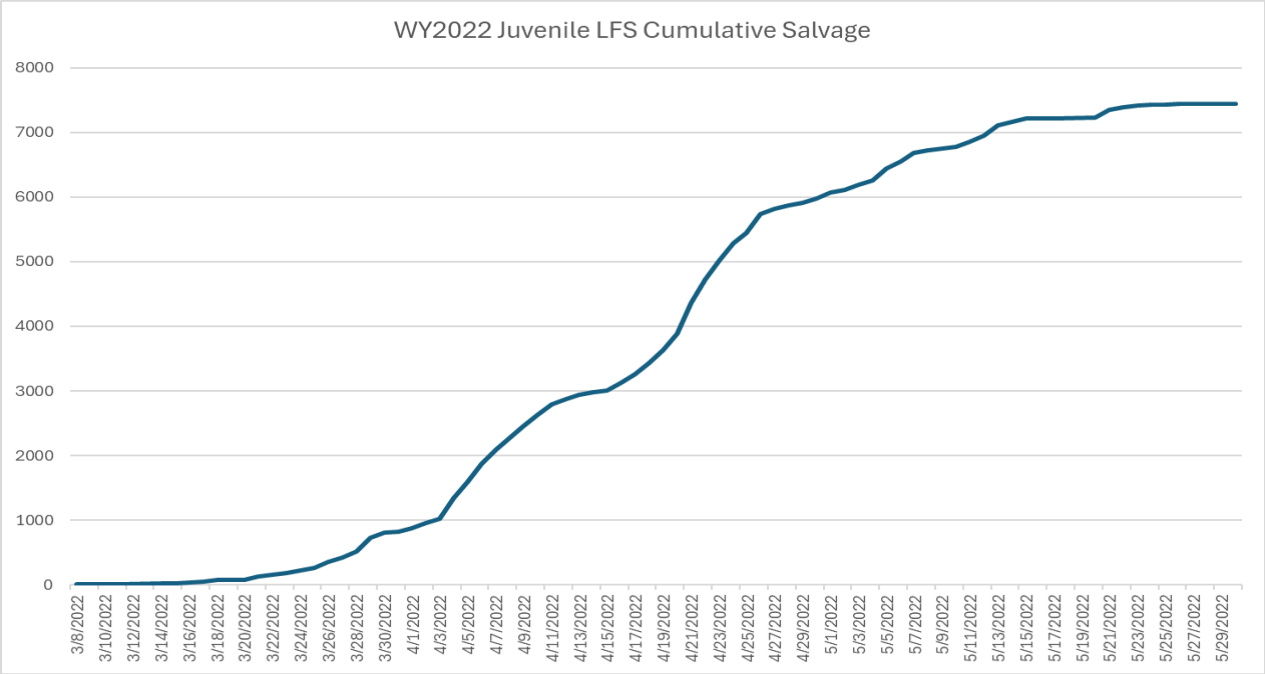

Figure 7. Cumulative salvage of juvenile LFS in WY2022.

Figure 7 is the cumulative salvage of juvenile LFS in Water Year 2022 from March 8, 2022, to May 29, 2022 showing an increase beginning on March 26, 2022.

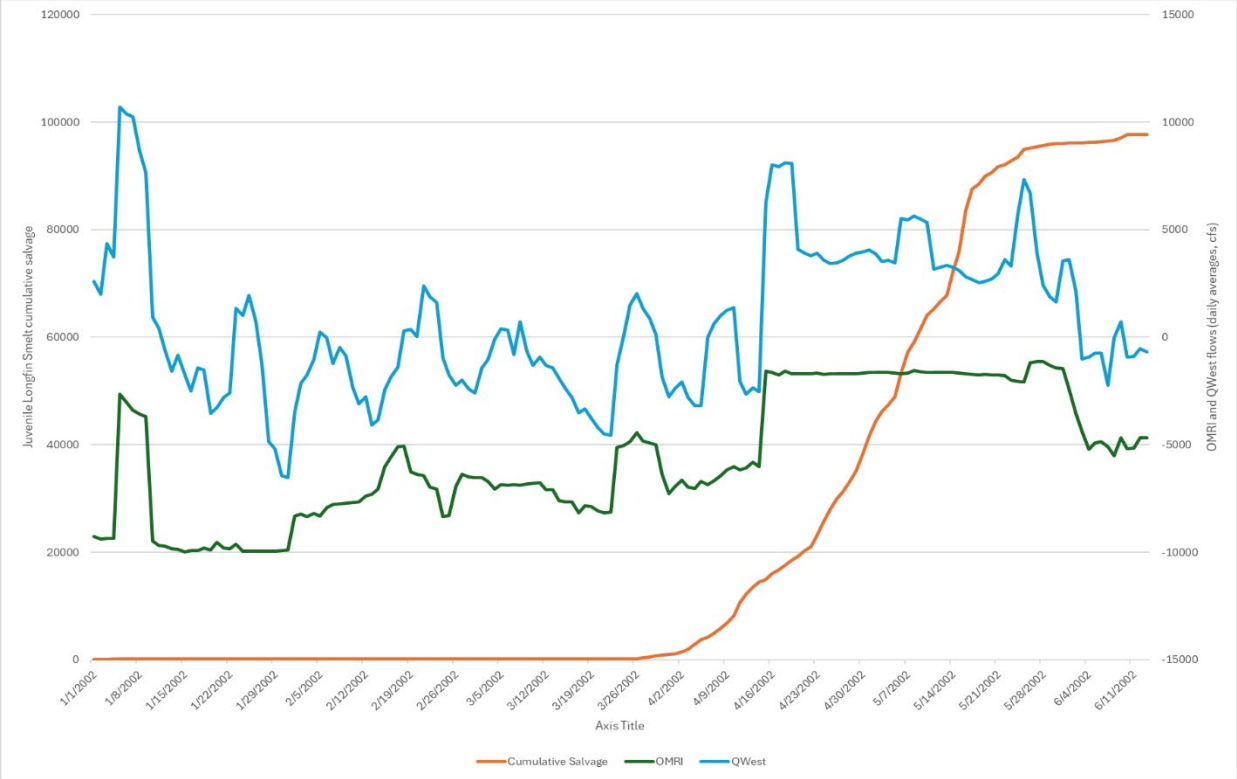

Figure 8. Cumulative salvage of juvenile LFS in WY2002 (orange), with daily average OMRI (green) and QWest (blue) during the same period.

Figure 8 is a line graph showing three lines: the cumulative salvage, daily average OMRI, and Qwest from January 1, 2022, to June 11, 2022.

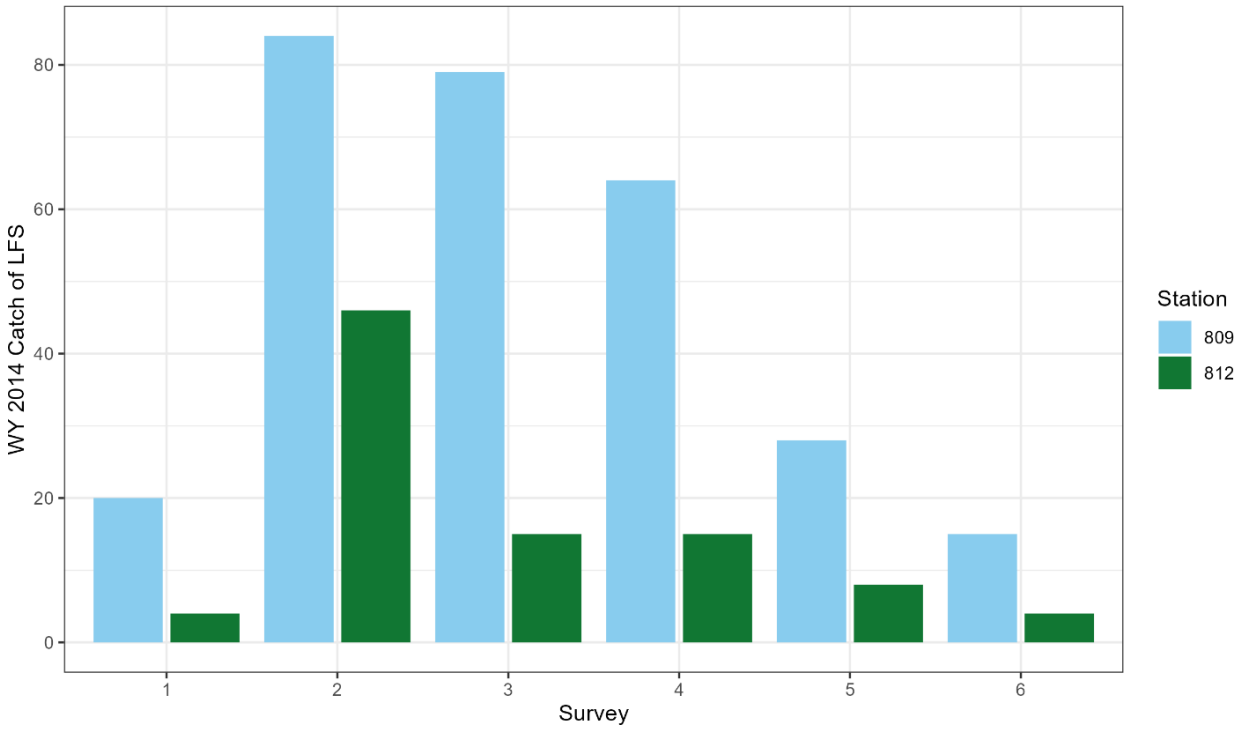

Figure 9. SLS catch of LFS at Stations 809 and 812 during WY2014.

Figure 9 is a bar graph that shows the SLS catch of LFS at stations 809 and 812 for Water Year 2014 during each survey period. For all survey periods, 1-6, station 809 has higher SLS catches.

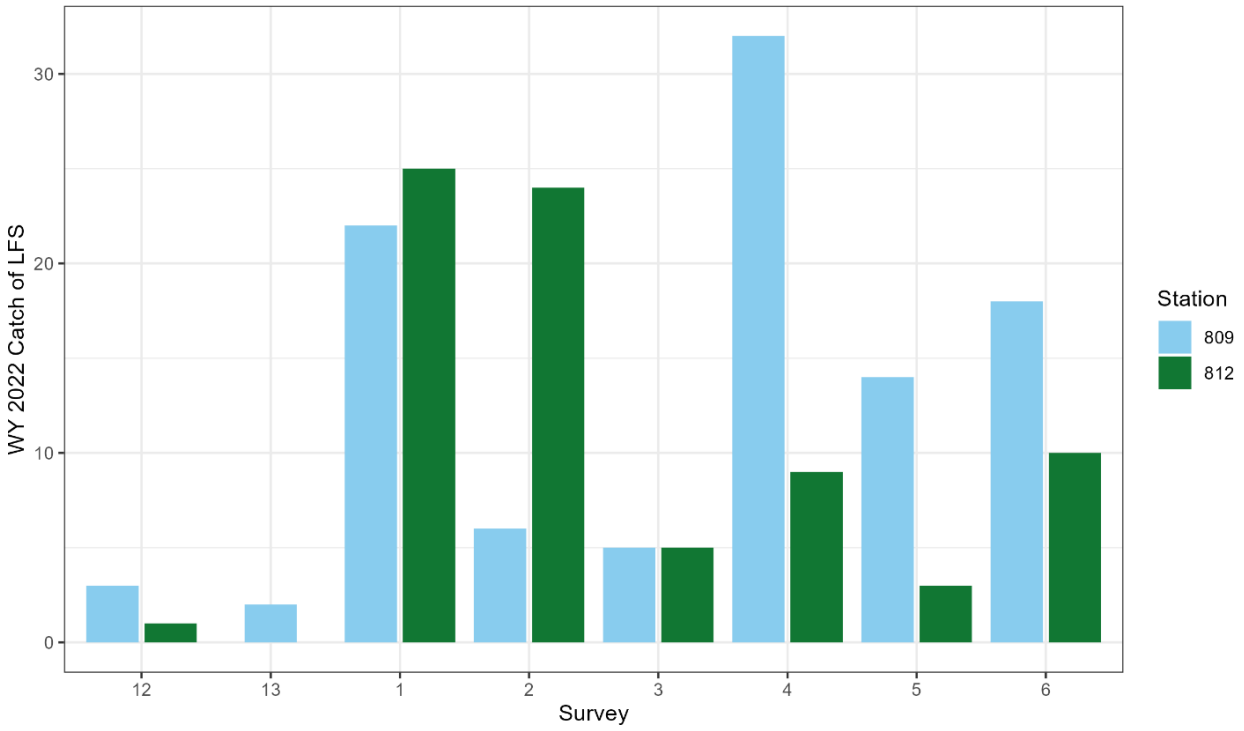

Figure10. SLS catch of LFS at Stations 809 and 812 during WY2022.

Figure 10 is a bar graph that shows the SLS Catch of LFS at stations 809 and 812 for Water Year 2022 during each survey period. For survey periods, 12, 13, 4, 5, and 6, station 809 has higher SLS catches. For survey periods 1 and 2, station 812 has higher SLS catches. And, for survey period 3, the SLS catches are equal.

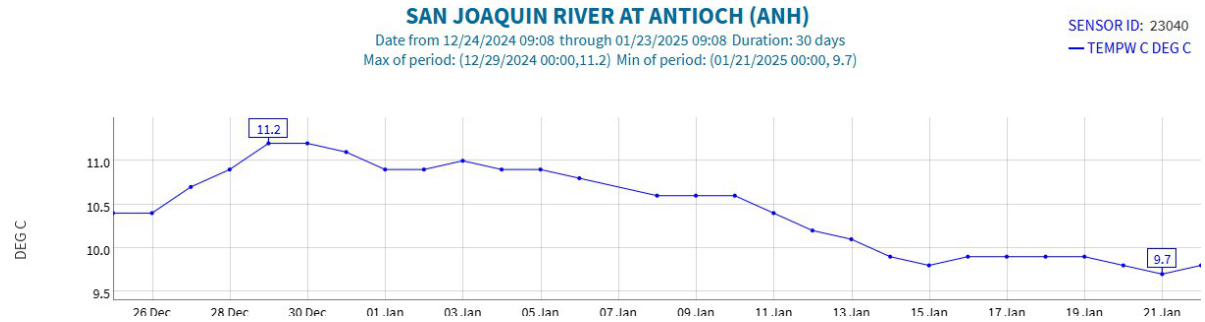

Figure 11. Daily average temperature at Antioch in the lower San Joaquin River.

Figure 11 is a line graph showing the daily average temperature at Antioch in the lower San Joaquin River from December 29, 2024, until January 21, 2025. The highest temperature is 11.2°C and lowest temperature of 9.7 °C.

Biology Distribution and Evaluation of Green Sturgeon

- Delta Life Stages:
    - Juveniles
- Current Information
    - 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.
    - There are no estimates of green sturgeon juvenile abundance.
    - No juvenile or adult green sturgeon have been salvaged in water year 2025.

Evaluation

With the proposed more negative OMRI in accordance with Storm Flex, there are not expected to be effects to juvenile or adult green sturgeon.

Biology Distribution and Evaluation of White Sturgeon

- Delta Life Stages:
    - Juveniles, Adults
- Current Information
    - Historically, juvenile sturgeon have been observed in the Delta during the winter. Some adult white sturgeon are likely entering the Delta especially with increased discharge coming from the river systems due to the rains creating attraction flows for sturgeon to migrate to spawning grounds in the Sacramento, Feather, and San Joaquin rivers.
    - There are no estimates of white sturgeon juvenile or adult abundance.
    - No juvenile or adult white sturgeon have been salvaged in water year 2025.

Evaluation

With the proposed more negative OMRI in accordance with Storm Flex, there are not expected to be effects to juvenile or adult white sturgeon.

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Attachments A: PTM Modeling

End of Week Summary

Particles Injected 1/28/2025

Notes:

1. Particles entrained by projects is the sum of CVP and SWP Flux.
2. Particles in OMR Corridor is the sum of Old River Flux and Middle River Flux minus Particles Entrained by Projects.
3. Particles Passed Chipps is the chipps Flux.

Table 10. Week 1 (02-04-2025) Particles Injected

Station	OMR	Particles Entrained by Projects	Particles in OMR Corridor	Particles Passed Chipps
809	Base OMR	0%	1%	34%
809	-6250	0%	1%	34%
812	Base OMR	0%	2%	9%
812	-6250	0%	2%	9%

Table 11. Week 2 (02-11-2025) Particles Injected

Station	Base OMR	Particles Entrained by Projects	Particles in OMR Corridor	Particles Passed Chipps
809	Base OMR	2%	1%	90%
809	-6250	2%	1%	89%
812	Base OMR	3%	3%	76%
812	-6250	4%	3%	73%

Table 12. Week 3 (02-17-2025) Particles Injected

Station	Base OMR	Particles Entrained by Projects	Particles in OMR Corridor	Particles Passed Chipps
809	Base OMR	2%	1%	91%
809	-6250	3%	1%	81%
812	Base OMR	5%	2%	82%
812	-6250	6%	2%	81%

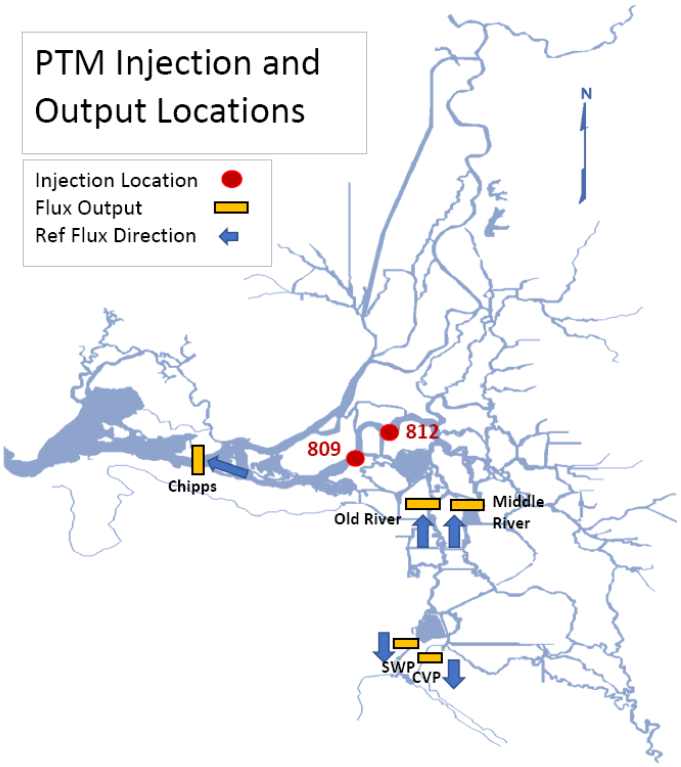

Figure 12. PTM Injection and Output Locations

Figure 12 is a map of PTM injection at Station 809 and 812 and flux output locations at Chipps, Old River, Middle River, SWP, and CVP.

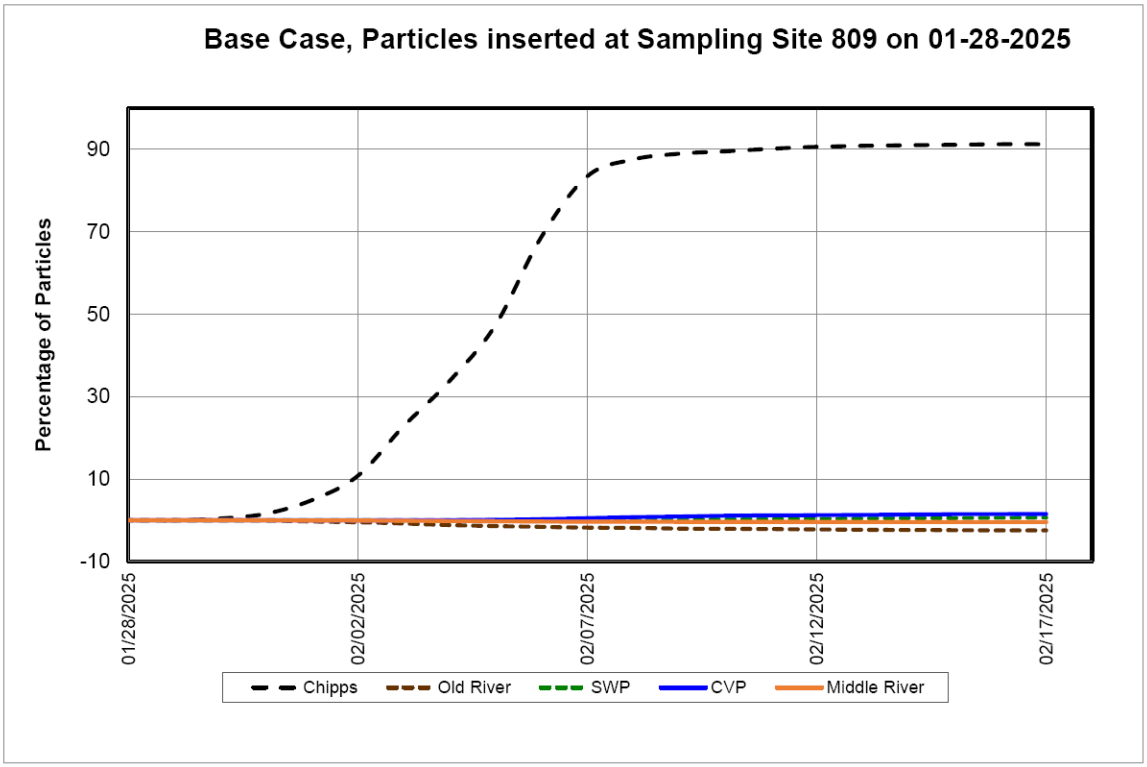

Figure 13. Base Case, Particles inserted at Sampling Site 809 on 01-28-2025

Figure 13 is a line graph showing the percentage of particles at Chipps, Old River, SWP, CVP, and Middle River locations.

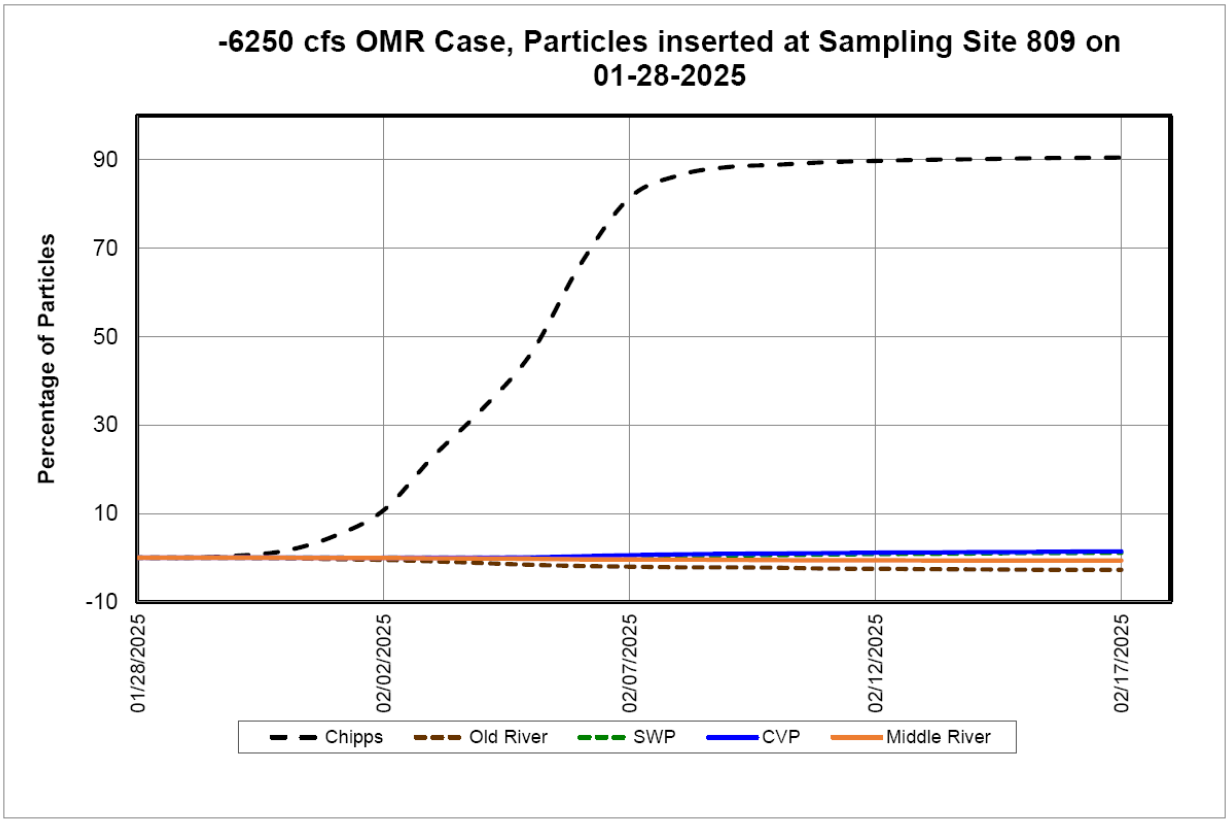

Figure 13.-6250 cfs OMR Case, Particles inserted at Sampling Site 809 on 01-28-2025

Figure 13 is a line graph showing the percentage of particles at Chipps, Old River, SWP, CVP, and Middle River locations for -6250 cfs OMR Case.

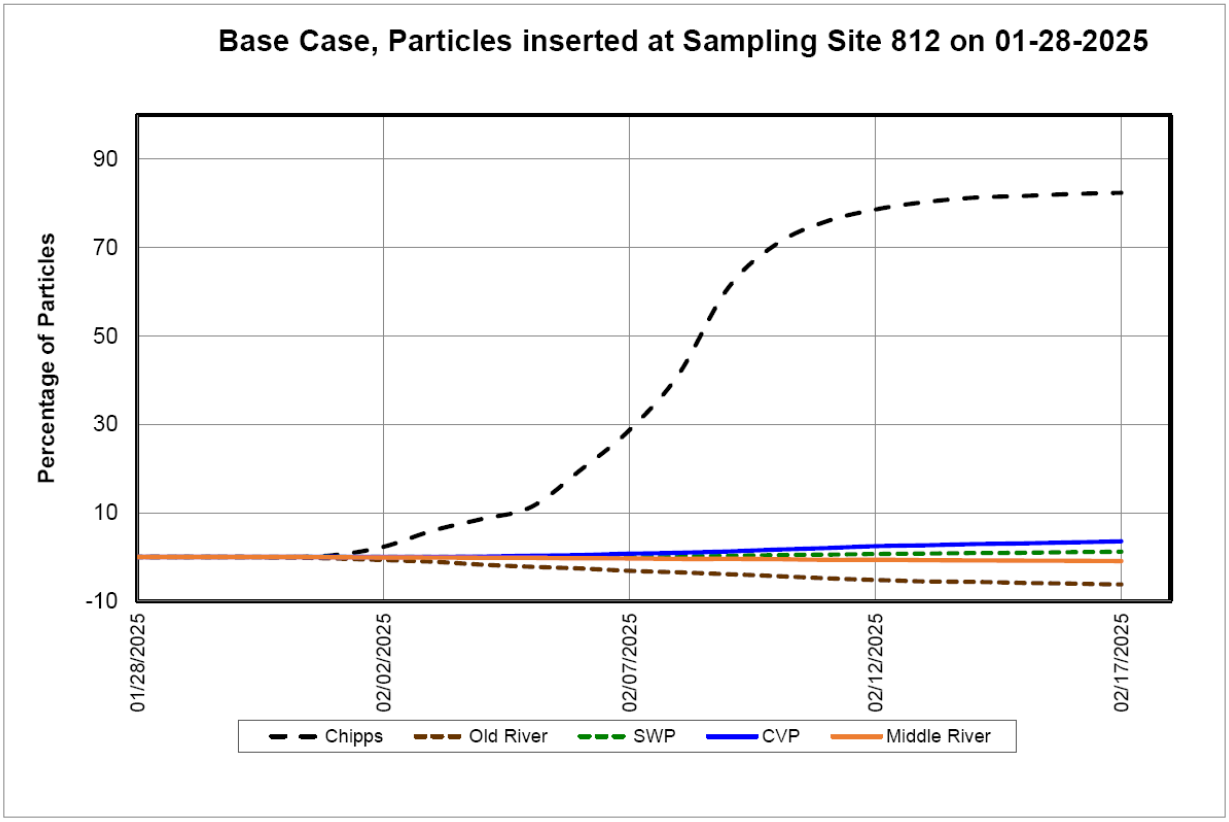

Figure 14. Base Case, Particles inserted at Sampling Site 812 on 01-28-2025

Figure 14 is a line graph showing the percentage of particles at Chipps, Old River, SWP, CVP, and Middle River locations for base case.

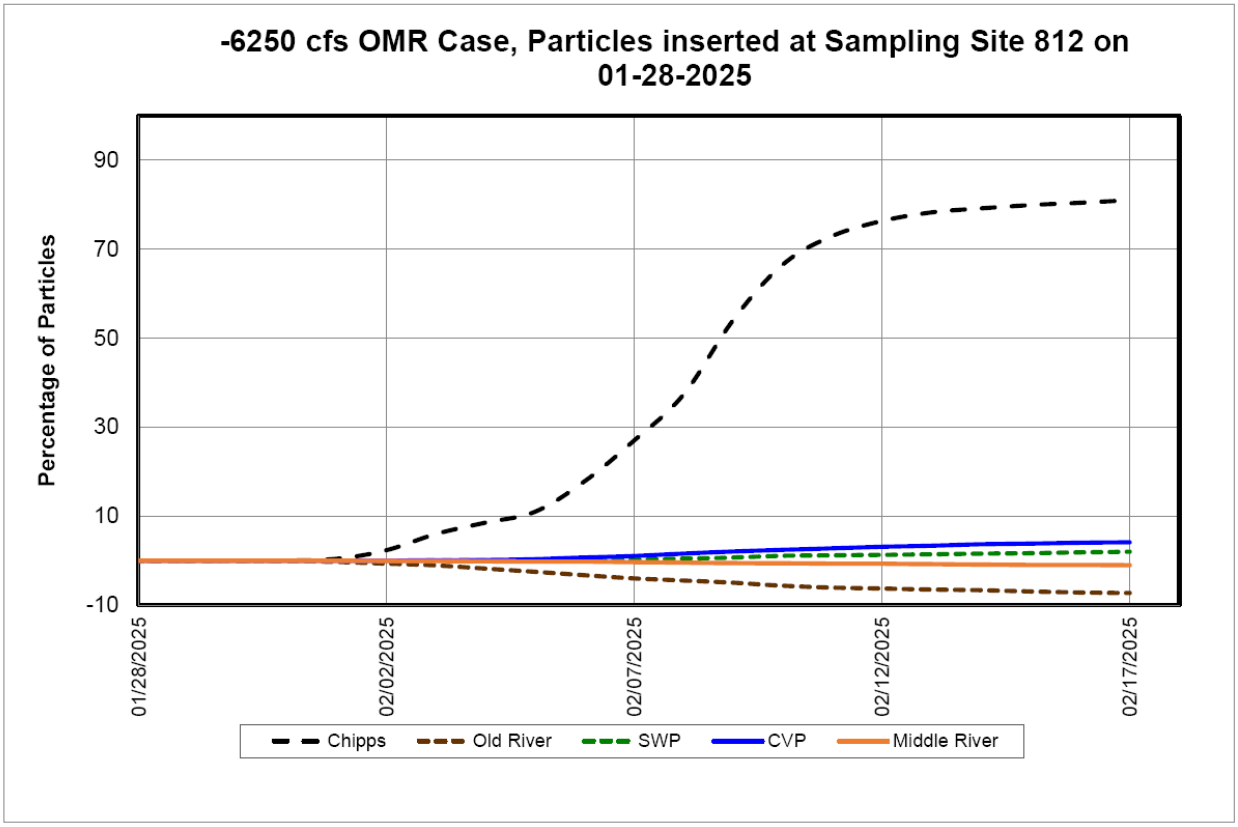

Figure 15. -6250 cfs OMR Case, Particles inserted at Sampling Site 812 on 01-28-2025

Figure 14 is a line graph showing the percentage of particles at Chipps, Old River, SWP, CVP, and Middle River locations for -6250 cfs OMR Case.