

# State Water Project Incidental Take Permit Risk Assessment for Delta Smelt and Longfin Smelt

## Section 1: Overview

**Date: 5/10/2022**

### **Life Stages Present:**

Delta Smelt (DS): Adults, juveniles, and larvae

Longfin Smelt (LFS): Adults, sub-adults, juveniles, and larvae

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

No advice.

ITP COA 8.4.2 was not triggered on May 9<sup>th</sup> by 20mm survey 4, however salvage continues to be elevated indicating that juvenile LFS are still present in areas at high risk of entrainment. The SMT continues to be concerned about the high salvage this year, but with no COA being triggered this week the previous recommendation was lifted.

A larval DS was detected in the OMR corridor in 20mm survey 2 on April 5<sup>th</sup>, this represents an increase in the likelihood of entrainment for larval DS. Although 20mm surveys 3 and 4 did not detect any DS in the OMR corridor, they may still be present at low densities. No trigger has been met for DS and the SMT is not making a recommendation for the protection of larval DS, however we want to recognize that the previous detection of larval DS in the OMR corridor represents an increased risk of entrainment. Water temperatures are still within the window for spawning and spawning is ongoing, therefore larval DS may still be in areas at high risk of entrainment. Larval DS may still be quite small and monitoring for these smaller sized larvae in qualitative larval sampling may be inefficient, so they may be present even if not being detected.

Projected operations are expected to be minimum exports and result in an OMRI of no more negative than -1,700 cfs this week, which past Particle Tracking Model (PTM) results indicate still poses a high risk of entrainment to larval DS and juvenile LFS present in the OMR corridor.

### **Risk Assessment:**

*Delta Smelt:* One larval DS was detected over a month ago in the OMR Corridor and any fish in this area are at an increased likelihood of entrainment. One larval DS was collected since 5/2/2022 in the lower Sacramento River. Larval and juvenile DS have been detected in the Lower San Joaquin River, the Lower Sacramento River, Old River, the confluence, and the North Delta. DS adults and sub-adults are less likely to move into the south and central delta since turbidity remains low.

*Longfin Smelt*: 20-mm survey 4 detected 7 larval and juvenile LFS in the two most downstream lower San Joaquin River stations, and this area is outside the zone with a high risk of entrainment. Juvenile LFS salvage remained elevated this last week. 20mm 4 did not trigger ITP COA 8.4.2 on May 9<sup>th</sup> and therefore the SMT lifts the recommendation to limit OMRI to -1,250 cfs on a 7-day average to limit risk of entrainment of larval and juvenile LFS.

The SMT continues to be concerned about the elevated LFS salvage during the last week, but with no concurrent detections in the monitoring surveys in the south Delta, the SMT has no regulatory mechanism to make a recommendation this week.

20mm survey 4 detected 7 larval and juvenile LFS at 2 of the stations in the lower San Joaquin River (station 809 n=4, station 812 n=3) and none in the central and south Delta. Although no LFS larvae or juveniles were detected in areas at high risk of entrainment, salvage remained elevated last week indicating LFS are still present and at risk. From 5/2/2022 through 5/8/2022, 540 juvenile LFS were salvaged at the SWP fish facility and 94 juvenile LFS were salvaged at the CVP fish facility, resulting in a total salvage of 6,790 juvenile LFS this season. Water year (WY) 2022 total salvage is now much higher than total salvage was in WY2020 or WY2021. LFS larvae (<20mm) were not detected in qualitative larval sampling at either facility this last week. Based on water temperature (Wang 2007 cites upper temperature for spawning at 14.5°C) and lack of smaller larval detections in recent surveys, the SMT believes that peak spawning has passed, and that spawning will cease by the end of June based on historical trends (Moyle 2002, Wang 1986). The SMT has determined that the overall risk of entrainment is low for sub-adults and adults. No adult or sub-adult LFS have been detected in the central and or south Delta stations since early March, when a sub-adult LFS was caught in the lower San Joaquin River by Enhanced Delta Smelt Monitoring (EDSM) on March 9th.

Barker Slough: COA 8.12 was not triggered by 20mm survey 4, as no DS were detected at station 716.

## **Section 1-A: Sacramento River and Confluence**

### **Risk of entrainment into the central Delta and export facilities for DS and LFS in Sacramento River (8.1.5.2 C ii, iii, iv)**

- Exposure Risk (Hydrology):
  - DS: Low. DS are spawning and larvae have been detected. 20mm 4 detected a DS larva in the lower Sacramento River at station 704. DS adults/sub-adults were last detected in the lower Sacramento River by SKT 3 on March 17<sup>th</sup>. Entrainment risk is low this week due to minimum exports and low turbidity.
  - LFS: Risk for larvae is low, due to minimum exports. Planned operations of minimum exports result in a low risk for larvae in the Sacramento River and confluence. See “Routing Risk” for more information on adults and sub-adults.
- Routing Risk (Behavior and life history):

- DS: Low. Spawning is ongoing; however, turbidity remains low, and DS are unlikely to move into the central and south Delta.
- LFS: Low risk of entrainment. Larvae do not exhibit swimming behaviors that would result in volitional movement into areas with a higher risk of entrainment. Some larger juveniles are being detected that have volitional movement. However, with the low turbidity juveniles are unlikely to move into the central and south Delta, distribution of larval-juvenile LFS may be associated with turbidity according to Mahardja et al. 2017, although other authors did not find a relationship with salvage (Grimaldo et al. 2009). Minimal exports result in a hydrology that potentially limits the movement of juveniles into areas with a higher risk of entrainment, either by entrainment or by negative flows miscuing the larger fish to swim towards the south Delta. Adult detections are continuing but declining, and there is potential for adult/sub-adult movement into the central Delta. However, risk remains low as exports will be minimal this week.
- Overall Entrainment Risk:
  - DS: Low.
  - LFS: Low, due to projected operations this week. X2 is currently estimated at approximately 87.2 km Qwest is positive and expected be in the 0-1000 cfs range and be variable over this week, as San Joaquin River pulse flows make their way to the Delta.

## **Section 1-B: Central Delta**

### **Risk of entrainment into the export facilities for DS and LFS in the central Delta (8.1.5.2 D iii, iv, v)**

- Exposure Risk (Low, Medium, High):
  - DS:
    - Adults and sub-adults: Low. The likelihood of adult and sub-adult DS entrainment remains low, due to no recent detections. There is a high degree of uncertainty regarding the response of cultured fish to environmental cues typically applied to wild DS. Water temperatures are increasing, spawning is ongoing, and larvae are present.
    - Juveniles: One juvenile was detected in the SDWSC but none have been detected in the central or south Delta.
    - Larvae:
      - Low risk for larva detected in the lower San Joaquin River by SLS Survey 6 (3/22/22), but none have been detected in the lower San Joaquin River by 20 mm surveys 1 through 4. X2 is currently estimated at approximately 87.2 km. Qwest is positive and expected to stay in the 0-1000 cfs range and be variable over this week, as San Joaquin River pulse flows make their way to the Delta. Past PTM run results show that at the less negative OMRI expected this week, larvae in the lower San Joaquin River are at low risk of entrainment.
      - High risk for the larva detected at station 902 in the OMR corridor by 20-mm survey 2 (4/5/2022). None have been detected in the OMR

corridor by 20mm surveys 3 or 4. Past PTM run results show that despite minimum exports and the less negative OMRI expected this week, any DS larvae that may be in the OMR corridor are at high risk of entrainment.

○ LFS:

- Adults and sub-adults: Low risk for adult and sub-adult LFS entrainment. There have been no recent detections of adults or sub-adults in the Central Delta. EDSM collected one sub-adult LFS in the lower San Joaquin River on 3/09/2022, but none have been detected since. However, sub-adults/adults may still be present, as they are still being detected at Chipps Island but at lower numbers than previous weeks. Projected operations being minimum exports creates a low risk of entrainment this week. Adult salvage has been rare in recent years.
- Larvae and juveniles:
  - Low risk for larvae and juveniles observed in the lower San Joaquin River by 20mm 4. X2 is currently estimated at approximately 87.2 km. Qwest is positive and expected to stay in the 0-1000 cfs range and be variable over this week, as San Joaquin River pulse flows make their way to the Delta. Past PTM run results show that at the less negative OMRI expected this week, larvae in the lower San Joaquin River are at low risk of entrainment.
  - High risk for LFS larvae and juveniles in the OMR corridor. The most recent 20mm survey 4 did not detect any LFS in the OMR corridor, however juvenile salvage remained elevated last week indicating juveniles are still present. Larvae were not detected in the qualitative larval sampling at either facility this last week. Salvage remained elevated this past week with 634 juveniles salvaged at both facilities from 5/2/2022 through 5/8/2022. Although higher salvage is expected in dry years, total salvage thus far in 2022 is now much higher than total salvage was for 2020 and 2021, also dry and critically dry years respectively. Given critically dry conditions this year and that LFS spawned in the central and south Delta and, as fish grow, the likelihood of being detected in salvage increases, salvage is expected to continue, despite minimum exports. Under current conditions, smaller larvae are unlikely to make their way out of the OMR corridor based on past PTM results and since LFS larvae are planktonic and can't volitionally move downstream once in the OMR corridor. Juvenile LFS have been salvaged that are at a larger size that can volitionally swim downstream, however despite minimum exports negative flows in the OMR corridor may miscue these fish to swim towards the export facilities instead of downstream. Salvage remained elevated last week and any increase in exports is likely to increase salvage. Salvage is expected to peak in April and May (Grimaldo et al. 2009).

- Change in exposure from previous week: (Note: The change in risk compared to previous weeks is not required by the Incidental Take Permit [ITP]).
  - DS: Risk remains low in the lower San Joaquin River due to minimum exports this week. However, a larval DS was detected at 902 in the OMR corridor by 20mm survey 2 and any larval DS that may still be in the OMR corridor are at high risk of entrainment.
  - LFS: Risk remains high. 20-mm 4 detected 7 larval and juvenile LFS in the lower San Joaquin River and none in the central and south Delta. Juvenile LFS salvage was still elevated this last week. We expect to see continued salvage as larvae and juveniles grow, until temperatures become limiting for LFS survival. Risk for LFS larvae and juveniles in the south Delta remains high, despite minimum exports.
- Reporting OMRI (Number and range of OMRI bins will vary based on anticipated hydrology and operations)
  - The SMT has determined that risk of entrainment is low for adult and sub-adult DS across the range of expected OMRI values. 20-mm 2 detected one larval DS at station 902 in the lower San Joaquin River, with the rest of the detections in the Lower Sacramento River and the North Delta. The less negative OMRI expected this week decreases risk of entrainment into the OMR corridor and water projects from the lower San Joaquin River. Despite the less negative OMRI expected this week (-1,000 to -1,700 cfs), larval DS in the OMR corridor are at high risk of entrainment.
  - The SMT determined that risk of entrainment is low for adult and sub-adult LFS, low for LFS larvae in the lower San Joaquin River, and high for LFS larvae in the OMR corridor at the less negative OMRI (-1,000 to -1,700 cfs) expected this week.

## Section 2: Basis for Advice

The 2020 ITP ([Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento-San Joaquin Delta 2081-2019-066-00](#)) states that advice to WOMT shall be based on the following Conditions of Approval:

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

8.3.1 Integrated Early Winter Pulse Protection. Between December 1 and January 31 each year Permittee shall reduce south Delta exports for 14 consecutive days to maintain a 14-day average OMRI no more negative than -2,000 cfs, and convene the SMT within one day of triggering the following criteria:

- Three-day running average daily flows at Freeport greater than, or equal to, 25,000 cfs, AND
- Three-day running average of daily turbidity at Freeport greater than, or equal to, 50 Nephelometric Turbidity Units (NTU), OR
- The SMT determines that real-time monitoring of abiotic and biotic factors indicates a high risk of DS migration and dispersal into areas at high risk of future entrainment.

After maintaining a 14-day average OMRI no more negative than -2,000 cfs for 14 days, Permittee shall maintain a 14-day average OMRI no more negative than -5,000 cfs, initiating the OMR Management season, until the OMR Management Season ends (Condition of Approval 8.8).

The Integrated Early Winter Pulse Protection Action may only be initiated once during the December 1 through January 31 time period each year.

8.3.3 Adult Longfin Smelt Entrainment Protection. After December 1, if an Integrated Early Winter Pulse Protection (Condition of Approval 8.3.1) has not yet initiated, Permittee shall reduce south Delta exports to maintain a 14-day average OMRI no more negative than -5,000 cfs and initiate OMR Management (Condition of Approval 8.3) if:

- Cumulative combined LFS salvage (total estimated LFS counts at the CVP and SWP salvage facilities beginning December 1 through February 28 exceeds the most recent Fall Midwater Trawl (FMWT) LFS index<sup>1</sup> divided by 10, OR

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<sup>1</sup> The Fall Midwater Trawl (FMWT) Survey annual abundance index for LFS is calculated as the sum of September through December monthly abundance indices and is typically reported at about the same date as adult salvage begins in December. The FMWT Index available beginning on December 1 each year shall be used to establish this threshold.

- Real-time monitoring of abiotic and biotic factors indicates a high risk of LFS movement into areas at high risk of future entrainment, as determined by DWR and CDFW SMT staff.

When evaluating the possibility of LFS movement into areas that may be subject to an elevated risk of entrainment, the SMT shall evaluate catch of LFS with fork length  $\geq 60$  mm by the Chipps Island Trawl (conducted by USFWS) as an early warning indicator for LFS migration movement into the Delta, in addition to other available survey and abiotic data. The SMT shall communicate the results of these risk assessments and advice to the WOMT (Condition of Approval 8.1.3), and operational decisions shall be made as described in Condition of Approval 8.1.4 (Collaborative Approach to Real-time Risk Assessment).

8.4.1 OMR Management for Adult Longfin Smelt. From the onset of OMR Management (Condition of Approval 8.3) through February 28, the SMT shall conduct weekly, or more often as needed, risk assessments (see Condition of Approval 8.1.5.2) and decide whether to recommend an OMR flow requirement between -5,000 cfs and -1,250 cfs to minimize entrainment and take of adult LFS. The SMT may provide advice to restrict south Delta exports for seven consecutive days to achieve a seven-day average OMRI within three risk categories:

- Low risk: OMR between -4,000 cfs to -5,000 cfs
- Medium risk: OMR between -2,500 cfs to -4,000 cfs
- High risk: OMR between -1,250 cfs to -2,500 cfs

If a risk assessment conducted by the SMT determines that a more restrictive OMR flow requirement is needed to minimize take of adult LFS, the SMT shall provide its advice to WOMT (Condition of Approval 8.1.3) and operational decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Approach to Real-time Risk Assessment).

This Condition will terminate when a high-flow off-ramp occurs (Condition of Approval 8.4.3), or when LFS spawning has been detected in the system, as determined by the SMT, or, if there is disagreement and resolution is not reached within WOMT, as determined by CDFW. The SMT shall consider results from Additional LFS Larval Sampling (Condition of Approval 7.6.1) to inform its assessment of the start of LFS spawning. After LFS spawning has been observed, Permittee shall implement Condition of Approval 8.4.2 to minimize take of larval and juvenile LFS.

8.4.2 Larval and Juvenile Longfin Smelt Entrainment Protection. From January 1 through June 30, when a single Smelt Larva Survey (SLS) or 20 mm Survey (20 mm) sampling period exceeds one of the following thresholds:

- LFS larvae or juveniles found in four or more of the 12 SLS or 20 mm stations in the central Delta and south Delta (Stations 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919), or

- LFS catch per tow exceeds five LFS larvae or juveniles in two or more of the 12 stations in the central Delta and south Delta (Stations 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919).

Permittee shall restrict south Delta exports for seven consecutive days to maintain a seven-day average OMR index no more negative than -5,000 cfs. Permittee shall also immediately convene the SMT to conduct a risk assessment (see Condition of Approval 8.5.1.2) to assess the risk of larval and juvenile LFS entrainment into the South Delta Export Facilities, determine if an OMR flow restriction is warranted, and recommend an OMR flow limit between -1,250 and -5,000 cfs. The SMT risk assessment and operational advice shall be reviewed by the WOMT (Condition of Approval 8.1.3) via the Collaborative Real-time Decision-making process (Condition of Approval 8.1.4). Permittee shall operate to the export restriction and OMR flow target approved through Conditions of Approval 8.1.3 and 8.1.4. Each week the SMT shall convene to conduct a new risk assessment and determine whether to maintain, or off ramp from, export restrictions based on the risk to LFS, or until the DS and LFS off-ramp has been met as described in Condition of Approval 8.8 (End of OMR Management).

From January 1 through June 30, DWR and CDFW SMT staff shall conduct weekly, or more often as needed, risk assessments (see Condition of Approval 8.5.1.2) to assess the risk of larval and juvenile LFS entrainment into the South Delta Export Facilities. As a part of the risk assessment the SMT shall provide advice on the appropriate OMR flow targets to minimize LFS entrainment or entrainment risk, or both. The SMT shall provide its advice to WOMT (Condition of Approval 8.1.3) and use the Collaborative Approach to Real-time Risk Assessment process described in Condition of Approval 8.1.4 to determine if an OMR flow restriction is warranted and determine OMR flow limit between -1,250 and -5,000 cfs. The OMR flow limit shall be in place until the next risk assessment conducted by the SMT determines that it is no longer necessary to minimize take or related impacts to LFS, or until the DS and LFS off-ramp has been met as described in Condition of Approval 8.8 (End of OMR Management).

8.4.3 High Flow Off-Ramp from Longfin Smelt OMR Restrictions. OMR management for adult, juvenile, or larval LFS as described in Conditions of Approval 8.4.1 and 8.4.2 are not required, or would cease if previously required, when river flows are (a) greater than 55,000 cfs in the Sacramento River at Rio Vista or (b) greater than 8,000 cfs in the San Joaquin River at Vernalis. If flows subsequently drop below 40,000 cfs in the Sacramento River at Rio Vista or below 5,000 cfs in the San Joaquin River at Vernalis, the OMR limit previously required as a part of Conditions of Approval 8.4.1 and 8.4.2 shall resume.

8.5.1 Turbidity Bridge Avoidance. The purpose of this Condition is to minimize the risk of entrainment of adult DS in the corridors of the Old and Middle rivers into the south Delta export facilities. This Condition is intended to avoid the formation of a turbidity bridge from the San Joaquin River shipping channel to the south Delta export facilities, which historically has been associated with elevated salvage of pre-spawning adult DS.

After the Integrated Early Winter Pulse Protection (Condition of Approval 8.1.3) or February 1 (whichever comes first), until April 1, Permittee shall manage exports to maintain daily average



turbidity in Old River at Bacon Island (OBI) at a level of less than 12 NTU. If the daily average turbidity at OBI is greater than 12 NTU, Permittee shall restrict south Delta exports to achieve an OMR flow that is no more negative than -2,000 cfs until the daily average turbidity at OBI is less than 12 NTU.

If, after five consecutive days of OMR flow that is less negative than -2,000 cfs and the daily average turbidity at OBI is not less than 12 NTU, the SMT may convene to assess the risk of entrainment of DS (Condition of Approval 8.1.5.2). The SMT may provide advice to WOMET regarding changes in operations that could be conducted to minimize the risk of entrainment of DS (Condition of Approval 8.1.3). The SMT may also determine that OMR restrictions to manage turbidity are infeasible and may instead provide advice for a different OMR flow target that is between -2,000 and -5,000 cfs and is protective based on turbidity and adult DS distribution and salvage to the WOMET for consideration (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).

Turbidity readings at individual sensors can generate spurious results in real time. Spurious results could be incorrectly interpreted as a turbidity bridge, when in fact the cause is a result of local conditions or sensor error. To assess whether turbidity readings at OBI are attributable to a sensor error or a localized turbidity spike, Permittee, in coordination with Reclamation, may consider and review data from other nearby locations and sources. Additional information that will be reviewed include regional visualizations of turbidity, alternative sensors, and boat-based turbidity mapping, particularly if there was evidence of a local sensor error. Permittee may bring data from these additional sources to the SMT for consideration during the development of a risk assessment to be provided to the WOMET for evaluation (Condition of Approval 8.1.3).

Permittee shall use the decision-making process described in Condition of Approval 8.1.4 (Collaborative Real-time Risk Assessment) to determine if south Delta exports may increase after five days of OMR no more negative than -2,000 cfs, or to determine that this action is not warranted due to a sensor error or localized turbidity event. Permittee shall implement this action until CDFW is in agreement that the action may be ended or modified.

8.5.2 Larval and Juvenile Delta Smelt Protection. If the five-day cumulative salvage of juvenile DS at the CVP and SWP facilities is greater than or equal to one plus the average prior three years' FMWT index (rounded down), Permittee shall restrict south Delta exports for seven consecutive days to maintain a seven-day average OMR index no more negative than -5,000 cfs. Additionally, if the five-day cumulative salvage threshold is met or exceeded, Permittee shall immediately convene the SMT to conduct a risk assessment (Condition of Approval 8.1.5.2) and determine the future risk of entrainment and take of larval and juvenile DS. The SMT may provide advice to further restrict south Delta exports to maintain a more positive OMR than -5,000 cfs. The SMT may provide advice for further restrictions within three risk categories:

- Low risk: Limit OMR between -4,000 cfs to -5,000 cfs
- Medium risk: Limit OMR between -2,500 cfs to -4,000 cfs

- High risk: Limit OMR between -1,250 cfs to -2,500 cfs

The duration and magnitude of operational advice shall be provided to the WOMT (Condition of Approval 8.1.3) and decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment). When conducting risk assessments to evaluate the risk of entrainment and take of juvenile DS, the SMT shall evaluate the following information sources, in addition to any other models or surveys they deem appropriate and those listed in Condition of Approval 8.1.5.2:

- Results from a CDFW approved DS life cycle model.
- DS recruitment levels identified by the SMT using the CDFW- approved life cycle model that links environmental conditions to recruitment, including factors related to loss as a result of entrainment such as OMR flows. In this context, recruitment is defined as the estimated number of post-larval DS in June per number of spawning adults in the prior February-March period.
- Hydrodynamic models and forecasts of entrainment informed by the EDSM or other relevant survey data to estimate the percentage of larval and juvenile DS that could be entrained.

If expanded salvage at the CVP and SWP facilities of juvenile DS exceeds 11 within a three-day period under this condition, Permittee shall restrict south Delta exports for seven consecutive days to maintain a seven-day average OMR index no more negative than -3,500 cfs. If juvenile DS continue to be salvaged at the CVP and SWP facilities during the seven days of OMR restrictions, then Permittee shall continue restrictions and request a risk assessment by the SMT to determine if additional advice and subsequent restrictions are warranted and provide advice to WOMT (see Condition of Approval 8.1.3) and follow the decision-making process described in Condition of Approval 8.1.4.

8.12 Barker Slough Pumping Plant Longfin and Delta Smelt Protection. Permittee shall operate the BSPP to protect larval LFS from January 15 through March 31 of dry and critical water years. Permittee shall operate to protect larval DS from March 1 through June 30 of dry and critical years. If the water year type changes after January 1 to below normal, above normal or wet, this action will be suspended. If the water year type changes after January to dry or critical, Permittee shall operate according to this Condition of Approval.

From January 15 through March 31 of dry and critical water years, Permittee shall reduce the maximum seven-day average diversion rate at BSPP to less than 60 cfs when larval LFS are detected at Station 716. In addition, in its weekly meetings from January 15 through March 31, the SMT shall review LFS abundance and distribution survey data and other pertinent abiotic and biotic factors that influence the entrainment risk of larval LFS at the BSPP. When recommended by the SMT, and as approved through the decision-making processes described in Conditions of Approval 8.1.3 and 8.1.4, Permittee shall reduce the maximum seven-day average diversion rate at BSPP according to the advice provided by the SMT.

From March 1 through June 30 of dry and critical water years, Permittee shall reduce the maximum seven-day average diversion rate at BSPP to less than 60 cfs when larval DS are

detected at Station 716. In addition, in its weekly meetings from March 1 through June 30, the SMT shall review DS abundance and distribution survey data and other pertinent abiotic and biotic factors that influence the entrainment risk of larval DS at the BSPP (including temperature and turbidity). When recommended by the SMT, and as approved through the decision-making processes described in Conditions of Approval 8.1.3 and 8.1.4, Permittee shall reduce the maximum seven-day average diversion rate at BSPP to less than 60 cfs.

The DS requirements described in this condition may be adjusted to align with USFWS requirements to minimize take of DS through an amendment to this ITP.

**8.13 Water Year Type Definition.** All references to water year type in this ITP shall be defined based on the Sacramento Valley Index (SVI) unless otherwise noted.

Additionally, ITP COA 3.8 Describes the Minimum Export Rate: As described in Permittee's December 2019 ITP application (page 3-56), in order to meet health and safety needs, critical refuge supplies, and obligations to senior water rights holders, the combined CVP and SWP export rates at Jones Pumping Plant and Banks Pumping Plant will not be required to drop below 1,500 cfs and SWP exports will not be required to drop below 600 cfs.

### **Discussion of Conditions of Approval**

*Provide discussion addressing criteria for each Condition of Approval listed in "Basis for Advice" section. Refer to data below where appropriate.*

COAs relevant to initiating OMR management went into effect December 1<sup>st</sup>. The SMT conducted a Risk Assessment based on COA 8.1.5.2.

8.3.1: This COA was triggered by conditions measured on 12/17/2021 when the running three-day average of daily flow and turbidity reached 27,152 cfs and 66.79 FNU respectively. Operations were reduced on 12/20/2021 targeting a 14-day average OMR index no more negative than -2,000 cfs for 14 consecutive days. After maintaining a 14-day average OMRI no more negative than -2,000 cfs for 14 days, Permittee shall maintain a 14-day average OMRI no more negative than -5,000 cfs, initiating the OMR Management season, until the OMR Management Season ends (Condition of Approval 8.8).

8.3.3: This COA is no longer active due to the initiation of an Integrated Early Winter Pulse Protection (COA 8.3.1).

8.4.1: This COA is no longer active due to the detection of larval LFS by SLS.

8.4.2: This COA went into effect on 1/03/2022 following the 14-day Integrated Early Winter Pulse Protection (COA 8.3.1).

- SLS 1 was initially canceled due to COVID mitigation, however, the 12 south and central Delta stations listed in this COA were sampled on 1/18/2022. The resulting data triggered this COA by detection of larval LFS at more than four

stations (809, 812, 815, 901, 906, and 910) and larval catch exceeded 5 fish per tow at two stations (809 and 812).

- Data collected by SLS 2 triggered this action for the second time this season on 1/31/2022. Larval LFS were detected at four of the relevant stations (809, 812, 815 and 906) and catch per tow exceeded five LFS at two stations (809 and 812). The SMT did not advise a less negative OMR Index under this COA due to reduced exports.
- Data collected by SLS 3 did not trigger this COA.
- Data collected by SLS 4 triggered this action for the third time this season on 2/28/2022. Larval LFS were detected at five of the relevant stations (809, 812, 901, 902, and 915) and catch per tow exceeded five LFS at three stations (809, 812, and 901). However, the SMT did not advise a less negative OMRI under this COA due to low exports and positive Qwest. On March 8<sup>th</sup> the SMT requested a PTM run to help inform risk for larvae and determine if the fate of particles in the lower San Joaquin River and the central and south Delta would change if a recommendation to limit OMR was made. The injection points selected were at stations 812, 815, and 902. The scenarios modeled compared planned exports (-3000 cfs for a couple of days slowly ramping down to -1,400 cfs) with a recommendation to limit OMR to -1,250 cfs.
- Data collected by SLS 5 triggered this action for the fourth time this season on 3/11/2022. Larval LFS were detected at four of the relevant stations (809, 812, 815, and 901). Of the 21 larvae detected, 12 had yolk sacs indicating spawning is ongoing. On March 11<sup>th</sup> the SMT met to discuss the results of the PTM run and evaluate survey and salvage data. The PTM results show that with a more negative OMRI of -3,000 cfs as with the base case scenario 43% of particles are entrained into the facilities and into the OMR corridor after 3 weeks. Whereas the -1,250 cfs scenario showed 31% of particles are entrained into the facilities and into the OMR corridor after 3 weeks. This shows that at the more negative OMRI scenario (base case) there is an increased risk to larvae and juveniles in the OMR corridor, and this difference in particles entrained under different scenarios is consistent with prior years when recommendations to limit OMR were made. The SMT met on 3/15/2022 and continued the recommendation that was made on 3/11/2022 to limit OMRI to no more negative than -1,250 cfs for the protection of juvenile LFS. The SMT met on 3/22/2022 and discussed OMRI was expected to temporarily become as negative as -2,500 cfs on the 25th, however new PTM run results discussed showed very little to no difference in particles entrained into the OMR corridor and the projects between a -1,250 cfs recommendation and an OMRI temporarily as negative as -2,000 cfs. Therefore, the SMT decided not to continue the recommendation from 3/11/2022 and 3/15/2022.
- Data collected by SLS 6 and 20mm survey 1 triggered this action for the fifth time this season on 3/29/2022. SLS 6 detected 34 LFS larvae at 5 of the 11 stations processed so far in the central and south Delta (see table 1 in attachments), and densities were higher than those detected by SLS 5 earlier in March. Some of the

larvae detected by SLS 6 in the central and south Delta still had yolk-sacs. 20mm survey 1 detected 71 LFS larvae at 5 of the 6 stations processed so far in the central and south Delta (see table 2 in attachments). On March 29<sup>th</sup> the SMT met to discuss the results of the PTM run and evaluate survey and salvage data. After 3 weeks, the PTM run results show that 10% of the particles at 815 (lower San Joaquin River) were entrained into the OMR corridor and projects at the -5,000 cfs scenario, whereas 5% were entrained into the OMR corridor and projects at the -1,250 cfs scenario. PTM results also show that at station 902 with a more negative OMRI of -5,000 cfs as with the base case scenario, 63% of particles are entrained into the projects and into the OMR corridor after 3 weeks (27% to the projects, 36% into the OMR corridor). Whereas the -1,250 cfs scenario, showed 55% of particles entrained into the facilities and into the OMR corridor after 3 weeks (12% to the projects, 43% into the OMR corridor). This shows that a recommendation of -1,250 cfs on a 7-day average will help decrease risk of entrainment of LFS larvae and juveniles in the OMR corridor, particularly entrainment to the projects, under these two scenarios. Juvenile LFS salvage is increasing and expected to peak in April and May, this recommendation is made to help decrease the risk of higher salvage this year. The SMT continued this recommendation on 4/5/2022.

- Data collected by 20mm 2 triggered this COA for the 6th time this season on 4/11/2022. The SMT continued the -1,250 cfs recommendation on 4/12/2022 and on 4/19/2022. These recommendations were based on continued larval and juvenile LFS presence in the central and south Delta and continued LFS juvenile salvage.
- Data collected by 20mm survey 3 triggered this COA for the 7th time this season on 4/26/2022. The SMT continued the -1,250 cfs recommendation for the protection of larval and juvenile LFS. This recommendation was based on continued presence of larval and juvenile LFS in the central and south Delta and the sharp increase in LFS juvenile salvage over the previous week. On 5/3/2022 the SMT continued the -1,250 cfs recommendation for the protection of larval and juvenile LFS. This recommendation is based on continued presence of larval and juvenile LFS in the central and south Delta and continued elevated salvage of juvenile LFS over the past week.
- Data collected by 20mm survey 4 did not trigger this COA and on May 10<sup>th</sup>, the previous recommendation was lifted by the SMT.

8.5.1: This COA went into effect on 1/3/2022 following the 14-day Integrated Early Winter Pulse Protection (COA 8.3.1). Current OBI turbidity levels are below the threshold.

8.5.2: The 2021 FMWT Annual Index for DS is zero for the fourth consecutive year. The salvage threshold is one Juvenile DS. No juvenile DS have been salvaged this water year. One cultured subadult DS (fork length = 54 mm, adipose fin clipped) was salvaged on 1/16/2022.

8.12: This COA became active on 2/8/2022 when the Sacramento Valley Water Year Type Index (SVI) February Forecast was released. The forecasted value of 6.2 (50% exceedance) is within the range for a dry water year. SLS 2 detected larvae at station 716, however, this COA was not active at the time based on the January SVI. SLS 3 collected 3 LFS larvae at station 716. This data was reported to the SMT via email on 2/14/2022, triggering this COA for the first time this season thereby limiting BSPP maximum diversion rate to no more than 60 cfs on a 7-day average. SLS 4 did not detect LFS or DS larvae at station 716, therefore this COA was not triggered thereby removing the limitation on BSPP of no more than 60 cfs exports on a 7-day average that was previously triggered by SLS 3. SLS 5 collected 3 LFS larvae at station 716. This data was reported to the SMT via email on 3/11/2022, triggering this COA for the second time this season. 20-mm survey 1 detected 5 larval DS on 3/21/2022, triggering this COA for the third time this season. BSPP LFS protections off-ramped March 31<sup>st</sup>. An amendment to this COA was approved on April 1<sup>st</sup> that allows the permittee to meet and confer with CDFW in the event this COA is triggered to determine if a higher maximum export rate than 60 cfs is needed for health and safety. 20-mm 2 did not detect DS at 716, so this COA was not triggered thereby removing the limitation on BSPP of no more than 60 cfs exports on a 7-day average on April 11<sup>th</sup> that was previously triggered by 20mm 1. 20mm surveys 3 and 4 did not detect DS at station 716, so this COA was not triggered.

8.13: The SVI February forecast corresponding to the 50% probability of exceedance is 6.2 which is in the range for a Dry water year classification. The forecast was reported on the California Data Exchange Center (CDEC) [Water Supply Index Webpage](#), accessed on 2/8/2022. The updated March SVI forecast was released on 3/8/2022 is 4.8 (50% exceedance) within the range for a critically dry water year. The updated April SVI forecast was 4.2 (50% exceedance) within the range for a critically dry water year.

### Section 3: Hydrology and Operations Assessment of hydrologic, operational, and meteorological information. 8.1.5.2 A.

#### **Section 3-A: Water operations conditions. 8.1.5.2.A. i**

- Antecedent Actions: *(e.g. Delta Cross Channel [DCC] gate closure and actions such as integrated early winter pulse protection, etc.)*
  - OMR Management was initiated on 1/3/2022 following the 14-day Integrated Early Warning Pulse Protection action (COA 8.3.1).
  - COA 8.3.1 was triggered by conditions measured on 12/17/2021. Exports were reduced to comply with this COA on 12/20/2021 through 1/2/2022.
  - DCC gates closed on 11/30/2021.
  - The Emergency Drought barrier at False River reconstruction was completed on 4/13/2022.
  - The Old River and Middle River Agricultural Barriers installation both started today and will be complete in the next week. Grant Line Canal Agricultural Barrier installation will begin on May 18<sup>th</sup>.

- Controlling Factors: Combined exports are targeting a Net Delta Outflow Index (NDOI) of 4,000 cfs, combined exports are limited to 1,500 cfs when NDOI is below 7,100 cfs for April through June per the TUCO ([link to TUCO](#)).
- Water Temperature:
  - Clifton Court Forebay (CCF) Daily Average Water Temperature = 18.7°C, 0 days > 25°C
  - 3 Station Average = 17.3°C
- Tidal Cycle: Entering stronger spring tide mid-month, need to increase outflow to maintain water quality.
- Turbidity:
  - 8.3.1 Freeport 3-day average = NA
  - 8.5.1 OBI Turbidity Daily Average = 2.13 FNU.
- Salinity: X2 is > 81 km. Estimated at 87.2 km.
- Hydrologic Footprint: Past PTM runs were used to inform the hydrologic footprint of the less negative OMRI expected this week.

#### **Section 3-B: Water operations outlook. 8.1.5.2.A. ii**

- Outages:
  - State Water Project (SWP): None
  - Central Valley Project (CVP): None
- Exports: Combined exports limited to 1,500 cfs when NDOI is below 7,100 cfs for April through May per the TUCO.
  - SWP: 300 to 600 cfs
  - CVP: 800 to 900 cfs

**Meteorological Forecast: No significant precipitation is in the forecast.**

#### **Section 3-C: Projected conditions. 8.1.5.2.A. iii**

- Some light precipitation late this last weekend and yesterday, unlikely to affect water operations.
- DCC Gates position: Closed 11/30/2021.
- Sacramento River flow at Freeport 6,200 cfs.
- San Joaquin River flow at Vernalis 1,100 cfs, this will be variable with San Joaquin pulse flows.
- Qwest: Has been positive and will remain positive in the 0-1,000 cfs range this week with San Joaquin pulse flows.
- Expected changes in South Delta Exports: Minimum exports and expected to remain stable. Banks pumping plant (SWP) will be down for maintenance from around 0600 on May 15<sup>th</sup> until approximately 1800 on May 20<sup>th</sup>. There will be no pumping and no salvage during this period, Clifton Court Forebay will be drawn down and then refilled during this period. If CCF fills, towards the end of this period it will be decided if the CVP will increase exports to make up for the SWP shut down.

- NDOI: 5,000 cfs today, will be between 3,500 cfs and 6,000 cfs this week with San Joaquin pulse flows.
- Upstream releases:
  - Keswick = 3,250 cfs
  - Nimbus = 1,500 cfs, range of 1,500-2,000 cfs in the outlook reflects potential increase depending on water quality in the delta.
  - Goodwin = 500 cfs, pulse flow later this week will increase to 850 cfs, and then go back down to 500 cfs.
  - Oroville = 2,200 cfs, may need to increase (possibly up to 3,000 cfs) to maintain water quality at Emmaton.

**Table 1:** Comparison of OMR and OMR Index (all values from [SacPAS website](#), accessed 5/10/2022).

Date	Averaging Period	USGS gauges (cfs)	Index (cfs)
5/7/2022	Daily	698 cfs	-1,210 cfs
5/7/2022	5-day	-1,120 cfs	-1,410 cfs
5/7/2022	14-day	-1,620 cfs	-1,400 cfs

#### Section 4: Distribution and Biology.

##### **8.1.5.2.B. Assessment of biological information for Delta Smelt and Longfin Smelt**

##### **Section 4-A: Delta Smelt population status 8.1.5.2.B. i**

- The last marked adult DS detection occurred on 4/14/2022 in Suisun Marsh (n=1), another was caught on 4/13/2022 in the SDWSC, both were pre-spawn males. The last wild adult DS detection occurred on 1/5/2022 in the lower Sacramento River stratum. Spawning has started and larval fish are being detected. One juvenile has also been detected.
- 20mm: Survey 4 was on the water from 5/2/2022 through 5/5/2022. Processing is ongoing, so far one DS has been detected in the lower Sacramento River. Preliminary data is in table 1 in attachments. Survey 3 was on the water from 4/18/2022 through 4/21/2022. Processing is ongoing, so far, no DS have been detected. The four DS previously reported were found to be wakasagi or LFS after QC's were completed. Preliminary data is in table 2 in attachments. Survey 2 was on the water from 4/4/2022 through 4/7/2022. Processing is ongoing. So far, 24 larval DS were detected. One was detected in Old River, two were detected in the lower Sacramento River, and 21 were detected in the north Delta in Miner Slough (724 and 726).
- EDSM: From 5/1/2022 through 5/7/2022 EDSM completed sampling at 40 sites. Currently there is minimal catch data available, but it is included along with effort and sample processing status in table 3 in attachments. From 4/24/2022 through 4/30/2022 EDSM



completed sampling at 40 sites, processing is ongoing. Several larval DS that had not yet been confirmed from previous sampling weeks were ultimately determined to be other Osmeridae after the QA/QC process, so the total EDSM DS count for the Phase 2 season is three (two in Suisun Bay the week of April 4<sup>th</sup>-8<sup>th</sup> and one in SDWSC the week of April 18<sup>th</sup>-22<sup>nd</sup>). Preliminary data for each week of phase 2 is summarized in table 3 in attachments. The abundance estimate thus far for the week of April 18<sup>th</sup>-22<sup>nd</sup> was 1,652, however processing is ongoing.

- Chipps: From 5/1/2022 through 5/7/2022 Chipps Island Trawl completed all 50 of the scheduled tows and collected no DS. See Table 4 in Attachments for details.
- Spring Kodiak Trawl (SKT): Survey 4 is complete and two pre-spawn male DS (marked) were caught. One was caught in the SDWSC, and the other was caught in Suisun Marsh. Survey 5 is on the water this week.
- Bay Study: Survey 4 sampling is complete, and no DS were detected. Survey 5 is currently underway.
- Fish Restoration Program: Caught three DS in lower Yolo Ranch the week of April 5<sup>th</sup>. This is a restoration site in the Cache Slough complex. All these fish were caught at different sampling locations using different gears. Two were caught in a mysid net on 4/5/2022 and one was caught in a lampara net on 4/6/2022. Fork lengths ranged from 20mm to 23mm. So far these were larger than other fish collected. All of them were preserved in ethanol, genetics will be run by UC Davis to get the parentage of these fish and diets will be analyzed by CDFW. There will be no histopathology workup as fish weren't flash frozen or in formalin.
- Salvage: No DS have been salvaged at either facility in the past seven days and no larvae have been detected in qualitative sampling.
- FMWT Index for DS = 0
- DS life cycle model (LCM) discussion: NA
- Biological Conditions: Water temperatures are within the range conducive to spawning as reported in Damon et al. (2016) and larval fish have been detected, indicating that spawning and hatching are ongoing.
- % of population in Delta zones: NA

#### **Section 4-B: Longfin Smelt population status 8.1.5.2.B. ii.**

- FMWT Index for LFS = 323
- 20mm: Survey 4 was on the water from 5/2/2022 through 5/5/2022. Processing is ongoing, so far LFS were detected in the lower San Joaquin River, the lower Sacramento River, the confluence, and Suisun Marsh. Preliminary data is in table 1 in attachments. Survey 3 was on the water from 4/18/2022 through 4/21/2022. Processing is ongoing, so far LFS were detected in the central and south Delta, the lower San Joaquin River, Suisun Bay, Suisun Marsh, the lower Sacramento River, the confluence, and the SDWSC. See table 2 in attachments for details. Survey 2 was on the water from 4/4/2022 through 4/7/2022. Processing is ongoing. So far LFS were detected in the lower San Joaquin River, the central and south Delta, the Sacramento River, the confluence, and Suisun Bay and Marsh.
- EDSM: From 5/1/2022 through 5/7/2022 EDSM completed sampling at 40 sites, processing is ongoing. Preliminary data for each week of phase 2 is summarized in table 3 in

attachments. So far larval and juvenile LFS were detected in Suisun Bay, Suisun Marsh, the lower Sacramento River, the lower San Joaquin River, and the SDWSC.

- Chipps: From 5/1/2022 through 5/7/2022 Chipps Island Trawl completed all 50 of the scheduled tows and collected 5 LFS. See Table 4 in attachments for details.
- SKT survey 4 sampling is complete and 155 LFS were detected in Suisun Marsh, Suisun Bay, and the confluence. SKT survey 5 is on the water sampling this week.
- LEPS larval sample processing is ongoing, however final data will not be available until the end of the season. Larval LFS were detected at low densities as of sampling conducted on 2/25/2022. No yolk sac larvae were present as of February 25<sup>th</sup>. LEPS is sampling again in April and May using a 20-mm net.
- Salvage: From 5/2/2022 through 5/8/2022, 540 juvenile LFS were salvaged at the SWP fish facility and 94 juvenile LFS were salvaged at the CVP fish facility, resulting in a total weekly salvage of 634 juvenile LFS and a total salvage of 6,709 juvenile LFS this season. This is much higher than total salvage was in WY2020 or WY2021.
- Qualitative larval sampling began at both facilities on February 7<sup>th</sup> and LFS larvae were not detected at either facility this week.

#### **Section 4-C: Additional data sources to assess sensitivity to entrainment Delta.8.1.5.2.C & D. i**

##### **Notes:**

- The SMT briefly discussed the very positive OMR tidally filtered flows reported at the gauge over the last couple of days, the daily average reported on CDEC for 5/9/2022 was 2,377 cfs compared to the OMRI of -1,100 cfs. The operators explained that during the neap tidal cycle the gauge usually reflects more positive numbers because although the numbers are tidally filtered for the average over a 25-hour period, they don't tidally average for the 14-day spring and neap tidal cycles. Additionally, it does appear that this gauge may have some fouling issues again.
- The SMT discussed that LFS juvenile salvage was again elevated this last week, although appears to be decreasing a bit compared to the previous week. A little more than about 9% of total salvage for the season occurred last week, compared to approximately 13% last week. So, although salvage appears to be decreasing, we don't know if this decrease is statistically significant, but remain hopeful that salvage will continue to decrease. The last pulse of salvage that occurred in 2020 occurred in the beginning of May.
- The SMT discussed the outage that is planned at the SWP on May 15<sup>th</sup> through the 20<sup>th</sup>. With Clifton Court Forebay being drawn down and then re-filled and not being pumped out for several days, pre-screen loss of larval and juvenile LFS and DS will increase and currently there is no way to account for these losses. The SMT discussed possibly using CVP salvage data during this time to try and extrapolate these losses, or when LEPS data is available using this data to attempt to extrapolate some of these losses.
- The SMT discussed the lengths of LFS currently being detected in salvage are in the 20-41mm range, and this is also within the range of lengths being detected in surveys. The CVP salvage lengths are a little smaller than the SWP lengths reported. The upper lengths reported in salvage are consistent with juveniles with the ability to volitionally swim.

Literature cited:

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Attachments: Table 1: 20mm Survey 4 Catch Table, Figure 1: 20mm Station Locations, Table 2: 20mm Survey 3 Catch Table, Table 3: EDSM Catch Table, Table 4: Chipps Island Catch Table.

Table 1. Delta Smelt and Longfin Smelt catch per station from 2022 20-mm Survey 4, which was in the field 5/2/2022 – 5/5/2022. Processing is ongoing and these data are preliminary and subject to change. Processing complete through 5/09/2022. Reduced tow times of 5 minutes indicated with \*.

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	4	323	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	340	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	342	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	343	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	344	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	345	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	346	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	4	405	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	411	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	418	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	501	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	504	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	519	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	602	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	606	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	609	3-May-22	1	Longfin Smelt	18	19	31	27.4	Suisun Bay & West
2022	4	610	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	508	NA	0	Not Yet Processed	NA	NA	NA	NA	Confluence
2022	4	513	02-May-22	2	Longfin Smelt	29	23	32	26.2	Confluence
2022	4	520	NA	0	Not Yet Processed	NA	NA	NA	NA	Confluence
2022	4	801	02-May-22	3	Longfin Smelt	28	22	30	26.1	Confluence
2022	4	804	03-May-22	3	No Smelt Catch	0	NA	NA	NA	Confluence
2022	4	703*	03-May-22	1	Longfin Smelt	2	22	25	23.5	Sac. River System
2022	4	704	02-May-22	2	Longfin Smelt	102	23	36	NA	Sac. River System
2022	4	704	02-May-22	2	<b>Delta Smelt</b>	1	24	24	24.0	Sac. River System
2022	4	705	02-May-22	3	Longfin Smelt	15	16	26	20.8	Sac. River System
2022	4	706*	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	4	707*	02-May-22	2	Longfin Smelt	8	19	25	22.3	Sac. River System
2022	4	711	02-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	4	716	04-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	4	718	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	4	719	04-May-22	2	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	4	720	04-May-22	2	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	4	723	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	4	724	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	4	726	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	4	809	03-May-22	3	Longfin Smelt	4	15	20	17.0	Central & South Delta
2022	4	812*	03-May-22	3	Longfin Smelt	3	17	22	19.0	Central & South Delta
2022	4	815	03-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	4	901	02-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	4	902	02-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	4	906	03-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	4	910	02-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	4	912	02-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	4	914	02-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	4	915	02-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	4	918	02-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	4	919	03-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta

Figure 1: 20mm station locations.

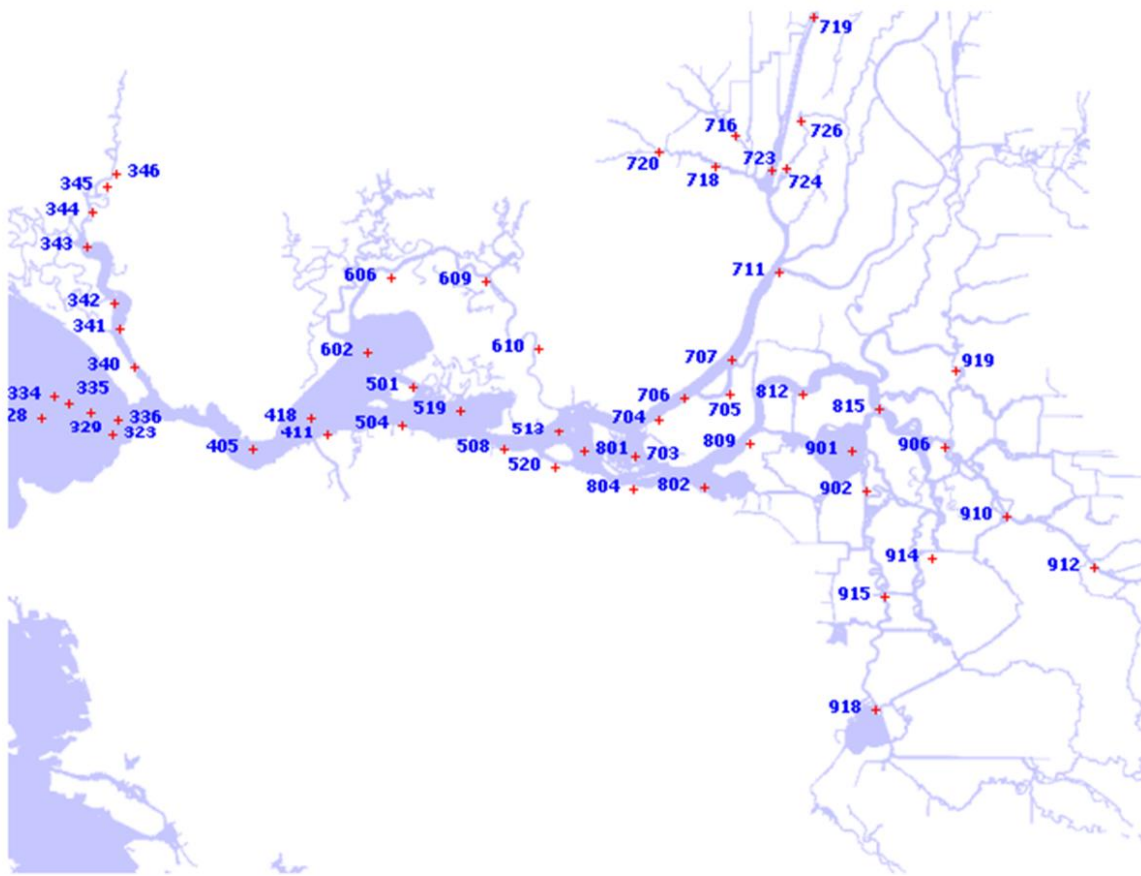


Table 2. Delta Smelt and Longfin Smelt catch per station from 2022 20-mm Survey 3, which was in the field 4/18/2022 – 4/21/2022. Processing is ongoing and these data are preliminary and subject to change. Processing complete through 05/09/2022. Reduced tow times of 5 minutes indicated with \*. Reduced tow times of 2.5 minutes indicated with \*\*. Stations with dropped tows indicated with \*\*\*.

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	3	323	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	3	340	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	3	342	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	3	343	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	3	344	NA	0	Not Sampled	NA	NA	NA	NA	Suisun Bay & West
2022	3	345	NA	0	Not Sampled	NA	NA	NA	NA	Suisun Bay & West
2022	3	346	NA	0	Not Sampled	NA	NA	NA	NA	Suisun Bay & West
2022	3	405	19-Apr-22	3	Longfin Smelt	5	15	83	36.6	Suisun Bay & West
2022	3	411	21-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Suisun Bay & West
2022	3	418	19-Apr-22	3	Longfin Smelt	5	20	37	26.2	Suisun Bay & West
2022	3	501	21-Apr-22	3	Longfin Smelt	8	16	39	31.0	Suisun Bay & West
2022	3	504	21-Apr-22	3	Longfin Smelt	1	30	30	30.0	Suisun Bay & West
2022	3	519	21-Apr-22	3	Longfin Smelt	12	20	39	27.2	Suisun Bay & West
2022	3	602	19-Apr-22	3	Longfin Smelt	11	12	34	21.5	Suisun Bay & West
2022	3	606	19-Apr-22	3	Longfin Smelt	96	11	30	NA	Suisun Bay & West
2022	3	609	19-Apr-22	1	Longfin Smelt	120	18	30	NA	Suisun Bay & West
2022	3	610	19-Apr-22	3	Longfin Smelt	210	18	29	NA	Suisun Bay & West
2022	3	508	21-Apr-22	3	Longfin Smelt	38	19	38	27.2	Confluence
2022	3	513	18-Apr-22	3	Longfin Smelt	55	16	76	26.4	Confluence
2022	3	520	21-Apr-22	3	Longfin Smelt	191	14	30	NA	Confluence
2022	3	801	18-Apr-22	3	Longfin Smelt	20	16	29	24.3	Confluence
2022	3	804	19-Apr-22	3	Longfin Smelt	18	9	25	16.0	Confluence
2022	3	703	19-Apr-22	3	Longfin Smelt	132	10	34	22.5	Sac. River System
2022	3	704	18-Apr-22	3	Longfin Smelt	2267	10	30	22.5	Sac. River System
2022	3	705	18-Apr-22	3	Longfin Smelt	67	10	24	17.5	Sac. River System
2022	3	706**	18-Apr-22	3	Longfin Smelt	151	10	24	NA	Sac. River System
2022	3	707	18-Apr-22	3	Longfin Smelt	9	10	20	15.6	Sac. River System
2022	3	711	18-Apr-22	3	Longfin Smelt	21	9	22	14.7	Sac. River System
2022	3	716	20-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	3	718	20-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	3	719	20-Apr-22	3	Longfin Smelt	1	27	27	27.0	Sac. River System
2022	3	720*	20-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	3	723	20-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	3	724	20-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	3	726	20-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System



Week	Stratum	# Sites	% Conf	L DSM Primary	J DSM Primary	A DSM Primary	L DS Confirmed	J DS confirmed	A DS confirmed	Marked DSM	LFS L	LFS J	LFS A
38	Suisun Bay	5	100	0	0	0	0	0	0	0	4	3	0
38	Suisun Marsh	10	0	0	0	0	0	0	0	0	217	1642	0
38	Lower Sacramento	5	80	0	0	0	0	0	0	0	29	22	0
38	Cache Slough LI	5	30	0	0	0	0	0	0	0	0	0	0
38	Sac DW Ship Chan	10	75	0	0	0	0	1	0	0	0	1	0
38	Lower San Joaquin	5	90	0	0	0	0	0	0	0	5	0	0
39	Suisun Bay	5	10	0	0	0	0	0	0	0	3	4	0
39	Suisun Marsh	10	15	0	0	0	0	0	0	0	76	98	0
39	Lower Sacramento	5	100	0	0	0	0	0	0	0	0	0	0
39	Cache Slough LI	5	36	0	0	0	0	0	0	0	0	0	0
39	Sac DW Ship Chan	5	70	0	0	0	0	0	0	0	0	0	0
39	Lower San Joaquin	10	74	0	0	0	0	0	0	0	1	0	0
40	Suisun Bay	10	10	0	0	0	0	0	0	0	1	15	0
40	Suisun Marsh	5	0	0	0	0	0	0	0	0	0	0	0
40	Lower Sacramento	10	5	0	0	0	0	0	0	0	4	4	0
40	Cache Slough LI	5	0	0	0	0	0	0	0	0	0	0	0
40	Sac DW Ship Chan	5	40	0	0	0	0	0	0	0	0	0	0
40	Lower San Joaquin	5	30	0	0	0	0	0	0	0	0	0	0

Table 4. Delta Smelt (DSM) and Longfin Smelt (LFS) catch in Chipps Island midwater trawls from a total of 50 tows conducted on May 1, 2, 3, 5, and 6, 2022. These data are preliminary and subject to change.

Water Year	Station Code	Date	Species	Mark Type	Fork Length	Total Catch	Disposition	Location
2022	SB018N	5/1/2022	LFS	None	87	1	Released	Chipps Island
2022	SB018N	5/1/2022	LFS	None	99	1	Released	Chipps Island
2022	SB018N	5/1/2022	LFS	None	108	1	Released	Chipps Island
2022	SB018N	5/5/2022	LFS	None	81	1	Released	Chipps Island
2022	SB018N	5/5/2022	LFS	None	98	1	Released	Chipps Island