

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

## Section 1: Overview

**Date: 5/17/2022**

### **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.

Projected operations are expected to be minimum exports and result in an OMRI of no more negative than -1,800 cfs this week, which past Particle Tracking Model (PTM) results indicate still poses a high risk of entrainment for larval and juvenile DS and juvenile LFS that are present in the OMR corridor. The SWP has an outage at the salvage and pumping facilities this week, however Clifton Court will continue to take in water, thereby increasing residence time and increasing pre-screen loss for fish in this area. When exports and salvage resume, salvage data will not reflect the pre-screen losses that occurred during the outage and therefore these losses will be unaccounted for.

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 the recommendation was lifted last week.

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 increasing and approaching the upper thermal window for spawning and spawning may be winding down for the season, 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.

## **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. Six juvenile DS were collected since 5/9/2022 in the Sacramento Deep Water Ship Channel (SDWSC). 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 and therefore the SMT lifted the recommendation to limit OMRI to -1,250 cfs on a 7-day average to limit risk of entrainment of larval and juvenile LFS on May 9<sup>th</sup>.

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 with the monitoring surveys, juvenile salvage remained elevated last week indicating LFS are still present and at risk. From 5/9/2022 through 5/15/2022, 471 juvenile LFS were salvaged at the SWP fish facility and 20 juvenile LFS were salvaged at the CVP fish facility, resulting in a total salvage of 7,218 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 9<sup>th</sup>.

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. Water temperatures are approaching the upper thermal limit for spawning, so it is likely that spawning is winding down for the season. 20mm 4 detected a DS juvenile 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, resulting 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. Water temperatures are approaching the upper thermal limit for spawning, so it is likely that spawning is winding down for the season.
  - LFS: Low risk of entrainment. 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). Minimum 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 82 km. Qwest is slightly positive and expected to be variable this week (+/- 500 cfs) due to tidal variation.

## **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: Juveniles have been 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 82 km. Qwest is slightly positive and expected to be variable this week +/- 500 cfs due to tidal variation. 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 (4/5/22). 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. Sub-adults/adults may still be present, as they are still being detected at Chipps Island in decreasing numbers and only one was detected this last week. 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 82 km. Qwest is slightly positive and expected to be variable this week (+/- 500 cfs) due to tidal variation. 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. Larvae were not detected in the qualitative larval sampling at either facility this last week. 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. Salvage remained elevated this past week with 491 juveniles salvaged at both facilities from 5/9/2022 through 5/15/2022. 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. Salvage of juvenile LFS is starting to decrease and include larger sizes 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. Juvenile 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 (-1,500 to -1,800 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 (-1,500 to -1,800 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 last week. Old River closed yesterday and Middle River will close on the 27<sup>th</sup> or 28<sup>th</sup>. Grant Line Canal Agricultural Barrier installation started today and will be closed on June 1<sup>st</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 = 20.25°C, 0 days > 25°C
  - 3 Station Average = 19.8°C
- Tidal Cycle: Stronger spring tide mid-month, releases needed to increase outflow to maintain water quality.
- Turbidity:
  - 8.3.1 Freeport 3-day average = NA
  - 8.5.1 OBI Turbidity Daily Average = 2.49 FNU.
- Salinity: X2 is > 81 km. Estimated at 82 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**

- Warm and dry conditions, no precipitation expected this week.
- DCC Gates position: Closed 11/30/2021.
- Sacramento River flow at Freeport 8,100 cfs, some significant variability expected this week due to atmospheric pressure exacerbating a strong spring tidal cycle.
- San Joaquin River flow at Vernalis 712 cfs, some significant variability expected this week due to atmospheric pressure exacerbating a strong spring tidal cycle.
- Qwest: Around 100 cfs yesterday, will be variable (+/- 500 cfs) due to atmospheric pressure exacerbating a strong spring tidal cycle.
- Expected changes in South Delta Exports: Minimum exports expected. Banks pumping plant (SWP) shut down for maintenance on May 15<sup>th</sup> and will be down until approximately 1800 on May 20<sup>th</sup>. There will be no pumping and no salvage during this period, Clifton Court Forebay was drawn down and will be refilled during this period.
- NDOI: 4,800 cfs today, will be around 5,000 cfs this week with some variability due to atmospheric pressure exacerbating a strong spring tidal cycle.

- Upstream releases:
  - Keswick = 3,500 cfs
  - Nimbus = 1,500 cfs, range of 1,500-2,000 cfs in the Operations Outlook reflects potential increase depending on water quality in the Delta.
  - Goodwin = 500 cfs, spring pulse flows complete but releases didn't go all the way down to baseflows due to Vernalis flow requirements.
  - Oroville = 2,200 cfs, hoping to remain steady this week, will look at how Delta water quality does over the spring tide and adjust as appropriate (up to 3,000 cfs possible as reflected in Operations Outlook) to maintain water quality at Emmaton.

**Table 1:** Comparison of OMR and OMR Index (all values from [SacPAS website](#), accessed 5/17/2022).

Date	Averaging Period	USGS gauges (cfs)	Index (cfs)
5/14/2022	Daily	-3,140 cfs	-1,560 cfs
5/14/2022	5-day	-1,930 cfs	-1,440 cfs
5/14/2022	14-day	-1,240 cfs	-1,360 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. Larval fish haven't been detected in surveys since April 7<sup>th</sup>, but may still be present at low densities. Water temperatures are increasing and approaching the thermal maximum at which spawning is expected, so spawning is likely winding down for the season. Six juveniles were detected by EDSM in the last week in the SDWSC.
- Spring Kodiak Trawl: SKT 5 was on the water from 5/9/2022 through 5/12/2022, this was the final survey for this season. No DS were detected. Data is in table 1 in attachments.
- 20mm: Survey 5 is on the water this week and no data is yet available. 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 2 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. Survey 2 was on the water from 4/4/2022 through 4/7/2022. Processing is ongoing. So far, two larval DS were detected, 22 of the previously



reported 24 larval DS were determined to be Wakasagi upon quality control checks. The two confirmed were detected in Old River and in Miner Slough in the north Delta.

- EDSM: From 5/8/2022 through 5/14/2022 EDSM completed sampling at 40 sites. Currently there is minimal catch data available for weeks 40 (May 2<sup>nd</sup>-5<sup>th</sup>) and 41 (May 8<sup>th</sup>-14<sup>th</sup>), but it is included along with effort and sample processing status in table 3 in attachments. Three confirmed DS were caught during week 40 (May 2<sup>nd</sup>-5<sup>th</sup>) in the SDWSC and three preliminary DS were caught during week 41 (May 8<sup>th</sup>-14<sup>th</sup>) in the SDWSC. The total EDSM DS count for the Phase 2 season is now 9. Two were caught 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> in addition to 6 caught in the SDWSC in the last two weeks mentioned above. Preliminary data for each week of phase 2 is summarized in table 3 in attachments. So far, the postlarval/juvenile abundance estimate for the week of May 2<sup>nd</sup>-5<sup>th</sup> was 9,493, however processing is ongoing.
- Chipps: From 5/8/2022 through 5/14/2022 Chipps Island Trawl completed all 50 of the scheduled tows and collected no DS. See Table 4 in Attachments for details.
- Bay Study: Survey 4 sampling is complete, and no DS were detected. Survey 5 is currently underway.
- Fish Restoration Program: Genetic results came back on the previously reported three DS in lower Yolo Ranch the week of April 5<sup>th</sup> and all three fish were determined to be Wakasagi.
- 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 approaching the upper thermal range limit that is conducive to spawning as reported in Damon et al. (2016), larval fish have not been detected since April 25<sup>th</sup>, but may still be present at low densities. Spawning is likely starting to wind down for the season.
- % of population in Delta zones: NA

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

- FMWT Index for LFS = 323
- Spring Kodiak Trawl: SKT 5 was on the water from 5/9/2022 through 5/12/2022, this was the final survey for this season. 92 LFS were detected; four were caught in the lower Sacramento River, 31 were caught in Suisun Bay, and 57 were caught in Suisun Marsh. Data is in table 1 in attachments.
- 20mm: Survey 5 is on the water this week and no data is yet available. 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. 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 5/8/2022 through 5/14/2022 EDSM completed sampling at 40 sites. Currently there is minimal catch data available for weeks 40 (May 2<sup>nd</sup>-5<sup>th</sup>) and 41 (May 8<sup>th</sup>-14<sup>th</sup>), but it is included along with effort and sample processing status in table 3 in attachments. So far juvenile LFS were detected in Suisun Bay, Suisun Marsh, and the lower Sacramento River.
- Chipps: From 5/8/2022 through 5/14/2022 Chipps Island Trawl completed all 50 of the scheduled tows and collected one LFS. See Table 4 in attachments for details.
- LEPS sampling with the 20mm net ends this week and 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>.
- Salvage: From 5/9/22 through 5/15/22, juvenile LFS continued to be salvaged at both facilities. 471 juvenile LFS were salvaged at the SWP fish facility and 20 juvenile LFS were salvaged at the CVP fish facility, resulting in a total weekly salvage of 491 juvenile LFS and a total salvage of 7,218 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 discussed increasing water temperatures and whether or not DS spawning had ended for the season. The three-station temperature average this week was 19.8°C, above the 18°C thermal limit noted in Damon et al. 2016 which the group had been referencing for DS spawning temperature. The three-station temperature average includes Mossdale, which is much warmer than the other stations at Rio Vista and Antioch, and a bit eastward of DS distribution in recent years. There are also other references such as Bennet 2005 that note a higher upper thermal limit for spawning, the group will look at the literature and discuss at the next meeting. The SMT decided it was appropriate to note that spawning is winding down for the season. More westward stations in the estuary are cooler and spawning may still be ongoing in some locations.
- The SMT briefly discussed the timing of larval DS recruitment into the 20mm net, which may have captured larvae into May and June depending on water temperature. CDFW will follow-up on this and USBR shared a tool on SacPAS that may be helpful.
- The SMT discussed the shutdown of Banks pumping and salvage facility for maintenance this week. The SMT is concerned that with CCF being filled and the water not being pumped out until late Friday, water residence time will increase and pre-screen loss of any remaining larval or juvenile smelt in the vicinity will increase. These losses will be unaccounted for when pumping and salvage resumes.
- The SMT discussed if risk to juvenile LFS has decreased, since the distribution appears to be farther westward now out of the zone of high entrainment risk. Because juvenile salvage continued to be elevated last week and the shutdown of Banks this week, the group

decided to wait to further discuss decreasing the risk from high next week. The group will also have new survey data from 20mm survey 5 available to help inform that decision.

Literature cited:

Bennet, W.A. 2005. Critical assessment of delta smelt in the San Francisco Estuary, California. San Francisco Estuary and Watershed Science 3, 2.

Damon, L. J., S. B. Slater, R. D. Baxter, and R. W. Fujimura. 2016. Fecundity and reproductive potential of wild female Delta smelt in the upper San Francisco Estuary, California. California Fish and Game 102(4):188–210.

Grimaldo L. F., Sommer T., Van Ark N., Jones G., Holland E., Moyle P.B., Herbold B., Smith P. 2009. Factors affecting fish entrainment into massive water diversions in a tidal freshwater estuary: can fish losses be managed? North American Journal of Fisheries Management 29:1253-1270.

Mahardja B, Young J, Schreier B, Sommer T (2017). Understanding imperfect detection in a San Francisco Estuary long-term larval and juvenile fish monitoring program. Fish Manag Ecol 24:488–503.

Moyle, P. 2002. Inland Fishes of California: revised and expanded. University of California Press.

Wang, J.C. 1986. Fishes of the Sacramento-San Joaquin Estuary and Adjacent Waters, California: A Guide to the Early Life Histories. Interagency Ecological Program Technical Report No. 9. Reprinted in 2010 by the U.S. Bureau of Reclamation.

Wang, J.C. 2007. Johnson CS. Spawning, early life stages, and early life histories of the Osmerids found in the Sacramento-San Joaquin Delta of California. Tracy Fish Facility Studies. Volume 38. Bureau of Reclamation, Technical Service Center, 2007.

Attachments: Table 1: Spring Kodiak Trawl survey 5 Catch Table, Figure 1: Spring Kodiak Trawl Station Locations, Table 2: 20-mm survey 4 Catch Table, Figure 2: 20-mm Station Locations, Table 3: EDSM Catch Table, Table 4: Chipps Island Catch Table

Table 1: Spring Kodiak Trawl survey 5 (5/9-5/12/2022) smelt catch table. Data is preliminary and subject to change.

Station	# of Delta Smelt	# of Longfin Smelt	Range of FL (mm)	# of Wakasagi	Range of FL (mm)	Region
340	0	0	NA	0	NA	Suisun Bay & West
405	0	1	30	0	NA	Suisun Bay & West
411	0	0	NA	0	NA	Suisun Bay & West

Station	# of Delta Smelt	# of Longfin Smelt	Range of FL (mm)	# of Wakasagi	Range of FL (mm)	Region
418	0	0	NA	0	NA	Suisun Bay & West
501	0	0	NA	0	NA	Suisun Bay & West
504	0	0	NA	0	NA	Suisun Bay & West
519	0	0	NA	0	NA	Suisun Bay & West
602	0	30	27-34	0	NA	Suisun Bay & West
606	0	20	17-36	0	NA	Suisun Bay & West
609	0	6	24-30	0	NA	Suisun Bay & West
610	0	31	25-33	0	NA	Suisun Bay & West
508	0	0	NA	0	NA	Confluence
513	0	0	NA	0	NA	Confluence
520	0	0	NA	0	NA	Confluence
801	0	0	NA	0	NA	Confluence
804	0	0	NA	0	NA	Confluence
704	0	2	25-27	0	NA	Sac River System
706	0	2	27-30	1	31	Sac River System
707	0	0	NA	0	NA	Sac River System
711	0	0	NA	0	NA	Sac River System
712	0	0	NA	0	NA	Sac River System
713	0	0	NA	0	NA	Sac River System
715	0	0	NA	0	NA	Sac River System
716	0	0	NA	0	NA	Sac River System
719	0	0	NA	3	NA	Sac River System
724	0	0	NA	0	NA	Sac River System
809	0	0	NA	0	NA	South & Central Delta
812	0	0	NA	0	NA	South & Central Delta
815	0	0	NA	0	NA	South & Central Delta
902	0	0	NA	0	NA	South & Central Delta
906	0	0	NA	0	NA	South & Central Delta
910	0	0	NA	0	NA	South & Central Delta
912	0	0	NA	0	NA	South & Central Delta
914	0	0	NA	0	NA	South & Central Delta
915	0	0	NA	0	NA	South & Central Delta
919	0	0	NA	0	NA	South & Central Delta
920	0	0	NA	1	30	South & Central Delta
921	0	0	NA	0	NA	South & Central Delta
922	0	0	NA	0	NA	South & Central Delta
923	0	0	NA	0	NA	South & Central Delta

Figure 1. Spring Kodiak Trawl Sampling Locations.

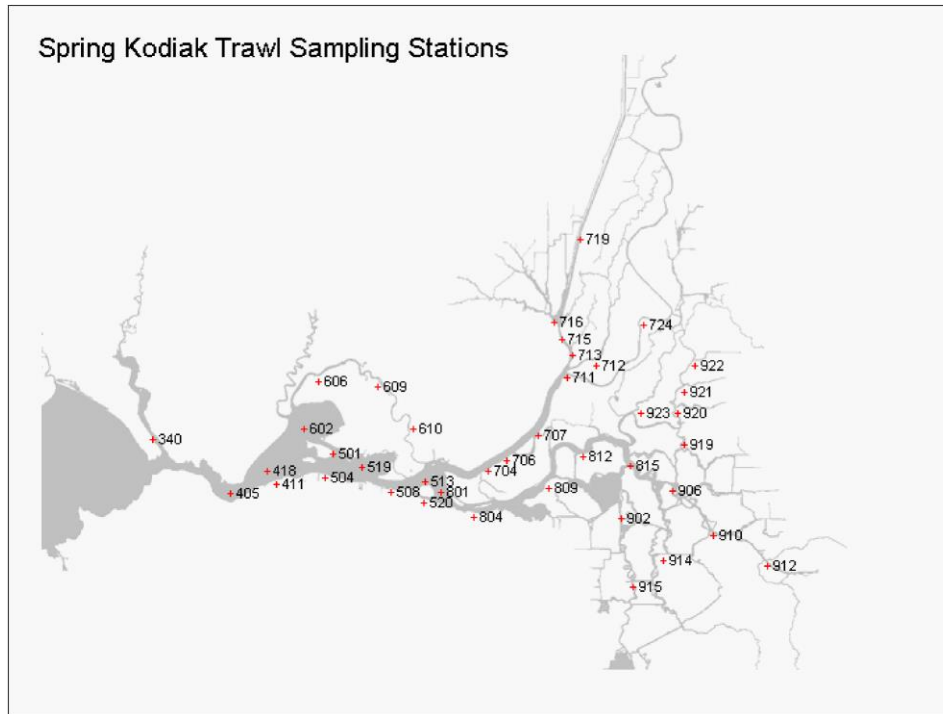


Table 2. Delta Smelt and Longfin Smelt catch per station from 2022 20-mm Survey 4, which was in the field 5/2/2022 – 5/5/2022. Processing is ongoing and these data are preliminary and subject to change. Processing complete through 5/16/2022. Reduced tow times of 5 minutes indicated with \*.

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
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

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
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	03-May-22	1	Longfin Smelt	18	19	31	27.4	Suisun Bay & West
2022	4	610	03-May-22	3	Longfin Smelt	2	23	30	26.5	Suisun Bay & West
2022	4	508		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	05-May-22	1	Longfin Smelt	12	17	25	22.3	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	2	Longfin Smelt	9	20	27	23.6	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*	02-May-22	1	Longfin Smelt	1429	21	30	NA	Sac. River System
2022	4	707*	02-May-22	3	Longfin Smelt	17	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	1	No Smelt Catch	0	NA	NA	NA	Sac. River System

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
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	04-May-22	2	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	4	724	05-May-22	3	Longfin Smelt	1	7	7	7.0	Sac. River System
2022	4	726	05-May-22	3	No Smelt Catch	0	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
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 2. 20mm sampling locations.

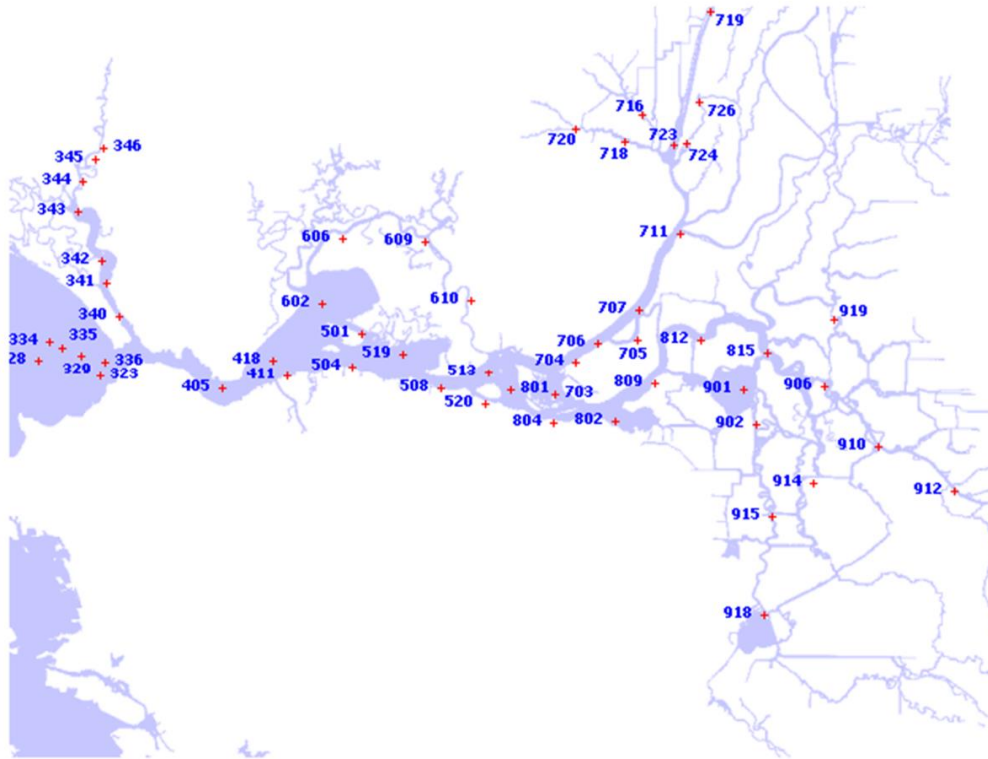


Table 3. Delta Smelt (DSM) and Longfin Smelt (LFS) catch data from EDSM Phase 2 (20mm larval surface trawling) by week and life stage or mark type (L=larvae, J=juvenile, A=adult, M=marked). Processing is complete for regions with percent confirmed (conf) of 100%. DSM that have not gone through the complete laboratory identification QA/QC process (“Primary ID”) are differentiated from those that have undergone full QA/QC (“Confirmed ID”). DSM counts in the Primary ID stage are subject to change as the samples move through the QA/QC process. LFS in both primary and confirmed status are grouped together. The catch from past weeks will be updated in each report as samples are processed. Please see the EDSM daily report for fork length ranges and detailed sample data. Survey week 36 April 4<sup>th</sup>-8<sup>th</sup>, survey week 37 April 11<sup>th</sup>-14<sup>th</sup>, survey week 38 April 18<sup>th</sup>-22<sup>nd</sup>, survey week 39 April 25<sup>th</sup>-29<sup>th</sup>, survey week 40 May 2<sup>nd</sup>-5<sup>th</sup>, and survey week 41 May 9<sup>th</sup>-12<sup>th</sup>.

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
36	Suisun Bay	5	100	0	0	0	2	0	0	0	195	106	0
36	Suisun Marsh	5	100	0	0	0	0	0	0	0	59	13	0
36	Lower Sacramento	5	100	0	0	0	0	0	0	0	222	52	0
36	Cache Slough LI	10	100	0	0	0	0	0	0	0	6	4	0





Week	Stratum	# Sites	% Conf	L DSM Primary	J DSM Primary	A DSM Primary	LDS Confirmed	J DS Confirmed	A DS Confirmed	Marked DSM	LFS L	LFS J	LFS A
41	Lower Sacramento	5	30	0	0	0	0	0	0	0	1	2	0
41	Cache Slough LI	10	5	0	0	0	0	0	0	0	0	0	0
41	Sac DW Ship Chan	10	5	0	3	0	0	0	0	0	0	0	0
41	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 9-13, 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	5/11/2022	LFS	None	73	1	Released	Chipps Island