

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

## Section 1: Overview

**Date: 04/19/2022**

### **Life Stages Present:**

Delta Smelt (DS): Adults, and larvae

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

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

ITP COA 8.4.2 was triggered on April 11<sup>th</sup> by 20mm survey 2 with the detection of 79 LFS at four of the stations in the central and south Delta, including larvae and juveniles in Franks Tract and at station 914 in the Old and Middle River (OMR) corridor. The Smelt Monitoring Team (SMT) recommends continuing to limit OMR Index (OMRI) to -1,250 cfs on a 7-day average to limit risk of entrainment of larval and juvenile LFS. This recommendation is based on continued larval and juvenile LFS presence in the central and south Delta and continued LFS juvenile salvage this last week.

A larval DS was detected in the OMR corridor, this represents an increase in the likelihood of entrainment for larval DS. 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 presence of larval DS in the OMR corridor represents an increased risk of entrainment this week. Projected operations are expected to be minimum exports and result in an OMRI of no more negative than -1,550 cfs this week, which past PTM results indicate still poses a high risk of entrainment to larval DS in the OMR corridor. Some rain is expected this week and in the unlikely event that exports can increase beyond the minimum and OMRI becomes more negative than -1,550 cfs, this would increase this risk. The SMT has requested that they be notified via email and a PTM run be completed before a change in exports is implemented so that risk to both DS and LFS can be assessed.

### **Risk Assessment:**

*Delta Smelt:* Based on recent detections, DS are present in the OMR Corridor. Detection data support DS also being present in the Sacramento Deep Water Ship Channel, Lower Sacramento River, and Suisun Marsh. DS adults and sub-adults are less likely to move into the south and central delta since turbidity remains low. Seven larval DS were collected since 4/12/2022. Larval DS have been detected in the Lower San Joaquin River, the Lower Sacramento River, Old River, the confluence, and the North Delta. Larval DS in the OMR corridor have an increased likelihood of entrainment.

*Longfin Smelt*: 20-mm 2 detected 79 larval and juvenile LFS in the central and south Delta, including areas at high risk of entrainment. Additionally, juvenile LFS salvage has continued to be elevated this last week. 20mm 2 triggered ITP COA 8.4.2 on April 11<sup>th</sup> and the SMT recommends continuing to limit OMRI to -1,250 cfs on a 7-day average to limit risk of entrainment of larval and juvenile LFS. This recommendation is based on continued larval and juvenile LFS presence in the most recent surveys in the central and south Delta and that juvenile LFS salvage continued to be elevated over the last week.

The SMT makes this recommendation to articulate our continued concern for larval and juvenile LFS in the south Delta, as risk remains high. This recommendation is made to prevent and minimize entrainment this week and future entrainment later this season of larval and juvenile LFS and to maintain consistency with past recommendations, with the understanding that this recommendation will be superseded by ITP COA 3.8 not requiring combined exports to drop below 1500 cfs for health and safety.

20mm survey 2 detected 79 larval and juvenile LFS at 4 of the stations in the central and south Delta, with some small larvae still being detected. This indicates that hatching is ongoing, and fish continue to be present in areas at high risk of entrainment. 20mm survey 2 detected 76 larvae and juveniles in the Lower San Joaquin River (stations 809 and 812) with fork lengths ranging from 6 mm to 23 mm, two in Frank's Tract (901) with fork lengths of 11 mm and 20 mm, and one in the South Delta (914) with a fork length of 20 mm. From 4/11/2022 through 4/17/2022, 351 juvenile LFS were salvaged at the SWP fish facility and 276 juvenile LFS were salvaged at the CVP fish facility, resulting in a total salvage of 3,259 juvenile LFS this season, which is higher than total salvage was in WY2020 or WY2021. LFS larvae also continue to be detected in qualitative larval sampling at CVP this last week. The SMT has determined that the overall risk of entrainment is low for sub-adults and adults. No adults 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 2, thereby lifting the 60 cfs maximum diversion rate limitation at Barker Slough Pumping Plant (BSPP) that was previously triggered by 20mm survey 1.

## **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 2 detected a DS larva in the lower Sacramento River at station 706. 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 will start having volitional movement soon, however low turbidity and minimal exports result in a hydrology that should not cue juveniles to enter areas with a higher risk of entrainment. Adult detections are continuing, 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 for adults, sub-adults, juveniles, and larvae, due to projected operations this week. X2 is currently estimated at approximately 87 km and is expected to move further upstream with decreasing inflows. Qwest is increasing and expected to be in the 500 to 2000 cfs range this week, depending on precipitation and San Joaquin River pulse flows.

## **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 has begun, and larvae are present.
    - Larvae:
      - Low risk for larvae detected in the lower San Joaquin River by 20mm Survey 1. X2 is currently estimated at approximately 87 km and is expected to move further upstream with decreasing inflows. Qwest is increasing and expected to be in the 500 to 2000 cfs range this week, depending on precipitation and San Joaquin River pulse flows. PTM run results discussed 3/29/2022 showed that at the less negative OMRI expected this week, larvae in the lower San Joaquin River are at low risk of entrainment. Hydrological conditions have not changed greatly since late March, so results from this PTM run continue to be used to evaluate risk.
      - High risk for the larva detected at station 902 in the OMR corridor by 20-mm survey 2. PTM run results discussed 3/29/2022 showed that

despite minimum exports and the less negative OMRI expected this week, DS larvae in the OMR corridor are at high risk of entrainment. Hydrological conditions have not changed greatly since late March, so results from this PTM run continue to be used to evaluate risk.

○ LFS:

- Adults and sub-adults: Low risk for adult and sub-adult LFS entrainment. EDSM collected one sub-adult LFS in the lower San Joaquin River on 03/09/2022, providing evidence that sub-adults/adults are still present. Projected operations being minimum exports creates a low risk of entrainment this week. Low risk for adults as 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 2. X2 is currently estimated at approximately 87 km and is expected to move further upstream with decreasing inflows. Qwest is increasing and expected to be in the 500 to 2,000 cfs range this week, depending on precipitation and San Joaquin River pulse flows. PTM run results discussed 3/29/2022 showed that at the less negative OMRI expected this week, larvae in the lower San Joaquin River are at low risk of entrainment. Hydrological conditions have not changed greatly since late March, so results from this PTM run continue to be used to evaluate risk.
  - High risk for LFS larvae and juveniles in the OMR corridor. LFS larvae and juveniles are present in the OMR corridor, based on salvage and survey detections. Larvae have been detected in the qualitative larval sampling at CVP this last week. Salvage continued to be elevated this past week with 627 juveniles salvaged at both facilities from 4/11/2022 through 4/17/2022. Although higher salvage is expected in dry years, total salvage thus far in 2022 is now higher than total salvage was for 2020 and 2021. Given 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. 20mm 2 detected two LFS larvae and juveniles at station 901 in Franks Tract and one juvenile LFS at station 914 in the south Delta. Under current conditions, smaller larvae are unlikely to make their way out of the OMR corridor based on 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 start volitionally swimming downstream. PTM run results discussed 3/29/2022 showed 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. Hydrology has not changed dramatically since late March, so results from this PTM run continue to be used to evaluate risk.

Salvage continued to be elevated over the last week, and increased exports at the end of March increased risk and the salvage trajectory expected this season. Salvage is expected to peak in April and May, (Grimaldo et al. 2009) this recommendation is made to help decrease the risk of high salvage this year.

- 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 and larval DS in this area are at high risk of entrainment.
  - LFS: Risk remains high. 20-mm 2 detected 76 larval and juvenile LFS in the lower San Joaquin River and 3 in the central and south Delta. Juvenile LFS salvage has remained elevated this last week. We expect to see more consistent detections at the fish facilities as larvae grow. 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, 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 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 01/03/2022 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 03/11/2022. 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 03/29/2022. 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 sixth 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.

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.

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 expected to be completed last week.
- Controlling Factors: The Temporary Urgency Change Petition was approved and the Temporary Urgency Change Order (TUCO) can be found on the SWRCB website ([link to TUCO](#)). 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. There are other water quality requirements in D-1641, including the San Joaquin I/E ratio for a critical year must be at 1:1, that must be met for exports to increase. It is unlikely that these requirements will be met this week, however with the anticipated precipitation there is a possibility that conditions may change, and these requirements could be met. If it appears that an increase in exports is feasible, the SMT has requested a PTM run to assess any changes in risk of entrainment at the minimum export scenario compared to the planned increase in exports.
- Water Temperature:
  - Clifton Court Forebay (CCF) Daily Average Water Temperature = 17.47°C (63.45°F), 0 days > 25°C (77°F)
  - 3 Station Average = 16.96°C
- Tidal Cycle: Emerging out of stronger spring tide.

- Turbidity:
  - 8.3.1 Freeport 3-day average = NA
  - 8.5.1 OBI Turbidity Daily Average = 6.88 FNU.
- Salinity: X2 is > 81 km. Estimated at 87.7 km on Sacramento River and 86.9 km on San Joaquin River.
- Hydrologic Footprint: Hydrologic footprint using the less negative (-1,250 cfs scenario) from 3/29/2022 PTM run was used to assess risk for larval and juvenile smelt in the lower San Joaquin River and the south Delta. Hydrology has not changed dramatically since late March, so results from this PTM run continued to be used to evaluate risk.

**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 are targeting an NDOI of 4,000 cfs, 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 is expected this week.
- DCC Gates position: Closed 11/30/2021.
- Sacramento River flow at Freeport 7,900 cfs, will be increasing as the week goes on if the storms expected produce precipitation.
- San Joaquin River flow at Vernalis 1,300 cfs.
- Qwest: 500 cfs as of Sunday, will be 500 to 2,000 cfs depending on in-delta precipitation and San Joaquin pulse flows.
- Expected changes in South Delta Exports: Minimum exports. Expected to remain stable; CCF has been at 600 cfs since April 1<sup>st</sup>, CVP is at 900 cfs and will stay there. If conditions later this week with the incoming storms meet D-1641 water quality requirements, there is a slight chance that exports could increase. The SMT has requested to be notified via email in that event and a PTM run completed to assess risk at minimum exports in comparison to the increased exports scenario.
- NDOI: 7,900 cfs, may increase depending on in-delta precipitation.
- Upstream releases:
  - Keswick = 3,250 cfs
  - Nimbus = 1,000 cfs
  - Goodwin = 465 cfs, pulse flows initiated 3 peaks expected April 18<sup>th</sup>-May 18<sup>th</sup> with peaks up to 1,000-1,250 cfs

- Oroville = 800 cfs, will be in the 800-1,500 cfs range this week to maintain water quality in the Delta.

**Table 1:** Comparison of OMR and OMR Index (all values from [SacPAS website](#), accessed 4/19/2022).

Date	Averaging Period	USGS gauges (cfs)	Index (cfs)
4/16/2022	Daily	-2,037 cfs	-1,460 cfs
4/16/2022	5-day	-1,060 cfs*	-1,460 cfs
4/16/2022	14-day	-610 cfs*	-1,400 cfs

\*USGS OMR gauge had been having technical difficulties. Came back online on the 7<sup>th</sup>, but readings may not be accurate, so the 5-day and 14-day averages may not be accurate.

#### 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 of these 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.
- 20mm: Survey 2 was on the water from 4/4/2022 through 4/7/2022. Processing is ongoing. So far, 23 larval DS were detected. One was detected in Old River, one was detected in the lower Sacramento River, and 21 were detected in the north Delta in Miner Slough (724 and 726). See Table 1 in attachments for details.
- EDSM: From 4/10/2022 through 4/16/2022 EDSM completed sampling at 40 sites. So far, two DS have been detected in the lower Sacramento River; processing is ongoing and preliminary data is in Table 2 in attachments. The abundance estimate for last week is 2,015,773 for post larval/juvenile DS.
- Chipps: From 4/10/2022 through 4/16/2022 Chipps Island Trawl completed 47 of the 50 tows and collected no DS. See Table 3 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 See Table 4 in Attachments for details.
- Bay Study: Survey 4 sampling is complete, and no DS were detected.
- 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 of 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 lampara net on 4/6/2022. Fork lengths ranged



from 20mm to 23mm. So far these are larger than other fish we've seen. 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.
- 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 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. See table 1 in attachments for details.
- EDSM: From 4/10/2022 through 4/16/2022 EDSM completed sampling at 40 sites. This was the second week of Phase 2, 20mm sampling for the season. Processing is ongoing, so far LFS were detected in Suisun Bay, Suisun Marsh, and the lower Sacramento River. See Table 2 in attachments for details.
- Chipps: From 4/10/2022 through 4/16/2022 Chipps Island Trawl completed 47 of the 50 tows and collected 20 LFS. See Table 3 in attachments for details.
- SKT survey 4 sampling is complete and 155 LFS were detected in Suisun Marsh, Suisun Bay, and the confluence.
- 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 using a 20-mm net.
- Salvage: From 4/11/2022 through 4/17/2022, 351 juvenile LFS were salvaged at the SWP fish facility (total state salvage 1,621) and 276 juvenile LFS were salvaged at the CVP fish facility (total federal salvage 1,638), resulting in a total salvage of 3,259 juvenile LFS this season, which is higher than total salvage was in WY2020 or WY2021.
- Qualitative larval sampling began at both facilities on February 7<sup>th</sup> and larvae were detected at CVP only 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 the presence of DS larvae in Old River in the OMR Corridor. This is the first evidence we have that larval DS are present in the OMR Corridor and at high

risk of entrainment. The SMT is concerned for DS larvae in this area and this is farther south than the last detection in the lower San Joaquin River when the SMT made a recommendation for protection. Despite minimum exports this week, the PTM run results discussed on March 29<sup>th</sup> show that about half of the particles in this area are either entrained to the export facilities or in the OMR Corridor, this is concerning to the SMT. Although no trigger has been met to make a recommendation, the risk for larval DS is now elevated and the SMT discussed that minimum exports may not be protective enough for larval DS in this high-risk area. If conditions this week change and D-1641 and ITP (COA 8.17) requirements are met, exports could potentially increase. This is unlikely, but nevertheless the SMT is sufficiently concerned and requested notification via email if it looks like exports will increase and a PTM run to be completed to compare risk levels at minimum exports to the projected increased export level to assess risk.

- The SMT discussed the salvage outage at the CVP that occurred last week. No salvage was recorded during this time and no expansion factor was used to try and estimate the salvage during those outages. This is concerning to the SMT, as DS may have already been salvaged during that time.
- The SMT made a recommendation when a larval DS was previously detected in the lower San Joaquin River, now that a larval DS has been detected farther south closer to the export facilities, some members felt that a recommendation was warranted. CDFW asked if USBR could be more specific as to how they propose to use the Life Cycle Model (LCM) to show the effect to the population? When LCM was operationalized in the March 2020 memo, information was generated about rates of entrainment with OMR index. The -3,500 cfs OMRI level was chosen as the level chosen for an acceptable rate of entrainment and reflected 10% entrainment relative to population at that time. There is no mechanism, using the LCM specifically to utilize it in real-time on a weekly basis. The SMT discussed that the OMRI level of -3500 cfs doesn't seem protective enough for larval DS in the OMR corridor, as past PTM runs show that at this OMRI level a large percentage of particles are entrained into the export facilities and the OMR Corridor.
- The SMT discussed that larval DS will move with the water despite turbidity levels, so only monitoring turbidity levels isn't predictive for larval DS entrainment, as they can't volitionally swim to be able to avoid entrainment and their distribution is less closely tied to turbidity compared with adults.
- The SMT discussed the wakasagi salvage that is occurring and is curious where these fish are coming from and whether this may be an early warning for DS salvage. Wakasagi salvage is rare and although in the past it did sometimes overlap with DS salvage, prior to 2008 some of those species identifications may not have been reliable. The wakasagis that are being salvaged are fairly large (30-40mm), so they could be coming from San Joaquin reservoir releases not from south delta spawning. DJFMP saw some small wakasagi in Feb/March in Colusa to lower Sacramento region, so it could be that conditions this year have been good for wakasagi and there are more fish in the system, so the salvage may just be an indication that the population is higher this year.
- CDFW shared an updated plot that compared LFS salvage with combined exports and OMRI so far in 2022 as of April 17<sup>th</sup> compared to all of 2020 and 2021. Despite lower exports in 2022, salvage is much higher to date than it was in 2020 and 2021. Salvage

started earlier in 2022 and a spike occurred on March 29<sup>th</sup> with increased exports. Salvage has started to decrease in the last week, and the SMT hopes this trend will continue. However, in 2020 salvage had a bimodal distribution so despite the decrease over the last week it could increase again, and we could have another wave of salvage.

Literature cited:

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.

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

Table 1. Longfin Smelt and Delta Smelt catch per station from 2022 20mm 2, survey 2 was conducted 4/4/2022 through 4/7/2022. Processing is ongoing. This data is preliminary and subject to change.

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	2	328	NA	0	Not Yet Processed	0	NA			San Pablo Bay
2022	2	329	NA	0	Not Yet Processed	0	NA	NA	NA	San Pablo Bay
2022	2	334	NA	0	Not Yet Processed	0	NA	NA	NA	San Pablo Bay
2022	2	335	NA	0	Not Yet Processed	0	NA	NA	NA	San Pablo Bay
2022	2	336	NA	0	Not Yet Processed	0	NA	NA	NA	San Pablo Bay
2022	2	323	NA	0	Not Yet Processed	0	NA	NA	NA	San Pablo Bay
2022	2	340	NA	0	Not Yet Processed	0	Na	NA	NA	Suisun Bay & West
2022	2	342	NA	0	Not Yet Processed	0	NA	NA	NA	Suisun Bay & West
2022	2	343	NA	0	Not Yet Processed	0	NA	NA	NA	Suisun Bay & West
2022	2	344	NA	0	Not Yet Processed	0	NA	NA	NA	Suisun Bay & West
2022	2	345	NA	0	Not Yet Processed	0	NA	NA	NA	Suisun Bay & West
2022	2	346	NA	0	Not Yet Processed	0	NA	NA	NA	Suisun Bay & West
2022	2	405	5-Apr-22	3	Longfin Smelt	2	12	17	14.5	Suisun Bay & West
2022	2	411	7-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Suisun Bay & West
2022	2	418	NA	0	Not Yet Processed	0	NA	NA	NA	Suisun Bay & West

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	2	501	NA	0	Not Yet Processed	0	NA	NA	NA	Suisun Bay & West
2022	2	504	7-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Suisun Bay & West
2022	2	519	NA	0	Not Yet Processed	0	NA	NA	NA	Suisun Bay & West
2022	2	602	05-Apr-22	3	Longfin Smelt	4	8	15	11.3	Suisun Bay & West
2022	2	606	5-Apr-22	3	Longfin Smelt	34	11	31	17.9	Suisun Bay & West
2022	2	609	5-Apr-22	3	Longfin Smelt	15	10	26	18.9	Suisun Bay & West
2022	2	610	05-Apr-22	0	Not Yet Processed	0	NA	NA	NA	Suisun Bay & West
2022	2	508	NA	0	Not Yet Processed	0	NA	NA	NA	Confluence
2022	2	513	NA	0	Not Yet Processed	0	NA	NA	NA	Confluence
2022	2	520	07-Apr-22	2	Longfin Smelt	161	9	25	20.2	Confluence
2022	2	801	04-Apr-22	3	Longfin Smelt	11	6	30	16.4	Confluence
2022	2	804	06-Apr-22	3	Longfin Smelt	32	8	23	15.9	Confluence
2022	2	703	04-Apr-22	3	Longfin Smelt	256	10	23	19.3	Sac. River System
2022	2	704	04-Apr-22	3	Longfin Smelt	177	6	24	19.2	Sac. River System
2022	2	705	04-Apr-22	3	Longfin Smelt	23	9	20	14.1	Sac. River System
2022	2	706	04-Apr-22	3	<b>Delta Smelt</b>	1	11	11	11.0	Sac. River System
2022	2	706	04-Apr-22	3	Longfin Smelt	74	9	17	13.1	Sac. River System
2022	2	707	04-Apr-22	0	Not Yet Processed	0	NA	NA	NA	Sac. River System
2022	2	711	04-Apr-22	3	Longfin Smelt	7	10	17	12.7	Sac. River System
2022	2	716	07-Apr-22	3	Longfin Smelt	1	10	10	10.0	Sac. River System
2022	2	718	07-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	2	719	07-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	2	720	07-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	2	723	07-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	2	724	07-Apr-22	3	<b>Delta Smelt</b>	14	10	12	11.2	Sac. River System
2022	2	726	07-Apr-22	3	<b>Delta Smelt</b>	7	9	14	11.3	Sac. River System
2022	2	809	06-Apr-22	3	Longfin Smelt	65	6	23	15.9	Central & South Delta
2022	2	812	06-Apr-22	3	Longfin Smelt	11	11	18	14.9	Central & South Delta
2022	2	815	06-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	2	901	05-Apr-22	3	Longfin Smelt	2	11	20	15.5	Central & South Delta
2022	2	902	05-Apr-22	3	<b>Delta Smelt</b>	1	8	8	8.0	Central & South Delta
2022	2	906	06-Apr-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	2	910	05-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	2	912	05-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	2	914	05-Apr-22	3	Longfin Smelt	1	20	20	20.0	Central & South Delta
2022	2	915	05-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	2	918	05-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	2	919	06-Apr-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta

Processing complete through 4/18/2022.

\*Reduced tow time (5 minutes)

\*\*Reduced tow time (2.5 minutes)

Figure 1: 20mm station locations.

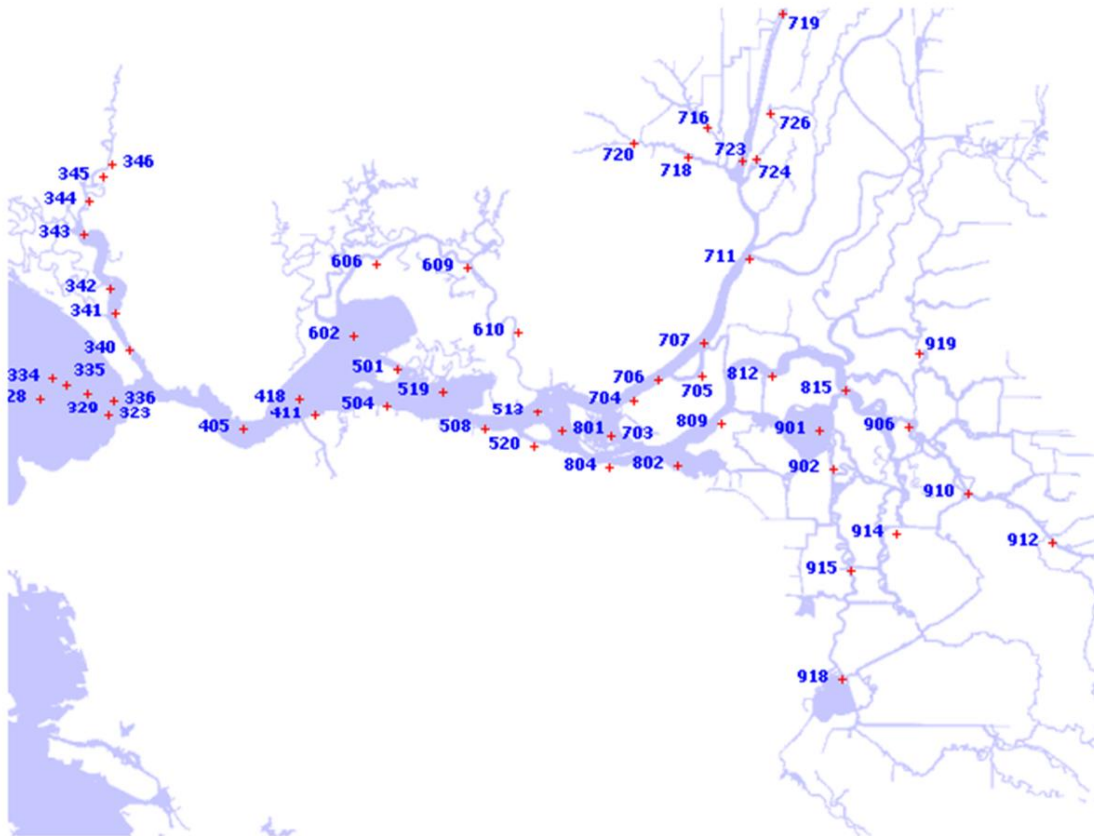


Table 2. Week 37 (4/11/2022–4/14/2022) EDSM 2022 Phase 2 (20mm) Delta Smelt (DSM), Longfin Smelt (LFS), and unidentified Osmerid (OSM) catch per station. These data are preliminary and subject to change.

Water Year	Phase	Station Code	Date	# Tows	Lab ID Status	Species	Mark Type	Fork Length Range	Total Catch	Stratum
2022	2	22-37-SB05	4/12/2022	2	Primary	no smelt	NA	NA	NA	Suisun Bay
2022	2	22-37-SB06	4/12/2022	2	Primary	no smelt	NA	NA	NA	Suisun Bay
2022	2	22-37-SB07	4/12/2022	2	Primary	LFS	None	29	1	Suisun Bay
2022	2	22-37-SB08	4/12/2022	2	Complete	no smelt	NA	NA	NA	Suisun Bay
2022	2	22-37-SB10	4/12/2022	2	Primary	no smelt	NA	NA	NA	Suisun Bay
2022	2	22-37-SB01	4/13/2022	2	Primary	LFS	None	22.7	1	Suisun Bay
2022	2	22-37-SB03	4/13/2022	2	Secondary	no smelt	NA	NA	NA	Suisun Bay
2022	2	22-37-SB04	4/13/2022	2	Primary	no smelt	NA	NA	NA	Suisun Bay
2022	2	22-37-SB09	4/13/2022	2	Primary	no smelt	NA	NA	NA	Suisun Bay
2022	2	22-37-SB11	4/13/2022	2	Primary	no smelt	NA	NA	NA	Suisun Bay
2022	2	22-37-SM01	4/11/2022	2	Primary	LFS	None	14.6–22.2	5	Suisun Marsh
2022	2	22-37-SM02	4/11/2022	2	Primary	LFS	None	6.7–23.3	11	Suisun Marsh
2022	2	22-37-SM03	4/11/2022	2	Complete	no smelt	NA	NA	NA	Suisun Marsh
2022	2	22-37-SM04	4/11/2022	2	Primary	no smelt	NA	NA	NA	Suisun Marsh
2022	2	22-37-SM06	4/11/2022	2	Complete	no smelt	NA	NA	NA	Suisun Marsh
2022	2	22-37-LSR03	4/13/2022	2	Primary	no smelt	NA	NA	NA	Lower Sac River
2022	2	22-37-LSR04	4/13/2022	2	Primary	LFS	None	16.8	1	Lower Sac River
2022	2	22-37-LSR07	4/13/2022	2	Primary	LFS	None	18.8–22.4	3	Lower Sac River
2022	2	22-37-LSR07	4/13/2022	2	Secondary	LFS	None	18.4–27	4	Lower Sac River
2022	2	22-37-LSR08	4/13/2022	2	Primary	no smelt	NA	NA	NA	Lower Sac River

Water Year	Phase	Station Code	Date	# Tows	Lab ID Status	Species	Mark Type	Fork Length Range	Total Catch	Stratum
2022	2	22-37-LSR10	4/13/2022	2	Primary	DSM	None	8.5–9	2	Lower Sac River
2022	2	22-37-LSR10	4/13/2022	2	Secondary	LFS	None	10.3–17	3	Lower Sac River
2022	2	22-37-LSR06	4/14/2022	2	Primary	no smelt	NA	NA	NA	Lower Sac River
2022	2	22-37-LSR09	4/14/2022	2	Primary	no smelt	NA	NA	NA	Lower Sac River
2022	2	22-37-LSJ01	4/14/2022	2	Primary	no smelt	NA	NA	NA	Lower San Joaquin River
2022	2	22-37-LSJ02	4/14/2022	2	Primary	no smelt	NA	NA	NA	Lower San Joaquin River
2022	2	22-37-LSJ03	4/14/2022	2	Primary	no smelt	NA	NA	NA	Lower San Joaquin River
2022	2	22-37-LSJ04	4/14/2022	2	Primary	no smelt	NA	NA	NA	Lower San Joaquin River
2022	2	22-37-LSJ05	4/14/2022	2	Primary	no smelt	NA	NA	NA	Lower San Joaquin River
2022	2	22-37-CS01	4/12/2022	2	Primary	no smelt	NA	NA	NA	Cache Slough
2022	2	22-37-CS02	4/12/2022	2	Primary	no smelt	NA	NA	NA	Cache Slough
2022	2	22-37-CS04	4/12/2022	2	Primary	no smelt	NA	NA	NA	Cache Slough
2022	2	22-37-CS05	4/12/2022	2	Primary	no smelt	NA	NA	NA	Cache Slough
2022	2	22-37-CS07	4/12/2022	2	Primary	no smelt	NA	NA	NA	Cache Slough
2022	2	22-37-SSC01	4/11/2022	2	Primary	no smelt	NA	NA	NA	Sac DW Ship Channel
2022	2	22-37-SSC02	4/11/2022	2	Primary	no smelt	NA	NA	NA	Sac DW Ship Channel
2022	2	22-37-SSC03	4/11/2022	2	Complete	no smelt	NA	NA	NA	Sac DW Ship Channel
2022	2	22-37-SSC04	4/11/2022	2	Complete	no smelt	NA	NA	NA	Sac DW Ship Channel

Water Year	Phase	Station Code	Date	# Tows	Lab ID Status	Species	Mark Type	Fork Length Range	Total Catch	Stratum
2022	2	22-37-SSC05	4/13/2022	2	Primary	no smelt	NA	NA	NA	Sac DW Ship Channel

Table 3. Delta Smelt (DSM) and Longfin Smelt (LFS) catch in Chipps Island midwater trawls from a total of 47 tows conducted on April 10, 11, 12, 14, and 15, 2022. These data are preliminary and subject to change.

Water Year	Station Code	Date	Species	Mark Type	Fork Length	Total Catch	Disposition	Location
2022	SB018M	4/11/2022	LFS	None	97	1	Released	Chipps Island
2022	SB018M	4/14/2022	LFS	None	84	1	Released	Chipps Island
2022	SB018N	4/14/2022	LFS	None	83	1	Released	Chipps Island
2022	SB018N	4/14/2022	LFS	None	100	1	Released	Chipps Island
2022	SB018N	4/15/2022	LFS	None	79	1	Released	Chipps Island
2022	SB018N	4/15/2022	LFS	None	86	1	L	Chipps Island
2022	SB018N	4/15/2022	LFS	None	86	1	Released	Chipps Island
2022	SB018N	4/15/2022	LFS	None	86	1	Released	Chipps Island
2022	SB018N	4/15/2022	LFS	None	91	1	Released	Chipps Island
2022	SB018N	4/15/2022	LFS	None	91	2	Released	Chipps Island
2022	SB018N	4/15/2022	LFS	None	92	1	Released	Chipps Island
2022	SB018N	4/15/2022	LFS	None	94	2	Released	Chipps Island
2022	SB018N	4/15/2022	LFS	None	95	1	Released	Chipps Island
2022	SB018N	4/15/2022	LFS	None	96	1	Released	Chipps Island
2022	SB018S	4/15/2022	LFS	None	26	2	L	Chipps Island
2022	SB018S	4/15/2022	LFS	None	31	1	L	Chipps Island



Water Year	Station Code	Date	Species	Mark Type	Fork Length	Total Catch	Disposition	Location
2022	SB018S	4/15/2022	LFS	None	42	1	L	Chippis Island

\*L fish brought back to LFWO lab due to being dead upon capture or for identification verification.

Table 4. Delta Smelt and Longfin Smelt catch in Spring Kodiak Trawl Survey 4 that sampled from April 11<sup>th</sup> through April 14<sup>th</sup>.

Station	# of Delta Smelt	DS Range of FL (mm)	# of Longfin Smelt	LFS Range of FL (mm)	Region
340	0	NA	0	NA	Suisun Bay & West
405	0	NA	0	NA	Suisun Bay & West
411	0	NA	0	NA	Suisun Bay & West
418	0	NA	0	NA	Suisun Bay & West
501	0	NA	0	NA	Suisun Bay & West
504	0	NA	0	NA	Suisun Bay & West
519	0	NA	5	22-43	Suisun Bay & West
602	0	NA	3	20-27	Suisun Bay & West
606	1	68	65	21-29	Suisun Bay & West
609	0	NA	56	17-30	Suisun Bay & West
610	0	NA	24	22-29	Suisun Bay & West
508	0	NA	0	NA	Confluence
513	0	NA	0	NA	Confluence
520	0	NA	0	NA	Confluence
801	0	NA	0	NA	Confluence
804	0	NA	2	23-25	Confluence
704	0	NA	0	NA	Sac River System
706	0	NA	0	NA	Sac River System
707	0	NA	0	NA	Sac River System
711	0	NA	0	NA	Sac River System
712	0	NA	0	NA	Sac River System
713	0	NA	0	NA	Sac River System
715	0	NA	0	NA	Sac River System
716	0	NA	0	NA	Sac River System
719	1	75	0	NA	Sac River System
724	0	NA	0	NA	Sac River System
809	0	NA	0	NA	South & Central Delta

Station	# of Delta Smelt	DS Range of FL (mm)	# of Longfin Smelt	LFS Range of FL (mm)	Region
812	0	NA	0	NA	South & Central Delta
815	0	NA	0	NA	South & Central Delta
902	0	NA	0	NA	South & Central Delta
906	0	NA	0	NA	South & Central Delta
910	0	NA	0	NA	South & Central Delta
912	0	NA	0	NA	South & Central Delta
914	0	NA	0	NA	South & Central Delta
915	0	NA	0	NA	South & Central Delta
919	0	NA	0	NA	South & Central Delta
920	0	NA	0	NA	South & Central Delta
921	0	NA	0	NA	South & Central Delta
922	0	NA	0	NA	South & Central Delta
923	0	NA	0	NA	South & Central Delta

Figure 2. Spring Kodiak Trawl Sampling Locations.

