

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

Section 1: Overview

Date: 5/31/2022

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.

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. Four juvenile DS from EDSM were collected on May 23rd in the Sacramento Deep Water Ship Channel (SDWSC). This season, 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. DS spawning is likely winding down due to increasing water temperatures and timing.

Barker Slough: COA 8.12 was not triggered by 20mm survey 5, as no DS were detected at station 716.

Longfin Smelt: 20-mm survey 5 did not trigger ITP COA 8.4.2, with the detection of only one juvenile LFS at the most downstream station in the lower San Joaquin River, an area outside the zone with a high risk of entrainment. Juvenile LFS salvage is starting to decrease.

20mm survey 5 detected one juvenile LFS at station 809 in the lower San Joaquin River and none in the central and south Delta. No LFS larvae or juveniles were detected in areas at high risk of entrainment with the monitoring surveys, and juvenile salvage is starting to decrease. From 5/23/22 through 5/30/22, 64 juvenile LFS were salvaged at the SWP fish facility and no juvenile LFS were salvaged at the CVP fish facility. Total weekly salvage was 64 juvenile LFS last week, a sharp decrease from 166 the previous week, for a total salvage of 7,448 juvenile LFS this season. Water year (WY) 2022 total salvage is 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 larval detections in recent surveys, the SMT believes that peak spawning has passed, and that spawning will cease by the end of June based on historical

trends (Moyle 2002, Wang 1986). The SMT has determined that the overall risk of entrainment is low for sub-adults and adults. No adult or sub-adult LFS have been detected in the central and or south Delta stations since early March, when a sub-adult LFS was caught in the lower San Joaquin River by Enhanced Delta Smelt Monitoring (EDSM) on March 9th.

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. DS adults/sub-adults were last detected in the lower Sacramento River by SKT 3 on March 17th. 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. Larval LFS haven't been detected in the Lower Sacramento River since May 16th, however processing is ongoing. 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 miscausing the larger fish to swim towards the south Delta. Adult detections are declining, and Chipps Island Trawl detected only one adult LFS last week. 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 96 km. Qwest was positive when the DCC gates were open this last weekend and will become slightly negative (-100 to -500 cfs) this week since the gates were closed.

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 winding down.
 - Juveniles: Low. 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 the 20 mm surveys. X2 is currently estimated at approximately 96 km, which is higher than in previous weeks. This may pose an elevated risk of entrainment despite lack of detections in monitoring surveys as historical data shows that larval DS distribution is generally upstream of X2 (Dege and Brown 2004). Qwest was positive when the DCC gates were open this last weekend and will become slightly negative (-100 to -500 cfs) this week since the gates were closed. 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 the more recent 20mm surveys. Past PTM run results show that despite minimum exports and the less negative OMRI expected this week (-1500 to -1900 cfs), 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 juveniles observed in the lower San Joaquin River by 20mm 5. However, X2 is currently estimated at approximately 96 km, which is higher than in previous weeks. This may pose an elevated risk of entrainment despite lack of detections in monitoring surveys as historical data shows that juvenile LFS distribution is generally around X2 (Dege and Brown 2004). Qwest was positive when the DCC gates were open this last weekend and will become slightly negative

(-100 to -500 cfs) this week since the gates were closed. Past PTM run results show that at the less negative OMRI expected this week (-1500 to -1800 cfs), 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 20 mm survey 5 did not detect any LFS in the OMR corridor, however LFS juveniles were salvaged last week indicating juveniles are still present. Salvage started to decrease this past week with 64 juveniles salvaged from 5/23/2022 through 5/30/2022, whereas 166 juveniles were salvaged at both facilities the previous week (5/16/2022 through 5/22/2022), this was despite a four-day outage at the SWP pumping and salvage facilities. 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 includes larger sized juveniles 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.
- 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 based on continued salvage. 20-mm 5 detected only one larval and juvenile LFS in the lower San Joaquin River and none in the central and south Delta. Juvenile LFS salvage has been decreasing over the last several weeks, and this decrease is expected to continue as water temperatures are approaching upper thermal limit 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 -1,900 cfs), larval DS that may be 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 and juveniles in the lower San Joaquin River, and high for LFS larvae

and juveniles in the OMR corridor at the less negative OMRI (-1,500 to -1,900 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 index¹ divided by 10, OR

¹ 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

- 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 ≥ 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:

begins in December. The FMWT Index available beginning on December 1 each year shall be used to establish this threshold.

- 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 WOMET (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 WOMET (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 1st. 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 8th 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 11th 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 29th 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 10th, the previous recommendation was lifted by the SMT.
- Data collected by 20mm survey 5 did not trigger this COA.

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 31st. An amendment to this COA was approved on April 1st 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 11th that was previously triggered by 20mm 1. 20mm surveys 3, 4 and 5 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. Opened on May 27th and closed again on May 31st.

- The Emergency Drought barrier at False River reconstruction was completed on 4/13/2022.
- The Old River and Middle River Agricultural Barriers installation is now complete. Grant Line Canal Agricultural Barrier installation started today and will be closed on June 1st.
- 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 = 21.8°C, 0 days > 25°C
 - 3 Station Average = 20.3°C
- Tidal Cycle: Emerging from mild spring tide with new moon yesterday, heading into stronger neap tide.
- Turbidity:
 - 8.3.1 Freeport 3-day average = NA
 - 8.5.1 OBI Turbidity Daily Average = 3.48 FNU.
- Salinity: X2 is > 81 km. Estimated at 96 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 June per the TUCO. Outlook reflects maximum combined exports of up to 1,600 cfs to include Byron Bethany Irrigation District diversions.
 - SWP: 300 to 700 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: Opened May 27th and closed again on May 31st. Currently considering keeping closed due to salinity concerns, operators will monitor and notify us if that changes.
- Sacramento River flow at Freeport 8,100 cfs.
- San Joaquin River flow at Vernalis 755 cfs yesterday.
- Qwest: +2,600 cfs yesterday with DCC gates open, will be slightly negative in the -100 to -500 cfs this week since gates are now closed.
- Expected changes in South Delta Exports: Minimum exports expected.

- NDOI: 5,300 cfs yesterday, with increased inflows, up from last week hit a low of 3,500 cfs.
- Upstream releases:
 - Keswick = 3,750 cfs
 - Nimbus = 1,750 cfs, may increase up to 2,000 cfs to meet Delta water quality requirements.
 - Goodwin = 800 cfs to meet D-1641 Vernalis flow requirements.
 - Oroville = 2,700 cfs, up from 2,200 cfs last week. Increased Friday due to increased salinity at Emmaton due to atmospheric pressure, may increase again up to 3,500 cfs if necessary to meet Delta water quality requirements.

Table 1: Comparison of OMR and OMR Index (all values from [SacPAS website](#), accessed 5/31/2022).

Date	Averaging Period	USGS gauges (cfs)	Index (cfs)
5/28/2022	Daily	-1,697 cfs	-1,450 cfs
5/28/2022	5-day	-2,550 cfs	-1,710 cfs
5/28/2022	14-day	-2,190 cfs	-1,670 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 7th 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 and confirmed by EDSM in the last few weeks in the SDWSC. Another four juveniles were preliminarily identified by EDSM last week also 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.
- 20mm: Survey 5 was on the water from 5/16/2022 through 5/19/2022, processing is ongoing and so far, no DS have been detected. Preliminary data is in table 1 of the attachments. Survey 4 was on the water from 5/2/2022 through 5/5/2022. Processing is ongoing, so far no DS have been detected. The previously reported DS in the lower Sacramento River at station 704 on May 2nd was determined to be a Wakasagi during quality control checks. Preliminary data is in table 2 of the attachments. Survey 3 was on

the water from 4/18/2022 through 4/21/2022. Processing is complete and no DS were detected. Survey 2 was on the water from 4/4/2022 through 4/7/2022. Processing is ongoing. So far two larval DS were detected, one in Old River and one in Miner Slough in the north Delta. The 20mm season total for DS is now 9.

- EDSM: From 5/22/2022 through 5/28/2022 EDSM completed sampling at 39 sites. Processing is ongoing and currently there is minimal catch data from last week, but preliminary data is included along with effort and sample processing status in table 3 in attachments. So far, four juvenile DS have been preliminarily identified from the SDWSC (26-38mm FL). The total EDSM DS count for the Phase 2 season is now 19 (including the four preliminarily identified from last week). Preliminary data for each week of phase 2 is summarized in table 3 in attachments. So far, the most recent postlarval/juvenile abundance estimate was for the week of May 9th-21st and was 13,086, however processing is ongoing.
- Chipps: From 5/22/2022 through 5/28/2022 Chipps Island Trawl completed all 30 of the scheduled tows and collected no DS. See Table 4 in attachments for details.
- Bay Study: Survey 5 sampling is complete, and no DS were detected.
- 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 7th, but may still be present at low densities. Spawning is likely to be winding 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.
- 20mm: Survey 5 was on the water from 5/16/2022 through 5/19/2022, processing is ongoing and so far, processing is ongoing and so far, LFS were detected in the lower San Joaquin River, the lower Sacramento River, and the confluence. Preliminary data is in table 1 in attachments.
- EDSM: From 5/22/2022 through 5/28/2022 EDSM completed sampling at 39 sites. Processing is ongoing and currently there is minimal catch data from last week, but preliminary data is included along with effort and sample processing status in table 3 in attachments. So far larval and juvenile LFS were detected in Suisun Bay, Suisun Marsh, and the lower Sacramento River in recent weeks.
- Chipps: From 5/22/2022 through 5/28/2022 Chipps Island Trawl completed all 30 of the scheduled tows and collected only one LFS adult (FL= 90mm). This was a decrease in catch from the previous week (n=25. See Table 4 in attachments for details.

- Bay Study: The May Bay Study survey is now complete. They caught 184 LFS, including 166 juveniles and 18 adults. Most fish were caught in Suisun Bay, but LFS were caught from the lower Sacramento River down to Central and South Bay. Anecdotally the adult LFS in Suisun were very fat and healthy looking.
- LEPS sampling with the 20mm net ended May 12th and sample processing is ongoing, however final data will not be available until later this. Larval LFS were detected at low densities as of sampling conducted on 2/25/2022. No yolk sac larvae were present as of February 25th.
- Salvage: From 5/23/22 through 5/30/22, 64 juvenile LFS were salvaged at the SWP fish facility and no juvenile LFS were salvaged at the CVP fish facility. Total weekly salvage was 64 juvenile LFS for a total salvage of 7,448 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 7th 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 the volume of water sampled monthly by the 20mm survey compared to the volume of water sampled by the qualitative larval sampling at the fish facilities as a percentage of the total volume of water exported by the south Delta export facilities monthly. USFWS calculated that from 1995 through 2017 on average, monthly the 20 mm survey (all stations included) sampled approximately 2.75% of the water volume exported, whereas the water volume sampled by qualitative larval sampling at the fish facilities sampled approximately 8% of the water volume exported. When looking at only the 6 stations sampled twice monthly in the south Delta, this decreases to only 0.35% of the water volume exported. Therefore, the qualitative larval sampling at the fish facilities samples a much larger volume of water than the 20 mm survey and is an important indicator of entrainment risk for larval smelt. It is unknown what the relative sampling efficiencies are between these two methods, but the SMT has previously characterized the sampling efficiency of the qualitative larval sampling as likely being extremely low.
- The SMT discussed whether to continue qualitative larval sampling at the fish facilities. Larval LFS have not been detected at the facilities since April 23rd, and larval LFS have not been detected in field surveys in the central and south Delta since May 3rd. No larval DS have been detected at the facilities this year and larval DS have not been detected in the recent field surveys. The only detection of a larval DS in the central and south Delta was in 20mm survey 2 at station 902 on April 5th, about two months ago. The SMT discussed that although the water temperatures are approaching the temperatures when qualitative larval sampling ended the last two years, this year's water temperatures are slightly cooler. This year has also been unusual with high LFS salvage, lots of Wakasagi salvage, and experimental release of DS. The SMT decided to hold off cessation of qualitative larval sampling for one more week to see if any smelt larvae are detected, and if none are detected then end sampling next week on June 6th. If a larval smelt is detected, then the

SMT will discuss next week whether to continue qualitative larval sampling at the fish salvage facilities.

Literature cited:

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Attachments: Table 1: 20-mm survey 5 Catch Table, Figure 1. 20-mm Sampling Locations, Table 2: EDSM Catch Table, Table 3: Chipps Island Catch Table, Table 4: Bay Study May Survey Smelt Catch Table. Figure 2. Bay Study sampling locations.

Table 1. Delta Smelt and Longfin Smelt catch per station from 2022 20-mm Survey 5, which was in the field 5/16/2022 – 5/19/2022. These data are preliminary and subject to change. Reduced tow times of 5 minutes indicated with *. Reduced tow times of 2.5 minutes indicated with **. Stations with dropped tows indicated with ***. Processing complete through 5/31/2022.

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	5	323	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	5	340	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	342	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	343	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	344	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	345	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	346	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	405	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	411	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	418	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	501	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	504	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	519	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	602	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	606	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	609	18-May-22	3	Longfin Smelt	70	23	41	NA	Suisun Bay & West
2022	5	610	18-May-22	3	Longfin Smelt	2	26	29	27.5	Suisun Bay & West
2022	5	508	NA	0	Not Yet Processed	NA	NA	NA	NA	Confluence
2022	5	513	NA	0	Not Yet Processed	NA	NA	NA	NA	Confluence
2022	5	520	NA	0	Not Yet Processed	NA	NA	NA	NA	Confluence
2022	5	801	16-May-22	3	Longfin Smelt	40	24	37	29.1	Confluence
2022	5	804	17-May-22	3	No Smelt Catch	0	NA	NA	NA	Confluence
2022	5	703	17-May-22	3	Longfin Smelt	1	27	27	27.0	Sac. River System
2022	5	704*	16-May-22	3	Longfin Smelt	67	23	36	28.8	Sac. River System
2022	5	705*	16-May-22	3	Longfin Smelt	3	24	27	25.7	Sac. River System
2022	5	706***	16-May-22	2	Longfin Smelt	220	19	36	28.0	Sac. River System
2022	5	707**	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	711*	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	712**	16-May-22	2	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	716	19-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	718	19-May-22	3	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	5	719	19-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	720	19-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	723	19-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	724	19-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	726	19-May-22	2	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	809	17-May-22	3	Longfin Smelt	1	23	23	23.0	Central & South Delta
2022	5	812*	17-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	815	17-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	901*	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	902**	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	906	17-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	910	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	912*	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	914*	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	915*	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	918*	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	919*	17-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta

Figure 1. 20mm sampling locations.

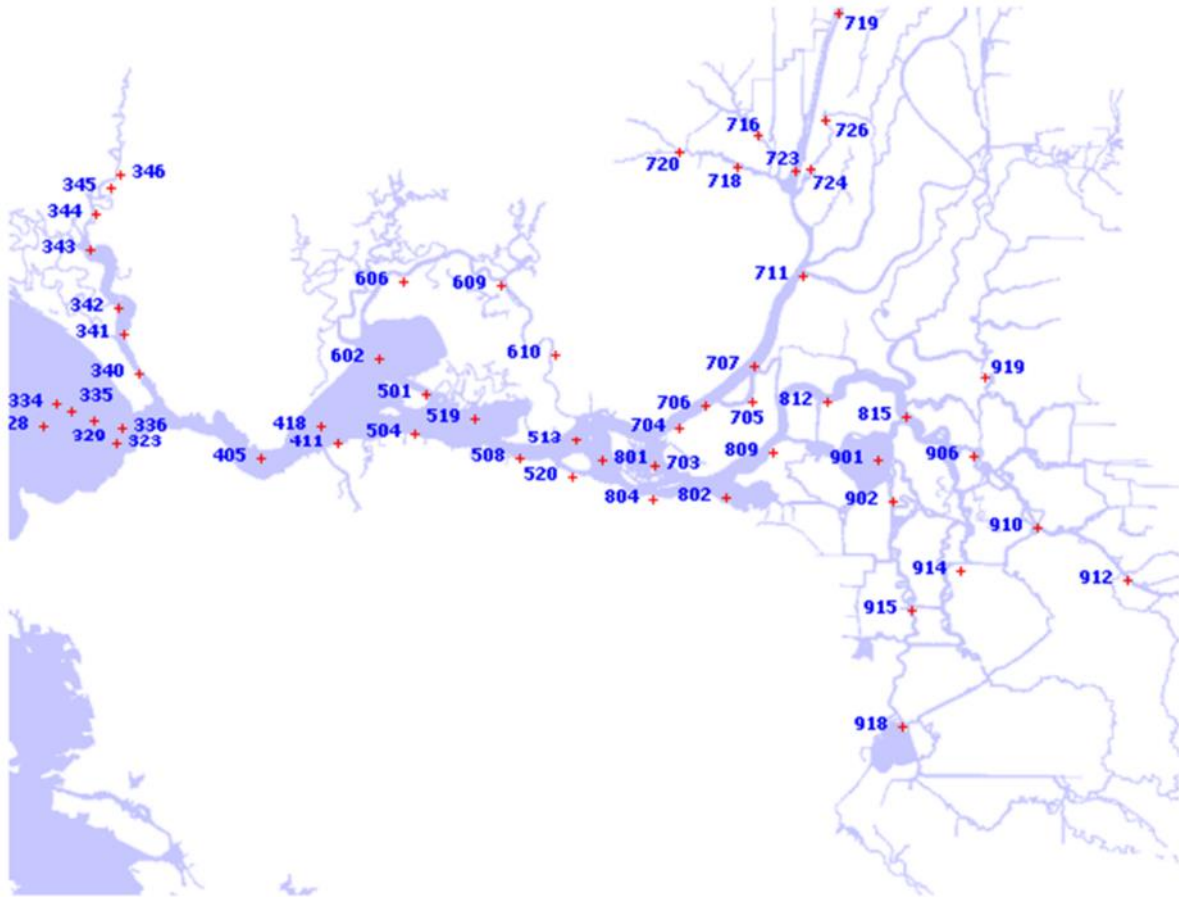


Table 2. Delta Smelt and Longfin Smelt catch per station from 2022 20-mm Survey 4, which was in the field 5/02/2022 – 5/05/2022. These data are preliminary and subject to change. Reduced tow times of 5 minutes indicated with *. Processing complete through 5/31/2022.

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

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	4	418	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	501	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	504	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	519	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	4	602	03-May-22	3	Longfin Smelt	18	18	32	25.8	Suisun Bay & West
2022	4	606	03-May-22	3	Longfin Smelt	103	11	34	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	NA	0	Not Yet Processed	NA	NA	NA	NA	Confluence
2022	4	513	02-May-22	3	Longfin Smelt	69	23	32	26.2	Confluence
2022	4	520	05-May-22	3	Longfin Smelt	41	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	3	Longfin Smelt	11	20	27	23.5	Sac. River System
2022	4	704	02-May-22	3	Longfin Smelt	177	23	36	NA	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	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	4	718	04-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	4	719	04-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	4	720	04-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	4	723	04-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	4	724	05-May-22	3	No Smelt Catch	0	NA	NA	NA	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

[illegible]

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
43	Cache Slough LI	5	0	0	0	0	0	0	0	0	0	0	0
43	Sac DW Ship Chan	5	0	0	4	0	0	0	0	0	0	0	0
43	Lower San Joaquin	9	0	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 30 tows conducted on May 23rd, 25th, and 27th, 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	05/23/2022	LFS	None	90	1	Released	Chipps Island