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

Section 1: Overview

Date: 03/22/2022

Life Stages Present:

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

Advice to Water Operations Management Team (WOMT):

No advice.

Risk Assessment:

Delta Smelt: Based on recent detections, Delta Smelt are unlikely to be prevalent in the South Delta. Detection data support Delta Smelt being present in the Sacramento Deep Water Ship Channel, Lower Sacramento River, Cache Slough Liberty Island, and Suisun Marsh. Delta Smelt are less likely to move into the south and central delta since turbidity remains low. Thirteen marked individuals have been collected since 3/15/2022. Two ripe females were observed in Suisun Marsh by SKT 3. A turbidity bridge avoidance action in not anticipated to be necessary in the next seven days. The expected less negative OMR Index should maintain a low overall likelihood of entraining adults. If larvae are present, the more negative OMRI range may increase the likelihood of entrainment. Water temperatures are within the range for Delta Smelt spawning.

Longfin Smelt: SLS 6 and 20mm are out sampling this week, but no new catch data is yet available. SLS 5 detected larvae in the south and central Delta, including yolk sac larvae, indicating that hatching is ongoing and has occurred in areas at high risk of entrainment. OMRI was between -500 cfs and -2800 cfs last week, and juvenile LFS salvage has increased. This week OMRI is expected to temporarily become as negative as -2500 cfs on the 25th, however new PTM run results discussed this week show that there is very little to no difference in particles entrained into the OMR corridor and the projects between a -1250 cfs recommendation and an OMRI temporarily as negative as -2000 cfs. These PTM results, in combination with field survey and salvage information, showed low risk for LFS larvae in the lower San Joaquin River (812 and 815) and high risk for LFS larvae in the OMR corridor (902). However, under both scenarios the same small percent of particles made it past Chipps and many particles were unresolved, particularly in the central Delta, indicating poor hydrologic conditions for LFS larvae in the central and south Delta under both scenarios.

SLS 5 detected 21 larvae at 4 of the 12 stations in the central and south Delta and 12 of those larvae had yolk sacs, indicating that spawning is ongoing and has occurred in areas at high risk of entrainment. Additionally, a sub-adult LFS was caught in the lower San Joaquin River by Enhanced Delta Smelt Monitoring (EDSM) on March 9th. From 3/15/2022 through 3/21/2022, 78 juvenile LFS were salvaged at the SWP fish facility and 32 juvenile LFS were salvaged at the CVP fish facility, resulting in a total salvage of 126 juvenile LFS this season. LFS larvae also continue to be detected in qualitative larval sampling at both fish facilities. The Smelt Monitoring Team (SMT) has determined that the overall risk of entrainment is low for sub-adults and adults.

Barker Slough: COA 8.12 was triggered on 3/11/2022 by SLS 5 with three LFS detected at station 716. No DS were detected. This limits BSPP maximum diversion rate to be less than 60 cfs on a seven-day running average for the protection of larval LFS. COA 8.12 became active on 02/08/2022 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. The updated March forecast was released on 03/08/2022 and is a forecasted value of 4.8 (50% exceedance) is within the range for a critically dry water year, therefore this COA remains in effect. BSPP is currently experiencing an outage and has been offline since 3/8/2022 and is expected to be back online around 3/25/2022.

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 expected to have made their migration in response to first flush and current temperatures are conducive to spawning as reported in Damon et al. (2016). Two ripe females DS were detected by SKT 3 in Suisun Marsh. DS were last detected in the lower Sacramento River by SKT 3 on March 17th; however minimal exports and low turbidity create a low risk of entrainment.
    - LFS: Risk for larvae is low, however exports are increasing later this week and Qwest will decrease to near zero temporarily. However, at the range of OMRIs expected this week, operations will not result in an increase in 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. DS are unlikely to move into the central and south Delta since turbidity remains low throughout the lower San Joaquin River. Water temperatures are increasing and spawning may start soon, 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 starting to be detected that may start having volitional movement soon. Adult detections are declining, however spawning is ongoing as

yolk sac larvae are still being detected. There is potential for adult and sub-adult movement into the central Delta however, risk remains low at the range of expected OMRIs this week.

- Overall Entrainment Risk:
    - DS: Low.
    - LFS: Low for adults, sub-adults, juveniles, and larvae, due to projected operations resulting in an OMR Index around -1300 cfs for most of this week, with the potential for OMRI briefly being no more negative than -2500 cfs as exports may increase later this week. X2 is currently at 79 km and is expected to remain steady. Qwest will become less positive reaching near zero later this week as exports increase.

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: Low. DS have been detected in the south Delta based on a marked fish in salvage on 01/16/2022 and EDSM caught a marked DS in the lower San Joaquin River on 02/04/2022. However, the likelihood of adult and sub-adult DS entrainment remains low due to projected operations resulting in an OMR Index around -1300 cfs for most of the week, with OMRI briefly being no more negative than -2500 cfs as exports may increase later this week. There is a high degree of uncertainty regarding the response of cultured fish to environmental cues typically applied to wild DS. With water temperatures increasing, there is a possibility that spawning has begun and larvae are present, however evidence of spawning has not been detected. Two ripe females were detected by SKT 3 in Suisun Marsh.
    - 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 adults are still present. Under current hydrology risk remains low and an OMRI temporarily reaching -2,500 cfs won't increase risk. Low risk for adults as exports are low and adult salvage has been rare in recent years.
        - Larvae and juveniles:
            - Low risk for larvae observed in the lower San Joaquin River by SLS five, as OMRIs approach -2500 cfs the risk may increase. Qwest is positive and is expected to stay positive or near zero. Exports have remained low since 02/01/2022 but are increasing over the next couple of days, which will increase risk of entrainment. X2 is currently at 79 km and is expected to remain stable. The risk of entrainment increases as OMRI becomes more negative, PTM results show that particles injected in the lower San Joaquin River (812 and 815) are at low risk of entrainment to the facilities and into the OMR corridor. However, only a few particles made it past Chipps under both scenarios and many particles were unresolved.

- High risk for LFS larvae and juveniles in the OMR corridor. LFS larvae and juveniles are present in the OMR corridor and in West Canal, based on salvage and survey detections. Larvae have been detected in the qualitative larval sampling at both fish facilities in the last week. Salvage increased over the past week with 110 juveniles salvaged at both facilities from 3/15/2022 through 3/21/2022. This pattern may be expected, 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. However, the SMT will explore historical salvage and continue to monitor salvage trends, particularly looking at salvage relative to the number of adult spawners at the beginning of the spawning season. SLS 5 detected LFS larvae with a yolk sac at station 902 in the OMR corridor. Under current conditions, those fish 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. A few juvenile LFS have been salvaged that are at a larger size that can start volitionally swimming downstream. PTM results from last week show that with a more negative OMRI of -2000 cfs as with the base case scenario, 49% of particles are entrained into the facilities and into the OMR corridor after 3 weeks. Whereas the -1250 cfs scenario, showed 46% of particles are entrained into the facilities and into the OMR corridor after 3 weeks. This shows that there is little to no difference in risk to larvae and juveniles in the OMR corridor under these two scenarios. Therefore, the SMT has no recommendation to limit OMRI for the next seven days as the PTM results show that the most protective OMR recommendation does not change the potential for entrainment into the OMR corridor or to the facilities and does not increase the particles to pass Chipps. The SMT requested a new PTM run for next week to inform risk.
- LEPS detected LFS larvae in West Canal during sampling on February 25th. Data has been quality controlled, however final data may not be available until the end of the season. LEPS has concluded sampling for the season as of 3/17/22.

- 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: No change from last week. X2 has stayed steady since last week and is expected to remain steady. Increasing exports may increase risk if spawning has begun and larvae are present, however none have been detected so far this season, limiting entrainment risk.
    - LFS: We expect to see more consistent detections at the fish facilities as larvae grow. Despite low exports and low turbidity, larvae have been detected in the OMR corridor and at the facilities. Juvenile salvage has begun and shows juveniles are also present in the south delta. Risk for LFS larvae and juveniles in the south Delta is high

and will increase as exports increase, however the PTM run results show that an OMRI recommendation does not reduce this risk.

- 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. No larvae or juvenile DS have been detected this season.
    - The SMT determined that risk of entrainment is low for adult and sub-adult LFS, low to medium for LFS larvae in the lower San Joaquin River, and high for LFS larvae in the OMR corridor across the range of expected OMRI values**.**

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 OMR index no more negative than -2,000 cfs, and convene the Smelt Monitoring Team 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 Smelt Monitoring Team 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 OMR index no more negative than -2,000 cfs for 14 days, Permittee shall maintain a 14-day average OMR index 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 OMR index 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[1] divided by 10, OR
- 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 Smelt Monitoring Team staff.

When evaluating the possibility of LFS movement into areas that may be subject to an elevated risk of entrainment, the Smelt Monitoring Team 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 Smelt Monitoring Team 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 Smelt Monitoring Team 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 Smelt Monitoring Team may provide advice to restrict south Delta exports for seven consecutive days to achieve a seven-day average OMR index 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 Smelt Monitoring Team determines that a more restrictive OMR flow requirement is needed to minimize take of adult LFS, the Smelt Monitoring Team 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 Smelt Monitoring Team, or, if there is disagreement and resolution is not reached within WOMT, as determined by CDFW. The Smelt Monitoring Team shall consider results from Additional LFS Larval Sampling (Condition of Approval 7.6.1) to inform its assessment of the start of LFS spawning.

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

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 Smelt Monitoring Team 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 Smelt Monitoring Team 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 Smelt Monitoring Team 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 Smelt Monitoring Team 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 Smelt Monitoring Team shall provide advice on the appropriate OMR flow targets to minimize LFS entrainment or entrainment risk, or both. The Smelt Monitoring Team 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 Smelt Monitoring Team 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 Smelt Monitoring Team may convene to assess the risk of entrainment of DS (Condition of Approval 8.1.5.2). The Smelt Monitoring Team may provide advice to WOMT regarding changes in operations that could be conducted to minimize the risk of entrainment of DS (Condition of Approval 8.1.3). The Smelt Monitoring Team 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 WOMT 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 Smelt Monitoring Team for consideration during the development of a risk assessment to be provided to the WOMT 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 Smelt Monitoring Team 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 Smelt Monitoring Team may provide advice to further restrict south Delta exports to maintain a more positive OMR than -5,000 cfs. The Smelt Monitoring Team 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 Smelt Monitoring Team 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 Smelt Monitoring Team 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 Smelt Monitoring Team 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 Smelt Monitoring Team 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 Smelt Monitoring Team, 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 Smelt Monitoring Team.

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 Smelt Monitoring Team 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 Smelt Monitoring Team, 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 unless otherwise noted.

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 Smelt Monitoring Team 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 OMR index no more negative than -2,000 cfs for 14 days, Permittee shall maintain a 14-day average OMR index 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 Smelt larva Survey (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 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 -1400 cfs) with a recommendation to limit OMR to -1250 cfs.
- Data collected by SLS 5 (Table 1 in attachments) 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 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 -3000 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 -1250 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 -1250 cfs for the protection of juvenile LFS.

8.5.1: This COA went into effect on 01/03/2022 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 02/08/2022 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 3 collected 3 LFS larvae at station 716. This data was reported to the SMT via email on 2/14/2022, triggering this COA. SLS 2 also detected larvae at station 716, however, this COA was not active at the time based on the January SVI. 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.

8.13: The Sacramento Valley Water Year Type Index (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 02/08/2022.

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.)*
    - COA 8.4.2 was triggered for a fourth time this season by data reported to the SMT on 3/11/2022. A recommendation was made to limit OMRI to no more negative than -1250 cfs on a 7-day average.
    - COA 8.12 was triggered for a second time this season by data reported to the SMT on 3/11/2022 limiting the BSPP to no more than 60 cfs exports on a 7-day average. BSPP has been offline since 3/8/2022 and will be back online on around 3/25/2022.
    - COA 8.4.2 was triggered for a third time this season by data reported to the SMT on 2/28/2022. No advice was provided due to low exports and positive Qwest.
    - COA 8.4.2 was triggered for a second time this season by data reported to the SMT 1/31/2022. No advice was provided.

    - OMR Management was initiated on 01/03/2021 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 01/02/2021.
    - DCC gates closed on 11/30/2021.
    - The Drought barrier at False River has been notched. The notch is quite large, such that hydrodynamically no barrier is present.
- Controlling Factors: Delta outflow/X2 (D-1641)
- Water Temperature:
    - Clifton Court Forebay (CCF) Daily Average Water Temperature = NA
    - 3 Station Average = 14.88°C
- Tidal Cycle: not discussed
- Turbidity:
    - 8.3.1 Freeport 3-day average = NA
    - 8.5.1 OBI Turbidity Daily Average = 5.43 FNU.
- Salinity: X2 is at 79 km.
- Hydrologic Footprint: A PTM run was requested on March 15th with injection points at 812, 815, and 902. The scenarios modeled compared a "no recommendation" scenario (where the Projects operate to the X2 requirement using water quality starting March 23rd with the week of March 23rd-29th OMR ranging from -2000 to -1400 cfs, with the remainder of the run at -1400 cfs OMR) with a recommendation to limit OMR to -1250 cfs. The PTM results were discussed 3/22/2022 and showed that with a more negative OMRI of down to -2000 cfs as with the base case scenario, 49% of particles are entrained into the facilities and into the OMR corridor after 3 weeks. Whereas the -1250 cfs scenario, showed 46% of particles are entrained into the facilities and into the OMR corridor after 3 weeks. This shows that there is little to no difference in risk to larvae and juveniles in the OMR corridor under these two scenarios.

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 7,100 cfs, may be an opportunity to increase exports and comply with X2 instead of outflow if a recommendation was not made.
    - SWP: 0 to 1,000 cfs
    - CVP: 800 to 1,800 cfs

Meteorological Forecast: No significant precipitation is in the forecast. Section 3-C: Projected conditions. 8.1.5.2.A. iii

- No significant precipitation expected this week.
- DCC Gates position: Closed 11/30/2021.

- Sacramento River flow at Freeport 9,000 cfs.
- San Joaquin River flow at Vernalis 800-900 cfs.
- Qwest: +800 cfs, expected to decrease to near zero to low positives for the remainder of the week.
- Expected changes in South Delta Exports: CCF has been at 600 cfs, may decrease later in the week if CVP increases exports. Potential for an opportunity to increase exports and comply with X2 instead of outflow if a recommendation was not made. CVP exports are at 900 cfs, but may increase to 1,800 cfs later this week. Increased exports may result in OMRI temporarily reaching -2500 cfs.
- NDOI: 7,500 cfs yesterday, transitioning down to 7,100 cfs this week.
- Upstream releases:
    - Keswick = 3,250 cfs
    - Nimbus = 1,200 cfs
    - Goodwin = 300 cfs, change order on the 24th to decrease to 250 cfs.
    - Oroville = 2,500 cfs

Table 1: Comparison of OMR and OMR Index (5-day and 14-day averages in this table for OMR Index and USGS gauge were reported on SacPAS website, accessed 03/22/2022).

Date	Averaging Period	USGS gauges (cfs)	Index (cfs)
03/20/2022	Daily	Not Reported	-1,273 cfs
03/19/2022	5-day	-2,620 cfs	-1,870 cfs
03/19/2022	14-day	-1,760 cfs	-1,190 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 DS (adipose fin clipped) detection occurred on 03/21/2022 in Cache Slough. The last wild DS detection occurred on 1/5/2022 in the lower Sacramento River stratum.
- EDSM: From 03/13/2022 through 03/19/2022 EDSM completed sampling at 36 sites and collected 1 marked DS in the SDWSC. Field crews noted that the fish looked fat like it had been eating well, but looked beat up and ragged (similar to LFS caught at Chipps). See Table 2 in Attachments for details.
- Chipps: From 03/13/2022 through 03/19/2022 Chipps Island Trawl completed 50 tows and collected no DS. See Table 3 in Attachments for details.
- Spring Kodiak Trawl (SKT): Survey 3 is complete and 11 marked DS were caught in the SDWSC, the Lower Sacramento River, and Suisun Marsh. Two ripe females were

detected in Suisun Marsh on 3/17/2022. See Tables 4 and 5 in Attachments for details.

- Bay Study: Survey 3 sampling is complete and no DS were detected. See table 6 in Attachments for details.
- Salvage: No DS have been salvaged at either facility in the past seven days and no larvae have been detected.
- Fall Mid-water Trawl (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).
- % of population in Delta zones: NA

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

- FMWT Index for LFS = 323
- EDSM: From 03/13/2022 through 03/19/2022 EDSM completed sampling at 36 sites and collected 4 LFS in Suisun Bay. See Table 2 in the Attachments for details.
- Chipps: From 03/13/2022 through 03/19/2022 Chipps Island Trawl completed 50 tows and collected 9 LFS. No LFS were transferred to FCCL for broodstock due to FCCL staffing availability and the condition of the captured fish. Fish looked ragged, not super healthy and looked like they would not survive so not transferred to FCCL. Poor condition could be related to increasing water temperatures. See Table 3 in the Attachments for details.
- SKT survey 3 sampling is complete and 73 LFS were detected in Suisun Marsh and Suisun Bay. See Tables 4 and 5 in Attachments for details.
- SLS Survey 5 sampled from March 7th-10th. Twenty-one LFS were caught at 4 of the 12 stations in the central and south Delta (809, 812, 815, 902) and 12 of these larvae had yolk sacs. Processing is ongoing, but so far shows the highest densities of LFS near the confluence, in the lower Sacramento River, and in Montezuma Slough. See table 1 in attachments for details.
- LEPS sampling continues, and processing is ongoing, however final data may not be available until the end of the season. Larval LFS continue to be detected at low densities as of sampling conducted on 02/25/2022. No yolk sac larvae were present as of February 25th.
- Salvage: Thirty-two juvenile LFS were salvaged at the CVP fish facility between 3/15/2022 and 3/21/2022, bringing the total federal salvage this season to 44. Seventy-eight juvenile LFS were salvaged at the SWP fish facility between 3/15/2022 and 3/21/2022, bringing the total state salvage this season to 82.
- Qualitative larval sampling began at both facilities on February 7th and larvae were detected at both facilities this week.

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

Notes:

- With the Interim Operations Plan in place, if any member of the SMT has an addition they recommend adding to the current PA Assessment please bring it to the Thursday Long Term Operations group.
- In recent years when DS were more abundant, SLS 6 often had the first larval detections. It will be interesting to see if any larvae are detected in SLS 6 this week, as this will be the first indication that DS spawning has commenced in the wild with cultured fish. If none are detected with SLS 6, we probably will not see them until later when they grow a bit larger and are detected by 20mm gear.

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.

Attachments: Table 1: SLS 5 Catch Table, Figure 1: SLS Station Locations, Table 2: EDSM Catch Table, Figure 2: EDSM bubbleplot map of DS and LFS catch, Table 3: Chipps Island Catch Table, Table 4: SKT 3 Delta Smelt Sex/Staging Table, Table 5: SKT 3 Catch Table, Figure 3: SKT Sampling stations map, Table 6: Bay Study March Survey Catch Table, Figure 4: Bay Study Sampling stations map.

Table 1. Longfin Smelt catch per station from 2022 Smelt Larva Survey, Survey 5 conducted between 03/07/2022 – 3/10/2022. Longfin Smelt incidental take permit criteria stations are highlighted in blue (Barker Slough Pumping Plant station 716) and yellow (South Delta exports stations 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919).

Year	Survey #	SLS Station	Turbidity (NTU)	Sample Status	Species	Smelt Catch	Min Length	Max Length	Mean Length
2022	5	340	38.3	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	342	32.8	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	343	21.4	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	344	12.9	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	345	9.5	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	346	11.0	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	347	10.4	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	348	10.6	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	349	10.4	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	405	74.4	Not Yet Processed	NA	NA	NA	NA	NA

Year	Survey #	SLS Station	Turbidity (NTU)	Sample Status	Species	Smelt Catch	Min Length	Max Length	Mean Length
2022	5	411	31.8	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	418	39.4	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	501	30.2	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	504	21.4	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	508	27.8	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	513	25.2	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	519	37.1	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	520	19.3	Processed	Longfin Smelt	29	6	11	7.7
2022	5	602	32.5	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	606	35.6	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	609	35.6	Not Yet Processed	NA	NA	NA	NA	NA
2022	5	610	28.7	Processed	Longfin Smelt	18	6	8	6.3
2022	5	703	13.7	Processed	Longfin Smelt	6	6	7	6.5
2022	5	704	25.5	Processed	Longfin Smelt	7	5	7	6.0
2022	5	705	7.7	Processed	Longfin Smelt	3	7	8	7.7
2022	5	706	25.4	Processed	Longfin Smelt	11	5	7	6.1
2022	5	707	10.4	Processed	Longfin Smelt	38	6	12	6.8
2022	5	711	3.6	Processed	Longfin Smelt	2	6	6	6.0
2022	5	716	5.1	Processed	Longfin Smelt	3	6	6	6.0
2022	5	723	4.8	Processed	Longfin Smelt	1	6	6	6.0
2022	5	801	25.8	Processed	Longfin Smelt	12	6	7	6.7
2022	5	804	14.2	Processed	Longfin Smelt	6	6	8	6.8
2022	5	809	9.1	Processed	Longfin Smelt	14	5	7	6.2
2022	5	812	8.3	Processed	Longfin Smelt	5	7	10	8.2
2022	5	815	5.8	Processed	Longfin Smelt	1	6	6	6.0
2022	5	901	7.3	Processed	NA	No Smelt Catch	NA	NA	NA
2022	5	902	6.2	Processed	Longfin Smelt	1	7	7	7.0
2022	5	906	4.6	Processed	NA	No Smelt Catch	NA	NA	NA
2022	5	910	6.1	Processed	NA	No Smelt Catch	NA	NA	NA

Year	Survey #	SLS Station	Turbidity (NTU)	Sample Status	Species	Smelt Catch	Min Length	Max Length	Mean Length
2022	5	912	5.3	Processed	NA	No Smelt Catch	NA	NA	NA
2022	5	914	4.5	Processed	NA	No Smelt Catch	NA	NA	NA
2022	5	915	4.8	Processed	NA	No Smelt Catch	NA	NA	NA
2022	5	918	4.8	Processed	NA	No Smelt Catch	NA	NA	NA
2022	5	919	4.1	Processed	NA	No Smelt Catch	NA	NA	NA

Processing is complete through 3/11/2022.

Figure 1: Smelt Larva Survey station locations.

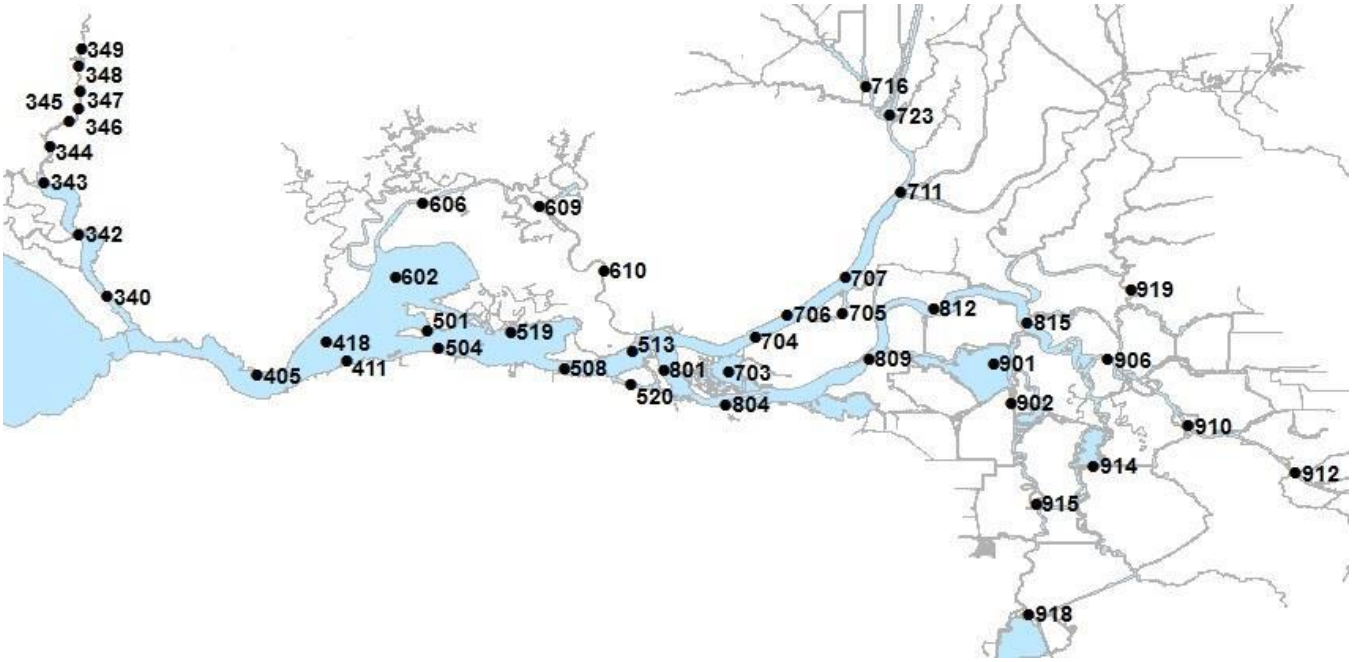

Table 2. Delta Smelt (DSM) and Longfin Smelt (LFS) catch per station for EDSM 2022 Phase 1 Kodiak trawls, from 3/13/2022–3/19/2022. These data are preliminary and subject to change.

Water Year	Phase	Station Code	Date	# Tows	Species	Mark Type	Fork Length	Total Catch	Disposition	Stratum
2022	1	22-33-CF01	3/15/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-33-SBM01	3/15/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-33-SBM02	3/15/2022	4	NA	NA	NA	NA	NA	Suisun Bay

Water Year	Phase	Station Code	Date	# Tows	Species	Mark Type	Fork Length	Total Catch	Disposition	Stratum
2022	1	22-33-SBW01	3/16/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-33-SBW02	3/16/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-33-SBW03	3/16/2022	4	LFS	None	70	1	Released	Suisun Bay
2022	1	22-33-SBW03	3/16/2022	4	LFS	None	75	1	Released	Suisun Bay
2022	1	22-33-SBW03	3/16/2022	4	LFS	None	80	2	Released	Suisun Bay
2022	1	22-33-SM01	3/17/2022	4	NA	NA	NA	NA	NA	Suisun Marsh
2022	1	22-33-SM02	3/17/2022	4	NA	NA	NA	NA	NA	Suisun Marsh
2022	1	22-33-SM03	3/17/2022	4	NA	NA	NA	NA	NA	Suisun Marsh
2022	1	22-33-LSR01	3/14/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-33-RV02	3/14/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-33-RV03	3/14/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-33-RV01	3/15/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-33-RV04	3/15/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-33-RV05	3/15/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-33-PP01	3/14/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-33-PP02	3/14/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-33-SJT01	3/14/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-33-SJT02	3/15/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-33-SJT03	3/15/2022	4	NA	NA	NA	NA	NA	Lower San

Water Year	Phase	Station Code	Date	# Tows	Species	Mark Type	Fork Length	Total Catch	Disposition	Stratum
										Joaquin River
2022	1	22-33-SJT04	3/15/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-33-CS02	3/16/2022	4	NA	NA	NA	NA	NA	Cache Slough
2022	1	22-33-CS03	3/16/2022	4	NA	NA	NA	NA	NA	Cache Slough
2022	1	22-33-CS04	3/16/2022	4	NA	NA	NA	NA	NA	Cache Slough
2022	1	22-33-LSSC01	3/17/2022	2	DSMT	AdClipped	61	1	UCD AHP	Sac DW Ship Channel
2022	1	22-33-LSSC02	3/17/2022	4	NA	NA	NA	NA	NA	Sac DW Ship Channel
2022	1	22-33-LSSC03	3/17/2022	4	NA	NA	NA	NA	NA	Sac DW Ship Channel
2022	1	22-33-FT01	3/16/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-33-HC01	3/16/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-33-HC02	3/16/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-33-MRW01	3/17/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-33-OR01	3/17/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-33-OR02	3/17/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-33-LNR01	3/14/2022	4	NA	NA	NA	NA	NA	Western Delta
2022	1	22-33-SPE01	3/14/2022	4	NA	NA	NA	NA	NA	Western Delta
2022	1	22-33-SPE02	3/14/2022	4	NA	NA	NA	NA	NA	Western Delta

Unmarked DSM collected during Phase 1 are transferred alive to FCCL to contribute to DSM broodstock if tow temperatures are below 17°C. If tow temperatures are above 17°C, unmarked DSM are flash frozen in liquid nitrogen and transferred to the UC Davis Aquatic Health Program for processing. All marked DSM are flash frozen in liquid nitrogen and transferred to UC Davis for processing.

Figure 2: Delta Smelt (DSM) and Longfin Smelt (LFS) catch per station for EDSM 2022 Phase 1 Kodiak trawls, from March 14–17, 2022. Sites with no DSM or LFS catch are indicated with squares.

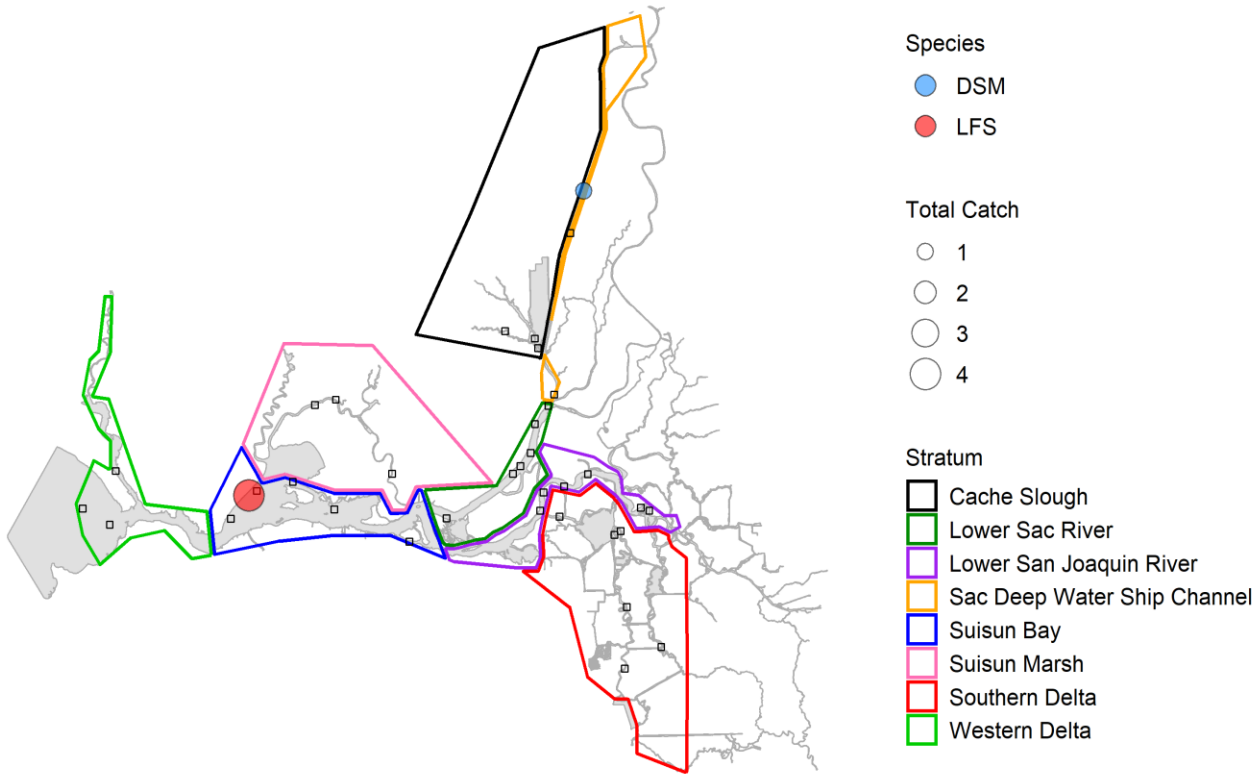

Table 3. Delta Smelt (DSM) and Longfin Smelt (LFS) catch in Chipps Island midwater trawls from a total of 50 tows conducted on March 13, 14, 15, 17, and 18, 2022. These data are preliminary and subject to change.

Water Year	Station Code	Date	Species	Mark Type	Fork Length	Total Catch	Disposition	Location
2022	SB018N	3/14/2022	LFS	None	72	1	Released	Chipps Island
2022	SB018N	3/14/2022	LFS	None	77	1	Released	Chipps Island
2022	SB018N	3/18/2022	LFS	None	66	1	Released	Chipps Island
2022	SB018N	3/18/2022	LFS	None	68	1	Released	Chipps Island
2022	SB018N	3/18/2022	LFS	None	70	1	Released	Chipps Island
2022	SB018N	3/18/2022	LFS	None	77	2	Released	Chipps Island
2022	SB018N	3/18/2022	LFS	None	84	1	Released	Chipps Island
2022	SB018N	3/18/2022	LFS	None	89	1	Released	Chipps Island

As requested, LFS >80 mm fork length collected in Chipps Island trawls during Dec–Apr are transferred alive to FCCL to contribute to LFS broodstock if tow temperatures are below 14.5°C.

All DSM are flash frozen in liquid nitrogen and transferred to the UC Davis Aquatic Health Program for processing.

Table 4. Delta Smelt Catch and Sex/Staging Table for SKT Survey 3, which was on the water from 3/14/2022-3/17/2022 and sampled all stations. Only stations with DS catch are reflected in this table.

Station	# of delta smelt	Range of FL (mm)	# of pre-spawn females	# of ripe females	# of spent females	# of fail-to-spawn females	# of pre-spawn males	# of ripe males	# of spent males	Sex undetermined	Larvae/ Juveniles	Region
606	4	69 - 85	2	1	0	0	1	0	0	0	0	Suisun Bay & West
609	4	71 - 81	1	1	0	0	2	0	0	0	0	Suisun Bay & West
704	1	70	1	0	0	0	0	0	0	0	0	Sac River System
719	2	59-80	1	0	0	0	1	0	0	0	0	Sac River System

Table 5. Catch Table for SKT Survey 3, which was on the water from 3/14/2022-3/17/2022 and sampled all stations. Only stations with DS, LFS, or wakasagi catch are reflected in this table.

Station	# of DS	Range of FL (mm)	# of LFS	Range of FL (mm)	# of Wakasagi	Range of FL (mm)	Region
418	0	NA	1	26	0	NA	Suisun Bay & West
602	0	NA	3	22-87	0	NA	Suisun Bay & West
606	4	69-85	68	23-31	0	NA	Suisun Bay & West
609	4	71-81	0	NA	0	NA	Suisun Bay & West
610	0	NA	1	29	0	NA	Suisun Bay & West
704	1	70	0	NA	0	NA	Sac River System
719	2	59-80	1	NA	1	104	Sac River System

Figure 3: Spring Kodiak Trawl station locations.

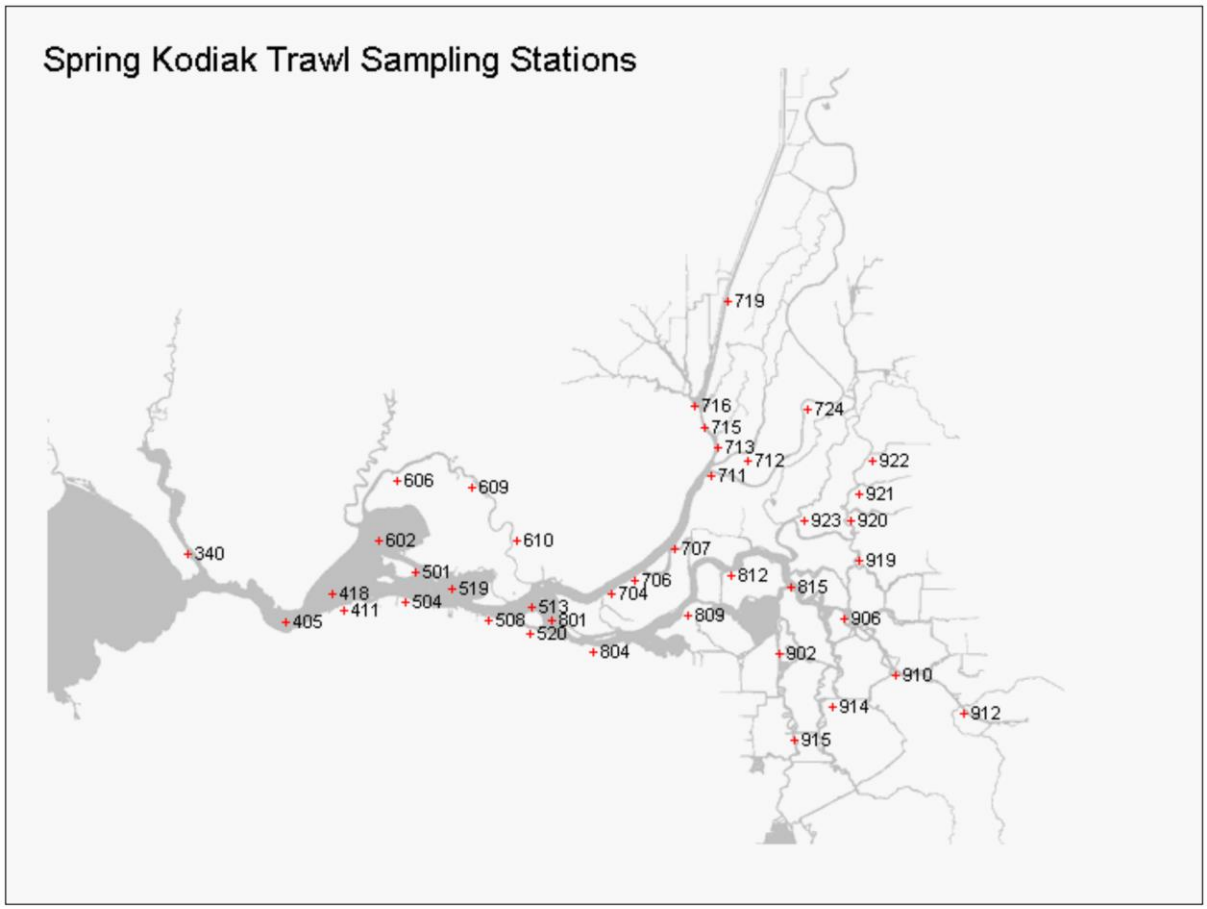

Table 6. Bay Study March Survey Longfin Smelt length- frequency data. No DS were caught. Midwater trawl is net 1, Otter trawl is net 2.

Year	Survey	Station	Net	AlphaCode	Length (mm)	Frequency	Comments
2022	3	104	2	LONSME	112	1	None
2022	3	107	1	LONSME	65	1	None
2022	3	107	1	LONSME	71	1	None
2022	3	107	2	LONSME	69	1	None
2022	3	107	2	LONSME	73	1	None
2022	3	108	2	LONSME	68	4	None
2022	3	108	2	LONSME	67	3	None
2022	3	108	2	LONSME	81	1	None
2022	3	108	2	LONSME	63	1	None
2022	3	108	2	LONSME	71	3	None
2022	3	108	2	LONSME	62	4	None
2022	3	108	2	LONSME	80	1	None

Year	Survey	Station	Net	AlphaCode	Length (mm)	Frequency	Comments
2022	3	108	2	LONSME	70	2	None
2022	3	108	2	LONSME	64	1	None
2022	3	108	2	LONSME	83	1	None
2022	3	108	2	LONSME	72	2	None
2022	3	108	2	LONSME	74	1	None
2022	3	108	2	LONSME	75	2	None
2022	3	108	2	LONSME	79	1	None
2022	3	108	2	LONSME	73	1	None
2022	3	108	2	LONSME	66	2	None
2022	3	108	2	LONSME	69	2	None
2022	3	108	2	LONSME	61	1	None
2022	3	108	2	LONSME	77	1	None
2022	3	110	2	LONSME	61	1	None
2022	3	110	2	LONSME	66	2	None
2022	3	110	2	LONSME	62	1	None
2022	3	110	2	LONSME	88	1	None
2022	3	110	2	LONSME	84	1	None
2022	3	110	2	LONSME	67	1	None
2022	3	110	2	LONSME	77	1	None
2022	3	110	2	LONSME	68	1	None
2022	3	140	2	LONSME	67	1	None
2022	3	211	2	LONSME	62	1	None
2022	3	211	2	LONSME	60	1	None
2022	3	213	2	LONSME	71	1	1 plus count
2022	3	213	2	LONSME	65	1	None
2022	3	214	2	LONSME	65	1	None
2022	3	214	2	LONSME	63	1	None
2022	3	215	2	LONSME	83	1	None
2022	3	215	2	LONSME	68	1	None
2022	3	215	2	LONSME	66	1	None
2022	3	215	2	LONSME	63	1	None
2022	3	215	2	LONSME	65	1	None
2022	3	215	2	LONSME	67	1	None
2022	3	325	2	LONSME	66	1	None
2022	3	345	2	LONSME	77	1	None
2022	3	346	2	LONSME	77	1	None
2022	3	346	2	LONSME	80	1	None
2022	3	428	1	LONSME	80	1	None

Year	Survey	Station	Net	AlphaCode	Length (mm)	Frequency	Comments
2022	3	428	1	LONSME	82	1	None
2022	3	428	1	LONSME	70	1	None
2022	3	429	1	LONSME	76	1	None
2022	3	429	1	LONSME	82	1	None
2022	3	429	1	LONSME	67	1	None
2022	3	430	2	LONSME	78	1	None
2022	3	430	2	LONSME	79	1	None
2022	3	431	1	LONSME	80	1	None
2022	3	431	2	LONSME	80	1	None
2022	3	431	2	LONSME	78	1	None
2022	3	432	1	LONSME	71	1	None
2022	3	433	1	LONSME	79	1	None
2022	3	433	1	LONSME	77	1	None
2022	3	433	1	LONSME	82	1	None
2022	3	433	1	LONSME	80	1	None
2022	3	535	1	LONSME	77	1	None
2022	3	535	1	LONSME	89	1	None
2022	3	535	1	LONSME	72	1	None
2022	3	535	2	LONSME	89	1	None
2022	3	535	2	LONSME	86	1	None
2022	3	535	2	LONSME	81	1	None
2022	3	535	2	LONSME	88	1	None
2022	3	736	2	LONSME	80	1	None
2022	3	736	2	LONSME	89	2	None
2022	3	736	2	LONSME	91	1	None
2022	3	736	2	LONSME	120	1	female
2022	3	736	2	LONSME	85	1	None

Figure 4: Bay Study sampling locations.