

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

## Section 1: Overview

**Date: 03/01/2022**

### **Life Stages Present:**

Delta Smelt (DS): Adults, sub-adults

Longfin Smelt (LFS): Adults, sub-adults, 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 San Joaquin River, South Delta, Suisun Marsh & Bay, and the Lower Sacramento River. Nine marked individuals have been collected since 2/22/2022. A turbidity bridge avoidance action will not be possible since the OMR Index will be equal to or less negative than -2,000 cfs. The expected less negative OMR Index should maintain a low overall likelihood of entraining adults. Water temperatures are within the range for Delta Smelt spawning.

*Longfin Smelt:* The OMR Index is projected to be between -500 cfs and -2,000 cfs due to compliance with D-1641. X2 has stayed nearly steady since last week and is currently at 78 km. The Smelt Monitoring Team (SMT) has determined that the overall risk of entrainment is low for larvae in the lower San Joaquin River and low for sub-adults and adults based on low exports and positive Qwest. LFS adults are present downstream of the confluence based on detections by Chipps Island Trawl and Enhanced Delta Smelt Monitoring (EDSM). Spawning occurred in the central and south Delta, due to LFS detections by Smelt Larva Survey (SLS) four and Larval Entrainment Pilot Study (LEPS). SLS four triggered Condition of Approval (COA) 8.4.2 and low densities of larvae were detected in the OMR corridor, however with low exports and positive Qwest, a recommendation is not warranted.

Barker Slough: COA 8.12 was not triggered as SLS four did not detect LFS or DS larvae at station 716. 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.

## 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). DS have been detected in the lower Sacramento River; however minimal exports create a low risk of entrainment.
  - LFS: Risk for larvae is low due to low exports and a resulting positive Qwest. See 'Routing Risk' for more information on adults and sub-adults.
- Routing Risk (Behavior and life history):
  - DS: Low. The daily average turbidity at Old River at Bacon Island (OBI) has not exceeded 12 FNU. Turbidity remains low throughout the lower San Joaquin River and Frank's Tract and into the OMR corridor.
  - 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. Adult detections have started declining. Spawning is ongoing. There is potential for adult and sub-adult movement into the central Delta; however, risk remains low due to low exports.
- Overall Entrainment Risk:
  - DS: Low.
  - LFS: Low for adults, sub-adults and larvae, due to:
    - Exports targeting Net Delta Outflow Index (NDOI) of 11,400 cfs which will result in an OMR Index no more negative than -2,000 cfs. Qwest is also positive.

## 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 no more negative than -2000 cfs. There is a high degree of uncertainty regarding the response of cultured fish to environmental cues typically applied to wild DS.
  - LFS: Low risk for adult and sub-adult LFS entrainment. EDSM collected one sub-adult LFS in the lower San Joaquin River on 02/04/2022.
    - Low risk for larvae observed in the lower San Joaquin River by SLS 4. Qwest remains positive and exports have remained low since 02/01/2022. X2 has remained relatively stable since last week and is located at 78 km. Hydrology is favorable, however the risk of future

entrainment into the OMR corridor at OMRI no more negative than -2000 cfs is uncertain and will be informed based on a PTM run to be requested by SMT next week.

- SLS 4 detected LFS larvae at five of the stations in the central and south delta, including low densities at stations 901, 902, and 915 in the OMR corridor. Under current conditions, those fish are unlikely to make their way out of the OMR corridor based on past PTM runs and since LFS larvae are planktonic and can't volitionally move downstream once in the OMR corridor.
  - LEPS detected LFS larvae in West Canal during sampling on February 17th. Data has been quality controlled, however final data may not be available until the end of the season.
  - Low risk for adults as exports are low and adult salvage has been rare in recent years.
- 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 remained stable compared to last week and exports remain low limiting entrainment risk.
    - LFS: No change from last week due to low exports and current hydrology. The presence of LFS larvae in south and central Delta has been confirmed by recent sampling, though reduced exports and positive Qwest minimize the risk of entrainment.
  - Reporting OMRI (Number and range of OMRI bins will vary based on anticipated hydrology and operations)
    - The SMT determined that risk of entrainment is low across the range of expected OMRI values. Projected exports limit the range of possible OMR Index 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<sup>1</sup> divided by 10, OR

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

- Real-time monitoring of abiotic and biotic factors indicates a high risk of LFS movement into areas at high risk of future entrainment, as determined by DWR and CDFW 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  $\geq 60$  mm by the Chipps Island Trawl (conducted by USFWS) as an early warning indicator for LFS migration movement into the Delta, in addition to other available survey and abiotic data. The 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. 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 1<sup>st</sup>. 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 (See Table 3 in attachments) 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.

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 Barker Slough Pumping Plant of no more than 60 cfs exports on a 7-day average that was previously triggered by SLS 3.

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 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 = 12.06°C
- Tidal Cycle: Spring tide, strongest for February, stronger neap tide for month of March next week.
- Turbidity:
  - 8.3.1 Freeport 3-day average = NA
  - 8.5.1 OBI Turbidity Daily Average = 4.46 FNU.
- Salinity: X2 is at 78 km.
- Hydrologic Footprint: No new particle tracking models were requested or reviewed.

**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 11,400 cfs.
  - 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 12,500 cfs yesterday
- San Joaquin River flow at Vernalis 1,150 cfs yesterday.
- Qwest: +2,600 cfs, expected to be +2,000 cfs this week.
- Expected changes in South Delta Exports: Exports are not expected to change substantially in the next 7 days, still anticipating minimal exports.
- NDOI: 11,800 cfs
- Upstream releases:
  - Keswick = 3,250 cfs
  - Nimbus = 2,000 cfs, looking for opportunities for reductions
  - Goodwin = 800 cfs
  - Oroville = Increased to 5,000 cfs to meet Delta outflow requirement, not likely to decrease, may have to increase more depending on conditions on the Sacramento River.

**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 03/01/2022).

Date	Averaging Period	USGS gauges (cfs)	Index (cfs)
02/27/2022	Daily	Not Reported	-374 cfs
02/26/2022	5-day	-960 cfs	-470 cfs
02/26/2022	14-day	-1,510 cfs	-1,020 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 02/24/2022 in the SDWSC stratum.
- EDSM: From 02/20/2022 through 02/26/2022 EDSM completed sampling at 34 sites and collected 5 marked DS in Suisun Marsh and 4 marked DS in the SDWSC. See Table 1 in Attachments for details.
- Chipps: From 02/20/2022 through 02/26/2022 Chipps Island Trawl completed 50 tows and collected no DS. See Table 2 in Attachments for details.
- Spring Kodiak Trawl (SKT): Survey 2 is complete and five marked DS were caught on 02/18/2022 in Suisun Marsh, none of them were ripe.
- Bay Study: Survey 2 sampling is complete and one marked DS was detected at station 762 (68 mm) on 02/03/2022 in the Sacramento River.
- 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
- Other Surveys:
- EDSM: From 02/20/2022 through 02/26/2022 EDSM completed sampling at 34 sites and collected six LFS in Suisun Marsh and 29 LFS in Suisun Bay. See Table 1 in the Attachments for details.
- Chipps: From 02/20/2022 through 02/26/2022 Chipps Island Trawl completed 50 tows and collected 9 LFS. See Table 2 in the Attachments for details.
- SKT survey 2 sampling is complete and one LFS was detected in Suisun Marsh.

- SLS 4 sampled from February 22<sup>nd</sup> through the 28<sup>th</sup>. Sample collection is complete and processing is ongoing. Stations in the central and south delta have been processed and LFS were caught at 5 of the 12 stations and catch exceeded 5 at 3 of those stations, triggering COA 8.4.2. No LFS were detected at 716, so COA 8.12 was not triggered. See Table 3 in Attachments for details. Many larvae still have yolk sacs indicating that hatching is ongoing.
- 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 02/17/2022. No yolk sac larvae were present as of February 17<sup>th</sup>.
- Salvage: No LFS have been salvaged and no larvae have been detected at either facility.

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

##### **Notes:**

- D-1641 is still controlling, targeting X2 at Chipps 11,400 cfs outflow. Once the Eight River Index is released around March 6<sup>th</sup> the number of Chipps Days that need to be met in March will be determined. Outflow at Vernalis of 1,140 cfs and Collinsville of 710 cfs will also come into play.
- PTM run will be requested next week to assess risk if exports increase.
- Effect of moon phase on LFS spawning was asked, CDFW will follow-up for discussion next week.
- Question was asked about if turbidity effects LFS distribution like it does for DS, there's an interest in future discussion on this topic.
- Discussion about where DS length cutoff for larval to juvenile life stage of >20mm fork length came from. For take purposes, the Interagency Ecological Program identifies equivalent adult estimates among life stages for eggs, larvae (<20mm FL), juveniles (20-58mm FL), and adults (>58mm FL). Various agencies to follow up with past Biological Opinions, ITP Effects Analysis, etc. and will discuss next week.

##### **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: EDSM Catch Table, Figure 1: EDSM Sample Locations, Table 2: Chipps Island Catch Table, Table 3: SLS 4 Catch Table, Figure 2: SLS Station Locations.

Table 1. Delta Smelt (DSM) and Longfin Smelt (LFS) catch per station for EDSM 2022 Phase 1 Kodiak trawls, from 2/22/2022–2/25/2022. 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	22-30-CF02	2/24/2022	4	LFS	None	67	1	Released	Suisun Bay
2022	1	22-30-CF02	2/24/2022	4	LFS	None	72	2	Released	Suisun Bay
2022	1	22-30-CF02	2/24/2022	4	LFS	None	73	2	Released	Suisun Bay
2022	1	22-30-CF02	2/24/2022	4	LFS	None	74	4	Released	Suisun Bay
2022	1	22-30-CF02	2/24/2022	4	LFS	None	75	2	Released	Suisun Bay
2022	1	22-30-CF02	2/24/2022	4	LFS	None	76	2	Released	Suisun Bay
2022	1	22-30-CF02	2/24/2022	4	LFS	None	77	1	Released	Suisun Bay
2022	1	22-30-CF02	2/24/2022	4	LFS	None	78	5	Released	Suisun Bay
2022	1	22-30-CF02	2/24/2022	4	LFS	None	79	2	Released	Suisun Bay
2022	1	22-30-CF02	2/24/2022	4	LFS	None	80	4	Released	Suisun Bay
2022	1	22-30-CF02	2/24/2022	4	LFS	None	81	2	Released	Suisun Bay
2022	1	22-30-CF02	2/24/2022	4	LFS	None	83	1	Released	Suisun Bay
2022	1	22-30-CF02	2/24/2022	4	LFS	None	88	1	Released	Suisun Bay
2022	1	22-30-SBM02	2/24/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-30-SBW01	2/24/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-30-CF01	2/25/2022	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	22-30-CF03	2/25/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-30-SBM01	2/25/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-30-SM01	2/23/2022	4	LFS	None	76	1	Released	Suisun Marsh
2022	1	22-30-SM02	2/23/2022	4	LFS	None	66	2	Released	Suisun Marsh
2022	1	22-30-SM02	2/23/2022	4	LFS	None	74	1	Released	Suisun Marsh
2022	1	22-30-SM02	2/23/2022	4	LFS	None	80	1	Released	Suisun Marsh
2022	1	22-30-SM02	2/23/2022	4	LFS	None	81	1	Released	Suisun Marsh
2022	1	22-30-SM03	2/23/2022	2	DSM	AdClipped	65	1	UCD AHP	Suisun Marsh
2022	1	22-30-SM03	2/23/2022	2	DSM	AdClipped	77	1	UCD AHP	Suisun Marsh
2022	1	22-30-SM03	2/23/2022	2	DSM	AdClipped	78	1	UCD AHP	Suisun Marsh
2022	1	22-30-SM03	2/23/2022	2	DSM	AdClipped	81	1	UCD AHP	Suisun Marsh
2022	1	22-30-SM03	2/23/2022	2	DSM	AdClipped	86	1	UCD AHP	Suisun Marsh
2022	1	22-30-LSR01	2/22/2022	3	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-30-RV01	2/22/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-30-RV03	2/22/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-30-RV02	2/23/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-30-RV04	2/23/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-30-RV05	2/23/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-30-LSJ01	2/24/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River

Water Year	Phase	Station Code	Date	# Tows	Species	Mark Type	Fork Length	Total Catch	Disposition	Stratum
2022	1	22-30-SJT01	2/24/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-30-SJT02	2/24/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-30-PP01	2/25/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-30-PP02	2/25/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-30-SJT03	2/25/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-30-CS01	2/25/2022	4	NA	NA	NA	NA	NA	Cache Slough
2022	1	22-30-CS02	2/25/2022	4	NA	NA	NA	NA	NA	Cache Slough
2022	1	22-30-CS03	2/25/2022	4	NA	NA	NA	NA	NA	Cache Slough
2022	1	22-30-LSSC01	2/24/2022	2	DSM	AdClipped	57	1	UCD AHP	Sac DW Ship Channel
2022	1	22-30-LSSC01	2/24/2022	2	DSM	AdClipped	66	1	UCD AHP	Sac DW Ship Channel
2022	1	22-30-LSSC01	2/24/2022	2	DSM	AdClipped	68	1	UCD AHP	Sac DW Ship Channel
2022	1	22-30-LSSC01	2/24/2022	2	DSM	AdClipped	80	1	UCD AHP	Sac DW Ship Channel
2022	1	22-30-USSC01	2/24/2022	4	NA	NA	NA	NA	NA	Sac DW Ship Channel
2022	1	22-30-USSC02	2/24/2022	4	NA	NA	NA	NA	NA	Sac DW Ship Channel
2022	1	22-30-FT01	2/22/2022	3	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-30-FT02	2/23/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-30-GLW01	2/23/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-30-OR01	2/23/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-30-CQS01	2/22/2022	4	NA	NA	NA	NA	NA	Western Delta



Water Year	Phase	Station Code	Date	# Tows	Species	Mark Type	Fork Length	Total Catch	Disposition	Stratum
2022	1	22-30-LNR01	2/22/2022	4	NA	NA	NA	NA	NA	Western Delta
2022	1	22-30-SPE02	2/22/2022	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.

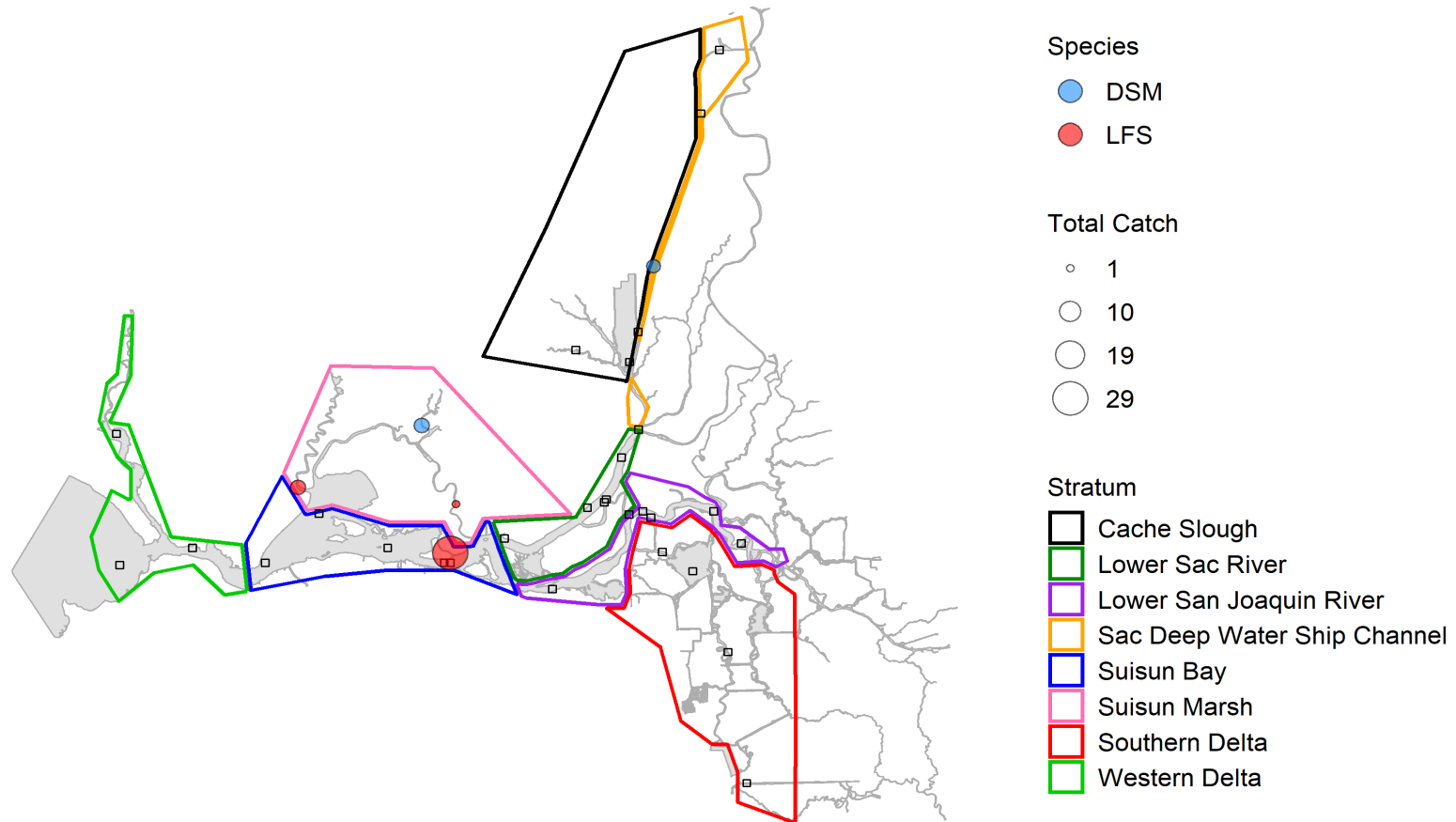


Figure 1. Delta Smelt (DSM) and Longfin Smelt (LFS) catch per station for EDSM 2022 Phase 1 Kodiak trawls, from 2/22/2022–2/25/2022. Sites with no DSM or LFS catch are indicated with squares.

Table 2. Delta Smelt (DSM) and Longfin Smelt (LFS) catch in Chipps Island mid-water trawls from 02/22/2022–2/26/2022. These data are preliminary and subject to change.

Water Year	Station Code	Date	Species	Fork Length	Total Catch	Mark Type	Disposition	Location
2022	SB018M	2/22/2022	LFS	75	1	None	Released	Chipps Island
2022	SB018M	2/22/2022	LFS	90	1	None	Released	Chipps Island
2022	SB018M	2/22/2022	LFS	99	1	None	Released	Chipps Island
2022	SB018M	2/22/2022	LFS	74	1	None	Released	Chipps Island
2022	SB018M	2/22/2022	LFS	78	1	None	Released	Chipps Island
2022	SB018M	2/22/2022	LFS	80	1	None	Released	Chipps Island
2022	SB018N	2/24/2022	LFS	91	1	None	Released	Chipps Island
2022	SB018N	2/25/2022	LFS	78	1	None	Released	Chipps Island
2022	SB018N	2/25/2022	LFS	85	1	None	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 3. Longfin Smelt catch per station from 2022 Smelt Larva Survey, Survey 4. Longfin Smelt incidental take permit criteria stations are highlighted in blue (Barker Slough Pumping Plant) and yellow (South Delta exports). Survey 4 was conducted between 02/22/2022 - 2/28/2022.

Year	Survey #	SLS Station	Turbidity (NTU)	Sample Status	Species	Smelt Catch	Min Length	Max Length	Mean Length
2022	4	340	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	342	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	343	NA	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	4	344	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	345	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	346	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	347	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	348	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	349	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	405	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	411	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	418	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	501	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	504	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	508	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	513	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	519	23.8	Processed	Longfin Smelt	10	6	10	7.6
2022	4	520	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	602	29.3	Processed	Longfin Smelt	14	7	9	7.9
2022	4	606	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	609	30.9	Processed	Longfin Smelt	7	6	7	6.9
2022	4	610	26.2	Processed	Longfin Smelt	3	7	8	7.7
2022	4	703	19.6	Processed	Longfin Smelt	13	7	8	7.2
2022	4	704	26.4	Processed	Longfin Smelt	21	6	8	6.8
2022	4	705	9.7	Processed	Longfin Smelt	1	8	8	8.0
2022	4	706	29.8	Processed	Longfin Smelt	35	6	8	6.7
2022	4	707	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	711	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	716	NA	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	723	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	801	29.5	Processed	Longfin Smelt	2	6	6	6.0

Year	Survey #	SLS Station	Turbidity (NTU)	Sample Status	Species	Smelt Catch	Min Length	Max Length	Mean Length
2022	4	804	18.4	Processed	Longfin Smelt	14	5	10	7.1
2022	4	809	NA	Processed	Longfin Smelt	32	6	8	6.7
2022	4	812	NA	Processed	Longfin Smelt	9	6	7	6.2
2022	4	815	NA	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	901	NA	Processed	Longfin Smelt	6	6	9	7.2
2022	4	902	NA	Processed	Longfin Smelt	1	7	7	7.0
2022	4	906	NA	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	910	NA	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	912	NA	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	914	NA	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	915	NA	Processed	Longfin Smelt	2	7	7	7.0
2022	4	918	NA	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	919	NA	Processed	NA	No Smelt Catch	NA	NA	NA

Processing is complete through 03/01/2022.

Figure 2: Smelt Larva Survey station locations.

