

Weekly Assessment of CVP and SWP Delta Operations on ESA-listed Species

1. Executive Summary

a. Operations anticipated during the week

See Weekly Fish and Water Operation Outlook document for December 14 – December 20.

b. Winter-run Chinook Salmon summary

No loss of natural winter-run Chinook Salmon (by length at date, LAD) has occurred in the past week at the State or Federal fish salvage facilities. Loss of natural winter-run Chinook Salmon at the Central Valley Project (CVP) and State Water Project (SWP) fish collection facilities could possibly occur over the next week based on hydrology but is unlikely based on life history. 30-34% of juvenile natural winter-run Chinook Salmon from brood year (BY) 21 are estimated to be present in the Delta. The Delta Cross Channel (DCC) gates closure for the season reduces exposure of winter-run Chinook Salmon juveniles that are present in the Sacramento River near the DCC gates into the interior Delta.

c. Spring-run Chinook salmon summary

There are no juvenile natural spring-run Chinook Salmon from BY 21 near the DCC gates; CV spring-run Chinook Salmon adults are building redds and spawning upstream. The exposure and effects of DCC closure are unlikely for natural spring-run Chinook Salmon. Length-at-date spring run were not observed in the Delta. Larger, older juveniles were observed that may be yearling spring run. 0-3% young of year spring-run Chinook Salmon are estimated to be in the Delta.

d. Central Valley Steelhead summary

Loss of natural Central Valley California (CCV) steelhead has not occurred in the past week at the State and Federal fish salvage facilities. Loss of Central Valley steelhead at the Central Valley Project (CVP) and State Water Project (SWP) fish collection facilities could possibly occur over the next week. 2-6% of juvenile CCV Steelhead are estimated to be present in the Delta. Closure of the DCC gates for the season will reduce exposure to Central Valley steelhead juveniles that are potentially present in the Sacramento River near the DCC gates.

e. Green Sturgeon summary

Loss of green sturgeon has not occurred in the past week at the State and Federal fish salvage facilities. Loss of green sturgeon is unlikely to occur over the next week due to their rare presence in the South Delta.

f. Delta Smelt summary

Based on distribution patterns over the past decade and rare detections, Delta Smelt are unlikely to be prevalent in the South Delta. Limited detection data support Delta Smelt

being present in the Sacramento Deep Water Ship Channel and life history information support the centroid of the population being close to the X2 position. The last Delta Smelt observed was in the Sacramento Deep Water Shipping channel on 8/20/2021. The increase in exports will result in a more negative OMR which increases the likelihood of entrainment if Delta Smelt are in the region. The likelihood of Delta Smelt adult entrainment remains low due to seasonal timing. First flush conditions may occur within the next seven days. The regulations for Integrated Early Winter Pulse Protection went into effect on 12/1/2021.

g. Monitoring Teams summary

There were no non-consensus issues to report from Salmon Monitoring Team.

There were no non-consensus issues to report from Smelt Monitoring Team.

2. Operational and Regulatory Conditions

See current Weekly Fish and Water Operation Outlook document.

3. Biology, Distribution, and Evaluation Winter-run Chinook salmon, Spring-run Chinook salmon, Central Valley Steelhead

4. Winter-run Chinook salmon

POPULATION STATUS

a. Delta Life Stages:

- Juveniles, Adults

b. Brood Year 2021 Productivity:

- Natural winter-run Chinook salmon: Juvenile production estimate (JPE) calculations have not been established for brood year (BY) 2021 winter-run Chinook salmon. The agencies in the winter-run Chinook salmon JPE project work team (WR JPE PWY) met in early December 2021 to begin formulating the JPE. Among other topics, the group discussed the thiamine vitamin deficiency that is being observed again in broodstock at the Livingston Stone NFH similar to last year's observation. Last year the thiamine vitamin deficiency appeared to negatively affect survival of juvenile fish as they migrate downstream towards the Delta. Mean cumulative weekly passage of winter-run Chinook salmon through 12/2/2021 for the last 18 years of passage data is 92.5% (one SD of 6.0%). By 12/2/2021, 552,818 winter-run Chinook salmon were estimated to have passed RBDD compared to the cumulative passage last year of 3,813,580 winter-run Chinook salmon.
- Hatchery winter-run Chinook salmon: No hatchery winter-run Chinook salmon have been released in WY 2022.

5. Spring-run Chinook salmon

a. Delta Life Stages:

Young-of-year (YOY) and Yearlings

b. Brood Year 2021 Productivity:

- Natural spring-run Chinook salmon: No JPE has been established for spring-run Chinook salmon. Approximately 16.2% juvenile spring-run sized Chinook salmon have been observed passing Red Bluff Diversion dam as of 12/12 based on historical data.
- Hatchery spring-run Chinook salmon surrogates: No hatchery spring-run Chinook salmon surrogates have been released in WY 2022.
- The agencies in the SaMT discussed the thiamine vitamin deficiency that was observed in winter run Chinook salmon broodstock at the Livingston Stone NFH in BY 2021. Last year the thiamine deficiency appeared to negatively affect survival of juvenile fish as they migrate downstream towards the Delta. The thiamine deficiency issue is also likely impacting spring-run Chinook salmon. Although the egg take goals have been met at the Feather River Fish Hatchery, they are still experiencing fertility issues that are impacting production.

6. Spring-run Chinook salmon

a. Delta Life Stages:

- Spawning Adults, Kelts, Juveniles

b. Brood Year 2021 Productivity:

- Spawner abundance: There is limited information about the adult steelhead population. It is estimated to be small, contributing to the limited productivity of the population
- Natural steelhead: No JPE has been established for steelhead. Data are limited.
- Hatchery steelhead: Reclamation's Proposed Action has no hatchery steelhead triggers.
 - Approximately 610,911 steelhead from Coleman NFH were released at Battle Creek from 12/12/2021 to 12/13/2021. This group is 100% marked only (with an adipose-fin clip) and has an estimated average fork length of 195mm.

7. Winter-run Chinook Salmon

DISTRIBUTION

a. Current Distribution:

- On 12/14/2021, SaMT estimated 30-34% of juvenile winter-run Chinook salmon were present in the Delta and 0-1% were estimated to have exited the Delta (Table 1).
- Since 9/1/2021, the Glenn Colusa Irrigation District (GCID) rotary screw traps (RSTs) have observed over 140 winter-run Chinook Salmon juveniles (by length at date criteria) in their daily catches. Fish have been steadily arriving since the beginning of October. GCID RST cone was removed from the bypass channel on 12/10/2021 due to anticipation of high water flows.

- Winter-run Chinook Salmon have not been observed in RST monitoring locations farther downstream (Knights Landing, Sacramento Trawls, Tisdale) and the fish appear to no longer be holding in the middle reaches of the Sacramento River and are migrating downstream (Table 2).
- Movement of winter-run Chinook Salmon juveniles into the lower reaches of the Sacramento River and upper Delta is continuing. Mill and Deer creeks daily flows were recorded higher than 95 cfs over the past week.

b. Historic Trends

- Based on historical trends in salvage, 0.3% of winter-run Chinook salmon should have been observed in salvage by this time of the water year (Table 3). Loss of natural winter-run Chinook salmon at the CVP and SWP fish collection facilities could possibly occur over the next week based on hydrology but is unlikely based on life history. If historic trends in salvage were to continue, winter-run Chinook salmon loss is expected to remain the same over the next week.

c. Forecasted Distribution within Central Valley and Delta regions

- Movement of winter-run Chinook salmon juveniles into the lower reaches of the Sacramento River and upper Delta are likely to occur with precipitation events and increasing river flows and turbidity. The agencies in the SaMT believe significant precipitation events could occur over the next week (see Ops Outlook). The STARS model projects route-specific proportion of entrainment, survival, and travel times (Table 4). This model does not estimate entrainment into the lower Sacramento River sloughs (i.e., Three-Mile Slough). The DCC gates were closed 11/30/21 and are expected to remain closed through mid-May 2022. If little precipitation is forecasted there may be a need to open the DCC gates to meet D-1641 water quality standards

8. Spring-run Chinook salmon

a. Current Distribution

- On 12/14/2021, SaMT estimated 0-3% of young of year CV spring-run Chinook salmon were present in the Delta (Table 1).
- Spring-run are also being observed in the Feather River rotary screw traps. Spring-run chinook are being observed at upstream monitoring sites including Tisdale, GCID, on the Feather River and Butte Creek.

b. Historical Trends

- Based on historical trends in salvage, 0% of YOY spring-run Chinook salmon were observed in salvage by this time of the water year (Table 3). If historic trends in salvage were to continue YOY spring-run Chinook salmon loss is unlikely to increase over the next week.

c. Forecasted Distribution within Central Valley and Delta regions

- On 12/14/2021 SaMT noted that many juvenile CV YOY spring-run Chinook Salmon have yet to emerge. Furthermore, larger, older juveniles were observed that

may be yearling spring run. Yearling CV spring run Chinook Salmon are likely beginning to move out from natal tributaries. Mill and Deer creek flows continue to exceed 95 cfs indicating that yearling spring-run Chinook Salmon may begin to move and migrate into the mainstem Sacramento River (Table 5).

9. Central Valley Steelhead

a. Current Distribution

- On 12/14/2021 SaMT estimated 2-6% of juvenile CCV steelhead were present in the Delta (Table 1).
- Combined total loss of hatchery steelhead equals 17.32 fish as of 12/12/2021.
- Combined total loss of natural steelhead between December 1 and March 31 equals 3.4 fish as of 12/12/2021.

b. Historical Trends

- Based on historical trends in salvage, 0.3% (December through March) of juvenile CCV steelhead should have been observed in salvage by this time of the water year. If historic trends in salvage were to continue, juvenile CCV steelhead loss is likely to not increase over the next week. However, since a few fish have been observed in salvage in WY 2022 earlier than in previous years, it is possible loss of CCV steelhead could occur over the next week.

c. Forecasted Distribution within Central Valley and Delta regions

- No natural steelhead were observed in key monitoring locations this past week.
- SaMT estimated that 2-6% of the population of CCV steelhead may be present in the Delta at this time. Closure of the DCC gates for the season will reduce exposure and possible entrainment of juvenile CCV steelhead into the interior Delta via the DCC gates.

TABLE 1. Salmonid distribution estimates

| Location | Yet to Enter Delta | In Delta | Exited Delta past Chipps Island |
|---|--------------------|----------|---------------------------------|
| Young-of-year (YOY) winter-run Chinook salmon | 65-70% | 30-34% | 0-1% |
| YOY spring-run Chinook salmon | 97-100% | 0-3% | 0% |
| YOY hatchery winter-run Chinook salmon* | NA | NA | NA |
| Natural origin steelhead | 93-98% | 2-6% | 0-1% |

TABLE 2. Catch indices for juvenile winter-run Chinook salmon observed in RSTs at Knights Landing (Knights Landing Catch Index, KLCI) and Sacramento Trawl and Beach Seine (Sacramento Seine Catch Index, SCI Trawl and SCI Beach Seine) monitoring locations

| <u>Date</u> | <u>KLCI</u> | <u>SCI Trawl</u> | <u>SCI Seine</u> | <u>Trigger Exceeded?</u> |
|-------------|-------------|------------------|------------------|--------------------------|
| 12/12/2021 | 0 | 0 | N.A. | N.A. |
| 12/11/2021 | 0 | N.A. | N.A. | N.A. |
| 12/10/2021 | 0 | 0 | 0 | N.A. |

TABLE 3. Historic migration and salvage patterns.

| <u>Date</u> (12/12/21) | <u>Red Bluff</u> <u>Diversion</u> <u>Dam</u> | <u>Tisdale</u> <u>RST</u> | <u>Knights</u> <u>Landing RST</u> | <u>Sac Trawl</u> <u>(Sherwood)</u> | <u>Chipps Island</u> <u>Trawl</u> | <u>Salvaged at</u> <u>Delta Facilities</u> |
|--|--|------------------------------|--------------------------------------|---------------------------------------|--------------------------------------|---|
| Chinook, Winter- run, Unclipped | 94.0% (91.4%, 96.7%) | 47.1% (21.9%, 72.2%) | 44.6% (16.2, 73.0%) | 22.6% (-3.1%, 48.2%) | 0.6% (-0.7%, 1.8%) | 0.3% (-0.4%, 1.0%) WY: 2012-2021 |
| Chinook, Spring- run, Unclipped | 16.2% (3.0%, 29.5%) | 13.0% (- 8.8%, 34.7%) | 12.2% (-6.9%, 31.4%) | 1.3% (-0.7%, 3.4%) | 0.0% (0.0%, 0.0%) | 0.0% (0.0%, 0.0%) WY: 2012-2021 |
| N.A. | N.A. | N.A. | N.A. | N.A. | N.A. | 0.3% (-0.1%, 0.8%) WY: 2012-2021 |

TABLE 4. STARS model output.

| <u>Date</u> (12/12/2021) | <u>DCC</u> | <u>Georgiana</u> <u>Slough</u> | <u>Sacramento</u> <u>River</u> | <u>Sutter and</u> <u>Steamboat</u> |
|------------------------------|------------|-----------------------------------|-----------------------------------|---------------------------------------|
| Proportion of Entrainment | 0 | 0.27 | 0.47 | 0.26 |
| Survival | N.A. | 19% | 53% | 39% |
| Travel Time | N.A. | 16.5 days | 10.6 days | 10.7 days |

TABLE 5. Mean daily flow and percent change (Wilkins Slough, Deer Creek, Mill Creek; cfs from CDEC) and temperature and percent change (Knights Landing; °F from RST).

| <u>Date</u> | <u>Mill Creek flow (MLM)</u> | <u>MLM Δ Change</u> | <u>MLM Alert</u> | <u>Deer Creek flow (DCV)</u> | <u>DCV Δ Change</u> | <u>DCV Alert</u> | <u>Wilkins Slough flow (WLK)</u> | <u>Knights Landing temperature (°C)</u> | <u>Alert Triggered</u> |
|-------------|------------------------------|---------------------|------------------|------------------------------|---------------------|------------------|----------------------------------|---|------------------------|
| 12/12/2021 | 128.3 | 12.8% | Flow>95cfs | 122.4 | 31.9% | Flow>95cfs | 3661.3 | N.A. | N.A. |
| 12/11/2021 | 113.8 | -2.2% | Flow>95cfs | 92.8 | -4.5% | N.A. | 3515.0 | N.A. | N.A. |
| 12/10/2021 | 116.2 | -2.9% | Flow>95cfs | 97.1 | 1.3% | Flow>95cfs | 3516.1 | N.A. | N.A. |
| 12/9/2021 | 119.8 | 3.6% | Flow>95cfs | 95.8 | 0.3% | Flow>95cfs | 3522.7 | 43.8 | N.A. |
| 12/8/2021 | 115.6 | -3.2% | Flow>95cfs | 95.6 | 0.0% | Flow>95cfs | 3506.0 | 44 | N.A. |
| 12/7/2021 | 119.5 | 5.2% | Flow>95cfs | 95.6 | 4.8% | Flow>95cfs | 3517.8 | 44 | N.A. |
| 12/6/2021 | 113.6 | -1.2% | Flow>95cfs | 91.2 | -0.1% | N.A. | 3488.2 | 44.1 | N.A. |

EVALUATION

- 1. After January 1, are more than 5% of juveniles from one or more salmonid species present in the Delta?**

This question is not applicable until 1/1/2022. Greater than 5% of juvenile winter-run Chinook salmon and CCV steelhead may be present in the Delta. No greater than 5% of juveniles from all other salmonid species are estimated to be present in the Delta.

- 2. Does the operational outlook's ranges impact fish movement and change the potential distribution of fish?**

Potential effects within the 7 days (near-term) in the operations outlook.

This question is not applicable until 1/1/2022. However, OMR flow is expected to remain at or below -5,000 this upcoming week.

Potential effects longer than the 7 days (longer-term) in the operations outlook.

Not applicable, see response above to (2) (i).

- 3. What is the likelihood of increased loss exceeding the next annual loss threshold (50%, 75% or 90% of threshold) resulting in OMR management actions based on population distribution, abundance, and behavior of fish in the Delta?**

Winter-run Chinook salmon

Total juvenile natural winter-run Chinook salmon (LAD) loss is 0 fish (as of 12/12/2021).

No loss of juvenile winter-run Chinook salmon has occurred in the past week at the CVP and SWP fish salvage facilities. JPE calculations have not been established for brood year (BY) 2021 winter-run Chinook salmon. The agencies in the SaMT assessed the likelihood of exceeding the next annual loss threshold and believe that loss occurring in the next week is unlikely to lead to exceedance of the 50% single-year loss threshold.

Spring-run Chinook salmon

Total juvenile spring-run Chinook salmon (LAD) loss is 0 fish (as of 12/12/2021). No loss of juvenile spring-run Chinook salmon has occurred in the past week at the CVP and SWP fish salvage facilities. The agencies in the SaMT assessed the likelihood of exceeding the next annual loss threshold and believes that loss occurring in the next week is unlikely to lead to exceedance of the 50% single-year loss threshold.

Central Valley Steelhead

Total natural juvenile steelhead loss (December 1 through March 31) is 3.4 fish (as of 12/12/2021). No loss of natural juvenile has occurred in the past week at the CVP and SWP fish salvage facilities. Total clipped steelhead loss is 17.32 fish (as of 12/12/2021). The agencies in the SaMT assessed the likelihood of exceeding the next annual loss threshold and believe that loss occurring in the next week is unlikely to lead to exceedance of the 50% single-year loss threshold.

- 4. If an annual loss threshold has been exceeded, do continued OMR restrictions benefit fish movement and survival based on real-time information?**

Winter-run Chinook salmon

The annual loss threshold for winter-run Chinook salmon has not been exceeded in WY 2022.

Spring-run Chinook salmon

The annual loss threshold for spring-run Chinook salmon has not been exceeded in WY 2022.

Central Valley Steelhead

The annual loss threshold for steelhead (December 1 – March 31) has not been exceeded in WY 2022.

5. If OMR is more negative than -5,000 cfs are their changes in spawning, rearing, foraging, sheltering, or migration behavior beyond those anticipated to occur under OMR management at -5,000 cfs?

Expected OMR flows are -4,000 to -10,000 cfs for the next week, this question is not applicable until 1/1/2022.

10. Biology Distribution and Evaluation of Green Sturgeon

POPULATION STATUS

a. Delta Life Stages:

- Adults and Juveniles

b. Juvenile Abundance:

- In 2021, 1037 larval green sturgeon and 5 juvenile green sturgeon were observed at the Red Bluff Diversion Dam during continuous fish monitoring using RSTs in the upper Sacramento River. 14 juveniles were captured and implanted with micro-acoustic tags during the month of October, and all were presumed to leave the upper Sacramento River during the unprecedented storm /run-off event that occurred on October 24, 2021, that resulted in flows at Bend Bridge of ~37,000 cfs.

DISTRIBUTION

a. Current Distribution

- Adults: Most abundant during spring spawning migration period of March through May, and post spawning out-migration periods May through June; October through January depending on first winter storm event resulting in significant Sacramento River flow increases. Adult presence year-round to a lesser extent mainly in San Pablo Bay. Recent sporadic occurrences of adult green sturgeon in the San Joaquin River system but spawning has not been documented. Unknown if spawning occurred historically in the San Joaquin River system.
- Juveniles: Age-1 through Age-3 juveniles present year-round and widely distributed. Juveniles tagged with acoustic tags in the main channel Sacramento River near Sherman Island detected in the Sacramento River as far upstream as the Cache Slough complex, in the San Joaquin River at the Antioch Bridge, in Threemile, Horseshoe Bend, and Montezuma Sloughs. Seasonal abundance at

the primary sampling site (near Sherman Island) appears to be highest during summer in based on capture and telemetry data. Residence time at the primary sampling site for individual fish ranges from one day to over one year but telemetry data show outmigration from the primary sampling site to the Pacific Ocean ranges from 27 to 552 days. Recent capture data shows diurnal depth preference in the main channel of the Sacramento River. No recent documentation of shallow water habitat presence or foraging but likely.

b. Historical Trends

- Juvenile and adult green sturgeon are historically present in the San Joaquin and Sacramento rivers and Delta

c. Forecasted Distribution within Central Valley and Delta regions

- Juvenile and adult green sturgeon are present in the San Joaquin and Sacramento rivers and Delta during the next week.

EVALUATION

1. Is there likely to be salvage that may exceed the annual loss limit?

Green sturgeon salvage is 0 fish (as of 12/12/2021). The agencies in the SaMT assessed the likelihood of salvage occurring in the next week is unlikely to occur.

11. Biology, Distribution, and Evaluation of Delta Smelt

POPULATION STATUS

a. Delta Smelt Life Stages:

- Adults

b. Brood Year 2021:

Abundance estimate:

No abundance estimate has been calculated in WY2022 so far. The most recent detection of a Delta Smelt was on 8/20/21 (EDSM) caught in the Sacramento Deep Water Ship Channel Stratum.

Biological Conditions:

Adult Delta Smelt are expected to be present in the Sacramento Deep Water Ship Channel based on the last survey detection. In December, historical patterns observed the centroid of the population close to the X2 position (Sommer et al 2011). Delta Smelt would be staging to respond to increases in turbidity and flow from “first flush” conditions. Currently X2 is estimated to be at 97.2 km on the Sacramento River which is several kilometers above the confluence of the Sacramento and San Joaquin Rivers. The Smelt Monitoring Team discussed the most recent monitoring data (Table 4) and considered professional opinion on the historical trends in regional distribution.

DISTRIBUTION

a. Current Distribution

- Real time detection data is currently limited to EDSM sampling, Chipps Island, Bay Study, SLS, and FMWT. Since there are no recent detections of Delta Smelt, the Smelt Monitoring Team's capacity to estimate where they are within the Delta is limited.
- The last Delta Smelt detection was on 8/20/2021 in the Sacramento Deep Water Ship Channel stratum.
- Larval sampling at the Skinner Fish Facility (SFF) and the Tracy Fish Collection Facility (TFCF) will be initiated by the SMT in February.

TABLE 6. Summary of recently reported detections of Delta Smelt by Region and Salvage Facilities between 12/7/2021 and 12/14/2021. Start and End dates reflect period of time between updates to SMT. Regional categories are determined from EDSM sampling. Delta Smelt >58mm FL are considered adults.

| Life Stage | North | South | West | Far West | Salvage |
|-----------------|-------|-------|------|----------|---------|
| Adult | 0 | 0 | 0 | 0 | 0 |
| Larvae/Juvenile | 0 | 0 | 0 | 0 | 0 |

TABLE 7. Summary of recent Delta Smelt detections reported since last assessment and the total detections for the current water year. Notes reflect latest information on reported

detections or completion of survey for the water year and include both larval and adult detections.

| Sampling Method | New Detections | WY2022 | Notes |
|-------------------------|----------------|--------|--|
| EDSM | 0 | 0 | Phase 3 began 6/28/2021 |
| SKT | 0 | 0 | Begins :1/18/2022 |
| SLS | 0 | 0 | Begins: 12/13/2021 |
| 20-mm | 0 | 0 | Begins: 3/21/2022 |
| Summer Townet | 0 | 0 | Complete |
| Bay Study | 0 | 0 | Ongoing |
| FMWT | 0 | 0 | Ongoing |
| Chippis Island Trawl | 0 | 0 | Ongoing |
| Brood Stock Collections | 0 | 0 | November |
| LEPS | 0 | 0 | Begins when SLS detects LFS or by 1/15/2022 |
| Total | — | 0 | Sum of all Delta Smelt observed during the OMR Management Season |

b. Historical Trends

- Delta Smelt detections in the Sacramento Deep Water Ship Channel indicate presence upstream of the confluence, but the fish may be freshwater residents and not representative of the migratory life history patterns in Delta Smelt (Hobbs 2019).
- In December, historical patterns observed the centroid of the population close to the X2 position (Sommer et al 2011).
- Historically, the highest peak in salvage is in May and the second highest is in June (Grimaldo et al 2009; figure 5).

c. Forecasted Distribution within Central Valley and Delta regions

- Predicting the distribution of adult Delta Smelt is currently difficult because detection data is limited to a few individuals and historic patterns may not be representative of the low population levels. No detections have been in the central or south delta.
- The SMT uses turbidity as a surrogate for Delta Smelt presence and in making assessments of the likelihood of entrainment for larval Delta Smelt after spawning begins.

ABIOTIC CONDITIONS

a. Turbidity

- As of 12/14/2021 turbidity continues to be less than 12 FNU at OBI, and is stable at other central and south Delta stations (See attachment A). However, south Delta

turbidity is expected to increase due to precipitation and may influence the distribution of Delta Smelt and the likelihood of entraining Delta Smelt in the next seven days.

- The pulse of turbidity from the San Joaquin River is expected to arrive in the south delta by 12/19/2021.
- Precipitation has occurred and is expected in the next seven days which may increase turbidity and flows at the Sacramento River at Freeport to trigger Early Winter Integrated Pulse Protections.

TABLE 8. Relevant Environmental Factors to the current management actions for Delta Smelt. FPT 3 Day Running Avg. of Turbidity includes a period when there was a sensor outage on 12/5-6/2021.

| Date Reported | FPT 3 Day Running Avg. of Daily Flows (cfs) | FPT 3 Day Running Avg. of Turbidity (FNU) |
|---------------|---|---|
| 12/14/2020 | 6621 | 3.60 |

b. X2 Conditions

- X2 is estimated to be at 97.2 km in the Sacramento River and the estimate for the San Joaquin River was unavailable due to a station outage.
- When X2 is above 81 km, the SMT uses the X2_EC_Graph.xlsx tool to estimate the position of X2 for both the Sacramento and San Joaquin Rivers and assumes the average of the two is representative of an approximate X2 position.

c. Other Environmental Conditions

- The Fish and Water Operation Outlook OMR Index values are expected to range between -4,000 to -10,000 cfs from 12/14/2021 to 12/20/2021.
- Real time tracking of environmental conditions, relevant thresholds and Delta Smelt catch data are updated daily at:
http://www.cbr.washington.edu/sacramento/workgroups/delta_smelt.html

EVALUATION

1. Between December 1 and January 31, has any first flush condition been exceeded?

The running 3-day average flows and running 3-day average turbidity at Freeport (Table 6) may exceed the triggers for Integrated Early Winter Pulse in the next seven days. The increases will depend upon the amount of precipitation and when recent run off reaches the Delta.

2. Do DSM have a high risk of migration and dispersal into areas at high risk of future entrainment? (December 1- January 31)

Based on distribution patterns over the past decade and no recent detection data, Delta Smelt are unlikely to be prevalent in the South Delta. Based on Sommer et al. (2011), the

centroid of Delta Smelt distribution is anticipated to be near X2, which is currently estimated to be at 97.2 km on the Sacramento River which indicates Delta Smelt distribution could be upstream of the Sacramento-San Joaquin confluence. Since “first flush” conditions may be met within the next seven days, Delta Smelt may migrate into areas with a higher likelihood of entrainment. As the season progresses, the likelihood that Delta Smelt may migrate even if “first flush” conditions are not met will increase.

3. Has a spent female been collected?

This question is not applicable until Turbidity Bridge Avoidance begins.

4. If OMR of -2000 does not reduce OBI turbidity below 12NTU/FNU, what OMR target is deemed protective between -2000 and -5000?

This question is not applicable until Turbidity Bridge Avoidance begins.

5. If OBI is 12 NTU/FNU, what do other station locations show?

OBI turbidity is currently below 12 FNU. The daily average turbidities on 12/13/2021 at Prisoners Point (4.93 NTU), Holland Cut (3.02 FNU) and Victoria Canal (3.84 NTU) are stable and not expected to increase notably in the next seven days.

6. If OBI is 12 NTU/FNU, is a turbidity bridge avoidance action not warranted? What is the supporting information?

This question is not applicable until Turbidity Bridge Avoidance begins.

7. After March 15 and if QWEST is negative, are larval or juvenile DSM within the entrainment zone of the CVP and SWP pumps based on surveys?

This question is not applicable until March 15th.

8. Based on real-time spatial distribution of Delta Smelt and currently available turbidity information, should OMR be managed to no more negative than -3,500?

This question is not applicable until March 15th.

9. What do hydrodynamic models, informed by EDSM or other relevant data, suggest the estimated percentage of larval and juvenile DSM that could be entrained may be?

This question is not applicable until March 15th

DELTA SMELT REFERENCES

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Attachment A: Delta Turbidity Report

Department of Water Resources
Division of Operations and Maintenance
SWP Water Operations Office

Delta Turbidity Conditions Report

For conditions through: December 12, 2021

General Conditions:

Inflows:

| | |
|-------------|----------|
| Freeport | 5747 CFS |
| Yolo Bypass | 24 CFS |
| Vernalis | 605 CFS |
| Cosumnes | 70 CFS |
| Mokelumne | 167 CFS |
| Calaveras | 57 CFS |

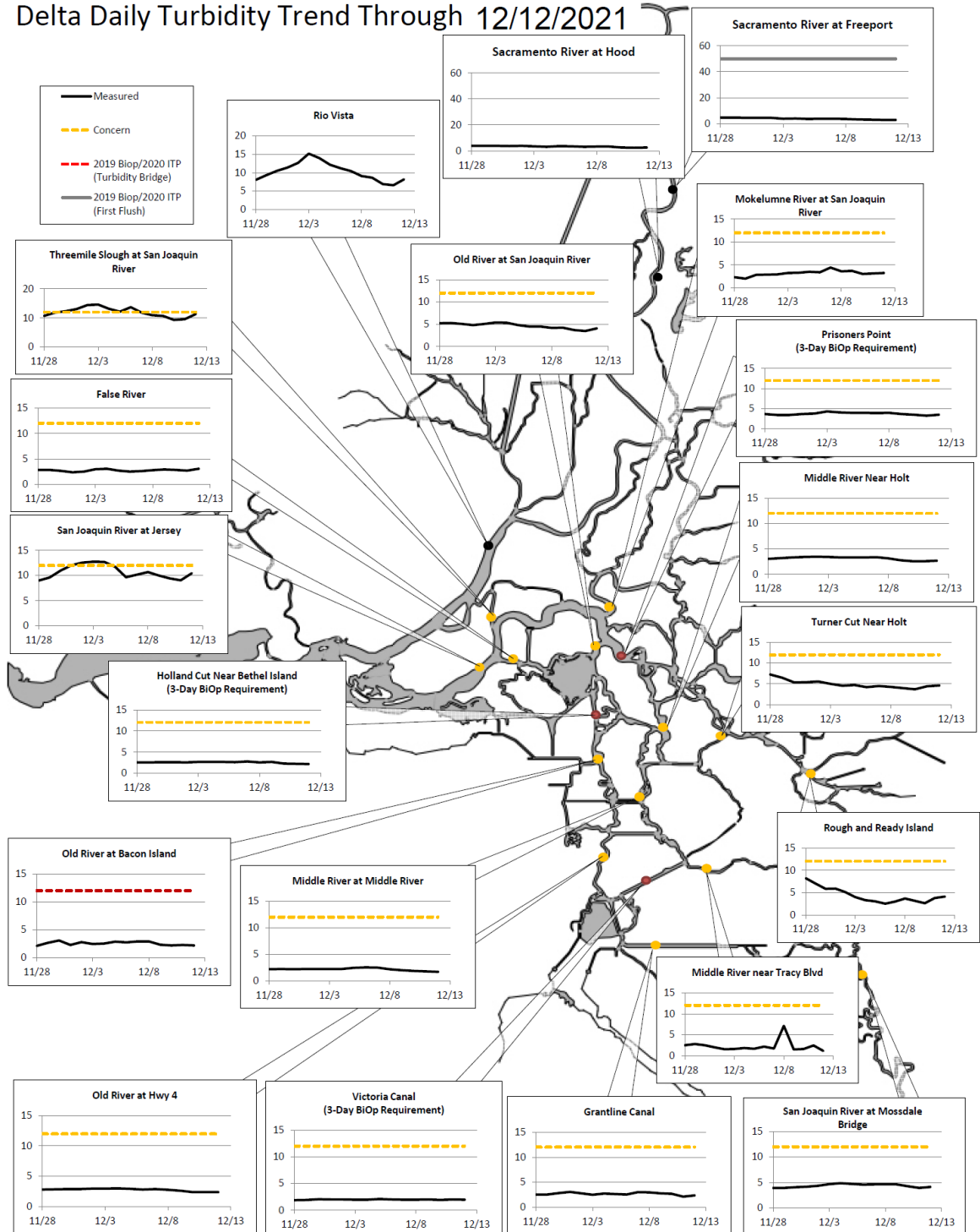
Exports:

| | |
|---------------|---------|
| Clifton Court | 293 CFS |
| Jones | 817 CFS |

Other:

| | |
|-------------|-----------|
| OMR (Index) | -1161 CFS |
| QWEST | 279 CFS |
| NDOI | 4280 CFS |

Delta Daily Turbidity Trend Through 12/12/2021



OBI station Turbidity values are CDEC daily data.
 All other stations Turbidity values are daily average calculated from CDEC event data.