

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 November 30 – December 6.

b. Winter-run Chinook Salmon

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. 26-30% 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 on 11/30/2021 reduces exposure of winter-run Chinook Salmon juveniles that are present in the Sacramento River near the DCC gates into the interior Delta. The effects of DCC closure, when it occurs, would be positive if juveniles are present. DCC gates closure has the potential to impact water quality.

c. Spring-run Chinook Salmon

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

Loss of natural California CV (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. DCC closure on 11/30/2021 will reduce exposure to Central Valley steelhead juveniles that are potentially present in the Sacramento River near the DCC gates. The effects of DCC gate closure, when it occurs, are likely to be positive if juveniles CCV steelhead are present.

e. Green Sturgeon

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. DCC gates recommendation

The DCC gates were closed on 11/30 for Rio Vista flow requirements and will remain closed for seasonal closure on 12/1.

g. Delta Smelt

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 likelihood of Delta Smelt subadult entrainment is low due to seasonal timing. First flush conditions are not anticipated to occur within the next seven days. The regulations for Integrated Early Winter Pulse Protection does not go into effect until 12/1/2021.

h. 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. Winter-Run Chinook Salmon

a. How much loss has occurred in the past week?

No loss of juvenile winter-run Chinook Salmon has occurred in the past week at the CVP and SWP fish salvage facilities.

b. What is the distribution of fish within the Delta?

On 11/30/2021 SaMT estimated 26-30% of juvenile winter-run Chinook Salmon were present in the Delta.

c. What is the exposure to winter-run Chinook Salmon due to DCC gate closure?

Juvenile winter-run Chinook Salmon have been observed this water year near the DCC gates and historical monitoring data indicates that juvenile winter-run Chinook Salmon would be present in the Delta at this time. Closure of the DCC gates, when it occurs for the season 11/30/2021, would reduce exposure and possible entrainment of juvenile winter-run Chinook Salmon into the Interior Delta via the DCC gates.

d. What are the effects to winter-run Chinook Salmon due to DCC gate closure?

Juvenile winter-run Chinook Salmon are present near the DCC gates though this past week were observed at Tisdale in very low numbers and not at Knights Landing. Closure

of the gates, when it occurs for the season 11/30/2021, would positively impact present juvenile winter-run Chinook Salmon.

Supporting Information regarding Exposure of winter-run Chinook Salmon

Since 9/1/2021, the Glenn Colusa Irrigation District (GCID) rotary screw traps (RSTs) have observed over 135 winter-run Chinook Salmon juveniles (by length at date criteria) in their daily catches. Fish have been steadily arriving since the beginning of October. Winter-run Chinook Salmon have been observed in RST monitoring locations farther downstream (Tisdale) and the fish appear to no longer be holding in the middle reaches of the Sacramento River and are migrating downstream. Movement of winter-run Chinook Salmon juveniles into the lower reaches of the Sacramento River and upper Delta is continuing. Mill Creek and Deer Creek daily flows were recorded higher than 95 cfs over the past week.

TABLE 1. Natural winter-run Chinook salmon distribution estimate.

<u>Date</u>	<u>Yet to Enter Delta</u>	<u>In Delta</u>	<u>Exited Delta past Chipps Island</u>
11/30/2021	67-74%	26-30%	0-1%

TABLE 2. Natural winter-run Chinook Salmon average percent of annual emigrating population (LAD) captured at following locations and salvaged at Delta fish facilities for Brood Years 2011 – 2020. The most recent RBDD bi-weekly report of daily estimates of passage for the period 11/5/2021 through 11/18/2021 is 544,541 fish for BY21 winter-run Chinook salmon.

<u>Date</u>	<u>Red Bluff Diversion Dam</u>	<u>Tisdale RST</u>	<u>Knights Landing RST</u>	<u>Sac Trawl (Sherwood)</u>	<u>Chipps Island Trawl</u>	<u>Salvaged at Delta Facilities</u>
11/28/2021	89.3% (84.6%,93.9%)	24.5% (7.7%,41.4%)	23.3% (2.5%,44.2%)	8.2% (-6.1%,22.5%)	0.0% (0.0%,0.0%)	0.0% (0.0%,0.0%) WY: 2012 - 2021

TABLE 3. Knight’s Landing (KLCI) and Sacramento Seine and Trawl (SCI) Catch indices for juvenile salmonid migration.

<u>Date</u>	<u>KLCI</u>	<u>SCI Trawl</u>	<u>SCI Seine</u>	<u>Trigger Exceeded?</u>
11/23/2021	0	N.A.	N.A.	N.A.
11/24/2021	0	0	0	N.A.

<u>Date</u>	<u>KLCI</u>	<u>SCI Trawl</u>	<u>SCI Seine</u>	<u>Trigger Exceeded?</u>
11/25/2021	*	N.A.	N.A.	N.A.
11/26/2021	*	0	0	N.A.
11/27/2021	0	N.A.	N.A.	N.A.
11/28/2021	0	N.A.	N.A.	N.A.
11/29/2021	0	0	0	N.A.

* Knights Landing data not reported 11/25/2021 and 11/26/2021.

TABLE 4 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>
11/28/2021	121.8	-0.3%	Flow>95cfs	93.9	-1.0%	N.A.	3892.6	N.A.	N.A.
11/27/2021	122.2	-0.5%	Flow>95cfs	94.8	0.8%	N.A.	3866.7	N.A.	N.A.
11/26/2021	122.8	-0.4%	Flow>95cfs	94.1	-0.8%	N.A.	3838.7	N.A.	N.A.
11/25/2021	123.2	-2.6%	Flow>95cfs	94.8	-3.0%	N.A.	3873.3	N.A.	N.A.
11/24/2021	126.5	-2.0%	Flow>95cfs	97.8	-1.0%	Flow>95cfs	3900.0	N.A.	N.A.
11/23/2021	129.1	-0.9%	Flow>95cfs	98.8	-1.4%	Flow>95cfs	3869.8	44.1	N.A.
11/22/2021	130.2	-2.7%	Flow>95cfs	100.2	-3.9%	Flow>95cfs	3961.8	44.3	N.A.

Supporting Information regarding DCC Management Effects on winter-run Chinook Salmon

The DCC gates were opened on 11/26/2021 and will be closed on 11/30/2021. Closure of the gates, when they occur for the season, would reduce entrainment of any juvenile winter-run Chinook Salmon near the DCC gates into the interior Delta.

TABLE 5 STARS model simulations for route-specific entrainment, travel times, and survival.

<u>Date</u>	<u>11/28/2021</u>	<u>N.A.</u>	<u>N.A.</u>	<u>N.A.</u>
N.A.	DCC	Georgiana Slough	Sacramento River	Sutter and Steamboat
Proportion of Entrainment	0.24	0.19	0.32	0.23
Survival	0.1	0.13	0.31	0.28
Travel Time	22.7 d	21.5 days	10.8 days	10.8 days

3. Spring-Run Chinook Salmon

a. How much loss has occurred in the past week?

No loss of juvenile CV YOY spring-run Chinook Salmon has occurred in the past week at the CVP and SWP fish salvage facilities.

b. What is the distribution of fish within the Delta?

On 11/30/2021 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. 0-3% young of year spring-run Chinook Salmon are estimated to be in the Delta. 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.

c. What is the exposure to CV spring-run Chinook Salmon due to DCC gate closure?

No juvenile CV YOY spring-run Chinook Salmon (LAD) have been observed near the DCC gates so far this water year. Adults are building redds and spawning upstream. Historical monitoring data suggests that very few YOY spring-run Chinook Salmon (<3% at Knight Landing RST) are present in the Delta at this time.

d. What are the effects to CV spring-run Chinook Salmon due to DCC gate closure?

The exposure and effects of DCC closure on natural CV spring-run Chinook Salmon are similar to winter-run Chinook Salmon. Closure of the gates, when it happens on 11/30/2021, would reduce entrainment of any juvenile CV spring-run Chinook Salmon near the DCC gates into the interior Delta.

Supporting Information regarding Exposure of spring-run Chinook Salmon

TABLE 6 *Natural spring-run Chinook salmon distribution estimate*

<u>Date</u>	<u>Yet to Enter Delta</u>	<u>In Delta</u>	<u>Exited Delta past Chipps Island</u>
11/30/2021	97-100%	0-3%	0%

TABLE 7 Natural spring-run Chinook Salmon average percent of annual emigrating population (LAD) captured at following locations and salvaged at Delta fish facilities for Brood Years 2011 - 2020

<u>Date</u>	<u>Red Bluff Diversion Dam</u>	<u>Tisdale RST</u>	<u>Knights Landing RST</u>	<u>Sac Trawl (Sherwood)</u>	<u>Chipps Island Trawl</u>	<u>Salvaged at Delta Facilities</u>
11/28/2021	12.1% (-0.9%,25.1%)	0.8% (-0.1%,1.7%)	2.9% (-3.0%,8.8%)	0.0% (-0.0%,0.0%)	0.0% (0.0%,0.0%)	0.0% (0.0%,0.0%) WY: 2012 - 2021

Supporting Information regarding DCC Management Effects on spring-run Chinook Salmon

See additional supporting information in winter-run Chinook Salmon section (section 3.b.).

4. California Central Valley Steelhead

a. How much loss has occurred in the past week?

Loss of juvenile CCV steelhead has not occurred in the past week at the Delta fish salvage facilities. There have now been observations of non-clipped steelhead at the CVP on 10/30/2021 and 11/19/2021 (loss = 3.4 fish). Note: Last week there was an error in reporting natural juvenile CCV steelhead loss in the Operations Outlook and PA Assessment. The loss of natural steelhead was reported as 3.29 fish due to an accounting error related to a predator removal event at the CVP. A value of 0.57 fish was incorrectly reported instead of the correct value of 0.68 fish. This error has been corrected.

b. What is the distribution of fish within the Delta?

On 11/30/2021 SaMT estimated 2-6% of juvenile CCV steelhead were present in the Delta.

c. What is the exposure to CCV steelhead due to DCC gate closure?

No juvenile Central Valley steelhead have been observed near the DCC gates in regional monitoring efforts at Tisdale and Knights Landing this past week and historical monitoring data does not show steelhead in the Delta at this time. Closure of the DCC

gates, when it occurs on 11/30/2021, would reduce exposure and possible entrainment of juvenile CCV steelhead into the interior Delta via the DCC gates.

d. What are the effects to CCV steelhead due to DCC gate closure?

Juvenile Central Valley steelhead could be present near the DCC gates, albeit in small numbers. Closure of the gates, when it occurs on 11/30/2021, would positively impact any present juvenile Central Valley steelhead.

Supporting Information regarding Exposure of CCV Steelhead

TABLE 8 Central Valley steelhead distribution estimate

Date	Yet to Enter Delta	In Delta	Exited Delta past Chipps Island
11/30/2021	93-98%	2-6%	0-1%

TABLE 9 Central Valley steelhead average percent of annual emigrating population salvaged at Delta fish facilities for Brood Years 2011 - 2020

Date	Salvaged at Delta Facilities
11/28/2021	0.0% (0.0%,0.0%)

Supporting Information regarding DCC Management Effects on Central Valley steelhead

See additional supporting information found in winter-run Chinook Salmon (section 3.b).

5. 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. Historical Trends

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

EVALUATION

- Currently, green sturgeon salvage is 0 fish. The agencies in the SaMT assessed the likelihood of salvage occurring in the next week is unlikely to occur.

6. Delta Smelt

POPULATION STATUS

a. Delta Smelt Life Stages:

- Subadults

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: Subadult Delta Smelt expected to be present in the Deep Water Ship Channel based on the last survey detection. In November, historical patterns observed the centroid of the population close to the X2 position (Sommer et al 2011). Currently X2 is estimated to be at 94 km 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, 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 8. Summary of recently reported detections of Delta Smelt by Region and Salvage Facilities between 11/23/2021 and 11/30/2021. 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 9. 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 11/29/2021
SKT	0	0	SKT :1/18/2022
SLS	0	0	Begins: 12/13/2021
20-mm	0	0	Begins: 3/21/2022
Summer Towntet	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 November 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 subadult 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

- First Flush Conditions can be triggered between Dec.1st and January 31st.
- As of 11/30/2021 turbidity continues to be less than 12 FNU at OBI, and is stable at other central and south Delta stations. South Delta Turbidity is expected to remain stable and is not expected to influence the distribution of Delta Smelt and the likelihood of entraining Delta Smelt in the next seven days.

TABLE 10. Relevant Environmental Factors to the current management actions for Delta Smelt.

Date Reported	FPT 3 Day Running Avg. of Daily Flows (cfs)	FPT 3 Day Running Avg. of Turbidity (FNU)
11/30/2020	6208	5.04

b. X2 Conditions

- X2 is estimated to be at 94 km.
- 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 -1,000 to -2,000 cfs from 11/30/2021 to 12/06/2021.
- 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?**
- 2. The running 3-day average flows and running 3-day average turbidity at Freeport (Table 6) are not expected exceed the triggers for Integrated Early Winter Pulse Protection which begin 12/1/2021.No precipitation is expected in the next seven days. 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 94 km which indicates Delta Smelt distribution could be upstream of the Sacramento-San Joaquin confluence. Since “first flush” conditions are not expected to be met within the next seven days, it is unlikely that Delta Smelt will migrate into areas with a high 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 11/29/2021 at Prisoners Point (3.57 NTU), Holland Cut (2.44 FNU; station likely down) and Victoria Canal (1.86 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

- Lenny F. Grimaldo, Ted Sommer, Nick Van Ark, Gardner Jones, Erika Holland, Peter B. Moyle, Bruce Herbold & Pete Smith (2009) Factors Affecting Fish Entrainment into Massive Water Diversions in a Tidal Freshwater Estuary: Can Fish Losses be Managed?, *North American Journal of Fisheries Management*, 29:5, 1253-1270, DOI: 10.1577/M08-062.1
- Hobbs, J. A., Lewis, L. S., Willmes, M., Denney, C., & Bush, E. (2019). Complex life histories discovered in a critically endangered fish. *Scientific Reports*, 9(1).
<https://doi.org/10.1038/s41598-019-52273-8>
- Polansky, L., Newman, K.B., Nobriga, M.L. et al. Spatiotemporal Models of an Estuarine Fish Species to Identify Patterns and Factors Impacting Their Distribution and Abundance. *Estuaries and Coasts* 41, 572–581 (2018). <https://doi.org/10.1007/s12237-017-0277-3>

Sommer, T., F. Mejia, M. Nobriga, and L. Grimaldo. 2011. The Spawning Migration of Delta Smelt in the Upper San Francisco Estuary. *San Francisco Estuary and Watershed Science* 9(2).