BUREAU OF RECLAMATION

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

November 07, 2023

Executive Summary

Operational Conditions

See the Weekly Fish and Water Operation Outlook document for November 07 – 13.

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 may occur over the next week. 1-3% of juvenile natural winter-run Chinook Salmon from brood year (BY) 2023 are estimated to be present in the Delta. The Delta Cross Channel (DCC) gates closure reduces far-field effects on winter-run Chinook Salmon juveniles that are potentially present in the Sacramento River near the DCC gates into the interior Delta.

Spring-run Chinook Salmon

No loss of natural spring-run Chinook Salmon (by length at date, LAD) has occurred in the past week at the State or Federal fish salvage facilities. 0% of juvenile natural spring-run Chinook Salmon was estimated in the Delta. It is unlikely that juvenile natural spring-run Chinook Salmon from BY 2023 are present near the DCC gates; CV spring-run Chinook Salmon adults have nearly completed spawning and eggs are in gravel. The DCC closure is unlikely to affect natural spring-run Chinook Salmon in the next seven days.

Central Valley Steelhead

No loss of natural California CV (CCV) steelhead has 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 is unlikely to occur over the next week. 0% of CCV steelhead were estimated in the Delta. DCC closure reduces exposure to Central Valley steelhead juveniles that are potentially present in the Sacramento River near the DCC gates.

DCC gates recommendation

The DCC gates will be closed on 11/08/2023 for Rio Vista requirements. The final Mokelumne River pulse flow ended 11/5/2023, and flows are now at JSA minimum (330 cfs) for a normal and above water type year out of Camanche Reservoir which will minimize straying of fall-run Chinook through the DCC gate. The DCC gate is currently scheduled to re-open on 11/10/2023 to allow boaters passage to the interior Delta.

Delta Smelt

Based on distribution patterns over the past decade and low detections in this water year, Delta Smelt are unlikely to be prevalent in the Central and South Delta. Limited detection data from the past month supports Delta Smelt presence in the lower Sacramento River. The last Delta Smelt observations were on 10/5/2023 and 10/24/2023 in the lower Sacramento River. The likelihood of Delta Smelt entrainment is low due to seasonal timing. The regulations for Integrated Early Winter Pulse Protection do not go into effect until 12/1/2023.

Monitoring Teams summary

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

Operational and Regulatory Conditions

See current Weekly Fish and Water Operation Outlook document.

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

Population Status

Winter-run Chinook Salmon

- Delta Life Stages:
    - Juveniles, Adults
- Supporting Information regarding Exposure
    - Catch at Red Bluff Diversion Dam continues to increase, which suggests that juvenile winter-run Chinook Salmon have started their migration towards the middle reaches of the Sacramento River. Knights Landing, Tisdale, and Lower Sacramento rotary screw traps have observed winter-run Chinook salmon which further confirms that winter-run Chinook salmon have begun migrating downstream.
- Supporting Information regarding DCC Management Effects

- DCC gate operations will continue with a weekday closed/weekend open pattern.
- See Attachment A – Mokelumne River pulse flow plan plot and data.

Spring-run Chinook Salmon

- Delta Life Stages:
  - Young-of-year (YOY) and Yearlings
- Supporting Information regarding Exposure
  - See additional supporting information found in winter-run Chinook Salmon section.
  - Mill Creek and Deer Creek daily flows were recorded more than 95 cfs over the past week.
- Supporting Information regarding DCC Management Effects
  - See additional supporting information in winter-run Chinook Salmon section.

Central Valley Steelhead

- Delta Life Stages
  - Spawning Adults, Kelts, Juveniles
- Supporting Information regarding Exposure of CCV Steelhead
  - See Additional supporting information found in winter-run Chinook Salmon.
- Supporting Information regarding DCC Management Effects on Central Valley steelhead
  - See additional supporting information found in winter-run Chinook Salmon.

Distribution

Table 1. Salmonid distribution estimates

Location	Yet to Enter Delta (%)	In the Delta (%)	Exited Delta past Chipps Island (%)
Young-of-year (YOY) winter-run Chinook salmon	Current: 97-99 % Last Week: 97-100%	Current: 1-3% Last Week: 1-3%	Current: 0% Last Week: 0%
YOY spring-run Chinook salmon	Current: 100% Last Week: 100 %	Current: 0% Last Week: 0%	Current: 0% Last Week: 0%
YOY hatchery winter-run Chinook salmon	Current: NA Last Week: NA	Current: NA Last Week: NA	Current: NA Last Week: NA

Location	Yet to Enter Delta (%)	In the Delta (%)	Exited Delta past Chipps Island (%)
Natural origin steelhead	Current: 100% Last Week: 100 %	Current: 0% Last Week: 0%	Current: 0% Last Week: 0%

Table 2. Historic migration and salvage patterns. Last updated 11/06/2023.

Species	Red Bluff Diversion Dam	Tisdale Rst	Knights Landing Rst	Sac Trawl Sherwood Catch Index	Chipps Island Trawl Catch Index	Salvage
Chinook, Winter-run, Unclipped	78.1%(69.6%,86.7%) BY: 2013 - 2022	18.8%(5.7%,31.9%) BY: 2013 - 2022	19.0%(4.3%,33.8%) BY: 2013 - 2022	7.5%(-8.2%,23.2%) BY: 2013 - 2022	1.4%(-1.8%,4.7%) BY: 2013 - 2022	0.0%(0.0%,0.0%) WY: 2014 - 2023
Chinook, Spring-run, Unclipped	1.3%(-0.3%,3.0%) BY: 2013 - 2022	0.2%(0.0%,0.3%) BY: 2013 - 2022	0.5%(-0.2%,1.3%) BY: 2013 - 2022	0.0%(0.0%,0.0%) BY: 2013 - 2022	0.0%(0.0%,0.0%) BY: 2013 - 2022	0.0%(0.0%,0.0%) WY: 2014 - 2023
Steelhead, Unclipped (January-December)	N/A	N/A	N/A	N/A	N/A	N/A
Steelhead, Unclipped (December-March)	N/A	N/A	N/A	N/A	N/A	N/A
Steelhead, Unclipped (April-June)	N/A	N/A	N/A	N/A	N/A	N/A

Table 3. Knight's Landing (KLCI) and Sacramento Seine and Trawl (SCI). No catch indices for juvenile salmonid migration were triggered during the past week.

Date	KLCI	SCI Trawl	SCI Seine	Trigger Exceeded
11/06/23	0	N/A	N/A	No
11/05/23	0	N/A	N/A	No
11/04/23	0	N/A	N/A	No
11/03/23	0	0	0	No
11/02/23	0	N/A	N/A	No

Date	KLCI	SCI Trawl	SCI Seine	Trigger Exceeded
11/01/23	0	0	0	No
10/31/23	0	N/A	N/A	No
10/30/23	N/A	0	0	No

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).

Date	Mill Creek (MLM): mean daily flow (cfs)	Mill Creek (MLM): flow percent change	Mill Creek (MLM): Alert	Deer Creek (DCV): mean daily flow (cfs)	Deer Creek (DCV): flow percent change	Deer Creek (DCV): Alert	Wilkins Slough (WLK): mean daily flow (cfs)	Knights Landing RST: water tempera-ture (f)	Alert Trigg-ered
11/5/2023	99.6	0.7%	Flow>95cfs	102.5	0.4%	Flow>95cfs	3,960.0	N/A	N/A
11/4/2023	98.9	0.5%	Flow>95cfs	102.1	0.1%	Flow>95cfs	4,114.0	N/A	N/A
11/3/2023	98.4	0.4%	Flow>95cfs	102.0	0.9%	Flow>95cfs	4,511.1	N/A	N/A
11/2/2023	98.0	-0.2%	Flow>95cfs	101.1	0.5%	Flow>95cfs	4,831.5	N/A	N/A
11/1/2023	98.2	0.8%	Flow>95cfs	100.6	0.6%	Flow>95cfs	4,976.5	N/A	N/A
10/31/2023	97.4	0.3%	Flow>95cfs	100.0	0.3%	Flow>95cfs	5,047.2	N/A	N/A
10/30/2023	97.2	-0.1%	Flow>95cfs	99.7	-1.2%	Flow>95cfs	5,027.9	43.4	N/A

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

Stock	Date	Route	Median Travel Time	Survival	Routing Probability
Winter Chinook	2023-11-04	Overall	6.77	0.25	N/A
Winter Chinook	2023-11-04	Sacramento River	6.33	0.27	0.58
Winter Chinook	2023-11-04	Yolo Bypass	9.78	0.58	0.00
Winter Chinook	2023-11-04	Sutter Slough	6.44	0.32	0.14
Winter Chinook	2023-11-04	Steamboat Slough	6.11	0.33	0.15
Winter Chinook	2023-11-04	Interior Delta	9.72	0.06	0.13
Late-fall Chinook	2023-11-04	Overall	13.20	0.25	N/A
Late-fall Chinook	2023-11-04	Delta Cross Channel	21.06	0.10	0.21
Late-fall Chinook	2023-11-04	Georgiana Slough	19.41	0.15	0.19
Late-fall Chinook	2023-11-04	Sacramento River	9.61	0.35	0.34

Stock	Date	Route	Median Travel Time	Survival	Routing Probability
Late-fall Chinook	2023-11-04	Sutter and Steamboat Slough	9.67	0.31	0.25

Evaluation

1. How much salmonid loss has occurred in the past week?

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

2. Were salmonids observed near the DCC gate in the last seven days?

   Juvenile salmonids are present near the DCC gates but historical monitoring data indicates that they are not present in the Delta in significant numbers at this time. Closure of the DCC gates would reduce likelihood of entraining juvenile salmonids into the Interior Delta.

3. Given forecasted conditions and observations of salmonids, what are the effects of DCC gate operations on salmonids in the next seven days?

   Juvenile winter-run Chinook Salmon are present near the DCC gates but have not triggered any actions. Closure of the gates would positively impact any present juvenile salmonids by preventing entrainment into the interior Delta. Closure of the DCC gates, also reduces straying of Mokelumne River adult fall-run Chinook salmon during the fall attraction flow releases.

Biology, Distribution, and Evaluation of Delta Smelt

Population Status

- Delta Smelt Life Stages:
    - Juveniles, Subadults, Adults
- Brood Year 2023:
- Abundance estimate:
    - The most recent non-zero abundance estimate for Delta Smelt is from October 27, 2023, and was 1,328 (95% CI: 184 to 4,803).
- Biological Conditions:

- Adult, subadult and juvenile Delta Smelt are expected to be present in the Low Salinity Zone and Sacramento Deep Water Shipping Channel and have been most recently detected in the lower Sacramento River. The Smelt Monitoring Team discussed the most recent monitoring data (TABLE 6) and considered published literature and professional judgement on the historical trends in regional distribution.

Distribution

Current Distribution

- Real time detection data are currently limited to EDSM and Chipps Island Trawl. Fall Midwater Trawl Survey and Bay Study provide data as available.
- One adult and one juvenile Delta Smelt have been detected by surveys in the lower Sacramento River between 10/5/2023-10/24/2023.
- No Delta Smelt have been detected in salvage at the SWP and CVP this water year.
- Larval sampling at the Skinner Fish Facility (SFF) and the Tracy Fish Collection Facility (TFCF) has not yet been initiated this year.
- COA 8.5.2: Spawning has not yet begun.

Table 6. Summary of newly reported detections of Delta Smelt by Region and Salvage Facilities since the last assessment. Regions are those defined by EDSM sampling. Delta Smelt >58mm FL are considered adults. Subadult fish are considered by the SMT to be fish from the previous year's cohort based on size and timing of collection. Young of year are considered juveniles and larvae.

Life Stage	North	South	West	Far West	Salvage
Adult	0	0	0	0	0
Subadult	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. Total Fish counts do not distinguish between hatchery origin and wild Delta Smelt. Table indicates new detections and previously reported detections that have undergone preliminary ID, QA/QC, and genetic confirmation. Numbers are updated as QA/QC and genetic confirmation become available.

Sampling Method	Frequency	New Detections	Preliminary Detections	QA/QC Detections	Genetically Confirmed to Date	Total WY2024	Notes
EDSM	Weekly	0	N/A	N/A	N/A	2	Phase 3 began 7/3/2023 Phase 1 begins 12/4/2023
SKT	Monthly	0	N/A	N/A	N/A	0	Begins: not occurring this year
SLS	Biweekly	0	N/A	N/A	N/A	0	Begins: 12/11/2023
20-mm	Biweekly	0	N/A	N/A	N/A	0	Begins: 3/18/2024
Summer Townet	Biweekly	0	N/A	N/A	N/A	0	Begins:
Bay Study	Monthly	0	N/A	N/A	N/A	0	Ongoing
FMWT	Monthly	0	N/A	N/A	N/A	0	Ongoing
Chipps Island Trawl	Weekly	0	N/A	N/A	N/A	0	Ongoing
FCCL Brood Stock Collections	Weekly	0	N/A	N/A	N/A	0	Begins: Mid-November
LEPS	As available	0	N/A	N/A	N/A	0	Begins: 1/3/2024 (depending on LFS catch)
FRP	Daily	0	N/A	N/A	N/A	0	Ongoing

Sampling Method	Frequency	New Detections	Preliminary Detections	QA/QC Detections	Genetically Confirmed to Date	Total WY2024	Notes
Tracy Fish Collection Facility (CVP)	Daily	0	N/A	N/A	N/A	0	Ongoing
Skinner Fish Facility (SWP)	Daily	0	N/A	N/A	N/A	0	Ongoing
Total	N/A	N/A	N/A	N/A	N/A	0	Sum of all Delta Smelt observed during the OMR Managem-ent Season

Cultured Delta Smelt Experimental Releases

- Experimental releases for Water Year 2024 are planned for:
    - Release 1: 11/15/2023
    - Release 2: 12/13-12/14/2023
    - Release 3: 12/20-12/21/2023
    - Release 4: 1/10/2024
    - Release 5: 1/24-1/25/2024
    - Release 6: 1/31-2/1/2024

Table 8. Weekly summary of the origin of Delta Smelt. These identifications are considered tentative and additional genetic testing will confirm the identity of individuals. Individuals with no tags are provided alive to the FCCL as potential additions to the FCCL Broodstock.

Date	Survey	Stratum/Station	Total Caught	Ad. Clipped	VIE	No Tag
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Historical Trends

- Upstream migration for Delta Smelt occurs between September and December and in response to "first flush" conditions (Sommer et al. 2011, Grimaldo et al. 2009). Migration typically ranges one to four weeks after flow and turbidity increases, based on salvage data (Sommer et al. 2011).
- Historically, detections of ripe Delta Smelt began in January and peaked in February and March and the majority of Delta Smelt spawning occurs within a temperature range of 9-18˚C (Damon et al. 2016).
- Based on historical monitoring data from the past few years (https://github.com/Delta-Stewardship-Council/deltafish), first detection of larvae in the Central and South Delta has typically occurred by mid to late March. (https://www.cbr.washington.edu/sacramento/tmp/hrtsalvage_1676407207_694.html).
- Salvage data as presented on SacPas indicates that adult Delta Smelt salvage in recent years has reached the 50th percentile at the end of February – beginning of March.
- Historically, the highest peak in salvage is in May and the second highest is in June (Grimaldo et al 2009).

Forecasted Distribution within Central Valley and Delta regions

- Predicting the distribution of Delta Smelt is currently difficult because detection data is limited to a few wild individuals and historic patterns may not be representative of the low population levels.
- 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.
- The potential of experimentally released Delta Smelt to distribute from their release site is unknown at this time and SMT cannot predict their distribution beyond the original release site and subsequent recaptures. There is a high degree of uncertainty regarding the response of cultured fish to environmental cues typically applied to wild Delta Smelt.

Abiotic Conditions

Turbidity

- Sunny and clear this week. Winds at Stockton are forecast to be NNW today ranging 7-11 mph with gusts up to 18 mph. In Antioch, WNW winds ranging 6-14 mph with gusts up to 24 mph today, and gusts up to 26 mph tomorrow.
- Turbidity is below 12 FNU at OBI and at other stations in the central and south Delta. Turbidity is expected to remain stable over the next week.

Table 9. Relevant Environmental Factors to the current management actions for Delta Smelt.

Date Reported	FPT 3-day Running Average Flow (cfs)	FPT 3-day Running Average Turbidity (FNU)
11/6/2023	8884.8	3.46

X2 Conditions

- As of 11/7/2023, X2 is estimated to be >81 km.

Other Environmental Conditions

- The Fish and Water Operation Outlook OMR Index values are expected to range between -3,000 to -7,000 cfs this week.
- QWEST was estimated at +500 cfs on 11/7/2023 and will be oscillating around 0 this week with DCC gates opening and closing.
- 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

USBR and DWR Proposed Operations:

- Monthly Delta Outflow and Rio Vista flow for November greater than 4,500 cfs; E/I ratio not to exceed 0.65.

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

The question is not applicable until Dec. 1.

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

The question is not applicable until Dec. 1.

3. Has a spent female been collected?

This question is not applicable until Turbidity Bridge Avoidance begins.

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

This question is not applicable until Turbidity Bridge Avoidance begins.

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

This question is not applicable until Turbidity Bridge Avoidance begins.

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 after March 15.

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 15.

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 15.

Delta Smelt References

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.

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

Grimaldo, L. F., T. Sommer, N. Van Ark, G. Jones, E. Holland, P. B. Moyle, B. Herbold & P. 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

Gross, E. S. (2021). Modeling Delta Smelt Distribution for Hypothesized Swimming Behaviors. San Francisco Estuary and Watershed Science, 19(1).

Kimmerer, W. J. (2008). Losses of Sacramento River Chinook Salmon and Delta Smelt to Entrainment in Water Diversions in the Sacramento-San Joaquin Delta. San Francisco Estuary and Watershed Science, 6(2).

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

Smith, W. E., Polansky, L., and M. L Nobriga. 2021. Disentangling risks to an endangered fish: using a state-space life cycle model to separate natural mortality from anthropogenic losses. Canadian Journal of Fisheries and Aquatic Sciences, 78: 1008-1029.

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).