

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

Executive Summary

a) Operations anticipated during the week

See Weekly Fish and Water Operation Outlook document for February 22 – February 28

b) Winter-run Chinook Salmon summary

Loss of natural winter-run Chinook Salmon (by length at date, LAD) has occurred in the past week at the Federal fish salvage facility (WY 2022 total loss = 20.56 fish, as of 2/20/2022). Loss of natural winter-run Chinook Salmon at the Central Valley Project (CVP) and State Water Project (SWP) fish collection facilities could occur over the next week based on hydrology and recent observations. 77-88% 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

Juvenile natural spring-run Chinook Salmon from BY 21 are migrating past the DCC gates. The exposure and effects of DCC closure are unlikely for natural spring-run Chinook Salmon. Length-at-date spring run were observed in the Delta within the previous seven days. Larger, older juveniles were observed that may be yearling spring run. 60-78% 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 (WY 2022 total loss = 59.80 fish, as of 2/20/2022). 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. 28-42% 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, Lower San Joaquin River, South Delta, Suisun Marsh & Bay, and the Lower Sacramento River. Six marked individuals have been collected since 2/15/2022. 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.

g) Monitoring Teams summary

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

There were no non-consensus issues to report from the 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

Brood Year 2021 Productivity:

- Natural winter-run Chinook salmon: A draft juvenile production estimate (JPE) calculation has been established for brood year (BY) 2021 winter-run Chinook salmon. The final winter-run Chinook salmon JPE is 125,038 fish. 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 2/11/2022 for the last 19 years of passage data is 98.8% (one SD of 1.4%). By 2/11/2022, 571,819 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:
 - Approximately 123,975 Livingston Stone NFH brood year 2021 winter Chinook salmon were released at dusk on 2/9/2022 into the Sacramento River at Caldwell Park in Redding, CA. This is the first release of LSNFH brood year 2021 winter Chinook salmon comprising of approximately 24% of the total hatchery production for the Sacramento River supplementation program. The release group is 100% marked (adipose-fin clip and CWT) with an overall estimated average fork length of 85mm. There has not been loss this water year associated with this group. Additionally, some of the fish from this group were acoustically tagged and are being tracked (Table 6).

Spring-run Chinook salmon

Delta Life Stages:

Young-of-year (YOY) and Yearlings

Brood Year 2021 Productivity:

- Natural spring-run Chinook salmon: No JPE has been established for spring-run Chinook salmon. Approximately 18.8% juvenile spring-run sized Chinook salmon have been observed passing Red Bluff Diversion dam as of 2/20 based on historical data.
- Hatchery spring-run Chinook salmon surrogates:
 - Approximately 84,343 late-fall Chinook salmon from Coleman NFH were released at Battle Creek on 12/15/2021. This group is 100% marked with adipose-fin clip and CWT and have an estimated average fork length of 145mm. This is the first spring-run Chinook salmon surrogates release group. There has been loss this water year of fish associated with the first surrogate release group.
 - Approximately 82,626 late-fall Chinook salmon from Coleman NFH were released at Battle Creek on 12/22/2021. This group is 100% marked with adipose-fin clip and CWT and have an estimated average fork length of 125mm. This is the second spring-run Chinook salmon surrogates release group. There has been loss this water year of fish associated with the second release group.
 - Approximately 77,325 late-fall Chinook salmon from Coleman NFH were released at Battle Creek on 1/6/2022. This group is 100% marked with adipose-fin clip and CWT and have an estimated average fork length of 145mm. This is the third spring-run Chinook salmon surrogates release group. There has been loss this water year of fish associated with the third release group.
- San Joaquin River Restoration Program (SJRRP) Salmon Conservation and Research Facility (SCARF) Chinook salmon:
 - Approximately 57,478 brood year 2021 spring-run Chinook salmon from the SJRRP SCARF were released on 2/14/2022 into the San Joaquin River at Fremont Ford Bridge (Highway 140). This release consisted of marked juveniles (adipose fin clip and CWR) and have an estimated average fork length of 85mm.
- 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.

Central Valley Steelhead

Delta Life Stages:

- Spawning Adults, Kelts, Juveniles

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.
 - Approximately 57,056 steelhead from Mokelumne River Fish Hatchery will be released into the Mokelumne River at Feist Ranch from 1/31/2022 to 2/1/2022. This group is 100% marked (CWT and adipose fin clip) and has an estimated average fork length of approximately 210mm.
 - Approximately 424,000 steelhead from Nimbus Fish Hatchery will be released into the Lower American River at the Sunrise Boat Ramp from 1/31/2022 through 2/4/2022. This group is 100% marked (adipose fin clip) and has an average fork length of approximately 240mm.
 - Approximately 475,000 steelhead from Feather River Fish Hatchery will be released into the Feather River at Boyd's Pump from 2/4/2022 through 2/11/2022. This group is 100% marked (adipose fin clip) and has an average fork length of approximately 210mm.

DISTRIBUTION

Winter-run Chinook Salmon

Current Distribution:

- On 2/22/2022, SaMT estimated 77-88% of juvenile winter-run Chinook salmon were present in the Delta and 3-7% were estimated to have exited the Delta (Table 1). The SaMT estimate is largely based on historical trends since few winter-run Chinook salmon have been seen in recent monitoring. The

SaMT expressed some concern that these numbers seem low especially given the precipitation events that occurred early in the Water Year (October 2021).

- Combined total natural winter-run Chinook salmon loss equals 20.56 fish (as of 2/20/2022).
- Combined total hatchery winter-run Chinook salmon loss equals 0 fish (as of 2/20/2022).
- Fish have been steadily arriving since the beginning of October 2021.
- Winter-run Chinook Salmon have been observed in RST monitoring locations over the past week (Lower Sacramento Rotary Screw Trap) however the fish appear to no longer be holding in the middle reaches of the Sacramento River and are migrating downstream (Table 2). DJFMP datasheet was not delivered prior to the SaMT meeting.
- 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 during the past week.

Historic Trends

- Based on historical trends in salvage, 33.7% 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 occur over the next week based on hydrology and recent observations. If historic trends in salvage were to continue, winter-run Chinook salmon loss is expected to remain the same over the next week.
- Based on historic loss patterns and historic cumulative loss, it is possible that in WY 2022 50% of the wild winter-run Chinook salmon Delta Performance single-year loss threshold (731.47 wild winter-run Chinook salmon, as set by the JPE estimate) could be exceeded (Figure 1, Operations Outlook Table 2a). However, members of the SaMT agree the likelihood of exceeding the next annual loss threshold and loss occurring in the next week is unlikely to lead to exceedance of the threshold.

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 don't believe precipitation events will 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

- The entrainment tool estimates a median loss of 0 fish and a maximum loss of 4 fish during this week (SacPAS last updated on 2/21/2022, Table 5, Figure 2).
- Genetic information from salvaged Chinook salmon results collected at Tracy Fish Collection Facility and Skinner through 1/12/2022. All the samples that were classified, by LAD method, as winter-run Chinook salmon were genetically identified as fall-run Chinook salmon with the exception of one. That fish was genetically identified as a spring-run Chinook salmon but with low probability (0.549). For results refer to Attachment C.
- This week, due to a Federal holiday, DSM2 model runs were not conducted prior to the SaMT meeting.
- For preliminary results of acoustically tagged salmonids currently in the system see Table 6.

Spring-run Chinook salmon

Current Distribution

- On 2/22/2022, SaMT estimated 60-78% of young of year CV spring-run Chinook salmon were present in the Delta (Table 1).
- Spring-run chinook are being observed at monitoring sites (Lower Sacramento, Feather River, and Tisdale).

Historical Trends

- Based on historical trends in salvage, 0.5% 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.

Forecasted Distribution within Central Valley and Delta regions

- On 2/22/2022 SaMT noted that some juvenile CV YOY spring-run Chinook Salmon have yet to emerge. Yearling CV spring run Chinook Salmon are moving 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 4).
- This week, due to a Federal holiday, DSM2 model runs were not conducted prior to the SaMT meeting.
- For preliminary results of acoustically tagged salmonids in the system see Table 6.

Central Valley Steelhead

Current Distribution

- On 2/22/2022 SaMT estimated 28-42% of juvenile CCV steelhead were present in the Delta (Table 1).
- Combined total loss of hatchery steelhead equals 191.86 fish as of 2/20/2022.
- Combined total loss of natural steelhead between December 1 and March 31 equals 59.80 fish as of 2/20/2022.

Historical Trends

- Based on historical trends in salvage, 32.4% (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.

Forecasted Distribution within Central Valley and Delta regions

- Natural steelhead were not observed in key monitoring locations this past week.
- SaMT estimated that 28-42% of the population of CCV steelhead may be present in the Delta at this time. Given large numbers of wild steelhead observed at Chipps Island, SaMT estimated 10-15% exited the Delta. 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.
- The entrainment tool estimates a median loss of 0 fish and a maximum loss of 17 fish during this week (SacPAS last updated on 2/21/2022, Table 5, Figure 2).
- This week, due to a Federal holiday, DSM2 model runs were not conducted prior to the SaMT meeting.

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	5-20%	77-88%	3-7%
YOY spring-run Chinook salmon	22-40%	60-78%	0%

Location	Yet to Enter Delta	In the Delta	Exited Delta past Chipps Island
YOY hatchery winter-run Chinook salmon*	100%	0%	0%
Natural origin steelhead	43-62%	28-42%	10-15%

Table 2. Historic migration and salvage patterns.

Date (2/20)	Red Bluff Diversion Dam	Tisdale RST	Knights Landing RST	Sac Trawl (Sherwood) Catch Index	Chipps Island Trawl Catch Index	Salvage
Chinook, Winter-run, Unclipped	98.8% (97.9%,99.6%) BY: 2012 - 2020	88.0% (68.7%,107.4%) BY: 2012 - 2020	90.5% (75.5%,105.6%) BY: 2013 - 2020	55.3% (28.8%,81.8%) BY: 2012 - 2020	9.7% (-1.5%,20.9%) BY: 2012 - 2020	33.7% (9.6%,57.8%)
Chinook, Spring-run, Unclipped	18.8% (5.7%,32.0%) BY: 2012 - 2020	29.0% (-0.3%,58.4%) BY: 2012 - 2020	28.1% (-1.8%,58.0%) BY: 2013 - 2020	9.0% (-2.6%,20.5%) BY: 2012 - 2020	0.0% (-0.0%,0.1%) BY: 2012 - 2020	0.5% (-0.6%,1.7%)
Steelhead, Unclipped (December - March)	N/A	N/A	N/A	N/A	N/A	32.4% (9.6%,55.2%)

Table 3. STARS model output.

Date (2/20/2022)	DCC	Georgiana Slough	Sacramento River	Sutter and Steamboat
Proportion of Entrainment	0	0.28	0.46	0.27
Survival	N/A	0.19	0.53	0.41
Travel Time	N/A	17.2d	10.4d	10.9d

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 flow (MLM)	MLM Change	MLM Alert	Deer Creek flow (DCV)	DCV Change	DCV Alert	Wilkins Slough flow (WLK)	Knights Landing temperature (°F)	Alert Triggered
2/20/2022	218.5	2.7%	Flow>95 cfs	184.8	1.0%	Flow>95cfs	4942.4	N/A	N/A
2/19/2022	212.8	2.6%	Flow>95 cfs	183.0	-0.7%	Flow>95cfs	5090.6	N/A	N/A
2/18/2022	207.5	-2.2%	Flow>95 cfs	184.3	-4.0%	Flow>95cfs	5191.6	43.2	N/A
2/17/2022	212.2	-5.2%	Flow>95 cfs	191.9	-4.8%	Flow>95cfs	5306.1	43.3	N/A
2/16/2022	223.9	-8.7%	Flow>95 cfs	201.6	-5.5%	Flow>95cfs	5326.0	43.8	N/A
2/15/2022	245.2	-1.7%	Flow>95 cfs	213.3	1.0%	Flow>95cfs	5265.0	44.5	N/A
2/14/2022	249.5	2.7%	Flow>95 cfs	211.2	0.7%	Flow>95cfs	5263.5	44.8	N/A

Table 5. a) WY 2022 loss and salvage predictor data: Predicted weekly loss of winter-run Chinook salmon and steelhead at CVP and SWP facilities. b) Environmental details, current and forecast.

Week	20	21
a)	Model	N/A
Steelhead median	0	0
Steelhead high	17	20
Winter-run Chinook median	0	0
Winter-run Chinook high	4	41
b)	Data	Forecast
Temperature (Mallard Island, C)	11.5	12.0
Precipitation (5-d running sum, inches)	0.00	0.00
Old + Middle river flows (cfs)	-1,794	-1,794
Sacramento River flow (Freeport, cfs)	12,614	12,614
DCC Gates	Open	Closed
San Joaquin River flow (Vernalis, cfs)	1,368	1,368
Export	2,378	2,378

Table 6. Preliminary survival (Φ) results for acoustically tagged salmonids.

Project	Group (n)	Release Date(s)	Release Location	Min. Φ to Tower Bridge	Min. Φ to Benicia Bridge (East Span)	Min. through-Delta Φ (Sac to Benicia)	Notes
Hatchery-origin Chinook salmon: Seasonal Survival Study	Week 1 (200)	12/15/2021 – 12/16/2021	RBDD	75% (SE = 3.1)	17.1% (SE = 2.7)	22.9% (SE = 3.5)	Fish detected at Old River receiver
Hatchery-origin Chinook salmon: Seasonal Survival Study	Week 2 (200)	2/2/2022 – 2/3/2022	RBDD	0%	0%	0%	
Hatchery-origin winter-run Chinook salmon	Week 1 (139)	2/9/2022	Caldwell Park, Redding	No Detections Yet	No Detections Yet	No Detections Yet	73% of fish detected at Salt Creek receiver (2/21/22) & 12% detected at Butte Bridge

Table updated 2/21/2022. Additional information for all projects can be found online at <https://oceanview.pfeg.noaa.gov/CalFishTrack/>

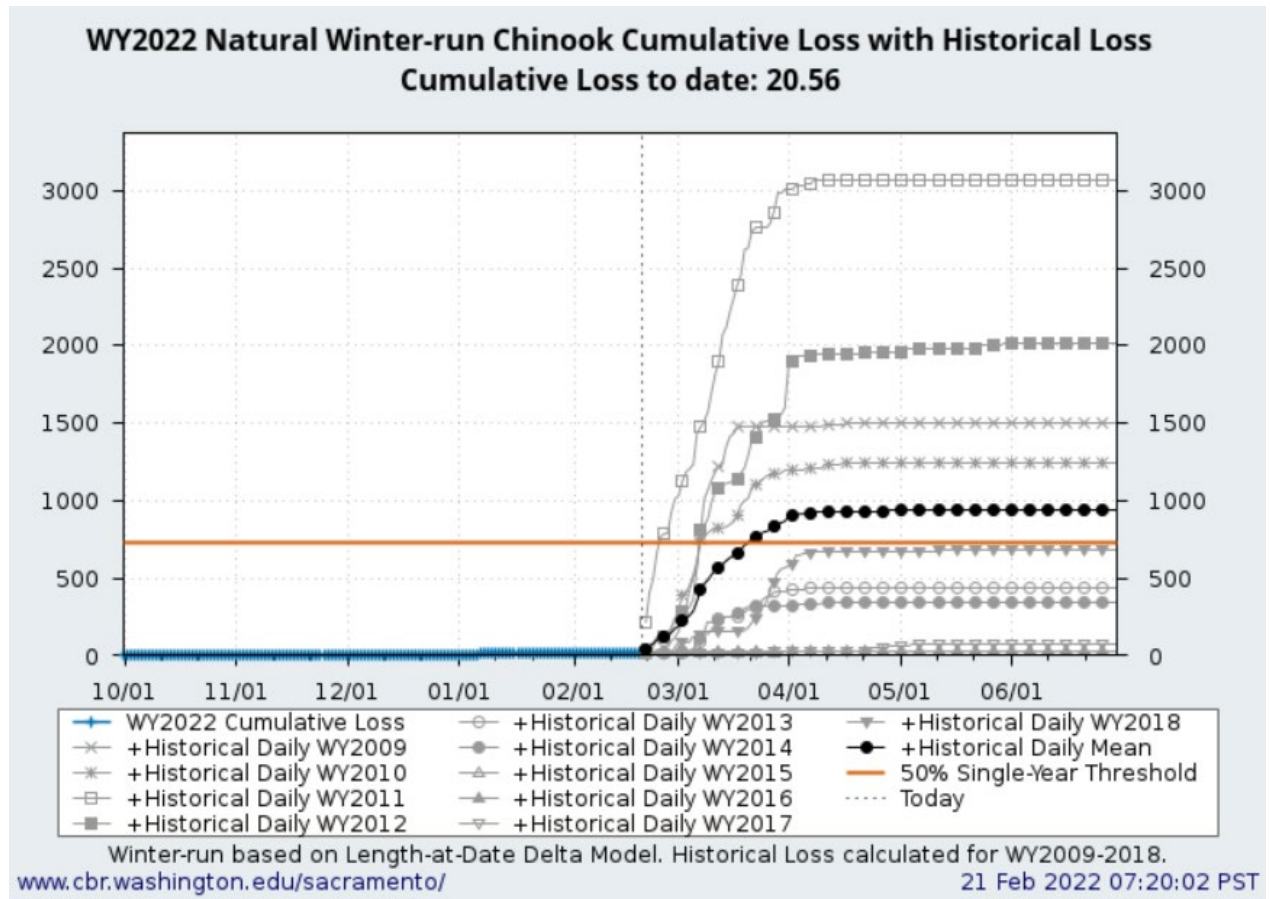


FIGURE 1. WY 2022 cumulative natural winter-run Chinook salmon loss (blue) and 2009 – 2018 historic cumulative loss (gray, different symbols). Historic daily mean plotted in black circles.

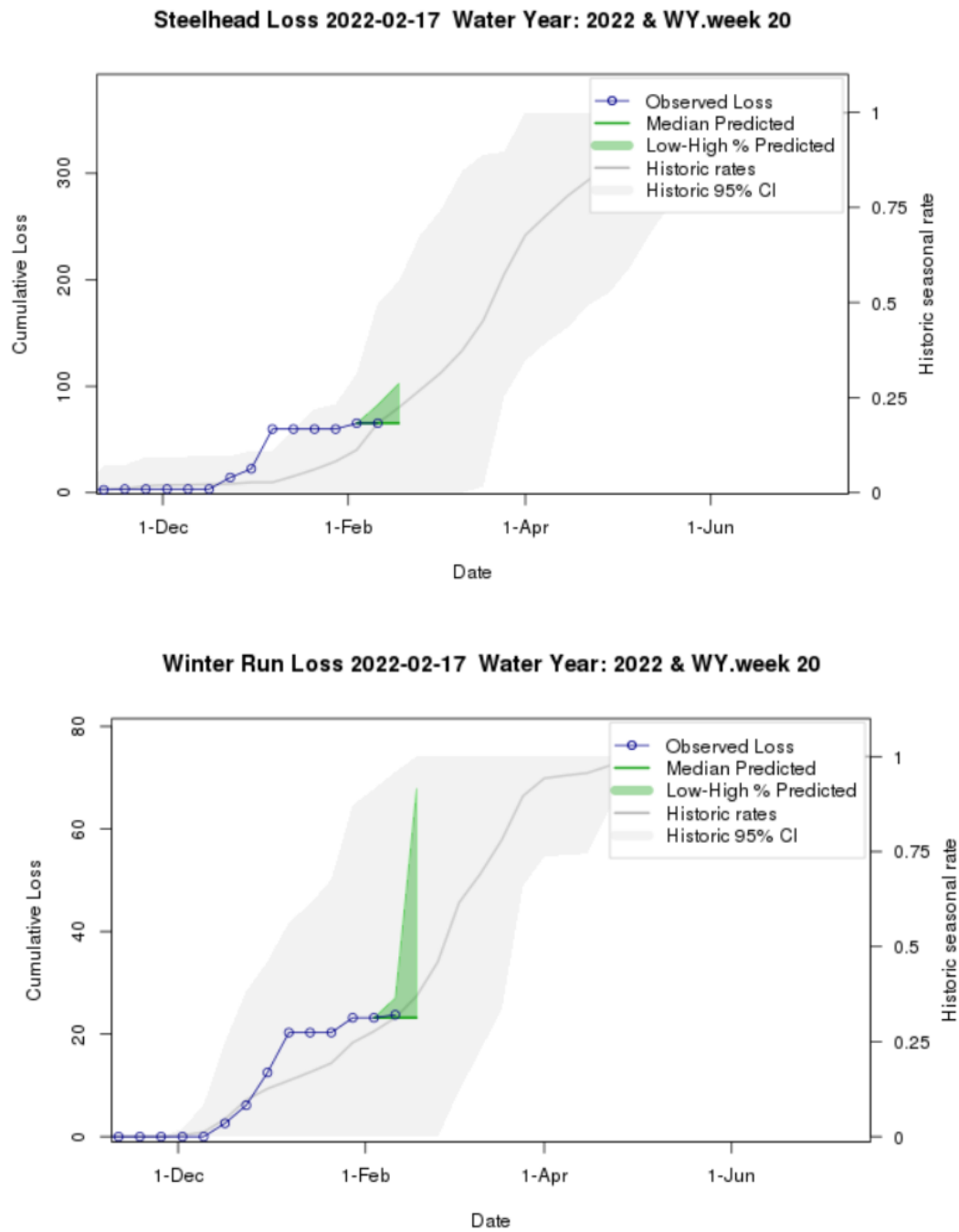


FIGURE 2. Predicted weekly loss of steelhead and winter-run Chinook salmon at the CVP and SWP facilities

EVALUATION

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

Greater than 5% of juvenile winter-run Chinook salmon, CCV steelhead, and young of year spring-run Chinook salmon are 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.

OMR flow is expected to remain at or more positive than -5,000 cfs this upcoming week.

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

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 20.56 fish (as of 2/20/2022). Loss of juvenile winter-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 believe that loss occurring in the next week is unlikely to lead to exceedance of the 50% single-year loss threshold.

Total hatchery winter-run Chinook salmon loss is 0 fish (as of 2/20/2022). Loss of hatchery winter-run Chinook salmon has not 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 believe that loss is unlikely to occur in the next week and is unlikely to lead to exceedance of the 50% loss threshold.

Spring-run Chinook salmon

Total juvenile spring-run Chinook salmon (LAD) loss is 0 fish (as of 2/20/2022). Loss of juvenile spring-run Chinook salmon has not 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 59.80 fish (as of 2/20/2022). Loss of natural juvenile has not occurred in the past week at the CVP and SWP fish salvage facilities. Total clipped steelhead loss is 191.86 fish (as of 2/20/2022). 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.

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.

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

OMR flows are not expected to be more negative than -5,000 cfs during the next week.

Biology Distribution and Evaluation of Green Sturgeon

POPULATION STATUS

Delta Life Stages:

- Adults and Juveniles

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

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. ARIS surveys confirmed adult sturgeon present in the Feather River.
- 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. The remains of a juvenile/young adult green sturgeon were collected at CVP on 1/6/22; however, this does not count towards green sturgeon salvage totals.

Historical Trends

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

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 2/20/2022). The agencies in the SaMT assessed the likelihood of salvage occurring in the next week is unlikely to occur.

Biology, Distribution, and Evaluation of Delta Smelt POPULATION STATUS

Delta Smelt Life Stages:

Subadults and Adults

Brood Year 2021:

Abundance estimate:

The All Strata abundance estimate for Delta Smelt was 2,496 for data collected between 2/14-18/2022. The most recent detection of Delta Smelt was on 2/18/2022 (5 individuals, marked, SKT) caught in the Suisun Marsh Stratum.

Biological Conditions:

Adult Delta Smelt are expected to be present in the Sacramento Deep Water Ship Channel, the Lower Sacramento, Suisun Marsh, South Delta, and Lower San Joaquin River based on the survey detections. Delta Smelt are expected to have migrated in response to increases in turbidity and flow from “first flush” conditions (Sommer et al 2011). Delta water temperatures have reached the range in which Delta Smelt spawning may be occurring (Damon et al 2016). As the season progresses the likelihood Delta Smelt are spawning increases despite larvae not being observed by monitoring surveys. The Smelt Monitoring Team discussed the most recent monitoring data (Table 4) and considered professional opinion on the historical trends in regional distribution.

DISTRIBUTION

Current Distribution

- Real time detection data is currently limited to EDSM sampling, Chipps Island, Bay Study, LEPS, SKT, and SLS. Since there are only a few 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 2/18/2022 in the Suisun Marsh stratum.
- Larval sampling at the Skinner Fish Facility (SFF) and the Tracy Fish Collection Facility (TFCF) began on 2/7/2021.

TABLE 7. Summary of recently reported detections of Delta Smelt by Region and Salvage Facilities between 2/15/2022 and 2/22/2022. 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. 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	6	0	0
Subadult	0	0	0	0	0
Larvae/Juvenile	0	0	0	0	0

Table 8. 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 may include preliminary data that may not have received full QA/QC, but any corrections will be made the following week.

Sampling Method	Frequency	New Detections	WY2022	Notes
EDSM	Weekly	0	25	Phase 1 began 11/29/2021
SKT	Monthly	5	5	Ongoing Ends: 2/22/2022
SLS	Biweekly	0	0	Survey 2: Complete Survey 3: Processing
20-mm	Biweekly	0	0	Begins: 3/21/2022
Summer Townet	Biweekly	0	0	Complete
Bay Study	Monthly	0	0	Ongoing
FMWT	Monthly	0	0	Complete
Chipps Island Trawl	Weekly	1	2	Ongoing
FCCL Brood Stock Collections	Weekly	0	1	Ongoing
LEPS	As available	0	0	Ongoing
TFCF	Daily	0	1	Ongoing

Sampling Method	Frequency	New Detections	WY2022	Notes
Total	N/A	N/A	34	Sum of all Delta Smelt observed during the OMR Management Season

Cultured Delta Smelt Experimental Releases

- On 12/14/2021-12/15/2021, the Experimental Release Technical Team trucked approximately ~12800 brood year 2021 Delta Smelt from the FCCL to Sacramento River at Rio Vista for release into the Delta. This release will include ~89% Adipose fin clipped individuals and ~11% Visible Implant Elastomer (VIE) tagged individuals.
- On 01/11/2022-01/12/2022, the Experimental Release Technical Team will truck approximately ~12,800 brood year 2021 Delta Smelt from the FCCL to Sacramento River at Rio Vista for release into the Delta. This release will include ~97% adipose fin clipped individuals and ~3% Visible Implant Elastomer tagged individuals.
- On 2/3/2022, the Experimental Release Technical Team trucked approximately ~6,400 brood year 2021 Delta Smelt from the FCCL to the Sacramento Deepwater Ship Channel for release into the Delta. This release will include ~56% adipose fin clipped individuals and ~44% Visible Implant Elastomer (VIE) tagged individuals.
- On 2/9/2022 – 2/10/2022, the Experimental Release Technical Team trucked approximately ~12,800 brood year 2021 Delta Smelt from the FCCL to the Suisun Marsh for release into Montezuma Slough at Belden’s Landing. This release will include ~99.5% adipose fin clipped individuals and ~0.5% Visible Implant Elastomer (VIE) tagged individuals.
- On 02/16/2022-02/17/2022, the Experimental Release Technical Team will truck approximately ~10933 brood year 2021 Delta Smelt from the FCCL to Sacramento Deepwater Ship Channel near channel marker 53 for release into the Delta. This release will include ~100% Adipose fin clipped individuals and ~0% Visible Implant Elastomer tagged individuals.
- Genetic analysis was completed on the two potentially wild Delta Smelt and they were determined to be of hatchery origin with poor quality fin clips. A third smelt collect by the FCCL was identified as a hybrid and additional analysis is being run to determine parentage.

Table 9. 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	Total Caught	Ad. Clipped	VIE	No Tag
2/17/2022	Chipps Island	Suisun Bay	1	1	0	0
2/18/2022	SKT #2	Suisun Marsh	5	5	0	0

Historical Trends

- Wild 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).
- Historically, the highest peak in salvage is in May and the second highest is in June (Grimaldo et al 2009; figure 5).

Forecasted Distribution within Central Valley and Delta regions

- Predicting the distribution of adult wild 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.
- 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.
- Given water temperatures are conducive to spawning, increasing turbidity and spring tides may influence the distribution of adults.
- 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.

ABIOTIC CONDITIONS

Turbidity

- As of 2/22/2022 turbidity continues to be less than 12 FNU at Old River at Bacon Island (OBI) (See attachment B).
- Integrated Early Winter Pulse Protection ended on 1/2/2021.

- Precipitation is not expected in the next seven days.
- Three Station Daily Average water temperature on 2/22/2021 was 12.00° C. This temperature is within the range of Delta Smelt spawning; 9-18 ° C (Damon et al 2016). Expression of gametes was observed (2/10/2022) in DWR Delta Smelt Enclosure Study sampling from the 2/8/2022 deployment. The females collected in Suisun Marsh by SKT 2 were categorized as pre-spawn after dissection.

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

Date Reported	OBI Daily Turbidity (FNU)
2/22/2022	3.73

X2 Conditions

- X2 is estimated to be at 79 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.

Other Environmental Conditions

- The Fish and Water Operation Outlook OMR Index values are expected to range between -500 to -2,000 cfs from 2/23/2022 to 3/2/2022.
- 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 exceeded the triggers for Integrated Early Winter Pulse Protection on 12/17/2021 (running 3-day averages: 27,152 cfs and 67 FNU). The CVP and SWP reduced exports from 12/20/2021 until 1/2/2022.

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 recent detection data, Delta Smelt are unlikely to be prevalent in the South Delta. Delta Smelt are expected to have made their migration in response to first flush and temperatures are conducive to spawning. The OMR index will continue to be more positive than possible under a turbidity bridge avoidance action.

3. Has a spent female been collected?

No spent female has been caught by SKT as of 2/22/2022. Two pre-spawn females were observed in SKT 2.

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

OBI turbidity is currently below 12 FNU. However, a turbidity bridge avoidance action is not possible since the OMR Index range is equal to or less negative than -2000 cfs.

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 2/21/2022 at Prisoners Point (4.74 NTU), Holland Cut (7.39 FNU) and Victoria Canal (3.35 NTU) and are expected to remain stable over the next seven days.

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

The turbidity at OBI is below 12 FNU, and a turbidity bridge avoidance action is not possible in the next 7 days due to the OMR index being equal to or less negative than -2,000 cfs.

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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- 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).
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- 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).

Attachment B: Delta Turbidity Report

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

Delta Turbidity Conditions Report

For conditions through: February 16, 2022

General Conditions:

Inflows:

Freeport	12754 cfs
Yolo Bypass	48 cfs
Vernalis	1172 cfs
Cosumnes	389 cfs
Mokelumne	184 cfs
Calaveras	64 cfs

Exports:

Clifton Court	592 cfs
Jones	1694 cfs

Other:

OMR (Index)	-1634 cfs
QWEST	1535 cfs
NDOI	11874 cfs

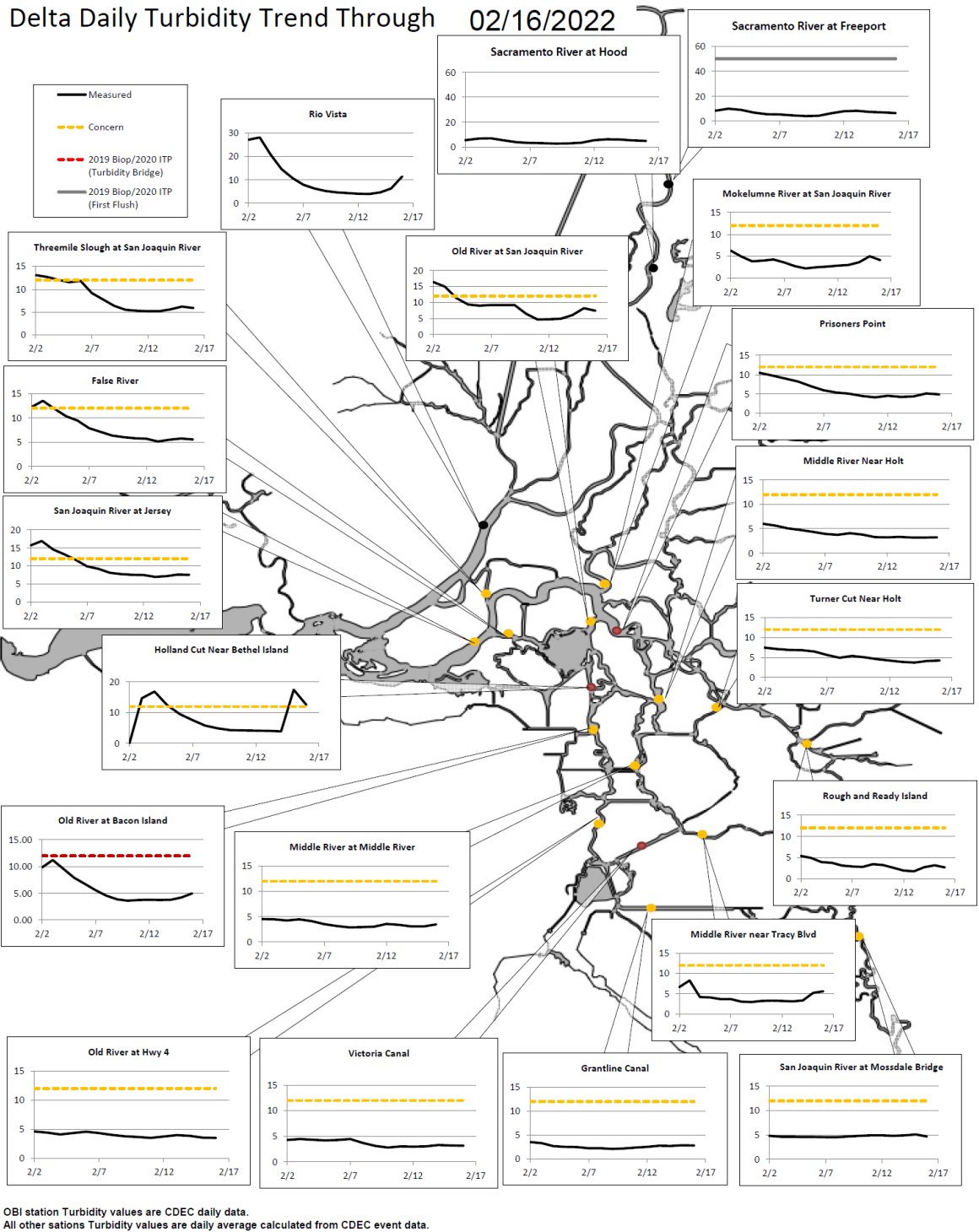


Figure 2. Delta Daily Turbidity Trends Through 02/16/2022

Attachment C:

Genetic information from salvaged Chinook salmon results collected at Tracy Fish Collection Facility and Skinner through 1/12/2022. Underlined text in column headers (“CV ...”) represents aggregate of probability over four Chinook salmon runs for each sample.

Sample Date	FL*	JD **	ots28	Sex	Assignment	Pos Prob 1	Group	Pos Prob2	CV fall	CV late-fall	CV spring	CV winter	Model	Facility
12/9/2021 14:00	233	162	late	M	Non-winter	1.000	Fall	1.000	1.000	0.000	0.000	0.000	Fall	CVP
12/19/2021 12:00	132	172	Late	F	Non-winter	1.000	Fall	1.000	1.000	0.000	0.000	0.000	Winter	CVP
12/24/2021 7:00	153	177	late	F	Non-winter	1.000	Fall	1.000	1.000	0.000	0.000	0.000	Late Fall	CVP
12/25/2021 12:00	158	178	late	M	Non-winter	1.000	Fall	1.000	1.000	0.000	0.000	0.000	Late Fall	CVP
12/25/2021 12:00	163	178	late	M	Non-winter	1.000	Fall	1.000	1.000	0.000	0.000	0.000	Late Fall	CVP
12/25/2021 12:00	130	178	late	M	Non-winter	1.000	Fall	1.000	1.000	0.000	0.000	0.000	Winter	CVP
12/27/2021 6:00	180	180	late	F	Non-winter	1.000	Fall	1.000	1.000	0.000	0.000	0.000	Late Fall	CVP
12/30/2021 14:00	185	183	late	F	Non-winter	1.000	Fall	1.000	1.000	0.000	0.000	0.000	Late Fall	SWP
12/31/2021 22:00	128	184	late	F	Non-winter	1.000	Fall	1.000	1.000	0.000	0.000	0.000	Winter	CVP
1/1/2022 6:00	174	185	late	M	Non-winter	1.000	Fall	1.000	1.000	0.000	0.000	0.000	Late Fall	CVP
1/7/2022 16:00	123	191	late	F	Non-winter	1.000	Fall	1.000	1.000	0.000	0.000	0.000	Winter	CVP

Proposed Action Assessment
 2/22/2022

Sample Date	FL*	JD **	ots28	Sex	Assignment	Pos Prob 1	Group	Pos Prob2	CV fall	CV late-fall	CV spring	CV winter	Model	Facility
1/7/2022 22:00	130	191	late	F	Non-winter	1.000	Spring	0.549	0.451	0.000	0.549	0.000	Winter	CVP
1/9/2022 18:00	135	193	late	F	Non-winter	1.000	Fall	0.932	0.932	0.000	0.068	0.000	Winter	CVP
1/12/2022 22:00	153	196	late	M	Non-winter	1.000	Fall	0.988	0.988	0.000	0.012	0.000	Winter	CVP

* FL: Fork Length

** JD: Julian Date