

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 February 9 – February 15

b. Winter-run Chinook Salmon summary

No loss of natural winter-run Chinook salmon (LAD) has occurred in the past week at the State or Federal fish salvage facilities (Facilities) (Figure 1, Figure 2). Loss of natural winter-run Chinook salmon at the Facilities is likely to occur over the next week. 60-85% of juvenile natural winter-run Chinook salmon from brood year (BY) 2020 are estimated to be present in the Delta. This percentage is likely to increase due to precipitation inflows, behavioral cues from other runs and maturation stage. Acoustic tagged hatchery winter-run Chinook salmon detected at Tower Bridge and Georgianna Slough.

c. Spring-run Chinook salmon summary

No loss of natural Central Valley (CV) YOY spring-run Chinook salmon has occurred in the past week at the Facilities. Loss of young of year Central Valley spring-run Chinook salmon at the Facilities is unlikely to occur over the next week. 35-45% of spring-run Chinook salmon are estimated to be in the Delta. This percentage is likely to increase due to precipitation inflows, behavioral cues from other runs and maturation stage.

c. Central Valley Steelhead summary

No loss of natural California CV (CCV) steelhead occurred last week at the Facilities (Figure 3, Figure 4). Loss of CCV steelhead at the Facilities may occur over the next week. 25-40% of juvenile CCV Steelhead are estimated to be present in the Delta. An estimated 0-5% have exited the Delta. This percentage is likely to increase due to precipitation inflows and maturation stage.

d. Green Sturgeon summary

Loss of green sturgeon at the Facilities is unlikely to occur over the next week due to their rare presence in the South Delta. Anticipated inflows are likely to influence emigration of juveniles from the tributaries.

e. Delta Smelt summary

Based on distribution patterns over the past decade and recent detections, Delta Smelt are unlikely to be prevalent in the South Delta. Limited detection data support Delta Smelt being present in Suisun Marsh, west of the Sacramento-San Joaquin confluence, and in the Sacramento Deep Water Ship Channel. The distribution of Delta Smelt is expected to extend upstream of the confluence which is supported by historical Spring Kodiak Trawl data analysis. The amount of precipitation this week and in-stream flow conditions may influence turbidity at OBI, but it is unlikely to reach 12 FNU in the next 7 days. The likelihood of Delta Smelt adult entrainment is slightly elevated relative to the previous seven days due seasonal timing. The more negative limits of the OMR Index create a greater probability of entrainment. However, the overall probability of Delta Smelt moving into the south Delta is low.

f. 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.

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

POPULATION STATUS

Winter-run Chinook salmon

- **Delta Life Stages:**
 - Juveniles, Adults
- **Brood Year 2020 Productivity:**
 - Natural winter-run Chinook salmon: The finalized estimate from the winter-run JPE PWT for total natural production entering the Delta (JPE) is 330,130 winter-run Chinook salmon individuals. Estimated winter-run Chinook salmon passage at Red Bluff Diversion dam (RBDD) is greater than recent years (BY 2014 – 2018) with the exception of BY 2019. By 1/28/2021, 1,985,860 winter-run Chinook salmon were estimated to have passed RBDD compared to a cumulative passage of 3,799,460 winter-run Chinook salmon RBDD on 1/28/2020.
 - Last two weeks of observations at the Tisdale and Knights Landing RSTs (1/26 -2/7/2021) have shown a substantial jump in the numbers of natural winter-run captured by the traps.
 - Hatchery winter-run Chinook salmon: Approximately 302,166 juvenile winter-run Chinook salmon were released from Livingston Stone NFH at Caldwell Park on 1/30/2021. The final estimate for the hatchery JPE released into the Sacramento River from Livingston Stone NFH is 97,888 fish.
 - The JPE for BY 2020 hatchery origin winter-run Chinook salmon juveniles released from Livingston Stone NFH into Battle Creek is 37,232 fish.

Spring-run Chinook salmon

- **Delta Life Stages:**
 - Young-of-year (YOY) and Yearlings
- **Brood Year 2020 Productivity:**
 - Natural spring-run Chinook salmon: No JPE has been established for spring-run Chinook salmon. Approximately 22.3% of the juvenile spring-run sized Chinook salmon population for BY 20 is expected to have passed passing Red Bluff Diversion dam as of 2/7 (see Ops Outlook) based on historical data.
 - Hatchery spring-run Chinook salmon surrogates: First hatchery releases of yearling spring-run Chinook salmon surrogates from Coleman NFH facility occurred on 1/8/2021, second hatchery releases occurred on 1/22/2021, third hatchery releases occurred on 1/29/2021.
 - First hatchery releases of yearling spring-run Chinook salmon from the SCARF facility occurred on 12/3/2020, a second hatchery releases of BY 2020 fish occurred on 1/26/2021.
 - 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 2020. 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. The Feather River Fish Hatchery experienced issues with infertile males. It is expected that the Feather River Hatchery will only meet about half of their production goals. On the Feather River, a larger than historical number of spring-run adults that entered the

system and were tagged appear to be spawning in-river instead of returning to the hatchery. This is one reason that low returns were being observed at the hatcheries in 2020.

Central Valley Steelhead

- **Delta Life Stages:**
 - Spawning Adults, Kelts, Juveniles
- **Brood Year 2020 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 415,000 steelhead from Coleman NFH were released at Red Bluff in the first half of December, part of the CCV Steelhead DPS.
 - Approximately 216,500 steelhead from Coleman NFH were released into the Sacramento River from 12/28/2020-12/29/2020, which are part of the CCV Steelhead DPS.
 - Starting 2/8/2021 through 2/12/2021 approximately 220,500 steelhead from Feather River Hatchery will be released into the Feather River at Boyd's Pump.
 - Starting 2/10/2021 through 2/12/2021, approximately 440,500 hatchery steelhead will be released from the Nimbus Fish Hatchery into the American River at Sunrise.
 - 12 hatchery steelhead have been observed in salvage at the Tracy Facilities in the past week.

DISTRIBUTION

Winter-run Chinook Salmon

- **Current Distribution:**
 - On 2/9/2021, SaMT estimated 60-85% of juvenile winter-run Chinook salmon were present in the Delta (Table 1). In October through December 2020, the GCID RSTs observed 967 winter-run Chinook salmon juveniles (by length at date criteria) in their daily catches. In January (through 1/25/2021), the GCID RSTs have observed 36~~000~~. GCID RST was lowered on 2/6/2021 and observed 2 natural winter-run Chinook salmon juveniles and 2 marked winter-run Chinook salmon (2/6/2021 – 2/7/2021). Winter-run Chinook salmon have been observed in RST monitoring locations farther downstream (24 at Tisdale 2/1/2021 – 2/7/2021 at Knights Landing~~000~~; 2/1/2021 – 2/7/2021). 65 marked winter-run Chinook salmon were observed at Tisdale this past week. 9 marked winter-run Chinook salmon observed at Knights Landing this past week. Over 50% of current water year's observations have occurred in last two weeks at Tisdale and Knights Landing RSTs.
 - Hatchery winter-run sized fish are being detected in downstream monitoring locations (Tisdale and Knights Landing) acoustic tagged hatchery winter-run Chinook salmon have been detected as far downstream as the Tower Bridge in Sacramento.
 - No winter-run sized Chinook salmon have been observed in the Sacramento trawl or Chipps Island trawl this past week.
 - Mean daily flow and percent change (Wilkins Slough (WLK), Deer Creek (DCV), Mill Creek (MLM); cfs from CDEC) and temperature and percent change (Knights Landing RST (KL); °F from RST) are monitored as alerts for juvenile salmonid migration (Table 2).
- **Historic Trends**
 - Based on historical trends in salvage, 31.5% of winter-run Chinook salmon should have been observed in salvage by this time of the water year (Table 3). If historic trends in salvage were to

continue winter-run Chinook salmon loss is expected to remain the same over the next week (Figure 1, Figure 2). Approximately 302,166 juvenile winter-run Chinook salmon were released from Livingston Stone NFH at Caldwell Park on 1/30/2021

- **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 increase with precipitation events and increasing river flows and turbidity. Significant precipitation is anticipated to occur this week (see Ops Outlook) and given the seasonal timing (late-January / early-February) any precipitation during a very dry period may stimulate fish movement. Furthermore, based on the time of year, and the maturation of juvenile fish, downstream migration is expected to continue even without any substantial precipitation events occurring. 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 12/1/20 and are expected to remain closed through mid-May 2021.
 - The entrainment tool estimates a median loss of 0 fish and a maximum loss of 7 fish during this week (SacPAS last updated on 2/3/21).
 - For results of entrainment into Delta strata regions from DSM2 model runs (North Delta into Interior and Central Delta, San Joaquin River and Central Delta into South Delta, and South Delta into fish facilities) refer to Attachment A.

Spring-run Chinook salmon

- **Current Distribution**
 - On 2/9/2021 SaMT estimated 35-45% of juvenile CV spring-run Chinook salmon were present in the Delta (Table 1). Flows at Mill Creek and Deer Creek are indicative that yearling spring-run Chinook salmon may begin to move out of tributaries into the mainstem Sacramento River, yearling spring-run Chinook salmon have also been detected in the Butte Creek monitoring locations. 11 unmarked spring-run Chinook salmon were observed at the Knights Landing RST and 29 at Tisdale RST in the past week. 2 natural spring-run Chinook salmon were observed at the Sacramento Trawls this week.
 - Yearling CV spring run Chinook salmon may be migrating downstream based on increased flows in the Sacramento River tributaries and have been observed at the Butte Creek monitoring locations. Mill Creek and Deer Creek flows are indicative that downstream migration of yearling spring-run Chinook salmon may occur soon.
 - A PIT tagged fish from the yearling SCARF release on 12/3/2020 was observed in salvage at the Tracy Facilities on 2/6/2021. A hatchery Chinook salmon from the 1/26/2021 SCARF release was observed at the Tracy Facilities on 2/5/2021.
- **Historical Trends**
 - Based on historical trends in salvage, 0% of spring-run Chinook salmon should have been observed in salvage by this time of the water year (Table 3). If historic trends in salvage were to continue spring-run Chinook salmon loss is expected to remain the same over the next week. The first, second, and third spring-run surrogate Chinook salmon groups were released into the Sacramento River at Battle Creek on 1/8/2021, 1/22/2021, and 1/29/2021, respectively. No fish from these release groups have been observed in salvage to date (2/7/2021).
- **Forecasted Distribution within Central Valley and Delta regions**
 - Movement of juvenile spring-run Chinook salmon into the lower reaches of the Sacramento River and upper Delta are likely to occur with increased river flows and turbidity due to recent precipitation events (see Weekly Fish and Water Operation Outlook document).

- Movement of juvenile spring-run Chinook salmon from the San Joaquin River basin into the southern Delta is likely to occur with increased precipitation and river flows.
- For results of entrainment into Delta strata regions from DSM2 model runs (North Delta into Interior and Central Delta, San Joaquin River and Central Delta into South Delta, and South Delta into fish facilities) refer to Attachment A.

Central Valley Steelhead

● **Current Distribution**

- On 2/9/2021 SaMT estimated 25-40% of juvenile CCV steelhead were present in the Delta (Table 1).

● **Historical Trends**

- Based on historical trends in salvage, 14.1% 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 expected to increase over the next week.

● **Forecasted Distribution within Central Valley and Delta regions**

- One natural juvenile Central Valley steelhead has been observed near the DCC gates in regional monitoring efforts this week and historical monitoring data detects an average of 13% of the annual population of natural juvenile steelhead in the Delta at this time. 2 hatchery steelhead was observed at Knights Landing this past week and 1 at Tisdale (2/1/2021 – 2/7/2021). SaMT estimated that 25-40% of the population of CCV steelhead may be present in the Delta at this time and 0-5% have exited the Delta past Chipps Island. Closure of the DCC gates would reduce exposure and possible entrainment of juvenile CCV steelhead into the interior Delta via the DCC gates. 14 marked and 1 unmarked steelhead were observed at the Sacramento Trawls. 5 marked steelhead were observed at Chipps Island Trawls. The first natural steelhead in salvage for WY 2021 occurred 1/11/2021 at the CVP (Figure 3, Figure 4). The first marked steelhead in salvage for WY 2021 occurred 1/20/2021 at the CVP.
- Recent precipitation in the Central Valley may stimulate fish movement due to increased inflows.
- The entrainment tool predicts a median loss of 0 fish will occur with a maximum loss of 20 fish (SacPAS last updated on 2/3/21).
- For results of entrainment into Delta strata regions from DSM2 model runs (North Delta into Interior and Central Delta, San Joaquin River and Central Delta into South Delta, and South Delta into fish facilities) refer to Attachment A.

TABLE 1. Distribution estimates

Location	Yet to Enter Delta	In the Delta	Exited the Delta (Past Chipps Island)
Young-of-year (YOY) winter-run Chinook salmon	15-40%	60-85%	0%
YOY spring-run Chinook salmon	55-65%	35-45%	0%
YOY hatchery winter-run Chinook salmon	95%	5%	0%
Natural origin steelhead	60-70%	25-40%	0-5%

TABLE 2. Mean daily flow and percent change (Wilkins Slough (WLK), Deer Creek (DCV), Mill Creek (MLM); cfs from CDEC) and temperature and percent change (Knights Landing RST (KL); °F from RST)

Date	MLM mean daily flow (cfs)	MLM flow % change	MLM Alert	DCV mean daily flow (cfs)	DCV flow % change	DCV Alert	WLK mean daily flow (cfs)	KL water temp (°F)	WLK-KNL: Alert
2/7/2021	147.7	-4.9%	Flow>95cfs	175.1	-6.2%	Flow>95cfs	6873.6		
2/6/2021	155.2	-9.0%	Flow>95cfs	186.7	-12.0%	Flow>95cfs	7838.4		
2/5/2021	170.7	-19.5%	Flow>95cfs	212.1	-21.0%	Flow>95cfs	9639.0		
2/4/2021	212.0	-32.3%	Flow>95cfs	268.5	-34.1%	Flow>95cfs	10234.5		
2/3/2021	313.4	-44.5%	Flow>95cfs	407.4	-40.1%	Flow>95cfs	7190.4	50.7	
2/2/2021	564.5	286.2%	Flow>95cfs Change>50%	680.2	293.9%	Flow>95cfs Change>50%	7066.9		
2/1/2021	147.7	-4.9%	Flow>95cfs	175.1	-6.2%	Flow>95cfs	6873.6		

TABLE 3. Historic migration and salvage patterns.

Date (2/7)	Red Bluff Diversion Dam	Tisdale RST	Knights Landing RST	Sac Trawl (Sherwood) Catch Index	Chipps Island Trawl Catch Index	Salvage
Chinook, Winter-run, Unclipped	98.0% (96.3%,99.7%) BY: 2011 - 2019	84.4% (60.9%,108.0%) BY: 2011 - 2019	85.0% (61.4%,108.6%) BY: 2011 - 2019	42.6% (11.6%,73.6%) BY: 2011 - 2019	5.4% (0.5%,10.3%) BY: 2011 - 2019	31.5% (9.1%,54.0%)
Chinook, Spring-run, Unclipped	22.3% (6.3%,38.2%) BY: 2011 - 2019	35.2% (2.8%,67.5%) BY: 2011 - 2019	24.4% (-2.5%,51.4%) BY: 2011 - 2019	5.5% (-3.1%,14.1%) BY: 2011 - 2019	0.0% (0.0%,0.0%) BY: 2011 - 2019	0.0% (-0.0%,0.0%)
Steelhead, Unclipped (Dec – March)						14.1% (-0.3%,28.5%)

TABLE 4. STARS model output

Date (2/7)	DCC	Georgiana Slough	Sacramento River	Sutter and Steamboat
Proportion of Entrainment	NA	27%	46%	28%
Survival	NA	20%	54%	44%
Travel Time	NA	17.1 d	9.8 d	10.3 d

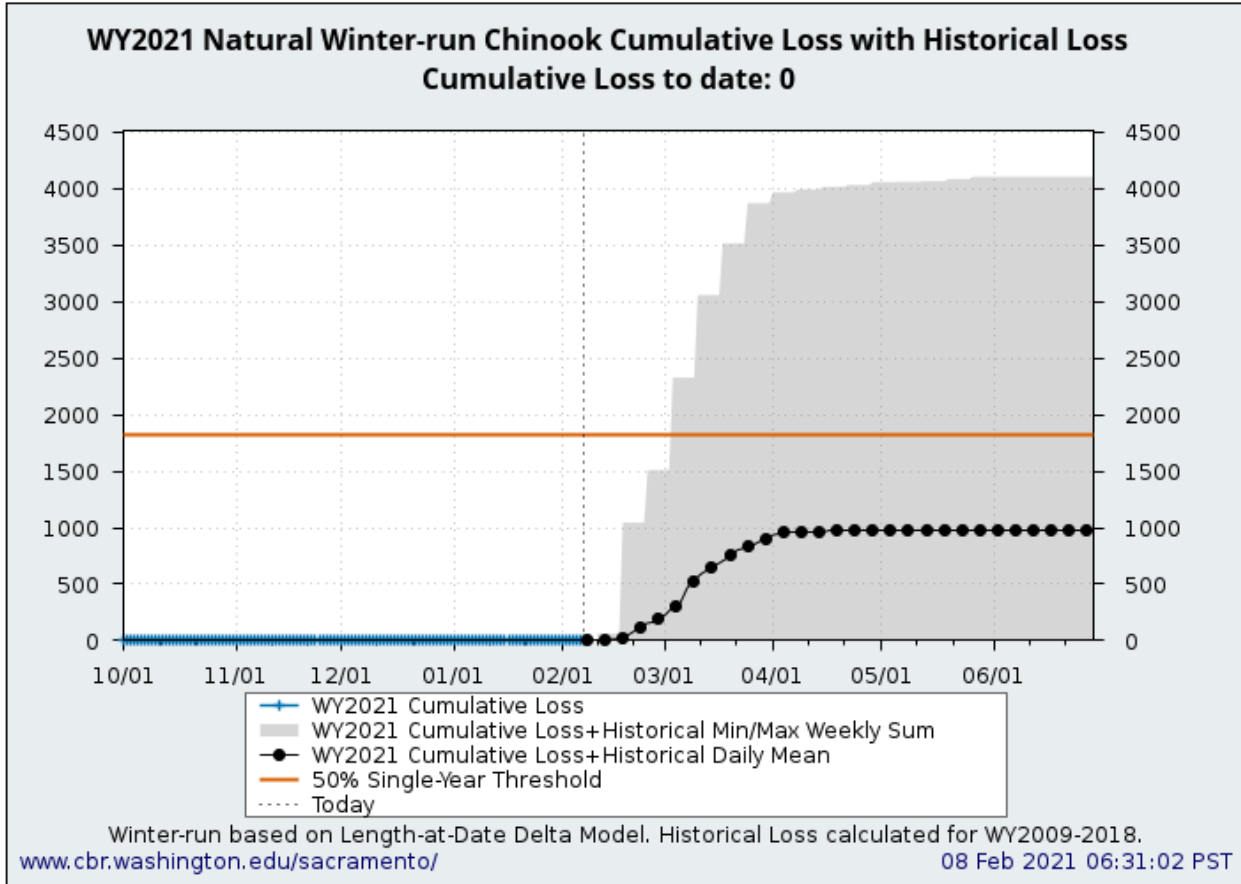


FIGURE 1. WY2021 natural winter-run Chinook salmon cumulative loss values through salvage season. Values depicted are not genetically corrected. No loss has occurred in WY2021. Based on historical cumulative loss values from 2009 – 2018, WY2021 observed loss (and potential future loss) are not likely to exceed the 50% loss threshold this week.

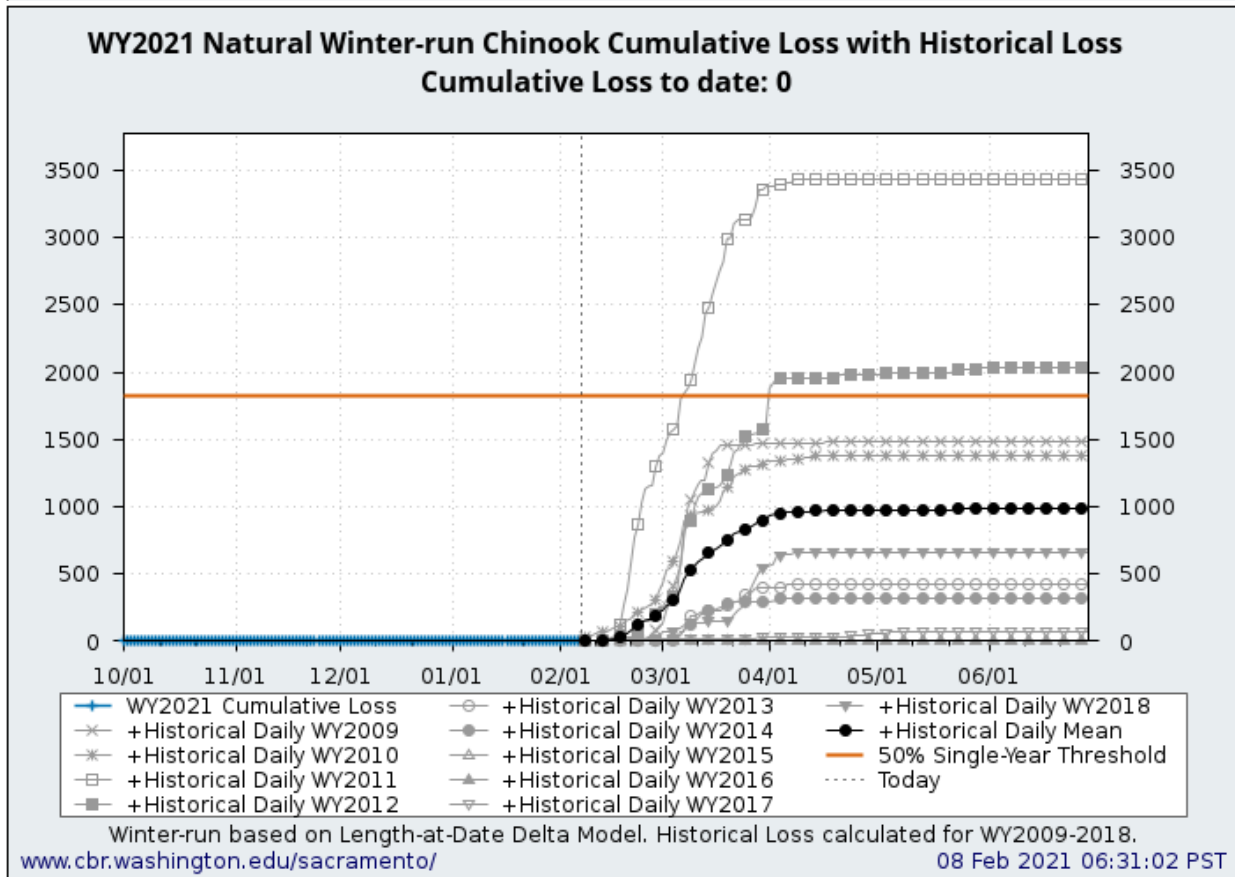


FIGURE 2. Daily natural winter-run Chinook salmon loss accumulates towards single-year loss threshold. Based on historical cumulative loss values from 2009 – 2018, WY2021 observed loss (and potential future loss) are not likely to exceed the 50% loss threshold this week.

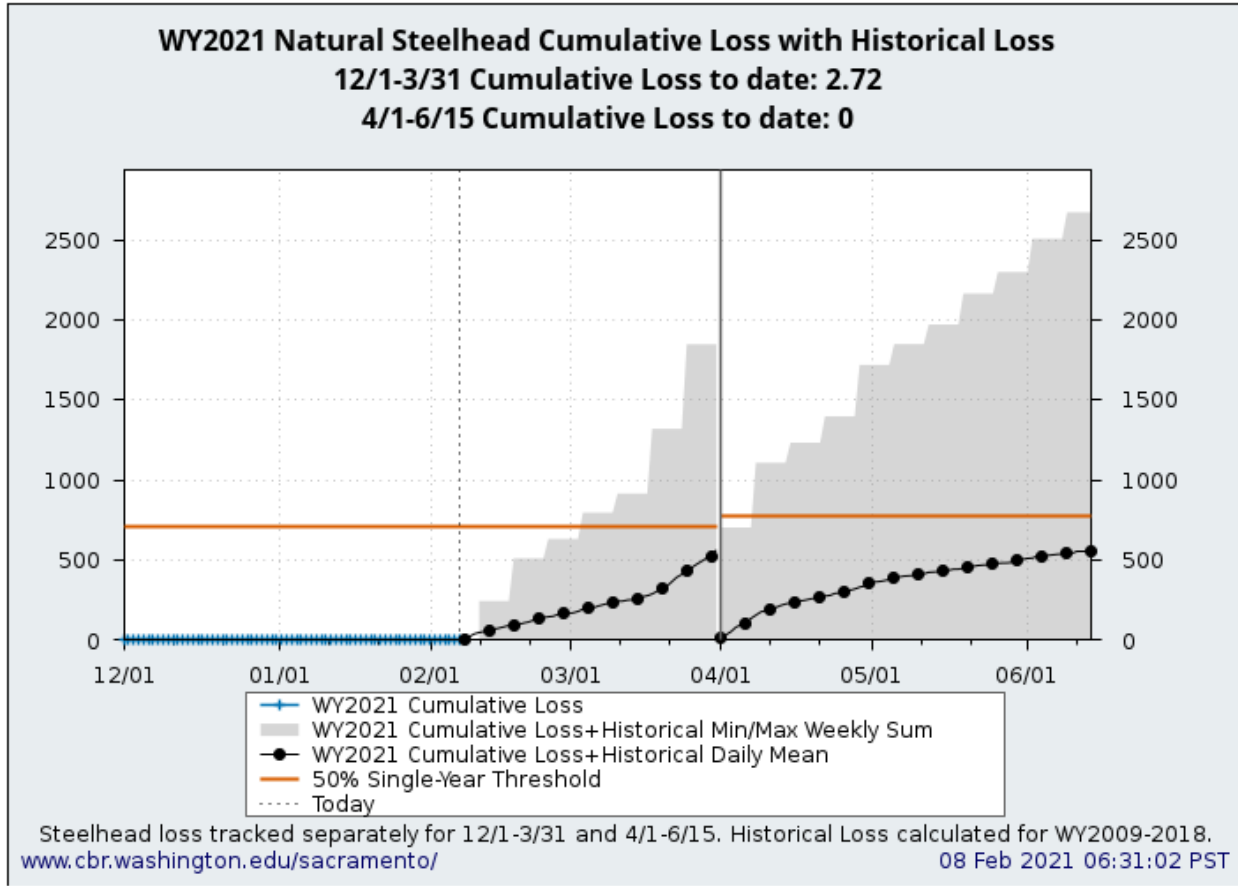


FIGURE 3. WY2021 natural steelhead cumulative loss values through salvage season: December 1 – March 31, April 1 – June 15. Based on historical cumulative loss values from 2009 – 2018, WY2021 observed loss (and potential future loss) are not likely to exceed the 50% loss threshold this week. The first steelhead loss occurred 1/18/2021.

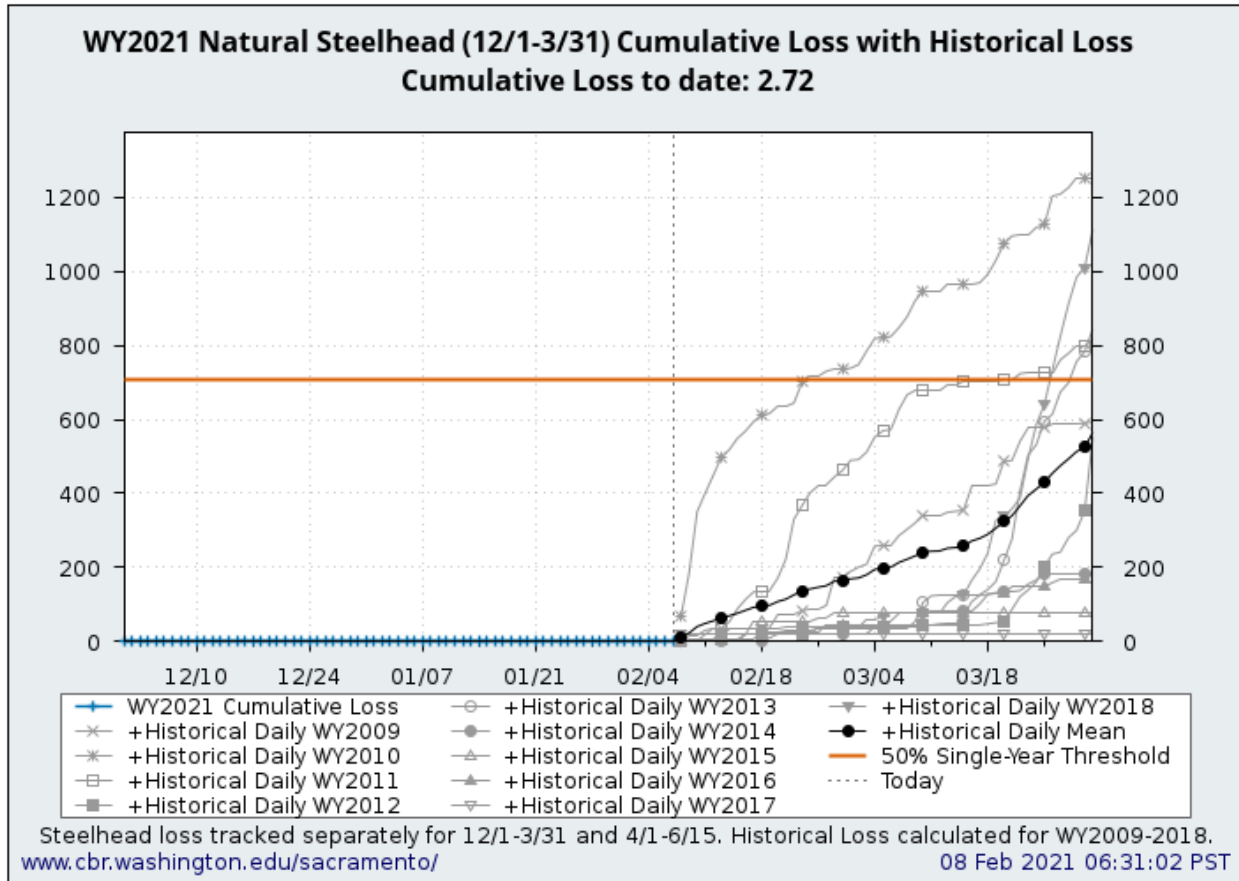


FIGURE 4. Daily natural steelhead loss accumulates towards single-year loss threshold: December 1 – March 31. Based on historical cumulative loss values from 2009 – 2018, WY2021 observed loss (and potential future loss) are not likely to exceed the 50% loss threshold this week.

EVALUATION

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

Yes. Greater than 5% of juvenile winter-run Chinook salmon, spring-run Chinook salmon, and steelhead are present in the Delta.

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

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

It appears that there is an increased risk of salmonids being exposed to export facilities and OMR flow is expected to remain at or below -5,000 cfs this upcoming week. The SaMT anticipates an increased number of salmonids entering the Delta currently due to recent hatchery releases of steelhead, surrogate hatchery yearling spring-run, and hatchery winter-run Chinook salmon over the past 3 weeks and the forecast for precipitation occurring this week. For DSM2 model run results refer to Attachment A.

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

The members of SaMT are not confident in projecting beyond 7 days due to uncertainty regarding weather forecasting. Precipitation is forecasted for this week. Furthermore, if current

trends were to continue then it is anticipated that more fish may appear at export facilities as fish begin to outmigrate based on historical trends.

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?

Reduced exports at the facilities reduces risk of entraining ESA-listed species.

Winter-run Chinook salmon

Total juvenile natural and hatchery winter-run Chinook salmon (LAD) loss is 0 fish (as of 2/7/2021). 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.

Spring-run Chinook salmon

Total juvenile spring-run Chinook salmon (LAD) loss is 0 fish (as of 2/7/2021). 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 exceeding the hatchery spring-run surrogate threshold.

Central Valley Steelhead

Total juvenile natural steelhead loss is 2.72 fish (as of 2/7/2021) for the December 1 through March 31 period. 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 natural or hatchery winter-run Chinook salmon has not been exceeded in WY 2021.

Spring-run Chinook salmon

No threshold for hatchery spring-run Chinook salmon surrogates has been exceeded in WY 2021.

Central Valley Steelhead

The annual loss threshold for steelhead (December 1 – March 31) has not been exceeded in WY 2021.

5. 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 index levels in the upcoming week are not anticipated to be more negative than -5,000 cfs.

Green Sturgeon

POPULATION STATUS

- **Delta Life Stages:**
 - Adults and Juveniles
- **Juvenile Abundance:**
 - No empirical estimates of the juvenile population (ages 0 – 3) in the Delta are available. Information about their rearing and distribution patterns within the Delta is limited. In 2019, 73 larval green sturgeon and six juvenile green sturgeon were observed at the Red Bluff Diversion Dam fish monitoring RSTs in the upper Sacramento River. In WY 2019, no green sturgeon were observed at the Delta fish salvage facilities. In WY 2020, two green were caught at the Delta fish salvage facilities (salvage = 8). One dead green sturgeon was observed on the SWP trash racks in WY 21.

DISTRIBUTION

- **Current Distribution**
 - Juvenile and adult green sturgeon present in the San Joaquin and Sacramento rivers and Delta during the next week. Acoustically tagged green sturgeon have been detected and remain in the vicinity of Sherman Island.
 - One dead green sturgeon was collected on the Skinner Delta Fish Protective Facility trash rack (1/22/2021).
- **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?

Currently, green sturgeon salvage is 0 fish (as of 2/7/2021). The agencies in the SaMT assessed the likelihood of salvage occurring in the next week is unlikely to occur.

Delta Smelt

POPULATION STATUS

- **Delta Smelt Life Stages:**
 - Adult
- **Brood Year 2020:**
 - **Abundance estimate:** The most recent population abundance estimate for Delta Smelt was 1,746 . This estimate was calculated from the sampling between 1/25/2021-1/29/2021. The most recent detection of a Delta Smelt was a 47 mm juvenile collected in the Sacramento Deep Water Ship Channel by EDSM on 1/26/2021. The most recent collection of a Delta Smelt for FCCL broodstock was on 1/21/2021. In order to reduce handling stress broodstock collections do not take additional data such as length or expression and are treated as adults in this assessment.
 - **Biological Conditions:** The Smelt Monitoring Team discussed the most recent monitoring data (Table 4) and considered professional opinion on the historical trends in regional distribution. Based on those discussions, the agency participants on SMT estimate Delta Smelt subadult/adults should be holding in the Suisun Marsh and west of the Sacramento-San Joaquin confluence in anticipation of migration but analysis of historic Spring Kodiak Trawl (SKT) supports Delta Smelt distribution being above the confluence and less tightly correlated to X2 position (available upon request from USFWS). They are also present in the Sacramento Deep Water Ship Channel.

DISTRIBUTION

- **Current Distribution**
 - Real time detection data is currently limited to EDSM sampling, SKT, and SLS. Due to the low number of detections of Delta Smelt, the SMT is also monitoring FCCL Broodstock Collections to inform distribution estimates. Since there are only a few recent detections, the Smelt Monitoring Team's capacity to estimate where Delta Smelt are within the Delta is limited.

- The last Delta Smelt detection was on 1/26/2021 in the Sacramento Deep Water Ship Channel by EDSM.
- Larval sampling was requested and is anticipated to start at the Skinner Fish Facility (SFF) on 2/22/2021 and the Tracy Fish Collection Facility (TFCF) on 2/15/2021.

TABLE 5. Summary of recently reported detections of Delta Smelt by Region and Salvage Facilities between 2/2/2021 and 2/9/2021. 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 6. 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	WY2021	Notes
EDSM	0	3	Phase 1 begins 11/30/20 Last Detection: 1/26/2021
SKT	0	0	SKT 2 Started: Complete
SLS	0	0	Survey 2: Complete Survey 3 Started: 2/8-10/2021
20-mm	0	0	Begins: March
Bay Study	0	0	Started: 2/4-16/2021
FMWT	0	0	Ended 12/15/2020
Chipps Island Trawl	0	0	5 day per week sampling began 12/7/2020 Ends: mid-May.
Brood Stock Collections	0	2	Last Catch: 1/21/2021

- **Historical Trends**
 - Based on historical analysis of SKT, the centroid of Delta Smelt distribution is anticipated to be above the Sacramento-San Joaquin confluence, but less closely correlated to X2 which is currently estimated to be at 96 km (Polansky et al 2018).
 - The recent Delta Smelt detections in the Deep Water ship channel are upstream of the confluence, but may be freshwater residents and not representative of the migratory life history patterns in Delta Smelt (Hobbs 2019).
- **Forecasted Distribution within Central Valley and Delta regions**
 - Delta Smelt distribution may change in response to recent precipitation and widespread wind driven turbidity. However, predicting the distribution is currently difficult because detection data is limited to a few individuals and historic patterns may not be representative of the low population levels of Delta Smelt. None of the recent detections have been in the central or south delta. The SMT is using turbidity as a surrogate for Delta Smelt presence in making risk assessments.

ABIOTIC CONDITIONS

- **Turbidity**

- Changes in Freeport flows and turbidity (Table 8) that would create “First Flush” conditions did not occur in WY 2021.
- As of 2/8/2021 turbidity has decreased to below 12 FNU ranges at all central and south Delta stations (see Attachment B).

TABLE 7. Relevant Environmental Factors to the current management actions for Delta Smelt.

Date Reported	OBI Daily Average Turbidity (FNU)
2/8/2021	3.32

- **X2 Conditions**

- X2 is estimated to be greater than 10 km upstream of the confluence of San Joaquin and Sacramento Rivers.

- **Other Environmental Conditions**

- The Smelt Monitoring Team expects environmental conditions to change based on the volume of precipitation and the associated increases of in-river flow on turbidity.
- The Fish and Water Operation Outlook OMR Index values are expected to range between -3,000 to -5,000 from 2/9/2021 to 2/16/2021.
- 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 did not exceeded the triggers for “First Flush” conditions in WY2021.

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

Delta Smelt were not detected in the South Delta between 12/1/2021 and 1/31/2021. The detection on 11/9/2020 supported Delta Smelt being present in Suisun Marsh and west of the Sacramento-San Joaquin confluence. Additional detections on the 6th, 15th, 21st and 26th of January support a presence of the species in the Sacramento Deep Water Ship Channel, but these fish may represent the freshwater resident population and may not be representative of the migratory life history pattern.

3. Has a spent female been collected?

As of 2/9/2021 no spent female Delta Smelt have been observed.

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. The expected OMR range is -3,000 to -5,000 and no turbidity bridge avoidance action has been taken.

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 2/9/2021 at Prisoners Point (5.21 NTU), Holland Cut (8.27 FNU) and Victoria Canal (3.33 NTU) have return to the expect range of values.

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 no turbidity bridge avoidance action is warranted as of 2/9/2021. A turbidity bridge avoidance action is not expected to be warranted in the next 7 days.

- 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, what is the OMR level between -3,500 and -5,000 cfs that manages weekly entrainment in the context of annual larval and juvenile entrainment levels?**

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

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>

Attachment A: DSM2 modeling

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Objective

Weekly modeling efforts are conducted to examine the effects of varying OMR conditions on the behavior of salmonids present in the Delta in a one-week “look ahead” or outlook. Members of the Salmon Monitoring Team (SaMT) use DSM2 modeling results to help answer how changing pumping regimes translates to differences in flows and velocities modeled at various channel locations within the Delta and what impact modeled environmental parameters have on rearing, foraging, migrating, and holding salmonids.

Each series of runs consists of three OMR conditions: minimum and maximum scenarios bounded by expected OMR index values for that week (Ops Outlook, Table 1) and a baseline which represents an anticipated operational value. Assumptions are made to best estimate future hydrologic characteristics. These inputs are more confident for the future one, two, and three-day timeframes; days four through six have lower confidence. Model scenarios hold hydrology inputs between runs constant and adjust Delta export pumping rates to compare between scenario OMR index values (unless otherwise noted). Although hydrologic ensembles could be used, a single value or deterministic projection is used for efficiency.

SaMT members use weekly DSM2 model results from a range of scenarios as part of a suite of tools to help assess distribution and changes to behavior of salmonids providing WOMT with advice on changes to operations. At each channel location over a six-day action period, environmental parameters are examined: modeled flow and velocity general statistics (e.g., magnitude, range, percent positive), differences in modeled flow and velocity values compared with the baseline scenario, etc. That information, in conjunction with channel location (e.g., close to the Delta pumping facilities, closer to areas with higher tidal influence, etc.) and other environmental considerations (e.g., tidal cycle, upcoming storms, etc.), is then interpreted from a biological perspective. SaMT explores the possible effects to salmonids of changing OMR index scenarios, assuming each of those potential operations could be that week’s controlling factor, which feeds into advice to WOMT.

Background

<i>Process</i>	
Weekly process	<ul style="list-style-type: none"> • DSM2 model runs use a historic and forecasted hydrological input dataset with no assumptions provided by DWR Thursdays and updated by Reclamation Mondays. • Input File updated Monday after initial distribution from DWR for removal of forecasted in lieu of historic input. • Reclamation provides scenarios based on expected OMR index values for the upcoming week. • DSM2 model runs produced Monday and distributed to SaMT members.
<i>Hydraulic footprint information</i>	
Baseline and Scenarios updated	2/8/2021
DSM2 modeling results range	2/9/2021 to 2/15/2021
<i>OMR index value scenarios</i>	
Baseline	-3,500 cfs
Scenario 1	-3,000 cfs (decreasing from Baseline; Δ 500 cfs)
Scenario 2	-5,000 cfs (increasing from Baseline; Δ 1,500 cfs)
<i>Changes between scenarios</i>	
Hydrology	Yes (see special considerations below)
Delta Exports	Yes
<i>Common assumptions</i>	
DSM2 run results based on the following assumptions	<ul style="list-style-type: none"> • CCFB Gates are operating to Priority 2 throughout the forecast period. • The Delta Cross Channel gates are closed throughout the forecast period. • Suisun Marsh salinity control flashboards are in, and 2 of the Suisun Marsh Salinity Control gates are in tidal operation and 1 gate is closed for maintenance. • San Joaquin River flow at Vernalis is at 1,325 cfs at the beginning of the forecast period and is estimated to increase to 1,400 cfs by the end of the forecast period in both wet and dry hydrology. (Figure A1) • Sacramento River flow at Freeport is at 10,500 cfs at the beginning of the forecast period and is expected to stay around 10,500 cfs in dry hydrology scenario and increase to 13,100 cfs in wet hydrology scenario by the end of the forecast period. (Figure A1)
<i>Additional information</i>	
Considerations for current DSM2 model run	This week's DSM2 model runs have two hydrology conditions. As such, distribution between model runs (Baseline vs. Scenario 1 and Baseline vs. Scenario 2) cannot be compared. Scenario 2 (-5,000 cfs) assumes a wetter hydrology while Scenario 1 (-3,000 cfs) and Baseline (-3,500 cfs) assume the same drier hydrology.
Caveats	<ul style="list-style-type: none"> • Time-step: DSM2 generates results at 15-minute time-steps. Visualizations of DSM2 model run results are aggregated over daily time-steps. Operations function on a more granular scale than daily time-step. • Salmonid behavior: DSM2 provides flow fields which salmonids may encounter but salmonids are not neutrally buoyant particles. Models which incorporate behavior from acoustic tagged salmonids are being developed for South Delta (ePTM, ecoPTM).

DSM2 model results: summary tables

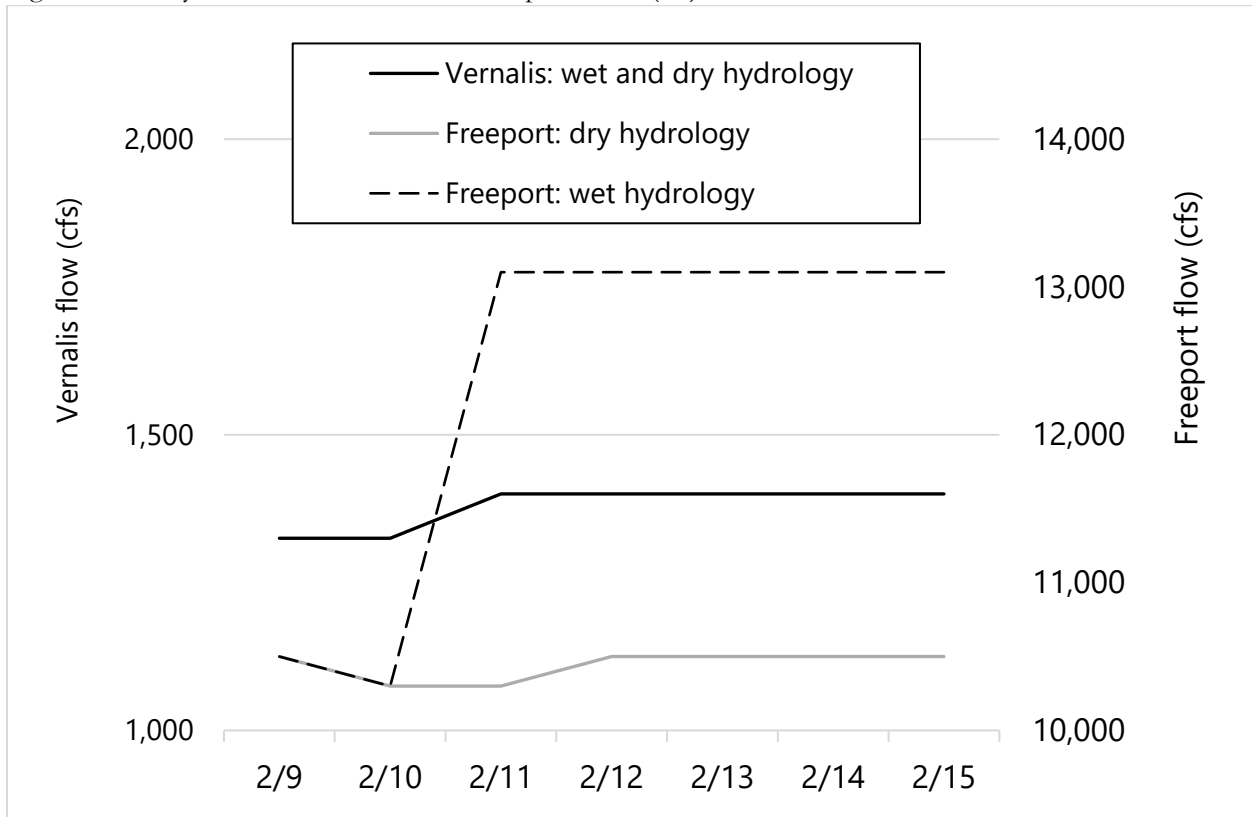
Table A1. Summary of minimum, maximum, mean, and percent positive flows (cfs) and velocities (ft/s) by DSM2 channel for OMR scenarios over a 6-day time period. For Baseline, Scenario 1, and Scenario 2 values refer to “Hydraulic Footprint Information” in the conditions / assumptions section above.

Scenario (cfs)	DSM2 Channel	Flow Min.	Flow Max.	Flow Mean	Flow % Positive	Velocity Min.	Velocity Max.	Velocity Mean	Velocity % Positive
Baseline	6	122	2160	1453	100	0.05	1.21	0.76	100
Scenario 1	6	27	2172	1451	100	0.01	1.21	0.76	100
Scenario 2	6	27	2174	1455	100	0.01	1.21	0.77	100
Baseline	21	-7504	7082	459	54	-0.50	0.47	0.04	54
Scenario 1	21	-7504	7123	484	54	-0.50	0.48	0.04	54
Scenario 2	21	-7532	7123	445	54	-0.50	0.48	0.04	54
Baseline	49	-159821	144842	871	53	-1.97	1.92	0.04	53
Scenario 1	49	-159775	145389	1222	53	-1.97	1.92	0.05	53
Scenario 2	49	-159714	145389	688	52	-1.97	1.92	0.04	52
Baseline	81	-6116	2333	-1743	32	-1.57	0.68	-0.47	32
Scenario 1	81	-5110	2250	-1748	34	-1.40	0.65	-0.47	34
Scenario 2	81	-5608	2475	-1734	32	-1.51	0.72	-0.47	32
Baseline	94	-15506	10284	-1776	47	-1.96	1.47	-0.21	47
Scenario 1	94	-13920	10369	-1526	48	-1.82	1.47	-0.18	48
Scenario 2	94	-15071	10369	-2142	47	-1.96	1.47	-0.27	47
Baseline	107	-6455	4313	-705	49	-1.70	1.24	-0.18	49
Scenario 1	107	-6371	4347	-634	49	-1.69	1.25	-0.16	49
Scenario 2	107	-6388	4347	-792	49	-1.71	1.25	-0.20	49
Baseline	124	-19233	12499	-3171	43	-0.61	0.42	-0.09	43
Scenario 1	124	-19211	12564	-3049	43	-0.61	0.42	-0.09	43
Scenario 2	124	-19305	12564	-3373	43	-0.61	0.42	-0.10	43
Baseline	148	-9127	6062	-986	47	-0.93	0.69	-0.09	47
Scenario 1	148	-8612	6168	-868	48	-0.90	0.69	-0.08	48

Scenario (cfs)	DSM2 Channel	Flow Min.	Flow Max.	Flow Mean	Flow % Positive	Velocity Min.	Velocity Max.	Velocity Mean	Velocity % Positive
Scenario 2	148	-8891	6168	-1145	47	-0.93	0.69	-0.11	47
Baseline	160	-5456	3629	-389	51	-0.55	0.48	-0.02	51
Scenario 1	160	-4980	3643	-342	51	-0.51	0.48	-0.02	51
Scenario 2	160	-4988	3643	-478	51	-0.52	0.48	-0.03	51
Baseline	434	-168282	160540	7575	54	-1.83	1.89	0.13	54
Scenario 1	434	-168278	160581	7668	54	-1.83	1.89	0.13	54
Scenario 2	434	-166735	162219	8958	54	-1.82	1.90	0.14	54

DSM2 model results: figures

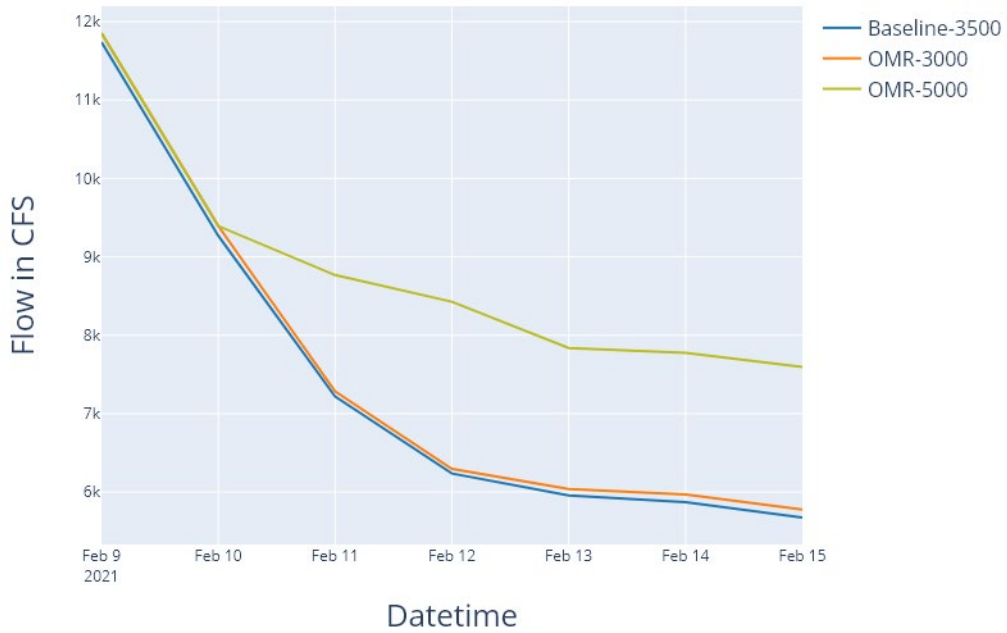
Figure A1. Daily forecasted Vernalis and Freeport flows (cfs)



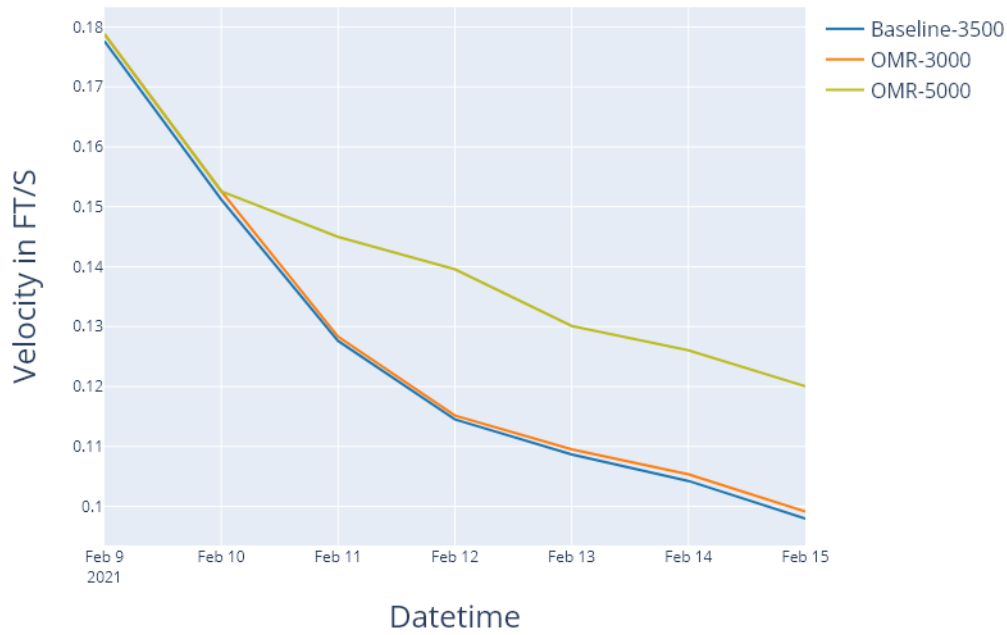
The following captions apply to the time-series plots for flow and velocity in selected locations (see Figure A11 and Table A2 for channel location information) below:

- (a) Time-series plot (1-day aggregated): Baseline, Scenario 1 OMR, and Scenario 2 OMR. X-axis represents daily time steps and y-axis represents flow (cfs) values. For Baseline, Scenario 1, and Scenario 2 values refer to “Hydraulic Footprint Information” in the section above. Reported summary statistics (minimum, maximum, etc.) are found in Table A1.
- (b) Time-series plot (1-day aggregated): Baseline, Scenario 1 OMR, and Scenario 2 OMR. X-axis represents daily time steps and y-axis represents velocity (cfs) values. For Baseline, Scenario 1, and Scenario 2 values refer to “Hydraulic Footprint Information” in the section above. Reported summary statistics (minimum, maximum, etc.) are found in Table A1.

Figure A2: Sacramento River at Sherman Island (CHAN434)



(a)

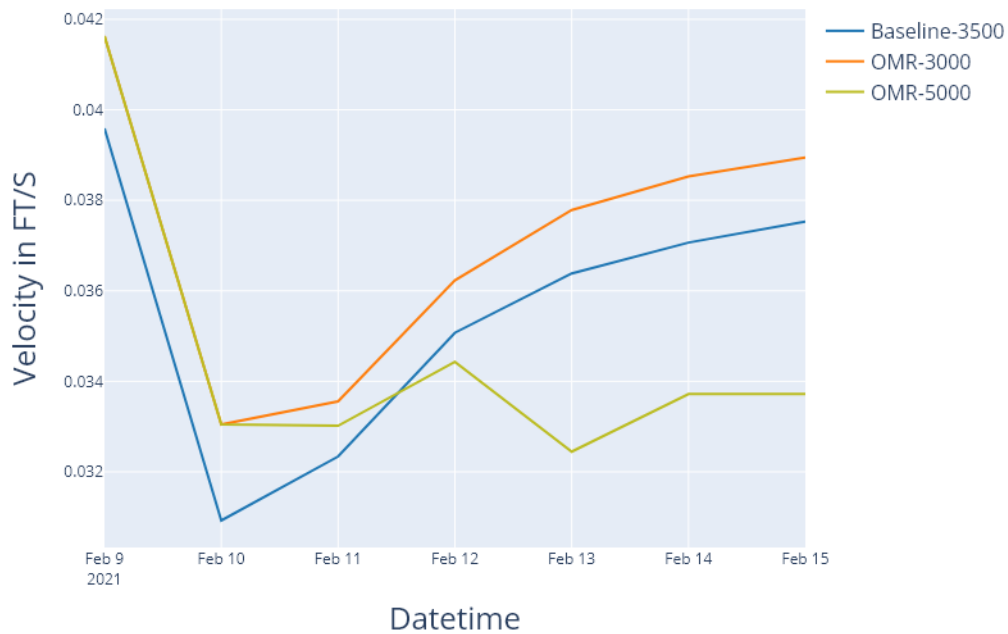


(b)

Figure A3: San Joaquin River downstream of confluence with Calaveras River (CHAN021)

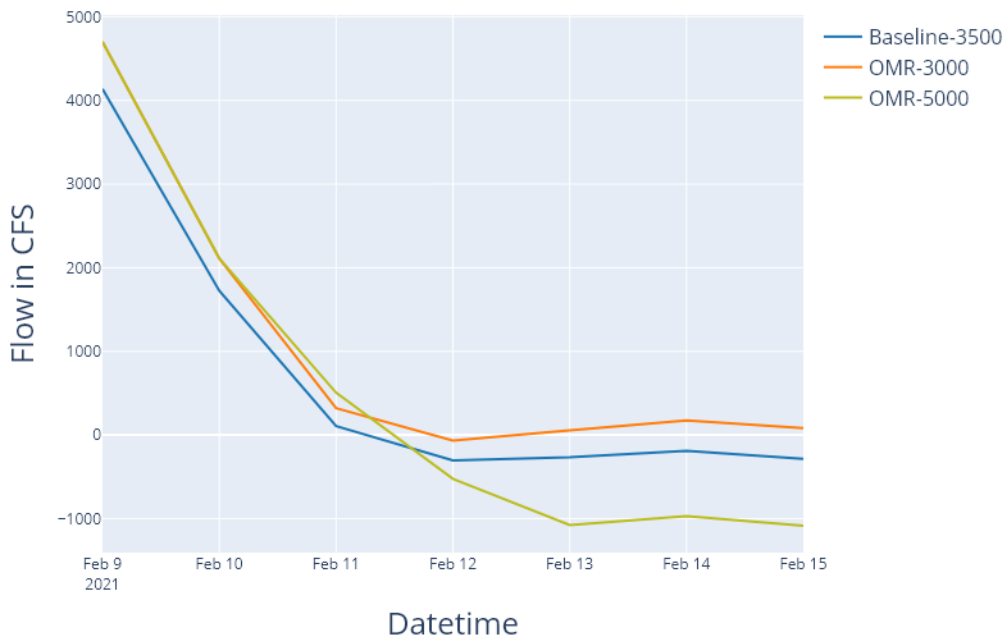


(a)

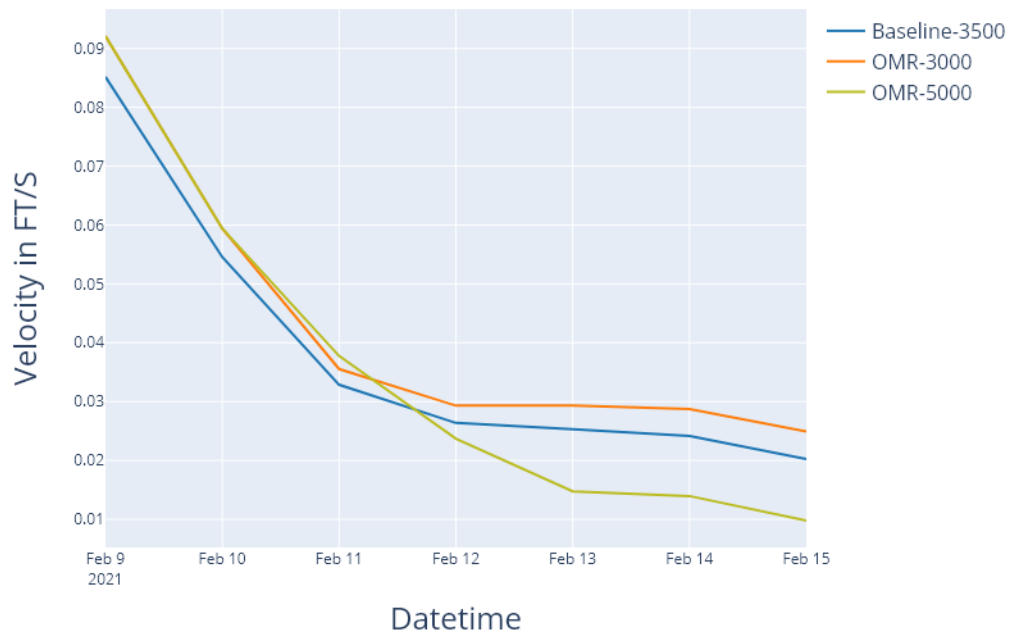


(b)

Figure A4: San Joaquin River at Sherman Island (CHAN049)

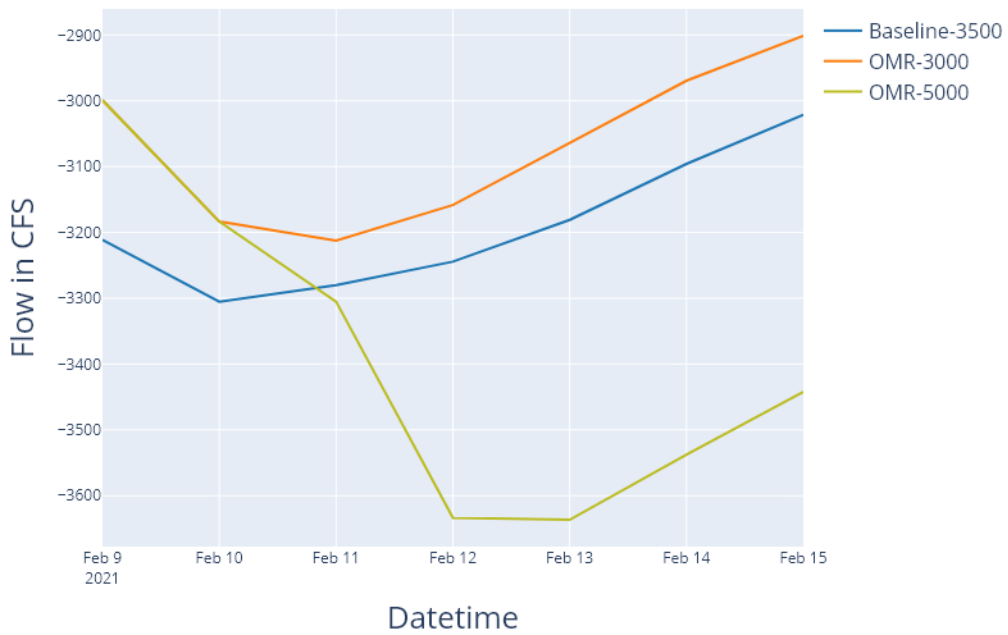


(a)

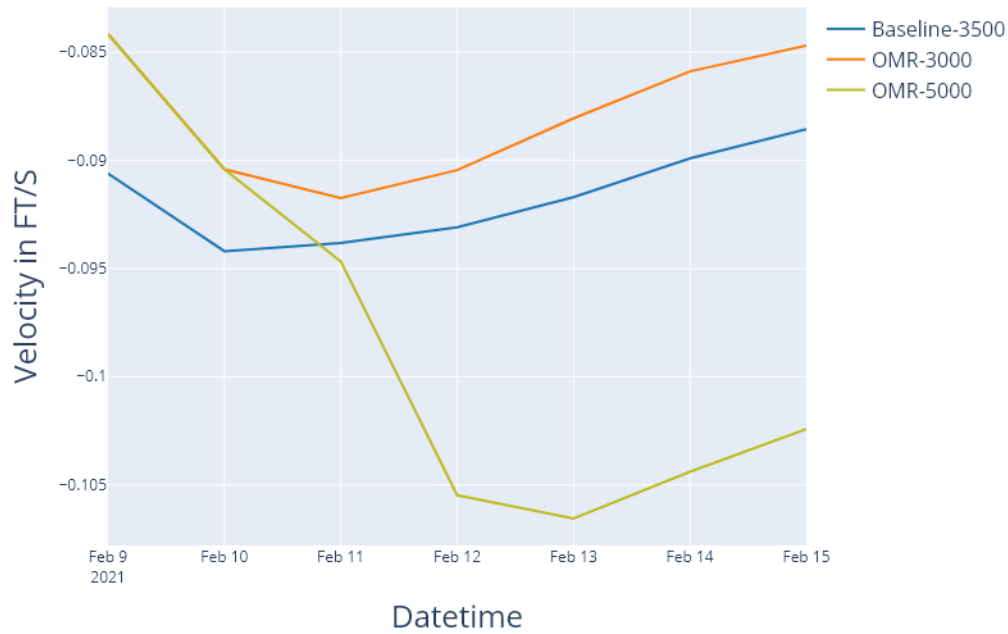


(b)

Figure A5: Old River between Franks Tract and San Joaquin River (CHAN124)

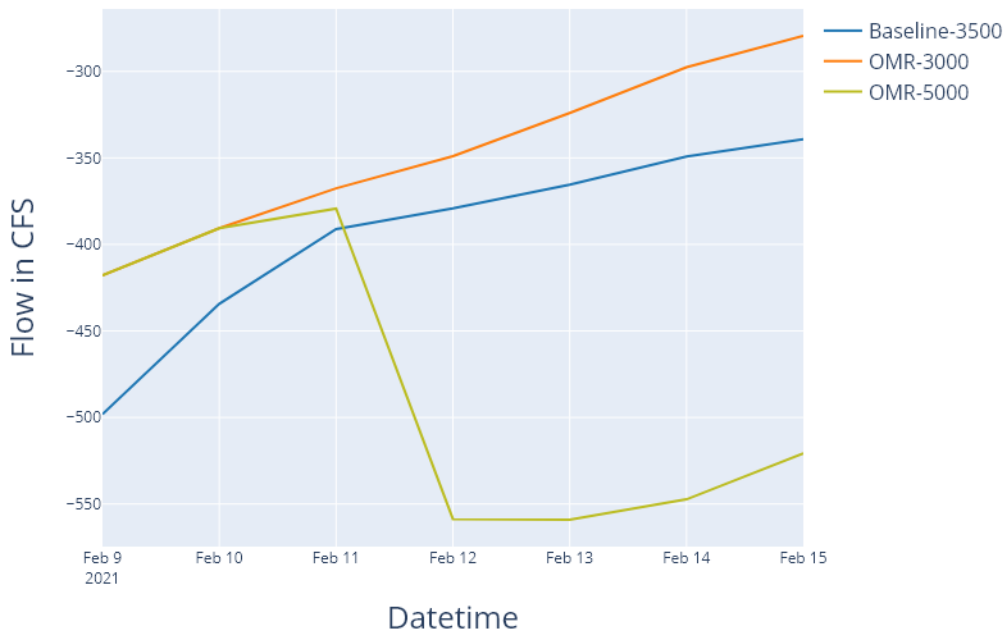


(a)

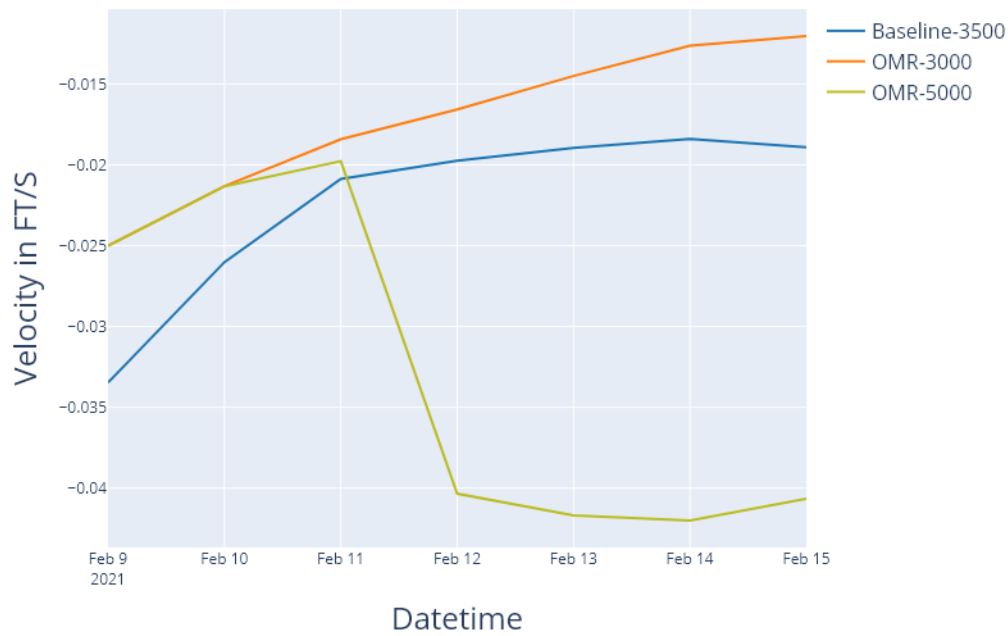


(b)

Figure A6: Lower San Joaquin River at Columbia Cut (CHAN160)

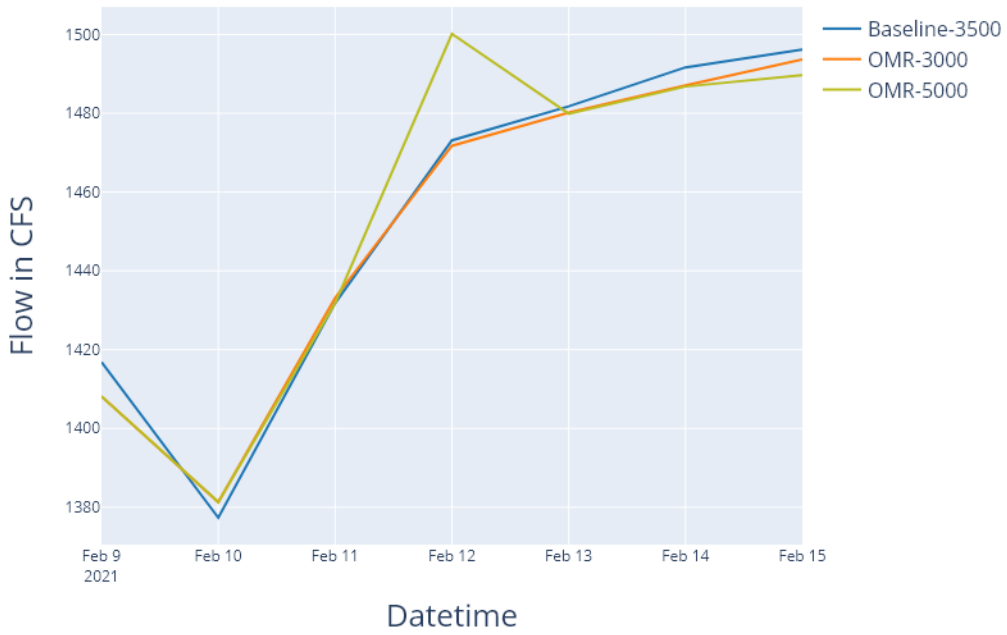


(a)

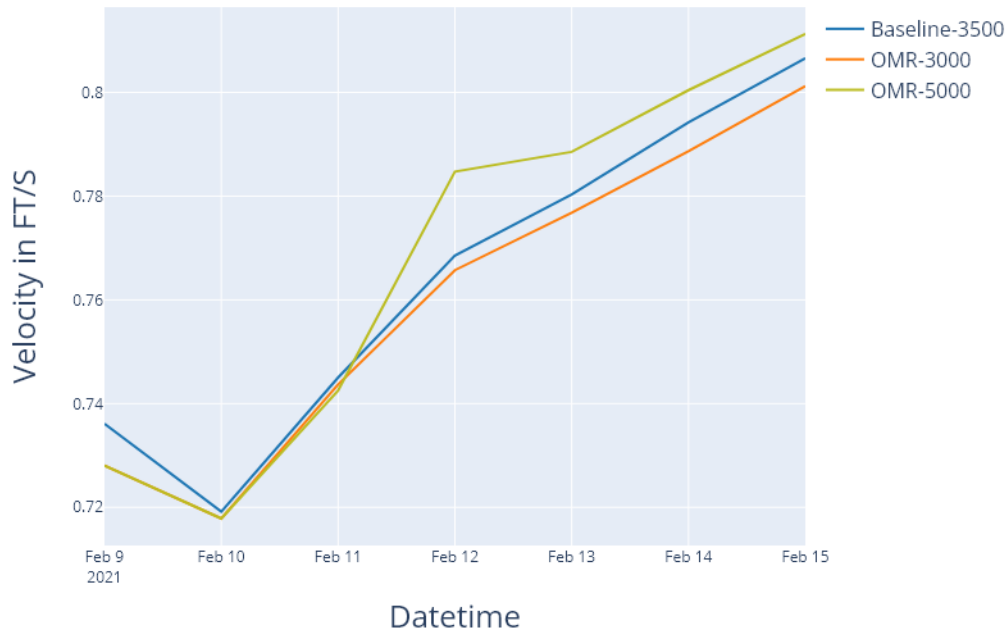


(b)

Figure A7: Slightly upstream of Head of Old River (CHAN006)

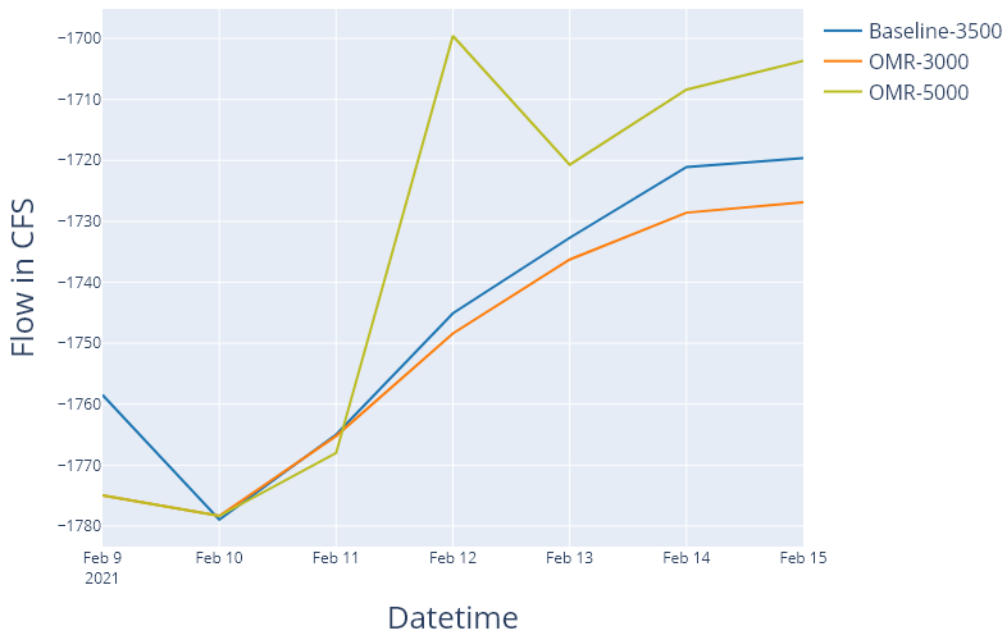


(a)

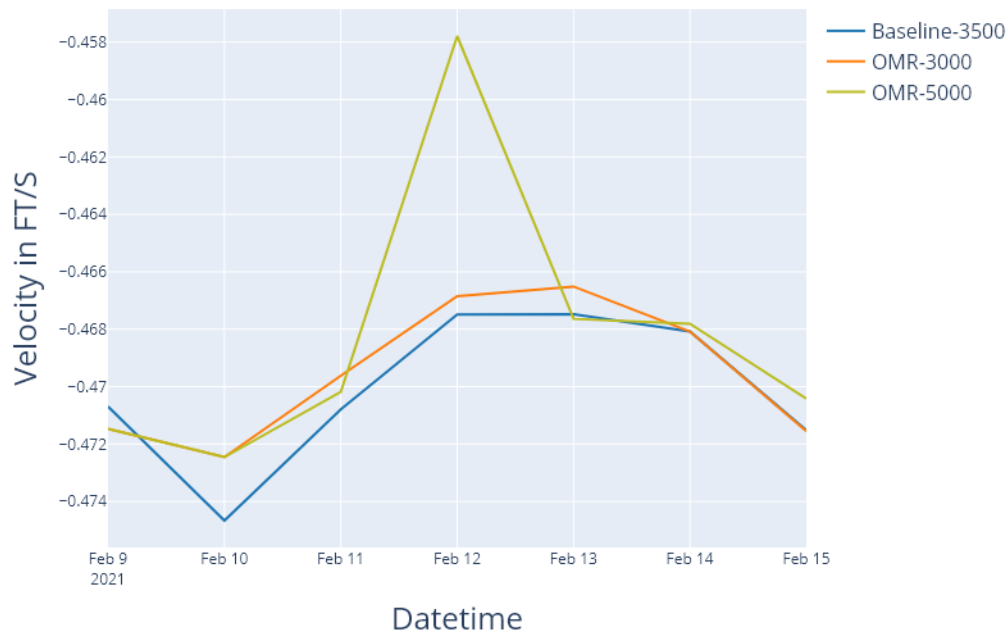


(b)

Figure A8: Old River adjacent to Grant Line Canal (CHAN081 – Old River between Grantline and CVP)

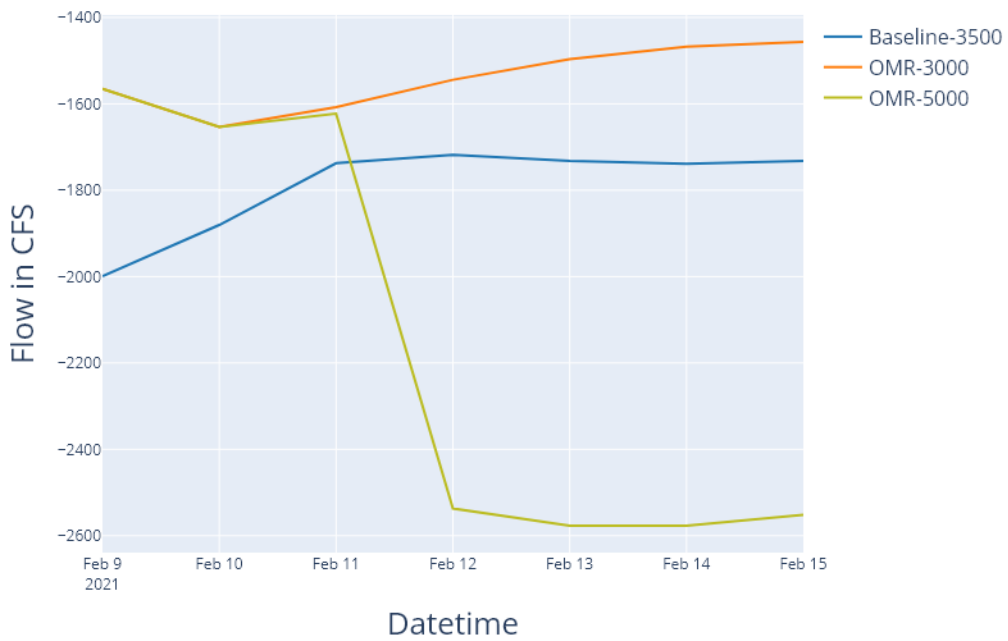


(a)

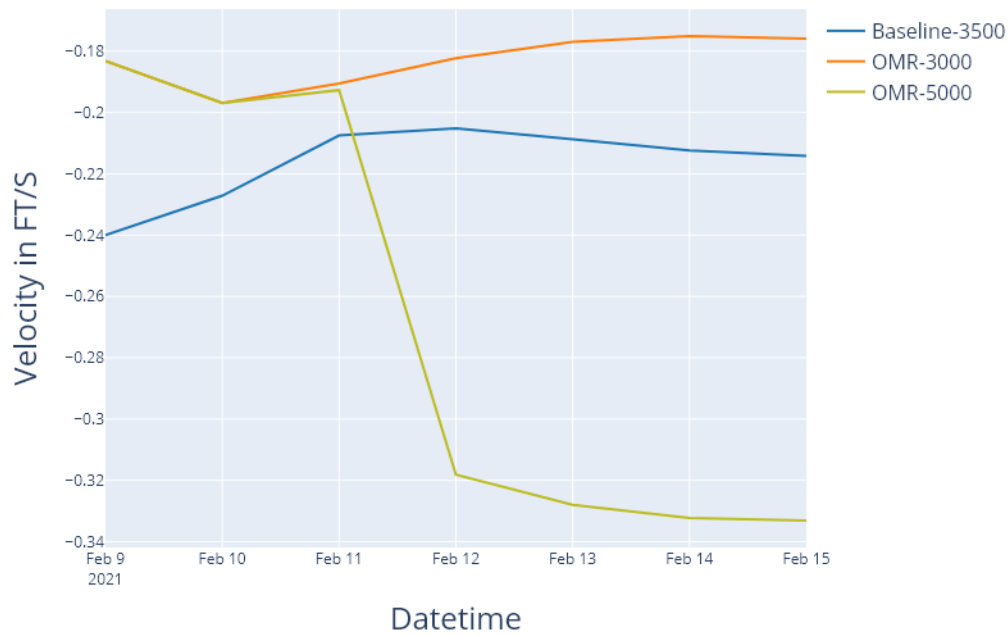


(b)

Figure A9: South Delta along Old River (CHAN094 – Old River/HW4)

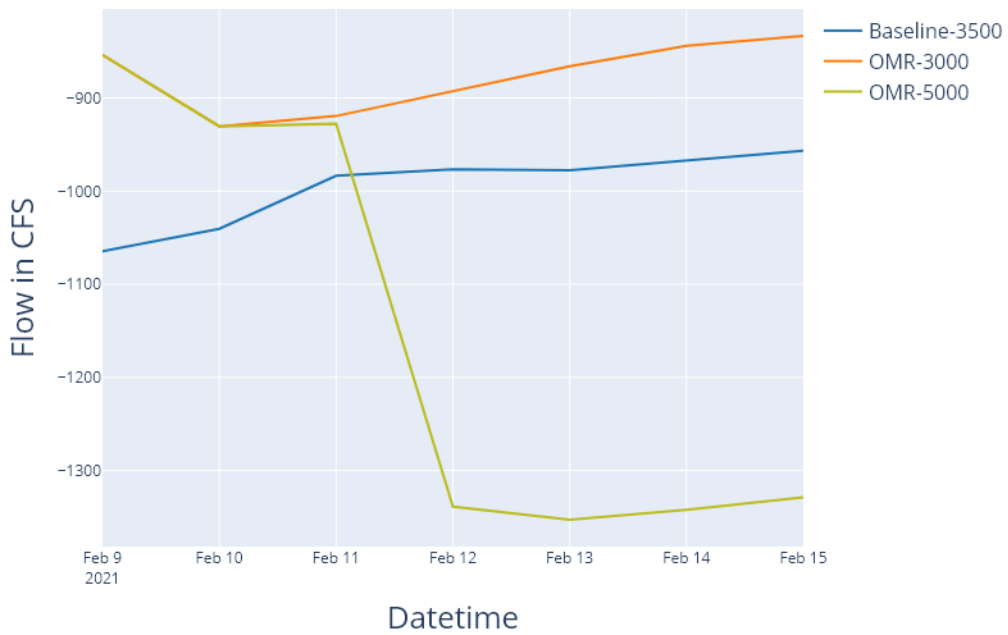


(a)

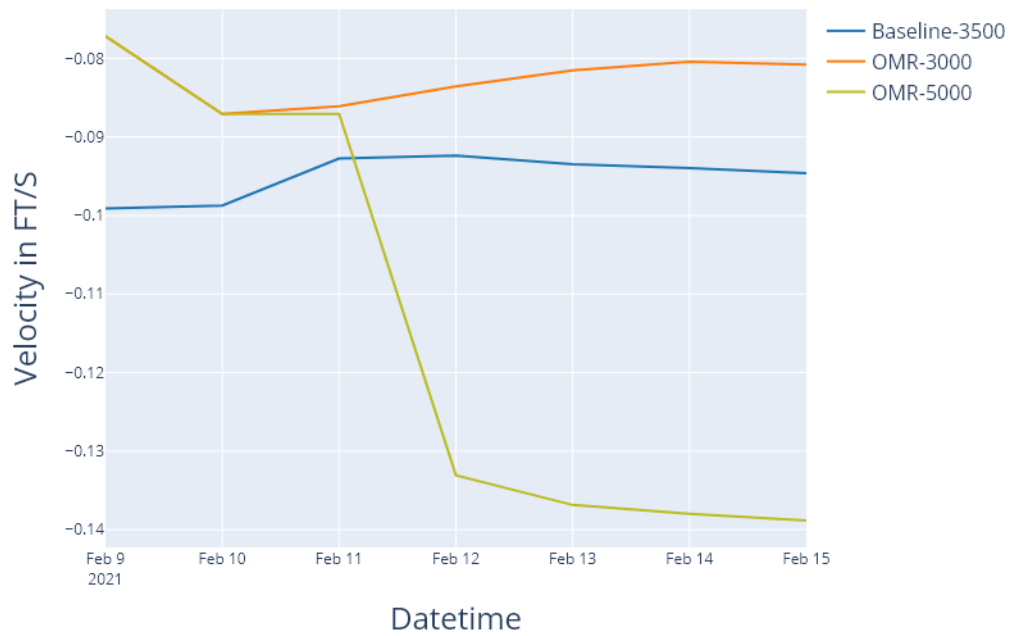


(b)

Figure A10: South Delta along Middle River (CHAN148 – Middle River/ Woodward Cut)

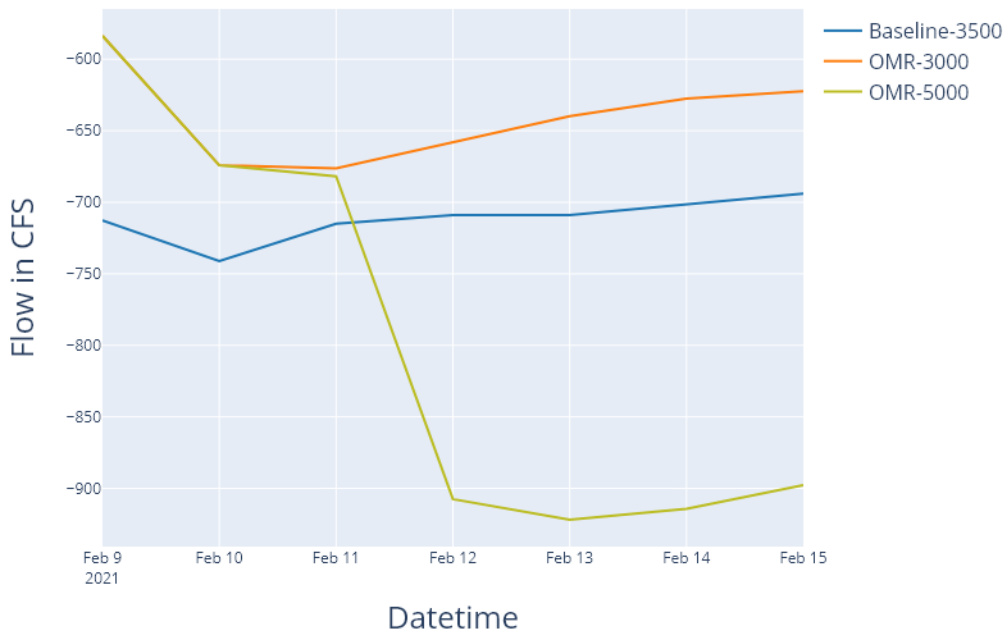


(a)

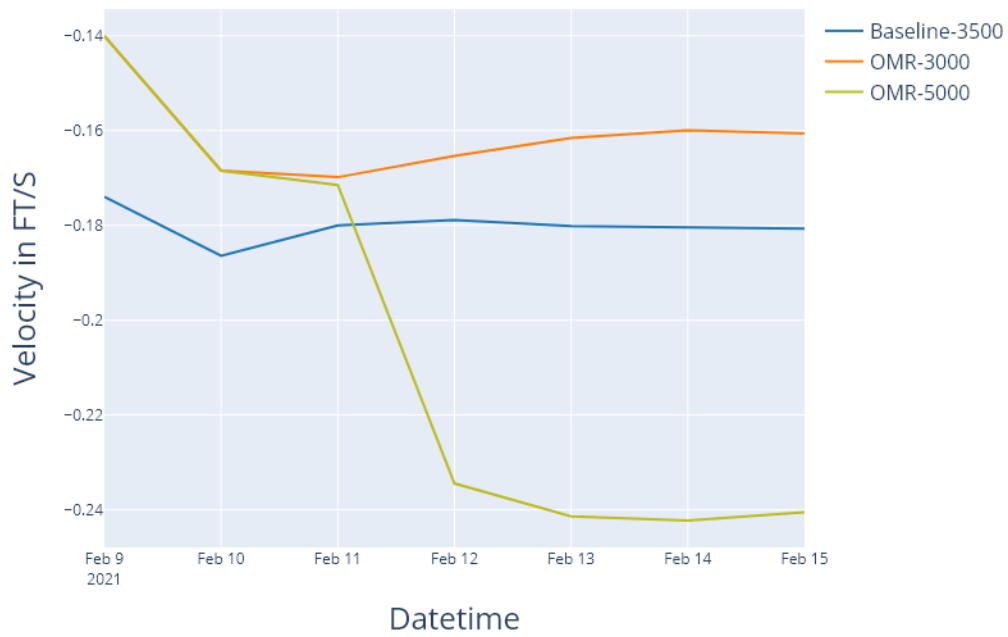


(b)

Figure A11: South Delta along Middle River (CHAN107 – Old River-Bacon Isl.)



(a)
(b)



DSM2 model interpretation entrainment in Delta strata regions

North Delta into Interior and Central Delta

Channels: 49 and 434

It is unlikely that listed salmonids will experience changes to rearing, foraging, sheltering or migrating related to modeled OMR conditions this week (Channels 49 and 434).

San Joaquin River and Central Delta into South Delta

Channels: 6, 21, 107, 124, and 160

Listed salmonids are present, but recent surveys suggest low densities. Changes in velocity related to modeled OMR conditions this week may be detectable by fish that are rearing or foraging but may increase transit rates for those that are present and migrating in the area (Channels 6, 21, 107, 124, and 160).

South Delta into facilities

Channels: 81, 94, and 148

Modeled hydrodynamic effects related to modeled OMR conditions this week suggest changes to migrating salmonid transit times (Channels 81, 94, and 148). For example, transit times would be delayed for salmonids coming from the north; whereas, transit times would be faster for salmonids moving from the head of Old River to the export facilities. However transit times for fish not entrained into the facilities would be prolonged for fish moving through the Old /Middle river corridors from the south.

DSM2 channel locations information

Figure A12. Highlighted DSM2 channels by Delta Strata.

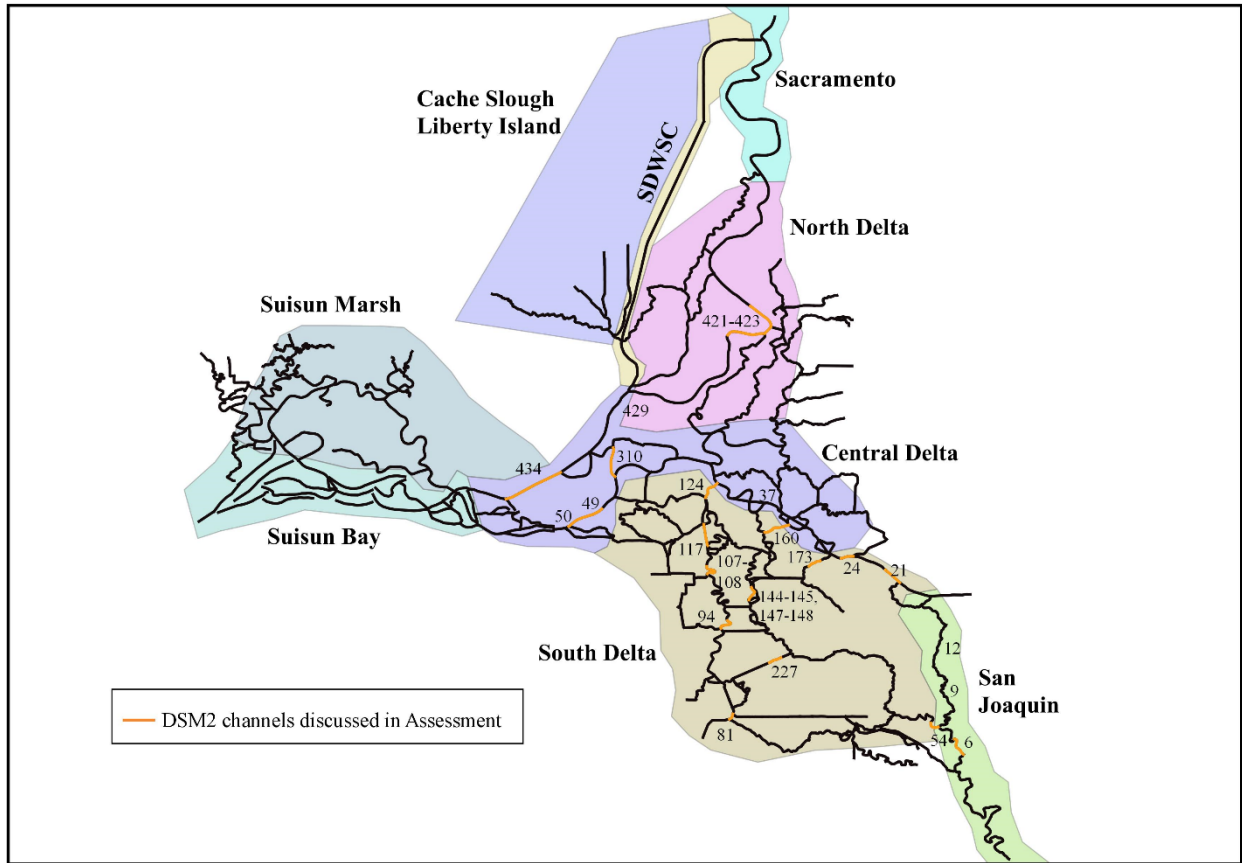


Table A2. Description of channel location, by Delta Strata region. Not all listed channels have model results presented in every weekly Proposed Action Assessment.

DSM2 Channel	Description
North Delta into Interior and Central Delta	
CHAN049	San Joaquin River at Sherman Island
CHAN310	Three-Mile Slough
CHAN421	Sacramento River at Delta Cross Channel
CHAN422	Sacramento River at Delta Cross Channel
CHAN423	Sacramento River at Delta Cross Channel
CHAN434	Sacramento River at Sherman Island
San Joaquin River and Central Delta into South Delta	
CHAN006	San Joaquin River at Head of Old River (HOR)
CHAN021	San Joaquin River downstream from confluence with Calaveras River
CHAN024	San Joaquin River upstream of Turner Cut
CHAN054	Old River at confluence with San Joaquin River (HOR)
CHAN107	Old River north of Rock Slough
CHAN117	Old River south of Franks Tract
CHAN124	Old River between Franks Tract and San Joaquin River
CHAN160	Columbia Cut
CHAN173	Turner Cut
South Delta into Facilities	
CHAN148	Middle River
CHAN227	Victoria Canal
CHAN081	Grant Line Canal
CHAN094	Old River

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 8, 2021

General Conditions:

Inflows:

Freeport	11022 CFS
Yolo Bypass	22 CFS
Vernalis	1453 CFS
Cosumnes	123 CFS
Mokelumne	203 CFS
Calaveras	26 CFS

Exports:

Clifton Court	1995 CFS
Jones	1884 CFS

Other:

OMR (Index)	-2959 CFS
QWEST	-74 CFS
NDOI	9669 CFS

Delta Daily Turbidity Trend Through 02/08/2021

