

## **Salmon Monitoring Team Weekly Meeting**

**Conference call: 3/3/2020 at 9:00 a.m.**

**Objective:** Provide information to the Water Operations Management Team (WOMT), Reclamation and California Department of Water Resources on measures to reduce adverse effects from Delta operations of the Central Valley Project (CVP) and the State Water Project (SWP) on salmonids and green sturgeon. Salmon Monitoring Team notes will be posted to Reclamation's web page <https://www.usbr.gov/mp/bdo/salmon-monitoring-team.html>.

**CDFW:** Adam Chorazyczewski, Kyle Griffiths, Jason Julienne, Duane Linander, Ken Kundargi, Jonathan Williams, Paige Uttley

**DWR:** Chris Cook, Harry Spanglet, Norman Lee, Ian Uecker, Tracy Pettit, Kevin Reece, Farida Islam

**Kearns & West:** Matt Marvin

**NMFS:** Kristin Begun, Kymmi Clements, Jeff Stuart, Garwin Yip

**Reclamation:** Mike Beakes, Towns Burgess, Elissa Buttermore, Josh Israel, Suzanne Manugian, Tom Patton

**SWRCB:** Craig Williams

**USFWS:** Katherine Sun, Craig Anderson

### **Agenda Items:**

1. Agenda review and introductions
2. Relevant Actions and Triggers
3. Weekly Ops and Fish Outlook Document
4. Current Operations and Weather Forecast
5. Fish Abundance, Distribution, and Lifestage
  - a. Environmental surrogates and catch indices
  - b. Fish Monitoring: RSTs/trawls/seines
  - c. Hatchery Releases
  - d. Fish Monitoring Acoustic Telemetry Data
  - e. Fish Monitoring by different strata
  - f. Historical Fish Monitoring Data
  - g. Fish Monitoring: Salvage

- h. Migration Status: Salmon Monitoring Team Estimates of Fish Distribution
- 6. Fish Exposure and Behavioral Cues
  - a. Historical patterns
  - b. Current conditions: DSM2 and entrainment modeling (STARs, Fish facilities)
  - c. Sensitivity to Operational Actions
- 7. Other Topics – Assessment, Salvaged Chinook Genetic Data for next week
- 8. Action Items
- 9. Additional Considerations for WOMT
- 10. Next SaMT Meeting

## **Agenda Item 2.**

### **Relevant Actions and Triggers Review**

#### **DCC gate operations**

- DCC gates are closed per operations described in NMFS' 2009 Biological Opinion (BiOp) RPA Action IV.1.2 and Reclamation's Proposed Action 4.10.5.3 and are expected to remain closed until 5/20/2020.

#### **OMR Management**

- Implementation of this action in water year (WY) 2020 began on 1/1/2020, and requires that Old and Middle River (OMR) flow be no more negative than -5,000 cfs (NMFS' 2009 BiOp RPA Action IV.2.3 and 2019 ROC Proposed Action). OMR flows are reported weekly with the OMR index and the tidally filtered USGS gauges at the daily, 5-day and 14- day running averages.
- The official [Juvenile Production Estimate \(JPE\) letter](#) from NMFS was signed and issued to Reclamation on 2/3/2020. The JPE for natural-origin brood year 2019 Sacramento River winter-run Chinook salmon is 854,941 fish surviving to enter the Delta. NMFS' RPA action IV.2.3 uses the length-at-date (LAD) for run assignment of older juveniles (i.e., larger than the minimum LAD for winter-run Chinook salmon), the first stage trigger will be exceeded if more fish are lost in salvage than calculated by multiplying 8 fish/TAF times the volume of water exported in TAF. The second stage is triggered if the number of older juvenile Chinook salmon lost is greater than the number calculated by multiplying 12 fish/TAF by the volume of water exported in TAF.

- If a trigger is exceeded, all older juvenile Chinook salmon will have a tissue sample processed through the rapid genetic analysis protocol to determine the genetic run assignment.
- When applying the rapid genetic analysis protocol, the first stage trigger is exceeded if genetically verified combined daily loss density of older-juvenile-sized winter-run Chinook salmon exceeds 4.27 fish per TAF of water exported, and the second stage trigger is exceeded if the genetically verified daily loss density of older-juvenile-sized winter-run Chinook salmon exceeds 8.55 fish per TAF of water exported.
- Refer to weekly operations and fish outlook document for more triggers.

**Agenda Item 3.**

**Weekly Ops and Fish Outlook Document**

Reclamation and DWR have been developing an operations and fish monitoring outlook every week to distribute to SaMT, Smelt Monitoring Team, and WOMT. The document summarizes: CVP and SWP operations, fish life stage presence, and status of Delta Performance Thresholds. SaMT reviewed this document.

**Agenda Item 4.**

**Current Operations (3/3/2020)**

<b>Current Operations</b>	<b>Location</b>	<b>Value</b>
<b>Clifton Court Inflow</b>	<b>Clifton Court Forebay</b>	<b>1000 cfs</b>
<b>CVP Exports</b>	<b>Jones Pumping Plant</b>	<b>1800 cfs (2 units)</b>

<b>Current Operations</b>	<b>Location</b>	<b>Value</b>
<b>CVP Reservoir Releases</b>	<b>American - Nimbus</b>	<b>2000 cfs</b>
<b>CVP Reservoir Releases</b>	<b>Sacramento - Keswick</b>	<b>5500 cfs</b>
<b>CVP Reservoir Releases</b>	<b>Stanislaus - Goodwin</b>	<b>2000 cfs ramping down to 1500 cfs tomorrow (3/4)</b>
<b>CVP Reservoir Releases</b>	<b>Trinity - Lewiston</b>	<b>300 cfs</b>
<b>SWP Reservoir Releases</b>	<b>Feather - Oroville</b>	<b>2250 cfs</b>
<b>CVP Reservoir Storage</b>	<b>San Luis (CVP)</b>	<b>473 TAF</b>
<b>CVP Reservoir Storage</b>	<b>Shasta</b>	<b>3545 TAF</b>
<b>CVP Reservoir Storage</b>	<b>Folsom</b>	<b>444 TAF</b>

<b>Current Operations</b>	<b>Location</b>	<b>Value</b>
<b>CVP Reservoir Storage</b>	<b>New Melones</b>	<b>1921 TAF</b>
<b>SWP Reservoir Storage</b>	<b>San Luis (SWP)</b>	<b>928 TAF</b>
<b>SWP Reservoir Storage</b>	<b>Oroville</b>	<b>2255 TAF</b>
<b>Environmental Parameters</b>	<b>Sacramento River at Freeport (cfs)</b>	<b>11937</b>
<b>Environmental Parameters</b>	<b>San Joaquin River at Vernalis (cfs)</b>	<b>2938</b>
<b>Environmental Parameters</b>	<b>Delta Outflow Index (cfs)</b>	<b>11500</b>
<b>Environmental Parameters</b>	<b>E:I (exports to Delta inflow)</b>	<b>16.5</b>
<b>Environmental Parameters</b>	<b>X2</b>	<b>73 Km</b>

<b>Current Operations</b>	<b>Location</b>	<b>Value</b>
<b>CVP</b>	<b>DCC Gates</b>	<b>Closed</b>

cfs = cubic feet per second

TAF = thousand acre feet

Km = kilometer

Location of X2 measured from the Golden Gate

Factors controlling Delta exports:

- 2/26/2020 – 3/2/2020: X2 requirements.

OMR Demonstration Project: OMR Index and USGS Tidally Filtered Values are displayed on SacPAS. [http://www.cbr.washington.edu/sacramento/data/delta\\_loss.html](http://www.cbr.washington.edu/sacramento/data/delta_loss.html)

Approximate OMRs as of 3/2/2020:

	Index (cfs)
Daily	-1,100cfs
5-day	-1,100cfs
14-day	-900cfs

Approximate OMR gage data as of 2/29/2020:

	USGS gauges (cfs)	Index (cfs)
Daily	-1426 cfs	-1,033 cfs
5-day	-2118 cfs	-1,233 cfs
14-day	-1408 cfs	-995 cfs

- DWR was not pumping at Skinner or Clifton Court on 3/2 due to Banks outage; the issue has now been fixed.
- Flows on the Stanislaus will depend on the number of Chipps days and the monthly average at Vernalis; March flows are not anticipated to exceed current volumes and will likely taper off.
- USBR anticipates a more accurate estimate of the March Chipps requirement by the end of the week when they know the volume of Collinsville x2; the official notice will be posted 3/9/20.

*Weather Forecast*

- The weather forecast is dry and warmer than average; while the long range forecast includes some precipitation, there are no major storms expected.

**Environmental Surrogates and Catch Indices**

- The First Alert has two components. Capture of yearling-sized spring-run Chinook salmon at the mouths of natal tributaries between October and April indicates that emigration from the tributaries has started or is occurring. As an environmental surrogate to the capture of the yearling-sized spring-run Chinook salmon, which are difficult to capture in the rotary screw traps, tributary flow increases are used to signal conditions conducive to emigration. The First Alert is triggered if either the first component (greater than 95 cfs flow threshold) or second component (greater than 50% change in mean daily flow) are exceeded. The First Alert was triggered due to flows greater than 95 cfs every day this past week.

Date	Mill Creek (MLM)		Deer Creek (DCV) *	
	mean daily flow (cfs)	change in mean daily flow	mean daily flow (cfs)	change in mean daily flow
2/25/2020	148	0%	133	-1%
2/26/2020	149	1%	130	-2%
2/27/2020	150	1%	130	0%
2/28/2020	152	2%	130	0%

Mill Creek (MLM)			Deer Creek (DCV) *	
2/29/2020	152	0%	129	0%
3/01/2020	151	0%	129	0%
3/02/2020	147	3%	125	-3%

\* 2/25/2020 @ 01:00 through 3/01/2020 @ 23:00

- The Second Alert is triggered only if **both** Wilkins Slough flows are greater than 7,500 cfs and Knights Landing temperature is less than 56.3°F. The second alert is in effect beginning 10/1/2019, and was not triggered this past week.

Date	Wilkins Slough (WLK)	Knights Landing (KL) *
	Mean Daily Flow (cfs)	Daily water temperature (°F)
2/25/2020	6287	53.4
2/26/2020	6394	54.8
2/27/2020	6258	54.8
2/28/2020	6083	55.3
2/29/2020	5939	55.9
3/01/2020	5923	56.3
3/02/2020	5,997	54.1

\* 2/25/2020 @ 10:15 through 3/01/2020 @ 11:00

**Alert on likelihood of entrainment or salvage at the export facilities:**

- The third alert is triggered during November 1-February 28 when Knights Landing Catch Index (KLCI) or Sacramento Catch Index (SCI) > 10 older juvenile fish. The alert was not triggered in the past week.

**Hatchery Releases**

None.

**Fish Monitoring:** The following table presents fish monitoring data summarized over the past week. Unless otherwise noted, reported races are based on fork length (length-at-date).



Location	Feather River RST Eye Channel <sup>A</sup>	Feather River RST Herring <sup>B</sup>	GCID RST <sup>C</sup>	Tisdale RST <sup>D</sup>	Knights Landing RST <sup>E</sup>	Beach Seines	EDSM	LAR RST <sup>F</sup>	Sacramento Trawl	Chippis Island Midwater Trawl	Mossdale Kodiak Trawl	Caswell RST <sup>G</sup>
Sample Dates	2/24 - 3/1	2/24 - 3/1	2/25 - 3/2	2/24-3/2	2/24 - 3/1	2/24-2/27	2/24-2/27	2/25 - 2/28	2/23-2/25, 2/27-2/28	2/23-2/25, 2/27-2/28	2/24, 2/26	2/25 - 2/28
FR Chinook	31,992	2,637	126	4	12	99		2,356				37
SR Chinook	28	24	3			12						
WR Chinook				1		5	2	6		20		
LFR Chinook												
Chinook (ad-clip)							2			1		
Steelhead (natural)		2								6		
Steelhead (ad-clip)				1	2	2	16	245	3	70		
Green Sturgeon												
Flows (avg. cfs)	800	2,250	901	5537	6,137							

Location	Feather River RST Eye Channel <sup>A</sup>	Feather River RST Herrer <sup>B</sup>	GCID RST <sup>C</sup>	Tisdale RST <sup>D</sup>	Knights Landing RST <sup>E</sup>	Beach Seines	EDSM	LAR RST <sup>F</sup>	Sacramento Trawl	Chippis Island Midwater Trawl	Mossdale Kodiak Trawl	Caswell RST <sup>G</sup>
W. Temp. (avg. °F)	51.2	53.8	53.8	54	55.1							
Turbidity (avg. NTU)	1.3	2.0	10.3	3.3	5.8							

A. Feather River RST Eye Channel sampling period was from 2/24/2020 at 14:32 to 3/1/2020 at 10:40.

B. Feather River RST Herrer sampling period was from 2/24/2020 at 10:29 to 3/1/2020 at 9:10.

C. GCID RST sampling period was from 2/25/2020 at 9:00 to 3/2/2020 at 9:00. Full cone effort.

D. Tisdale RST sampling period was from 2/24/2020 at 9:30 to 3/2/2020 at 10:00. Full cone effort. 1 older juvenile caught in period between 3/1/2020 at 11:30 and 3/2/2020 at 10:00.

E. Knights Landing RST sampling period was from 2/24/2020 at 11:00 to 3/1/2020 at 11:00. Full cone effort.

F. Lower American River RST sampling period was from 2/25/2020 to 2/28/2020.

G. Stanislaus River at Caswell RST sampling period was from 2/25/2020 to 2/28/2020.

### Red Bluff Diversion Dam Biweekly Report

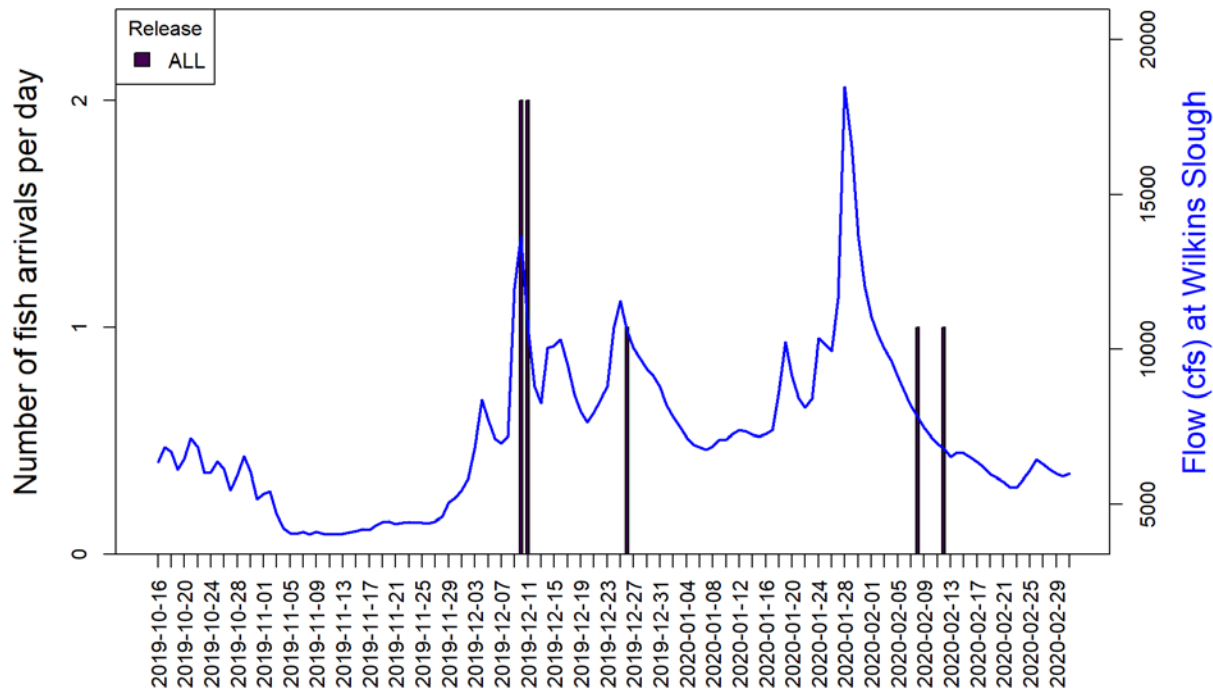
USFWS biweekly report (2/12-2/25/2020) for preliminary estimates of passage by Brood Year (BY) and run for estimated passage of unmarked juvenile Chinook salmon via rotary screw traps at RBDD included:

Run and Species	Biweekly Total	BY Total (90% CI)
Winter-run Chinook (BY2019)	573	3,803,852
Spring-run Chinook (BY2019)	2,603	53,836

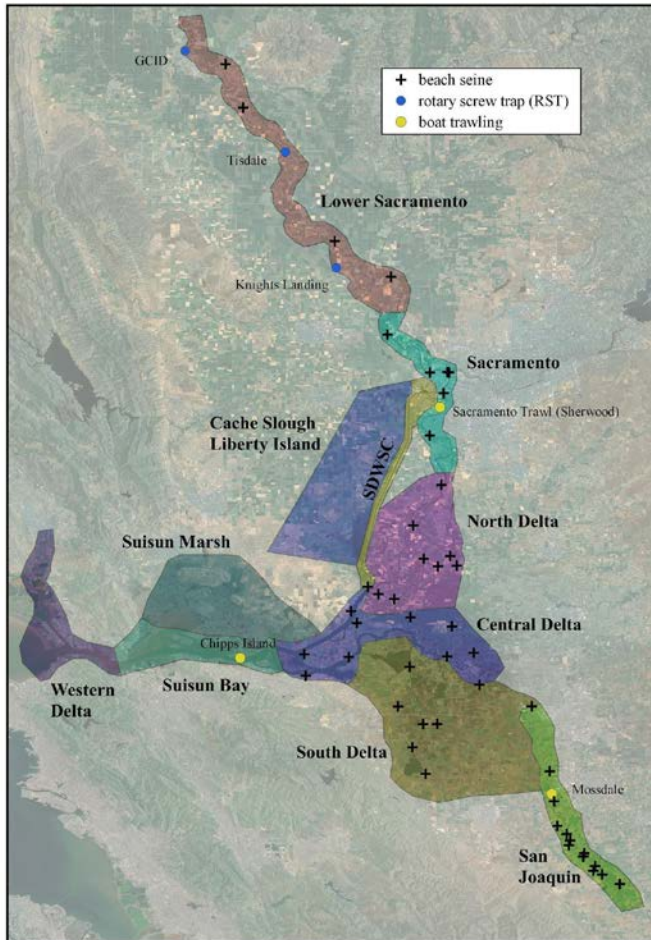
### Acoustic Telemetry Data

SaMT reviewed real-time acoustic telemetry fish detection data at the Central Valley Acoustic Telemetry webpage <https://calfishtrack.github.io/real-time/index.html>.

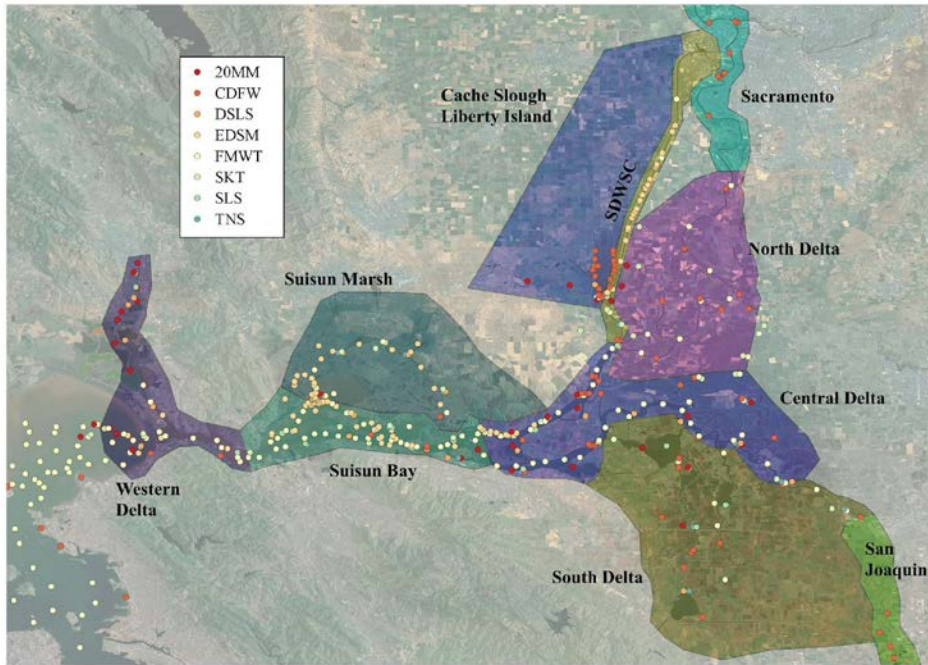
- Green sturgeon detected at Tower Bridge (near downtown Sacramento)



## Fish Monitoring by Delta Strata

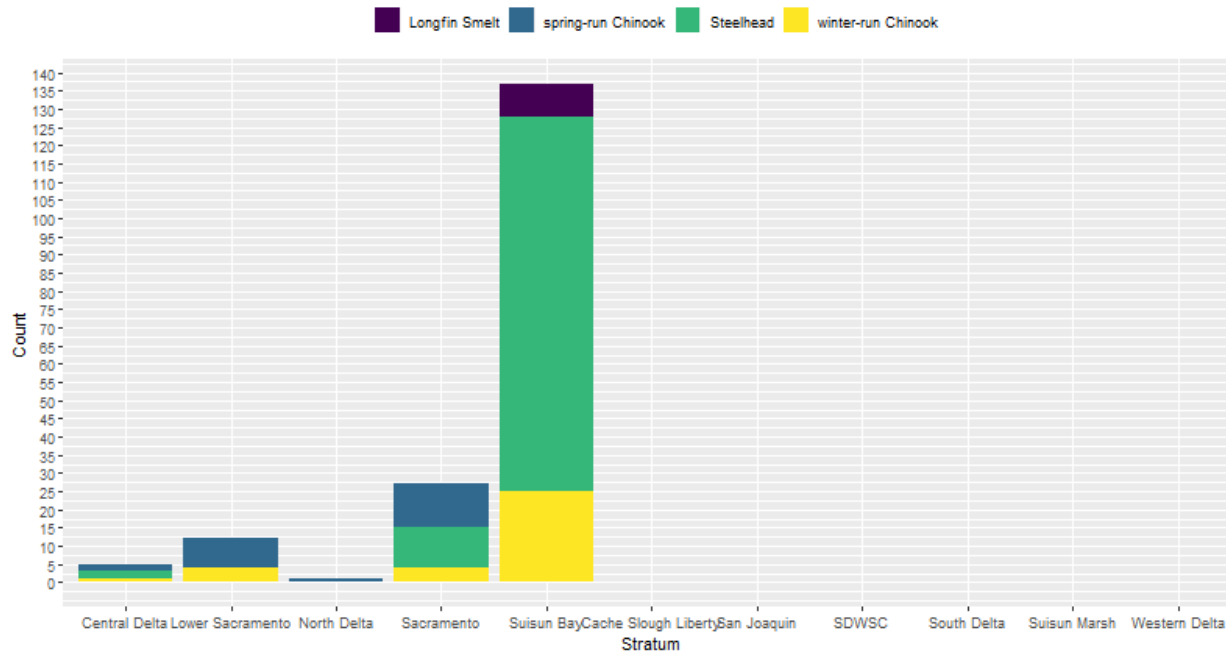


Delta Juvenile Fish Monitoring Program (DJFMP) monitoring sites displayed by 11 Delta Strata: Lower Sacramento, Sacramento, Cache Slough Liberty Island, Sacramento Deep Water Shipping Channel (SDWSC), North Delta, Central Delta, South Delta, San Joaquin, Suisun Bay, Suisun Marsh, and Western Delta. Sites categorized by sampling method: beach seine, rotary screw trap (RST), and boat trawl.



Enhanced Delta Smelt Monitoring (EDSM) monitoring sites displayed by the same Delta Strata as listed in the above figure. Sites categorized by sampling source.

2020-02-18 to 2020-03-02



Count by Delta Strata for 6 species of interest: winter-run Chinook, spring-run Chinook, steelhead, longfin smelt, Delta smelt, and green sturgeon. Query of monitoring data 2/10/2020 - 3/2/2020, data available 2/18/2020 - 3/2/2020.

### Historical Fish Monitoring Data

Because of challenges with limited data and interpretation real-time steelhead catch data, SaMT reviewed historical catch data on SacPAS's Migration Timing and Conditions page and the Salvage Timing page.

SacPAS main page: <http://www.cbr.washington.edu/sacramento/>

Migration Timing: [http://www.cbr.washington.edu/sacramento/data/query\\_hrt.html](http://www.cbr.washington.edu/sacramento/data/query_hrt.html)

*Migration Timing:*

Average percent for each species of interest (clipped and unclipped) captured at the following locations by March 1st in previous years. Average sampled represents historic data spanning years 2005 to 2018.

<b>Brood Year</b>	<b>Species, species run</b>	<b>Average Percent Captured Red Bluff Diversion Dam</b>	<b>Average Percent Captured Tisdale</b>	<b>Average Percent Captured Knights Landing</b>	<b>Average Percent Captured Beach Seines</b>	<b>Average Percent Captured Sac Trawl (Sherwood)</b>	<b>Average Percent Captured Chipps Island</b>
Average 2005 - 2018	winter-run Chinook	99.2%	95.2%	93%	96.3%	59.5%	15.5%
Average 2005 – 2018	spring-run Chinook	43.6%	26.9%	43.9%	70.8%	13.3%	0%
Average 2005 – 2018	Steelhead	1.7%	48.4%	42.8%	64.6%	77.9%	58.4%

*Salvage timing:*

Average percent for each species (based on length at date) of interest captured at SWP and CVP Delta Fish Facilities by March 1st in previous years. Average sampled represents historic data spanning years 2005 – 2018.

<b>Brood Year</b>	<b>Species, species run</b>	<b>Average Percent Salvaged at SWP and CVP Delta Facilities</b>
Average 2005 - 2018	winter-run Chinook (unclipped)	44.9%
Average 2005 – 2018	spring-run Chinook (unclipped)	0.9%
Average 2005 – 2018	Steelhead (unclipped)	30.6%

## Fish Monitoring: Salvage

### Salmon Monitoring Weekly Salvage Update

Reporting Period: February 24-March 1, 2020

Prepared by Kyle Griffiths on March 2, 2020 15:37

Preliminary Results -Subject to Revision

Criteria	24-Feb	25-Feb	26-Feb	27-Feb	28-Feb	29-Feb	1-Mar	Trend	
<b>Loss Densities</b>									
Wild older juvenile CS	0	0	0	0	0	0	0	→	0.00
Wild steelhead	0	0	0	0	0	0	0	→	0.00
<b>Exports</b>									
SWP daily export	2,033	1,630	4,209	3,817	5,123	599	0	↗	2,487
CVP daily export	1,727	1,725	1,723	1,726	1,737	1,735	3,574	↗	1,992
SWP reduced counts	0	0	0	0	0	0	0/NA		
CVP reduced counts	8%	0	0	0	0	0	0		

Loss Density = fish lost/TAF; water export = AF; Trend = compared to previous week; wild = adipose fin present

Loss = estimated number of fish lost at the CVP and SWP Delta export facilities based on estimated salvage (see below)

Reduced counts = percentage of time that routine salvage sample time were less than 30 min per 2 hours of salvage and export operations

Yellow highlighted dates indicate TFCF salvage outage occurred



### Chinook Salmon Weekly/Season Salvage and Loss

Combined salvage and loss for both CVP and SWP fish facilities  
Race determined by size at date of capture; hatchery = adipose fin missing;

Category	Weekly Total			Season Total	
	Salvage	Loss	Trend	Salvage	Loss
<b>Wild</b>					
Winter Run	0	0	→	20	14
Spring Run	0	0	→	0	0
Late Fall Run	0	0	→	12	8
Fall Run	0	0	→	28	19
Unclassified	0	0	→	0	0
<b>Total</b>	<b>0</b>	<b>0</b>		<b>60</b>	<b>41</b>
<b>Hatchery</b>					
Winter Run	0	0	→	8	5
Spring Run	0	0	→	128	88
Late Fall Run	0	0	→	195	153
Fall Run	0	0	→	21	14
Unclassified	0	0	→	0	0
<b>Total</b>	<b>0</b>	<b>0</b>		<b>352</b>	<b>261</b>

Trend = weekly loss per race; Salvage = estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time  
NC = cannot be calculated; hatchery salmon salvage and loss estimates have been corrected using CWT readings when available

### Steelhead Weekly/Season Salvage and Loss

Combined salvage and loss for both CVP and SWP fish facilities

Category	Weekly Total			Season Total	
	Salvage	Loss	Trend	Salvage	Loss
Wild	0	0	→	0	0
Hatchery	4	3	↗	20	14
<b>Total</b>	<b>4</b>	<b>3</b>		<b>20</b>	<b>14</b>

State Water Project loss = salvage x 4.33; Central Valley Project loss = salvage x 0.68

DWR provided the below summary of hatchery spring-run surrogate Chinook salmon losses at the facilities last week. No additional spring-run surrogate Chinook salmon have been observed in salvage since 1/9/2020.

**CONFIRMED HATCHERY (ADIPOSE-FIN CLIPPED) CHINOOK SALMON LOSS AT THE SWP & CVP DELTA FISH FACILITIES as of 3/2/2020**

Release Date	CWT Race	Hatchery	Release Site	Release Type	Confirmed Loss	Number Released <sup>1</sup>	Total Entering Delta	% Loss of Number Released <sup>2</sup>	% Loss of Total Entering Delta <sup>3</sup>	First Stage Trigger	Date of First Loss <sup>4</sup>	Date of Last Loss <sup>4</sup>
12/9/2019	LF	Coleman NFH	Battle Creek	Spring Surrogate	20.21	84,869	n/a	0.024	n/a	0.5%	12/22/2019	1/9/2020
12/18/2019	LF	Coleman NFH	Battle Creek	Spring Surrogate	25.03	77,672	n/a	0.032	n/a	0.5%	1/1/2020	1/4/2020
1/13/2020	LF	Coleman NFH	Battle Creek	Spring Surrogate		77,866	n/a		n/a	0.5%		

SWP and CVP adipose-fin clipped Chinook lost from 10/1/2019 through 2/6/2020.

<sup>1</sup>Number released with the adipose-fin clipped and a coded-wire tag (CWT).

<sup>2</sup>% Loss of Number Released = (Confirmed Loss/Number Released)\*100.

<sup>3</sup>% Loss of Total Entering Delta= (Confirmed Loss/Total Entering Delta)\*100.

<sup>4</sup>Date of first and last loss accounts for all CWT loss even those from special studies where salvage and loss=0.

DWR-DES Revised 2/7/2020

Preliminary data from DFW, DWR, FWS, and Reclamation; subject to revision.

**SaMT Estimates of Fish Distribution**

SaMT estimates of the current distribution of listed Chinook salmon, as a percentage of the population, are based on recent monitoring data and historical migration timing patterns.

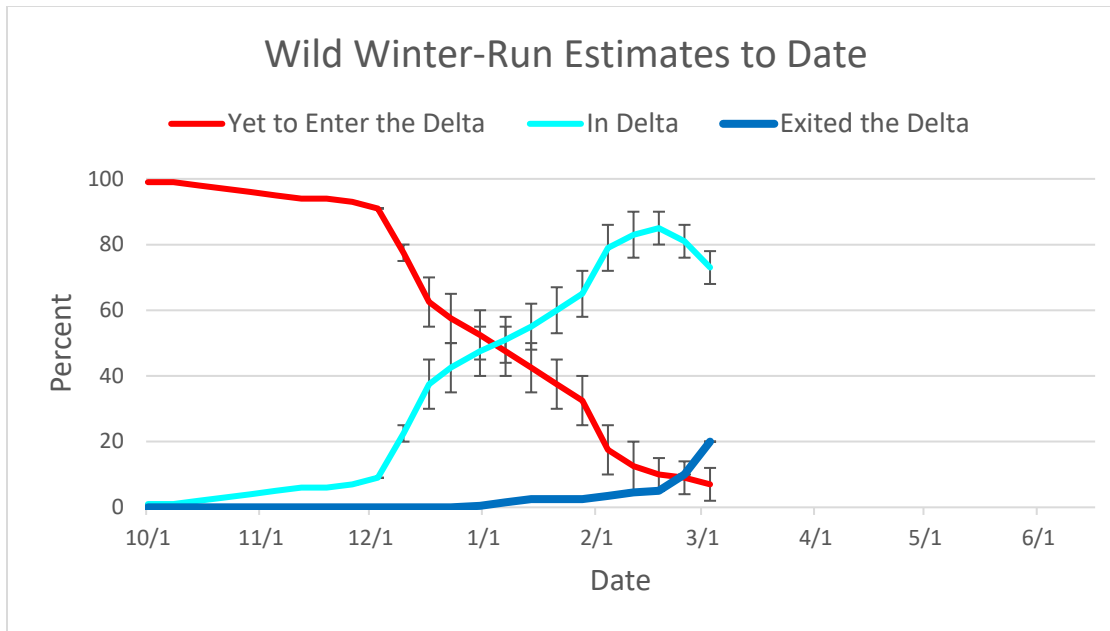
Location	Yet to Enter Delta (Upstream of Knights Landing)	In the Delta	Exited the Delta (Past Chipps Island)
<i>Young-of-year (YOY) winter-run Chinook salmon</i>	2-12% Last week: 4-14%	68-78% Last week: 76-86%	20% Last week: 10%

<b>Location</b>	<b>Yet to Enter Delta (Upstream of Knights Landing)</b>	<b>In the Delta</b>	<b>Exited the Delta (Past Chipps Island)</b>
<i>Young-of-year (YOY) spring-run Chinook salmon</i>	40-50% Last week: 40-43%	50-60% Last week: 57-60%	0% Last week: 0%
<i>Young-of-year (YOY) hatchery winter-run Chinook salmon</i>	100% (Not released)	0%	0%

**Rationale for changes in distribution**

*Natural winter-run Chinook salmon:*

Over 3.8 million brood year (BY) 2019 winter-run Chinook salmon have passed RBDD so far in water year 2020. In the last week, 1 length-at-date winter-run was captured at Tisdale, 5 were captured in the beach seines, 2 in the EDSM survey (Twitchell Island and Suisun Bay) and 20 in Chipps Trawl. SaMT estimates that the percentage of winter-run Chinook salmon population that has moved downstream into the Delta changed from 76% - 86% to 68% - 78%. SaMT also estimates an additional 10% exited past Chipps Island. Based on the time of year, winter-run Chinook salmon juveniles are likely to be rearing in the Delta after emigrating from upstream locations on the Sacramento River. Captures with seines and non-natal tributaries such as the 6 observed in the lower American River RST further indicate that fish are rearing near shore.

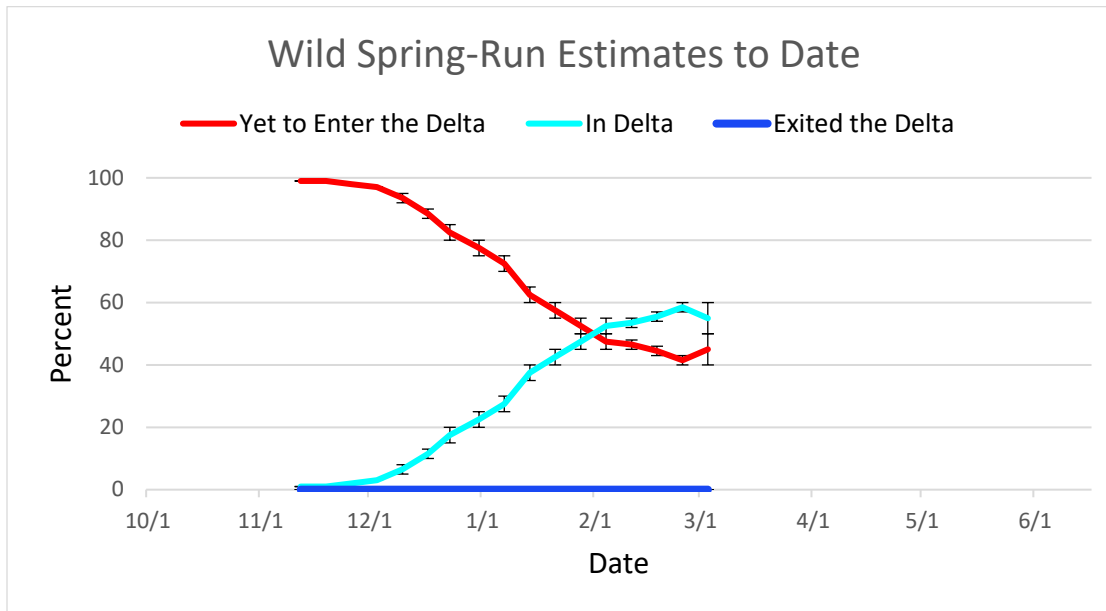


**WY 2020 natural winter-run distribution estimates to date.**

*Natural spring-run Chinook salmon:*

3 length-at-date spring-run Chinook salmon were caught at the GCID RST and 12 were caught in the beach seines this past week. 58 length-at-date spring-run Chinook salmon have also been detected in the Feather River RSTs. Based on discussion among the SaMT, members agreed to broaden the range of spring-run Chinook salmon distribution in the Delta to capture the uncertainty of the elasticity of spring-run Chinook salmon emigration timing from multiple tributaries. Butte Creek and Feather River spring-run Chinook salmon typically emigrate into the Delta later in the season and are not captured at the Knights Landing monitoring station. In addition, historical timing based on passage at Knights Landing indicate that 40% of the natural young-of-year spring-run Chinook salmon are considered to be in the Delta by this time of year. The SaMT estimates 40-50% of the spring-run Chinook salmon population are upstream of the Delta and 50-60% are in the Delta. No spring-run Chinook salmon have been observed in the

Chippis Island Trawl this season and therefore the SaMT estimates that no spring-run have exited the Delta.



**WY 2020 natural spring-run distribution estimates to date.**

*Natural Steelhead:*

Several factors increase uncertainty of measuring downstream movements of steelhead including varying life history and residency times, as well as monitoring gear avoidance. To provide an estimate of steelhead presence in the Delta, the SaMT discussed historical catch and emigration timing data and estimates 5-10% of natural Steelhead are currently in the Delta.

**Agenda 6.  
Fish Exposure and Behavioral Cues**

**Behavior:** Seine data indicate that most salmonids have been rearing in the Delta. Catches in Chippis Island trawl indicate that winter-run are outmigrating.

**DSM2:** Reclamation is developing a data visualization tool for displaying hydrologic data, such as water velocities comparisons for different operating scenarios. DSM2 is a 1D-hydrodynamic model simulating 1D flow, velocity, and particle tracking. Reclamation would like to share data output from this tool with DOSS in future meetings. Reclamation intends to present the DSM information next week and will share the associated Assessment document.

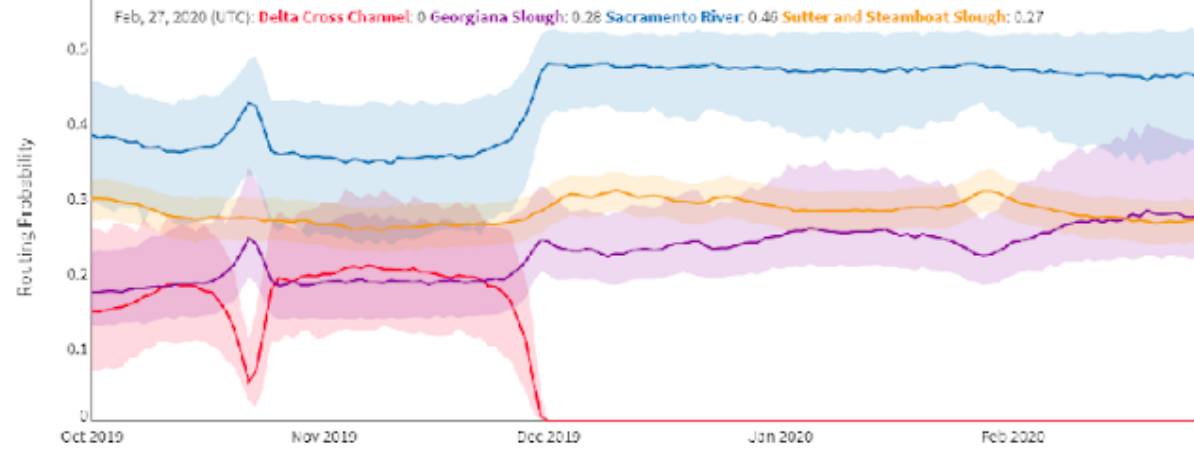
**Delta STARS Model:** <https://oceanview.pfeg.noaa.gov/shiny/FED/CalFishTrack/>

The Delta STARS Model is an individual-based simulation model that predicts survival, travel time, and routing of juvenile salmon migrating through the Delta. The model's structure and parameters are based on a recent analysis (Perry et al. in press) that relates individual survival, travel time, and routing of late-fall Chinook salmon to daily Sacramento River flows at Freeport and Delta Cross Channel operations. SaMT reviewed the STARS model for route-specific survival and routing probabilities. Routing probabilities into the interior Delta from the Sacramento River appeared to be similar to last week.

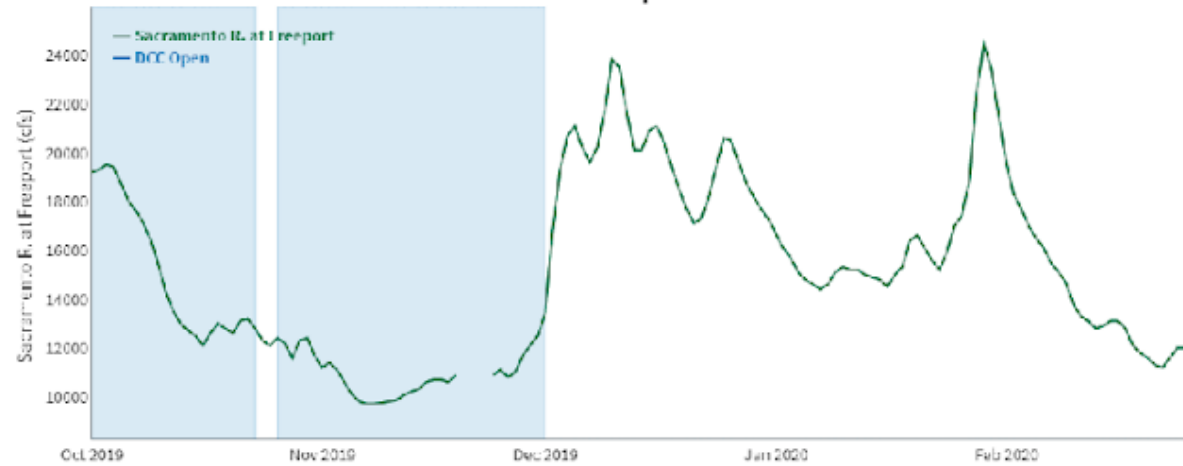
Graph description: Proportion of daily cohorts using each migration route.

Show 80% Uncertainty Intervals?

### Simulation Model Output



### Flow and DCC Operations



## SaMT Feedback on Entrainment Risk

### Assessment for Old and Middle River Flow Management Evaluation.

An interagency team was formed to provide guidance related to OMR Flow Management. Page 25 of the OMR Guidance document lists several questions to be included in an evaluation section of the assessment.

- After January 1, are more than 5% of the juveniles from one or more salmonid species present in the Delta?
  - Yes. Refer to Fish Monitoring Sections for more information.
- Does the action impact fish movement and change the potential distribution of fish?
  - The hydrologic footprint does not extend far outside of the south Delta Region. The distribution of Sacramento-origin fish are unlikely to be affected by Delta Exports. San Joaquin River flows are low. Under conditions similar to those being experienced currently in past years, a lot of fish have been routed through Old River. No salmonids are being captured at Mossdale. The group wanted clarification on what “action” meant (e.g., Delta Exports or all CVP and SWP operations).
- How much loss has occurred at the salvage facilities in the past week?
  - No ESA listed species have been observed at the salvage facilities in the past few weeks. Last week there was no observed loss of natural-origin salmonids. One hatchery-origin steelhead was observed in salvage.
- What is the likelihood of increased loss exceeding the next single year loss threshold based on the population distribution, abundance, and behavior of fish in Delta?
  - Highly unlikely.
- If a single-year loss threshold has been exceeded, do continued OMR restrictions benefit fish movement based on real-time information?
  - Not applicable. No thresholds have been exceeded during this water year.
- 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?
  - Not applicable. Current OMR flows more positive than -5,000 cfs.



SaMT also provides weekly entrainment risk outlooks by considering (a) two different categories of entrainment risk based on listed fish distribution and (b) factors that influence their potential for entrainment. The two entrainment risk categories considered include:

- **Interior Delta Entrainment Risk**- fish in the Sacramento River that have the potential to be entrained into the Interior Delta through the Delta Cross Channel (when open) and/or Georgiana Slough; and
- **CVP/SWP Facilities Entrainment Risk**- fish in the Interior Delta that have the potential to be entrained into the CVP/SWP facilities.

Influencing factors considered include:

- **Exposure Risk** (both categories): estimated scale (low, medium, high) of fish anticipated to be in vicinity of an entrainment risk,
- **Routing Risk** (Interior Delta Entrainment Risk): estimated scale (low, medium, high) that flow split conditions could result in fish migrating into the Interior Delta instead of remaining in main channel, and
- **OMR/Export Risk** (CVP/SWP Facilities Entrainment Risk): for fish in the Interior Delta, estimated scale (low, medium, high) that OMR and/or export levels could result in entrainment into the CVP/SWP facilities.

To provide an overall assessment of entrainment risk, the estimated current status of these influencing factors are described below for each of the entrainment risk categories.

**Interior Delta Entrainment Risk for listed salmonids in the Sacramento River over the next week:**

- **Exposure Risk: HIGH** (Low flows in the lower Sacramento River predicted; similar to last week)
  - Approximately 68-78% of the juvenile BY19 population of winter-run Chinook salmon are estimated to be in the Delta.
  - Approximately 50-60% of the juvenile BY19 population of spring-run Chinook salmon are estimated to be in the Delta.

- California Central Valley steelhead are in the lower Sacramento and Northern Delta based on monitoring data.
- Clipped steelhead have been observed at the fish salvage facilities.
- Anticipate emigration to continue into the Delta.
- **Routing Risk: MEDIUM**
  - DCC is closed.
  - Flows are predicted to be similar or slightly decreased compared to last week. Lower flows enhance the effects of tides around Georgiana Slough and Threemile Slough, leading to a higher probability of routing into these waterways. Refer to STARS Model section above.
- **Overall Entrainment Risk: MEDIUM-HIGH**

**CVP/SWP Facilities Entrainment Risk for listed salmonids in the Interior Delta over the next week:**

- **Exposure Risk: MEDIUM**
  - Listed Chinook salmon from the Sacramento River basin continue to be observed in monitoring sites in the Delta
  - Flows are predicted to be similar or slightly decreased compared to last week..
  - Salvage is expected to remain at stable levels this week. Exports will continue to be managed to lower than -5,000 cfs OMR flows.
  - Exports are expected to be low during the next week in order to meet Delta outflow and X2 location requirements. OMR is expected to be similar to last week.
- **OMR/Export Risk:**
  - OMR -1,000 cfs: LOW
  - OMR -2,500 cfs: LOW
  - OMR -3,500 cfs: LOW
- **Overall Entrainment Risk:**

- OMR -1,000 cfs: LOW
- OMR -2,500 cfs: LOW
- OMR -3,500 cfs: LOW

These assessments are based on anticipated and current hydrology and fish distributions for the next week.

### **Agenda 7.**

**Other Topics** – Assessment, Salvaged Chinook Genetic Data for next week

Agenda 8.

### **Action Items**

- USBR will update the Weekly Ops and Fish Outlook Document to include CDFW edits to the American River section regarding steelhead spawning; hatchery status will not be incorporated into the Outlook. Other revisions include: removal of references to daily loss density in non-clipped steelhead; change of Table 3's title to "ITP."
- USBR will include SacPAS data that speaks to the 25<sup>th</sup> and 75<sup>th</sup> percentile with a 95% confidence interval to see the distribution around the average for both migration timing and salvage timing.
- The spring run observed at Herringer appears to have a travel time of about three days; there are fewer observed fish than previous years but their timing is similar.
- SaMTs spring run migration estimations appear to be may be trending earlier than the historical distribution but that is based largely on Knight's Landing data, which may not be reflective of average arrival in the Delta. There is a lot of elasticity in the timing of fish in the tributaries but few lower tributary monitoring stations to reflect that. Staff are trying to address that bias in different ways, including assessing Butte Creek fish.
- Team is encouraged to provide suggestions on collecting better steelhead distribution data.
- USBR will present outputs from the DSM2 model next week.

**Agenda 8.**

**Additional Considerations for WOMT**

- **No recommendation for current operations for this week (e.g. changing planned exports)**
- USBR anticipates a more accurate estimate of the March Chipps requirement by the end of the week when they know the volume of Collinsville x2; the official notice will be posted 3/9/20.

**Agenda Item 9.**

**Next SaMT Meeting scheduled for Tuesday, March 10<sup>th</sup> at 9:00 am.**