

Salmon Monitoring Team Weekly Meeting
Conference call: 3/10/2020 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: Geir Aasen, Adam Chorazyczewski, Kyle Griffiths, Chris McKibbin

DWR: Chris Cook, Brittany Davis, Farida Islam, Mike Ford, Bryant Giorgi., En-Ching Hsu, Tracy Pettit, Kevin Reece

Kearns & West: Matt Marvin

NMFS: Kristin Begun, Jeff Stuart

Reclamation: Nick Bertram, Elissa Buttermore, Josh Israel, Suzanne Manugian, Tom Patton

USFWS: Katherine Sun

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 Historical patterns
 - a. Current conditions: DSM2 and entrainment modeling (STARs, Fish facilities)
 - b. Sensitivity to Operational Actions
7. Other Topics – Preliminary Genetic Data for CVP/SWP Salvage, email distribution list/roster, calendar invite.
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: current and projected CVP and SWP operations, fish life stage presence, and status of Delta Performance Thresholds. SaMT reviewed this document.

Agenda Item 4.

Current Operations (3/10/2020)

Current Operations	Location	Value (last week)	Value (this week)
Clifton Court Inflow	Clifton Court Forebay	1,000 cfs	2,300 cfs reducing to 1,000-1,500 cfs
SWP Reservoir Releases	Feather - Oroville	2,250 cfs	2,255 cfs
SWP Reservoir Storage	San Luis (SWP)	928 TAF	932 TAF
SWP Reservoir Storage	Oroville	2,255 TAF	1,750 TAF
Environmental Parameters	Sacramento River at Freeport	11,937 cfs	11,800 cfs receding to 11,000 cfs
Environmental Parameters	San Joaquin River at Vernalis	2,938 cfs	2,500 cfs receding
Environmental Parameters	Delta Outflow Index	11,500 cfs	9,400 cfs
Environmental Parameters	E:I (exports to Delta inflow)	16.5%	30%
Environmental Parameters	X2	73 Km	>81 Km
CVP Exports	Jones Pumping Plant	1,800 cfs (2 units)	2,700 cfs (3 units)
CVP Reservoir Releases	American - Nimbus	2,000 cfs	1,750 cfs reducing
CVP Reservoir Releases	Sacramento - Keswick	5,500 cfs	5,000 cfs ramping down.
CVP Reservoir Releases	Stanislaus - Goodwin	2,000 cfs	1,000 cfs ramping down to 200 cfs on 3/10/20 for stepped

Current Operations	Location	Value (last week)	Value (this week)
			release plan. It is a critical year based on San Joaquin Basin Index)
CVP Reservoir Releases	Trinity - Lewiston	300 cfs	300 cfs
CVP Reservoir Storage	San Luis (CVP)	473 TAF	467 TAF
CVP Reservoir Storage	Shasta	3,545 TAF	3,528 TAF
CVP Reservoir Storage	Folsom	444 TAF	431 TAF
CVP Reservoir Storage	New Melones	1,921 TAF	1,893 TAF
CVP	DCC Gates	Closed	Closed

cfs = cubic feet per second

TAF = thousand acre feet

Km = kilometer

Location of X2 measured from the Golden Gate

- The March X2 requirement was 7 Chipps days

Factors controlling Delta exports:

- 3/3/2020 – 3/9/2020: 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

Approximate OMR gage data as of 3/7/2020:

	USGS gauges (cfs)	Index (cfs)
Daily	-1,900	-2,000
5-day	-1,800	-1,300
14-day	-1,600	-1,100

Approximate OMRs as of 3/9/2020:

	Index (cfs)
Daily	-3,800
5-day	-2,400
14-day	-1,600

Weather Forecast

- Unsettled weather continues into mid-week. Best chances for precipitation will be over the mountains. Drier weather returns next Thursday into Friday, then more precipitation possible next weekend.

<https://forecast.weather.gov/product.php?site=STO&issuedby=STO&product=AFD&format=CI&version=1&glossary=1>

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.

Mill Creek (MLM)			Deer Creek (DCV) *	
Date	mean daily flow (cfs)	change in mean daily flow	mean daily flow (cfs)	change in mean daily flow
3/3/2020	146	0%	123	-1%
3/4/2020	148	2%	124	1%
3/5/2020	151	3%	124	0%
3/6/2020	152	1%	124	0%
3/7/2020	161	6%	130	5%
3/8/2020	163	2%	133	3%

- 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.

Wilkins Slough (WLK)		Knights Landing (KL) *
Date	Mean Daily Flow (cfs)	Daily water temperature (°F)
3/3/2020	6,193	53.7
3/4/2020	6,427	53.9
3/5/2020	6,495	55.2

	Wilkins Slough (WLK)	Knights Landing (KL) *
3/6/2020	6,501	56.8
3/7/2020	6,463	56.4
3/8/2020	6,426	55.9

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. Neither of the Sacramento Catch indices (trawl, seines) or the KLCI were triggered in the past week.

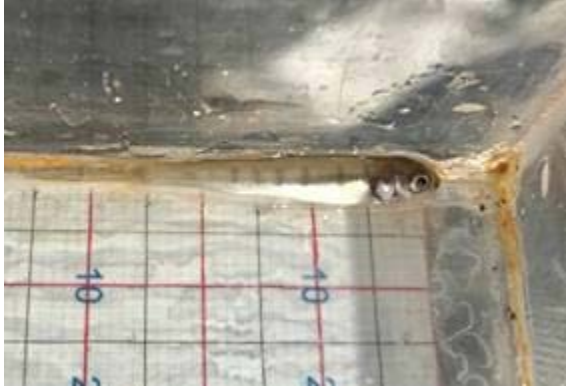
Hatchery Releases

Planned release of approximately 152,000 juvenile winter-run Chinook salmon from Livingston Stone National Fish Hatchery (NFH). This is a partial release of the production for Livingston Stone NFH brood year 2019 winter-run Chinook salmon. The release will occur at dusk on Tuesday, March 10, 2020 at the Caldwell Park boat ramp located in Redding, California.

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 ^A	Feather River RST Herringer ^B	GCID RST ^C	Tisdale RST ^D	Knights Landing RST ^E	Beach Seines	EDSM	LAR RST ^F	Sacramento Trawl	Chippis Island Midwater Trawl	Mossdale Kodiak Trawl	Caswell RST ^G
Sample Dates	3/2 – 3/8	3/2 – 3/8	3/3 – 3/9	3/2 – 3/8	3/2 - 3/9	3/3 - 3/6	3/2-3/5	3/3 – 3/5	3/1-3/6	3/1-3/3, 3/5-3/6	3/2, 3/4-3/6	3/3 – 3/5
FR Chinook	20,021	3,338	125	2	14	8		13,329	1			10
SR Chinook	68	33	3		1	1		4				
WR Chinook							1	6		2		
LFR Chinook												
Chinook (ad-clip)												
Steelhead (natural)	2							5 (fry)	2			
Steelhead (ad-clip)							4	32	1	35		
Green Sturgeon												
Flows (avg. cfs)	800	2,067		5,867	6,396							
W. Temp. (avg. °F)	51.2	54.5	54.3	55	55,							
Turbidity (avg. NTU)	1.7	2.15	2.4	3.6	5							

- A. Feather River RST data from Eye Channel sampling period were from 3/2/2020 at 12:31 to 3/8/2020 at 10:50.
- B. Feather River RST data at Herringer sampling period were from 3/2/2020 at 9:25 to 3/8/2020 at 9:05.
- C. GCID sampling period was from 3/3/2020 at 9:00 to 3/9/202 at 9:00. Full cone. Bypass flow (cfs) recorded N/A all 7 days.
- D. Tisdale RST sampling period was from 3/2/2020 at 10:00 to 3/8/2020 at 10:45. Full cone.
- E. Knights Landing RST sampling period was 3/2/2020 at 10:45 to 3/9/3030 at 10:00. Full cone.
- F. Lower American River RST sampling period was from 3/3/2020 to 3/5/2020. Image is a recently emerged steelhead button-up fry, first captured this season on LAR.



- G. Stanislaus River at Caswell RST sampling period was from 3/3/2020 to 3/5/2020.

Green Sturgeon

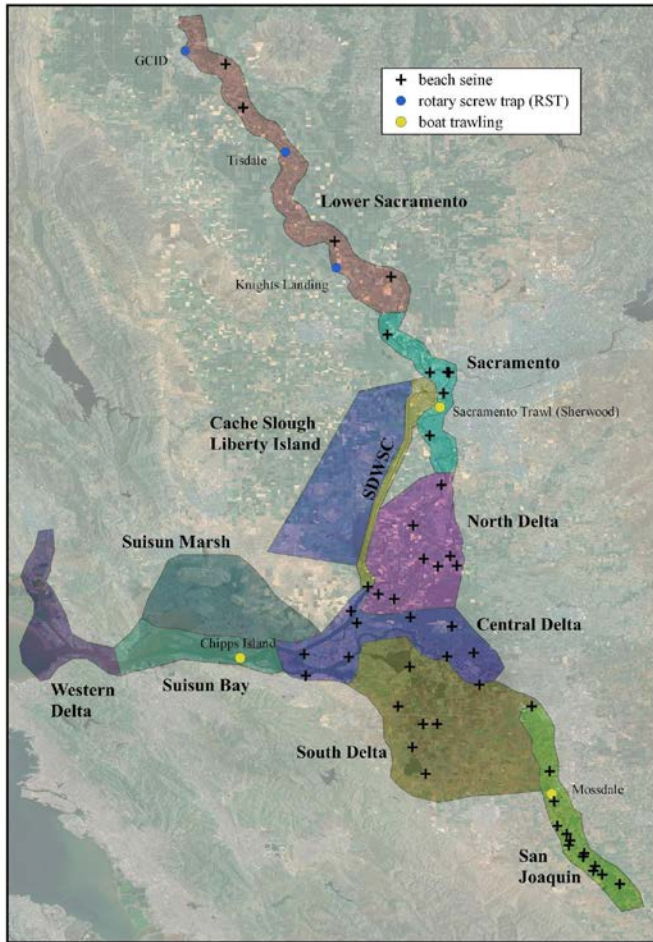
2 juvenile green sturgeon were detected north of Sherman Lake on March 3 and one juvenile was detected at this location on March 5. One adult was detected at the Fremont Weir on March 5th. No new real-time detections were posted on the Central Valley Acoustic Telemetry web page <https://calfishtrack.github.io/real-time/index.htm>

Red Bluff Diversion Dam Biweekly Report

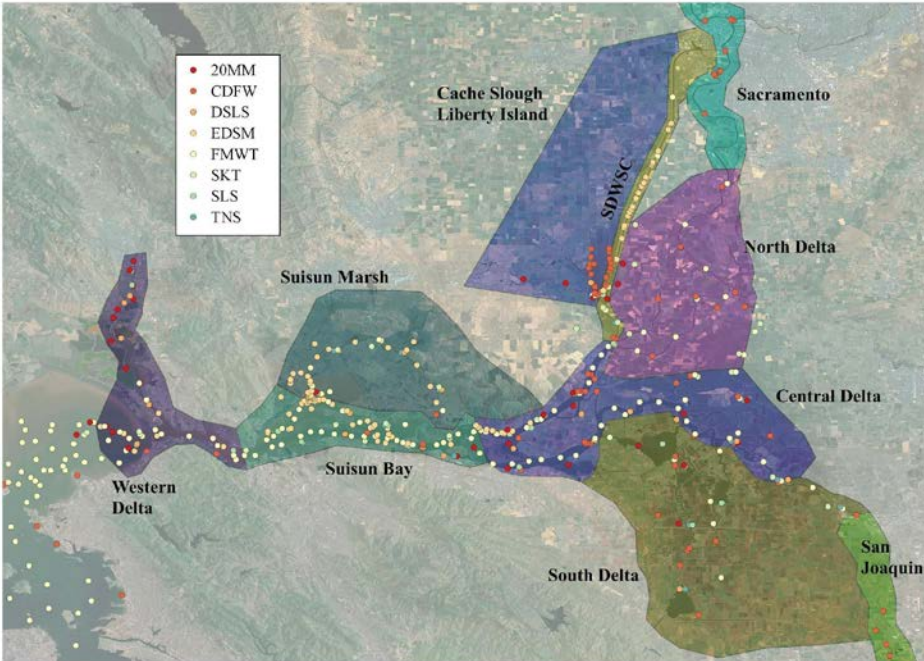
USFWS biweekly report (2/12-2/25/2020) for preliminary estimates of passage by Brood Year (BY) and run for estimated passage of unmarked juvenile Chinook salmon via rotary screw traps at RBDD included:

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

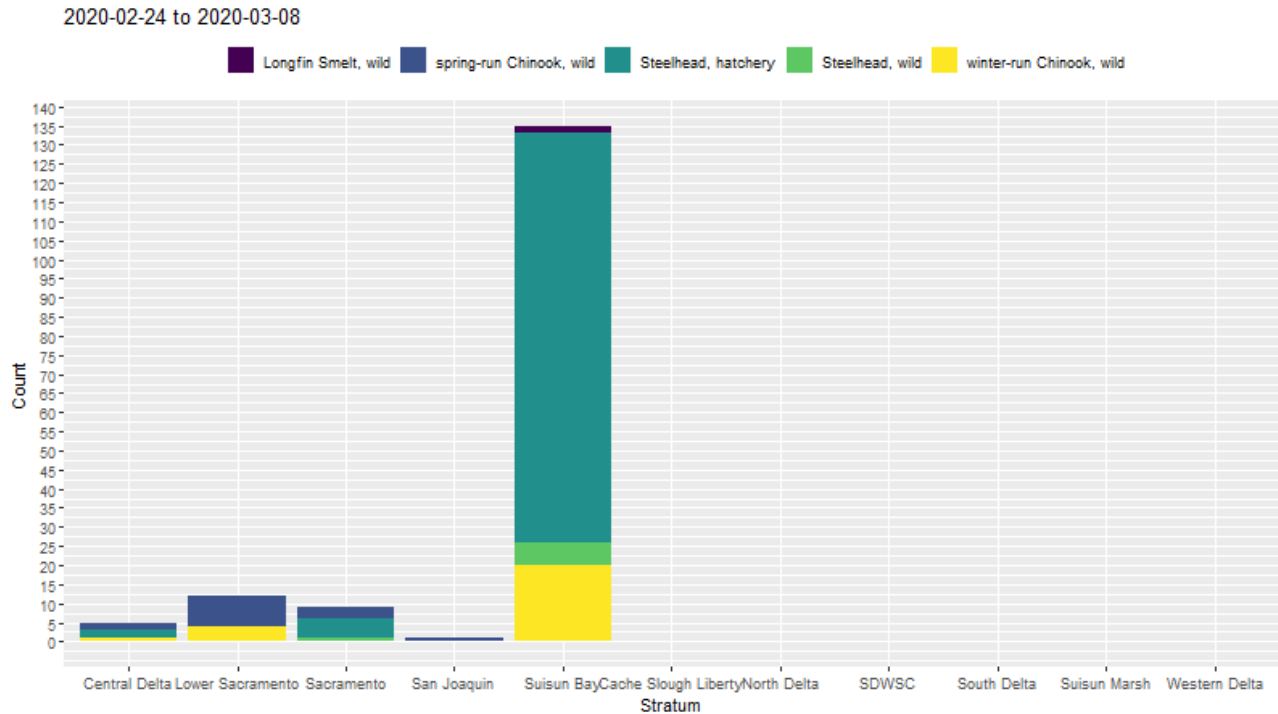
Fish Monitoring by Delta Strata



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.



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 2/17/2020 - 3/9/2020, data available 2/24/2020 - 3/8/2020.

Historical Fish Monitoring Data

Because of challenges with limited data and interpretation real-time steelhead catch data, SaMT reviews 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

Migration Timing:

Average percent for each species of interest (clipped and unclipped) captured at the following locations by March 8th in previous years. Average sampled represents historic data spanning years 2005 to 2018.

Brood Year	Species, species run	Average Percent Captured Red Bluff Diversion Dam	Average Percent Captured Tisdale	Average Percent Captured Knights Landing	Average Percent Captured Beach Seines	Average Percent Captured Sac Trawl (Sherwood)	Average Percent Captured Chipps Island
Average 2005 - 2018	winter-run Chinook	99.3%	97%	96.7%	99.2%	61.8%	24.7%
Average 2005 – 2018	spring-run Chinook	44.5%	28.3%	47.7%	74%	15.4%	0.1%
Average 2005 – 2018	Steelhead	2.3%	48.4%	47.9%	66.8%	84.2%	68.3%

Salvage timing:

Average percent for each species (based on length at date) of interest captured at SWP and CVP Delta Fish Facilities by March 8th in previous years. Average sampled represents historic data spanning years 2005 – 2018.

Brood Year	Species, species run	Average Percent Salvaged at SWP and CVP Delta Facilities
Average 2005 - 2018	winter-run Chinook (unclipped)	59.9%
Average 2005 – 2018	spring-run Chinook (unclipped)	1%
Average 2005 – 2018	Steelhead (unclipped)	36.5%

Fish Monitoring: Salvage

DOSS Weekly Salvage Update

Reporting Period: March 2-March 8, 2020
 Prepared by Kyle Griffiths on March 9, 2020 15:1
 Preliminary Results -Subject to Revision

Criteria	2-Mar	3-Mar	4-Mar	5-Mar	6-Mar	7-Mar	8-Mar	Trend	
Loss Densities									
Wild older juvenile CS	0	0	0	0	3.46	0	1.93	↗	0.77
Wild steelhead	0	0	0	0	0	0	0	→	0.00
Exports									
SWP daily export	0	3,703	1,974	1,250	1,447	2,010	4,752	↘	2,162
CVP daily export	3,571	3,655	3,631	3,585	3,577	3,575	5,116	↘	3,816
SWP reduced counts	0	0	0	0	0	0	0		
CVP reduced counts	0	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
Wild					
Winter Run	10	36	↗	10	36
Spring Run	0	0	→	0	0
Late Fall Run	0	0	→	12	8
Fall Run	0	0	→	48	33
Unclassified	0	0	→	0	0
Total	10	36		70	78
Hatchery					
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
Total	0	0		352	261

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	20	14	↘	40	27
Total	20	14		40	27

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

* The season totals indicate that the wild winter-run salvaged by CDFW in this week's data equals the total for the season. This is a result of genetic results being applied through the end of February 2020. Season total for winter-run Chinook based on LAD is estimated to be 54.38.

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 3/9/2020

Release Date	CWT Race	Hatchery	Release Site	Release Type	Confirmed Loss	Number Released ¹	Total Entering Delta	% Loss of Number Released ²	% Loss of Total Entering Delta ³	First Stage Trigger	Date of First Loss ⁴	Date of Last Loss ⁴
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.

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

²% Loss of Number Released = (Confirmed Loss/Number Released)*100.

³% Loss of Total Entering Delta= (Confirmed Loss/Total Entering Delta)*100.

⁴Date 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

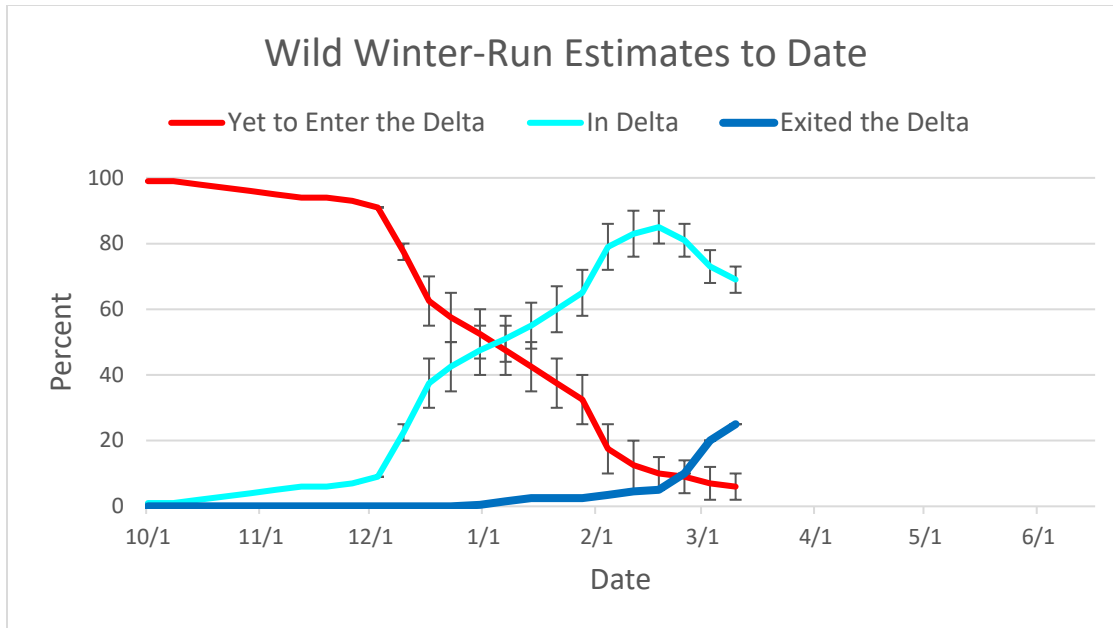
SaMT estimates of the current distribution of listed Chinook salmon, as a percentage of the population, are based on recent monitoring data and historical migration timing patterns.

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>	2-10% Last week: 2-12%	65-73% Last week: 68-78%	25% Last week: 20%
<i>Young-of-year spring-run Chinook salmon</i>	37-47% Last week: 40-50%	53-63% Last week: 50-60%	0% Last week: 0%
<i>Young-of-year hatchery winter-run Chinook salmon</i>	100%	0%	0%

Rationale for changes in distribution

Natural winter-run Chinook salmon:

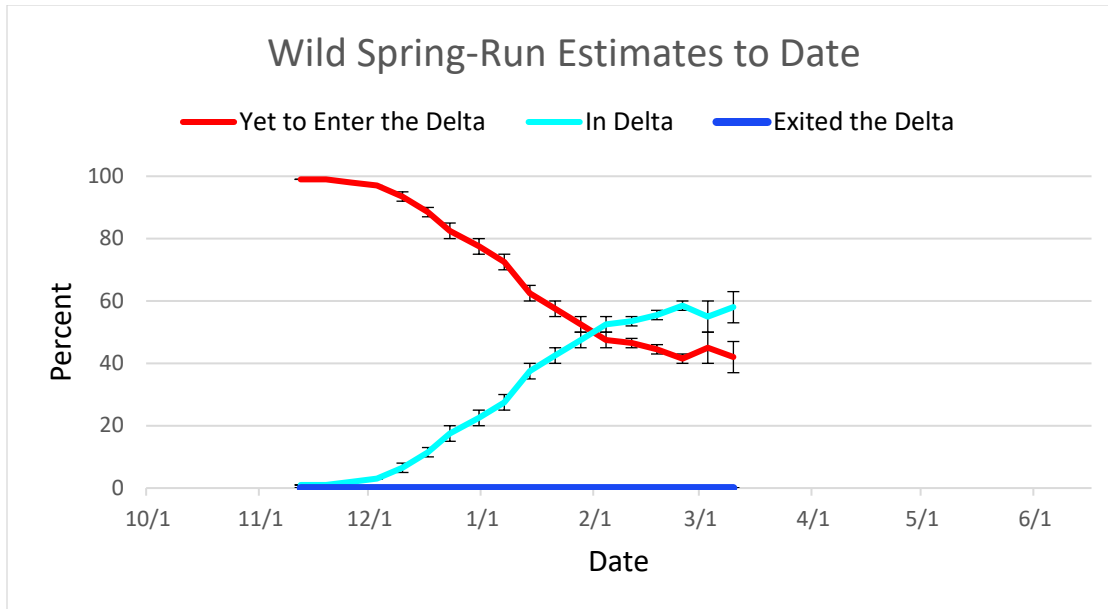
Over 3.8 million brood year (BY) 2019 winter-run Chinook salmon have passed RBDD so far in water year 2020. In the last week, 6 length-at-date winter-run were captured in the lower American River and 2 in Chipps Trawl. SaMT estimates that the percentage of winter-run Chinook salmon population that has moved downstream into the Delta changed from 68% - 78% to 65%-73%. SaMT also estimates an additional 5% exited past Chipps Island. Based on the time of year, winter-run Chinook salmon juveniles are likely to be shifting from rearing in the Delta to migrating out of the Delta.



WY 2020 natural winter-run Chinook salmon distribution estimates to date.

Natural spring-run Chinook salmon:

3 length-at-date spring-run Chinook salmon were caught at the GCID RST and 1 were caught in the beach seines this past week. 101 length-at-date spring-run Chinook salmon have also been detected in the Feather River and 4 in the lower American River RSTs. 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 48% 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 37-47% of the spring-run Chinook salmon population are upstream of the Delta and 53-63% are in the Delta. No spring-run Chinook salmon have been observed in the Chipps Island Trawl this season and therefore the SaMT estimates that no spring-run have exited the Delta.



WY 2020 natural spring-run Chinook salmon 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. Clipped steelhead observed in salvage and Chipps Island. Historically, 36.5% of steelhead are salvaged by this time of the year. SaMT estimates 8-15% of natural Steelhead are currently in the Delta. Last week 5-10% were estimated to be in the Delta.

Agenda 6.

Fish Exposure and Behavioral Cues

Behavior: Catches in Chipps Island trawl indicate that winter-run are emigrating. Because spring tide is shifting to neap tide, we expect steelhead and winter-run to move with the incoming neap tide.

DSM2: Reclamation would like to share data output from this tool with SaMT.

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. The STARS model predicts the following proportion of entrainment: 0% DCC, 27% Georgiana Slough, 46% Sacramento River, and 27% Sutter and Steamboat Slough.

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. Greater than 5% of winter-run, spring-run, and steelhead are estimated to be in the Delta. Refer to Fish Monitoring Sections for more information.
- Does the action (outlook for exports, OMR flows) impact fish movement and change the potential distribution of fish?
 - Yes.
 - Winter-run and steelhead are shifting from a rearing phase (where they are closer to the river banks) to migration phase (where they are moving in the river channel). This behavior makes them more vulnerable to exports. Not as many fish were detected in the seines as previous weeks.
 - Storms events will also cue fish movement.
 - Considering historical timing of outmigration for winter-run and steelhead as well as monitoring data (in salvage and Chipps Island Trawl), we believe that the distribution of Sacramento-origin fish are likely 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. However, we are not observing San Joaquin origin fish in monitoring (RSTs, salvage, Mossdale trawl).
 - With increased exports, we have observed an increase of salvage of salmonids (clipped steelhead and winter-run LAD) over the past week.
 - Risk is greater than the previous week.
- How much loss has occurred at the salvage facilities in the past week?
 - In the past week, winter-run sized Chinook salmon were salvaged at the Delta Fish Collection facilities (estimated loss = 36).
 - 4 additional winter-run were salvaged yesterday (3/9/2020).
 - Hatchery-origin steelhead were salvaged (weekly loss = 14).
 - An additional 4 clipped steelhead were observed yesterday (3/9/2020).
- 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 because D-1641 is controlling exports.

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 65-73% of the juvenile BY19 population of winter-run Chinook salmon are estimated to be in the Delta.
 - Approximately 53-63% of the juvenile BY19 population of spring-run Chinook salmon are estimated to be in the Delta.
 - Anticipate emigration to continue into the Delta.
- **Routing Risk: MEDIUM-HIGH**
 - 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-HIGH**

- Listed Chinook salmon from the Sacramento River basin continue to be observed in monitoring sites in the Delta and have been observed in salvage during the past week.
-
- Exports are expected to continue to be managed to less negative than -5,000 cfs OMR flows.
- Winter-run and steelhead are shifting to a migration phase from rearing. They are moving from the shores toward the river channels as they migrate out of the Delta.
- Lunar phase > Delta emptying > stimulate fish movement

- **OMR/Export Risk:**

- OMR -1,000 cfs: LOW
- OMR -2,500 cfs: LOW
- OMR -3,500 cfs: LOW-MEDIUM
- OMR -5,000 cfs: MEDIUM

- **Overall Entrainment Risk:**

- OMR -1,000 cfs: LOW
- OMR -2,500 cfs: LOW
- OMR -3,500 cfs: MEDIUM
- OMR -5,000 cfs: MEDIUM-HIGH

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

Agenda 7.

Other Topics – Preliminary Genetic Data for CVP/SWP Salvage. Reclamation and DWR shared preliminary genetic results for salvaged Chinook salmon. Additional markers were incorporated into the dataset. All Chinook salmon samples that have been collected and analyzed during this water year were genetically fall/late-fall run. Please see attachment at the end of these notes for more information.

Communications: Please email Matt Marvin at mmarvin@kearnswest.com if you are not on the roster, receiving all emails, or the calendar invite.

Agenda 8.

Action Items

- SaMT members agreed to foregoing in-person attendance moving forward.
- The March 31, 2020 SaMT meeting will be moved to April 1, 2020 at 9:00 a.m. in observance of Cesar Chavez Day, a state holiday.

Agenda 9.

Additional Considerations for WOMT

- Currently the SWP is operating to the ITP associated with 2008 and 2009 BiOps as described in weekly Fish and Operations Outlook.
- Refer to the Weekly Fish and Operation Outlook for more information on the currently controlling regulatory factor.

Agenda Item 10.

Next SaMT Meeting is scheduled for Tuesday, March 17, 2020 at 9:00 am.

Preliminary Genetic Data for CVP/SWP Salvage – Data subject to revision.

Caution should be exercised when interpreting population assignment results, as the nuances of the statistical analysis used to generate the results may not be apparent. The mathematical error regarding the broad determination of winter run versus non-winter run is essentially zero. There is high confidence in the “Assignment” and probability shown in “PosProb1”, so that information could be viewed as “certain”. Regarding finer sub-divisions of population assignment, error can increase. The “Group” label is categorized by run type (or race); however, there is little genetic difference between fall and late-fall. It is more appropriate to collapse the information into the National Marine Fisheries Service’s designated Evolutionary Significant Units (ESU): 1) fall/late fall; 2) spring; and 3) winter. Regarding the probabilities themselves, a value greater than 0.80 is viewed as highly likely and is interpreted as the observed assignment to the “group” shown was statistically greater than to any other possible group. Similarly, values lower than 0.80 are statistically less uncertain. The “Assignment” and “Group” categories represent genetic identification using markers and methods that have been NMFS-approved.

Additional analyses have been included in the population assignments results table. The “ots28” column represents the outcome of an analysis using 18 markers spanning two genes associated with migration timing (i.e. greb1L and rock1). Early migrating stocks (e.g. winter Chinook Salmon, spring Chinook Salmon) have different genetic information at markers than late migrating stocks (e.g. fall Chinook Salmon). Currently, ots28 data are not included in genetic assignment process (i.e. “Assignment, “Group”). Ots28 information has been included in reporting table to enhance characterization of fall-run versus spring-run ambiguity and provide a useful supplement to population assignments. The “sexid” column represents the genotype at a Y-Chromosome sex determination marker that is highly correlated with phenotypic sex. Accurately documenting sex visually is quite challenging for juvenile or immature Salmon.

For the results provided below, assignment probabilities were high for winter/non-winter (shown; PosProb1) and ESU level (i.e., fall and late fall combined; not shown). In addition, known introgression between Feather River spring-run and Feather River fall-run Chinook salmon may result in low assignment probabilities when those individuals are present.

Both methods (ots28 and Group) indicate that all Chinook salvaged during this water year that have been analyzed were fall/late fall-run.

Sample Date	Fork Length	ots28	sexid	Assignment	PosProb1	Group	PosProb2	DeltaModel	Facility
12/3/2019 18:00	185	-	-	Non-winter	1.000	Late Fall	0.500	Fall	CVP
12/5/2019 0:00	168	late	female	Non-winter	1.000	Fall	0.987	Late Fall	CVP
1/18/2020 0:00	181	late	female	Non-winter	1.000	Fall	0.903	Late Fall	CVP
1/20/2020 0:00	170	late	male	Non-winter	1.000	Fall	0.985	Winter	CVP
1/22/2020 0:00	135	late	male	Non-winter	1.000	Fall	0.997	Winter	CVP
1/28/2020 0:00	128	late	female	Non-winter	1.000	Fall	0.978	Winter	CVP
1/29/2020 0:00	181	late	female	Non-winter	1.000	Fall	0.996	Winter	CVP
2/7/2020 0:00	35	late	female	Non-winter	1.000	Fall	0.992	Fall	CVP
2/8/2020 0:00	37	late	male	Non-winter	1.000	Fall	0.920	Fall	CVP
2/8/2020 0:00	40	late	female	Non-winter	1.000	Fall	0.983	Fall	CVP
2/9/2020 0:00	202	late	female	Non-winter	1.000	Fall	0.981	Winter	CVP
2/9/2020 0:00	32	late	male	Non-winter	1.000	Fall	0.981	Fall	CVP

For more information on new science related to these markers:

Blankenship, S. 2020. Genetic Data Report Guidance – Premature Migration. Technical Memorandum.

Narum, S. R., A. Di Genova, S. J. Micheletti, and A. Maass. 2018. Genomic variation underlying complex life-history traits revealed by genome sequencing in Chinook salmon. *Proceedings of the Royal Society B: Biological Sciences* 285(1883):20180935.

Prince, D. J., S. M. O'Rourke, T. Q. Thompson, O. A. Ali, H. S. Lyman, I. K. Saglam, T. J. Hotaling, A. P. Spidle, and M. R. Miller. 2017. The evolutionary basis of premature migration in Pacific salmon highlights the utility of genomics for informing conservation. *Science Advances* 3(8):e1603198.

Quinn, T. P., P. McGinnity, and T. E. Reed. 2015. The paradox of “premature migration” by adult anadromous salmonid fishes: patterns and hypotheses. *Canadian Journal of Fisheries and Aquatic Sciences* 73(7):1015–1030.

Thompson, T. Q., M. R. Bellinger, S. M. O'Rourke, D. J. Prince, A. E. Stevenson, A. T. Rodrigues, M. R. Sloat, C. F. Speller, D. Y. Yang, V. L. Butler, M. A. Banks, and M. R. Miller. 2019. Anthropogenic habitat alteration leads to rapid loss of adaptive variation and restoration potential in wild salmon populations. *Proceedings of the National Academy of Sciences* 116(1):177.

Rapid Genetic Protocol Correspondence:

- 2019: [Reclamation's request to implement rapid genetic analysis in WY 2019 \(December 18, 2019\)](#) and [NMFS' Response \(December 20, 2019\)](#)
- 2018: [Reclamation's request to implement rapid genetic analysis in WY 2018 \(November 17, 2018\)](#) and [NMFS' Response \(December 17, 2018\)](#)
- 2017: [Reclamation's request to implement rapid genetic analysis in WY 2018 \(November 17, 2017\)](#) and [NMFS' response \(December 18, 2017\)](#)
- 2016: [Reclamation's request to implement rapid genetic analysis in WY 2017 \(October 20, 2016\)](#) and [NMFS' response \(November 21, 2016\)](#)