

Delta Operations for Salmonids and Sturgeon (DOSS) Group
Conference call: 3/26/2019 at 9:00 a.m.

Objective: Provide advice to the Water Operations Management Team (WOMT) and National Marine Fisheries Service (NMFS) on measures to reduce adverse effects from Delta operations of the Central Valley Project and the State Water Project on salmonids and green sturgeon. DOSS will work with other technical teams. DOSS notes and advice can be found at the [NMFS Water Ops page: www.westcoast.fisheries.noaa.gov/central_valley/water_operations/doss.html](http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/doss.html).

CDFW: Ken Kundargi, Duane Linander, Jason Julienne

DWR: Bryant Giorgi, Farida Islam, Kevin Reece

NMFS: Kristin Begun

Reclamation: Tom Patton, Elissa Buttermore

SWRCB: Craig Williams, Chris Carr

USFWS: Craig Anderson, Felipe Carrillo

Agenda Items

1. Agenda review and introductions
2. RPA Implementation review (For the DOSS Dashboard, click on the "Triggers & Indices" tab at: www.baydeltalive.com/djfmj)
3. Current Operations
4. Smelt Working Group
5. Fish Monitoring: RSTs/trawls/seines
6. Fish Monitoring: Salvage
7. Hatchery Releases
8. DOSS Estimates of Fish Distribution
9. DOSS Feedback on Entrainment Risk
10. DOSS advice
11. Next DOSS meeting

Agenda Item 2.

RPA Implementation Review

Delta RPA Actions affecting operations during March:

Action IV.1.1 (Alerts that indicate the Delta Cross Channel (DCC) gate operations may be triggered soon)¹:

- Starting on 10/1, the First Alert is triggered if either the first component (>95 cfs flow threshold) or second component (>50% change in mean daily flow) has been exceeded at either the Deer Creek gage at Vina (DCV), or the Mill Creek gage at Los Molinos

¹ For details, see pages 60-61 in Enclosure 2 of the 2011 Amendments to the 2009 RPA document at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf. Note that in October 2014, NMFS approved a modification of the first component of the first alert to a 95 cfs mean daily flow threshold in either Mill Creek or Deer Creek in lieu of operating the Mill and Deer Creek rotary screw traps.

(MLM). The First Alert was triggered every day this past week. See table below for details.

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
3/19/2019	371	5%	593	3%
3/20/2019	409	10%	643	8%
3/21/2019	422	3%	666	4%
3/22/2019	404	-4%	651	-2%
3/23/2019	427	6%	677	4%
3/24/2019	407	-5%	654	-4%
3/25/2019	585	44%	833	27%

- Second Alert (triggered only if both Knights Landing water temperatures are <56.3°F and Wilkins Slough flows are >7,500 cfs). The Second Alert was triggered every day this past week. See table below for details.

Wilkins Slough (WLK)		Knights Landing (KL)
Date	Mean Daily Flow (cfs)	Daily water temperature (°F)
3/19/2019	25,388	52.8
3/20/2019	24,838	53.3
3/21/2019	24,230	53.5
3/22/2019	24,043	53.4
3/23/2019	23,439	53.0
3/24/2019	23,067	52.8
3/25/2019	23,000	52.1

Action IV.1.2² (DCC gate operations):

- DCC gates will remain closed per operations described in RPA IV.1.2 starting 12/1/18.

Action IV.2.3³ (OMR Management):

- Implementation of this action in WY 2019 began on 1/1/19, and requires that Old and Middle River (OMR) flow be no more negative than -5,000 cfs. OMR flows are reported weekly with the OMR index and the tidally filtered USGS gauges at the 5-day and 14-day running averages.
- No salvage-based triggers that would require OMR to be more positive than -5,000 cfs were exceeded this week.

² For details, see pages 62-66 in Enclosure 2 of the 2011 Amendments to the 2009 RPA document at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

Action IV.3³ (Reduce likelihood of entrainment or salvage at the export facilities, including an alert that indicates that export operations may need to be altered):

- The Third Alert [November 1-February 28 Knights Landing Catch Index (KLCI) or Sacramento Catch Index (SCI) >10] was not triggered this past week.
- Since the action went into effect on 11/1/18, no salvage-based triggers that would require export reduction have been exceeded.

Agenda Item 3.

Current Operations (3/26/19)

SWP		CVP	
Exports (cfs)			
Clifton Court Forebay	4,500	Jones Pumping Plant	1,800
Reservoir Releases (cfs)			
Feather - Oroville	10,300*	American - Nimbus	5,200
		Sacramento - Keswick	10,000**
		Stanislaus – Goodwin	4,500
		Trinity - Lewiston	300
Reservoir Storage (in TAF)			
San Luis (SWP)	1,063 (full)	San Luis (CVP)	966 (full)
Oroville	2,730	Shasta	3,843
New Melones	2,020	Folsom	687
Delta Operations			
DCC	Closed	Sacramento River at Freeport (cfs)	56,164
Outflow Index (cfs)	~74,700	San Joaquin River at Vernalis (cfs)	15,234
E:I	7% (14-day avg.)	X2	<56 km

* -Oroville releases may increase to 11,000 cfs later today (3/26).

** Keswick releases are scheduled to increase tomorrow (3/27) to 15,000 cfs.

Factors controlling Delta exports:

- 3/19/19-3/26/19: Available physical capacity

Approximate OMR as of 3/17/19:

	USGS gauges (cfs)	Index (cfs)
Daily	200	200
5-day	2,400	2,100
14-day	1,300	1,000

³ For details, see pages 79-80 in Enclosure 2 of the 2011 Amendments to the 2009 RPA document at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

Approximate OMR as of 3/25/19:

	Index (cfs)
Daily	-600
5-day	-800
14-day	600

Weather Forecast

Light precipitation continues today through Thursday as a cold front moves over northern California. Snow levels at 4,000 feet on Thursday with 2-3 feet of possible snowfall accumulation in the northern Sierra. Dry weather expected in the Sacramento region on Friday into the weekend.

Agenda Item 4.

Smelt Working Group

The Smelt Working Group met on Monday, 3/25/19, at 10 am. The following meeting summary is preliminary and is subject to change.

The Smelt Working Group (SWG) reviewed current Delta conditions, survey data, expected exports, and forecasted weather. On 1/31, the 3-station average daily water temperature at Mossdale, the Rio Vista Bridge, and Antioch exceeded 12°C, which is the temperature indicative of Delta Smelt spawning as identified in the Biological Opinion and a potential trigger for the start of Action 3. With this week’s forecasted storm, river flows are expected to remain elevated and OMR flow rates are expected to be in the positive territory. The SWG determined that the risk of entrainment for Delta Smelt would be very low for fish that are currently outside of the South Delta. Fish in the South and Central Delta, however, could still be at risk of entrainment based on the current rate of water exports.

The Service determined on 2/6 that Action 3 had been implemented for the protection of larval and juvenile Delta Smelt. The implementation of Action 3 requires OMR flow rates to be no more negative than -5,000 cfs on a 14-day running average. The SWG will continue to monitor Delta Smelt survey and salvage data and Delta conditions, and the group plans to meet again next Tuesday, 4/2/19 at 10 am.

Agenda Item 5.

Fish Monitoring: The following table presents fish monitoring data summarized over the past week. Unless otherwise noted, reported sizes are fork length. Empty cells indicate zero catches at those locations with sample dates shown.

Location	GCID RST ^A	Tisdale RST ^B	Knights Landing RST ^C	Beach Seines ^D	Sacramento Trawl ^D	Chippis Is. Midwater Trawl ^D	Mossdale Kodiak Trawl ^D
Sample Date	-	3/15-3/21	3/18-3/23	3/18-3/20	3/17-3/19, 3/21-3/22	3/17-3/19, 3/21-3/22	3/18, 03/20, 3/22
FR Chinook		5	17	237	48	8	

SR Chinook		1	22	3	8	7	
WR Chinook			1		1	5	
LFR Chinook							
Chinook (ad-clip)			7 SR 1 WR	2	30	4	
Steelhead (wild)							
Steelhead (ad-clip)			2		3	7	
Green Sturgeon							
Flows (avg. cfs)		36,034	24,191				
W. Temp. (avg. °F)		53	53.1				
Turbidity (avg. NTU)		47.1	38.71				

^A The GCID trap was raised on 2/22 due to predicted high flows.

^B Tisdale RST sampling period was from 3/15 at 9:30 am at 3/21 at 9:30 am.

^C Knights Landing RST sampling period was from 3/18 at 11:00 am to 3/23 at 11:30 am.

^D Data reported in the 3/17 to 3/23 DJFMP sampling summary.

Enhanced Delta Smelt Monitoring (EDSM):

16 fall-run Chinook salmon, 5 spring-run Chinook salmon, winter-run Chinook salmon, and 8 clipped steelhead were observed in the EDSM this past week.

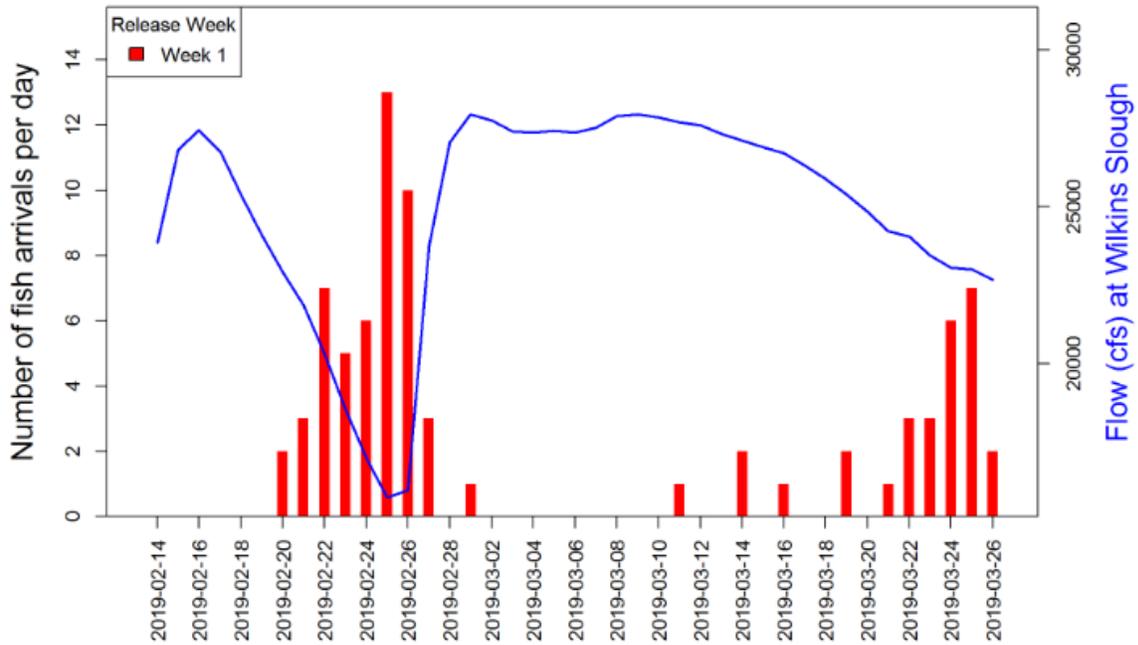
Tracking of acoustic-tagged hatchery winter-run Chinook salmon

The Livingston Stone National Fish Hatchery released acoustic-tagged (JSATS) winter-run Chinook salmon from brood year 2018. The following table provides the detection frequencies downstream of the release site. Detections through 3/26/19 below.

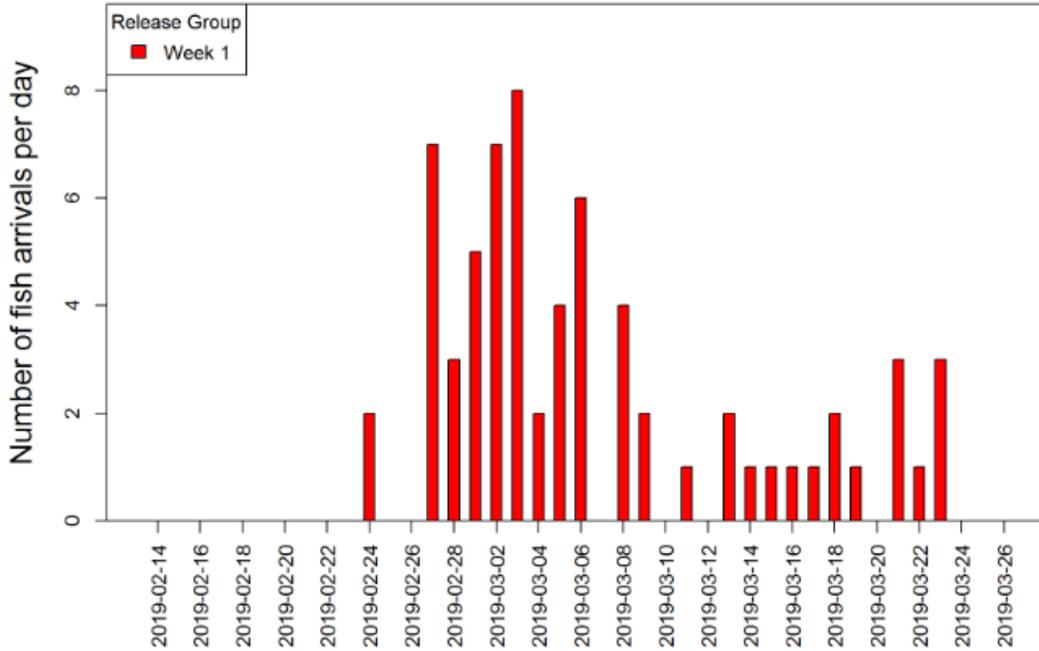
Date of release	2/14/19
# acoustically tagged (JSATS)	649 fish
Butte City Bridge	209 (32%)
Tower Bridge	78 (12%)
Minimum survival to Tower Bridge	30%
I-80/50 Bridge	81 (12%)
Georgiana Slough	12 (2%)
Detections at Benicia Bridge	64 (10%)
Minimum survival to Benicia Bridge	10%

https://calfishtrack.github.io/real-time/pageLSWR_2019.html

Detections at Tower Bridge (downtown Sacramento) versus Sacramento River flows at Wilkins Slough



Detections at Benicia Bridge



Lower American River

RST catch through 3/18/19 on the American River at Watt Avenue. From 1/10 to 3/18, 9,436 unmarked fall-run, 39 spring-run, 18 winter-run, and 47 steelhead have been observed.

Acoustic-tagged green sturgeon

CDFW has acoustic-tagged 46 juvenile sturgeon (41 green sturgeon and 5 white sturgeon) captured between 7/24/18 and 2/7/19 near Sherman Lake on the Sacramento River (western Delta). The mean fork length is 40.2 cm. Residency time at Sherman Lake is 2 to 135 days. Initial detections at Benicia Bridge have ranged from 1 to 31 days.

Agenda Item 6.

Fish Monitoring: Salvage

Griffiths (CDFW) provided a salvage summary for the period of 3/18-3/24.

Chinook salmon

Unclipped (wild origin) Chinook: Weekly salvage of wild origin Chinook salmon included 6 winter-run, 10 spring-run, and 21 fall-run sized fish (estimated from subsample). Total WY19 salvage of wild-origin Chinook salmon is 3,831 fish.

Clipped (hatchery origin) Chinook: Weekly salvage of ad-clipped Chinook salmon included 77 winter-run and 148 spring-run sized fish. Total WY19 salvage of ad-clipped Chinook salmon is 889 fish. Clipped Chinook were identified with CWT codes to San Joaquin River Restoration Program SCARF (Salmon Conservation and Release Facility) with the exception of one. A yearling winter-run sized Chinook (229 mm FL) was observed at the state facility on 3/19. This fish was identified per CWT as a Livingston Stone National Fish Hatchery winter-run production release from 3/13/2018.

Steelhead

Unclipped steelhead: 12 fish salvaged for a season total to date of 259.

Clipped steelhead: 19 fish salvaged for a season total to date of 1,663.

Operations

CVP reported outages due to Hydrolox screen failure on 3/20 (16% reduced count time) and on 3/22 for maintenance (4% reduced count time).

DOSS Weekly Salvage Update

Reporting Period: March 18-March 24, 2019

Prepared by Kyle Griffiths on March 25, 2019 14:58

Preliminary Results -Subject to Revision

Criteria	18-Mar	19-Mar	20-Mar	21-Mar	22-Mar	23-Mar	24-Mar	Trend
Loss Densities								
Wild older juvenile CS	0	0	0.53	0	0	1.11	0	↘ 0.23
Wild steelhead	0	0.56	0.53	0.51	1.00	0	0.58	↘ 0.45
Exports								
SWP daily export	13,025	13,680	12,663	13,248	13,567	12,400	11,295	↗ 12,840
CVP daily export	1,622	1,681	3,690	3,728	3,720	3,717	3,712	↗ 3,124
SWP reduced counts	0	0	0	0	0	0	0	
CVP reduced counts	0	0	16%	0	4%	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	6	27	↘	154	408
Spring Run	10	28	↗	18	49
Late Fall Run	0	0	→	3	13
Fall Run	21	22	↘	3,652	3,959
Unclassified	0	0	↘	4	NC
Total	37	77		3,831	4,429
Hatchery					
Winter Run	77	339	↗	127	544
Spring Run	148	583	↗	404	1,262
Late Fall Run	0	0	→	354	776
Fall Run	0	0	→	0	0
Unclassified	0	0	→	4	NC
Total	225	922		889	2,581

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	12	52	↘	259	811
Hatchery	19	82	↘	1,663	5,019
Total	31	134		1,922	5,830

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

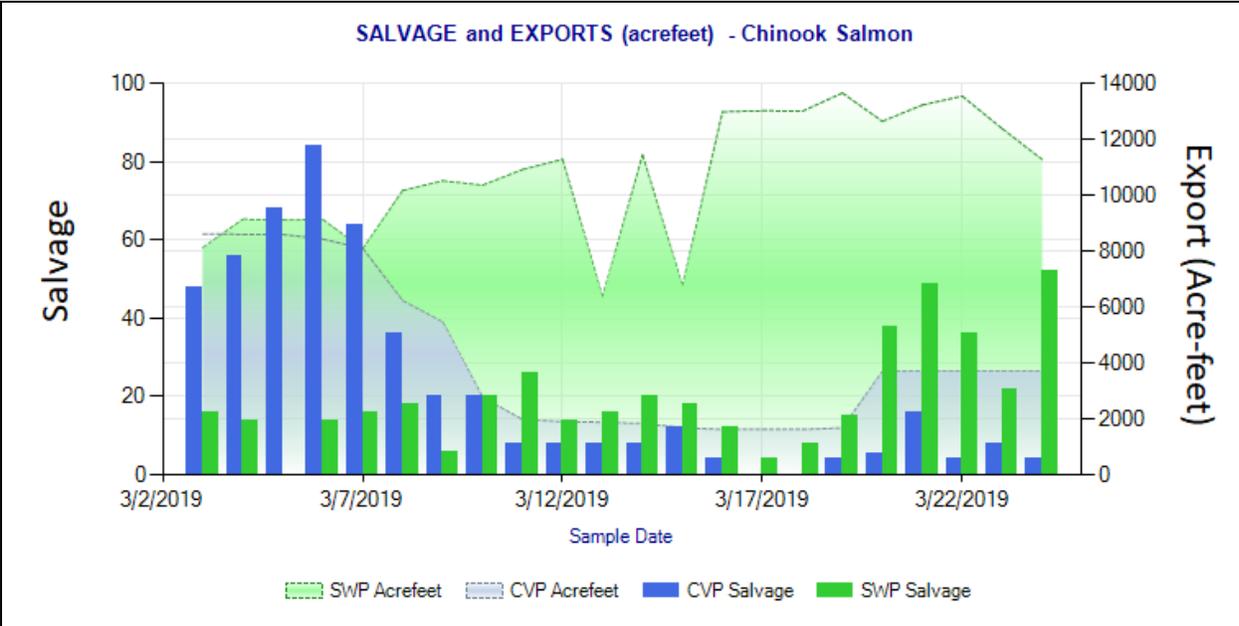


Fig 1. Chinook Salmon Salvage (values = number of fish salvaged) and export (acre-feet) at state/federal salvage facilities. All CS races/origins combined. Dates: 3/3/2019 - 3/24/2019

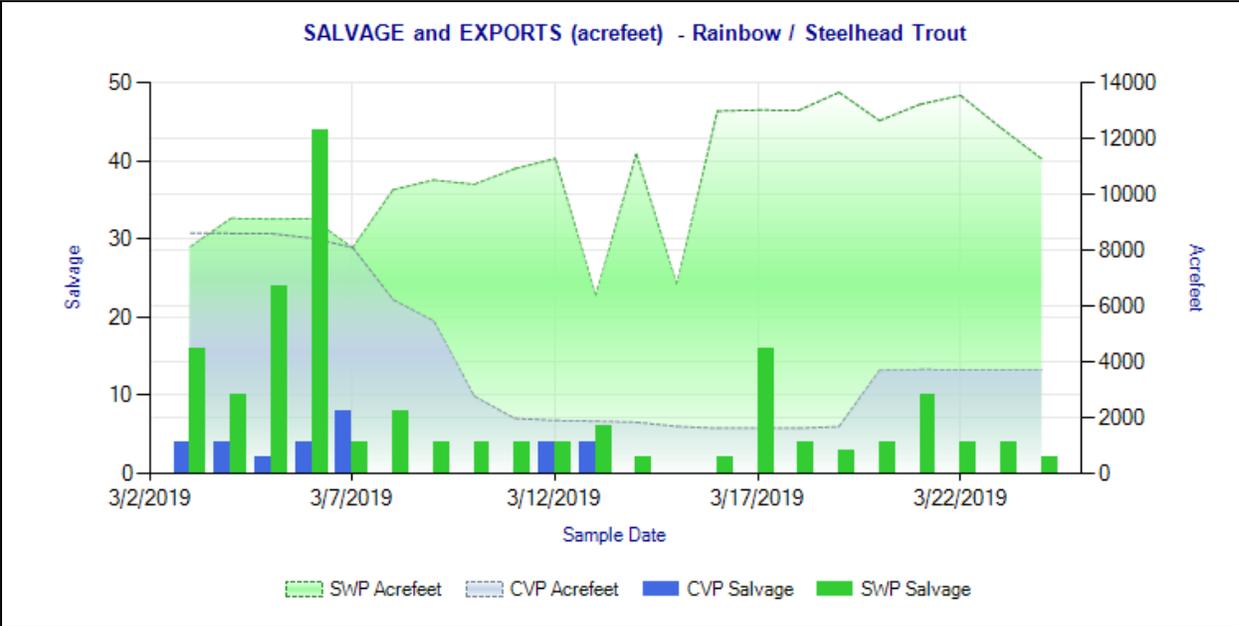


Figure 2. Salvage of clipped & unclipped Steelhead for state & federal salvage facilities. Dates: 3/3/2019 - 3/24/2019

CONFIRMED HATCHERY (ADIPOSE-FIN CLIPPED) CHINOOK SALMON LOSS AT THE SWP & CVP DELTA FISH FACILITIES as of 3/16/19

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 Trigg	Date of First Loss ⁴	Date of Last Loss ⁴
12/3/2018	LF	Coleman NFH	Battle Creek	Spring Surrogate	67.33	61,277	n/a	0.110	n/a	0.5%	12/27/2018	2/16/2019
12/14/2018	LF	Coleman NFH	Battle Creek	Spring Surrogate	24.57	66,266	n/a	0.037	n/a	0.5%	12/27/2018	2/10/2019
1/4/2019	LF	Coleman NFH	Battle Creek	Spring Surrogate	457.26	73,952	n/a	0.618	n/a	0.5%	1/16/2019	2/20/2019

SWP and CVP adipose-fin clipped Chinook lost from 10/1/2018 through 3/16/2019.

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.

Agenda Item 7.

Hatchery Releases

On 3/25/19, the U.S. Fish and Wildlife Service (USFWS) conducted an experimental early release of approximately 1.4 million brood year 2018 fall Chinook salmon from the Coleman National Fish Hatchery into Battle Creek. This release will include 25% marked (adipose fin clip and [coded-wire tagged] CWT) and 75% unmarked fish.

On 3/26/19, the USFWS will release approximately 126,213 winter-run Chinook salmon into the North Fork Battle Creek. This is the first planned release of approximately 183,000 total juvenile winter-run Chinook salmon that will be released into Battle Creek. These fish are the progeny of captive broodstock from the Livingston Stone National Fish Hatchery. They are approximately 75 mm fork length and are 100% CWT and marked with both an adipose-fin clip and a left pelvic-fin clip.

Release notification received after the DOSS call:

On 3/28/19, the USFWS will release of approximately 57,502 winter-run Chinook salmon into the North Fork Battle Creek. This is the final planned release of brood year 2018 juvenile winter-run Chinook salmon that will be released into Battle Creek. These fish are the progeny of captive broodstock from the Livingston Stone National Fish Hatchery. They are approximately 75 mm fork length and are 100% CWT and marked with both an adipose-fin clip and a left pelvic-fin clip.

Agenda Item 8.

DOSS Estimates of Fish Distribution

DOSS 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 Chippis Island)
<i>Young-of-year (YOY) winter-run Chinook salmon</i>	0-1% (Last week: same)	29-35% (Last week: 34-40%)	65-70% (Last week: 60-65%)
<i>Young-of-year (YOY) spring-run Chinook salmon</i>	5% (Last week: same)	70-75% (Last week: 75-80%)	20-25% (Last week: 15-20%)
<i>Hatchery winter-run Chinook salmon</i>	0-1% (Last week: same)	25-35% (Last week: same)	65-75% (Last week: same)

Rationale for distribution

Wild winter-run Chinook:

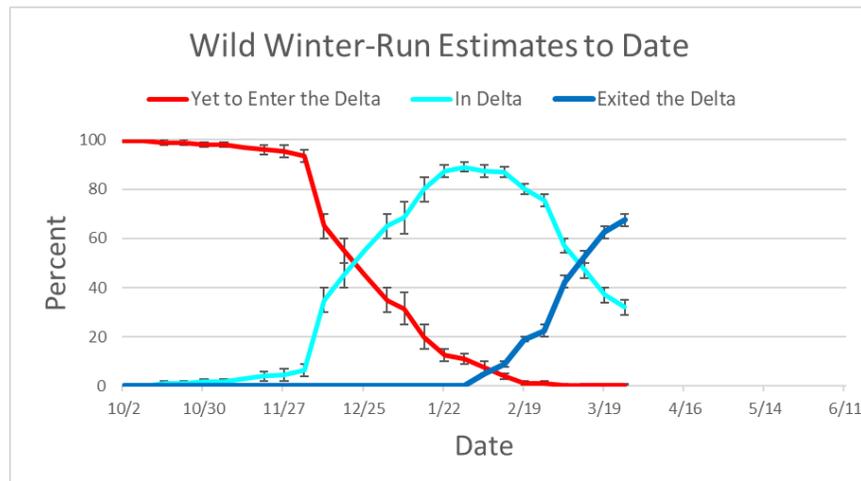
One wild winter-run Chinook salmon was observed at Knights Landing, 1 at Sacramento trawl, and 5 at Chippis Island trawl. Since few fish were observed at monitoring locations, outflow remains high, and due to seasonal timing, DOSS estimates that an additional 5 percent of wild winter-run Chinook salmon population has exited the Delta past Chippis Island and few fish remain upstream of Knights Landing.

Wild spring-run Chinook:

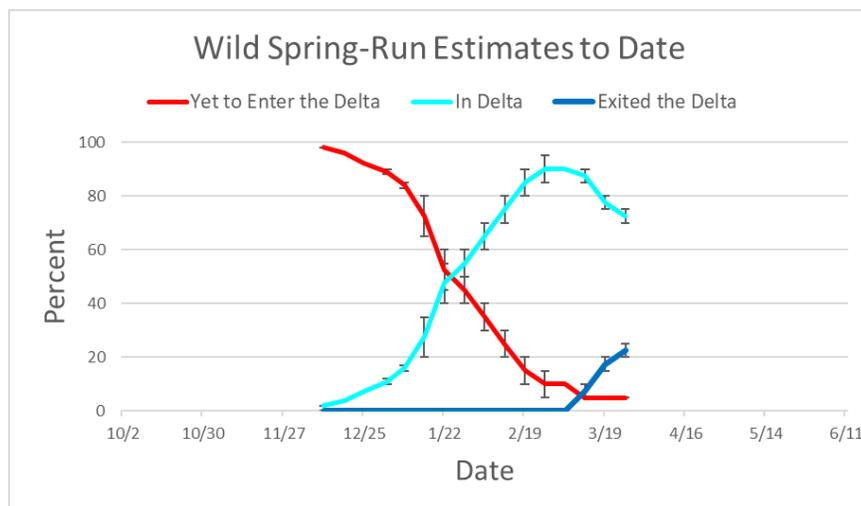
One wild spring-run Chinook salmon was observed at Tisdale, 22 at Knights Landing, 3 at the beach seines, 8 at Sacramento trawl, and 7 at Chipps Island trawl. Since fish were observed at monitoring locations, outflow remains high, and due to seasonal timing, DOSS estimates that an additional 5 percent of the population has exited the Delta past Chipps Island and 5 percent remain upstream of Knights Landing.

Hatchery winter-run Chinook:

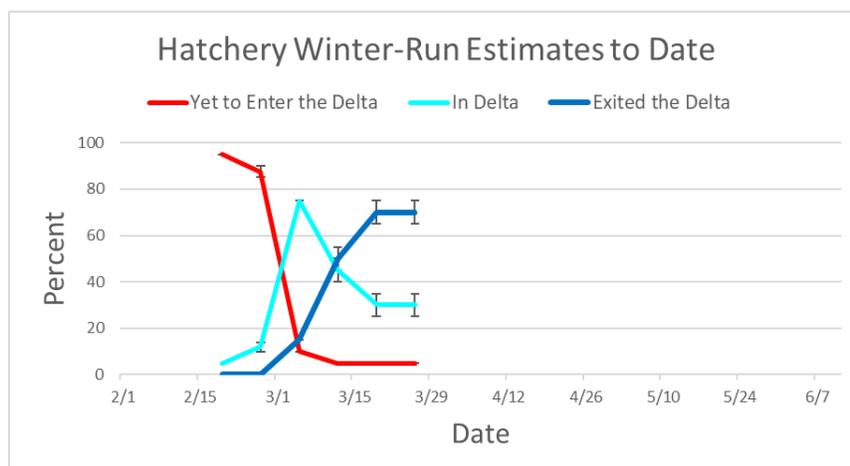
209 acoustically-tagged (AT) hatchery winter-run have been detected at Butte City Bridge, 78 at Tower Bridge, 81 at I80-50, and 64 at Benicia Bridge. Although more fish were detected this week, DOSS kept distribution estimates for AT hatchery winter-run Chinook the same as last week, since the group believes survival of fish upstream was underestimated. Survival may be greater this year due to higher flows and access to floodplain habitat in the upper Sacramento River, but potentially slows the migration rate of emigrating juveniles. DOSS estimates that 65-75 percent of the group has exited past Chipps Island. This estimate assumes a high in-river survival rate, does not account for predation or other sources of mortality, and incorporates the additional detections at Tower Bridge and Benicia Bridge over the past week.



WY 2019 wild winter-run distribution estimates to date.



WY 2019 wild spring-run distribution estimates to date.



WY 2019 hatchery winter-run distribution estimates to date.

Agenda Item 9.

DOSS Feedback on Entrainment Risk

DOSS 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**
 - Approximately 29-35% of winter run juveniles estimated to be in the Delta.

- Approximately 70-75% of spring run juveniles estimated to be in the Delta.
- Central Valley steelhead are in the system, including the Delta.
- **Routing Risk: LOW**
 - DCC is closed.
 - Flows are elevated on the Sacramento River (~74,700 cfs) which increases the muting of tidal effects around Georgiana Slough and Threemile Slough. Flows are expected to remain above 30,000 cfs for the duration of the week.
 - Fremont Weir is expected to overflow this week, so some fish are expected to bypass export facilities.
 - CWT fish salvaged this past week were all from the San Joaquin side. Lack of salvage of CWT winter-run fish from Sacramento River indicates that the interior Delta routing risk is low due to the current hydrology.
- **Overall Entrainment Risk: LOW**
 - Inflows from the Sacramento River are expected to remain high over the next week which balances exports to remain in the Low to Medium entrainment risk.
 - Due to high flows some salmonids may use the Fremont weir route and bypass interior Delta entrainment routes this week.

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

- **Exposure Risk: LOW-MEDIUM**
 - Listed Chinook salmon and steelhead have been salvaged and observed in monitoring sites in the Delta.
 - Exports are expected to remain steady of the week with the exception of a couple of maintenance days.
 - Flows at San Joaquin River are expected to remain high over the next week keeping exports steady and the risk of entrainment, especially for steelhead remains unchanged.
 - OMR is expected to be positive over the next week.
 - Exposure risk is medium for San Joaquin steelhead and low for Sacramento listed fish.
- **OMR/Export Risk:**
 - OMR -2,500 cfs: LOW
 - OMR -3,500 cfs: LOW
 - OMR -5,000 cfs: MEDIUM
 - OMR -6,250 cfs⁴: MEDIUM-HIGH
 - OMR -7,500 cfs⁴: HIGH
 - OMR -9,000 cfs⁴: HIGH
- **Overall Entrainment Risk:**
 - OMR -2,500 cfs: LOW-MEDIUM

⁴By request of management, DOSS also assessed risks at an OMR flow more negative than -5,000 cfs.

- OMR -3,500 cfs: LOW-MEDIUM
- OMR -5,000 cfs: MEDIUM
- OMR -6,250 cfs⁴: MEDIUM-HIGH
- OMR -7,500 cfs⁴: HIGH
- OMR -9,000 cfs⁴: HIGH

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

Agenda Item 10.

DOSS Advice to WOMT and NMFS: None

Agenda Item 11.

Next Meeting: The next DOSS conference call will be on **4/2/19 at 9am.**