Delta Operations for Salmonids and Sturgeon (DOSS) Group
Conference call: 4/30/2019 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.

CDFW: Ken Kundargi, Duane Linander, Kyle Griffith
DWR: Chris Cook, Norman Lee
NMFS:
Reclamation: Tom Patton, Elissa Buttermore
SWRCB: Michael Macon, Craig Williams
USFWS: Craig Anderson

Agenda Items

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

Agenda Item 2.
RPA Implementation Review

Delta RPA Actions affecting operations during April:

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: 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
4/23/2019	699	16%	910	-2%
4/24/2019	830	19%	977	7%
4/25/2019	929	12%	1,033	6%
4/26/2019	979	5%	1,050	2%
4/27/2019	944	-4%	1,018	-3%
4/28/2019	885	-6%	970	-5%
4/29/2019	816	-8%	912	-6%

- 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 not triggered this past week. See table below for details.

	Wilkins Slough (WLK)	Knights Landing (KL)
Date	Mean Daily Flow (cfs)	Daily water temperature (°F)
4/23/2019	21,759	59.4
4/24/2019	19,941	60.5
4/25/2019	18,055	62.6
4/26/2019	16,617	65.0
4/27/2019	15,459	66.6
4/28/2019	14,496	66.7
4/29/2019	13,511	66.5

Action IV.1.2[2] (DCC gate operations):

- DCC gates will remain closed through 5/20/19, per operations described in RPA IV.1.2 starting 12/1/18.

Action IV.2.1 San Joaquin River Inflow to Export (I:E) Ratio

- For the period of 4/1 through 5/31, the level of combined SWP and CVP exports is determined by the San Joaquin River inflow as measured at Vernalis. For the current water year type (WET in the San Joaquin River basin) the ratio of San Joaquin River inflow to combined CVP and SWP exports is 4:1, based on a 14-day running average.
- An exception procedure provides for minimum health and safety needs, identified as 1,500 cfs combined exports in the 2009 RPA with 2011 amendments.

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

Action IV.2.3[3] (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.

Action IV.3[3] (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.

Agenda Item 3.

Current Operations (4/30/19)

SWP		CVP	
Exports (cfs)			
Clifton Court Forebay	1,200	Jones Pumping Plant	1,000
Reservoir Releases (cfs)			
Feather - Oroville	10,500	American - Nimbus	7,300
		Sacramento - Keswick	5,500
		Stanislaus – Goodwin	3,000*
		Trinity - Lewiston	9,300**
Reservoir Storage (in TAF)			
San Luis (SWP)	877	San Luis (CVP)	897
Oroville	3,270	Shasta	4,194
New Melones	1,918	Folsom	877
Delta Operations			
DCC	Closed	Sacramento River at Freeport (cfs)	45,555
Outflow Index (cfs)	54,600	San Joaquin River at Vernalis (cfs)	8,785
E:I	2.8% (14-day avg.)	X2	~60 km

* Goodwin releases will decrease to 2,500 cfs on 5/2/19.

** Trinity releases are currently following ROD pulse flow schedule.

Factors controlling Delta exports:

- 4/24/19-4/30/19: 4:1 San Joaquin I:E ratio per NMFS BiOp RPA Action IV.2.1

Approximate OMR as of 4/29/19:

	Index (cfs)

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

Daily	1,600
5-day	1,600
14-day	1,800

Agenda Item 4.

Smelt Working Group

The Smelt Working Group met on Monday, 4/29/19, at 10 am.

SWG did not provide any advice for Delta Smelt due to high outflow. The Longfin Smelt Incidental Take permit is still off-ramped due to high flow in the Sacramento and San Joaquin Rivers. This year's cohort of Longfin Smelt will not be at risk of entrainment for the rest of water year 2019 based on their current distribution and life history. There is no need for further Longfin Smelt advice for the remainder of Water Year 2019. See the Risk Discussion section for further details.

RPA

Action 3 (Protection of larval Delta Smelt) has been in place since February 6th.

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]	Chipps Is. Midwater Trawl[D]	Mossdale Kodiak Trawl[E]
Sample Date	4/25-4/29	4/23-	4/22-4/29	4/21-4/27	4/21-4/27	4/21-4/27	
Chinook							
FR Chinook	281 juv.		282	18	199	486	
SR Chinook	60 juv. 4 smolts		97	1	104	566	
WR Chinook						4	
LFR Chinook			1				
Chinook (ad-clip)	60 FR		77 FR 29 SR	4	152	431	
Steelhead (wild)	2				1		
Steelhead (ad-clip)					1	1	
Green Sturgeon							
Flows (avg. cfs)	1,487		17,926				
W. Temp. (avg. °F)	62.9		63.3				
Turbidity (avg. NTU)	43.74		32.60				

[A] The GCID trap was lowered on 4/25 at 0800. The cone was stopped upon arrival on 4/28 and modified to half cone sampling on 4/29 due to heavy debris load.

[B] Tisdale RST sampling data was not received before the call.

[C] Knights Landing RST sampling period was from 4/22 at 10:30 am to 4/29 at 11:15 am.

[D] Data reported in the 4/21 to 4/27 DJFMP sampling summary *6 of the ad-clipped fish observed at Chipps Island trawl were left pelvic fin and ad-clipped, indicating they were Battle Creek winter-run from LSNFH.

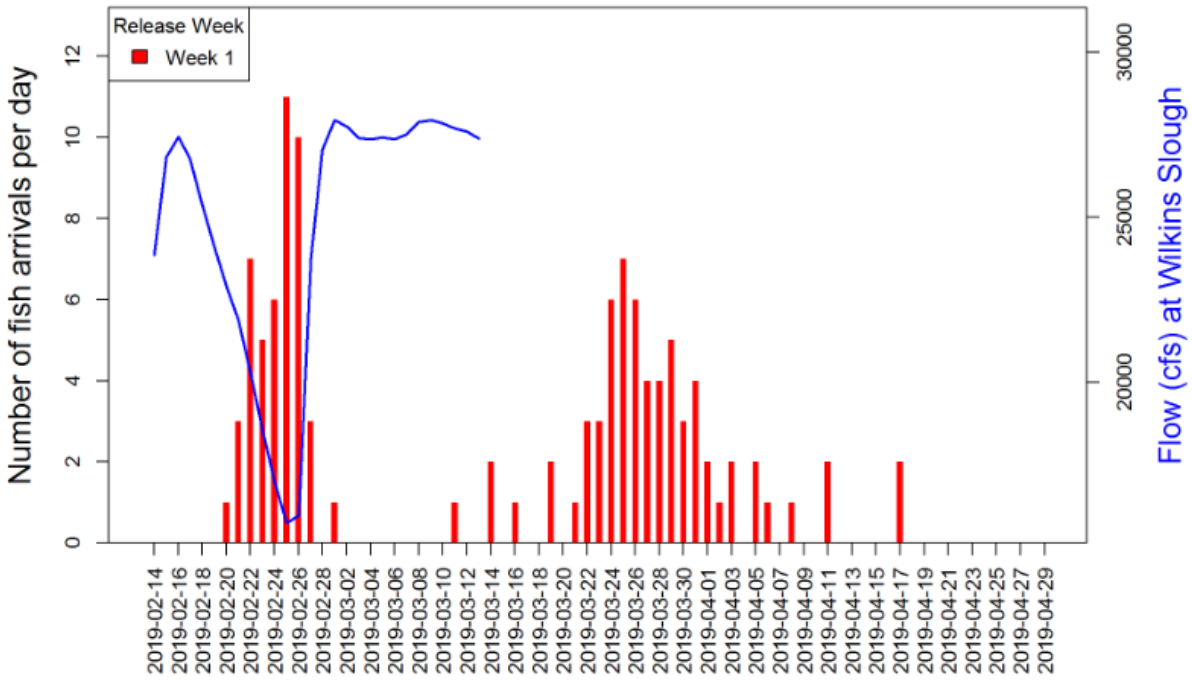
[E] Mossdale trawls sampled by CDFW (Region 4) instead of the DJFMP between 4/1 and 6/30. Mossdale trawl sampling data was not received before the call.

Tracking of acoustic-tagged winter-run Chinook salmon released at Caldwell Park
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 4/29/19 below.

Date of release	**2/14/19**
# acoustically tagged (JSATS)	**650 fish**
Butte City Bridge	195 (30%)
Tower Bridge	112 (17%)
Minimum survival to Tower Bridge	25%
I-80/50 Bridge	126 (19%)
Georgiana Slough	21 (3%)
Detections at Benicia Bridge	163 (25%)
Minimum survival to Benicia Bridge	26%

[Hatchery-origin winter-run Chinook salmon: https://calfishtrack.github.io/real-time/pageLSWR_2019.html](https://calfishtrack.github.io/real-time/pageLSWR_2019.html)

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



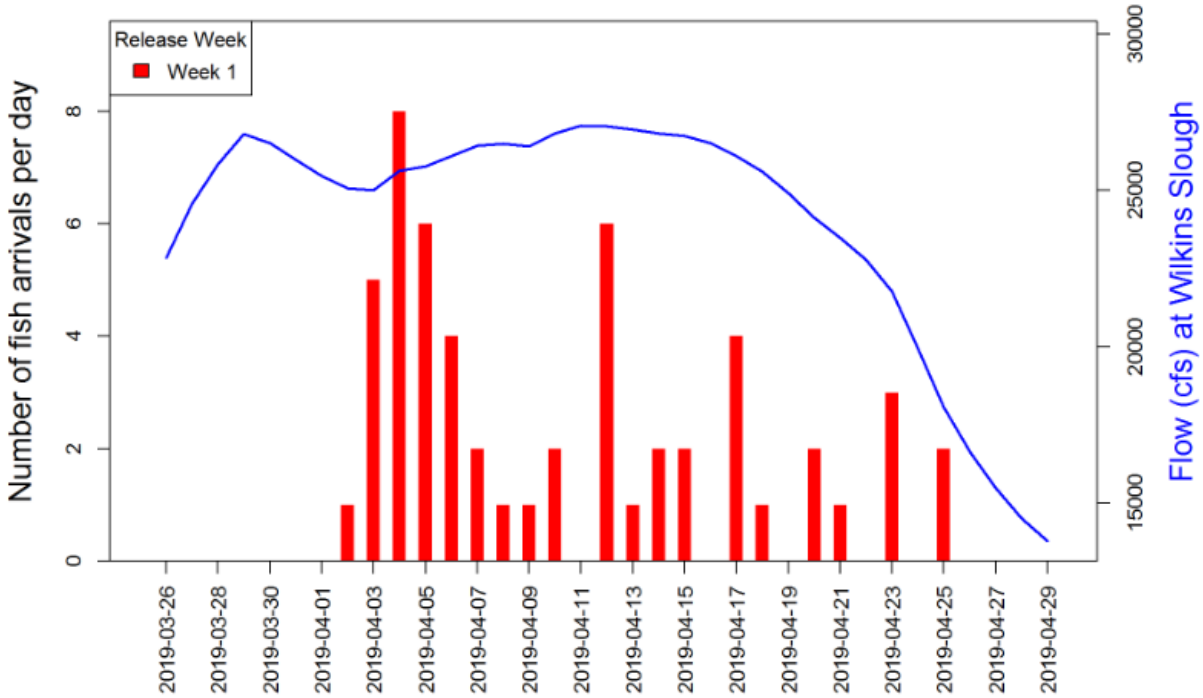
Tracking of acoustic-tagged winter-run Chinook salmon released at Battle Creek
The Livingston Stone National Fish Hatchery released acoustic-tagged (JSATS) winter-run Chinook salmon from brood year 2018. The following table provides the detection frequencies downstream of the release site. Detections through 4/22/19 below.

Date of release	**3/26/19**

# acoustically tagged (JSATS)	500 fish
Butte City Bridge	30 (6%)
Tower Bridge	54 (11%)
Minimum survival to Tower Bridge	21%
I-80/50 Bridge	74 (15%)
Georgiana Slough	22 (4%)
Detections at Benicia Bridge	70 (14%)
Minimum survival to Benicia Bridge	14%

[Hatchery-origin Battle Creek winter-run Chinook salmon: https://calfishtrack.github.io/real-time/pageBCJSWR_2019.html](https://calfishtrack.github.io/real-time/pageBCJSWR_2019.html)

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



Lower American River

RST catch from 1/10 to 4/22/19 on the American River at Watt Avenue: 14,555 unmarked fall-run, 63 spring-run, 18 winter-run, 74 late-fall-run, and 284 steelhead have been observed. RST catch also observed in addition 167 ad-clipped Chinook salmon and 13 steelhead.

Feather River

Cook (DWR) provided Feather River RST data for two RST sites on the Feather River. At the Eye Side Channel from 4/23 to 4/27, 34 fall-run Chinook salmon, 7 late-fall-run and 10 steelhead were observed. At the Herringer site from 4/23 to 4/27, 66 fall-run Chinook salmon, 185 ad-clipped spring-run, and 1 steelhead were observed.

Agenda Item 6.

Fish Monitoring: Salvage

DOSS Weekly Salvage Update

Reporting Period: April 22-April 28, 2019
Prepared by Bob Fujimura on April 29, 2019 15:46
Preliminary Results -Subject to Revision

Criteria	22-Apr	23-Apr	24-Apr	25-Apr	26-Apr	27-Apr	28-Apr	Trend	
Loss Densities									
Wild older juvenile CS	0	0	0	0	0	0	0	↘	0.00
Wild steelhead	0.60	7.04	0.58	0	3.67	0	0	↘	1.70
Exports									
SWP daily export	1,092	1,417	1,237	1,235	1,235	816	1,215	↘	1,178
CVP daily export	3,427	3,503	3,470	3,456	3,487	3,470	3,452	→	3,466
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;

		Weekly Total			Season Total	
Category		Salvage	Loss	Trend	Salvage	Loss
Wild						
	Winter Run	0	0	↘	184	537
	Spring Run	269	689	↗	455	1,238
	Late Fall Run	0	0	→	3	13
	Fall Run	85	122	↗	3,783	4,133
	Unclassified	0	0	→	4	NC
	Total	**354**	**811**		**4,429**	**5,921**
Hatchery						
	Winter Run	0	0	→	131	561
	Spring Run	46	153	↘	1,201	4,182
	Late Fall Run	0	0	→	354	776
	Fall Run	0	0	→	4	3
	Unclassified	0	0	→	4	NC
	Total	**46**	**153**		**1,694**	**5,522**

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

	Weekly Total			Season Total	
Category	Salvage	Loss	Trend	Salvage	Loss
Wild	20	57	↘	378	1,246
Hatchery	31	120	↗	1,818	5,675
Total	**51**	**177**		**2,196**	**6,922**

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

This report covers 4/22/2019 – 4/28/2019

Prepared 4/29/2019 by Kyle Griffiths – Preliminary Results, subject to change

Chinook Salmon:

WILD ORIGIN (UNCLIPPED)

No Unclipped (wild origin) winter run-sized Chinook were observed at the salvage facilities this week. Seasonal salvage for this race to date is n = **184**.

Non-clipped spring run-sized Chinook were salvaged at the state facility 4/23, 4/26, & 4/27, and at the federal facility 4/22, 4/23, 4/24, 4/25, 4/26 & 4/28. Weekly salvage for this race is n = **269**. Total WY19 salvage for this race is n = **455**.

Wild origin fall-run-sized Chinook were salvaged at the state facility on 4/26 & 4/27, and at the federal facility on 4/22, 4/23, 4/25, & 4/26. The total weekly salvage for this group was n = **85**. Total WY19 salvage of this group is n = **3,783.**

Weekly salvage of wild-origin Chinook was n = **354**, including 269 spring-run sized Chinook salmon. Total WY19 salvage of wild-origin fish is n = **4,429**.

CLIPPED (HATCHERY ORIGIN)

Clipped (hatchery origin) Spring-run-sized Chinook were observed at the federal facility only 4/22, 4/23, & 4/27. All fish originated from SJRRP's SCARF Spring run releases. Weekly salvage for clipped Chinook was n = **69**. Total WY19 salvage for clipped salmon is n = **1,648**.

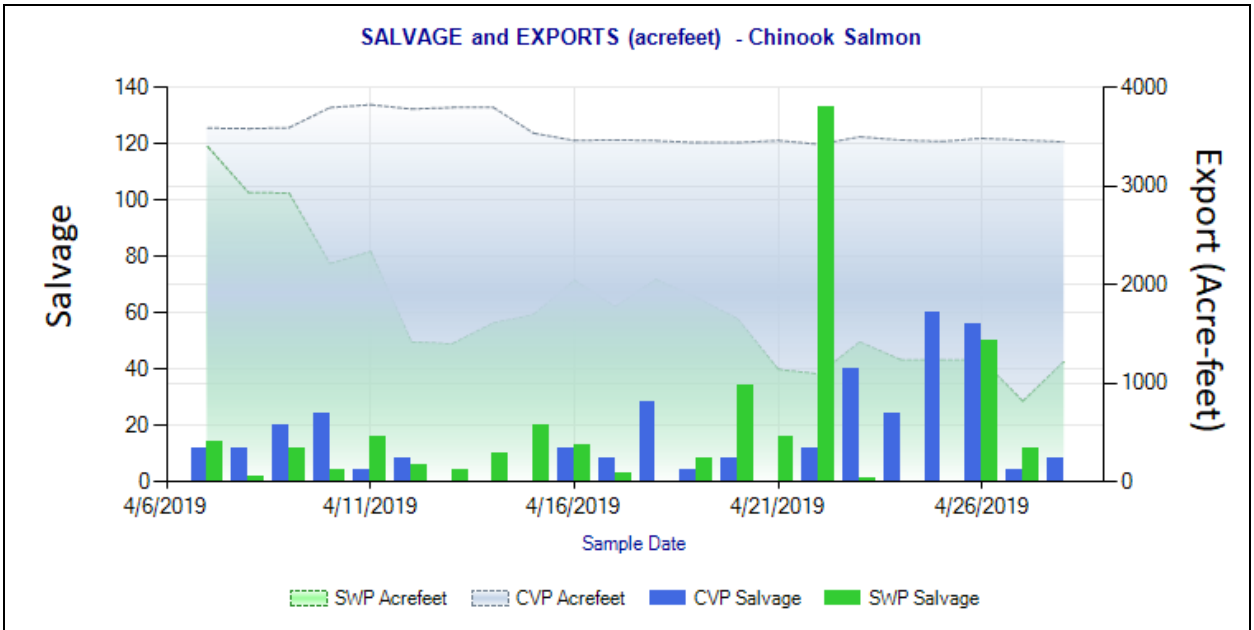


Fig 1. Chinook Salmon Salvage (values = number of fish salvaged) and export (acre-feet) at state/federal salvage facilities. All CS races/origins combined. Dates: 4/7/2019 - 4/28/2019.

Steelhead

Unclipped Steelhead were observed at the state facility on 4/23 & 4/26, and at the federal facility 4/22 & 4/22. The weekly salvage total of unclipped Steelhead was n = **20**, raising the WY19 salvage total to n = **378**.

Clipped steelhead were observed at the state facility on 4/23, 4/25, 4/26, 4/28 and at the federal facility on 4/23.
The weekly salvage total of clipped Steelhead was n = **31**, raising the Total WY19 salvage to n = **1,818**.

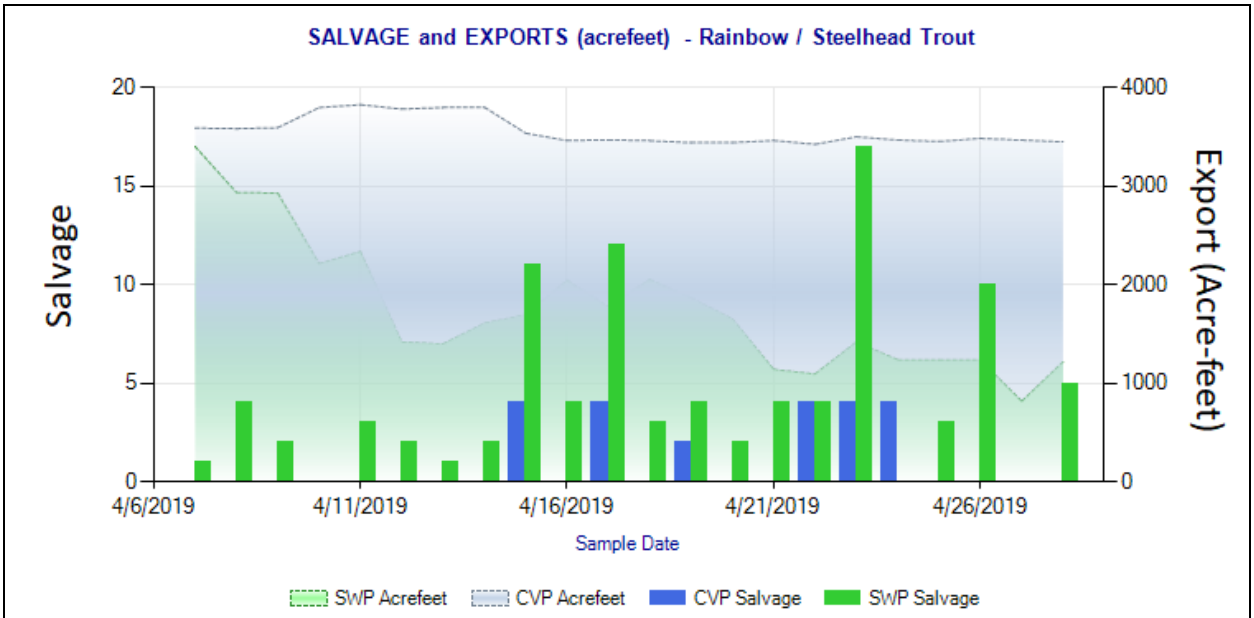


Figure 2. Salvage of clipped & unclipped **Steelhead** for state & federal salvage facilities. Dates: 4/7/2019 - 4/29/2019.

Sturgeon

No Sturgeon were salvaged at either facility this week.

Operations:

No operational outages or reduced counts were reported this week.

CONFIRMED HATCHERY (ADIPOSE-FIN CLIPPED) CHINOOK SALMON LOSS AT THE SWP & CVP DELTA FISH FACILITIES as of 4/29/19

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 4/15/2019.

[1]Number 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.

[4] Date of first and last loss accounts for all CWT loss even those from special studies where salvage and loss=0.

Agenda Item 7.

Discontinuation of Rapid Genetic Protocol

Rapid genetic protocol has been put on hold for the remainder of April and the group said that we would re-assess the need for the remainder of the season at a later date.

Considering current hydrology, regulations that are controlling Delta Exports (NMFS 2009 BO RPA IV.2.1 - 4:1 I/E ratio), and the fact that we do not salvage many winter-run sized fish during this time of year, we do not think that it is necessary to implement rapid genetic protocol (i.e., 24 hour turnaround time of results) at this time. We expect OMR flows to continue to be more positive than -2,500 cfs. Thus, we are interested in discontinuing rapid genetic protocol for the rest of season. We plan to continue genetic monitoring of salvaged Chinook salmon and will continue our reporting of this water year's genetic results through DOSS.

CDFW is in agreement with DWR and USBR. NMFS was not on the line to participate, but USBR will reach out to confirm with NMFS their position.

Agenda Item 8.

Hatchery Releases

On 4/24/19 and 4/26/2019 the California Department of Fish and Wildlife (CDFW) released approximately a total of 900,000 brood year 2018 fall-run Chinook salmon from the Mokelumne River Hatchery into the San Joaquin River at the Sherman Island Net Pen site. This release includes 25% marked (adipose fin clip) and CWT fish.

On 5/3/19 and 5/4/2019 the CDFW released approximately a total of 1,000,000 brood year 2018 fall-run Chinook salmon from the Feather River Hatchery into San Pablo Bay at the Mare Island Net Pen site. This release includes 25% marked (adipose fin clip) and CWT fish.

On 5/8/19 the CDFW will release approximately 1,005,135 brood year 2018 fall-run Chinook salmon from the Feather River Hatchery into the Feather River at Boyd’s Pump. This release includes 25% marked (adipose fin clip) and CWT fish.

Agenda Item 9.

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 Chipps Island)
Young-of-year (YOY) winter-run Chinook salmon	0-1% (Last week: 0-1%)	4% (Last week: 4-10%)	95% (Last week: 90-95%)
Young-of-year (YOY) spring-run Chinook salmon	5% (Last week: 5%)	20-25% (Last week: 30-35%)	70-75% (Last week: 60-65%)
Hatchery winter-run Chinook salmon	0-1% (Last week: 0-1%)	1% (Last week: 4%)	98% (Last week: 95%)

Rationale for distribution

Wild winter-run Chinook:

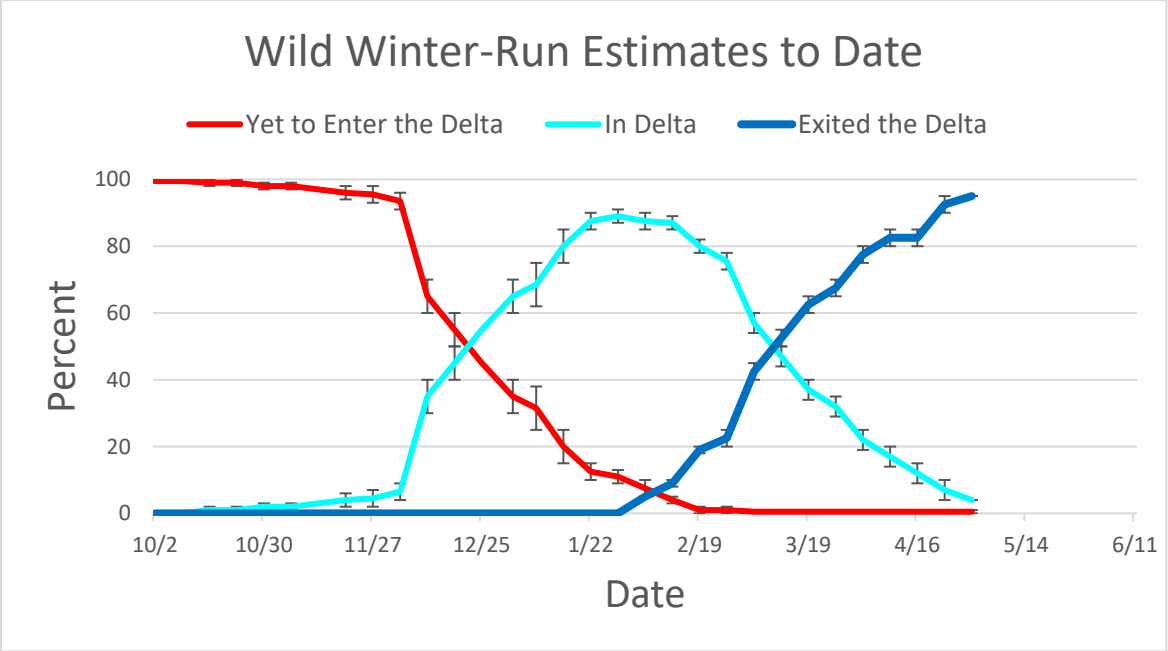
Four wild winter-run Chinook salmon were observed at Chipps Island. Since fish were observed at monitoring locations, and due to life history and seasonal timing, DOSS recommends tightening up estimate ranges and estimates that an additional 5 percent of wild winter-run Chinook salmon population has exited the Delta past Chipps Island and few fish remain upstream of Knights Landing.

Wild spring-run Chinook:

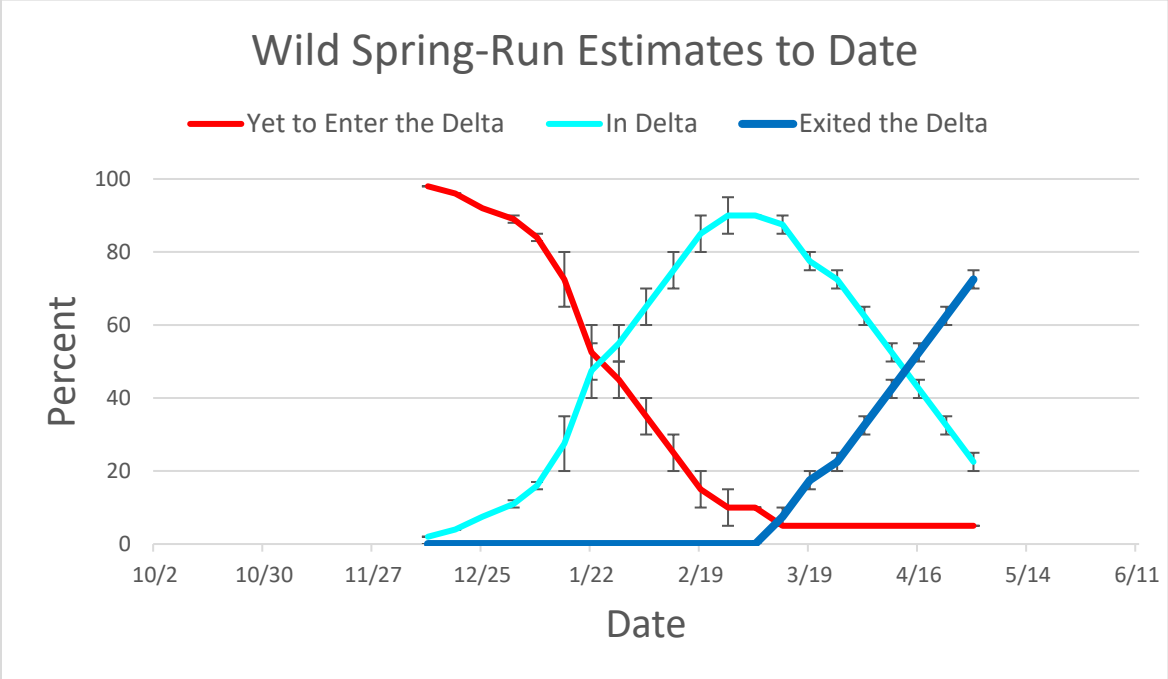
97 wild spring-run Chinook salmon were observed at Knights Landing, 1 at the beach seines, 104 at Sacramento trawl, and 566 at Chipps Island trawl. Many of these fish are assumed to be unmarked hatchery fall-run Chinook recently released upstream. Since more fish were observed at monitoring locations, and due to life history and seasonal timing, DOSS estimates that an additional 10 percent of the population has exited the Delta past Chipps Island and 5 percent remain upstream of Knights Landing.

Hatchery winter-run Chinook:

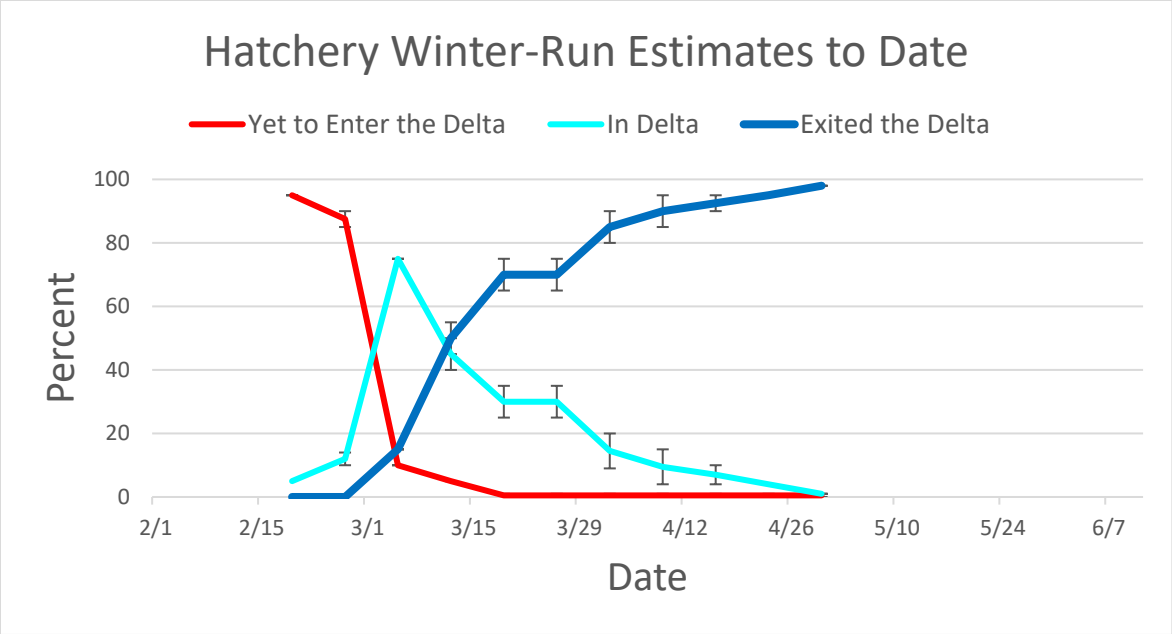
195 acoustically-tagged (AT) hatchery winter-run have been detected at Butte City Bridge, 112 at Tower Bridge, 126 at I80-50, and 163 at Benicia Bridge. No additional fish were detected at receivers above Tower Bridge and 1 additional fish was detected at Benicia in the past week. Since one more fish was detected by receivers this past week at Benicia Bridge, DOSS estimates the majority of the group has migrated through the Delta past Chipps Island. This estimate assumes a high in-river survival rate and does not account for predation or other sources of mortality.



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 10.

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:** LOW-MEDIUM
  - Approximately 4% of winter run juveniles estimated to be in the Delta.
  - Approximately 20-25% 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 (~45,555 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.
- **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.

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.
  - Flows at San Joaquin River are decreasing, but so is exports based on inflows at Vernalis. The risk of entrainment, especially for steelhead remains unchanged.
  - OMR is expected to remain 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 cfs[4]: MEDIUM-HIGH
  - OMR -7,500 cfs[4]: HIGH
  - OMR -9,000 cfs[4]: HIGH

- **Overall Entrainment Risk:**
  - OMR -2,500 cfs: LOW-MEDIUM
  - OMR -3,500 cfs: LOW-MEDIUM
  - OMR -5,000 cfs: MEDIUM
  - OMR -6,250 cfs[4]: MEDIUM-HIGH
  - OMR -7,500 cfs[4]: HIGH
  - OMR -9,000 cfs[4]: HIGH

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

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

Agenda Item 11.
DOSS Advice to WOMT and NMFS: None

Agenda Item 12.
Next Meeting: The next DOSS conference call will be on **5/7/19 at 9am**.