Delta Operations for Salmonids and Sturgeon (DOSS) Group
Conference call: 1/10/2017 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: http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/doss.html.

CDFW: Bob Fujimura, Ken Kundargi, Duane Linander
DWR: Bryant Giorgi, Kevin Reece, Farida Islam, Mike Ford
NMFS: Barb Byrne, Garwin Yip, Bruce Oppenheim, Kristin McCleery
Reclamation: Tom Patton, Towns Burgess, Mike Hendrick, Josh Israel
SWRCB: Chris Kwan, Chris Carr, Brittany Kammerer
USFWS: Leigh Bartoo, Filipe 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/djfmp)
3. Smelt Working Group update
4. Current Operations
5. Hatchery Releases
6. Fish Monitoring: Salvage
7. Fish Monitoring: RSTs/trawls/seines
   SacPAS (http://www.cbr.washington.edu/sacramento/) has some summaries of juvenile sampling)
8. Special Topic: SacPAS fish modeling (Josh Israel, Reclamation)
   See Fish Model options and output at: http://www.cbr.washington.edu/sacramento/migration/
9. DOSS Estimates of Fish Distribution and Assessments of Entrainment Risk
10. DOSS advice
11. Next DOSS meeting

Agenda Item 2.
RPA Implementation Review

Delta RPA Actions affecting operations during January:

Action IV.1.2[1] (DCC gate operations):

- From December 1 to January 31, the gates will remain closed, with limited exceptions**.**

[1] 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.2.3[2] (OMR Management)

- Implementation of this action in WY 2017 began 1/1/17, and requires that Old and Middle River (OMR) flow be no more negative than -5,000 cfs.
- Since the action went into effect on 1/1/17, no salvage-based triggers that would require more positive OMR levels have been exceeded.

Agenda Item 3.

Smelt Working Group update

The Smelt Working Group (SWG) met on Monday, 1/9/17 at 10am. Bartoo (FWS) provided the following SWG meeting summary:

> The Working Group reviewed current Delta conditions, survey data, and forecasted weather. Members indicated that the risk of entrainment into the facilities currently is high, and that pre-spawning adults have already been entrained into the south Delta. The SWG indicated there was no OMR level prescribed in the RPA Component 1 Action 2 that would minimize entrainment into the south Delta, given the current and anticipated hydrology (including turbidity). Members indicated that hydrology that meets the Release from OMR Prescriptions as identified in the RPA Component 1, Action 2 (page 356) are expected later this week. The SWG recommended that the Service look to the EDSM catches and salvage results this week in order to minimize take at the facilities. Should any detections occur in the "high risk, low density" zone or any salvage take place, OMR should immediately be returned to the most positive level afforded in the Biological Opinion.
>
> The Working Group is following guidance for entrainment protections from Action 2 (adult Delta Smelt). The Working Group will continue to monitor Delta Smelt survey and salvage data and Delta conditions, and will meet again on Tuesday, January 17, 2017 at 10 am.

Agenda Item 4.

Current Operations

SWP		CVP	
Exports (cfs)			
Clifton Court Forebay	5,800	Jones Pumping Plant	4,200
Reservoir Releases (cfs)			
Feather - Oroville	5,000	American - Nimbus	50,000
		Sacramento - Keswick	14,000*
		Stanislaus - Goodwin	1,500
		Trinity - Lewiston	300
Reservoir Storage (in TAF)			
San Luis (SWP)	842	San Luis (CVP)	511
Oroville	2,433	Shasta	3,549

[2] For details, see pages 74-79 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

New Melones	751	Folsom	621
Delta Operations			
DCC	Closed	Sacramento River at Freeport (cfs)	~83,000
Outflow Index (cfs)	~150,900	San Joaquin River at Vernalis (cfs)	~8,135**
E:I	18.1% (14-day avg.)	X2	<59 km

*Keswick releases will increase tomorrow (1/11) to 19,000 cfs.
**Flows at Vernalis are forecasted to increase to 18,000 by Friday (1/13).

OMR indices as of 1/10/16:

- Daily: ~ -4,900 cfs
- 5-day: ~ -4,900 cfs
- 14-day: ~5,600 cfs *(note that the current 14-day average includes days prior to 1/1/7, when -5,000 cfs OMR limit went into effect for WY 2017)*

OMR outlook

Byrne (NMFS) asked whether or not, given the high forecasted Vernalis flows, the OMR Index was expected to become more positive than -5,000 cfs, even at maximum exports. DWR explained that depending on the maximum operational SWP capacity (likely less than the designed maximum of 10,300 cfs), the OMR Index could become more positive than -5,000 cfs at Vernalis flows of 13,500 cfs or more. Vernalis forecasts available at: http://cdec.water.ca.gov/guidance_plots/VNS_gp.html

Factors controlling Delta exports:

- 1/3/17-1/5/17: -5,000 cfs OMR limit per Action IV.2.3 of the NMFS BiOp.
- 1/6/17-1/10/17: -5,000 cfs OMR limit per both Action IV.2.3 of the NMFS BiOp & the 1/6/17 FWS determination[3].

Agenda Item 5.

Hatchery Releases

The third (and final) spring-run surrogate group (~75,000 fish) of brood year 2016 genetic late-fall run Chinook salmon were released on 1/9/17 into Battle Creek from Coleman National Fish Hatchery (CNFH). All fish were marked with a CWT and a clipped adipose fin. The purpose of this experimental late-fall release is to provide insight into the migratory behavior and fate of yearling spring Chinook salmon emigrating from the upper Sacramento River and its tributaries.

Agenda Item 6.

Fish Monitoring: Salvage[4]

For the period of 1/2/17 to 1/8/17, juvenile Chinook salmon continued to be salvaged at both facilities. All winter-run sized fish were adipose clipped.

[3] https://www.fws.gov/sfbaydelta/documents/smelt_working_group/DeterminationJan62017.pdf

[4] Salvage data reported in this section represent the total estimated and expanded salvage based on the number of fish observed at the fish collection facility. For example, if one steelhead is observed in the typical ½-hour sampling period within a 2-hour operation period, the single steelhead is expanded to a salvage of four.

Four wild steelhead were salvaged at the CVP.

DOSS Weekly Salvage Update

Reporting Period: January 2-January 8, 2017

Prepared by Bob Fujimura on January 9, 2017 19:00

Preliminary Results -Subject to Revision

Criteria	2-Jan	3-Jan	4-Jan	5-Jan	6-Jan	7-Jan	8-Jan	Trend	
Loss Densities									
Wild older juvenile CS	0	0	0	**0.79**	0	0	0	↗	0.11
Wild steelhead	0	**0.24**	0	0	0	0	0	↗	0.03
Exports									
SWP daily export	5,896	6,233	6,078	6,260	7,991	8,593	9,521	↗	7,225
CVP daily export	4,986	4,969	4,984	4,980	6,488	8,078	7,992	↘	6,068
SWP reduced counts	0%	0%	20%	0%	0%	0%	0%	↗	3%
CVP reduced counts	0%	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 brief 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	↘	12	23
	Spring Run	0	0	→	0	0
	Late Fall Run	2	9	↗	6	12
	Fall Run	80	47	↗	84	49
	Unclassified	4	NC	↗	74	NC
	Total	**86**	**55**		**176**	**84**
Hatchery						
	Winter Run	68	169	↗	133	289
	Spring Run	0	0	→	0	0
	Late Fall Run	70	134	↘	511	991
	Fall Run	4	3	↘	94	156
	Unclassified	0	0	→	6	NC
	Total	**142**	**305**		**744**	**1,436**

Trend = weekly loss per race; Salvage = estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time

NC = can not be calculated

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	4	3	→	12	23
Hatchery	0	0	→	0	0
Total	**4**	**3**		**12**	**23**

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

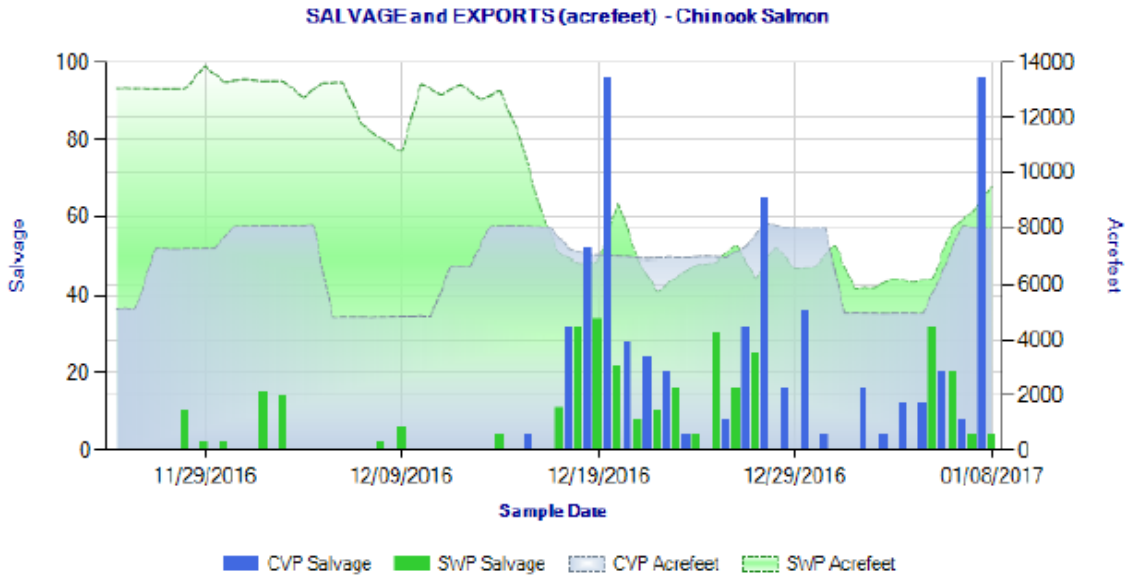


Figure 1. Daily salvage of Chinook Salmon (all races) and water exports from the state and federal fish salvage facilities during Nov 25, 2016 through Jan 8, 2017. Graph obtained from the DFG salvage monitoring web-page: http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx.

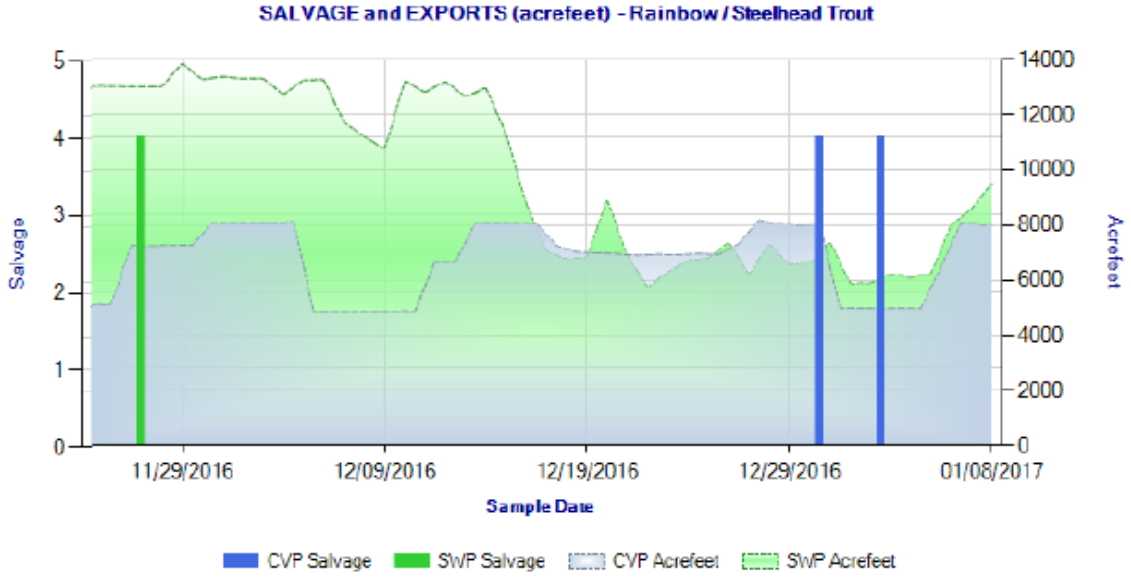


Figure 2. Daily salvage of Steelhead and water exports from the state and federal fish salvage facilities during Nov 25, 2016 through Jan 8, 2017. Graph obtained from the DFG salvage monitoring web-page: http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx.

CONFIRMED HATCHERY (ADIPOSE-FIN CLIPPED) CHINOOK SALMON LOSS AT THE SWP & CVP DELTA FISH FACILITIES as of 1/8/17

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 Concern Level	Second Concern Level	Date of First Loss[4]	Date of Last Loss[4]
12/9/2016	LF	Coleman NFH	Battle Creek	Production	891.33	861,966	n/a	0.103	n/a	n/a	n/a	12/18/2016	1/5/2017
12/12/2016	LF	Coleman NFH	Battle Creek	Spring Surrogate	99.70	75,000	n/a	0.133	n/a	0.50%	1.00%	12/22/2016	1/8/2017
12/21/2016	LF	Coleman NFH	Battle Creek	Spring Surrogate	35.12	81,279	n/a	0.043	n/a	0.50%	1.00%	1/5/2017	1/8/2017
1/9/2017	LF	Coleman NFH	Battle Creek	Spring Surrogate	0.00	75,000	n/a	0	n/a	0.50%	1.00%	*	*

Agenda Item 7.

Fish Monitoring: The following table presents fish monitoring data summarized over the identified sampling dates. Unless otherwise noted, any reported sizes are fork length.

Location	Chipps Is. Midwater Trawl[A, E]	Sacramento Trawl[A]	Beach Seines[A]	Knights Landing RST[B]	Tisdale RST[C]	GCID RST[D]	Mossdale Kodiak Trawl[A]
Sample Date	1/3, 1/5, 1/6	1/3, 1/5, 1/6	1/3-1/6	12/30-1/9	12/30-1/8	1/1, 1/4	1/3, 1/4, 1/6
FR Chinook		5	128	310	181	156 juveniles	
SR Chinook			29	9	30	4 juveniles	
WR Chinook			7			1 juvenile	
LFR Chinook	4						
Ad-Clipped Chinook	3			2	1		
Delta Smelt	2						
Longfin Smelt	13						
Steelhead (ad-clip)							
Steelhead (wild)							
Green Sturgeon							
Flows (avg. cfs)				19,256	17,360	1,321.5	
W. Temp. (avg. °F)				45.6	44.3	49.3	
Turbidity (avg. NTU)				57.4	63.9	9.8	

[A]Data reported in the 1/1 to 1/7 DJFMP sampling summary

[B]Knights Landing RST sampling period was from 12/30 at 9:00 am to 1/9 at 2:30 pm.

[C]Tisdale RST sampling period was from 12/30 at 10:00 am to 1/8 at 10:00 am.

[D]GCID sampling period was from 1/1 at 8:00 am to 1/4 at 9:00 pm. On 1/4 the RST cone was pulled due to predicted high flows and heavy debris.

Red Bluff Diversion Dam (RBDD)

USFWS biweekly report (12/17/16-12/31/16) for preliminary estimates of passage by brood-year and run for unmarked juvenile Chinook salmon captured by rotary screw traps at RBDD included:

Run and Species	Biweekly Total	Brood Year Total (90% CI)
Winter-run Chinook (BY2016)	12,600	521,186 (388,983-653,390)
Spring-run Chinook (BY2016)	1,811	49,909 (30,011-69,806)

Enhanced Delta Smelt Monitoring (EDSM) Catch

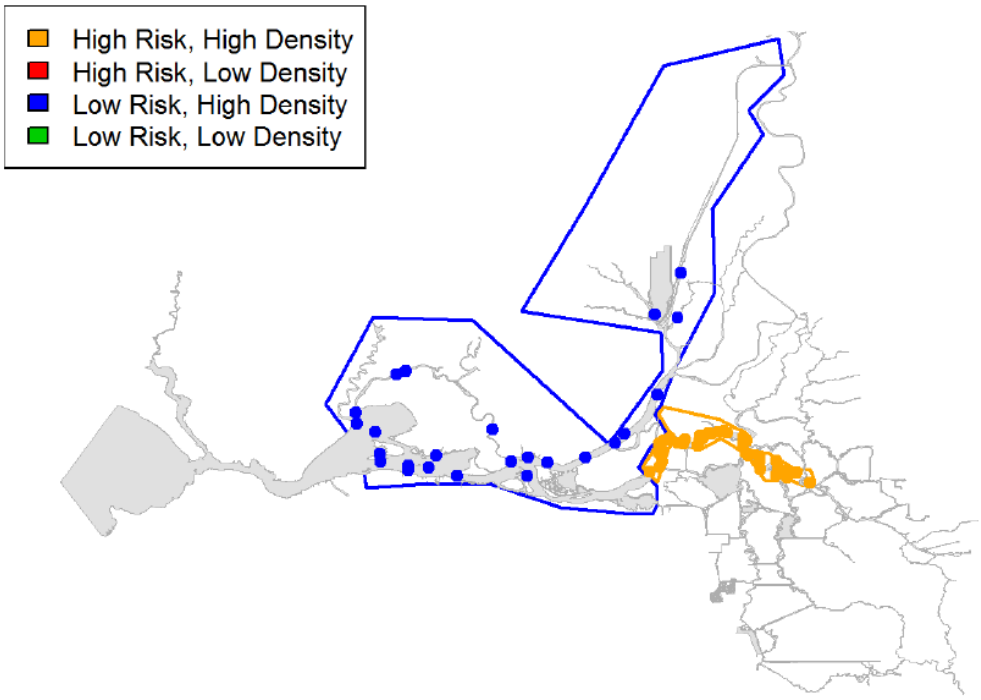
EDSM data posted on DJFMP website:
https://www.fws.gov/lodi/juvenile_fish_monitoring_program/jfmp_index.htm

During the third week of sampling, a total of four ad-clipped Chinook (late-fall run Chinook salmon from the recent Coleman National Fish Hatchery releases) were caught across all sampling sites.

Note: The EDSM sampling regions in the following table and map are named according to relative entrainment risk for and population density of Delta Smelt.

Week	Dates	Number of Sites	Species	Low Risk, High Density (LR.HD)	Low Risk, Low Density (LR.LD)	High Risk, High Density (HR.HD)	High Risk, Low Density (HR.LD)	Total Catch
1	Dec 15 - Dec 22	23	FR Chinook	2	*Not sampled in Week 1*	0	*Not sampled in Week 1*	2
			SR Chinook	1		1		2
			WR Chinook	0		0		0
			Tagged Chinook	3		4		7
2	Dec 27 - Dec 30	16	FR Chinook	0	*Not sampled in Week 2*	0	*Not sampled in Week 2*	0
			SR Chinook	0		0		0
			WR Chinook	0		0		0
			Tagged Chinook	1		0		1
3	Jan 3 - Jan 9	24	FR Chinook	0	*Not sampled in Week 3*	0	*Not sampled in Week 3*	0
			SR Chinook	0		0		0
			WR Chinook	0		0		0
			Tagged Chinook	1		3		4

Map of Sampling Locations Across All Weeks



Agenda Item 8.

SacPAS fish modeling

J. Israel (Reclamation) provided a brief demonstration on using SacPAS for predicting fish migration[5] through the Delta.

Agenda Item 9.

DOSS Estimates of Fish Distribution and Assessment of Entrainment Risk

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

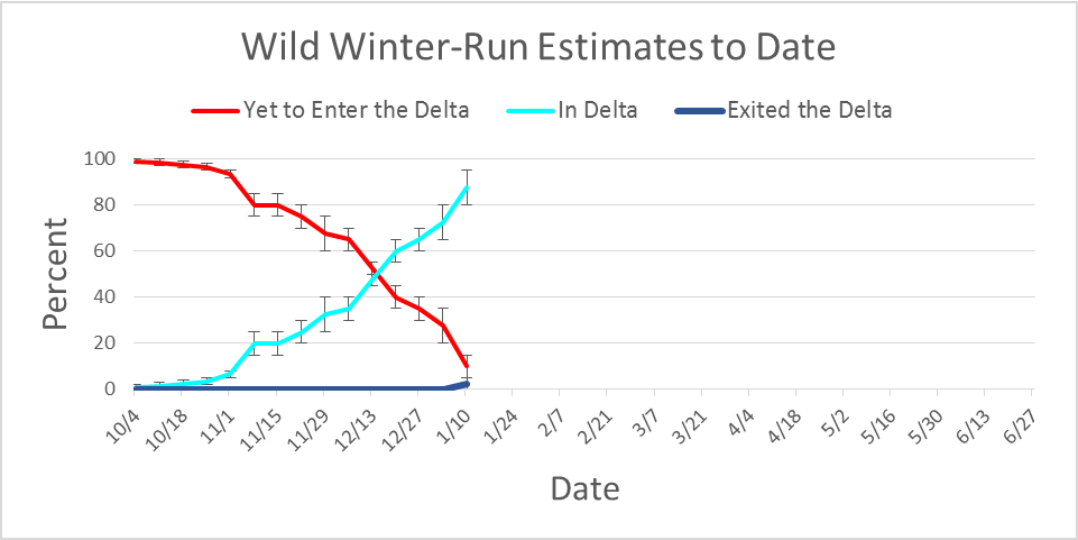
Location	Yet to Enter Delta (Upstream of Knights Landing)	In the Delta	Exited the Delta (Past Chipps Island)
Wild young-of-year (YOY) winter-run Chinook salmon	5% - 15% (Last week: 20% - 35%)	80% - 90% (Last week: 65% - 80%)	0-5% (Last week: 0%)
Wild young-of-year (YOY) spring-run Chinook salmon	35% - 50% (Last week: 55% - 70%)	50% - 60% (Last week: 30% - 45%)	0-5% (Last week: 0%)

[5] http://www.cbr.washington.edu/sacramento/migration/

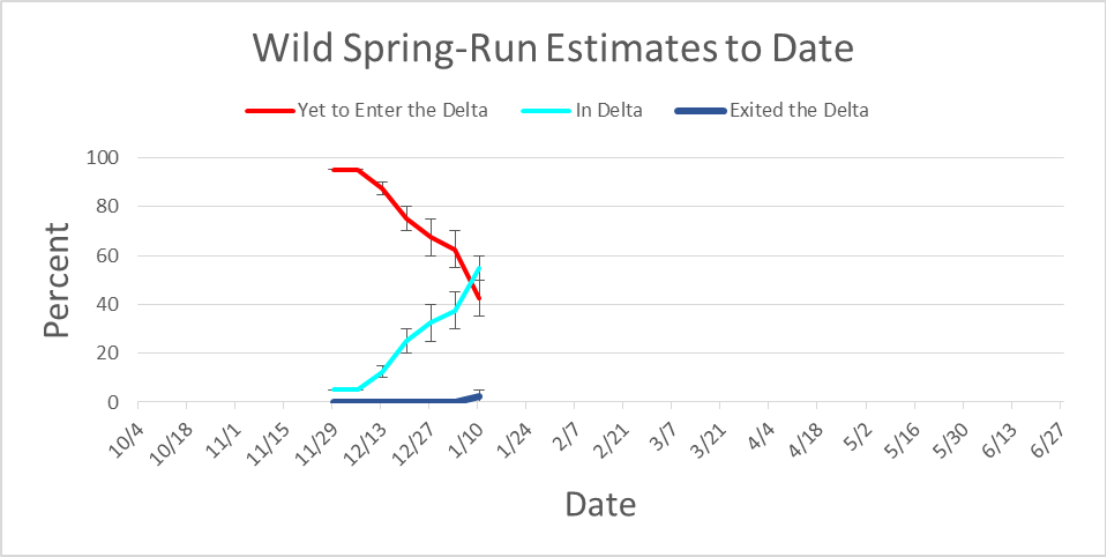
Rationale for changes in distribution

Wild winter-run Chinook: While relatively few juvenile winter-run Chinook salmon were observed at monitoring locations upstream of the Delta, extremely high flows have occurred over the past couple of days. Because of these high flows and due to seasonal timing, DOSS shifted the distribution ranges by 15-20% into the Delta. No winter-run Chinook salmon have been observed at Chipps Island trawl, however a small percentage are expected to have exited the Delta at the recent high Delta outflows.

Wild spring-run Chinook: Over the past week, 31 juvenile spring-run were observed at Tisdale, 9 at Knights Landing and 29 in the beach seines. Because of this observed catch, and due to recent high flows, DOSS shifted the distribution ranges by 15-20% into the Delta. No spring-run have been observed at Chipps Island trawl, however a small percentage are expected to have exited the Delta at the recent high Delta outflows.



WY 2017 wild winter-run distribution estimates to date.



WY 2017 wild spring-run distribution estimates to date.

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
  - Flow and turbidities from recent rains, which are cues for salmonid movement, have been high since the weekend and are expected to remain high through the coming weekend.
  - Some fish are going into bypasses. Fish entering the Yolo Bypass will exit the bypass downstream of the Georgiana Slough junction, reducing entrainment risk into the interior Delta.
  - Overall, despite bypass overflow, the group assessed the exposure risk as high.

- **Routing Risk:** LOW
  - Continued high river flows are expected to mute the tidal effects at Georgiana Slough (reducing the risk of routing into Georgiana Slough).
  - Delta Cross Channel is closed.
  - However, we are seeing Sacramento-basin-origin fish in salvage

- **Overall Entrainment Risk:** MEDIUM

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

- **Exposure Risk:** MEDIUM-HIGH
  - Have seen consistent salvage of CNFH hatchery Chinook released into Battle Creek (which enter the Sacramento River upstream of the Red Bluff Diversion Dam) which shows that Sacramento basin fish are present in the south Delta and being entrained into the export facilities; also have seen salvage of unclipped Chinook, likely from the Sacramento basin.

- **OMR/Export Risk:**
  - OMR -2,500 cfs: LOW
  - OMR -3,500 cfs: MEDIUM
  - OMR -5,000 cfs: HIGH
  - OMR -6,250 cfs[6]: HIGH (given current hydrology and high Vernalis flow)

    Under the current conditions of a high and rapidly rising Vernalis flow, some members thought the OMR/Export risk at -6,250 was incrementally higher relative to -5,000 cfs; others felt the risk of entrainment was similar under the two levels. At least some members expect the relative risk of an OMR limit of -6,250 compared to -5,000 cfs to increase as Vernalis flows decrease, hence the caveat on the current week's assessment of risk at the -6,250 cfs level. At the high Vernalis flows forecasted for much of the upcoming week, OMR flows as negative as -6,250 might not even be *possible* even at maximum export levels.

- **Overall Entrainment Risk:**
  - OMR -2,500 cfs: LOW
  - OMR -3,500 cfs: LOW-MEDIUM (given current hydrology and high Vernalis flow)
  - OMR -5,000 cfs: MEDIUM-HIGH (given current hydrology and high Vernalis flow)
  - OMR -6,250 cfs[6]: MEDIUM-HIGH (given current hydrology and high Vernalis flow)

    Under the extremely high Sacramento River and Vernalis flows forecasted through the weekend, and with the expectation that most ESA-listed salmonids will be entering the Delta from the Sacramento basin (no salmonids yet observed in WY 2017 at the Mossdale trawl which samples the San Joaquin River near Delta entry), most members felt that overall entrainment risk into the export facilities was lower at most OMR levels than would be the case under lower flow conditions. The overall entrainment risk was driven in large part by the MEDIUM-HIGH exposure risk and less so (given current hydrology) by the OMR/Export Risk. Considering current hydrologic conditions, the difference

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

between OMR levels of -5,000 and -6,250 does not represent a significantly elevated overall entrainment risk to Sacramento Basin salmonid populations. This assessment is likely to change should export levels continue at the current levels and San Joaquin flows diminish, at which point risk to Sacramento Basin salmonids will increase.

Agenda Item 10.
DOSS Advice to NMFS and WOMT: None

Agenda Item 11.
Next Meeting: The next DOSS conference call will be on **1/17/17 at 9am**.