

Delta Operations for Salmonids and Sturgeon (DOSS) Group
Conference call: 3/15/16 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.

DWR: Aaron Miller, Rhiannon Mulligan, Kevin Reece
Reclamation: Peggy Manza, Josh Israel
NMFS: Barb Byrne, Jeff Stuart
CDFW: Bob Fujimura, Duane Linander, Ken Kundargi
SWRCB: Matt Holland, Chris Carr, Laurel Karren
FWS: Craig Anderson, Leigh Bartoo
EPA: Erin Foresman

Agenda Items

1. Agenda review and introductions
2. RPA Implementation review
3. Current Operations
4. Smelt Working Group
5. Fish Monitoring: Salvage
6. Fish Monitoring: Hatchery winter-run Chinook acoustic-tracking
7. Fish Monitoring: RSTs/trawls/seines
8. Recent or Upcoming Hatchery Releases
9. DOSS Estimates of Fish Distribution and Entrainment Risk
10. DOSS Advice
11. Next DOSS meeting

Agenda Item 2.

RPA Implementation Review

Delta RPA Actions that may affect operations during March:

Action IV.1.2¹ (DCC gate operations):

- DCC gates have been closed since 12/15/15.

Action IV.2.3² (OMR Flow Management)

- No triggers exceeded over past week.
- OMR limit of -5,000 cfs is in effect

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

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

Agenda Item 3.

Current Operations (3/15/16)

SWP		CVP	
Exports (cfs)			
Clifton Court Forebay	3,600	Jones Pumping Plant	3,400
Reservoir Releases (cfs)			
Feather - Oroville	800*	American - Folsom	20,000**; releases will decrease to 8,000-10,000 over the next week.
		Sacramento - Keswick	5,000
		Stanislaus - Goodwin	200
		Trinity - Lewiston	300
Reservoir Storage (in TAF)			
San Luis (SWP)	608	San Luis (CVP)	368
Oroville	2,600	Shasta	3,709
New Melones	541	Folsom	699
Delta Operations			
DCC	Closed	Sacramento River at Freeport (cfs)	76,108
Outflow Index (cfs)	~140,500	San Joaquin River at Vernalis (cfs)	3,453
E:I	12% (14-day avg.)	X2	<56 km

*Oroville reservoir storage is getting close to the flood control curve; releases may be increased sometime this week.
 **Folsom is encroached into the flood control space and higher releases are required to ensure sufficient flood control capacity for future runoff.

OMR as of 3/12/16:

	USGS gauges (cfs)	Index ³ (cfs)
5-day	-4,780	-5,000
14-day	-5,120	-5,000

The daily OMR Index on 3/14/16 was -5,000 cfs.

Review of factors controlling Delta exports for the period 3/8/16 to 3/15/16:

- *Friday (3/8/16) – Tuesday (3/15/16):* -5,000 cfs OMR limit per both NMFS BiOp and 3/8/16 FWS determination (which continued the -5,000 cfs limit in the 2/10/16 FWS determination).

³ Beginning 2/16/16, the OMR Index values reported in the DOSS notes were calculated using an OMR Index equation that no longer includes (per the original intent of the index equation) the Contra Costa Water District's Rock Slough diversion in the export term. Beginning February 2016, the OMR Index values reported in the monthly OMR reports on the "CVO Reports" website (<http://www.usbr.gov/mp/cvo/index.html>) were calculated using this adjusted equation without the Rock Slough diversion.

Weather forecast indicates a chance of limited precipitation sometime next week.

Assorted operations updates:

- The construction on the Spring Head of Old River barrier⁴ started on March 10, 2016.
- Fremont Weir started overtopping over the weekend; currently spilling ~58,000 cfs into Yolo Bypass
- Shasta storage is high enough that Reclamation was able to issue a change order to shut the middle gates of the Temperature Control Device (TCD) on Shasta Dam, so that water can be withdrawn entirely through the top gates.
- Whiskeytown Reservoir elevation is high enough that water is spilling through the glory hole.

Agenda Item 4.

Smelt Working Group

The SWG met on Monday, 3/14/16 at 10am. Bartoo (FWS) provided the following SWG meeting summary:

The Working Group reviewed current Delta Smelt distribution, salvage data, and Delta conditions. The Working Group agreed that the relative risk of entrainment to adult Delta Smelt likely has decreased. Members noted that spawning likely is well underway, and adults are most likely holding their positions, rather than continuing migration. In light of this, the group's discussions primarily focused on the entrainment risk to larval Delta Smelt.

The Working Group described the risk of entrainment under the Service-provided advice framework. Under this framework the relative risk of entrainment for OMR flow ranges is discussed and assessed. For the current week, the risk of entrainment of larval Delta Smelt for each of the flow ranges is characterized as follows:

- -1250 to -2000 cfs has a low risk of entrainment,
- -2000 to -3500 cfs has a low risk of entrainment,
- -3500 to -5000 cfs has a medium risk of entrainment.

The Working Group is following guidance for entrainment protections from both Action 2 (adult Delta Smelt) and Action 3 (juvenile Delta Smelt). The Working Group will continue to monitor Delta Smelt survey and salvage data and Delta conditions, and will meet again on Monday, March 21, 2016 at 10 am.

SWG meeting notes are available at: http://www.fws.gov/sfbaydelta/cvp-swp/smelt_working_group.cfm.

⁴ Temporary barrier updates are available at: http://baydeltaoffice.water.ca.gov/sdb/tbp/web_pg/tempbar/weekly.cfm

Agenda Item 5.

Fish Monitoring: Salvage⁵

Fujimura (CDFW) provided the following summaries of salvage and loss at the SWP and CVP fish collection facilities. The salvage figures were generated on the CDFW salvage monitoring web-page: <http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx>.

⁵ 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.

DOSS Weekly Salvage Update

Reporting Period: March 7-March 13, 2016

Prepared by Bob Fujimura on March 14, 2016 14:24

Preliminary Results -Subject to Revision

Criteria	7-Mar	8-Mar	9-Mar	10-Mar	11-Mar	12-Mar	13-Mar	Trend	
Loss Densities									
Wild older juvenile CS	0	0	0	0	0	0	0	→	0
Wild steelhead	0	0	0	0	0.21	0.22	0	↗	0.06
Exports									
SWP daily export	4,764	3,079	6,913	5,926	6,124	5,824	5,733	↗	5,480
CVP daily export	6,794	6,771	6,771	6,805	6,791	6,799	6,109	→	6,691
SWP reduced counts	0%	0%	0%	0%	0%	0%	0%	→	0%
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 TFCF salvage outages 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	0	0	→	28	51
Spring Run	0	0	→	16	10
Late Fall Run	0	0	→	44	166
Fall Run	0	0	↘	60	71
Unclassified	4	NC		14	NC
Total	4	0		162	299
Hatchery					
Winter Run	4	3	↘	205	607
Spring Run	0	0	→	0	0
Late Fall Run	0	0	→	93	298
Fall Run	0	0	→	1	4
Unclassified	0	0	→	0	0
Total	4	3		299	909

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

Category	Weekly Total			Season Total	
	Salvage	Loss	Trend	Salvage	Loss
Wild	8	5	↗	50	85
Hatchery	81	194	↗	786	1,892
Total	89	199		836	1,977

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

Figure 1. DOSS weekly salvage update for the reporting period 3/7/16-3/13/16.

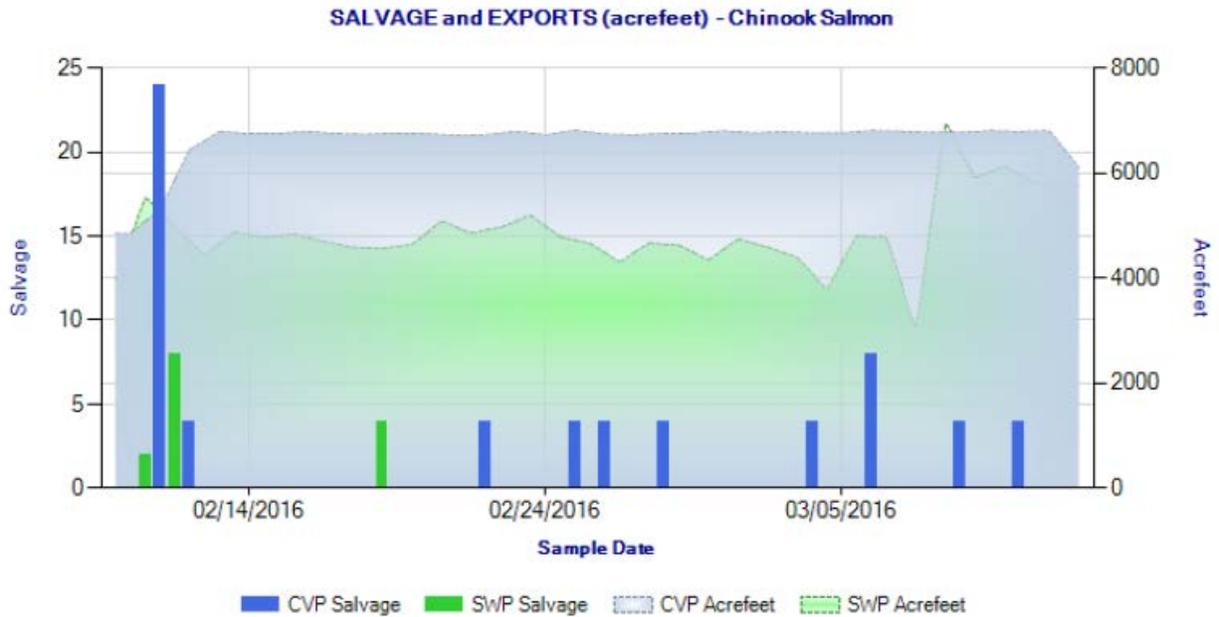


Figure 2. Daily salvage of Chinook salmon (all races) and water exports from the state and federal fish salvage facilities during February 10, 2016 through March 13, 2016.

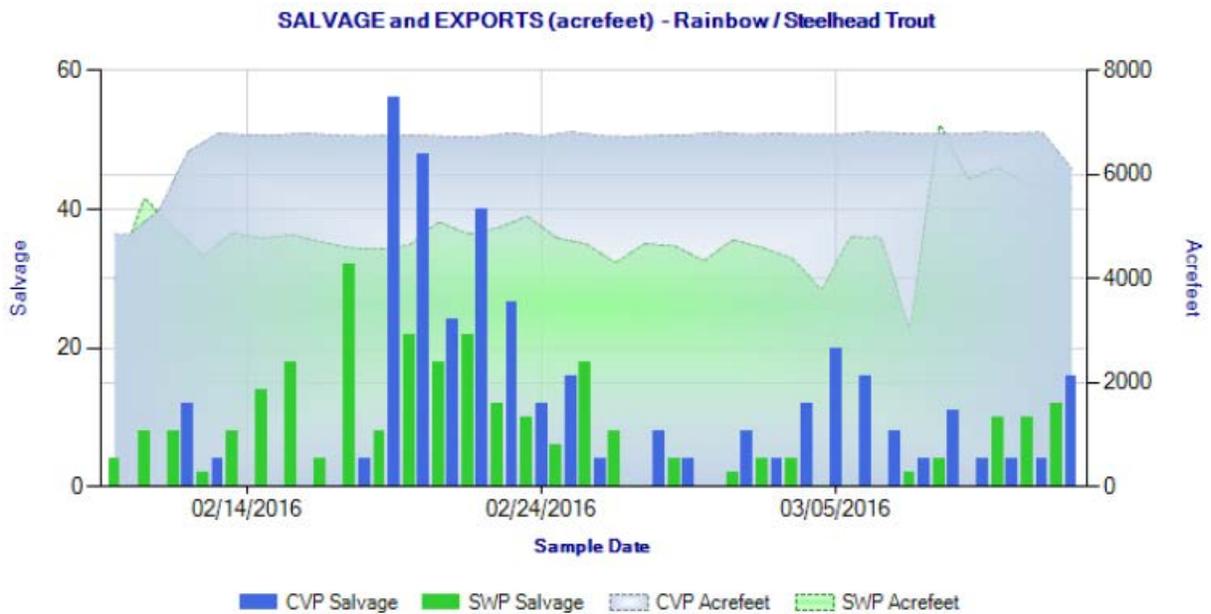


Figure 3. Daily salvage of steelhead and water exports from the state and federal fish salvage facilities during February 10, 2016 through March 13, 2016.

Preliminary salvage report for Monday, 3/14/16:

- 34 clipped steelhead (16 at the CVP and 18 at the SWP)
- 4 wild steelhead (at the SWP)
- 4 spring-run-sized clipped Chinook (at the CVP; the CWT indicated that the single fish collected and expanded to a salvage of four was a hatchery winter-run Chinook from Livingston Stone National Fish Hatchery)

Coded-wire-tag recoveries

Mulligan (DWR) provided the following summary of coded-wire-tag recoveries at the SWP and CVP fish collection facilities. The cumulative loss of the hatchery winter-run Chinook group (released by Livingston Stone National Fish Hatchery (LSNFH) on 2/17/16 to 2/18/16) is 11.19, 0.003% of the number released. The most recent salvage of LSNFH hatchery winter-run Chinook occurred on Monday, 3/14/16. The cumulative loss of the third spring-run Chinook surrogate group (released from Coleman National Fish Hatchery on 1/12/16) continues to hold at 0.412%, near the 0.5% OMR trigger threshold under Action IV.2.3. Loss of Chinook within any spring-run Chinook surrogate group has not occurred since 2/12/16.

CONFIRMED HATCHERY (ADIPOSE-FIN CLIPPED) CHINOOK SALMON LOSS AT THE SWP & CVP DELTA FISH FACILITIES, 2015/2016

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
8/11/2015 to 8/12/2015	LF	Coleman NFH	Balls Ferry Boat Ramp, Sacramento River	Production	0.00	434,227	n/a	0.000	n/a	n/a	n/a	*	*
12/9/2015	LF	Coleman NFH	Battle Creek	Production	305.22	261,213	n/a	0.117	n/a	n/a	n/a	12/25/2015	2/12/2016
12/11/2015	LF	Coleman NFH	Battle Creek	Spring Surrogate	128.05	77,000	n/a	0.166	n/a	0.5%	1.0%	12/25/2015	1/21/2016
12/22/2015	LF	Coleman NFH	Battle Creek	Spring Surrogate	170.59	88,000	n/a	0.251	n/a	0.5%	1.0%	1/8/2016	2/2/2016
1/12/2016	LF	Coleman NFH	Battle Creek	Spring Surrogate	278.85	87,700	n/a	0.412	n/a	0.5%	1.0%	1/20/2016	2/12/2016
2/17/2016 to 2/19/2016	W	Livingston stone NFH	Sacramento River	Winter Run Production	11.19	420,006	155,400	0.003	0.0072	0.5%	1.0%	3/8/2016	3/14/2016
3/14/2016	F	Coleman NFH	Battle Creek	Fall run Production	0.00	894,488	n/a	0.000	0.000	n/a	n/a	*	*

UNCONFIRMED HATCHERY (ADIPOSE-FIN CLIPPED) CHINOOK SALMON LOSS AT THE SWP & CVP DELTA FISH FACILITIES, 2015/2016

Facility	Unknown CWT Loss ⁵	Unread CWT Loss ⁶	Unknown Hatchery Loss ⁷	Acoustic Tag Loss ⁸	Number of Unassigned CWT ⁹
SWP	18.16	0.00	0.00	0.00	0
CVP	0.00	0.00	0.00	0.00	0
TOTAL	18.16	0.00	0.00	0.00	0

SWP and CVP adipose-fin clipped Chinook lost from 12/25/2015

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.

⁵Adipose-fin clipped Chinook was observed during fish count, but tag code could not be determined (e.g., damaged tag, lost tag, no tag, or Chinook accidentally released).

⁶Adipose-fin clipped Chinook was collected during fish count and has not been processed yet.

⁷CWT has been read, but hatchery release information not yet available.

⁸Adipose-fin clipped Chinook released due to presence of sutures.

⁹CWT cannot currently be assigned to a salvage record with certainty since the CWT was lost and then found. CWT may be assigned to a salvage record if new information is available.

** Information not yet available.

DWR-DES Revised 03/15/2016

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

Agenda Item 6.

Fish Monitoring: Hatchery winter-run Chinook acoustic-tracking

LSNFH released two groups of about 210,000 (for a total of approximately 420,000) hatchery winter-run Chinook at Bonnyview Bridge in Redding – one group on 2/17/16 and the other group on 2/18/16. 285 of each release group (for a total of 570) were acoustic-tagged with JSATS tags and NOAA’s Southwest Fisheries Science Center (SWFSC) is tracking movement of these acoustic-tagged fish past eight “real-time” receiver locations from Redding to Middle River.

Highlights from the latest (as of 1:00 pm on 3/14/16) acoustic-tracking data from Arnold Amman (SWFSC) are provided below.

- Preliminary estimate of survival between Redding and Colusa (based on a preliminary run of the Cormack-Jolly-Seber mark-recapture model) is ~71% (95% CI 0.67 to 0.75), the highest survival through that reach compared to the previous three years of data. See preliminary survival estimates for BY 2015 in Table 3 of the acoustic-tracking report.
- Receivers at I-80/Hwy 50 bridge in Sacramento are not operating properly, which precludes estimation of detection probability at the Tower Bridge receivers
- Hood River receiver is offline
- Small increase in tags detected at Tower Bridge over the past few days.
- 48% of the acoustic-tagged hatchery winter-run Chinook have passed the Tower Bridge receiver in Sacramento.

Livingston Stone National Fish Hatchery JSATS acoustic tagged smolt movement as of 3/14/2016 13:00. Redding - Bonnyview = site of release, fish trucked from LSNFH. Bonnyview is 6.8 river miles below the usual Caldwell Park release location.

Table 1. FIRST RELEASE ONLY - Preliminary Data, subject to change

FASTEST FISH ID: 4AA8						
Location	rkm of location	Total Fish detected	First arrival	Travel Time (days)	Speed (rkm/day)	Speed (miles/day)
Redding	540.4	285	2/17/2016 18:00			
Colusa	314.4	197	2/20/2016 5:40	2.5	90.9	56.5
Tisdale	269.2	175	2/20/2016 20:38	0.6	72.5	45.0
Knights Landing	224.1	160	2/21/2016 11:09	0.6	74.6	46.3
Verona	203.5	108	* went through this area when receivers not operating			
Tower Bridge	172.0	131	2/22/2016 4:22	0.7	72.6	45.1
I80 Bridge	170.8	126	2/22/2016 4:54	0.0	53.9	33.5
Hood	138.9	75				
Middle River	150	0				

rkm of location = distance via mainstem path from Golden Gate Bridge, GG Bridge = 0 rkm.

Travel Time = arrival date to location minus arrival date of location above / distance

Verona receivers not online until 2/22/2016 13:23

Hood receiver online starting 2/26/2016 14:35

Table 2. SECOND RELEASE ONLY - Preliminary Data, subject to change

FASTEST FISH ID: 4AD2						
Location	rkm of location	Total Fish detected	First arrival	Travel Time (days)	Speed (rkm/day)	Speed (miles/day)
Redding	540.4	285	2/18/2016 18:00			
Colusa	314.4	200	2/21/2016 9:18	2.6	85.7	53.2
Tisdale	269.2	178	2/22/2016 1:20	0.7	67.7	42.1
Knights Landing	224.1	159	2/22/2016 17:55	0.7	65.3	40.6
Verona	203.5	104	2/22/2016 23:30	0.2	88.4	54.9
Tower Bridge	172.0	142	2/23/2016 19:30	0.8	37.8	23.5
I80 Bridge	170.8	129	2/23/2016 20:01	0.0	56.1	34.8
Hood	138.9	75				
Middle River	150	0				

Table 3. Survival estimates by reach for Livingston Stone National Fish Hatchery JSATS acoustic tagged winter-run juveniles for Brood year (BY)2012, BY2013, BY2014. The BY2015 data are only from real time receivers. Preliminary data and subject to change.

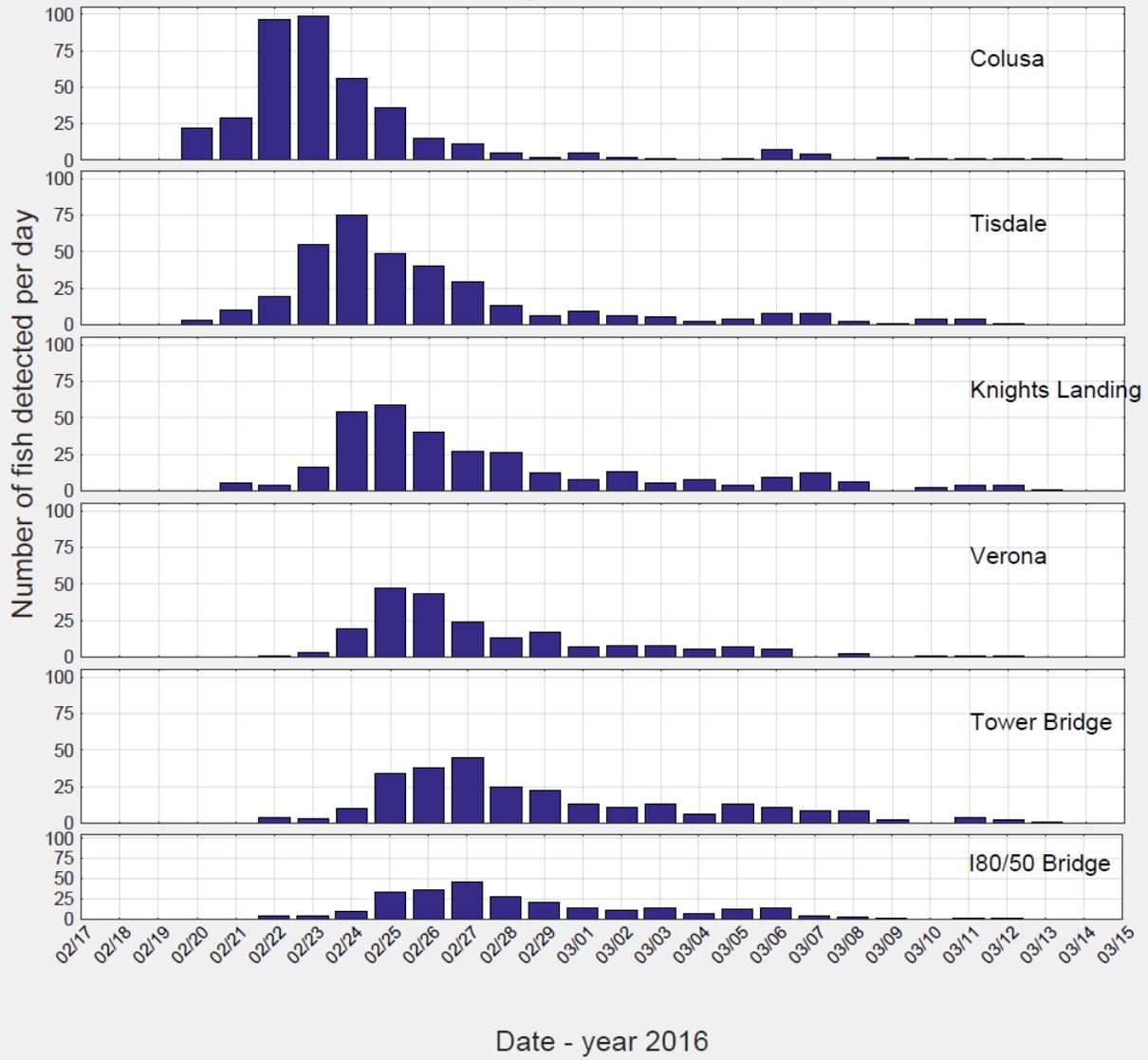
Reach	Reach Length (rkm)	Survival Estimates				BY2015 both releases*
		BY2012	BY2013	BY2014 release 1	BY2014 release 2	
Redding to Colusa	237	0.204	0.419	0.510	0.600	0.709
Colusa to Tisdale	45	0.811	0.983	0.989	0.968	0.869
Tisdale to Knights Landing	45	0.996	0.986	0.916	0.942	0.904
Kights Landing to Verona	21	0.900	1.000	0.973	0.999	0.928
Verona to Tower/I80 Bridge	32	1.000	0.931	0.972	0.962	0.910
I80 to Hood	33	NA	NA	NA	0.961	NA
Redding to Tower/I80 Bridge	379	0.149	0.378	0.441	0.525	0.471

*BY = Brood Year, hatchery releases occur in next calander year, example BY2012 were released 2013
Survival estimates from Cormack-Jolly-Seber model with survival and detection probability varying by reach
Release of hatchery fish each year occurred in early February at Redding, Caldwell Park (Bonnyview in BY2015)*

Table 4. Average travel time in days from release location to each downriver location for the two release groups of LSNFH winter-run Chinook salmon juveniles.

Location	rkm	Release Date	
		2/17/2016	2/18/2016
Colusa	314	6.3	6.4
Tisdale	269	8.8	8.3
Knights Landing	224	10.5	9.7
Verona	203	10.8	9.2
Tower Bridge	172	11.6	11.2
I80 Bridge	171	11.3	10.6
Hood	138	12.1	10.8

Winter-run hatchery juveniles detected per day
570 fish released in Redding 2/17-2/18 - data as of 3/14/2016 13:00



Agenda Item 7.

Fish Monitoring: RSTs/trawls/seines

The following table presents fish monitoring data. Unless otherwise noted, reported sizes are fork length. See also:

<http://www.water.ca.gov/swp/operationscontrol/calFed/calFedMonitoring.cfm>.

Location	Chippis Is. Midwater Trawl ^A	Station 902/Jersey Pt./Prisoners Pt. Trawls ^A	Sacramento Trawl ^A	Beach Seines ^A	Knights Landing RST ^B	Tisdale RST ^C	GCID RST ^D	Mossdale Kodiak Trawl ^A
Sample Date	3/7, 3/9, 3/11	902: 3/11 Jersey Pt: 3/8, 3/10 Pris. Pt: 3/7, 3/9	3/7, 3/9, 3/11	3/8, 3/10, 3/11	3/4-3/13	3/6-3/13	No sampling since 3/4	3/7, 3/9, 3/11
FR Chinook		1	110	596	127	79		No species of management concern
WR Chinook	1			1	1			
SR Chinook			3	9	4	3		
LFR Chinook								
Ad-Clipped Chinook	20		13	1	7	1		
Chinook Adult								
Steelhead (wild)					2	1		
Steelhead (ad-clip)	11				1	2		
Green Sturgeon								
Delta Smelt								
Splittail				1				
Longfin Smelt								
Flows (avg. cfs)					20,600	30,063		
W. Temp. (avg. °F)					53.9	51		
Turbidity (avg. NTU)					93.8	123		

^A Data reported in the 3/6 to 3/12 DJFMP sampling summary

^B Sampling period was from 3/4 at 9:30 am to 3/7 at 1:30pm (at which time traps were pulled), and 3/8 at 1:45pm to 3/13 at 9:15 am. Cones were modified to 50% catch at 1:45 pm on 3/8.

^C Sampling period was from 3/6 at 4:00 pm to 3/13 at 4:00 pm. Cones were modified to 50% catch throughout this sampling period.

^D On 3/4 at 9:00 am, the GCID trap was pulled from the bypass channel to avoid the expected peak in high flows and heavy debris.

Monitoring Summary for DCC and Early Warning surveys: This table provides recent monitoring information not included in the 3/6 to 3/12 DJFMP sampling summary and thus not captured in the table above.

Location	Prisoners Pt. Trawls	Sacramento Trawl
Sample Date	3/14	3/14
FR Chinook	8	59
WR Chinook		
SR Chinook		
Ad-Clipped Chinook		
Delta Smelt	1	

Red Bluff Diversion Dam (RBDD) Monitoring

USFWS biweekly report (2/26/16-3/10/16) 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
Winter-run Chinook (BY2015)	507	334,677

Spring Kodiak Trawl Sampling

Fujimura (DFW) shared data on salmonid catch in the Spring Kodiak Trawl sampling conducted in early March and DOSS discussed the potential origins of the ten winter-run-sized, clipped Chinook captured at Station 920 (on the south fork of the Mokelumne River near Sycamore Slough). After mid-December, when the Delta Cross Channel (DCC) was closed, Sacramento basin fish could reach Station 920 only by moving upstream into the south fork of the Mokelumne River via a route from Georgiana Slough or from the mainstem San Joaquin River. DOSS thought it unlikely (though possible) that hatchery winter-run from the mid-February release near Redding would have moved into the Mokelumne’s south fork; it was suggested that those fish might be late-fall-run Chinook from the early December release from Coleman National Fish Hatchery (before the DCC closed) or residualized Chinook from last year’s Mokelumne Hatchery releases.

Agenda Item 8.

Recent or Upcoming Hatchery Releases

Coleman National Fish Hatchery released approximately 864,400 brood year 2015 fall-run Chinook salmon into Battle Creek on Monday, 3/14/16.

Agenda Item 9.

DOSS Estimates of Fish Distribution and 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. As monitoring information is received, listed species distribution will be updated and included in the following table.

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 salmon¹</i>	<1% (Last week: <5%)	60% - 80% (Last week: >95%)	20% - 40% (Last week: <5%)
<i>Young-of-year (YOY) spring-run Chinook salmon*</i>	5% - 20% (Last week: 30-40%)	50% - 75% (Last week: 60% - 70%)	20% - 30% (Last week: 0% - 5%)
<i>Hatchery winter-run Chinook salmon</i>	5% - 15% (Last week: 5% - 25%)	35%-65% (Last week: 50% - 80%)	30% - 50% (Last week: 10% - 40%)

*Once hatchery fall-run releases (75% of which are unmarked) occur upstream of a monitoring location, DOSS assumes that many of the unclipped spring-run-sized Chinook observed in monitoring may be unmarked fall-run Chinook that fall into the spring-run size range. This week’s distribution estimates are based on data before any hatchery fall-run release. However, because Coleman National Fish Hatchery released 864,400 BY 2015 fall-run Chinook into Battle Creek on 3/14/16, this assumption will become relevant next week as DOSS reviews data that may include individuals from that first hatchery fall-run release.

Rationale for changes in distribution

Wild winter-run Chinook: The decrease in the fraction of wild winter-run upstream of the Delta is based on the very few winter-run-sized Chinook seen in the Sacramento River monitoring locations upstream of the Delta for the last several weeks, despite high flows and turbidities (conditions conducive to salmonid movement). The increase in the fraction of wild winter-run having exited the Delta is based on the very high flows and seasonal timing (historical peak winter-run outmigration from the Delta is in March), both of which DOSS considers conducive to winter-run outmigration. While just one winter-run-sized wild Chinook was reported in the Chippis Trawl, low trawl efficiency and a low winter-run population may mean that the Chippis trawl may not collect many winter-run this year, even during peak outmigration. The decrease in the fraction of wild winter-run remaining in the Delta was due to DOSS’s estimate that many more winter-run exited the Delta than entered.

Wild spring-run Chinook: The decrease in the fraction of wild spring-run upstream of the Delta is based on the observations of spring-run-sized Chinook seen in Sacramento River monitoring upstream of the Delta last week, as well as high flows and turbidities (conditions conducive to salmonid movement). The increase in the fraction of wild spring-run having exited the Delta is based on the very high flows expected to move some fish out of the Delta. While no spring-run-sized wild Chinook were reported in the Chippis Trawl, DOSS assumed that some of the 60-70% of spring-run estimated to be in the Delta last week moved out with the increased Delta outflow associated with the recent storm. Because DOSS was uncertain about the relative movement of

spring-run into and out of the Delta, the estimate of the fraction of wild spring-run in the Delta is wider than last week's estimate.

Hatchery winter-run Chinook: The decrease in the fraction of hatchery winter-run upstream of the Delta is based on: (a) the very few acoustic-tagged hatchery winter-run Chinook detected passing the Tower Bridge receivers last week, despite high flows and turbidities (conditions conducive to salmonid movement), and (b) the observations of hatchery Chinook (likely from the LSNFH winter-run release based on size) seen in the Sacramento Trawl and Sacramento River monitoring upstream of the Delta last week⁶, and (c) recent high flows and turbidities (conditions conducive to salmonid movement). The increase in the fraction of wild winter-run having exited the Delta is based on the very high flows and seasonal timing (peak winter-run outmigration from the Delta is in March), both of which DOSS considers conducive to winter-run outmigration. It is also based on the observation of 20 ad-clipped Chinook (likely from the LSNFH winter-run release based on size) in the Chipps Trawl this week, combined with the previous week's high numbers (42 fish), indicating elevated migration past Chipps Island for at least 2 weeks. The decrease in the fraction of wild winter-run in the Delta was due to DOSS's estimate that more winter-run exited the Delta than entered, but DOSS included a fairly wide range to represent uncertainty in this estimate.

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 associated with 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.

⁶ Items (a) and (b) may seem contrary at first glance ("few fish" and "more fish" both indicate a distribution shift?), but DOSS generally makes changes to distribution estimates based on "few fish" observed only when "few fish" are observed after conditions conducive to movement (the case this week; i.e. few wild fish observed despite the recent storms) or when "few fish" are observed over multiple weeks during a time when (based on historical migration timing) the run of interest is expected to be moving.

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

Reduction in routing risk compared to last week's assessment is based on an expectation of continued high Sacramento River flow past Georgianna Slough over the upcoming week.

- **Exposure Risk:** MEDIUM (*last week: same*)
 - High flows and turbidities from recent rains are cues for continued salmonid movement.
- **Routing Risk:** LOW (*last week: LOW to MEDIUM*)
 - Very high river flows are expected to mute the tidal effects at Georgianna Slough (reducing the risk of routing into Georgianna Slough).
- **Overall Entrainment Risk:** LOW to MEDIUM (*last week: same*)

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

All reductions in risks compared to last week's assessments are based on an expectation of continued high inflows to the Delta over the upcoming week and associated in-Delta conditions. For example, current inflows are associated with a positive "QWEST" of ~13,000 cfs and Delta outflow of over 100,000 cfs.

- **Exposure Risk:** MEDIUM to HIGH (*last week: same*)
 - Natural-origin individuals from listed runs are expected to have previously migrated into and be rearing within the Interior Delta; a substantial fraction of the hatchery winter-run production is estimated to be present in the Delta.
- **OMR/Export Risk:**
 - OMR -2,500 cfs to -3,500 cfs: LOW (*last week: same*)
 - OMR -3,500 cfs to -5,000 cfs: MEDIUM (*last week: MEDIUM to HIGH*)
- **Overall Entrainment Risk:**
 - OMR -2,500 cfs to -3,500 cfs: LOW to MEDIUM (*last week: MEDIUM*)
 - OMR -3,500 cfs to -5,000 cfs: MEDIUM (*last week: MEDIUM to HIGH*)

Agenda Item 10.

DOSS Advice to WOMT and NMFS: None

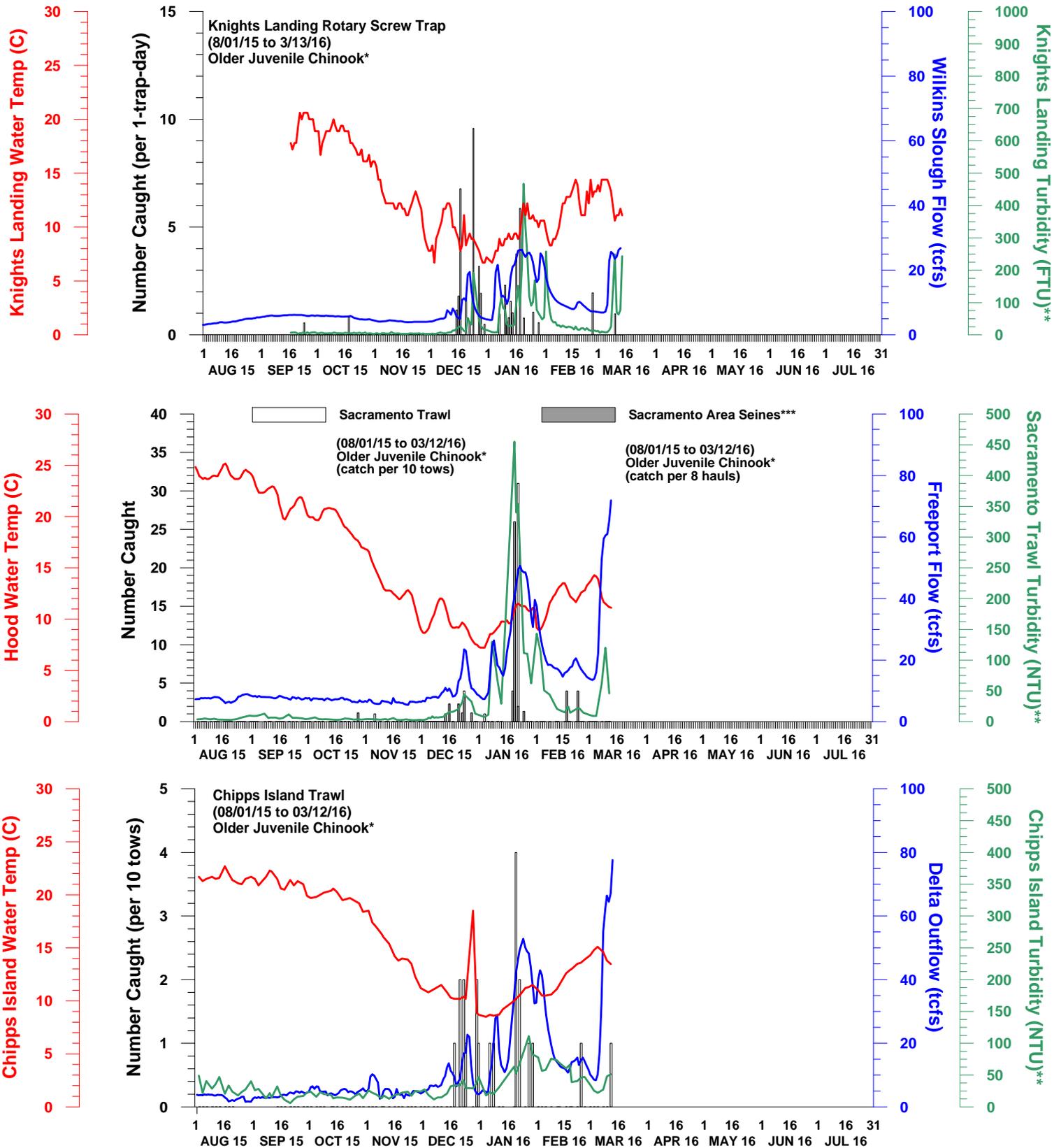
Agenda Item 11.

Next Meeting: The next DOSS conference call will be on 3/22/16 at 9am.

The following graphs were provided by DWR for Chinook salmon and steelhead observed at monitoring locations in the Sacramento and San Joaquin rivers and Delta. Also available at:

<http://www.water.ca.gov/swp/operationscontrol/calfed/calfedmonitoring.cfm>

NUMBER OF UNMARKED OLDER JUVENILE CHINOOK MEASURED IN THE LOWER SACRAMENTO RIVER AND CHIPPS ISLAND



DWR-DES 15 MARCH 2016

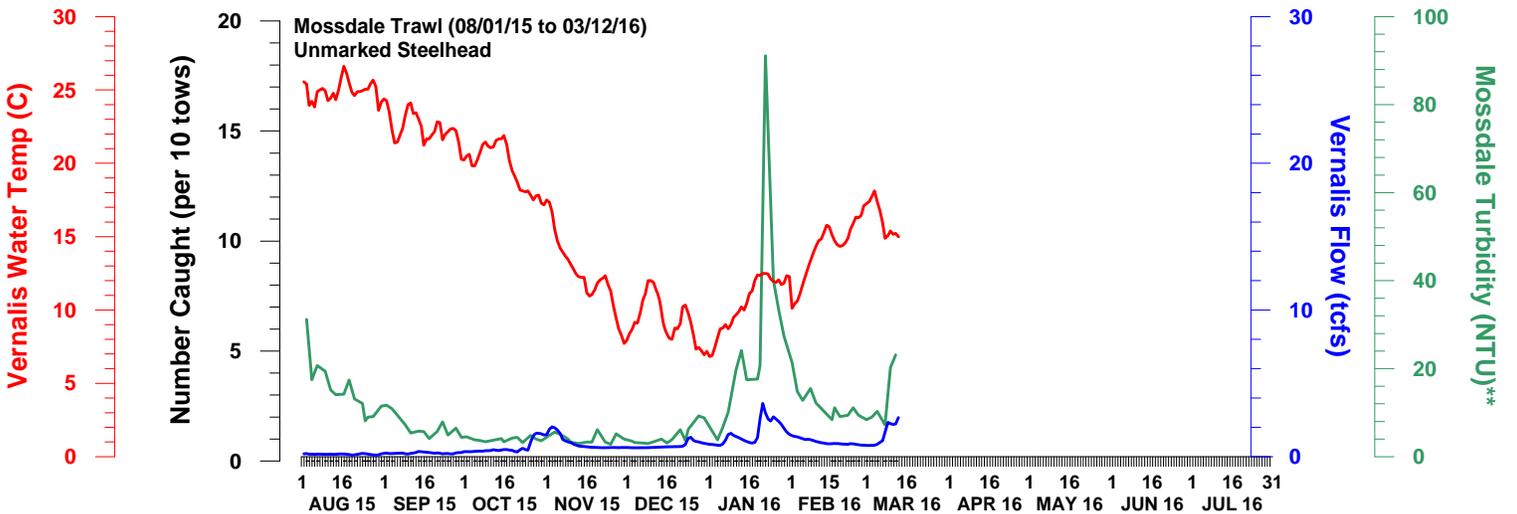
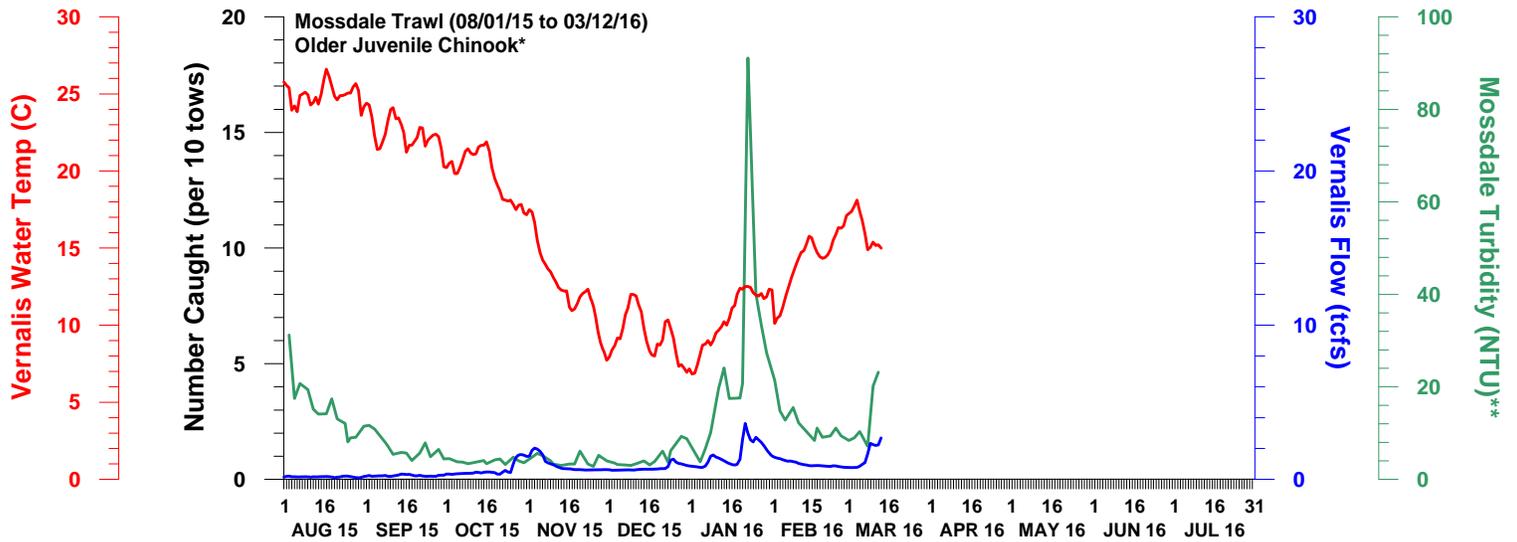
Preliminary data from DFW, FWS, and CDEC; subject to revision.

*Older juvenile Chinook defined as all Chinook greater than or equal to the minimum winter run length-at-date criteria and less than the maximum size included in the length-at-date criteria (Frank Fisher Model) for which a race is assigned on a given sampling date.

**Turbidity is a discrete measurement and is not measured continuously. Therefore, data are interpolated on days when turbidity was not measured unless data are missing for more than five days. Knights Landing turbidity measured in FTU, which should be roughly equivalent to NTU.

***Sacramento area seine route consists of the following seine sites: Verona, Elkhorn, Sand Cove, Discovery Park, American River, Miller Park, Sherwood Harbor, and Garcia Bend. Bars are stacked if Chinook caught from the trawl and seines are from the same day.

NUMBER OF UNMARKED OLDER JUVENILE CHINOOK AND STEELHEAD MEASURED IN THE SAN JOAQUIN RIVER

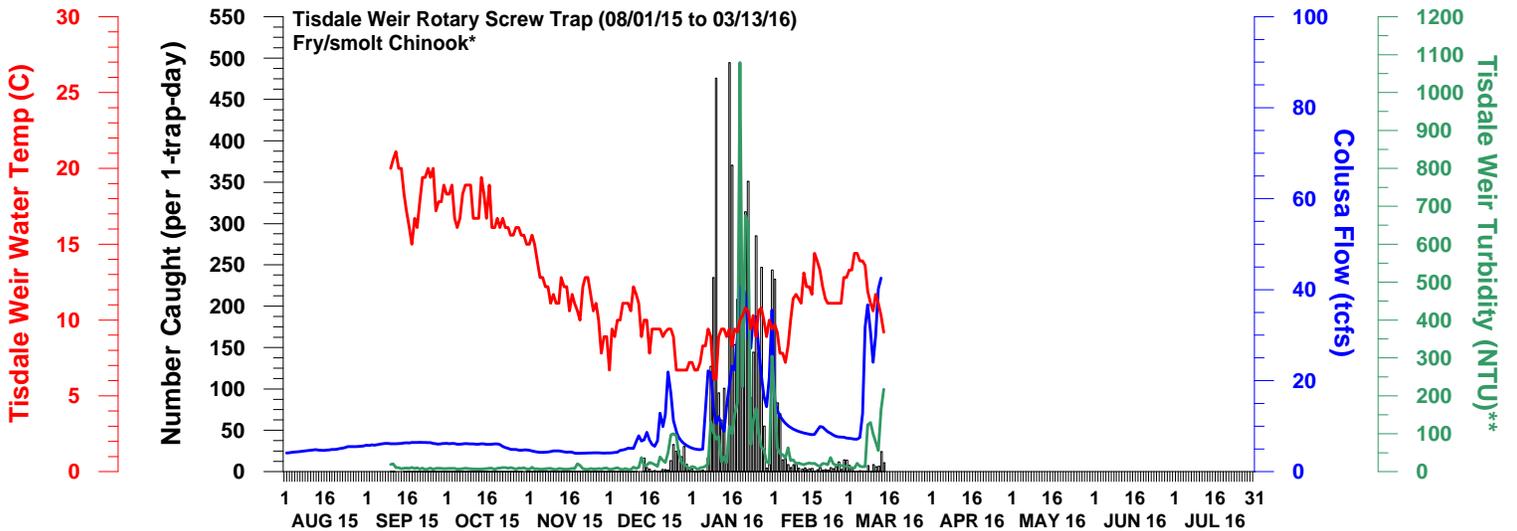
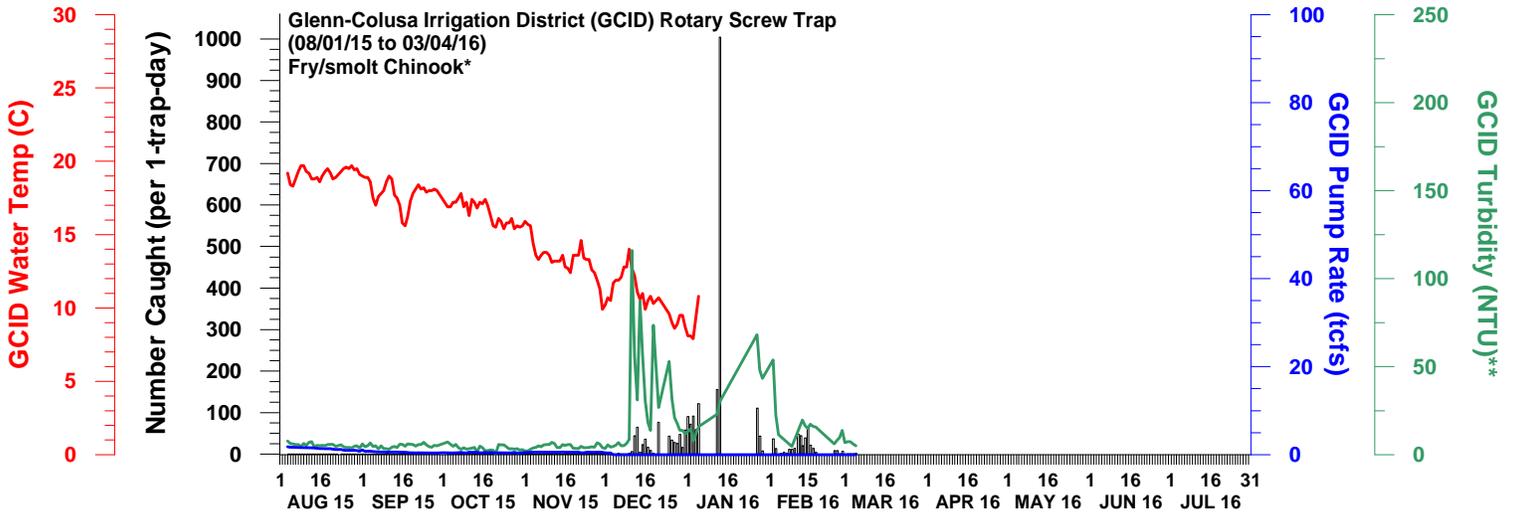
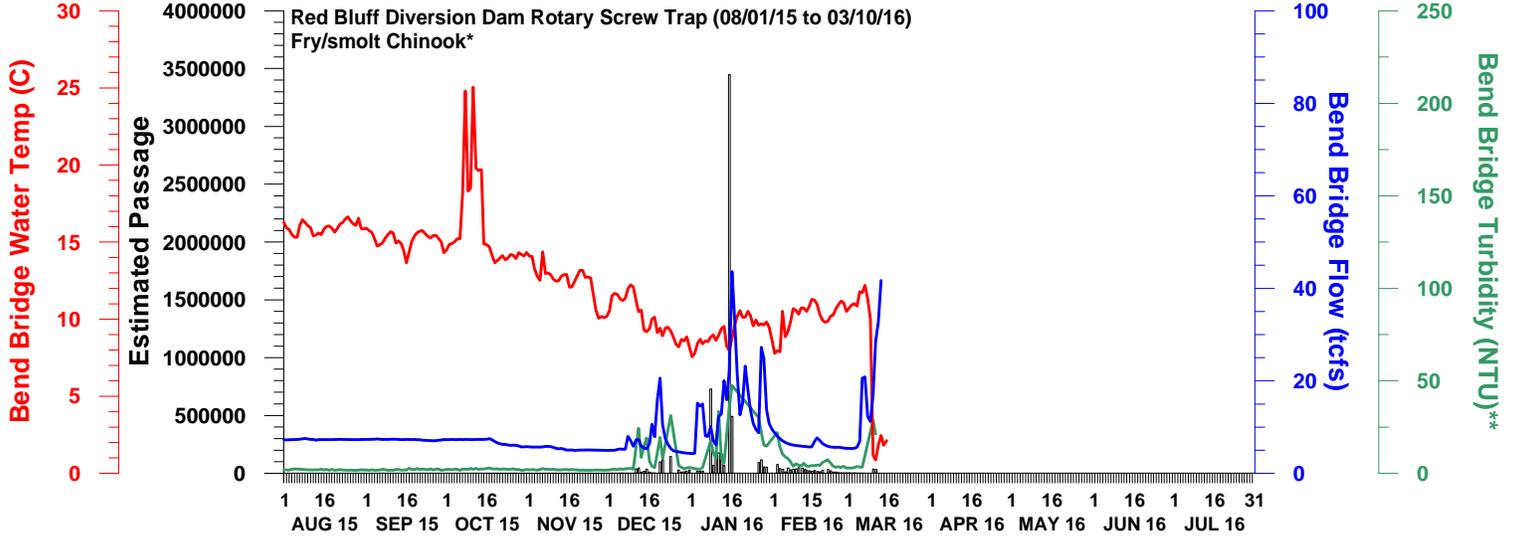


DWR-DES 15 MARCH 2016
Preliminary data from FWS and CDEC; subject to revision.

*Older juvenile Chinook defined as all Chinook greater than or equal to the minimum winter run length-at-date criteria and less than the maximum size included in the length-at-date criteria (Frank Fisher model) for which a race is assigned on a given sampling date.

**Turbidity is a discrete measurement and is not measured continuously. Therefore, data are interpolated on days when turbidity was not measured unless data are missing for more than five days.

NUMBER OF UNMARKED FRY/SMOLT CHINOOK MEASURED IN THE SACRAMENTO RIVER

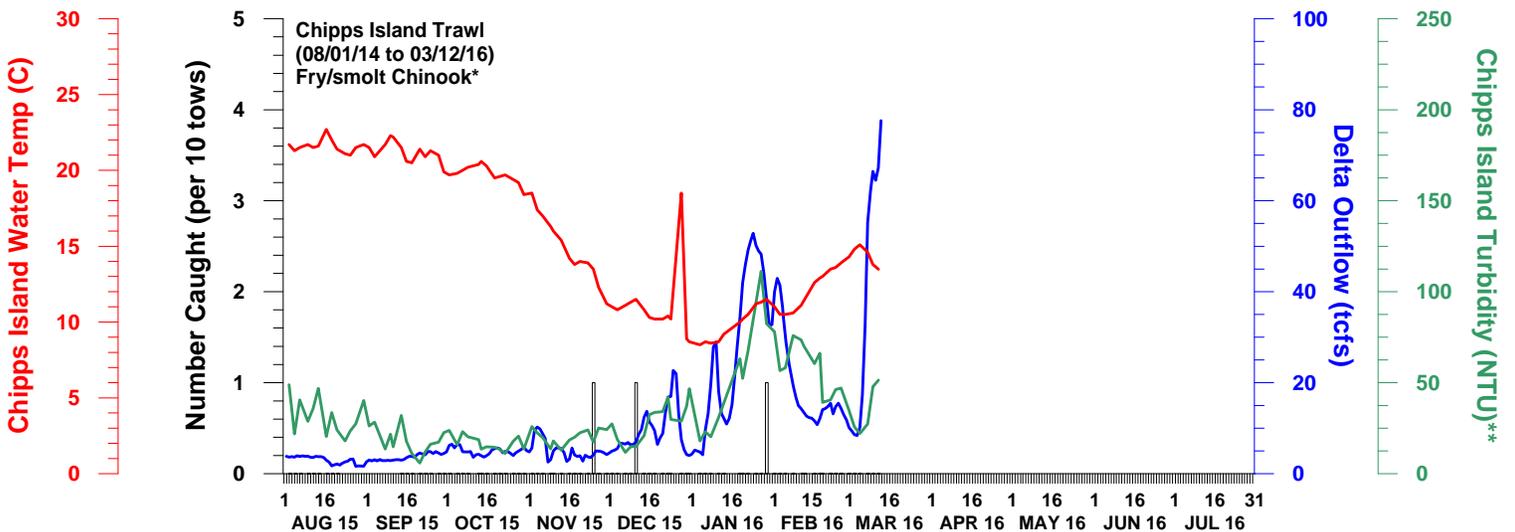
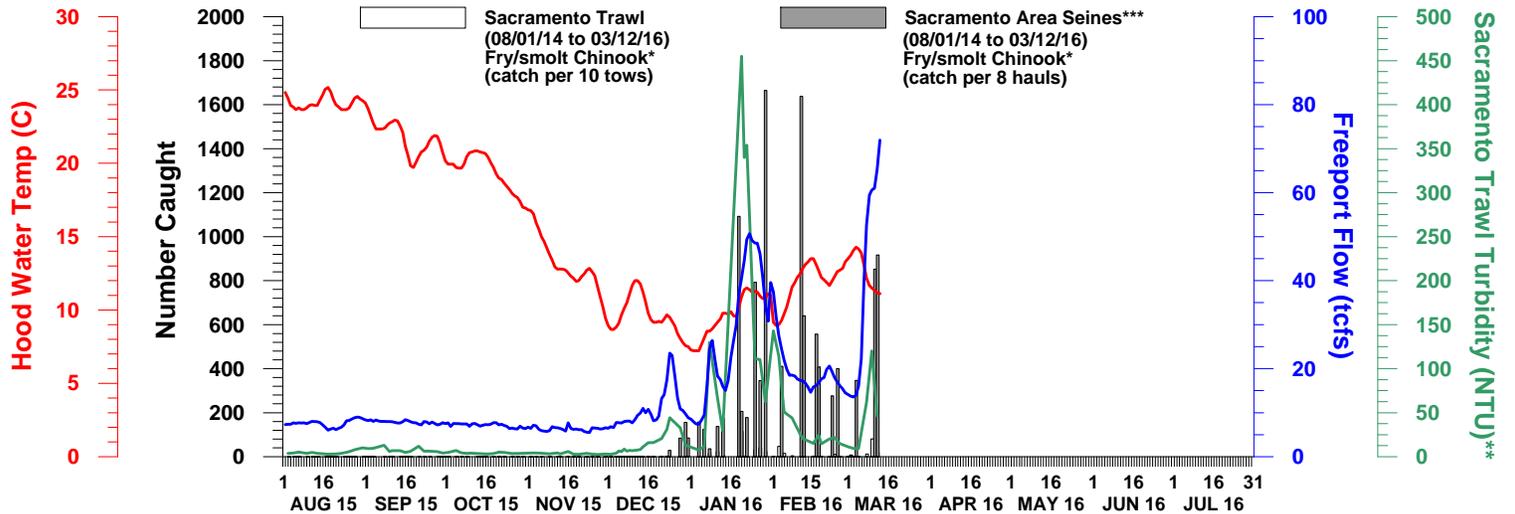
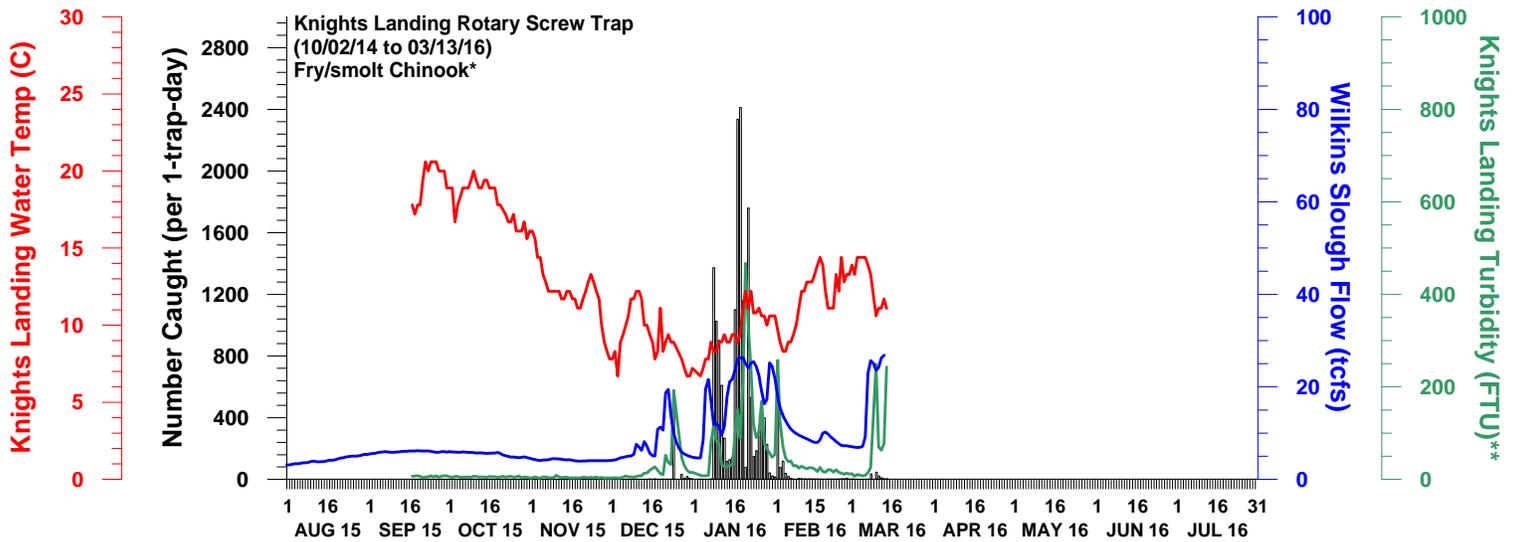


DWR-DES 15 March 2016
Preliminary data from DFW, FWS, GCID, and CDEC; subject to revision.

*Fry/smolt Chinook defined as all Chinook less than the minimum winter run length-at-date criteria (Frank Fisher model).

**Turbidity is a discrete measurement and is not measured continuously. Therefore, data are interpolated on days when turbidity was not measured unless data are missing for more than five days.

NUMBER OF UNMARKED FRY/SMOLT CHINOOK MEASURED IN THE LOWER SACRAMENTO RIVER AND CHIPPS ISLAND



DWR-DES 15 MARCH 2016

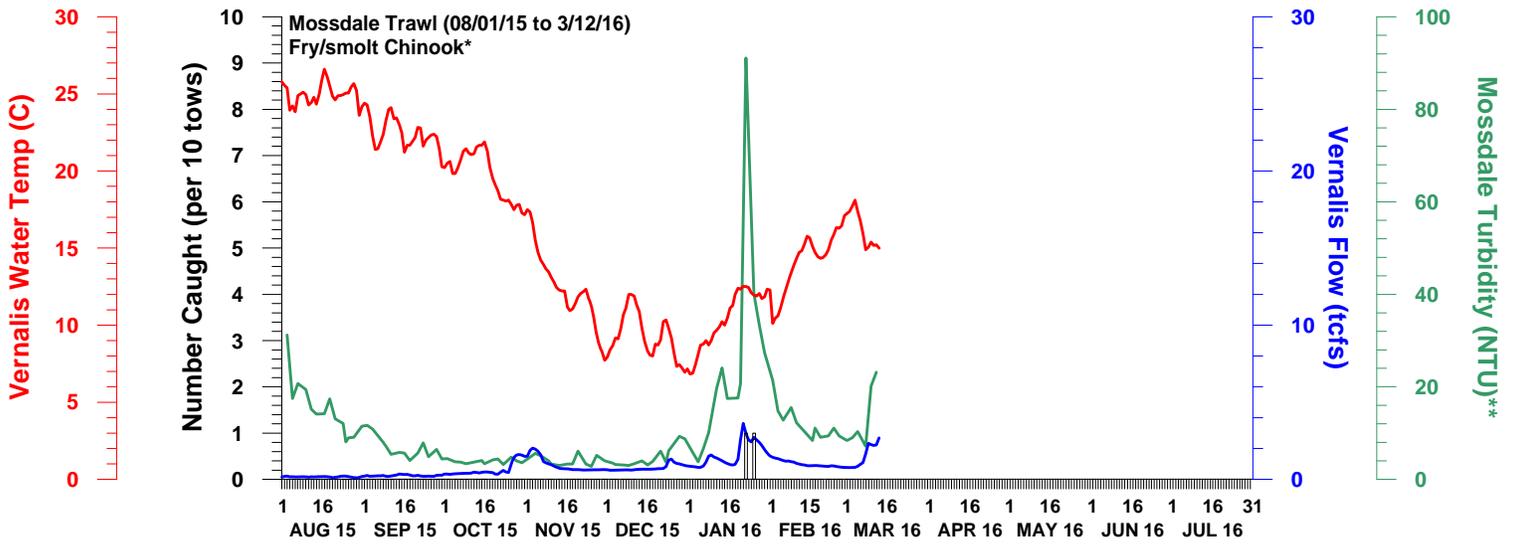
Preliminary data from DFW, FWS, and CDEC; subject to revision.

*Fry/smolt Chinook defined as all Chinook less than the minimum winter run length-at-date criteria (Frank Fisher model).

**Turbidity is a discrete measurement and is not measured continuously. Therefore, data are interpolated on days when turbidity was not measured unless data are missing for more than five days. Knights Landing turbidity measured in FTU, which should be roughly equivalent to NTU.

***Sacramento area seine route consists of the following seine sites: Verona, Elkhorn, Sand Cove, Discovery Park, American River, Miller Park, Sherwood Harbor, and Garcia Bend. Bars are stacked if Chinook caught from the trawl and seines are from the same day.

NUMBER OF UNMARKED FRY/SMOLT CHINOOK MEASURED IN THE SAN JOAQUIN RIVER



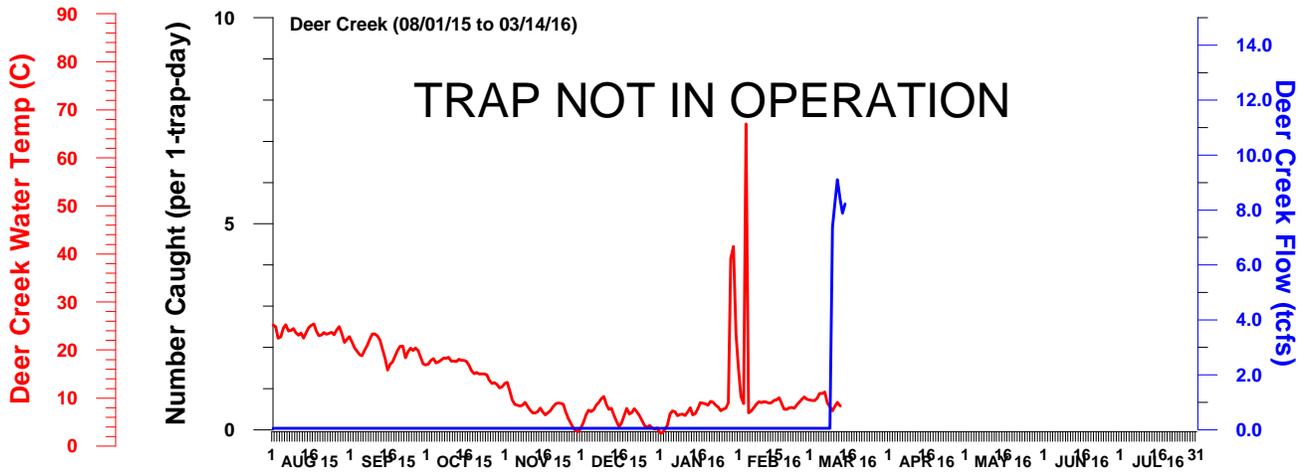
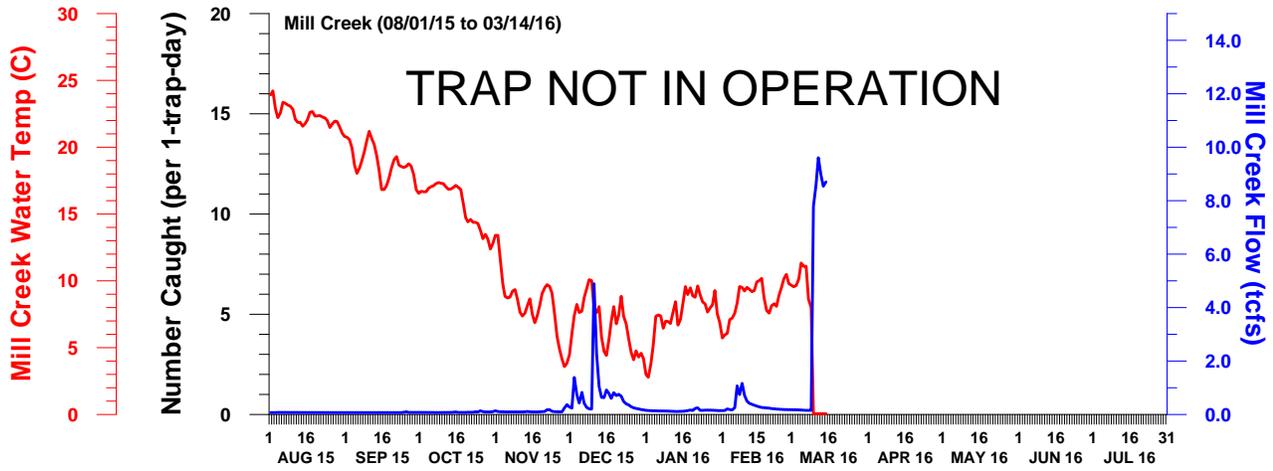
DWR-DES 15 MARCH 2016

Preliminary data from FWS and CDEC; subject to revision.

*Fry/smolt Chinook defined as all Chinook less than the minimum winter run length-at-date criteria (Frank Fisher model).

**Turbidity is a discrete measurement and is not measured continuously. Therefore, data are interpolated on days when turbidity was not measured unless data are missing for more than five days.

WATER TEMPERATURE AND FLOW MEASURED AT MILL AND DEER CREEK



Data Acquisition:

All data are preliminary and subject to revision.

The estimated passage data for the Red Bluff Diversion Dam were obtained directly from the US Fish and Wildlife Service (FWS), Red Bluff Fish and Wildlife Office (http://www.fws.gov/redbluff/rbdd_biweekly_final.html).

The catch data for Glenn-Colusa Irrigation District (GCID) were obtained directly from GCID.

The catch data for Tisdale Weir and Knights Landing were obtained directly from the California Department of Fish and Wildlife (DFW)¹, North Central Region.

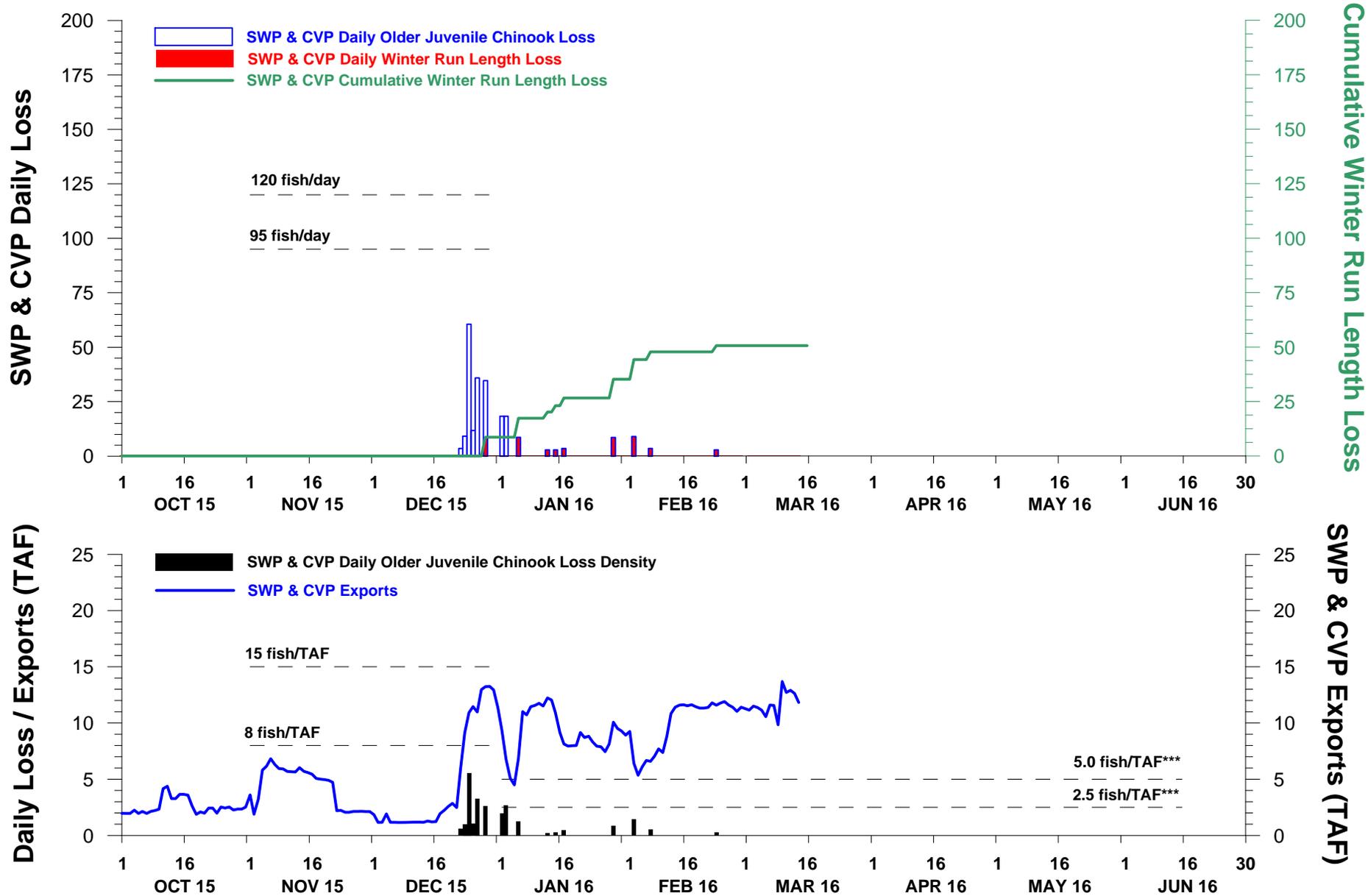
Sacramento River Trawl, Sacramento Area Beach Seine, and Chipps Island Trawl data were obtained directly from FWS, Stockton Fish and Wildlife Office (<http://www.fws.gov/stockton/ifmp/>).

Mossdale Trawl data were either obtained directly from FWS, Stockton Fish and Wildlife Office or from DFW (Region 4).

The hydrology data were either downloaded from the California Data Exchange Center (CDEC) (<http://cdec.water.ca.gov>) or obtained directly from the California Department of Water Resources, Operations Control Office.

¹ Formerly known as the California Department of Fish and Game (DFG).

NON-CLIPPED WINTER RUN & OLDER JUVENILE CHINOOK LOSS AT THE DELTA FISH FACILITIES 01 OCT 2015 THROUGH 15 MARCH 2016



DWR-DES 15 MARCH 2016

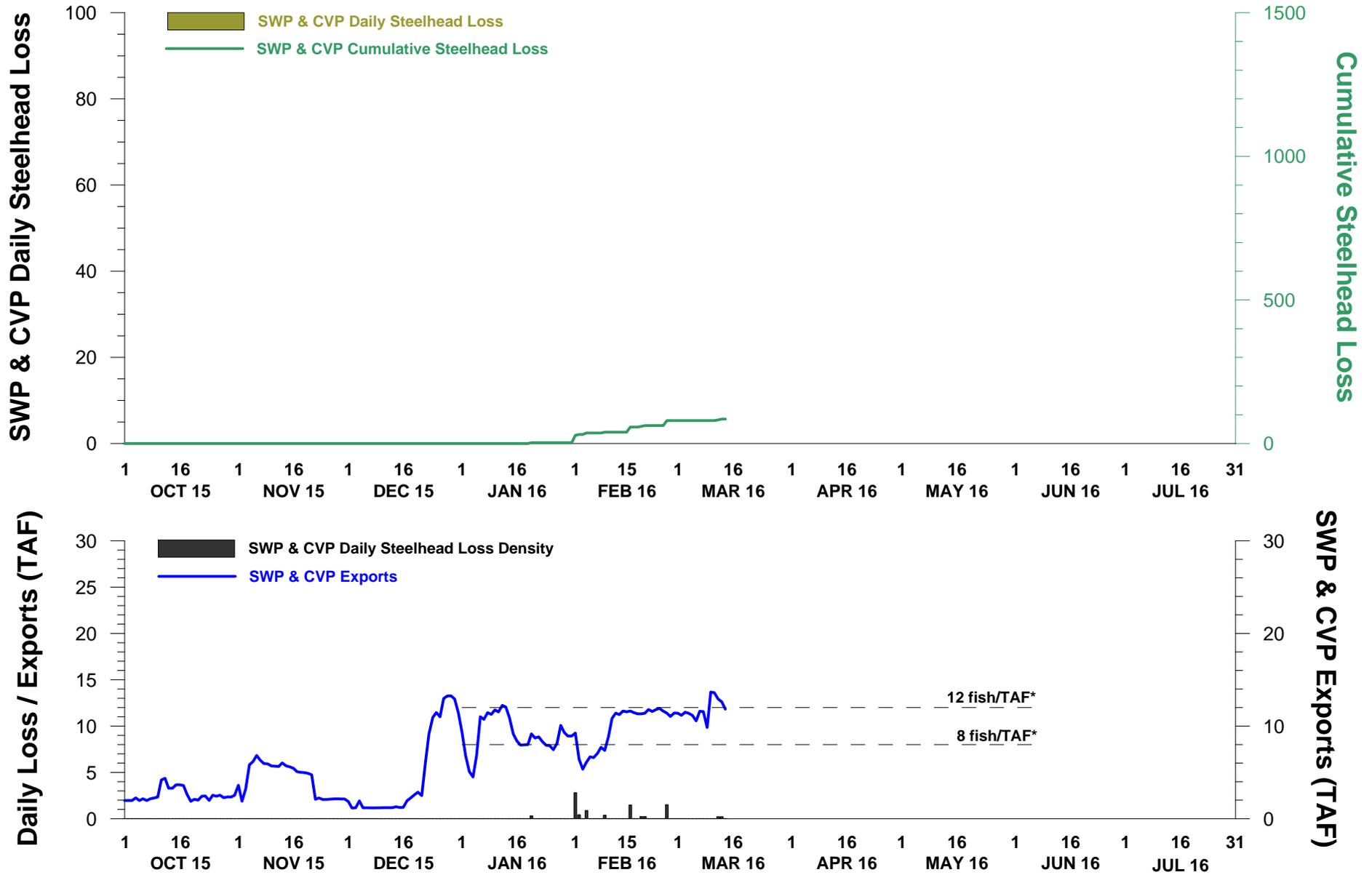
Preliminary data from DFW; subject to revision.

*Older juvenile Chinook defined as all Chinook greater than or equal to the minimum winter run length-at-date criteria and less than the maximum size included in the length-at-date criteria (Delta model) for which a race is assigned on a given sampling date.

**ITL (Incidental Take Limit) is based on the JPE, which is not yet available.

***minimum value determined by NMFS

NON-CLIPPED STEELHEAD LOSS AT THE DELTA FISH FACILITIES 01 OCT 2015 THROUGH 15 MARCH 2016

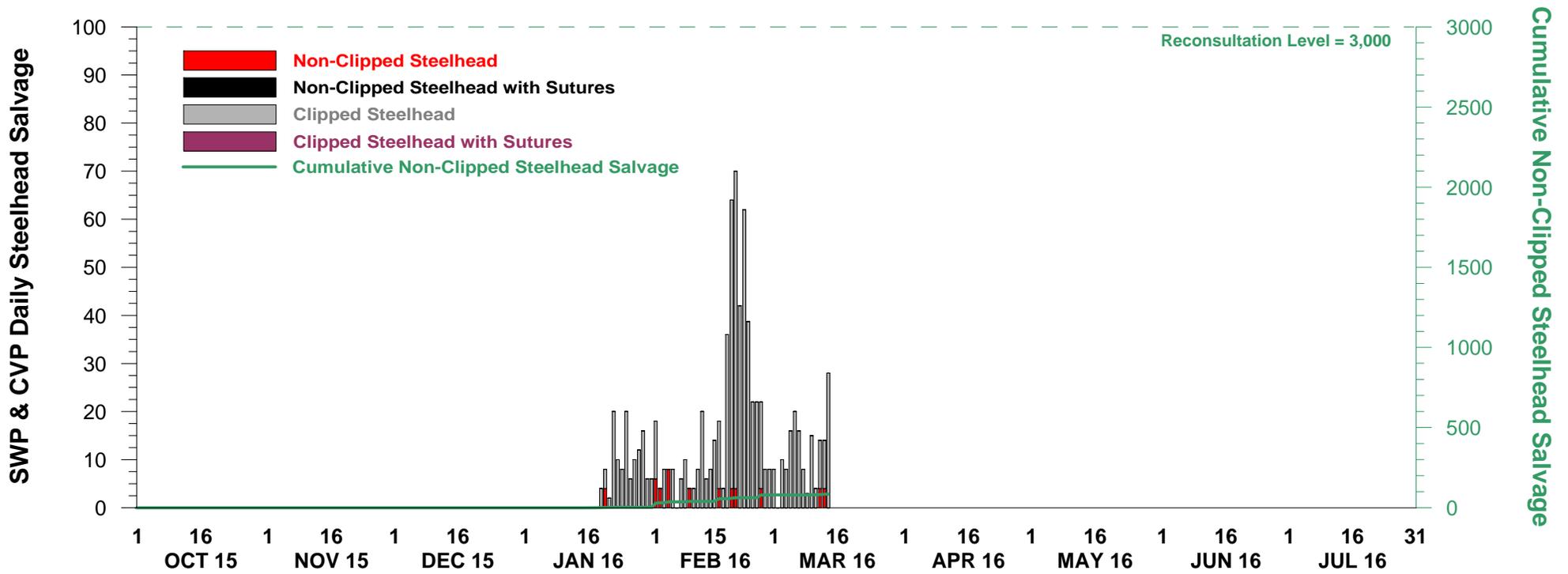


DWR-DES 15 March 2016

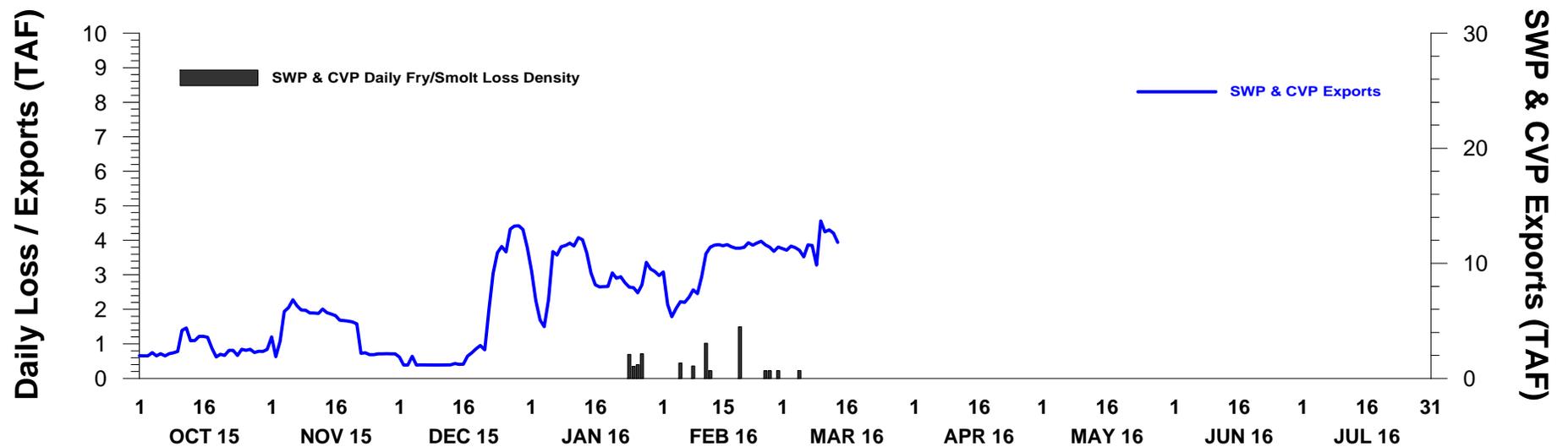
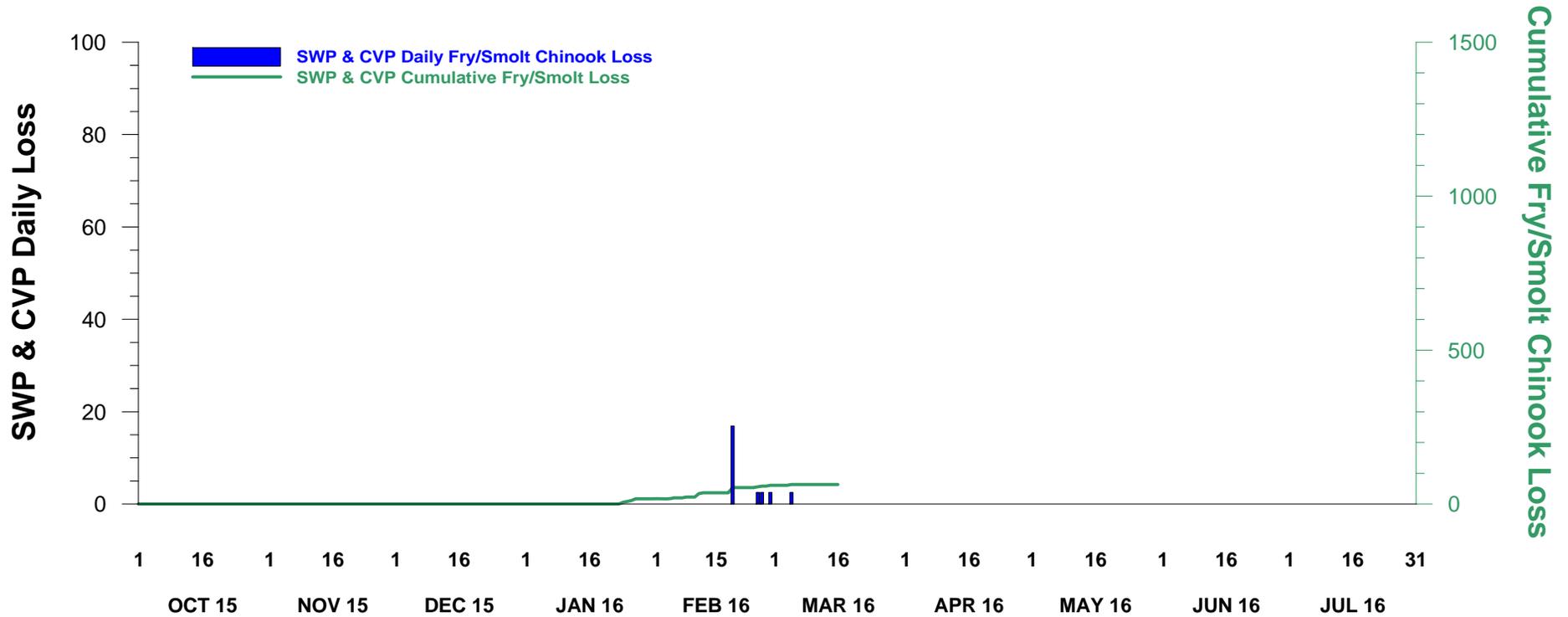
Preliminary data from DFW; subject to revision.

*Used to roughly estimate whether the daily loss is greater than 8 fish/TAF multiplied by the volume exported in TAF or 12 fish/TAF multiplied by the volume exported in TAF.

STEELHEAD SALVAGE AT THE DELTA FISH FACILITIES 01 OCT 2015 THROUGH 15 MARCH 2016



NON-CLIPPED FRY/SMOLT CHINOOK LOSS AT THE DELTA FISH FACILITIES 01 OCT 2014 THROUGH 15 MARCH 2016



DWR-DES 15 MARCH 2016

Preliminary data from DFW; subject to revision.

*Fry/smolt Chinook defined as all Chinook less than the minimum winter run length-at-date criteria (Delta model).