

Delta Operations for Salmonids and Sturgeon (DOSS) Group
Conference call: 5/3/16 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, Dan Yamanaka, Reza Shahcheraghi

Reclamation: Josh Israel, Peggy Manza, Towns Burgess

NMFS: Jeff Stuart, Kristin McCleery

CDFW: Bob Fujimura, Duane Linander

SWRCB: Chris Carr, Brittany Kammerer, Kevin Reece

FWS: Craig Anderson

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 May:

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.

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

- Current OMR limit of -5,000 cfs is in effect for NMFS' species under this RPA action.

Action IV.2.1³ (I:E ratio)

- Currently, the Dry⁴ year 2:1 ratio (San Joaquin River inflow at Vernalis to combined CVP/SWP exports) is in effect. This action restricts combined exports to 50% of Vernalis flow, or 1,500 cfs for human health and safety, whichever is greater.
- On 4/14/16, NMFS concurred with Reclamation's request for flexibility in the I:E ratio to allow additional releases from from New Melones reservoir by Oakdale Irrigation District and South San Joaquin Irrigation District (augmented water) to be diverted at a 1:1 ratio by the Projects and to move this water south of Delta. Remaining "unaugmented water" in the system, as measured at Vernalis, would be continued to be exported at the 2:1 ratio by the Projects, with a minimum export rate of 1,500 cfs for human health and safety.
- On 4/27 FWS issued a determination reaffirming the previous OMR limit of no more negative than -2,500 cfs on a 14-day average.

Agenda Item 3.

Current Operations (5/3/16)

SWP		CVP	
Exports (cfs)			
Clifton Court Forebay	1,000*	Jones Pumping Plant	1,600*
Reservoir Releases (cfs)			
Feather - Oroville	1,700**	American - Nimbus	3,000****
		Sacramento - Keswick	5,500*****
		Stanislaus - Goodwin	2,777*****
		Trinity - Lewiston	4,000*****
Reservoir Storage (in TAF)			
San Luis (SWP)	546	San Luis (CVP)	400
Oroville	3,403	Shasta	4,233
New Melones	619	Folsom	830
Delta Operations			
DCC	Closed	Sacramento River at Freeport (cfs)	10,369
Outflow Index (cfs)	~8,900	San Joaquin River at Vernalis (cfs)	2,875
E:I	14.4% (14-day avg.)	X2	73 km

* Both the CVP and SWP plan to adjust export pumping (SWP adjusts inflows to CCFB) to mirror changes in the San Joaquin River flows at Vernalis and while complying with RPA Action IV.2.1 and the relaxation of the I:E ratio per the request by Reclamation to pick up augmented water released on the Stanislaus River.

**Oroville Reservoir releases are increasing to supply additional water to the system for water quality and flow requirements. Releases scheduled to reach 2,000 cfs by 5/3/16.

³ For details, see pages 68-70 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

⁴ I:E Ratio in effect depends upon the San Joaquin basin yeartype. The yeartype is currently designated as Dry.

*** Nimbus scheduled to go to 3500 cfs releases on 5/4/16.

**** Keswick releases scheduled to go to 6,000 cfs on 5/4/16.

*****Goodwin flows include the augmented flows as well as the required Appendix 2-e pulse volume as reshaped by the Stanislaus Operating Group. Stanislaus River spring pulse flows are expected to end no later than May 31, 2016. Flows will decrease to 1400 cfs by 5/7/16.

*****Lewiston released up to 4,000 cfs today, will reduce tomorrow, and then continue to cycle through pulse flow releases over next two weeks.

OMR as of 4/30/16:

	USGS gauges (cfs)	Index ⁵ (cfs)
5-day	-2,550	-2,800
14-day	-2,240	-2,310

The daily OMR Index on 5/3/16 was -2,820 cfs.

Review of factors controlling Delta exports for the period 4/26/16 to 5/3/16:

- Over the past week, both the NMFS RPA action IV.2.1 and the USFWS Delta smelt determination have been co-controlling exports.
- As of the time of the DOSS call (9am, 5/3/16), the USFWS had not granted Reclamation's 4/28/16 request for relaxation of the OMR flows no more negative than -2500 cfs 14-day average OMR limit per USFWS' 4/27/16 determination.
- Without granting the request for relaxation of the -2500 cfs OMR limit, OMR is expected to become the controlling factor for exports as of 5/3/16.

The weather forecast predicts scattered storms this week, mostly in the Sierras, with scattered showers in the valley. Early next week a high pressure ridge will bring drier and warming temperatures above normal.

Agenda Item 4.

Smelt Working Group

The SWG met on Monday, 5/2/16 at 10am. Bartoo (FWS) provided the following SWG meeting summary via e-mail:

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 and juvenile Delta Smelt for each of the flow ranges is characterized as follows:

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

⁵ 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.

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, May 9, 2016 at 10 am.

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

Agenda Item 5.

Fish Monitoring: Salvage⁶

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>.

⁶ 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: April 25-May 1, 2016
 Prepared by Bob Fujimura on May 2, 2016 19:37
 Preliminary Results -Subject to Revision

Criteria	25-Apr	26-Apr	27-Apr	28-Apr	29-Apr	30-Apr	1-May	Trend	
Loss Densities									
Wild older juvenile CS	0	0	0	0	0	0	0	→	0.00
Wild steelhead	0	0	0	0	0	0	0	→	0.00
Exports									
SWP daily export	2,723	3,058	3,036	2,894	3,076	3,076	1,904	↗	2,824
CVP daily export	1,957	1,951	1,936	1,944	1,944	1,970	3,139	↗	2,120
SWP reduced counts	0%	0%	0%	0%	0%	0%	0%	→	0%
CVP reduced counts	8%	8%	0%	0%	0%	0%	0%	↗	2%
	= missed count collection								

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 fish salvage facility 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	0	0	→	36	56
Spring Run	28	80	↗	114	204
Late Fall Run	0	0	→	44	166
Fall Run	17	73	↗	99	165
Unclassified	0	0	→	14	NC
Total	45	153		307	592
Hatchery					
Winter Run	0	0	→	213	629
Spring Run	0	0	→	650	560
Late Fall Run	0	0	→	93	298
Fall Run	0	0	→	5	7
Unclassified	0	0	→	0	0
Total	0	0		961	1,494

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	0	0	→	113	267
Hatchery	10	40	↗	1,311	3,538
Total	10	40		1,424	3,804

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 4/25/16-5/1/16.



Figure 2. Daily salvage of Chinook salmon (all races) and water exports from the state and federal fish salvage facilities during March 28, 2016 through May 1, 2016.

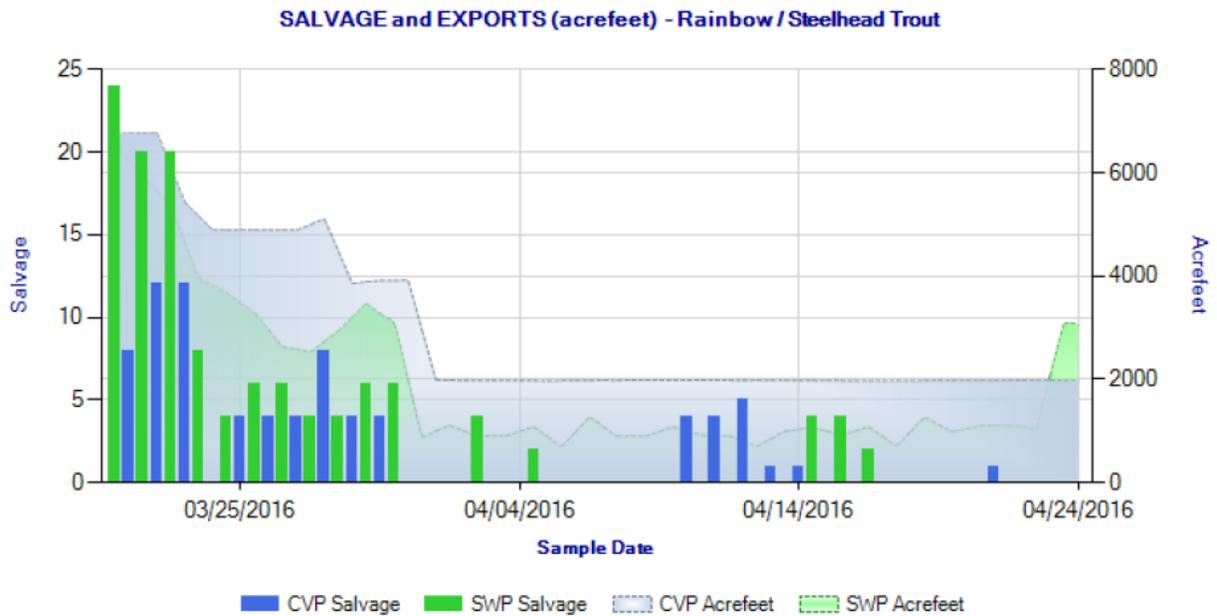


Figure 3. Daily salvage of steelhead and water exports from the state and federal fish salvage facilities during March 28, 2016 through May 1, 2016.

Preliminary salvage report for Monday, 5/2/16:

- 7 spring-run sized non-clipped Chinook and 1 wild steelhead were observed at the SWP.
- No listed species were observed at the CVP.

- An unexpected facility outage occurred last week. 1 salvage was missed on 4/25. There were 5 hours of unmitigated water exports.

Coded-wire-tag recoveries

Mulligan (DWR) provided the following summary of coded-wire-tag recoveries at the SWP and CVP fish collection facilities. No changes to the cumulative losses of either hatchery winter-run Chinook salmon or the yearling spring-run surrogate releases of LFRCS have occurred since the end of March. 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%. Loss of Chinook within any spring-run Chinook surrogate group has not occurred since 3/29/16.

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
6/11/2015 to 6/12/2015	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	188.93	68,000	n/a	0.278	n/a	0.5%	1.0%	1/6/2016	3/29/2016
1/12/2016	LF	Coleman NFH	Battle Creek	Spring Surrogate	278.65	67,700	n/a	0.412	n/a	0.5%	1.0%	1/20/2016	2/12/2016
2/17/2016 to 2/18/2016	W	Livingstone NFH	Sacramento River	Winter Run Production	11.19	420,006	155400	0.003	0.00720	0.5%	1.0%	3/6/2016	3/14/2016
3/14/2016	F	Coleman NFH	Battle Creek	Fall run Production	0.00	864,486	n/a	0.000	n/a	n/a	n/a	*	*
3/18/2016	S	Feather River Hatchery	San Joaquin River	River restoration program	439.33	45,000	n/a	0.976	n/a	n/a	n/a	3/20/2016	4/6/2016
3/19/2016	S	Feather River Hatchery	San Joaquin River	special study	82.156	60000	n/a	0.136	n/a	n/a	n/a	3/21/2016	4/7/2016
2/1/2016	F	Coleman NFH	Yolo bypass inundated Rice fields at Knaggs Ranch	special study	0.00	6,145	n/a	0.000	n/a	n/a	n/a	*	*
3/1/2016	F	Feather River Hatchery	Yolo bypass at Toe drain and Sacramento river at Elkhorn	special study	0.00	94,000	n/a	0.000	n/a	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 CWTs ⁹
SWP	35.30	0.00	0.00	0.00	0
CVP	7.95	0.00	0.00	0.00	0
TOTAL	43.25	0.00	0.00	0.00	0

SWP and CVP adipose-fin clipped Chinook lost from 10/1/2015 through 5/01/2016.

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 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.

¹⁰Chinook outside of the length-at-date criteria (Delta model) are not reported.

** Information not yet available.

DWR-DES Revised 5/03/2016

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

Agenda Item 6.

Fish Monitoring: Hatchery winter-run Chinook acoustic-tracking

No detections of tagged winter-run hatchery fish has occurred in the last week. The summary update from March 28 was the final update for this year unless additional tagged fish are detected in the real-time array. As of the final update, 49% of the acoustic-tagged hatchery winter-run Chinook had passed the Tower Bridge receiver in Sacramento.

Agenda Item 7.

Fish Monitoring: RSTs/trawls/seines

The following table presents fish monitoring data. Unless otherwise noted, reported sizes are fork length and runs are based on length at date criteria. 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 ^E
Sample Date	4/25, 4/27, 4/29	902: Jersey Pt: Pris. Pt: No data received	4/25, 4/27, 4/29	4/25-4/29	4/25-5/1	4/25-5/2	No data received	4/25, 4/26, 4/28, 4/29, 4/30
FR Chinook	211		8	20	10	11		36
SR Chinook	76		4		3			
WR Chinook	1							
LFR Chinook								
Ad-Clipped Chinook	59		7			2		
Chinook Adult								
Steelhead (wild)								1
Steelhead (ad-clip)								1
Green Sturgeon								
Delta Smelt								
Splittail	5			435				
Longfin Smelt								
Flows (avg. cfs)					4,307	5,386		
W. Temp. (avg. °F)					65.7	62.4		
Turbidity (avg. NTU)					16.8	21.3		

^A Data reported in the 4/24 to 4/30 DJFMP sampling summary.

^B Sampling period was from 4/25 at 7:15 pm to 5/1 at 10:00 am.

^C Sampling period was from 4/25 at 9:15 am to 5/2 at 9:00 am.

^D The GCID trap was pulled on 4/23 due to a large amount of debris and lowered on 4/24. The trap was again raised on 4/25.

^E Mossdale trawl sampling being conducted by CDFW starting April 4 through end of June. Data does not distinguish runs, only total ad-clipped and no ad-clipped Chinook salmon. 59 total tows this week.

Red Bluff Diversion Dam (RBDD) Monitoring

USFWS biweekly report (4/8/16 to 4/21/16) for preliminary daily estimates of passage, 90% confidence intervals, and fork length ranges of unmarked juvenile salmonids captured by rotary screw traps at RBDD included:

Run and Species	Biweekly Total	Brood Year Total (90% CI)
Winter-run Chinook (BY2015)	333	338,774 (235,991; 441,557)

Agenda Item 8.

Recent or Upcoming Hatchery Releases

CDFW has scheduled the following releases:

- On 4/27, approximately 450,000 brood year 2015 Chinook from Mokelumne River Hatchery into San Joaquin River at Sherman Island. This release included 25% marked (adipose fin clip and CWT) fish.
- On 4/28, approximately 350,000 brood year 2015 Chinook from Merced River Hatchery into the San Joaquin River at Sherman Island. This release included marked (adipose fin clip and CWT) fish.
- On 5/1, 5/2, and 5/3, approximately 1,000,000 brood year 2015 Fall-run Chinook salmon from Feather River Hatchery into San Pablo Bay and an additional 540,000 fish at Mare Island. These releases included 25% marked (adipose fin clip and CWT) fish.
- On 5/5, approximately 450,000 brood year 2015 Chinook from Mokelumne River Hatchery into the San Joaquin River at Sherman Island. This release will include 25% marked (adipose fin clip and CWT) fish.

On April 29, 2016, USFWS released approximately 1,879,000 brood year 2015 fall Chinook salmon from the Coleman National Fish Hatchery into Battle Creek. This completes the release of brood year 2015 fall Chinook and will include 25% marked (adipose fin clip and CWT) and 75% unmarked fish.

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 Chipp's Island)
<i>Young-of-year (YOY) winter-run Chinook salmon¹</i>	<1% (Last week: same)	≤5% (Last week: 5% - 10%)	≥95% (Last week: 90% - 95%)
<i>Young-of-year (YOY) spring-run Chinook salmon*</i>	<5% (Last week: same)	5% - 10% (Last week: 5% - 15%)	85% - 95% (Last week: 80% - 90%)
<i>Hatchery winter-run Chinook salmon**</i>	<1% (Last week: same)	<5% (Last week: same)	>95% (Last week: same)

*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. Coleman National Fish Hatchery (CNFH) has released approximately 7 million hatchery production Fall-run Chinook salmon into the upper Sacramento River at Battle Creek since mid-March 2016. The average size for the released FRCS production fish were just slightly smaller than the size at date for the minimum size of SRCS.

**Discussion between DOSS members regarding a “central clearing house” of CWT codes so that interested parties could keep track of recovered CWTs occurred. If parties were interested, CDFW could create a nexus so CWT meta data can be viewed and applied to monitoring updates such as the DAT data that is distributed. Currently there is not a dedicated effort to providing this service.

Rationale for changes in distribution

Wild winter-run Chinook: The fraction of wild winter-run upstream of the Delta stayed the same since DOSS thinks a few stragglers may still remain upstream, but that this fraction is very small relative to the entire population. The increase in the fraction of wild winter-run having exited the Delta is based on warmer water temperatures, seasonal timing (historical peak winter-run outmigration from the Delta is in March), and no winter-run were reported in the Delta this week. The fraction in the Delta remained at >95% due to seasonal timing and the majority having left the system (only 1 winter-run sized fish was recorded exiting the Delta at Chipp’s Island during the past week, indicating some presence still in the Delta, albeit a small presence.

Wild spring-run Chinook: The fraction of wild spring-run upstream of the Delta stayed the same since there are still spring-run entering the Delta. The fraction of wild spring-run remaining in the Delta decreased due to increasing water temperatures, decreased flow, and observing fewer fish this week compared to last week. The increase in the fraction of wild spring-run having exited the Delta is based on the 76 spring-run-sized wild Chinook reported in the Chipp’s Trawl; some of which are assumed to be true spring-run Chinook salmon and not just larger hatchery fall-run Chinook salmon from the CNFH releases and Sherman Island releases, warming temperatures, and seasonal timing. Therefore the DOSS group believes that the majority of spring-run have exited the Delta.

Hatchery winter-run Chinook: The fraction of hatchery winter-run upstream of the Delta, in the Delta, and having exited at Chipp’s Island stayed the same since water conditions have not changed much in the last week and no hatchery winter-run have been observed since late March. DOSS estimates that most hatchery winter-run have exited the Delta since it has been 2 months

since they were released and none have been seen any at the monitoring locations in recent weeks.

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; or fish from the San Joaquin River basin through the numerous distributaries of the mainstem San Joaquin River; 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.

Interior Delta Entrainment Risk for listed salmonids in the Sacramento River and San Joaquin River basins over the next week:

Most winter-run and spring-run are out of the system, only 5% winter-run and 5%-10% spring-run are considered to be in the Delta. Flows have decreased since last week and the number of salmon in the Delta has decreased. Pulse flows are being released on the Stanislaus River.

- **Exposure Risk**
 - From Sacramento River origin: **LOW** (*last week: same*)
 - Flow and turbidities have decreased which are cues for salmonid movement, and most fish are likely to have moved downstream and into the Delta at this time.
 - From San Joaquin River origin: **LOW TO MEDIUM** (*last week: same*)
 - Increased pulse flows on the Stanislaus River may stimulate steelhead to emigrate downriver into the Delta from the Stanislaus. Few steelhead (2 natural unclipped fish) have been seen in the Mossdale trawl to date, although trawl may be inefficient at detection of steelhead smolts.
- **Routing Risk:**
 - For Sacramento River **LOW** (*last week: same*)

- River flows have decreased in the last week and but are expected to still continue muting the tidal effects at Georgiana Slough and maintain positive downstream flows during all tidal phases (reducing the risk of routing into Georgiana Slough) for those fish remaining upstream of this divergence. Current flows are still a minimum of ~1,000 cfs on the flood tide, maintaining a positive flow in the downstream direction.
 - **For San Joaquin River: LOW TO MEDIUM** (*last week: same*)
 - Installation of the HOR barrier will substantially reduce the number of fish entrained into the Old River route leading to the interior of the South Delta and the Projects, although 8 open culverts are present in the barrier. Tributaries to the north (Turner, Columbia, Middle River and Old River) are still open routes to the South Delta and the Projects.
- **Overall Entrainment Risk:**
 - Sacramento River: LOW (*last week: same*)
 - **San Joaquin River: LOW TO MEDIUM** (*last week: same*)

CVP/SWP Facilities Entrainment Risk for listed salmonids in the Interior Delta over the next week: Most fish have moved through the Delta, the DCC barrier is in place, and export levels are low, which is a cue for salmonids to move downstream and out of the Delta. San Joaquin Basin fish may be emigrating at this time based on pulse flows in the tributaries and historical timing of previous emigrations.

- **Exposure Risk from Sacramento River:** LOW (*last week: same*)
- **Exposure Risk from San Joaquin River:** LOW TO MEDIUM (*last week: same*)
- **OMR/Export Risk:**
 - OMR -2,500 cfs to -3,500 cfs:
 - LOW for Sacramento River fish (*last week: same*)
 - **LOW for San Joaquin River steelhead** (*last week: same*)
 - OMR -3,500 cfs to -5,000 cfs:
 - MEDIUM for Sacramento River fish (*last week: same*)
 - **MEDIUM for San Joaquin River steelhead** (*last week: same*)

- **Overall Entrainment Risk:**
 - OMR -2,500 cfs to -3,500 cfs:
 - LOW for Sacramento River fish (*last week same*)
 - **LOW for San Joaquin River steelhead** (*last week: same*)
 - OMR -3,500 cfs to -5,000 cfs:
 - LOW for Sacramento River fish (*last week: same*)
 - **LOW for San Joaquin River steelhead** (*last week: same*)

San Joaquin River fish are substantially protected from entrainment into the upper Old River channel corridor to the export facilities by the presence of the HOR barrier (although it has 8 culverts that may allow some passage into Old River), and risk to entrainment along the lower mainstem of the San Joaquin River is similar to the risk faced by Sacramento fish in co-occupied river reaches. Although San Joaquin River basin fish have a longer route of potential diversion into the South Delta and a longer time of exposure to the Projects, some members of

DOSS believe the predominant tidal changes in the mainstem San Joaquin River channel are substantially greater than the difference between the -2500 and -5,000 cfs OMR flows contained in the risk assessment and thus negate the relatively small differences in the effects of the two OMR flow levels considered. Other members of DOSS indicated that the risk to entrainment at the facilities under the more negative OMR flows provided an elevated risk to fish that were already present within the south Delta channels and should be considered in the overall risk assessment. Given these two viewpoints, the DOSS working group decided to assign an overall entrainment risk of LOW to SJ River steelhead entrainment due to OMR flows between -3500 to -5000 cfs.

Agenda Item 10.

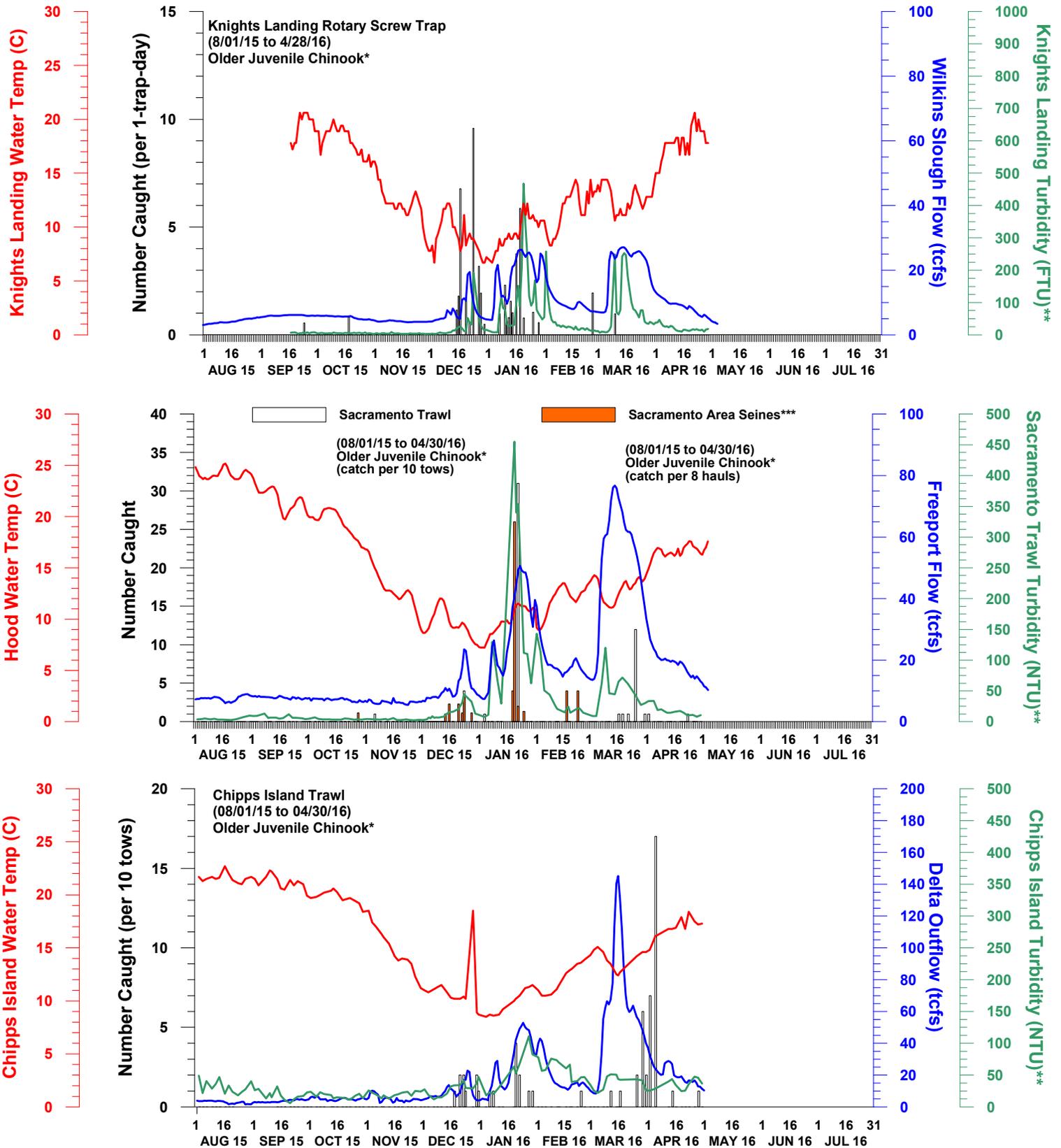
DOSS Advice to WOMT and NMFS: None

Agenda Item 11.

Next Meeting: The next DOSS conference call will be on 5/10/16 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 03 MAY 2016

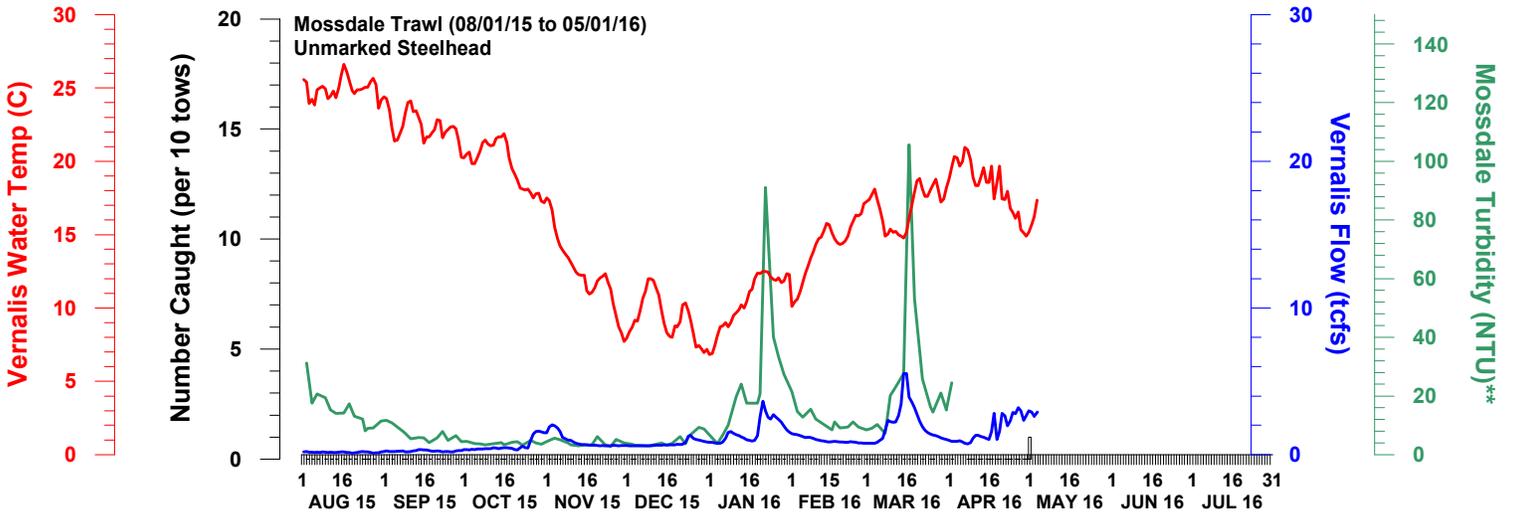
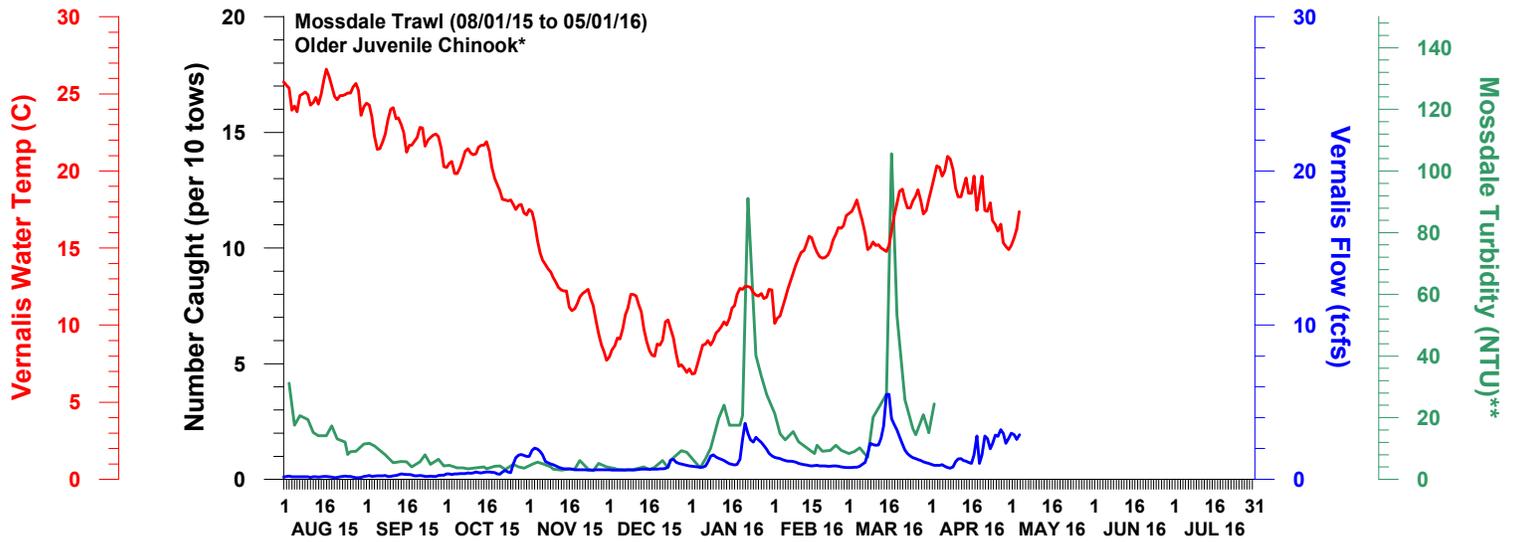
Preliminary data from DFW, FWS, and CDEC; subject to revision.

*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

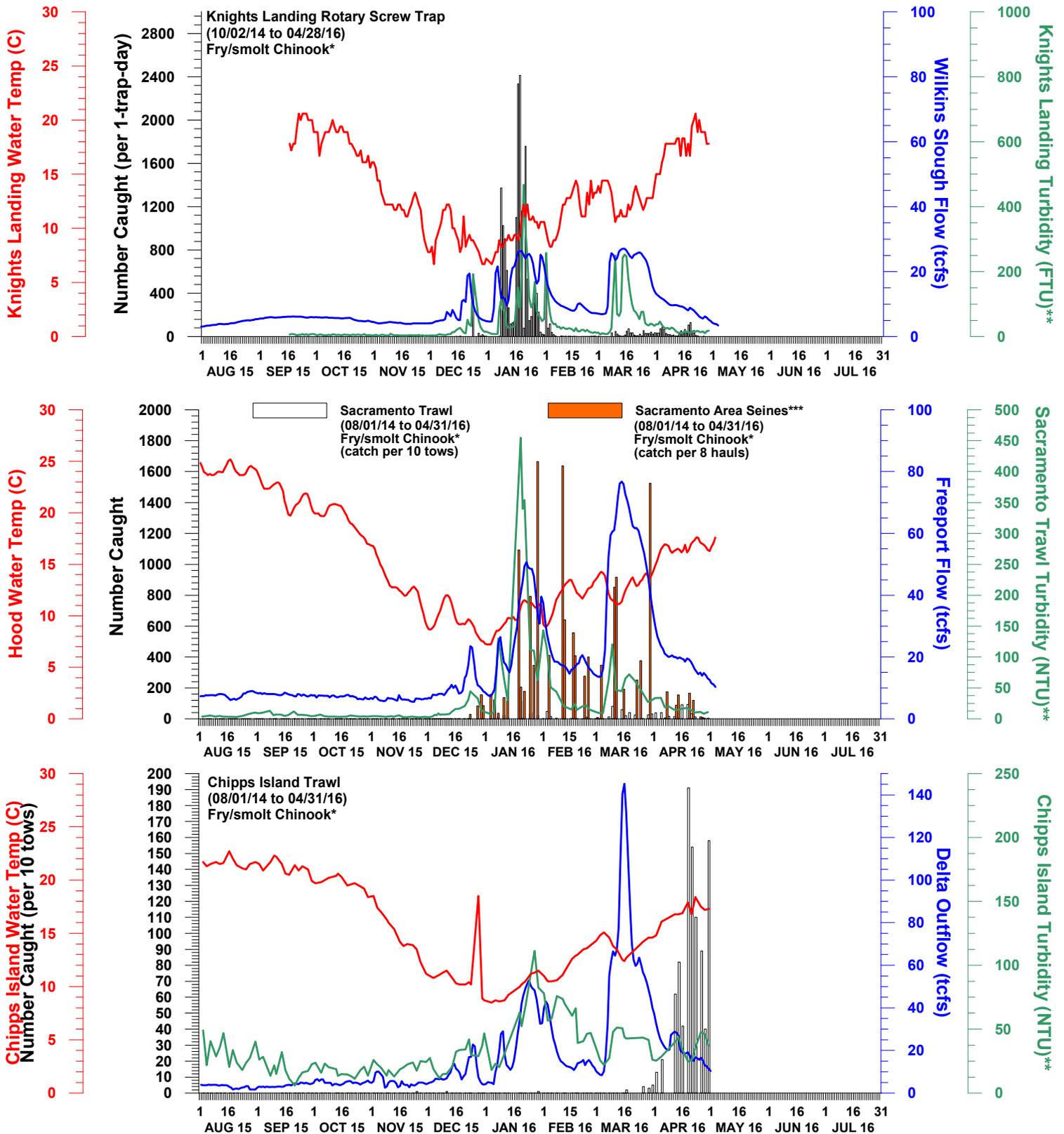


DWR-DES 03 MAY 2016
Preliminary data from FWS and CDEC; subject to revision.

*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 LOWER SACRAMENTO RIVER AND CHIPPS ISLAND



DWR-DES 03 MAY 2016

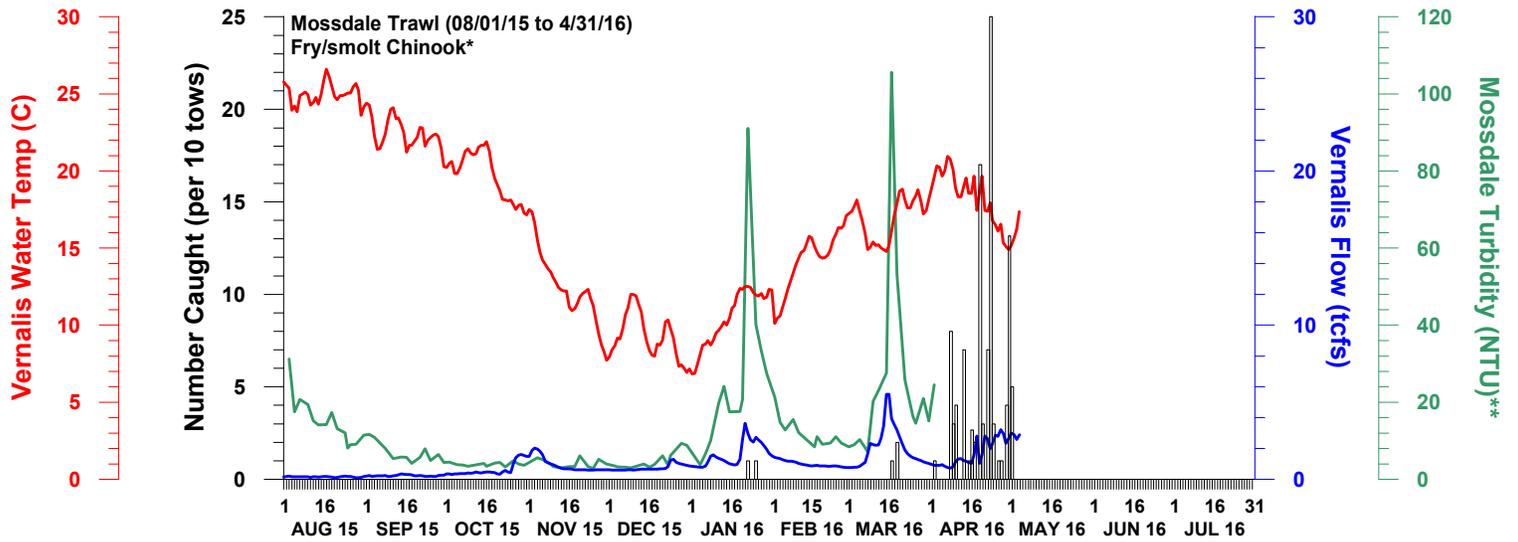
Preliminary data from DFW, FWS, and CDEC; subject to revision.

*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



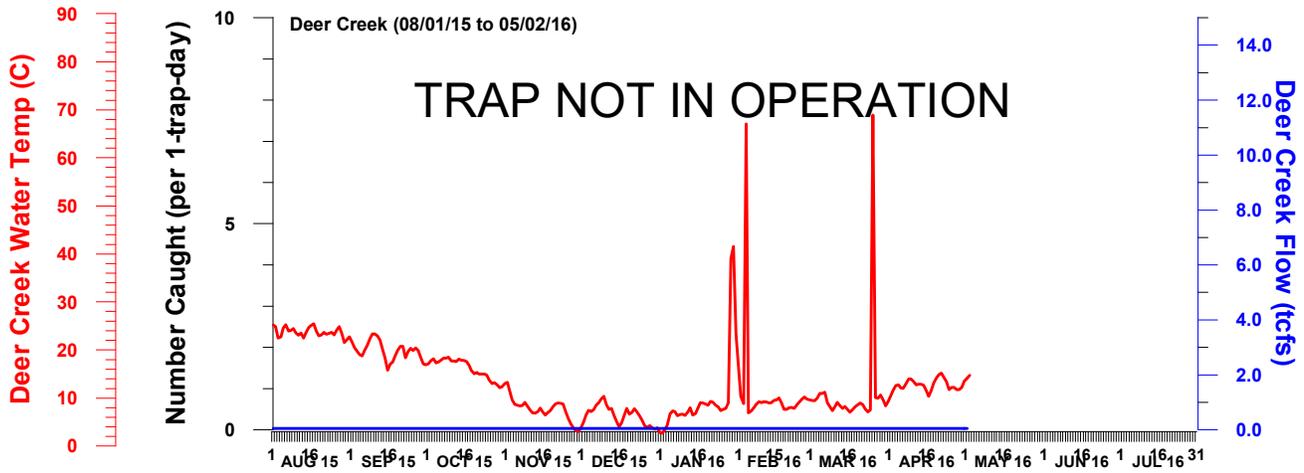
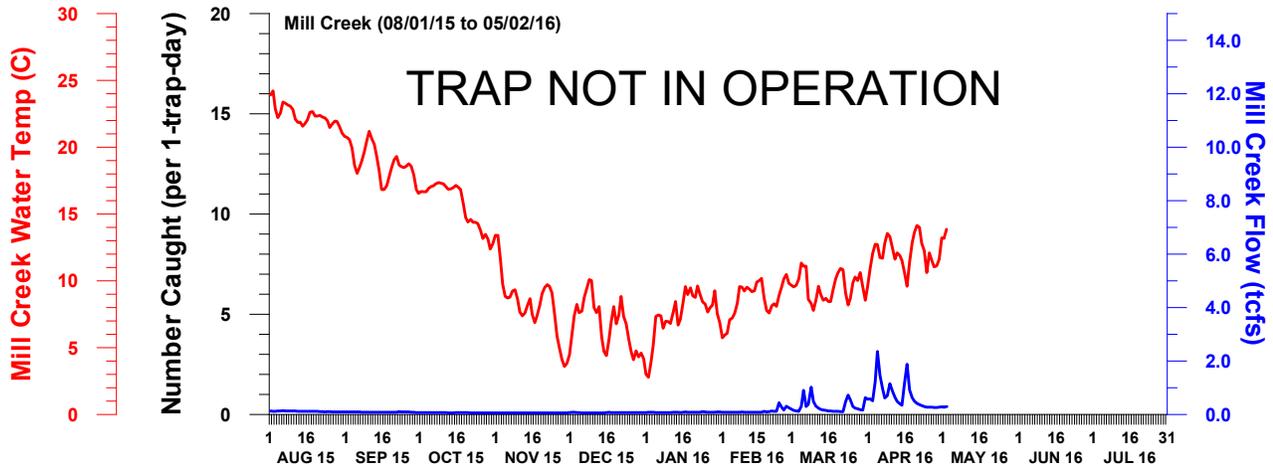
DWR-DES 03 MAY 2016

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.

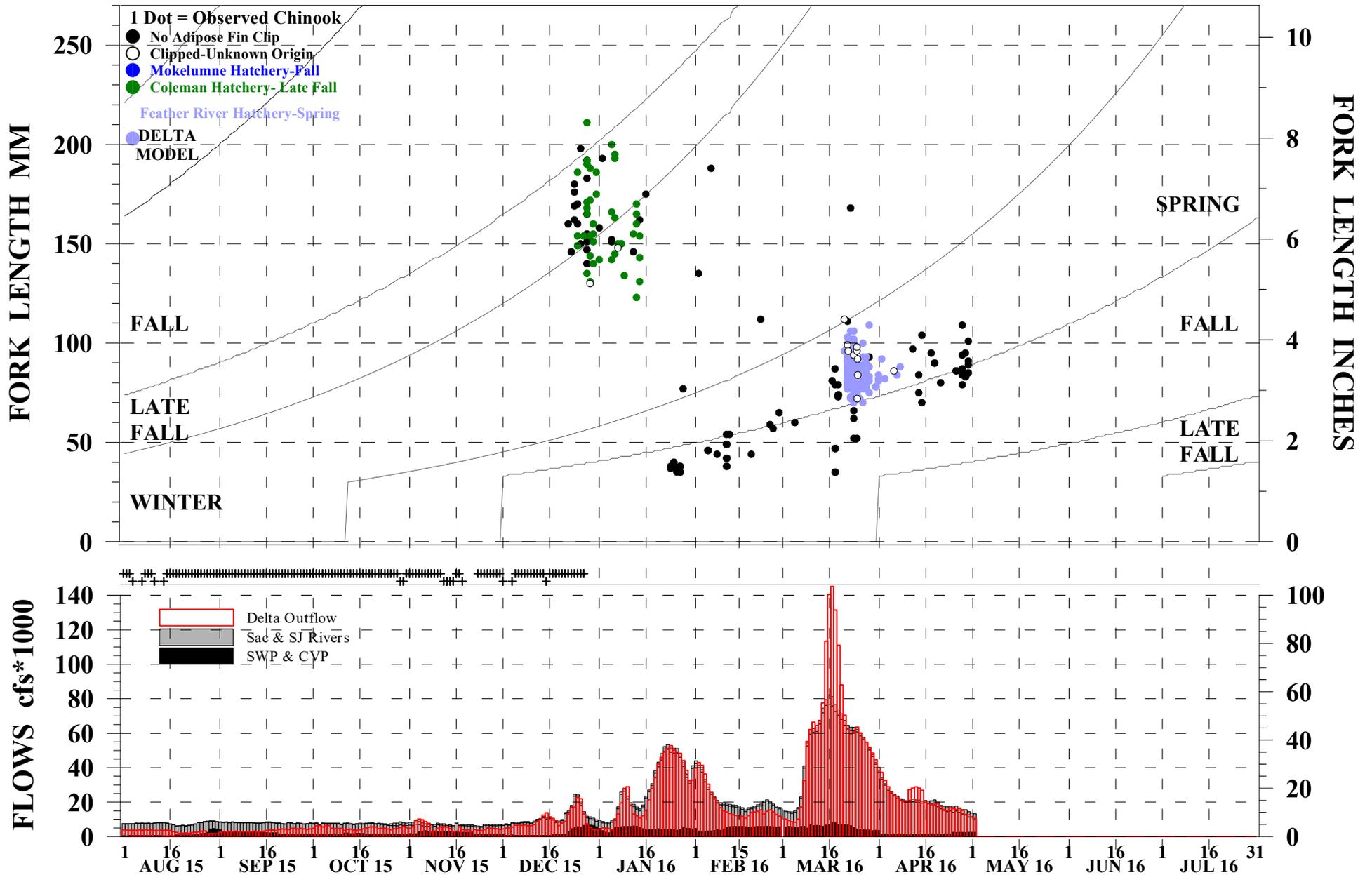
Sacramento River Trawl, Sacramento Area Beach Seine, and Chipps Island Trawl data were obtained directly from FWS, Stockton Fish and Wildlife Office (<http://www.fws.gov/stockton/ifmp/>).

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).

OBSERVED CHINOOK SALVAGE AT THE SWP & CVP DELTA FISH FACILITIES 08/01/2015 THROUGH 05/01/2016

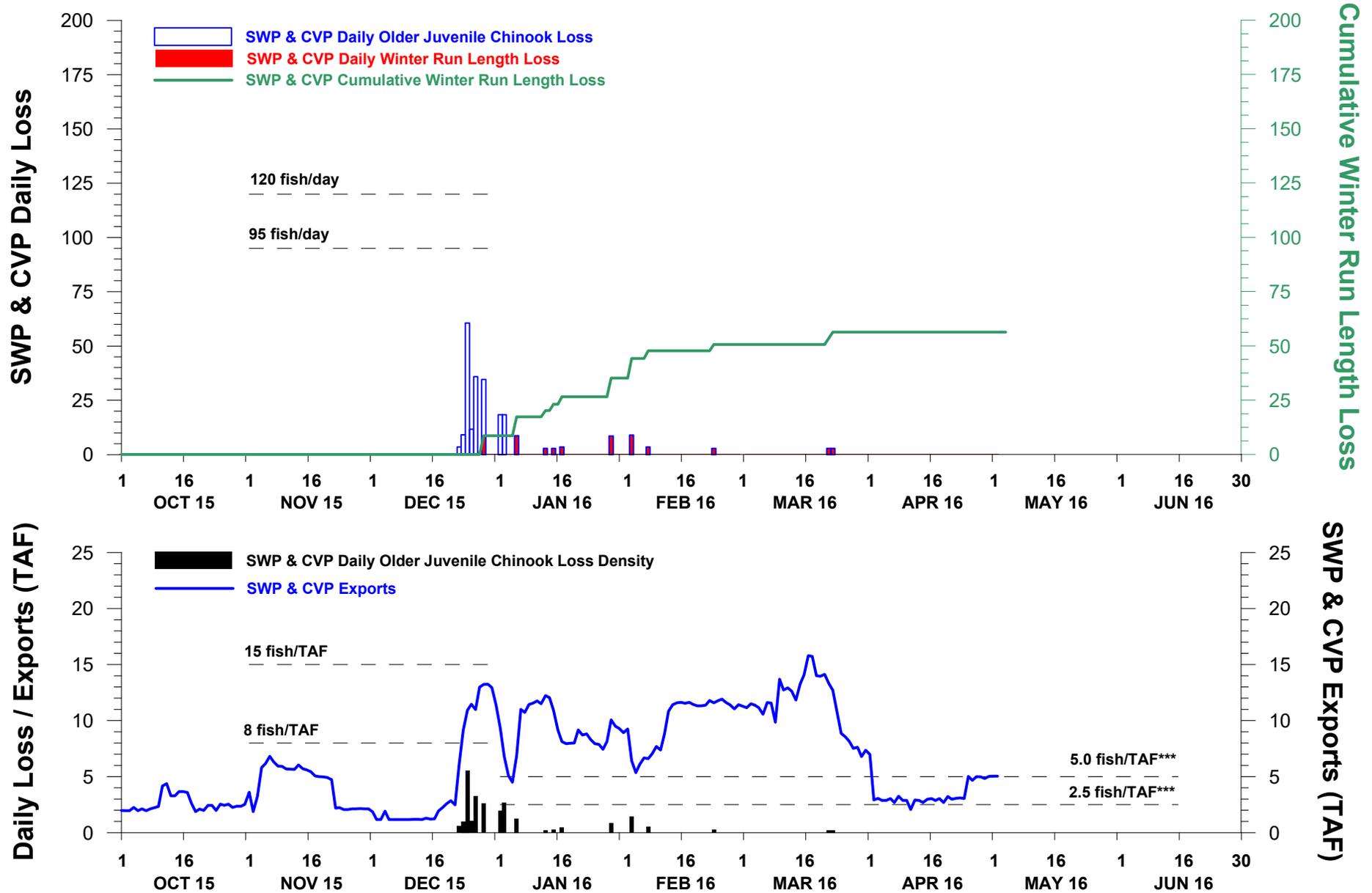


DWR-DES 05 MAY 2016

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

*Chinook not measured for length and Chinook outside of the length-at-date criteria (Delta model) are not reported.

NON-CLIPPED WINTER RUN & OLDER JUVENILE CHINOOK LOSS AT THE DELTA FISH FACILITIES 01 OCT 2015 THROUGH 03 MAY 2016



DWR-DES 03 MAY 2016

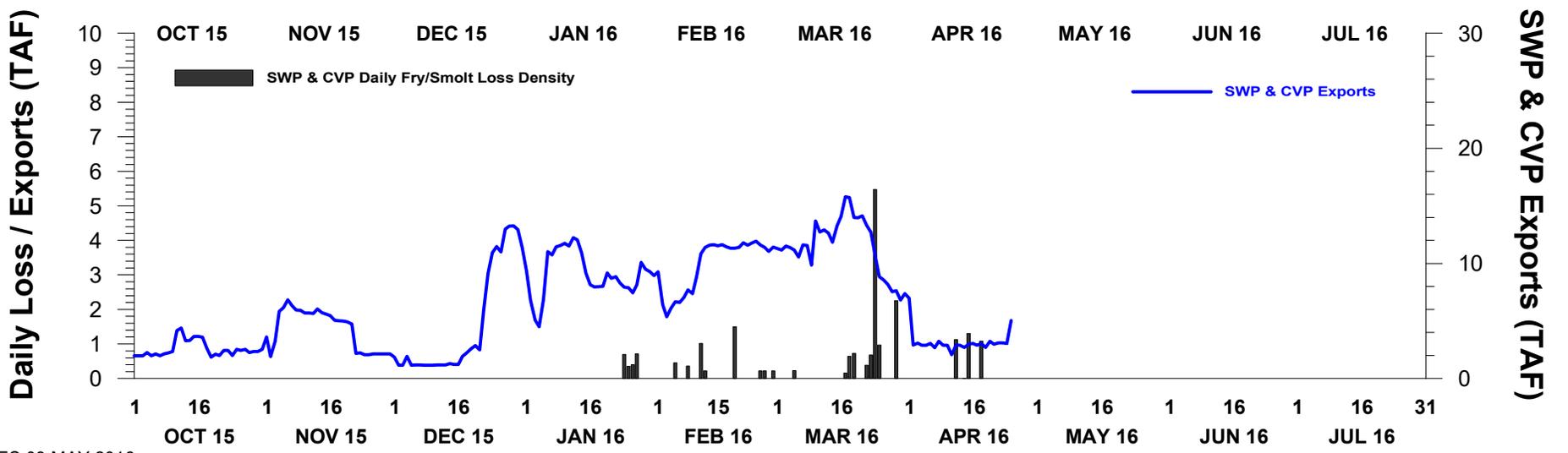
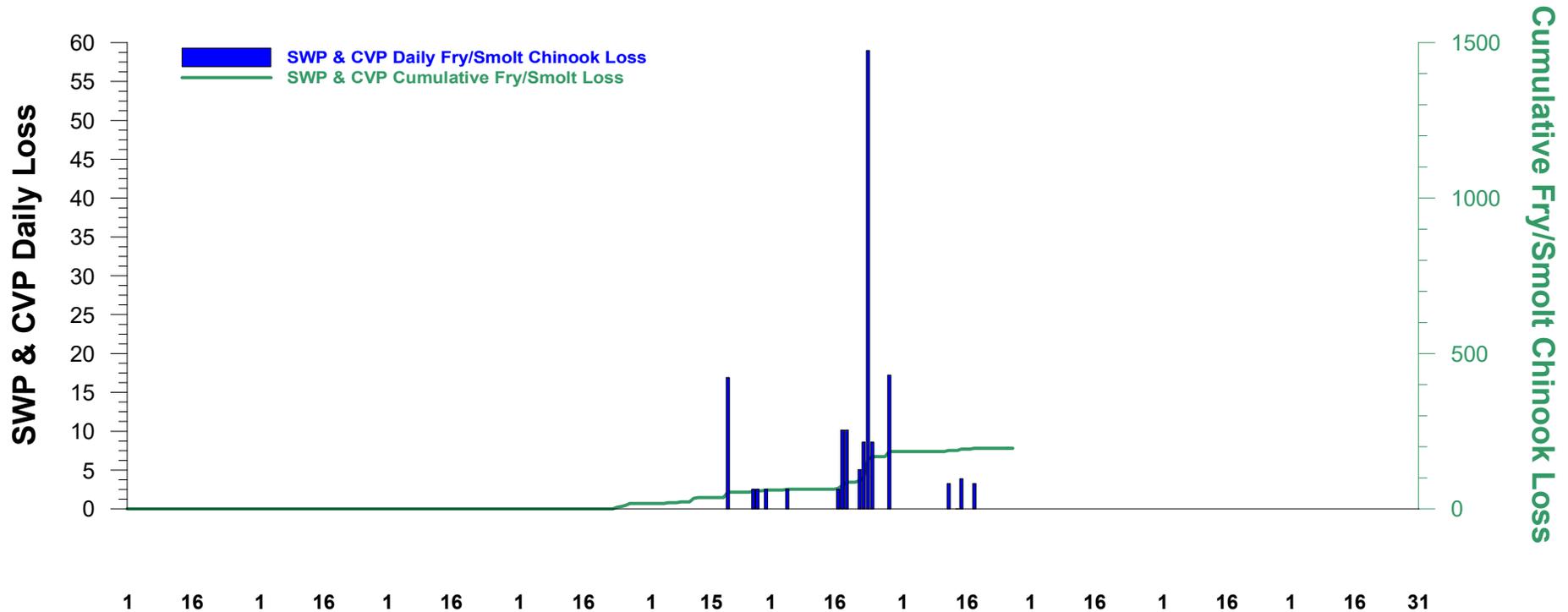
Preliminary data from DFW; subject to revision.

*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.

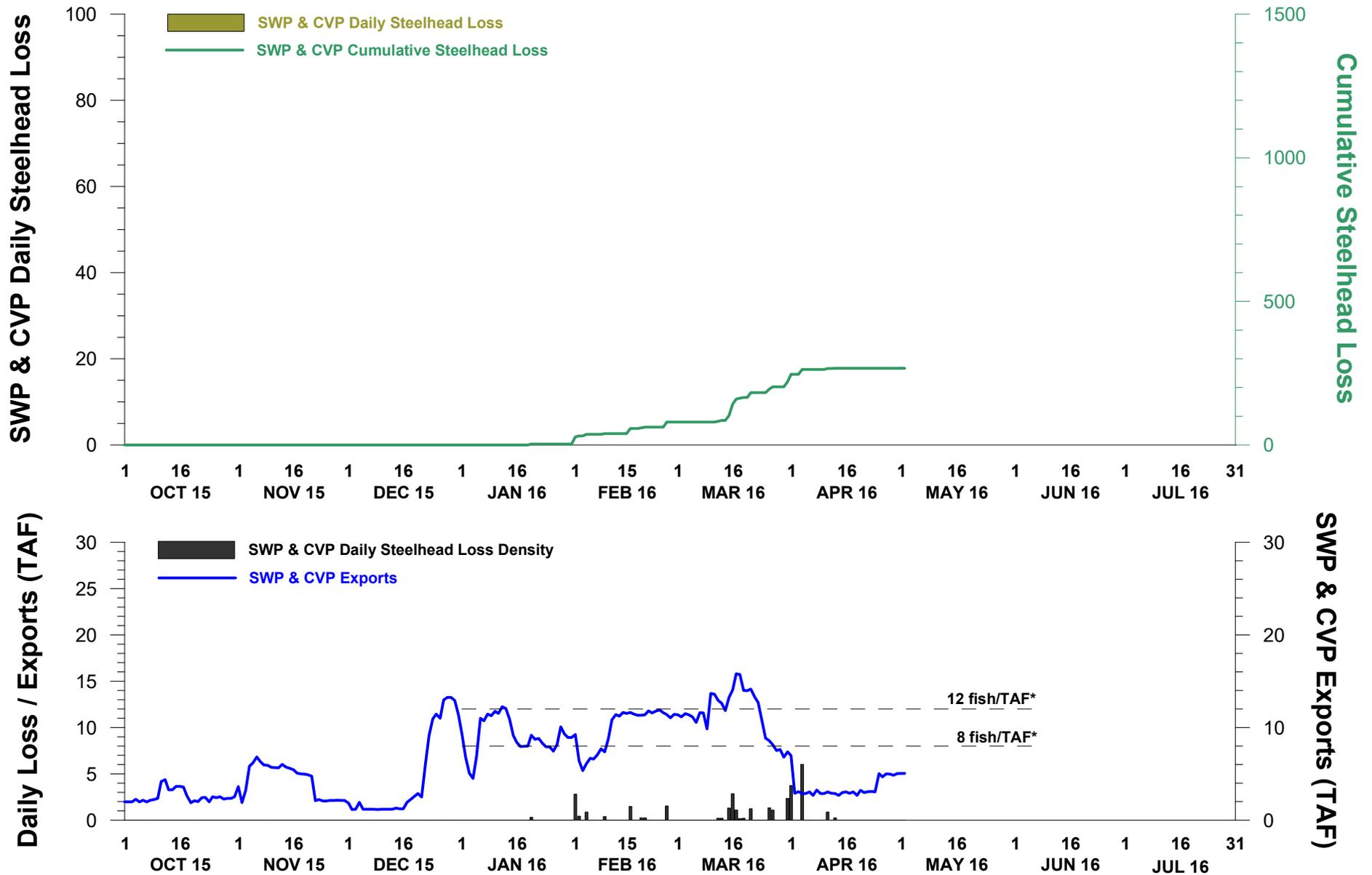
***minimum value determined by NMFS

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



DWR-DES 03 MAY 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).

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



DWR-DES 03 MAY 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 01 MAY 2016

