

Delta Operations for Salmonids and Sturgeon (DOSS) Group
Conference call: 5/31/16 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: Rhiannon Mulligan, Bryant Giorgi, Mike Ford
Reclamation: Peggy Manza, Towns Burgess
NMFS: Barb Byrne, Jeff Stuart, Kristin McCleery
CDFW: Bob Fujimura, Ken Kundargi, Duane Linander
SWRCB: Chris Carr, Brittany Kammerer
FWS: Craig Anderson

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: RSTs/trawls/seines
7. Recent or Upcoming Hatchery Releases
8. DOSS Estimates of Fish Distribution and Entrainment Risk
9. DOSS Advice
10. 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 were opened at 9am on Friday, 5/27/16, and will be closed at noon today. Through June 15, the expectation is that gates will be opened on Fridays at 9 am and will close on Mondays at noon. After June 15, the expectation is that the gates will remain open.

Action IV.2.3² (OMR Flow Management)

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

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

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.
- Today is the last day of the I:E ratio implementation in WY 2016.

Agenda Item 3.

Current Operations (5/31/16)

SWP		CVP	
Exports (cfs)			
Clifton Court Forebay	700*	Jones Pumping Plant	800
Reservoir Releases (cfs)			
Feather - Oroville	2,750	American - Nimbus	4,000
		Sacramento - Keswick	6,500**
		Stanislaus - Goodwin	~650***
		Trinity - Lewiston	3,400****
Reservoir Storage (in TAF)			
San Luis (SWP)	335	San Luis (CVP)	332
Oroville	3,312	Shasta	6,500
New Melones	650	Folsom	826
Delta Operations			
DCC	Open; closing at noon	Sacramento River at Freeport (cfs)	11,575
Outflow Index (cfs)	~9,178	San Joaquin River at Vernalis (cfs)	1,018
E:I	9% (14-day avg.)	X2	74 km

*Exports at Clifton Court Forebay will increase to 1,800 cfs tomorrow (6/1).

** Shasta Reservoir releases will increase to 7,500 cfs on 6/1 and to 8,000 cfs on 6/2.

***Goodwin releases will be ramping down by 50 cfs every other day.

****Trinity releases will be gradually ramping down.

OMR as of 5/28/16:

	USGS gauges (cfs)	Index ⁵ (cfs)

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.

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

5-day	-2,480	-2,290
14-day	-2,420	-2,140

The daily OMR Index on 5/30/16 was -2,190 cfs.

Review of factors controlling Delta exports for the period 5/24/16 to 5/31/16:

- Exports were controlled by the San Joaquin River I:E ratio for the 5/24/16 to 5/31/16 period.
- Starting 6/1/16, exports are expected to be controlled by the -3,000 cfs OMR limit per the latest FWS determination⁶.

The weather forecast predicts hot weather in the interior northern California throughout the week with no chance of precipitation.

Agenda Item 4.
Smelt Working Group

Because Monday was a holiday, the SWG will meet today at 10am.

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

Agenda Item 5.
Fish Monitoring: Salvage⁷

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>.

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.

⁶ The 5/24/16 FWS determination available at: http://www.fws.gov/sfbaydelta/documents/smelt_working_group/R8_Signed_Determination_Memo_to_BOR_05-24-2016.pdf

⁷ 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: May 23-May 29, 2016
 Prepared by Bob Fujimura on May 30, 2016 9:45
 Preliminary Results -Subject to Revision

Criteria	23-May	24-May	25-May	26-May	27-May	28-May	29-May	Trend	
Loss Densities									
Wild older juvenile CS	0	0	0	0	0	0	0	→	0
Wild steelhead	2.72	0	0	0	0	0	0	↗	0.39
Exports									
SWP daily export	0	0	0	0	173	3,267	2,711	↘	879
CVP daily export	1,593	3,822	1,977	1,956	1,954	1,591	1,586	↗	2,068
SWP reduced counts	NR	NR	NR	NR	0%	47%	12%	↗	20%
CVP reduced counts	17%	0%	0%	0%	0%	0%	0%	→	2%

Loss Density = fish lost/TAF; water export = AF; Trend = compared to previous week; wild = adipose fin present
 Loss = estimated number of fish lost at the CVP and SWP Delta export facilities based on estimated salvage (see below)
 Reduced counts = percentage of time that routine salvage sample time were less than 30 min per 2 hours of salvage and export operations
 Yellow highlighted dates indicate TFCF salvage outage occurred
 NR = not relevant

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	0	0	↗	158	298
Late Fall Run	0	0	↗	44	166
Fall Run	0	0	↗	119	223
Unclassified	0	0	→	14	NC
Total	0	0		371	743
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	1	4	↗	119	293
Hatchery	0	0	↘	1,321	3,566
Total	1	4		1,440	3,859

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 5/23/16-5/29/16.

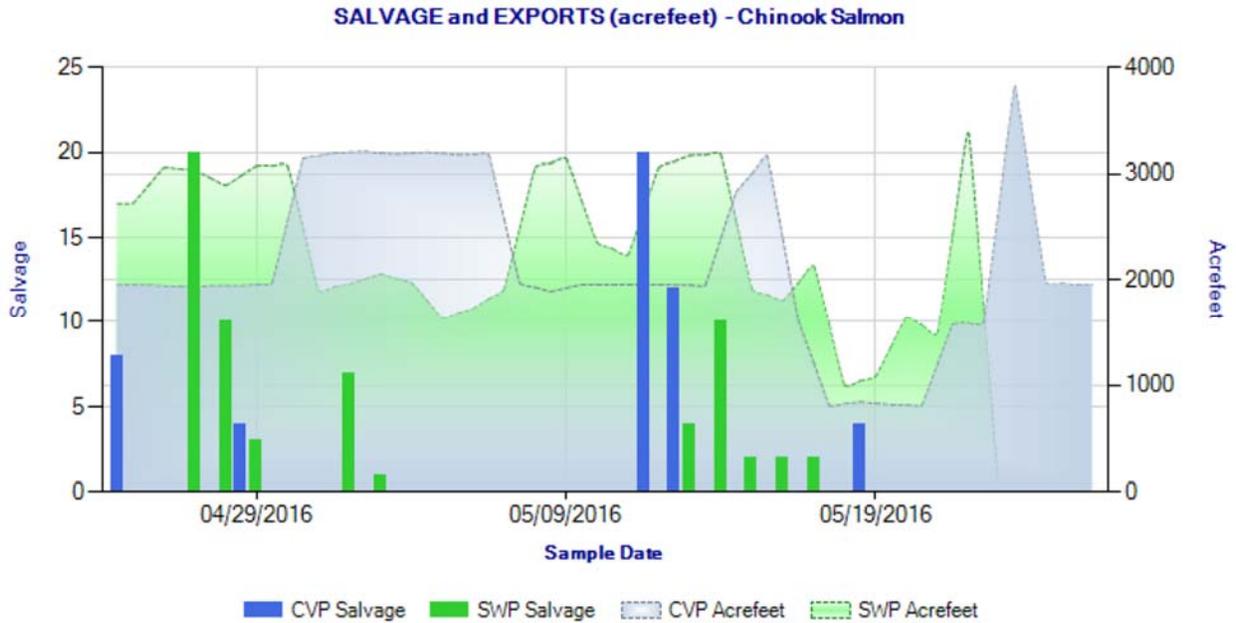


Figure 2. Daily salvage of Chinook salmon (all races) and water exports from the state and federal fish salvage facilities during April 25, 2016 through May 26, 2016.

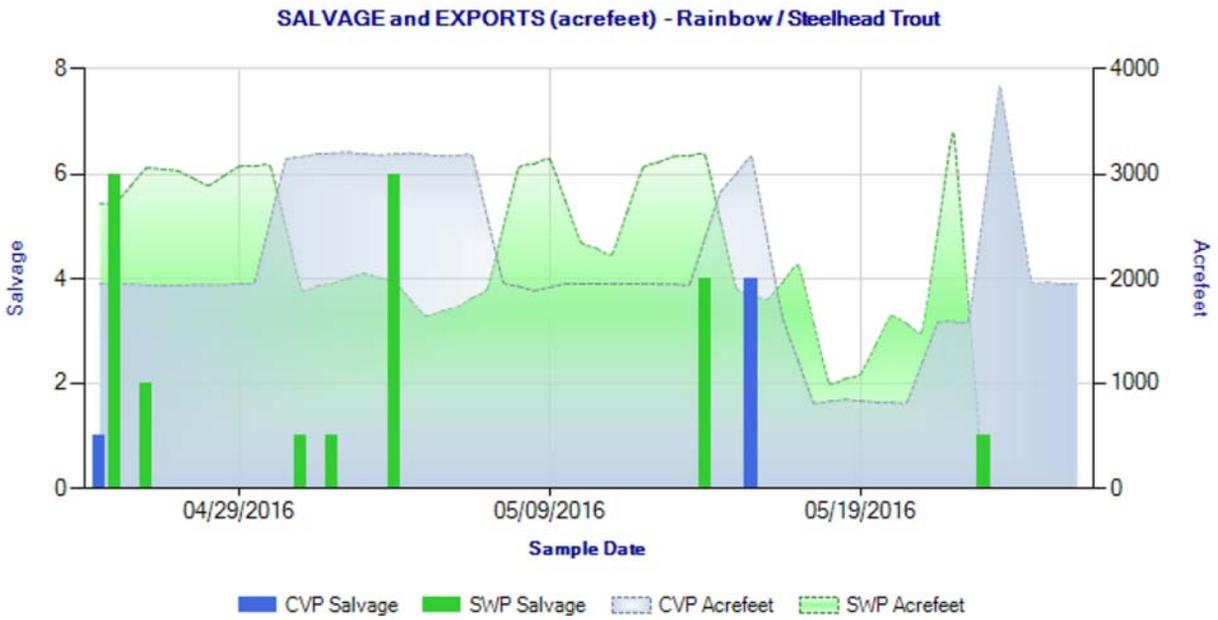


Figure 3. Daily salvage of Steelhead and water exports from the state and federal fish salvage facilities during April 25, 2016 through May 26, 2016.

Preliminary salvage report for Tuesday, 5/31/16:

- Preliminary results for yesterday (5/30/16) indicated no listed fish species were observed at either facility.

- The CVP Tracy Fish Collection Facility halted salvage operations on two occasions on 5/23/16 for a total of 60 minutes for repair work on their secondary channel travelling screens.
- The SWP halted water exports during the period of 5/23/16 to 5/27/16 for annual maintenance work. The Skinner Fish Facility did perform fish predator or salvage collections on 5/23/16 and 5/24/16 in their secondary channel system as part of their maintenance work.
- On 5/28/16, the Skinner operators reduced night-time collection times to as low as 5 minutes per 2 hour period to handle high numbers of young-of-year striped bass and threadfin shad.

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	River Restoration	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	River restoration program	82.156	60,000	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 5/29/2016.

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 6/01/2016

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

Agenda Item 6.

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. The “early warning” sampling trawls at Jersey Point and Prisoners Point were last conducted the week of 3/28/16. Sampling at the Tisdale rotary screw trap location ended 5/2/16. See also:

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

Location	Chippis Is. Midwater Trawl ^A	Sacramento Trawl ^A	Beach Seines ^A	Knights Landing RST ^B	GCID RST ^C	Mossdale Kodiak Trawl ^D
Sample Date	5/23, 5/25, 5/27	5/23, 5/25, 5/27	5/23, 5/25, 5/26, 5/27	5/23-5/24	5/24-5/30	5/23-5/28
FR Chinook	69	2			462	40
SR Chinook	1		1		2	5
WR Chinook						
LFR Chinook						
Ad-Clipped Chinook	16	1			43	
Chinook Adult						
Steelhead (wild)					4	
Steelhead (ad-clip)						
Green Sturgeon						
Delta Smelt	1					
Splittail	5		158			87
Longfin Smelt						
Flows (avg. cfs)				3980	845	
W. Temp. (avg. °F)				69	64.2	
Turbidity (avg. NTU)				13	10.3	

^A Due to the holiday on Monday, 5/30/16, DAT data was not sent to DOSS by the time of the DOSS call; DAT data is provided for convenience at the end of the meeting notes.

^B Sampling period was from 5/23 at 8:30 am to 5/24 at 9:45 am.

^C The GCID trap was lowered on 5/23 at 10:30 am. Sampling period was from 5/24 at 9 am to 5/30 at 9 am.

^D 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. A total of 80 tows this week.

Red Bluff Diversion Dam (RBDD) Monitoring

USFWS biweekly report (5/20/16 to 6/2/16) 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)	0	338,897 (235,961; 441,833)

Agenda Item 7.

Recent or Upcoming Hatchery Releases

On 6/3/16 to 6/4/16, CDFW will release approximately 815,000 brood year 2015 Mokelumne River Hatchery fall-run Chinook into the Sherman Island net pens on the San Joaquin River. This release will include 25% marked (adipose fin clip) CWT fish.

Agenda Item 8.

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 Chipps Island)
<i>Young-of-year (YOY) winter-run Chinook salmon¹</i>	0% (Last week: same)	<1% (Last week: same)	>99% (Last week: same)
<i>Young-of-year (YOY) spring-run Chinook salmon*</i>	<1% (Last week: same)	<1% (Last week: same)	>98 (Last week same)
<i>Hatchery winter-run Chinook salmon</i>	0% (Last week: same)	<1% (Last week: same)	>99% (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. The average size for the released FRCS production fish were just slightly smaller than the size at date for the minimum size of SRCS.

Rationale for changes in distribution

Wild winter-run Chinook: The fractions of wild winter-run Chinook remain the same as last week. No wild winter-run Chinook salmon have been observed in the system for the last 4 weeks. Water temperatures continue to warm creating inhospitable environmental conditions in the Delta and upriver in the Sacramento River mainstem. These factors and seasonal timing indicate that the majority of wild winter-run Chinook salmon have left the system.

Wild spring-run Chinook: The fractions of wild spring-run upstream of the Delta remained at less than 1 percent since DOSS thinks a few may still remain upstream in the tributaries and

these are likely to remain as yearlings in the upper watersheds. The fraction in the Delta and having exited the Delta remained the same as last week. The DOSS group believes that the majority of spring-run have exited the Delta.

Hatchery winter-run Chinook: DOSS estimates that the majority of hatchery winter-run Chinook salmon have exited the Delta since it has been more than 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: Less than 1% of winter-run (wild or hatchery) and spring-run are considered to be in the Delta.

- **Exposure Risk**
 - **For Sacramento River origin: LOW** (*last week: same*)
 - Water temperatures continue to warm and most fish are likely to have moved downstream and out of the Delta at this time.
 - **For San Joaquin River origin: LOW** (*last week: LOW TO MEDIUM*)
 - Stanislaus River, Tuolumne, and Merced Rivers are at or approaching their base flows. No steelhead were observed in the Mossdale trawl this week. Trawling may be inefficient at detection of steelhead smolts, although few steelhead are expected to remain in the south Delta. Water temperatures at Mossdale and Vernalis have increased this week.

- **Routing Risk:**
 - **For Sacramento River: LOW to MEDIUM** (*last week: same*)
 - River flows have decreased in the last week and reverse flows are more prevalent on the flood tide. Water temperatures are continuing to rise. The DCC gates are expected to be open on the weekend, which increases the chance of listed fish being redirected into the interior Delta. Risk is LOW when DCC gates are closed and MEDIUM when open.
 - **For San Joaquin River: LOW TO MEDIUM** (*last week: same*)
 - The HOR barrier will stay in place until 6/1, which 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*)

Agenda Item 9.

DOSS Advice to WOMT and NMFS: None

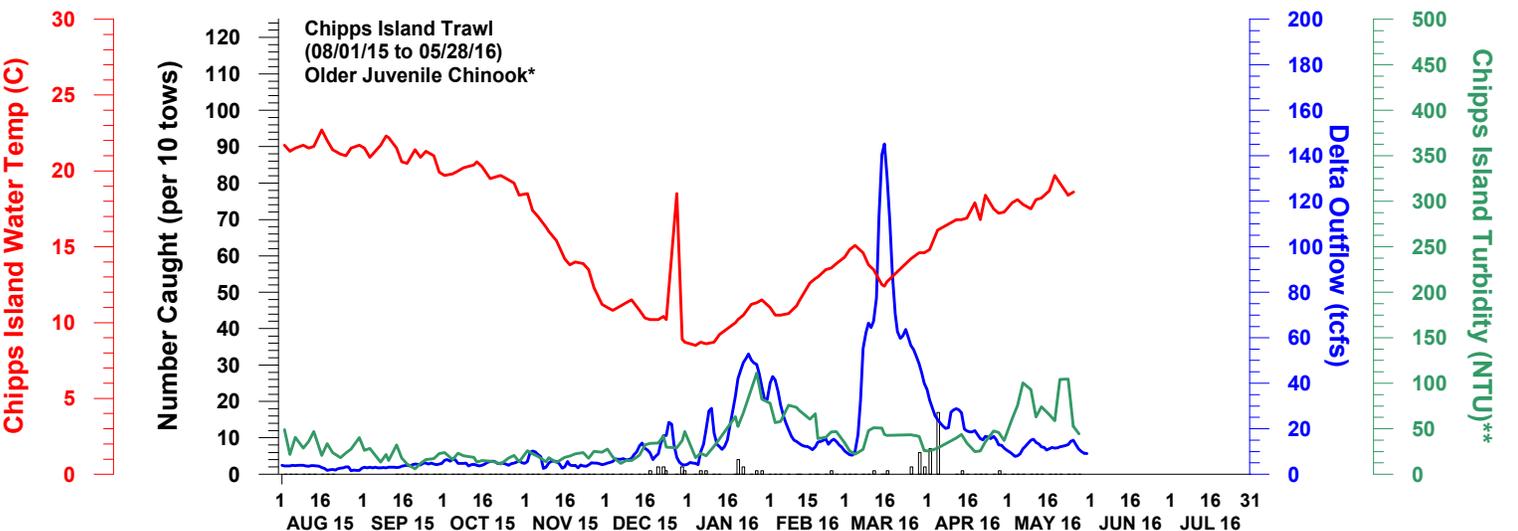
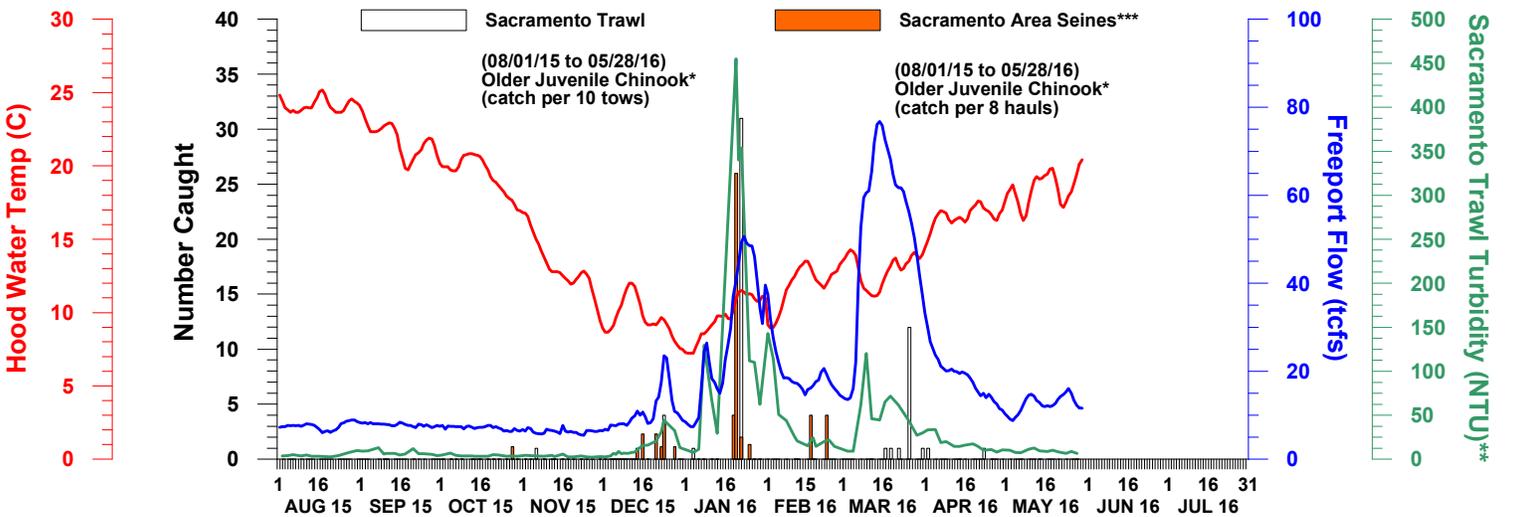
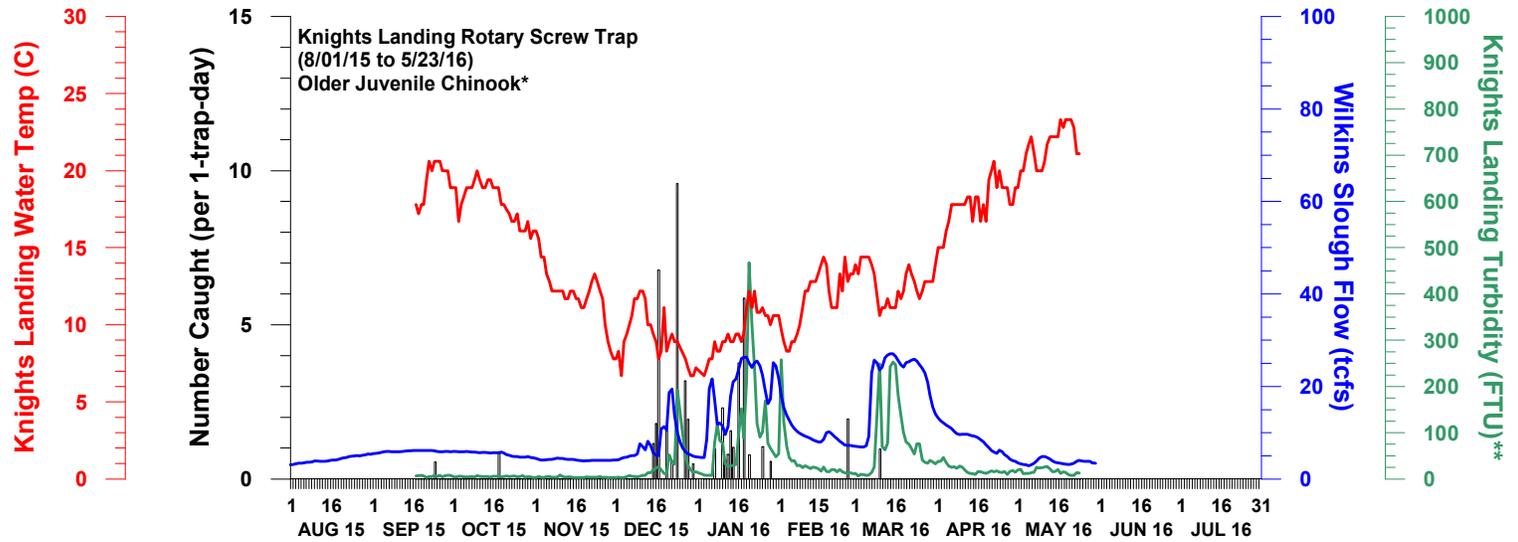
Agenda Item 11.

Next Meeting: The next DOSS conference call will be on 6/7/16 at 9am. The last weekly DOSS call is tentatively scheduled for 6/14/16. The group will discuss preparation of the annual report on the last call.

The following graphs were provided (after the DOSS call) 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 1 JUNE 2016

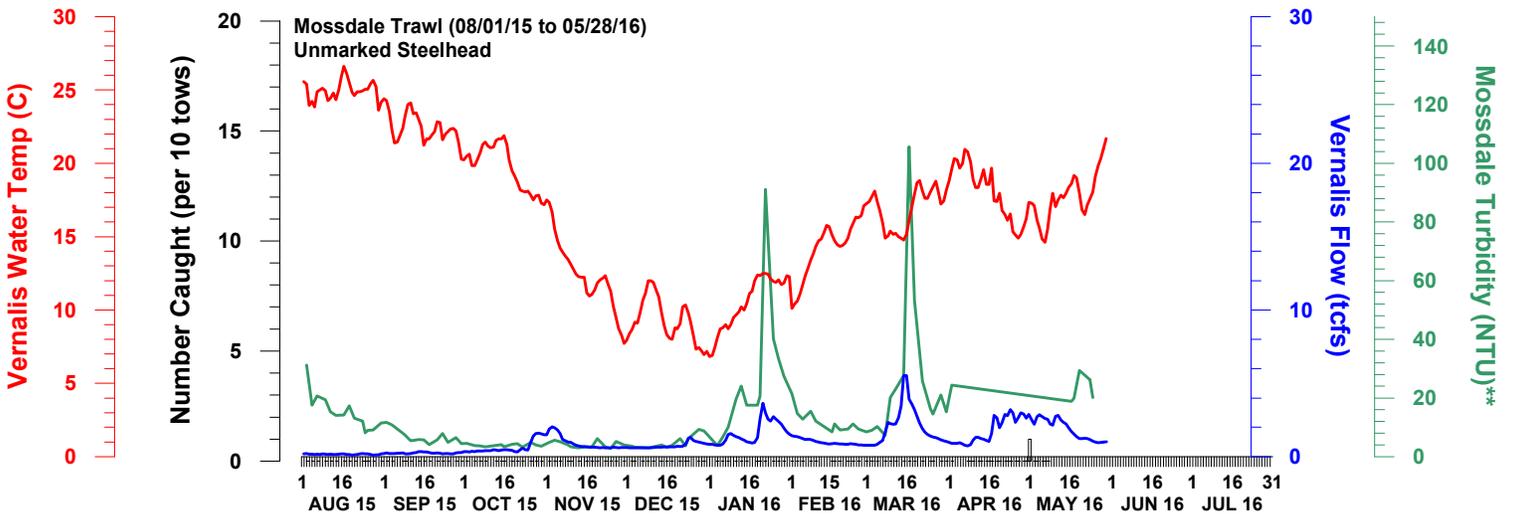
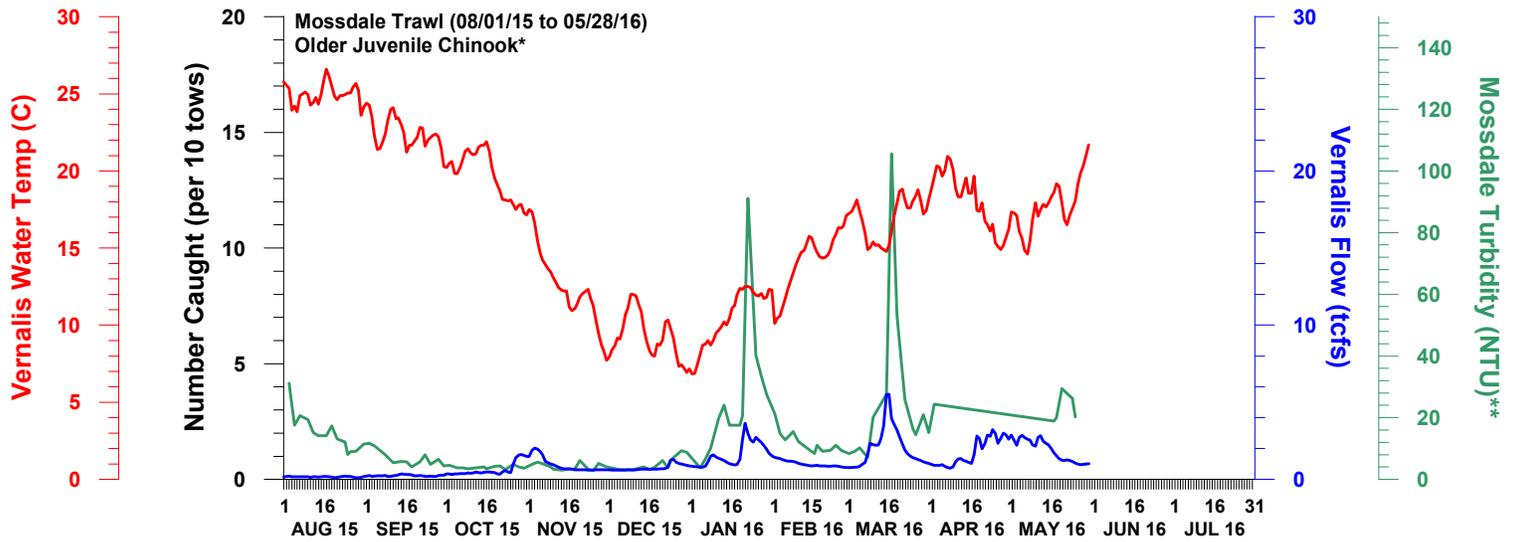
Preliminary data from DFW, FWS, and CDEC; subject to revision.

*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

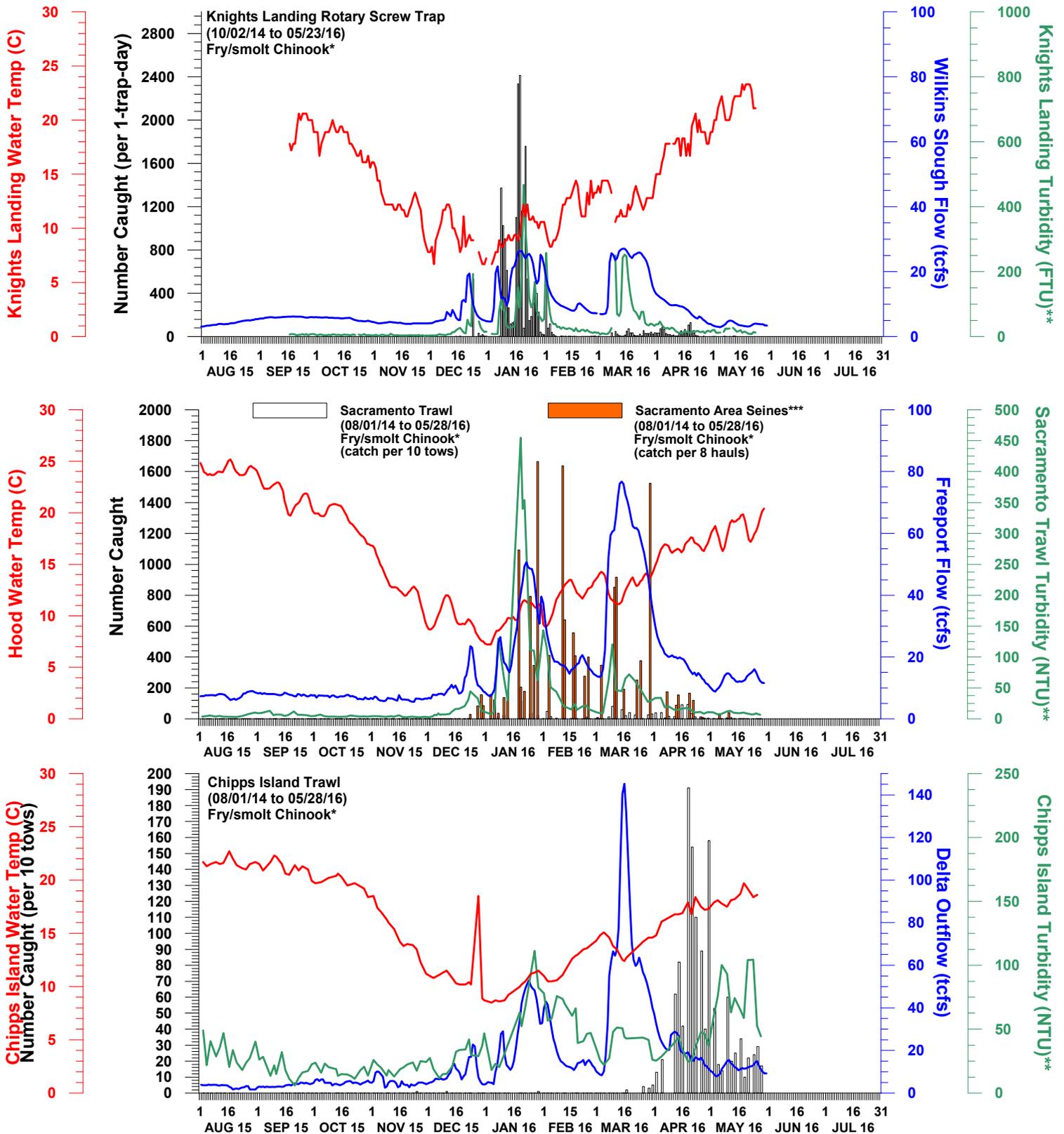


DWR-DES 1 JUNE 2016
Preliminary data from FWS,CDFW, and CDEC; subject to revision.

*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 1 JUNE 2016

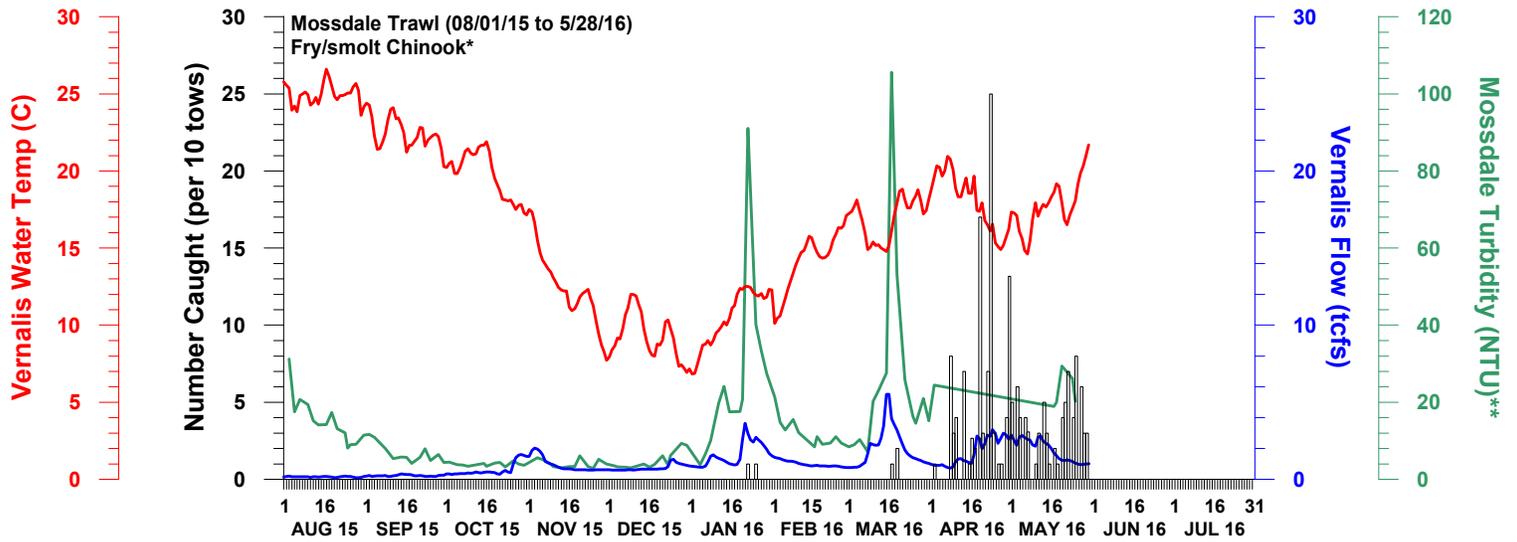
Preliminary data from DFW, FWS, and CDEC; subject to revision.

*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



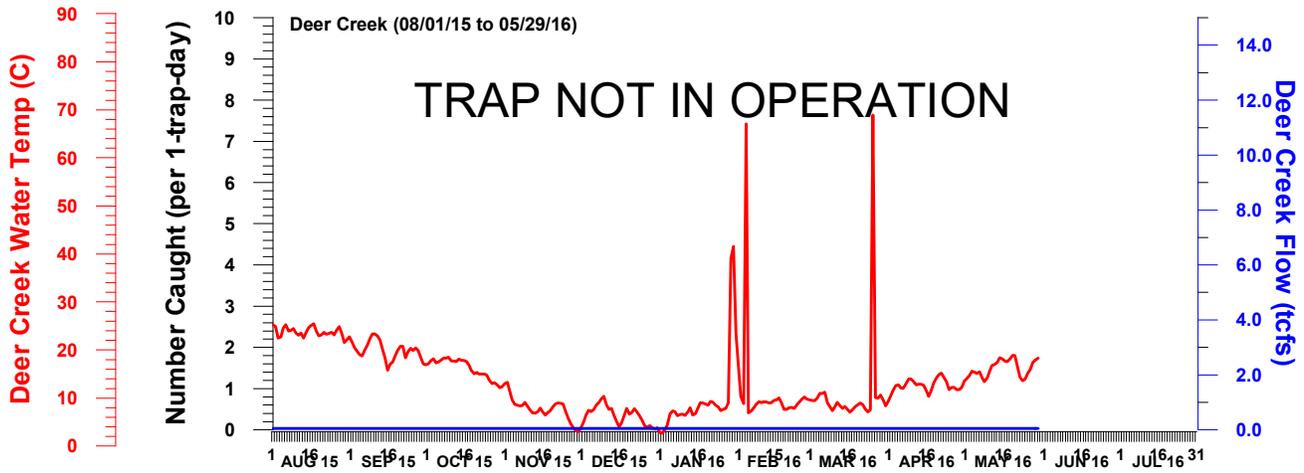
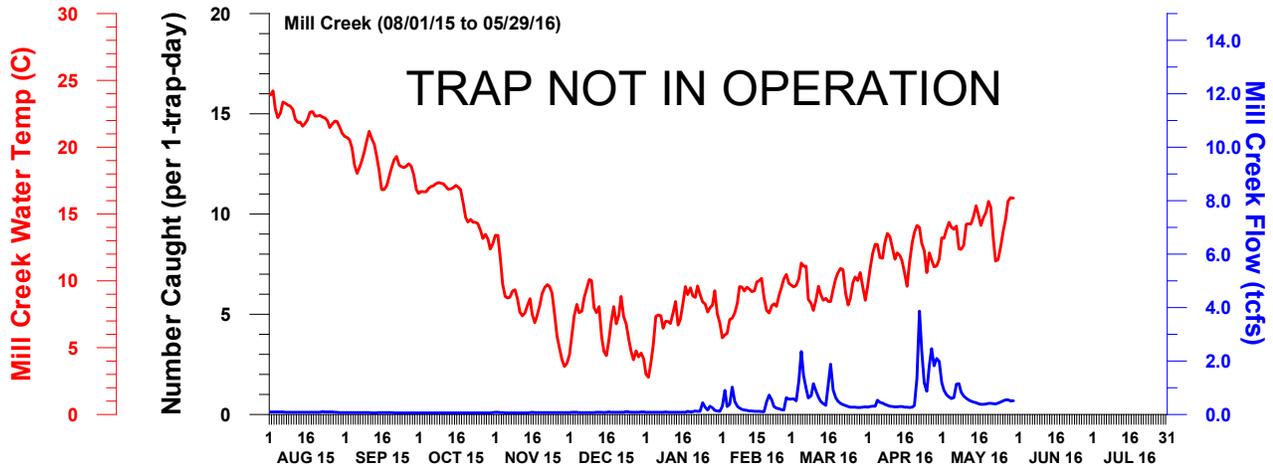
DWR-DES 1 JUNE 2016

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.

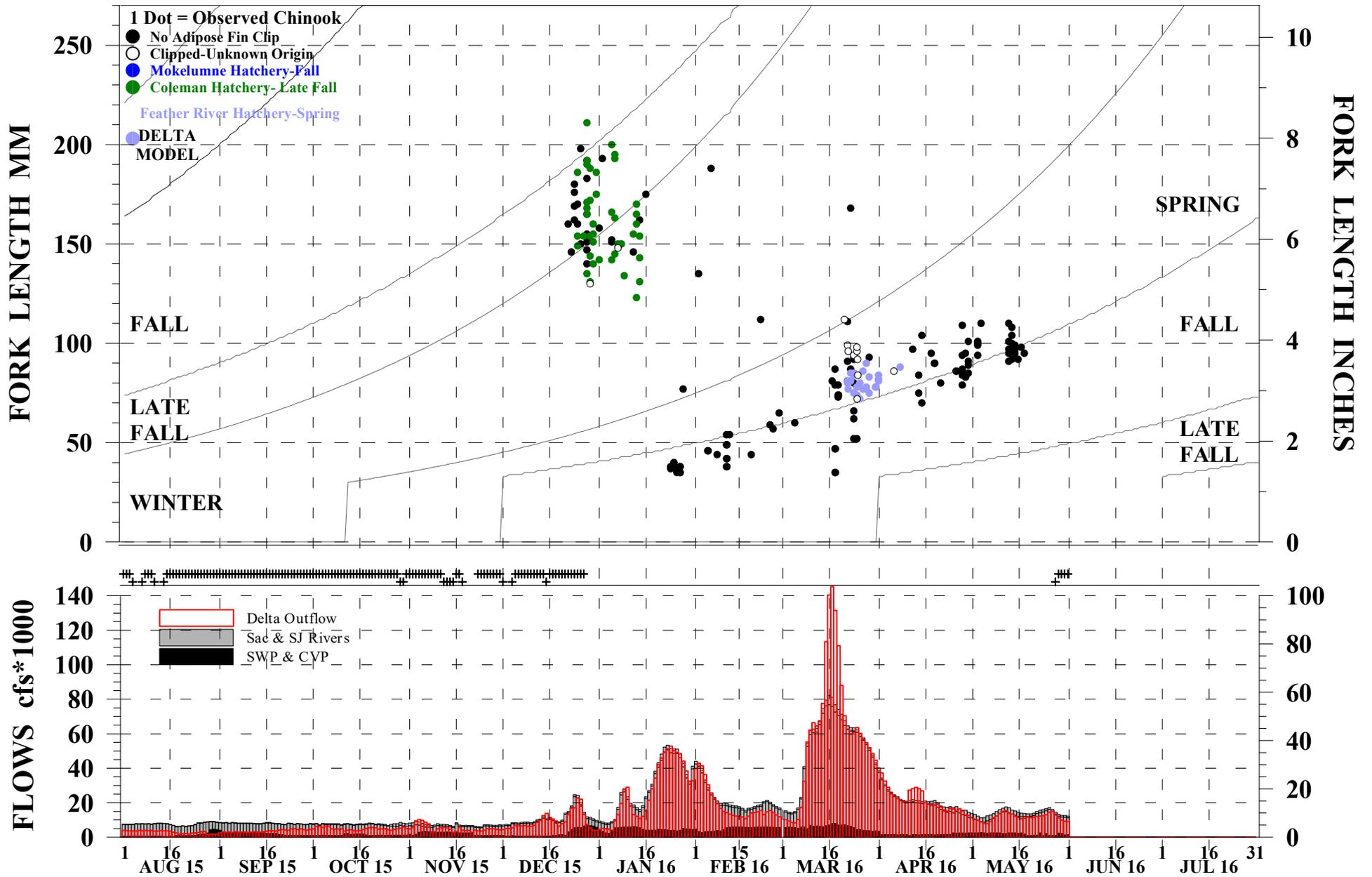
Sacramento River Trawl, Sacramento Area Beach Seine, and Chipps Island Trawl data were obtained directly from FWS, Stockton Fish and Wildlife Office (<http://www.fws.gov/stockton/ifmp/>).

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 05/29/2016

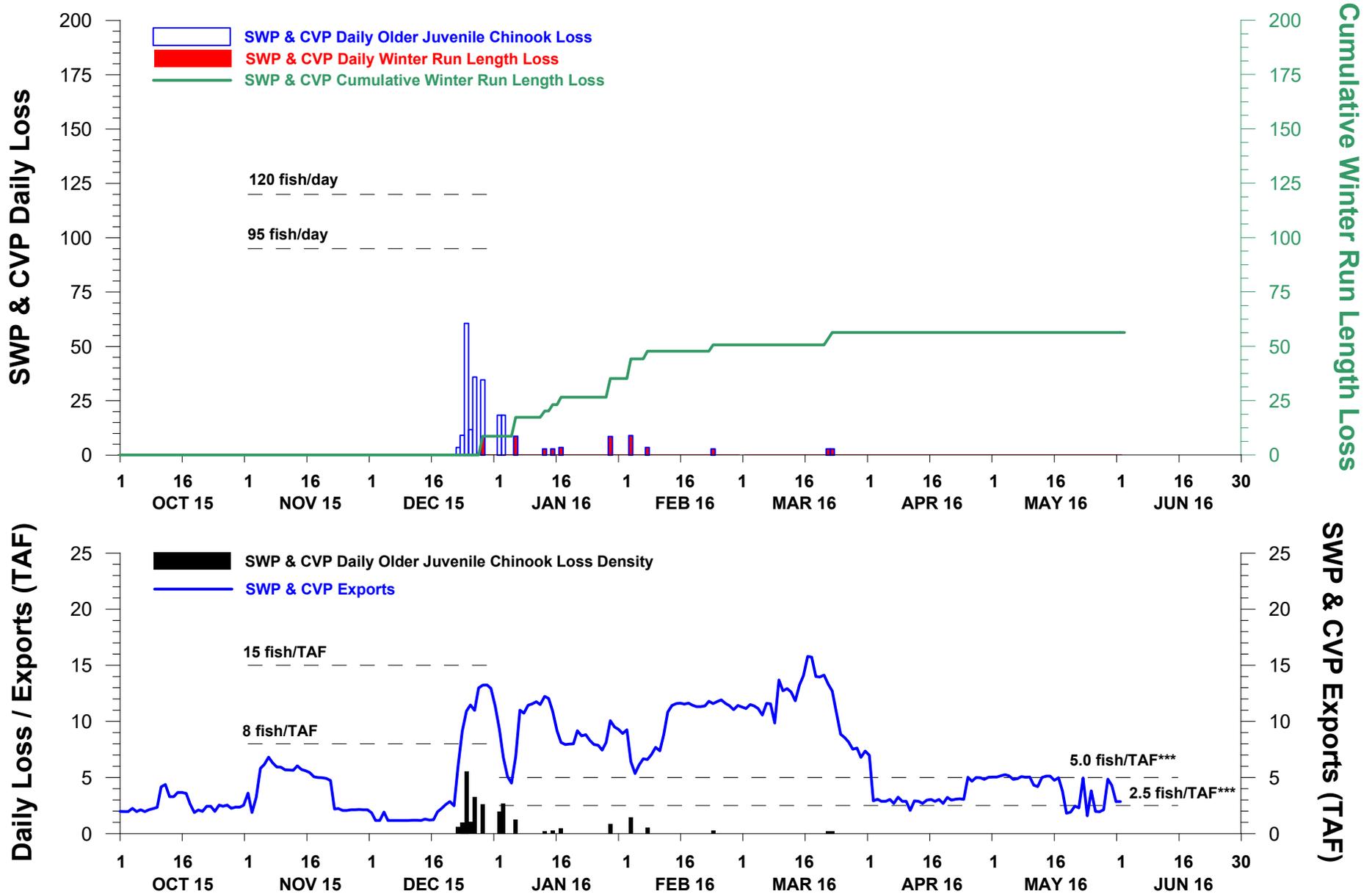


DWR-DES 01 JUNE 2016

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 29 MAY 2016



DWR-DES 1 JUNE 2016

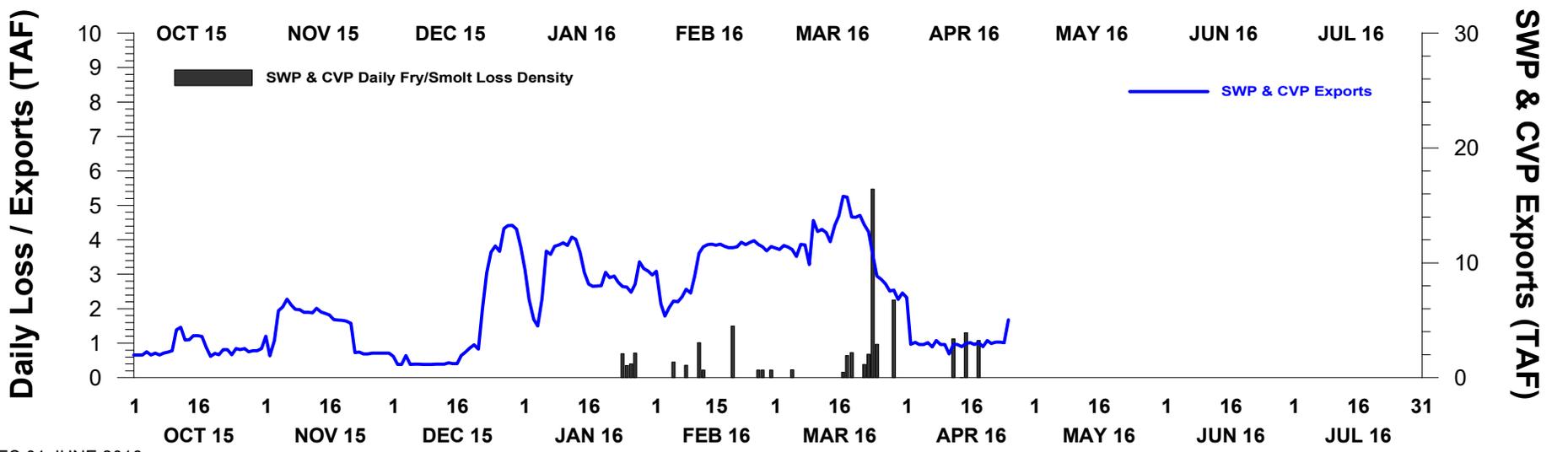
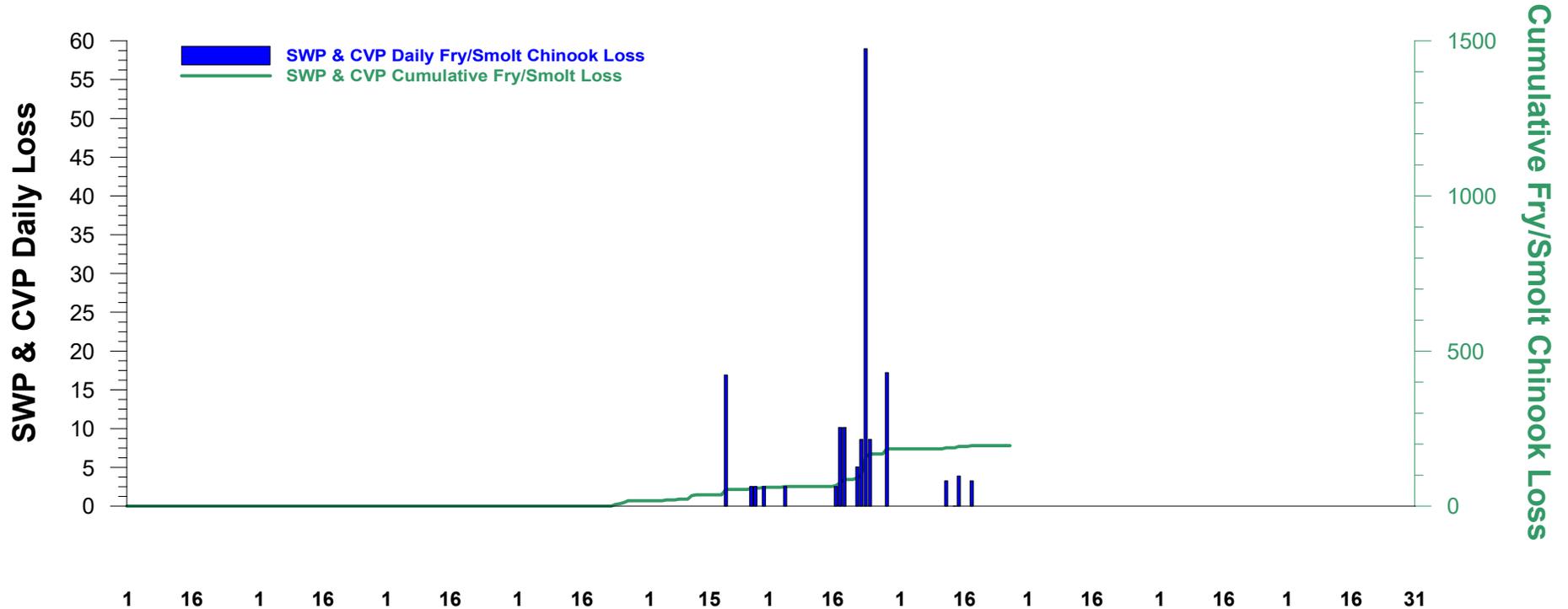
Preliminary data from DFW; subject to revision.

*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.

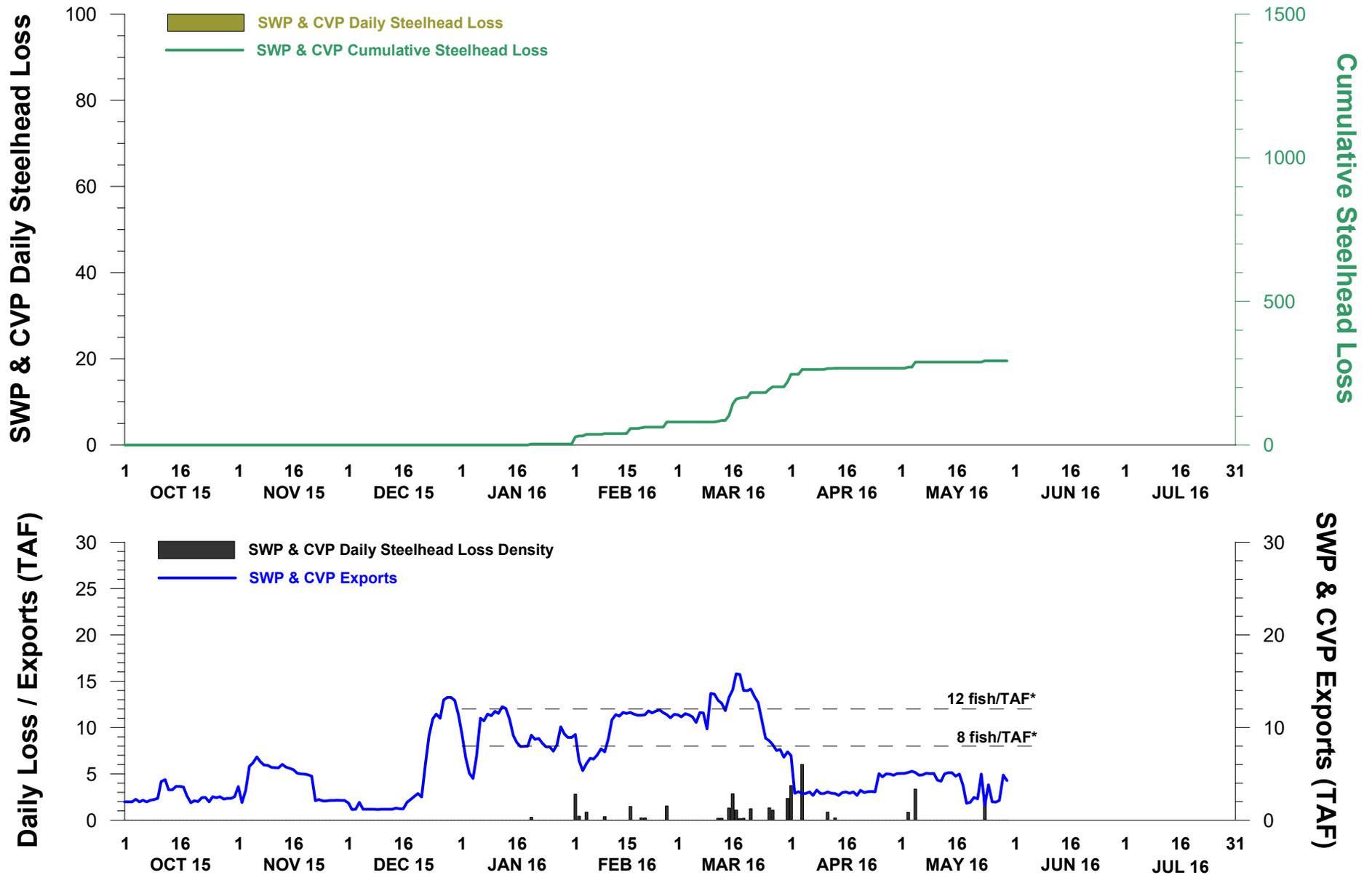
***minimum value determined by NMFS

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



DWR-DES 01 JUNE 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 29 MAY 2016



DWR-DES 1 JUNE 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 29 MAY 2016

