

Delta Operations for Salmonids and Sturgeon (DOSS) Group
Conference call: 5/17/16 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, Dan Yamanaka, Mike Ford, Brian Schreier
Reclamation: Josh Israel, Peggy Manza, Towns Burgess, Mike Hendrix
NMFS: Jeff Stuart, Kristin McCleery
CDFW: Bob Fujimura, Ken Kundargi, Jerry Morinaka, Duane Linander
SWRCB: Brittany Kammerer, Chris Carr
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: 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. DCC gates may open as early as this weekend (May 21) per the RPA action.

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 New Melones reservoir by Oakdale Irrigation District (OID) and South San Joaquin Irrigation District (SSJID) (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 5/3/16, FWS issued a determination stating that the OMR flow should be no more negative than -3,000 cfs on a 14-day average with a simultaneous 5-day running average of no more negative than -3,750 cfs (within 25%).
- Reclamation may be asking NMFS for an extension to their request for flexibility in export levels since the Projects are currently restricted by water quality conditions and Delta outflows and cannot divert the full volume of "augmented flows" previously released by OID and SSJID on the Stanislaus River.

Agenda Item 3.

Current Operations (5/17/16)

SWP		CVP	
Exports (cfs)			
Clifton Court Forebay	800*	Jones Pumping Plant	800*
Reservoir Releases (cfs)			
Feather - Oroville	3,500**	American - Nimbus	4,500**
		Sacramento - Keswick	6,500**
		Stanislaus - Goodwin	1,100***
		Trinity - Lewiston	5,656*****
Reservoir Storage (in TAF)			
San Luis (SWP)	465	San Luis (CVP)	395
Oroville	3,398	Shasta	4,211
New Melones	615	Folsom	842
Delta Operations			
DCC	Closed	Sacramento River at Freeport (cfs)	11,935
Outflow Index (cfs)	~10,643	San Joaquin River at Vernalis (cfs)	1,982
E:I	16% (14-day avg.)	X2	73 km

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.

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* 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, the relaxation of the I:E ratio per the request by Reclamation to pick up augmented water released on the Stanislaus River, and water quality and river flows required by D-1641.

**Oroville, Keswick/Shasta and Folsom reservoir releases increased to supply additional water to the system for water quality and flow requirements.

***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 over the next week and will target 800 cfs on 5/25.

****Trinity releases continue to follow the pulse flow schedule.

OMR as of 5/14/16:

	USGS gauges (cfs)	Index ⁵ (cfs)
5-day	-2,580	-2,780
14-day	-2,810	-2,830

The daily OMR Index on 5/16/16 was -2,970 cfs.

Review of factors controlling Delta exports for the period 5/17/16 to 5/24/16:

- Delta outflow, X2 location, and water quality are controlling exports this week.
- FWS determination of OMR flow no more negative than -3,000 cfs on a 14-day average with a simultaneous 5-day running average of no more negative than -3,750 cfs ($\pm 25\%$ of the 14-day average).
- Vernalis flows to exports 1:1 ratio stipulated by D-1641 during the 30-day pulse period.

The weather forecast predicts hot, dry weather with a slight chance of showers on Friday and Saturday, mostly north of the Sacramento area.

Agenda Item 4.

Smelt Working Group

The SWG met on Monday, 5/16/16 at 10am. Bartoo (FWS) provided the following draft 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 risk of entrainment,
- -2000 to -3500 cfs has a medium 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.

- -3500 to -5000 cfs has a high risk of entrainment.

Should salvage occur before 5/23/16, 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.

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 23, 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: May 9-May 15, 2016

Prepared by Bob Fujimura on May 16, 2016 15:20

Preliminary Results -Subject to Revision

Criteria	9-May	10-May	11-May	12-May	13-May	14-May	15-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	3,144	2,355	2,235	3,060	3,172	3,181	1,916	↘	2,723
CVP daily export	1,893	1,959	1,958	1,957	1,955	1,953	2,831	↘	2,072
SWP reduced counts	0%	0%	0%	0%	0%	0%	0%	→	0%
CVP reduced counts	0%	0%	0%	0%	0%	8%	8%	↗	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 TFCF salvage outage occurred

Chinook Salmon Weekly/Season Salvage and Loss

Combined salvage and loss for both CVP and SWP fish facilities

Race determined by size at date of capture; hatchery = adipose fin missing;

Category	Weekly Total			Season Total	
	Salvage	Loss	Trend	Salvage	Loss
Wild					
Winter Run	0	0	→	36	56
Spring Run	32	55	↗	154	294
Late Fall Run	0	0	→	44	166
Fall Run	16	40	↗	115	205
Unclassified	0	0	→	14	NC
Total	48	95		363	721
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	↘	118	288
Hatchery	4	17	↘	1,317	3,563
Total	4	17		1,435	3,852

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 5/9/16-5/15/16.

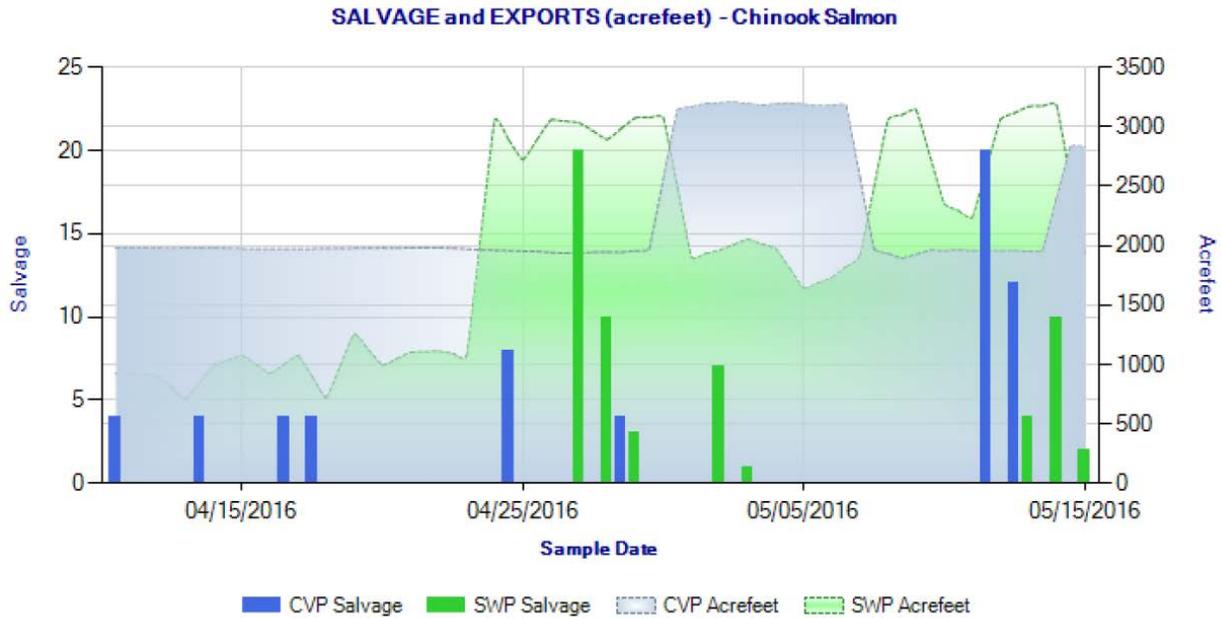


Figure 2. Daily salvage of Chinook salmon (all races) and water exports from the state and federal fish salvage facilities during April 11, 2016 through May 15, 2016.

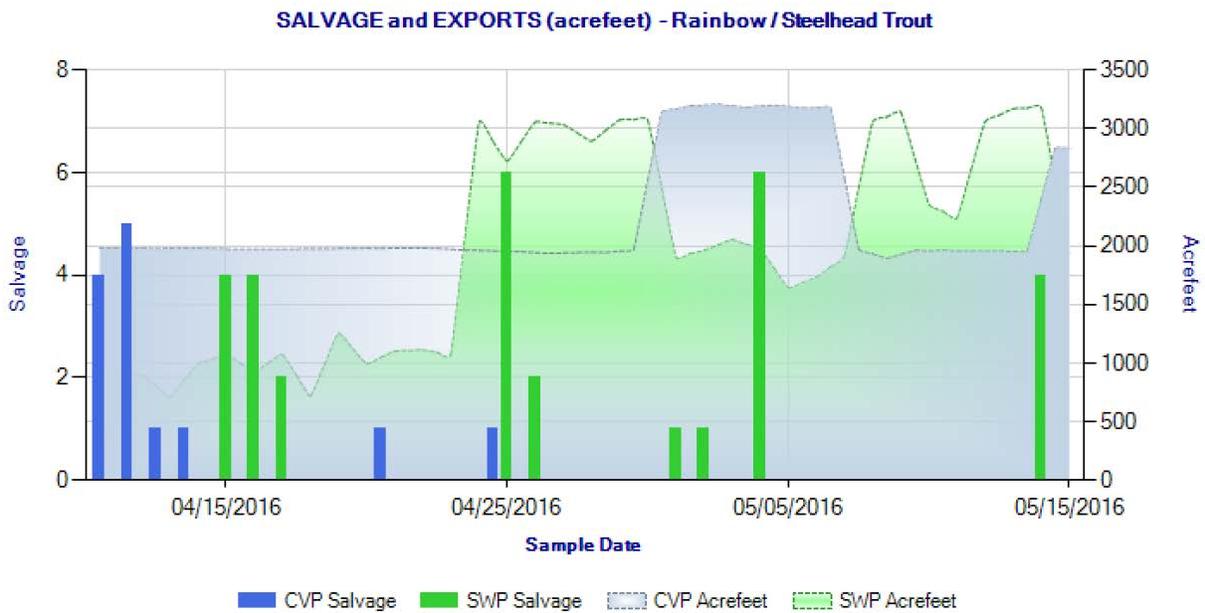


Figure 3. Daily salvage of Steelhead and water exports from the state and federal fish salvage facilities during April 11, 2016 through May 15, 2016.

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

- 2 wild spring-run and fall-run sized Chinook salmon were salvaged at the SWP.
- 4 hatchery steelhead were salvage at the CVP.

- On 5/16, the Tracy Fish Collection Facility had a scheduled outage for electrical work, which lasted 70 minutes.
- On 5/14 and 5/15, salvage operations were halted at the Tracy Fish Collection Facility due to mechanical problems with the secondary travelling screen for 2 ½ and 3 hours respectively. One 30-minute count was missed with each outage. Temporary repairs were made to the screens.

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 5/15/2016.

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 5/17/2016

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	5/9, 5/11, 5/13	902: Jersey Pt: Pris. Pt: No data received	5/9, 5/11, 5/13	5/10, 5/12-13	5/8-5/16	No data received	5/11	5/8-5/14
FR Chinook	100		14	10	26		75	13
SR Chinook	6				1		2	
WR Chinook								
LFR Chinook								
Ad-Clipped Chinook	32		2	3	10		9	
Chinook Adult								
Steelhead (wild)								
Steelhead (ad-clip)								
Green Sturgeon								
Delta Smelt								
Splittail	2			2045				
Longfin Smelt	2							
Flows (avg. cfs)					4287.5		955	
W. Temp. (avg. °F)					71.3		64.8	
Turbidity (avg. NTU)					19.7		18.8	

^A Data reported in the 5/8 to 5/14 DJFMP sampling summary.

^B Sampling period was from 5/8 at 10:00 am to 5/16 at 11:00 am. RST monitoring is expected to cease soon due to warm water temperatures (above 70 degrees).

^C Tisdale RST was last operated on 5/3/16.

^D The GCID trap was lowered on 5/10/16 at 1:00 pm and was raised on 5/12/16 due to high volume of debris, which is potentially hazardous to fish in the trap.

^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. 50 total tows this week.

Water temperatures at Knights Landing are approaching levels (74° F) that will preclude additional sampling for salmonids with the RSTs. CDFW will be discussing this situation this week.

Red Bluff Diversion Dam (RBDD) Monitoring

USFWS biweekly report (4/22/16 to 5/5/16) 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)	123	338,897 (235,961; 441,833)

Agenda Item 8.

Recent or Upcoming Hatchery Releases

On 5/15-5/17, CDFW will release approximately 1,630,982 brood year 2015 Fall-Run Chinook salmon from Feather River Hatchery into the San Pablo Bay net pens near Mare Island. This release will include 25% marked (adipose fin clip) 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 Chipps Island)
<i>Young-of-year (YOY) winter-run Chinook salmon¹</i>	<1% (Last week: same)	≤5% (Last week: same)	≥95% (Last week: same)
<i>Young-of-year (YOY) spring-run Chinook salmon*</i>	<1% (Last week: <5%)	≤5% (Last week: 5%)	≥95% (Last week: >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.

Rationale for changes in distribution

Wild winter-run Chinook: The fraction of wild winter-run upstream of the Delta, in the Delta, and having exited at Chipp's Island 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. As water temperatures continue to warm, the final outmigration from the Delta of any remaining fish is expected to occur due to inhospitable environmental conditions in the Delta. No winter-run were reported in the Delta monitoring or salvage this week further indicating the majority have left the system.

Wild spring-run Chinook: The fractions of wild spring-run upstream of the Delta and in the Delta were reduced since water temperatures have increased and the majority of spring-run are likely to have left the system or have taken up residency in the upper tributaries to over-summer as yearlings. The fraction of wild spring-run having exited the Delta increased due to warming temperatures, seasonal timing, and the lack of precipitation forecasted for the Central Valley. 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 in regional monitoring efforts. DOSS estimates that most hatchery winter-run 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: Most winter-run and spring-run are out of the system, only 5% winter-run and 5% spring-run are considered to be in the Delta. Pulse flows released on the Stanislaus River have ended and are ramping down to summer base flow levels this week.

- **Exposure Risk**
 - From Sacramento River origin: **LOW** (*last week: same*)
 - Flow has decreased and water temperatures continue to warm, 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*)
 - It is the end of the pulse flows on the Stanislaus River. Tuolumne and Merced Rivers are at their base flows. This week will likely be the last week we detect steelhead as they emigrate downriver into the Delta from the Stanislaus. No steelhead were observed in the Mossdale trawl this week, although trawl may be inefficient at detection of steelhead smolts.
- **Routing Risk:**
 - For Sacramento River **LOW to MEDIUM** (*last week: same*)
 - River flows have decreased in the last week and reverse flows are becoming more prevalent on the flood tide. Water temperatures are continuing to rise.
 - **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*)
 Wild steelhead are present in the San Joaquin River, but low exports (more positive OMR levels) and reduced entrainment potential into interior Delta channels due to the presence of the HOR barrier create a low risk of overall entrainment.
 - 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 of **LOW to MEDIUM** to fish that were already present within the south Delta channels and should be considered in the overall risk assessment. Through the discussion of 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. Assessment of the factors influencing the characterization of entrainment risk will be further discussed by the DOSS group after the end of this migration season. Discussion will focus on further clarification of the conceptual model of entrainment risk factors faced by fish in the southern Delta.

Agenda Item 10.

DOSS Advice to WOMT and NMFS: None

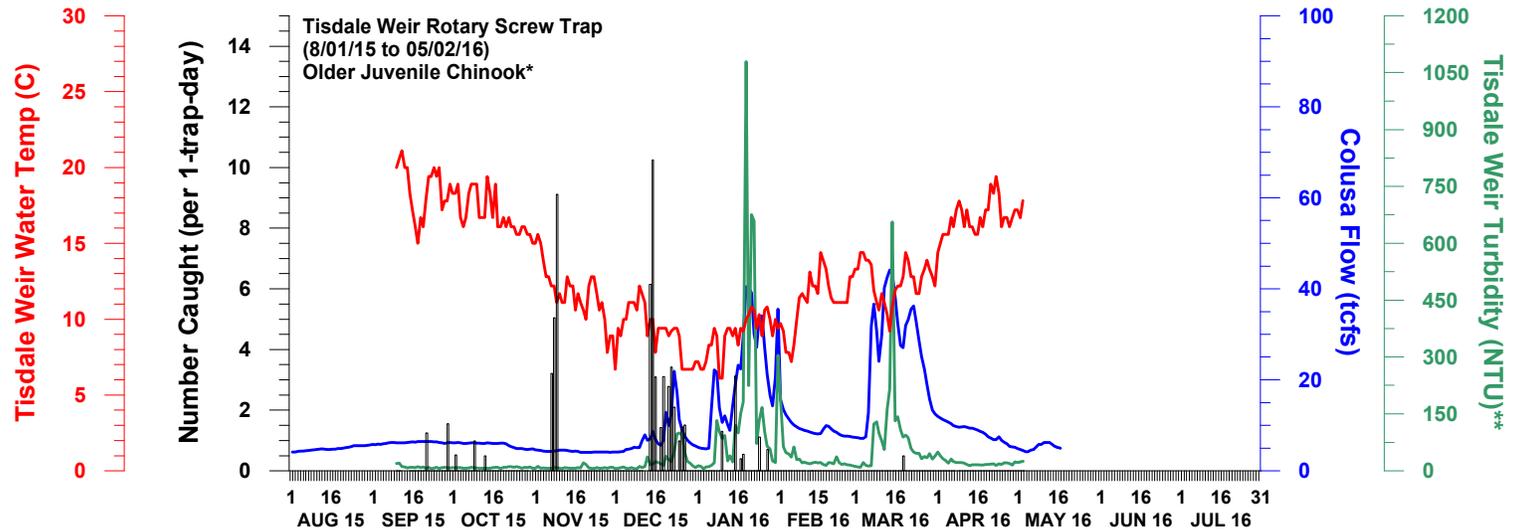
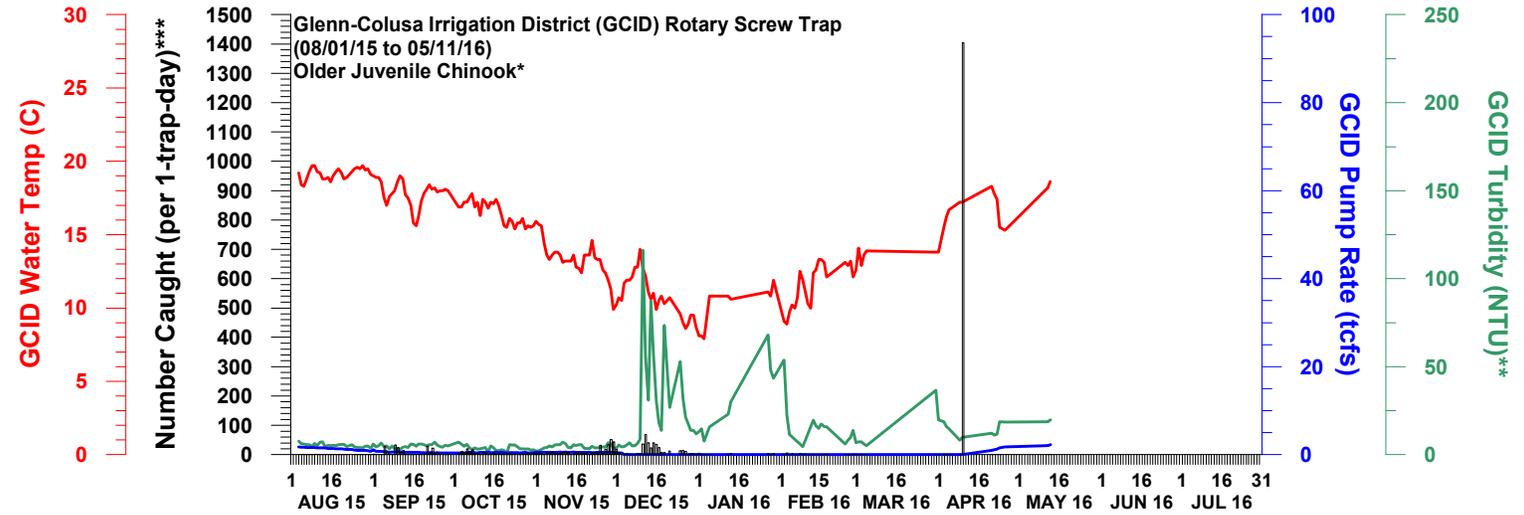
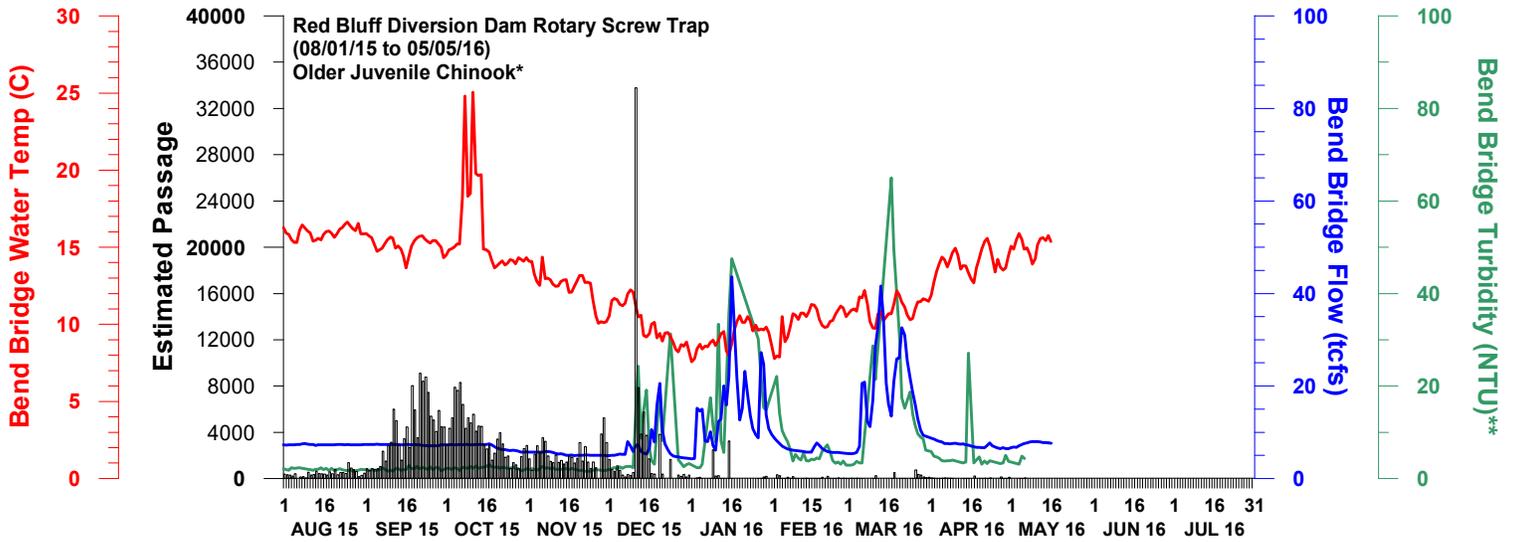
NMFS will draft a TOC for the annual report and will distribute it to the group for the 6/8/2016 meeting.

Agenda Item 11.

Next Meeting: The next DOSS conference call will be on 5/24/16 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 SACRAMENTO RIVER

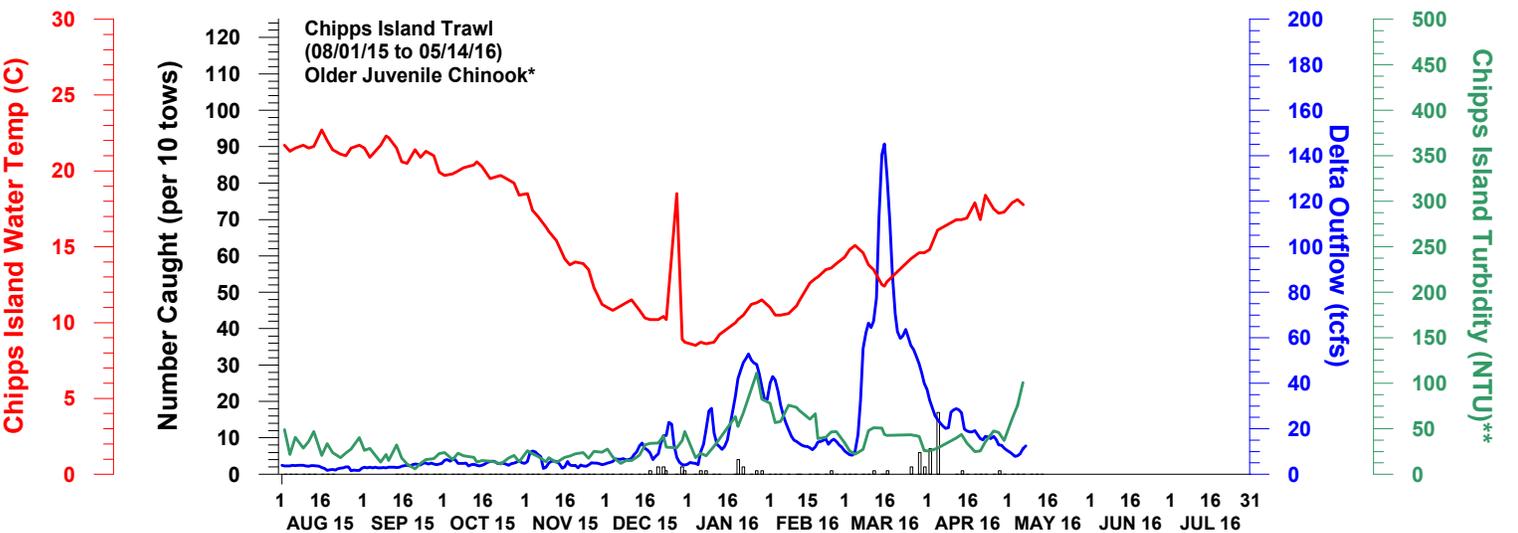
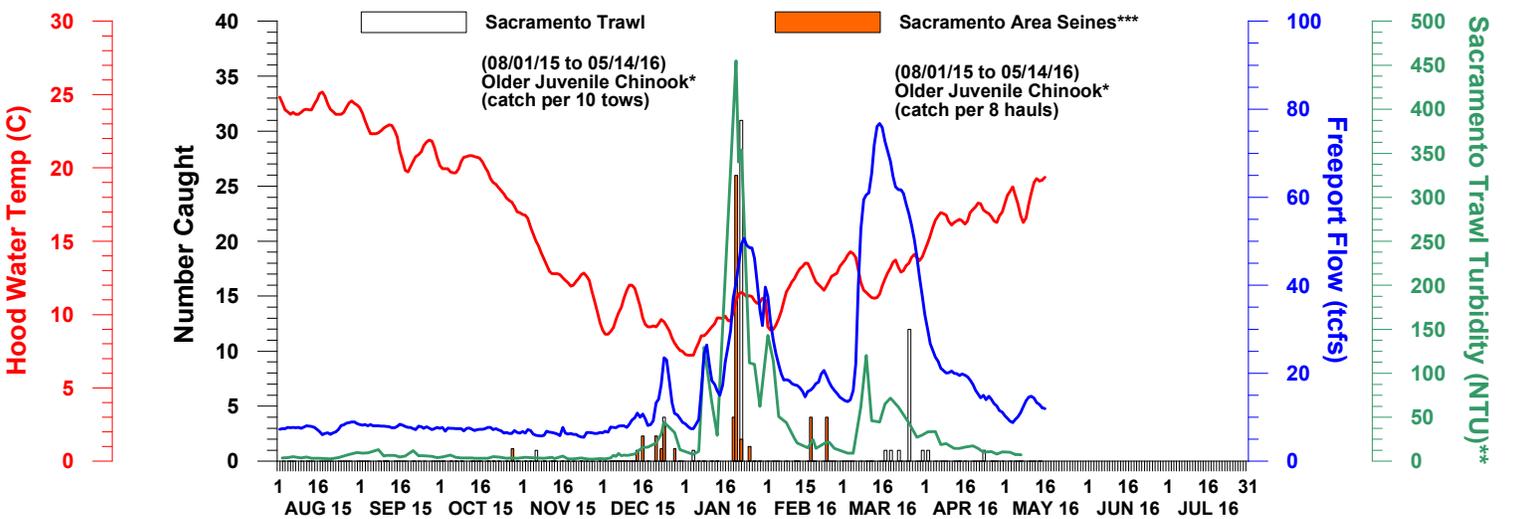
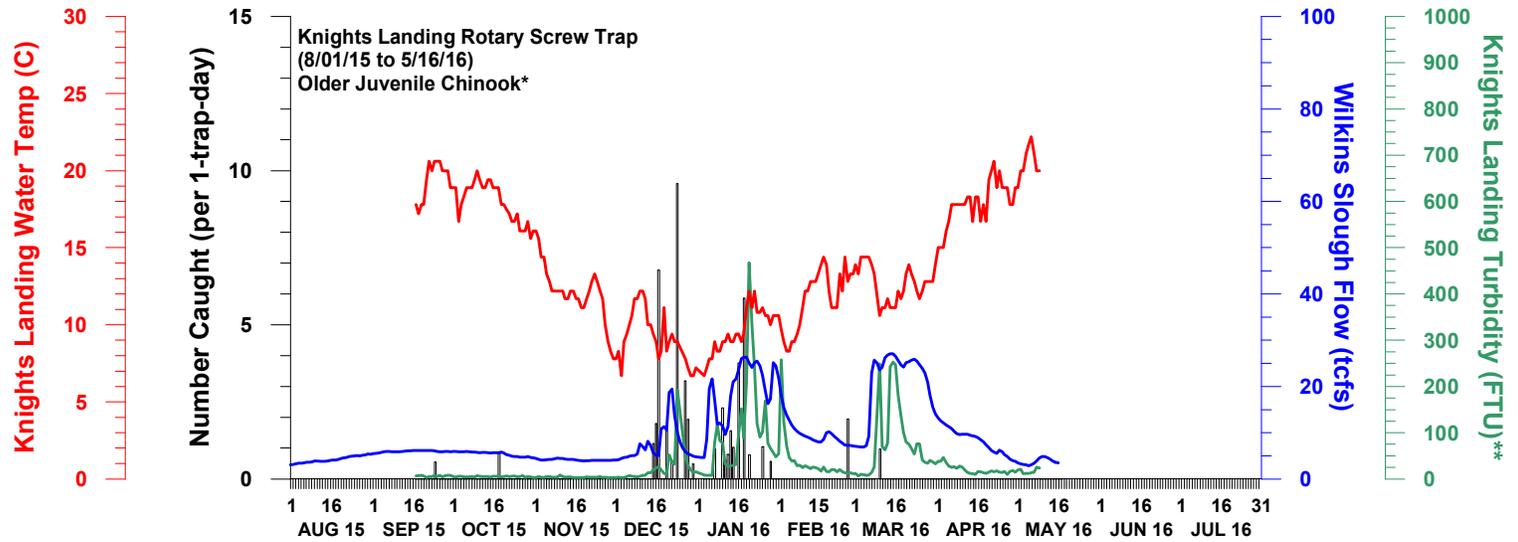


DWR-DES 17 MAY 2016
 Preliminary data from DFW, FWS, GCID, and CDEC; subject to revision.

*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.

-Tisdale: 12/12/2015-12/13/2015 there was a river right revolution malfunction.

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



DWR-DES 17 MAY 2016

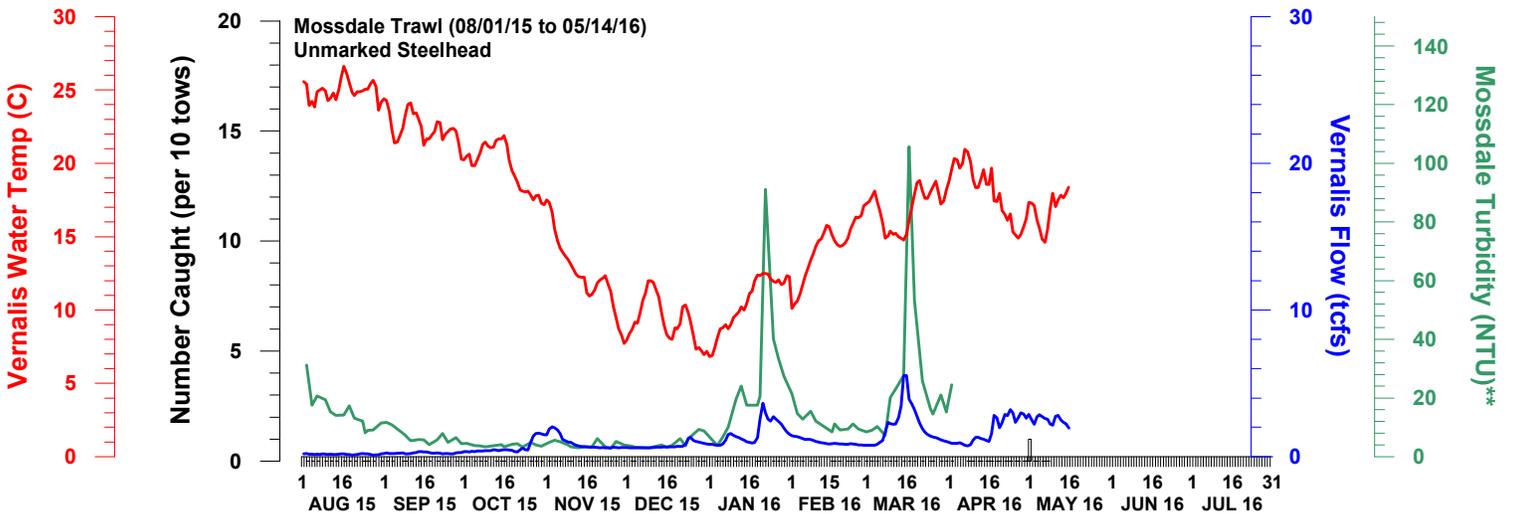
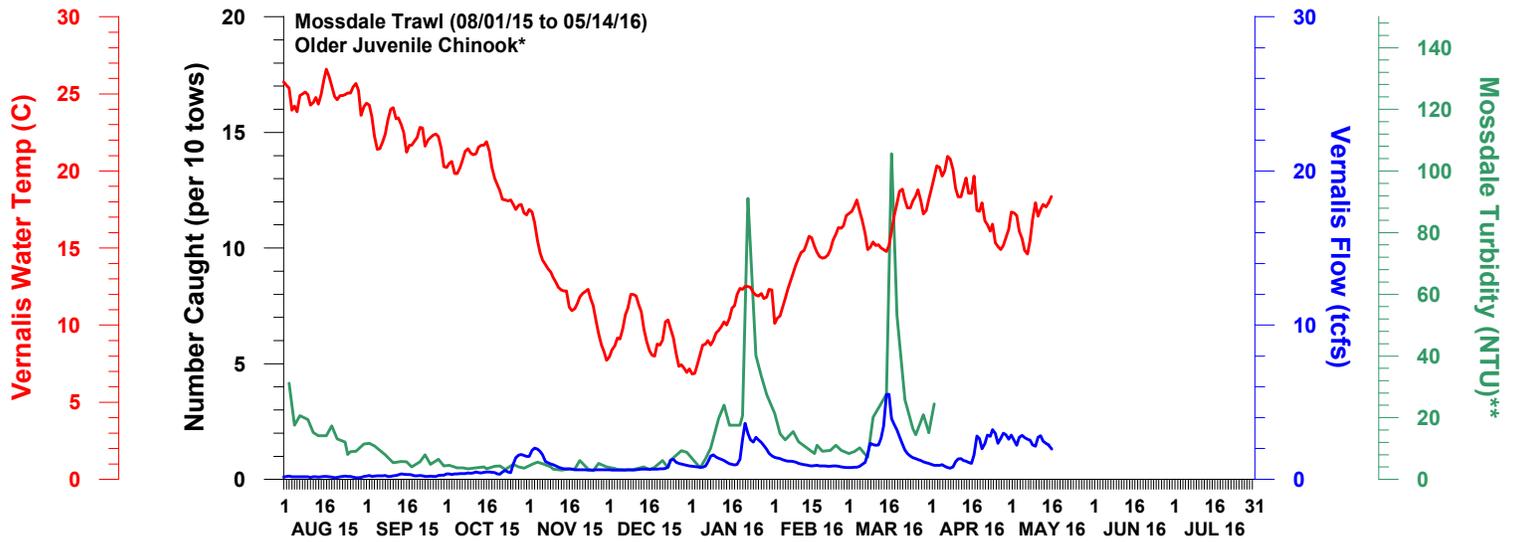
Preliminary data from DFW, FWS, and CDEC; subject to revision.

*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

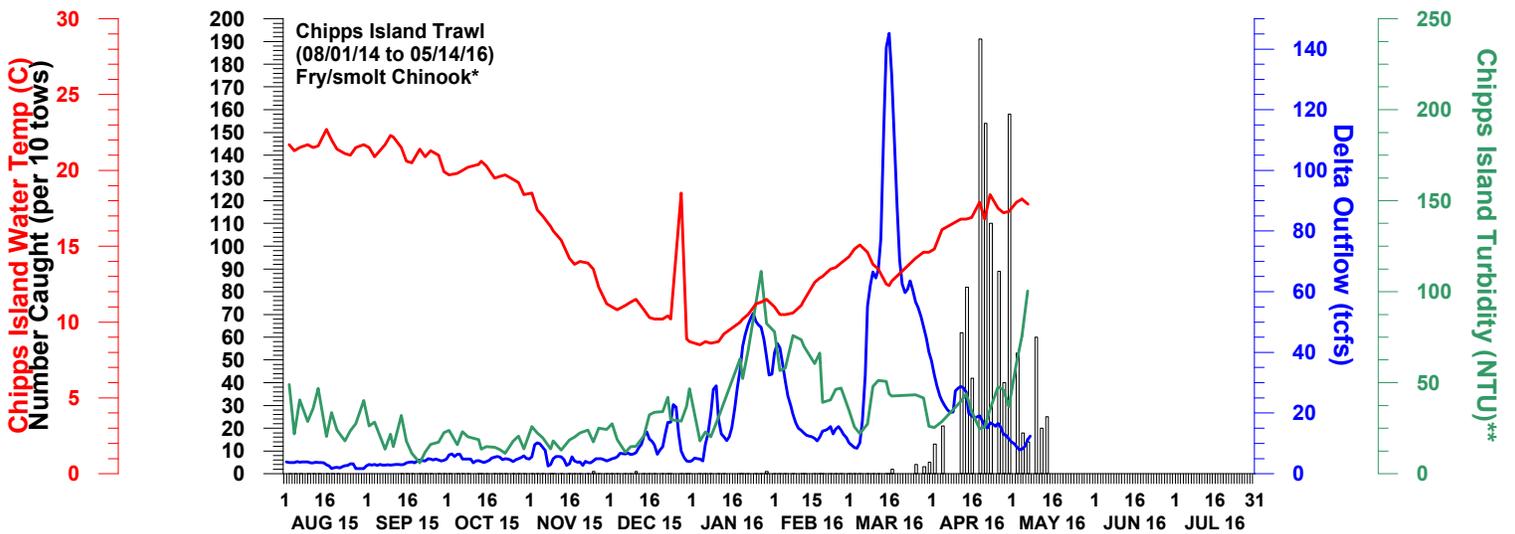
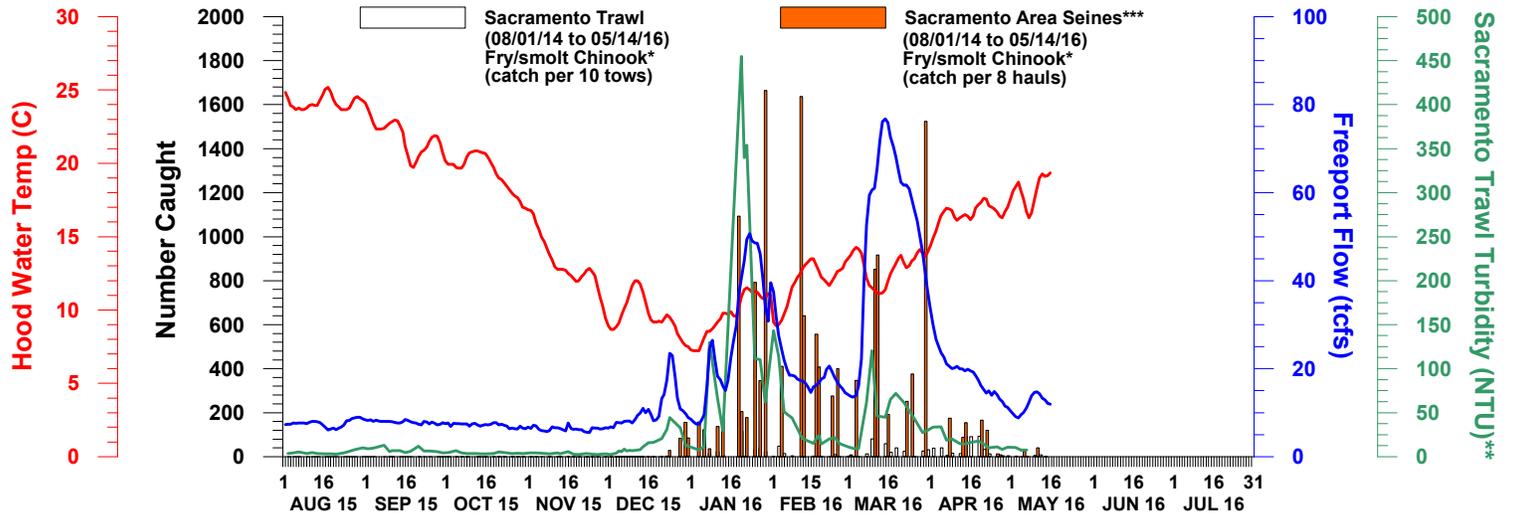
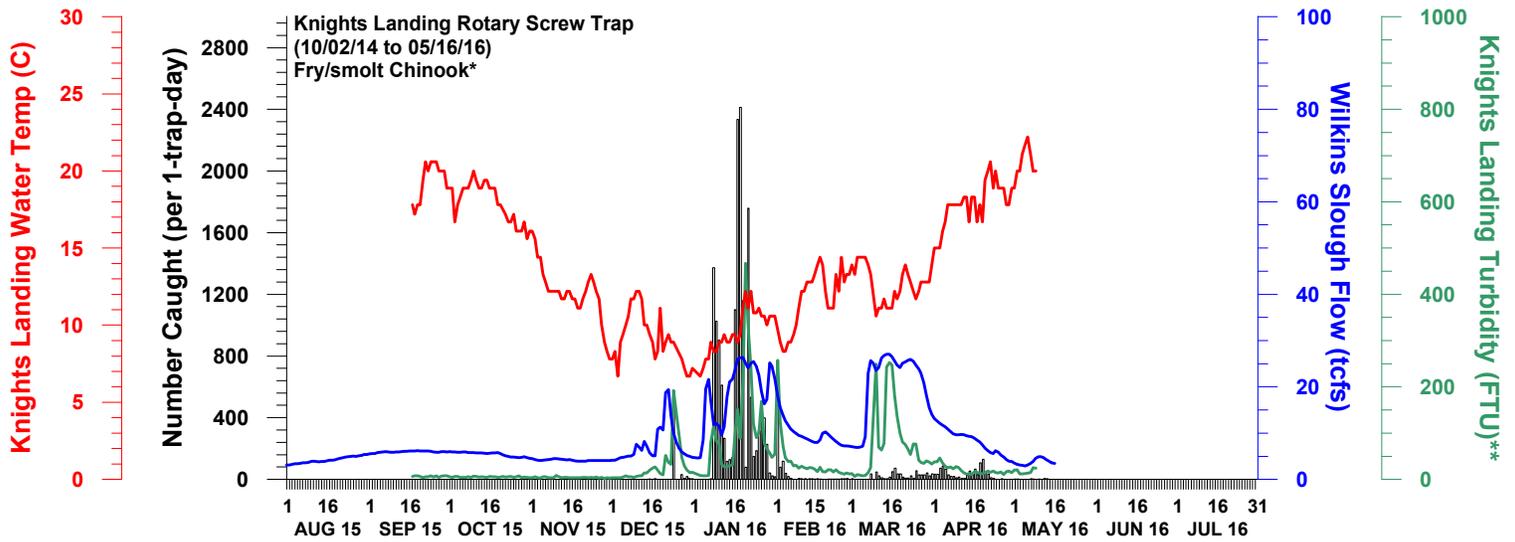


DWR-DES 17 MAY 2016
Preliminary data from FWS,CDFW, and CDEC; subject to revision.

*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 17 MAY 2016

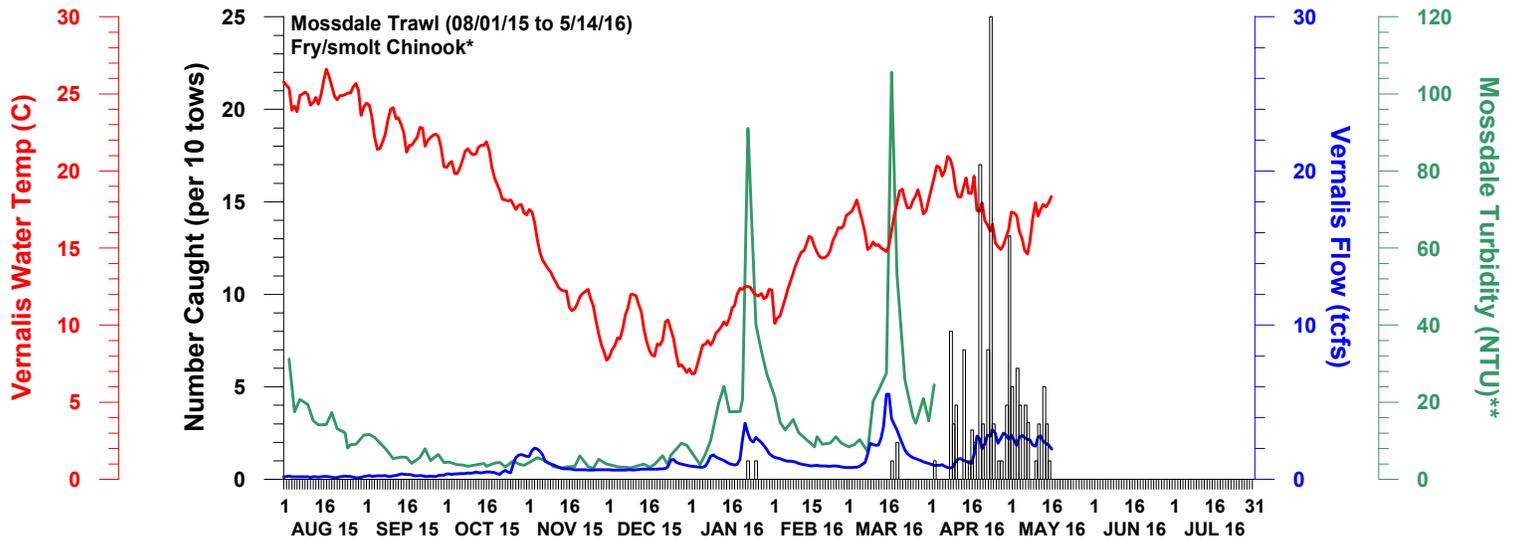
Preliminary data from DFW, FWS, and CDEC; subject to revision.

*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



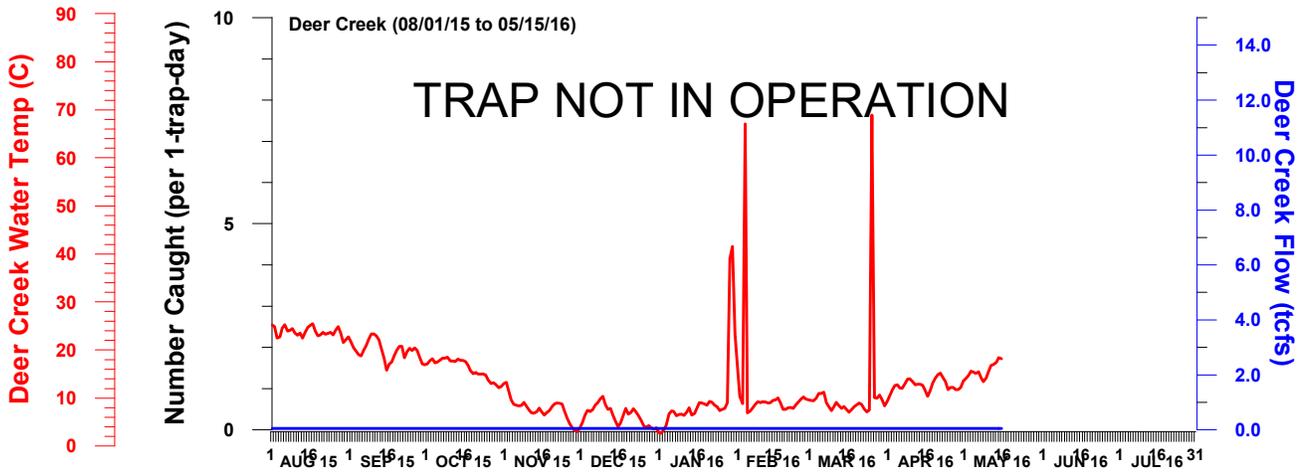
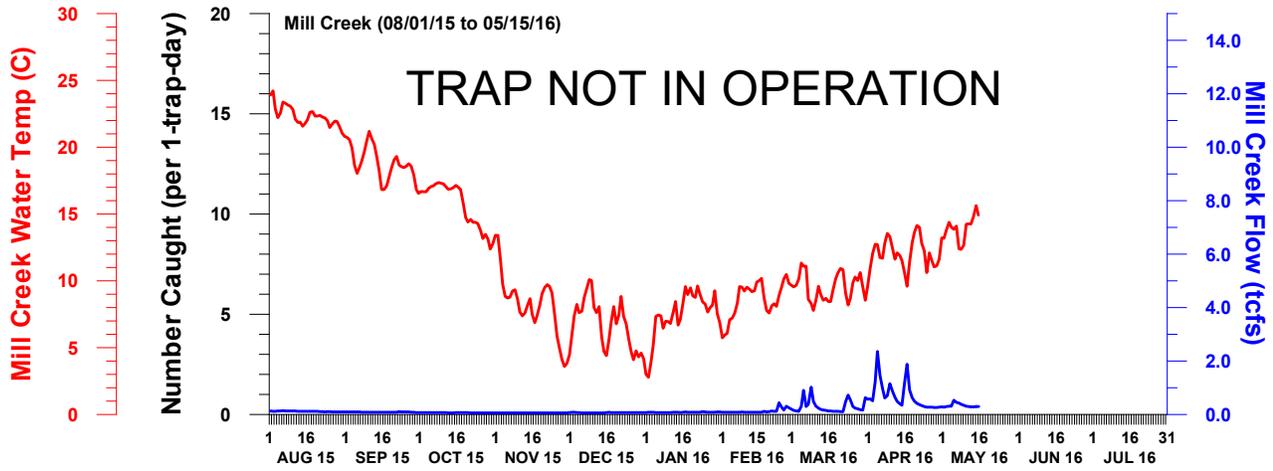
DWR-DES 17 MAY 2016

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.

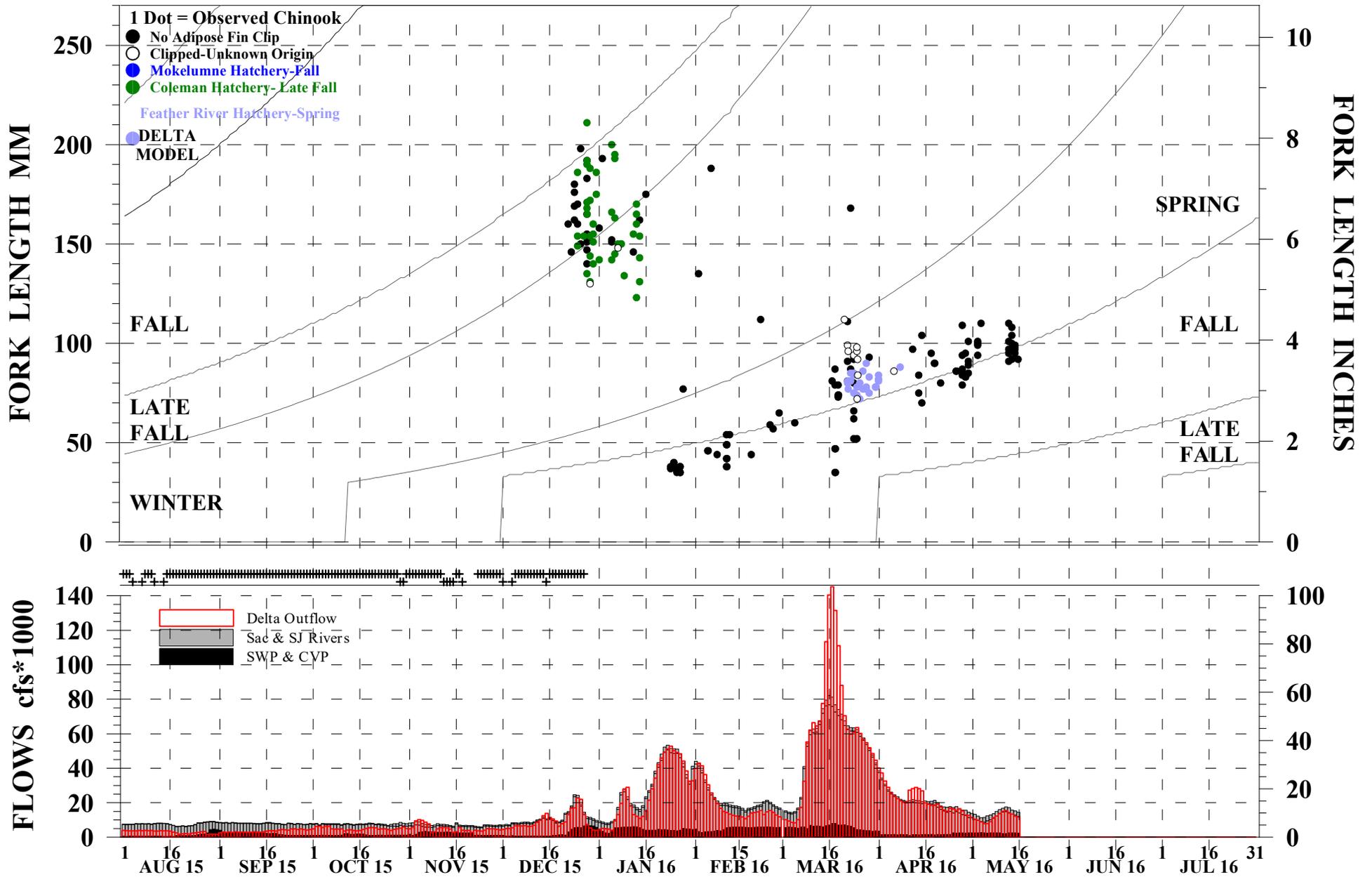
Sacramento River Trawl, Sacramento Area Beach Seine, and Chipps Island Trawl data were obtained directly from FWS, Stockton Fish and Wildlife Office (<http://www.fws.gov/stockton/ifmp/>).

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 05/15/2016

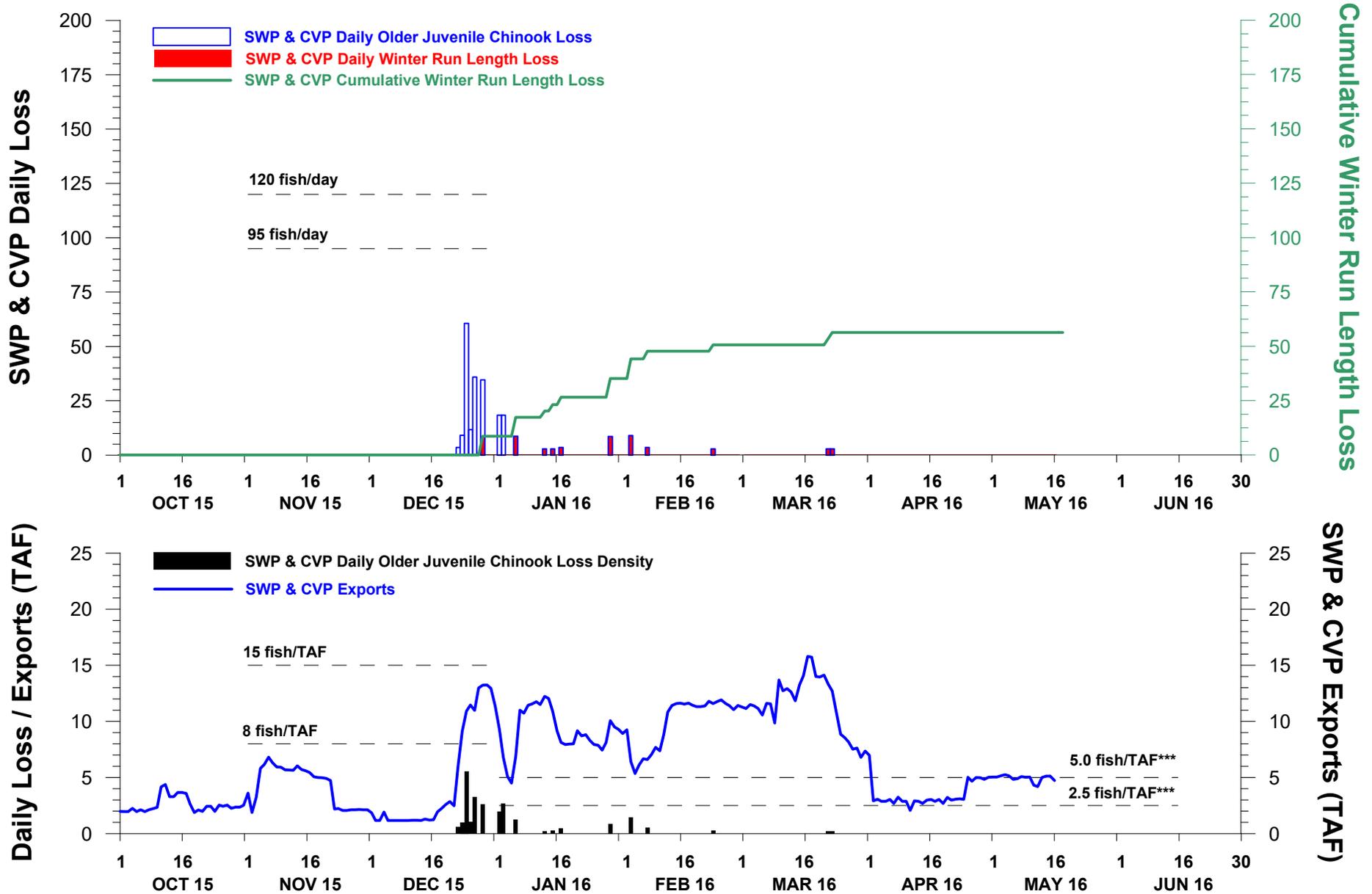


DWR-DES 17 MAY 2016

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 15 MAY 2016



DWR-DES 17 MAY 2016

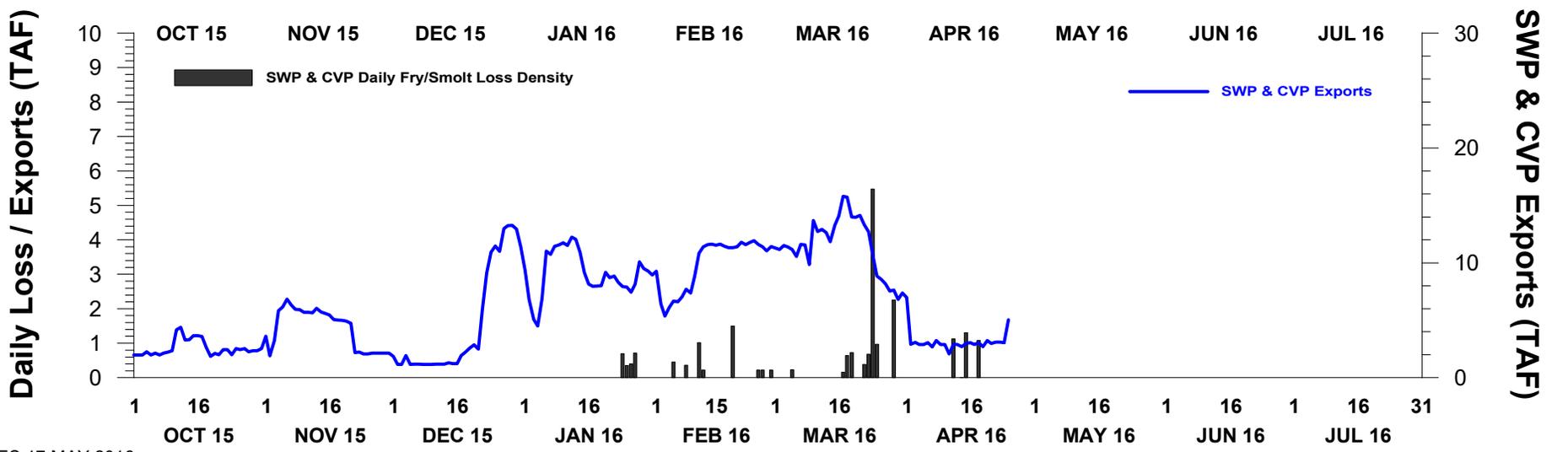
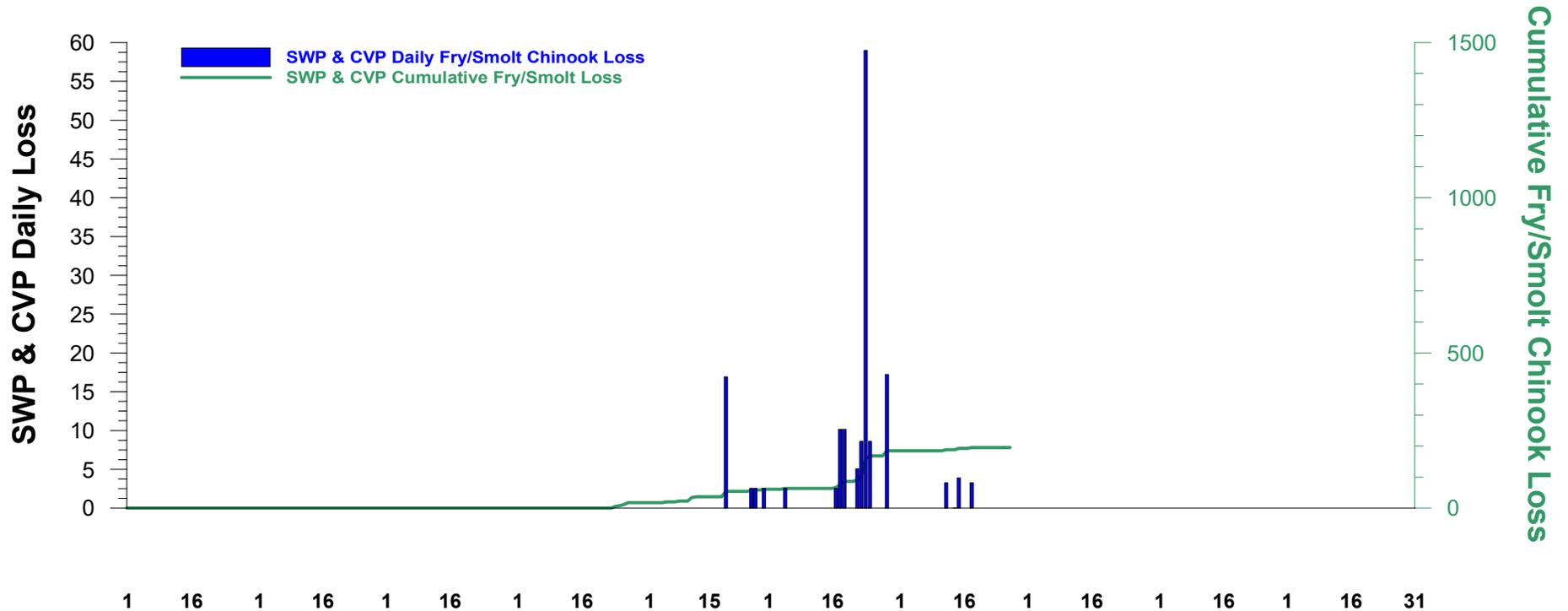
Preliminary data from DFW; subject to revision.

*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.

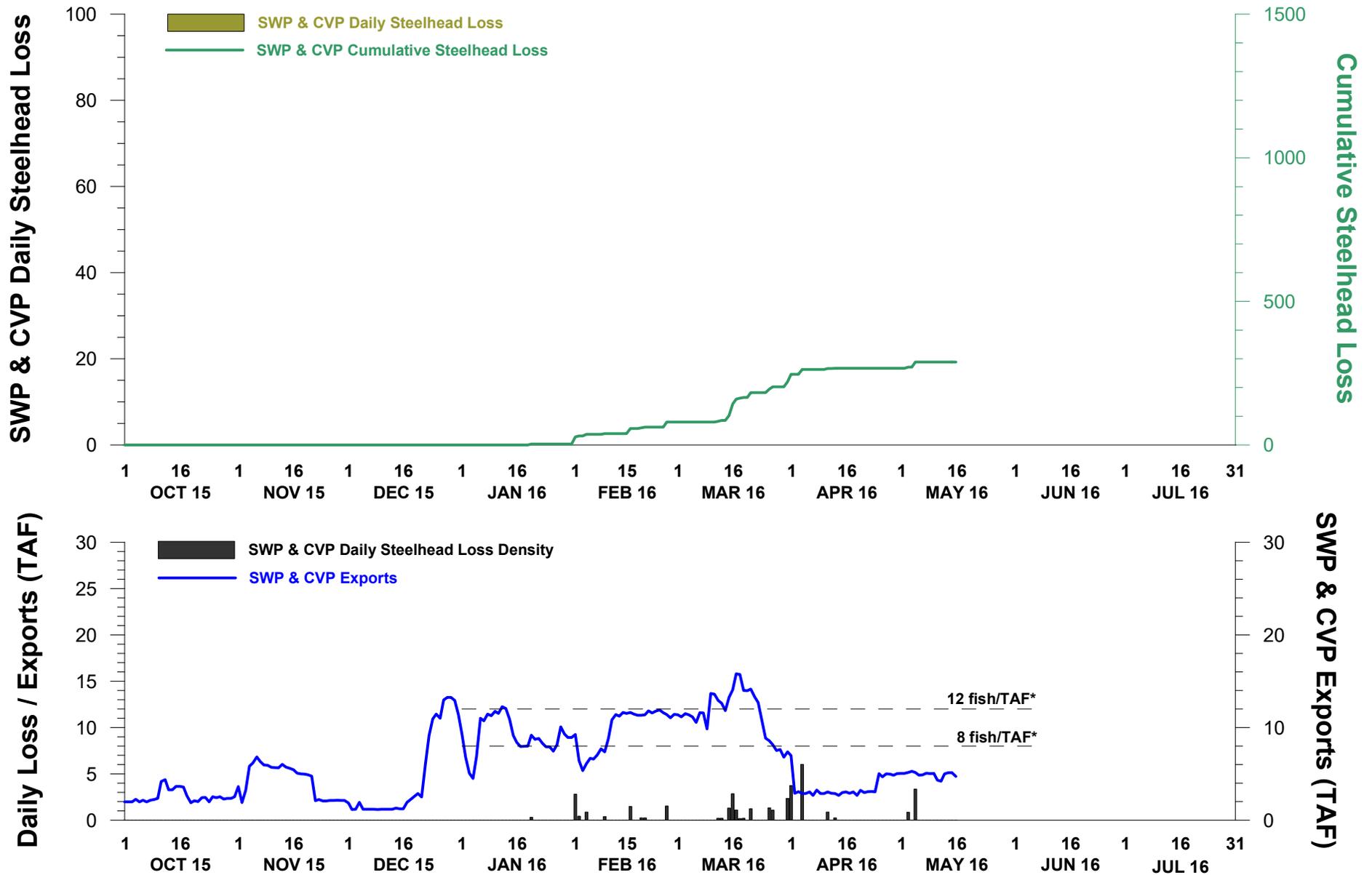
***minimum value determined by NMFS

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



DWR-DES 17 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 15 MAY 2016



DWR-DES 17 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 15 MAY 2016

