

Delta Operations for Salmonids and Sturgeon (DOSS) Group
Conference call: 6/7/16 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, Dan Yamanaka, Kevin Reece

Reclamation: Towns Burgess, Josh Israel

NMFS: Barb Byrne, Kristin McCleery

CDFW: Bob Fujimura, Ken Kundargi, Duane Linander

SWRCB: Brittany Kammerer

FWS: Craig Anderson, Leigh Bartoo

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, 6/3/16, and closed at noon on 6/6/16. 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.

¹ For details, see pages 62-66 in Enclosure 2 of the 2011 Amendments to the 2009 RPA document at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

Action IV.2.3² (OMR Flow Management)

- No triggers were exceeded over the past week.
- Current OMR limit of -5,000 cfs is in effect.
- The offramp for IV.2.3 is satisfied by seven consecutive days, in June, of Mossdale³ average daily water temperature >72°F. To date, Mossdale water temperatures have exceeded 72°F for six consecutive days in June (6/1/16 through 6/6/16).

Action IV.2.1⁴ (I:E ratio)

- The I:E ratio implementation for WY 2016 ended on 5/31/16.

Agenda Item 3.

Current Operations (6/7/16)

SWP		CVP	
Exports (cfs)			
Clifton Court Forebay	3,600	Jones Pumping Plant	800
Reservoir Releases (cfs)			
Feather - Oroville	4,000*	American - Nimbus	4,000
		Sacramento - Keswick	8,000
		Stanislaus - Goodwin	~526
		Trinity - Lewiston	2,746
Reservoir Storage (in TAF)			
San Luis (SWP)	317	San Luis (CVP)	297
Oroville	3,272	Shasta	4,129
New Melones	638	Folsom	819
Delta Operations			
DCC	Closed**	Sacramento River at Freeport (cfs)	13,062
Outflow Index (cfs)	~7,100	San Joaquin River at Vernalis (cfs)	765
E:I	22% (3-day avg.)	X2	81 km

*Releases at Oroville Reservoir were increased for export.

**Through June 15, the expectation is that gates will be opened on Friday morning and closed mid-day on Monday.

OMR as of 6/6/16:

	Index ⁵
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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

³ Based on water temperatures reported at the “MSD” station on CDEC

⁴ 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

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

	(cfs)
Daily	-4,600
5-day	-4,400
14-day	-2,700

Review of factors controlling Delta exports for the period 5/31/16 to 6/7/16:

- Tuesday, 5/31/16: Exports were controlled by the San Joaquin River I:E ratio
- 6/1/16 to 6/7/16: Exports were controlled by the Delta outflow requirement in D-1641.

The weather forecast predicts highs in the upper 80’s and lower 90’s through the end of the week with no chance of precipitation.

Agenda Item 4.

Smelt Working Group

The Smelt Working Group’s last regularly scheduled meeting of WY 2016 was 5/31/16. 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>.

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 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 30-June 5, 2016

Prepared by Bob Fujimura on June 6, 2016 14:37

Preliminary Results -Subject to Revision

Criteria	30-May	31-May	1-Jun	2-Jun	3-Jun	4-Jun	5-Jun	Trend	
Loss Densities									
Wild older juvenile CS	0	0	0	0	0	0	0	→	0
Wild steelhead	0	0	0	0	0	0	0	↘	0
Exports									
SWP daily export	1,268	1,274	5,150	3,713	3,439	1,446	4,674	↘	2,995
CVP daily export	1,586	1,587	1,587	1,593	1,589	1,590	1,595	↘	1,590
SWP reduced counts	0%	29%	10%	25%	19%	0%	38%	↘	17%
CVP reduced counts	0%	0%	0%	0%	0%	0%	0%	↘	0%

Loss Density = fish lost/TAF; water export = AF; Trend = compared to previous week; wild = adipose fin present

Loss = estimated number of fish lost at the CVP and SWP Delta export facilities based on estimated salvage (see below)

Reduced counts = percentage of time that routine salvage sample time were less than 30 min per 2 hours of salvage and export operations

Yellow highlighted dates indicate TFCF salvage 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	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	0	0	↘	119	293
Hatchery	1	1	↘	1,322	3,567
Total	1	1		1,441	3,860

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 5/30/16-6/5/16.

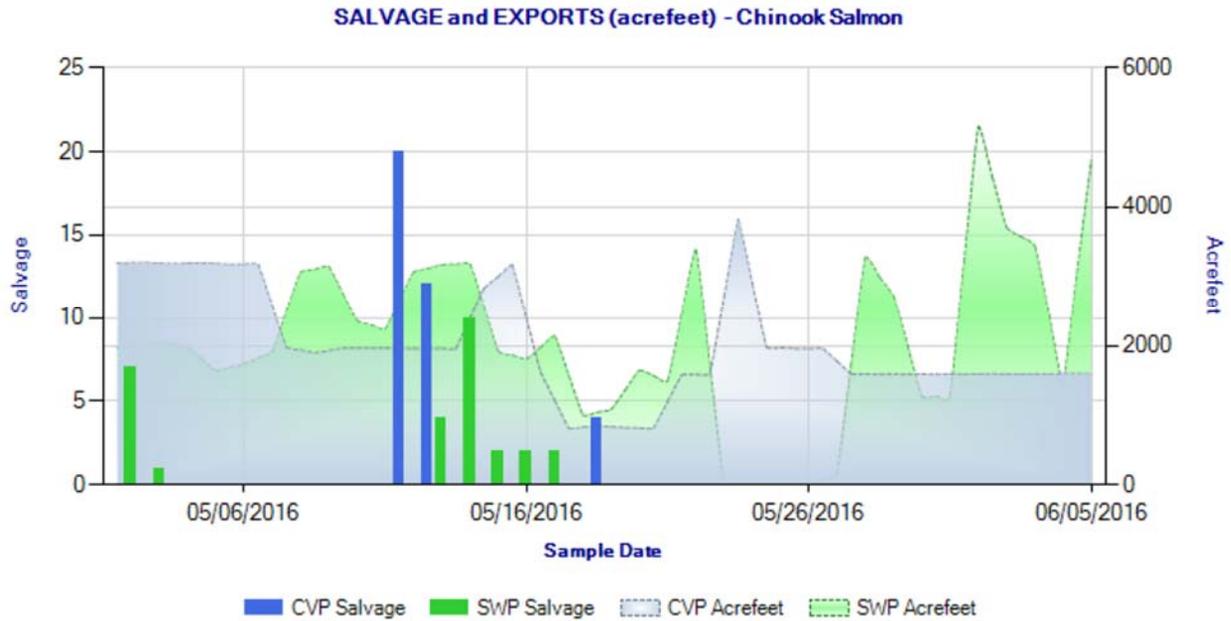


Figure 2. Daily salvage of Chinook salmon (all races) and water exports from the state and federal fish salvage facilities during May 2, 2016 through June 5, 2016.

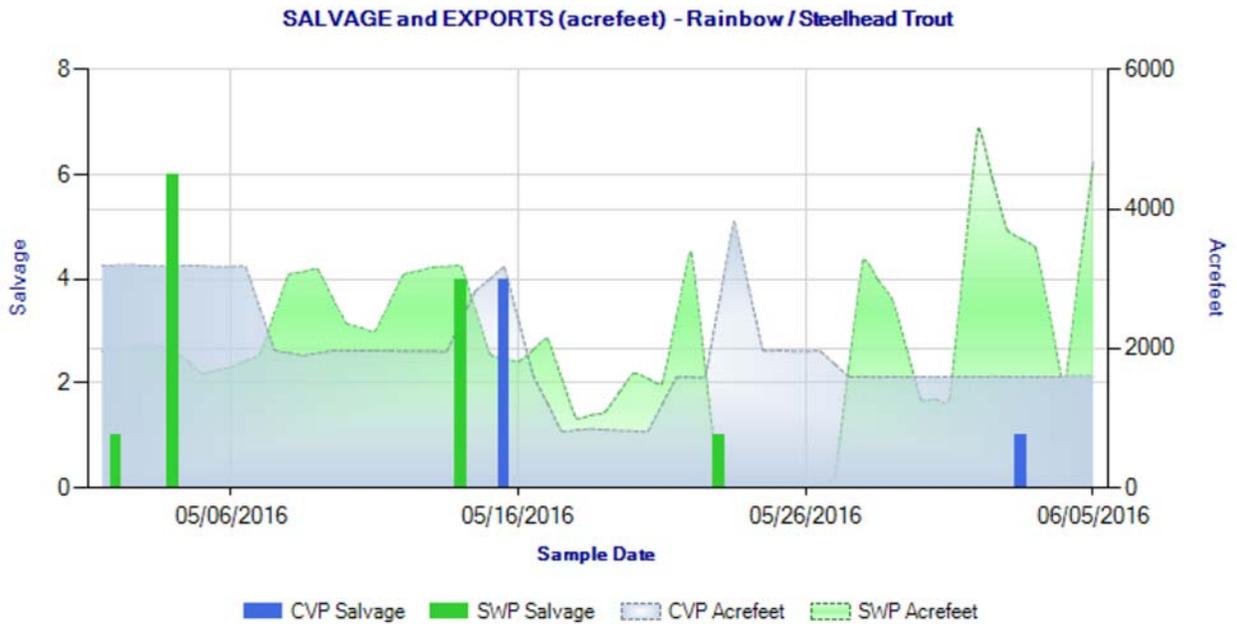


Figure 3. Daily salvage of Steelhead and water exports from the state and federal fish salvage facilities during May 2, 2016 through June 5, 2016.

Preliminary salvage report for Tuesday, 6/7/16:

- No salmonids were observed at either facility.

- On 6/2/16, the Skinner Fish Facility briefly halted salvage operations for less than 10 minutes for predator removal in their secondary channel system.
- Over the past week, the Skinner Fish Facility has frequently reduced night-time salvage counts to less than 30 minutes (usually around 20 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.

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 6/5/2016.

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 6/06/2016

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	5/31, 6/1, 6/3	5/31, 6/1, 6/3	5/31-6/2	Sampling suspended	5/31-6/6	5/31-6/5
FR Chinook	36				132	1
SR Chinook	8					
WR Chinook						
LFR Chinook						
Ad-Clipped Chinook	5				7	
Chinook Adult						
Steelhead (wild)						
Steelhead (ad-clip)						
Green Sturgeon					1	
Delta Smelt						
Splittail	5		206			
Longfin Smelt						
Flows (avg. cfs)					844	
W. Temp. (avg. °F)					66.5	
Turbidity (avg. NTU)					12.9	

^A Data reported in the 5/29 to 6/4 DJFMP sampling summary.

^B As of 6/1, trapping at Knight’s Landing has been suspended due to increased water temperatures reaching unsafe handling levels. River temperatures will continue to be monitored.

^C The GCID trap sampling period was from 5/31 at 9 am to 6/6 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 non ad-clipped Chinook salmon. Mossdale data was received after the weekly call. 30 total trawl 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

The following information was shared with DOSS on 6/7/16 via e-mail, soon after the DOSS call:

On 6/6/16 to 6/7/16, CDFW will release approximately 1,378,281 brood year 2015 fall-run Chinook from Nimbus Hatchery into net pens at Mare Island. This release includes two tag groups, one 25% marked (CWT and adipose fin clip) and the other 26% marked.

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.

Rationale for distributions

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 recently. 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. The winter-run hatchery release occurred in February, 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. Water temperatures at Mossdale and Vernalis are in the mid-70's this week.

- **Routing Risk:**
 - **For Sacramento River: LOW to MEDIUM** (*last week: same*)
 - 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 was removed on 6/1, increasing the chance of fish entrainment into the Old River route leading to the interior of the South Delta and the Projects. Because fish entrainment into the interior channels of the South Delta through Turner Cut, Columbia Cut, the mouth of Middle River, and the mouth of Old River is possible regardless of HOR barrier status, the overall entrainment risk remains unchanged compared to last week.
- **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: Few listed salmonids remain in the Delta.

- **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.

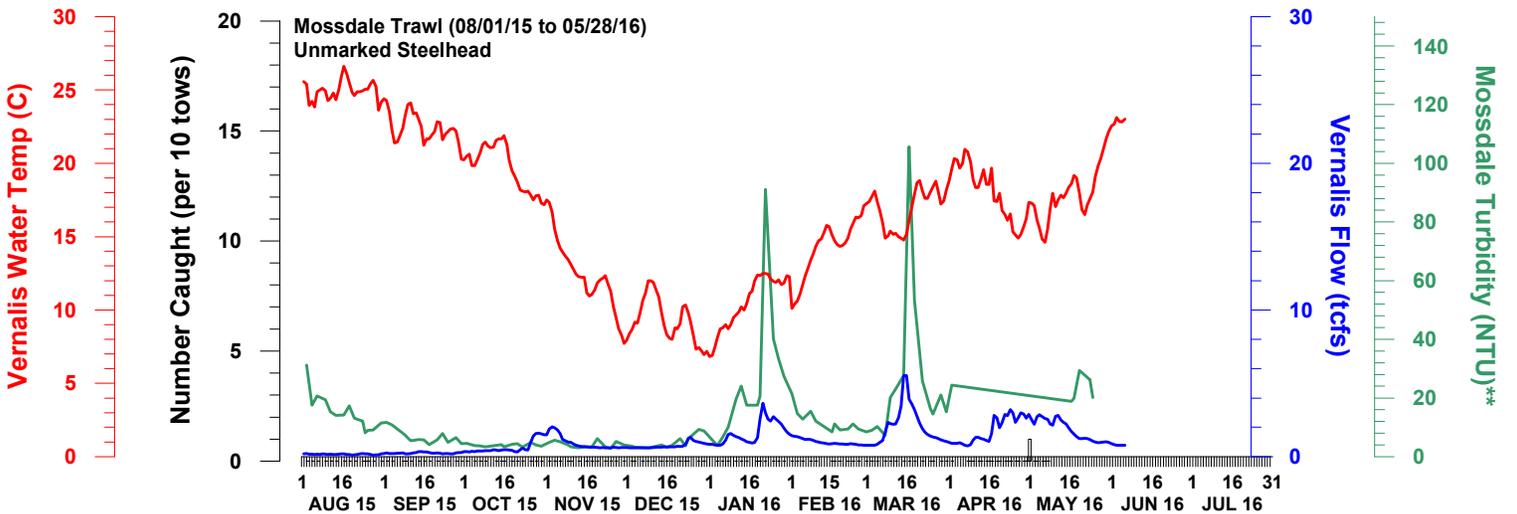
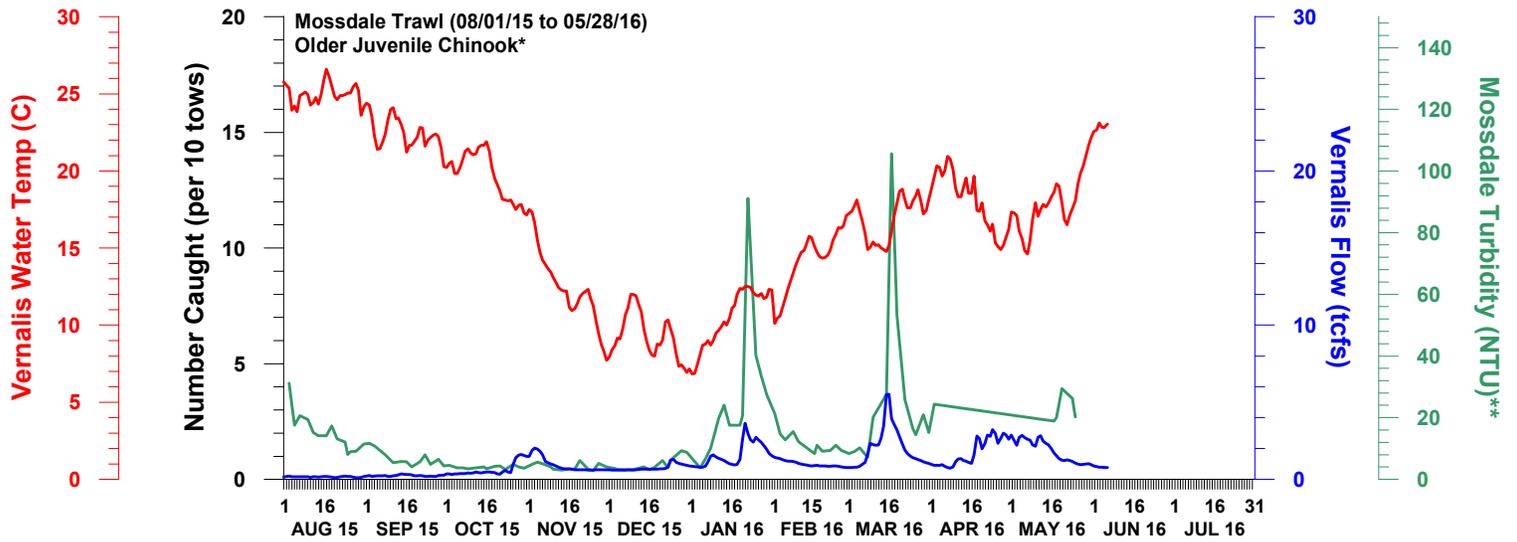
DOSS Advice to WOMT and NMFS: None

Agenda Item 11.

Next Meeting: The next DOSS conference call will be on 6/14/16 at 9am. The 6/14/16 call will be the last weekly DOSS call for WY 2016. The group will discuss preparation of the WY 2016 DOSS Annual Report.

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 AND STEELHEAD MEASURED IN THE SAN JOAQUIN RIVER

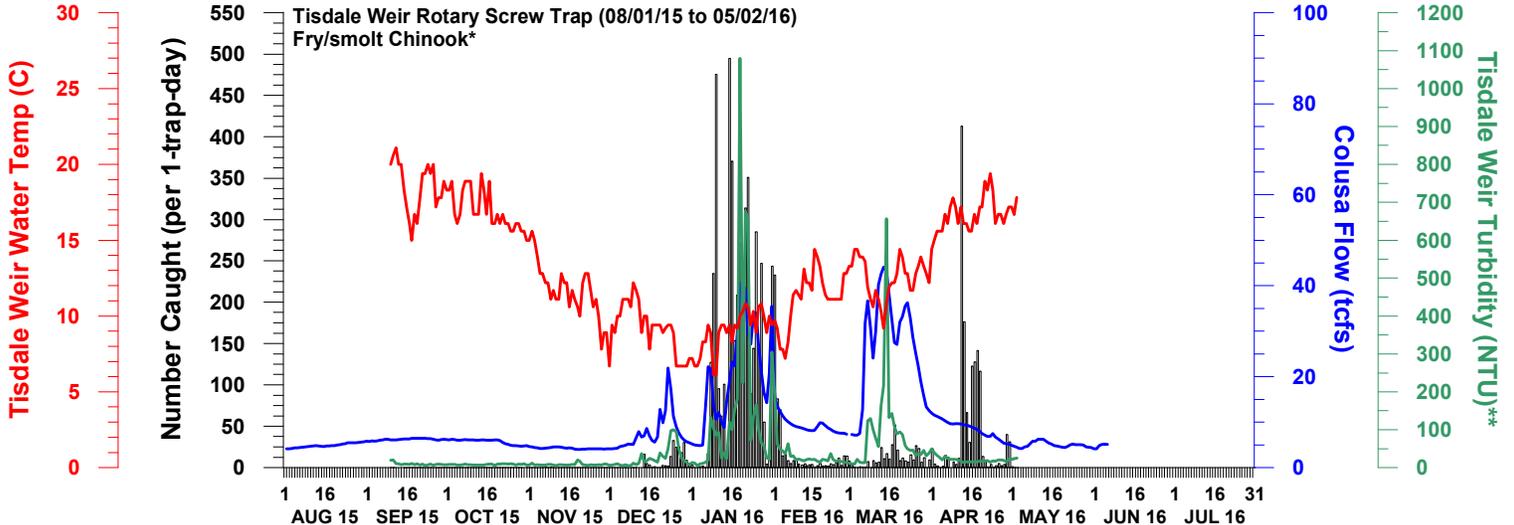
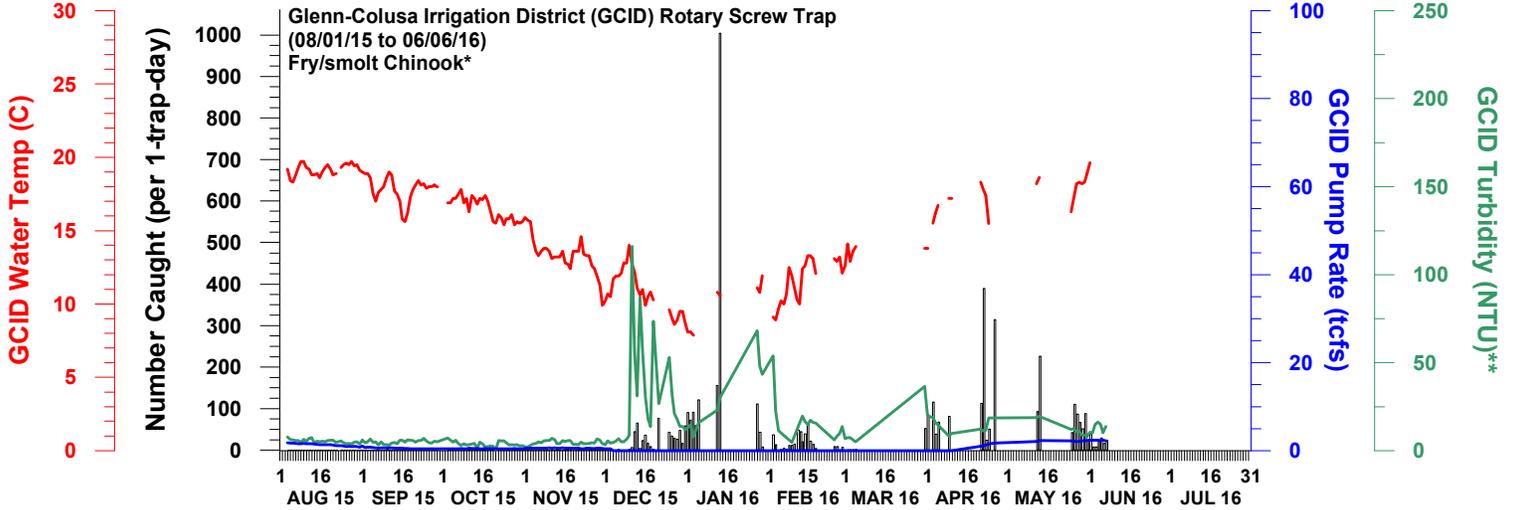
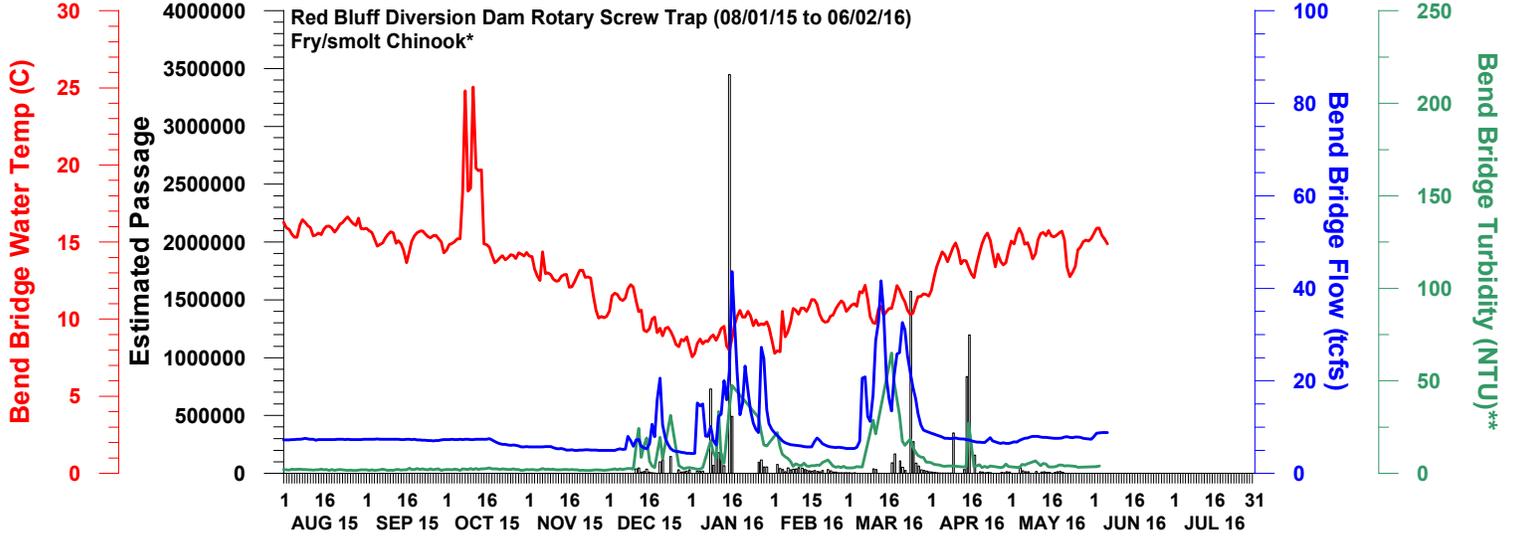


DWR-DES 7 JUNE 2016
Preliminary data from FWS,CDFW, and CDEC; subject to revision.

*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 SACRAMENTO RIVER



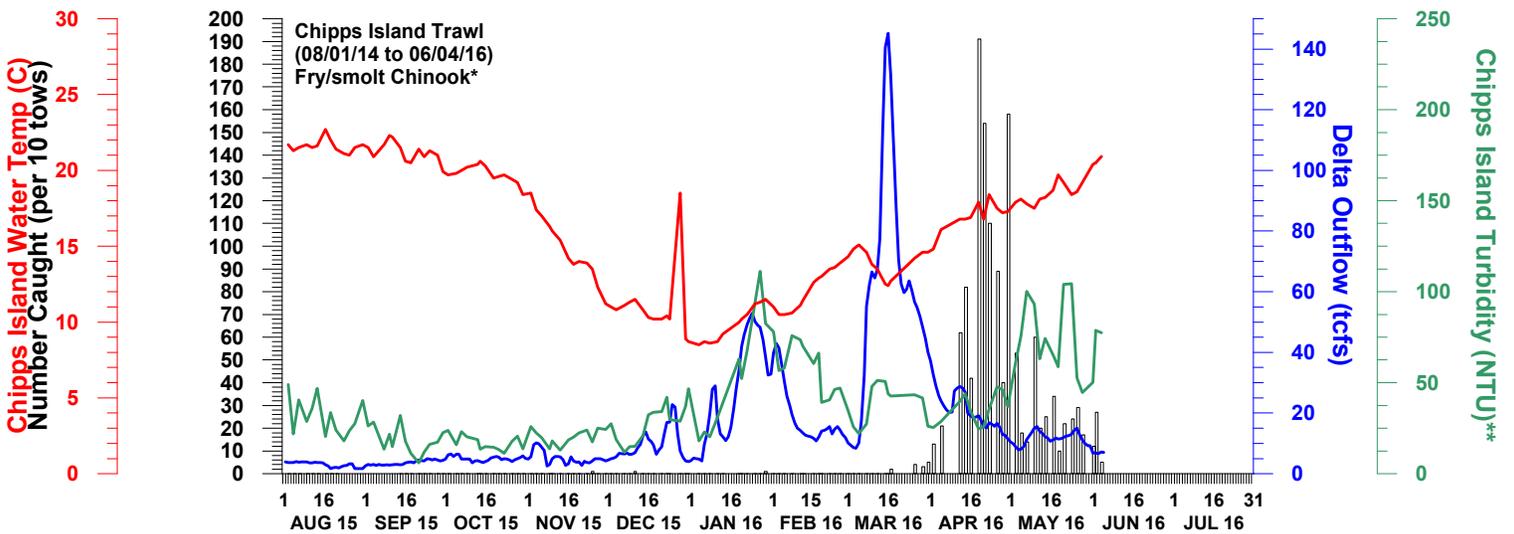
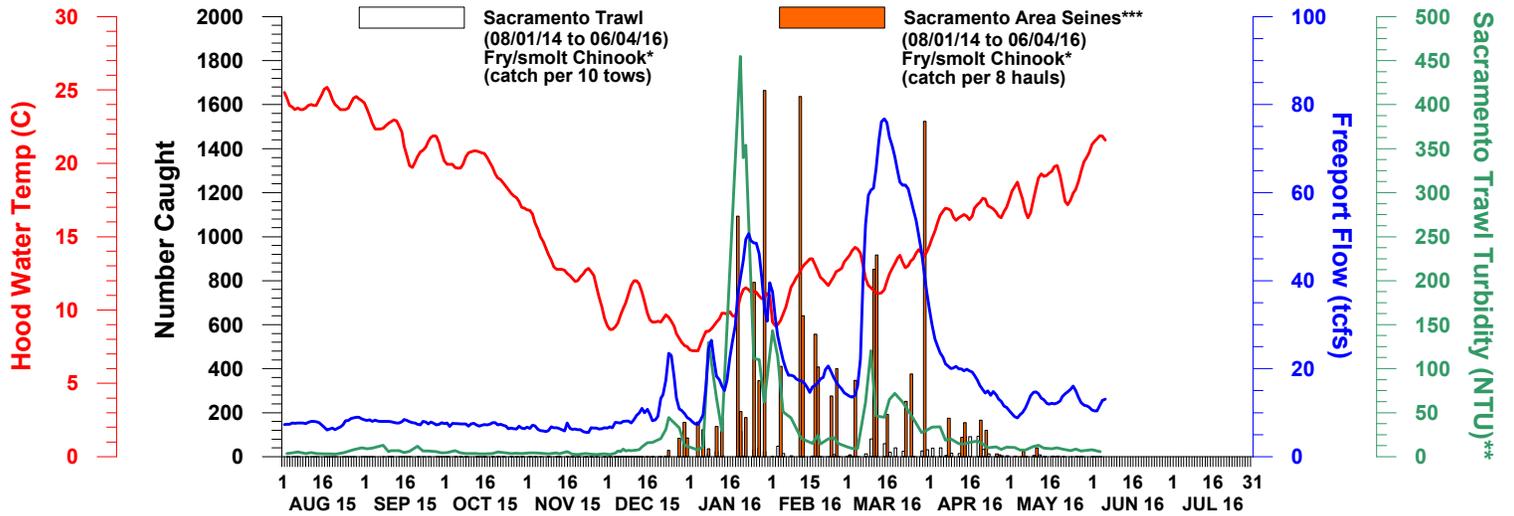
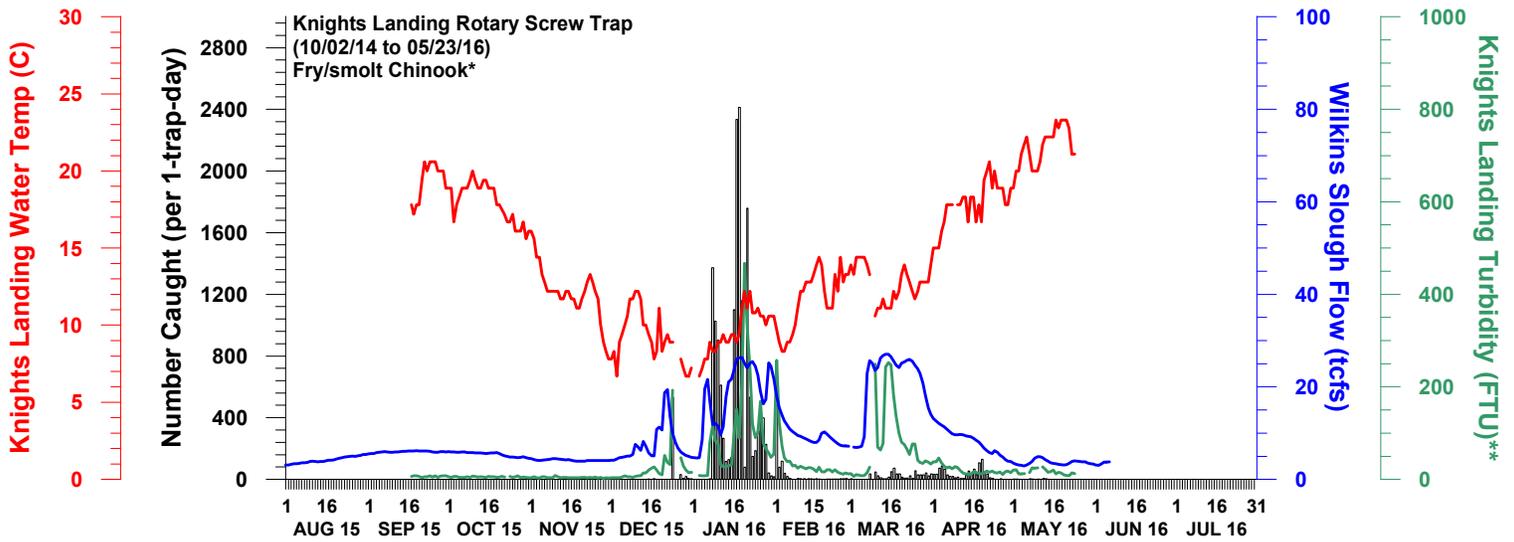
DWR-DES 7 JUNE 2016

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

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

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

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



DWR-DES 7 JUNE 2016

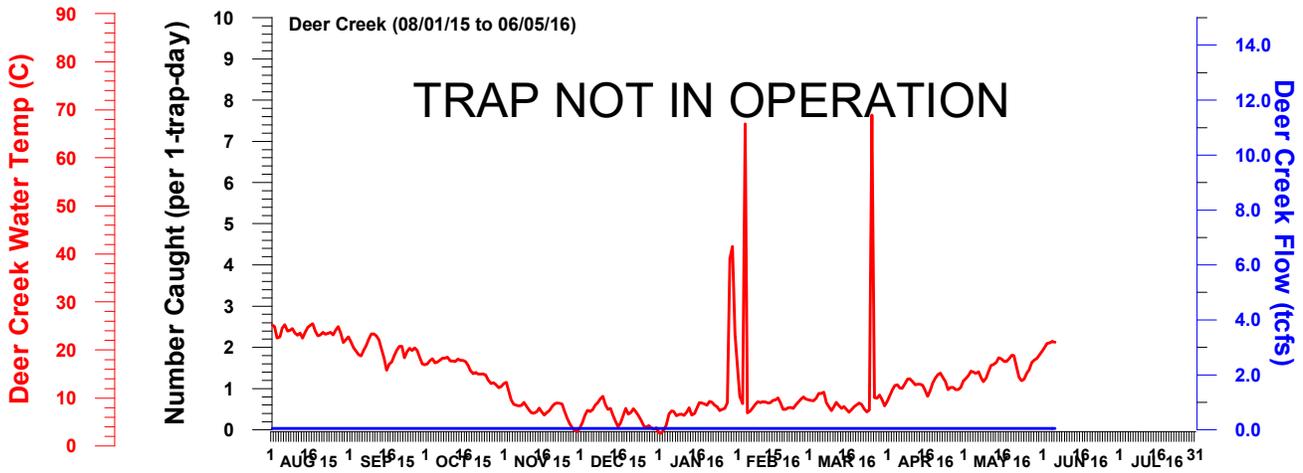
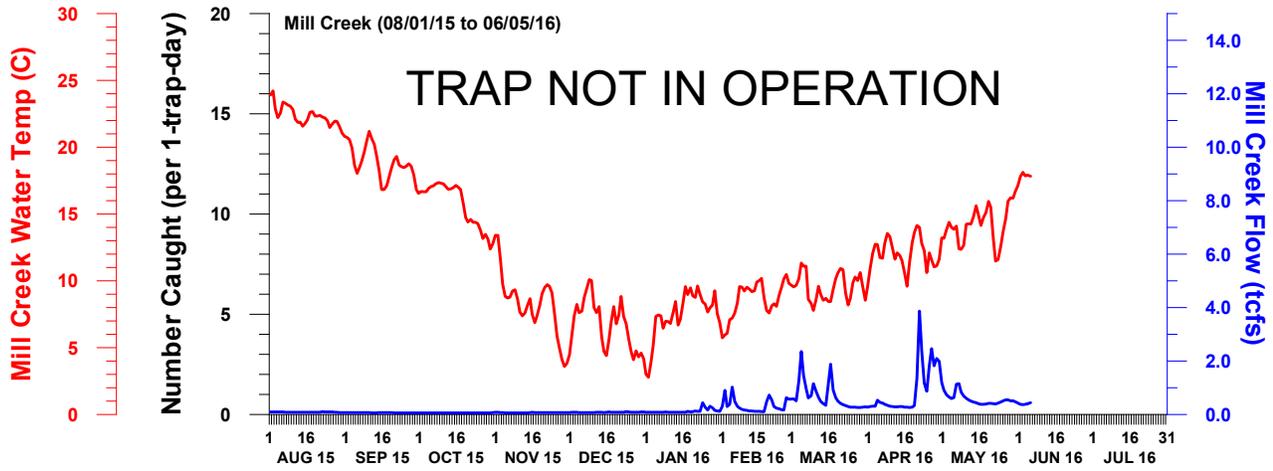
Preliminary data from DFW, FWS, and CDEC; subject to revision.

*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.

WATER TEMPERATURE AND FLOW MEASURED AT MILL AND DEER CREEK



Data Acquisition:

All data are preliminary and subject to revision.

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

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

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

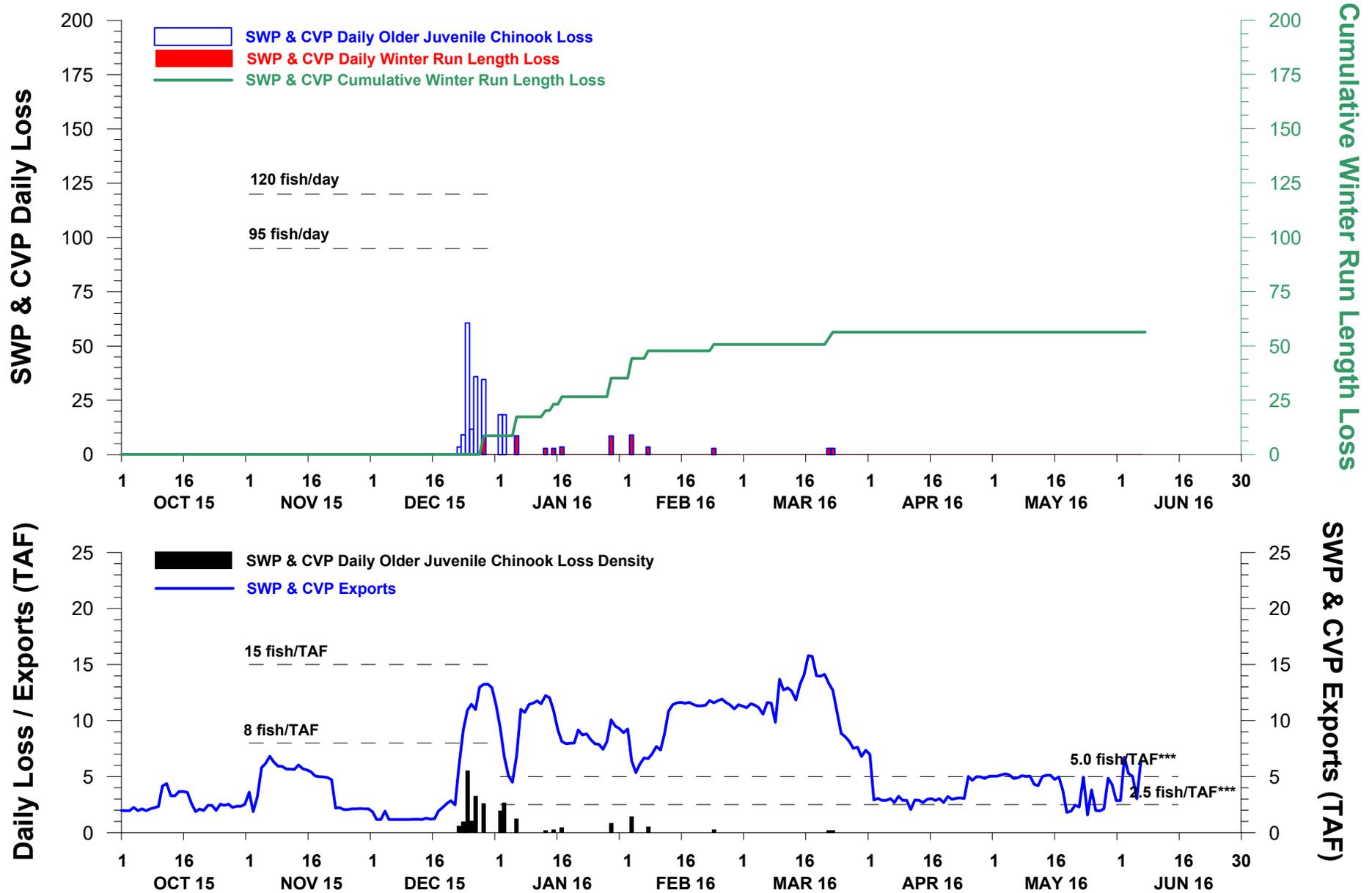
Sacramento River Trawl, Sacramento Area Beach Seine, and Chipps Island Trawl data were obtained directly from FWS, Stockton Fish and Wildlife Office (<http://www.fws.gov/stockton/ifmp/>).

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

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

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

NON-CLIPPED WINTER RUN & OLDER JUVENILE CHINOOK LOSS AT THE DELTA FISH FACILITIES 01 OCT 2015 THROUGH 05 JUNE 2016



DWR-DES 6 JUNE 2016

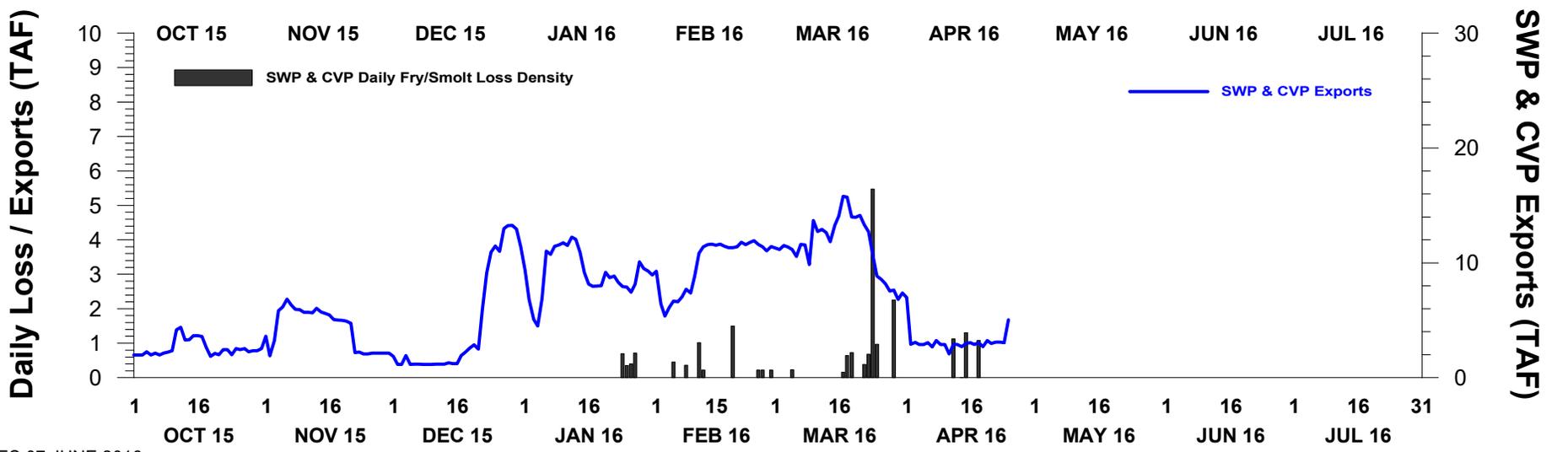
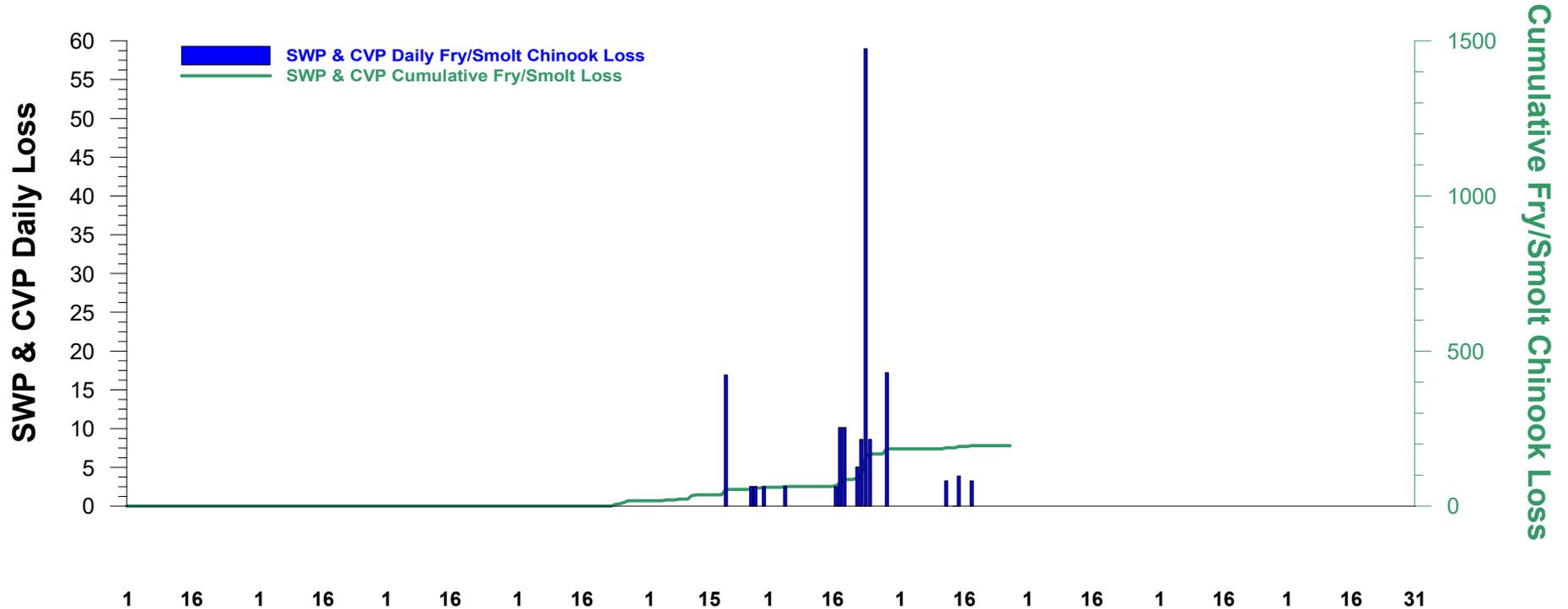
Preliminary data from DFW; subject to revision.

*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.

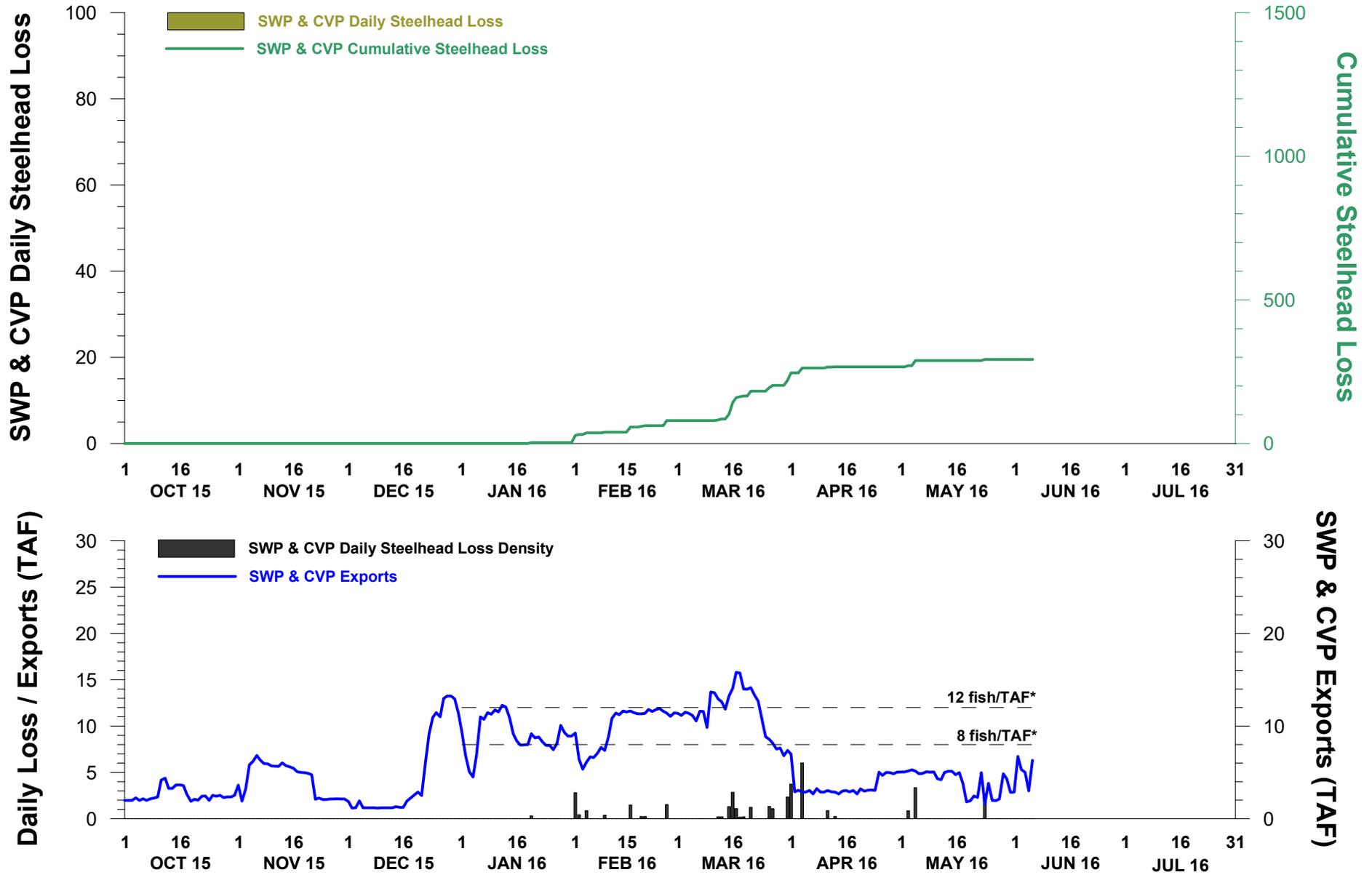
***minimum value determined by NMFS

NON-CLIPPED FRY/SMOLT CHINOOK LOSS AT THE DELTA FISH FACILITIES 01 OCT 2014 THROUGH 05 JUNE 2016



DWR-DES 07 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 05 JUNE 2016



DWR-DES 6 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 05 JUNE 2016

