

Delta Operations for Salmonids and Sturgeon (DOSS) Group
Conference call: 04/07/2015 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: Farida Islam, Kevin Reece, Aaron Miller, Rhiannon Mulligan

Reclamation: Josh Israel

NMFS: Barb Byrne, Jeff Stuart, Meiling Roddam

USFWS: Craig Anderson, Roger Guinee

CDFW: Duane Linander

SWRCB: Matt Holland

EPA: Erin Foresman

Agenda Items

1. Agenda review and introductions
2. RPA Implementation review
3. Current Operations
4. Latest on drought planning
5. Smelt Working Group
6. Fish Monitoring
7. DOSS Advice
8. eTPM Revisited: Review of ePTM output for April-May TUCP scenarios

Agenda Item 2.

RPA Implementation Review

Delta RPA Actions affecting operations during April:

Action IV.1.2 (DCC gate operations):

- Default DCC gate closure.

Action IV.2.3 (OMR Flow Management)

- The OMR limit of no more negative than -5,000 cfs is in effect, but not controlling delta exports.

Action IV.2.1 (I:E ratio)

- Currently, the Critical year 1:1 ratio (of San Joaquin inflow at Vernalis to combined CVP/SWP exports) is in effect, this action restricts combined exports to 100% of Vernalis flow, or 1,500 cfs, whichever is greater)

Agenda Item 3.

Current Operations (04/07/2015)

SWP		CVP	
Exports (cfs)			
Clifton Court Forebay	550 ¹	Jones Pumping Plant	1,000
Reservoir Releases (cfs)			
Feather - Oroville	1,200 ²	American - Nimbus	500
		Sacramento - Keswick	3,300 ³
		Stanislaus - Goodwin	200 ⁴
		Trinity – Lewiston	300
Reservoir Storage (in TAF)			
San Luis (SWP)	947	San Luis (CVP)	394
Oroville	1,795	Shasta	2,700
New Melones	866	Folsom	571
Delta Operations			
DCC	Closed	Sacramento River at Freeport (cfs)	7,262
Outflow Index (cfs)	5,400	San Joaquin River at Vernalis (cfs)	815 ⁵
E:I	19% (14-day avg.)	X2	>81 km

¹ May go to 525 cfs today (4/7).

² Will be reduced to 1,000 cfs today (4/7)

³ Will be reduced to 3,250 cfs tomorrow (4/8)⁴ Second peak of the pulse flow not started yet.

⁵ May increase to 1,500 to 2,000 cfs range later this week.

Export limits in the TUCP Order are currently controlling exports.

OMR flow values on 4/4:

	USGS gauges (cfs)	Index (cfs)
5-day	-1,197	-1,397
14-day	-1,203	-1,518

Agenda Item 4.

Latest on drought planning

DOSS discussed the April 6, 2015, Revised Order from the SWRCB (available at: http://www.swrcb.ca.gov/waterrights/water_issues/programs/drought/docs/tucp/2015/tucp_order040615.pdf).

Agenda Item 5.

Smelt Working Group (Working Group)

Bartoo (FWS) provided the following email update:

The Working Group agreed that given present distribution, current salvage, and Delta conditions, there was no indication that the projected combined exports of approximately 1500 cfs for the week (potentially resulting in daily average OMR flows of approximately -1800 cfs) need to be modified for the protection of Delta Smelt adults and larvae.

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 also agreed that given their present distribution, existing constraining conditions were sufficient to protect longfin smelt from entrainment in the southern Delta.

The Working Group will continue to monitor Delta Smelt survey and salvage data and Delta conditions and will meet again Monday, April 13, 2015 at 10 am.

Agenda Item 6.

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

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

Location	Chippis Is. Midwater Trawl	Prisoners Pt/ Jersey Pt.	Sacramento Trawl	Mossdale Kodiak Trawl	GCID RST	Knights Landing RST ^C	Tisdale RST ^E	Beach Seines
Sample Date	3/29-4/4	3/29-4/4	3/29-4/4	3/29-4/4	3/31-4/6	3/30-4/5	3/29-4/3	3/29-4/4
Total Catch	292	2	12	10	289	7 (80mm-110mm)	1	16
FR Chinook	11 (63-71mm)	2 (57mm, 71mm)	5 (66-71mm)	9 (Avg. FL range: 76-81mm)	48			7
WR Chinook	1 (98mm)				13	1		1
SR Chinook	201 (72-100mm)				219	5	1 (82mm)	7
LFR Chinook								
Ad-Clipped Chinook	79 (68-93mm)		5 (98-115mm)		4 ^B	1 ^D		1 (128mm)
Delta Smelt								
Splittail			1 (286mm)					
Longfin Smelt								

Steelhead (ad-clip)			1 (327mm)	1 ^A	3			
Steelhead (wild)					2			
Green Sturgeon								
Flows (avg. cfs)					733	3,896	3,916	
W. Temp. (avg. °F)					59	64	62	
Turbidity (avg. NTU)					4.1	15	16	

^A Sutures were visible.

^B The 4 ad-clipped Chinook were winter-run sized.

^C Sampling period was from 3/30 at 11:15 am to 4/5 at 9:15am. From 3/30 at 11:15am to 3/31 at 8:30 am, both RSTs modified to sample at half efficiency to conduct trap calibrations.

^D The 1 ad-clipped Chinook was winter-run sized.

^E Sampling period was from 3/29 at 8:30am to 4/3 at 9:00am. From 3/29 at 8:30am to 3/30 at 3:30pm, cones modified to 50% catch for trap efficiency trials.

Preliminary Sherwood Harbor & Chipps Island Trawl data

4/6: Sherwood Harbor— 1 fall-run Chinook, 1 winter-run Chinook, 7 ad-clipped Chinook (86-125mm); Total = 9 fish.

4/6: Chipps Island— 43 Ad-clipped Chinook (74-121mm), 5 fall-run Chinook, 117 spring-run Chinook, 1 Long Fin Smelt; Total = 166 fish.

Update on 6-year Steelhead Study from Israel (Reclamation):

- There have been two releases of steelhead so far¹.
- Low flow and unseasonally high water temperature in the San Joaquin River are providing poor migratory conditions for salmonids.
- Due to low flows and low turbidity, during the sunrise and sunset releases, folks could observe striped bass predating on acoustic-tagged study fish.
- Reclamation, NMFS-SWFSC and USFWS discussed changing the release dates and locations; but due to both logistical reasons and study design and goals, but decided that release dates and locations should remain unchanged.
-
- Preliminary observations suggest an upstream shift in predation and a very high rate of predation.

Acoustic-Tagged Hatchery Winter-Run Chinook Tracking with Real-Time Receivers:

¹ Bay Delta Live is now posting real time data from receivers at Head of Old River, Garwood Bridge, and Turner Cut to show fish moving through the system (see <http://www.baydeltalive.com/projects/7046>). If people are interested in another version on real time information visualization at your fingertips, the site is available to all with a password, which can be requested at: <http://www.baydeltalive.com/login>.

- The NMFS-SWFSC stopped reporting real-time winter-run tag information a few weeks ago, due to the extremely low observed fish passage rates and the expectation that the ~60-day tag battery life was coming to an end
- As of 3/23, 27.8% (based on 2 or more detections) to 39.2% (based on single detections) of the 572 acoustic-tagged fish released on 2/4 and 2/6 in Redding (379 river km upstream of Sacramento) had been detected² passing the receiver at the I80/I50 bridge in Sacramento.

Acoustic-Tagged Hatchery Spring-Run Chinook from Feather River Fish Hatchery-- Tracking with Real-Time Receivers:

- JSATS tagged spring-run Chinook were released in the Feather River on 3/18/2015 at about 10:45am at Boyds rkm 258 (75 tagged fish along with the 500k-fish release group) and 11:30am at Gridley rkm 303 (75 tagged fish along with the 500k-fish release group).
- Proportion of tag codes observed passing receiver as of 4/5 at 2:00pm:

<u>Receiver</u>	<u>Release 1: Boyds</u> [Percent with 2+ detects]	<u>Release 1: Gridley</u>	<u>Both Releases</u>	<u>Release 2: Boyds</u>	<u>Release 2: Gridley</u>	<u>All Releases</u>
Sacramento I80 Bridge	9.3	1.3	5.3	2.7	0.0	1.3
Hood* (activated on 2/27)	1.3	0.0	0.7	0.0	0.0	0.0
Middle River (activated on 2/16)	0.0	0.0	0.0	0.0	0.0	0.0

*Out of service from 3/4 – 3/17; Re-activated on 3/18.

Fish Salvage³:

Fujimura (DFW) provided the following email update on preliminary salvage:

Preliminary salvage results for yesterday (4/6) indicate that 4 non-clipped Chinook salmon in the spring-run size range were salvaged at the CVP. Official results will be posted at our CDFG Region 3 Salvage FTP or web-site later today [4/7].

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

² A tag detection indicates that a tag has passed the receiver, but it is possible that the tag could be in a predator that ate a tagged winter-run Chinook. There is limited ability to apply a “predator filter” even with tag detection data from the entire acoustic receiver array (most of which are not real-time receivers); no predator filter is attempted on the reported real-time data.

³Salvage data reported in this section represent the total estimated and expanded salvage based on the number of fish observed at the fish collection facility. For example, if one steelhead is observed in the typical ½-hour sampling period within a 2-hour operation period, the single steelhead is expanded to a salvage of four.

DOSS Weekly Salvage Update
Reporting Period: March 30 - April 5, 2015
 Prepared by Bob Fujimura on April 6, 2015 21:00 - Corrected title on April 13, 2015
 Preliminary Results - Subject to Revision

Criteria	30-Mar	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	Trend	
Loss Densities									
Wild older juvenile CS	0	1.42	0	0	0	0	0	↗	0.20
Wild steelhead	0	0	0	0	0	0	0	→	0.00
Exports									
SWP daily export	1,074	1,074	1,083	1,083	455	1,085	983	↘	977
CVP daily export	1,970	1,973	1,964	1,962	1,959	1,959	1,962	→	1,964
SWP reduced counts	0%	0%	0%	0%	0%	0%	0%	→	0%
CVP reduced counts	0%	0%	0%	0%	0%	0%	0%	→	0%

Loss Density = fish lost/TAF; water export = AF; Trend = compared to previous week; wild = adipose fin present
 Loss = estimated number of fish lost at the CVP and SWP Delta export facilities based on estimated salvage (see below)
 Reduced counts = percentage of time that routine salvage sample time were less than 30 min per 2 hours of salvage and export operations
 Yellow highlighted dates indicate TFCF salvage 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	1	4	↗	53	106
Spring Run	15	12	↗	15	12
Late Fall Run	0	0	→	6	26
Fall Run	0	0	→	16	26
Unclassified	0	0	→	24	NC
Total	16	16		114	171
Hatchery					
Winter Run	0	0	→	62	214
Spring Run	0	0	→	0	0
Late Fall Run	0	0	→	136	340
Fall Run	0	0	→	41	180
Unclassified	0	0	→	12	NC
Total	0	0		251	734

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	→	22	95
Hatchery	15	21	↗	515	1,821
Total	15	21		537	1,916

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 03/30/15-04/05/15.

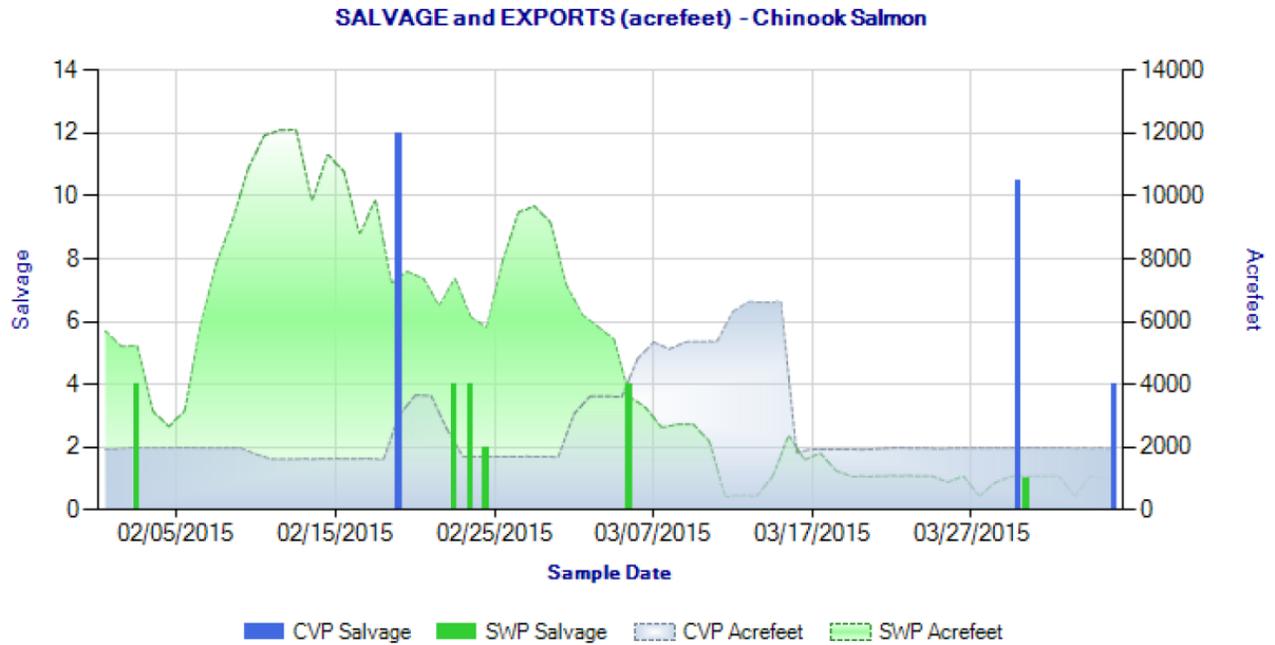


Figure 2. Daily salvage of Chinook salmon (all races) and water exports from the state and federal fish salvage facilities during 02/01/15 through 04/05/15.

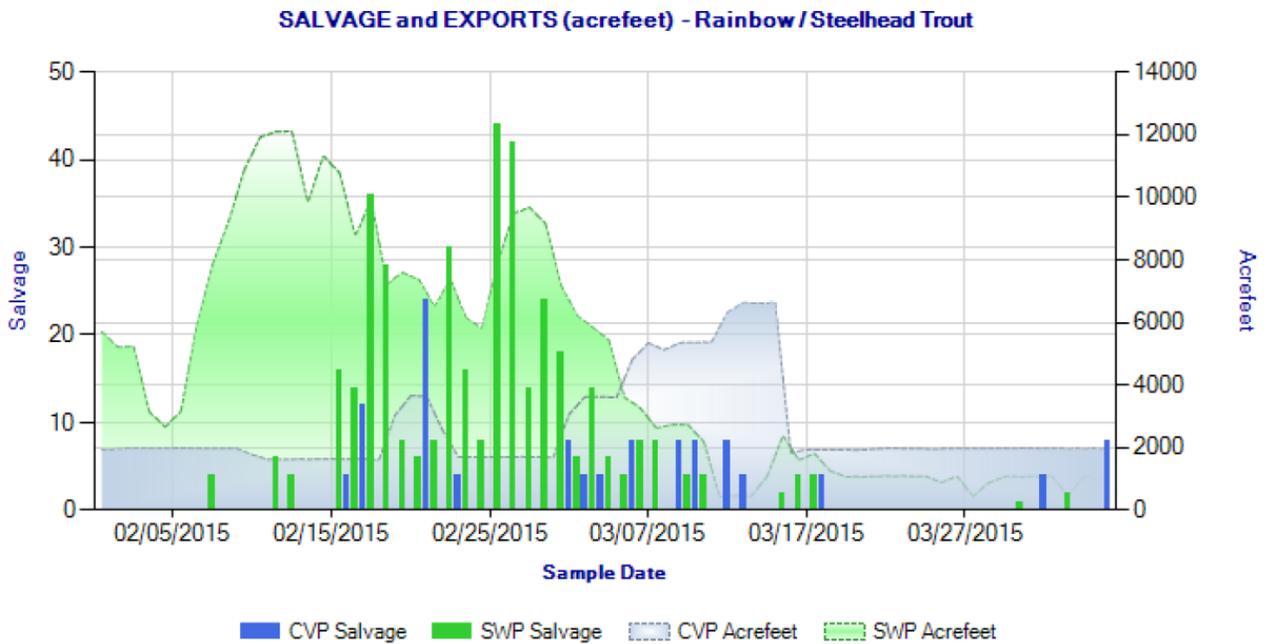


Figure 3. Daily salvage of steelhead and water exports from the state and federal fish salvage facilities during 02/01/15 through 04/05/15.

Islam (DWR) provided the following summary of coded-wire-tag recoveries at the SWP and CVP fish collection facilities.

CONFIRMED HATCHERY (ADIPOSE-FIN CLIPPED) CHINOOK SALMON LOSS AT THE SWP & CVP DELTA FISH FACILITIES, 2014/2015

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
12/1/2014	LF	Coleman NFH	Battle Creek	Production	574.59	853,100	n/a	0.067	n/a	n/a	n/a	12/12/2014	1/16/2015
12/4/2014	LF	Coleman NFH	Battle Creek	Spring Surrogate	34.98	77,000	n/a	0.045	n/a	0.5%	1.0%	12/25/2014	12/29/2014
12/18/2014	LF	Coleman NFH	Battle Creek	Spring Surrogate	45.42	78,000	n/a	0.058	n/a	0.5%	1.0%	11/2015	1/17/2015
2/5/2015	LF	Coleman NFH	Battle Creek	Spring Surrogate	0.00	83,100	n/a	0.000	n/a	0.5%	1.0%	*	*
2/4 - 2/6/2015	W	Livingstone NFH	Sacramento River	Production	8.40	612,056	185500	0.001	0.00004	0.5%	1.0%	2/25/2015	2/25/2015
4/2-4/3/2015	F	Coleman NFH	Rio Vista net pens	Production	0.00	109,500	n/a	0.000	n/a	0.5%	1.0%	*	*

UNCONFIRMED HATCHERY (ADIPOSE-FIN CLIPPED) CHINOOK SALMON LOSS AT THE SWP & CVP DELTA FISH FACILITIES, 2014/2015

Facility	Unknown CWT Loss ⁵	Unread CWT Loss ⁶	Unknown Hatchery Loss ⁷	Acoustic Tag Loss ⁸	Number of Unassigned CWTs ⁹
SWP	18.01	0.00	0.00	17.00	0
CVP	26.62	0.00	0.00	0.00	0
TOTAL	44.63	0.00	0.00	17.00	0

SWP and CVP adipose-fin clipped Chinook lost from 10/1/2014 through 4/05/2015.

¹Number released with the adipose-fin clipped and a coded-wire tag (CWT).

²% Loss of Number Released = (Confirmed Loss/Number Released)*100.

³% Loss of Total Entering Delta = (Confirmed Loss/Total Entering Delta)*100.

⁴Date of first and last loss accounts for all CWT loss even those from special studies where salvage and loss=0.

⁵Adipose-fin clipped Chinook was observed during fish count, but tag code could not be determined (e.g., damaged tag, lost tag, no tag, or Chinook 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 4/06/2015

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

DOSS Estimates of Fish Distribution

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. The table below reflects current distribution, but DOSS expects an increased proportion of fish to exit the system next week due to the recent storm event.

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 salmon</i> (<u>naturally produced</u>)	Few stragglers only (last week: Same)	40% (last week: 50%)	60% (last week: 50%)
<i>YOY winter-run Chinook salmon</i> (<u>hatchery-produced</u>)	Few stragglers only (last week: same)	40% (last week: 50%)	60% (last week: 50%)
<i>YOY spring-run Chinook salmon</i> ^A	~5% (last week: 5% - 15%)	60% (last week: 70% - 80%)	40% (last week: 20% - 25%)
<i>Yearling spring-run Chinook salmon</i> ^B	Few stragglers only (last week: same)	10% (last week: 10% - 30%)	90% (last week: 70% - 90%)
<i>Hatchery Steelhead</i> ^C	5% (last week: ~10% all hatchery fish)	15% (last week: 25% all hatchery fish)	85% (last week: 65% all hatchery fish)
<i>Sacramento River steelhead</i> (<u>naturally- produced</u>)	Limited catch data		
<i>San Joaquin River steelhead</i> ^D	10% (last week: 15%)	50% (last week: 60%)	35% - 40% (last week: 25% - 30%)

^A Chipp Island Trawl data of spring-run is difficult to interpret now that the 75% unmarked fall-run productions are likely masking the wild spring-run Chinook catch.

^B No yearling spring-run Chinook salmon have been caught in 2014 monitoring. In general, very few yearling spring-run Chinook salmon are observed because of their relatively large size and strong swimming (and associated gear avoidance) abilities.

^C Difficult to assess now that all hatchery releases are in the system (CNFH, Feather River Fish Hatchery, and Mokelumne Fish Hatchery released as usual; Nimbus Hatchery released their steelhead in the spring of 2014 because of expected unsuitable hatchery water temperatures during the summer of 2014). Percentages are intended to capture distribution of steelhead that migrate out; not those that may residualize.

^D Have not observed juvenile steelhead in monitoring data; Distribution estimates are based on 10 years of historical data from Mossdale Trawls, and RST data from Caswell Park on the Stanislaus River.

DOSS Feedback on Entrainment Risk

Entrainment risk of fish from the Sacramento River into the Interior Delta (same as last week except for tidal conditions)

DOSS noted that generally, there is an increased risk of entrainment into the interior Delta during spring tides, compared to during neap tides, at any OMR level. During a spring tide, tidal conditions extend further upstream and may, for example, create conditions at Georgiana Slough

(e.g., reverse flows) that are associated with routing into Georgiana Slough, a route to the interior Delta. Currently, the Delta is experiencing neap tides.

Entrainment risk of fish in the Interior Delta into the CVP/SWP facilities (same as last week)
DOSS assessed the current risk of entrainment for YOY winter-run Chinook salmon. For both naturally-produced and hatchery-produced YOY winter-run in the Delta, the current risk of entrainment for each OMR flow ranges was characterized as follows:

- -1,200 to -2,000 cfs has a medium risk of entrainment
- -2,000 to -3,500 cfs has a medium to high risk of entrainment
- -3,500 to -5,000 cfs has a high risk of entrainment
- more negative than -5,000 cfs has a higher risk of entrainment

DOSS estimated a high risk of entrainment at OMR flows of -3,500 cfs or more negative than -3,500 cfs, since salvage of salmonids (including 4 clipped Chinook -- in the winter-run size range based on the length-at-date criteria -- at the SWP on Monday, 2/23) has been observed at those OMR levels. The less negative ranges of OMR flow were considered to create medium or medium-high risk of entrainment because 1) currently there are physiological cues for migration (*i.e.* high temperatures) which increases the vulnerability of migrating fish across even the lower ranges of OMR; and 2) the threshold for exceeding a trigger is low, which means that even low salvage is associated with a fairly high risk of exceeding an OMR trigger.

Agenda Item 7.

DOSS Advice to WOMT and NMFS: None.

Next Meeting: The next DOSS conference call will be on 04/14/15 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. For additional graphs, please visit the DWR website at:

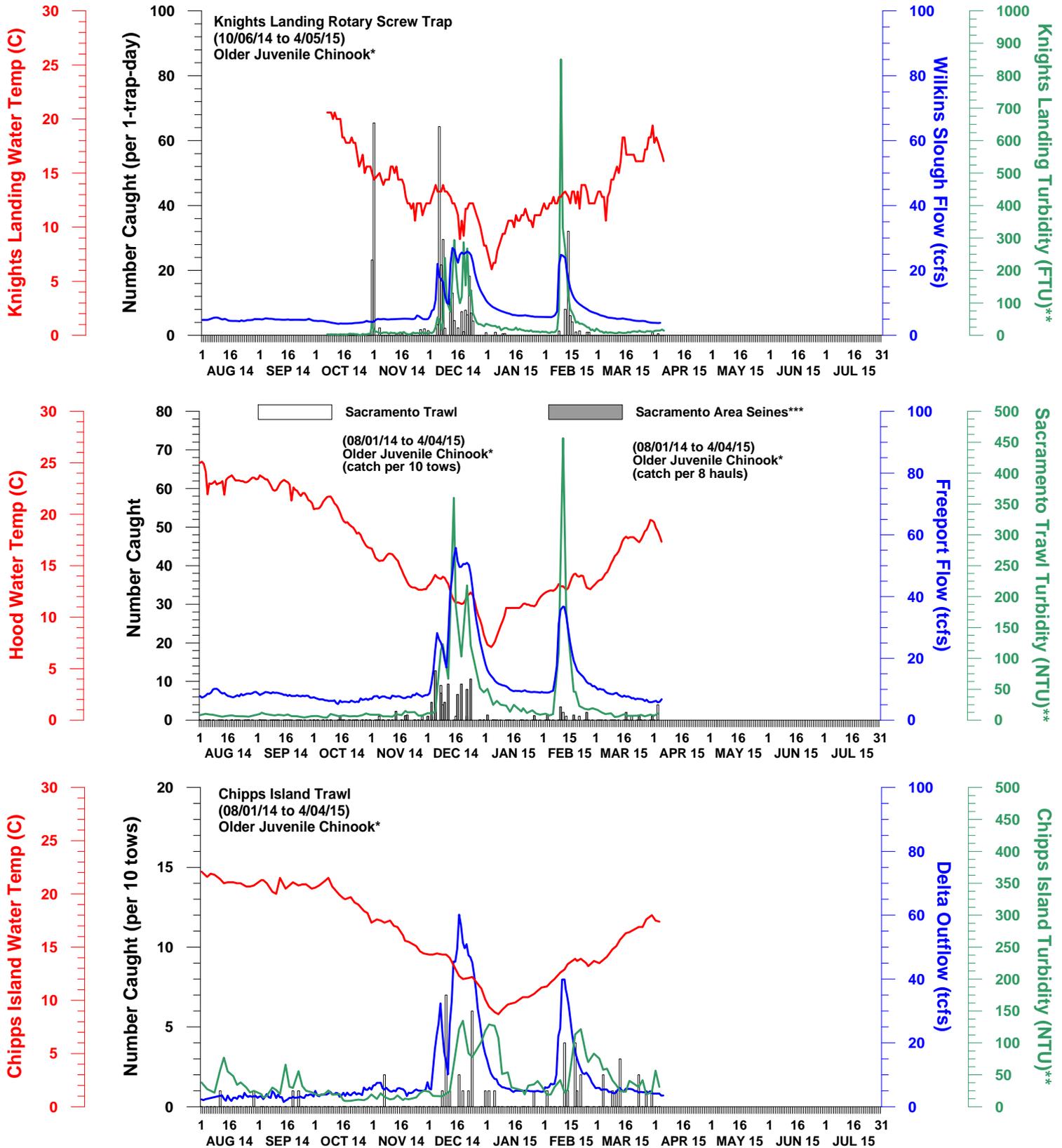
<http://www.water.ca.gov/swp/operationscontrol/calfed/calfedmonitoring.cfm>

Agenda Item 8.

eTPM Revisited: Review of ePTM output for April-May TUCP scenarios

DOSS revisited and reviewed the updated ePTM output graphs and spatial summaries from the April/May model runs and briefly discussed interpretations of the results. The ePTM output and spatial summaries are posted separately on the DOSS notes page.

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



DWR-DES 6 APR 2015

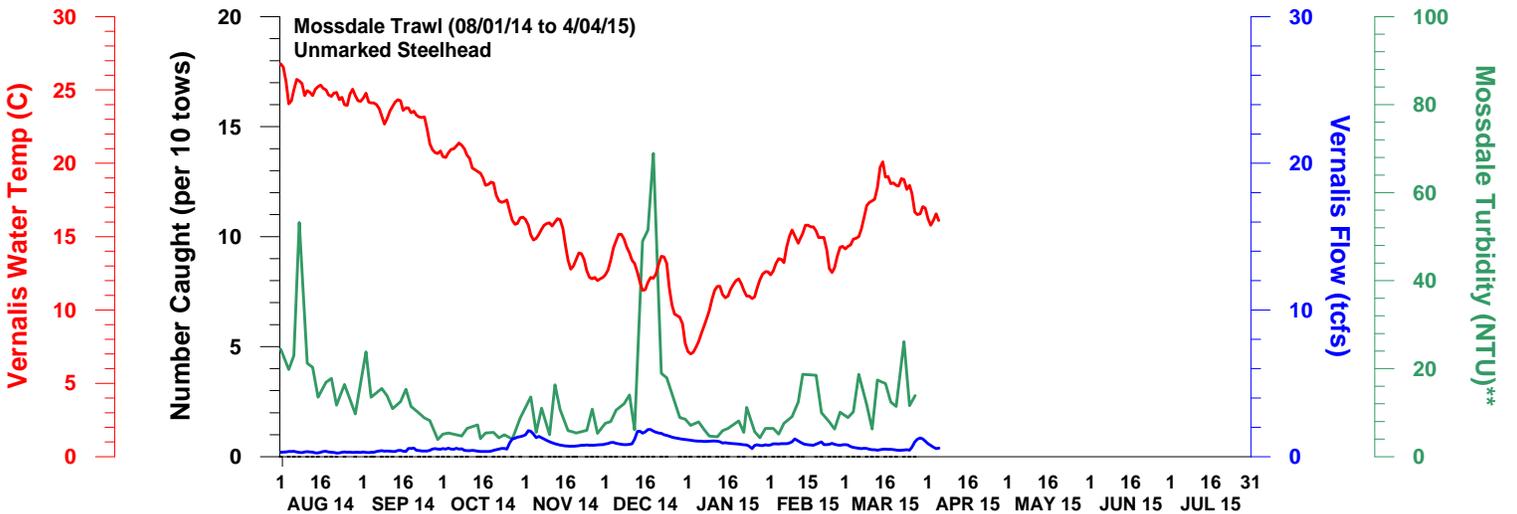
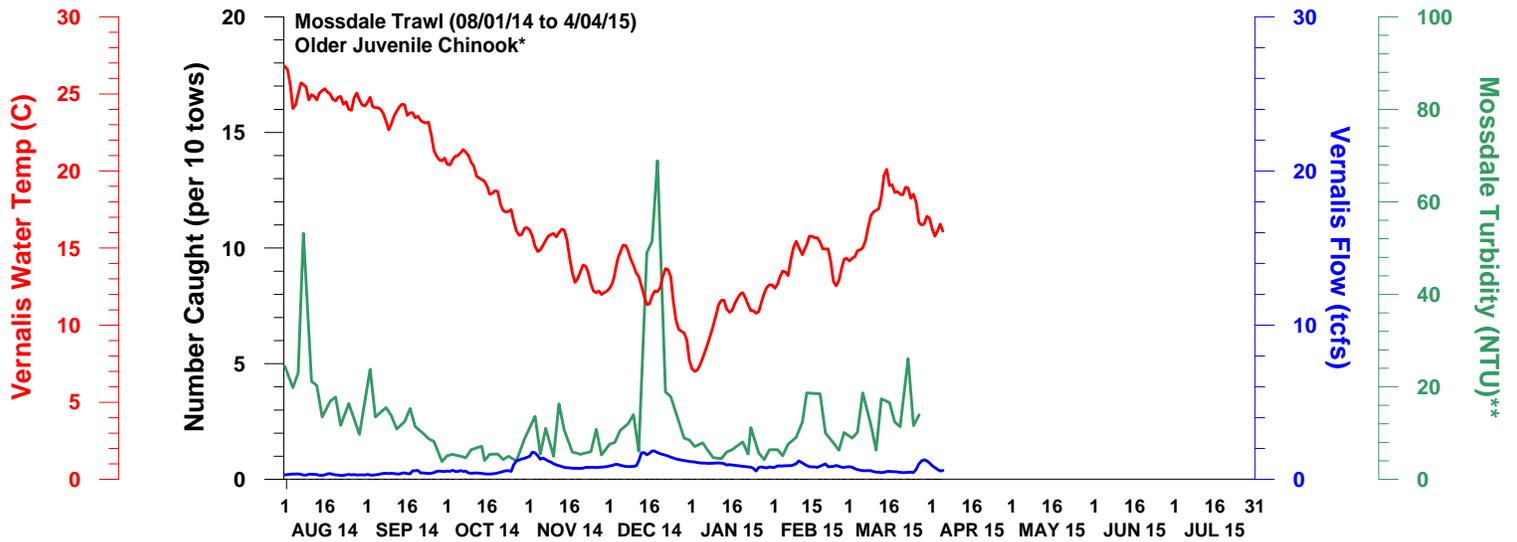
Preliminary data from DFW, FWS, and CDEC; subject to revision.

*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

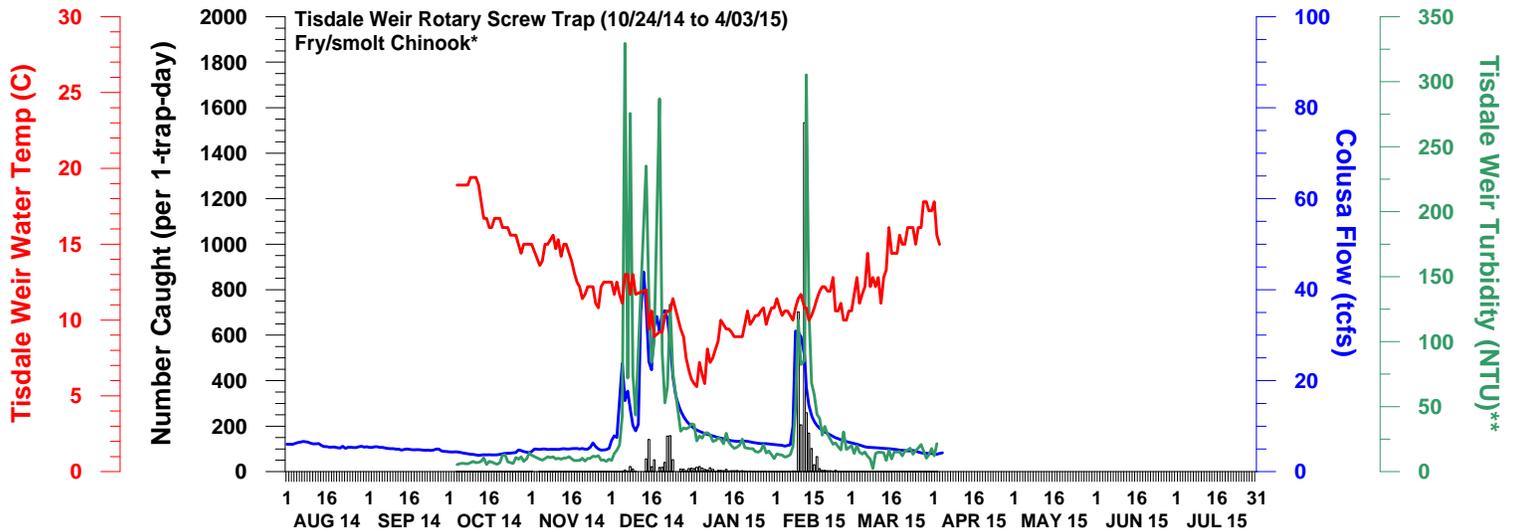
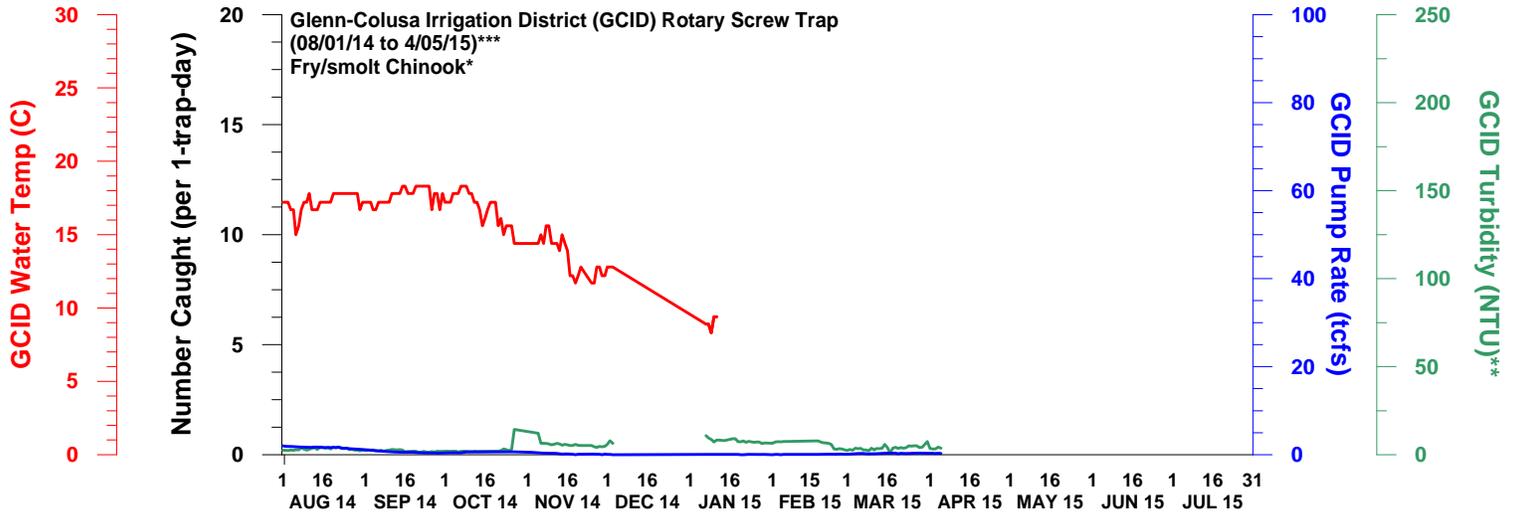
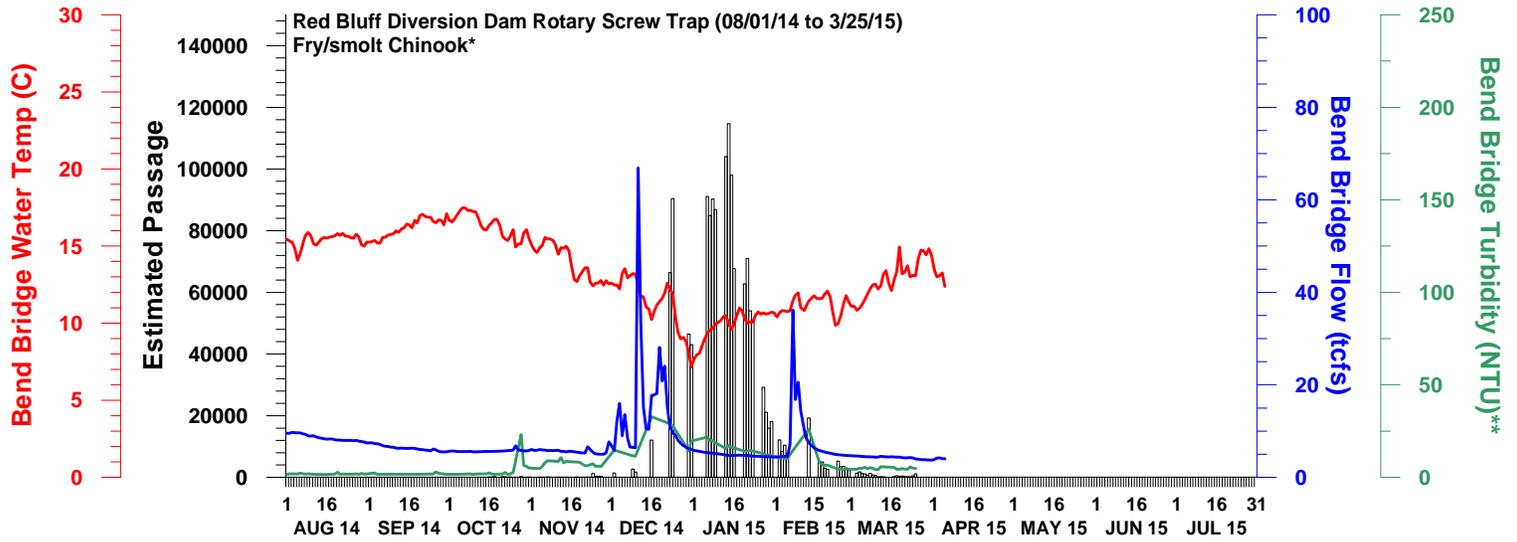


DWR-DES 6 APR 2015
Preliminary data from FWS and CDEC; subject to revision.

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



DWR-DES 6 APR 2015

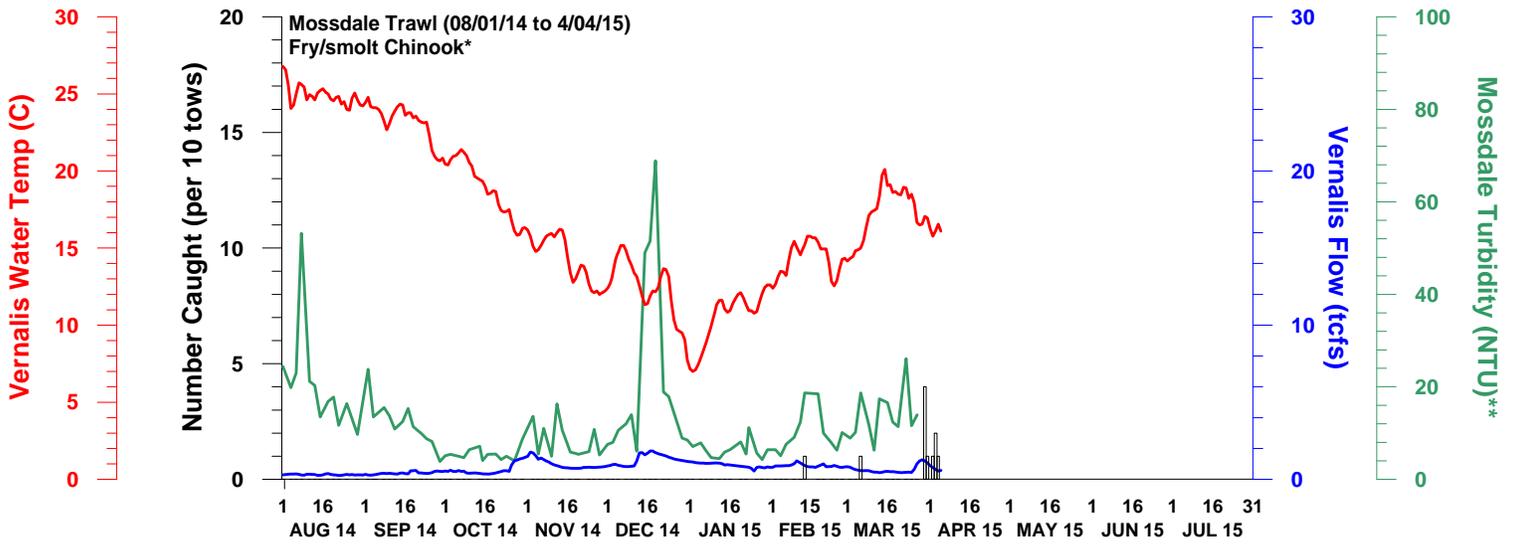
Preliminary data from DFW, FWS, GCID, and CDEC; subject to revision.

*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.

***Trap was pulled on 10/28/14 due to extremely turbid conditions, heavy debris, and high number of listed winter run Chinook and has resumed since 11/5/14.

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



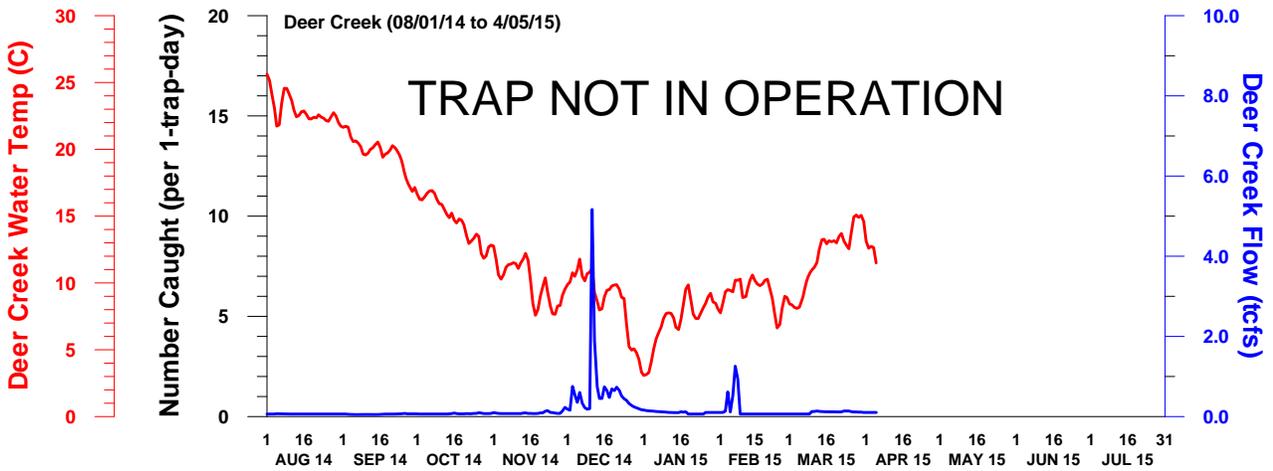
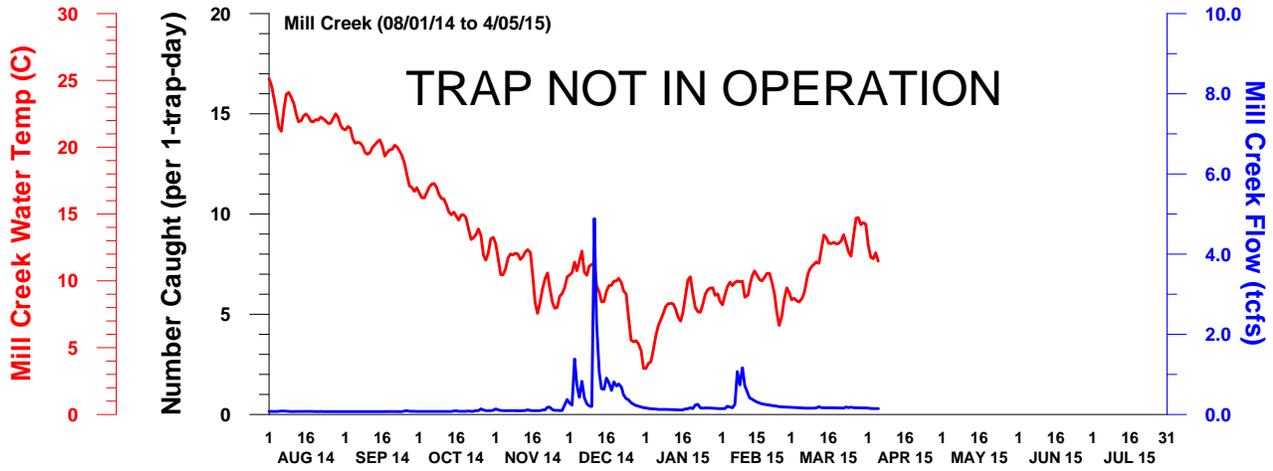
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**Turbidity is a discrete measurement and is not measured continuously. Therefore, data are interpolated on days when turbidity was not measured unless data are missing for more than five days.

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.

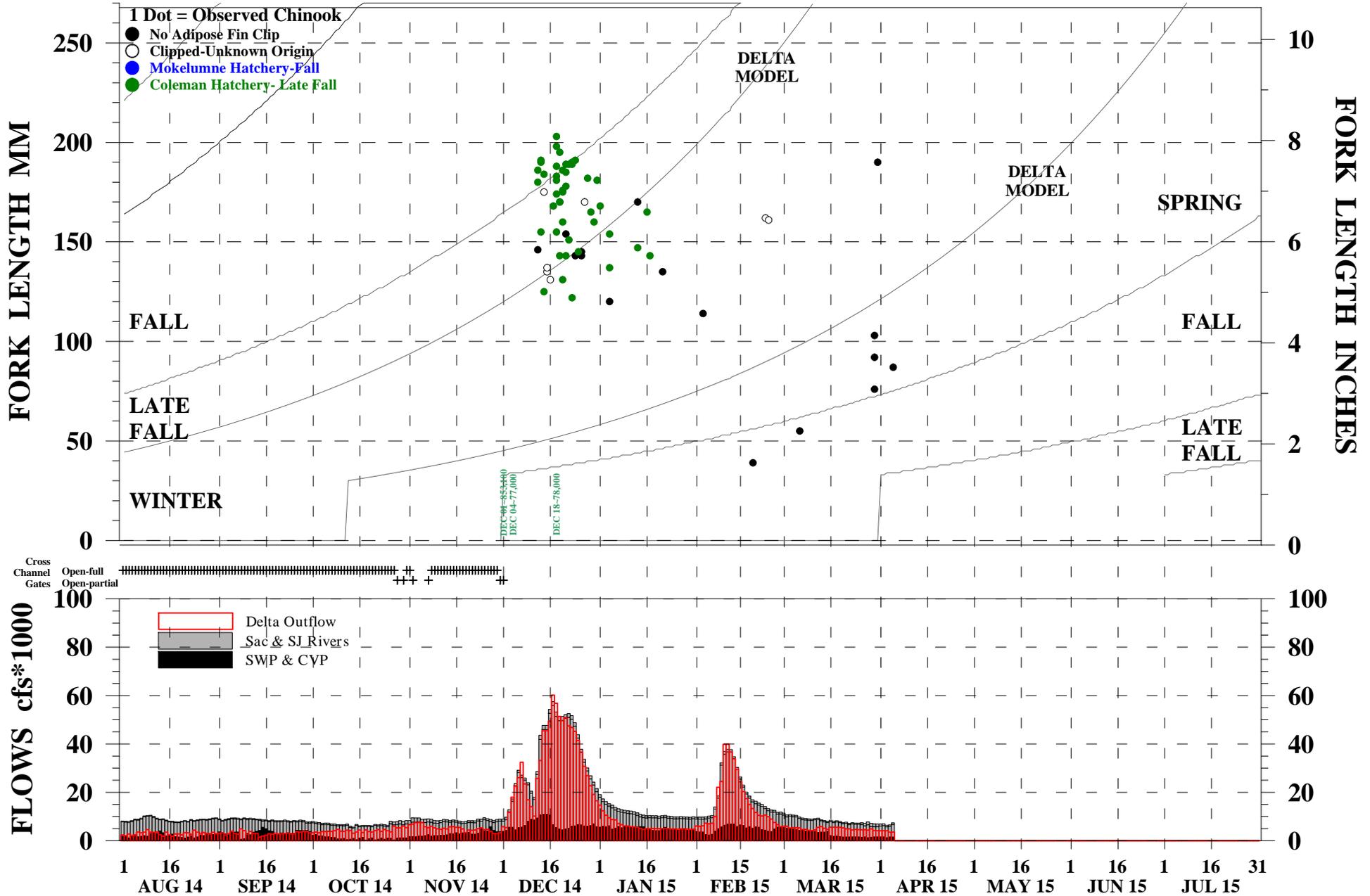
Sacramento River Trawl, Sacramento Area Beach Seine, and Chipps Island Trawl data were obtained directly from FWS, Stockton Fish and Wildlife Office (<http://www.fws.gov/stockton/ifmp/>).

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 08/01/2014 THROUGH 4/05/2015

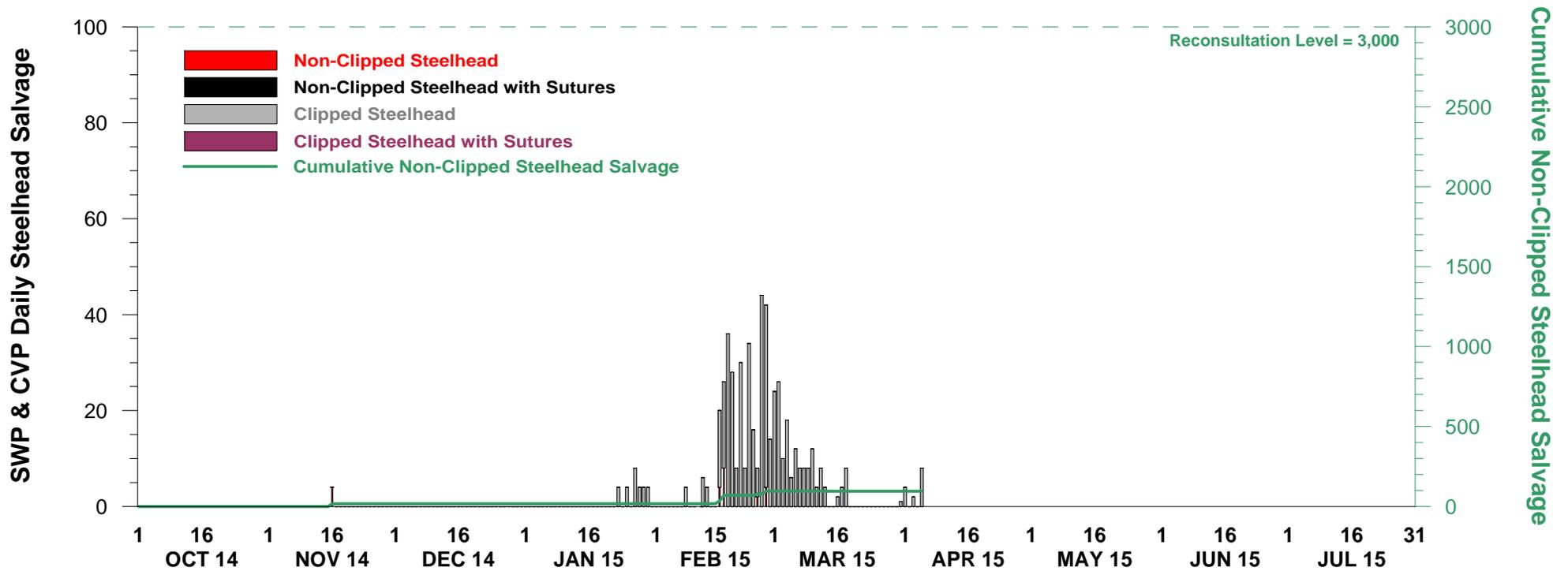


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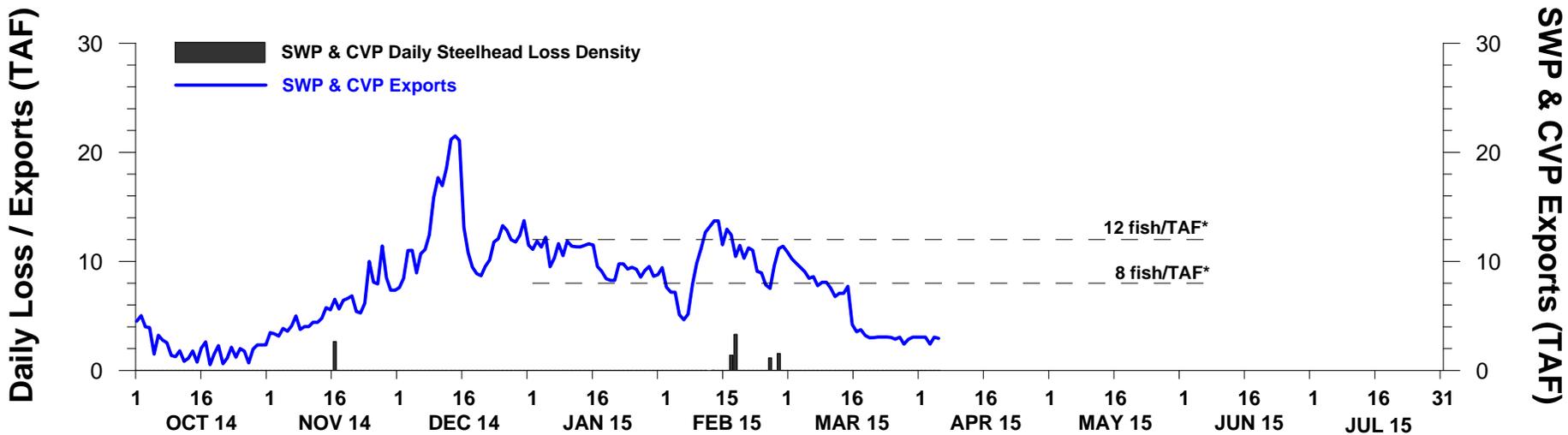
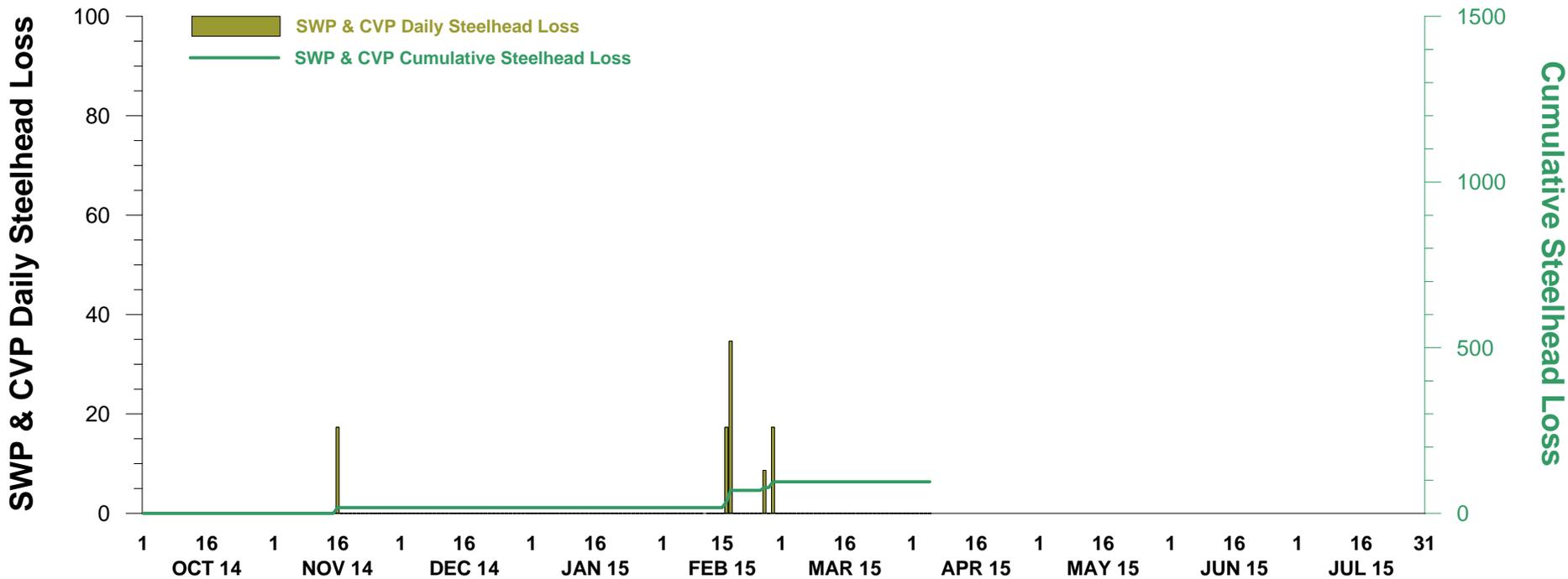
Preliminary data from DFW, DWR, FWS, Reclamation, and CDEC; subject to revision.

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

STEELHEAD SALVAGE AT THE DELTA FISH FACILITIES 01 OCT 2014 THROUGH 5 APR 2015



NON-CLIPPED STEELHEAD LOSS AT THE DELTA FISH FACILITIES 01 OCT 2014 THROUGH 5 APR 2015



DWR-DES 6 APRIL 2015

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.