

Delta Operations for Salmonids and Sturgeon (DOSS) Group
Conference call: 2/23/16 at 9:00 a.m.

Objective: Provide advice to the Water Operations Management Team (WOMT) and National Marine Fisheries Service (NMFS) on measures to reduce adverse effects from Delta operations of the Central Valley Project and the State Water Project on salmonids and green sturgeon. DOSS will work with other technical teams. DOSS notes and advice can be found at: http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/doss.html.

DWR: Aaron Miller, Kevin Reece, Rhiannon Mulligan
Reclamation: Josh Israel
NMFS: Barb Byrne, Jeff Stuart
CDFW: Bob Fujimura, Duane Linander, Ken Kundargi
SWRCB: Matt Holland, Chris Carr
FWS: Craig Anderson
EPA: Erin Foresman

Agenda Items

1. Agenda review and introductions
2. RPA Implementation review
3. Current Operations
4. Smelt Working Group
5. Fish Monitoring
6. Release of hatchery winter-run Chinook and acoustic-tracking
7. 6-year steelhead study
8. DOSS Advice
9. Next DOSS meeting

Agenda Item 2.

RPA Implementation Review

Delta RPA Actions that may affect operations during February:

Action IV.1.2¹ (DCC gate operations):

- DCC gates have been closed since 12/15/15.

Action IV.2.3² (OMR Flow Management)

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

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

Agenda Item 3.

Current Operations (2/23/16)

SWP		CVP	
Exports (cfs)			
Clifton Court Forebay	2,400	Jones Pumping Plant	3,400
Reservoir Releases (cfs)			
Feather - Oroville	950*	American - Folsom	7,200**
		Sacramento - Keswick	3,250
		Stanislaus - Goodwin	200
		Trinity - Lewiston	300
Reservoir Storage (in TAF)			
San Luis (SWP)	560	San Luis (CVP)	285
Oroville	1,797	Shasta	2,677
New Melones	444	Folsom	634
Delta Operations			
DCC	Closed	Sacramento River at Freeport (cfs)	17,940
Outflow Index (cfs)	~13,200	San Joaquin River at Vernalis (cfs)	868
E:I	30% (14-day avg.)	X2	71 km

*Oroville release expected to decrease next week, probably to ~800 cfs. The minimum Oroville release during March is 750 cfs.

**A rampdown of the Nimbus release will begin 2/24/16, with the release decreasing to 4,600 cfs by 2/27/16.

DWR reported that the Projects had no concerns about meeting the requirement for 28³ “Chippis Days” during February 2016 per the D-1641 outflow requirement. During the associated discussion about the “three ways to win⁴”, Foresman (EPA) commented that it was her understanding that at lower flows (e.g. Outflow Index < 10,000 cfs), the Outflow Index was not as well associated with measured outflow (and the location of the 2.64 mmhos/cm electrical conductivity threshold) as at higher flows. Miller (DWR) noted that the gages measuring outflow tend to be biased at more extreme (low or high) flows.

Review of factors controlling Delta exports for the period 2/16/16 to 2/23/16:

- *Friday (2/16/16) – Tuesday (2/23/16):* -5,000 cfs OMR limit per both NMFS BiOp and 2/10/16 FWS determination.

OMR as of 2/19/16:

³ D-1641 never requires more than 28 “Chippis Days” during February, even in a leap year when February has 29 days.

⁴ See footnote 11 for the Table 3 objectives in the 2006 Water Quality Control Plan for the Bay-Delta at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/2006wqcp/

	USGS gauges (cfs)	Index ⁵ (cfs)
5-day	-5,510	-4,986
14-day	-4,235	-4,244

Agenda Item 4.

Smelt Working Group

The SWG met on Monday, 2/22/16 at 10am. Stuart (NMFS), a member of the SWG, provided the following SWG meeting summary:

The Working Group reviewed current Delta Smelt distribution, salvage data, and Delta conditions. 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 adult delta smelt for each of the flow ranges is characterized as follows:

- -1250 to -2000 cfs has a medium risk of entrainment,
- -2000 to -3500 cfs has a 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 risk values provided for this week refer only to adult fish as there currently is no evidence of hatching. The Working Group will continue to monitor Delta Smelt survey and salvage data and Delta conditions, and will meet again on Monday, February 29, 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: 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	Station 902/Jersey Pt./Prisoners Pt. Trawls	Sacramento Trawl	Beach Seines	Knights Landing RST ^A	Tisdale RST ^B	GCID RST ^C	Mossdale Kodiak Trawl
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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.

Sample Date	2/16, 2/18, 2/19	902: 2/17 Jersey Pt: 2/19 Pris. Pt: 2/16, 2/18	2/16, 2/18, 2/19	2/16-2/19	2/11-2/22	2/12- 2/22	2/15- 2/19	2/16, 2/17, 2/19
FR Chinook		5	7	464	41	48	55	No species of management concern
WR Chinook		1		1			2	
SR Chinook			1	4	2	3		
LFR Chinook								
Ad-Clipped Chinook					1	10	204 (WR-sized)	
Chinook Adult								
Steelhead (wild)	1							
Steelhead (ad-clip)	25			2		2		
Green Sturgeon								
Delta Smelt	1	4						
Splittail	2							
Longfin Smelt								
Flows (avg. cfs)					8942	8,987	1065	
W. Temp. (avg. °F)					55.1	54.1	54.8	
Turbidity (avg. NTU)					20.3	20.9	17.0	

^A Sampling period was from 2/11 at 10:15 am to 2/22 at 9:45 am.

^B Sampling period was from 2/12 at 9:30 am to 2/22 at 8:30 am.

^C Sampling period was from 2/15 at 9:00 am to 2/19 at 9:00 am. On 2/19, the RST cone was raised to avoid the increase in flows, heavy debris, and the release of 420,000 hatchery winter-run Chinook salmon.

CDFW reported that two efficiency trials were recently conducted at the Knights Landing rotary screw trap (RSTs). Of two groups of fish marked and released about one mile upstream of the RSTs (630 on 2/10/16, 476 on 2/17/16), not a single fish was recovered in the RSTs – a reminder of the relatively low efficiency of these RSTs.

Fish Salvage⁶:

⁶Salvage 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.

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>.

DOSS Weekly Salvage Update

Reporting Period: February 15-February 21, 2016
 Prepared by Bob Fujimura on February 22, 2016 13:10
 Preliminary Results -Subject to Revision

Criteria	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb	21-Feb	Trend	
Loss Densities									
Wild older juvenile CS	0	0	0	0	0	0	0	→	0.00
Wild steelhead	0	1.49	0	0	0.24	0.24	0	↗	0.28
Exports									
SWP daily export	4,778	4,838	4,703	4,586	4,567	4,646	5,078	↗	4,742
CVP daily export	6,756	6,789	6,746	6,734	6,756	6,746	6,716	↗	6,749

SWP reduced counts
 CVP reduced counts

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	→	24	48
Spring Run	0	0	↘	8	5
Late Fall Run	0	0	→	44	166
Fall Run	4	17	↗	52	66
Unclassified	0	0	→	10	NC
Total	4	17		138	285
Hatchery					
Winter Run	0	0	↘	193	599
Spring Run	0	0	→	0	0
Late Fall Run	0	0	→	93	298
Fall Run	0	0	→	1	4
Unclassified	0	0	→	0	0
Total	0	0		287	901

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	12	23	↗	38	62
Hatchery	236	569	↗	448	1,210
Total	248	592		486	1,272

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 2/15/16-2/21/16.

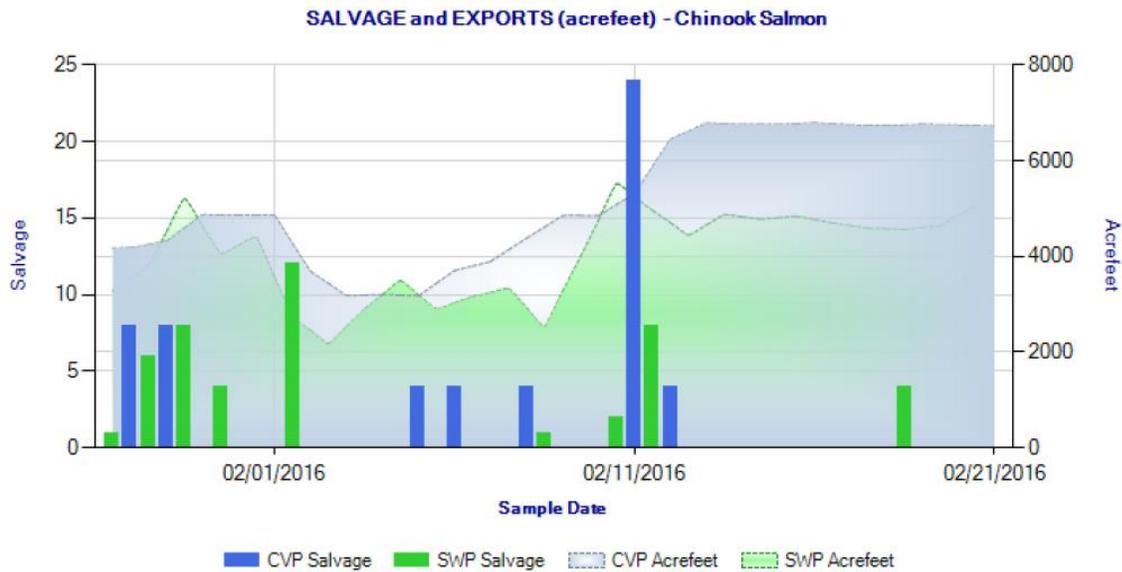


Figure 2. Daily salvage of Chinook salmon (all races) and water exports from the state and federal fish salvage facilities during January 26, 2016 through February 21, 2016.

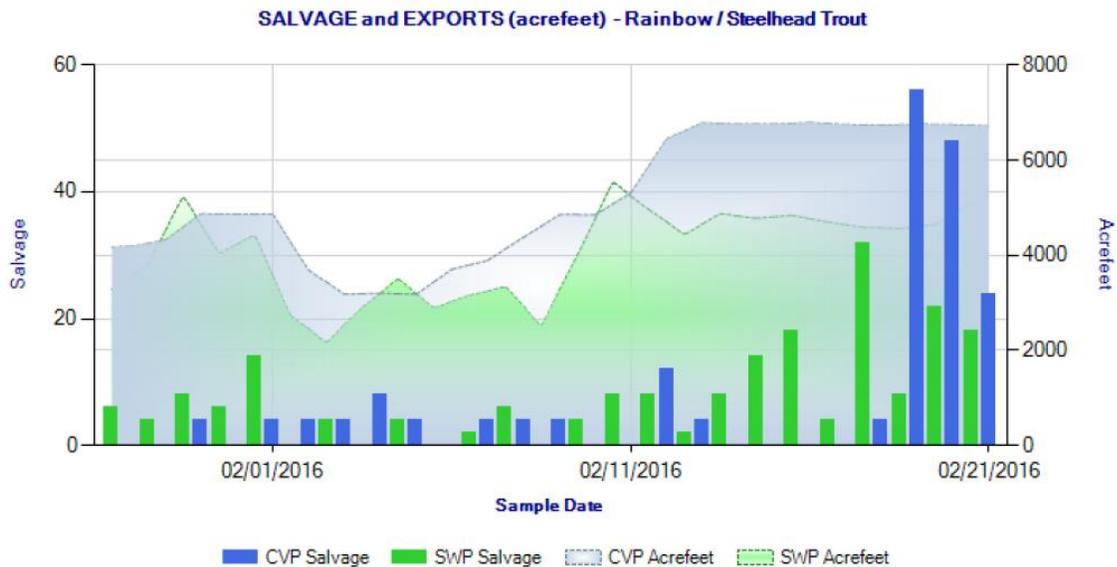


Figure 3. Daily salvage of steelhead and water exports from the state and federal fish salvage facilities during January 26, 2016 through February 21, 2016.

Coded-wire-tag recoveries

On 2/22/16, Mulligan (DWR) provided the following summary of coded-wire-tag recoveries at the SWP and CVP fish collection facilities. DOSS noted that the 0.412% cumulative loss of the third spring-run Chinook surrogate group (released from Coleman National Fish Hatchery on 1/12/16) was near 0.5%, an OMR trigger threshold under Action IV.2.3. However, no loss of hatchery Chinook has occurred since 2/12/16.

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	281,213	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	170.59	68,000	n/a	0.251	n/a	0.5%	1.0%	1/6/2016	2/2/2016
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

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	18.16	0.00	0.00	0.00	0
CVP	0.00	0.00	0.00	0.00	0
TOTAL	18.16	0.00	0.00	0.00	0

SWP and CVP adipose-fin clipped Chinook lost from 12/25/2015

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 accidentally 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.

** Information not yet available.

DWR-DES Revised 02/17/2016

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. 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 salmon</i>	5-10% (Last week: same)	90-95% (Last week: same)	0% - 5% (Last week: same)
<i>Young-of-year (YOY) spring-run Chinook salmon*</i>	30% - 40% (Last week: 35% - 45%)	60% - 70% (Last week: 55% - 65%)	0% - 5% (Last week: same)
<i>Hatchery winter-run Chinook salmon</i>	>95% (First estimate of WY 2016)	0-5% (First estimate of WY 2016)	0% (First estimate of WY 2016)

*When reviewing monitoring data, DOSS assumes that some of the juvenile Chinook categorized as fall-run (based on the length at date criteria) are actually genetic spring-run Chinook.

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; 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 over the next week:

- **Exposure Risk: MEDIUM**
 - Relatively low flows and turbidities are expected to be associated with limited salmonid movement.
- **Routing Risk: MEDIUM**
 - Relatively low river flows (compared to Sacramento River flows during January storms) are associated with greater tidal effects at Georgiana Slough and a medium risk of routing into Georgiana Slough.
- **Overall Entrainment Risk: MEDIUM**

CVP/SWP Facilities Entrainment Risk for listed salmonids in the Interior Delta over the next week:

- **Exposure Risk: MEDIUM**
 - Listed runs are expected to have previously migrated into and be rearing within the Interior Delta.
- **OMR/Export Risk:**
 - OMR -2,500 cfs to -3,500 cfs: LOW
 - OMR -3,500 cfs to -5,000 cfs: MEDIUM to HIGH
- **Overall Entrainment Risk:**
 - OMR -2,500 cfs to -3,500 cfs: LOW to MEDIUM
 - OMR -3,500 cfs to -5,000 cfs: MEDIUM

Agenda Item 6.

Release of hatchery winter-run Chinook and acoustic-tracking

Livingston Stone National Fish Hatchery released 2 groups of about 210,000 (for a total of approximately 420,000) hatchery winter-run Chinook last week at Bonnyview Bridge in Redding – 1 group on Wednesday (2/17/16) and the other group on Thursday (2/17/16). 285 of each release group (for a total of 570) were acoustic-tagged with JSATS tags and NOAA’s Southwest Fisheries Science Center (SWFSC) is tracking movement of these acoustic-tagged fish past eight “real-time” receiver locations from Redding to Middle River.

The latest acoustic-tracking update from the SWFSC is provided below. The SWFSC noted that the first tagged fish detected at Sacramento this year arrived 4.5 days after release, while the first fish arrived within 2.9 days of release last year. Not surprising, since flows soon after the release are lower this year -- ~10,000 cfs at Colusa in February 2016 compared to ~30,000 cfs at Colusa in February 2015.

Livingston Stone National Fish Hatchery JSATS acoustic tagged smolt movement as of 2/22/2016 17:00

FIRST RELEASE ONLY			FASTEST FISH ID: 4AA8			
Location	rkm of location	Total Fish detected	First arrival	Travel Time (days)	Speed (rkm/day)	Speed (miles/day)
Bonneyview	540.4	285	2/17/2016 18:00			
Colusa	314.4	74	2/20/2016 5:40	2.5	90.9	56.5
Tisdale	269.2	17	2/20/2016 20:38	0.6	72.5	45.0
Knights Landing	224.1	8	2/21/2016 11:09	0.6	74.6	46.3
Tower Bridge	172.0	1	2/22/2016 4:54	0.7	70.5	43.8
I80 Bridge	170.8	0				
Hood	138.9	0				
Middle River	150	0				

SECOND RELEASE ONLY			FASTEST FISH ID: 4AD2			
Location	rkm of location	Total Fish detected	First arrival	Travel Time (days)	Speed (rkm/day)	Speed (miles/day)
Bonneyview	540.4	285	2/18/2016 18:00			
Colusa	314.4	52	2/21/2016 9:18	2.6	85.7	53.2
Tisdale	269.2	4	2/22/2016 1:20	0.7	67.7	42.1
Knights Landing	224.1	0				
Tower Bridge	172.0	0				
I80 Bridge	170.8	0				
Hood	138.9	0				
Middle River	150	0				

Bonneyview = site of release, fish trucked from LSNFH

rkm of location = distance via mainstem path from Golden Gate Bridge, GG Bridge = 0 rkm.

Travel Time = arrival date of location above minus arrival date of current location / distance

Agenda Item 7.
6-year steelhead study

2016 is the last year of implementing the 6-year steelhead study required per Action IV.2.2 of the NMFS BiOp. Israel (Reclamation) reported that the first release of steelhead for the 6-year study in 2016 is occurring this week at Durham Ferry on the San Joaquin River.

Agenda Item 8.

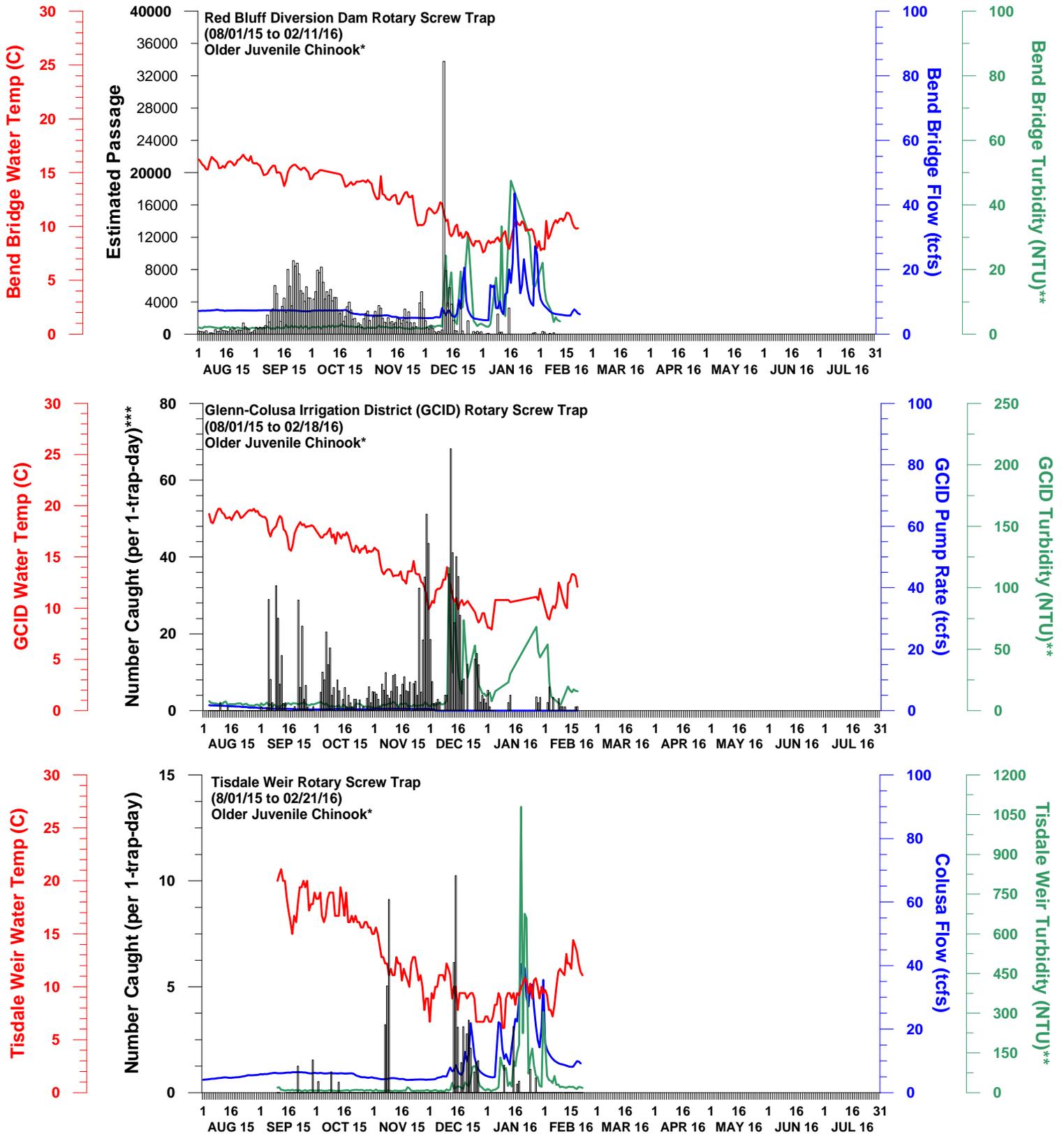
DOSS Advice to WOMT and NMFS: None

Agenda Item 9.

Next Meeting: The next DOSS conference call will be on 3/1/16 at 9am.

The following graphs were provided (after the DOSS call) by DWR for Chinook salmon and steelhead observed at monitoring locations in the Sacramento and San Joaquin rivers and Delta. Also available at: <http://www.water.ca.gov/swp/operationscontrol/calfed/calfedmonitoring.cfm>

NUMBER OF UNMARKED OLDER JUVENILE CHINOOK MEASURED IN THE SACRAMENTO RIVER

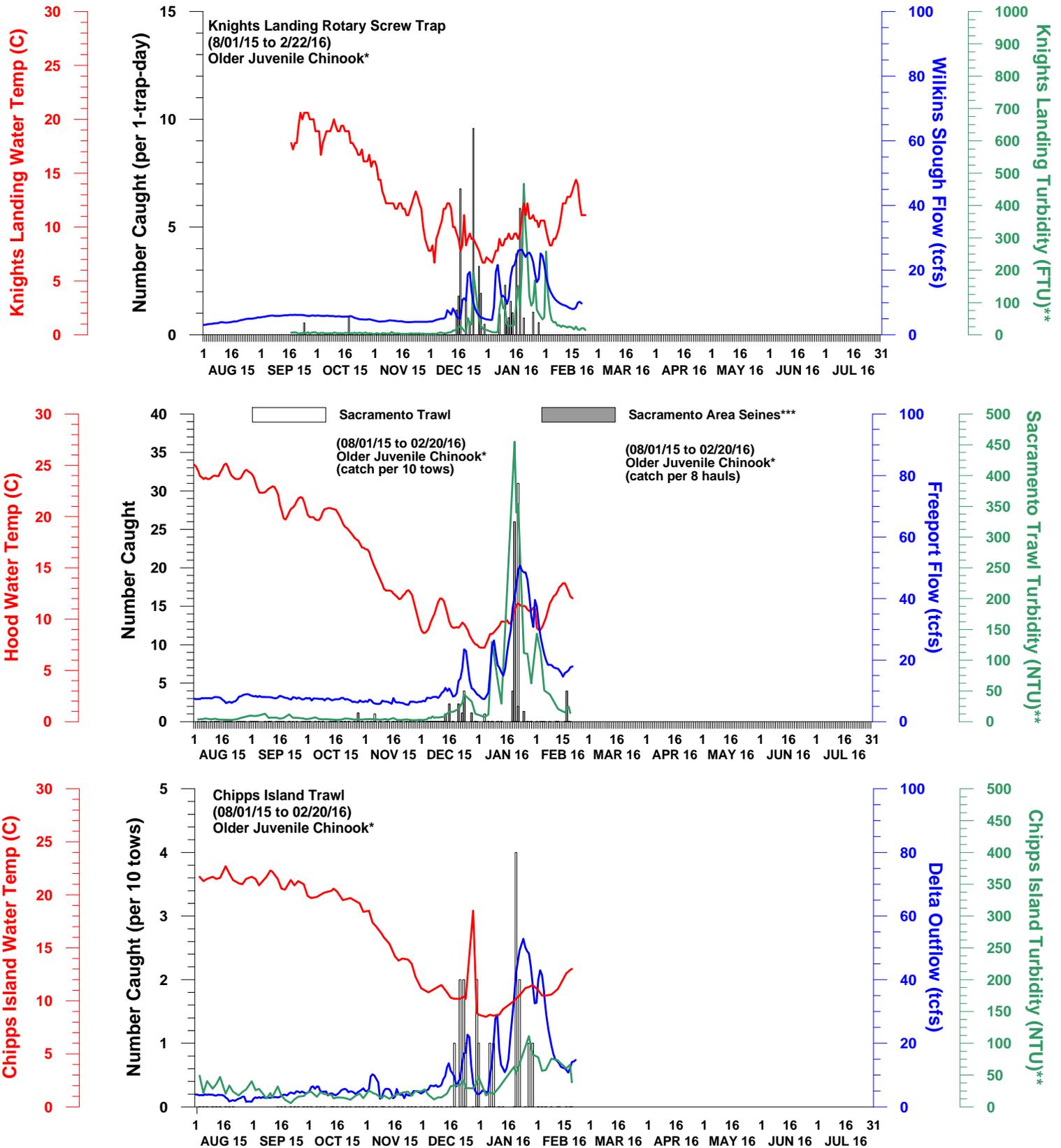


DWR-DES 23 FEB 2016
 Preliminary data from DFW, FWS, GCID, and CDEC; subject to revision.

*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 23 FEB 2016

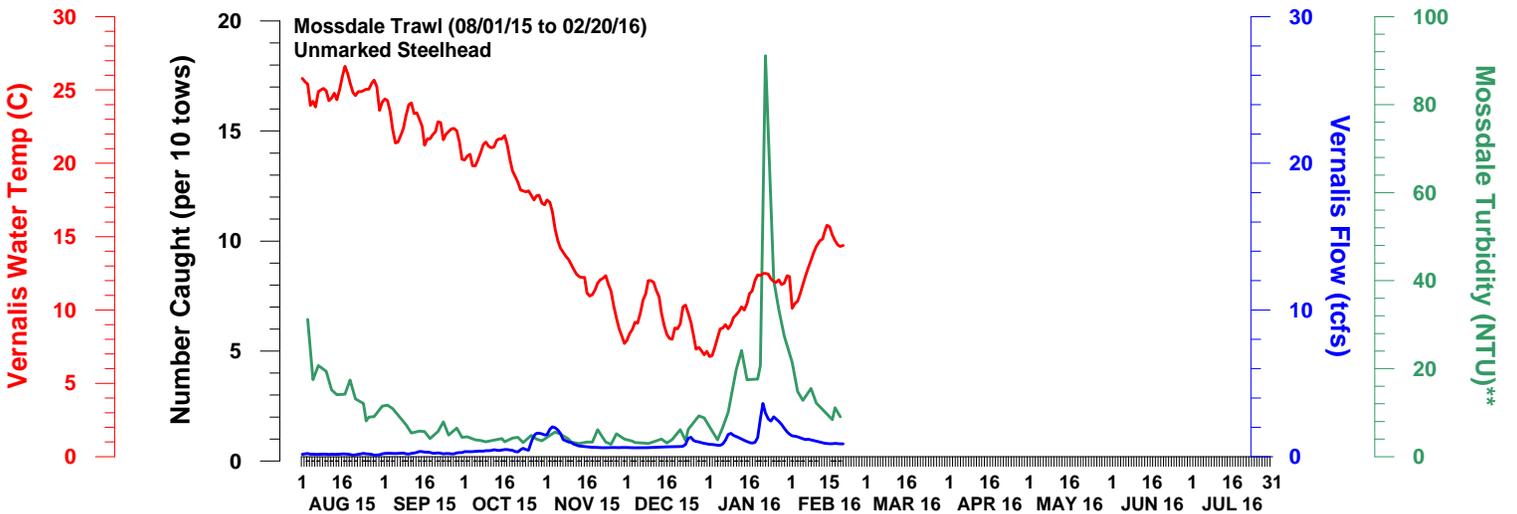
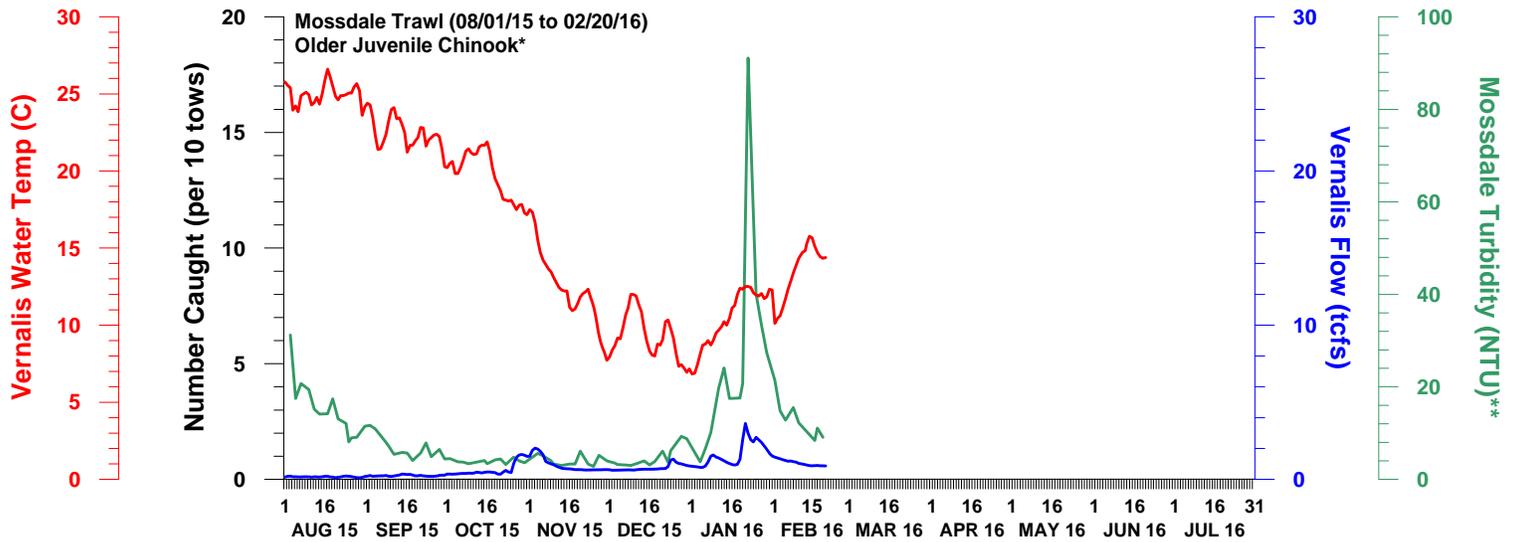
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**Turbidity is a discrete measurement and is not measured continuously. Therefore, data are interpolated on days when turbidity was not measured unless data are missing for more than five days. Knights Landing turbidity measured in FTU, which should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

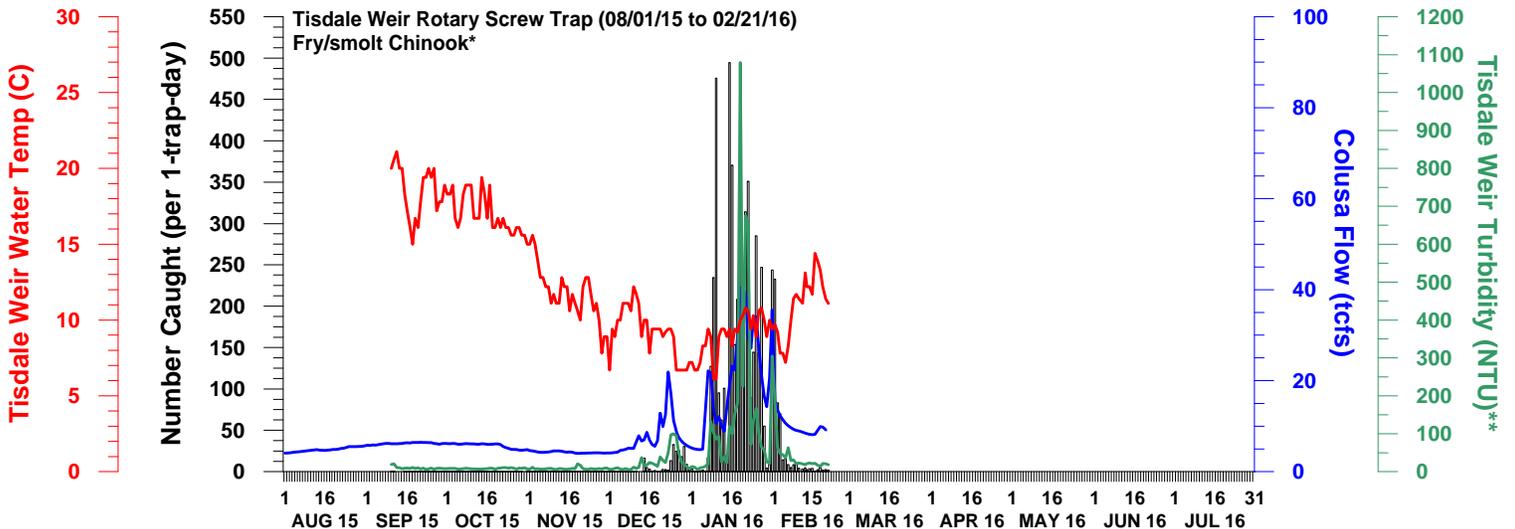
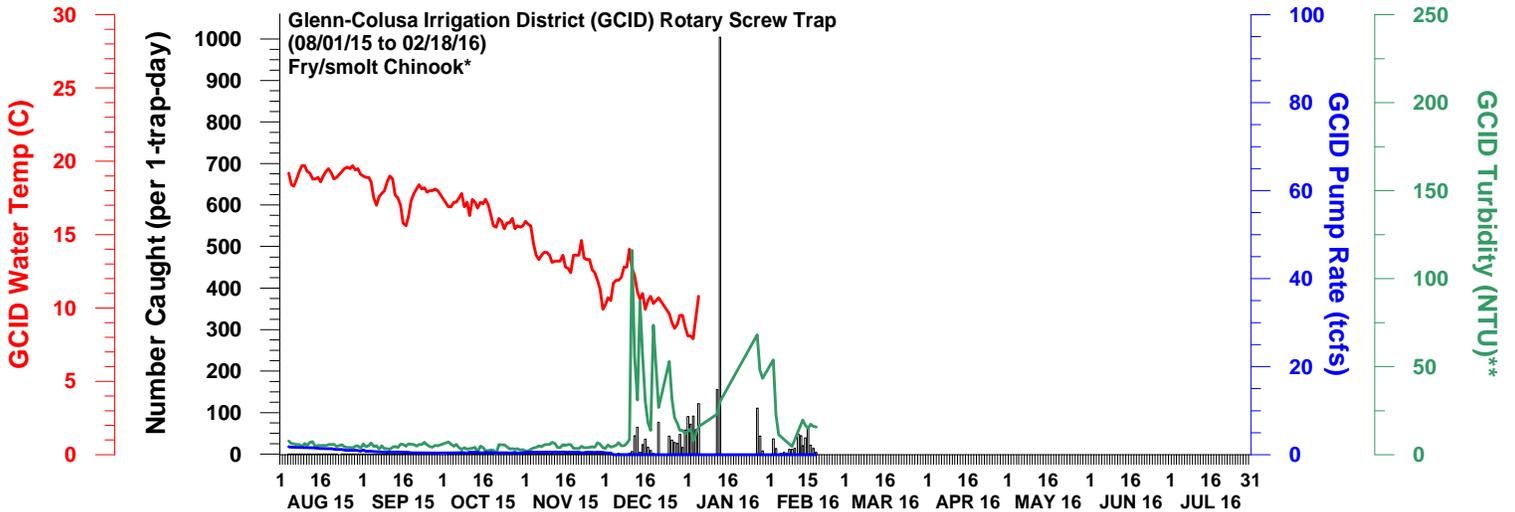
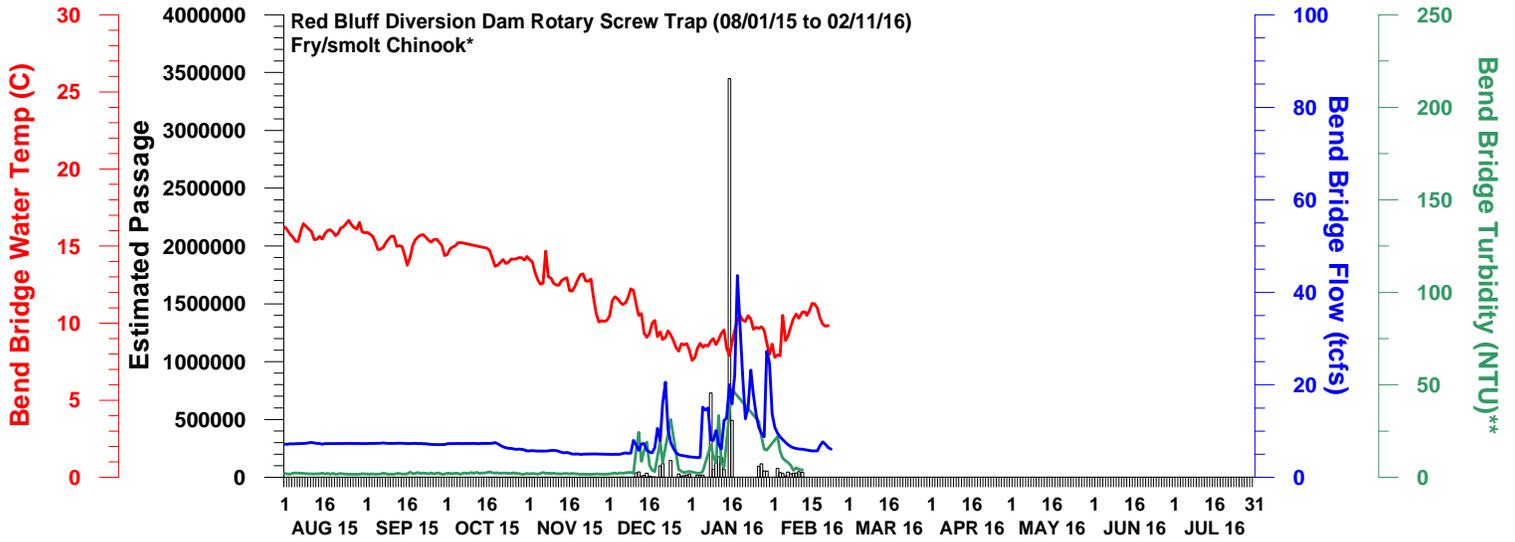


DWR-DES 23 FEB 2016
Preliminary data from FWS and CDEC; subject to revision.

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



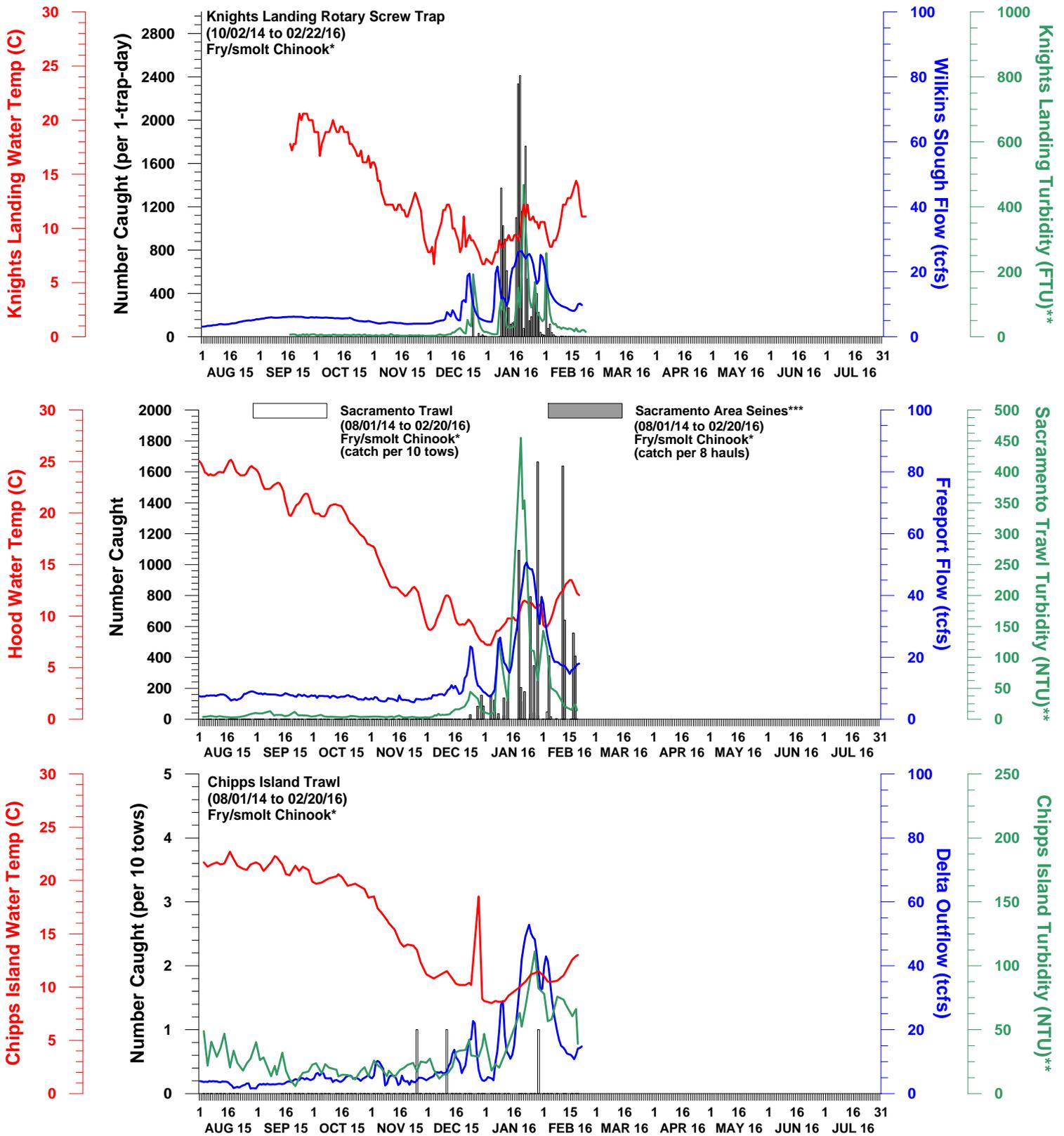
DWR-DES 23 FEB 2016

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

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



DWR-DES 23 FEB 2016

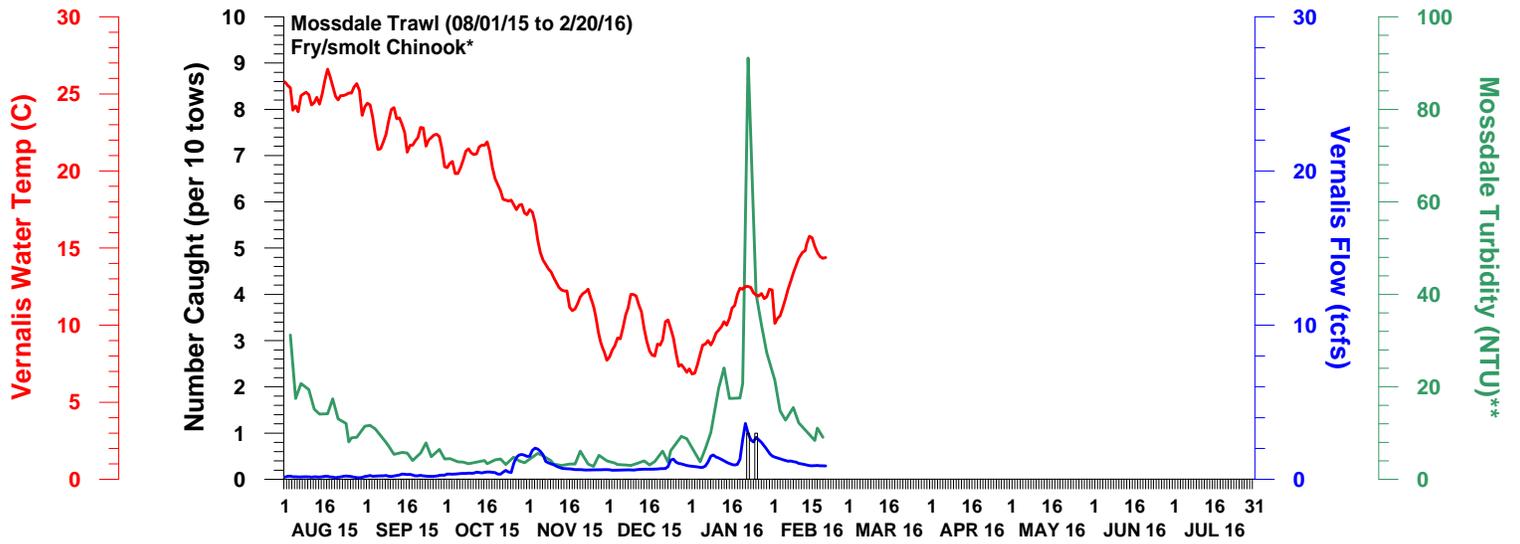
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**Turbidity is a discrete measurement and is not measured continuously. Therefore, data are interpolated on days when turbidity was not measured unless data are missing for more than five days. Knights Landing turbidity measured in FTU, which should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



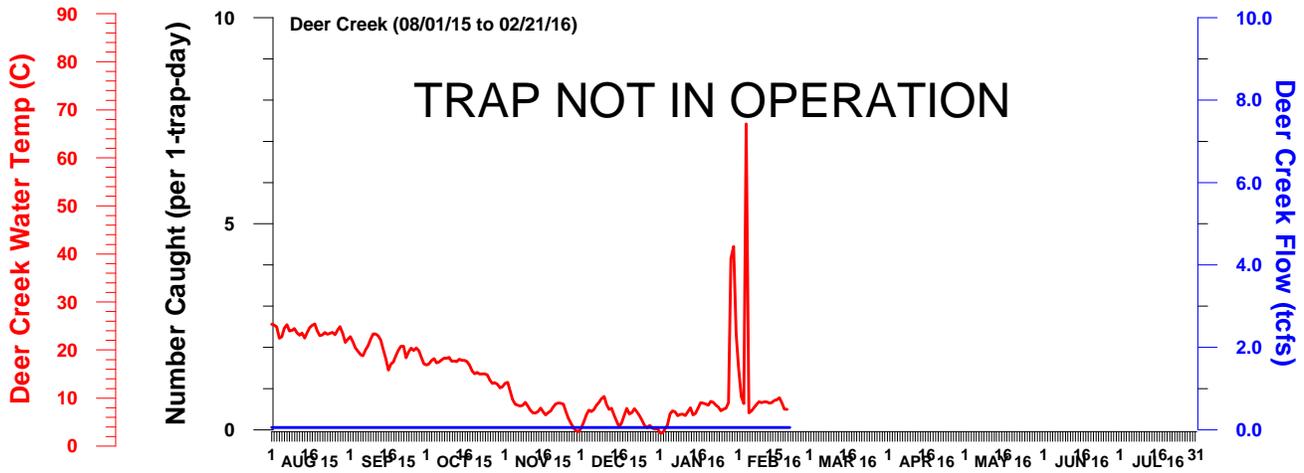
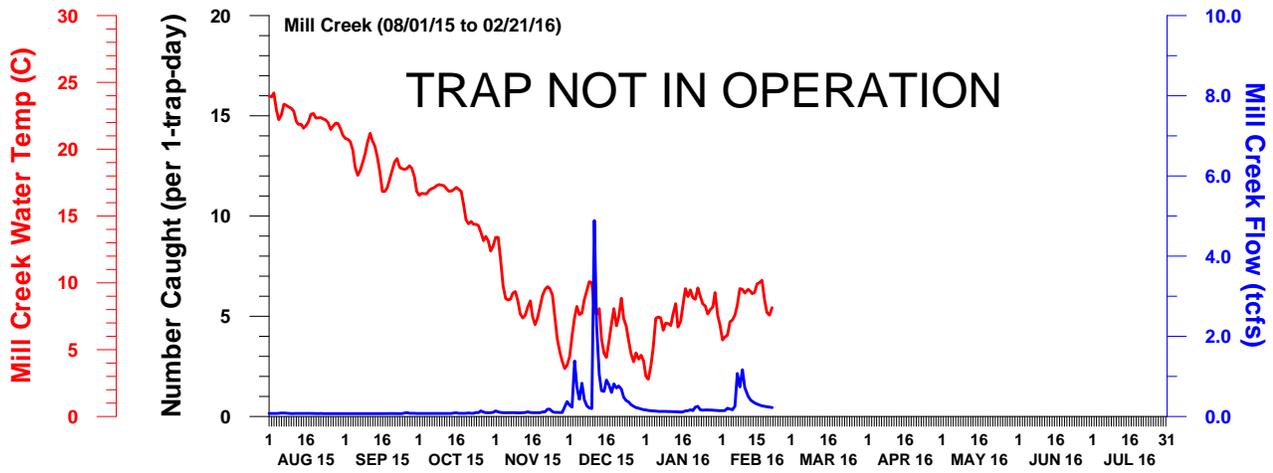
DWR-DES 23 FEB 2016

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.

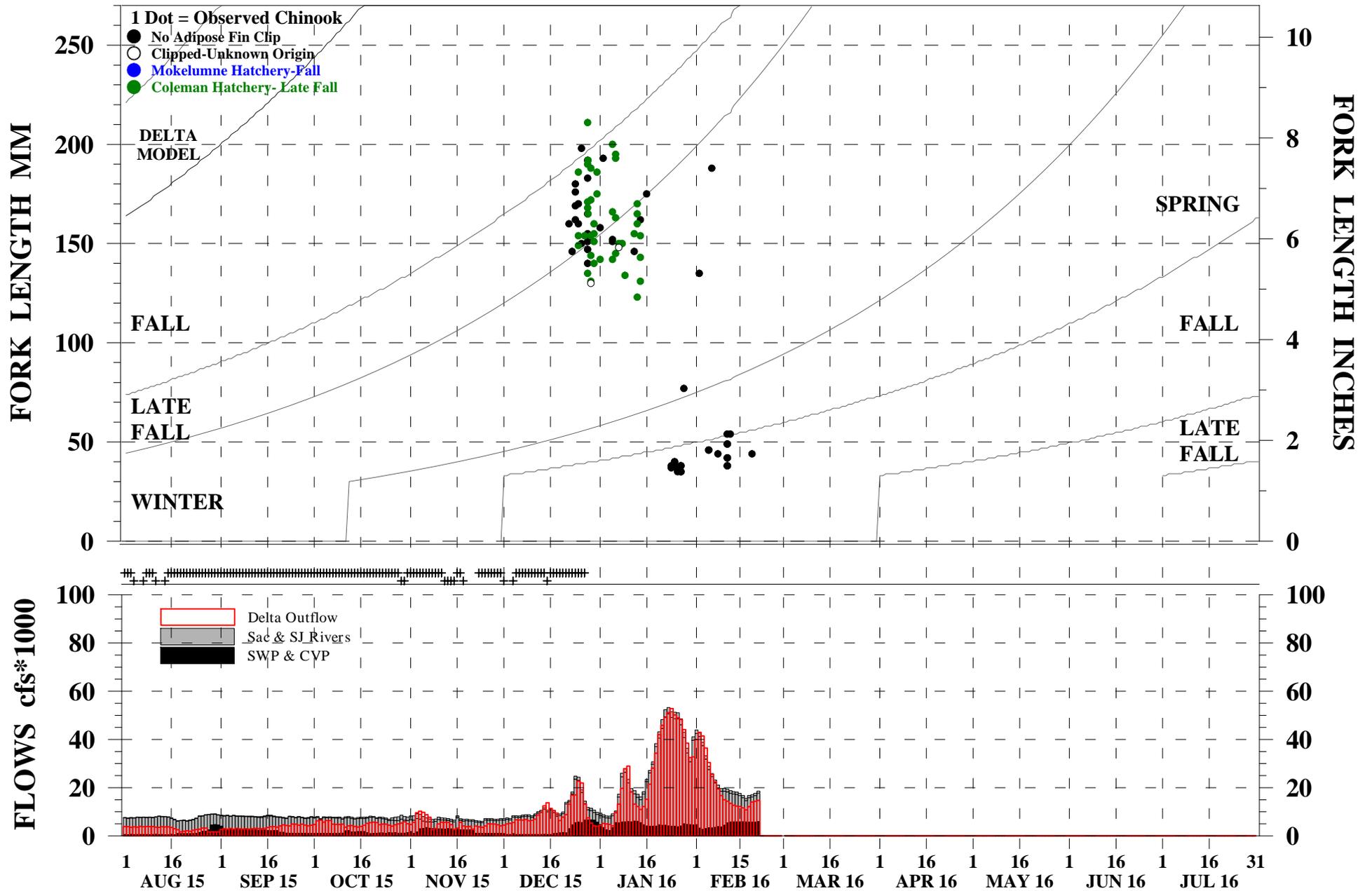
Sacramento River Trawl, Sacramento Area Beach Seine, and Chipps Island Trawl data were obtained directly from FWS, Stockton Fish and Wildlife Office (<http://www.fws.gov/stockton/ifmp/>).

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 02/23/2016

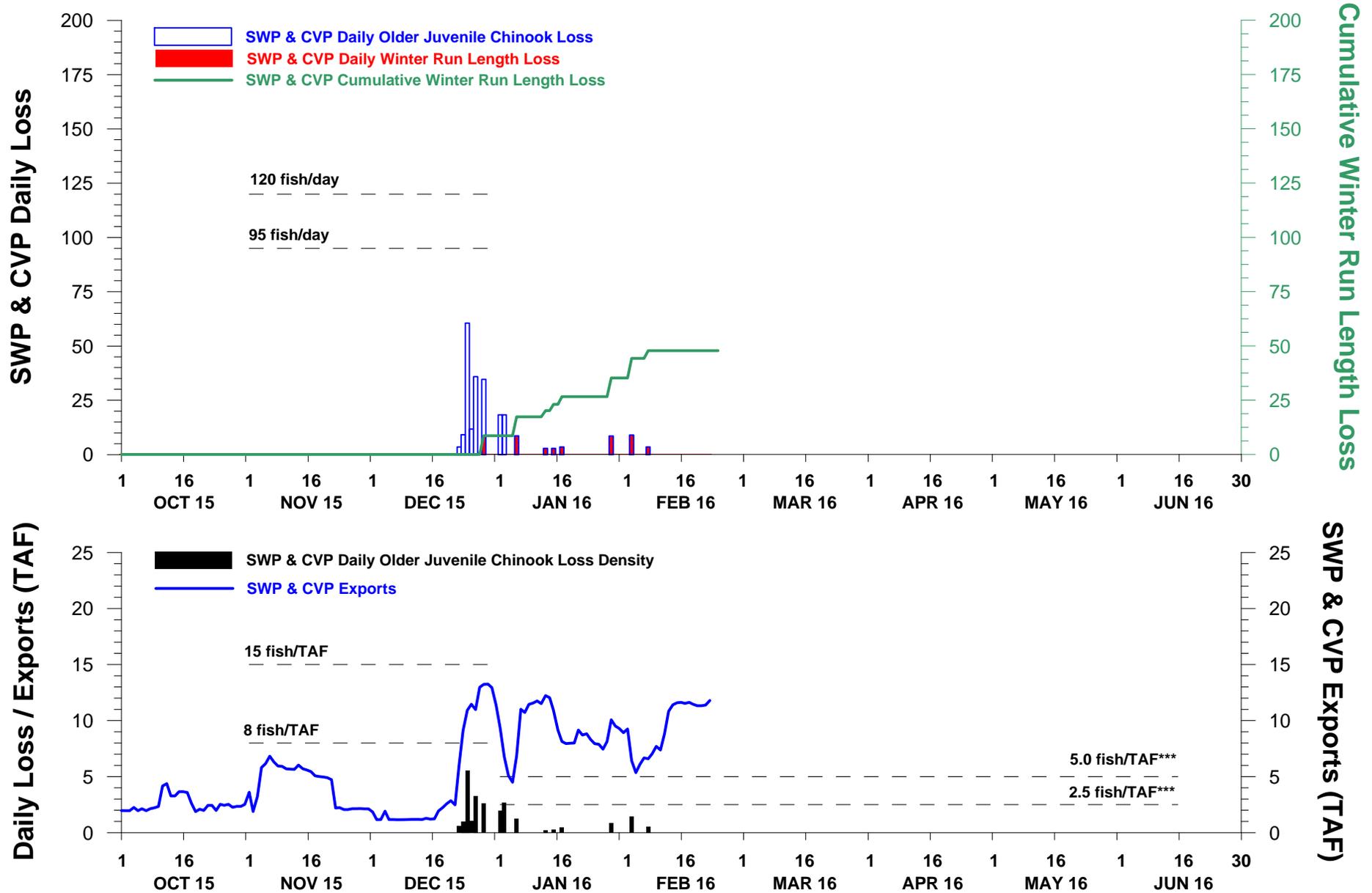


DWR-DES 23 FEB 2016

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 23 FEB 2016



DWR-DES 23 FEB 2016

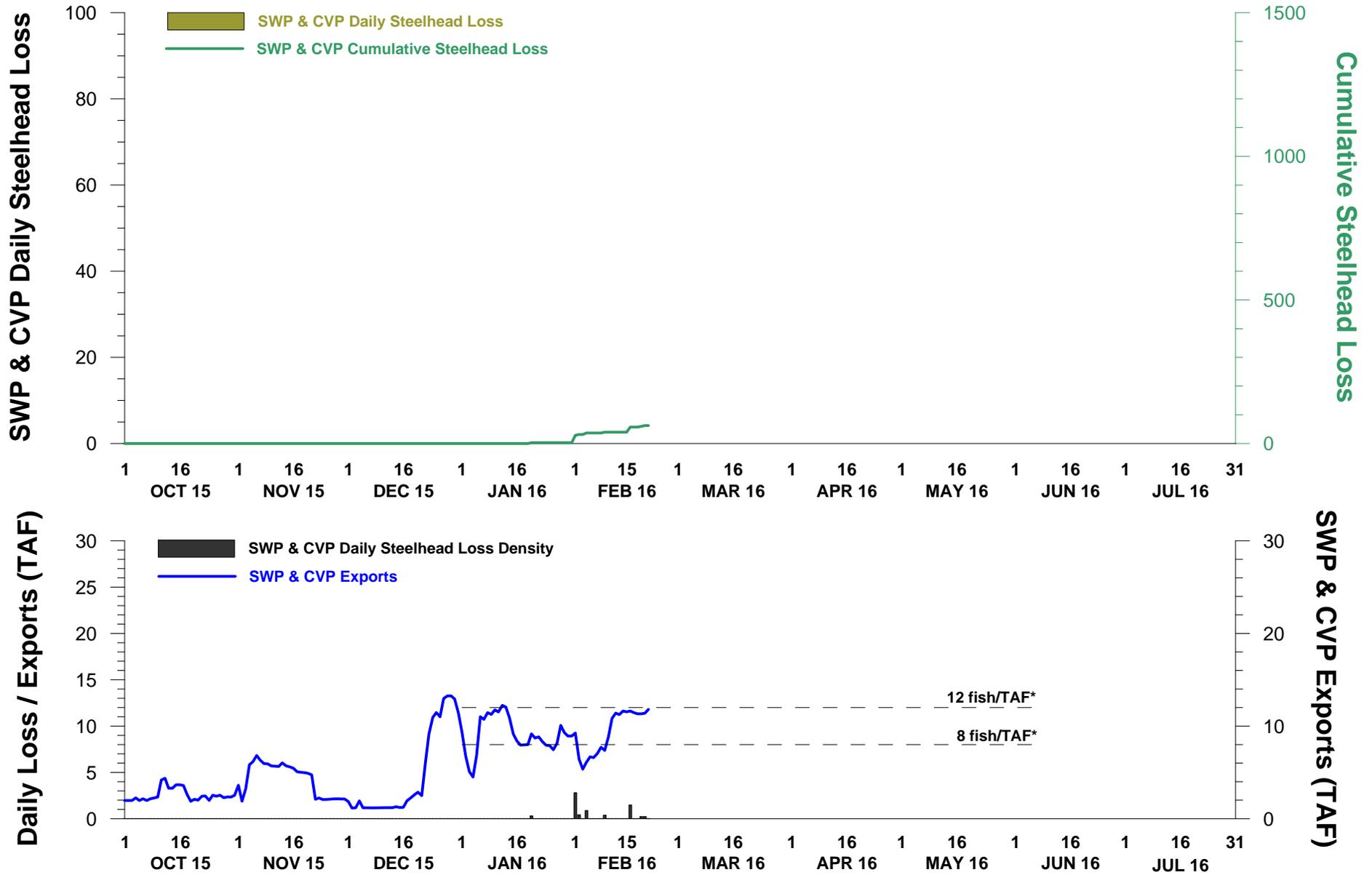
Preliminary data from DFW; subject to revision.

*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 STEELHEAD LOSS AT THE DELTA FISH FACILITIES 01 OCT 2015 THROUGH 23 FEB 2016

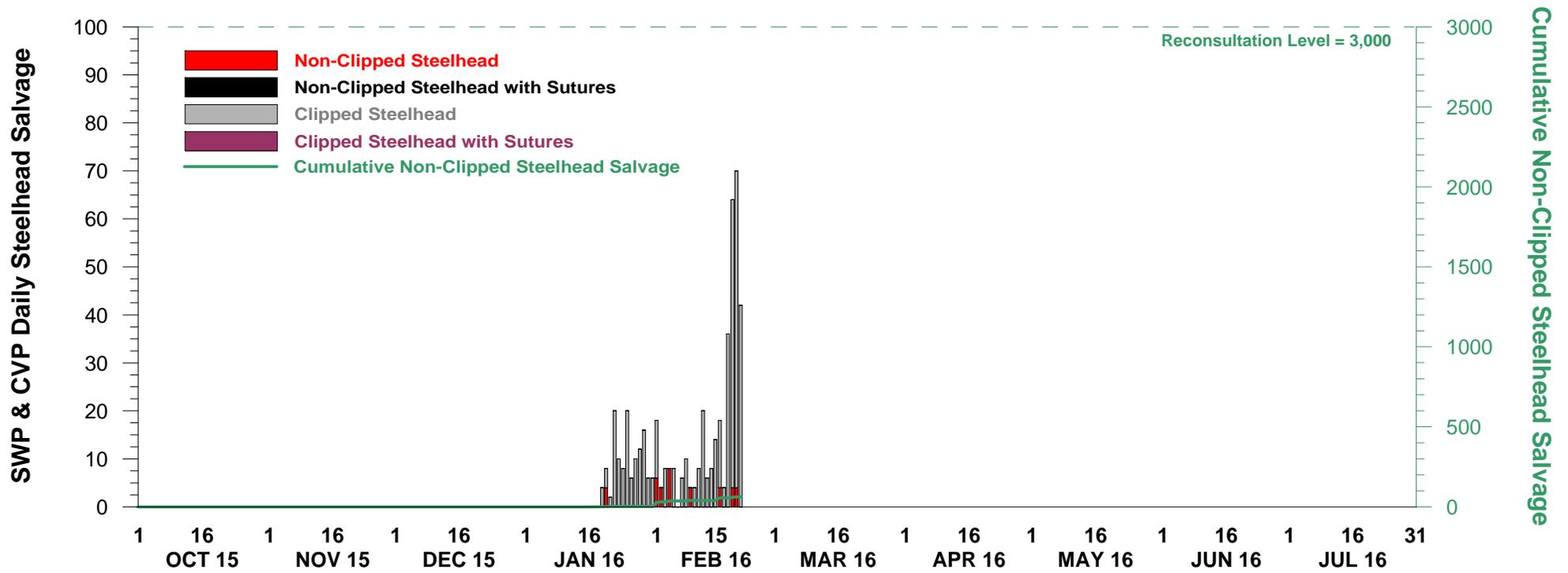


DWR-DES 23 FEB 2016

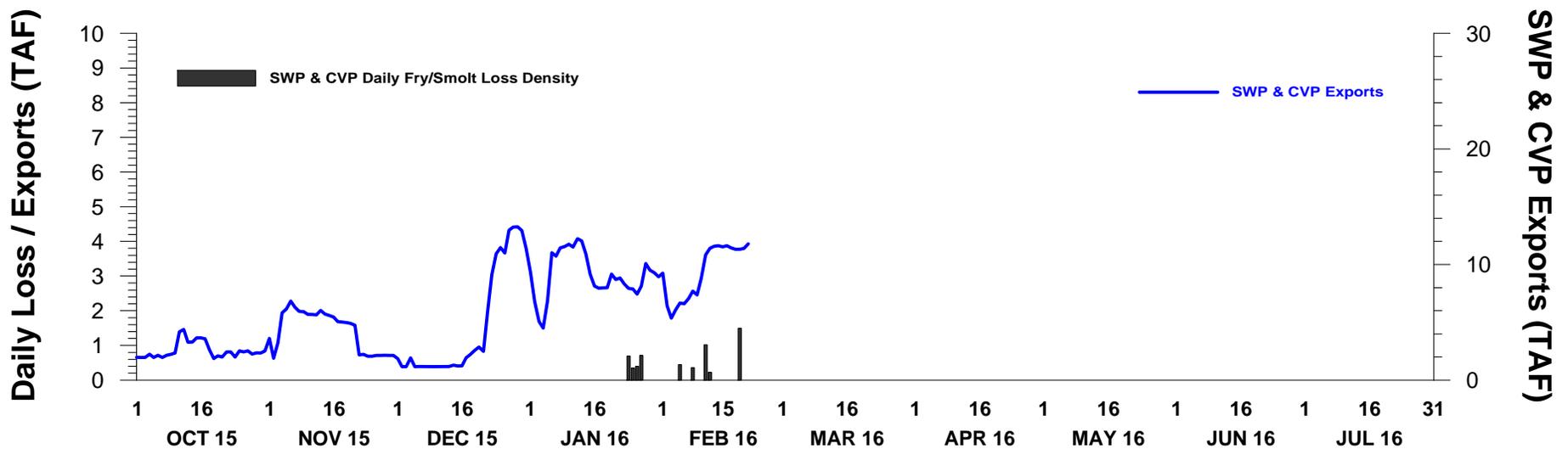
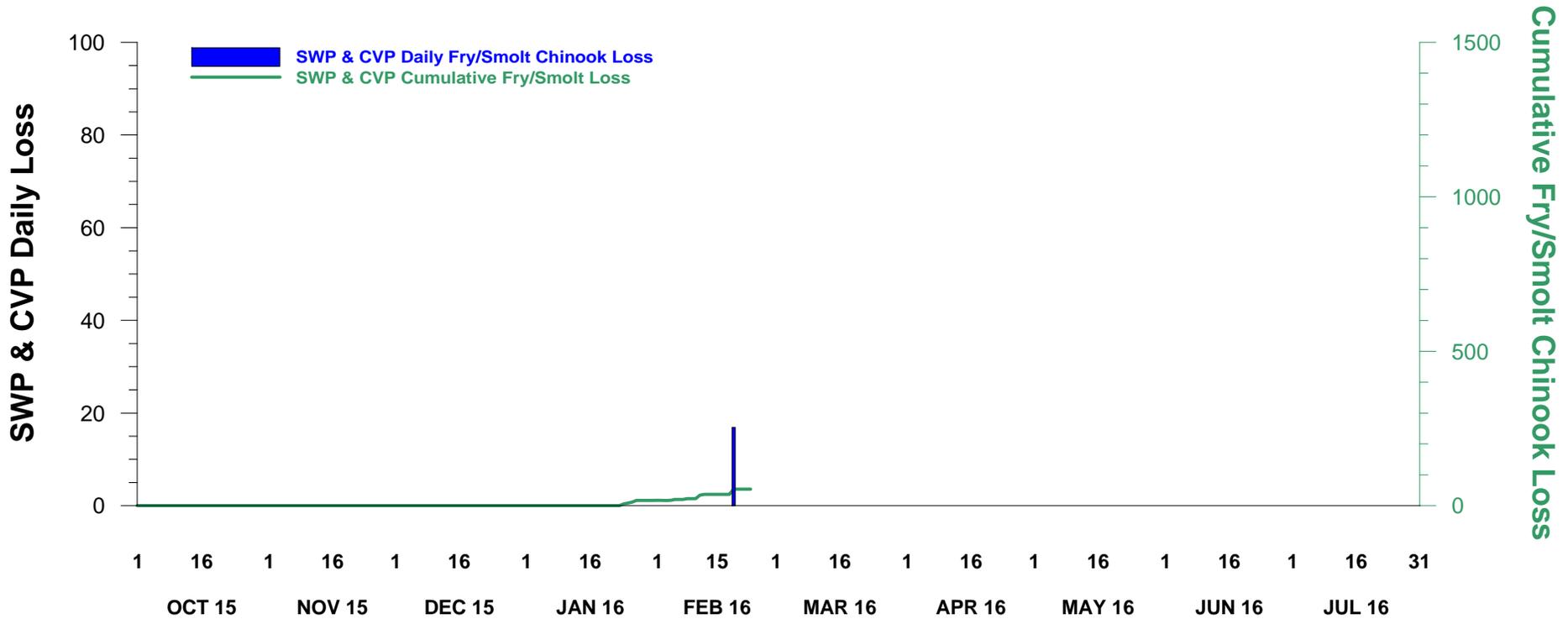
Preliminary data from DFW; subject to revision.

*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 23 FEB 2016



NON-CLIPPED FRY/SMOLT CHINOOK LOSS AT THE DELTA FISH FACILITIES 01 OCT 2014 THROUGH 17 FEB 2016



DWR-DES 23 FEB 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).

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	170.59	68,000	n/a	0.251	n/a	0.5%	1.0%	1/6/2016	2/2/2016
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

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	18.16	0.00	0.00	0.00	0
CVP	0.00	0.00	0.00	0.00	0
TOTAL	18.16	0.00	0.00	0.00	0

SWP and CVP adipose-fin clipped Chinook lost from 12/25/2015

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 accidentally 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.

** Information not yet available.

DWR-DES Revised 02/23/2016

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