

## Delta Operations for Salmonids and Sturgeon (DOSS) Group

4/29/14

**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](http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/doss.html).

### Attendees

**DWR:** Mike Ford, Farida Islam, Aaron Miller, Dan Yamanaka, James Gleim, Rhiannon Mulligan

**FWS:** Erin Gleason

**NMFS:** Barbara Rocco, Barb Byrne, Jeff Stuart, Erin Strange

**Reclamation:** Russ Yaworsky, David van Rijn

**DFW:** Bob Fujimura, Chris McKibbin, Colin Purdy

**EPA:** Erin Foresman

**SWRCB:** Scott Ligare

**USGS:** not present

### Agenda

1. Agenda Review and Introductions
2. Fish Monitoring
3. Spring-Run Chinook Reintroduction to the San Joaquin River (Erin Strange, NMFS San Joaquin River Branch)
4. Current Ops
5. SWG
6. DOSS Advice?

**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	Sacramento Trawls <sup>1</sup>	Mossdale Kodiak Trawl <sup>2</sup>	GCID	Knights Landing RST	Tisdale RST	Beach Seines	Jersey Point
<b>Sample Date</b>	4/23, 25	4/23, 25	4/22–26	4/22–29	4/22–27	4/22–28	4/22–24	n/a
<b>Total Catch</b>	<b>140</b>	<b>66</b>	<b>41</b>	<b>1,909</b>	<b>20</b>	<b>42</b>	<b>69</b>	
<b>FR</b>	57	56	40	1,725	16	39	51	
<b>WR</b>				1				
<b>SR</b>	53	8		135	2	3	6	
<b>LFR</b>								
<b>Ad-Clipped Chinook</b>	28	2	1	48 (FR)	2		1	

<b>DS</b>								
<b>Splittail</b>	1 (285 mm)						11	
<b>Longfin</b>								
<b>SH (ad-clip)</b>	1							
<b>SH (wild)</b>				1				
<b>W. Temp. (avg. °F)</b>	63.0	65.8		67.0	65.2	62.3	65.1	
<b>Flows (avg. cfs)</b>					4,295	4,620		
<b>Turbidity (avg. NTU)</b>	42.9	6.7		4.62	5.5	8.9	11.0	
<b>WR/LFR Avg. CPUE</b>				11.39				
<b>FR/SR Avg. CPUE</b>					0.066	0.114		

CPUE = catch per unit of effort reported as the average fish/hour over reported sampling dates; AC=ad-clipped; ACT = acoustic tag; GCID = Glenn-Colusa Irrigation District; RST = rotary screw trap

<sup>1</sup>Sacramento Trawls changed gear type from a Kodiak trawl arrangement to a midwater trawl arrangement on 4/3.

<sup>2</sup>Mossdale Trawls to be conducted by CDFW between 4/1 and 6/30.

**Fish Salvage<sup>1</sup>:** DFW provided an update on fish salvage at CVP’s Tracy Fish Collection Facility (TFCF) and SWP’s Skinner Fish Collection Facility (SFCF) from 4/21 to 4/27. All salmonids salvaged were at TFCF except for the salvage of one ad-clipped steelhead at the SFCF. There was an increase in the salvage of non-clipped juvenile salmon in the fall-run size (205) and a slight decrease in spring-run-sized salmon (77). No non-clipped winter-run-sized salmon were salvaged. No ad-clipped Chinook salmon were salvaged. No sturgeon have been observed this season. Some DOSS members suggested that the salvaged fall-run-sized Chinook were most likely from the San Joaquin Basin because the Mossdale trawl is showing increased Chinook passage with the recent increase in San Joaquin flows.

The season total loss for wild steelhead is 255. Twelve hatchery (loss of 12) and 3 wild steelhead (loss of 2) were salvaged.

Preliminary data for 4/28 indicates that 44 non-clipped fall run and 4 non-clipped spring run were salvaged at TFCF; no steelhead or sturgeon were recorded.

**TFCF:** On 4/25, there was an unannounced 35-min outage to install a low-pressure pump in the secondary channel. Exports continued and fish counts were not affected during that period.

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<sup>1</sup>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: April 21-27, 2014**  
 Prepared by Bob Fujimura on April 28, 2014 2000  
 Preliminary Results - Subject to Revision

Criteria	21-Apr	22-Apr	23-Apr	24-Apr	25-Apr	26-Apr	27-Apr	Trend	
<b>Loss Densities</b>									
Wild older juvenile CS	0	0	0	0	0	0	0	↗	0.00
Wild steelhead	0	0	0.33	0	0	0	0		0.05
<b>Exports</b>									
SWP daily export	926	1,290	1,290	248	248	245	926	↗	739
CVP daily export	3,956	4,689	4,958	4,951	4,955	4,963	4,958		4,776

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)  
 \*Value includes the latest interpretation of a NMFS/USBR interim procedure to estimate loss due to secondary channel construction outage.

**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
<b>Wild</b>					
Winter Run	0	0	↘	192	338
Spring Run	77	56	↘	452	323
Late Fall Run	0	0	↘	0	0
Fall Run	205	144	↘	297	209
Unclassified	0	0	↘	0	0
<b>Total</b>	<b>282</b>	<b>200</b>		<b>941</b>	<b>870</b>
<b>Hatchery</b>					
Winter Run	0	0	↘	6	12
Spring Run	0	0	↘	12	8
Late Fall Run	0	0	↘	0	0
Fall Run	0	0	↘	0	0
Unclassified	0	0	↘	0	0
<b>Total</b>	<b>0</b>	<b>0</b>		<b>18</b>	<b>20</b>

Trend = weekly loss per race; Salvage = estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time  
 \*Value includes the latest interpretation of a NMFS/USBR interim procedure to estimate loss due to secondary channel construction outage.

**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	3	2	↘	177	255
Hatchery	12	12	↘	226	311
<b>Total</b>	<b>15</b>	<b>14</b>		<b>403</b>	<b>566</b>

State Water Project loss = salvage x 4.33; Central Valley Project loss = salvage x 0.68

Generated by Bob Fujimura on April 28, 2014



Figure 1. Daily salvage of Chinook salmon (all races) and water exports from the state and federal fish salvage facilities during March 16 through April 27, 2014. Graph obtained from the DFG salvage monitoring web-page: <http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx>.

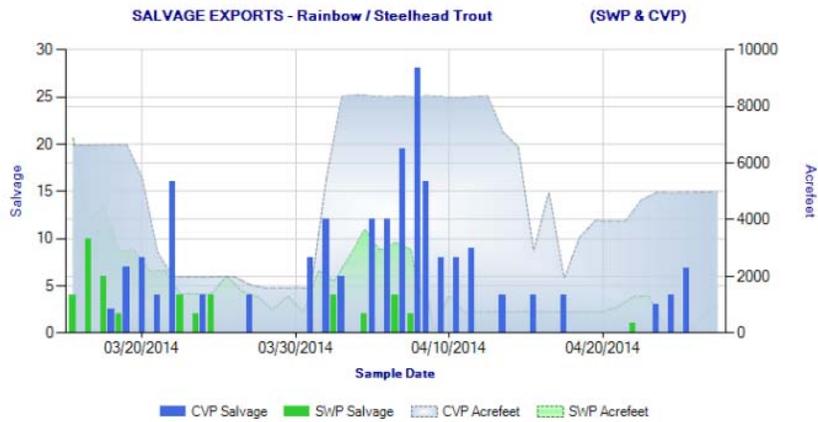


Figure 2. Daily salvage of steelhead and water exports from the state and federal fish salvage facilities during March 16 through April 27, 2014. Graph obtained from the DFG salvage monitoring web-page: <http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx>

**Coded Wire Tags (CWTs):** The salmon with a 06-05-59 tag code salvaged at TFCF on 4/13 is a fall-run Chinook released on 3/7 at the Hills Ferry Barrier as part of the San Joaquin River Restoration Program. The ad-clipped Chinook caught on 4/8 at TFCF was released because the wand used to check for CWTs did not indicate a CWT was present; therefore, there will be no CWT results available.

CONFIRMED HATCHERY (ADIPOSE-FIN CLIPPED) CHINOOK SALMON LOSS AT THE SWP & CVP DELTA FISH FACILITIES, 2013/2014

Release Date	CWT Race	Hatchery	Release Site	Release Type	Confirmed Loss	Number Released <sup>1</sup>	Total Entering Delta	% Loss of Number Released <sup>2</sup>	% Loss of Total Entering Delta <sup>3</sup>	First Concern Level	Second Concern Level	Date of First Loss <sup>4</sup>	Date of Last Loss <sup>4</sup>
11/1/2013	F	Mokelumne River Hatchery	Mokelumne River Hatchery	Production	8.90	99,553	n/a	0.009	n/a	n/a	n/a	3/20/2014	4/11/2014
12/10/2013	LF	Coleman NFH	Battle Creek	Production	0.00	267,301	n/a	0.000	n/a	n/a	n/a	*	*
1/7/2014	LF	Coleman NFH	Battle Creek	Spring Surrogate	0.00	68,516	n/a	0.000	n/a	0.5%	1.0%	*	*
1/13/2014	LF	Coleman NFH	Battle Creek	Spring Surrogate	0.00	81,962	n/a	0.000	n/a	0.5%	1.0%	*	*
1/13 to 1/14/2014	LF	Coleman NFH	Battle Creek	Production	2.88	464,300	n/a	0.001	n/a	n/a	n/a	3/7/2014	3/7/2014
1/23/2014	LF	Coleman NFH	Battle Creek	Spring Surrogate	0.00	73,600	n/a	0.000	n/a	0.5%	1.0%	*	*
2/10/2014	W	Livingston Stone NFH	Caldwell Park	Production	0.00	193,224	30,880	0.000	0.000	0.5%	1.0%	*	*
3/24 to 3/28/2014	F	Coleman NFH	Rio Vista net pens	Production	2.33	629,400	n/a	0.0004	n/a	n/a	n/a	4/4/2014	4/4/2014
2/28/14 to TBA	F	**	Hills Ferry Barrier/Fremont Ford Bridge	Experimental/SJRRP	2.33	**	n/a	**	**	n/a	n/a	4/13/2014	4/13/2014
4/17 to 4/18/14	S	Feather River Hatchery	Hills Ferry Barrier	Production	0	54,000	n/a	0	**	n/a	n/a	*	*

UNCONFIRMED HATCHERY (ADIPOSE-FIN CLIPPED) CHINOOK SALMON LOSS AT THE SWP & CVP DELTA FISH FACILITIES, 2013/2014

Facility	Unknown CWT Loss <sup>5</sup>	Unread CWT Loss <sup>6</sup>	Unknown Hatchery Loss <sup>7</sup>	Acoustic Tag Loss <sup>8</sup>	Number of Unassigned CWTs <sup>9</sup>
SWP	0.00	0.00	0.00	0.00	0
CVP	3.01	0.00	0.00	0.00	0
<b>TOTAL</b>	<b>3.01</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0</b>

SWP and CVP adipose-fin clipped Chinook lost from 10/1/2013 through 4/27/2014.

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

<sup>2</sup>% Loss of Number Released = (Confirmed Loss/Number Released)\*100.

<sup>3</sup>% Loss of Total Entering Delta = (Confirmed Loss/Total Entering Delta)\*100.

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

<sup>5</sup>Adipose-fin clipped Chinook was observed during fish count, but tag code could not be determined (e.g., damaged tag, lost tag, or Chinook released).

<sup>6</sup>Adipose-fin clipped Chinook was collected during fish count and has not been processed yet.

<sup>7</sup>CWT has been read, but hatchery release information not yet available.

<sup>8</sup>Adipose-fin clipped Chinook released due to presence of sutures.

<sup>9</sup>CWT 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 4/28/2014

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

**Fish Distribution:** Based on the information provided in the monitoring reports, DOSS agreed that the yearling spring-run estimate has not changed over the last week, but updated the estimated distribution of YOY winter and spring run. Flows are so low in the Sacramento River that fish might not be moving or be able to avoid the rotary screw traps (RSTs); it is difficult to know for sure how to assess some monitoring data in terms of estimating fish distribution. Nonetheless, with increased water temperatures and based on historical patterns (seasonally —temps actually dropped a bit since last week), DOSS estimates that most of the winter run are already past Chipps Island. The hatchery fall run were released at a size near the threshold of length-to-date spring-run size, which makes it difficult to distinguish the two races.

	Yet to Enter Delta	In the Delta	Exited the Delta Past Chipps Island
<i>Young-of-year (YOY) winter-run Chinook salmon</i>	<5% (same as last week)	5–10% (last week <25%)	90–95% (last week: >75%)
<i>Yearling spring-run Chinook salmon</i>	Most yearling spring run have most likely exited the Delta.		
<i>YOY spring-run Chinook salmon</i>	<10–15% (last week: ~15–30%)	25–75% (last week: ~40–75%)	>25%* (last week: ~5–25%)

\*DOSS believes that many of spring-run-sized Chinook in the monitoring data are from the millions of fall-run hatchery fish in the system—hatchery releases of fall run (25% ad-clipped and with coded wire tags, 75% unmarked) have occurred at Rio Vista and in Battle Creek. Estimates of the YOY spring-run Chinook distribution take this “spillover” into consideration. For example, the range estimated for the fraction of the YOY spring-run population having passed Chipps Island is lower than it would have been had DOSS believed that all spring-run-sized fish reported at Chipps were actually genetic spring run; however, because DOSS cannot “correct” for the hatchery fish spillover effect exactly, the ranges for the YOY spring-run distribution are rather wide.

### Operations (4/29/14)

SWP		CVP	
<b>Exports (cfs)</b>			
Clifton Court Forebay	500 (will adjust in response to Vernalis flows)	Jones Pumping Plant	2,550 (will decrease to 2,000 on 5/1 with Vernalis flows receding)
<b>Reservoir Releases (cfs)</b>			
Feather - Oroville	800	American - Nimbus	800
		Sacramento - Keswick	4,450 (increasing to 5,000 on 4/30 for anticipated depletion upstream of Wilkins Slough)*
		Stanislaus - Goodwin	2,500 (will increase to 2,900 tonight; decrease to 2,100 on 4/30 a.m.)
<b>Reservoir Storage (in TAF, % of capacity)</b>			
San Luis (SWP)	386	San Luis (CVP)	567 (59)
Oroville	1,876	Shasta	2,409
New Melones		Folsom	542
<b>Delta Operations</b>			
DCC	Closed (expected to remain closed through end of April)	Sacramento River at Freeport (cfs)	6,682
Outflow Index (cfs)	~8,800	San Joaquin River (cfs) at Vernalis	2,984
Total Delta Inflow (cfs)	~10,322	OMR (daily) (cfs)	
Water Temperature (°F)		OMR 5-day avg (cfs index method)	-3,100
X2 (km)	>81	OMR 14-day avg (cfs, index method)	-2,900
E/I (%)	29.1 (14-d avg)		

\*At the time these notes were reviewed, actual Keswick releases had not yet reached these projected levels.

**OMR Index vs Gage Measurements:** Over the past 7 days for which gage data are available, the OMR using the index method for the 5-day average is running ~500 cfs more negative and on the 14-day average about ~300 cfs more negative than the gage measurements.

#### Feather River Flows:

CDFW noted that one of the CDEC gages on the Feather River was not working and asked which gage would represent Oroville releases. Miller (DWR) advised that the THA gage at Thermalito should reflect the total release into the Feather River from Oroville Reservoir.

**Controlling Operations:** The 1:1 I:E ratio is controlling exports.

**Spring-Run Releases in the San Joaquin River:** Erin Strange, NMFS San Joaquin River Branch, summarized the Delta operations–related elements of the 2014 Technical Memorandum which, “calculates and documents the proportionate contribution of Central Valley (CV) spring-

*run Chinook salmon originating from the reintroduction to the San Joaquin River and deducts or otherwise adjusts for this share of CV spring-run Chinook salmon take when applying the operational triggers and incidental take statements associated with the NMFS 2009 Biological Opinion...”*

Information (including the 2014 Technical Memorandum) related to the spring-run experimental population is available at:

[http://www.westcoast.fisheries.noaa.gov/central\\_valley/san\\_joaquin/san\\_joaquin\\_reint.html](http://www.westcoast.fisheries.noaa.gov/central_valley/san_joaquin/san_joaquin_reint.html).

NMFS committed to accounting for outmigrants from the experimental population of spring run to be reintroduced to the San Joaquin River and will prepare a technical memorandum each year that will identify methods by which to identify these spring run at the Delta facilities so as to not impose more than *de minimus* water supply reductions, additional storage releases, or bypass flows on unwilling third-party users as required by the San Joaquin River Restoration Settlement Act. Spring-run Chinook were released into the San Joaquin on 4/17–18 and there is a potential for them to be salvaged at the fish collection facilities. Because all spring-run Chinook salmon released in 2014 as part of the San Joaquin River Restoration Program (SJRRP) are 100% marked with an adipose fin clip and a coded-wire tag, it is straightforward to identify any SJRRP spring-run Chinook that are salvaged at the Delta export facilities this year. Accounting for the SJRRP fish will become more challenging once naturally produced (and unmarked) spring-run Chinook salmon begin to emigrate from the San Joaquin Basin, as is expected to occur 3 years from now. A technical team (comprising water users, agency staff, non-agency experts, Reclamation, and others) is discussing how to account for this natural production; approaches discussed include using marked sentinel groups, a juvenile production estimate, or genetic testing to help estimate the fraction of SJRRP Chinook in Delta salvage.

DOSS Q & A session with Strange:

Q: Are there plans to do a study of growth rates for spring run on the San Joaquin to potentially develop an adjusted set of length-at-date criteria for San Joaquin Basin Chinook?

A: The technical team considering how to differentiate between fall and spring runs, but not this year because the growth and migration behavior of the hatchery fish released this year might not be representative of naturally produced fish.

Q: Could stable isotopes be used as a natural marker for SJRRP spring-run Chinook?

A: The technical team will look into the feasibility of using a stable isotope marker to identify San Joaquin Chinook.

Q: If the spring-run population is reestablished in the San Joaquin, is it considered experimental or is it protected under ESA?

A: There is no “end date” yet associated with the experimental population. FWS has released experimental populations and has indicated an end date; however, NMFS did not set an end date because there are so many unknowns about how the system might change and how the fish might respond over the next 30 years. Within the experimental population area, otherwise lawful activities are accepted under the ESA section 9 take prohibitions for the spring-run Chinook salmon experimental population.

Anyone interested in joining the SJRRP technical team or who has information or suggestions relating to accounting for SJRRP fish is encouraged to contact Strange.

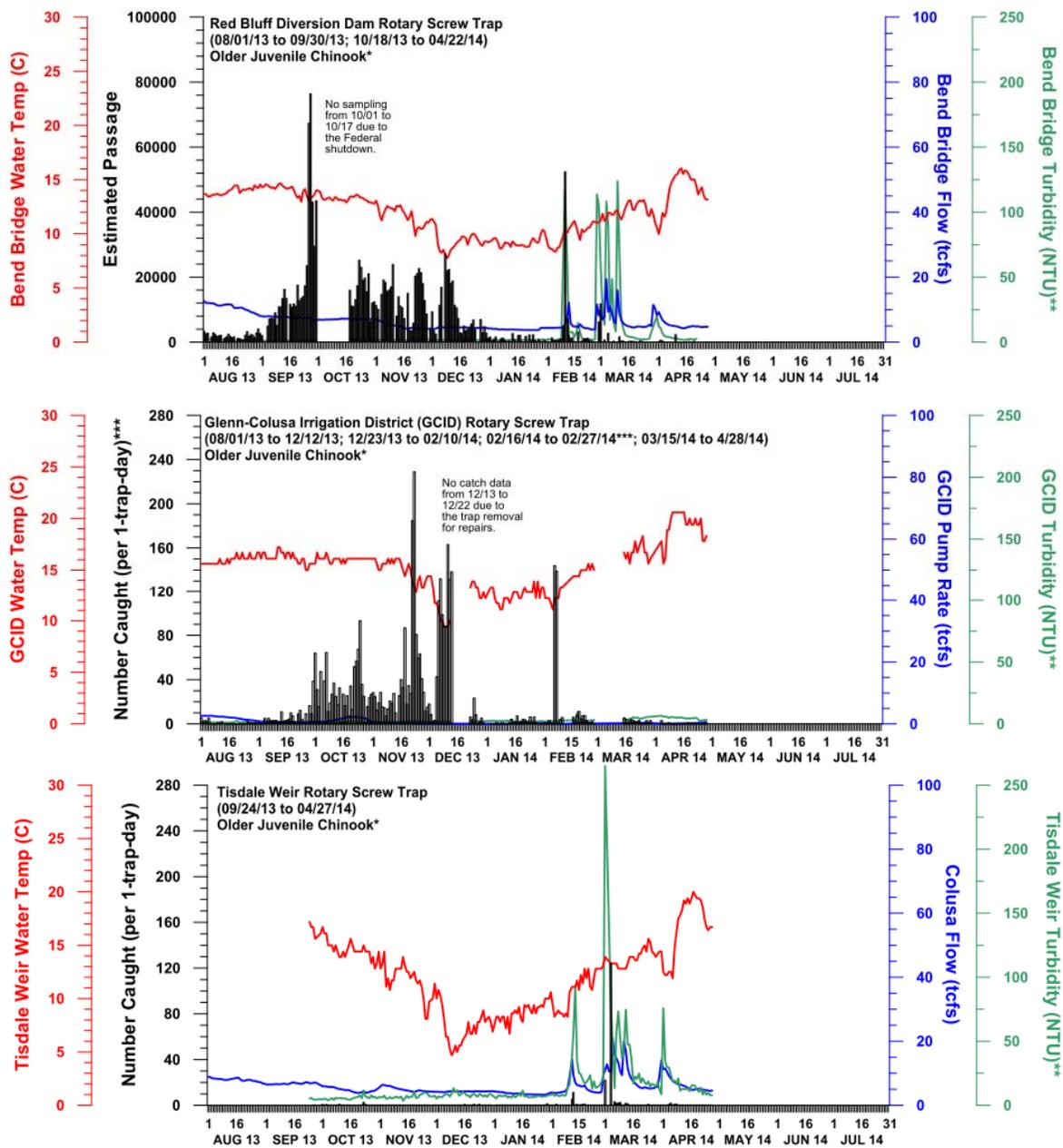
**Smelt Working Group (SWG):** Gleason (FWS) presented the SWG report. Delta smelt were salvaged at both fish collection facilities; the season total is 4 at TFCF and 16 at SFCF. SWG met on 4/28 and agreed that, given their present distribution, current salvage, and Delta conditions, there was no indication that projected exports (potentially resulting in OMR flows as negative as approximately -3,000 cfs daily average) need to be more restrictive for the protection of delta smelt adults and larvae. SWG also agreed that given their present distribution, existing constraining conditions were sufficient to protect longfin smelt from entrainment in the southern Delta. SWG will continue to monitor conditions and salvage data. Previous SWG meeting notes are available at: [http://www.fws.gov/sfbaydelta/cvp-swp/smelt\\_working\\_group.cfm](http://www.fws.gov/sfbaydelta/cvp-swp/smelt_working_group.cfm).

**DOSS Advice to WOMT and NMFS:** None.

**Next Meeting:** The next scheduled conference call will be on 5/6 at 9:00 a.m.

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

## NUMBER OF UNMARKED OLDER JUVENILE CHINOOK MEASURED IN THE SACRAMENTO RIVER



DWR-DES 28 APRIL 2014

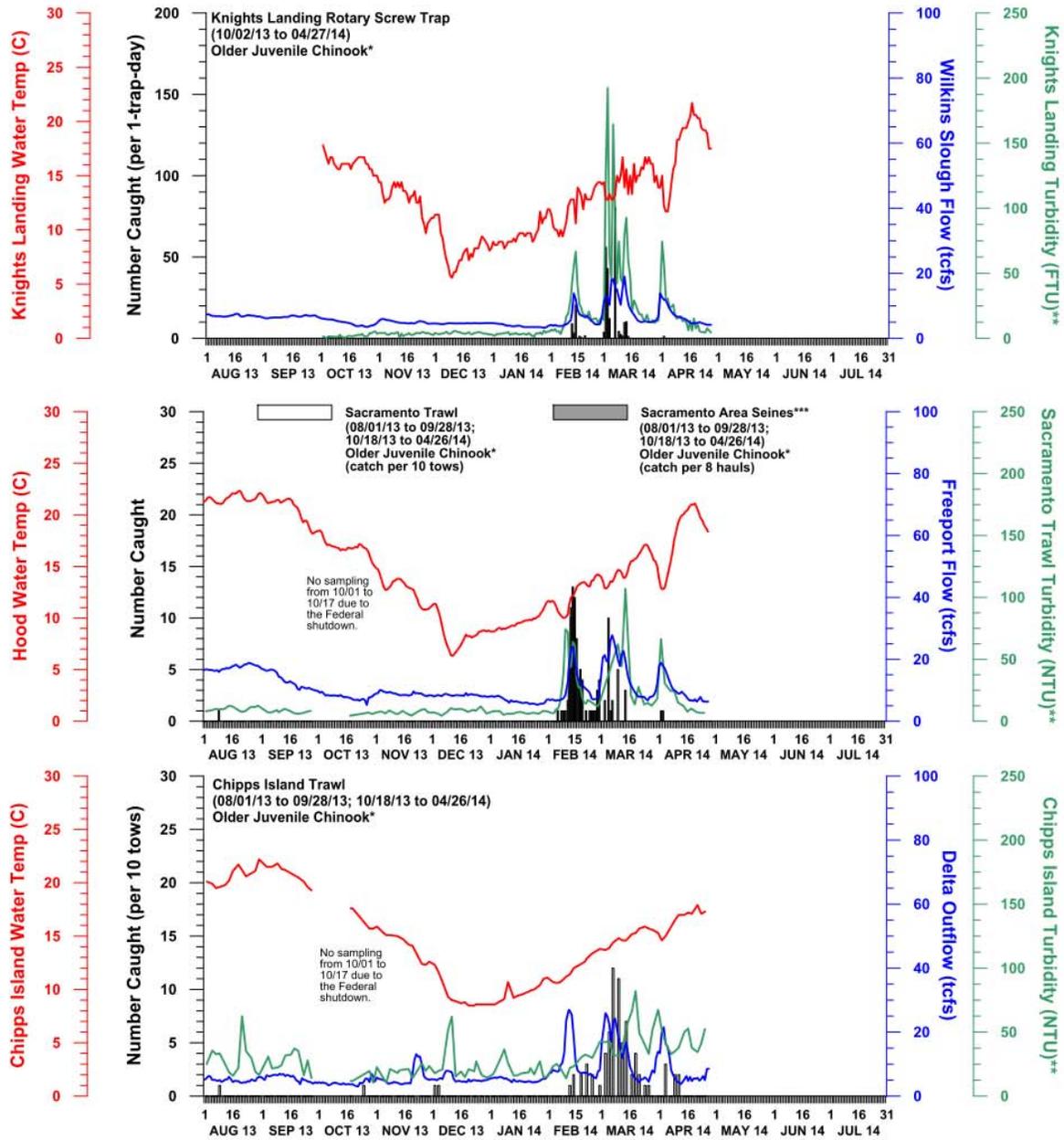
Preliminary data from DFW, FWS, GCID, and CDEC; subject to revision.

\*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.

\*\*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.

\*\*\*No catch data at GCID from 2/28 to 3/14 since trap cone was raised due to high flow and debris.

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



DWR-DES 28 APRIL 2014

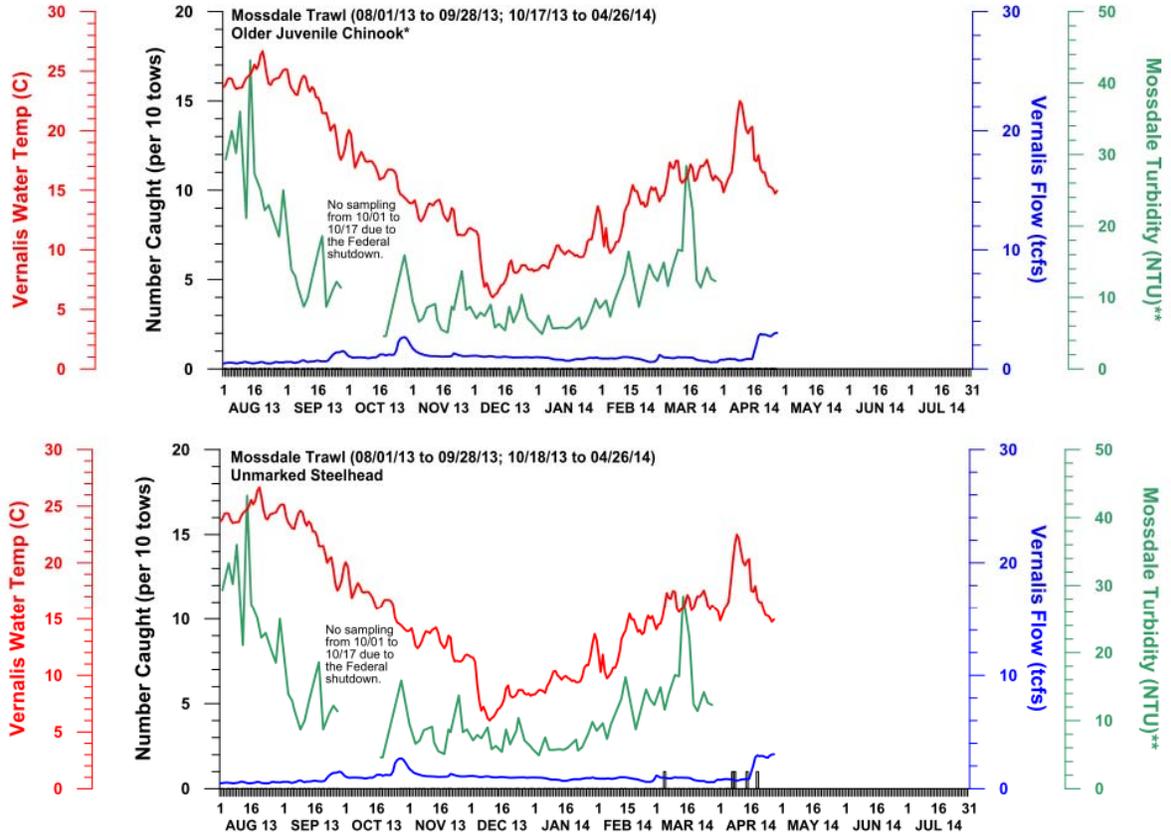
Preliminary data from DFW, FWS, and CDEC; subject to revision.

\*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



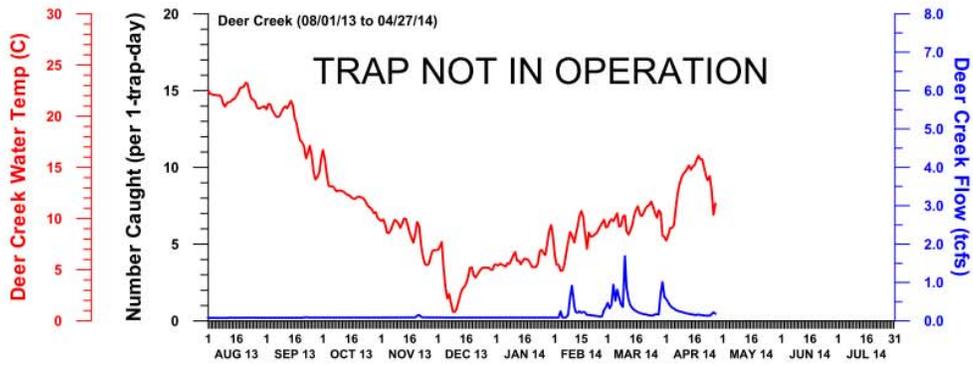
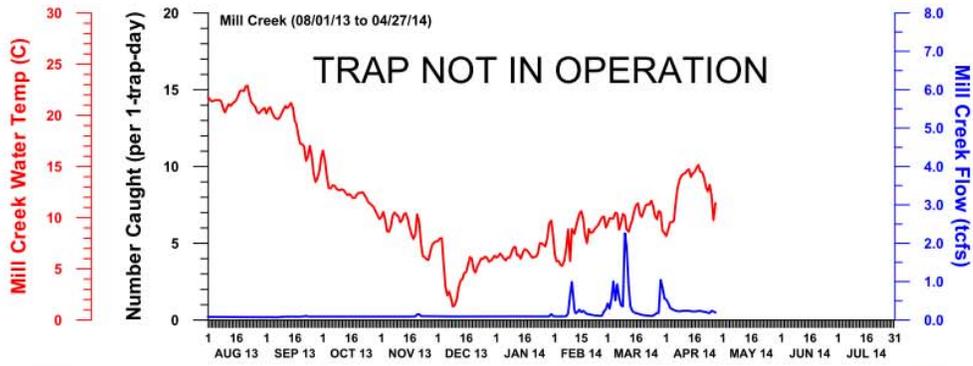
DWR-DES 28 APRIL 2014

Preliminary data from 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.

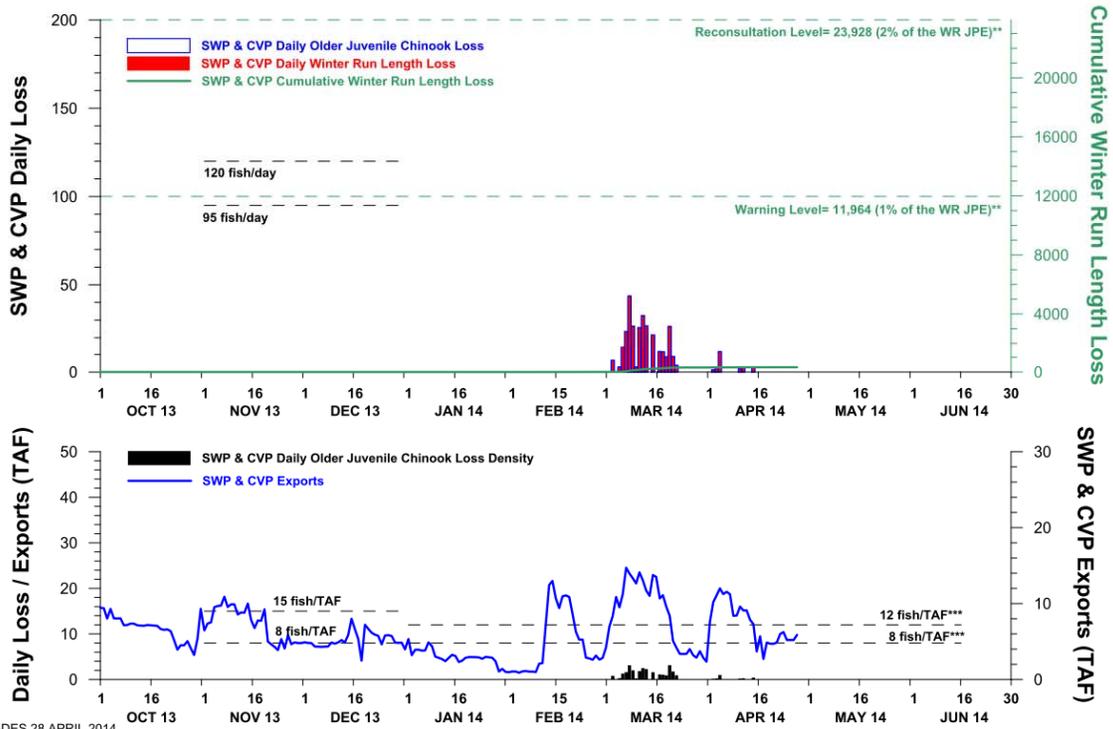
\*\*Turbidity is a discrete measurement and is not measured continuously. Therefore, data are interpolated on days when turbidity was not measured unless data are missing for more than five days.

## WATER TEMPERATURE AND FLOW MEASURED AT MILL AND DEER CREEK



DWR-DES 28 APRIL 2014  
Preliminary data from CDEC; subject to revision.

## NON-CLIPPED WINTER RUN & OLDER JUVENILE CHINOOK LOSS AT THE DELTA FISH FACILITIES 01 OCT 2013 THROUGH 27 APRIL 2014



DWR-DES 28 APRIL 2014

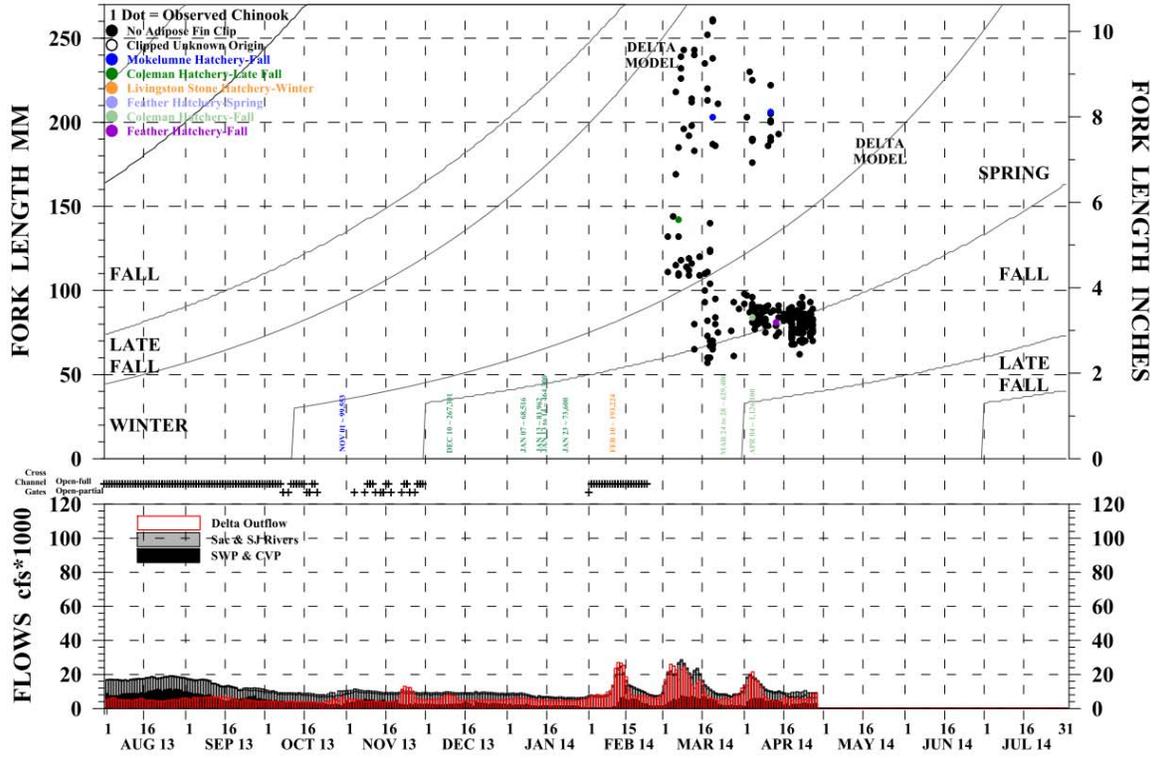
Preliminary data from DFW; subject to revision.

\*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.

\*\*Based on the final juvenile production estimate (JPE), which comes out to 1,196,387 non-clipped winter run (WR) Chinook entering the Delta during water year 2014.

\*\*\*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. The daily JPE based older juvenile Chinook loss density triggers of 11.96 fish/TAF (first stage) and 23.93 fish/TAF (second stage) are not controlling this water year.

# OBSERVED CHINOOK SALVAGE AT THE SWP & CVP DELTA FISH FACILITIES 08/01/2013 THROUGH 04/27/2014



DWR-DES 28 APRIL 2014  
 Preliminary data from DFW, DWR, FWS, Reclamation, and CDEC; subject to revision.  
 \*Chinook outside of the length-at-date criteria (Delta model) are not reported.