Delta Operations for Salmonids and Sturgeon (DOSS) Group
Conference call: 5/1/12 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 coordinate the work of other technical teams. DOSS notes and advice can be found at: http://www.swr.noaa.gov/ocap/doss.htm

DWR: Mike Ford, Andy Chu, Angela Llaban, Tracy Pettit, James Gleim, Kevin Reece, Edmund Yu, Dan Yamanaka
FWS: Craig Anderson, Roger Guinee
NMFS: Barbara Rocco, Barb Byrne, Garwin Yip, Jeff Stuart, Bruce Oppenheim
Reclamation: Russ Yaworsky, Josh Israel
DFG: Bob Fujimura, Jason Roberts, Robert Vincik, Julio Adib-Samii
EPA, SWRCB, USGS: not present

Agenda
1. Fish monitoring
2. Current operations
3. Implementation of OMR per stipulation

Action Item [1/3/12]: Review the DOSS section of the annual review report and provide responses regarding implementation of recommendations. **Carry.** 5/1/12: No update.

Fish Monitoring: The following table presents fish monitoring data. Unless otherwise noted, reported sizes are fork length. No data were received before the conference call from Speegle (FWS). See: http://www.water.ca.gov/swp/operationscontrol/calfed/calfedmonitoring.cfm.

NOTE: No data were received from FWS by today's call for downstream monitoring.

Location	Chipps Is. Midwater Trawl	Sacramento Trawls	Mossdale Kodiak Trawl	Beach Seines	Knights Landing RST	Tisdale Weir RST
Sample Date					4/23–4/30	4/23–4/30
Total Catch					**298**	**813**
FR					236	603
WR						
SR					27	63
LFR						
Ad-Clipped Chinook					35 (probably from Coleman fall-run release	146 (probably from Coleman fall-run release 4/19–4/20)

					4/19–4/20)	
DS						
Splittail						
Longfin						
SH (ad-clip)						
SH (wild)						1
W. Temp. (avg. °F)					67.0	61.0
Flows (avg. cfs)					11,925	10,831
Turbidity (avg. NTU)					19.6	15.0
WR/LFR Avg. CPUE						
FR/SR Avg. CPUE					0.876	2.62

Key: FR = Fall run; LFR = Late-fall run; SR = Spring run; WR = Winter run; SH = Steelhead; DS = Delta smelt; LFS = Longfin smelt; CPUE = catch per unit of effort,

Fish Salvage Data (4/23–30): Reports are also posted at ftp://ftp.delta.dfg.ca.gov/salvage: and you can locate the table under folder "DOSS salvage tables" (you can also try http://www.dfg.ca.gov/delta/apps/salvage/Default.aspx) and click on "salvage FTP site".

Complied by Bob Fujimura on April 30, 2012

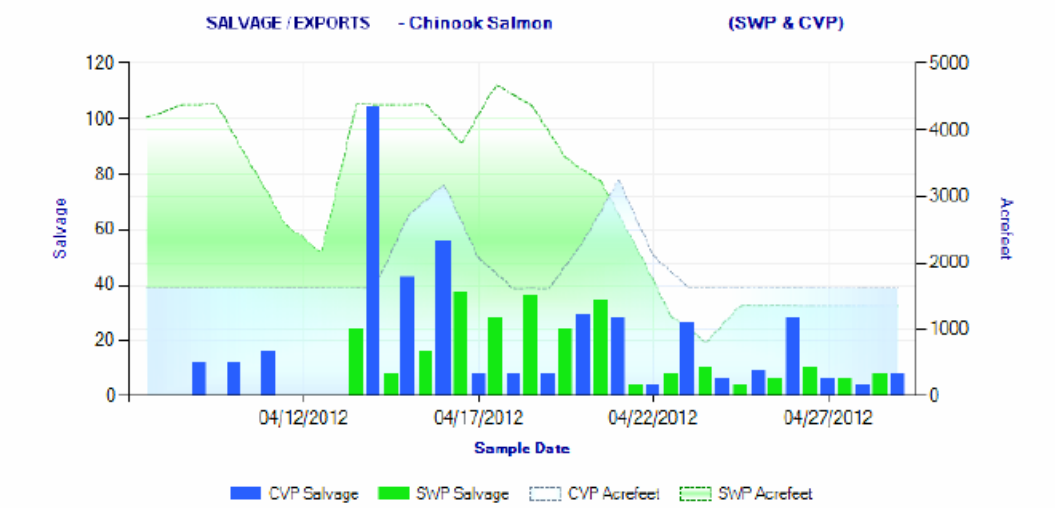


Figure 1. Daily salvage of Chinook salmon (all races) and water exports from the state and federal fish salvage facilities during April 8 through April 29, 2012. Graph obtained from the DFG salvage monitoring web-page: http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx.

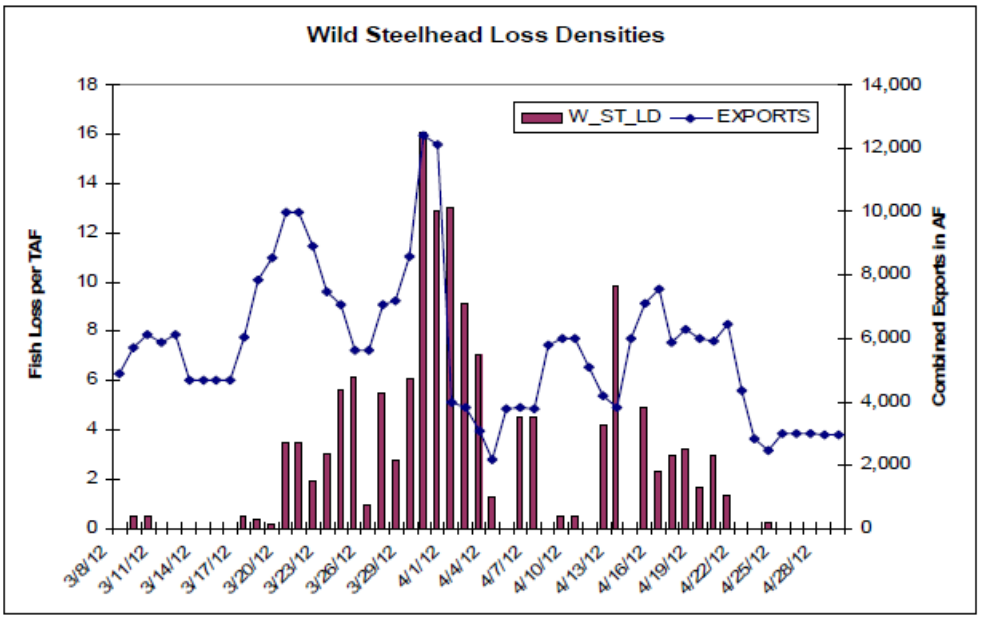


Figure 2. Wild steelhead loss densities and exports for the combined CVP and SWP facilities from March 8 through April 29, 2012. Information from DFG daily steelhead and smelts summary tables (G. Aasen; 4/30/12). Prepared by Bob Fujimura on April 30, 2012.

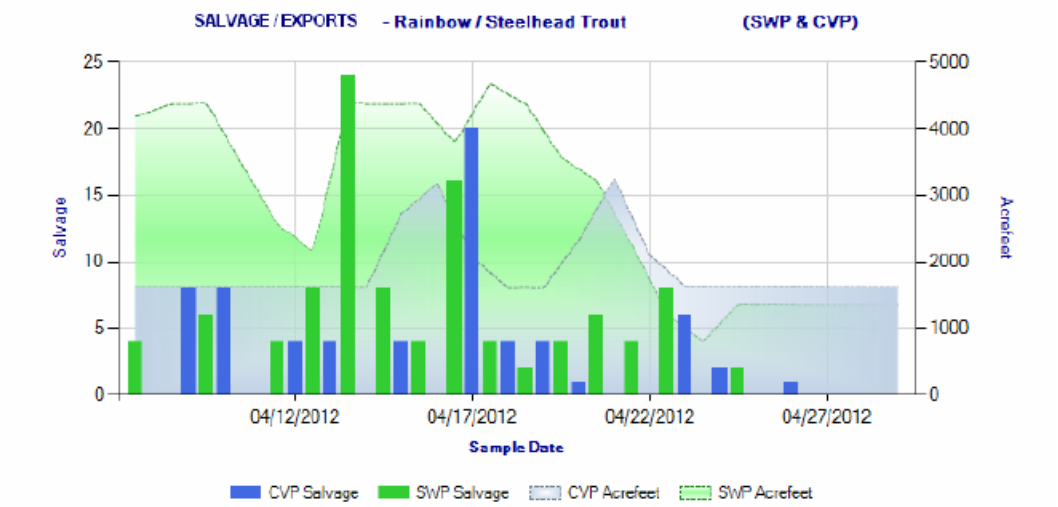


Figure 3. Daily salvage of steelhead and water exports from the state and federal fish salvage facilities during April 8 through April 29, 2012. Graph obtained from the DFG salvage monitoring web-page: http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx

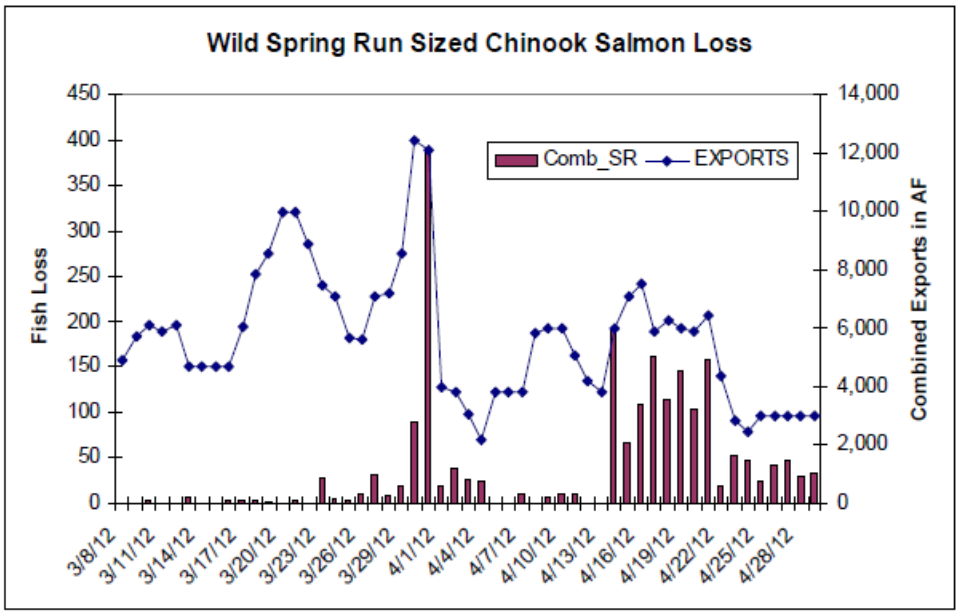


Figure 4. Daily losses of wild spring-run sized Chinook salmon and exports for the combined CVP and SWP facilities from March 8 through April 29, 2012. Information from DFG daily salmon and smelts summary tables (G. Aasen; 4/30/12). Prepared by Bob Fujimura on April 30, 2012.

The following table reported by DFG shows weekly and water-year totals for salvage and loss densities of Chinook and steelhead.

DOSS Weekly Salvage Update
Reporting Period: April 23-29, 2012
Prepared by Bob Fujimura on April 30, 2012
Preliminary Results -Subject to Revision

Criteria	23-Apr	24-Apr	25-Apr	26-Apr	27-Apr	28-Apr	29-Apr	Trend
Loss Densities								
Wild winter-run CS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	↘
Wild steelhead	0.0	0.3	0.0	0.0	0.0	0.0	0.0	↘
SWP daily export	1,206	819	1,356	1,365	1,356	1,356	1,356	↘
CVP daily export	1,638	1,629	1,630	1,632	1,625	1,619	1,616	↘

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

Chinook Salmon Weekly/Season Salvage and Loss
Combined salvage and loss for both CVP and SWP fish facilities

		Weekly Total			Season Total		
Category		Salvage	Loss	Trend	Salvage	Loss	
Wild							
	Winter Run	0	0	↘	829	**2,021**	exceeds "warning level"
	Spring Run	115	276	↘	936	2,094	
	Late Fall Run	1	1	→	20	14	
	Fall Run	24	20	↗	52	68	
	Total	140	297		1,837	4,197	
Hatchery							
	Winter Run	0	0	↘	456	1,192	
	Spring Run	0	0	→	4	17	
	Late Fall Run	0	0	→	25	20	
	Fall Run	0	0	→	0	0	
	Total				485	1,229	

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

Steelhead Weekly/Season Salvage and Loss
Combined salvage and loss for both CVP and SWP fish facilities

	Weekly Total			Season Total	
Category	Salvage	Loss	Trend	Salvage	Loss
Wild	1	0.7	↘	316	1,073
Hatchery	18	49	↘	585	1,098
Total	19	50		901	2,171

Tagged Steelhead: One sutured steelhead (indicating acoustic tag) was collected at the CVP last week but accidentally died. Memos were sent to both collection facilities with pictures of the sutured and tagged steelhead so that they could be identified. The facilities have the protocol for re-releasing those tagged fish.

Sturgeon: No green or white sturgeon were salvaged at either facility.

Coded Wire Tagged (CWT) Salvage and Loss as of 4/30/12 (see table below):

Coleman Hatchery Late-Fall Run and Livingston Stone Winter-Run Chinook Loss at the Delta Fish Facilities, 2011/2012

Release Date	CWT Race	Release Site	Release Type	Confirmed Loss	Number Released	Total Entering Delta	% Loss[1]	First Concern Level	Second Concern Level	Date of First Loss	Date of Last Loss
12/16/2011	LF	Battle Creek	Production	134.66	394,700	n/a	0.034	n/a	n/a	1/11/2012	3/31/2012
12/23/2011	LF	Battle Creek	Spring	2.92	62,400	n/a	0.005	0.5%	1.0%	1/18/2012	1/31/2012

1/3/2012	LF	Battle Creek	Surrogate Production	635.12	448,600	n/a	0.142	n/a	n/a	1/19/2012	4/19/2012
1/13/2012	LF	Battle Creek	Spring Surrogate	52.17	80,800	n/a	0.065	0.5%	1.0%	1/31/2012	2/18/2012
1/20/2012	LF	Battle Creek	Spring Surrogate[2]	101.04	20,000	n/a	0.505	n/a	n/a	1/30/2012	3/29/2012
2/9/2012	W	Redding	Production	16.96	194,000	96,525	0.018	0.5%	1.0%	3/31/2012	3/31/2012

For Chinook lost 10/1/2011 through 4/29/2012

SWP coded-wire tags read 10/1/2011 through 4/29/2012

CVP coded-wire tags read 10/1/2011 through 4/29/2012

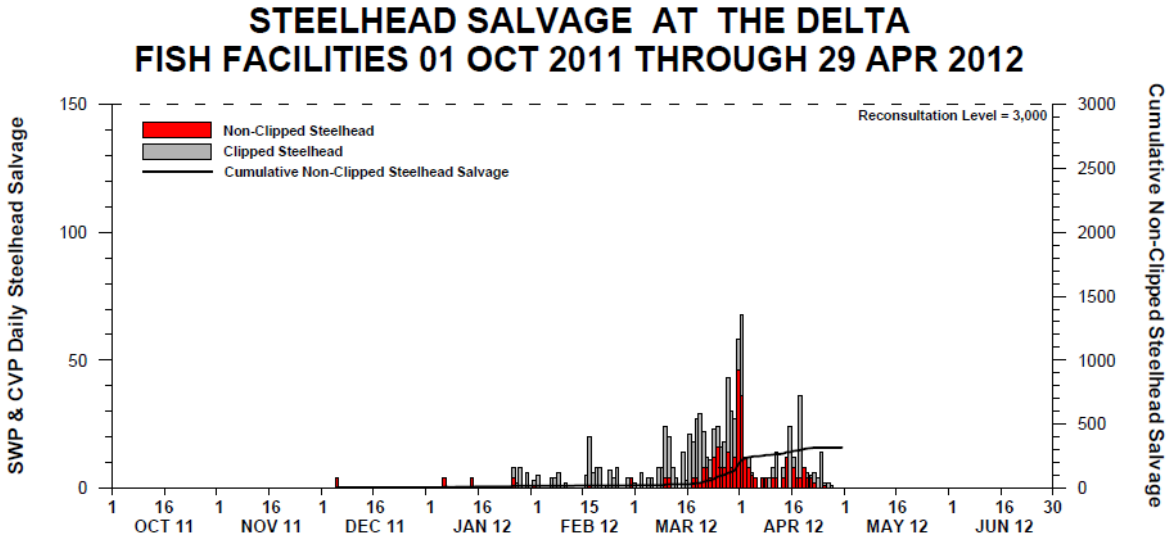
[1]LF % Loss = (Confirmed Loss/Number Released)*100; W % Loss = (Confirmed Loss/Total Entering Delta)*100
[2]Because of the equipment malfunction that stranded a large proportion of the release in the gravel, this 3rd surrogate release is tracked for monitoring and information only and not for compliance with Action IV.2.3.

DWR-DES Revised 4/30/2012

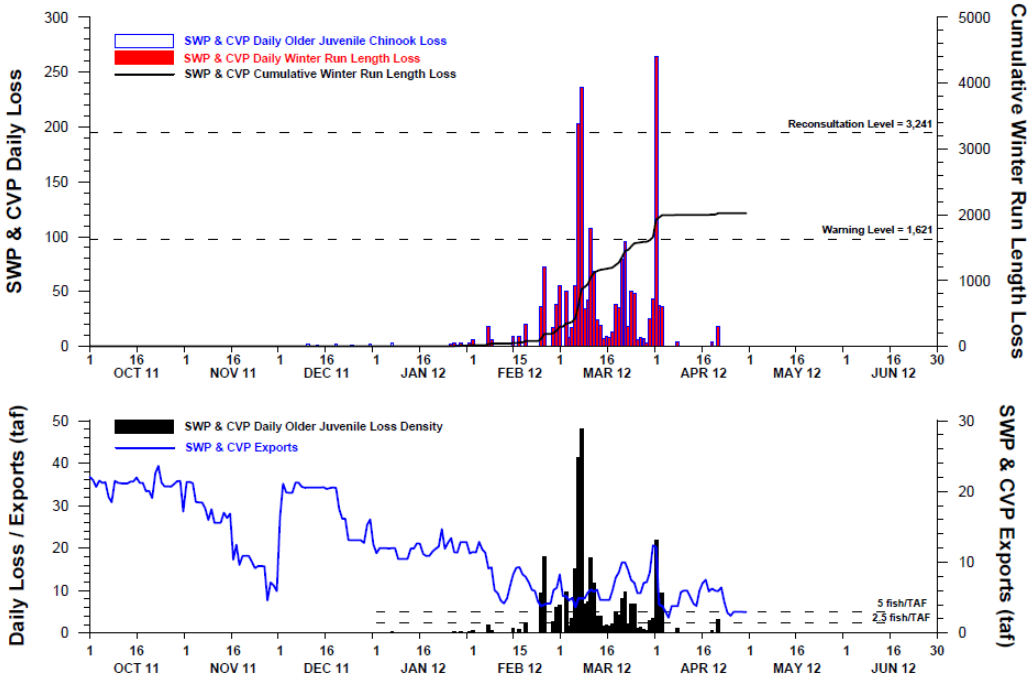
Preliminary, subject to revision

No CWT fish have been salvaged since 4/19/12. All tags are current as of 4/29/12.

Below are the salvage and loss graphs for Chinook and steelhead from Llaban (DWR) as of 4/30/12. For additional salvage and loss graphs, please visit the DWR website at: http://www.water.ca.gov/swp/operationscontrol/calfed/calfedmonitoring.cfm.

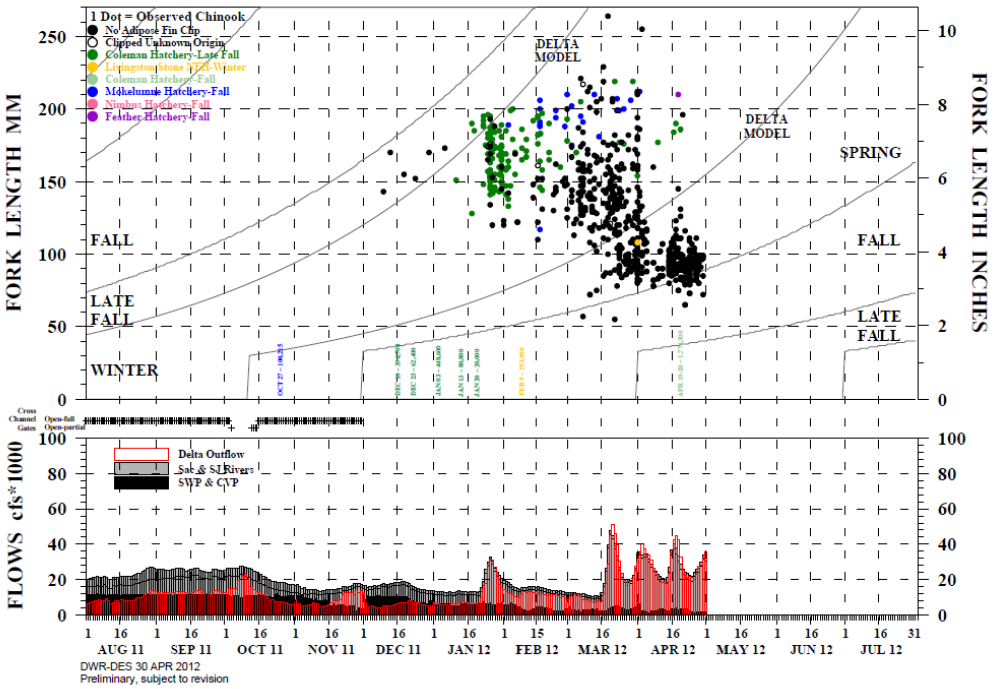


NON-CLIPPED WINTER RUN & OLDER JUVENILE CHINOOK LOSS AT THE DELTA FISH FACILITIES 01 OCT 2011 THROUGH 29 APR 2012



DWR-DES 30 APR 2012
Preliminary, subject to revision
* Older juveniles defined as all Chinook above the minimum winter run length line (Delta model)

OBSERVED CHINOOK SALVAGE AT THE SWP & CVP DELTA FISH FACILITIES 08/01/2011 THROUGH 04/29/2012



DWR-DES 30 APR 2012
Preliminary, subject to revision

Operations (5/1/12)

SWP		CVP	
Exports (cfs)			
Clifton Court Forebay	1,200	Jones Pumping Plant	1,000
Reservoir Releases (cfs)			
Feather - Oroville	1,350 (up to 1,750 by end of today)	American - Nimbus	8,000
		Sacramento - Keswick	6,000 (may go to 6,500 or 7,000 in next few days for temp. control)
		Stanislaus - Goodwin	1,500
Reservoir Storage (in TAF, % of capacity)			
San Luis (SWP)	919 (87)	San Luis (CVP)	728 (75)
Oroville	3,422	Shasta	4,440 (98)
New Melones	1,945	Folsom	933
Delta Operations			
DCC	Closed as of 12/1/11	Sacramento River at Freeport (cfs)	28,260
Outflow Index (cfs)	28,600	San Joaquin River (cfs) at Vernalis	2,399
Total Delta Inflow (cfs)	32,337	OMR (daily) (cfs)	
Water Temperature (°F)	~19.0 (CC is ~20–21)	OMR 5 day (cfs)	-1,113 (more positive than -1,250 for 3-4 days)
X2 (km)	64 (Port Chicago)	OMR 14 day (cfs)	-1,852
E/I (%)	4.8 (3-d avg.)		

X2: For May, the trigger is Port Chicago. There were no days used in April so the 6–12 days from April can be carried over into May. Chipps: No carryover for May.

Weather Forecast: There is a slight chance of a system coming in this week on Wednesday, but not much precipitation is forecast in the Sierras. The 90-day long-term forecast is for below-normal conditions; however, this is not definite as there is only a 50% chance of it occurring. It appears that the major storm systems are done for this year,

OMR Flows: The OMR Technical Memorandum (tech memo), adjusted by NMFS' April 27, 2012, determination, provided for an OMR flow target of -5,000 cfs for the second experimental period beginning on May 1, 2012. Last week, DOSS advised WOMT for the projects to operate to a 1:1 Vernalis flow beginning May 1 to target as negative an OMR flow feasible under the D-1641 export restriction. The NMFS determination letter further directed that NMFS reconvene the technical planning committee to reevaluate the trigger and action response from the tech memo based on the preliminary data from the first experimental period. It was noted that the actual level of OMR would also be affected by the flows at Vernalis; there is still some uncertainty in the exact schedule for the San Joaquin tributary flows.

Delta Conditions Team (DCT) Report: The DCT met on Monday, but didn't have a recommendation to provide to DOSS. The bulk of the meeting was focused on the proposal from Cramer Fish Sciences (Cramer memo, attached), but there was also some discussion on a proposal verbally presented by Byrne (NMFS).

The proposals presented:

1) Proposal from Cramer Fish Sciences (CFS): The CFS proposal considers the junctions of the mainstem San Joaquin River with Turner Cut, Columbia Cut, the mouth of Middle River, and the mouth of Old River, and assumes that fish turn into those channels at the same proportion as does flow. Survival was assumed to vary around the estimate of 0.97/km based on a 2010 VAMP acoustic study. By randomly sampling from a distribution of flow splits and survival rates, the CFS approach generates a distribution of tag detections expected at Railroad Cut. Under these assumptions, a mean of 24% of the release group would be expected to show up at Railroad Cut receivers, or about 39 tags (based on the first release group size of 166). The minimum was 11% and the maximum would be 41% or 67 tags. The proposal identified the 90th percentile of expected tag distribution at Railroad Cut (34% of the release group, or 57 fish) as a "reasonably conservative metric". The CFS proposal did not make a specific recommendation for the trigger but suggested using the presented statistical approach as the basis for an adjusted trigger.

2) Proposal from Byrne (NMFS): If DOSS believes that the number of tags seen so far at Railroad Cut (latest report from the first experimental OMR period is 49 tags observed at Railroad Cut) is similar to what would be expected under Action IV.2.1 (comparable to 1:1 San Joaquin-to-export ratio without a barrier at the head of Old River installed), then DOSS could advise using that number as the Railroad Cut trigger instead of making adjustments to the trigger calculation.

DOSS DISCUSSION

Another thought was whether DWR/Reclamation are considering switching exports from SWP to CVP to reduce loss at the pumps. There was no response from the projects on this, but it was noted that it would take a considerable shift in exports to change the trigger.

The group discussed the trigger calculation approach presented by CFS, including the possible effects on fish movement of natural tidal fluctuations and OMR conditions, at junctions and within south Delta channels. The proposal from Byrne was also discussed briefly.

Israel (Reclamation) suggested that the action response, rather than the Railroad Cut trigger, be adjusted. For example, if we stick with the current trigger of 9 based on the spreadsheet calculation (using original assumptions), the action response could be changed to mimic the action response in RPA Action IV.2.3. That is, rather than requiring the more positive OMR for the remainder of the experimental period if the trigger is exceeded, the required action response could be to provide a 5-day period at the more positive OMR flows. After the 5-day action response, operations would return to the initial OMR for the remainder of the experimental period (currently D-1641 limit of exports no greater than 100% of the 3-day average of Vernalis flows). With this proposal, the action response would be a 5-day period, regardless of when the Railroad Cut trigger is met (unless it occurs after day 10 of the experimental period). This proposal would limit the water cost and still allow for useful empirical data.

The experimental design was that initial OMR levels for each experimental period were set to be as different as possible to get a sense of fish behavior under different OMR conditions; changing operations within a period also provides valuable empirical information. A 5-day reduction in

OMR specifically tests the response of steelhead over this period, which is information relevant to implementation of the (at least) 5-day action response required by Action IV.2.3 of the NMFS BiOp. Whatever adjustment(s) DOSS supports, it needs to provide a biological rationale to justify the adjustment(s).

If the exposure trigger is exceeded sooner rather than later during the experimental period (as happened during the first experimental period), the information collected at the initial OMR treatment level is more limited and the more positive OMR hypothesized by NMFS to provide greater protection for San Joaquin Basin salmonids is in place for a longer duration (unless the action response is adjusted). DOSS has not yet received a full month of data and we do not have a good sense of what those "tags" that go by Railroad Cut are actually doing—for example, do tags move south of the Railroad Cut receivers but then move back north toward the mainstem San Joaquin? We won't know these more detailed movement responses until all the receivers in the Delta are downloaded and analyzed. We should be cautious about jumping to conclusions based on only very preliminary data analysis from a limited number of receiver locations.

It was pointed out that this study is being done in the context of the joint stipulation to learn about how fish respond to different hydrodynamics conditions in the Delta.

Several people agreed that Israel's proposal provides a good balance between the study and minimizing the water supply impact while also protecting the fish, and it tests the 5-day action response of this study and RPA Action IV.2.3.

Others on DOSS were asked to weigh in. FWS stated its support of Israel's proposal and also that DOSS would not provide advice until it receives feedback from the planning committee that was scheduled to meet after DOSS today. There were no objections from DFG. It was also agreed by DOSS to have a special DOSS call tomorrow at 9:00 a.m. and during the DOSS update, a request to have a special WOMT meeting following the DOSS call.

Tributary Flows: There was a question regarding the flow schedule for the Vernalis flow requirement in D-1641. DWR noted that tributary releases were going to be finalized through 5/15/12. Reclamation has purchased water from the Merced Irrigation District this year. There are two peaks proposed: one for the first week in May and the second for the second week in May so that Vernalis is approximately 3,700 cfs. Discussions continue regarding the shaping of the tributary releases to meet the Vernalis flow requirement while also considering temperature conditions and needs in the tributaries themselves. Only the northern California reservoirs (Shasta, Oroville, Folsom) are encroached in their respective flood storage space at this point. The southern California reservoirs are below their encroachment levels.

Smelt Working Group (SWG): Neither Bartoo (FWS) nor Fujimura were available to report on the SWG meeting from Monday. Stuart (NMFS) provided an "unofficial" report that SWG concluded that current operating conditions are believed to be protective of delta smelt and longfin smelt.

DOSS advice to WOMT and NMFS:
DOSS agreed to defer providing advice to WOMT and NMFS until after the meeting of the reconvened OMR technical committee. Instead, DOSS will relay to WOMT and NMFS that DOSS discussed the various proposals to adjust the Railroad Cut trigger or action response and

would consider any proposals from the reconvened OMR technical committee in a special meeting tomorrow.

Next Meeting: A special DOSS call will be held on May 2, 2012, at 9:00 a.m. to discuss the recommendations from today's technical committee meeting. The subsequent "regular" DOSS conference call will be May 8, 2012, at 9:00 a.m.

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TECHNICHAL MEMORANDUM

TO: Delta Conditions Team and Stipulation Acoustic Tagging Study Leads
FROM: Brad Cavallo
DATE: April 30 2012
SUBJECT: Revaluation of Railroad Cut Trigger for Stipulation Study

On April 16th one-hundred and sixty-three (163) acoustically tagged steelhead smolts originating from the Mokelumne River Fish Hatchery were released near Buckley Cove on the San Joaquin River (just downstream from Stockton). These fish were released as part of the "sentinel steelhead study" specified in the March 16th NMFS technical memorandum required by the joint stipulation agreement (Document 659-2) for the Consolidated Salmonid Cases (Case 1 :09-cv-01053-LJO -DLB).

As of April 30th, 40 acoustically tagged fish, roughly 25% of the total fish released as part of the "sentinel steelhead study" have reached receiver arrays located at Railroad Cut on Old and Middle River corridors. This rate of detection exceeds by a factor of five the "trigger" defined in the stipulation technical memorandum and occurred despite OMR flows being near -2,500 cfs rather than the -3,500 cfs originally planned for the experiment (Figure 1). Additional releases of sentinel steelhead are planned for May 1st and May 15th and there is concern that these releases will produce similar results; exceeding the stipulation study trigger and forcing an immediate reduction of South Delta exports.

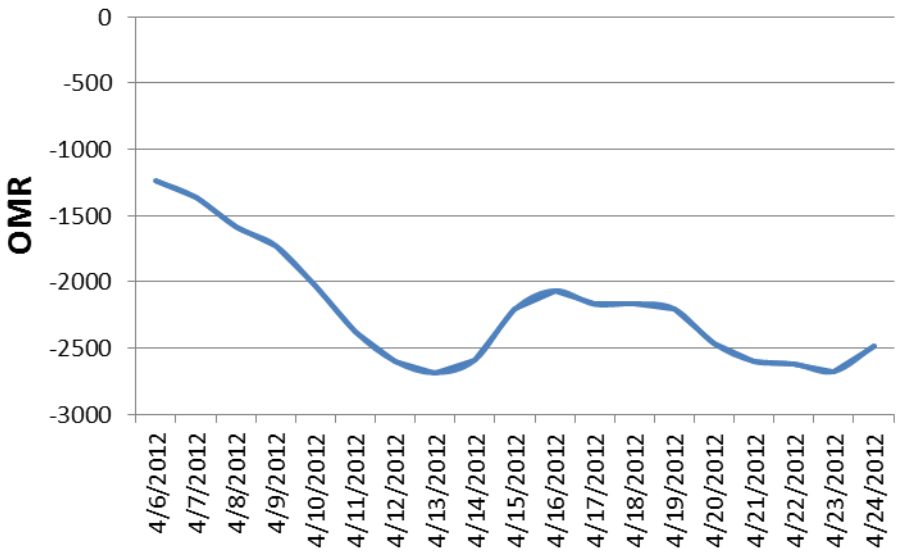


Figure 1. Five-day moving average of OMR conditions during April, 2012.

In light of result from the April 16th release, and in recognition of concerns about forthcoming release, Cramer Fish Sciences staff conducted an analysis of the conditions and factors which could contribute to exceeding the stipulation study trigger.

Specifically, we created a simple simulation model (in Microsoft Excel) which allowed us to evaluate the influence of two key factors: 1) route selection at four junctions to the interior Delta, and 2) survival rate per kilometer (km). The stipulation study trigger calculations applied a survival rate of 0.97/km, thus we explored values between 0.95/km and 0.99/km. For simplicity, and because we currently lack more detailed information, this survival rate was applied to all migration corridors evaluated. For route selection, we used the range of fish entrainment indicated by DSM2 Hydro analysis and PTM analysis (@ 2 days) presented at the February 7th stipulation workshop: Turner Cut: 9% to 15%; Colombia Cut (10% to 20%); Middle River (10% to 20%); Old River (5% to 13%). Lastly, once fish entered one of the interior Delta routes (via any junction) we assumed all fish would continue moving southward and would fail to reach Railroad Cut only due to mortality. In reality, some fraction of fish entering the interior Delta may turn around and return to mainstem San Joaquin River; however the rate at which this occurs is currently unknown.

Results of analyses conducted with our simple simulation model indicate that under a variety survival and routing conditions, a relatively large number of sentinel steelhead smolts can be expected to arrive at the Railroad Cut Receiver Array (Figure 2).

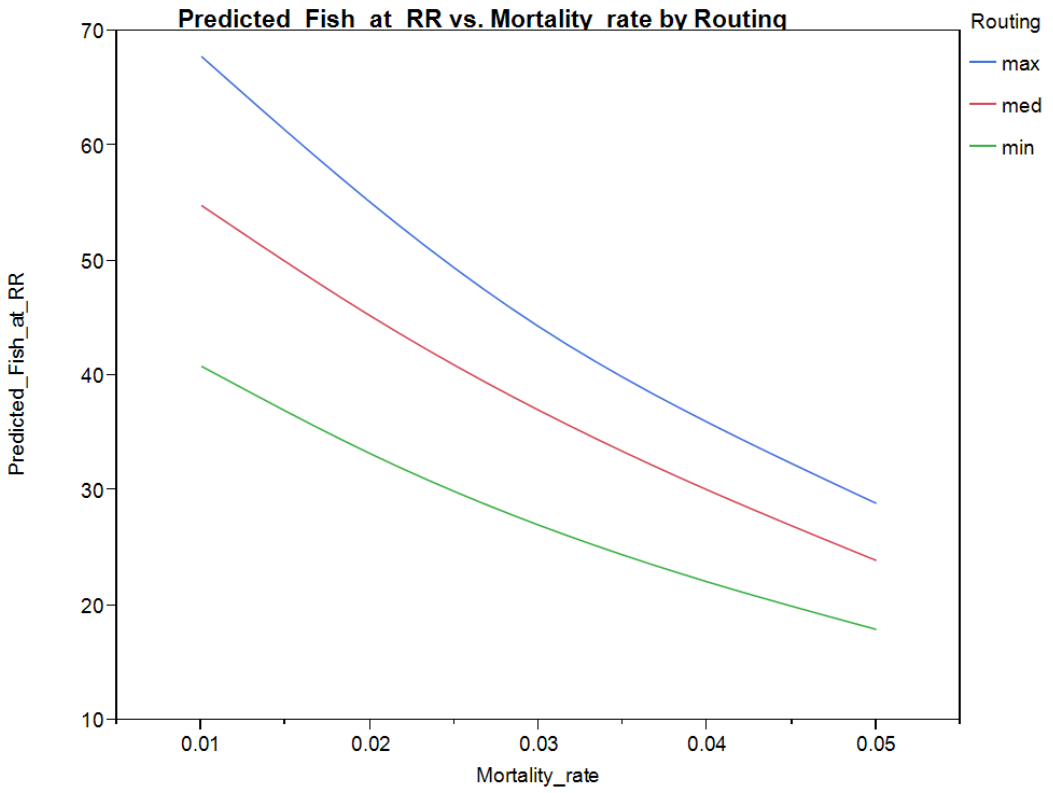


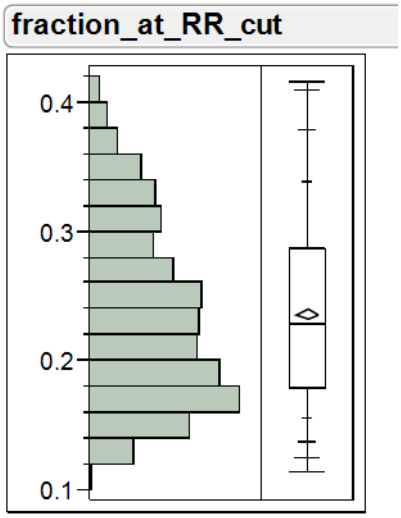
Figure 2. Predicted number of fish arriving at Railroad Cut receiver arrays (y-axis) as a function of mortality rate (x-axis) and three routing levels (legend). Routing levels refer to the minimum, median, and maximum of ranges for each junction as defined in the text.

Indeed, the results suggest that 40 sentinel fish arriving at the Railroad Cut receiver array is a very likely event. To provide a more complete assessment of this probability, and in particular to inform expectations for forthcoming releases of stipulation study sentinel fish, we conducted a bootstrap re-sampling exercise. Using the same model assumptions described previously, we randomly resampled 1,000 times among the range of survival rates and routing probabilities and estimated the fraction of fish which would be expected. The results of this resampling exercise are depicted in Figure 3. The mean response was that 24% of sentinel fish would be expected to arrive at Railroad Cut arrays, with a minimum of 11% and a maximum of 41%.

Collectively, the results of the analyses presented here indicate a relatively large fraction of sentinel steelhead should be expected to arrive at the Railroad Cut receiver array regardless of OMR conditions, and thus, the trigger defined in the stipulation technical memorandum was in error. These results suggest the trigger should be re-evaluated for the remaining two releases of sentinel steelhead smolts.

The bootstrap resampling results may provide basis for establishing a new experimental trigger. OMR flows during the first release of sentinel fish were roughly -2500 and produced results very near the mean response of the resampling simulation. If more negative OMR flows cause more fish to reach Railroad Cut (as has been hypothesized), then OMR flows of -3,800 cfs (for example) would be expected to significantly increase the fraction of sentinel steelhead arriving at Railroad Cut. Though there is no objective definition of "significant" possible in these circumstances, an observation of sentinel fish greater than the 90% percentile from the bootstrap resampling provides a reasonably conservative metric. For example, a revised trigger criteria might state: "If the proportion of sentinel fish arriving at Railroad Cut exceeds 34% (the 90th percentile of observations from simulations studies), then the trigger will have been reached."

The Delta Conditions Team and stipulation study investigators should discuss these findings and discuss appropriate revisions to the original stipulation study trigger.



Quantiles

100.0%	maximum	0.41483
99.5%		0.40994
97.5%		0.37775
90.0%		0.33865
75.0%	quartile	0.2866
50.0%	median	0.22759
25.0%	quartile	0.1791
10.0%		0.15491
2.5%		0.13639
0.5%		0.12463
0.0%	minimum	0.11355

Moments

Mean	0.2366853
Std Dev	0.0686293
Std Err Mean	0.0021703
Upper 95% Mean	0.240944
Lower 95% Mean	0.2324265
N	1000

Figure 3. Results from bootstrap resampling exercise of sentinel study routing and survival probabilities.