Smelt Working Group
February 22, 2016

Meeting Summary

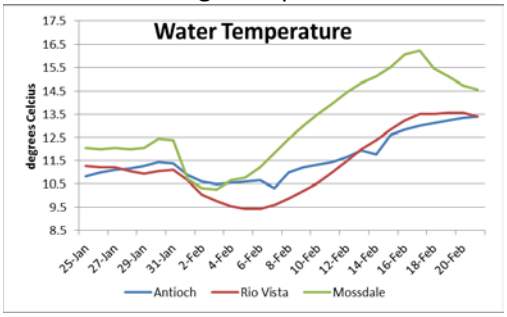
The Working Group reviewed current Delta Smelt distribution, salvage data, and Delta conditions. The Working Group described the risk of entrainment under the Service-provided advice framework. Under this framework the relative risk of entrainment for OMR flow ranges is discussed and assessed. For the 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.

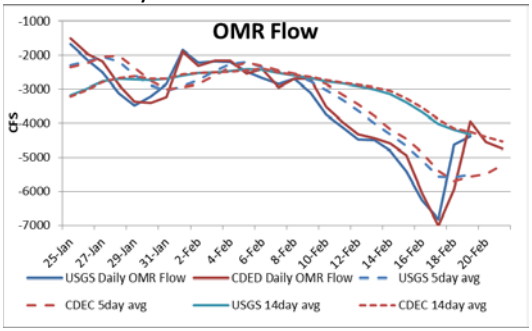
The Working Group is following guidance for entrainment protections from both Action 2 (adult Delta Smelt) and Action 3 (juvenile Delta Smelt). The risk values provided for this week refer only to adult fish as there currently is no evidence of hatching. The Working Group will continue to monitor Delta Smelt survey and salvage data and Delta conditions, and will meet again on Monday, February 29, 2016 at 10 am.

Reported Data

1. Current environmental data
    a. Temperature
    Combined average temperature for February 21 is 13.8°C

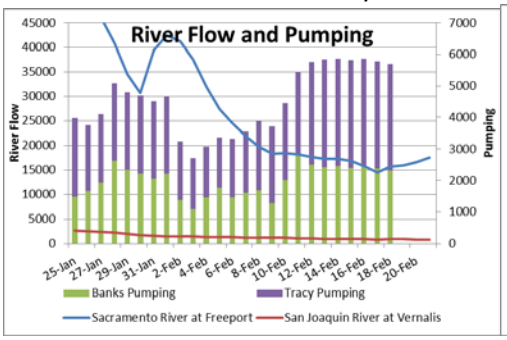


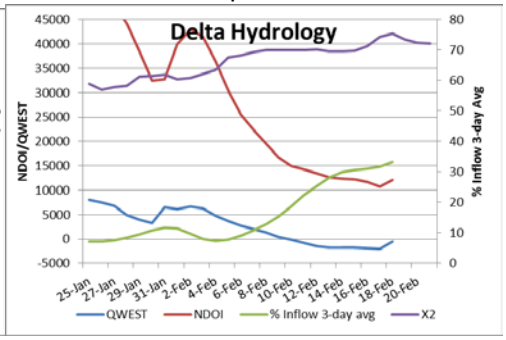
    b. OMR flow
    USGS OMR daily average flow on February 19 is -4390 cfs. CDEC OMR daily average flow for February 21 is -4747 cfs.



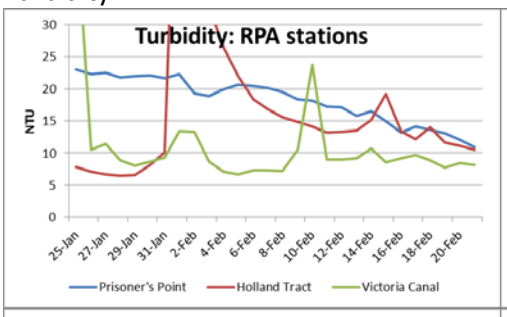
    c. River Flows and pumping

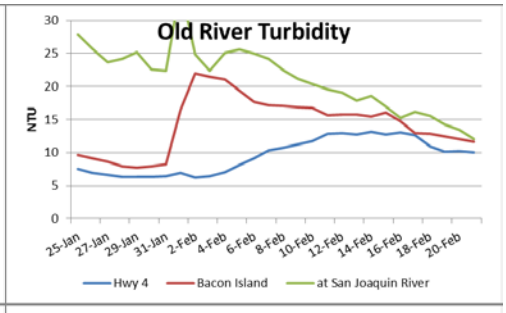
Sacramento River at Freeport flow for February 21 was 17,518 cfs. San Joaquin River at Vernalis river flow for February 21 was 878 cfs. Combined exports are 5800 cfs today.

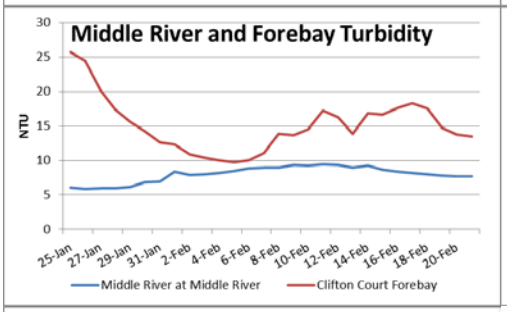


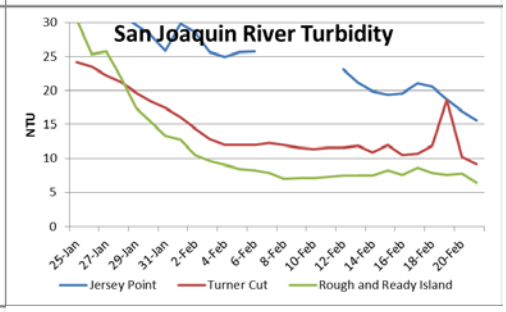


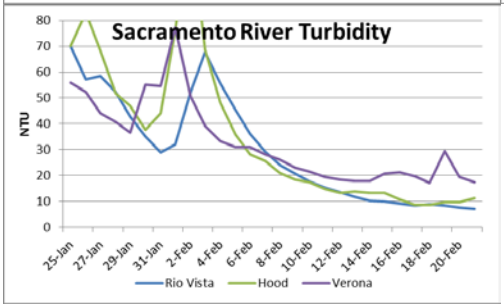
d. Turbidity











2. Delta fish monitoring

CDFW has released the 2015 FMWT indices:
The 2015 Delta Smelt annual FMWT index is 7.
The 2015 Longfin Smelt annual FMWT index is 4.
Both indices are the lowest on record (i.e. since 1967).

SKT #2 was in the field February 8 through 11. A total of six Delta Smelt were collected, ranging in size from 63 to 72 mm. Two of the six fish were ripe while four were immature. SKT #3 is in the field starting March 7.

Smelt Larva Survey #4 was in the field last week. Processing is 50% complete. No Delta Smelt have been detected in the sampled processed to date. A total of 40 Longfin Smelt have been detected from the 20 stations processed. SLS #3 was in the field the week of February 1. Processing is about 80% complete. No Delta Smelt larvae have been detected in the samples processes so far.

The Early Warning Survey began November 30.

Early Warning Survey Results, February 15 through 19

Date	Location	Delta Smelt Catch
2/15	N/A	0
2/16	Prisoners Point	2
2/17	Station 902	0
2/18	Prisoners Point	0
2/19	Jersey Point	2

3. Modeling

No Particle Tracking modeling runs were requested or reviewed.
DWR turbidity modeling was provided by the DCT; however, given the low model accuracy discussed in previous weeks' notes they are not being relied upon for turbidity forecasting.

4. Salvage

An estimated four Delta Smelt were salvaged on January 21 at the CVP fish salvage facility and four Delta Smelt were salvaged on February 18 at the SWP fish salvage facility (see attached). Salvage of eight Delta Smelt represents 19% of the concern level of the WY 2016 adult Delta Smelt incidental take. No additional Delta Smelt have been observed in salvage sampling at either water export since February 18. No Longfin Smelt has been observed in salvage sampling at either the federal or state Delta facilities during the current water year.

5. Expected Project Operations

Jones pumping plant is pumping 3400 cfs today. The daily average intake to Clifton Court (CC) is 2400 cfs. Combined pumping is 5800 cfs today. Pumping is constrained by the Service's February 12, 2016 Determination, which limits OMR flow to no more negative than -5000 cfs.

6. Delta Conditions Team

DCT met on 02/19; the February 19 DWR turbidity transect data (see attached) and a DCT summary (including turbidity forecasting) were provided (see attached). The turbidity forecasting model results remain unreliable, and have therefore been distributed but not discussed at the DCT.

7. Assessment of Risk:

<u>BiOp Background</u>

RPA Component 1, Action 2 states, “An action implemented using an adaptive process to tailor protection to changing environmental conditions after Action 1. As in Action 1, the intent is to protect pre-spawning adults from entrainment and, to the extent possible, from adverse hydrodynamic conditions.” “The range of net daily OMR flows will be no more negative than -1,250 to -5,000 cfs. Depending on extant conditions specific OMR flows within this range are recommended by the Working Group from the onset of Action 2 through its termination…”

RPA Component 2, Action 3: “The objective of this RPA component (which corresponds to Action 3 in Attachment B), is to improve flow conditions in the Central and South Delta so that larval and juvenile delta smelt can successfully rear in the Central Delta and move downstream when appropriate” (page 282).

“Upon completion of RPA Component 1 or when Delta water temperatures reach 12°C (based on a 3-station average of daily average water temperature at Mossdale, Antioch, and Rio Vista) or when a spent female delta smelt is detected in the trawls or at the salvage facilities, the projects shall operate to maintain OMR flows no more negative than -1,250 to -5000 cfs based on a 14-day running average with a simultaneous 5-day running average within 25 percent of the applicable 14-day OMR flow requirement. Depending on the extant conditions, the SWG shall make recommendations for the specific OMR flows within this range from the onset of implementing RPA Component 2 through its termination. The Service shall make the final determination regarding specific OMR flows. This action shall end June 30 or when the 3-day mean water temperature at Clifton Court Forebay reaches 25° C, whichever occurs earlier” (page 282).

OMR flow setting after initiation of Action 2 (page 354-355)
a) The SWG will review all available information and request updated entrainment simulations and/or other information, as needed, on a weekly basis to decide whether the current OMR flow requirement is appropriate or should be changed.

b) Unless OMR flow is grossly positive regardless of water project operations, due to high Delta inflows, then important variables that affect the risk of adult entrainment during Action 2 include (1) salvage or other actual entrainment indicators, (2) turbidity, (3) available monitoring results, hydrologic variables other than export pumping rates that affect OMR flow, (4) apparent population size from the preceding FMWT survey, and (5) particle tracking or other model-based entrainment risk information.

c) As described above, the risk of entrainment is generally higher when there is evidence of ongoing entrainment or turbidity is high, and these two variables are the most likely triggers of decisions to raise or lower OMR flow requirements.

d) Based on historical experience, OMR flow requirements between the limits of -2,000 cfs and -5,000 cfs are likely to be adequate in most years. The exception is years in which there appears, for whatever reasons, to be a substantial fraction of the adult spawning migrant population in the Central and/or South Delta. When this occurs, more stringent OMR limitation (possibly to no more negative than - 1,250 cfs) may be required.

The OMR flow prescriptions set forth during Action 2 will be based upon analysis of population status in any given year, available monitoring data from the SKT, seasonal variables such as WY

type, CVP and SWP reservoir storage levels, temperature, and observed salvage during Action 1. Of these, population status and real-time salvage data are expected to be the primary driving criterion.

The WY 2016 adult Delta Smelt incidental take (IT) is 56, as stated in the Service's December 23, 2015 memo to the Bureau of Reclamation. The concern level is 42. The method to calculate the adult IT is described on p 386 of the 2008 BiOp, with the corrections described in both the February 22, 2013, and December 23, 2015 memos. The alternative approach that the Service presented to the 2015 independent review panel at the Long-term Operation Biological Opinions annual science review will be piloted this year.

The WY 2016 larval/juvenile Delta Smelt incidental take is 392, and the concern level is 261. The method to calculate the larval/juvenile IT is described on p 389, with revision provided in the February 22, 2013 Service memo to the Bureau of Reclamation.

Discussion:
The Working Group concluded that risk of entrainment into the south Delta would remain high at current levels (OMR flows of -4700 cfs as of yesterday). Sporadic low catches of Delta Smelt at Prisoners Point and Jersey Point indicate fish are present in the lower San Joaquin and the salvage of Delta Smelt at the SWP last week indicates the species also is in the Old River corridor and the south Delta. In addition, turbidity levels are elevated throughout the Old River corridor and south Delta. The higher turbidity could encourage fish movement into the sphere of influence of the pumps.

Turbidity transect data from February 19 verified high turbidity in Old River and the south Delta. The DWR boat turbidity monitoring crew will be doing transects again on Monday, Wednesday, and Friday of this week.

The Working Group expects that entrainment into the south Delta export facilities may be continuing; although Delta Smelt may not be detected in salvage sampling due to detection limitations associated with record low abundance (a concern raised by the Working Group throughout the year).

The Working Group also discussed that Delta Smelt spawning may have begun based on the presence of ripe females in the EWS, SKT, February 18th salvage, and increase in water temperatures. SKT Survey 2 captured only 6 Delta Smelt, including 1 in the Central Delta (roughly 17% of the sample), and therefore there is concern about a sizeable portion of the spawning population being at risk (see RPA Component 2, Action 3, Part d above). In addition to risk to the spawning adults, this would create a prolonged increased risk of entrainment for the species as the season progresses into the juvenile protection period.

Last week and this week members indicated the possibility that another larger spawning movement of adults may soon occur, based upon a review of historical data, which indicate that once the Delta has surpassed 12^{o}C water temperature, an increased number of adults have been detected in some surveys. Although it is unknown how much confidence this historical information has in the group's discussion this year, members recognize the possibility that the last surge of migrating adults may happen very soon.

2015 Delta Smelt abundance indices

The four primary 2015 annual abundance indices for all Delta Smelt life stages are the lowest on record.

	2014	2015
SKT	30.1	13.8
20-mm	1.1	0.3
TNS	0.5	0.0
FMWT	9	7

Early Warning Survey as an indicator of upstream movements and entrainment risk

Previously, members of the Working Group stated that elevated catch in the Jersey Point south lane trawl or at Prisoners Point would indicate increased Delta Smelt movement and increased risk of entrainment into interior Delta channels. The Working Group particularly is concerned about these locations since the south lane at Jersey Point is more hydrodynamically linked to tidal flow into these interior Delta channels, and presence of fish at Prisoners Point reinforces the evidence that Delta smelt are moving upriver. Fish in these areas are considered at greater risk of entrainment into Old River than fish distributed downstream or along the Sacramento River. Delta Smelt were collected at Prisoners Point on February 16 and at Jersey Point in the south lane on February 19. Although there is no comparable early warning survey data on the Sacramento River system, the Working Group is concerned that an unusually large percentage of the population may be in the lower San Joaquin River. This concern is supported by the observation that 2015/2016 EWS catches are high relative to the overall species abundance as indicated by the 2015 FMWT index.

Sporadic catches of gravid females and females expressing eggs during the early warning survey, SKT trawls, and in salvage with the increase in water temperatures greater than 12^{o}C suggest that the start of spawning season may have begun or is imminent.

The Working Group discussed the Service's EWS continued sampling at station 902 in the Old River corridor just south of Frank's Tract. Members warned that the location of this station may not provide early warning information regarding entrainment risk with sufficient sensitivity to measure the expected lower concentrations of adult Delta Smelt entrained into the south Delta. The lack of catches at this location may not indicate the absence of Delta Smelt in this reach, even though approximately 100 trawls have been completed. Given the strong decline in catch densities from Jersey Point to Prisoners Point (both areas with historical consistent presence of the species) and the occurrences of zero daily catches at these central Delta stations, the Working Group believes that Delta Smelt likely are present in this reach, but at densities below detection level under existing sampling efforts. Additionally, the Working Group is concerned zero catches at 902 may be a reflection of a change in habitat preference for fish reaching this area that makes them less vulnerable to the sampling gear. The Working Group believes adult Delta Smelt that have moved to this upstream area in response to tides, turbidity, and OMR flows begin holding their position by dropping out of the tidal flux, i.e., distributing themselves near the bottom or along the banks. This behavior would result in very low or no detections in survey efforts and could also reduce susceptibility to entrainment. Members continue to emphasize the need to maintain monitoring continuity at Prisoners Point and Jersey Point as these two stations provide essential early warning data on entrainment risk.

In previous weeks, the Working Group reiterated their unanimous understanding of adult Delta Smelt movement in the interior Delta during spawning migration/movement season: fish that have moved with turbidity upstream to freshwater spawning areas will seek to hold there even as turbidity decreases.

The Working Group reviewed the summary of the DCT meeting on February 19. Members indicated their concern that the Service's maintenance of the February 12 Determination (OMR flows to be no more negative than -5000 cfs) was at least partially based on the assertion that came from some members of the DCT that there has been no detection of the species at 902 and only 4 fish salvaged on February 18 and also the sporadic low catch at the lower San Joaquin stations, which indicates little risk of entrainment to the species. The Working Group has consistently indicated that any level of salvage is of great concern, and has looked to the BiOp's guidance to use population status as a driving criterion for the setting of protective OMR flows under Action 2 (see page 355). Given the unprecedented low Delta Smelt catches in SKT surveys 1 and 2 in the current year and the continuation of widespread turbidity levels conducive to entrainment, the Working Group stressed that the sporadic low catch at Prisoners Point and Jersey Point should not be misinterpreted as a decrease in the proportional risk of entrainment in the lower San Joaquin River. Additionally, members have not expected any detection of the species at 902 under the current protocols (see earlier discussion of early warning survey). Members indicated their expectation that sporadic low catch at the lower San Joaquin stations and zero catches at station 902 will continue for the remainder of the survey. The fact that sporadic Delta Smelt catches have continued to occur at Prisoners Point under the lowest February SKT survey on record indicates that the risk of entrainment remains high and is incompatible with current pumping levels.

Salvage

The Working Group concluded that any salvage observed at either facility will be of high concern because Delta Smelt abundance is at a historic low, contributing to low detection probability of Delta Smelt in salvage under RPA compliant operations (BiOp page 338). One fish was detected in salvage sampling on January 21 and February 18, counting as eight salvaged Delta Smelt due to an expansion factor of four.

Turbidity and Delta Smelt Distribution

The four primary Delta Smelt abundance indices, as well as catches from the December 2015, January and February 2016 SKT all indicate that abundance has been at a record low all last year and continues to decline sharply. As a result, the Working Group expects that salvage and single tow trawl surveys are less reliable indicators of Delta Smelt distribution in lower fish densities. As members of the Working Group have stressed in previous meetings, sporadic, low catch in surveys from record low abundance makes using those survey results for assessing the species' distribution and risk of entrainment into the South Delta increasingly difficult based on zero catches. The Working Group has used turbidity as a proxy for location of Delta Smelt during the migration season, based on well documented associations of the fish with turbid water, its migration response to turbidity (BiOp pages 146 and 347 and EWS results) and more than two decades of salvage events which have occurred in association with the dispersal of turbidity from the San Joaquin River into the South Delta to the export facilities.

Members indicated that the percentage of the population that has completed their migration and are focused on making smaller movements in search of appropriate spawning

circumstances is unknown. However, the group indicated that some fish likely are still migrating and therefore sensitive to variations in turbidity levels.

OMR Flow

Scheduled OMR flow for today (-5000 cfs) is anticipated to represent a high risk of entrainment for fish in the Old River corridor and the lower San Joaquin River due to the current widespread turbidity levels. The Working Group suspects that fish are being entrained but not detected in salvage–as they are too diluted to have much likelihood of being detected in the salvage counts.

The above discussion points influenced and contributed to all three flow ranges described below:

Advice Framework OMR Level Risk Ranking and Discussion

- OMR flow of -1250 to -2000 cfs: There is a medium risk of entrainment under this flow range. This is the most protective range for Delta Smelt.
    - Risk factors: lowest annual indices on record, confirmed Delta Smelt presence in south Delta, in addition to current elevated turbidity in the south Delta.
    - Salvage: Four on February 18, geographic influence of the pumps does not extend to central Delta under this flow range
    - Unknowns: detection ability in salvage and trawl surveys has been severely reduced, given the record low abundance indexes; low Sacramento River catch densities (unable to assess percentage of population in the lower San Joaquin River); unknown duration of widespread elevated turbidity.
    - Persistence of risk: contingent upon early warning survey catch, potentially reduced to low once the daily maximum turbidity levels from the OH4 station to the export facilities is 8 NTU or less
- OMR flow of -2000 to -3500 cfs: There is a high risk of entrainment under this flow range, given conditions listed below:
    - Risk factors: lowest annual index on record, confirmed Delta Smelt presence in central Delta based upon Jersey Point, Prisoners Point, and SKT catch, in addition to current elevated turbidity. Confirmed presence in south Delta.
    - Salvage: Four on February 18, influence of pumps into Old River, not likely to extend to the lower San Joaquin River under this OMR flow range.
    - Unknowns: detection ability in salvage and trawl surveys has been severely reduced, given the record low abundance indexes, low Sacramento River catch densities (unable to assess percentage of population in the lower San Joaquin River) and duration of current widespread elevated turbidity. A lower risk of entrainment for this flow range could occur should Old River corridor and south Delta turbidity decrease to 8 NTU or less (CDEC station and DWR boat transect).
    - Persistence of risk: contingent upon early warning survey catch, potentially reduced to “medium to high” once the daily maximum turbidity levels in Old River and the south Delta decrease to 8 NTU or less.
- OMR flow of -3500 to -5000 cfs: There is a high risk of entrainment under this flow range.

- Risk factors: lowest annual index on record, confirmed Delta Smelt presence in Prisoners Point and Jersey Point catch data, confirmed presence in south Delta, current elevated turbidity bridge.
- Salvage: Four on February 18, geographic influence of the pumps extends to the lower San Joaquin River at the more negative end of this flow range, especially affecting the southern bank near Jersey Point. Recent salvage of adult Delta Smelt confirms that entrainment into the export facilities has occurred and likely is continuing.
- Unknowns: detection ability in salvage and trawl surveys has been severely reduced, given the record low abundance indexes, low Sacramento River catch densities (unable to assess percentage of population in the lower San Joaquin River), duration of current widespread elevated turbidity. It is unclear if a lower risk of entrainment for this flow range could occur should Old River corridor and south Delta turbidity decrease to 8 NTU or less (CDEC station and DWR boat transect), due to the possibility that particles can be pulled from the lower San Joaquin River at the higher end of this flow range.
- Persistence of risk: contingent upon early warning survey catch, unlikely to change until turbidity levels in Old River decrease to 8 NTU, and possibly not until turbidity levels in the lower San Joaquin River decrease to a similar level.

The risk factors considered most pertinent to the above assessment of risk were extremely low population abundance (detailed above), confirmed Delta Smelt presence in the south Delta and San Joaquin River, increased water temperatures, and the present turbidity bridge.

The Working Group will continue to monitor conditions and smelt distribution and will meet again on Monday, February 29, 2016.

WEEKLY ADVICE FOR THE DEPARTMENT OF FISH AND WILDLIFE FOR LONGFIN SMELT

Advice for week of February 22, 2016:
The Smelt Working Group does not have any advice for Longfin Smelt based on recent information.

No Barker Slough operations advice is warranted at this time (see #5 below).

Basis for advice:
The 2009 State Water Project 2081 for Longfin Smelt states that advice to WOMT and the DFW Director shall be based on:

1. Adult Salvage – total adult (>=80 mm) Longfin Smelt salvage (SWP+CVP) for December through February > 5 times the Fall Midwater Trawl Longfin Smelt annual abundance index.

2. Adult abundance, distribution or other information indicates that OMR flow advice is warranted.

3. Larva distribution in the Smelt Larva Survey or the 20-mm Survey finds Longfin Smelt larvae present at 8 of 12 central and south Delta sampling stations in 1 survey (809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919; see Figure 1).

4. Larva catch per tow exceeds 15 Longfin Smelt larvae or juveniles in 4 or more of the 12 survey stations listed.

5. During the period January 15 through March 31 of a dry or critically dry water year only, advice for Barker Slough pumping plant operations may be warranted if larval Longfin Smelt are detected at station 716 and other information indicates risk of entrainment.

Discussion of Criteria

1. As of February 14, 2016, no Longfin Smelt has been salvaged for the water year. The **Longfin Smelt adult salvage threshold for advice is 20** based on a Fall Midwater Trawl abundance index of 4 for 2015 (see criterion in #1 above). No advice is warranted based on this criterion.

2. February Bay Study sampling has not yet commenced. January Bay Study sampling detected no Longfin Smelt in the lower San Joaquin or Sacramento rivers and no data reported for February. December Bay Study sampling collected no Longfin Smelt in the San Joaquin River. The December Fall Midwater Trawl sampled the region and did not detect Longfin Smelt in the San Joaquin River or the south Delta. Distribution information does not indicate advice is warranted based on this criterion.

3 & 4. The fourth Smelt Larva Survey (SLS) of 2016 was completed during the week of February 16th and sample processing is incomplete. Longfin Smelt larvae were detected in low numbers at 4 of 12 criteria stations (Table 1, Figure 1). Neither the distribution (Basis for advice #3) nor the catch density (Basis for advice #4) criterion was achieved. Over all, catches of Longfin Smelt larvae were very low.

5. The January 1 water supply index forecast at 90 percent exceedance remains within the "critical" range of water year types, and triggers review of larva distribution and Barker Slough operations. One larva was detected at station 716 or 723 during SLS survey 4 (not shown in Table 1, Figure 1). Barker Slough exports remained below 30 cfs since January 1. These results were not sufficient to warrant advice for Barker Slough operations.

Current conditions: The Sacramento River flow was 17,518 on February 21. The San Joaquin River at Vernalis was 878 on February 21. X2 was at 72 on February 21. Qwest was slightly positive at 214 cfs on February 21. On February 21, combined State and federal exports reached about 5,800 cfs targeting an OMR of -5,000 cfs; this is planned to continue with exports varying with San Joaquin River inflow. Barker Slough exports have been $\leq$ 20 cfs for the past three weeks and < 30 cfs since January 1, 2016; these export levels do not pose much risk of entrainment.

Bay Study sampling has not yet started for February. During January sampling, Bay Study detected no Longfin Smelt within the Delta and Suisun Bay. Chipps Island Trawl sampling has collected very few Longfin Smelt this water year (all adult size): three on February 8th, one on the 11th and 12th; eight Longfin Smelt were collected January 13th; two adults on December 18 and the third adult on December 23. In December, a few Longfin Smelt were collected by the

Fall Midwater Trawl, one each in Carquinez Strait, Grizzly Bay and just upstream of Chipps Island. These were the first and only collections of Longfin Smelt by the Fall Midwater Trawl this year. Also in December, a single Longfin Smelt was collected by the Bay Study in Carquinez Strait. No Longfin Smelt was collected in the San Joaquin River or south Delta by either survey in December.

The Smelt Larva Survey #4 caught larvae at four criteria stations in the central and south Delta (Table 1), but did not achieve either trigger criterion (Criteria 3 & 4 above). A single larva was detected at station 716, the criterion station for potential advice on Barker Slough operations during dry and critical water-year types.

No Longfin Smelt has been salvaged this water year.

Summary of Risk: Risk of entrainment remains moderate due to negative OMR. A neutral Qwest reduces the likelihood of entrainment from the main-stem San Joaquin River, but Qwest will likely turn negative shortly, once the Delta drains after the last low pressure. The likelihood remains high of additional larvae hatching in the lower San Joaquin River, but their numbers may remain low: few larvae have been detected in the lower San Joaquin River and south Delta by the Smelt Larva Survey (Table 1). Increased hatching has occurred through February in past years, but lack of adult catch makes predictions of the same this year highly speculative. We currently have no information indicating much or any spawning in the central or south Delta.

The Barker Slough distribution trigger, that is larvae present at Smelt Larva Survey station 716, was achieved with a single larva (not shown in Table 1, Figure 1). Nonetheless, Barker Slough exports have been low (<30 cfs) so far through the month of February, so risk of entrainment remains very low at this location.

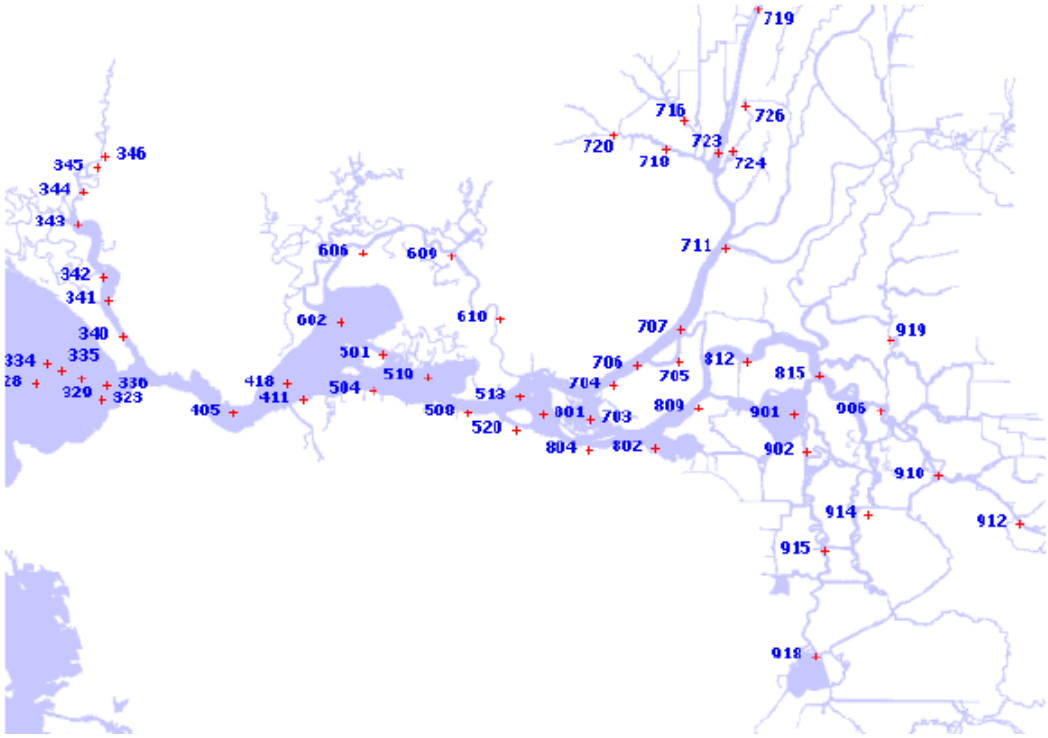
Table 1. Longfin Smelt catch by station in the Smelt Larva Survey 4. Sample processing is incomplete.

Study Year	Survey #	SLS Station	Sample Status	Species	Smelt Catch
2016	4	340	Not yet processed		
2016	4	342	Not yet processed		
2016	4	343	Not yet processed		
2016	4	344	Not yet processed		
2016	4	345	Not yet processed		
2016	4	346	Not yet processed		
2016	4	347	Not yet processed		
2016	4	348	Not yet processed		
2016	4	349	Not yet processed		
2016	4	405	Not yet processed		
2016	4	411	Not yet processed		
2016	4	418	Not yet processed		
2016	4	501	Not yet processed		
2016	4	504	Not yet processed		
2016	4	508	Not yet processed		
2016	4	513	Not yet processed		
2016	4	519	Not yet processed		
2016	4	520	Not yet processed		
2016	4	602	Not yet processed		
2016	4	606	Not yet processed		
2016	4	609	Not yet processed		
2016	4	610	Not yet processed		
2016	4	703	Not yet processed		
2016	4	704	Not yet processed		
2016	4	705	Not yet processed		
2016	4	706	Not yet processed		
2016	4	707	Not yet processed		
2016	4	711	Not yet processed		
2016	4	716	Not yet processed		
2016	4	723	Not yet processed		
2016	4	801	Not yet processed		
2016	4	804	Not yet processed		
2016	4	809	Processed	Longfin Smelt	3
2016	4	812	Processed	Longfin Smelt	3
2016	4	815	Processed	Longfin Smelt	1
2016	4	901	Processed	Longfin Smelt	2
2016	4	902	Processed		No Smelt Catch
2016	4	906	Processed		No Smelt Catch
2016	4	910	Processed		No Smelt Catch
2016	4	912	Processed		No Smelt Catch
2016	4	914	Processed		No Smelt Catch
2016	4	915	Processed		No Smelt Catch
2016	4	918	Processed		No Smelt Catch
2016	4	919	Processed		No Smelt Catch

SWP ITP Criteria Stations

Processing is complete through 2/19/15.

Figure 1. DFW's Smelt Larva Survey/20-mm Survey station locations.



Generated by Bob Fujimura on February 21, 2016

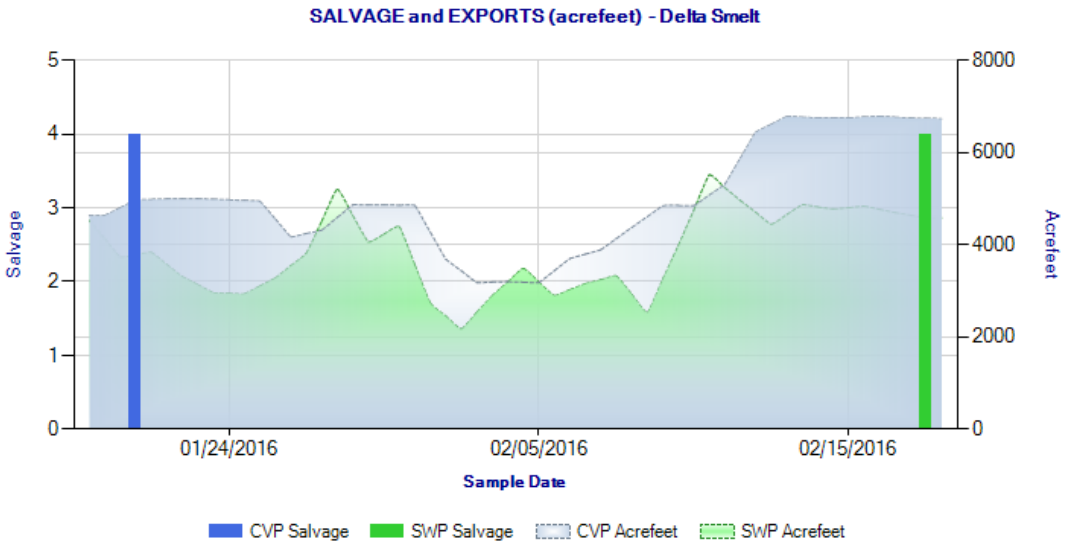


Figure 1. Daily salvage of Delta Smelt and water exports from the state and federal fish salvage facilities during January 20-February 18, 2016. Graph obtained from the DFG salvage monitoring web-page: http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx

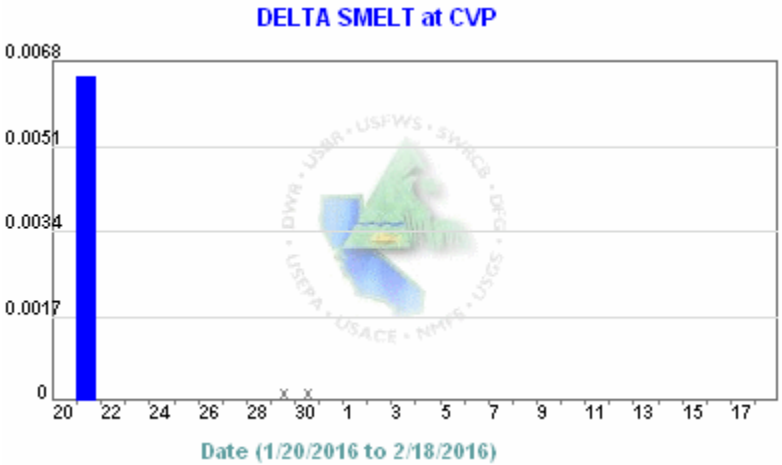


Figure 2. Daily salvage densities (fish per 10,000 m3) Delta Smelt from the federal fish salvage facilities during January 20-February 18, 2016. Graph obtained from the DFG salvage monitoring web-page: http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx

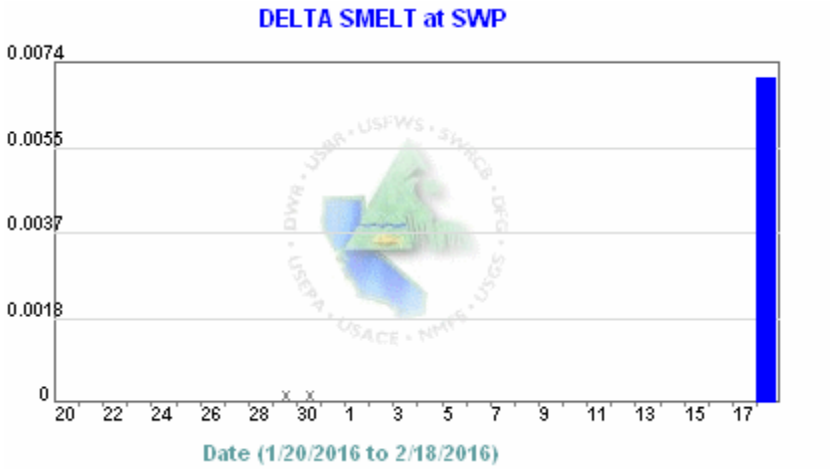


Figure 3. Daily salvage densities (fish per 10,000 m3) Delta Smelt from the state fish salvage facilities during January 20-February 18, 2016. Graph obtained from the DFG salvage monitoring web-page: http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx

PRELIMINARY DATA
SUBJECT TO REVISION WITHOUT NOTICE

EXECUTIVE OPERATIONS SUMMARY ON 2/18/2016

This summary can also be found at:
http://www.water.ca.gov/swp/operationscontrol/docs/delta/deltaops.pdf

SCHEDULED EXPORTS FOR TODAY

Clifton Court Inflow	=	2,400 cfs
Jones Pumping Plant	=	3,400 cfs

State Water Project Informational Data can be found at:
http://www.water.ca.gov/swp/operationscontrol/projectwide.cfm
ESTIMATED DELTA HYDROLOGY

Total Delta Inflow	~	16,335 cfs
Sacramento River	=	14,607 cfs
San Joaquin River	=	877 cfs

Data for previous 30-days is available at:
http://www.water.ca.gov/swp/operationscontrol/docs/delta/DeltaWQ.pdf

DELTA OPERATIONS

Delta Conditions	=	Excess
Delta x-channel Gates (% of day is open)	=	0%
Outflow Index	~	12,100 cfs
% Inflow Diverted	=	26.3% (14-day avg)
X2 Position	=	74 km
Controlling Factor(s)	=	OMR(-5000)

~~~~~~

RESERVOIR STORAGES (AS OF MIDNIGHT)

Shasta Reservoir	=	2,583 TAF
Folsom Reservoir	=	619 TAF
Oroville Reservoir	=	1,727 TAF
San Luis Res. Total	=	809 TAF
SWP Share	=	549 TAF

Reservoir data and reports are available at:
http://cdec.water.ca.gov/reservoir.html

Reservoir Releases

Keswick	=	3,250 cfs
Nimbus	=	3,000 cfs
Oroville	=	950 cfs

~~~~~~

Provisional Old River & Middle River Flows (as of 2/17/2016)
Based on USGS stations 11312676 & 11313405 via CDEC available at:
http://www.usbr.gov/mp/cvo/vungvari/OMR_Feb2016.pdf

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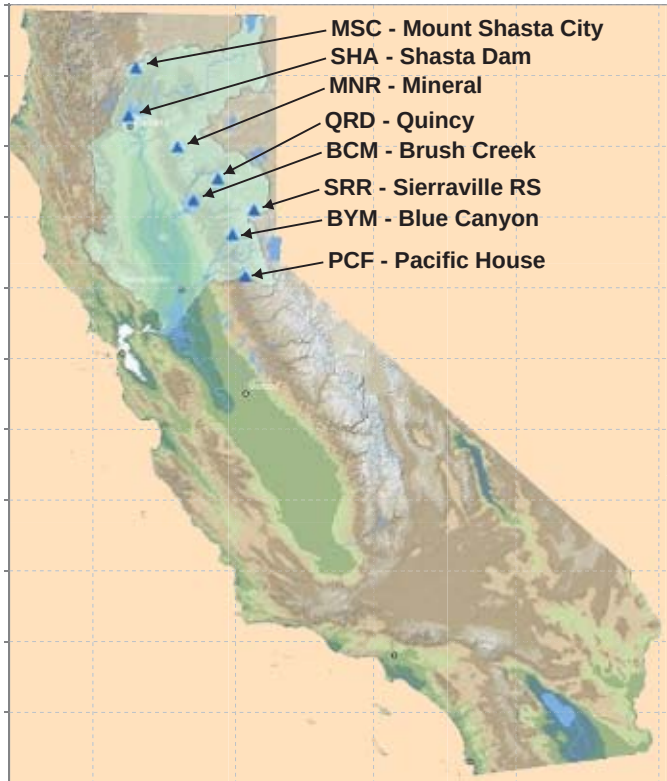
If you have any questions regarding the preliminary data
in this report, please contact OCO_Export_Management@water.ca.gov
~~~~~~

North Sierra Precipitation: 8-Station Index, February 18, 2016



Percent of Average for this Date: 108%

1982-1983 (wettest) 88.5

1997-1998 82.4

Average (1922-1998) 50.0

Current Daily Precip:34.3

2014-2015 Daily Precip 37.2

1976-1977(2nd driest & driest thru Aug) 19.0

Cumulative Daily/Monthly Precipitation (inches)

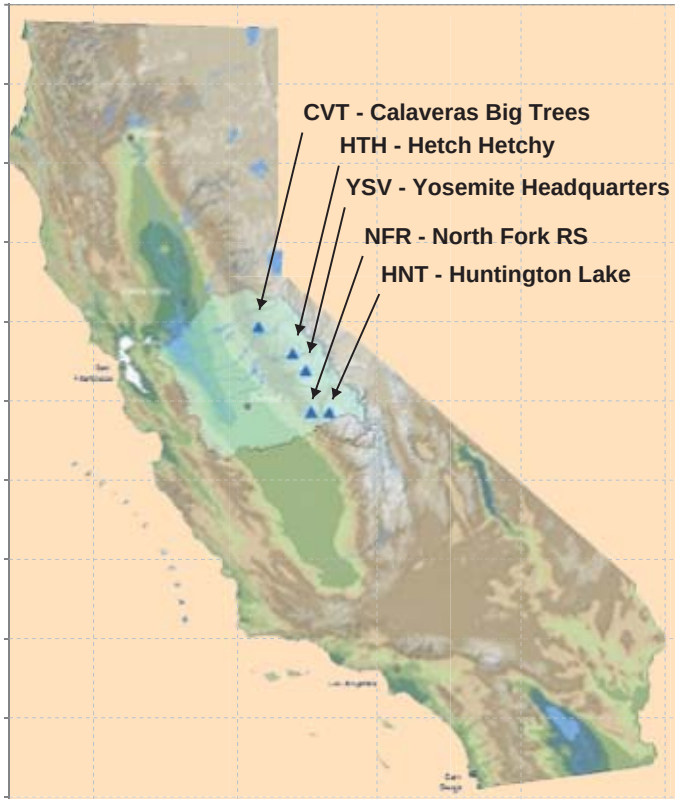
Total Water Year Precipitation

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Oct 1 Nov 1 Dec 1 Jan 1 Feb 1 Mar 1 Apr 1 May 1 Jun 1 Jul 1 Aug 1 Sep 1 Oct 1

Water Year (October 1 - September 30)

San Joaquin Precipitation: 5-Station Index, February 18, 2016



Percent of Average for this Date: 107%

1982-1983 (wettest) 77.4

1997-1998 65.2

Average (1961-2010) 40.8

Current Daily Precip: 26.8

2014-2015 Daily Precip 19.0

1976-1977(2nd driest & driest thru Aug) 15.4

Cumulative Daily/Monthly Precipitation (inches)

Total Water Year Precipitation

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90

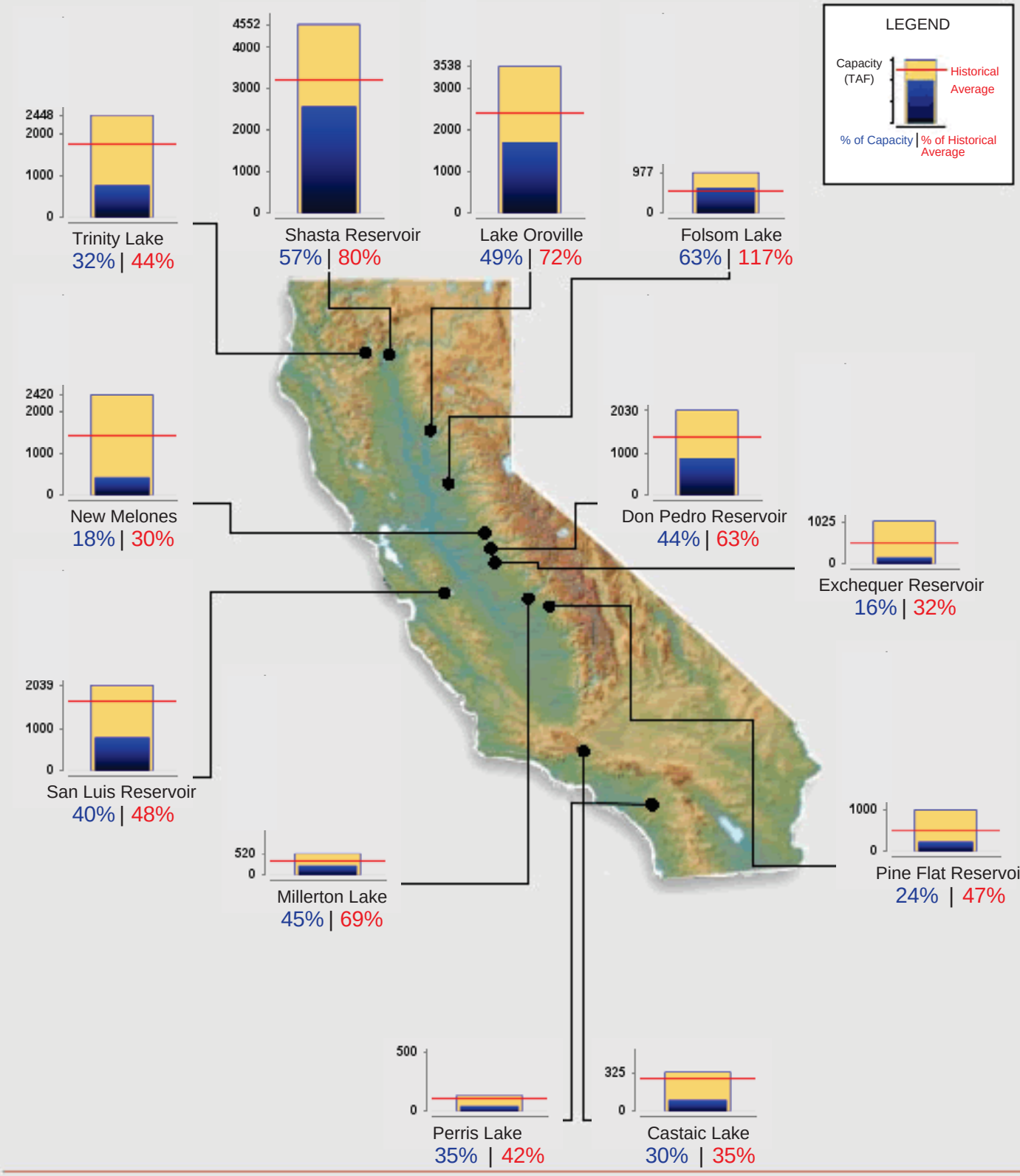
Oct 1 Nov 1 Dec 1 Jan 1 Feb 1 Mar 1 Apr 1 May 1 Jun 1 Jul 1 Aug 1 Sep 1 Oct 1

Water Year (October 1 - September 30)

Reservoir Conditions

Ending At Midnight - February 17, 2016

CURRENT RESERVOIR CONDITIONS



Graph Updated 02/18/2016 10:45 AM

Turbidity Forecast 2/16/2016

General Information

The attached model run results cover the period of February 16, through March 7, and are based on the following assumptions:

Common Assumptions

1. CCFB Gates are operating to Priority 3 throughout the forecast period.
2. The Delta Cross Channel gates will be closed throughout the forecast period.
3. Suisun Marsh salinity control flashboards are in, and the three Suisun Marsh Salinity Control Gates are in open position.

INPUT FLOW DATA (-5000 cfs OMR)

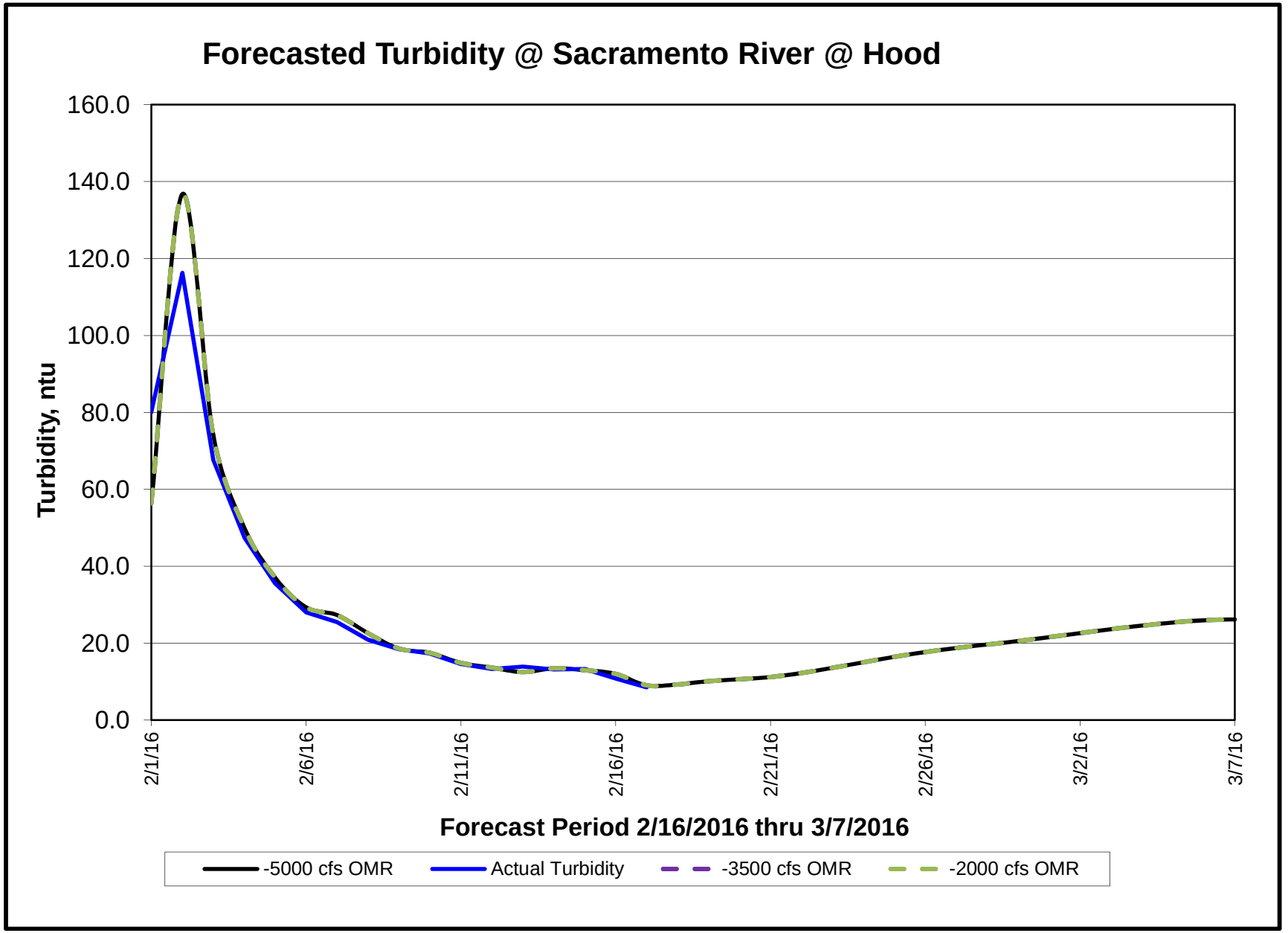
Date	Delta Inflows [cfs]								Delta Exports [cfs]	
	Sacram. River Freeport prev.day FPT	Yolo bypass Cache &weirs pr.day	Sacto Treat. rel. estim. week avg pr.day	DXC Gate ops % of day open **current day**	San Joaquin River Vernalis prior day VNS	Cosum River Michigan Bar pr. Day	Mokel. River Wood-bridge pr.day	Calaver River New Hogan pr.day	Clifton Court intake	Jones pump
16-Feb-16	16,707	62	190	0	930	462	107	11	2,439	3,423
17-Feb-16	15,819	60	190	0	891	463	107	13	2,400	3,400
18-Feb-16	15,504	60	190	0	880	480	100	10	2,400	3,400
19-Feb-16	15,714	120	190	0	880	1,100	100	10	2,400	3,400
20-Feb-16	17,104	70	190	0	920	1,230	100	10	2,450	3,400
21-Feb-16	18,905	70	190	0	960	900	100	10	2,450	3,400
22-Feb-16	17,400	60	190	0	950	750	100	10	2,450	3,400
23-Feb-16	16,900	60	190	0	800	500	100	10	2,350	3,400
24-Feb-16	16,400	60	190	0	800	400	100	10	2,350	3,400
25-Feb-16	15,900	60	190	0	800	300	100	10	2,350	3,400
26-Feb-16	15,400	60	190	0	800	300	100	10	2,350	3,400
27-Feb-16	14,900	60	190	0	800	300	100	10	2,350	3,400
28-Feb-16	14,400	60	190	0	800	300	100	10	2,350	3,400
29-Feb-16	13,900	60	190	0	800	300	100	10	2,350	3,400
01-Mar-16	13,400	60	190	0	800	300	100	10	2,350	3,400
02-Mar-16	12,900	60	170	0	800	300	100	10	2,350	3,400
03-Mar-16	12,400	60	170	0	800	300	100	10	2,350	3,400
04-Mar-16	11,900	60	170	0	800	300	100	10	2,350	3,400
05-Mar-16	11,900	60	170	0	800	300	100	10	2,300	3,400
06-Mar-16	11,900	60	170	0	800	300	100	10	2,300	3,400
07-Mar-16	11,900	60	170	0	800	300	100	10	2,300	3,400

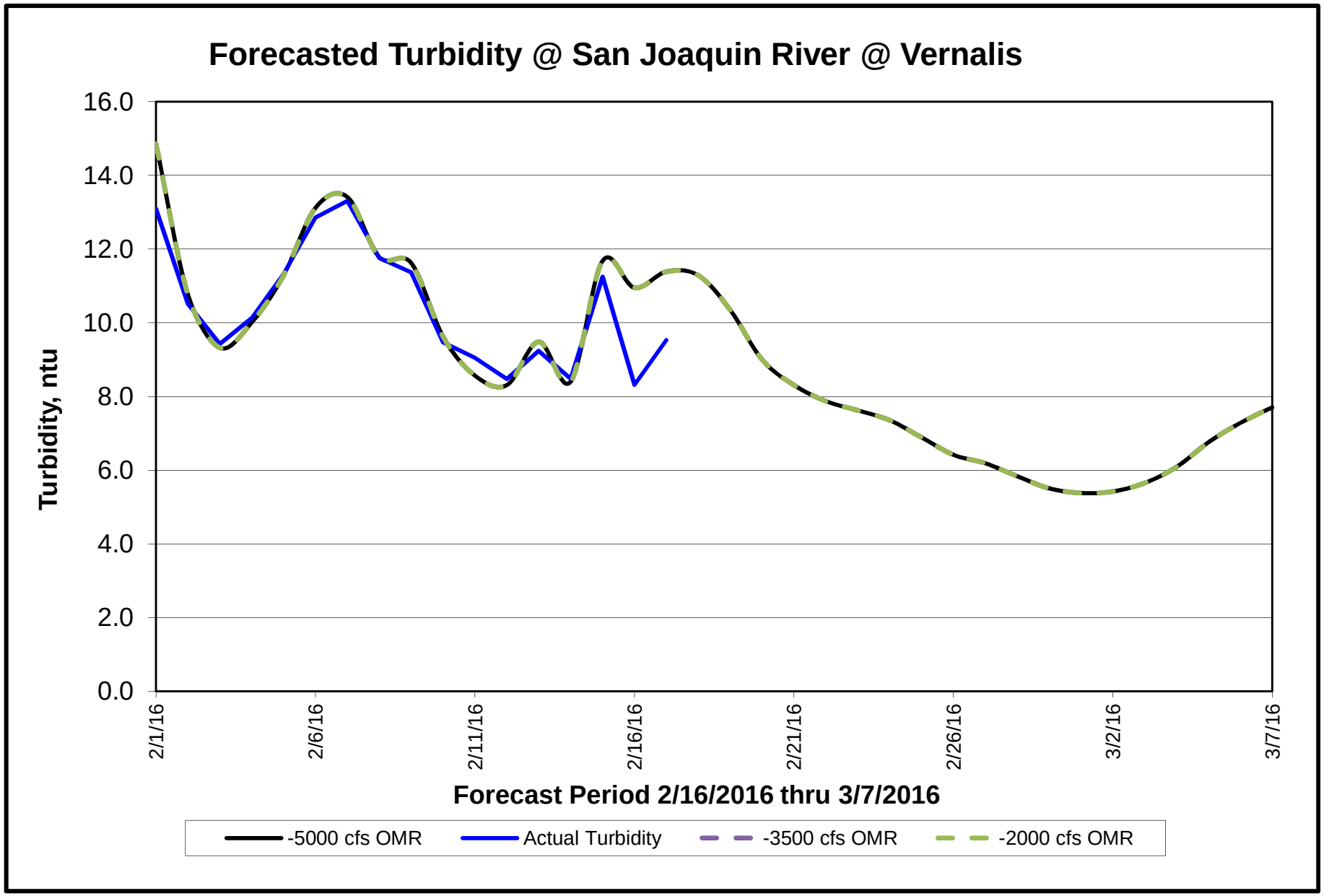
INPUT FLOW DATA (-3500 cfs OMR)

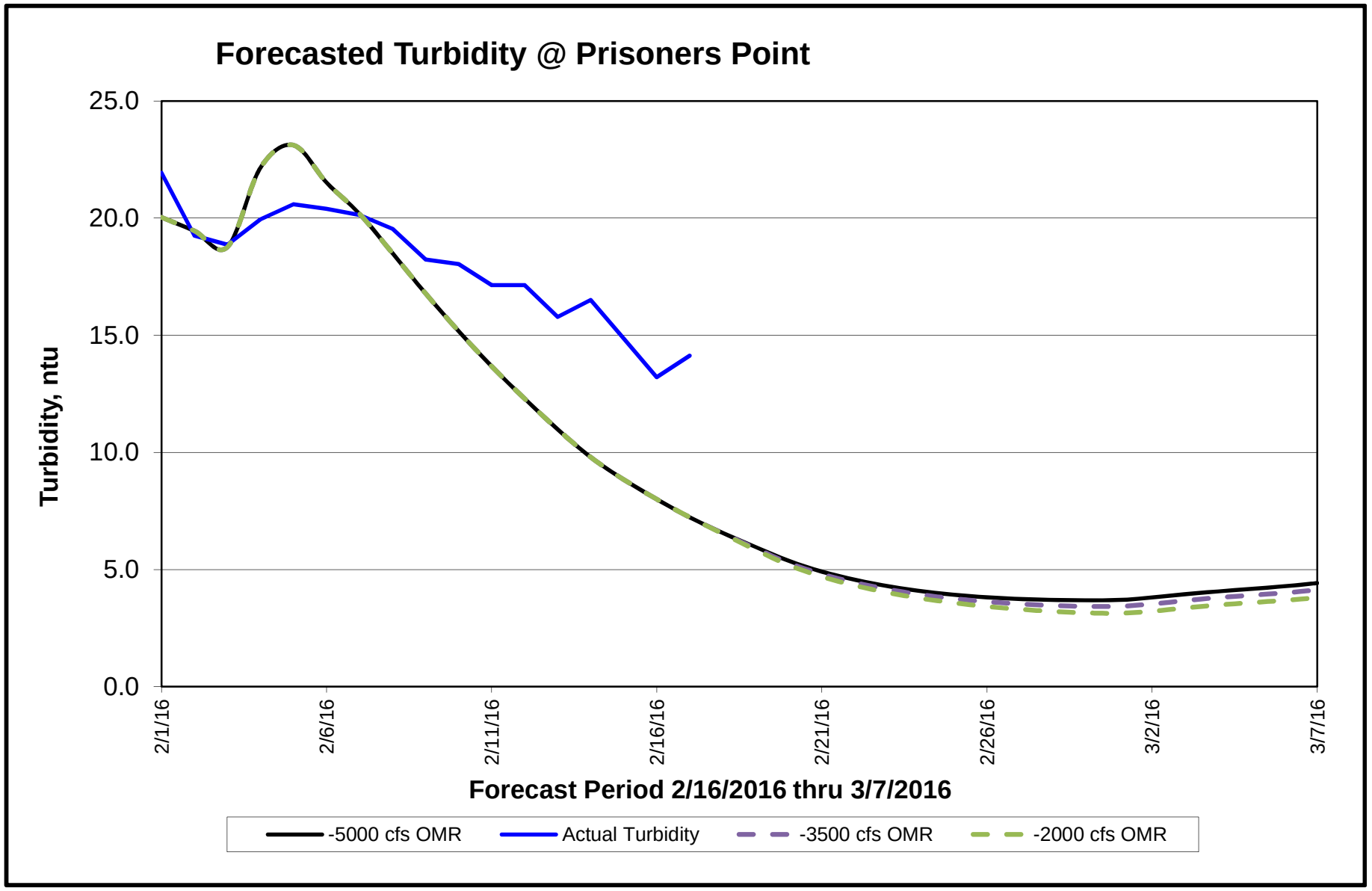
Date	Delta Inflows [cfs]								Delta Exports [cfs]	
	Sacram. River Freeport prev.day FPT	Yolo bypass Cache &weirs pr.day	Sacto Treat. rel. estim. week avg pr.day	DXC Gate ops % of day open **current day**	San Joaquin River Vernalis prior day VNS	Cosum River Michigan Bar pr. Day	Mokel. River Wood-bridge pr.day	Calaver River New Hogan pr.day	Clifton Court intake	Jones pump
16-Feb-16	16,707	62	190	0	930	462	107	11	2,439	3,423
17-Feb-16	15,819	60	190	0	891	463	107	13	2,400	3,400
18-Feb-16	15,504	60	190	0	880	480	100	10	2,150	2,000
19-Feb-16	15,714	120	190	0	880	1,100	100	10	2,150	2,000
20-Feb-16	17,104	70	190	0	920	1,230	100	10	2,200	2,000
21-Feb-16	18,905	70	190	0	960	900	100	10	2,200	2,000
22-Feb-16	17,400	60	190	0	950	750	100	10	2,200	2,000
23-Feb-16	16,900	60	190	0	800	500	100	10	2,100	2,000
24-Feb-16	16,400	60	190	0	800	400	100	10	2,100	2,000
25-Feb-16	15,900	60	190	0	800	300	100	10	2,100	2,000
26-Feb-16	15,400	60	190	0	800	300	100	10	2,100	2,000
27-Feb-16	14,900	60	190	0	800	300	100	10	2,100	2,000
28-Feb-16	14,400	60	190	0	800	300	100	10	2,100	2,000
29-Feb-16	13,900	60	190	0	800	300	100	10	2,100	2,000
01-Mar-16	13,400	60	190	0	800	300	100	10	2,100	2,000
02-Mar-16	12,900	60	170	0	800	300	100	10	2,100	2,000
03-Mar-16	12,400	60	170	0	800	300	100	10	2,100	2,000
04-Mar-16	11,900	60	170	0	800	300	100	10	2,100	2,000
05-Mar-16	11,900	60	170	0	800	300	100	10	2,050	2,000
06-Mar-16	11,900	60	170	0	800	300	100	10	2,050	2,000
07-Mar-16	11,900	60	170	0	800	300	100	10	2,050	2,000

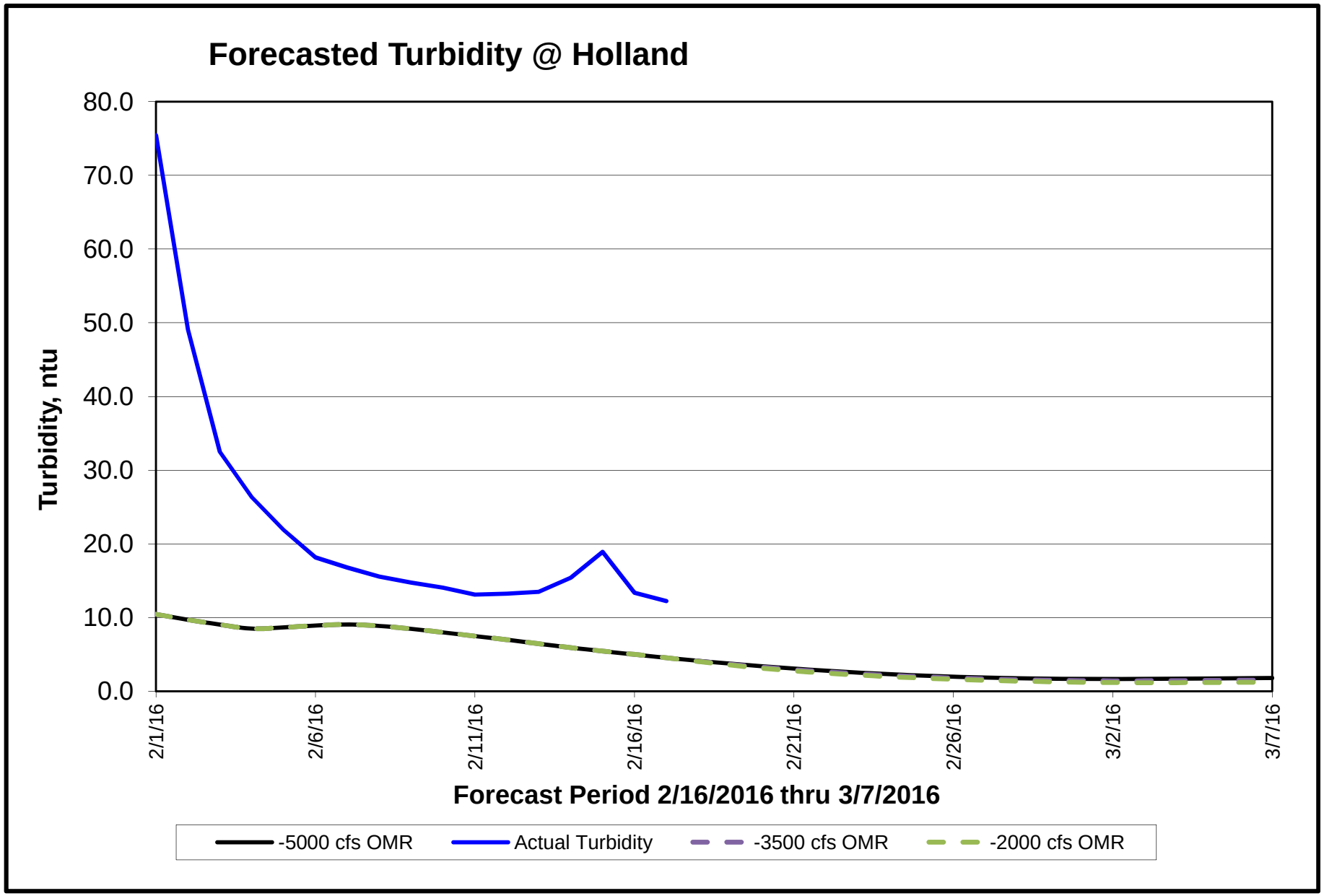
INPUT FLOW DATA (-2000 cfs OMR)

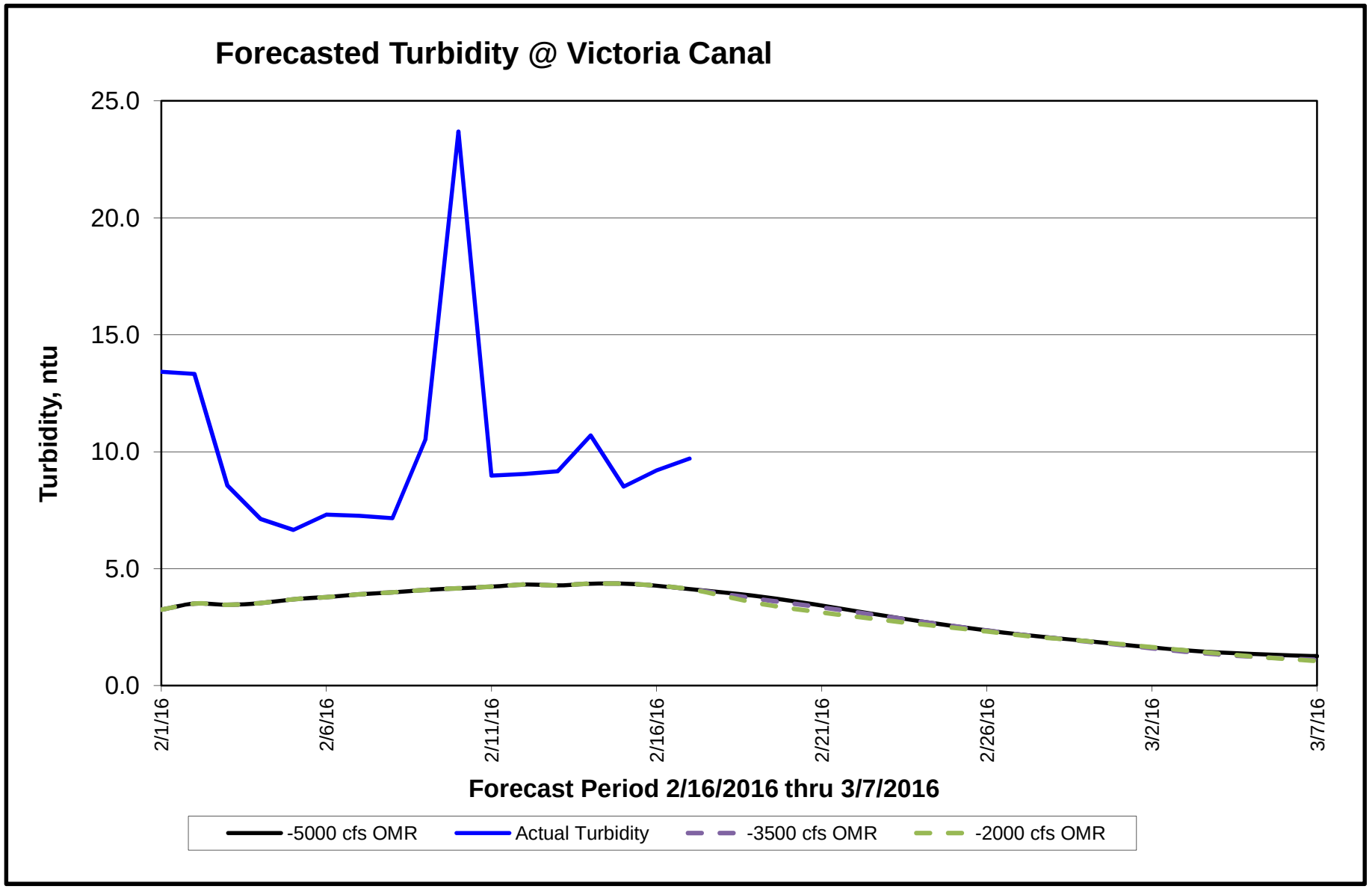
Date	Delta Inflows [cfs]								Delta Exports [cfs]	
	Sacram. River Freeport prev.day FPT	Yolo bypass Cache &weirs pr.day	Sacto Treat. rel. estim. week avg pr.day	DXC Gate ops % of day open **current day**	San Joaquin River Vernalis prior day VNS	Cosum River Michigan Bar pr. Day	Mokel. River Wood-bridge pr.day	Calaver River New Hogan pr.day	Clifton Court intake	Jones pump
16-Feb-16	16,707	62	190	0	930	462	107	11	2,439	3,423
17-Feb-16	15,819	60	190	0	891	463	107	13	2,400	3,400
18-Feb-16	15,504	60	190	0	880	480	100	10	1,500	1,000
19-Feb-16	15,714	120	190	0	880	1,100	100	10	1,500	1,000
20-Feb-16	17,104	70	190	0	920	1,230	100	10	1,550	1,000
21-Feb-16	18,905	70	190	0	960	900	100	10	1,550	1,000
22-Feb-16	17,400	60	190	0	950	750	100	10	1,550	1,000
23-Feb-16	16,900	60	190	0	800	500	100	10	1,450	1,000
24-Feb-16	16,400	60	190	0	800	400	100	10	1,450	1,000
25-Feb-16	15,900	60	190	0	800	300	100	10	1,450	1,000
26-Feb-16	15,400	60	190	0	800	300	100	10	1,450	1,000
27-Feb-16	14,900	60	190	0	800	300	100	10	1,450	1,000
28-Feb-16	14,400	60	190	0	800	300	100	10	1,450	1,000
29-Feb-16	13,900	60	190	0	800	300	100	10	1,450	1,000
01-Mar-16	13,400	60	190	0	800	300	100	10	1,450	1,000
02-Mar-16	12,900	60	170	0	800	300	100	10	1,450	1,000
03-Mar-16	12,400	60	170	0	800	300	100	10	1,450	1,000
04-Mar-16	11,900	60	170	0	800	300	100	10	1,450	1,000
05-Mar-16	11,900	60	170	0	800	300	100	10	1,450	1,000
06-Mar-16	11,900	60	170	0	800	300	100	10	1,450	1,000
07-Mar-16	11,900	60	170	0	800	300	100	10	1,450	1,000


Forecasted Turbidity @ Sacramento River @ Hood
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Turbidity, ntu
2/1/16
2/6/16
2/11/16
2/16/16
2/21/16
2/26/16
3/2/16
3/7/16
Forecast Period 2/16/2016 thru 3/7/2016
-5000 cfs OMR
Actual Turbidity
-3500 cfs OMR
-2000 cfs OMR


Forecasted Turbidity @ San Joaquin River @ Vernalis
Turbidity, ntu
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2/1/16
2/6/16
2/11/16
2/16/16
2/21/16
2/26/16
3/2/16
3/7/16
Forecast Period 2/16/2016 thru 3/7/2016
-5000 cfs OMR
Actual Turbidity
-3500 cfs OMR
-2000 cfs OMR


Forecasted Turbidity @ Prisoners Point
25.0
20.0
15.0
10.0
5.0
0.0
Turbidity, ntu
2/1/16
2/6/16
2/11/16
2/16/16
2/21/16
2/26/16
3/2/16
3/7/16
Forecast Period 2/16/2016 thru 3/7/2016
-5000 cfs OMR
Actual Turbidity
-3500 cfs OMR
-2000 cfs OMR


Forecasted Turbidity @ Holland
Turbidity, ntu
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
2/1/16
2/6/16
2/11/16
2/16/16
2/21/16
2/26/16
3/2/16
3/7/16
Forecast Period 2/16/2016 thru 3/7/2016
-5000 cfs OMR
Actual Turbidity
-3500 cfs OMR
-2000 cfs OMR


Forecasted Turbidity @ Victoria Canal
Turbidity, ntu
25.0
20.0
15.0
10.0
5.0
0.0
2/1/16
2/6/16
2/11/16
2/16/16
2/21/16
2/26/16
3/2/16
3/7/16
Forecast Period 2/16/2016 thru 3/7/2016
-5000 cfs OMR
Actual Turbidity
-3500 cfs OMR
-2000 cfs OMR

Department of Water Resources
Division of Operations and Maintenance
SWP Water Operations Office

Delta Turbidity Conditions Report

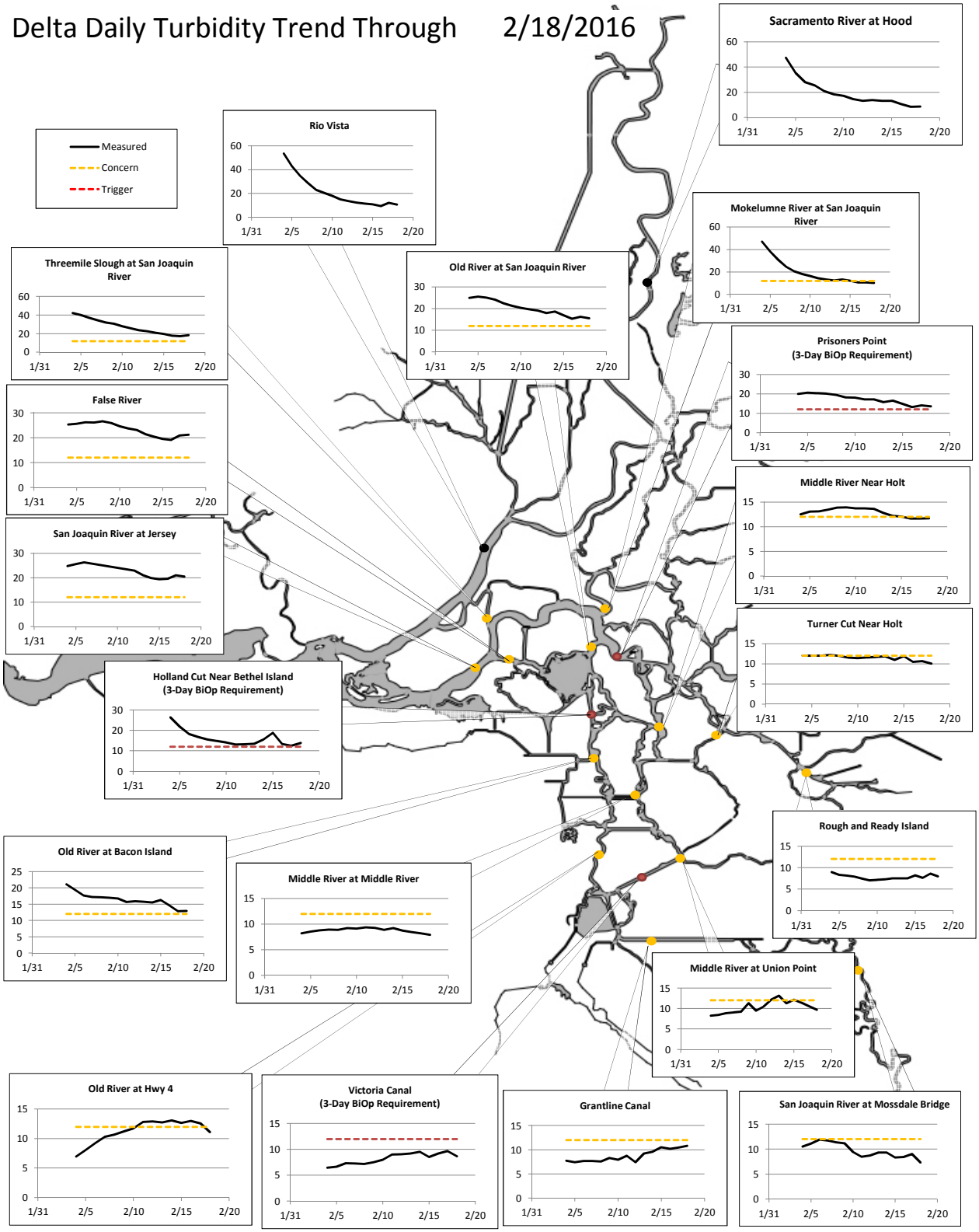
For conditions through: February 18, 2016

General Conditions:

Inflows:		
	Freeport	15848 CFS
	Yolo Bypass	81 CFS
	Vernalis	891 CFS
	Cosumnes	914 CFS
	Mokelumne	129 CFS
	Calaveras	28 CFS
Exports:		
	Clifton Court	2399 CFS
	Jones	3395 CFS
Other:		
	OMR (Index)	-4976 CFS
	QWEST	-519 CFS
	NDOI	12110 CFS

Missing/Suspect Data:

Delta Daily Turbidity Trend Through 2/18/2016



Old and Middle River turbidity, Feb. 19, 2016

NOTE: Data have not undergone initial quality assurance and quality control procedures.

OSJ @ 10:50
boat: 16.4
CDEC: 12.7; 24h: 12.6-21.7

PPT @ 10:34
boat: 15.2
CDEC: 13.9; 24h: 10.9-23.6

HOL @ 11:13
boat: 13.3
CDEC: 12.2; 24h: 10.6-13.4

OBI @ 11:54
boat: 14.0
CDEC: 13.4; 24h: 10.3-16.1

OH4 @ 12:29
boat: 10.8
CDEC: 10.1; 24h: 8.4-12.1

GLC @ 13:09
boat: 4.4
CDEC: 4.4; 24h: 3.2-16.1

HLT:
24h range
9.0 - 13.1

MDM:
24h range
6.9 - 9.9

MUP:
24h range
7.8 - 1056.0

VCU:
24h range
5.2 - 11.4

data collected 10:07 - 13:09
FLOOD TIDE
(see attached tide graph)

turbidity range: 4.2 - 20.1

winds 5 - 15 mph

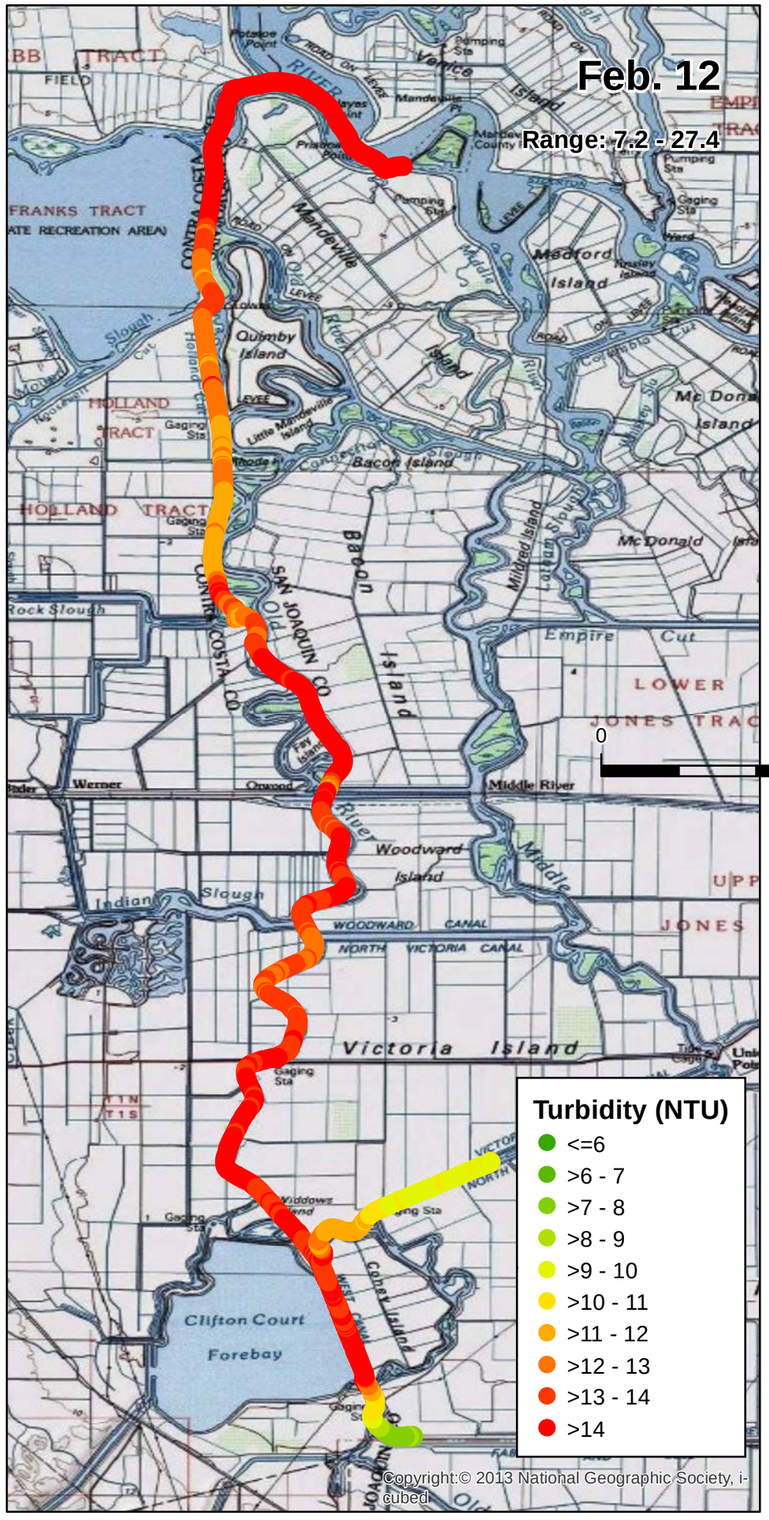
turbidity (NTU)

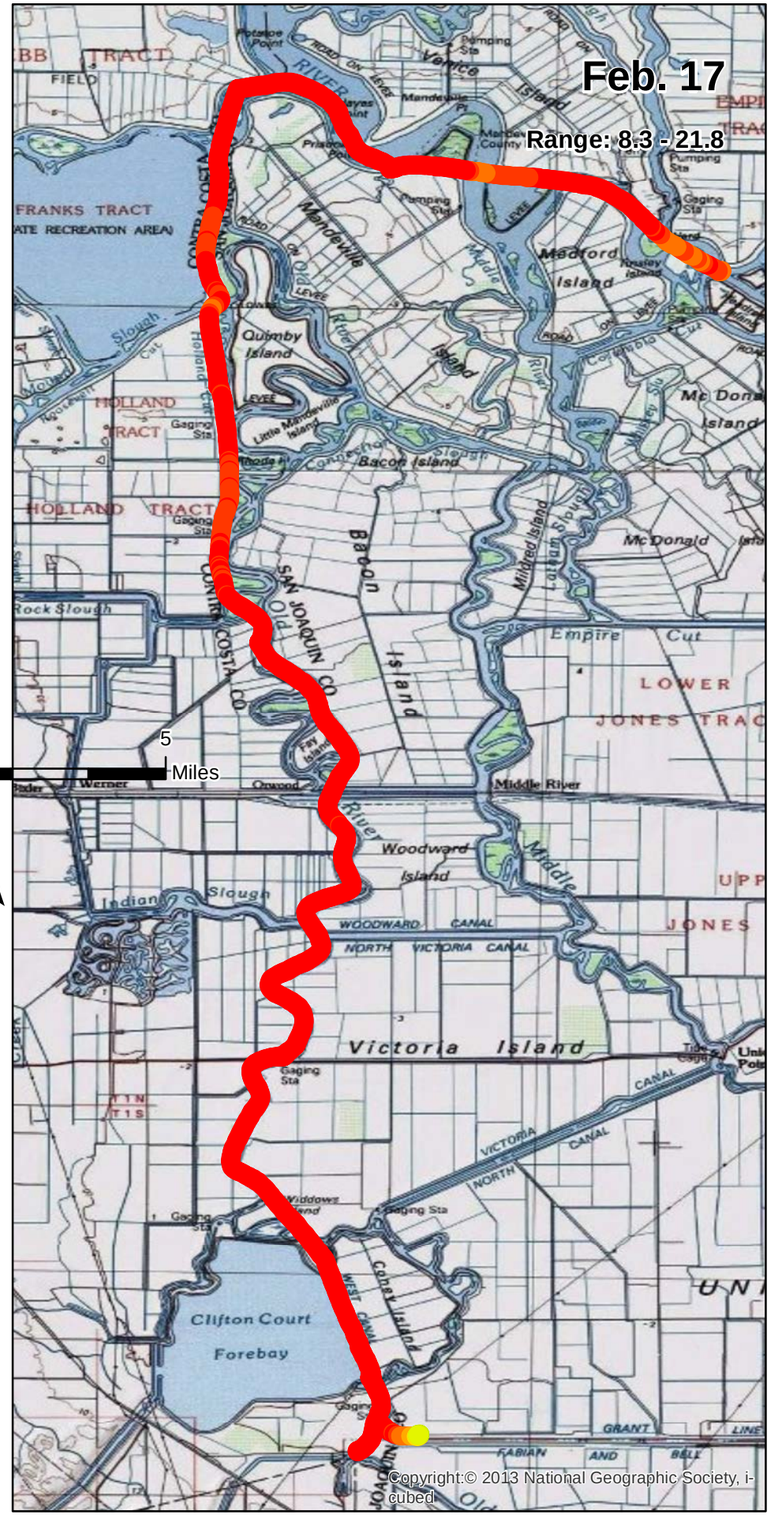
- <=6
- >6 - 7
- >7 - 8
- >8 - 9
- >9 - 10
- >10 - 11
- >11 - 12
- >12 - 13
- >13 - 14
- >14

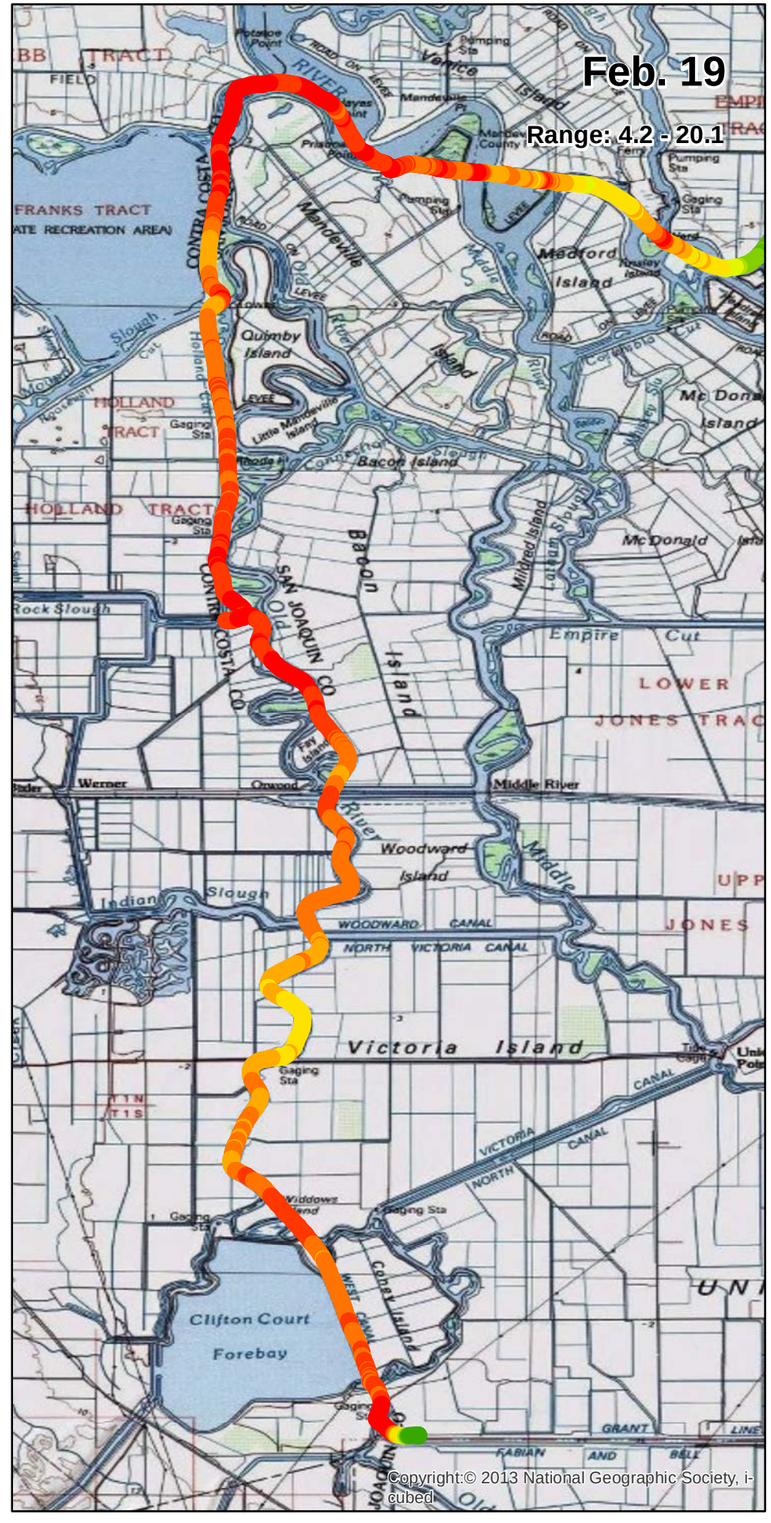
station	name
GLC	Grantline Canal (USGS)
HLT	Middle River near Holt
HOL	Holland Cut near Bethel Island
MDM	Middle River at Middle River
MOK	Mokelumne River at San Joaquin River
MUP	Middle River at Union Point
OBI	Old River at Bacon Island (USGS)
OH4	Old River at Highway 4
OSJ	Old River at Franks Tract near Terminous
PPT	Prisoners Point
VCU	Victoria Canal near Byron

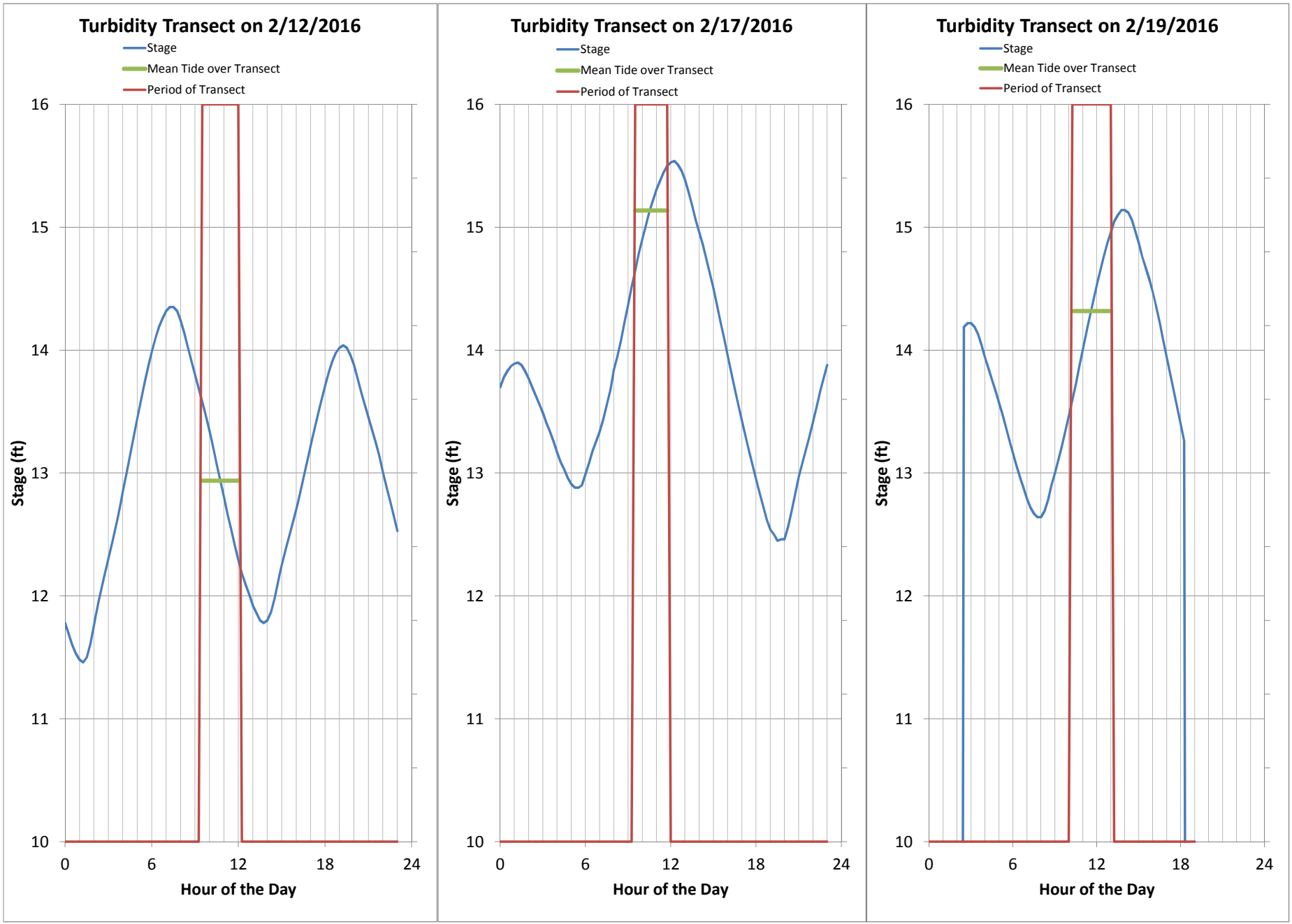
N

0 1 2 3 4 Miles


Feb. 12
Range: 7.2 - 27.4
Turbidity (NTU)
<=6
>6 - 7
>7 - 8
>8 - 9
>9 - 10
>10 - 11
>11 - 12
>12 - 13
>13 - 14
>14
0
5
Miles
N
Copyright:© 2013 National Geographic Society, i-cubed


Feb. 17
Range: 8.3 - 21.8
Copyright:© 2013 National Geographic Society, i-cubed


Feb. 19
Range: 4.2 - 20.1
Copyright:© 2013 National Geographic Society, i-cubed


Turbidity Transect on 2/12/2016
Stage
Mean Tide over Transect
Period of Transect
16
15
14
13
12
11
10
Stage (ft)
0
6
12
18
24
Hour of the Day
Turbidity Transect on 2/17/2016
Stage
Mean Tide over Transect
Period of Transect
16
15
14
13
12
11
10
Stage (ft)
0
6
12
18
24
Hour of the Day
Turbidity Transect on 2/19/2016
Stage
Mean Tide over Transect
Period of Transect
16
15
14
13
12
11
10
Stage (ft)
0
6
12
18
24
Hour of the Day

SWG Weekly Salvage Update

Reporting Period: February 15-21

Prepared by Bob Fujimura on February 22, 2016 7:40

Preliminary Results -Subject to Revision

	Daily Salvage								
Species/Life Stage	***15-Feb***	***16-Feb***	***17-Feb***	***18-Feb***	***19-Feb***	***20-Feb***	***21-Feb***	***Trend***	
Adult Delta Smelt									
SWP	0	0	0	4	0	0	0		1
CVP	0	0	0	0	0	0	0		0
TOTAL	0	0	0	4	0	0	0	↗	0.6
CUM TAKE	4	4	4	8	8	8	8		
% of 2016 CL	10%	10%	10%	19%	19%	19%	19%		
Adult Longfin Smelt									
SWP	0	0	0	0	0	0	0		0
CVP	0	0	0	0	0	0	0		0
TOTAL	0	0	0	0	0	0	0	→	0
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	0%	0%	0%	0%	0%	0%	0%	→	0%
CVP reduced counts	0%	0%	0%	0%	0%	0%	0%	→	0%

TOTAL = combine daily salvages for CVP+SWP; daily water export = AF; Trend = compared to previous week

NA = not available at the time of this report

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