

Smelt Working Group  
February 8, 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 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.

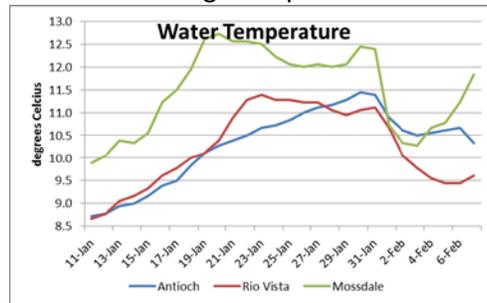
The Working Group will continue to monitor Delta Smelt survey and salvage data and Delta conditions, and will meet again on Tuesday, February 16, 2016 at 10 am.

**Reported Data**

1. Current environmental data

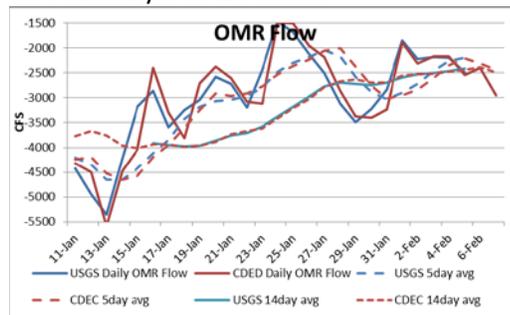
a. Temperature

Combined average temperature for February 7 is 10.6°C



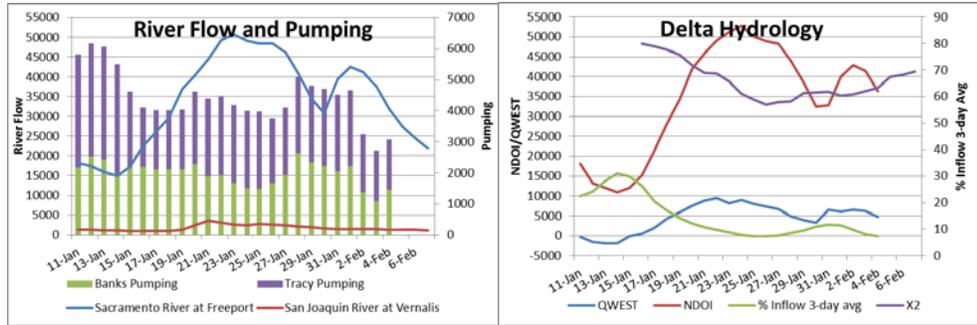
b. OMR flow

USGS OMR daily average flow on February 5 is -2489 cfs. CDEC OMR daily average flow for February 7 is -2946 cfs.

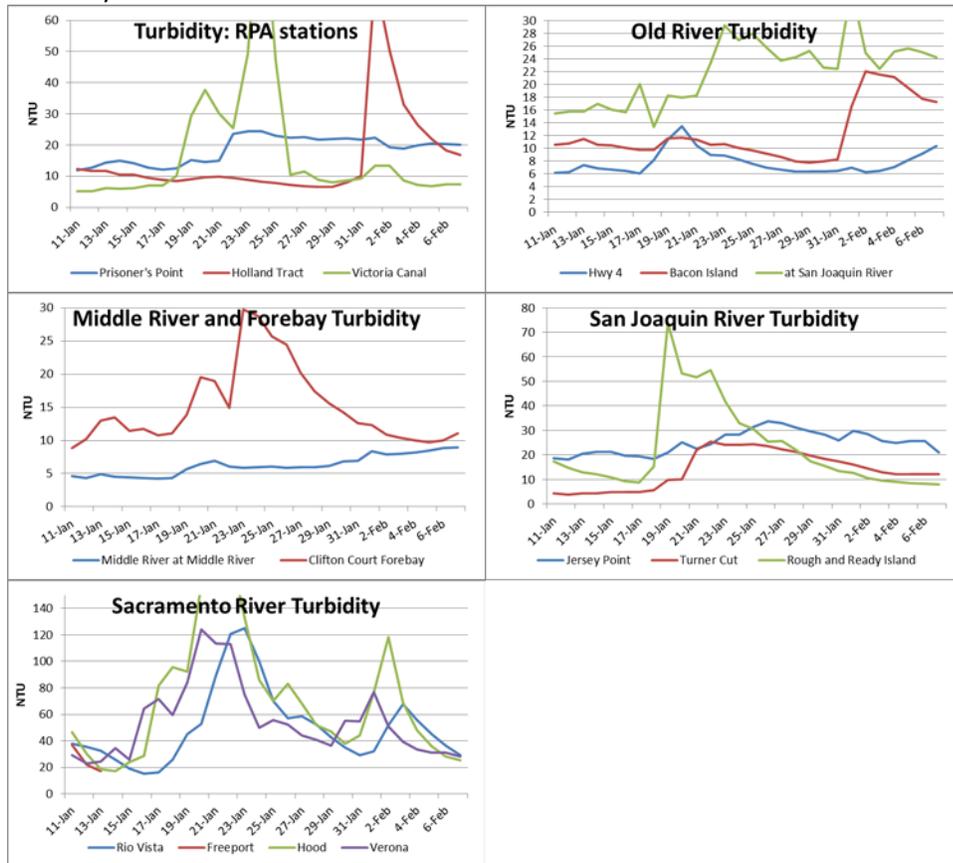


c. River Flows and pumping

Sacramento River at Freeport flow for February 7 was 21,889 cfs. San Joaquin River at Vernalis river flow for February 7 was 1226 cfs. Combined exports are 3650 cfs today; combined exports may increase later in the week.



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 is in the field this week. An update from the field was provided during the call. The survey is trawling in the central and south Delta today. Of the five stations sampled at the time of the report, one ripe female was collected at Jersey Point, station 809.

Smelt Larva Survey #3 was in the field last week. Processing is approximately 50% complete. No Delta Smelt have been detected as yet; twenty-three Longfin Smelt, ranging in length from 5-11mm, were collected. SLS #4 is in the field next week.

The Early Warning Survey began November 30.

Early Warning Survey Results, February 1 through 7

Date	Location	Delta Smelt Catch
2/1	Prisoners Point	0*
2/2	Station 902	0
2/3	Prisoners Point	1
2/4	Station 902	0
2/5	Prisoners Point	1

\*5 trawls only

**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. Salvage of 4 Delta Smelt represents 10% 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 January 21. No Longfin Smelt have 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 2350 cfs today. The daily average intake to Clifton Court (CC) is 1400 cfs. Combined pumping is 3650 cfs today and potentially may increase later in the week. Pumping is constrained by the Service’s February 5, 2016 Determination, which limits OMR flow to no more negative than -4000 cfs.

**6. Delta Conditions Team**

DCT met on 02/5; the February 5 DWR turbidity transect data and a DCT summary (including turbidity forecasting) were provided. The turbidity forecasting model results remain unreliable, and have therefore been distributed but not discussed at the DCT (see attached).

**7. Assessment of Risk:**

BiOp Background

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...”

The Service stated in its January 14, 2016 Determination that "...we have moved into Action 2 of Component 1 of the 2008 Biological Opinion..." According to the Biological Opinion, "Action 2 reflects the period when OMR prescriptions for pre-spawning adult delta smelt are still required to protect parental stock" once "the main pulse of fish migration has occurred and adults are holding more tightly to their selected spawning areas" (p 355).

A brief review of the BiOp's guidance on OMR flow setting after initiation of Action 2 (p 354-355) was provided during the call:

OMR flow setting after initiation of Action 2

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 -3000 cfs and potentially become more negative this week to match the -4000 cfs Service Determination level). Recent Delta Smelt catches at Prisoners Point indicate fish will continue to move into areas where they will be vulnerable to entrainment. In addition, turbidity levels are elevated throughout the Old River corridor and to the forebay radial gates. The higher turbidity has resulted from resuspension of particles from high winds last week (as well as resulting from inflow of highly turbid water from east side streams) and is expected to encourage fish movement into the sphere of influence of the pumps.

Turbidity transect data from February 5 verified high turbidity on the flood tide in Old River. The transect did not extend to the export facilities. Point samples from this morning's field survey at Holland Tract and Orwood indicated a turbidity of 15.5 and 14.8 NTU, respectively. The DWR boat transect is in the field today, Wednesday, and Friday of this week.

The Working Group noted that Delta Smelt are in the south Delta, as evidenced by the salvage event at the CVP Fish Facility on January 21. It was noted that this salvage event, in addition to a similar event in Feb 2015, occurred immediately following a wind driven turbidity event in Old River, and the recent wind event of 1/31-2/1 increased members concern for another potential salvage event. The Working Group expects that further salvage may occur; especially should pumping be increased, 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 the possibility that Delta Smelt will remain in the south Delta and in the Old River corridor through spawning. This would create a prolonged increased risk of entrainment for the species as the season progresses into the juvenile protection period. It is unclear at this time if this scenario can be avoided.

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 have been collected at Prisoners Point in the past week with one individual

collected on both February 3 and 5. 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 EWS catches are high relative to the overall species abundance as indicated by the 2015 FMWT index.

A ripe female detected this morning at Jersey Point during the SKT survey and the detection of females expressing eggs at Prisoners Point during the early warning surveys earlier in the year suggest that the start of spawning season may be imminent.

The Working Group discussed the Service's EWS sampling at station 902 in the Old River corridor just south of Frank's Tract (instead of sampling at Jersey Point). Members were concerned that the location of this station does not provide early warning information and that conclusions could be erroneously drawn that catches of zero indicate no Delta Smelt in this reach. The Working Group believes that Delta Smelt likely are present in this reach, but at densities below detection level under existing sampling conditions. Additionally, the Working Group is concerned zero catches at 902 may simply 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. This behavior would result in very low or no detections in survey efforts. Members emphasized the need to maintain monitoring continuity at Prisoners Point and Jersey Point as these two stations provide essential data on entrainment risk.

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 recedes.

#### 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, counting as four 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 and January 2016 SKT all indicate that abundance has been at a record low all last year and remains so. As a result, the Working Group expects that salvage and single tow trawl surveys are increasingly unreliable indicators of Delta Smelt distribution. 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 very challenging. 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.

Given the current elevated Old River turbidity levels, members again stressed the importance of minimizing the movement of adult Delta Smelt into Old River, which potentially reduces the risk of entrainment for both adults in active pre-spawn movement and later of hatching larvae and juveniles in the coming weeks/months. Members indicated that management of OMR flow to prevent entrainment of young of year fish hatched in the Old River corridor would be exceptionally challenging.

Members noted that elevated turbidities have lingered in the Old River corridor longer than initially anticipated and that a zone of clearing close to the export facilities that began to form two weeks ago has reversed and become more turbid. During the call it was reported that CDEC Station OH4 had reached a daily average turbidity of 10.3 NTU, with a maximum value of 13.4 NTU, and that the daily average turbidity of CDEC Station CLC for February 7 was 11 NTU with an hourly value of 17 NTU as of 8am February 8 indicating that a turbidity bridge had formed in Old River. Members stressed the importance of achieving turbidity levels in Old River and the south Delta of 8 NTU or less as soon as possible, at least from CDEC Station OH4 to the forebay. The group discussed other specific turbidity levels, and decided that 8 NTU or less would be necessary to ensure conditions that do not encourage the species to move closer to the pumps. There is no clear evidence that 8 NTU will be sufficiently low to discourage actively moving Delta Smelt. However, published research (Grimaldo 2009) and unpublished data from Early Warning Sampling suggest fish begin moving into higher velocity areas of the water column around 10 NTU, suggesting Delta Smelt would not cease such movement until turbidity dropped to at least 8 NTU. However, much lower turbidity would provide greater assurance of reduced Delta Smelt vulnerability to advection toward the pumps.

#### OMR Flow

Scheduled OMR flow for today (-2900 cfs) is anticipated to represent a high risk of entrainment for fish in the Old River corridor 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 Working Group will be considering the following suite of conditions criteria this week to gauge the potential for diminished entrainment risk:

- Consecutive days of favorable turbidity, indicating a “break” in a turbidity bridge, or dispersion of turbidity into an area within the entrainment zone. This would include gauge readings of 8 NTU or less through the Old River corridor (from CDEC Stations HOL to the export facilities). This value is based upon the observation that Delta Smelt salvage can occur at turbidities in the Old River of approximately 10 NTU, and also the observation that values from the fixed sensors have been consistently lower than those observed in the turbidity transect survey. The Service should look to both the CDEC gauge data and the DWR turbidity transect data to monitor turbidity levels as the boat transects usually return higher turbidity levels than the gauges. The Working Group cautions that the boat transects are not completed at consistent points of tide levels. The Working Group would like to see turbidities at or less than 8 NTU at all points of the tidal cycle.
  - Additionally, members indicated the risk level for the middle range of OMR flows potentially could be “medium to low” should the daily maximum turbidity reduce to at least 8 NTU from station OH4 to the export facilities.
- Consecutive days of  $\leq 1$  Delta Smelt catch at Prisoners Point in the early warning survey.

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 central Delta based upon Prisoners Point catch and observed salvage data, and current turbidity bridge.
  - Salvage: Four salvaged on January 21, 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 current turbidity bridge.
  - 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 Prisoners Point catch, SKT catch, and observed salvage data and current turbidity bridge.
  - Salvage: Four salvaged on January 21, influence of pump 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 turbidity bridge. 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 low” 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 catch data and observed salvage data, current turbidity bridge.
  - Risk factors: lowest annual index on record, confirmed Delta Smelt presence in central Delta based upon Prisoner’s Point catch, SKT catch, and observed salvage data.
  - Salvage: Four salvaged on January 21, geographic influence of the pumps could extend to the lower San Joaquin River at the more negative end of this flow range, especially affecting the southern bank near Jersey Point.
  - 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 turbidity bridge. 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 San Joaquin River, and the present turbidity bridge.

The Working Group will continue to monitor conditions and smelt distribution and will meet again on Tuesday, February 16, 2016.

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

### **Advice for week of February 8, 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 ( $\geq 80$  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 January 24, 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. 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 third Smelt Larva Survey (SLS) of 2016 was completed during the week of February 1<sup>st</sup> and sample processing is incomplete. Longfin Smelt larvae were detected in low numbers at 3 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. No larvae were detected at station 716 or 723 during SLS survey 3 (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 peaked at 50,850 cfs on January 23 and dropped slightly to 30,968 on the 30<sup>th</sup> and then peaked again at 42,642 on February 1. The San Joaquin at Vernalis peaked at 3,627 cfs on January 21<sup>st</sup> and declined slowly to 1,,226 cfs February 7<sup>th</sup>. X2 reached about 57 on January 26<sup>th</sup> and increased to 69 on February 7<sup>th</sup>. Qwest turned positive on January 16 and has fluctuated in the positive range since; recently as high as 6,626 cfs on February 2<sup>nd</sup>; +2,022 cfs on February 7. On February 8, combined State and federal exports reached about 3,650 cfs targeting an OMR of -2,900 cfs, but expect to increase pumping later this week targeting -4,000 cfs OMR. 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 detected no Longfin Smelt within the Delta and Suisun Bay during January sampling. For the week of January 10 through January 16, eight additional Longfin Smelt were collected by the Chipps Island Trawl (January 13<sup>th</sup>), the first catches since December 23<sup>rd</sup>. Only three Longfin Smelt have been previously reported by Chipps Island Trawl sampling: 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 #3 caught larvae at three criteria stations in the central and south Delta (Table 1), but did not achieve either trigger criterion (Criteria 3 & 4 above). No larvae were

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 is very low due to a substantially positive Qwest and the few larvae detected in the lower San Joaquin River and south Delta by the Smelt Larva Survey (Table 1). Increased hatching is expected in upcoming weeks, but we currently have no information indicating much or any spawning in the central or south Delta.

Current Qwest flows remain positive and favorable for downstream transport away from the export pumps. Exports will target -2,900 cfs OMR in the next couple days then increase to target -4,000 cfs OMR in the absence of a more protective action by the USFWS to protect Delta Smelt. Few Longfin Smelt larvae appear at risk.

The Barker Slough distribution trigger, that is larvae present at Smelt Larva Survey station 716, was not achieved, though larvae were detected in the vicinity at station 723 (see Table 1, Figure 1). Nonetheless, Barker Slough exports have been low (<30 cfs) throughout the month of January, so risk of entrainment remains very low.

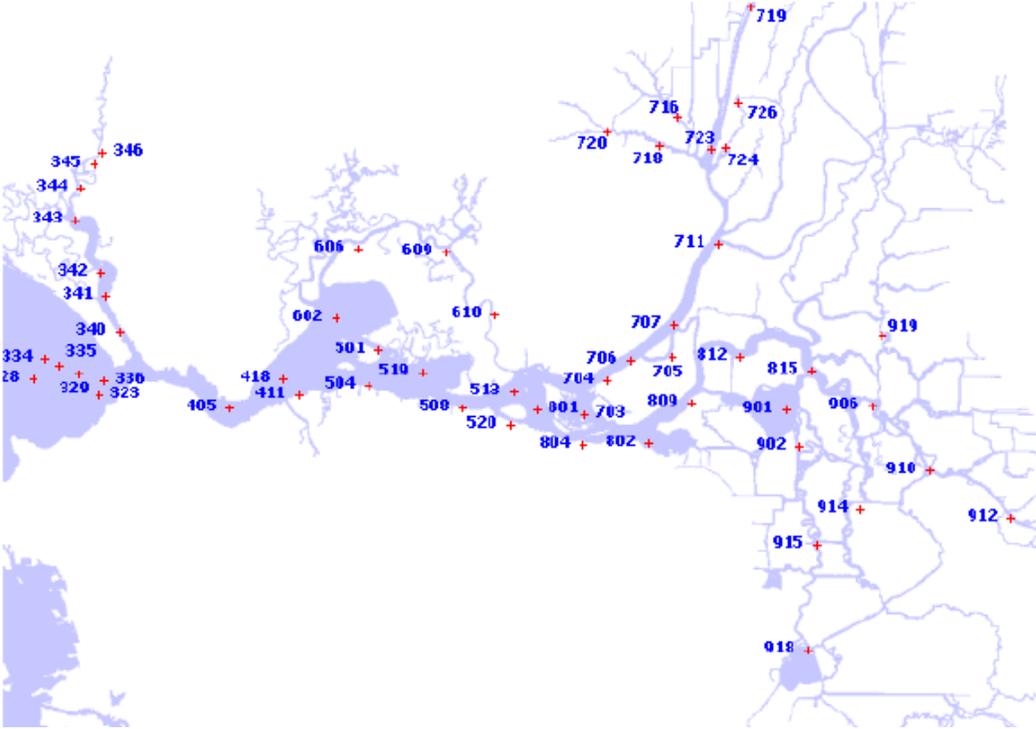
Table 1. Longfin Smelt catch by station in the Smelt Larva Survey 3. Sample processing is incomplete.

Year	Survey #	SLS Station	Sample Status	Species	Smelt Catch
2016	3	340	Not yet processed		
2016	3	342	Not yet processed		
2016	3	343	Not yet processed		
2016	3	344	Not yet processed		
2016	3	345	Not yet processed		
2016	3	346	Not yet processed		
2016	3	347	Not yet processed		
2016	3	348	Not yet processed		
2016	3	349	Not yet processed		
2016	3	405	Not yet processed		
2016	3	411	Not yet processed		
2016	3	418	Not yet processed		
2016	3	501	Not yet processed		
2016	3	504	Not yet processed		
2016	3	508	Not yet processed		
2016	3	513	Not yet processed		
2016	3	519	Not yet processed		
2016	3	520	Processed	Longfin Smelt	1
2016	3	602	Not yet processed		
2016	3	606	Not yet processed		
2016	3	609	Not yet processed		
2016	3	610	Not yet processed		
2016	3	703	Processed		No Smelt Catch
2016	3	704	Processed		No Smelt Catch
2016	3	705	Processed		No Smelt Catch
2016	3	706	Processed	Longfin Smelt	1
2016	3	707	Processed	Longfin Smelt	3
2016	3	711	Processed		No Smelt Catch
2016	3	716	Processed		No Smelt Catch
2016	3	723	Processed		No Smelt Catch
2016	3	801	Processed	Longfin Smelt	3
2016	3	804	Processed	Longfin Smelt	1
2016	3	809	Processed	Longfin Smelt	11
2016	3	812	Processed		No Smelt Catch
2016	3	815	Processed	Longfin Smelt	1
2016	3	901	Processed	Longfin Smelt	2
2016	3	902	Processed		No Smelt Catch
2016	3	906	Processed		No Smelt Catch
2016	3	910	Processed		No Smelt Catch
2016	3	912	Processed		No Smelt Catch
2016	3	914	Processed		No Smelt Catch
2016	3	915	Processed		No Smelt Catch
2016	3	918	Processed		No Smelt Catch
2016	3	919	Processed		No Smelt Catch

SWP ITP Criteria Stations

Processing is complete through 2/4/2016.

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



PRELIMINARY DATA  
SUBJECT TO REVISION WITHOUT NOTICE

EXECUTIVE OPERATIONS SUMMARY ON 2/4/2016

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	=	1,500 cfs
Jones Pumping Plant	=	1,600 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	~	40,313 cfs
Sacramento River	=	37,428 cfs
San Joaquin River	=	1,424 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	~	36,400 cfs
% Inflow Diverted	=	6.7% (14-day avg)
X2 Position	=	62 km
Controlling Factor(s)	=	OMR(-2500)

RESERVOIR STORAGES (AS OF MIDNIGHT)

Shasta Reservoir	=	2,422 TAF
Folsom Reservoir	=	569 TAF
Oroville Reservoir	=	1,595 TAF
San Luis Res. Total	=	710 TAF
SWP Share	=	509 TAF

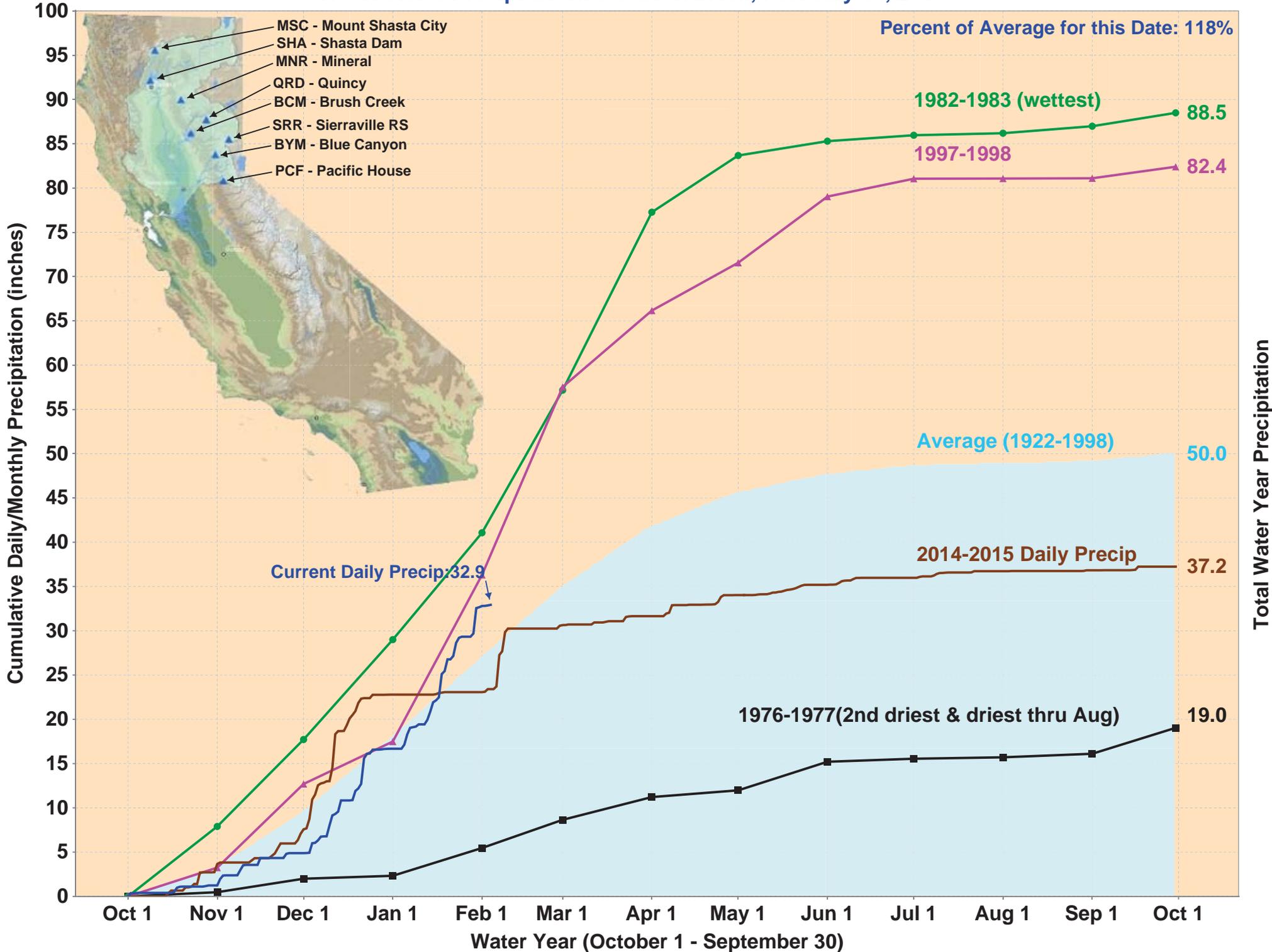
Reservoir data and reports are available at:  
<http://cdec.water.ca.gov/reservoir.html>

Reservoir Releases		
Keswick	=	3,250 cfs
Nimbus	=	800 cfs
Oroville	=	950 cfs

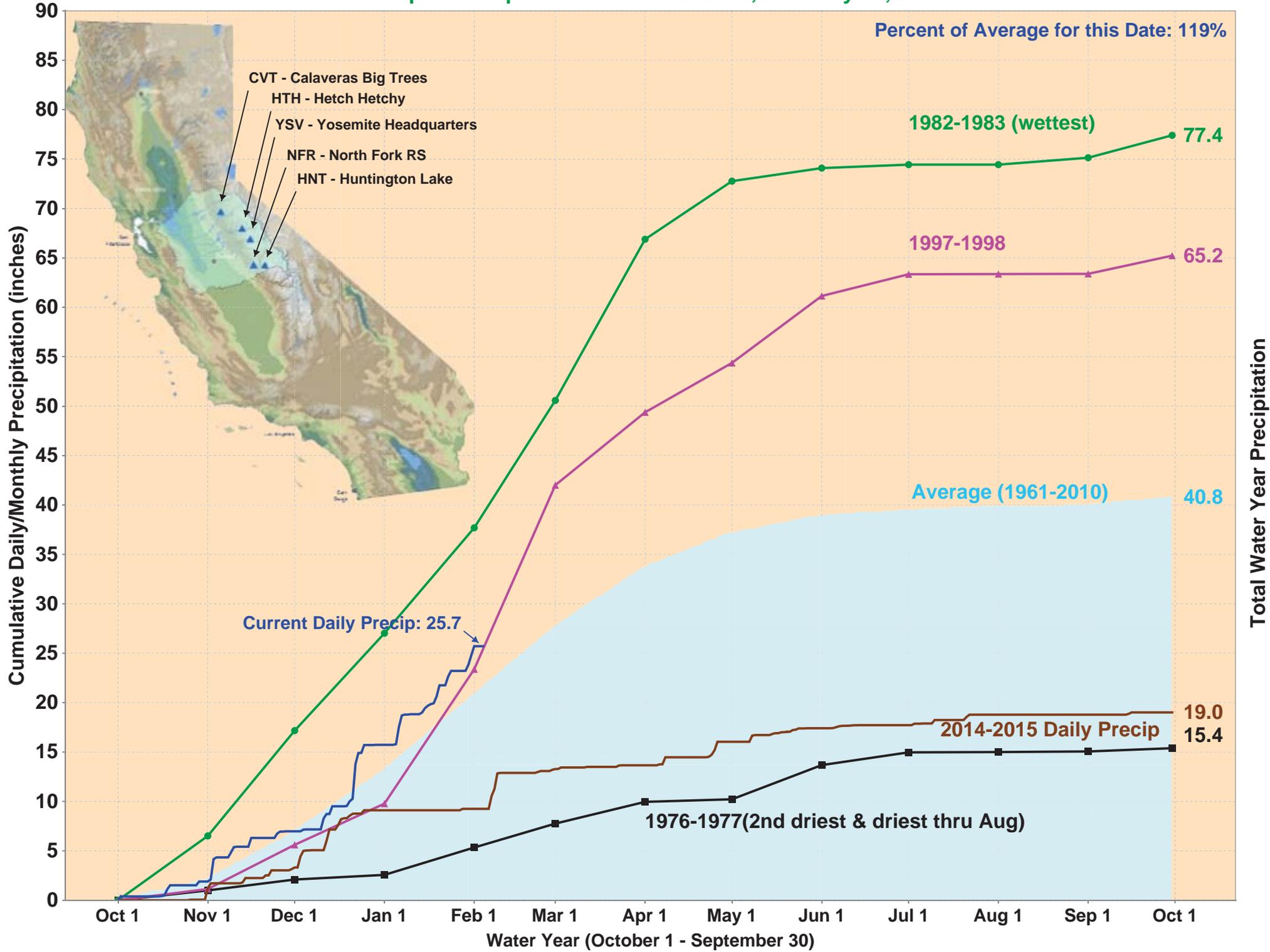
Provisional Old River & Middle River Flows (as of 2/3/2016)  
Based on USGS stations 11312676 & 11313405 via CDEC available at:  
[http://www.usbr.gov/mp/cvo/vungvari/OMR\\_Feb2016.pdf](http://www.usbr.gov/mp/cvo/vungvari/OMR_Feb2016.pdf)

If you have any questions regarding the preliminary data  
in this report, please contact [OCO\\_Export\\_Management@water.ca.gov](mailto:OCO_Export_Management@water.ca.gov)

# North Sierra Precipitation: 8-Station Index, February 04, 2016



# San Joaquin Precipitation: 5-Station Index, February 04, 2016

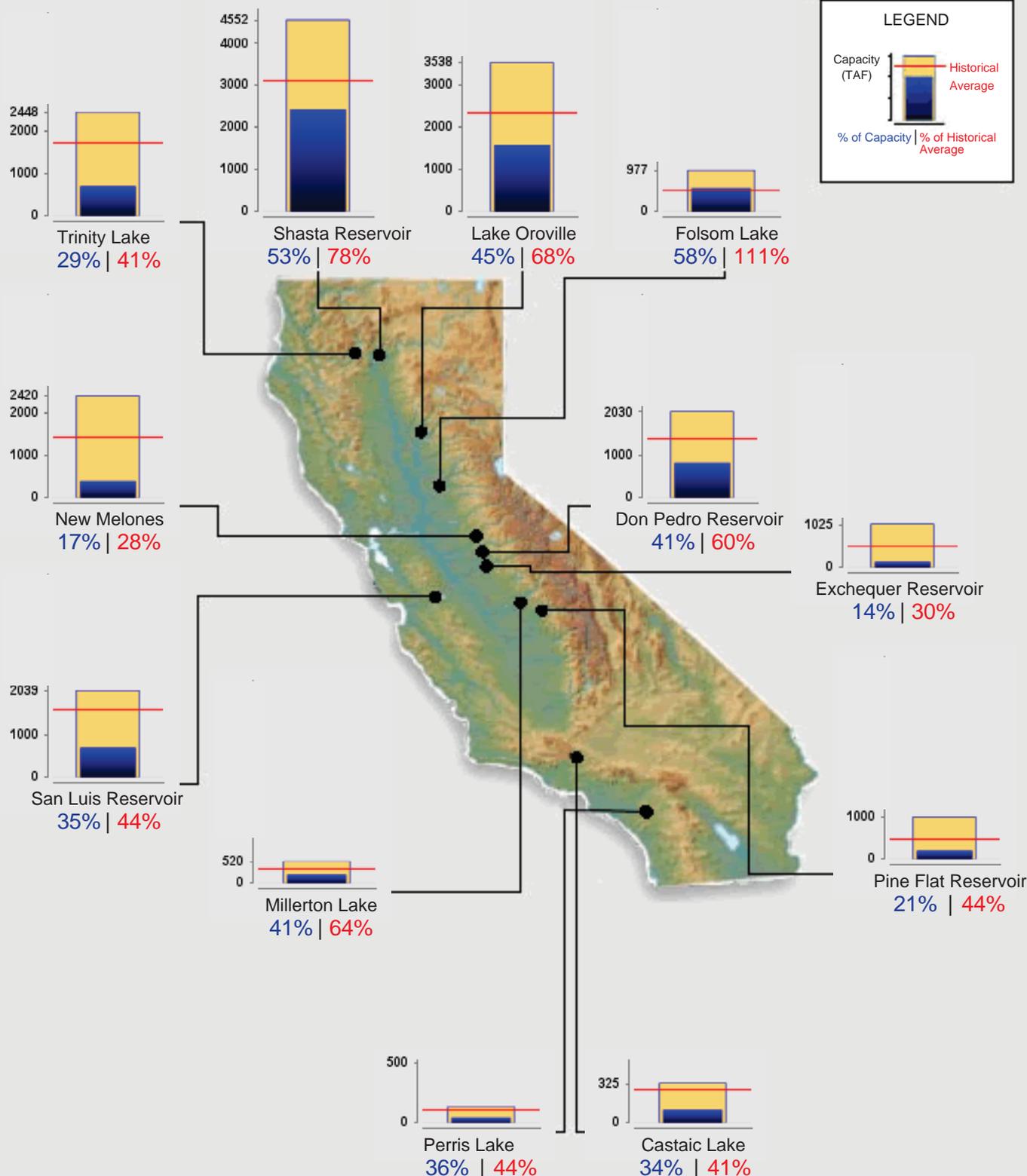




# Reservoir Conditions

Ending At Midnight - February 3, 2016

## CURRENT RESERVOIR CONDITIONS



## **Turbidity Forecast 2/2/2016**

### **General Information**

The attached model run results cover the period of February 2, through February 22, 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 were changed from tidal operation to open position on February 3.

**INPUT FLOW DATA (-2500 cfs OMR)**

Date	Delta Inflows [cfs]								Delta Exports [cfs]	
	Sacram. River	Yolo bypass	Sacto Treat. rel.	DXC Gate ops	San Joaquin River	Cosum River	Mokel. River	Calaver River	Clifton Court intake	Jones pump
	Freeport prev.day FPT	Cache &weirs pr.day	estim. week avg pr.day	% of day open current day	Vernalis prior day VNS	Michigan Bar pr. Day	Wood- bridge pr.day	New Hogan pr.day		
02-Feb-16	42,452	122	190	0	1,483	1,761	136	22	1,499	1,862
03-Feb-16	41,201	111	190	0	1,476	1,273	124	22	1,500	1,600
04-Feb-16	35,996	100	190	0	1,440	1,050	100	20	1,500	1,600
05-Feb-16	30,738	100	190	0	1,410	930	100	20	1,500	1,600
06-Feb-16	28,523	90	190	0	1,390	860	100	20	1,500	1,600
07-Feb-16	26,673	80	190	0	1,350	780	100	20	1,500	1,600
08-Feb-16	23,650	80	190	0	1,280	740	100	20	1,500	1,600
09-Feb-16	20,650	70	190	0	1,100	600	100	20	1,500	1,600
10-Feb-16	20,650	70	190	0	1,000	400	100	20	1,500	1,600
11-Feb-16	20,650	70	190	0	900	300	100	20	1,500	1,600
12-Feb-16	20,650	70	190	0	800	300	100	20	1,500	1,600
13-Feb-16	20,650	70	190	0	800	300	100	20	1,500	1,600
14-Feb-16	20,650	70	190	0	800	300	100	20	1,500	1,600
15-Feb-16	20,650	70	190	0	800	300	100	20	1,500	1,600
16-Feb-16	20,650	70	190	0	800	300	100	20	1,500	1,600
17-Feb-16	20,650	70	190	0	800	300	100	20	1,500	1,600
18-Feb-16	20,650	70	190	0	800	300	100	20	1,500	1,600
19-Feb-16	20,650	70	190	0	800	300	100	20	1,500	1,600
20-Feb-16	20,650	70	190	0	800	300	100	20	1,500	1,600
21-Feb-16	20,650	70	190	0	800	300	100	20	1,500	1,600
22-Feb-16	20,650	70	190	0	800	300	100	20	1,500	1,600

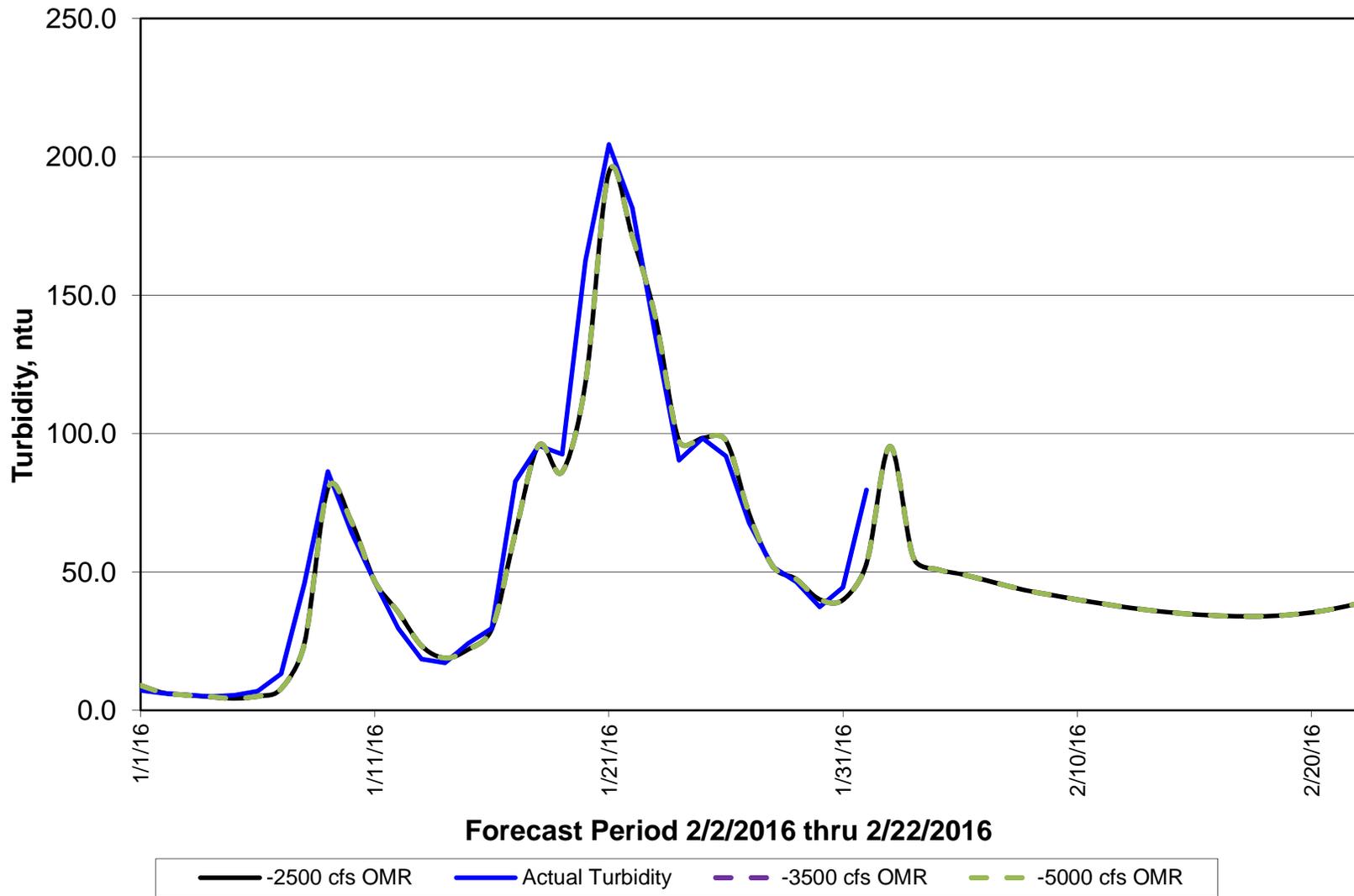
**INPUT FLOW DATA (-3500 cfs OMR)**

Date	Delta Inflows [cfs]								Delta Exports [cfs]	
	Sacram. River	Yolo bypass	Sacto Treat. rel.	DXC Gate ops	San Joaquin River	Cosum River	Mokel. River	Calaver River	Clifton Court intake	Jones pump
	Freeport prev.day FPT	Cache &weirs pr.day	estim. week avg pr.day	% of day open current day	Vernalis prior day VNS	Michigan Bar pr. Day	Wood- bridge pr.day	New Hogan pr.day		
02-Feb-16	42,452	122	190	0	1,483	1,761	136	22	1,499	1,862
03-Feb-16	41,201	111	190	0	1,476	1,273	124	22	1,500	1,600
04-Feb-16	35,996	100	190	0	1,440	1,050	100	20	2,450	2,000
05-Feb-16	30,738	100	190	0	1,410	930	100	20	2,450	2,000
06-Feb-16	28,524	90	190	0	1,390	860	100	20	2,400	2,000
07-Feb-16	26,673	80	190	0	1,350	780	100	20	2,400	2,000
08-Feb-16	23,650	80	190	0	1,280	740	100	20	2,350	2,000
09-Feb-16	20,650	70	190	0	1,100	600	100	20	2,300	2,000
10-Feb-16	20,650	70	190	0	1,000	400	100	20	2,250	2,000
11-Feb-16	20,650	70	190	0	900	300	100	20	2,200	2,000
12-Feb-16	20,650	70	190	0	800	300	100	20	2,150	2,000
13-Feb-16	20,650	70	190	0	800	300	100	20	2,150	2,000
14-Feb-16	20,650	70	190	0	800	300	100	20	2,150	2,000
15-Feb-16	20,650	70	190	0	800	300	100	20	2,150	2,000
16-Feb-16	20,650	70	190	0	800	300	100	20	2,150	2,000
17-Feb-16	20,650	70	190	0	800	300	100	20	2,150	2,000
18-Feb-16	20,650	70	190	0	800	300	100	20	2,150	2,000
19-Feb-16	20,650	70	190	0	800	300	100	20	2,150	2,000
20-Feb-16	20,650	70	190	0	800	300	100	20	2,150	2,000
21-Feb-16	20,650	70	190	0	800	300	100	20	2,100	2,000
22-Feb-16	20,650	70	190	0	800	300	100	20	2,100	2,000

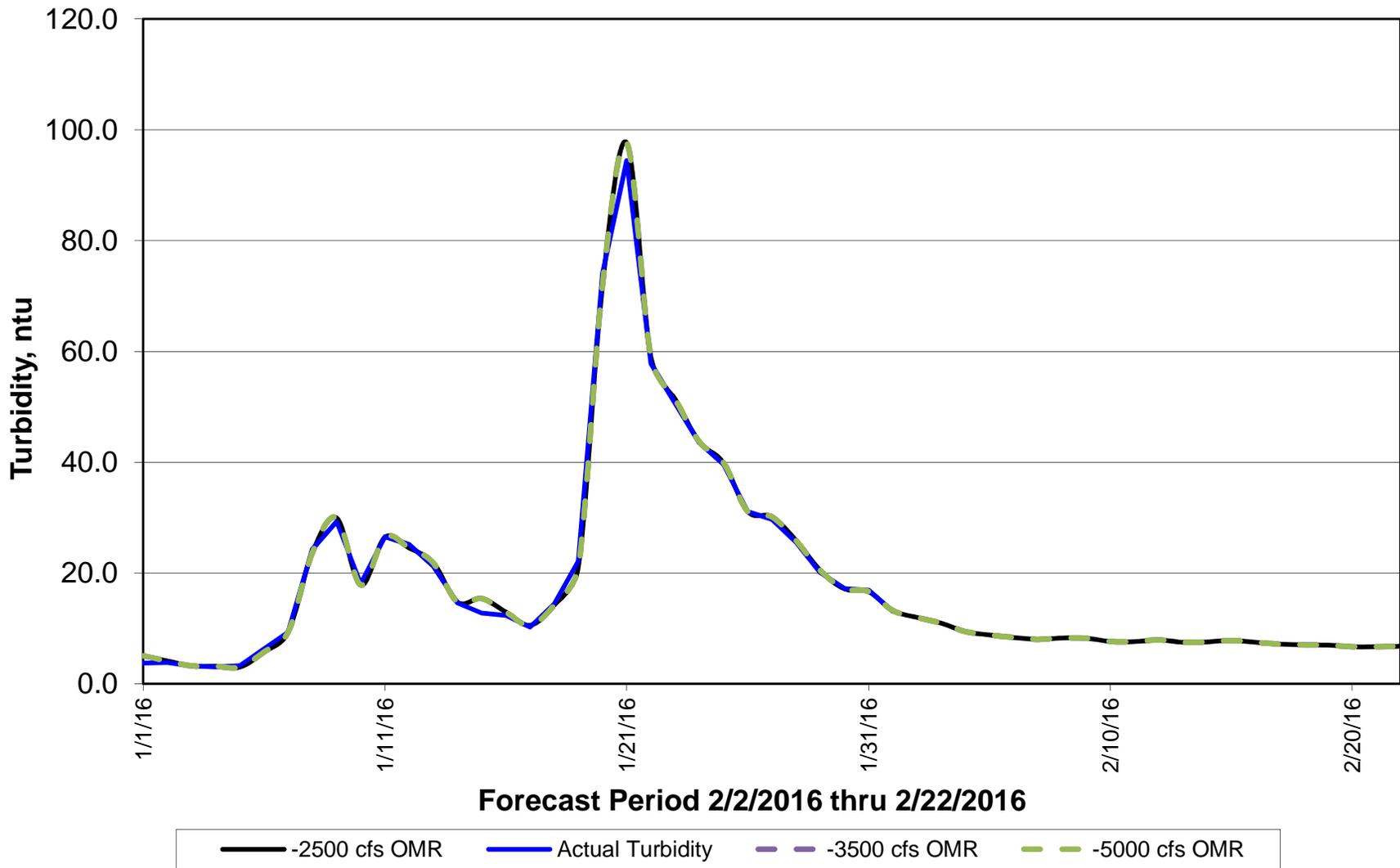
**INPUT FLOW DATA (-5000 cfs OMR)**

Date	Delta Inflows [cfs]								Delta Exports [cfs]	
	Sacram. River	Yolo bypass	Sacto Treat. rel.	DXC Gate ops	San Joaquin River	Cosum River	Mokel. River	Calaver River	Clifton Court intake	Jones pump
	Freeport prev.day FPT	Cache &weirs pr.day	estim. week avg pr.day	% of day open current day	Vernalis prior day VNS	Michigan Bar pr. Day	Wood- bridge pr.day	New Hogan pr.day		
02-Feb-16	42,452	122	190	0	1,483	1,761	136	22	1,499	1,862
03-Feb-16	41,201	111	190	0	1,476	1,273	124	22	1,500	1,600
04-Feb-16	35,996	100	190	0	1,440	1,050	100	20	4,100	2,000
05-Feb-16	30,738	100	190	0	1,410	930	100	20	4,100	2,000
06-Feb-16	28,524	90	190	0	1,390	860	100	20	4,100	2,000
07-Feb-16	26,673	80	190	0	1,350	780	100	20	4,050	2,000
08-Feb-16	23,650	80	190	0	1,280	740	100	20	4,000	2,000
09-Feb-16	20,650	70	190	0	1,100	600	100	20	3,950	2,000
10-Feb-16	20,650	70	190	0	1,000	400	100	20	3,900	2,000
11-Feb-16	20,650	70	190	0	900	300	100	20	3,850	2,000
12-Feb-16	20,650	70	190	0	800	300	100	20	3,800	2,000
13-Feb-16	20,650	70	190	0	800	300	100	20	3,800	2,000
14-Feb-16	20,650	70	190	0	800	300	100	20	3,750	2,000
15-Feb-16	20,650	70	190	0	800	300	100	20	3,750	2,000
16-Feb-16	20,650	70	190	0	800	300	100	20	3,750	2,000
17-Feb-16	20,650	70	190	0	800	300	100	20	3,750	2,000
18-Feb-16	20,650	70	190	0	800	300	100	20	3,750	2,000
19-Feb-16	20,650	70	190	0	800	300	100	20	3,750	2,000
20-Feb-16	20,650	70	190	0	800	300	100	20	3,750	2,000
21-Feb-16	20,650	70	190	0	800	300	100	20	3,750	2,000
22-Feb-16	20,650	70	190	0	800	300	100	20	3,750	2,000

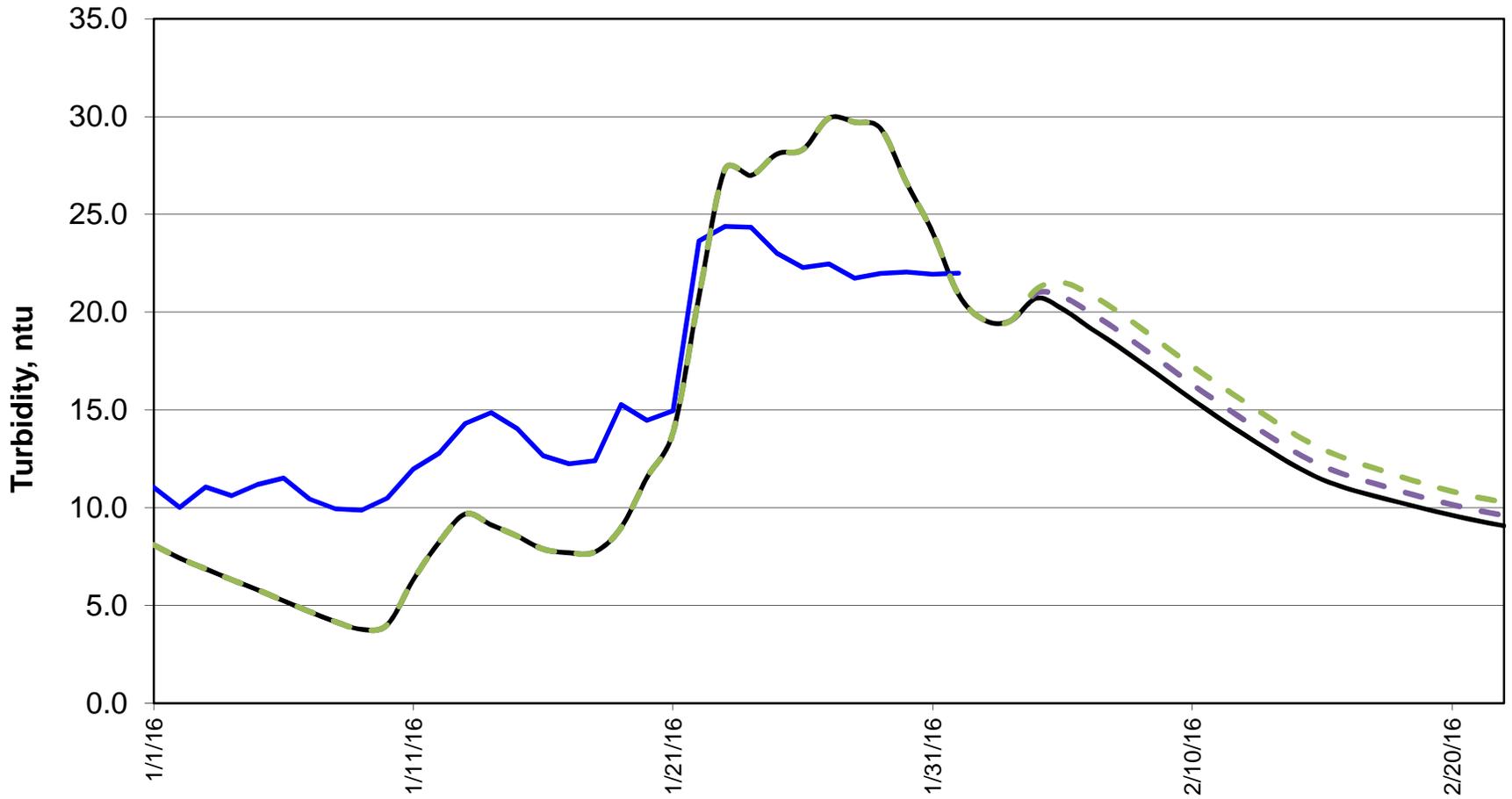
### Forecasted Turbidity @ Sacramento River @ Hood



### Forecasted Turbidity @ San Joaquin River @ Vernalis



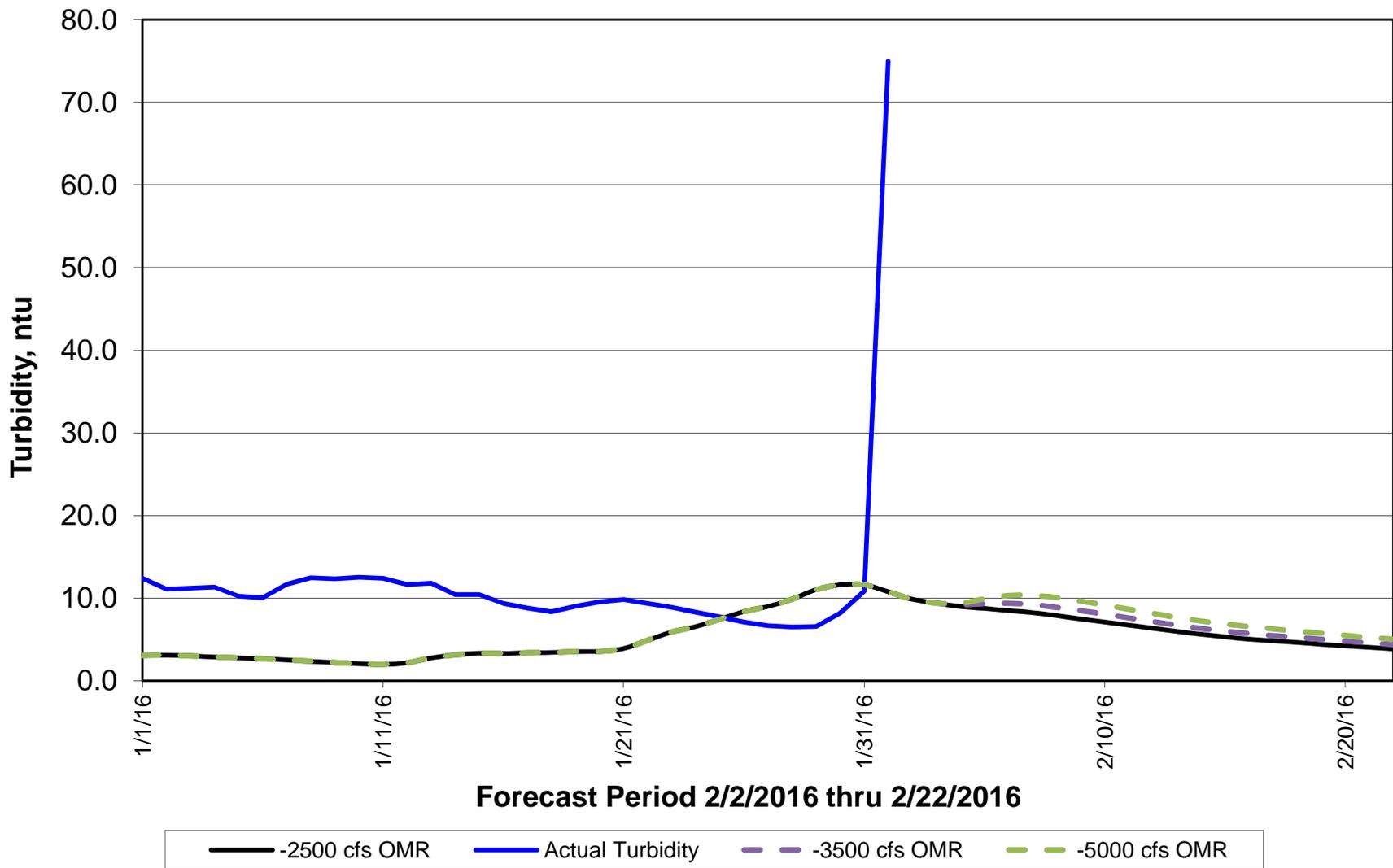
### Forecasted Turbidity @ Prisoners Point



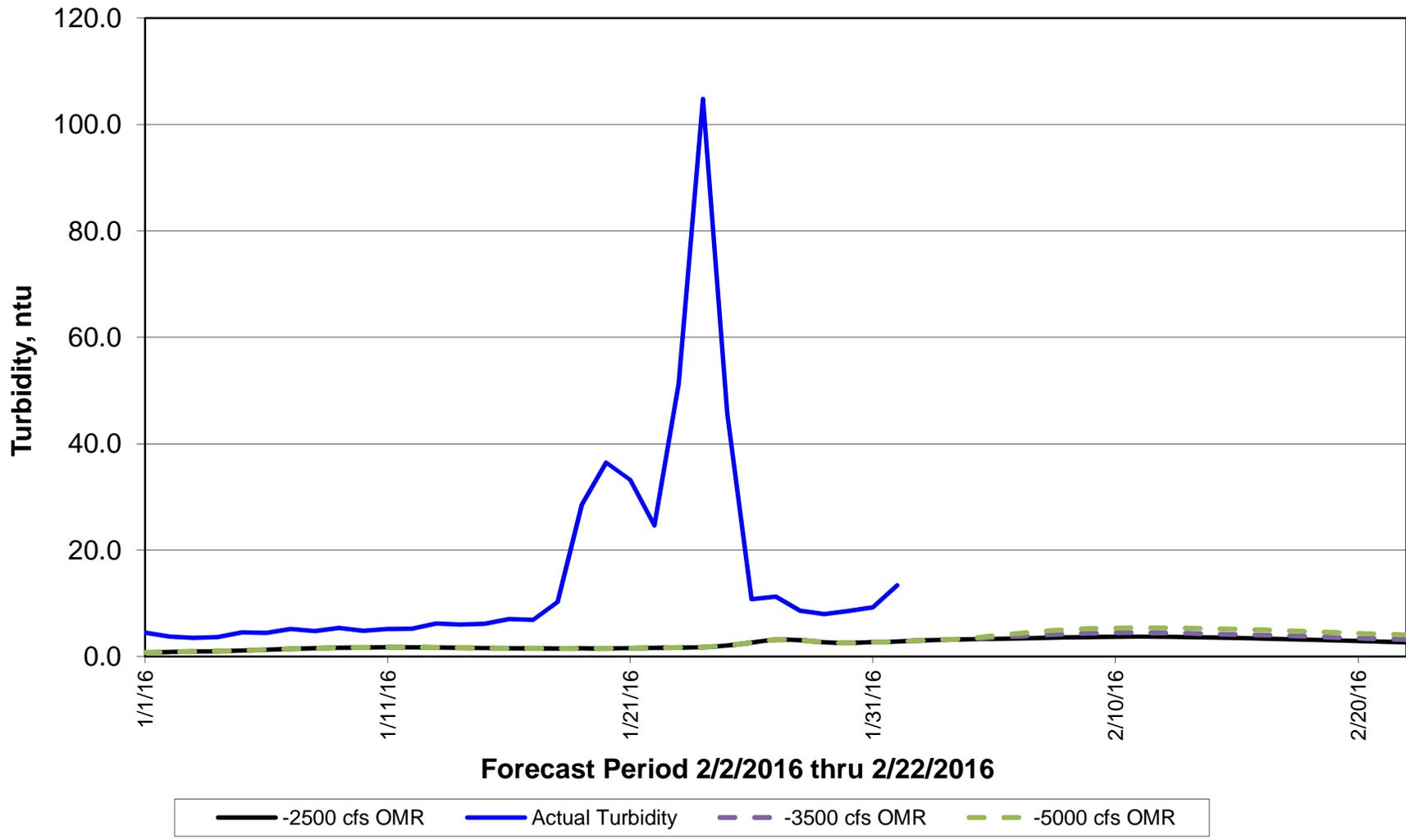
Forecast Period 2/2/2016 thru 2/22/2016



### Forecasted Turbidity @ Holland

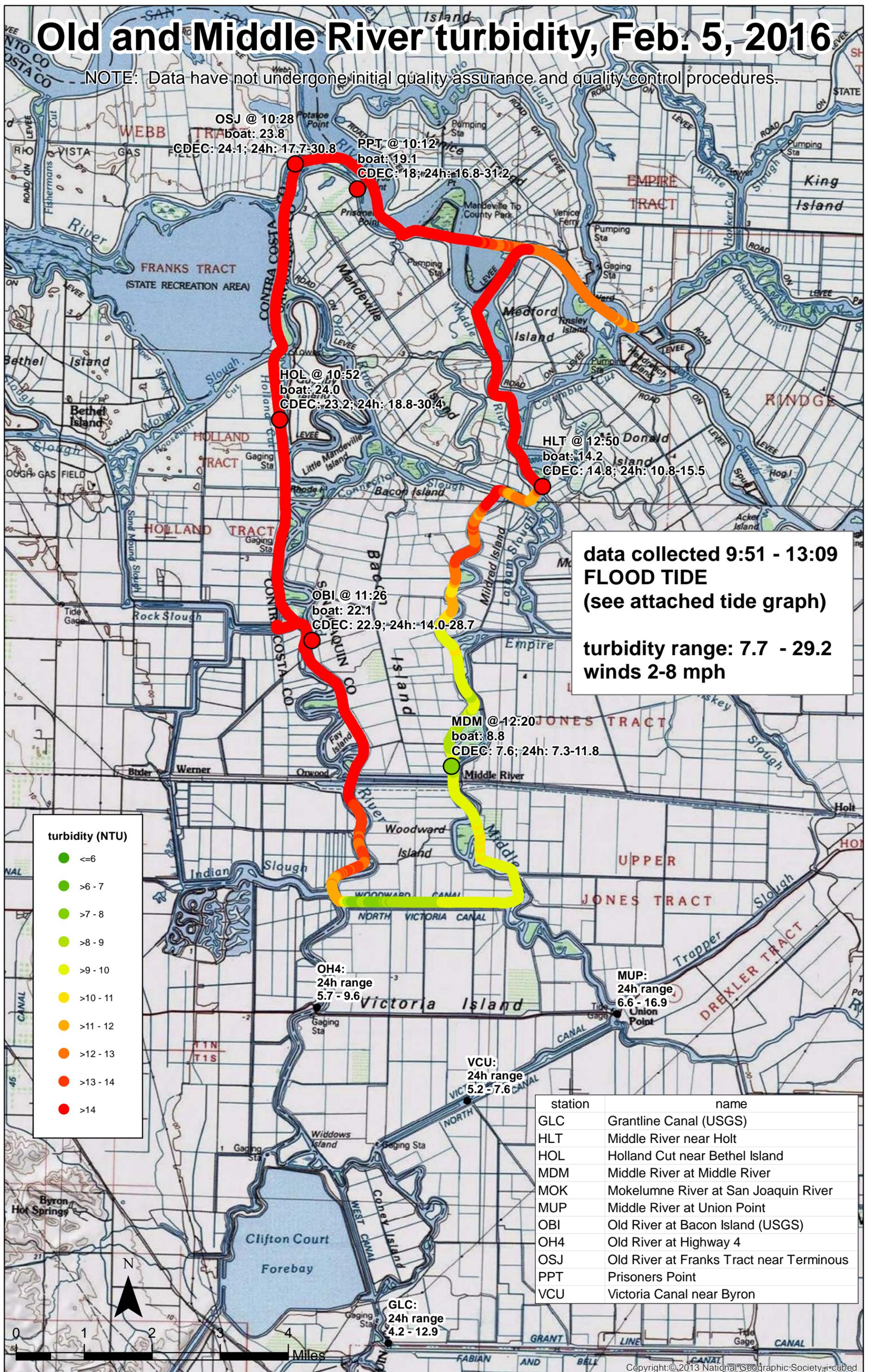


### Forecasted Turbidity @ Victoria Canal



# Old and Middle River turbidity, Feb. 5, 2016

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



OSJ @ 10:28  
boat: 23.8  
CDEC: 24.1; 24h: 17.7-30.8

PPT @ 10:12  
boat: 19.1  
CDEC: 18; 24h: 16.8-31.2

HOL @ 10:52  
boat: 24.0  
CDEC: 23.2; 24h: 18.8-30.4

HLT @ 12:50  
boat: 14.2  
CDEC: 14.8; 24h: 10.8-15.5

OBI @ 11:26  
boat: 22.1  
CDEC: 22.9; 24h: 14.0-28.7

MDM @ 12:20  
boat: 8.8  
CDEC: 7.6; 24h: 7.3-11.8

OH4:  
24h range  
5.7 - 9.6

MUP:  
24h range  
6.6 - 16.9

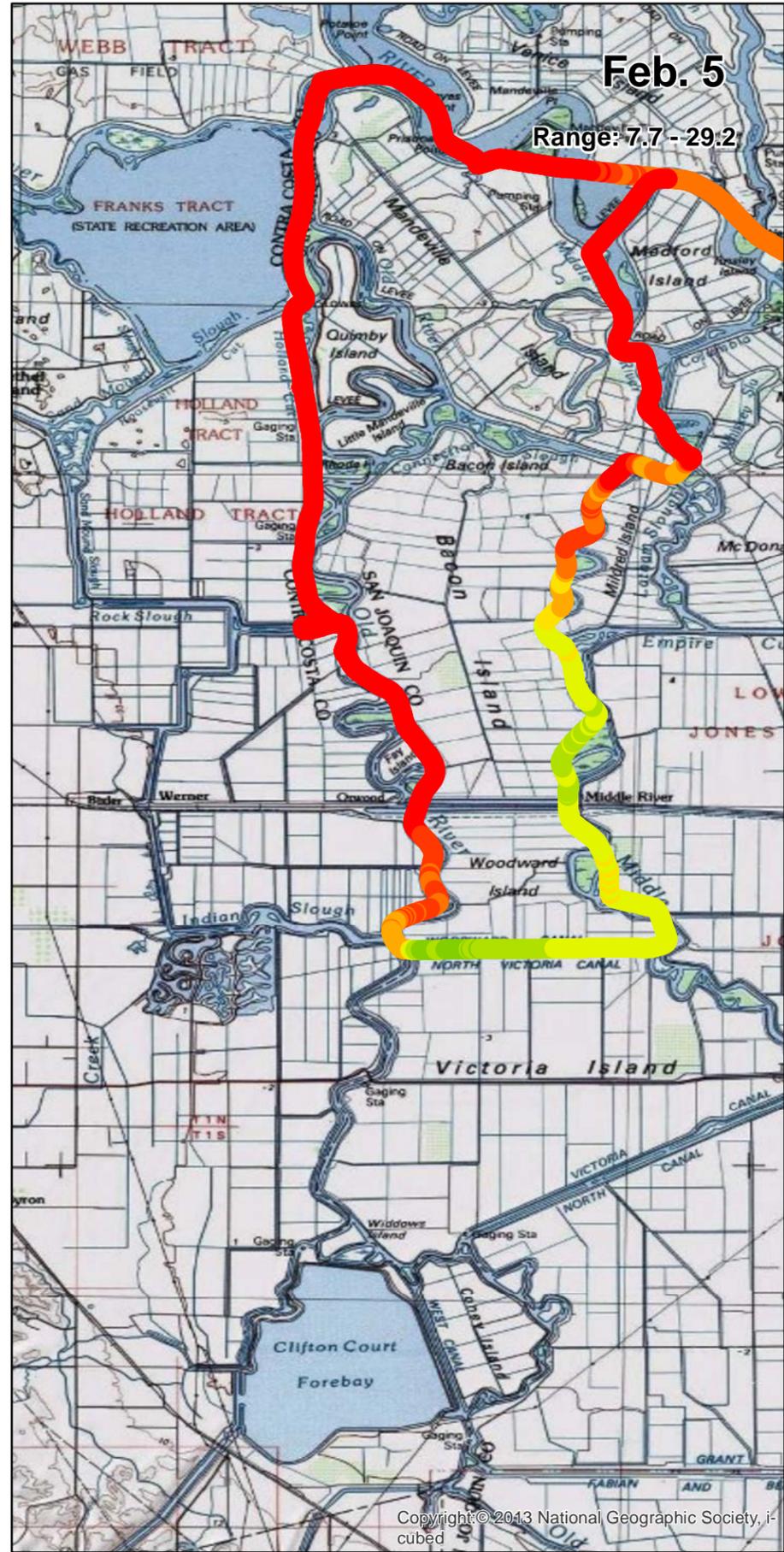
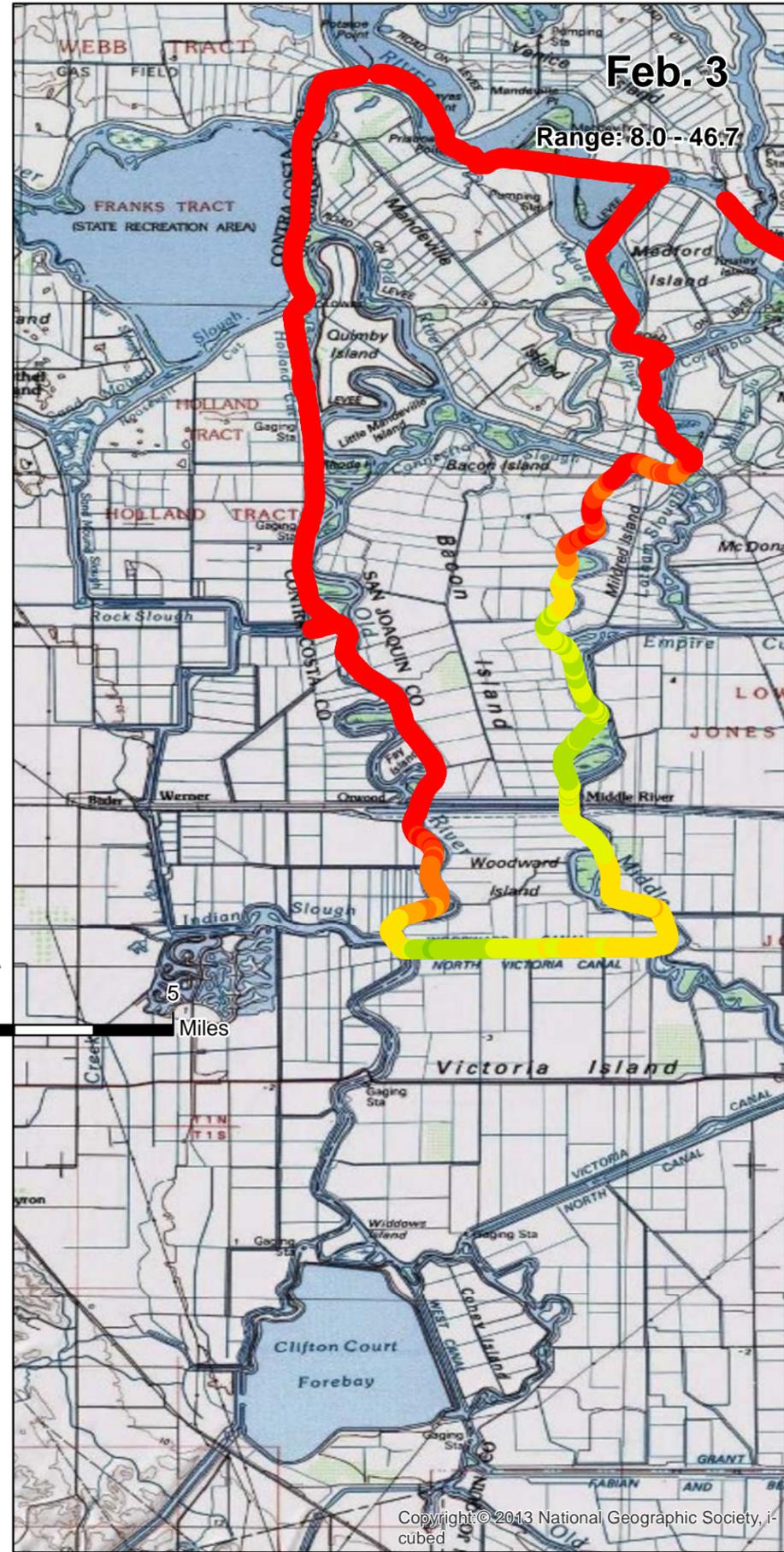
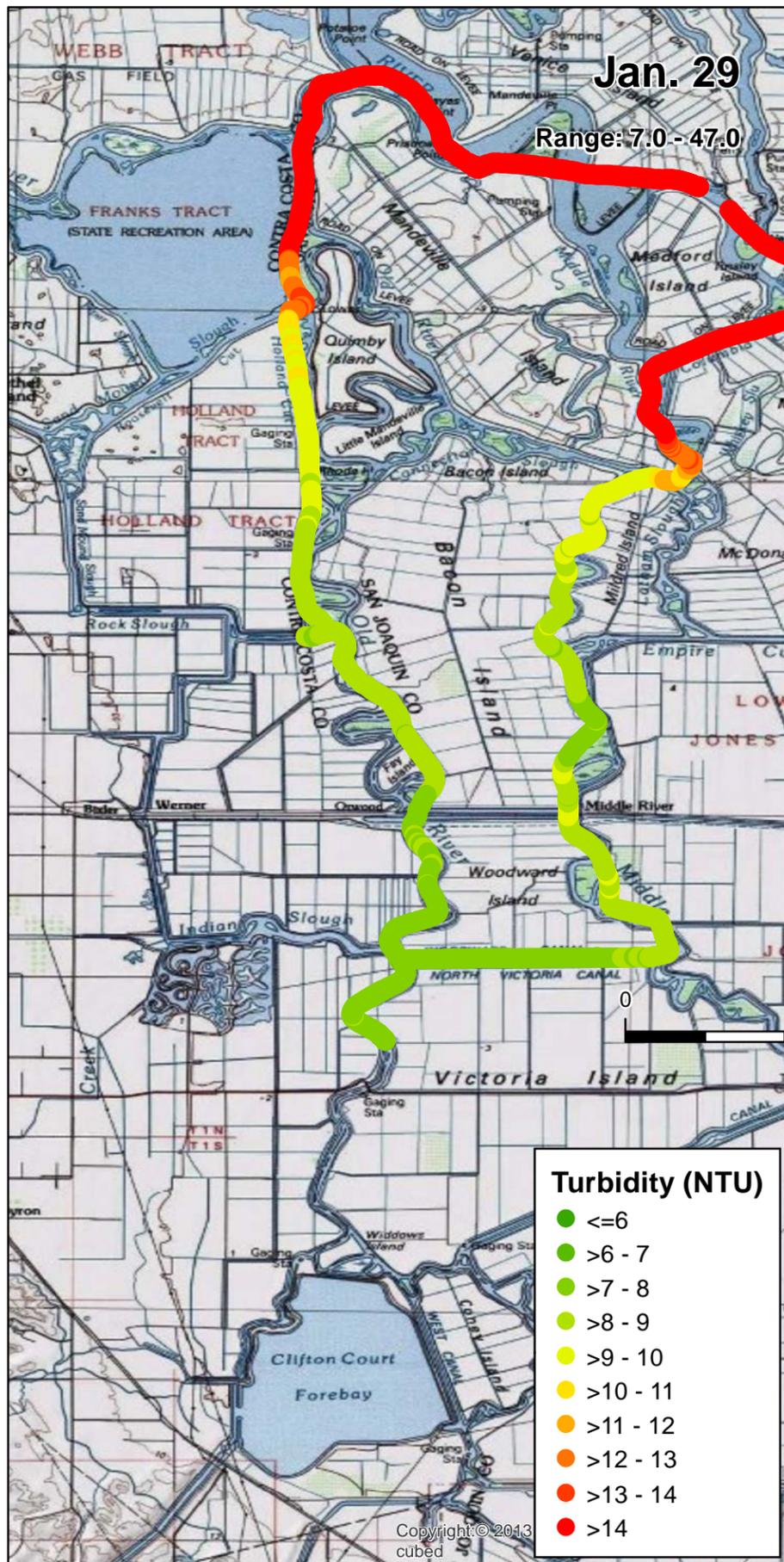
VCU:  
24h range  
5.2 - 7.6

GLC:  
24h range  
4.2 - 12.9

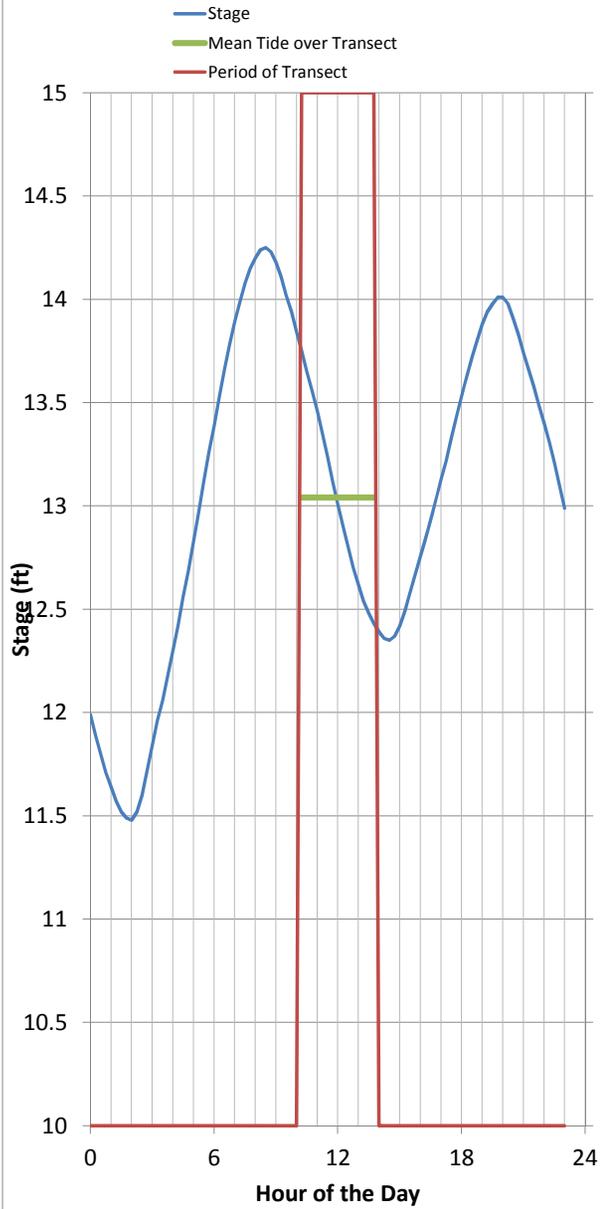
data collected 9:51 - 13:09  
**FLOOD TIDE**  
(see attached tide graph)  
  
turbidity range: 7.7 - 29.2  
winds 2-8 mph

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

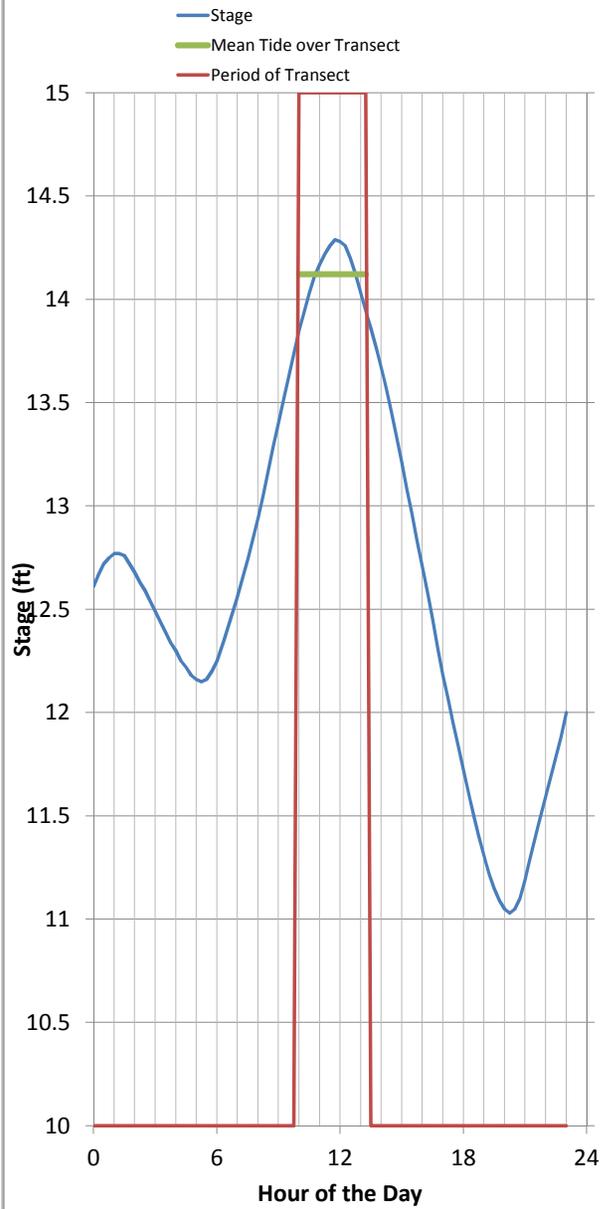
- turbidity (NTU)
- <=6
  - >6 - 7
  - >7 - 8
  - >8 - 9
  - >9 - 10
  - >10 - 11
  - >11 - 12
  - >12 - 13
  - >13 - 14
  - >14



**Turbidity Transect on 1/29/2016**



**Turbidity Transect on 2/3/2016**



**Turbidity Transect on 2/5/2016**

