

Smelt Working Group  
February 16, 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.

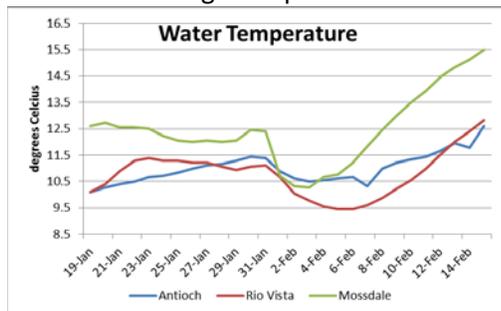
The Working Group is following guidance for entrainment protections from both Action 2 (adult Delta Smelt) and Action 3 (juvenile Delta Smelt). The risk values provided for this week refer only to adult fish as there currently is no evidence of hatching. The Working Group will continue to monitor Delta Smelt survey and salvage data and Delta conditions, and will meet again on Monday, February 22, 2016 at 10 am.

**Reported Data**

1. Current environmental data

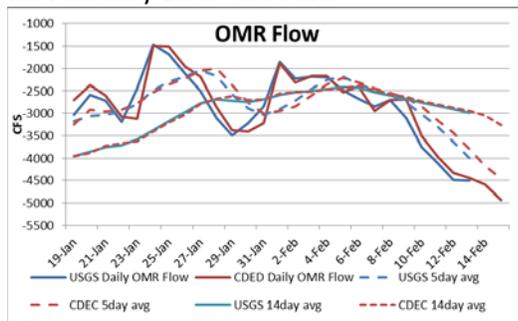
a. Temperature

Combined average temperature for February 15 is 13.6°C



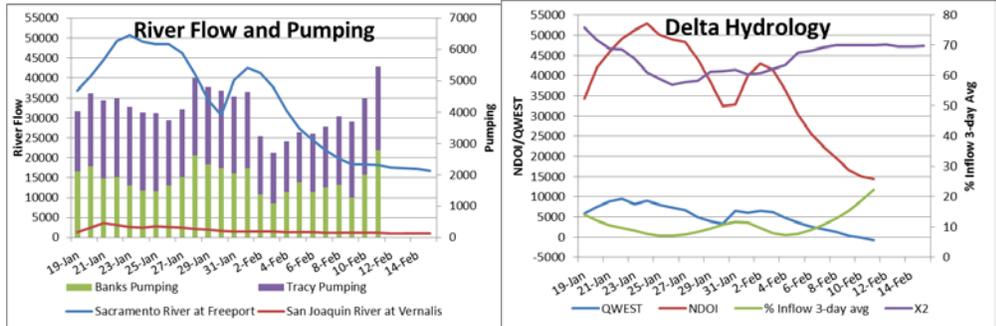
b. OMR flow

USGS OMR daily average flow on February 13 is -4500 cfs. CDEC OMR daily average flow for February 15 is -4934 cfs.

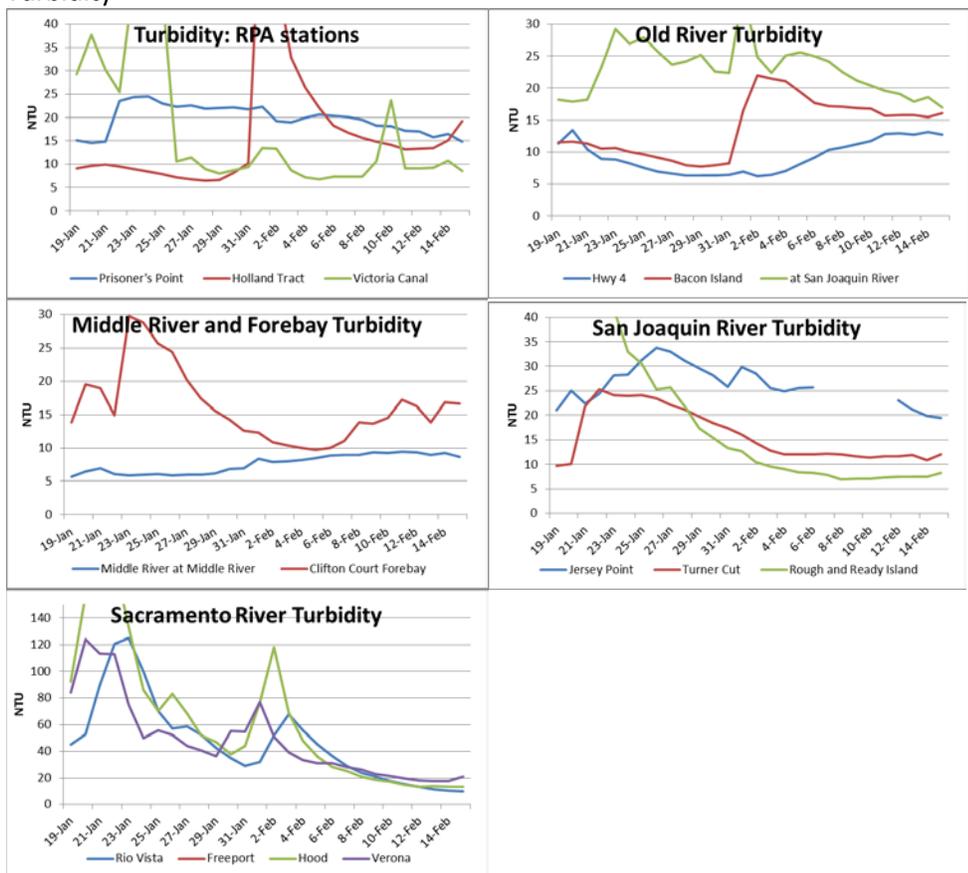


c. River Flows and pumping

Sacramento River at Freeport flow for February 15 was 16,819 cfs. San Joaquin River at Vernalis river flow for February 15 was 932 cfs. Combined exports are 5850 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 last week. 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 is in the field this week. SLS #3 was in the field the week of February 1. Processing is 75% 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 1 through 7

Date	Location	Delta Smelt Catch
2/8	Prisoners Point	1
2/9	Jersey Point	2
2/10	Prisoners Point	1
2/11	Jersey Point	0
2/12	Station 902	0

**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 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 2450 cfs. Combined pumping is 5850 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 02/12; the February 12 DWR turbidity transect data (see attached) 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.

**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...”

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).

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 -5000 cfs). Sporadic low catches of Delta Smelt at Prisoners Point and Jersey Point indicate fish are present in the lower San Joaquin and suggest the likelihood that the species is also in the Old River corridor. 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 12 verified high turbidity in Old River and the south Delta. The DWR boat transect is in the field Wednesday and Friday of this week.

The Working Group expects that entrainment may occur; 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 have begun or will soon begin spawning based on water temperature and the presence of ripe females in the SKT. 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.

Members indicated the possibility that another larger movement of adults may be happening or will happen soon. This is supported by historical records which indicate that once the Delta has surpassed 12°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 have been collected at Prisoners Point in the past week with one individual collected on both February 8 and 10. 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 last week at Jersey Point during the SKT survey and the increase in water temperatures greater than 12°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 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. Given the strong decline in catch densities from Jersey Point to Prisoners Point and the consistent absence of catch at station 902, 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 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 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.

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.

Members indicated the recent sporadic low catch at Jersey and Prisoners Point. The Working Group suspects these results may have significantly contributed to the Service's February 12 Determination, which indicated that the Projects should limit their pumping to match an OMR flow of -5000 cfs. 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 these stations should not be misinterpreted as a decrease in the proportional risk of entrainment in the lower San Joaquin River. Members indicated their expectation that sporadic low catch will continue at these stations 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 it 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, 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, 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 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 into the South Delta increasingly difficult. 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.

Although members indicated their desire that turbidity levels in the Old River corridor and the south Delta should drop significantly, it was noted that the widespread high turbidity levels are not expected to clear up soon. Operators indicated their expectation that operating at high or low export levels will not significantly change turbidity patterns. 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 may still be migrating and therefore, more susceptible to 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 central Delta based upon Jersey Point, Prisoners Point, and SKT catch, in addition to current elevated turbidity in the south Delta.
  - Salvage: None since 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 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. A minority indicated risk was “medium to high” for this flow range.
  - Salvage: None since January 21, influence of pump 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 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, current elevated turbidity bridge.
  - Risk factors: lowest annual index on record, confirmed Delta Smelt presence in central Delta based upon Jersey Point, Prisoner’s Point catch and SKT catch, in addition to current elevated turbidity.
  - Salvage: None since January 21, 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.
  - 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 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 22, 2016.

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

### **Advice for week of February 16, 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 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 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 was 16,897 on February 15. It 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 River at Vernalis was 930 on February 15. It 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 negative on February 10 and was -1,809 on February 15. Through early February Qwest 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 15, combined State and federal exports reached about 5,800 cfs targeting an OMR of -5,000 cfs. 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: eight Longfin Smelt were collected January 13<sup>th</sup>; 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 moderate due to a negative Qwest and the likelihood of additional larvae hatching in the lower San Joaquin River; however, 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.

Current Qwest flows remain negative and likely result in modest transport of water from the lower San Joaquin River toward the export pumps. Combined State and federal exports will target -5,000 cfs OMR in the coming week.

The Barker Slough distribution trigger, that is larvae present at Smelt Larva Survey station 716, was not achieved (see 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.

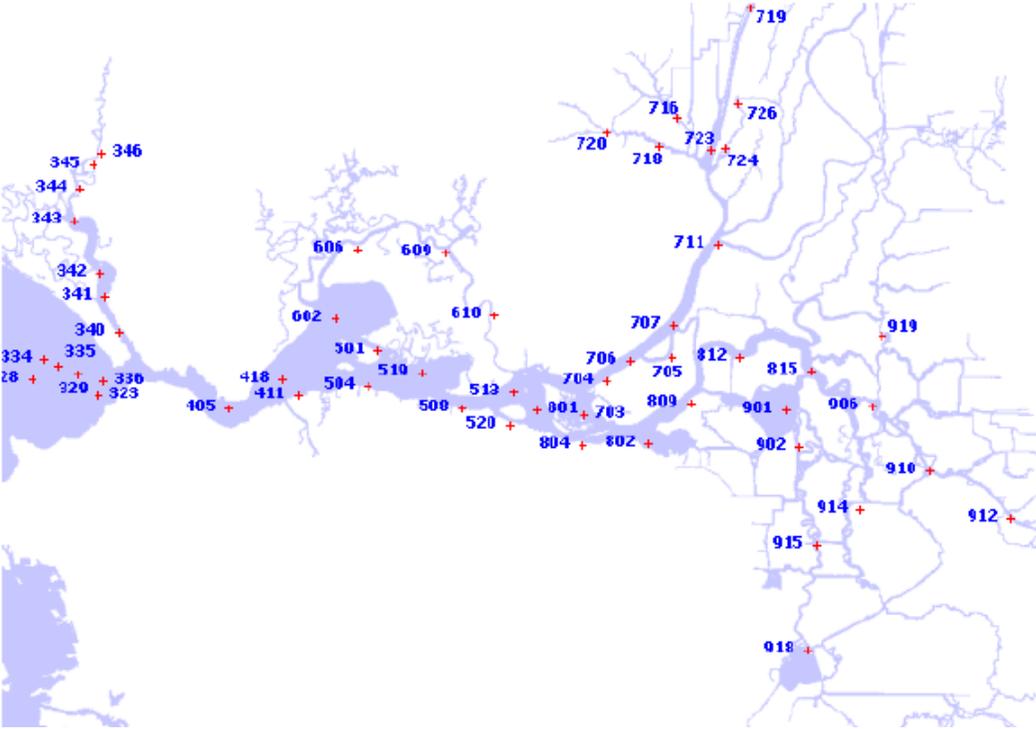
Table 1. Longfin Smelt catch by station in the Smelt Larva Survey 3. Sample processing is incomplete.

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	Processed	Longfin Smelt	2
2016	3	411	Not yet processed		
2016	3	418	Processed	Longfin Smelt	2
2016	3	501	Processed	Longfin Smelt	21
2016	3	504	Not yet processed		
2016	3	508	Processed	Longfin Smelt	4
2016	3	513	Processed	Longfin Smelt	1
2016	3	519	Processed	Longfin Smelt	3
2016	3	520	Processed	Longfin Smelt	1
2016	3	602	Processed	Longfin Smelt	74
2016	3	606	Processed	Longfin Smelt	6
2016	3	609	Processed	Longfin Smelt	7
2016	3	610	Processed	Longfin Smelt	1
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

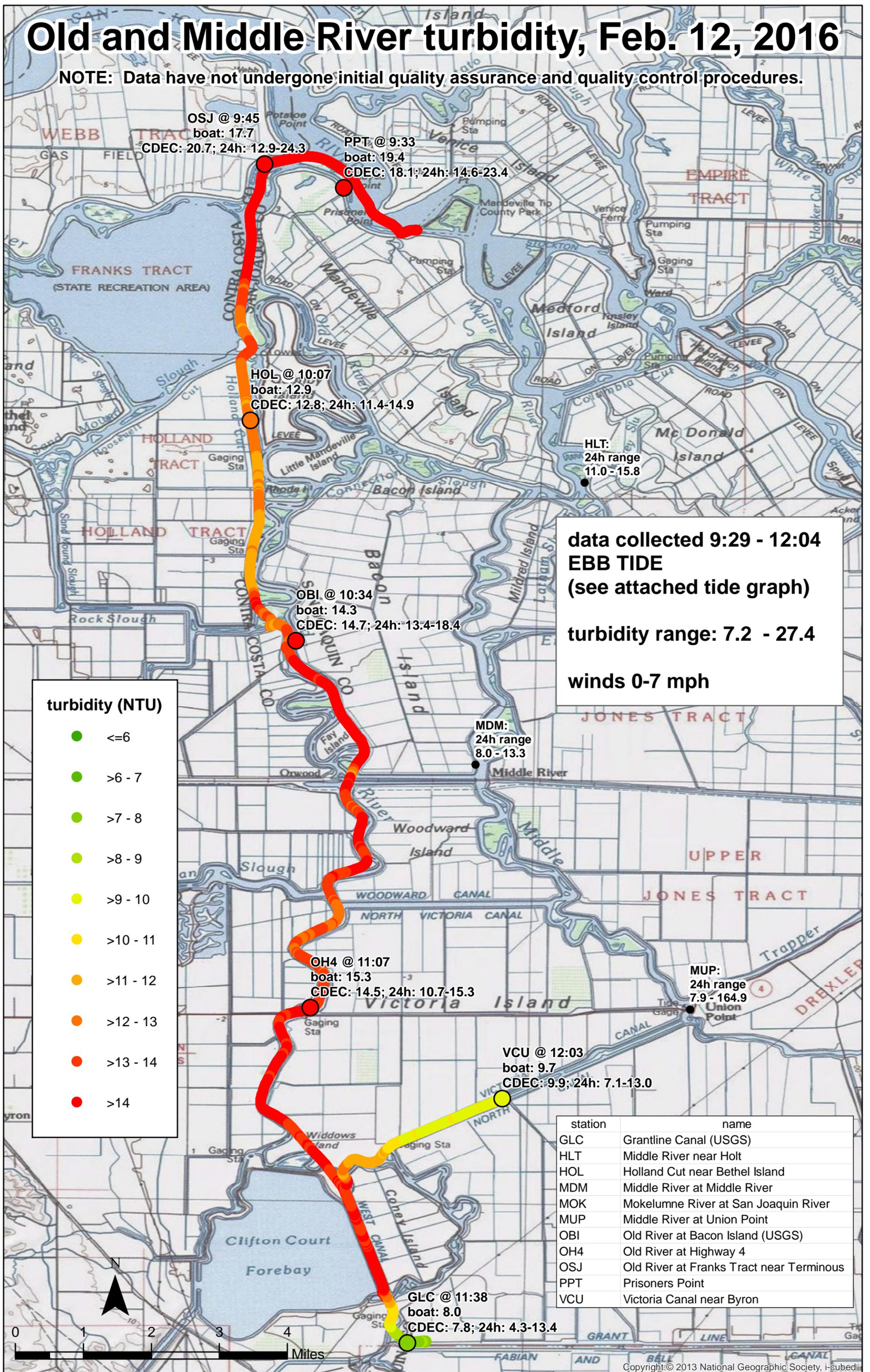
Processing is complete through 2/12/2018.

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



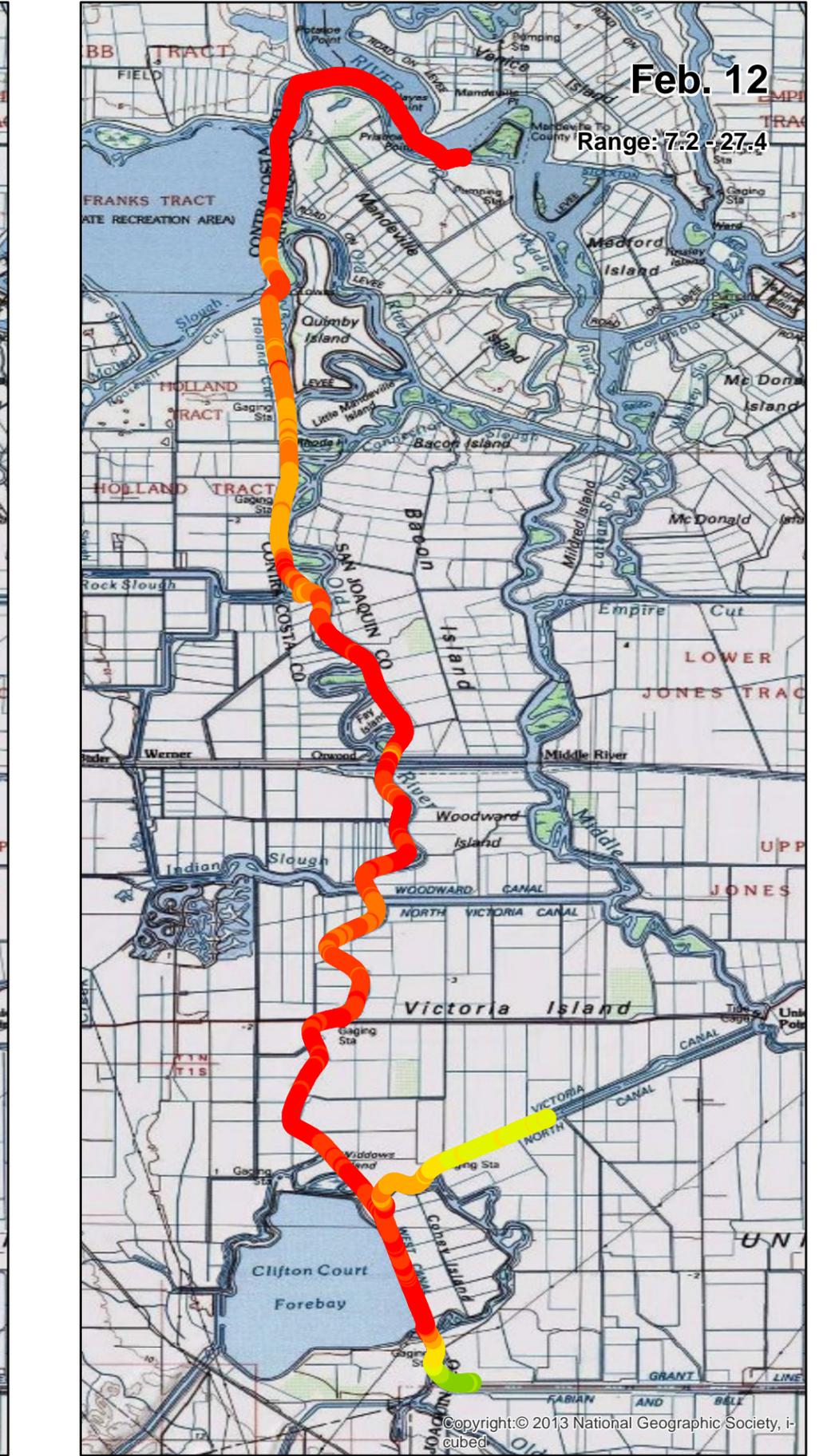
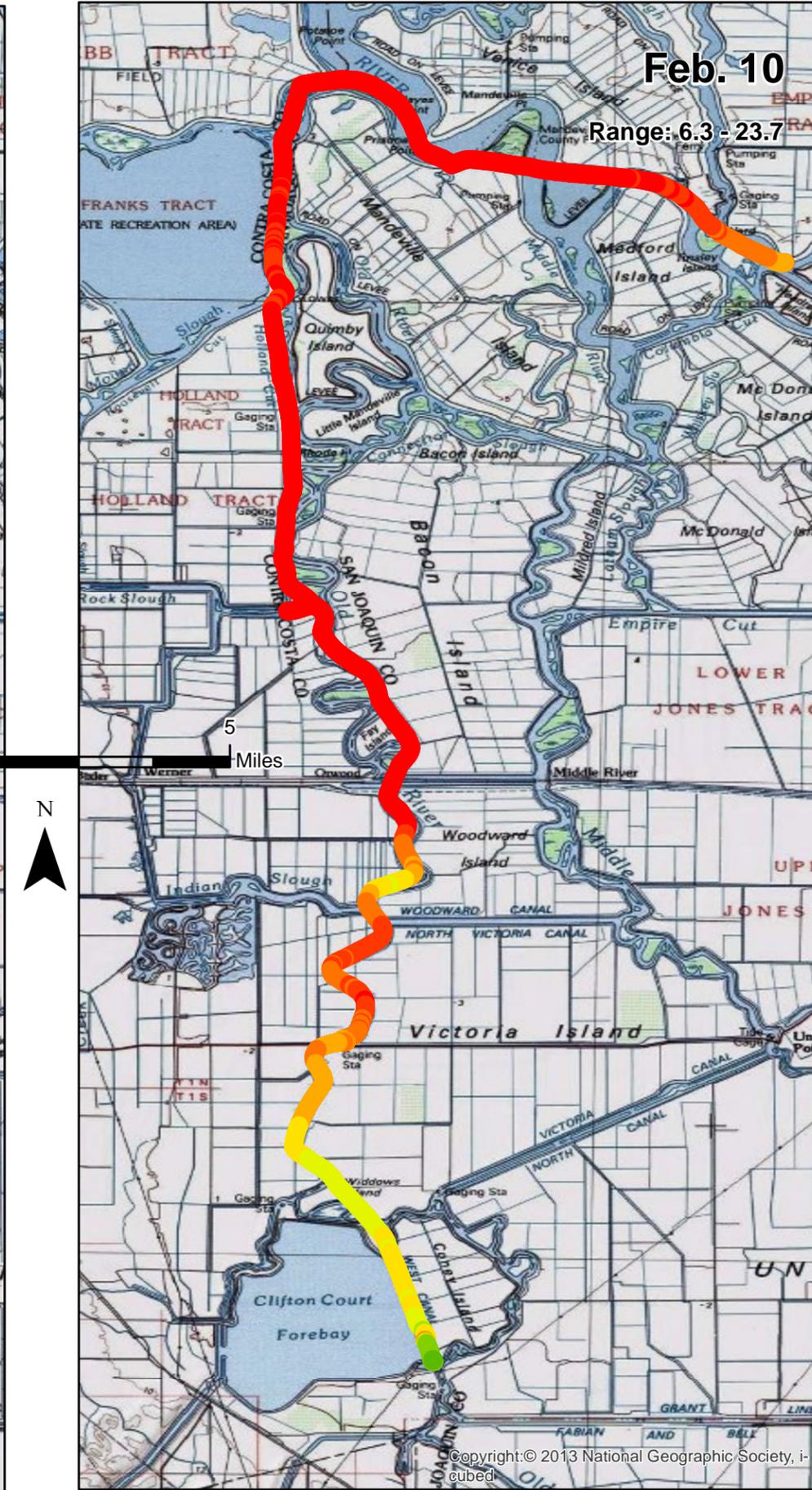
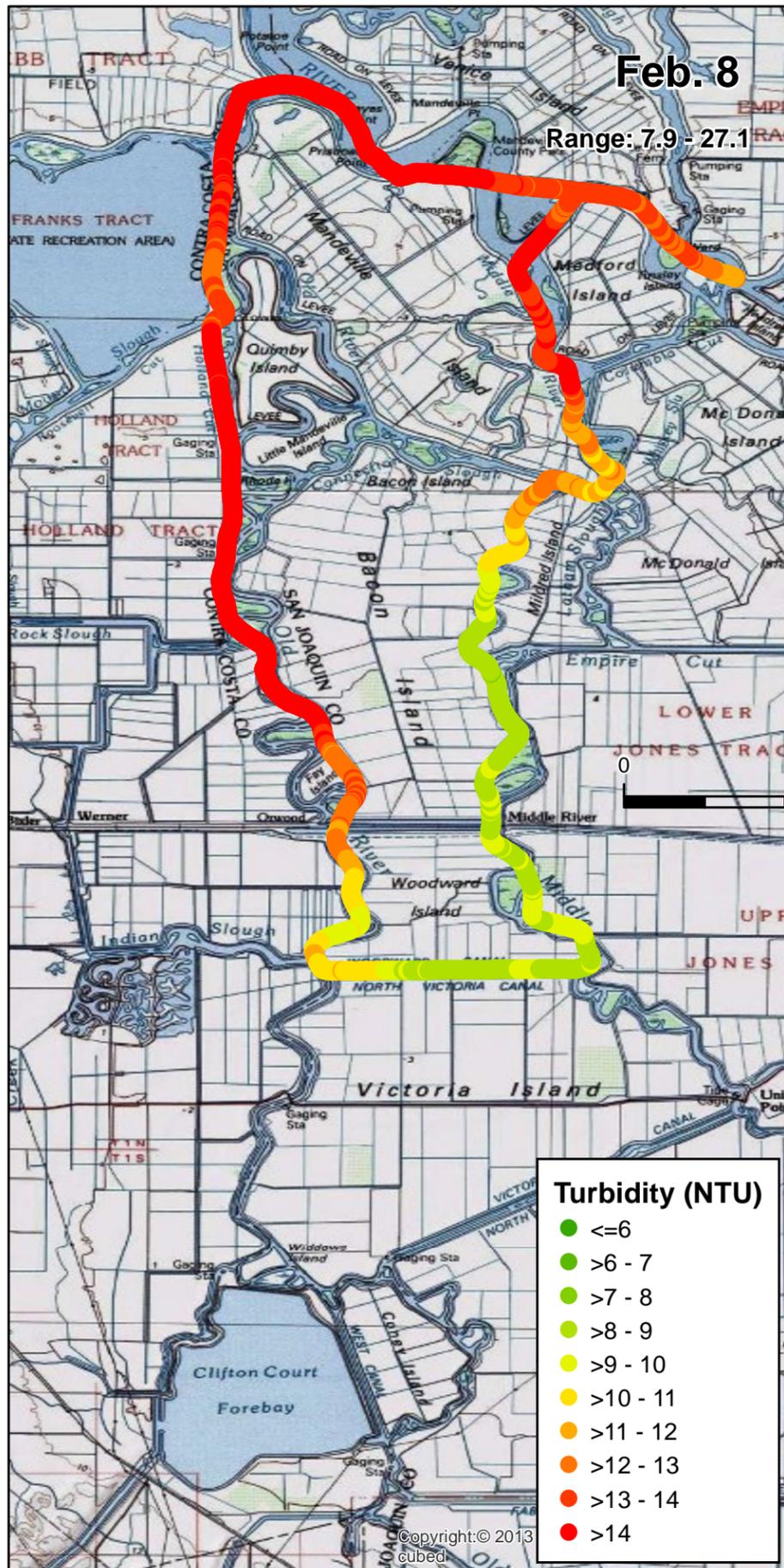
# Old and Middle River turbidity, Feb. 12, 2016

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

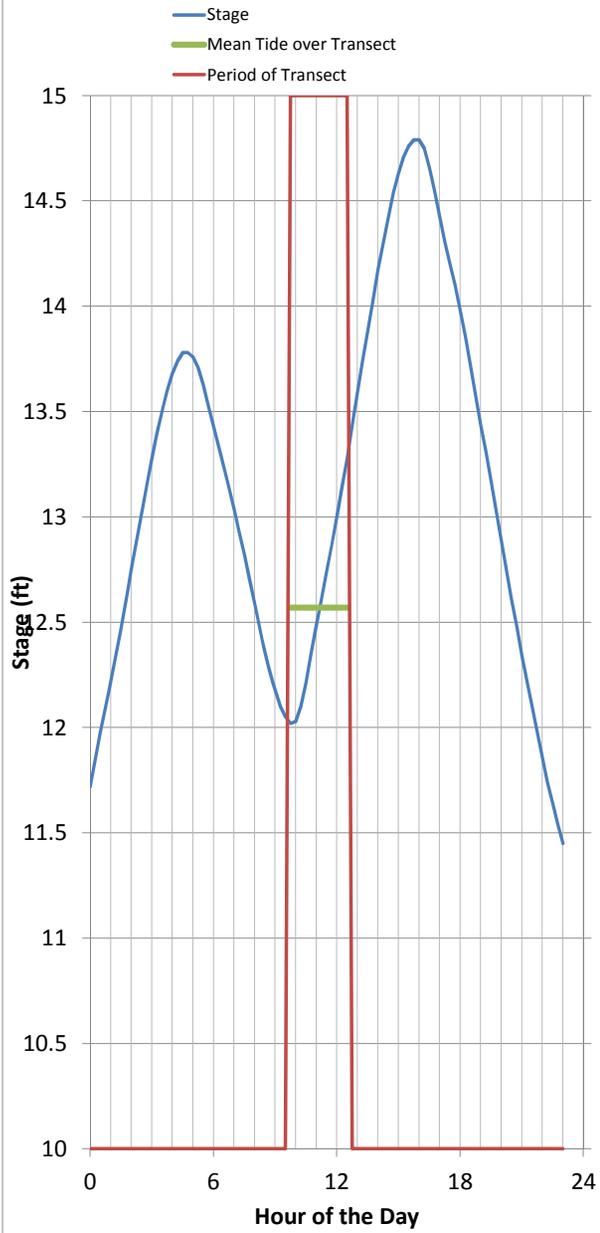


data collected 9:29 - 12:04  
**EBB TIDE**  
 (see attached tide graph)  
 turbidity range: 7.2 - 27.4  
 winds 0-7 mph

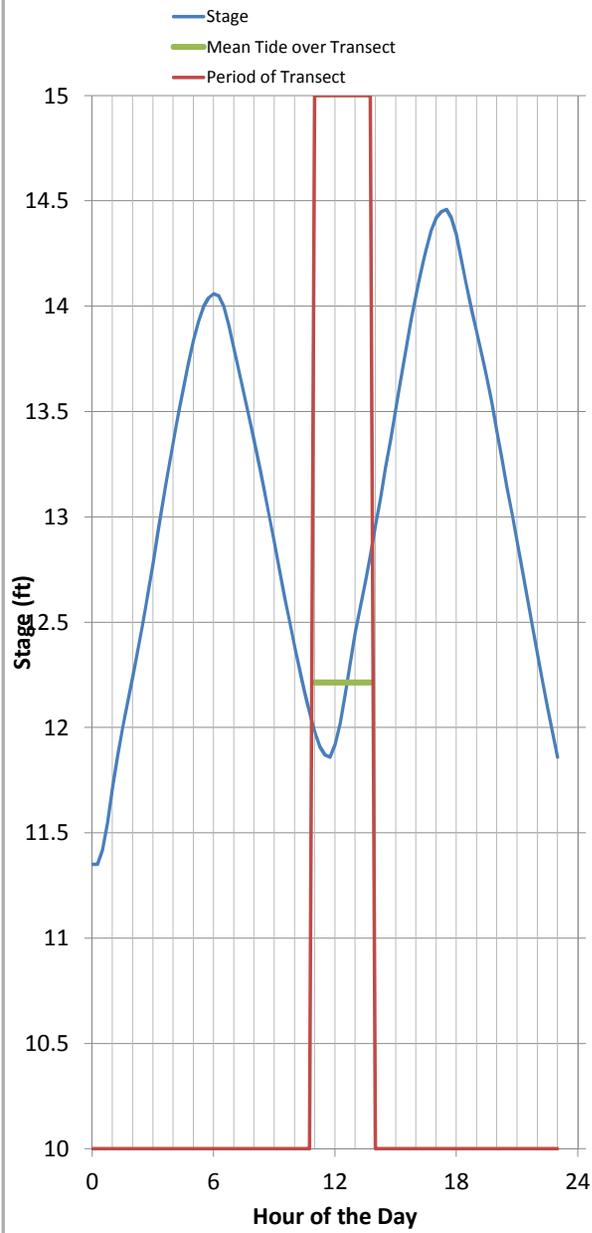
station	name
GLC	Grantline Canal (USGS)
HLT	Middle River near Holt
HOL	Holland Cut near Bethel Island
MDM	Middle River at Middle River
MOK	Mokelumne River at San Joaquin River
MUP	Middle River at Union Point
OBI	Old River at Bacon Island (USGS)
OH4	Old River at Highway 4
OSJ	Old River at Franks Tract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



**Turbidity Transect on 2/8/2016**



**Turbidity Transect on 2/10/2016**



**Turbidity Transect on 2/12/2016**

