Smelt Working Group
January 11, 2016

Meeting Summary

The Working Group reviewed current Delta Smelt distribution, salvage data, and t Delta conditions. The Working Group considers the proposed current operations to carry a high risk of Delta Smelt entrainment at the State and Federal Projects.

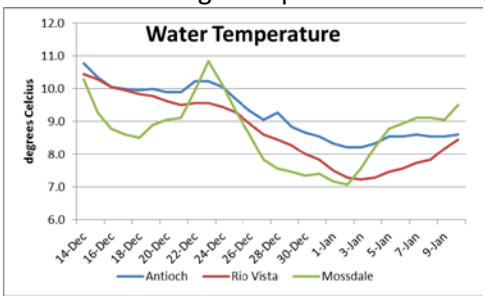
The Working Group has been reviewing the guidance in the 2008 BiOp for Action 1 and Action 2 under the RPA Component 1, both of which are designed to protect pre-spawn adult Delta Smelt from entrainment. Action 1 provides protection of adult Delta Smelt during the "initial pulse of (the) pre-spawning migration" (p 331). "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).

Though neither the hard turbidity trigger (12NTU at PPT, HOL and VCU), nor the hard salvage trigger (3 days of salvage of Delta Smelt) has been met, the DWR turbidity transect survey and FWS early warning survey indicate that fish movement has occurred, and entrainment protection actions consistent with the intent of Action 1 are needed to protect pre-spawning Delta Smelt adults.

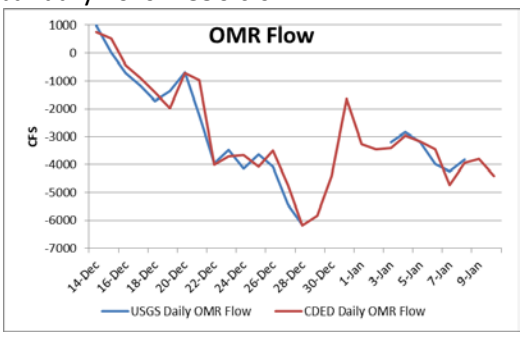
The Working Group will continue to monitor Delta Smelt survey and salvage data and Delta conditions and will meet again on Tuesday, January 19, 2016 at 10am.

Reported Data

1. Current environmental data
    a. Temperature
    Combined average temperature for January 10 is 8.9°C

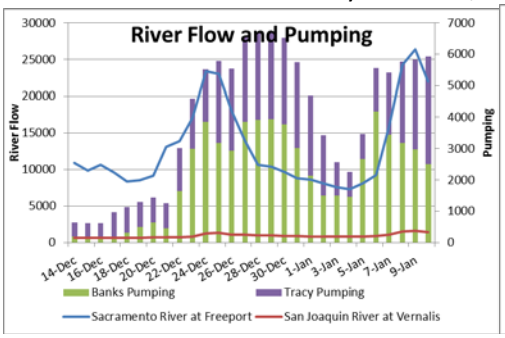


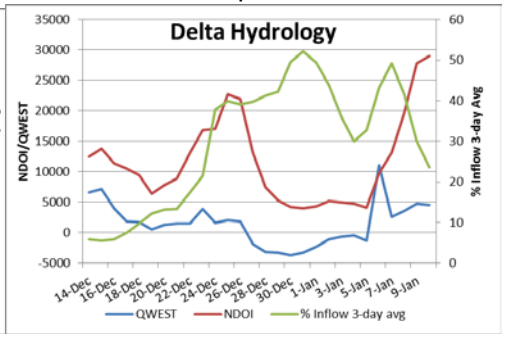
    b. OMR flow
    USGS OMR daily average flow on January 8 is -3820. CDEC OMR daily average flow for January 10 is -4396 cfs.



c. River Flows and pumping

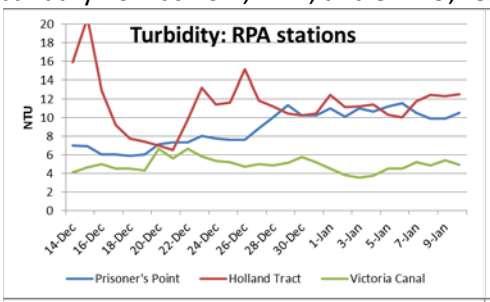
Sacramento River at Freeport flow for January 10 was 21,974 cfs. San Joaquin River at Vernalis river flow for January 10 was 1,446 cfs. Combined exports are 6100 cfs today.

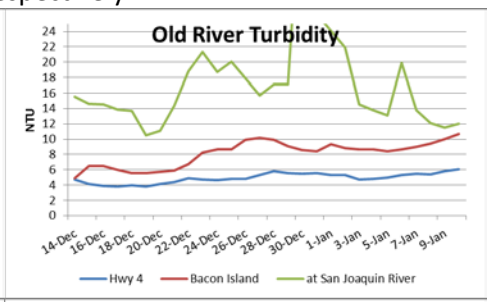


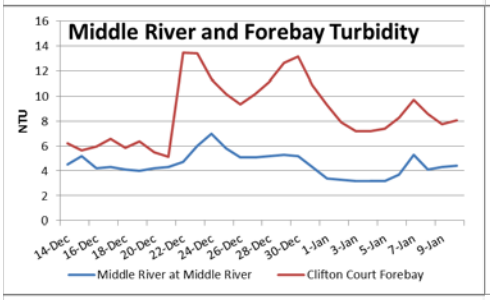


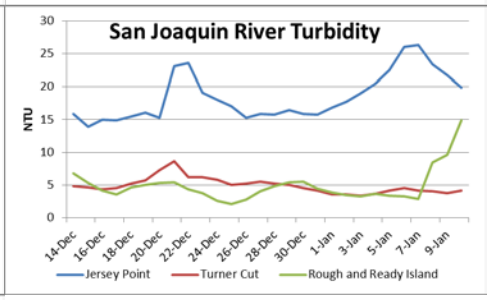
d. Turbidity

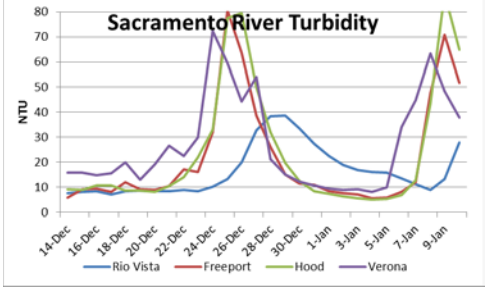
Three day average turbidity for Prisoner's Point, Holland Tract, and Victoria Canal as of January 10 was 10.1, 12.4, and 5 NTU, respectively.











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).

The 2016 Spring Kodiak Trawl #1 survey is in the field this week.

Smelt Larva Survey #1 was in the field last week. Processing is ongoing. Of the stations processed thus far, no Delta Smelt have been collected.

The Early Warning Survey began November 30. Sampling has increased from last week and is alternating between Jersey and Prisoner's Point daily.

Early Warning Survey Results, January through December 30

Date	Location	Delta Smelt Catch
1/5	Prisoner's Point	1
1/6	N/A	
1/7	Prisoner's Point	0
1/8	Jersey Point	10
1/9	Prisoner's Point	0
1/10	Jersey Point	8
1/11	Prisoner's Point	2*

*update from field during meeting, not all tows complete

3. Modeling

Results for DWR's turbidity modeling were distributed. DWR indicated and the Working Group agreed that that the results do not appear to match actual data.
No Particle Tracking modeling runs were requested or reviewed.

4. Salvage

There has been no salvage of Delta Smelt or Longfin Smelt at either the federal or state Delta pumping facilities during the current water year.

5. Expected Project Operations

Jones pumping plant is pumping 3800 cfs. The daily average intake to Clifton Court (CC) is 2300 cfs. Combined pumping is 6100 cfs. Pumping currently is being controlled by NMFS RPA Action IV.2.3, which restricts OMR flows to no more negative than -5000 cfs. Operators indicated the projected OMR Index is expected to be approximately -5000 cfs today.

DWR's boat turbidity transect survey is in the field today, and will be again on January 13 and January 15. Results from the transect conducted on January 8 were discussed (Attachment 1)

6. Delta Conditions Team

No DCT recommendation.

7. Assessment of Risk:

WY 2016 adult Delta Smelt incidental take

The WY 2016 adult Delta Smelt incidental take limit (ITL) is 56, as is stated in the Service's December 23, 2015 memo to the Bureau of Reclamation. The method to calculate the 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.

BiOp Background:
RPA Component 1, Action 1, Part B states, "High-entrainment risk period: Delta Smelt have historically been entrained when first flush conditions occur in late December. In order to prevent or minimize such entrainment, Action 1 shall be initiated on or after December 20 if the 3 day average turbidity at Prisoner's Point, Holland Cut, and Victoria Canal exceeds 12 NTU, or if there are three days of Delta Smelt salvage at either facility or if the cumulative daily salvage count is above the risk threshold based upon the 'daily salvage index' approach described in Attachment B. Action 1 shall require the Projects to maintain OMR flows no more negative than -2,000 cfs (14-day running average) with a simultaneous 5-day running average flow no more negative than -2,500 cfs to protect adult Delta Smelt for 14 days. However, the Working Group can recommend a delayed start or interruption based on other conditions such as delta inflow that may affect vulnerability to entrainment." (BiOp page 281).

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 (and the general guidelines below) specific OMR flows within this range are recommended by the Working Group from the onset of Action 2 through its termination…"

The timing of Action 2 is immediately after Action 1. Before this date (in time for operators to implement the flow requirement) the SWG will recommend specific requirement OMR flows based on salvage and on physical and biological data on an ongoing basis. If Action 1 is not implemented, the SWG may recommend a start date for the implementation of Action 2 to protect adult delta smelt. (BiOp page 352).

Discussion:
Action 1 has specific turbidity and salvage triggers. The Working Group considers it unlikely that the salvage trigger could be met without approaching or surpassing this year's take limit given the current record low abundance of Delta Smelt. The turbidity levels at two of the three trigger stations are at or near the trigger level, but Victoria Canal is well below the threshold. However, the Working Group has newer information that suggests Action 1 is warranted: specifically Early Warning Sampling, which detected Delta Smelt at Prisoners Point on January 5 and 11, and the DWR turbidity transects indicating that turbidity surpassed 10 NTU well south in Old River. The Working Group reviewed Delta Smelt distribution data, salvage data, and current Delta conditions. The working group concluded that Action 1 of the BO should be implemented. Risk of entrainment has increased from last week and the Working Group concluded that entrainment risk would remain high at OMR flows of -3500 to -5000 cfs because recent catches at Jersey Point and Prisoner's Point indicate fish are moving, turbidity in Old River is higher than 10 NTU down to the southern end of Bacon Island (at least), and another storm is forecast to elevate Sacramento River flow at Freeport back up to approximately 25,000 cfs which is anticipated to increase sediment delivery and distribution in the south Delta (see Attachment 1). Thus, both current conditions and conditions forecast for later this week encourage the movement of Delta Smelt into Old River. The Working Group indicated that some Delta Smelt

likely are already in Old River, and thus have already been entrained in the south Delta. Although the spread of turbidity into the central and south Delta toward the Banks and Jones pumping facilities has been more gradual than in the past, most members felt that conditions in the Delta warranted implementation of Action 1.

Actions 1 through 3 of the RPA are designed to protect Delta Smelt from entrainment. RPA Action 1 and Action 2 are specifically designed for protection of adult spawning stock in the San Joaquin River during December to March via real-time management of OMR flows. Members of the Working Group currently are evaluating conditions relative to the guidance in the BiOp for Action 1 (BiOp p 329). The following details were discussed by the group:

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 is particularly concerned about these locations since the south lane at Jersey Point is more hydrologically linked to tidal flow into these interior Delta channels, and presence of fish at Prisoners Point would indicate that Delta smelt are moving upriver in a pre-spawning behavior. Therefore, fish in these areas are considered at greater risk of entrainment into Old River. Delta Smelt have been collected in all three Jersey Point lanes and at Prisoner's Point in the past few days.

Members agreed that the Early Warning catches suggest Delta Smelt have begun upstream spawning movement. No comprehensive trawl surveys have been conducted since the poorly performing December SKT to indicate how many fish may still be downstream of Jersey Point that could potentially move into the San Joaquin River. The Working Group agreed that the majority of fish may not have begun spawning movement, but that conditions conducive to such a mass movement have occurred or are likely to occur in the coming week. Therefore this week would be the appropriate time to implement actions to minimize Delta Smelt distribution into the Old River and Middle River prior to spawning. Members indicated that it is unlikely any fish have settled down and reached their spawning area since spawning seldom occurs before February.

Salvage

Any level of salvage observed at either facility will be of concern to the Working Group, considering the low abundance and associated low detection probability (BiOp page 338) of Delta Smelt in salvage under RPA compliant operations. With the ITL of 56 adults and given the typical expansion rates for salvage operations at the facilities, members are concerned that just a few fish detected in salvage will be problematic. Our concern is for both direct mortality and

indirect mortality of the spawning stock, which are 2 of the 3 factors affecting Delta Smelt (BiOp, page 325):

"1) direct mortality associated with entrainment of pre-spawning adult delta smelt by CVP/SWP operations; 2) direct mortality of larval and early juvenile delta smelt associated with entrainment by CVP/SWP operations; and 3)indirect mortality and reduced fitness through reductions to and degradation of Delta habitats by CVP/SWP operations."

The Working Group indicated they cannot wait for Delta Smelt to be detected in salvage to make a recommendation to reduce the risk of entrainment. The Working Group indicated that abundance levels for 2016 no longer support waiting for increased salvage, as the BO is written (refer to salvage trigger), given that at such low abundance levels, detection in salvage is unlikely unless a substantial proportion of the existing population has already distributed into areas of high entrainment risk.

Turbidity and Delta Smelt Distribution

The four primary Delta Smelt abundance indices and the December SKT all indicate that abundance has been at a record low all year, and as a result, the Working Group expects that detection ability in salvage and trawl surveys has been reduced. 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 suggested monitoring turbidity as a proxy for location of Delta Smelt, based on a documented migration response to turbidity (BiOp pages 146 and 347) and last water year's salvage events which once again followed a turbidity plume that extended from the San Joaquin River into the South Delta to the export facilities.

Given the high turbidities (> 10 ntu) that were recorded in the Old River to at least the southern end of Bacon Island, and the relatively small section of channel possessing lower turbidity separating the 10 ntu turbidity front from the export facilities, members indicated their concern for the high likelihood that high turbidity will continue to move to the export facilities and that these conditions are conducive to a Delta Smelt distribution concurrent with these areas of elevated turbidity.

Turbidity

The DWR Turbidity Transect data from January 8 indicated that elevated turbidity (10-14 NTU) had encroached upstream to Hwy 4 in the Old River corridor. There appears to be an area of lower turbidity between Hwy 4 and the export facilities, but the Working Group indicated that at an OMR flow of -5000 cfs, the higher turbidities likely will continue to encroach to the export facilities. More storms of similar magnitude as those last week are anticipated on January 13 and also later in the week. Given current turbidity levels and the predicted weather systems, the Working Group suspects that turbidity will increase in the central and south Delta. On January 4, the Working Group indicated that should turbidities greater than 10 NTU extend upstream in the Old River past Bacon Island, the Working Group would need to meet again to reassess the risk of entrainment. Existing conditions have met and exceeded this indication.

Additionally, during the January 4 Working Group meeting, members indicated that the extension of turbid water from the San Joaquin River further upstream into Old and Middle rivers in conjunction with repeated catch at San Joaquin EWS Prisoner's Point and the Jersey

Point south lane, would be considered a clear indicators of high risk of entrainment into Old and Middle rivers, and from there, into the SWP and CVP intake facilities. These indications have been met or exceeded.

Members pointed out the apparent disparity between turbidity readings at the CDEC station OH4 and the readings from DWR's transect data at that location. OH4 indicates turbidity levels of 5-6 NTU for the past several days, whereas the DWR turbidity transect data indicates levels of 12-14 NTU for January 8. This turbidity transect data indicate that 12-14 NTU turbidity has extended from Prisoner's Point to Woodward Island, which is the terminus of the sampling.

Comparison to last winter

The first salvage of Delta Smelt last season occurred on January 2, after a period of OMR flows that ranged from around -6000 to -4000 (see SWG notes, 01/05/2015). The start of the salvage season began one to two weeks after increased inflow and turbidity was observed in the Delta. Although some hydrological conditions are presently different from this time last season, recent higher flows, elevated turbidity, and presence of Delta Smelt at Prisoner's Point suggest the migration "season" has started. Given the exceedingly low abundance and sporadic catch in surveys, the Working Group is concerned that there will be little, if any, catch in the early warning survey beyond what has already been observed to indicate the fish are moving into the south Delta.

OMR Flow

Scheduled OMR flow for the week (-5000 cfs) is anticipated to increase the risk of entrainment to fish in the lower San Joaquin River. Fish currently farther upstream in the Old River corridor (following the turbidity plume) are at higher risk for entrainment into the export facilities. The Working Group suspects that some fish may have already been entrained, but have not been detected in salvage counts.

The Working Group pointed to the BiOp's analysis supporting the Action 1 OMR flow prescriptions (-2000cfs), and action duration (14 days), as measures necessary to protect pre-spawning adult Delta Smelt from entrainment and provide advantageous hydrodynamic conditions at this early stage of the migration period (BiOp p 329, 351). Some members stated that though current conditions pose a high risk to Delta Smelt, the OMR flows slightly more negative than -2000 cfs may have acceptable risk. Similarly, no consensus was reached on assigning risk under the Service-provided advice framework for the OMR -2000 to -3500 flow range, when assessing entrainment risk under the Action 2 OMR flow ranges (-1250cfs to -5000cfs):

- -1250 to -2000 cfs has a low risk of entrainment,
- -2000 to -3500 cfs has a medium / high risk of entrainment,
- -3500 to -5000 cfs has a high risk of entrainment.

The risk factors considered most pertinent to the above assessment of risk were low population abundance (evidenced from lowest annual index on record), confirmed Delta Smelt presence in central Delta based upon Jersey Point and Prisoner's Point catches from the Early Warning Survey, and the distribution of turbidity greater than 10 NTU into the central and south Delta.

The Working Group will continue to monitor conditions and smelt distribution and will meet again on Tuesday, January 19, 2016.

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

Advice for week of January 11, 2016:
The Smelt Working Group does not have any advice for Longfin Smelt based on recent information.

Barker Slough operations advice was not provided by the Smelt Work Group, because the meeting occurred prior to concern period beginning January 15 (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 January 10, 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 has been delayed. December Bay Study sampling collected no Longfin Smelt in the San Joaquin River, suggesting no recent proximity to the export pumps. 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 first Smelt Larva Survey (SLS) of 2016 was completed during the week of January 4th. 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.

5. Criterion does not begin until January 15th.

Current conditions: The Sacramento River flow appears to have peaked at 26,573 cfs on January 9 and began to declined 22,185 cfs on January 10. The San Joaquin at Vernalis peaked at 1,589 cfs and declined to 1,443 cfs on January 10. X2 has been >81. Qwest turned positive on January 6 and became increasingly positive to 4,731 on January 9; as of January 10, Qwest was 4,545 cfs. Combined State and federal exports reached about 5,800 cfs on January 10. In the absence of a Smelt Working Group recommendation to the contrary, exports will target -5,000 cfs OMR or less negative based on NMFS criteria.

Bay Study has yet to start sampling for January, so no Delta or upper estuary distribution information exists for large juvenile and adult Longfin Smelt. For the week of December 27 through January 2, no additional Longfin Smelt were collected by the Chipps Island Trawl; only three Longfin Smelt had been reported to date by Chipps Island Trawl sampling: two adults on December 18 and the third adult on December 23. For comparison, by this date in water year 2015, the Chipps Island Trawl achieved 50% (over 50 fish) of its catch of yearling and adult Longfin Smelt for the season. Another interpretation is that we reached the mid-point in adult migration for spawning and only 3 adult Longfin Smelt have been detected. 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.

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 are positive and favorable for downstream transport away from the export pumps. Exports will target -5,000 cfs OMR in the absence of a more protective action by the USFWS to protect Delta Smelt. Exports targeting -5,000 cfs OMR will slightly increase risk of entrainment through the week as inflow declines until predicted rainfall on Wednesday causes Delta inflow to rise again about Saturday. A USFWS implemented recommendation from the SWG of -2,000 cfs OMR would be highly protective of Longfin Smelt adults and larvae.

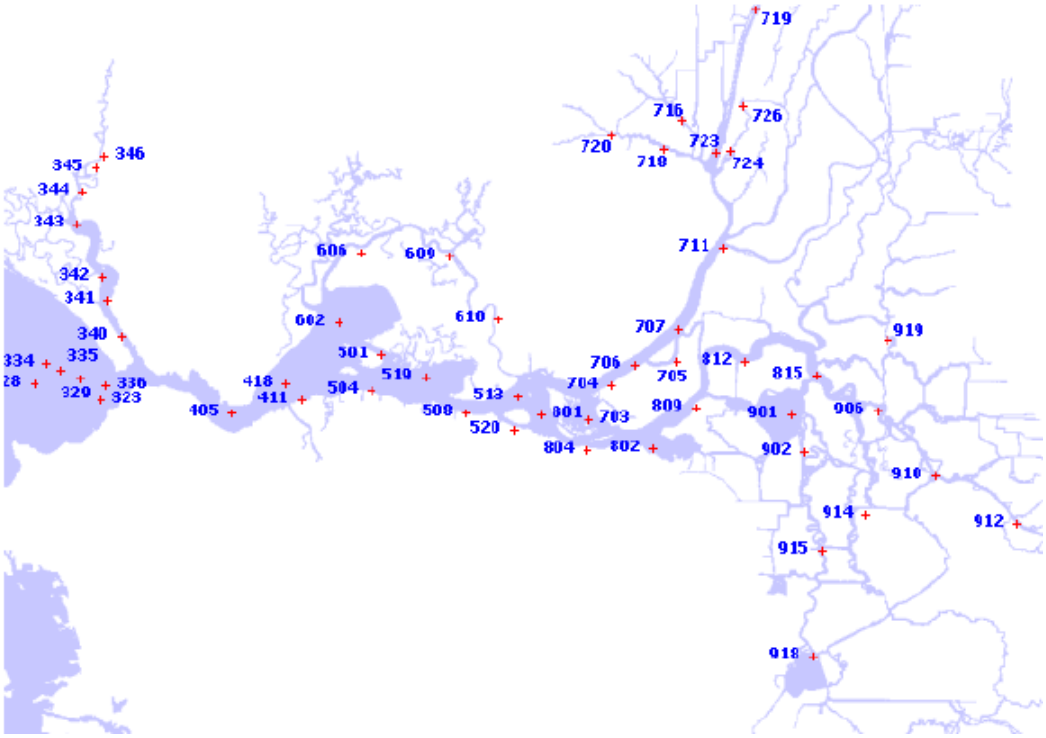
Table 1. Longfin Smelt catch by station in the Smelt Larva Survey 1. Sample processing is incomplete.

Year	Survey #	SLS Station	Sample Status	Species	Smelt Catch
2016	1	340	Not yet processed		
2016	1	342	Not yet processed		
2016	1	343	Not yet processed		
2016	1	344	Not yet processed		
2016	1	345	Not yet processed		
2016	1	346	Not yet processed		
2016	1	347	Not yet processed		
2016	1	348	Not yet processed		
2016	1	349	Not yet processed		
2016	1	405	Not yet processed		
2016	1	411	Not yet processed		
2016	1	418	Not yet processed		
2016	1	501	Not yet processed		
2016	1	504	Not yet processed		
2016	1	508	Not yet processed		
2016	1	513	Not yet processed		
2016	1	519	Not yet processed		
2016	1	520	Not yet processed		
2016	1	602	Processed	Longfin Smelt	1
2016	1	606	Processed	Longfin Smelt	1
2016	1	609	Not yet processed		
2016	1	610	Not yet processed		
2016	1	703	Not yet processed		
2016	1	704	Processed	Longfin Smelt	3
2016	1	705	Not yet processed		
2016	1	706	Not yet processed		
2016	1	707	Not yet processed		
2016	1	711	Not yet processed		
2016	1	716	Not yet processed		
2016	1	723	Not yet processed		
2016	1	801	Not yet processed		
2016	1	804	Processed		No Smelt Catch
2016	1	809	Processed	Longfin Smelt	9
2016	1	812	Processed	Longfin Smelt	3
2016	1	815	Processed		No Smelt Catch
2016	1	901	Processed	Longfin Smelt	3
2016	1	902	Processed		No Smelt Catch
2016	1	906	Processed		No Smelt Catch
2016	1	910	Processed		No Smelt Catch
2016	1	912	Processed		No Smelt Catch
2016	1	914	Processed		No Smelt Catch
2016	1	915	Processed		No Smelt Catch
2016	1	918	Processed		No Smelt Catch
2016	1	919	Processed		No Smelt Catch

SWP ITP Criteria Stations

Processing is complete through 1/7/16.

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



Old and Middle River turbidity, Jan. 8 2016

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

data collected 10:21a - 1:42p: FLOOD - EBB TIDE

min 3.0, max 18.9

Low 11:18a, Low 4:23p
(Middle R., Borden Hwy Br.)

OSJ: 11
boat: 12.1

PPT: 9.8
boat: 9.8

HOL: 11.7
boat: 13.8

HLT: 9.8
boat: 8.1

OBI: 8.8
boat: 10.4

MDM: 3.5
boat: 4.5

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 5 Miles

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Jan. 4

Range: 3.6 - 19.9

Jan. 6

Range: 4.0 - 53.0

Jan. 8

Range: 3.0 - 18.9

0 5 Miles

N

Turbidity (NTU)

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

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