

Smelt Working Group Annual Report on the Implementation
of the Delta Smelt Biological Opinion on the Coordinated Operations of the
Central Valley Project and State Water Project
("OCAP" Biological Opinion) Water Year 2012

Prepared for the Delta Science Program Independent Review
By Bay-Delta Fish and Wildlife Office Staff
U.S. Fish and Wildlife Service Sacramento, California

September 2012



Acronyms and Abbreviations

BDFWO	Bay-Delta fish and Wildlife Office
BO	Biological Opinion
CDEC	California Data Exchange Center
[C]DFG	California Department of Fish and Game
[C]DWR	California Department of Water Resources CFS Cubic Feet per Second
CVP	Central Valley Project
ESA	Endangered Species Act
FMWT	Fall Mid-Water Trawl
IEP	Interagency Ecological Program
NMFS	National Marine Fisheries Service (NOAA Fisheries)
NTU	Nephelometric Turbidity Unit
OCAP	Operations Criteria and Plan
OMR	Old and Middle River Flow (combined, in cubic feet per second)
QWEST	A calculation of net flow in the lower San Joaquin River, in cubic feet per second
Reclamation	U.S. Bureau of Reclamation
RPA	Reasonable and Prudent Alternative
Service	U.S. Fish and Wildlife Service
SKT	Spring Kodiak Trawl Survey
STNS	Summer Tow-Net Survey
SWP	State Water Project
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VAMP	Vernalis Adaptive Management Program
WOMT	Water Operations Management Team
WY	Water Year (October 1 – September 30)

Table of Contents

Acronyms and Abbreviations i
Table of Contents..... iii
List of Tables iii
List of Figures iii
Chapter 1. Background 1
 1.1 *Background* 1
 1.2 *Adaptive Decision Process* 2
 1.3 *Smelt Working Group* 3
Chapter 2. Summary of Actions and Outcomes for Water Year 2012 4
 2.1 *Component 1: Adult Entrainment*..... 4
 2.2 *Component 2: Juvenile Entrainment* 6
Chapter 3. Summary Narrative of Smelt Working Group Discussions for Water Year 2012 6
Chapter 4. Water Operations Summary for Water Year 2012 8
 4.1 *Export Pumping*..... 8
 4.2 *River Flows* 8
 4.3 *Delta Outflow and the Winter Pulse*..... 8
Chapter 5. Summary of Selected Fish Monitoring Data 9
Chapter 6. Discussion of Turbidity Criteria..... 10
Chapter 7. Year in Review and Request for Feedback..... 13
 7.1 *Responses to the Water Year 2011 Panel’s Recommendations*..... 13
 7.2 *Issues that arose during 2012 that are likely to be revisited by the SWG in 2013* 13
 7.3 *Successes and request for feedback*..... 13

List of Tables

Table 1. Simple illustration of the first two components of the OCAP RPA2
Table 2. Incidental take for juvenile delta smelt at least 20 mm in size, WY 20126

List of Figures

Figure 1. Map of the Sacramento-San Joaquin Delta. ii
Figure 2. Graphic depiction of Sacramento River flow in cubic feet per second and cumulative adult salvage at the CVP and SWP fish salvage facilities in WY 2012.5
Figure 3. Export pumping, river flow, and outflow levels for WY2012.....9
Figure 4. Approximate timetable of the primary surveys used to assess relative abundance and distribution of delta smelt.9
Figure 5. Map of turbidity stations monitored by the Smelt Working Group. Red dots are criterion stations specified in the RPA and green dots are additional stations. 12

Chapter 1. Background

In an effort to enable review of the coordinated operation decisions implemented under the U.S. Fish and Wildlife Service's (Service) Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP) ("OCAP") and the real-time species information underlying those decisions, the Bay-Delta Fish and Wildlife Office (BDFWO) has prepared the following report. The report is intended to facilitate review by the Independent Review Panel (IRP, Panel), and includes introductory text as well as a summary of the actions implemented under the Reasonable and Prudent Alternative (RPA).

The reader should be aware that the tables and figures in this document were constructed from the data available to and used by the Smelt Working Group (SWG) in near-real-time. In some instances, these data may have been updated. However, the data provided herein reflect that which was reviewed by the SWG at the time, irrespective of whether updates may have subsequently become available.

1.1 Background

The federal Endangered Species Act (ESA) is administered primarily by the National Marine Fisheries Service (NMFS) and the Service. A *biological opinion* (BO) is a product of an interagency consultation under section 7 of the ESA, which provides that "each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded or carried out by such agency... is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical] habitat..." In December 2008 the Service completed a BO ("OCAP" opinion) on the effects of the coordinated operations of the Central Valley Project (CVP) and the State Water Project (SWP) (Projects) on the Federally-listed threatened delta smelt (*Hypomesus transpacificus*). The BO includes the written opinion of the Service, a summary of the information used, and a detailed discussion of the effects of the proposed action on the listed species or its critical habitat, and reasonable and prudent measure(s) (RPM) necessary in order for the project to move forward.

There are three major factors related to operations of the Projects affecting delta smelt population resilience and long-term viability. These three factors are: 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, with the fall as a particular concern (BO, p 325). Entrainment of all life stages of delta smelt may occur irrespective of Delta hydrology. Additionally, entrainment risk tends to increase with increased reverse flows on Old and Middle rivers (OMR). Reverse OMR flows resulting from Project export pumping is a proximal cause of entrainment, while the position of the two-parts-per-thousand isohaline (termed "X₂" and measured as kilometers from the Golden Gate Bridge) is a distal cause of entrainment.

In formal consultation with the U.S. Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR), the Service determined that the coordinated operations of the CVP and SWP, as proposed, were likely to jeopardize the continued existence of the delta smelt and adversely modify its

critical habitat. Thus, in collaboration with Reclamation and DWR, the Service developed a *reasonable and prudent alternative* (RPA). The Service’s biological opinion for delta smelt (“OCAP”) includes five RPA components to protect different delta smelt life stages and minimize impacts to critical habitat. The two primary Components affecting CVP and SWP operations are Components 1 and 2 (Table 1). Component 1 protects adult delta smelt by reducing OMR flows to a range of -1,250 to -5,000 cubic feet per second (cfs) at times when the fish are most vulnerable to entrainment at the project diversions, occurring as early as December and continuing until spawning has begun. Component 2 protects larval and juvenile delta smelt by reducing OMR flows to a range of -1,250 to -5,000 cfs at times when these life stages are vulnerable to entrainment. Component 2 is implemented from the onset of spawning to June 30, or when water temperatures reach 25° Celsius, whichever is first.

Table 1. Simple illustration of the first two components of the OCAP RPA

Component 1			Component 2
Action 1(a)	Action 1(b)	Action 2	Action 3
Dec 1 to Dec 20			
	Dec 20 to Action 2		
		Immediately following Action 1	
			Onset of spawning

These Components are implemented through an adaptive process that is guided by hydrological and biological data, an interagency team of experts, and real-time project operational decisions.

1.2 Adaptive Decision Process

Real-time decision making to assist fishery management is a process that promotes flexible decision making and can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. For CVP and SWP operations, high uncertainty exists for how to best manage water operations while protecting listed species. Sources of uncertainty relative to CVP and SWP operations include hydrologic conditions and the biology and ecology of species.

Under current Project operations, the goals for real-time decision making to assist fishery management are to minimize impacts to water deliveries and minimize adverse effects to listed species. Decisions regarding CVP and SWP operations to avoid and minimize adverse effects on listed species must consider factors that include public health, safety, water supply reliability, and water quality. To facilitate such decisions, the Project agencies and the Service, NMFS, and the California Department of Fish and Game (DFG) have developed and refined a set of processes to collect data, disseminate information, develop recommendations, make decisions, and provide transparency. This process consists of three types of groups that meet on a recurring basis. Management teams (e.g., the Water Operations Management Team or WOMT) are made up of management staff from Reclamation, DWR, the Service, NMFS, the U.S. Environmental Protection Agency (USEPA) and DFG. Information teams are teams whose role is to disseminate and coordinate information among agencies and stakeholders. Fisheries and Operations Technical Teams are made up of technical staff from state and Federal agencies. These teams review the

most up-to-date information on fish status and Delta conditions, and develop recommendations that fishery agencies' management can use in identifying actions to protect listed species.

The process to identify actions for protection of listed species varies to some degree among species but follows this general outline: a Fisheries or Operations Technical Team compiles and assesses current information regarding species, such as stages of reproductive development, geographic distribution, relative abundance, and physical habitat conditions. The team then provides a recommendation to the agency having the statutory obligation to enforce protection of the species in question. The agency's staff and management then review the recommendation and use it as a basis for developing, in cooperation with Reclamation and DWR, a modification of water operations that will minimize adverse effects to listed species by the Projects. If the Project agencies do not agree with the action, then the fishery agency with the statutory authority makes the final decision on an action that they deem necessary to protect the species. The outcomes of any protective actions that are implemented are monitored and documented, and this information informs future recommended actions (BO, pp 27-29).

1.3 Smelt Working Group

The SWG is a Fisheries Technical Team that evaluates biological and technical issues regarding delta smelt and develops recommendations for consideration by the Service. When the longfin smelt (*Spirinchus thaleichthys*) became a state candidate species in 2008 (in March 2012 longfin smelt were determined to be warranted for listing under the federal ESA, but precluded due to higher-priority listing actions), the SWG began developing recommendations for DFG to minimize adverse effects to longfin smelt. The SWG consists of representatives from the Service, NMFS, DFG, USEPA, DWR, and Reclamation. The Service chairs the group, and members are assigned by each agency.

The SWG compiles and interprets the latest near real-time information regarding state- and Federally-listed smelt, such as stages of development, distribution, and salvage. After evaluating available information, and if they agree that a protection action is warranted, the SWG will submit their recommendations in writing to the Service and DFG.

The SWG may meet at any time at the request of the Service, but generally meets weekly during the months of December through June, when smelt salvage at the Projects has historically occurred. However, the Delta Smelt Risk Assessment Matrix (Attachment 1) outlines the conditions when the SWG will convene to evaluate the necessity of protective actions and provide the Service with a recommendation. Further, following the State of California listing of longfin smelt, the SWG will also convene based on longfin salvage history at the request of DFG (BO, pp 30-31).

Typically, around the beginning of December, the SWG begins meeting weekly to review information on Delta hydrology and smelt distribution and abundance. Once data indicate that smelt may be at risk for entrainment, the SWG recommends OMR flows within the ranges in the RPA to the Service. The Service's staff and managers then review the recommendation and, if warranted and in cooperation with Reclamation and DWR, use it to develop a modification of water operations that will minimize adverse effects to listed species caused by operations. If Reclamation and DWR do not agree with the action, the agency with statutory authority will make a final decision on the action. This adaptive process continues

throughout the winter and spring until smelt are no longer vulnerable to entrainment. For detailed notes on the SWG 2012 Water Year meetings please visit <http://www.fws.gov/sfbaydelta/ocap> .

Chapter 2. Summary of Actions and Outcomes for Water Year 2012

The SWG held regular conference calls that were well-attended. At least one representative from each agency was able to participate on most calls. Weekly discussion topics included fish salvage for the Projects' fish salvage facilities, DFG and Service biological surveys, Delta hydrology, projected operations for the coming week, status of NMFS BO actions, and risk of entrainment for delta and longfin smelt. Periodic discussion topics included applicable sections of the Service BO for delta smelt, updates for ongoing field studies, historical survey results, hydrology patterns, water quality requirements, Delta turbidity modeling results, and the status of temporary Delta barriers.

The WOMT met in person or via conference call throughout the December through June implementation period.

2.1 Component 1: Adult Entrainment

Incidental take is that take which occurs as a direct effect of the project, but not as an intentional effect. The incidental take statement of the BO, which exempts the Projects from the prohibition against take of a listed species, is based on historical take but also uses the Fall Mid-Water Trawl (FMWT) index to scale allowable take to apparent abundance (BO, pp 285-288). The FMWT index for delta smelt for 2011 was 343. Therefore, authorized incidental take for adult delta smelt in WY 2012 was 2,487 fish, combined for both Projects, for the December-through-March period; the concern level was 1,862 fish.

Action 1

Adult delta smelt entrainment generally occurs when a pulse of pre-spawning migrants enters the central and south Delta following the first winter pulse of precipitation in the watershed. This event is characterized by the first substantial flow increase of the winter and is generally coincident with an increase in turbidity. Flow and turbidity are believed to serve as cues for adult delta smelt migration. Action 1, once triggered, requires OMR flow be managed to no more negative than -2,000 cfs for 14 days. This decrease in reverse OMR flow results in the draw of little to no Sacramento River water into the central and southern Delta and typically allows some portion of the San Joaquin River flow to reach the confluence area. Action 1 is intended to decrease the risk of entrainment of pre-spawning adult delta smelt, and improve habitat conditions for the species. Additionally, Action 1 is intended to decrease the risk of entrainment of larval and juvenile delta smelt later in the season by allowing environmental cues to encourage the species to spawn in the northern Delta.

The SWG monitored turbidity and Delta hydrology as indicators of the occurrence of the first winter pulse flow in an effort to assess the entrainment risk. Additionally, the SWG monitored salvage and survey results as an indicator of relative species abundance and distribution. Action 1 was not implemented in WY 2012 because the criteria for its implementation were not met.

Action 2

Action 2 encompasses the period when OMR prescriptions for pre-spawning adult delta smelt are still required to protect parental stock prior to reproduction; however, such controls may be relaxed if the main pulse of fish migration already has occurred and adults are holding more tightly to their selected spawning areas. Action 2 may also be needed to extend protections consistent with Action 1 in years of longer spawning migration periods or changing environmental conditions. Conditions are highly variable both between and within years. Rather than provide a prescription that is protective under all circumstances, an adaptive process based on the RPA guidelines is appropriate. This process can most efficiently and effectively provide protections utilizing analysis of all available data and seasonal conditions. The SWG monitors environmental conditions including turbidity, flow, and water temperature, as well as relative fish abundance, distribution and spawning readiness, and salvage at the export facilities, to assess the risk of entrainment. The RPA describes a variety of potential recommendations, according to the assessed level of risk (BO, pp 354-356).

The SWG monitored Delta hydrology, turbidity, and delta smelt distribution as indicated by the Spring Kodiak Trawl survey (SKT). Because net Delta flows were generally positive or weakly negative for January through March and delta smelt were largely distributed to the north or west of Franks Tract, the risk of entrainment was estimated to be low, and Action 2 was not implemented.

Combined salvage of delta smelt (the Projects' fish facilities) was 203 adults for the December-through-March period, well below the authorized take of 2,487 adults. As expected, cumulative salvage roughly followed the initial high-flow event in January (Figure 2).

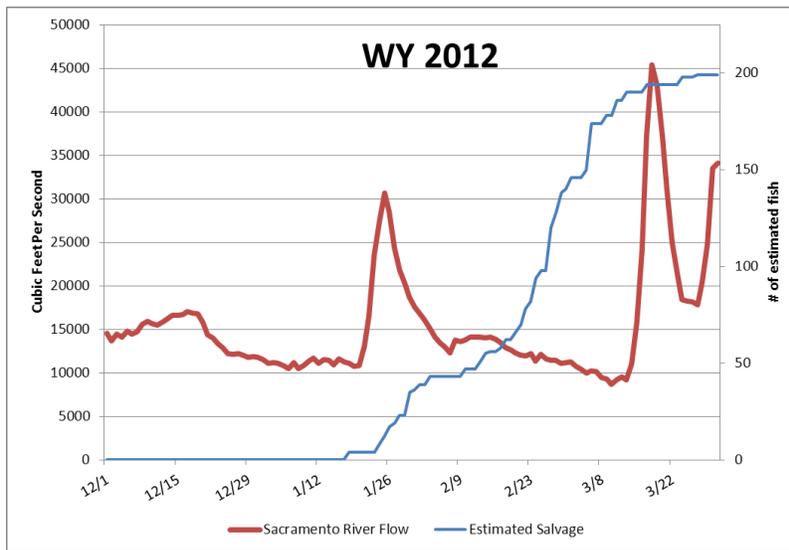


Figure 2. Graphic depiction of Sacramento River flow in cubic feet per second and cumulative adult salvage at the CVP and SWP fish salvage facilities in WY 2012.

2.2 Component 2: Juvenile Entrainment

Incidental take for adult and juvenile delta smelt is based upon historic observed take as well as upon apparent abundance (BO, pp 289-293). Because of the difficulty in distinguishing among larval smelts, only delta smelt greater than 20 mm in length are counted in salvage. Juvenile take is estimated by month for the April-through-July period. Authorized take for WY 2012 is provided in Table 2, below.

Table 2. Incidental take for juvenile delta smelt at least 20 mm in size, WY 2012

	Concern Level	Authorized Take	Actual Take*
April	101	151	22
May	4,471	6,705	1938
June	11,327	16,991	195
July	12,851	19,276	0

* Actual Take numbers are the final combined salvage data published on Reclamation's Mid Pacific Region's website at <http://www.usbr.gov/mp/cvo/fishrpt.html>, which were obtained on September 26, 2012, and are not necessarily the salvage data reviewed by the SWG at the time of its meetings.

Action 3.

Implementation of Action 3 begins when the SWG determines that spawning has begun and larval fish are present in the Delta. It is likely that Delta conditions (primarily water temperature) will be appropriate for the presence of larvae before larvae are detected by routine survey sampling. Therefore, the SWG monitors water temperature, adult spawning condition (i.e., gonad development) and larval occurrence and distribution to assess the relative risk of entrainment. Action 3 concludes when Delta water temperatures reach a daily average of 25° Celsius at Clifton Court Forebay for three consecutive days, or until June 30, whichever is first (BO pp 357-359).

The SWG monitored Delta hydrology and juvenile distribution as indicated by the 20-mm Survey. Survey catches were low, and fish were mostly collected north or west of Franks Tract with a few scattered catches in the central and southern Delta. Delta outflow was strongly positive in April, followed by weakly positive to weakly negative flows in May and June. By the time of the eighth 20-mm Survey from June 18 through 21, juvenile delta smelt were collected at and downstream of the confluence, in the Sacramento River system in the lower San Joaquin River. Throughout the season, the SWG estimated that the risk of entrainment for juvenile delta smelt was low. See Chapter 3. Summary Narrative of Smelt Working Group Discussions for Water Year 2012, for a summary of the SWG's weekly review of data.

Chapter 3. Summary Narrative of Smelt Working Group Discussions for Water Year 2012

During WY 2012, the SWG began meeting on November 28, 2011 and met last on June 25, 2012. For the meetings in January, the SWG watched for signs of the first winter pulse as an indication of potential upstream movement and increased vulnerability to entrainment. In addition to the turbidity stations mandated in the RPA (criterion stations), the SWG monitored several other turbidity stations to obtain a better picture of overall conditions.

On December 31, CVP filled their share of San Luis Reservoir, and as of January 1, the SWP adjusted pumping to meet a number of conditions for the Delta (NMFS RPA restriction, SWRCB D-1641 monthly outflow standard, and Contra Costa Water District water quality standard).

On January 3, the first regular meeting of the SWG, members estimated that the risk of entrainment was low, as hydrology had remained steady for both the Sacramento and San Joaquin rivers, no evidence of salvage, and results from the December 2011 FMWT Survey indicated most delta smelt were located at the confluence area. No recommendation was provided to the Service.

The first delta smelt salvage of the year occurred on January 18 (estimated four fish).

Hydrology remained steady until late January. This first winter pulse flow peaked at approximately 30,000 cfs (Sacramento River at Freeport) on January 25. Flows at Freeport remained above 20,000 cfs until January 30. Field surveys consistently collected delta smelt in the Sacramento River system and downstream of the confluence. A small number of adults (32) were observed in salvage between January 24 and 31. The SWG held a call on January 27, 2012 (outside of the normal Monday meetings) as there had been three consecutive days of delta smelt salvage, which met the criteria for the initiation of Action 1 of the OCAP RPA. The SWG determined that while the salvage criterion had been met, delta smelt distribution and Delta conditions remained favorable, and therefore, the risk of entrainment remained low. No recommendation was made to the Service.

Steady hydrology persisted throughout February and the first half of March. Salvage was sporadic to regular at low levels throughout this time. Most SKT survey collections occurred in the Sacramento River and at, or downstream of the confluence. The SWG estimated that the risk of entrainment remained low. Longfin smelt distribution also remained favorable. The first juvenile longfin smelt was salvaged on February 29.

SKT Survey #2 (February 13 through 16) collected spent male and female delta smelt, confirming the onset of spawning. The 3-day, 3-station average temperature surpassed 12°C in late February, the temperature at which it is assumed widespread spawning has begun and therefore indicating a transition from Action 2 into Action 3 of the OCAP RPA.

By mid-March, hydrology began to change. Sacramento River flow at Freeport peaked on March 18 at 45,000 cfs and remained above 20,000 cfs until March 24. Freeport flows increased above 20,000 cfs again on March 28 and remained elevated until April 9. The last two occurrences of adult salvage were on March 27 and April 17, bringing the season total to 203. Throughout these increased flow periods, the SKT survey rarely detected delta smelt in the central and southern Delta, turbidity in the interior Delta remained low, and the SWG did not see the need to recommend a change in OMR flow to the Service.

An increase in young-of-year (YOY) delta smelt salvage occurred in May. Salvage remained relatively high from May 8 through the remainder of the month. 20mm Survey #5 (May 7-10) indicated a widespread distribution of YOY delta smelt, but very few individuals detected in the interior Delta. 20mm Survey #6 (May 21-24) indicated a slightly less widespread distribution, with a similar interior Delta distribution as in Survey #5. The SWG agreed that the numbers did not reach a high level of concern requiring a change in operations, as detailed in the OCAP BO RPA because seasonal cumulative salvage had not reached the

total concern level of 12,851, the center of delta smelt distribution appeared to be out of the south and central Delta, and -5000 OMR was within the allowable level of the OMR range of action 3 of the RPA.

20mm Survey #8 (June 18-21) indicated a favorable distribution, as well as an increase in the size of the collected larvae (average size was >20mm). Hydrological conditions remained stable throughout June. No recommendation was made. The last meeting of the SWG was June 25.

Chapter 4. Water Operations Summary for Water Year 2012

In WY 2012, hydrologic year-types in both the Sacramento and San Joaquin river basins were classified as below-normal. No export curtailments were necessary at the Delta water export facilities for the protection of delta smelt. Some export curtailments were required to meet NMFS BO's RPA requirements for salmon and steelhead during the January to June period, when a -5,000 cfs OMR flow cap was in place.

Please refer to Figure 3 for the following discussions.

4.1 Export Pumping

The combined Project export rate averaged approximately 9,000 cfs in December and 6,000 cfs in January. The remainder of the spring saw a continued lower export rate, with February averaging 3,700 cfs, March averaging 3,300 cfs, April averaging 2,200 cfs, May averaging 3,100 cfs, and June averaging 3,300 cfs.

4.2 River Flows

Relatively steady hydrology continued from December through February, broken by a small pulse in the third week of January. This small pulse brought slightly elevated turbidity levels at Freeport, which decreased to lower levels within a few days. An early spring pulse, which peaked at approximately 45,000 cfs on the Sacramento River, began in mid-March and continued with elevated flows (20,000 to 30,000 cfs) until early May. The first few days of this spring pulse brought elevated turbidity levels to Freeport, but quickly returned to lower levels. Flows on the Sacramento River for the remainder of May through the end of June ranged between 10,000 and 15,000 cfs. The San Joaquin River remained below 2,000 cfs until early April. From early April through the end of May, San Joaquin River flows ranged from 2,200 to 4,400 cfs. In June, flows on the San Joaquin River ranged from 1,200 to 1,700 cfs. Turbidity readings from the San Joaquin River system generally remained low, with a few elevated readings over a short duration occurring from the Mokelumne River. Turbidity levels at the interior Delta stations remained low throughout the season.

4.3 Delta Outflow and the Winter Pulse

Delta outflow generally parallels Sacramento River flows, depending on the rainfall and snowfall patterns throughout the water year. Although Delta outflow exhibited a late January pulse, and turbidity levels did increase at Freeport, the flows did not contain as much sediment as would be expected from a first-pulse turbidity event. After flows declined at the end of January, outflow remained relatively steady between

10,000 and 14,000 cfs until the mid-March pulse. Outflow remained above 30,000 cfs for only five days, and peaked again at the end of March and remained above 30,000 cfs for seven days. Turbidity levels rose slightly for these events, but dropped quickly.

Although turbidity levels did not increase to a level expected for winter pulse, this is still likely to have provided a cue to adult delta smelt to begin their migration to spawning areas, and therefore was an important event for the species. Because the winter pulse occurred after spawning had already begun, it is presumed that this pulse did not serve as an adult migration cue, but rather, provided outflow conditions for emerging and developing larvae and juveniles.

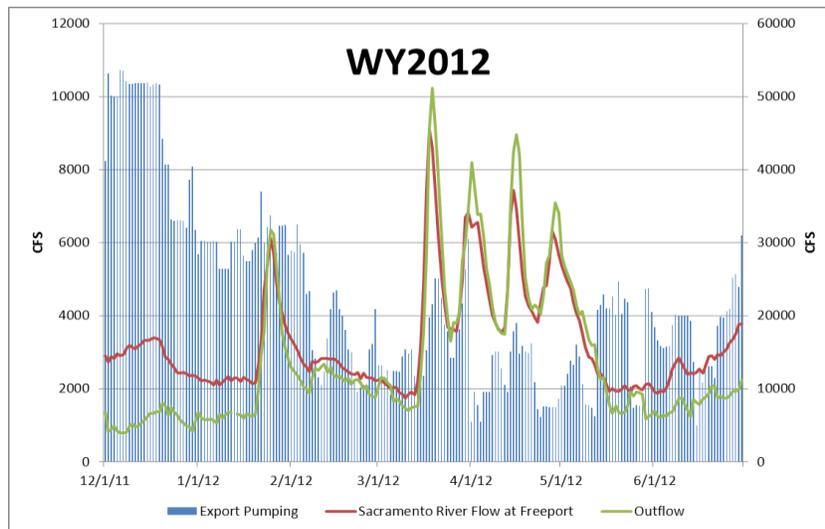


Figure 3. Export pumping, river flow, and outflow levels for WY 2012.

Chapter 5. Summary of Selected Fish Monitoring Data

Most research and monitoring in the Bay-Delta are coordinated through the IEP. The IEP is led by state and federal agencies, with university and private partners. There are currently 16 fish monitoring programs that are implemented each year across the entire estuary. Each study has the potential to capture delta smelt to some degree; however, only a few are commonly used to index the abundance and distribution of delta smelt (Figure 4).

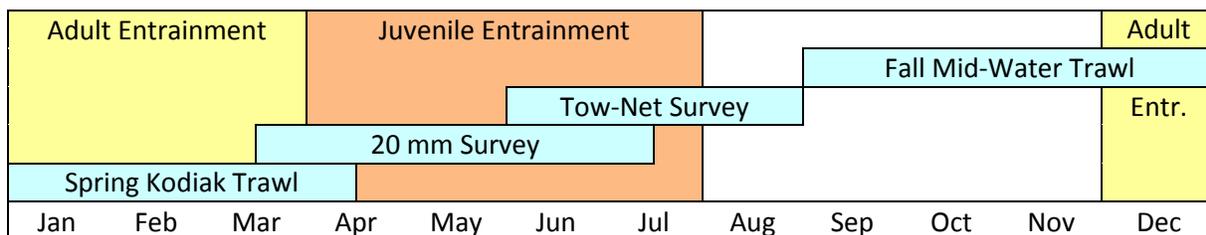


Figure 4. Approximate timetable of the primary surveys used to assess relative abundance and distribution of delta smelt.

The FMWT and the Summer Tow-Net Survey (STNS) are the two longest-running IEP fish monitoring programs that are used to index delta smelt abundance. Neither was originally designed specifically to sample delta smelt. Two more recent programs, the 20-mm Survey and the SKT survey, were designed specifically to sample delta smelt. Each of these four sampling programs targets different life stages and encompasses the entire life cycle and distribution. Data from the FMWT (September – December) are used to calculate relative indices of abundance and is used in the BO to calculate allowable incidental take for Project operations. Data from the SKT (January – May) are used to monitor distribution and spawning readiness of adults. Data from the 20-mm Survey (March – June) are used to monitor the distribution and relative abundance of post-larval delta smelt. Data from the STNS (June – August) are used to monitor the distribution and relative abundance of juvenile delta smelt.

Both the state and Federal water projects utilize behavioral-barrier fish screens designed to route fish away from export water and into a fish “salvage” facility where they are collected, counted, and trucked to a release site in the Delta. The salvage process was designed for young Chinook salmon and striped bass; delta smelt that enter the facility are not thought to survive the release process and are counted as mortality. The fish salvage facilities report delta smelt and longfin smelt salvage to the Service and publish the data on a public website. (BO, pp 143-145).

Hydrologic information is available from the California Data Exchange Center (CDEC) and the U.S. Geological Survey (USGS). Particle Tracking Modeling is supplied to the SWG by DWR when requested.

Chapter 6. Discussion of Turbidity Criteria

The objective of Component 1, Action 1 of the RPA, is to reduce entrainment of pre-spawning adult delta smelt during the December through March period by controlling OMR when these fish are vulnerable. Action 1 is intended to protect delta smelt moving into freshwater prior to spawning by limiting average daily OMR for a 14-day period while the first pulse of winter precipitation is moving through the Sacramento River Watershed. Movement of delta smelt during this period is associated with increased entrainment as reflected by salvage at the state and Federal facilities.

After December 20, the implementation of Action 1 is based on two criteria; one is salvage-based and the other is turbidity-based. The RPA specifies turbidity exceeding 12 NTU for three days at Prisoner’s Point (PPT), Holland Cut (HOL), and Victoria Canal (VCU) stations as the turbidity-based criterion for implementation (Figure 5). Thus, turbidity at these three stations must be reflective of conditions in the Sacramento River that lead to entrainment events for delta smelt in order to meet the intent of the Action.

Action 1 has not been implemented since the promulgation of the biological opinion in December 2008 because the criteria for implementation were never met or exceeded. WY 2009 and WY 2010 were classified as dry and below normal, respectively. WY 2011 was classified as wet and WY 2012 was classified as below normal for the Sacramento River system. The SWG has noted that entrainment events tend to be associated when flows on the Sacramento River exceed 25,000 cfs. In WY 2012, flows on the Sacramento River did not exceed 25,000 cfs until mid-March. In WY 2011, flows on the Sacramento River

exceeded 25,000 cfs on December 8, 2010, and did not drop below 25,000 cfs until January 22, 2011. In WY 2010 flows on the Sacramento River exceeded 25,000 cfs on January 20, 2010, and remained above 25,000 cfs until February 18, 2010. Using 25,000 cfs as an indicator of winter pulse flow conditions, the 3-station 3-day average (herein after referred to as the “3x3 rule”) failed to reflect the pulse flow, even in water year 2011, when flows on the Sacramento River exceeded 25,000 cfs in early December.

Criterion Stations

The criterion stations were initially selected because of their geographic location and also because turbidity data were collected at these specific gauges. Since the BO was written, many existing USGS gauging stations have added turbidity to the data that they collect. During the OCAP Science Panel Review in 2010, the Service noted the deficiency of the 3x3 rule in detecting the winter pulse and proposed an analysis of the available data to determine how best to address the problem. A complete discussion of the analysis can be found in the Service’s SWG WY 2011 Annual Review Report (Attachment 2). No further analysis was performed in WY 2012, although all additional stations continued to be monitored and reviewed during the weekly decision process.

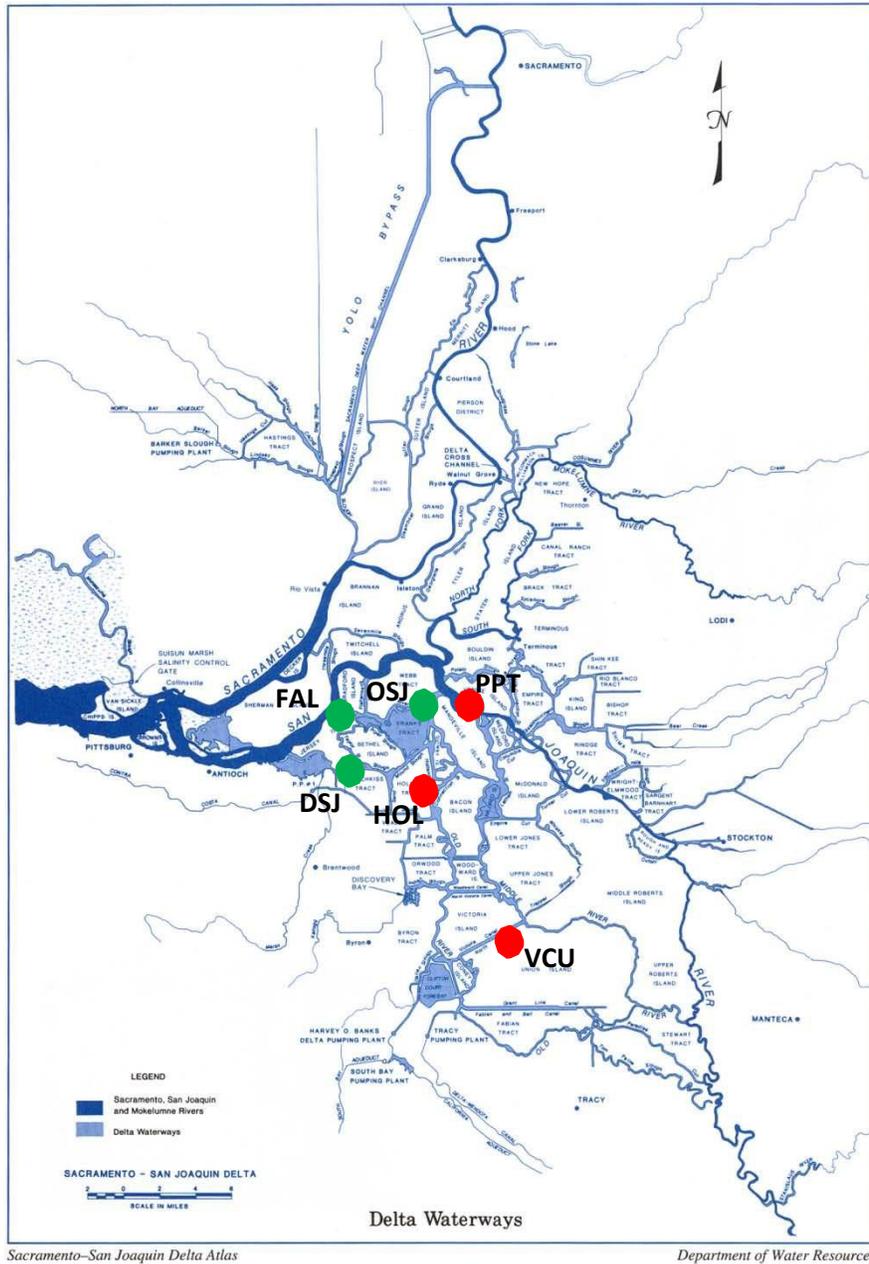


Figure 5. Map of turbidity stations monitored by the Smelt Working Group. Red dots are criterion stations specified in the RPA and green dots are additional stations.

Additional Stations

To address the apparent deficiency in the 3x3 rule, the Service undertook to track turbidity at several additional stations in the Delta and the lower tributaries, just as we did in WY 2011. We considered

turbidity from Old River at San Joaquin (OSJ), False River (FAL) and Dutch Slough at Jersey Island (DSJ) (Figure 5), as well as several other stations within the interior Delta.

Discussion

Please see the attached SWG WY 2011 Annual Review Report (Attachment 2) for a discussion of the existing turbidity criteria of RPA Action 1 and implementation.

Conclusion

The Service does not have sufficient data to construct a meaningful analysis. At this point, the only conclusion we are able to reach is that more years of observation and analysis are needed before the Service is able to use turbidity to reflect the winter pulse with confidence. We will continue to collect additional turbidity data in the Delta and the lower tributaries and provide that information to the SWG for review and discussion.

Chapter 7. Year in Review and Request for Feedback

7.1 Responses to the Water Year 2011 Panel's Recommendations

The Service responded to Panel recommendations from the Water Year 2011 Independent Panel Review in a letter dated June 20, 2012. Please refer to Attachment 3 for the complete letter.

Since the June 2012 response letter, and in response to feedback from the Water Year 2011 Panel, the Service is currently developing an "expert mathematical model" as an additional tool in making management recommendations.

7.2 Issues that arose during 2012 that are likely to be revisited by the SWG in 2013

The Service began working with the Project agencies to revise the existing protocol for handling large amounts of debris and high fish counts at the fish salvage facilities. This work is on-going.

The SWG was consulted by the Project agencies concerning the timing of larval sampling at the fish salvage facilities. A larval sampling protocol has not yet been developed; the Service will work with the Project agencies to develop and implement a protocol for larval sampling.

7.3 Successes and request for feedback

The SWG met regularly in WY 2012, mainly via conference call. In general, SWG meetings were well attended by all member agency representatives. Discussion has been facilitated through the development and use of a standardized meeting agenda beginning in WY 2010. The process of preparing, reviewing, and distributing SWG meeting notes has been facilitated through an improved internal process of management review and website coordination.

Each week, the Service distributed to the SWG for discussion the results of Metropolitan Water District's Delta Turbidity Screening Model. Modeling results distributed to the SWG members did not predict an interior turbidity event, nor did interior Delta turbidity increase during this WY.

The Service worked with USGS staff to better interpret turbidity data in WY 2011 and WY 2012 and will continue this practice into WY 2013. Because most Delta turbidity stations are new and have very few years of data available, we have not yet undertaken an in-depth analysis of turbidity station suitability. Any suggestions that the Panel may have regarding evaluation of the turbidity stations with respect to the implementation of Action 1 is welcome.

Attachment 1: Delta Smelt Risk Assessment Matrix

Attachment 2: October 2011 Annual Report on the Implementation of the Biological Opinion on the Coordinated Operations of the Central Valley Project and State Water Project (“OCAP” Biological Opinion), Water Year 2011.

Attachment 3: June 20, 2012, Draft Response to the 2011 Independent Review Panel (IRP) on the Implementation of Reasonable and Prudent Alternative (RPA) Actions Affecting the Long-Term Operations of the State and Federal Water Projects.