Napa River Fisheries Monitoring Program
Final Report
2002

Prepared for

U.S. Army Corps of Engineers

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EXECUTIVE SUMMARY

The Napa River/Napa Creek Flood Protection Project was designed by the Napa County Flood Control and Water Conservation District and the U.S. Army Corps of Engineers to provide flood protection and improve habitat in the vicinity of the City of Napa by reconnecting the Napa River to its floodplain, creating wetlands throughout the area, maintaining fish and wildlife habitats, and restoring the natural characteristics of the river. The Napa Project is being implemented along 6.9 miles of the Napa River in Napa County, California. The Project features include dike removal, channel modifications to create floodplain and marsh plain terraces, levees and floodwalls, bridge relocations, pump stations, and maintenance roads/recreation trails for the reach of the river from Highway 29 to Trancas Street. The Fisheries Monitoring Program involves sampling the enhanced areas and the surrounding habitats to evaluate the use of the areas by various fish species. The purpose of the Fisheries Monitoring Program is to determine fish use of the restored and created habitats (open water, marsh plain, and floodplain) created by the Napa Project, with special emphasis on threatened and endangered species.

Fish were captured using beach seines, otter trawls, purse seines, and fyke nets. The otter trawl and purse seine were fished actively in the open water, marsh plain, and floodplain terrace sites, during high tide slack water. The beach seine was fished in the marsh plain and floodplain terraces at varying high tidal heights. Fyke nets were used in small channels in the marsh plain terrace where fish were likely to be concentrated during a falling tide.

Sampling to date has documented that restoration of the area is already providing habitat for native and non-native species. A total of 6,993 adult and juvenile fish, consisting of 26 native and non-native species, have been caught to date (July 2001 to July 2002). An additional 3,800 larval delta smelt were captured in 20 mm tow-net surveys operated by CDFG in the mainstem Napa River between March and May of 2001, along with over 51,500 larval fish of 16 other species. Sampling for adult and juvenile fish species in 2002 incidentally captured an additional 1,309 larval fish, dominated by longfin smelt. The restored South Wetlands Opportunity Area is already showing use by Sacramento splittail. The dominant species in the area were Pacific herring and inland silversides, and the listed species captured were Sacramento splittail, delta smelt, and steelhead. The sampling program to date (March 2001 to July 2002) has documented use of the Napa Project area by 62,872 larval, juvenile, and adult fish of 30 species. The number of fish captured varied widely between sampling sites within the Napa Project area.

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Annual Report
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1 INTRODUCTION

1.1 Background

Otter trawl Site 1B-1, April 2002.

The Napa River/Napa Creek Flood Protection Project ("Napa Project") was designed by the Napa County Flood Control and Water Conservation District and the U.S. Army Corps of Engineers (USACE) to provide flood protection for and improve habitat in the vicinity of the City of Napa by reconnecting the Napa River to its floodplain, creating wetlands throughout the area, maintaining fish and wildlife habitats, and restoring the natural characteristics of the river. The Project consists of five separate contracts developed as a cooperative effort between the City of Napa, Napa County, the USACE, Community Coalition, Federal and State resource agencies, and consultants. Construction of the Project is currently phased over seven years from 2000 through 2006.

The Napa River Fisheries Monitoring Program (FMP) was developed as a requirement of the 9 April 1999 U.S. Fish and Wildlife Service (USFWS) Biological Opinion for the Napa Project. The FMP is primarily designed to detect the presence of fish species in the program area before and after construction of the Napa Project. Fish habitat restoration features of the flood protection project are being evaluated to determine use of the area by various fish species. A work plan for the FMP was published in March 2002 (USACE 2002a). The FMP is Interagency Ecological Program Element 2002-105.

1.2 Project Description

The Napa Project is being implemented along 6.9 miles of the Napa River in Napa County, California (Figure 1-1). Project features include dike removal, channel modifications to create floodplain and marsh plain terraces, levees and floodwalls, bridge relocations, pump stations, maintenance roads, and recreation trails for the reach of the river from Highway 29 to Trancas Street.

The Napa Project also includes the Napa River Enhancement Plan for the South Wetlands Opportunity Area (SWOA). This enhancement plan calls for restoration of physical and biological processes in the Napa River estuary and the SWOA, extending along the west side of the river from Newport North Marina to the Highway 29 bridge. The enhancement plan also calls for creating 104 acres of emergent marsh, converting 262 acres of farmland to emergent marsh, and creating and enhancing 136 acres of seasonal wetlands (USACE 2001a). The enhancement plan includes lowering levees, breaching dikes, and constructing marsh plain and floodplain terraces.

The FMP involves sampling of the enhanced areas and surrounding habitats to evaluate the use of the areas by various fish species. Information gathered as part of the FMP will potentially influence future management decisions and restoration designs, and serve to validate environmentally fish-friendly designs in future flood control programs. Data collected as part of the FMP will also be used to guide the adaptive management decisions described in the Mitigation Monitoring Program for the Napa Project (Jones and Stokes 2001).

1.3 Construction Project Status

The construction contracts completed to date are the Demolition East Side, Kennedy Park to Third Street (January - September 2002), and the Third Street Bridge Relocation (July 2000 – August 2002). Contract 1A (terrace excavation, construction of vineyard dike) was completed Fall of 2000. Projects currently in progress include the Napa Valley Wine Train Phase 1 Relocation, which will be completed in January 2003; the Soscol Avenue Bridge Relocation, which will be completed in May 2004; and the Revegetation Contract for Contract 1A, which is ongoing, to be completed Fall of 2003. Other work in progress includes the Petroleum Contaminated Soil Remediation (June 2002 to October 2003), which includes creation of marsh plain terrace and floodplain terrace habitat, completed to Oil Co Road in December 2002. The rest of the remediation, to Sixth Street, will be completed in Summer 2003. Contract 1B is a marsh plain and floodplain excavation upstream of the Contract 1A location and is scheduled to begin in Summer 2004 (Mike Dietl, USACE, pers. comm., 2003).

Otter trawl Site 1A-2, June 2002.

1.4 Fisheries Monitoring Status

The purpose of the FMP is to determine fish use of the restored and created habitats (open water, marsh plain, and floodplain) created by the Napa Project, with special emphasis on threatened and endangered species. Sampling efforts in 2002 consisted of monthly sampling between February and July, plus semi-monthly sampling in April.

Although this annual report is for 2002, it includes both 2001 and 2002 data where appropriate in order to provide a full year of sampling results (July 2001 - July 2002). Tables and figures are labeled as to whether the data included represents information for both 2001 and 2002, or for only 2002.

Otter trawl Site 1A-1, May 2002

The FMP has the following objectives:

1) Document presence and relative abundance of fish species (particularly delta smelt and Sacramento splittail) utilizing restored and created habitats.

2) Document life stages and seasonality of fish species (particularly delta smelt and Sacramento splittail) in restored and created habitats.

3) Determine if correlations exist between collected fish species and environmental conditions at each sampling site.

In order to meet these objectives, the following hypotheses were developed as part of the monitoring program:

- Fish, in particular delta smelt and Sacramento splittail, will use habitat created or restored by the Napa Project.
- Certain life stages of fish species, in particular delta smelt and Sacramento splittail, will use specific habitat types in the Napa Project area during specific seasons and environmental conditions.

Sampling to date has documented that the restoration of the SWOA is already providing habitat for native and non-native species. In 2001, a total of 57,120 fish from 24 species was sampled. Of these, the California Department of Fish and Game captured 54,570 larval fish representing 17 species with a 20-mm tow net, during a focused larval sampling effort. Another 2,550 juvenile and adult fish representing 17 species were captured during other parts of the FMP. In 2002, sampling focused on gear types for capturing non-larval fish. A total of 5,752 fish were sampled: 4,443 juvenile and adult fish from 22 species, and incidental capture of 1,309 larval fish from 5 identified species. To date (July 2001 - July 2002), a total of 6,993 juvenile and adult fish have been sampled, representing 26 species.

Submerged fyke net at Site 1A-7, May 2002.

Native species captured in 2002 included Sacramento splittail, delta smelt, Pacific herring, steelhead, chinook salmon, threespine stickleback, staghorn sculpin, prickly sculpin, Pacific sanddab, long-jawed mudsucker, and tule perch. Introduced species captured included yellowfin goby, American shad, threadfin shad, golden shiner, shimofuri goby, channel catfish, black crappie, striped bass, inland silverside, mosquitofish, common carp, and wakasagi.

Subsequent sections of this document present the methods and results of the FMP to date, and begin to address the objectives and hypotheses stated above. Background information, data, and reports associated with the FMP (including this report) are available online at *http://www.napariverfishmonitoring.org*.

2 METHODS

Sampling methods consisted of deploying various gear types (Table 2-1) at selected sites (USACE 2001b) on a monthly or semi-monthly schedule (Table 2-2), to capture various life stages of the fish species that occurred in the area.

Table 2-1. Napa River Fisheries Monitoring Program: Gear Specifications and Level of Effort in 2002.

Gear/ Sampling Technique	Dimensions	Mesh Size	Site Locations	Sampling Duration	Number of Samples per Sampling Event
Fyke Nets	Opening: 0.9-1.2 m Length: 6.1-9.2 m Leads: 3.1 m	0.64 cm	SWOA Slough (1A-6), SWOA Marsh (1A-7), SWOA Marsh (1A-8), SWOA HB Marsh (1A-10)	4-6 hours	1 set
Otter Trawl	Opening: 1 x 2.5 m Length: 5.3 m	Variable: 0.64cm – 3.8cm	Open Water-HB (1A-2), Open Water (1A-1), Open Water (3-1), Open Water (2-1), Open Water (1B-1)	10-15 minutes per tow, at 1-2 knots	2-3 tows
Purse Seine	Length: 30.5 m Depth: 1.8 m	0.64 cm	SWOA Levee Breach (1A-9), Open Water (3-1)	20-30 minutes per set	2-3 sets
Tow-net	Opening: 1.51 x 1.51 m Length: 5.4 m	1600 :	Open Water (1A-1), Open Water (1B-1), Open Water (2-1)	10 minutes	3 tows
Beach Seine	Length: 30.5 m and 15.24 m Depth: 1.2 m Plus bag	0.64 cm	Floodplain Terrace (1A-4), Marsh Plain Terrace (1A-3)	20 minutes per haul	2-3 hauls

In this report, the period referred to as July 2001 through July 2002 represents the sampling efforts during July through December of 2001 and February through July 2002.

Table 2-2. Napa River Fisheries Monitoring Program: Monthly Sampling Schedule in 2002.*

Site	Classification	Description	Feb 25	Mar 25-26	Apr 8-9	Apr 22-23	May 22-23	Jun 20-21	Jul 19
1A-1	Open water	Open water (River)	OT	OT	OT	OT	OT	OT	-
1A-2	SWOA	SWOA slough	-	OT	OT	OT	OT	OT	-
1A-3	Marsh plain	Marsh plain terrace	BS	BS	BS	BS	BS	BS	BS
1A-4	SWOA	Flood plain terrace	BS	BS	BS	BS	BS	BS	BS
1A-6	SWOA	SWOA marsh	-	FN	FN	FN	FN	FN	-
1A-7	SWOA	SWOA marsh	-	FN	FN	FN	FN	FN	-
1A-8	SWOA	SWOA marsh	-	FN	FN	FN	FN	FN	-
1A-9	SWOA	SWOA levee breach	-	PS	PS	PS	PS	PS	-
1A-10	SWOA	SWOA HB marsh	-	FN	FN	FN	FN	FN	-
1B-1	Open water	Open water (River)	OT	OT	OT	OT	OT	OT	-
2-1	Open water	Open water (River)	OT	OT	OT	OT	OT	OT	-
3-1	Open water	Open water (River)	-	PS	PS	PS	PS	PS	-

*FN = fyke net; PS = purse seine; OT= otter trawl; BS = beach seine

2.1 Site Selection

On 8 June 2001, Stillwater staff and USACE personnel established 13 fish monitoring sample sites along 6.9 miles in the Napa Project area, including the SWOA (Figures 2-2 through 2-5). Individual sites were typically marked by 1.3-2.4 m (6-8 ft) metal posts driven into the substrate, spray-painted orange, and flagged with green tape. Chaudhary and Associates surveyed the selected sample sites (USACE 2001b) to a tolerance of 0.3 m for latitude and longitude, and 0.15 m for elevation. The 13 sites represent three habitat types that may attract breeding and rearing of delta smelt and Sacramento splittail: marsh plain terrace, floodplain terrace, and open water habitat. There is a total of seven SWOA sites, including two sites in the Horseshoe Bend channel and five sites north of the levee breach. There is one marsh plain site, which can be found east of the SWOA area. The four open water sites can be found throughout the main waterway of the Napa River. The open water sites begin just east of the SWOA in the main channel and continue throughout the 6.9 mile project area. Table 3 summarizes locations of sampling sites for 2002. Three sites were subject to minor relocations from 2001 to 2002. One site was removed from the sampling list due to ineffectiveness and lack of fish caught (Site 1A-5). These changes are noted in Table 2-3 and are detailed in the site descriptions that follow.

Beach seining at Site 1A-4.

2.2 Site Locations

Sampling locations are documented in Figures 2-1 through 2-4. Locations and elevations of the sites are shown in Table 2-3. Brief descriptions of each site are provided below.

Table 2-3. Location of Sampling Sites for the 2002 Napa River Monitoring Program.

Site No.	Latitude			Longitude			Elevation (feet)
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds	
1A-1	38	15	17.7	122	17	0.3	N/A
1A-2**	38	14	54.567	122	17	16.942	4.0
1A-3	38	16	2.0674	122	17	11.425	0.6
1A-4*	38	16	1.378	122	17	15.732	5.7
1A-6**	38	15	13.487	122	17	37.573	-3.2
1A-7	38	15	21.592	122	17	34.580	-0.5
1A-8	38	15	21.339	122	17	38.150	-1.1
1A-9	38	15	11.124	122	17	38.159	4.3
1A-10**	38	14	57.725	122	17	16.777	-3.3
1B-1	38	16	23.1	122	17	4.7	N/A
2-1	38	17	10.1	122	17	0.2	N/A
3-1	38	18	8.708	122	16	43.884	26.5
Standpipe*	38	16	4.838	122	17	26.263	2.6

* Standpipe and a t-bar post at Site 1A-4 were used for obtaining position bearings during roving beach seines in the SWOA if a GPS signal could not be recorded.
** Positions approximate due to minor relocations in 2002.

Site 1A-1 is an otter trawl site (Figure 2-1). The site position was previously established by CDFG for the 20 mm tow-net surveys in 2001. This site is located by the SWOA in the main Napa River channel, in close proximity to the peninsula formed by Horseshoe Bend.

Site 1A-2 is an otter trawl site that was originally located in the upper reaches of the main drainage channel in Horseshoe Bend. However, due to excessive and repeated clogging of the otter trawl by debris (automobile tires), the site was relocated to the main channel that flows north-south through the SWOA (Figure 2-1).

Site 1A-3 is a beach seine site located on the west bank of the main channel of the Napa River, just upstream of the JFK Park boat ramp (Figure 2-2). The site is located on bare earth or mud where a levee was removed by the USACE as part of the Napa Program. The site is inundated during high tides. Site 1A-3 was originally a fyke net site, but was more effectively sampled with a beach seine.

Site 1A-6: Fyke net site in the SWOA, May 2002.

Site 1A-4 is an area at the north end of the SWOA sampled by beach seine (Figure 2-2). The roving beach seine was used to sample various locations in the marsh during the flood, high, and ebb tides.

Site 1A-5 was a fyke net site that was initially sampled through November, 2001 (Figure 2-1). However, since the site was not conducive to effective gear deployment and no specimens were ever captured, sampling effort was redistributed to other sites.

Site 1A-6 is a fyke net site (Figure 2-1). The location of this site was moved due to safety and fish injury concerns. The placement and removal of the fyke net in high velocity water was dangerous, and allowed for potential injury and mortality to the fish captured. The site was first moved to the east side of the terrace where water velocities were lower. The site is currently located about 7 m west from its initial location, across the main channel, in a small channel that drains the southwest part of the SWOA. The substrate is mud. This site is currently positioned to sample fish that concentrated in the tidal channel during a receding tide.

Site 1A-7 is a fyke net site (Figure 2-1). This site is located in a tidal channel that drains from the eastern side of the SWOA marsh into the main marsh channel, which drains into Horseshoe Bend. This site was established to sample fish that concentrated in the tidal channel during a receding tide.

Site 1A-8 is a fyke net site similar to Site 1A-7, except that it is located in a tidal channel that drains from the western side of the SWOA marsh, instead of the eastern side (Figure 2-1). This site was located to sample fish that concentrated in the tidal channel during a receding tide.

Purse seine at Site 1A-9.

Site 1A-9 is a purse seine site located at the levee breach where the main SWOA marsh channel enters Horseshoe Bend (Figure 2-1). This site was established to sample for fish concentrated in mid-water at the levee breach.

Site 1A-10 is a fyke net site located slightly upstream of the peninsula levee breach (Figure 2-1). The substrate is mud. This site was established to sample for fish concentrated in the channel during a receding tide. The location of this site was moved due to safety and fish injury concerns. The placement and removal of the fyke net in high velocity water was dangerous, and allowed for potential injury and mortality to the fish captured. The site has been moved about 9.5 m northwest from its initial location to an outflow channel that allows easier boat and wading access.

Retrieving a fyke net at Site 1A-10, May 2002.

Site 1B-1 is an open water otter trawl site. This site is located in the main Napa River channel, 1 km upstream of the JFK Park boat ramp (Figure 2-2).

Site 2-1 is an open water otter trawl site. This site is located in the main Napa River channel, at Jacks Bend (Tulocay Creek confluence) (Figure 2-3).

Site 3-1 is an open water purse seine site. This site is located in the main Napa River channel, just downstream of the First Street Bridge (Figure 2-4). This site was chosen so that a more upstream mid-water habitat area could be sampled.

2.3 Gear Types

Various gear types tested in 2001 and subsequent adjustments are presented in detail in the 2001 Napa River Fisheries Monitoring Program Annual Report (USACE 2002b). Except where noted, sampling during the February 2002 through July 2002 period used these same gear types and methods.

2.4 Quality Control Procedures

The methodology and standard operating procedures implemented for quality control (Q/C) are described in the Final Workplan and QA/QC Plan for Implementation of the Year 2001 Napa River Fisheries Monitoring Program (USACE 2001a) and summarized below.

2.4.1 Preparation of Equipment

All equipment was prepared and calibrated prior to use each month. The following list itemizes equipment preparation procedures:

- YSI 85 meter (DO, Salinity, Temperature, Conductivity): calibrate to manufacturer's specifications.
- General Oceanics flow meter: Initially calibrate the number of revolutions with the distance traveled through the water. Recheck calibration prior to use each month.
- The "calibration checklist" on the data sheets was used to verify completed calibration procedures for all equipment, and completion was noted on the data sheets for each field effort.

2.4.2 Sample Replications

Replicate samples of two or three tows, or sets, were performed at sites where an otter trawl, purse seine, or beach seine was used.

There were no replicate samples taken at the fyke net sites. Individual fyke nets were set monthly or semi-monthly at each site, and generally "fished" from high slack water until their retrieval near low water.

2.4.3 Sample Preservation, Transportation, Storage and Disposal

Specimens used to confirm positive fish species identification in larval and adult samples collected by the FMP Implementation Team were preserved in 10 percent formalin and placed in glass or plastic specimen jars for storage. Jars were labeled with date, time, location, and the sample collector's name. Fish collected for fish identification are currently being stored at Stillwater Sciences in Davis.

2.4.4 Sample and Data Collection

Field data were collected on standard forms to minimize the potential for missing values. The Field Leader, or other crew members that did not record the data, reviewed the datasheets on a daily basis for the following:

- Completion of all data fields
- Reasonableness of measurements
- Legibility of recorded data

The reviewer initialed each data sheet as having been reviewed for accuracy and completeness before leaving the site on each sampling date.

2.4.5 Data Summary and Processing

Following field data checking, additional Q/C measures were implemented during data entry and data summary. During data entry into the relational database, the database software was able to prevent or detect many types of errors with the following methods:

Mandatory Fields. Although not all fields must be entered for every record, there are many mandatory fields, such as sampling-site identification number and date.

Data Format Checks. The data entry form prevented the wrong type of data from being entered into a field. For example, text could not be entered into numeric fields, and numeric data must be entered with the correct decimal placement.

Lookup Tables. Many data elements had unique values that must be used; such as fish sample method and sampling plot identification number. Rather than enter values for these fields and risk making a typographical error, lookup tables were used with data entry drop-down menu lists, so that only a listed, valid value would be selected.

Numeric Range Tests. For numeric data elements, such as fish counts, the value entered was tested against preset minimum and maximum values, to ensure that the data entered was within the valid range.

Incomplete or Illegible Data. If the field data collection forms had illegible or missing mandatory data, the data was corrected and a member of the QA/QC team revised the database with the correct information.

Data Entry Report and Field Form Comparison. At the completion of each data entry session, the data entry technician printed out a report of the data entered. This printout was compared to the field data entry forms for accuracy.

2.5 Sampling Methods

Four gear types were used to sample fish in the Project area, with the use of a 5.2 m (17 ft) Boston Whaler (in 2001) or 6.4 m (21 ft) aluminum workboat. Fyke nets were used in small channels in the marsh plain terrace where fish were likely to be concentrated during a falling tide. The otter trawl and the purse seine were fished in the open water sites, during high tide slack water. The beach seine was fished in the marsh plain and floodplain terraces at varying high tidal heights and during flooding periods. Gear specifications and replicate numbers can be found in Table 2-1.

2.5.1 Fyke Nets

Deploying fyke net at Site 1A-7, May 2002

Fyke nets were deployed to capture fish in shallow marsh areas with moderate to swift current. The fyke nets were approximately 3.6 m (12 ft) long with 0.64 cm (¼ in) mesh. Each net consisted of seven 0.91 m (3 ft) diameter hoops with two 3 m (10 ft) leads. Fyke nets were secured in the current by t-posts that had been driven into the substrate. Four pieces of PVC pipe were attached to the entrance of the net and each wing, and slid over the t-posts. The pipe facilitated deployment and retrieval, and a secure fit of the nets to the t-posts. Fyke nets were deployed during daytime high tides and were fished for approximately four to six hours during the receding tide. During the receding tide, the fyke net wings diverted the fish into the traps. The field crew retrieved the nets during the ebbing tide, and collected all fish that were captured. All fyke nets were removed from the water after each sample was collected. Catch per unit effort (CPUE) was calculated by dividing the number of fish of each species by the time the fyke net was fished (beginning at the time of slack tide).

2.5.2 Otter Trawls

Otter trawls are funnel-shaped nets used to sample benthic and mid-water column fish. The tail, or "cod" end of the net is 0.64 cm (¼ in) mesh, and the mouth opening is 1 x 2.5 m (8.2 ft). The length is approximately 5.3 m (17.4 ft). The otter trawl was towed from the stern of the boat. The otter trawls were fished once or twice a month during daylight hours, around high tide slack water. The duration of each trawl was short (approximately 10-15 minutes), to minimize stress to captured fish. The water volume sampled by the trawl was calculated using a General Oceanics flow meter that was towed from the side of the boat. The flow meter was calibrated over a measured distance prior to sampling. Volume was calculated by multiplying the distance sampled (represented by flow meter readings that accounted for the horizontal distance traveled and the current) by the known area of the net opening. CPUE was calculated by dividing number of fish of each species by the volume of water sampled.

2.5.3 Tow-nets

In 2001, 20 mm tow-net surveys were conducted by CDFG, targeting larval fish in the mid-water zone. Methods and results from the 2001 tow-net sampling are presented in the 2001 report (USACE 2002b). Tow-nets were not used as a method of sampling in 2002.

2.5.4 Purse Seines

A purse seine was used to sample fish concentrated in the mid-water zone. The seine was a 30.4 m (100 ft) long by 2.5 m (8 ft) deep net with 0.64 cm (¼ in) mesh. The top of the net was connected to floats which supported the net in open water. The net was deployed off the boat in a circular pattern. Once the circle was completed, the purse line along the bottom of the net was pulled tight to seal the opening, trapping the fish. The volume of water was sampled by estimating the length and the width of the deployed seine once the enclosure was complete. CPUE was calculated by dividing the number of fish of each species by the water volume.

2.5.5 Beach Seines

Two beach seines were used alternately to target fish in shallow water habitats with low to moderate current. The first beach seine measured 30.5 m (100 ft) long by 1.8 m (6 ft) high. The second seine measured or 15.3 m (50 ft) long, and was also 1.8 m (6 ft) high. Both seines had 0.64 cm (¼ in) mesh and a 1.8 m^2 (6 ft^2) bag. Once deployed, the seine created a net wall extending from the surface with a floated line, to the bottom of the water column with a lead line. The mesh panels hanging from the float line to the lead line prevented fish from escaping. One sampling method involved deploying the beach seine from the boat, which required one end of the seine to be secured onto the bank and one end secured to the boat. The boat was backed away from the shore, deploying the net, and then was driven back to the shore downstream or upstream of where the seine was secured on the bank. The seine was then pulled onto the shore by hand. Alternatively, in shallow water, the beach seine was stretched out between two people and dragged through the water toward shore or back to the boat where it was hauled out of the water. Beach seining was conducted during the day, near slack water at high tide each month. The volume of water sampled was estimated by multiplying the seine width by water depth and the distance covered. CPUE was calculated by dividing the number of fish of each species by the calculated volume of water sampled.

2.5.6 Fish Processing

After the fish were retrieved from the sampling gear, they were placed into buckets with water. Fish were kept in water during processing, and gloves used where necessary and practical to minimize injury to fish. If necessary, an anesthetic such as MS222 or CO_2 was available for use. All fish specimens were collected, processed, and returned to the water as soon as possible.

The following data were recorded for fish collected at each sampling site location:

- Identification of all fish captured to species level;
- Fork length (mm). If large numbers of a non-listed fish species were captured [e.g., inland silversides], then fish were counted and a representative sample of size ranges was measured;
- Weight (g) was measured for all listed species;
- Reproductive state or spawning stage was verified for specimens of listed species by applying mild pressure to belly to examine if milt or eggs were present
- Noticeable lesions were recorded for listed species specimens and,
- Photos were taken of representative fish species

2.5.7 Larval Fish Processing 2002

The 2002 surveys incidentally captured larval fish in the adult and juvenile sampling gear (fyke nets, otter trawls, and beach seines). Larval fish captured in 2002 were processed using the larval fish processing protocol of 2001 (USACE 2002b). Larval fish were identified to determine if any listed species were sampled. For samples containing more than one hundred fish of the same species, the first one hundred were measured and lengths were estimated on the additional fish. Quality Assurance and Quality Control (QA/QC) was performed by a larval fish specialist to insure correct identification of larval fish.

2.5.8 Environmental Conditions

Environmental conditions were measured while sampling at each site on each sampling day. The Napa River flow was determined upstream of the tidal influence from the Napa River gaging station. The gaging station is located 9.6 km upstream of the Project area (38.3670°N, 122.3000°W). Napa Creek and Soda Creek tributary flows are not included as their confluence with the Napa River is below the gaging station. Digital photographs were taken at each site to document vegetation conditions, site conditions, and examples of captured fishes. These digital photographs were catalogued along with the associated site identification. The following data were collected at each site and input into the FMP database:

- Dissolved oxygen, water temperature, and salinity were measured at the surface and bottom at each site with a YSI Model 85 meter.
- Turbidity was measured using a secchi disk. The disk was lowered into the water column on a cable, and the greatest depth at which the disk could be observed was recorded in cm.
- Tidal elevation was noted daily from a Napa River gage near the Horseshoe Bend confluence. The tide elevation during each sampling event was calculated with the use of a Nautical Software tidal chart for the Napa River.
- Water depth was measured via marks on a stadia rod or with a depth sounder.
- Photos were taken with a Cannon A40 digital camera (resolution 1024x768).

3 RESULTS

3.1 Fish Relative Abundance and Distribution

The results of the FMP 2002 field effort, including the number of each species captured during each sampling effort by site and gear type, are presented in Table B-1 (Appendix B). In 2002, a total of 4,443 juvenile and adult fish were sampled, representing 11 native and 11 non-native species (Table 3-1). During the combined 2001 and 2002 sampling effort, a total of 6,993 non-larval fish (Table B-1), from 26 species (Table 3-1), were captured.

Table 3-1. Napa River Fisheries Monitoring Program: Fish Species Captured in July 2001-July 2002.

Common Name	Scientific Name	Juvenile and Adult Fish	Larval Fish	Native or Introduced
American shad	*Alosa sapidissima*	• ∗		Introduced
Arrow goby	*Clevelandia ios*		•	Native
Bay goby	*Lepidogobius lepidus*		•	Native
Black crappie	*Pomoxis nigromaculatus*	∗		Introduced
Channel catfish	*Ictalurus punctatus*	∗		Introduced
Chinook salmon	*Oncorhynchus tshawytscha*	∗		Native
Common carp	*Cyprinus carpio*	• ∗		Introduced
Delta smelt [FT, CT]	*Hypomesus transpacificus*	∗	•	Native
Golden shiner	*Notemigonus crysoleucas*	∗		Introduced
Inland silverside	*Menidia beryllina*	• ∗	•	Introduced
Jack smelt	*Atherinopsis californiensis*		•	Native
Longfin smelt [CSC]	*Spirinchus thaleichthys*	•	• ∗	Native
Long-jawed mudsucker	*Gillichthys mirabili*	• ∗	•	Native
Mosquitofish	*Gambusia affinis*	• ∗		Introduced
Northern anchovy	*Engraulis mordax*	•	• ∗	Native
Pacific herring	*Clupea pallasii*	∗	• ∗	Native
Pacific sanddab	*Citharichthys sordidus*	∗		Native
Prickly sculpin	*Cottus asper*	• ∗	•	Native
Sacramento splittail [FT, CSC]	*Pogonichthys macrolepidotus*	• ∗	•	Native
Sacramento sucker	*Catostomus occidentalis*		•	Native
Shimofuri goby	*Tridentiger bifasciatus*	• ∗	• ∗	Introduced
Staghorn sculpin	*Leptocottus armatus*	• ∗		Native
Starry flounder	*Platichthys stellatus*	•		Native
Steelhead [FT]	*Oncorhynchus mykiss*	∗		Native
Striped bass	*Morone saxatilis*	• ∗	•	Introduced
Threadfin shad	*Dorosoma petenense*	• ∗	•	Introduced
Threespine stickleback	*Gasterosteus aculeatus*	∗	•	Native
Tule perch	*Hysterocarpus traski*	• ∗		Native
Wakasagi	*Hypomesus nipponensis*	• ∗		Introduced
Yellowfin goby	*Perca flavescens*	• ∗	• ∗	Introduced

• July – December 2001
∗ February – July 2002
FT = Listed as threatened under ESA
CT = Listed as California Threatened
CSC = Listed As California Species of Concern

All gear types captured fish in 2002 (Figure A-1 [Appendix A]). The percent of fish captured by gear type were otter trawl (7 percent), beach seine (34 percent), purse seine (8 percent), and fyke nets (51 percent). The dominant species captured by each gear type were inland silversides in the beach seine (69 percent), Pacific herring in the fyke net (89 percent), striped bass in the otter trawl (64 percent), and inland silversides in the purse seine (88 percent) (Figure A-2).

The number of juvenile and adult fish captured varied widely between sampling sites within the Napa Project area (Figures A-3 through A-14). The most common non-larval species captured in 2002 was juvenile Pacific herring (n=3,338) followed by staghorn sculpin (n=372), both of which were captured mostly in the spring (Table B-1). The next most numerous species was inland silversides (n=222), followed by striped bass (n=116).

Differences in fish species composition were also observed in different habitat types from February to July 2002 (Figures A-15 through A-17). Open water habitat catches were dominated by striped bass (48 percent), followed by shimofuri goby (15 percent) and Sacramento splittail (10 percent). Marsh plain habitat catches were dominated by staghorn sculpin (47 percent) followed by threespine stickleback (16 percent), Sacramento splittail (15 percent), and yellowfin goby (11 percent). SWOA habitat catches were dominated by Pacific herring (86 percent) followed by inland silverside (5 percent), and staghorn sculpin (5 percent).

While sampling for juvenile and adult fish in the SWOA and open water habitat, larval fish were caught using beach seines, fyke nets, and otter trawls. Sampling efforts for juvenile and adult fish captured over 1,300 larval fish, including five identified species (Tables 3-1 and 3-2). The dominant larval species captured were longfin smelt (71 percent) and shimofuri goby (20 percent), followed by a few specimens of unidentified larvae (4 percent), Pacific herring (3 percent) and yellowfin goby (2 percent) (Figure A-18). All larval longfin smelt were captured in the months of March and April, while all larval shimofuri goby were captured during May and June. This may reflect seasonal differences in life history patterns, such as spawning time, or egg maturation rates between the two species. Larval longfin smelt were captured by otter trawls, fyke nets and beach seines. Larval shimofuri goby were only captured by otter trawls.

In February through July 2002, both native and non-native species were represented in the catch (Figure 3-1). Native fish dominated the catch in March through May of 2002, mostly represented by the high numbers of Pacific herring that were caught. Non-native species dominated the catch during February, June and July 2002. A notable difference can be seen when the most dominant native species (Pacific herring) and non-native species (inland silversides) are excluded from the data, a similar pattern exists with the sub-dominant native and non-native species in 2002 and in 2001-2002 (Figure 3-2). This fish species composition may change substantially when the sampling period is sufficiently long to include several years of data. Continued change in habitat and vegetation conditions in the newly created marsh plains and SWOA may also alter the species composition.

A notable difference can be seen between native and non-native species in the habitat types represented in the Napa River Project area in 2001-2002. In the open water and marsh plain habitat, introduced species represented more than 85 percent of the catch (Figures 3-3 and 3-4). In the SWOA, the fish composition dramatically changes, showing the native species dominating with 76 percent of the catch (Figure 3-5), but when the Pacific herring are excluded the introduced species dominate 80 percent of the catch (Figure 3-6).

Table 3-2. Larval fish results for the Napa River Project Area 2002.

Location Code / Gear Type / Replicate Number	Pacific herring	Longfin smelt	Northern anchovy	Yellowfin goby	Shimofuri goby	Gobidae spp.	Unidentified (damaged)	Total
Date: 3/25/02								
1A-6 Fyke	2	59	2				6	**69**
1A-7 Fyke		3						**3**
1A-4 Beach Seine (North End) 1 of 2	1	15						**16**
1A-4 Beach Seine (South End) 2 of 2	11	7						**18**
1A-2 Otter Trawl 1 of 2	2	454	3	1			34	**494**
1A-2 Otter Trawl 2 of 2		7					1	**8**
Date: 3/26/02								
1B-1 Otter Trawl 1 of 2		5						**5**
1B-1 Otter Trawl 2 of 2		29				1		**30**
1A-1 Otter Trawl 1 of 2		54					2	**56**
1A-10 Fyke		47						**47**
March Subtotal	**16**	**680**	**5**	**1**	**0**	**1**	**43**	**746**
Date: 4/8/02								
1A-1 Otter Trawl 1 of 2	1	4		1				**6**
1A-1 Otter Trawl 2 of 2		8		1				**9**
2-1 Otter Trawl 1 of 1	2	167		3				**172**
1A-4 (North End) Beach Seine 1 of 4	3							**3**
1A-4 (North End) Beach Seine 2 of 4	1							**1**
1A-4 (North End) Beach Seine 4 of 4	4							**4**
1A-10 Fyke	6	5						**11**
Date: 4/9/02								
2-1 Otter Trawl 1 of 3		15		10			2	**27**
2-1 Otter Trawl 2 of 3		1		2				**3**
1B-1 Otter Trawl 1 of 2		4						**4**
1B-1 Otter Trawl 2 of 2		2		2				**4**

Location Code / Gear Type / Replicate Number	Pacific herring	Longfin smelt	Northern anchovy	Yellowfin goby	Shimofuri goby	Gobidae spp.	Unidentified (damaged)	Total
Date: 4/22/02								
1A-4 Beach Seine 1 of 2	1							**1**
Date: 4/23/02								
1A-1 Otter Trawl 1 of 1		2						**2**
1B-1 Otter Trawl 1 of 2		34		9			2	**45**
1B-1 Otter Trawl 2 of 2		10		1				**11**
April Subtotal	**18**	**252**	**0**	**29**	**0**	**0**	**4**	**303**
Date: 5/22/02								
2-1 Otter Trawl 1 of 3					61			**61**
2-1 Otter Trawl 3 of 3				1	73			**74**
1B-1 Otter Trawl 1 of 2					13			**13**
May Subtotal	**0**	**0**	**0**	**1**	**147**	**0**	**0**	**148**
Date: 6/21/02								
1A-2 Otter Trawl 1 of 2					9			**9**
1A-2 Otter Trawl 2 of 2					40			**40**
2-1 Otter Trawl 2 of 2					63			**63**
June Subtotal	**0**	**0**	**0**	**0**	**112**	**0**	**0**	**112**
2002 Larval Fish*	**34**	**932**	**5**	**31**	**259**	**1**	**47**	**1,309**

*2001 CDFG larval fish catch efforts not included in this table.

3.2 Environmental Conditions

Physical parameters in the project area varied by season. The physical parameters during the winter months were characterized low water temperatures, very low salinities, high dissolved oxygen, and high fresh water flow (Figures A-19 through A-22). In the spring, salinity levels began to increase along with water temperatures while dissolved oxygen decreased. Summer conditions appear more estuarine-like with moderately high temperatures, low dissolved oxygen, and higher salinity levels followed by decreasing temperatures, decreasing salinities and increasing dissolved oxygen in the fall. This is presumably due to higher freshwater inflows beginning in December and tapering off in the spring. With decreased freshwater inflow in the summer and fall months, the salinities increased with increased tidal influences; temperatures increased and dissolved oxygen decreased during the summer months as the flow of fresh water through the system decreased and the ambient temperature increased. Detailed results of environmental conditions at each sample site to date are presented in Tables C-1 through C-3 (Appendix C).

The average environmental conditions for the July 2001 - July 2002 juvenile and adult fish sampling period are summarized in Table 3-3. Water temperatures during the 2001-2002 sampling period ranged from a low of 11.5^{o}C in December 2001 to a high of 26.9^{o}C in August 2001. Salinity ranged from a low of 0.2 ppt in December 2001 to a high of 26.9 ppt in August 2001, and dissolved oxygen ranged from a low of 0.11 mg/l in September 2001, to a high of 19.11 mg/l in April 2002 (Table 3-3).

The average temperatures during the 2001-2002 season were lowest in December, and steadily increased through winter and spring (December through June), followed by a steady decline again in late summer through the fall (July through November). Average temperatures between all of the sample locations peaked at 24^{o}C in summer, and dropped to 12^{o}C in the winter. Average salinities peaked in late summer and early fall at 21 ppt, and decreased through mid-fall with a sharp decline to 0 ppt in December. From December through late summer, salinities steadily increased. The average dissolved oxygen was highest in winter and spring, reaching 11 mg/l in February 2002, followed by a steady decline from late spring through the summer months to 4 mg/l, rising again in the fall (Figures A-19 through A-21).

Table 3-3. Napa River Fisheries Monitoring Program: Average Environmental Conditions During Juvenile and Adult Fish Sampling in July 2001–July 2002.

Sample Date	Location	Water Depth (m)	Water Temperature Surface (°C)	Water Temperature Bottom (°C)	Water Turbidity (cm)	Dissolved Oxygen Surface (mg/l)	Dissolved Oxygen Bottom (mg/l)	Water Salinity Bottom (ppt)	Water Salinity Surface (ppt)	Daily Mean Flow (cfs)
Jul-01	Open Water	5.8	23.3	22.3	45.8	6.0	4.0	19.6	19.0	1
	SWOA	1.0	23.0	23.1	46.6	6.5	6.6	21.4	20.7	
	Marsh Plain	0.6	24.6	24.5	106.5	5.2	5.1	19.8	19.9	
Aug-01	Open Water	4.1	22.6	21.4	45.0	6.5	3.8	20.8	20.0	0
	SWOA	2.0	21.1	21.2	54.0	4.4	3.1	22.2	22.1	
	Marsh Plain	0.2	17.8	17.8	46.0	7.4	7.4	20.9	20.9	
Sep-01	Open Water	0.3	21.4	21.4	46.0	9.8	9.8	19.9	19.9	0
	SWOA	5.7	15.9	15.7	72.5	4.9	4.6	17.2	16.9	
	Marsh Plain	-	-	-	-	-	-	-	-	
Oct-01	Open Water	-	-	-	-	-	-	-	-	0
	SWOA	0.2	17.8	17.8	46.0	7.4	7.4	20.9	20.9	
	Marsh Plain	0.3	21.4	21.4	46.0	9.8	9.8	19.9	19.9	
Nov-01	Open Water	5.7	15.9	15.7	72.5	4.9	4.6	17.2	16.9	0
	SWOA	1.2	15.7	15.7	65.5	7.2	6.6	18.5	18.5	
	Marsh Plain	2.5	15.3	15.1	68.6	4.9	4.6	17.9	17.3	
Dec-01	Open Water	6.3	11.6	11.5	23.0	9.5	9.5	0.3	0.3	293
	SWOA	0.6	11.7	11.7	21.5	9.2	9.2	0.5	0.5	
	Marsh Plain	0.6	11.9	12.0	23.0	9.8	9.8	0.2	0.2	
Feb-02	Open Water	7.5	14.6	14.0	32.0	11.2	10.8	2.2	1.8	177
	SWOA	0.5	14.6	14.6	14.8	10.8	10.2	2.4	2.5	
	Marsh Plain	0.5	14.2	13.9	15.0	10.7	11.0	0.9	0.9	
Mar-02	Open Water	6.5	14.6	13.9	40.7	9.6	6.8	2.1	0.7	177.5
	SWOA	1.0	15.7	15.6	24.0	10.3	8.7	2.7	2.5	
	Marsh Plain	0.5	15.2	14.8	46.0	10.0	9.9	0.3	0.3	
Apr-02	Open Water	6.7	18.2	17.5	45.0	10.0	8.3	3.0	2.1	64
	SWOA	0.8	19.1	18.8	22.3	10.4	10.0	4.8	4.6	
	Marsh Plain	0.6	20.8	19.8	46.0	10.6	11.8	3.1	2.8	
May-02	Open Water	6.2	18.7	18.3	29.3	7.4	6.2	3.7	3.3	27.5
	SWOA	0.7	21.0	20.2	20.3	7.2	6.2	8.2	7.2	
	Marsh Plain	0.6	20.8	20.7	18.0	7.8	7.7	5.2	5.2	

Sample Date	Location	Water Depth (m)	Water Temperature Surface (°C)	Water Temperature Bottom (°C)	Water Turbidity (cm)	Dissolved Oxygen Surface (mg/l)	Dissolved Oxygen Bottom (mg/l)	Water Salinity Bottom (ppt)	Water Salinity Surface (ppt)	Daily Mean Flow (cfs)
Jun-02	Open Water	5.8	22.9	23.0	40.8	6.7	5.4	7.5	7.4	9.5
	SWOA	0.6	23.7	23.7	30.8	7.5	7.0	11.7	11.7	
	Marsh Plain	0.8	21.9	22.0	48.0	5.5	5.4	9.9	9.8	
Jul-02	Open Water	-	-	-	-	-	-	-	-	5
	SWOA	0.5	21.5	21.5	30.0	4.9	4.9	15.9	15.9	
	Marsh Plain	1.8	20.3	22.5	36.0	6.2	6.4	14.8	14.7	

3.3 State and Federally Listed Species

Reporting requirements were established as part of the take permit for listed species (steelhead, delta smelt, and Sacramento splittail)(Table 3-4). NMFS was contacted to report the capture of a steelhead. The USFWS was notified of the captured delta smelt and an injured Sacramento splittail.

During the 2002 sampling efforts, the listed species captured were Sacramento splittail (n=79), delta smelt (n=1), and steelhead (n=1) (Table B-1). During the 2002 sampling period, splittail were caught in all months and all habitat types, including open water, marsh plain, and SWOA; and by all gear types including beach seines, purse seines, otter trawls, and fyke nets (Table 3-5; Figures A-23 through A-26). The delta smelt was captured on 26 March 2002, in a fyke net in the SWOA (Site 1A-7). The steelhead was captured on 23 May 2002, by purse seine in Site 3-1, which is the most upstream, open water site in the main Napa River channel.

Table 3-4. State and Federal Listing of Captured Species in the Napa River Project Area in 2002.

	Federal listing	State listing
Steelhead	Threatened	-
Delta smelt	Threatened	Threatened
Sacramento splittail	Threatened	Special concern
Longfin smelt	-	Special concern

Splittail were examined for their reproductive state at the time of capture. Out of the 79 splittail captured in 2002, 27 adults showed no evidence of spawning, 8 adults showed milt (males), 1 adult showed spawning colors and 43 were determined to be juveniles (Figure 3-7).

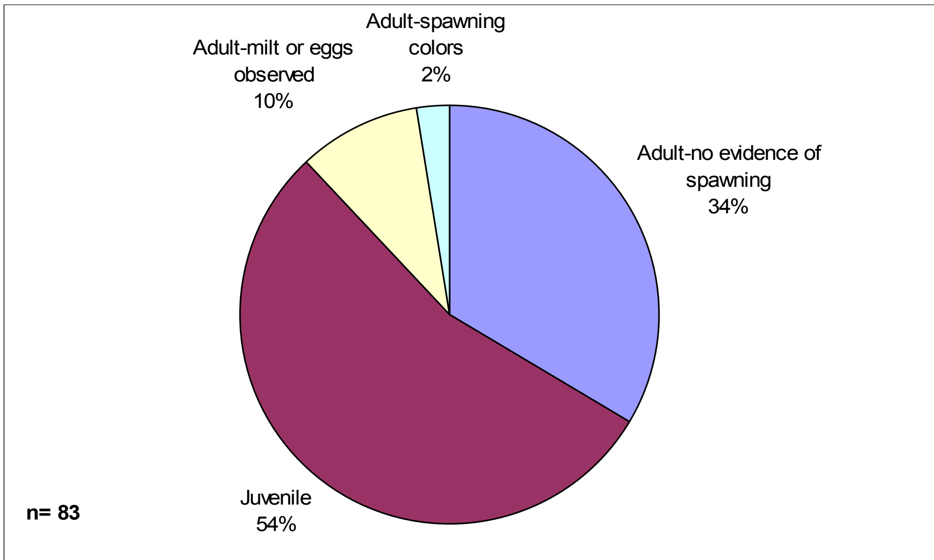


Figure 3-7. Spawning stage of juvenile and adult Sacramento splittail captured in the Napa River Project area in 2001-2002.

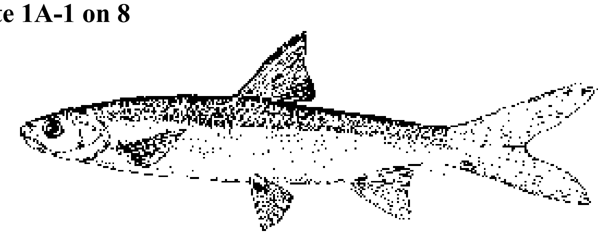
Splittail numbers were highest from April through June (Figure A-23). The CPUE for splittail was highest in marsh plains and SWOA during late April through June, although the CPUE in early April was higher in open water than in any other habitat (Figure A-24). Different gear types used in capturing splittail were more efficient during certain months (Figure A-25). The most successful gear types for capturing splittail in 2001-2002 were the beach seine, followed by the otter trawl, and fyke net (Table 3-5 and Figure A-26). The four splittail captured in 2001 were caught by fyke net and otter trawl (USACE 2002b).

At the time of release, all but one splittail were in excellent shape and released unharmed. If fish were observed with lesions or abnormalities, they were noted. Two splittail, captured on 23 April 2002 had lesions or slight abnormalities.

Table 3-5. Sacramento Splittail Caught in the Napa River Project Area in 2001-2002.

	1A-1 Otter Trawl	**1A-2** Otter Trawl	**1A-3** Beach Seine	**1A-4** Beach Seine	**1A-8** Fyke Net	**1A-9** Purse Seine	**1A-10** Fyke Net	**1B-1** Otter Trawl	**2-1** Otter Trawl	**Total Per Month**
February			1	2						3
March						1				1
April-early	2			4				8	1	15
April-late								5	3	8
May	1	3	9	4	1		2		1	21
June		1	27			2				30
July			1				2			3
August									1	1
December	1									1
Total Per Site	3	4	39	10	1	3	2	13	5	83

Sacramento splittail caught on the Napa River at Site 1A-1 on 8



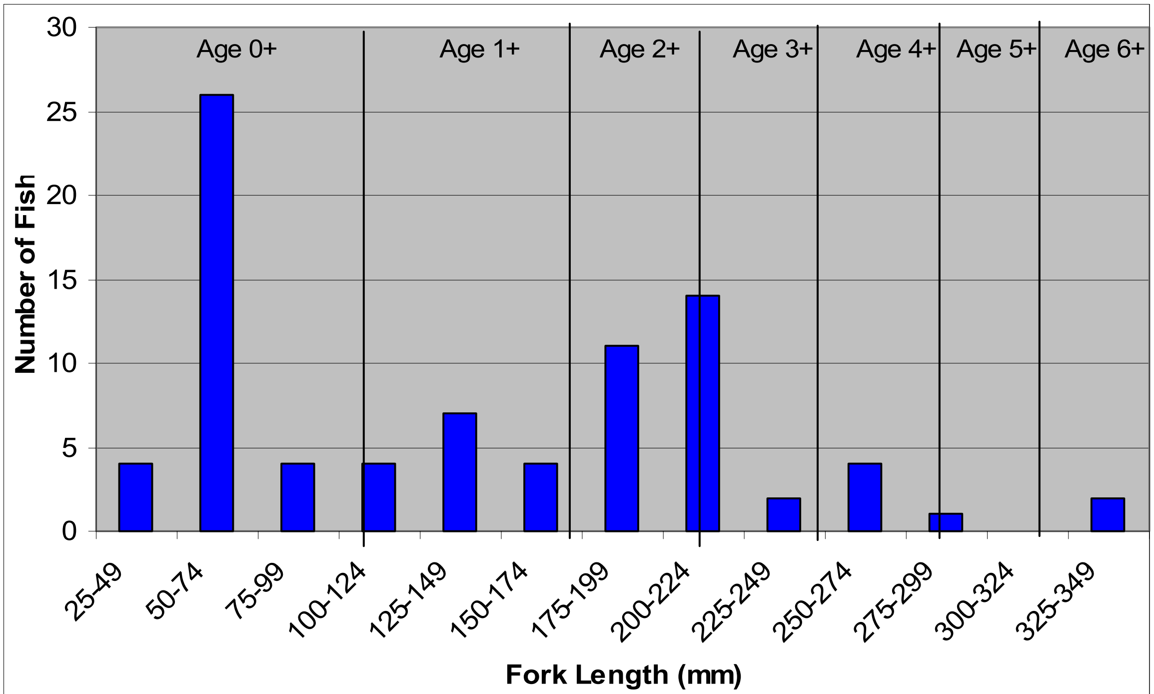


Figure 3-8. Lengths of captured Sacramento splittail in the Napa River Project area in 2001-2002 with approximate age class distribution based on Daniels and Moyle 1983.

Age/length correlations show that age 1+ splittail range from 111.4 mm - 171.2 mm, age 2+ fish range from 171.2 mm – 215 mm, and age 3+ fish range from 215 mm – 250 mm (Daniels and Moyle 1983). The 2001-2002 splittail captures by fork length are presented in Figure 3-8. These data indicate that the 2001-2002 catch included a number of YOY 1+, 2+, 3+ aged splittail, and seven individuals that were potentially older than 3+ (Figure 3-8).

One delta smelt was captured at the SWOA fyke net Site 1A-7 on 25 March 2002. At the time of release, the delta smelt was in excellent shape and released unharmed. There were no signs of lesions or other abnormalities. The capture of this adult specimen may indicate that the SWOA was used by delta smelt for spawning and larval rearing in 2002.

A wild winter-run juvenile steelhead was captured with a purse seine at Site 3-1 on 23 May 2002, which is the most upstream open river site on the Napa River, and just downstream of the First Street Bridge.

3.4 Vegetation Types

Contract 1A will provide approximately 2,000 linear feet of emergent vegetation, seasonal wetland, and riverbank vegetation along the Napa River. Throughout four acres, a total of 130,000 plantings, not including grasses, will be initiated including: rush spp., bulrush spp., common cattail, salt grass, jaumea, gum plant, pickleweed, fat hen, willow spp., oak spp., Fremont cottonwood, and California walnut.

Site 1A-8, May 2002

Most of the SWOA is in the first stages of transition from mud flats to estuarine aquatic plants, following the rapid conversion from meadow plants once flooding began in June 2001. The substrate is currently mud with some vegetation, primarily consisting of previously established estuarine plants (such as tule reeds, pickle weed, and algae). Photos at each sampling site reflect the transformation from meadow to tide flats. It appears that the abrupt transition from meadow to tide flats will be followed by a gradual colonization by various aquatic and emergent estuarine plants, which in turn will provide habitat for various species and food webs. Future observations in the area, and photos taken at each site, will document plant colonization in the SWOA.

3.5 Use of Current Vegetation and Tide Flats by Birds

The colonization of the tide flats by aquatic plants and use of the tide flats by aquatic organisms provides food for numerous bird species in the Napa River SWOA. During a fisheries survey on 9 April 2002, a peregrine falcon was sighted clutching a recent bird kill on the tide flats in the SWOA. The falcon had apparently killed a whimbrel, *Numenius phaeopus,* that had been feeding on the restored tidal flat during low tide. The kill site was located in the middle of the SWOA area, on the east bank of the main north-south running channel.

Whimbrel at the kill location on 9 April 2002.

On the previous day (8 April 2002) a biologist from the USACE conducted a bird survey in the SWOA concurrently with the fish survey. Thirty-six species of birds were sighted during the survey, which is relatively high for this region (Jonathan Foster, USACE, pers. comm., 2002). No whimbrels were recorded that day, although several specimens of a similar species, the long-billed curlew, *Numenius americanus*, were sighted.

4 DISCUSSION/CONCLUSIONS

4.1 Sampling Sites

Some non-larval fish species demonstrated a distinct seasonal presence throughout the 2001-2002 sample period (Figures A-3 through A-14). For example, while over 3,300 juvenile Pacific herring were captured between March and April, only 10 were caught in May, and none were caught in June or July. Many species were not detected during the month of July and it should be noted that these results may stem from gear selectivity and sampling location, rather than actual species absence. In July 2002, only Sites 1A-3 and 1A-4 were fished. Since these two sites are shallow, low- and mid-marsh sites sampled by beach seine, species more common in open water habitats would not be expected.

During the sampling period, six sites (1A-3, 1A-4, 1A-6, 1A-7, 1A-9, and 1A-10) had a distinct seasonal variation (five or more species) in the number of species (Table 4-1). Shallow water sites had the greatest seasonality in species composition. These areas tend to be used more seasonally as spawning or nursery areas, particularly by species such as Pacific herring, Sacramento splittail, and inland silversides. The number of species and percentage that were native was highest in spring and summer 2002. Deeper water sites tended to have a more consistent species composition with regular catches of striped bass. In a similar study, catches were also found to vary by locations within Suisun Marsh associated with slough size, substrate, and proximity to freshwater sources (Matern et al. 2002).

The number of larval fish showed a similar pattern of seasonal abundance (Table 4-2). In 2001, the number of larval fish species was greatest in spring with more native species captured than non-native species. In 2001 the CDFG 20 mm tow-net surveys targeted larval fish and were only conducted in open water sites (1A-1, 1B-1, 2-1). CDFG tow net surveys were discontinued after 2001.

In spring 2002, the number of larval fish species captured declined from 2001 levels. This decline in numbers of larval fish species is an artifact of gear selectivity and an absence of the CDFG larval fish sampling rather than an actual reduction in the number of fish species present in the Project area. In spring 2002, larval fish were incidentally captured in shallow and open water sites using otter trawls, fyke nets, and beach seines, while targeting juvenile and adult fish. Native larval fish species slightly outnumbered non-native species in spring 2002.

Table 4-1. Total Number of Juvenile and Adult Fish Species Caught per Site per Season on the Napa River in 2001-2002.

	Total number of species (# native/non-native)				
SITE	**Summer 2001**	**Fall 2001**	**Winter 2001**	**Spring/Summer 2002**	**Total**
1A-1	5 (4/1)	4 (2/2)	4 (1/3)	4 (2/2)	9 (5/4)
1A-2	3 (0/3)	1 (0/1)	3 (1/2)	2 (1/1)	7 (2/5)
1A-3	0	2 (0/2)	4 (2/2)	8 (4/4)	10 (4/6)
1A-4	3 (1/2)	3 (1/2)	9 (4/5)	10 (6/4)	15 (8/7)
1A-5	-	-	-	-	-
1A-6	1 (0/1)	3 (0/3)	4 (2/2)	6 (3/3)	6 (3/3)
1A-7	2 (0/2)	0	3 (2/1)	6 (3/3)	7 (4/3)
1A-8	2 (0/2)	2 (0/2)	3 (3/0)	3 (2/1)	10 (6/4)
1A-9	1 (0/1)	1 (0/1)	5 (4/1)	6 (3/3)	7 (3/4)
1A-10	2 (1/1)	NA	1 (1/0)	7(3/4)	7 (3/4)
1B-1	5 (3/2)	2 (0/2)	2 (0/2)	6 (3/3)	9 (5/4)
2-1	7 (5/2)	5 (2/3)	3 (0/3)	7 (4/3)	14 (6/8)
3-1	1 (0/1)	1 (0/1)	0	4 (3/1)	7 (3/4)

Table 4-2. Total Number of Larval Fish Species Caught per Site per Season on the Napa River in 2001-2002.

	Total number of species (# native/non-native)			
SITE	**Spring 2001**	**Summer 2001**	**Spring 2002**	**Total**
1A-1	*15(12/3)	*4(2/2)	3(2/1)	15(12/3)
1A-2	-	-	3(1/2)	3(1/2)
1A-3	-	-	0	0
1A-4	-	-	2(2/0)	2(2/0)
1A-5	-	-	NA	0
1A-6	-	-	3(3/0)	3(3/0)
1A-7	-	-	1(1/0)	1(1/0)
1A-8	-	-	0	0
1A-9	-	-	0	0
1A-10	-	-	1(1/0)	1(1/0)
1B-1	*11(9/2)	*2(1/1)	3(1/2)	*11(9/2)
2-1	*11(8/3)	*5(3/2)	4(2/2)	*11(8/3)
3-1	-	-	0	0

* Larval fish data from California Department of Fish and Game

4.2 Fish Abundance, Distribution, and Seasonality

A total of 26 species (juvenile and adult stages) was caught during the cumulative July 2001-July 2002 FMP field effort. Pacific herring (n=3,338) was the most abundant species captured during the project sampling to date. The second most abundant species captured was inland silversides (n=2,458). Native species accounted for 54 percent (14 out of 26) juvenile and adult fish species caught in 2001-2002 (Table 3-1). Of the total number of juvenile and adult fish caught, 56 percent were native (Figure 3-1).

In comparison, trawling surveys in Suisun Marsh in 233 of 245 months from May 1979 to December 1999 collected nearly 127,000 fish, most of which were juveniles, and 28 native and 25 non-native species (Matern et al. 2002). During the same period, over 900 beach seine hauls were taken collecting nearly 46,000 fish, of which 15 were native species and 21 were non-native (Matern et al. 2002).

Over the entire 2001-2002 field effort more than 85 percent of the catch in open water and marsh plain habitats was comprised of non-native fishes (Figures 3-3 and 3-4). In contrast, in the SWOA 76 percent of the catch was comprised of native fishes, predominantly juvenile Pacific herring captured in spring (Figure 3-5). Native fish were more abundant in late winter and spring (Figure 3-1) but occurred throughout the year, particularly notable if the most abundant species (inland silversides and Pacific herring) were excluded (Figure 3-2).

The lowest catches occurred in winter 2002 (n=278) with 16 species captured, of which 7 were native species. Sampling was the least intensive during the winter months. Sampling intensity was highest in spring/summer 2002, reflected also by the highest catches (n=4,165) with 17 species caught, of which 9 were native.

In Suisun Marsh, catches of most species were low from October through March when water temperatures were coolest, and highest catches occurred from June to August when water temperatures were warmest (Matern et al. 2002). The peak catches were associated with non-native species, whereas native species peaked earlier in the year and were more evenly abundant throughout the year (Matern et al. 2002).

Catches from the first representative year of sampling (July 2001 through July 2002) indicated some trends in seasonality and distribution, particularly for juvenile Pacific herring, inland silversides, and Sacramento splittail (Table 4-3). Juvenile Pacific herring were most abundant in March and April at marsh plain sites. Larval herring may either seek out or be transported into marsh plain habitats, however the distribution of larval herring in bays and estuaries is not well known (Watters et al. 2001). Herring are known to spawn in bays and estuaries over aquatic vegetation between November and March, and their juveniles have been found in San Francisco Bay until summer or early fall, when they migrate to the open ocean (Watters et al. 2001). Inland silversides were most abundant in the summer and fall of 2001 in marsh plain and SWOA sites. Inland silversides prefer shallow water habitat with aquatic vegetation (Moyle 2002) and spawning is known to occur between April and September (Wang 1986, as cited in Moyle 2002). Inland silversides grow quickly and spawn and die in their first or second summer of life (Moyle 2002). In Suisun Marsh, inland silversides were the second-most abundant species caught, primarily by beach seine (Matern et al. 2002). It is worth noting that inland silversides are hypothesized to be a potential predator on larval delta smelt (Bennett and Moyle 1996).

Table 4-3. Abundance of the Dominant Fish Species Caught per Site per Season in the Napa River Project Area in 2002.

Fish species	Total #	Season with most abundant catch	Site with most abundant catch
Pacific herring	3,338	Spring 2002	1A-10
Inland silverside	2,458	Fall 2001	1A-3
Staghorn sculpin	375	Spring 2002	1A-4
Striped bass	330	Summer 2001	1B-1

Staghorn sculpin were most abundant in spring, and have also been found to peak seasonally in Suisun Marsh in March through May (Matern et al. 2002). Staghorn sculpin are considered one of the most common species in California's bays and estuaries (Moyle 2002). Striped bass were most abundant in summer 2001 as juveniles, and were the most abundant species captured in Suisun Marsh in association with warm temperatures and high salinity (Matern et al. 2002). The origin of the juvenile striped bass caught in the project area is unknown, although striped bass from the Sacramento and San Joaquin rivers are known to rear in Suisun Bay (Stevens et al. 1985, as cited in Moyle 2002) and may conceivably rear in the project area.

It is not known for certain whether chinook salmon (*Oncorhynchus tshawytscha)* naturally occur in the Napa River. The National Marine Fisheries Service did not include the Napa River in the ranges of adjacent chinook salmon evolutionarily significant units (ESU) in their status review of chinook salmon from Washington, Idaho, Oregon, and California (Myers et al. 1998). Chinook ESUs that are adjacent to, but do not include the Napa River, include the Sacramento River Winter-Run ESU, the Central Valley Spring-Run ESU, the Central Valley Fall and Late-fall ESU, and the California Coastal ESU.

Chinook salmon captured at Site 1A-4, April 2002.

On April 22, 2002 one juvenile chinook salmon was captured at Site 1A-4 in the SWOA using a beach seine. Site 1A-4 is sampled by using a beach seine in a roving matter at various locations, on the tide flats during high tide, throughout the SWOA. The chinook was captured at the south end of the tide flats in the SWOA. Water salinity at the time of capture was 6.3 ppt. The captured juvenile chinook salmon had a clipped adipose fin and was likely to be of hatchery origin. It is speculated that it originated from one of the Central Valley salmon hatcheries and migrated into the Napa estuary, since there are no hatcheries on the Napa River and there are many hatcheries in the Central Valley. After being weighed, measured, and photographed, the specimen was returned to the water alive. It is interesting to note that if the juvenile chinook originated from a hatchery in the Central Valley, it would have had to swim upstream approximately 25.7 km to the Project area from San Pablo Bay. The occurrence of this specimen in the SWOA may indicate the importance of estuaries and tidelands in the Napa River as foraging and rearing areas for juvenile salmonids.

Consideration should be given to retaining future captured chinook specimens, especially if they are adipose-clipped. Adipose-clipped specimens may contain a coded wire tag, which would enable identification of the hatchery of origin. Retention of tissue samples from both adipose-clipped and non-clipped specimens for genetic testing should also be considered to identify the ESU to which the specimen belongs.

Uncertainties currently exist on whether chinook salmon naturally occur in the Napa River and whether they should be included in existing ESUs, or one of their own. The status of chinook salmon in the Napa River system could potentially be clarified if chinook spawning surveys on the Napa River were conducted and combined with genetic testing of adults (if present) and juveniles.

4.2.1 State and Federally Listed Species

Sacramento Splittail

In 2002, catches of Sacramento splittail started to increase in early April and peaked in May and June before declining in July. Rising temperatures influence Sacramento splittail to spawn from March through May. Spawning occurs in slow moving reaches of large rivers, over flooded vegetation in tidal freshwater and in euryhaline habitats of estuarine marshes and sloughs. During spring, they may congregate in dead-end sloughs of the marsh areas of the delta, and Napa and Suisun marshes, to spawn over beds of aquatic or flooded terrestrial vegetation (Moyle 2002; CDFG unpublished data). Shallow water habitats, such as inundated floodplains provide important spawning, rearing and foraging habitat for threatened Sacramento splittail (Sommer et al. 1997, Sommer et al. 2002). Catches in the 2002 study were highest in marsh plain and SWOA sites, but splittail were also captured in open water areas. The greatest numbers of splittail were captured by beach seines, which were used in the shallow water SWOA and marsh plain sites; followed by otter trawls, which were used in the open water sites. A total of 79 individuals were captured in 2002, compared to only four in 2001. This indicates that the gear types used in this study in specific habitat types and during appropriate seasons were effective in detecting the presence of splittail in the project area. In Suisun Marsh, splittail of all sizes were collected fairly evenly in all months in the trawls, but mainly young of the year were caught in large numbers by beach seines from June to September (Matern et al. 2002).

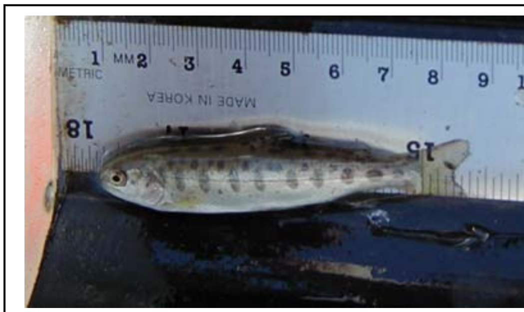
Beach seining at Site 1A-3, May 2002.

Splittail usually reach sexual maturity by the end of their second year. This study, along with the CDFG surveys, successfully captured splittail of various size and age classes including larval, 1+, 2+, 3+ and seven individuals greater than 3+ (Figure 3-7). This range of sizes indicates that all age groups, from larval to age 6+, are using the area. Sexually mature fish were identified with 44% of the fish captured between July 2001 and July 2002, showing either spawning colors or milt and eggs. This indicates that spawning activity is likely occurring in the project area. Sacramento splittail were expected to use the program area for rearing and spawning. From March through June 2001, CDFG 20 mm tow-net surveys captured two larval splittail. The capture of mature as well as larval and juvenile splittail in the program area confirms that the area is important to all life stages of Sacramento splittail. Additional larval sampling may confirm increased use of the created habitat by sub-juvenile splittail.

Delta Smelt

Delta smelt prefer a euryhaline environment and spawn in fresh water. Shortly before spawning, adult delta smelt disperse widely into river channels and tidally influenced backwater sloughs (Moyle 2002; Radtke 1966; Wang 1991). The spawning season varies from year to year and may occur from later winter (December) to early summer (July). Delta smelt spawn in shallow, fresh, or slightly brackish water (Wang 1991), with most spawning occurring in tidally influenced backwater sloughs and channel edgewaters (Moyle 2002; USFWS 1995). Eggs are known to be adhesive and demersal, and are usually attached to substrate (Moyle 2002; Wang 1991). Capture of larval delta smelt in the main stem of the Napa River in 2001 may indicate that this location has been used for spawning. After the June 2001 levee breach, the Napa River floodplain was expected to support delta smelt larvae throughout the restored marsh area in the 2002 and future spawning seasons.

CDFG captured numerous delta smelt larvae in 20 mm tow-net surveys (USACE 2002b). However, in 2002, only one adult delta smelt was captured, by fyke net in the SWOA (1A-7). Considering that thousands of larvae were captured in the 20 mm tows the previous year, it would be expected that adults and juveniles would be present and detectable in 2002. The capture of only one delta smelt, an adult, in 2002 does not support this assumption. The capture of a single specimen may be due to several factors. One such factor may have been gear selectivity. Adult delta smelt may not be as vulnerable to fyke nets, otter trawls, beach seines or purse seines as other species. The mesh size in the gear used (Table 2-1) may have been too large to successfully capture larval delta smelt, although delta smelt were captured in otter trawls with similar mesh sizes in Suisun Marsh (Matern et al. 2002). The nets may not have been in appropriate locations to capture delta smelt. In addition, the sampling times of day or the frequency of sampling per month may not have been adequate. Sampling generally occurred once a month (twice in April 2002) during high tides that occurred in the late morning. Adult delta smelt may not frequent the area during the daytime or during the phase of the tidal cycle that was repeatedly sampled. Alternate survey times or night surveys, including the use of light traps, may be necessary to properly sample delta smelt. Assessment of delta smelt presence and habitat use in the project area will likely require an increased effort to better sample both larval and adult stages.



Steelhead

Winter-run steelhead populations generally enter spawning streams from fall through spring as sexually mature adults and spawn a few months later in late winter or spring (Roelofs 1985, Meehan and Bjornn 1991, Behnke 1992). Juvenile steelhead rear in freshwater, then they migrate downstream to the ocean as smolts, typically at a length of 150 to 200 mm (Meehan and Bjornn 1991). They have variable life histories and may migrate downstream to the estuaries at age 0+ juveniles or may rear in streams up to four years before outmigrating to the estuary and ocean (Shapovalov and Taft 1954).

The 2002 survey captured a single juvenile steelhead at Site 3-1 on May 23, 2002. Site 3-1 is the most upstream site in the Napa River in this study and is located just downstream of the First Street bridge. This site has the lowest salinity of all the sampling sites (1.2 ppt with a flow of 25 cfs)(Table 3-3). A purse seine was used to sample this open water site. Unlike the other open water sites, this location has less tidal influence, and usually has little current unless the Napa River is flowing. The specimen that was captured could have been rearing in the lower reaches of freshwater in the Napa River, or it could have been preparing to smolt and out-migrate to the Bay and ocean.

Otter trawl Site 2-1, April 2002.

The presence of a single specimen may have been a result of gear selectivity or poor gear efficiency. A purse seine in an open water site could easily be avoided by a juvenile salmonid. Salmonids may also be more likely to avoid a purse seine that is fished in the day rather than one fished at night. The presence of a single specimen in our survey could also have been a reflection of an actual low abundance of juvenile steelhead in the project area. Continued sampling may result in additional salmonid specimens, which may give further insights as to the effectiveness of the sampling gear and to the distribution and abundance of salmonids and their use of habitats in the project area.

4.3 Vegetation Types

The establishment of vegetation in the Napa Project and SWOA is providing habitat for non-aquatic species. The area is already attracting numerous and diverse shorebirds, waterfowl, and their predators. The number and diversity of bird species using the SWOA suggests that the area has already become important to waterfowl. The SWOA tide flat has been exposed to daily flooding for approximately one and a half years, and is still in the very early stages of restoration. However, it bodes well that an apex predator, such as the peregrine falcon, has already been sighted depredating a shorebird that was using the tide flats. This sighting provides an indication of progress toward restoration of the salt marsh in the SWOA, and the ecological web of species that it supports. Continued monitoring will document the recovery of the area and the restoration of a properly functioning salt marsh and estuarine ecosystem in the Napa River.

4.4 Environmental Conditions

Environmental conditions such as temperature, salinity, dissolved oxygen, and turbidity varied seasonally and between the four open water sites, two river-marsh plain sites, and seven sites located in the SWOA area and Horseshoe Bend during the July 2001 through July 2002 season (Table 3-3).

Temperature

Throughout the July 2001 through July 2002 sampling year, average water temperature in SWOA, marsh plain and open water habitats fluctuated seasonally, with an average surface water temperature of 18.8 ^{o}C (range 13.9-26.2^{o}C) and bottom water temperature of 18.6 ^{o}C (range 13.4-26.2^{o}C). Water temperature decreased in all habitats in fall 2001, whereas water temperature increased in all habitats during spring 2002. The highest water temperatures were observed in summer 2001.

Additionally, the deeper channels of open water sites had average water temperatures that were 0.2^{o}C and 0.5^{o}C cooler than the shallower SWOA and marsh plain sites, respectively, indicating shallow water habitats warmed more than deeper channels.

Salinity

Average salinity in SWOA, marsh plain, and open water habitats also fluctuated seasonally throughout the July 2001 through July 2002 sampling year, with an average surface water salinity of 5.1 ppt (range 0.2-15.9 ppt) and bottom water salinity of 5.5 ppt (range 0.2-15.9 ppt). The greatest increase in salinity in all habitats occurred in early summer 2001. The greatest decrease in average salinity occurred in December 2001, when average salinity fell to 0 ppt in all habitats. During winter 2002 average salinity levels increased slightly but remained below 5 ppt in all habitats. However, throughout spring 2002, average salinity for SWOA and marsh plain habitats increased significantly to 15 and 14 ppt, respectively, while average salinity for open water habitats rose to 8 ppt.

Purse seine Site 3-1, March 2002.

There is a notable increase in salinity levels at the SWOA sites by 2.7 ppt and 1.9 ppt over open water and marsh plain sites, respectively, for all samples in July 2001 through July 2002. This could be explained by the concentration of saline water in the SWOA marsh habitat during the warmer seasons caused by evaporation of water on the mud flats within pooled areas. The retention of water in the SWOA marsh areas and lower circulation than the marsh plain sites or open water sites, results in elevated salinity in comparison to the other habitat sites.

Flow

Throughout the 2001-2002 sampling year, average Napa River water flow fluctuated seasonally. During sampling events, the daily average flow between July and early November 2001 was less than or equal to 1 cfs. In the winter months the average flow during sampling events increased to 293 cfs and steadily declined through late spring. During the July 2002 sampling event, the average flow was 5 cfs.

Dissolved oxygen

Average dissolved oxygen in SWOA, marsh plain, and open water habitats fluctuated seasonally with an average surface water DO of 9.0 mg/l (range 4.9-19.1 mg/l)) and bottom water DO of 8.1 mg/l (range 1.8-19.1 mg/l). Little fluctuation in DO occurred in marsh plain and open water habitats during summer 2001, while DO fluctuated most significantly in SWOA. The greatest fluctuations in DO occurred in marsh plain habitats during fall 2001. Average DO levels in open water and SWOA habitats increased most significantly in late fall 2001 and early winter 2002, and decreased during spring.

The SWOA sites had slightly lower average dissolved oxygen than the open water sites, which were also slightly lower than the river marsh plain sites, at 7.3 mg/l, 7.5 mg/l, and 8.0 mg/l, respectively. When comparing the dissolved oxygen levels for the surface readings only, the highest levels were found in the open water channels.

Transparency

Transparency did not differ between the three habitat types. Average transparency for the July 2001 through July 2002 sampling effort was 30 cm, with a range of 2 cm to 81 cm.

Other characteristics based on habitat type

There were notable differences in physical parameters between surface and bottom readings (Table 3-3). The most notable differences occurred primarily in the open water sites where the average depth was 5.6 m. The average difference between surface and bottom temperatures of the open water sites was 0.6^{o}C with an average dissolved oxygen gradient of 1.3 mg/l and an average salinity gradient of 0.5 ppt. Temperature and dissolved oxygen readings were higher in the surface water readings, while salinity greater in the bottom readings. No notable differences were observed in physical conditions between surface and bottom in the SWOA and marsh plain sites, as the average depth was 1.2 m and 0.8 m respectively. Average temperature differences were less than 0.1^{o}C, average differences in dissolved oxygen were less than 0.6 mg/l, and average salinity differences were less than 0.15 ppt for SWOA and marsh plain sites.

4.5 Recommendations for 2003 Program

The FMP surveys have included nearly one full year of monthly sampling dates, beginning in July 2001 and ending in July 2002. We have continued to test and review the effectiveness of the various gear types and sampling sites for detecting fish presence over different seasons and under different hydrologic conditions. We anticipate that continued sampling over the next year and analysis of that data where we will be able to make comparisons between different years will produce more definitive conclusions and recommendations. Recommendations regarding gear types and sampling schedules are provided below.

Further experimentation with sampling dates, time of day of sampling, and type of gear may be required. Some species, such as delta smelt and salmonids, may be more vulnerable to capture when fishing the gear at night or under different tidal/time conditions. Alternatively, different sampling gear, such as light traps or smaller mesh nets, may be needed to adequately sample certain life stages of some species, such as larval delta smelt. Year round sampling, several times a month during the spring and early summer when focus species are most likely to be encountered, and during various times and tides should be considered. Further experiments should be conducted to differentiate between actual fish species distribution, presence, and abundance, and the selectivity of sampling gear.

4.5.1 Sampling Schedule

Sampling in 2002 was originally scheduled to occur on a monthly basis to allow for monitoring of fish distribution and abundance during all seasons and across all habitat types. However, funding constraints in 2002 forced a reduction in the sampling effort, which restricted sampling to February through July 2002. In order to make best use of available resources, sampling events were concentrated around the critical March through April time period, including two surveys in April to capture spawning delta smelt and splittail. The frequency of otter trawling was also increased to partially compensate for the termination of the CDFG 20 mm tow-net sampling. The 2002 schedule focused on time periods when delta smelt and Sacramento splittail were most likely to be found in the project area. This more focused effort was successful in documenting the presence of one adult delta smelt and 79 splittail.

Comprehensive fisheries monitoring of the restored areas would include some year-round sampling on at least a monthly basis, and larval sampling to help document spawning in the restored marsh. The proposed 2003 sampling schedule, shown in Table 4-4, is an attempt to meet critical goals of the monitoring program within the current funding constraints. The final sampling schedule will be dependent on availability of funding. The proposed 2003 sampling schedule increases sampling in March and April to better document use of the area by listed species. Additionally, all sites are sampled in March through August to better compare month-to-month changes in abundance and distribution. Three of the beach seine sites are sampled for 12 months, to improve evaluation of seasonal shifts in abundance and distribution. If additional funding can be secured, larval light trapping is recommended to better document delta smelt and splittail use of the SWOA and marsh plain terraces.

Table 4-4. Proposed Monthly Sampling Schedule and Gear Type for 2003.*

Site	Location	Jan 13-16 (27-30)	Feb 11-14 (25-27)	March 12-15	March 26-29	April 9-12	April 23-26	May 10-12 (22-25)	June 8-11 (21-24)	July 7-9 (20-23)	Aug 5-7 (19-21)	Sep 3-5 (17-19)	Oct 2-4 (16-18)	Nov 1-4 (16-19)	Dec 1-3 (16-19)
1A-1	Open Water (River)	O	O	O	O	O	O	O	O	O	O	--	--	--	--
1A-2	SWOA Slough	O	O	O	O	O	O	O	O	O	O	--	--	--	--
1A-3	Marsh Plain Terrace	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS
1A-4	Floodplain Terrace	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS
1A-5	Emergent Marsh	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1A-6	SWOA Marsh	--	--	F	F	F	F	F	F	F	F	--	--	--	--
1A-7	SWOA Marsh	--	--	F	F	F	F	F	F	F	F	--	--	--	--
1A-8	SWOA Marsh	--	--	F	F	F	F	F	F	F	F	--	--	--	--
1A-9	SWOA Levee Breach	--	--	P	P	P	P	P	P	P	P	--	--	--	--
1A-10	SWOA HB Marsh	--	--	F	F	F	F	F	F	F	F	--	--	--	--
1B-1	Open Water (River)	O	O	O	O	O	O	O	O	O	O	--	--	--	--
2-1	Open Water (River)	O	O	O	O	O	O	O	O	O	O	--	--	--	--
2-2	Marsh Plain Terrace	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	--	--	--	--
2-3	Floodplain Terrace	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS	BS
3-1	Open Water (River)	P	P	P	P	P	P	P	P	P	P	--	--	--	--

*FN = fyke net; PS = purse seine; OT = otter trawl; BS = beach seine

4.6 Program Team Members

The Napa River Fisheries Monitoring Program team members are listed in Table 4-5.

Table 4-5. Napa River Fisheries Monitoring Program Team.

Name	Affiliation	Experience	Program Responsibility
Mike Dietl	Army Corps of Engineers	B.S. Fisheries Six years experience in environmental management and fishery biology.	USACE Program Manager, Contracting Officer's Representative
Sharon Kramer	Stillwater Sciences	Ph.D. Marine Biology M.S. Zoology B.S. Aquatic Biology 26 years experience in marine, estuarine, and stream ecology in California and elsewhere.	Principal Investigator
Scott Wilcox	Stillwater Sciences	M.Ed. Natural Resources Management; B.S. Wildlife and Fisheries Biology. 23 years experience in fisheries and aquatic resource studies in California.	Project Manager
Steven Kramer	Stillwater Sciences	M.S. Natural Resources/Fisheries B.S. Fisheries Biology 21 years experience in marine, estuarine, and stream ecology.	Field Leader
Stephanie Theis	Jones and Stokes	M.S. Applied Ecology and Conservation Biology B.S. Fisheries Biology 13 years of fisheries experience.	Field Leader
Ethan Bell	Stillwater Sciences	M.S. Fisheries Biology B.S. Ecology and Evolution Seven years experience sampling and handling fishes including juvenile anadromous salmonids.	Field Biologist
Lauren Dusek	Stillwater Sciences	B.S. Wildlife, Fish, and Conservation Biology. Two years of experience conducting fisheries studies in the Delta and tributary streams.	Field Biologist
Donna Maniscalco	Jones and Stokes	B.S. Wildlife, Fish, and Conservation Biology Four years conducting fisheries surveys of anadromous salmonids.	Field Biologist
Susan Davis	Jones and Stokes	M.A. English Literature B.A. English Literature Five years of technical computer experience.	Web Developer
Kris Bonner	Jones and Stokes	M.S. Range Management B.S. Range Science 26 years of experience with information systems, internet, database, management, development and design.	Information Services Specialist
Micah Rousey	Jones and Stokes	Certified in Microsoft Access, Excel, and Relation Database Management Systems. 5 years experience developing custom databases and business applications.	Database Administrator
Johnson Wang	Consultant	Ph.D. Fisheries Over 30 years experience in larval fish studies.	Larval Fish Expert

4.7 Materials Purchase Report

No durable, capital expense items were purchased for the Napa River Fisheries Monitoring Program in 2002.

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