

Fish Sampling on the Salt River, Phase 1

Summary of Results

Spring-Summer 2014 & Fall-Winter 2014/2015



CDFW, AmeriCorps, and HSU participants seine the lower Salt River (April 2014)

This summary describes the immediate utilization of a diverse assemblage of fish after the completion of a large estuary restoration effort in the Eel River Estuary, CA.

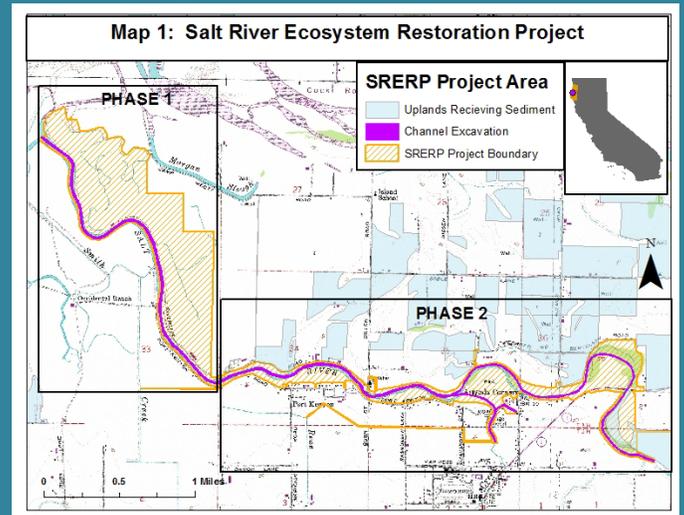
INTRODUCTION

The Salt River lies in lower portion of the Eel River Delta, CA. The Salt River has severely aggraded with sediment from the surrounding hills over the past century. So much so, that its hydrologic conveyance is compromised and heavy flooding and lengthy periods of inundation throughout the watershed occurs multiple times annually. Wildlife habitat and fish passage has also been lost due to the dysfunctional river system.

To address the myriad of environmental problems, the community began to develop the Salt River Ecosystem Restoration Project (SRERP). The SRERP is a long-term, watershed-based project that will ultimately re-establish a functioning riverine, riparian, wetland and estuarine ecosystem as part of a water quality improvement, flood alleviation, and watershed management program.

The project consists of two major phases that will be constructed over several years. Construction of Phase 1 was completed in 2013 and reconverted approximately 330 acres of dairy pasture back into tidal estuary habitat. Phase 1 also rehabilitated 2 miles of tidally-influenced Salt River Channel. The work completed in Phase 1 restored tidal connectivity and created the necessary tidal prism to maintain the depth and width of the restored channel and suspend sediment loads so they can be flushed through the system. Completion of Phase 1 also restored fish passage and greatly enhanced a variety of habitats for fish, waterfowl, and other wildlife. Aspects of Phase 1 design also improve drainage of adjacent agricultural fields, thereby reducing impacts from flooding.

At the conclusion of the Phase 1 construction, members from CDFW, NOAA/NMFS, Humboldt State University, Humboldt County Resource Conservation District, and Ducks Unlimited met to discuss future monitoring for fish species in the newly restored river and estuary systems. A Spring-Summer (March to July) low tide monitoring program was developed and intended for the first three years after Phase 1 construction completion. A Fall-Winter (November to March) low tide and high tide monitoring program was developed for the 2014/2015 season. Both fish

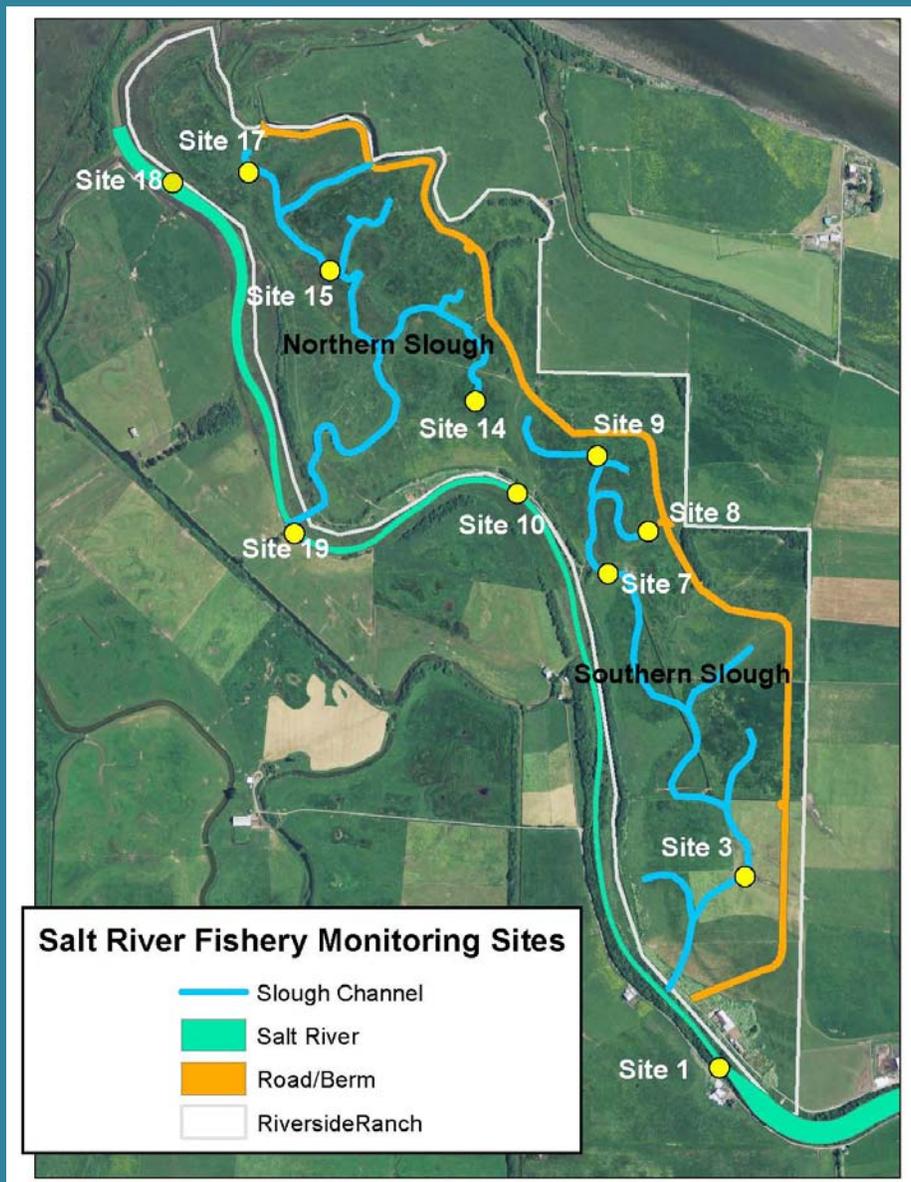


Map of the Salt River Restoration Project Area

sampling efforts propose to determine fish presence and assemblages across the restored habitat.

METHODS

Eleven fish sampling sites were chosen across the Phase 1 restoration area. These sites included main stem river locations; sites associated with installed large wood structures; and slough areas behind channel structures specifically designed to create backwater habitat for ESA listed species tidewater goby (*Eucyclogobius newberryi*). The following map depicts the established sites.



Established fish sampling sites across the restored estuary and Salt River

Spring-Summer sampling occurred between March and July and was led by either CDFW or HSU members. Sampling events took place once a month. These events usually took on average of two days to complete all eleven sites. Low tide sampling consisted of running a 30' seine net approximately along 100' to 150' of channel length. Sampling crews collected, identified, and enumerated caught fish. Lengths of all captured salmonids (Coho (*Oncorhynchus kisutch*) and Chinook (*O. tshawytscha*)) were measured. All fish were then released after processing. Water quality parameters were also measured (Dissolved oxygen, temperature, and salinity). Minnow traps were deployed at each site and retrieved at a minimum of a hour later. Trapped fish were again collected, identified, enumerated, and released.

Fall-Winter sampling occurred between November (2014) and March (2015). This effort incorporated the low tide sampling described above along with high tide sampling. High tide sampling attempted to use all the established sites, however due to access and channel size, some sites had to be abandoned (#7, #15, and #17) as sampling equipment could not be deployed. Two additional sites were established near fish sampling site #1. As with low tide sampling, sampling events took on average of two days to complete. High tide sampling consisted of deploying a 100' seine net from a kayak in an arc configuration and then hauled to the bank. Sampling crews collected, identified, and enumerated fish caught, then released. Lengths of all captured salmonids were measured. Water quality parameters were also measured.



Setting the 100' seine net on the main stem Salt River for high tide sampling (March 2015)

RESULTS

Surveys throughout the spring and summer months showed that air temperatures averaged 16.2 °C with a maximum of 20°C and minimum of 10.5°C. Water temperatures averaged 16.8°C with a maximum of 21.5°C and minimum of 11°C. Salinity measurements over the survey period averaged 26.4 ppt with a maximum of 36.5 ppt and a minimum of 12.05 ppt (ocean water is approximately 36ppt). Dissolved oxygen was also measured during the surveys where the average was calculated to be 7.5 mg/L; the maximum was 16.2 mg/L; and the minimum was 3.3 mg/L (100% oxygen saturation is 10.0 mg/L). The dissolved oxygen maximum value is beyond a maximum level, though dissolved oxygen probes are notorious for reading above 10.0 mg/L. In any case, the data appears to indicate that dissolved oxygen level decreased as the summer progressed. Seining and minnow trapping at the eleven fisheries monitoring sites, over the five month sampling period, identified the presence of over 19 species of fish. The presence, and immediate utilization, of fish at each site indicates that the restored habitat supports a healthy diversity and abundance of fish.



Over 70 tidewater gobies captured at Site #8 (July 2014)

Fall-Winter surveys showed that water temperatures averaged 13.7 °C with a maximum of 21.2°C and minimum of 9.2°C. Salinity measurements over the survey period averaged 11.2 ppt with a maximum of 28.0 ppt and a minimum of 0.4 ppt (winter storms and increased Eel River flows increased fresh water inputs). Dissolved oxygen was also measured during the surveys where the average was calculated to be 6.5 mg/L; the maximum was 10.8 mg/L; and the minimum was 2.0 mg/L. Fall-Winter low and high tide surveys captured 19 species of fish (not necessarily the same species as during the Spring-Summer surveys).

The following table provides a summary of the number of fish caught, by species, during the two sampling seasons.

Fish Species	Number Sampled	
	Spring-Summer 2014	Fall-Winter 2014-15
Coho (juvenile)	40	37
Chinook (juvenile)	6	4
Tidewater Goby	327	318
Starry Flounder	3	2
Saddleback Gunnel	8	2
Pacific Herring	5	1
Pacific Lamprey (juvenile)	0	1
Shiner Perch	6	1
Surf Perch	8	0
Sacramento Pike Minnow	34	131
Bay Pipefish	17	3
CA Roach	0	4
Copper Rock Fish (juvenile)	1	0
Rock Fish (unidentified juvenile)	0	4
Pacific Staghorn Sculpin	-	154
Sculpin (unidentified)	1,753	1,092
Longfin Smelt	0	8
Night Smelt	183	0
Surf Smelt	29	233
Top Smelt	929	0
Smelt (unidentified juvenile)	1,026	0
Three-Spine Stickleback	25,975	9,875
Bay Shrimp	-	1,020
Dungeness Crab (juvenile)	8	157
Jellyfish (unidentified)	5	-

DISCUSSION

Prior to the restoration efforts on Phase 1, all fish were relocated from the site area, thus leaving a clean slate for fish to migrate to and exploit the newly available habitat. Fish sampling monitoring began five months post construction and fish were found throughout the restoration area.

Eleven fish sampling sites were monitored primarily for salmonids and tidewater gobies. However, other fish species were recorded with each sampling event. Spring-Summer and Fall-Winter sampling periods demonstrates fish presence and distribution across the restoration area. Salmonids, specifically juvenile Coho and Chinook, were captured during winter and early spring months, thus providing evidence that they are using the restored estuary as off channel habitat. Tidewater goby re-established in the terminal ends of slough channels where channel features were especially designed for goby habitat; though some gobies were captured in the main channel as well.

The ubiquitous three-spine stickleback and sculpin are present throughout the seasons. Non-native Sacramento pike minnow appear to be more prevalent during low salinity times (winter). The tidally influence estuary channels also provided habitat for a variety of marine species such as rockfish, smelt, herring, Bay pipefish, and Dungeness crab. It is expected that as the estuary evolves with habitat elements, such as eelgrass beds establishing and further vegetative cover recruiting along the banks, species abundance and diversity should increase.



Tidewater Goby (March 2014)



Coho Salmon (March 2014)