

SALT RIVER ECOSYSTEM RESTORATION PROJECT

SPRING-SUMMER FISH MONITORING PROGRAM

2023

Results of Fish Species Presence and Distribution Monitoring Conducted
From April to June 2023 within the Salt River, Eel River Estuary,
Phase 1 & 2 Project Area, Humboldt County California

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August 2023

Abstract

Phase 1 of the Salt River Ecosystem Restoration Project (SRERP), which includes 330 acres of a restored estuary and 2.5 miles of restored river channel, was implemented in 2013. Portions of the Phase 2 footprint (3.7 miles of the river channel and 0.5 miles of the Frances Creek tributary) were constructed in 2014, 2015, 2017, 2018, and 2019. A fish sampling program was developed in the spring of 2014 and is conducted annually across the constructed reaches of the SRERP. Monitoring in 2023 began in April and continued through June and sampled across Phase 1 and 2. The 2023 sampling completed 10 years of fish monitoring in Phase 1. A 1/8" mesh pole seine and baited minnow traps were the methods used to sample various sites. Captured fish were identified, enumerated, and released. Surveys identified the presence of Coho salmon (*Oncorhynchus kisutch*), Chinook salmon (*Oncorhynchus tshawytscha*), Steelhead salmon (*Oncorhynchus mykiss*), Three-spined Stickleback (*Gasterosteus aculeatus*), Staghorn sculpin (*Leptocottus armatus*), Prickly Sculpin (*Cottus asper*), Sacramento Pikeminnow (*Ptychocheilus grandis*), Starry flounder (*Platichthys stellatus*), Saddleback Gunnel (Pholis ornate), Shiner Perch (*Cymatogaster aggregate*), Topsmelt (*Atherinops affinis*), and California Roach (*Hesperoleucus symmetricus*) among others unidentifiable species.

Introduction

The Salt River is a tidally influenced slough tributary to the Eel River Estuary located in Humboldt County near Ferndale, California. Salinity in the Salt River varies by the interaction of tides, the Eel River flow stage, and the input of freshwater tributary streams that drain from the Wildcat Hills above Ferndale. In the mid-1800s the Salt River channel was deep enough to support ship traffic to Port Kenyon on the Salt River, however, increased sediment delivery from the upper watershed to the Salt River channel and the reduction of tidal prism in the lower watershed resulted in an aggraded channel of much smaller dimension. The frequency of flooding of Ferndale and surrounding farmland increased incrementally as the Salt River filled with sediment over the last century, and efforts to find a solution were initiated as flooding

became an annual issue. Planning by residents and agricultural interests, as well as local, state, and federal governments, culminated in a multi-phase plan, known as the Salt River Ecosystem Restoration Project (SRERP), to restore hydraulic and ecological function to the Salt River.

The Humboldt County Resource Conservation District (HCRCD) is the lead agency implementing the SRERP, which has been constructed in phases since 2013. At the mouth of the Salt River, the 420-acre Riverside Ranch was purchased from an interested seller and transferred to CDFW. Phase 1 of the SRERP focused on this area in 2013 to restore 330 acres of tidal estuary, which included the excavation of 2.5 miles of the main Salt River channel, excavation of three miles of a slough channel network, and levee and tide gate removal. These elements increase hydraulic function to the lower two and a half miles of the Salt River. By 2019, approximately 3.7 miles of Salt River channel corridor, immediately upstream of Phase 1, have been restored, as well as 0.5 miles of the Francis Creek tributary. Fish removal/relocation and dewatering occurred during each construction season of the project, thus fish captured during the post-construction monitoring surveys all emigrated from surrounding areas.

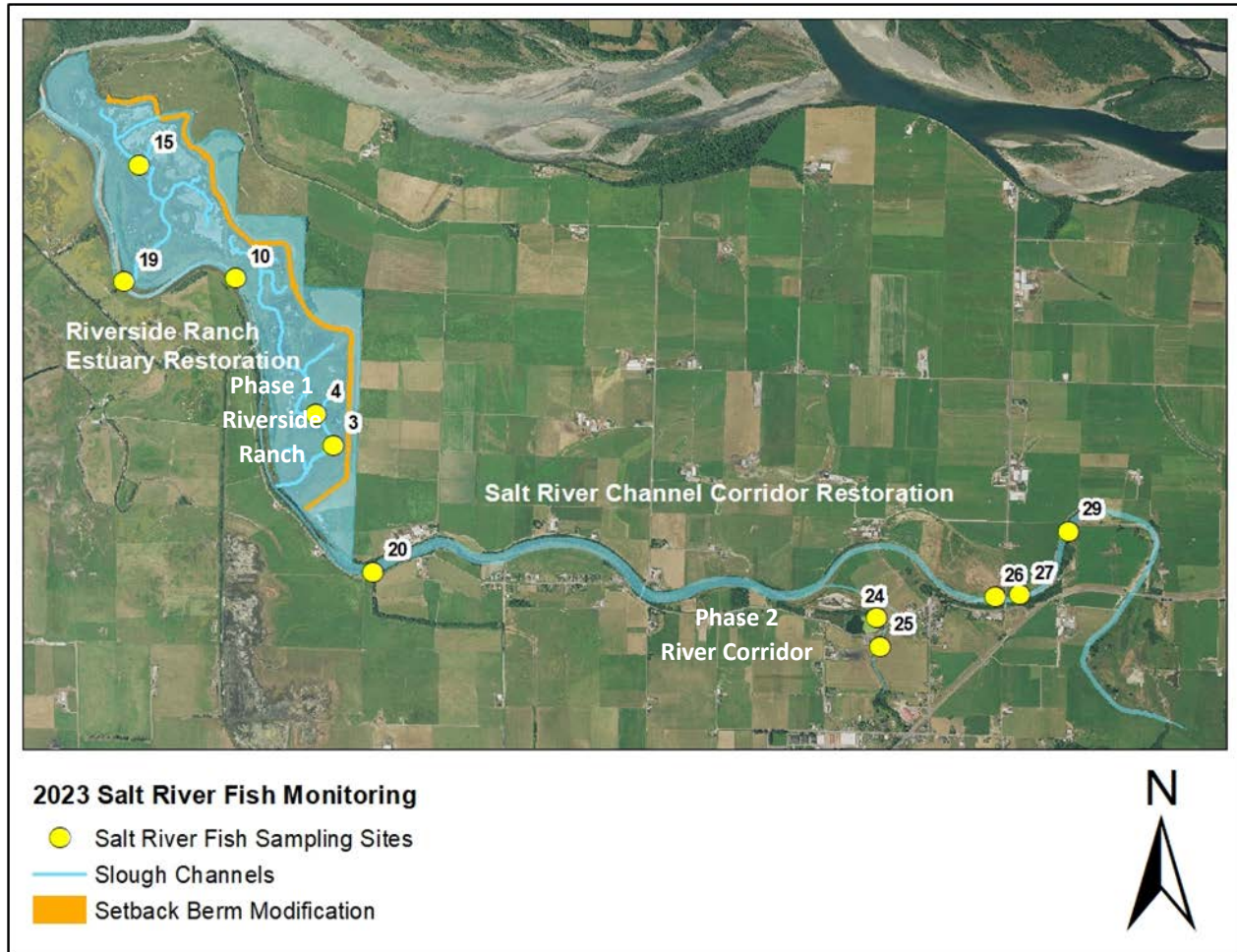
In 2014, NOAA, CDFW, Humboldt State University, and HCRCD developed a post-implementation low-tide spring-summer fish sampling program to determine fish species' presence and distribution after each phase of SRERP construction. This report describes the 2023 monitoring effort that occurred on the portions of the SRERP constructed from 2013 – 2019.

2. Method

1. **Site Selection:** In 2023, the HCRCD and CDFW representatives reviewed fish survey requirements, performed field reconnaissance of identified sites, and selected eleven sites across the project footprint (Figure 1). The site selection was based on environmental conditions at each site (e.g., the presence of water and depth of water). The monitoring sites were selected across the Phase 1 and 2 project footprints as required by monitoring documents (Sites: 3, 4, 10, 15, 19, 20, 24, 25, 26, 27, and 29).
2. **Survey Gear:** Biologists determined that baited minnow traps are most effective in the Phase 2 channel corridor of the project area as the confined channel limits seining efforts. However, each site with a significant scour pool is sampled using either a 1/8th inch or a 1/16th inch mesh pole seine net and a baited minnow trap. Captured fish are held in aerated buckets, identified to species, counted, and released back into the waterway. Additionally, juvenile salmonids are measured, held in a recovery bucket, and then released back into the waterway. Captured non-native Sacramento Pikeminnow are enumerated into 100-millimeter size classes by ocular estimation, and humanely euthanized and buried via permit requirement.

3. Environmental Data Collection: A start time, end time, and air and water temperature are recorded for each seine deployment. Salinity and dissolved oxygen measurements are also recorded for each seine and minnow trap deployment.
4. Survey Frequency: A monthly survey interval, from March to July (this year, April to June) of the eleven sites identified seasonal use, presence, and distribution of fish within the Salt River Phase 1 and 2 project area.
5. Data Storage and Analysis: Monitoring site survey data is recorded in the field on paper data forms. Paper data sheets are error-checked in the field, and survey data is entered into an Excel data file. Excel files are shared between CDFW, HCRCDC, consultants, and Humboldt State University with a backup file system on the CDFW Fortuna server at location U/FRGP Data/Salt River/Monitoring. Paper data sheets are retained on file at the CDFW Fortuna office 1487 Sandy Prairie Ct, Suite A, Fortuna, CA 95540. Data will be analyzed for fish species presence associated with each monitoring site, seasonality, water temperature, salinity, dissolved oxygen, and project habitat features. Pikeminnow data is analyzed for the presence of length classes of pikeminnow in 100-millimeter size class increments. Salmonid fork length data will be analyzed for seasonal growth rate.
6. Data Reporting and Distribution: An annual report will be written and distributed under the title "*CDFW Salt River Restoration Project Fisheries Monitoring Annual Report Number Year_Month_Year_Month. Results of Fish Species Presence and Distribution Monitoring Conducted Year Month to Year Month Within the Salt River, Eel River Estuary, Phases One and Two Project Areas, Humboldt County California*". Reporting is distributed to HCRCDC, United States Fish and Wildlife Service (USFWS), NOAA Fisheries Service, and the California Coastal Commission. Reports are archived and available from the CDFW Fortuna office 1487 Sandy Prairie Ct, Suite A, Fortuna, CA, 95540. Reports can also be found on the HCRCDC website under the Resources and Documents page:
<http://humboldtrcd.org/resources/reports-and-documents/>

Figure 1: Salt River 2023 Project Area Fisheries Monitoring Site Locations. Eleven sites (3, 4, 10, 15, 19, 20, 24, 25, 26, 27, and 29) were sampled in 2023.



Salt River Project fisheries monitoring site location descriptions:

1. Site 3 is located at the confluence of the S1 slough and a left bank tide gated drainage channel not depicted in blue line on the map. Seine both the S1 slough and runoff channel.
2. Site 4 is located at a LWD structure in the lower third of the S1 slough channel. Seine around the LWD structure.
3. Site 10 is on the mainstem Salt River between the mouths of the two sloughs. Seine 150 feet of the river channel.
4. Site 15 is on the mainstem of the N1 slough upstream of the second left bank branch. The seine is 150 feet above the confluence with the slough branch.
5. Site 19 is on the main stem of the Salt River just upstream of the confluences with the N1 Slough. Seine the 150 feet above the confluence.

6. Site 20 is located at the confluence of Reas Creek. The seine in the main Salt River channel across the mouth of Reas Creek. Seine up the Reas Creek wood weirs (step pools) to the outfall of the box culvert.
7. Site 24 is located on Francis Creek at the first LWD structure downstream of the Port Kenyon Bridge. Deploy baited minnow traps in the plunge pool and seine.
8. Site 25 is located on Francis Creek at the first LWD structure upstream of the Port Kenyon Bridge. Deploy baited minnow traps in the plunge pool and seine.
9. Site 26 is an off-channel alcove with a large multi-log LWD structure on Salt River, approximately 250 ft downstream of Fulmor Bridge. Deploy baited minnow traps and dip net.
10. Site 27 is an off-channel alcove with a large multi-log LWD structure on Salt River, approximately 250 ft upstream of Fulmor Bridge. Deploy baited minnow traps and dip net.
11. Site 29 is a terminal side channel located on Salt River near the western corner of where the channel makes a large loop (locally called "211 loops"). Deploy baited minnow traps at nearby LWD and seine if possible.

Observations

In 2023, five Phase 1 tidal estuary sites (3, 4, 10, 15, 19) and six Phase 2 channel corridor sites (20, 24, 25, 26, 27, and 29) were monitored. Salt River surveys occurred once monthly from April to June 2023. The surveys were performed by CDFW's biologist, Christopher Loomis, and associated crew members, as well as a Humboldt County Resource Conservation District Watershed Coordinator and Project Assistant.

Concurrent with the fish seining and trapping, water quality measurements are recommended to be taken for temperature, salinity/conductivity (depending on what equipment was available), and dissolved oxygen. Surveys throughout the spring and summer showed that water temperatures ranged between a maximum of 25.4°C (June) and a minimum of 10.3°C (April). Average temperatures increased across sampling months from spring to summer, with a 15.1 °C increase between April and June.

Table 1. Water Quality Parameters Across Phase 2 Channel Corridor of the Salt River Ecosystem Restoration Project.

Phase 2 Water Temperature (°C)	2023 Sampling		
	April	May	June
Average	16.1	16.6	19.2
Range	10.3 to 23.2	13.4 to 24.7	16.2 to 25.4

Seining and minnow trapping at the eleven fisheries monitoring sites, over the three-month sampling period, identified the presence of 13 known species. Approximately 2,224 individuals were captured, 1,200 of these individuals were an unknown species of baitfish. Table 2 presents the total number of fish and marine invertebrates sampled from April to June in 2023.

Salmonids

Ten juvenile Coho salmon (*Oncorhynchus kisutch*) were present during the April sampling and four were present during the May sampling; Seven were captured at site #10, two were captured at site #19, and one at site #26 in the minnow trap. One Steelhead (*Oncorhynchus mykiss*) juvenile was sampled at site #24. See Figures 2, 3, and 4.

Table 2. Number of Individual Fish Captured by Each Month’s Fish Survey Efforts in Salt River Ecosystem Restoration Project, Phase 2 Area, in 2023

Common Species Name	2023			
	April	May	June	Total
Chinook Salmon	0	1	0	1
Coho Salmon	10	4	0	14
Steelhead	0	0	1	1
California Roach	27	6	0	33
Prickly Sculpin	11	62	35	108
Sacramento Pikeminnow	52	135	16	203
Saddleback Gunnel	0	0	2	2
Shiner Perch	0	1	39	40
Staghorn Sculpin	68	73	42	183
Starry Flounder	0	5	6	11
Three-Spine Stickleback	38	109	278	425
Top smelt	0	0	1	1
Unknown Baitfish	0	0	1200	1200
Unknown Sculpin	0	0	2	2
TOTAL	206	395	1622	2223

Figure 2: Juvenile Coho caught at site 3 in May 2023
April 2023



Figure 3: Juvenile Coho caught at site 19 in



Figure 4: Juvenile Steelhead at site 24 in June 2023



Additional Fish Species

Fish species sampled in 2023 included the following: Coho salmon (*Oncorhynchus kisutch*), Chinook salmon (*Oncorhynchus tshawytscha*), Steelhead salmon (*Oncorhynchus mykiss*), Three-spined Stickleback (*Gasterosteus aculeatus*), Staghorn sculpin (*Leptocottus armatus*), Prickly Sculpin (*Cottus asper*), Sacramento Pikeminnow (*Ptychocheilus grandis*), Starry flounder (*Platichthys stellatus*), Saddleback Gunnel (*Pholis ornate*), Shiner Perch (*Cymatogaster aggregate*), Topsmelt (*Atherinops affinis*), and California Roach (*Hesperoleucus symmetricus*) among others unidentifiable species. The number of captured Sacramento pikeminnow (*Ptychocheilus grandis*) (203 individuals) has once again increased from the 2022 sample size of 175 individuals and the 2019 sample size of 65 individuals. The largest number of pikeminnow sampled was at site 24 with 73 individuals counted.

4. Discussion

Multiple phases of the SRERP were constructed across the years 2013, 2014, 2015, 2017, 2018, and 2019. Further phases are expected to be constructed in the coming years. During each construction season, the construction site was de-fished, cut off from inflowing water by coffer dams and diversions, and fully dewatered. Water is allowed back into the Salt River following the completion of the project's excavation and construction activities. A multi-year monitoring effort of fish species presence and distribution within the Salt River restored areas was initiated with monitoring site selection and fish capture and identification surveys in March 2014. Additional sites are determined and added after each completed restoration phase.

Twenty-three spring-summer fish sampling sites exist across the Phase 1 and Phase 2 areas of the SRERP. In 2023, the project sampled eleven sites across the Phase 1 restored estuary and Phase 2 riverine corridor. These eleven sites include tidal sloughs habitats, Salt River's tidally influenced main channel, stepped weirs at the Reas Creek confluence of the Salt River, off-channel habitat, and scour pools associated with log structures along the Salt River corridor, including Francis Creek.

The presence of juvenile salmonids is expected in the early spring months (March and April), given their presence in previous years' sampling efforts. In 2022 and 2023, fish surveys did not occur in March. However, 16 juvenile salmonids were captured during our 2023 surveys months which included species such as Coho (*Oncorhynchus kisutch*) Chinook (*Oncorhynchus tshawytscha*), and Steelhead (*Oncorhynchus mykiss*). Coho was captured at sites #26, #25, #24, #20, #19, #10, and #3. One Chinook was captured at site 20 near Reas Creek and one steelhead was captured at site #24.

Six of the lower sites in the Salt River restoration footprint (sites #3, #4, 10, #15, #19, and #20) are tidally influenced. Species that are specific to these sites in 2023 include Starry flounder (*Platichthys stellatus*), California roach (*Hesperoleucus symmetricus*), Saddleback GUNNEL (*Pholis ornate*), Shiner Perch (*Cymatogaster aggregate*), Topsmelt (*Atherinops affinis*), Prickly Sculpin (*Cottus asper*), Staghorn sculpin (*Leptocottus armatus*) and an unidentifiable species of baitfish. Tidally tolerant fish such as the Three-spined stickleback (*Gasterosteus aculeatus*), Prickly sculpin (*Cottus asper*), and Sacramento pikeminnow (*Ptychocheilus grandis*) were found throughout the project area.

As each new restoration reach is completed, fish appear to utilize the newly constructed channel immediately. The past 10 years of fish surveys have shown that, overall, the Salt River Ecosystem Restoration Project has created a diverse ecosystem where native fish species can be successful.