

SALT RIVER ECOSYSTEM RESTORATION PROJECT

SPRING-SUMMER FISH MONITORING PROGRAM

2018

Results of Fish Species Presence and Distribution Monitoring Conducted
From April to July, 2018 within the Salt River, Eel River Estuary,
Phase 1 and 2 Project Areas, Humboldt County California

Prepared By: Doreen Hansen (Humboldt County Resource Conservation District)

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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 (2.1 miles of river channel and 0.5 miles of the Frances Creek tributary) were constructed in 2014, 2015, and 2017. A fish sampling program was developed in the spring of 2014 and is conducted annually across 13 sites throughout the constructed reaches of the SRERP. Monitoring for fish species presence and distribution in 2018 began in April and continued through to July. A 1/8 inch mesh pole seines and baited minnow traps were methods used to sample various sites. Captured fish were identified, enumerated, and released. Surveys identified the species presence of Coho salmon (*Oncorhynchus kisutch*), Chinook salmon (*Oncorhynchus tshawytscha*), tidewater goby (*Eucyclogobius newberryi*), three-spined stickleback (*Gasterosteus aculeatus*), staghorn sculpin (*Leptocottus armatus*), topsmelt (*Atherinops affinis*), and starry Flounder (*Platichthys stellatus*), among others.

1. 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, Eel River flow stage, and the input of freshwater tributary streams that drain from the Wildcat Ridge above Ferndale. In the mid 1800's the Salt River channel was deep enough to support ship traffic to Port Kenyon on the Salt River, but increased sediment delivered from the upper watershed and reduced tidal prism to flush sediment 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 in this area in 2013 to restore 330 acres of tidal estuary, which included 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 flow function to the lower two and a half miles of the Salt River. By 2017, 2 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. An additional 2.5 miles of Salt River channel will be restored in future construction seasons to complete Phase 2 and the SRERP construction implementation phase. 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 (hereby known as the fish monitoring team) developed a post-implementation low-tide spring-summer fish sampling program to determine fish species presence and distribution for five years after each phase of SRERP construction. This report describes the 2018 monitoring effort that occurred on the portions of the SRERP constructed from 2013 – 2017.

2. METHODS

- a. Site Selection: 13 sites on Phase 1 and Phase 2 of the SRERP were selected for fish presence and distribution monitoring to represent the diversity of channel size and

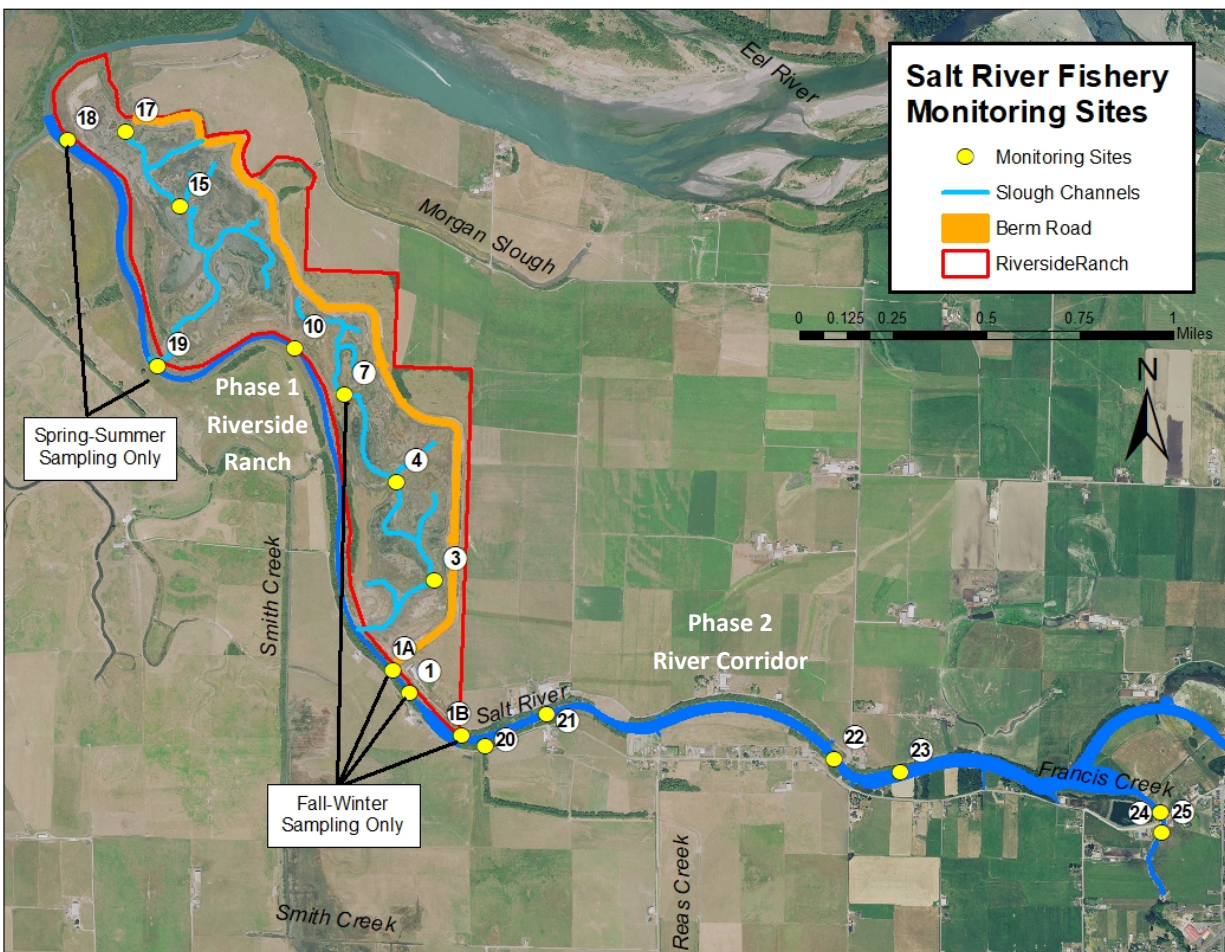
habitats in the main Salt River project footprint (Figure 1). Some sites are associated with constructed project habitat features such as in-channel large wood.

- b. As of 2016, biologists and project partners observed that three sampling sites established in Year-1 on Phase 1 were degrading due to the erosion of channel features or sedimentation. Thus, during low tides, these particular sites held minimal water to seine or use baited traps. The fish monitoring team determined that sites 8, 9, and 14 should be abandoned due to lack of water (no longer on Figure 1 map). Sites 1 and 7 also have limited water for low-tide surveys and are surveyed during fall-winter high-tide monitoring.
- c. Survey Gear and Methods: Minnow traps were implemented in the first year of monitoring (2014), however, were not effective in capturing fish in the tidal estuary. Therefore, minnow trapping was abandoned in the Phase 1 portion of the project area in the second year, 2015. Net seining continued to be an effective method of sampling fish in Phase 1. Each site is sampled using either a 1/8th inch or a 1/16th inch mesh pole seine net and a baited minnow trap. Typically, a single 1/8th inch or 1/16th inch mesh pole seine pass is made through each site. 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.
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. Limited seining will continue if conditions allow.
Captured non-native pike minnow are enumerated into 100-millimeter size classes by ocular estimation, and humanely euthanized and buried via permit requirement. 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 deployment.
- d. Survey Frequency: A monthly survey interval, from March to July (this year, April to July) of the 13 sites identifies seasonal use, presence, and distribution of fish within the Salt River Phase 1 and 2 project areas.
- e. 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, HCRCD, 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 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. Pike minnow data will be analyzed for presence of length classes of pike minnow in 100-millimeter size class increments. Salmonid fork length data will be analyzed for seasonal growth rate.

- f. 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 HCRC, United States Fish and Wildlife Service (USFWS), NOAA Fisheries Service, and the California Coastal Commission. Reports are archived and available from CDFW Fortuna office 1487 Sandy Prairie Ct, Suite A, Fortuna, CA, 95540.

Figure 1: Salt River 2018 Project Area Fisheries Monitoring Site locations



Salt River Project fisheries monitoring site location descriptions:

- Site 1 is located on the main stem Salt River near the Riverside Ranch Barn and a telephone pole adjacent to the main road. Seine the main channel from approximately 150 feet up stream of the telephone pole down to the pole. Associated sites for high-tide fall-winter surveys, 1A and 1B, are approximately 100' upstream and 50' downstream of Site 1. Site 1 has been **ABANDONED** for low-tide spring-summer surveys, however, is sampled during fall-winter high-tide surveys when conducted.

- 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.
- Site 4 is located at a LWD structure in the lower third of the S1 slough channel. Seine around LWD structure.
- Site 7 is associated with a piece of placed large woody debris (LWD) in the S1 slough. Seine 100 feet on either side of the LWD. Site has been **ABANDONED** for low-tide spring-summer surveys, however, is sampled during fall-winter high-tide surveys when conducted.
- Site 8 is associated with a goby lift on a branch of the S1 slough. Seine from the lift to the upstream end of the excavated channel. Site has been **ABANDONED**.
- Site 9 is associated with a goby lift on a branch of the S1 Slough. Seine from the lift to the upstream end of the excavated channel. Site has been **ABANDONED**.
- Site 10 is on the main stem Salt River between the mouths of the two sloughs. Seine 150 feet of the river channel (Fig. 2).
- Site 14 is located on a branch of the N1 Slough. Seine last 150 feet of the channel and has been **ABANDONED**.
- Site 15 is on main stem of the N1 slough upstream of the second left bank branch. Seine 150 feet above confluence with slough branch (Fig. 3).
- Site 17 is associated with a piece of placed LWD on the main stem of the N1 Slough. Seine 100 feet on both sides of the LWD.
- Site 18 is on the main stem of the Salt River near the confluence with Cutoff Slough. Seine 150' of river channel.
- Site 19 is on the main stem of the Salt River just upstream of the confluence with the N1 Slough. Seine the 150 feet above the confluence.
- Site 20 is located at the confluence of Reas Creek. 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.
- Site 21 is located approximately 400' upstream from the "Regli" rocked entrance on Port Kenyon Road (or 1,100' upstream from Reas Creek). The site is located just

downstream of a floodplain outlet and associated with a LWD. Deploy baited minnow traps at near-by LWD and seine if possible.

- Site 22 is approximately 180' downstream of Dillon Road Bridge. The site is associated with LWD. Deploy baited minnow traps at near-by LWD and seine if possible.
- Site 23 is approximately 650' upstream of Dillon Road Bridge. It is the first LWD structure encountered upstream of the first floodplain outlet above Dillon Road Bridge. Deploy baited minnow traps at near-by LWD and seine if possible.
- Site 24 is located on Francis Creek at the first LWD structure downstream of the Port Kenyon Bridge. Deploy baited minnow traps in plunge pool and seine.
- Site 25 is located on Francis Creek at the first LWD structure upstream of the Port Kenyon Bridge. Deploy baited minnow traps in plunge pool and seine.

Figure 2. Seining at site 10



Figure 3. Seining at site 15



3. Observations

Salt River surveys occurred once monthly from April to July 2018. Ross Taylor and Associates completed the March survey and those results are presented in the fall-winter report "Fisheries Sampling in the Lower Salt River during the Fall and Winter of 2017-2018" (Taylor 2018). The April and May surveys were performed by CDFW's biologists and associated crew members. The June and July surveys were conducted by Humboldt State University (HSU) fisheries biology professor, Darren Ward and his associates.

Concurrent with the fish seining and trapping, water quality measurements are taken for temperature, salinity/conductivity (depending on what equipment was available), and dissolved oxygen (Table 1). Surveys throughout the spring and summer months showed that water temperatures ranged between a maximum of 22.8°C (June) at site #4 and minimum of 9.7°C (April) at site #20. However, average temperatures were similar across all sampling months. Conductivity measurements were collected during April and May. Conductivity ranged from 760.6 mm/hg to 773 mm/hg throughout the entire sampling area. The average conductivity was 766.9 mm/hg. These values indicate that conductivity is not only high in saline waters but also in the freshwater reaches. Salinity was measured in June and July. Average salinity ranged from 0.2ppt (June) to 32.7 ppt (July) throughout the entire sampling area. Average salinity in the estuary was 24.8 ppt and 0.3ppt in the river corridor (Reas Creek and upstream). Dissolved oxygen was also measured during April and May and ranged between 7.0 ppm and 14.7 ppm. Average dissolved oxygen was 11.1 ppm (100% oxygen saturation is 10.0 ppm). The stated maximum dissolved oxygen values are beyond the 100% oxygen saturation level, though dissolved oxygen probes are notorious for reading above 10.0 ppm.

Table 1. Water Quality Parameters Across Constructed Portions of the Salt River Ecosystem Restoration Project.

	Water Quality Parameters in 2018			
	Temp H ₂ O (C)	SALINITY (ppt)	Conductivity (mm/hg)	D.O. (ppm)
Range	9.7 to 22.8	0.2 to 32.7	760.6 to 773	7.04 to 14.7
Average	16.1	12.1	766.9	11.1

Seining and minnow trapping at the 13 fisheries monitoring sites, over the four month sampling period, identified the presence of 15 known species. Approximately 6,903 individuals were captured (approximate numbers in 2018 were often made during the capture of three-spined stickleback, staghorn sculpin, topsmelt, and unidentified shrimp). The following table (Table 2) presents the total number of fish and marine invertebrates sampled from April to July in 2018.

Table 2. Number of Individual Fish Captured by Each Month's Fish Survey efforts in Salt River Ecosystem Restoration for 2018

Common Species Name	2018				TOTAL
	April	May	June	July	
Tidewater Goby	0	1	1	3	5
Coho	7	0	0	1	8
Chinook	0	2	0	0	2
Bay Pipefish	0	0	0	1	1
California Roach	0	0	0	1	1
Dungeness Crab	0	2	0	24	26
English Sole	0	0	1	1	2
Pacific Herring	0	0	0	1	1
Sacramento Pikeminnow (<100mm)	49	65	0	60	174
Saddleback Gunnel	0	0	0	1	1
Shiner Surf Perch	0	0	5	2	7
Staghorn sculpin	95	503	38	12	648
Starry Flounder	0	41	15	5	61
Three-Spined Stickleback	57	1682	1585	1280	4604
Topsmelt	0	0	100	765	865
Unidentified Sculpin	40	0	0	0	40
Unidentified Flatfish	0	2	0	0	2
Unidentified Shore Crab	0	0	7	45	52
Unidentified Shrimp	0	403	0	0	403
TOTAL	248	2701	1752	2202	6903

Seven Coho salmon (*Oncorhynchus kisutch*) juveniles were present during the April sampling month (Fig. 4 and 6). Two juvenile Chinook salmon (*Oncorhynchus tshawytscha*) were captured in May, which was the first time Chinook salmon were captured in the project area that year. These spring salmonids were captured in the tidal marsh area and in the main channel Salt River. In July, a juvenile Coho salmonid was captured in a deep pool in Francis Creek (site 24) (Fig. 6).

Figure 4. Coho captured in April 2018



Figure 5. Coho captured in April 2018



Figure 6. Coho captured at site 24 in July 2018



In previous years immediately after construction of the tidal marsh in 2013, tidewater gobies (*Eucyclogobius newberryi*) were abundant in the southern slough channel terminal arms, where over a hundred individuals would be caught in one sampling period (month). The numbers of tidewater goby captured since 2014 has been dramatically declining. In 2018, only five tidewater goby individuals were captured during the sampling season. The low numbers are highly likely due to degraded or loss of backwater habitat, caused by sedimentation and/or erosion of channel features within the created slough channels at three former sites. The 2018 captured tidewater gobies occurred at sites 15 and 17.

Multiple marine species were present in the estuary portion of the project area. Most marine species were captured in the estuary slough channels, both in the northern (sites 15 and 17) and southern (sites 3 and 4) slough networks. Marine species include: Bay Pipefish (*Syngnthus leptorhynchus*), Dungeness crab (*Metacarcinus magister*), English Sole (*Parophrys vetulus*), Pacific Herring (*Clupea pallasii*), Saddleback Gunnel (*Pholis ornate*), Shiner Surfperch (*Cymatogaster aggregata*), Starry Flounder (*Platichthys stellatus*), and Topsmelt (*Atherinops affinis*).

Numbers of staghorn sculpins (*Leptocottus armatus*) continue to increase in numbers since 2014 within the project area; zero in 2014, zero in 2015, 148 in 2016, 212 in 2017, and 648 in 2018. Three-spined stickleback (*Gasterosteus aculeatus*) continue to be captured in the thousands of individuals. The number of Sacramento pikeminnow (*Ptychocheilus grandis*) has dramatically decreased from 2017 to 2018. This may be due to the lower precipitation through the winter and spring creating higher salinity habitat throughout a majority of project area, preventing their presence in the estuary. An abundance of Starry flounder (*Platichthys stellatus*), 30 individuals, were captured at site 3 during the May survey effort.

4. DISCUSSION

In the summer of 2013, all fish were captured and relocated from the main stem Salt River and agricultural ditches within the SRERP's Phase 1 construction area. The area was cut off from inflow by coffer dams and diversions and fully dewatered. Water was allowed back into the Salt River Phase 1 project area in October of 2013 following completion of the project's excavation and construction activities. Since re-watering of the Salt River occurred, all fish currently present in the Salt River Phase 1 project area have emigrated from non-project sections of the Salt River and its connection to the Eel River Estuary. Additional Phase 2 reaches of channel were restored in 2014, 2015, and 2017 and underwent fish removal and dewatering. A multi-year monitoring effort of fish species presence and distribution within the Salt River restored areas were initiated with monitoring site selection and fish capture and identification surveys in March of 2014. Additional sites are determined and added after each completed restoration phase. Fish surveys are conducted once monthly, from March to July, annually. However, the 2018 March survey was conducted as part of the 2017-18 fall winter fish surveys.

The 13 sites for the low-tide spring-summer fish monitoring program on the Salt River restoration project area were selected for fish presence and distribution monitoring to represent the diversity of channel size and habitats in the main Salt River, estuary slough channels, and restored tributaries (Figure 1). Some of the 13 sites were also associated with constructed project habitat features such as in-channel large wood structures.

Tidewater goby are listed under the federal Endangered Species Act and Salt River Phase 1 project permit conditions included the construction of habitat features for the benefit of tidewater goby. At several locations, a hump was constructed in the longitudinal profile of a reconstructed slough channel, and this feature, referred to as a goby lift, was placed to provide tidewater goby an area of muted tidal exchange. In previous years, abandoned fisheries monitoring sites 8 and 9 that receive muted tidal exchange associated with a project constructed goby lift, proved to be ideal habitat for tide water gobies where upwards of 70 individuals were captured with one seine pull. However, in 2016 these sites degraded due to either the erosion of the goby lift or sedimentation behind the lift, thus backwater environments are no longer sustained during low tide periods. The program fish monitoring team addressed this situation and determine that these sites were to be abandoned and a new site was identified in the southern slough network (site 4) as an alternative site, though no tidewater gobies were sampled at site 4 in 2018. However, tidewater gobies were captured in 2017 at site 4.

The presence of juvenile salmonids are expected in the early spring months (March and April), given their presence in previous years' sampling efforts. In 2018, predictively, juvenile salmonids were sampled in March and April. A large Coho juvenile was also captured in July. Some biologist believe that this July juvenile did not out migrate due to warm water temperatures and low dissolved oxygen levels immediately downstream which created a temporary fish barrier to the estuary and ocean.

Marine species in the tidally influenced areas of the project footprint continue to be sampled as in previous years. Juvenile Topsmelt are usually present in the summer months. Bottom fish, such as English sole and Starry flounder, are present throughout most the sampling season. Strictly freshwater species, such as the California roach, are small in number. Tidally tolerant fish such as the Three-Spined stickleback and Staghorn sculpin are abundant throughout the project area.

As each new restoration reach is completed, fish appear to utilize the newly constructed channel immediately. The past five years of fish surveys have shown that, overall, the Salt River Ecosystem Restoration Project has been successful for native fish species.