

# SALT RIVER ECOSYSTEM RESTORATION PROJECT

## FISH MONITORING PROGRAM

2017

Results of Fish Species Presence and Distribution Monitoring Conducted  
From March to August, 2017 within the Salt River, Eel River Estuary,  
Phase 1 and 2 Project Areas, Humboldt County California

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December 12, 2017

### **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. A fish sampling program was developed in the spring of 2014. A lower portion of the Phase 2 footprint (1.6 miles of river channel) was constructed in 2014 and 2015. Currently 11 sites are established across Phase 1 (Riverside Ranch) and the completed portion of the Phase 2 channel corridor of the SRERP. Monitoring for fish species presence and distribution in 2017 began in March and continued through to August (though monitoring did not occur in the month of July). A 1/8th inch mesh pole seine 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*), top smelt (*Atherinops affinis*), shiner perch (*Cymatogaster aggregate*); and Bay pipefish (*Syngnathus leptorhyncus*), 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 2016, a portion of Phase 2 construction was completed, restoring an additional 1.6 miles of Salt River channel immediately upstream of Phase 1. An additional 2.9 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 fish sampling program to determine fish species presence and distribution for five years after each phase of SRERP construction. This report describes the 2017 monitoring effort that occurred on the portions of the SRERP constructed from 2013 – 2015.

## **2. METHODS**

- a. Site Selection: 11 sites on Phase 1 and Phase 2 of the SRERP were selected in 2017 for fish presence and distribution monitoring to represent the diversity of channel size and habitats in the main Salt River channel, northern slough channel network,

and the southern slough network (Figure 1). Some of the sites were also associated with constructed project habitat features such as in-channel large wood.

- b. As of 2016, biologists and project partners observed that four sampling sites established in Year-1 on Phase 1 were degrading due to the erosion of channel features or sedimentation. Thus, during low tide, these particular sites held minimal water to seine or use baited traps. The fish monitoring team determined that site #14 should be abandoned due to lack of water. Sites #1, #7, #8, and #9 also have limited water for low-tide surveys.
- 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 1/8<sup>th</sup> inch or a 1/16<sup>th</sup> inch mesh pole seine net and a baited minnow trap. Typically, a single 1/8<sup>th</sup> inch or 1/16<sup>th</sup> 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.

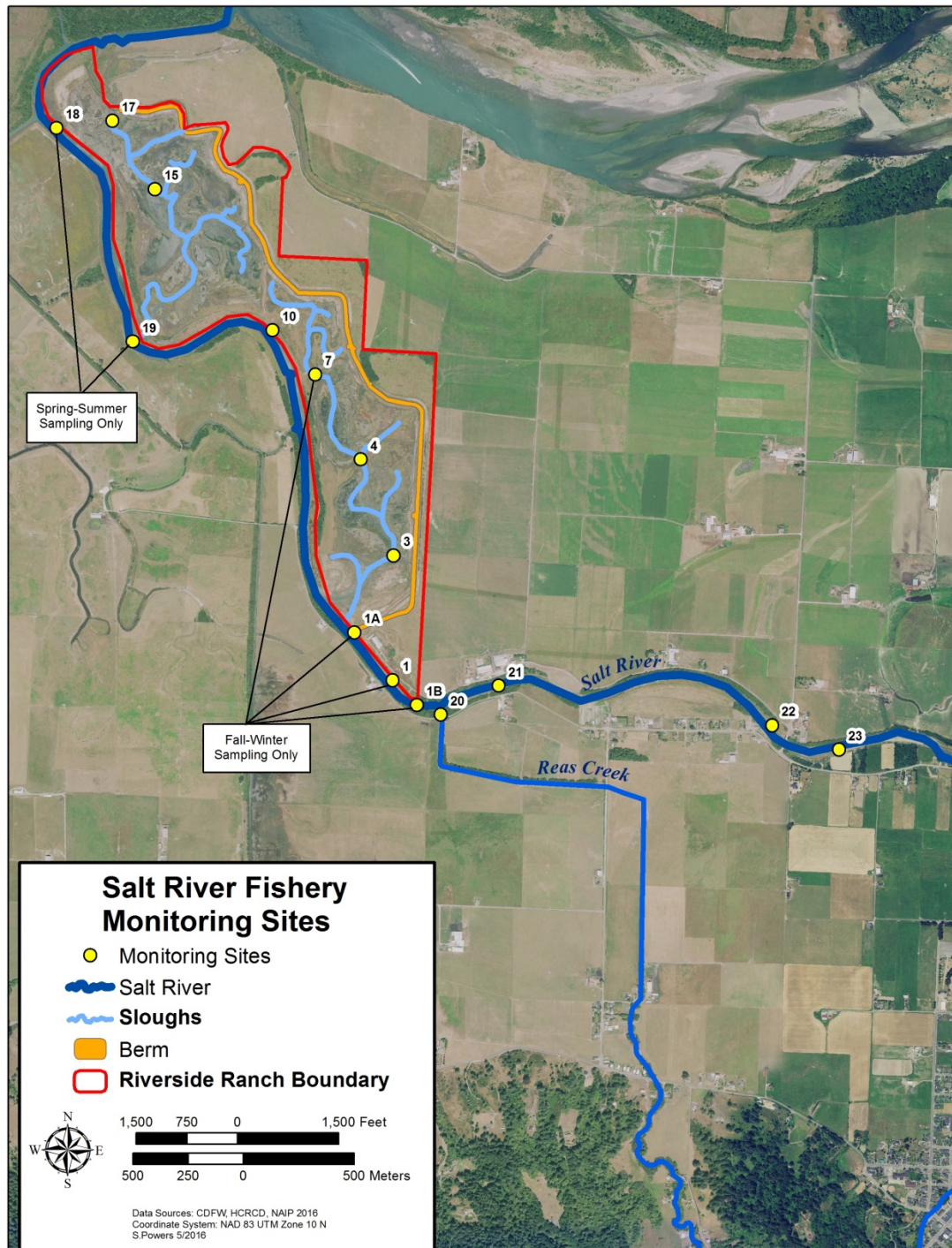
Captured non-native pike minnow are enumerated into 100-millimeter size classes by ocular estimation, and humanely euthanized and buried via permit requirement. A start time, end time, and air and water temperature are recorded for each seine deployment. Salinity and dissolved oxygen measurements are also recorded for each seine deployment.

- d. Survey Frequency: A monthly survey interval, from March to July (this year, in 2017, the July effort moved to August) of the 14 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 2017 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. Site has been **ABANDONED** for low-tide spring-summer surveys.
- 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.
- 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.
- 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.
- 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 slough.
- 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.

- 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 sein 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 sein 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 sein if possible.

### **3. Observations**

Salt River seining surveys occurred once monthly from March to August 2017 (the July effort was performed in August). Ross Taylor and Associates lead the March survey. The April and May surveys were performed by CDFW's biologists Scott Monday and associated crew members. The June and August surveys were conducted by Humboldt State University (HSU) fisheries biology professor, Darren Ward and his associates.

Surveys throughout the spring and summer months showed that water temperatures ranged between a maximum of 22°C (June) at site #17 and minimum of 9.5°C (April) at site #3. Salinity was measured in June and August. Average salinity ranged from 0.3ppt (March) to 15.5ppt (August) throughout the entire sampling area. Average salinity ranged from 0.4 ppt (March) to 25.5ppt (August) in the estuary and 0.09ppt (March) to 2.37ppt (August) upstream of Reas Creek in the river channel corridor. Dissolved oxygen was also measured during the surveys and each month's average ranged between a maximum of 16.6 ppm and a minimum of 8.9 ppm (100% oxygen saturation is 10.0 ppm) (Table 1). The stated maximum dissolved oxygen value is beyond the 100% oxygen saturation level, though dissolved oxygen probes are notorious for reading above 10.0 ppm.

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

	Average Water Quality Parameters		
	Temp H <sub>2</sub> O (C)	Average of SALNITY (ppt)	D.O. (ppm)
<b><u>2017</u></b>			
<b>March</b>	13.7	0.3	8.9
<b>April</b>	11.1	0.6	14.0
<b>May</b>			
<b>June</b>	19.6	0.9	16.6
<b>August</b>	17.9	15.5	

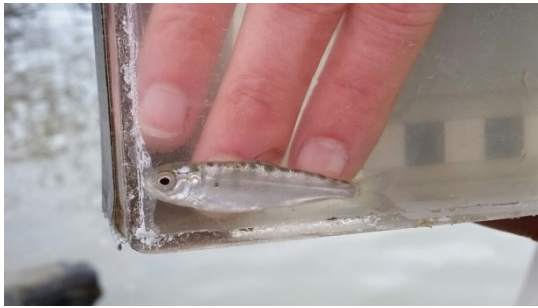


Figure 2. Chinook captured at site #15 in April 2017



Figure 3. Coho captured at site #18 in April



Figure 4. Coho captured at site 20 in March 2017

Seining and minnow trapping at the 11 fisheries monitoring sites, over the five month sampling period, identified the presence of 15 known species (20 species were sampled in 2016).

Approximately 7,692 individuals were captured (approximate numbers were often made for three-spined stickleback and smelt). The following table (Table 1) presents the total number of



fish and marine invertebrates sampled from March to August in 2017 (excluding the month of July).

**Table 2. Number of Individual Fish Captured by Each Month's Fish Survey efforts in Salt River Ecosystem Restoration for 2017**

	<b>Number of Fish Captured in 2017</b>					
	<b>March</b>	<b>April</b>	<b>May</b>	<b>June</b>	<b>August</b>	<b>Total</b>
<b><u>Fish Common Name</u></b>						
<b>Tidewater Goby</b>	3	9	0	0	3	<b>15</b>
<b>Coho</b>	6	4	0	0	0	<b>10</b>
<b>Chinook</b>	0	1	0	0	0	<b>1</b>
<b>Three-spined Stickleback</b>	1,699	157	82	1,755	1293	<b>4,986</b>
<b>Staghorn sculpin</b>	127	40	18	21	6	<b>212</b>
<b>Un. ID Sculpin</b>	2	0	1	0	0	<b>3</b>
<b>Pike Minnow</b>	960	49	82	44	100	<b>1,235</b>
<b>Pacific Herring</b>	2	0	0	0	0	<b>2</b>
<b>Bay Pipefish</b>	0	0	0	3	0	<b>3</b>
<b>Top Smelt</b>	0	0	0	0	1,105	<b>1,105</b>
<b>Un. ID Smelt (juv)</b>	0	0	0	10	0	<b>10</b>
<b>Starry Flounder</b>	0	0	0	2	1	<b>3</b>
<b>Shiner Surf Perch</b>	0	0	0	50	5	<b>55</b>
<b>California Roach</b>	37	3	0	9	0	<b>49</b>
<b>Dungeness Crab</b>	0	0	0	0	0	<b>0</b>
<b>Yellow/Lined Shore Crab</b>	0	0	0	2	1	<b>3</b>
<b>Total</b>	<b>2,836</b>	<b>263</b>	<b>183</b>	<b>1,896</b>	<b>2,514</b>	<b>7,692</b>

Ten Coho salmon (*Oncorhynchus kisutch*) juveniles were present during the March and April sampling months (Fig. 3 and 4) as well as one Chinook salmon (*Oncorhynchus tshawytscha*) (Fig. 2). Salmonids were captured in the tidal marsh area and in the main channel Salt River.

In previous years immediately after construction of the tidal marsh in 2013, tidewater gobies (*Eucyclogobius newberryi*) were abundant at the southern slough channel terminal arms (sites #8 and #9), where over a hundred individuals would be caught in one sampling period (month). In 2017, only 13 tidewater goby individuals were sampled 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 sites (sites #8, #9, and #14). These sites previously held high concentrations of tidewater goby and have now been abandoned as fish sampling sites. The 2017 captured tidewater gobies occurred at site #3, #4, and #17.

Marine species were present in the estuary portion of the project area. Though the internal slough channel network provides saline habitat, most marine species were captured in the main channel Salt River. Marine species include: Bay Pipefish (*Syngnthus leptorhynchus*), Pacific Herring (*Clupea pallasii*), Shiner Surfperch (*Cymatogaster aggregata*) (Fig. 3), Starry Flounder (*Platichthys stellatus*) (Fig. 2), and Top Smelt (*Atherinops affinis*).

Significant numbers (212) of staghorn sculpins (*Leptocottus armatus*) were captured in 2017. This is the second year of increased staghorn sculpin numbers in the project area. Three-Spined Stickleback continue to be captured in the thousands of individuals. The number of Sacramento Pike Minnow has increased alarmingly in 2017 as compared to previous years. This may be due to the higher precipitation through the winter and spring providing suitable low salinity habitat throughout a majority of project area, whereas previous years the region was in a drought and the marine environment stayed highly saline throughout the winter and spring. In June of 2016, a highly abundant species of shore crab (yellow or lined) was first seen in the estuary since restoration was completed in 2013 (Fig 5). For this sampling season, the crabs have reduced from numbers in the thousands in 2016 to just a few individuals in 2017.



Figure 5. Unidentified shore crab (Yellow or Lined) in June 2016 at site #8

#### 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 (Figure 1). 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 and 2015 and underwent fish removal and dewatering. A multi-year monitoring of fish species presence and distribution within the Salt River completed project areas were initiated with monitoring site selection and fish capture and identification surveys in March of 2014. Subsequent fish surveys are conducted once monthly, from March to July/August, annually.

The 11 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 and estuary slough channels (Figure 1). Some of the 11 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, 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, as of 2016 these sites have 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. Program biologists addressed this situation and determine that these sites are to be abandoned and a new site was identified in the southern slough network (#4) as an alternative site.

The presence of juvenile salmonids are expected in the early spring months (March and April), given their presence in previous years' sampling efforts. In 2017, predictively, juvenile salmonids were sampled in March and April. Additionally, a Salt River fall-winter salmonid sampling program sampled Coho from January to March each year. Restoration efforts appear to be benefiting this species.