

Fisheries Sampling in the Lower Salt River during the Fall and Winter of 2016 – 2017

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for
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Conservation District**



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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 with the interactions of tides, Eel River flows, and freshwater inflows from its tributaries (Williams, Francis, and Reas creeks). In the mid-1800s the Salt River channel was sufficiently deep to support ship traffic up to Port Kenyon, however increased sediment delivered from the upper watershed and reduced tidal prism to flush sediment resulted in an aggraded channel with significantly reduced widths and depths. The frequency of flooding in Ferndale and the surrounding farmland progressively increased as the Salt River filled with sediment over the past century, and efforts to alleviate flooding have become a persistent issue. An intensive multi-stakeholder planning process was started in 1990 with a Coastal Conservancy grant that initiated studies on sedimentation, hydrology, and aquatic and avian biology. Stakeholders have included Ferndale residents and dairy farmers, as well as tribal, city, county, state, and federal entities. The culmination of this process was a multi-phase plan to restore the hydraulic and ecological function of the Salt River.

Near the Salt River mouth, the Riverside Ranch was purchased from an interested seller and the title is now held by the California Department of Fish and Wildlife (CDFW). Phase 1 of the Salt River Restoration Program was focused on the Riverside Ranch parcel. In 2013, the Salt River channel was expanded and deepened, selected levees around Riverside Ranch were lowered, a tide gate was removed, and interior slough channels were excavated to meet the following objectives: 1) increase hydrologic function to the lower 2.5 miles of the Salt River, 2) provide access for re-colonization of the lower Salt River by native fish species, and 3) improve habitat for waterfowl and other avian species. The interchange of flow between the Eel River estuary and the lower Salt River was restored in October of 2013 following completion of Phase 1 excavation and other construction activities.

During the spring and early summer of 2014, fish sampling was conducted in the lower Salt River by CDFW, the Humboldt County RCD and other partners to monitor the presence and distribution of fish within the recently restored main channel and sloughs located on the Riverside Ranch. This sampling captured fish with seine nets and minnow traps at 11 sites that were selected to encompass the diversity of channel sizes, depths and locations throughout the main Salt River channel, the northern slough (N1), the southern slough (S1), and smaller side channels to the two sloughs (Figure 1).

Phase 2 implementation of the channel restoration also occurred during the summer of 2014, with approximately 7,000 feet channel excavated up to the Dillon Road Bridge. During the

summer of 2015, an additional 1,500 feet of channel was excavated upstream of Dillon Road Bridge. No channel work was conducted in 2016 due to landowner access issues, which were resolved and work is scheduled to resume during the summer of 2017.

Ross Taylor and Associates (RTA) started the fall and winter low tide and high tide sampling in November of 2014 and also conducted a second season of similar sampling during the fall and winter of 2015-2016. This report provides the results of RTA's third season of fall and winter fisheries sampling which occurred between November 2016 and March 2017.

The remainder of this report includes the following sections:

1. Descriptions of the sites sampled at low and high tides by RTA during the fall and winter of 2016-2017.
2. Methods used at low and high tides.
3. Results from the monthly sampling.
4. Discussion of results and recommendations for future monitoring.
5. Updated photographic catalogs which include the new sample sites and fish species captured between November 2016 and March 2017 (Appendices A and B).

Salt River Fisheries Monitoring Site Descriptions

In October of 2016, RTA met with the Humboldt County RCD, NOAA Fisheries, CDFW and Humboldt State University Fisheries staff to discuss the previous year's sampling and the upcoming fall and winter sampling. A major topic was a discussion of sampling sites, including sites to drop and sites to add to the 2016-2017 sampling. Sites #8, #9 and #14 were dropped because these three locations had failed Tidewater Goby lifts that no longer held water at low tides and were also filled with mud and fine sediments. Site #19 was also dropped from the 2016-2017 fall and winter sampling due to difficult access and because this site's open, main-channel habitat was similar to Site #10. A new sampling site was established in the Southern Slough channel and was designated as Site #4.

The following descriptions are for all the sites established for the Salt River fisheries monitoring:

1. Site #1 is located on the Salt River main channel near the Riverside Ranch barn and a utility pole adjacent to the main road. Approximately 150 feet of channel upstream of the utility pole was sampled at low and high tides.
2. Site #1-A is located Salt River main channel, downstream of Site #1 near the downstream end of the Riverside Ranch barn. This site was sampled only at high tide. Up to three net sets were made with the kayak and 100-foot seine net.

3. Site #1-B is located Salt River main channel, upstream of Site #1, just downstream of the Reas Creek confluence. This site was sampled mostly at high tide. Up to three net sets were made with the kayak and 100-foot seine net.
4. Site #3 is located at the confluence of the Southern Slough and a left-bank tide-gated drainage ditch. Both the slough channel and the drainage ditch were sampled at low tide.
5. Site #4 is a new site located in the Southern Slough that has a LWD root wad. This site was sampled with the 30-foot seine net at low tide and was also sampled during incoming tides with baited minnow traps.
6. Site #7 is associated with a piece of LWD in the Southern Slough, in the upper end of the slough. Approximately 100 feet of channel on both sides of the LWD was sampled at low tide and was also sampled during incoming tides with minnow traps.
7. ~~Site #8 is located on a branch of the upper Southern Slough and is associated with a goby lift. The channel was sampled from the goby lift up to its terminal end at both low and high tides.~~ NOTE: the goby lift failed at this site in 2015 – at low tide the channel is nearly drained. Also appeared filled-in with mud and fine sediment. Not sampled in 2016-17.
8. ~~Site #9 is associated with a goby lift on a branch of the Southern Slough, at the upper end of the slough. The channel was sampled from the goby lift up to its terminal end at both low and high tides.~~ NOTE: the goby lift failed at this site in 2015 – at low tide the channel is nearly drained. Also appeared filled-in with mud and fine sediment. Not sampled in 2016-17.
9. Site #10 is located on the Salt River between the confluences of the Southern and Northern sloughs. Approximately 150 feet of channel was sampled at both low and high tides. NOTE: extremely wet conditions limited our vehicle access to Site #10 during the 2016-17 winter months.
10. ~~Site #14 is on a branch of the Northern Slough that has a terminal end. Approximately 150 feet of the channel was sampled up to the terminal end at low and high tides.~~ NOTE: the goby lift failed at Site #14 during the winter of 2014-15 and was not sampled during the winters of 2015-16 and 2016-17.
11. Site #15 is located on the Northern Slough's main channel, just upstream of the second branch off of the slough. Approximately 150 feet of channel was sampled at low tide, upstream of the second slough channel branch.
12. Site #17 is associated with a piece of LWD in the upper reach of the Northern Slough's main channel. Approximately 100 feet of channel on both sides of the LWD was sampled at low tide. NOTE: the channel upstream of the LWD has completely filled-in with mud and fine sediment, and only the lower section was sampled during 2016-2017.

13. Site #18 is on the Salt River's main channel, approximately 300 feet upstream of the confluence with Cutoff Slough. Approximately 150 feet of channel was sampled at low tide. NOTE: due to extremely wet conditions during the winter of 2016-2017, Site #18 was often too deep to safely wade, even at low tides.
14. ~~Site #19 is located on the Salt River, just upstream of the Northern Slough confluence. Approximately 150 feet of channel was sampled at low tide, upstream of the confluence.~~ NOTE: due to the poor access road and similar open main-channel habitat as Site #10, this site (#19) was dropped from the 2016-2017 sampling.
15. Site #20 is located at the confluence of the Salt River and Reas Creek. This was a new site for the fall/winter 2015-16 and was sampled primarily with minnow traps in scour pools formed by the fully-spanning log weirs in lower Reas Creek.
16. Site #21 encompasses an approximately 600-foot channel reach that starts just upstream of Reas Creek. There are installed wood structures near the upper end of this reach. This was a new site for the fall/winter 2015-16 and was sampled with minnow traps.
17. Site #22 located downstream of the Dillon Road Bridge, this reach is approximately 250 feet in length with two wood structures and a deep scour pool just below the bridge. This was a new site for the fall/winter 2015-16 and was sampled primarily with minnow traps; however several passes were made with the 20-foot seine net.
18. Site #23 encompasses an approximately 2,000-foot long reach above Dillon Road Bridge that terminates at the uppermost end of the 2015 channel excavation. The upper end included Sousa Lake, a large pool with a rock grade-control ramp at the terminus of the 2015 channel excavation. During the 2016-2017 fall/winter season, this site was sampled with baited minnow traps.

Photographs of all the Salt River fisheries sampling sites are located in Appendix A.

Low Tide Seine Net Sampling Methods

RTA used two seine nets to conduct the low tide sampling: a 20-foot long x 4-foot tall net with a 1/8-inch mesh and a 30-foot long x 4-foot tall net with a 1/4-inch mesh. Both nets were attached to six-foot long poles. At each site, we made a single pass in the manner described in previous CDFW reports; typically a 150-foot reach was seined at each location. Unless the tide was completely slack, we always seined against the current to maintain a bag in the seine to more effectively capture and hold fish.

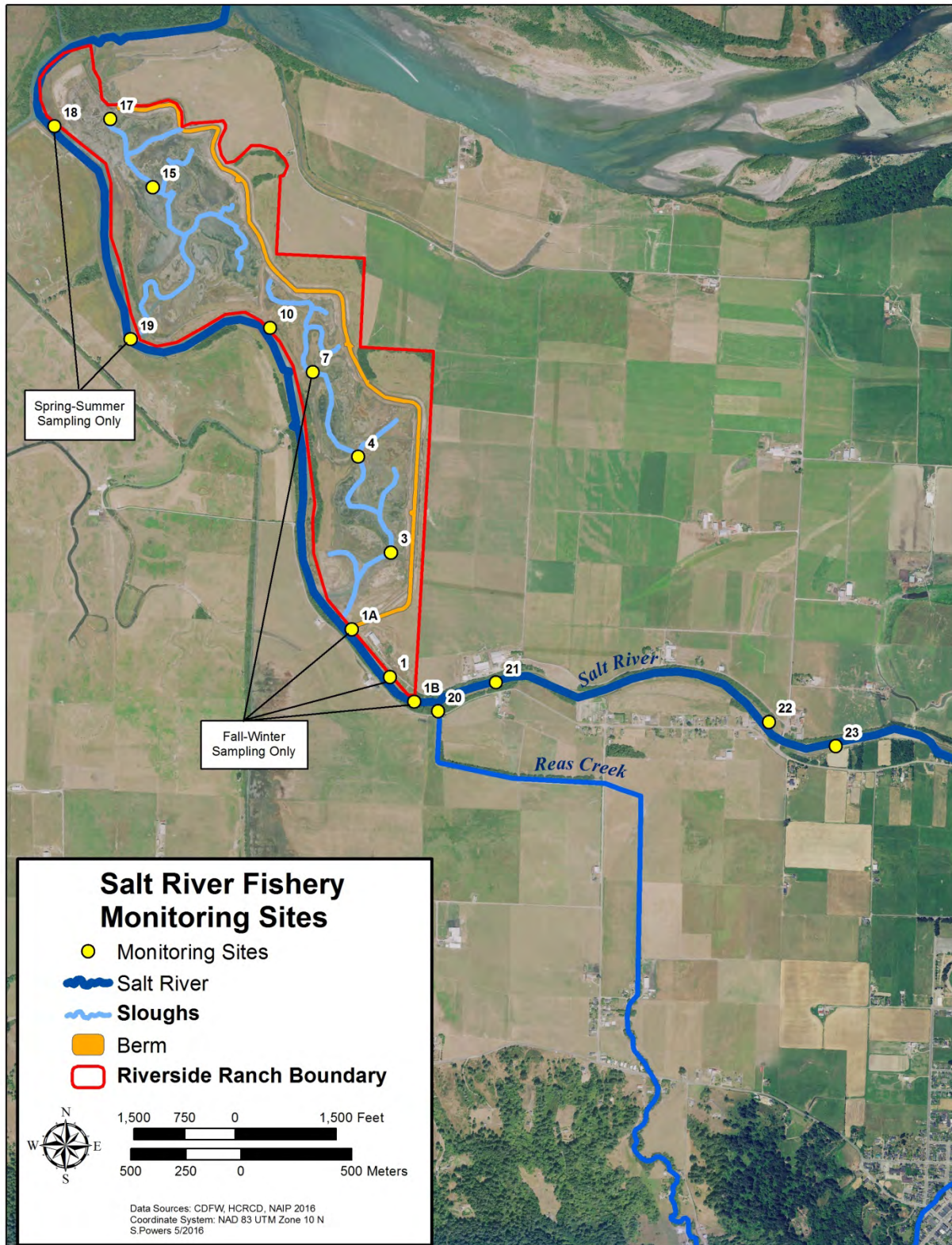


Figure 1. Salt River fisheries monitoring sites for winter of 2016-2017. Map produced by CDFW.

High Tide Seine Net Sampling at Main Channel Sites

At high tide, increased water depths and channel widths in the Salt River's main channel dictated using different sampling gear than wading with the 30 foot seine net. A kayak was used to set a 100-foot long seine net that was six feet tall and had ¼-inch mesh. On each end, the 100-foot net had approximately 10 feet of additional line, allowing for a 120-foot set. The stern end of the kayak was modified to hold a 100-quart cooler that had one end removed, in which the 100-foot seine net was carefully stacked (Figure 2).



Figure 2. Kayak with cooler holding the 100-foot seine net for high tide sampling on 12/02/14.

To set the 100-foot net with the kayak, the following steps were followed by the two-person sampling crew:

1. The terminal ends of the cork and lead lines were clipped to the stern of the kayak with a carabineer and the leading ends of the seine net lines were held to the river bank by a four-foot length of rebar that was securely staked to the bank. The rebar was located approximately 10 feet from the water's edge so that the leading edge of the net was just out of the water.
2. The 100-foot seine net was carefully stacked in the cooler, accordion-style, with cork and lead lines separated to prevent tangling and wrapping.
3. The kayaker wore a life jacket and chest waders with a snugly clipped waist belt.
4. The kayaker paddled the kayak in a large semi-circle from the rebar stake to a predetermined location; either upstream or downstream from the starting location (prevailing wind and tide movement dictated direction) (Figure 3).
5. The shore-based crew member monitored the net-set and informed the kayaker if the net was setting correctly or needed adjustment – the kayaker occasionally had to grab the cork line and give it a firm yank to avoid tangles or wrapping of the lead line.
6. Once the kayaker completed the net-set and pulled the kayak ashore, both crew members started pulling in the net from both ends, working in such a manner to keep the cork line from drifting over the top of the lead line. The lead line was kept as low as possible to minimize lifting the lead line off the channel bottom.
7. Once the entire net was pulled, the two crew members carefully maneuvered the net so that all captured fish were centralized in a small pocket. Then one crew member used an aquarium net to collect fish and place them in aerated five-gallon buckets.
8. After the sampled fish were processed, the 100-foot seine net was restacked into the cooler, making sure all sticks and other debris were removed.

The 2016-17 fall/winter high tide sampling with the kayak and 100-foot seine net was conducted at Sites #1, #1-A, #1-B, and #10. When feasible, three net sets were made at each location, however tidal currents occasionally limited the number of sets made.



Figure 3. Setting the 100-foot seine net at Site #1-A on a high tide on December 12, 2016.

Sampling with Minnow Traps

During the winter of 2016-17, RTA continued sampling the Salt River with minnow traps baited with frozen steelhead eggs. Sites #3, #4, #7, #17, #22 and #23 were the areas most focused for detection of juvenile Coho Salmon (Figures 1 and 4). As was done in 2015-2016, traps were placed adjacent to wood structures (Figure 4) and also in open areas which lacked cover. Roe “balls” were made by wrapping the loose steelhead eggs in fine-meshed cloth and loose eggs were also placed inside the trap (Figure 5). Traps were typically fished for one to two hours. Deployment and retrieval times were recorded and water quality measurements were taken when the traps were retrieved. Fork lengths were measured to the nearest mm of all juvenile Coho Salmon captured in minnow traps.



Figure 4. LWD at Site #22, located downstream of the Dillon Road Bridge on February 28, 2017.



Figure 5. Minnow trap baited with roe ball and loose steelhead roe, February 24, 2016.

Fish Sampling Results – November 2016

In November, the sampling occurred on the 10th and 11th (Tables 1 and 2). On the 10th, the low tide (at Humboldt Bay North Spit) was 1.55 ft at 13:55 hours. On the 11th, the high tide was 7.12 ft at 08:42 hours and the low tide was 0.63 ft at 15:07 hours.

Between November 10th and 11th, the Eel River discharge at Scotia decreased from 3,740 cfs to 2,870 cfs. For the November 2016 fish sampling, salinity readings ranged between 198 ppm and 22.11 ppt (Table 1).

Table 1. Dates, site numbers, start and end times, and water quality measurements for November 2016 Salt River fisheries sampling. The (#) indicates how many traps were deployed.

| DATE | SITE # | SAMPLE METHOD | TIDE LEVEL | START TIME | END TIME | WATER TEMP (°C) | D.O. (mg/L) | SALINITY (ppt) |
|------------|--------|--------------------|------------|------------|----------|-----------------|-------------|----------------|
| 11/10/2016 | #1 | Seine Net – 30 ft | Low | 13:55 | 14:10 | 17.0 | 8.0 | 1.11 |
| 11/10/2016 | #3 | Seine Net – 30 ft | Low | 14:20 | 14:35 | 18.6 | 9.1 | 8.34 |
| 11/10/2016 | #3 | Seine Net – 20 ft | Low | 14:45 | 15:00 | 19.3 | 9.6 | 8.19 |
| 11/10/2016 | #4 | Seine Net – 30 ft | Low | 15:15 | 15:40 | 18.8 | 8.8 | 8.86 |
| 11/11/2016 | #1 | Seine Net – 100 ft | High | 10:20 | 10:45 | 12.0 | 9.7 | 13.9 |
| 11/11/2016 | #1-B | Seine Net – 100 ft | High | 11:10 | 11:40 | 13.1 | 9.3 | 10.5 |
| 11/11/2016 | #1-A | Seine Net – 100 ft | High | 08:50 | 09:15 | 15.1 | 6.3 | 9.09 |
| 11/11/2016 | #10 | Seine Net – 100 ft | High | 09:25 | 09:50 | 15.3 | 5.7 | 9.20 |
| 11/11/2016 | #22 | Minnow Traps (3) | Ebbing | 11:00 | 13:30 | 16.3 | 13.8 | 247 ppm |
| 11/11/2016 | #23 | Minnow Traps (3) | Ebbing | 11:15 | 13:45 | 16.7 | 9.8 | 198 ppm |
| 11/11/2016 | #7 | Seine Net – 20 ft | Low | 15:00 | 15:20 | 15.4 | 7.3 | 9.26 |
| 11/11/2016 | #17 | Seine Net – 30 ft | Low | 15:45 | 16:10 | 15.5 | 10.7 | 22.11 |
| 11/11/2016 | #15 | Seine Net – 30 ft | Low | 16:15 | 16:30 | 15.3 | 9.7 | 20.30 |
| 11/11/2016 | #18 | Seine Net – 30 ft | Low | 16:35 | 16:50 | 15.1 | 8.6 | 16.81 |

Nine fish species were captured during the November 2016 sampling: Tidewater Goby (*Eucyclogobius newberryi*), juvenile Coho Salmon (*Oncorhynchus kisutch*), Threespine Stickleback (*Gasterosteus aculeatus*), sculpin species, Pacific Staghorn Sculpin (*Leptocottus armatus*), Surf Smelt (*Hypomesus pretiosus*), California Roach (*Hesperoleucus symmetricus*), Sacramento pike minnow (*Ptychocheilus grandis*) and Pacific Herring (*Clupea harengus*) (Table 2). We also captured Green Shore Crab (*Hemigrapsus oregonensis*) and Bay Shrimp (*Carragon sp.*). Threespine Sticklebacks were the most common species captured and comprised 98% of all fish sampled in November 2016. Nine Coho Salmon were captured at five different sites: #1, #3 (in both slough and ditch), #4, #7, and #10. The one Tidewater Goby was captured at Site #17 (Table 2). The six minnow traps set at Sites #22 and #23 caught Threespine Stickleback, California Roach, and Sacramento Pike Minnow; no juvenile Coho Salmon were caught in these traps.

Table 2. Species and numbers of fish captured during the November 2016 Salt River fisheries sampling.

| DATE | SITE # | Tidewater Goby | Coho Salmon | Three-spine Stickleback | Sculpin <i>sp.</i> | Pacific Staghorn Sculpin | Sac. Pike Minnow | Surf Smelt | Green Shore Crab | Shrimp <i>Crangon spp.</i> |
|--------------------------------|--------|----------------|-------------|-------------------------|--------------------|--------------------------|------------------|------------|------------------|----------------------------|
| 11/10/2016 | #1 | 0 | 1 | 2 | 0 | 2 | 0 | 0 | 0 | 1 |
| 11/10/2016 | #3 | 0 | 1 | 33 | 1 | 3 | 0 | 0 | 0 | 38 |
| 11/10/2016 | #4 | 0 | 1 | 1,357 | 0 | 0 | 0 | 0 | 1 | 0 |
| 11/11/2016 | #1 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 3 |
| 11/11/2016 | #1-B | 0 | 0 | 40 | 0 | 0 | 1 | 1 | 1 | 0 |
| 11/11/2016 | #1-A | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11/11/2016 | #10 | 0 | 1 | 8 | 0 | 9 | 0 | 0 | 0 | 0 |
| 11/11/2016 | #22 | 0 | 0 | 172 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11/11/2016 | #22 | 0 | 0 | 166 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11/11/2016 | #22 | 0 | 0 | 158 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11/11/2016 | #23 | 0 | 0 | 137 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11/11/2016 | #23 | 0 | 0 | 51 | 0 | 0 | 1 | 0 | 0 | 0 |
| 11/11/2016 | #23 | 0 | 0 | 51 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11/11/2016 | #7 | 0 | 5 | 390 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11/11/2016 | #17 | 1 | 0 | 578 | 0 | 2 | 0 | 0 | 1 | 0 |
| 11/11/2016 | #15 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 11/11/2016 | #18 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Catch Totals by Species | | 1 | 9 | 3,165 | 1 | 17 | 2 | 1 | 3 | 42 |

Fish Sampling Results – December 2016

In December, the sampling occurred on the 12th and 27th (Tables 3 and 4). On the 12th, the high tide (at Humboldt Bay North Spit) was 8.45 ft at 09:37 hours and the low tide was -1.24 ft at 16:31 hours. On the 27th, the high tide was 7.40 ft at 09:58 hours and the low tide was -0.18 ft at 16:58 hours. Although the low tide on December 12th was a minus tide, water levels at most of the sampling sites were too deep to wade due to the elevated Eel River discharge. On December 27th, flows were lower during the low tide period, yet timing of the low tide in the late afternoon limited the number of sites we could sample before it became too dark.

At noon on December 12th, the Eel River discharge at Scotia was approximately 32,000 cfs and the Van Duzen River was at nearly 3,000 cfs. Flows were considerably lower on the 27th; the Eel River discharge at Scotia was approximately 9,600 cfs and the Van Duzen River was at nearly 1,100 cfs. Because of the nearly constant storms during December of 2016, salinity measurements were very low, with most meter readings in parts-per-million (ppm) that ranged from 115 ppm to 3.88 ppt (Table 3).

Table 3. Dates, site numbers, start and end times, and water quality measurements for December 2016 Salt River fisheries sampling.

| DATE | SITE # | SAMPLE METHOD | TIDE LEVEL | START TIME | END TIME | WATER TEMP (°C) | D.O. (mg/L) | SALINITY (ppm) |
|------------|--------|--------------------|------------|------------|----------|-----------------|-------------|----------------|
| 12/12/2016 | #1 | Seine Net – 100 ft | High | 09:40 | 10:05 | 8.7 | 9.5 | 128.1 |
| 12/12/2016 | #1-B | Seine Net – 100 ft | High | 10:15 | 10:45 | 8.7 | 9.6 | 126.3 |
| 12/12/2016 | #1-A | Seine Net – 100 ft | High | 10:55 | 11:15 | 9.0 | 9.5 | 124.6 |
| 12/12/2016 | #10 | Seine Net – 100 ft | High | 11:25 | 11:55 | 10.2 | 11.5 | 66.3 |
| 12/12/2016 | #22 | Minnow Traps (7) | Ebb | 12:15 | 14:50 | 10.2 | 10.4 | 115.0 |
| 12/12/2016 | #17 | Seine Net – 20 ft | Low | 15:30 | 15:45 | 10.9 | 10.3 | 294.1 |
| 12/12/2016 | #8 | Seine Net – 20 ft | Low | 16:05 | 16:15 | 10.3 | 7.6 | 568.5 |
| 12/27/2016 | #17 | Minnow Traps (2) | Ebb | 14:45 | 16:50 | 8.2 | 13.0 | 1.07 ppt |
| 12/27/2016 | #7 | Minnow Traps (2) | Ebb | 15:00 | 17:00 | 7.8 | 11.0 | 3.88 ppt |
| 12/27/2016 | #4 | Minnow Traps (2) | Ebb | 15:15 | 17:10 | 7.6 | 10.6 | 2.29 ppt |
| 12/27/2016 | #1 | Seine Net – 30 ft | Low | 15:30 | 15:50 | 7.1 | 11.1 | 176.7 |
| 12/27/2016 | #3 | Seine Net – 30 ft | Low | 16:00 | 16:10 | 7.5 | 11.9 | 1.16 ppt |
| 12/27/2016 | #15 | Seine Net – 30 ft | Low | 16:15 | 16:25 | 7.8 | 10.7 | 1.19 ppt |
| 12/27/2016 | #18 | Seine Net – 30 ft | Low | 16:30 | 16:40 | 8.3 | 10.8 | 1.30 ppt |

Nine fish species were captured during the December 2016 sampling: juvenile Coho Salmon, Threespine Stickleback, California Roach (*Hesperoleucus symmetricus*), sculpin species, Pacific Staghorn Sculpin, Sacramento Pike Minnow, Longfin Smelt (*Spirinchus starksi*) Pacific Rainbow Smelt (*Osmerus dentex*), and Green Sunfish (*Lepomis cyanellus*) (Table 4). The Pacific Rainbow Smelt was a new species for the fall/winter sampling. Threespine Sticklebacks were the most common species captured and comprised 81% of all fish sampled in December 2016. Seven Coho Salmon were captured at four different sites: #3, #4, #7, and #17. A total of 67 Sacramento Pike Minnow were captured at nine sample sites and comprised 10% of all fish captured in December 2016. Two Longfin Smelt were captured at Site #1 on 12/27/16 at low tide in very low salinity water (176.7 ppm). A total of 10 Green Shore Crabs were caught at four different sites and 100 Bay Shrimp were caught at Site #17. The Green Sunfish was captured at low tide at Site #8 and had a fork length of 28 mm. The seven minnow traps set at Site #22 on 12/12/16 caught Threespine Stickleback, California Roach, and Sacramento Pike Minnow; no juvenile Coho Salmon were caught in these traps.

Fish Sampling Results – January 2017

In January of 2017, fish sampling in the lower Salt River was infeasible due to the frequent storms created unsafe and extremely high water levels on the handful of pre-selected days with suitable tides during daylight hours. For example, the Eel River discharge peaked at 256,000 cfs on the 11th and water levels inundated the lower Salt River and sections of the berm road on the Riverside Ranch property (Figure 6).



Figure 6. Lower Eel River and Salt River on January 9, 2017.

Table 4. Species and numbers of fish captured during the December 2016 Salt River fisheries sampling.

| DATE | SITE # | Coho Salmon | Three- spine Stickle- back | CA. Roach | Sculpin <i>sp.</i> | Pacific Staghorn Sculpin | Sac. Pike Minnow | Longfin Smelt | Pacific Rainbow Smelt | Green Sunfish | Green Shore Crab | Shrimp <i>Crangon</i> <i>spp.</i> |
|------------------------------------|--------|----------------|-------------------------------------|--------------|-----------------------|--------------------------------|---------------------|------------------|-----------------------------|------------------|------------------------|---|
| 12/12/2016 | #1 | 0 | 46 | 0 | 0 | 3 | 4 | 0 | 0 | 0 | 0 | 0 |
| 12/12/2016 | #1-B | 0 | 24 | 5 | 0 | 6 | 10 | 0 | 0 | 0 | 0 | 0 |
| 12/12/2016 | #1-A | 0 | 48 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| 12/12/2016 | #10 | 0 | 33 | 2 | 2 | 4 | 16 | 0 | 0 | 0 | 0 | 0 |
| 12/12/2016 | #22 | 0 | 101 | 0 | 2 | 0 | 6 | 0 | 0 | 0 | 0 | 0 |
| 12/12/2016 | #17 | 1 | 20 | 1 | 0 | 11 | 2 | 0 | 0 | 0 | 1 | 100 |
| 12/12/2016 | #8 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 12/27/2016 | #17 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12/27/2016 | #17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 12/27/2016 | #7 | 1 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 12/27/2016 | #7 | 1 | 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 12/27/2016 | #4 | 2 | 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| 12/27/2016 | #4 | 1 | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 |
| 12/27/2016 | #1 | 0 | 7 | 2 | 0 | 4 | 8 | 2 | 1 | 0 | 0 | 0 |
| 12/27/2016 | #3 | 1 | 53 | 1 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 |
| 12/27/2016 | #15 | 0 | 13 | 0 | 0 | 5 | 4 | 0 | 0 | 0 | 0 | 0 |
| 12/27/2016 | #18 | 0 | 11 | 0 | 0 | 3 | 7 | 0 | 0 | 0 | 0 | 0 |
| Catch Totals by Species | | 7 | 550 | 11 | 4 | 36 | 67 | 2 | 1 | 1 | 10 | 100 |

Fish Sampling Results – February 2017

In February, the sampling was limited to setting minnow traps on the 28th due to elevated flows in the Eel River for most of the month (Tables 5 and 6). On the 28th, the low tide (at Humboldt Bay North Spit) was 1.25 ft at 06:44 hours and the high tide was 6.96 ft at 12:49 hours.

In February, extremely high flows on potential sample days included, the Eel River discharge at Scotia peaking at 199,000 cfs on the 10th and 112,000 cfs on the 21st. On the 28th, the discharge at the Scotia gauge was 13,900 cfs, plus an additional 2,330 cfs in the Van Duzen River. Salinity measurements on the 28th were the lowest that RTA has measured during three seasons of fall/winter sampling; less than 50 ppm at all sites sampled (Table 5).

Table 5. Dates, site numbers, start and end times, and water quality measurements for February 2017 Salt River fisheries sampling.

| DATE | SITE # | SAMPLE METHOD | TIDE LEVEL | START TIME | END TIME | WATER TEMP (°C) | D.O. (mg/L) | SALINITY (ppm) |
|-----------|--------|------------------|------------|------------|----------|-----------------|-------------|----------------|
| 2/28/2017 | #17 | Minnow Traps (2) | Flood | 10:15 | 12:15 | 10.4 | 11.5 | 29.3 ppm |
| 2/28/2017 | #7 | Minnow Traps (2) | Flood | 10:30 | 12:40 | 10.6 | 10.2 | 48.7 ppm |
| 2/28/2017 | #4 | Minnow Traps (2) | Flood | 10:45 | 13:10 | 10.4 | 10.4 | 40.3 ppm |
| 2/28/2017 | #3 | Minnow Trap (1) | Flood | 11:00 | 13:25 | 10.4 | 10.6 | 37.9 ppm |
| 2/28/2017 | #22 | Minnow Traps (6) | High | 14:05 | 15:10 | 10.7 | 10.8 | 37.3 ppm |

Only four fish species were captured during the February 2016 minnow trap sampling: juvenile Coho Salmon, Threespine Stickleback, Pacific Staghorn Sculpin, and Sacramento Pike Minnow (Table 6). Threespine Stickleback was the most common species captured and comprised 80% of all fish sampled in February 2017. The two Coho Salmon sampled in February 2017 were captured at Site #4 in the trap set adjacent to the placed LWD/rootwad. The other trap at Site #4 was set mid-channel and caught Threespine Stickleback and Pacific Staghorn Sculpin.

The growth and condition of juvenile Coho Salmon captured during the February 2017 sampling appeared good and their fork lengths were 88 mm and 92 mm.

Table 6. Species and numbers of fish captured during the February 2017 Salt River fisheries sampling.

| DATE | SITE # | Juvenile Coho Salmon | Threespine Stickle-back | Pacific Staghorn Sculpin | Sac. Pike Minnow |
|-----------|--------|----------------------|-------------------------|--------------------------|------------------|
| 2/28/2017 | #17 | 0 | 13 | 2 | 0 |
| 2/28/2017 | #17 | 0 | 10 | 0 | 0 |
| 2/28/2017 | #7 | 0 | 6 | 0 | 10 |
| 2/28/2017 | #7 | 0 | 3 | 0 | 0 |
| 2/28/2017 | #4 | 2 | 10 | 1 | 0 |
| 2/28/2017 | #4 | 0 | 9 | 2 | 0 |

Table 6 (continued).

| DATE | SITE # | Juvenile Coho Salmon | Threespine Stickle-back | Pacific Staghorn Sculpin | Sac. Pike Minnow |
|---------------------|--------|----------------------|-------------------------|--------------------------|------------------|
| 2/28/2017 | #3 | 0 | 13 | 0 | 0 |
| 2/28/2017 | #22 | 0 | 2 | 0 | 0 |
| 2/28/2017 | #22 | 0 | 3 | 0 | 0 |
| 2/28/2017 | #22 | 0 | 0 | 0 | 0 |
| 2/28/2017 | #22 | 0 | 0 | 0 | 0 |
| 2/28/2017 | #22 | 0 | 2 | 0 | 0 |
| 2/28/2017 | #22 | 0 | 3 | 0 | 1 |
| Catch Totals | | 2 | 74 | 5 | 11 |

Fish Sampling Results – March 2017

In March, the sampling occurred on the 14th and 23rd (Tables 7 and 8). On the 14th the low tide (at Humboldt Bay North Spit) was 0.88 ft at 07:46 hours and on the 23rd, the high tide was 5.96 ft at 08:42 hours and the low tide was 0.50 ft at 15:37 hours.

The Eel River discharge at Scotia was between approximately 13,000 cfs on the 14th and 24,800 cfs on the 23rd. Salinity measurements remained low in March of due to the numerous storms and elevated flows that persisted through most of the winter of 2016-2017.

Table 7. Dates, site numbers, start and end times, and water quality measurements for March 2017 Salt River fisheries sampling.

| DATE | SITE # | SAMPLE METHOD | TIDE LEVEL | START TIME | END TIME | WATER TEMP (°C) | D.O. (mg/L) | SALINITY |
|-----------|--------|-----------------|------------|------------|----------|-----------------|-------------|-----------|
| 3/14/2017 | #1-B | Seine – 30 ft | Low | 08:15 | 08:35 | 14.0 | 8.5 | 14.3 ppm |
| 3/14/2017 | #1 | Seine – 30 ft | Low | 08:40 | 08:55 | 13.9 | 8.6 | 19.1 ppm |
| 3/14/2017 | #3 | Seine – 30 ft | Low | 09:10 | 09:50 | 12.9 | 7.1 | 23.0 ppm |
| 3/14/2017 | #4 | Seine – 20 ft | Low | 10:00 | 10:20 | 13.1 | 5.9 | 26.1 ppm |
| 3/14/2017 | #15 | Seine – 30 ft | Low | 10:30 | 10:40 | 12.9 | 8.6 | 98.3 ppm |
| 3/14/2017 | #18 | Seine – 30 ft | Low | 10:50 | 11:05 | 13.0 | 9.7 | 504 ppm |
| 3/14/2017 | #17 | Seine – 20 ft | Low | 11:15 | 11:30 | 15.7 | 9.3 | 167.9 ppm |
| 3/23/2017 | #1 | Seine – 100 ft | High | 09:25 | 09:50 | 11.0 | 9.4 | 92.8 ppm |
| 3/23/2017 | #1-B | Seine – 100 ft | High | 10:10 | 11:00 | 11.7 | 9.7 | 98.1 ppm |
| 3/23/2017 | #4 | Minnow Trap (3) | Ebbing | 13:15 | 15:25 | 14.7 | 9.7 | 1.02 ppt |
| 3/23/2017 | #22 | Minnow Trap (4) | Ebbing | 13:45 | 16:00 | 14.1 | 9.4 | 89.7 ppm |
| 3/23/2017 | #7 | Minnow Trap | Ebbing | 14:30 | 15:00 | 14.6 | 9.2 | 1.68 ppt |

Eight fish species were captured during the March 2017 sampling: juvenile Coho Salmon, Tidewater Goby, Threespine Stickleback, California Roach, sculpin species, Pacific Staghorn Sculpin, Sacramento Pike Minnow, and Pacific Herring. Threespine Stickleback was the most common species captured and comprised 60% of all fish sampled in March 2017. Sacramento Pike Minnow comprised 34% of the fish sampled in March 2017 and were mostly juveniles with fork lengths less than 100 mm. The two Pacific Herring were caught at Site #3 in the drainage ditch (in very low salinity) and both were approximately 180 mm in fork length.

Six juvenile Coho Salmon were captured in March 2017 and the three fish caught on the 23rd were relatively large, silver in coloration and probably close to smolting. Their fork lengths (mm) were: 104, 129, and 147.

Table 8. Species and numbers of fish captured during the March 2017 Salt River fisheries sampling.

| DATE | SITE # | Coho Salmon | Threespine Stickleback | CA. Roach | Tidewater Goby | Pacific Herring | Sculpin <i>sp.</i> | Pacific Staghorn Sculpin | Sac. Pike Minnow |
|--------------------------------|--------|-------------|------------------------|-----------|----------------|-----------------|--------------------|--------------------------|------------------|
| 3/14/2017 | #1-B | 0 | 7 | 5 | 0 | 0 | 0 | 0 | 97 |
| 3/14/2017 | #1 | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 76 |
| 3/14/2017 | #3 | 1 | 83 | 5 | 0 | 0 | 0 | 1 | 265 |
| 3/14/2017 | #3* | 0 | 525 | 0 | 0 | 2 | 0 | 0 | 0 |
| 3/14/2017 | #4 | 0 | 350 | 0 | 0 | 0 | 0 | 48 | 0 |
| 3/14/2017 | #15 | 1 | 7 | 0 | 0 | 0 | 0 | 2 | 0 |
| 3/14/2017 | #18 | 1 | 6 | 1 | 0 | 0 | 2 | 0 | 10 |
| 3/14/2017 | #17 | 0 | 91 | 0 | 3 | 0 | 0 | 41 | 0 |
| 3/23/2017 | #1 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 30 |
| 3/23/2017 | #1-B | 3 | 7 | 1 | 0 | 0 | 0 | 4 | 34 |
| 3/23/2017 | #4 | 0 | 31 | 0 | 0 | 0 | 0 | 1 | 0 |
| 3/23/2017 | #4 | 0 | 78 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3/23/2017 | #4 | 0 | 71 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3/23/2017 | #22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3/23/2017 | #22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3/23/2017 | #22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 3/23/2017 | #22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 3/23/2017 | #7 | 0 | 434 | 24 | 0 | 0 | 0 | 29 | 443 |
| Catch Totals by Species | | 6 | 1,699 | 37 | 3 | 2 | 3 | 127 | 960 |

*Ditch section of Site #3

Fish Sampling Results – Comparison of Data Sets from three Fall/Winter Seasons

Fish sampling within the restored Riverside Ranch reach of the Salt River has occurred for three consecutive fall/winter seasons; November through March of 2014-2015, December through April of 2015-2016, and November through March of 2016-2017. During these three sampling periods RTA has captured 21 fish species; 18 native and three non-native (Sacramento Pike Minnow, California Roach and Green Sunfish) (Table 11). When comparing the data, the most apparent difference is the species diversity between the first season and the subsequent seasons (Table 11). A total of 18 fish species were captured during the 2014-2015 season, 12 fish species were captured during the 2015-2016 season and 11 species were captured during the 2016-2017 season (Table 11). The reduced number of species captured in 2015-2016 and 2016-2017 was most likely a function of wetter winters and consistently lower salinity levels when compared to the 2014-2015 season. At least six species not sampled in 2015-2016 and in 2016-2017 could be considered more brackish to marine species, thus were not present in the lower Salt River during the wetter winters. These species were Starry Flounder, Saddleback Gunnel, Shiner Surfperch, Bay Pipefish, juvenile Rockfish, and Top Smelt.

Tidewater Goby numbers dropped dramatically between the first two sampling seasons; 318 fish in 2014-2015 versus only seven fish in 2015-2016 and remained low in 2016-2017 when only four fish were captured. During the 2014-2015 season, Tidewater Gobies were sampled at eight locations (Sites #1, #3, #7, #8, #9, #14, #15 and #17) versus two locations during the 2015-2016 season (Sites #7 and #8) and at one location during the 2016-2017 season (Site #17). The goby-lifts constructed at Sites #8, #9 and #14 have failed and the channel above these lifts filled-in with fine sediments and also failed to hold back water during low tides. The reason for the absence of Tidewater Gobies at Sites #1, #3, #7, and #15 is unknown. Again, the main difference between the three sampling periods was the wetter conditions in 2015-2016 and 2016-2017, which resulted in higher flows and lower salinities. Continued sampling will hopefully provide more insight into the dynamics of the Tidewater Goby's distribution and relative abundance within the lower Salt River. NOTE: CDFW captured seven Tidewater Goby during their April 2017 sampling; five at Site #17 and two at Site #3.

Another shift in species distribution and relative abundance between the first two sampling periods was evident with Pacific Staghorn Sculpin and what have been identified generically as sculpin "species" (Tables 2, 4, 6, and 8). During the 2014-2015 sampling, sculpin "species" were widely distributed (present at 12 sites) and common (1,092 fish captured). During 2014-2015 sampling, Pacific Staghorn Sculpin were also well distributed (present at 10 sites), but appeared less common (157 fish captured). Then during the 2015-2016 season, the distribution and relative abundance of sculpin "species" decreased to a total of 10 fish captured at six sites; whereas Pacific Staghorn Sculpin were caught at 13 sites in relatively higher numbers (481 fish). This shift in relative abundance between sculpin "species" and Staghorn Sculpin was also evident during the 2016-2017 sampling, with a total of seven sculpin "species" captured at four sites and 188 Pacific Staghorn Sculpin captured at 10 sites.

Sacramento Pike Minnow were sampled during periods (or in areas) of low salinity and their relative abundance increased between the 2014-2015 and 2015-2016 sampling seasons. In 2014-2015, a total of 131 Sacramento Pike Minnow were captured and during the 2015-2016 sampling their numbers increased to 408 fish. These increases were most likely a function of lower salinities due to increased rainfall during the 2015-2016 sampling, as well as the addition of new sampling sites located upstream of Reas Creek that were also above the tidal prism. Nearly all the Sacramento Pike Minnow captured in 2015-2016 were less than 100 mm in length; the largest fish was 188 mm in length and its stomach was empty. In 2016-2017, a total of 1,080 Sacramento Pike Minnow were captured at nearly every site sampled, including: #1, #1-A, #1-B, #3, #4, #7, #10, #15, #17, #18, #22 and #23.

Fish species that occurred infrequently may be either rare in occurrence, present in low numbers, or not susceptible to sampling methods employed by RTA. For example, the two juvenile Pacific lamprey sampled in December (2014 and 2015) were caught with the 100-foot seine. Both times, the lampreys wriggled through the ¼-inch mesh and were almost missed as fish were being collected. Conversely, other species such as starry flounder are relatively strong swimmers and may avoid capture as seine nets are hauled-in at a relatively slow pace.

Table 11. Comparison summaries of Salt River fish species diversity by sampling season.

| SPECIES LIST | Captured in 2014-2015 | Captured in 2015-2016 | Captured in 2016-2017 |
|------------------------------|------------------------------|------------------------------|------------------------------|
| COHO SALMON | X | X | X |
| TIDEWATER GOBY | X | X | X |
| STICKLEBACK | X | X | X |
| SCULPIN SP. | X | X | X |
| STAGHORN SCULPIN | X | X | X |
| PIKE MINNOW | X | X | X |
| CALIFORNIA ROACH | X | X | X |
| SURF SMELT | X | X | X |
| PACIFIC LAMPREY | X | X | |
| PACIFIC HERRING | X | X | X |
| LONGFIN SMELT | X | | X |
| GREEN SUNFISH | | X | X |
| BAY PIPEFISH | X | | |
| SHINER SURFPERCH | X | | |
| TOP SMELT | X | | |
| STARRY FLOUNDER | X | | |
| SADDLEBACK GUNNEL | X | | |
| CHINOOK SALMON | X | | |
| JUVENILE ROCKFISH | X | | |
| STEELHEAD | | X | |
| PACIFIC RAINBOW SMELT | | | X |
| No. of Species Caught | 18 | 12 | 11 |

Fish Sampling Results – Salmonids

In regards to juvenile Coho Salmon, 37 fish were captured during the 2014-2015 season, 42 fish were captured during the 2015-2016 season and 24 fish were captured during the 2016-2017 season. During all three seasons, within the Salt River main channel below Reas Creek, juvenile Coho Salmon were more frequently captured during high tide than during low tide (Sites #1, #1-A, #1-B, and #10). During the second season of sampling, more effort was made with minnow traps in the recently excavated channel upstream of Reas Creek, and 17 juvenile Coho Salmon (40% of the total catch) were captured in baited minnow traps. During the 2016-2017 season, approximately 30% of the juvenile Coho Salmon were caught in minnow traps. For a second season (2016-2017) RTA experimented with setting traps in open channel areas and adjacent to wood structures; overwhelmingly juvenile Coho Salmon were caught in traps placed next to wood structures. For example at Site #4, minnow traps set adjacent to the LWD accounted for 80% of the juvenile Coho Salmon trapped at this site. RTA also measured the fork length to the nearest millimeter of all juvenile Coho Salmon caught during fall/winter 2016-2017 sampling. As during the previous two years of sampling, juvenile Coho Salmon captured in 2016-2017 appeared in good condition and were generally larger each subsequent month (Table 12 and Figures 7-9). In 2016-2017, minnow traps set at Sites #22 and #23 failed to catch any Coho Salmon, locations where 33% of the Coho Salmon were caught during the 2015-2016 season.

Table 12. Fork length (mm) summaries of 24 juvenile Coho Salmon captured during the winter/spring 2016-2017 Salt River sampling.

| SAMPLING MONTH | NUMBER OF COHO CAPTURED | FORK LENGTH RANGE (mm) | AVERAGE FORK LENGTH (mm) |
|-----------------------|--------------------------------|-------------------------------|---------------------------------|
| November | 9 fish | 59 - 87 | 72.0 |
| December | 7 fish | 56 – 93 | 75.9 |
| February | 2 fish | 88 - 92 | 90.0 |
| March | 6 fish | 71 – 147 | 106.2 |

For a second consecutive season, RTA failed to capture any juvenile Chinook Salmon. However; CDFW captured one juvenile Chinook Salmon in April of 2017.

Salt River Fall and Winter Sampling – Discussion and Recommendations

The November 2016 to March 2017 fall/winter Salt River sampling resulted in the capture of 11 fish species, as well as Green Shore Crab and Bay Shrimp. Over this five month sampling period, Threespine Sticklebacks were the most common species captured. Juvenile Coho Salmon were first sampled in November 2016. Between the 2014-2015 and 2016-2017 sampling seasons, the number of Tidewater Gobies captured dropped by 99%. Numbers of generic sculpin “species” also dropped between the first two sampling seasons by 99%. Conversely, the total catch of Pacific Staghorn Sculpin increased by 206% between the 2014-2015 and 2015-2016 seasons. Lower salinities from the relatively wet winters of 2015-2016 and 2016-2017 appeared to influence the diversity of fish species, with fewer saline/brackish species present and a higher total catch of species more common to freshwater.



Figure 7. Coho salmon (59 mm FL) – caught at Site #7 on November 11, 2016.



Figure 8. Coho salmon (90 mm FL) - caught at Site #7 on December 27, 2016.



Figure 9. Coho salmon (104 mm FL) - caught at Site #1-B on March 23, 2017.

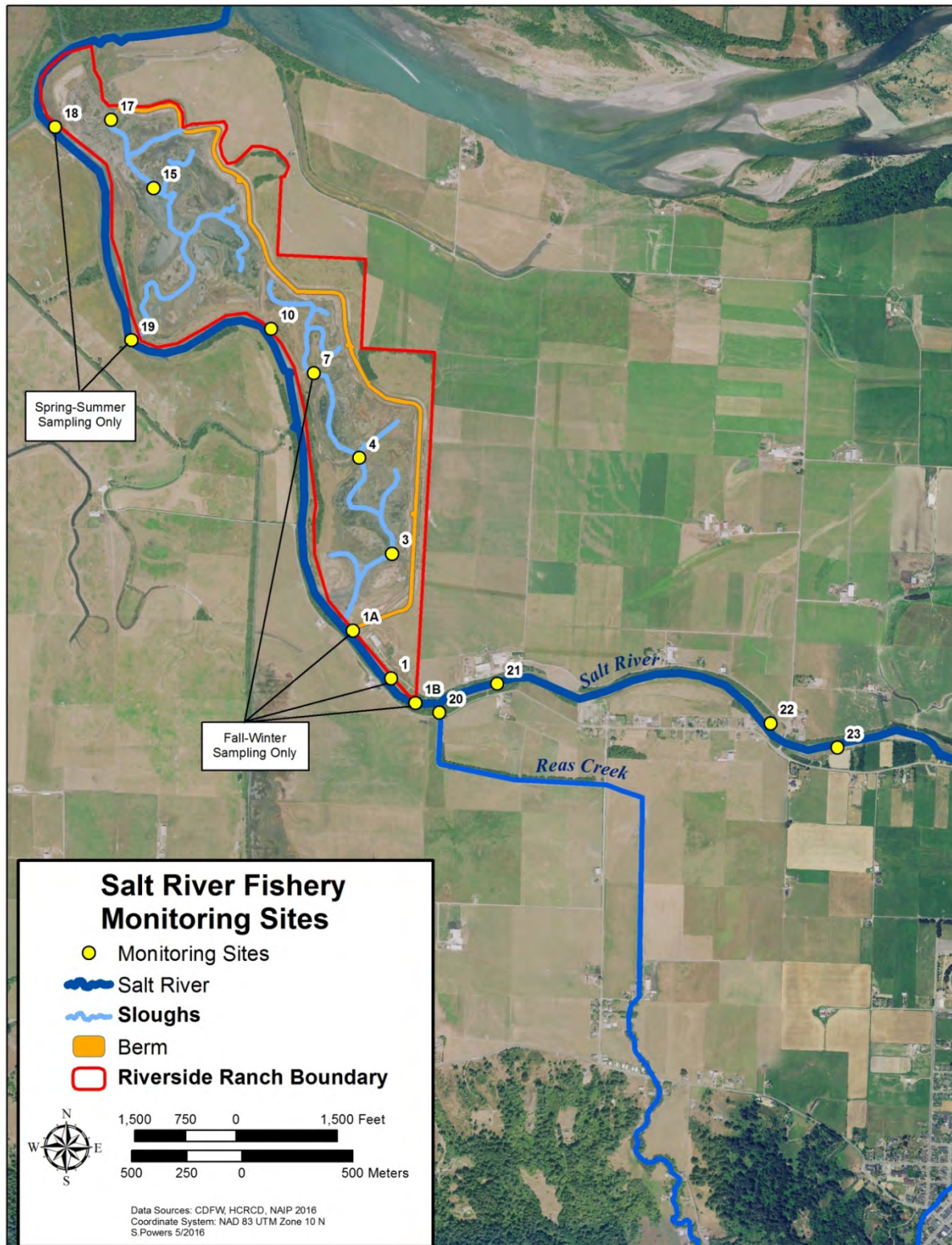
NOTE: Figures 7-9 are not to exact scale, but the 80 mm hash marks on the measuring board were lined-up to reflect relative size differences of the three juvenile Coho Salmon.

Setting the 100-foot seine net with a kayak proved to be an effective method for sampling the Salt River's main channel at high tide. We recommend that high tide sampling be continued since this method was effective at capturing juvenile Coho Salmon in the main channel downstream of the Reas Creek confluence at Sites #1, #1-A, #1-B, and #10. For the upcoming 2017-2018 fall/winter sampling, additional locations should be considered for sampling, specifically areas where channel excavation occurred during the summer of 2017. Another sampling location to consider is the main channel downstream of Site #18 at the Salt River's confluence with Cutoff Slough. There's a deep pool at this confluence and there are ongoing efforts to improve fish passage and tidal movement at the entrance to Cutoff Slough and lower Russ Creek. Sampling with the kayak and the 100-foot seine net at this confluence could provide useful information about the potential for fish recolonization of lower Russ Creek.

Minnow traps baited with frozen steelhead roe proved to be an effective way to sample the newly constructed channel located upstream of the Riverside Ranch due to its narrow width and nearly vertical banks defining the main channel. Minnow traps were also used around wood structures that made seine netting difficult, such as at Sites #4 and #7. Juvenile Coho Salmon were most frequently caught in traps placed adjacent to wood structures, whereas traps set in open channel areas mainly caught Pacific Staghorn Sculpin and Threespine Sticklebacks. Because the Salt River monitoring program is based on adaptive management, we recommend that the placement of more wood structures with rootwads in the existing Northern and Southern sloughs as well as the upper sections of the main channel be considered. Additional wood structures may also assist in keeping fine sediments in suspension, so that these sediments are flushed out of the lower Salt River as opposed to settling and causing channel aggradation.

We recommend that fisheries sampling is continued in the lower Salt River to better understand the temporal and spatial use of the restored channel by the various fish species. We also recommend that sampling is continued at established sites and that additional sites are established upstream of Riverside Ranch as the channel excavation process moves farther upstream. Finally, we recommend that future fall/winter sampling is modified to better assess movement and growth of juvenile Coho Salmon through the use of PIT tags and possibly several antenna/receiver arrays. RTA would like to explore possible methods to conduct this type of study with NOAA Fisheries, CDFW and Humboldt County RCD staff.

APPENDIX A: CATALOG OF SALT RIVER SAMPLE SITES



Site #1: Main channel of the Salt River near the Riverside Ranch barn and telephone pole on the main access road. Seine about 150 feet upstream of telephone pole.



Site #1-A: Located on the main channel, downstream of Site #1 near the downstream end of the Riverside Ranch barn. This site was sampled only at high tide with kayak and 100-foot seine.



Site #1-B: Located on the main channel, upstream of Site #1 between stage plate and confluence of Reas Creek.



Site #3: Located at confluence of S1 slough and tide gate drainage channel. Seine both the S1 slough (approximately 150 feet) and the drainage channel from the confluence up to the tide gate.



Site #3: Photographs of tide gate and drainage channel at low and high tides.



Site #4: Located in the main channel of the S1 slough and is associated with a piece of placed LWD. Approximately 150 feet of channel was sampled on the downstream side of the LWD. Minnow traps were also fished at this location, at both low and incoming tides.



Site #7: Located in the upper end of the S1 slough and is associated with a piece of placed LWD. Approximately 100 feet of channel was sampled on both sides of LWD.



Site #8: is associated with a goby lift on a branch of the S1 slough. Seine from lift to the upstream end of channel.



Site #9: is associated with a goby lift on a branch of the S1 slough, near the upper end of the slough. Seine from lift to the upstream end of channel.



Site #10: is located on the Salt River main channel between the mouths of north and south sloughs. The site is accessed from the one side road that leaves the Riverside Ranch main road.



Site #14: Access Site #14 from the side road taken down to #10 and #19. Site #14 is on branch of N1 slough that has a terminal end. Seine uppermost 150 feet of channel.



Site #15: Located on the Northern Slough's main channel, just upstream of the 2nd branch off of the slough. We parked vehicle at end of levee road to access Site #15.



Site #17: Located on the Northern Slough's main channel, just upstream of the 2nd branch off of the slough.



Site #18: Lowest main channel sampling site, accessed from turnaround at end of levee road.



Site #19: Located at confluence of the Salt River main channel and Northern Slough.



Site #20: Located at confluence of the Salt River main channel and Reas Creek – sampled up into Reas Creek and series of pools created by log weirs.



Site #21: Channel reach located upstream of the Salt River – Reas Creek confluence.



Site #22: Channel reach located downstream of Dillon Road Bridge.



Site #23: Salt River main channel reach from Dillon Road Bridge upstream to Sousa Lake.



Sousa Lake at upper end of Site #23 channel reach on January 27, 2016.



Wood structure in Site #23 channel reach - approximately 1,500 feet upstream of Dillon Road.

APPENDIX B:
CATALOG OF FISH SPECIES CAPTURED IN THE SALT RIVER
DURING FALL/WINTER SAMPLING IN 2014-2015, 2015-2016
AND 2016-2017

Threespine Stickleback (*Gasterosteus aculeatus*)



Gravid female captured in March of 2015



Male in spawning colors captured in March of 2015



Age-0 and adult captured in March of 2015

Tidewater Goby (*Eucyclogobius newberryi*)



Tidewater Goby captured at Site #8 on February 24, 2015

California Roach (*Hesperoleucus symmetricus*)



California Roach captured at Site #1 on March 23, 2015

Pacific Staghorn Sculpin (*Leptocottus armatus*)



Adult Pacific Staghorn Sculpin captured at Site #18 on February 26, 2015



Age-0 Pacific Staghorn Sculpin captured in March of 2015

Sculpin Species (*Cottus sp.*)



Sculpin sp. captured at Site #7 on November 12, 2014



Comparison of Pacific Staghorn Sculpin (left) and sculpin species (right) from Site #3 on February 24, 2015

Starry Flounder (*Platichthys stellatus*)



Starry Flounder caught at Site #18 on November 11, 2014



Starry Flounder caught at Site #18 on February 24, 2015

Coho Salmon (*Oncorhynchus kisutch*)



Coho Salmon: 65 mm juvenile captured on December 2, 2014



Coho Salmon: 90 mm juvenile captured on January 20, 2015

Coho Salmon (*Oncorhynchus kisutch*)



Coho Salmon: 120 mm juvenile captured on February 17, 2015



Coho Salmon: 135 mm juvenile captured on March 24, 2015

Chinook Salmon (*Oncorhynchus tshawytscha*)



Chinook Salmon: 35 mm juvenile captured at Site #3 on March 24, 2015

Steelhead (*Oncorhynchus mykiss*)



Steelhead: 112 mm juvenile captured at Site #1-A on March 23, 2016

Surf Smelt (*Hypomesus pretiosus*)



Two of the 71 Surf Smelt captured during the January 2015 sampling



Juvenile smelt (50 mm in length) captured at Site #1 on November 11, 2014

Longfin Smelt (*Spirinchus starksi*)



Longfin Smelt (130 mm in length) captured at Site #1 on December 1, 2014



Two Longfin Smelt captured at Site #1-A on February 17, 2015

Pacific Rainbow Smelt (*Osmerus dentex*)



Pacific Rainbow Smelt (130 mm in length) captured at Site #1 on December 27, 2016

Pacific Herring (*Clupea harengus*)



Juvenile Pacific Herring (30 mm in length) captured at Site #3 on March 24, 2015



Pacific Herring (200 mm in length) captured at Site #3 on March 24, 2015

Sacramento Pikeminnow (*Ptychocheilus grandis*)



One of nine Sacramento Pike Minnow caught during the March 2015 sampling

Shiner Surfperch (*Cymatogaster aggregata*)



Shiner Surfperch (160 mm in length) captured at Site #19 on March 24, 2015

Saddleback Gunnel (*Photis ornata*)



One of two Saddleback Gunnels caught at Site #18 on March 23, 2015

Pacific Lamprey (*Entosphenus tridentatus*)



Juvenile (out-migrant) Pacific Lamprey caught at Site #10 on December 2, 2014

Rockfish species (*Sebastes sp.*)



One of four juvenile (newly settled) rockfish caught at Site #3 (in the drainage ditch) on March 24, 2015

Bay Pipefish (*Syngnathus leptorhynchus*)



One of two Bay Pipefish caught at Site #1-A (high tide site) on March 24, 2015



Close-up of Bay Pipefish caught at Site #1-A (high tide site) on March 24, 2015

Green Sunfish (*Lepomis cyanellus*)



Green Sunfish caught at Site #23 (Sousa Lake) on January 27, 2016



Green Sunfish, 34 mm fork length, caught at Site #7 (low tide) on February 26, 2016

Dungeness Crab (*Metacarcinus magister*)



Two of 28 Dungeness crab caught at Site #18 on March 23, 2015; male (left) and female (right)

Bay Shrimp (*Crangon Sp.*)



One of two Bay Shrimp caught at Site #1 on March 24, 2015

Green Shore Crab (*Hemigrapsus oregonensis*)



Green Shore Crab caught at Site #1 on January 26, 2016