

Salt River Ecosystem Restoration Project



Habitat Mitigation and Monitoring Plan Monitoring Report 2023

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Prepared by the Humboldt County Resource Conservation District

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EXECUTIVE SUMMARY

The Salt River Ecosystem Restoration Project (Project) has been developed in collaboration with landowners as well as resource and regulatory agencies since the late 1980s. The Humboldt County Resource Conservation District (HCRCD) is spearheading the Project on behalf of multiple private landowners throughout the Salt River watershed. The Salt River watershed is located in Humboldt County, California; approximately 15 miles south of the City of Eureka. The watershed surrounds the City of Ferndale and is bordered to the south by the Wildcat Mountains, to the east and north by the Eel River, and to the west by the Pacific Ocean. The watershed derives its name from the Salt River that historically flowed across the southern Eel River delta discharging into the Eel River estuary, approximately 0.2 miles from the mouth of the Eel River.

The overarching goal of the Project is to restore and improve hydrologic function in addition to fish and wildlife habitat in the Salt River watershed. The Project area includes the main stem of the Salt River, four Salt River tributaries originating in the Wildcat Hills (Williams Creek, Francis Creek, Reas Creek, and Smith Creek), and the approximately 400-acre Riverside Ranch, which is contiguous to the Salt River estuary. The California Department of Fish and Wildlife (CDFW) acquired Riverside Ranch in 2012 from Western Rivers Conservancy, who had purchased the property from a willing seller. CDFW is an active partner in the Project. The remainder of the Project area is primarily under private ownership, and the City of Ferndale occupies multiple small parcels at the wastewater treatment plant.

The Project intends to restore natural hydrologic processes to a significant portion of the watershed, promoting restoration of ecological processes and functions. The Project is presented in two primary phases to distinguish between the tidal wetland restoration (known as Phase 1) and the riverine restoration work (known as Phase 2). The Project includes work that will be accomplished over several years. Within the two phases, the Project is further broken down into four primary components, discussed below:

- **Upslope erosion control:** Work with willing landowners to implement upslope erosion control activities in the upper portions of the Francis, Williams, and Reas Creeks watersheds to reduce the level of sediment input and delivery to the Salt River, thereby improving water quality while reducing sediment deposits in the channel.
- **Riverside Ranch tidal marsh restoration:** Restore tidal marsh in the lower Salt River. This will also increase the tidal prism exchanged through the lower river, increasing sediment transport potential, increasing scour, and promoting hydraulic connectivity with the upper watershed.

- **Salt River channel excavation:** Excavate and rehabilitate approximately 7.4 miles of the historic Salt River channel to restore hydrologic connectivity within the watershed thereby improving aquatic and riparian habitat, providing fish passage to tributaries, and improving drainage in the delta.
- **Adaptive Management:** Work with the community and regulatory agencies to implement an environmentally and geomorphically acceptable adaptive maintenance and management program to maintain hydraulic and ecological function in the Project area into the future.

In 2013, the restoration of Riverside Ranch (Phase 1 of the Project) restored 330 acres of pastureland back into intertidal wetland habitat, while also preserving approximately 70 acres that will be agriculturally managed to provide short-grass habitat for Aleutian cackling geese and other wetland-associated birds. Three miles of internal slough networks were excavated to create additional habitat for salmonids, tidewater goby, and other fish and aquatic species, and provide areas for the natural recruitment of eelgrass. Two miles of setback berm were constructed to create a boundary between the tidal area and the retained agricultural area. A gravel road was installed on top of the berm to provide access for monitoring and maintenance. This component of the Project also widened and deepened approximately 2.5 miles of the tidally-influenced portion of the Salt River channel, thereby increasing tidal exchange and greatly improving fish passage and fish habitat in the lower Salt River channel.

Phase 2, representing the Salt River “corridor restoration” segment of the larger project, involves the construction and restoration of 4.5 miles of the Salt River channel and its adjacent floodplain. The wetlands and riparian corridors within this phase have been re-vegetated using a diverse palette of native plants. Furthermore, fish passage has been restored to two watershed tributaries – Reas and Francis Creeks. In total, across the years 2013 – 2015 and 2017 – 2019, 6.2 miles of the Salt River channel and floodplain were constructed and re-vegetated, reconnecting two tributaries in the process. The 2017 construction season specifically addressed the restoration of 0.5 miles in lower Francis Creek (Figure 1). While the last mile of the river channel leading to Williams Creek remains unconstructed, with plans for future restoration, the entire 1.2 miles required to complete Phase 2 are currently on indefinite hold due to regulatory and hydraulic constraints, as well as landowners' beliefs regarding the watershed's function.

Salt River Ecosystem Restoration Project Permitted Project Area & Implementation Status

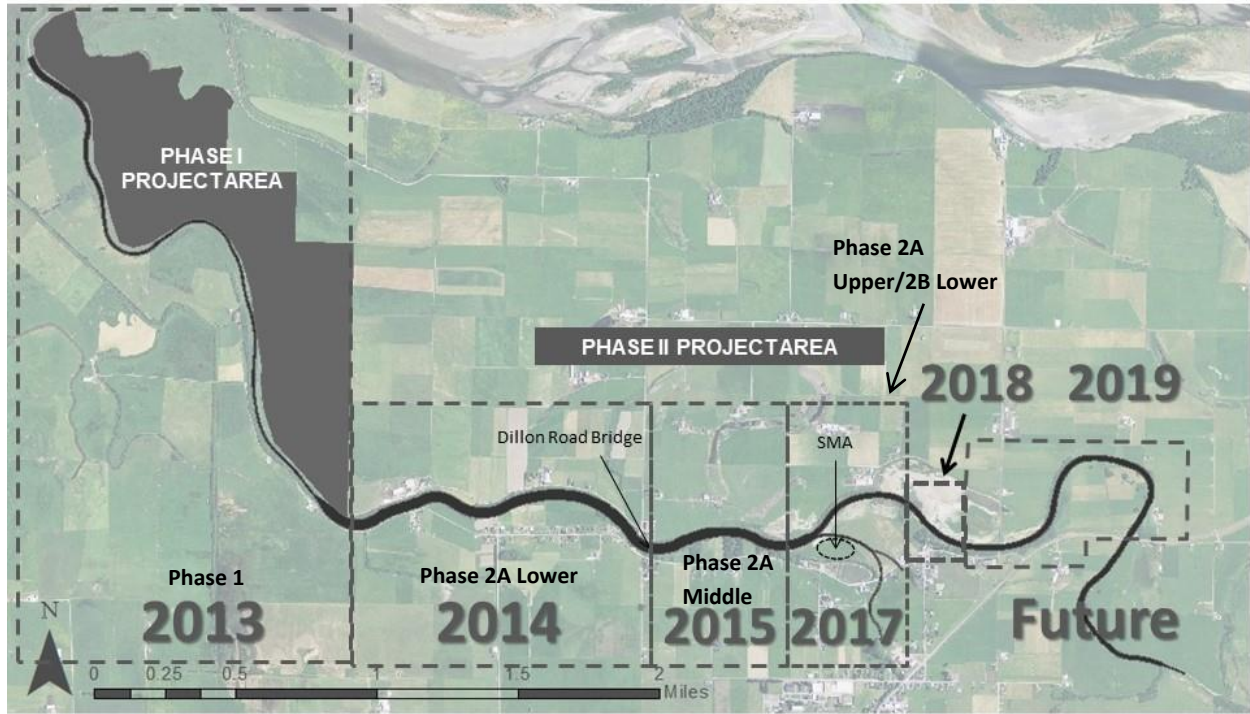


Figure 1: Salt River Ecosystem Restoration Construction Timeline as of 2023

Upon completing portions of the Project, monitoring is performed under the direction of the Humboldt County Resource Conservation District and complies with requirements generated from Project documents, including the Salt River Ecosystem Restoration Project's Habitat Mitigation and Monitoring Plan (HMMP) (H. T. Havey et al 2012) and the Adaptive Management Plan (AMP). This report provides information on data collected for monitoring tasks pertaining to the HMMP of the Salt River Ecosystem Restoration Project as follows:

- Phase 1: Year 10 (post-construction 2013)
- Phase 2: Year 9, Year 8, Year 6, Year 5, Year 4 (post-construction 2014, 2015, 2017, 2018, and 2019 respectively)

As mentioned in the Summary of Conclusions section below, monitoring results demonstrate the Project is performing successfully and largely meeting Project goals.

SUMMARY OF CONCLUSIONS

As detailed in this report, the 2023 monitoring results provide a point of reference on how the restoration activities completed in 2013 (Phase 1), 2014 (Phase 2A Lower), 2015 (Phase 2A Middle), 2017 (Phase 2A Upper/2B Lower), 2018 (Phase 2B Middle), and 2019 (Phase 2B Upper) have responded to the area's environmental conditions during its formative years after construction. One important environmental input to consider is the previous season's amount of precipitation. The north coast of California generally experiences precipitation from October to the end of April. This period of time is referred to as a *hydrologic year*. The amount of the hydrologic year's precipitation prior to monitoring efforts can significantly affect the findings of a handful of monitoring tasks, such as riparian success and cross-sectional surveys. The 2022/2023 hydrologic year experienced 39.58 inches of precipitation, which is about 5.4 inches below the average rainfall for coastal Humboldt.

The following is a brief summary of the findings of the various HMMP monitoring efforts. Detailed findings are located within the reports listed at the end of this HMMP monitoring summary.

Vegetation

Habitat monitoring effort in 2023 addressed both Phase 1— Riverside Ranch Tidal

Marsh and Phase 2 — Salt River Corridor Restoration Areas. This assessment consisted of the mapping and areal analysis of restored habitats, as well as the community composition and structural development of vegetation within specific habitats for evaluation against respective restoration success criteria. Results from the 2023 habitat assessment indicate that the Phase 1 “tidal salt and brackish marsh” habitat complex does satisfy the respective final minimum area success threshold in what is scheduled to be the final monitoring year. Phase 2B (Middle), which only covers one-third of the project area has changed little, however, it is expected that other Phase 2 habitats with riparian species will compensate for the acreage deficit.

The Vegetation percent cover and basal area sampling effort, performed in 2023 indicate poor establishment and survival on woody riparian vegetation throughout the 2B (Middle) restoration area. This is likely due to the drought-related conditions experienced during the original revegetation effort that prevented their success in developing into a forested riparian habitat within the monitoring time frame.

Two invasive grasses *Spartina densiflora* (“dense flowered cord grass”) and *Phalaris arundinacea* (“reed canary grass”) have independently resulted in the failure to maintain

abundance levels of invasive vegetation below the respective final threshold. These grasses have also resulted in the failure to reach the minimum cover threshold of co-occurring native vegetation. With the application of invasive vegetation management and additional supplemental revegetation, it is anticipated that the development of the projected restoration habits will be successfully achieved.

Wildlife

An annual spring and summer fish sampling program has been established since 2014 in constructed phases of the project. The California Department of Fish and Wildlife led fish monitoring efforts from April to June 2023. Over 16 salmonids were sampled across the Salt River and Francis Creek restoration area. Ten of these salmonids were juveniles present during the April sampling and four were collected during the May survey. Other native fish species that were sampled include three-spined stickleback, staghorn sculpin, prickly sculpin, saddleback gunnel, and starry flounder.

Geomorphic

Geomorphic monitoring tasks include photo documentation at established photo points and cross-sectional and longitudinal surveys. The photo documentation visually records the dramatic differences between pre-construction to post-construction conditions and records the vegetation recruitment and tidal effects. Phase 1 and 2 geomorphic surveys were not performed in 2023 due to a lack of funding and available surveyors. However, observational accounts were collected throughout the Phase 2 channel corridor and no significant concerns were identified.

INTRODUCTION

The Salt River Ecosystem Restoration Project (SRERP) took some 30 years to develop and drew upon several studies and assessments completed during the time which examined cultural, biological, geological, aquatic, and vegetative resources as well as tidal influences in the watershed. Project proponents also developed documents to guide implementation, maintenance, and long-term monitoring. Monitoring documents include the Salt River Monitoring Plan, Habitat Mitigation and Monitoring Plan, the Adaptive Management Plan, and other specialized plans to assure the protection of sensitive wildlife habitats, landowner properties, and the hydrologic system itself.

As outlined in the Project's CEQA and the Habitat Mitigation and Management Plan documents, a variety of monitoring tasks are required to be conducted to help determine if Project goals and objectives are being achieved, as well as to guide Project management and maintenance. Most of the monitoring tasks are to be completed over ten years, post-implementation. Monitoring was conducted prior to the Project's

implementation to establish baseline data and/or assist in identifying and protecting resources in the Project area. Post-implementation monitoring is being conducted as required by the Project's various funders, permit requirements, and environmental compliance documents. Many of the individual monitoring reports are available from the Humboldt County Resource Conservation District upon request or can be accessed on the website (<http://humboldtccd.org/resources/reports-and-documents/>).

This report presents monitoring results under three broad categories:

1. Vegetation
2. Wildlife
3. Geomorphic

Within each category is a discussion that identifies 1) the discrete task called for, 2) the agency requiring the task, 3) the reference document, 4) a description of the task, 5) goals and objectives of the tasks, 6) the resulting monitoring report (if applicable), 7) a description of methods, and 8) a results and discussion section.

VEGETATION

Monitoring Task: Habitat Mapping & Area Analysis – (Phase 1 and Phase 2B Middle Restoration Areas)

Agencies/Acts: Coastal Commission

Compliance Documents: Coastal Development Permit- Special Conditions; SRERP Habitat Mitigation and Monitoring Plan and the Adaptive Management Plan

Description: For the 2023 monitoring effort, habitat mapping and area analysis efforts focused on the restoration areas within the Phase 1 – Riverside Ranch tidal marsh habitats and the Phase 2 – Salt River Corridor riparian habitats.

Goals:

- Achieve 298.50 acres of tidal salt and brackish marsh in Phase 1 project area by year 10.
- Achieve a minimum of 11.57 acres of riparian within Phase 2B (Middle) project area by year 10.

Report: 2023 Annual Habitat Monitoring Report - Salt River Ecosystem Restoration Project, Prepared for the Humboldt County Resource Conservation District by J.B. Lovelace & Associates

Methods: Habitat maps were created by refining and updating existing project data. Geographic field data was collected during July 19-21 and August 2, 2023, using Environmental Systems Research Institute's (ESRI) ArcGIS® Field Maps geographic information system application operating on a handheld IOS mobile device paired with external Bad Elf Flex®, or Surveyor®, Global Navigation Satellite System (GNSS) capable of 1 m accuracy (Bad Elf 2023). The habitat maps and resulting area quantifications were developed using the collected geographic data and the most recently available satellite imagery (i.e., ESRI's World Imagery 2023, National Agriculture Imagery Program [NAIP] 2018, Google Earth 2023), and a combination of ESRI's ArcGIS® Online web application, and the following desktop software: ESRI's ArcGIS® and ArcMap™, and Google Earth (2023).

Results & Discussion: In the 10th monitoring year for Phase 1 - Riverside Ranch Tidal Marsh Restoration Area no significant changes have occurred and the habitat continues to exceed the respective final minimum acreage success threshold. The tidal salt and brackish marsh cover 303.93 acres of the project area, 14.43 acres greater than the final minimum success threshold (i.e., 298.50 acres) seen in Table 1.

The riparian habitats distributed throughout the Phase 2B (Middle) restoration reach have not changed substantially since the previous habitat mapping was completed in 2021. Minor changes were documented, such as a decrease from 2.55 to 2.34 acres of retained existing riparian forest. This decrease is attributable to the mortality of mature riparian trees in the adjacent agricultural pastureland. Within the 2023 habitat monitoring effort, only 51% of the project area (12.86 acres) is represented by 6.58 acres of either retained existing riparian forest or replanted woody riparian vegetation (Table 2). That is 4.99 acres less than the respective final minimum success threshold of 11.57 acres.

Table 1. Summary of 2023 habitats addressed during the 2023 SRERP habitat monitoring effort and their respective success criteria

Habitats & Restoration Design Components	Area (Acres) ^{1,2}			
	Projected ³	Final Success Criteria ⁴	2023	
			Observed	% of Projected
“Tidal Salt & Brackish Marsh” ⁵				
Salt Marsh Senu Stricto	–	–	210.30	–
Mudflat ⁶	20.81	≥18.73	25.23	278%
Aquatic ⁶			32.69	
Brackish Marsh	–	–	15.71	–
Upland	–	–	20.00	–
“Tidal Salt & Brackish Marsh” ⁴ Total	321.67	≥289.50	303.93	95%

Table 2. Summary of 2023 retained existing and replanted riparian area contributions to the total acreage of Phase 2 riparian forest habitats addressed in the 2023 SRERP habitat monitoring effort.

Habitats & Restoration Design Components	Habitat Area (Acres) ¹			
	Projected ²	Final Success Criteria ³	Observed	% of Projected
Phase 2B (Middle)				
Existing Riparian Forest & Riparian Planting Zones	12.86	≥11.57	4.30	33%
Supplemental Riparian Planting Areas ⁴	–	–	2.28	–
Total	12.86	≥11.57	6.58	51%

VEGETATION

Monitoring Task: Vegetation Percent Cover – Phase 1 Riverside Ranch Tidal Marsh Restoration Area, Phase 2 Salt River Corridor Restoration Area

Agencies/Acts: Coastal Commission

Compliance Documents: Coastal Development Permit- Special Conditions; SRERP Habitat Mitigation and Monitoring Plan and the Adaptive Management Plan

Description: Estimate percent cover of vegetation in the salt marsh, riparian, and high marsh ecotone habitats within the Phase 2B (Middle) Salt River Corridor Restoration Area and Phase 1 Riverside Ranch Tidal Marsh Restoration Area

Goals:

- Achieve Native Vegetation Percent Cover of: ≥60% in Phase 2B (Middle) Salt River channel wetlands, Phase 2B (Middle) active bench sampling region; Vegetation percent cover of: ≥50% in the riparian planting zones in the Phase 2B (Middle) restoration reach, Phase 2B (Middle) active riparian berm
- Achieve Non-Native Non-Invasive Vegetation Percent Cover of: <15% in all restored habitats
- Achieve Invasive Vegetation Percent Cover of: <5% in all restored habitats

Report: 2023 Annual Habitat Monitoring Report - Salt River Ecosystem Restoration Project, Prepared for the Humboldt County Resource Conservation District by J.B. Lovelace & Associates

Methods: A stratified, randomized sampling approach was used to characterize the abundance, composition, and structural developmental stage of existing vegetation within each sampling region. Sample sizes were determined based on power analyses performed on the most recent preceding SRERP vegetation sampling data for respective habitat types. Using updated SRERP habitat GIS data and ArcMap desktop

software, each phase and sub-phase of the restoration area was partitioned into ecologically distinct vegetation sampling regions of perceived relative homogeneity based on currently mapped restoration habitat design components. ArcMap desktop software was then used to randomly distribute sampling plots throughout each of these sampling areas. Given that most sampling regions are composed of multiple, geographically separated polygons, sample plots were randomly allocated throughout each sampling area, in quantities proportionate to the size (i.e., area) of each polygon. Once sample plots were located in the field, a 1-m² sampling frame, or "quadrat," constructed from ¼-inch diameter PVC was then used to visually estimate:

- (total) percent vegetative cover, and
- (absolute) percent cover of each species present.

In order to evaluate this field data against respective success criteria for

specific vegetative parameters, each observed plant species was subsequently

- categorized as: native,
- "non-native non-invasive", or
- invasive

As well as being:

- herbaceous (an herb),
- arborescent (a tree),
- a shrub, or
- a vine.

The same modified Braun-Blanquet (1928) cover-abundance scale used in previous monitoring efforts was used in the 2023 sampling fieldwork to assign a "cover class" to the visually estimated absolute percent cover for each species observed during sampling. Median percent cover values for the range associated with each cover class were then used in subsequent analyses.

The vegetation success criteria specified in the HMMP consist of minimum percent cover thresholds for native species and maximum percent cover thresholds for both non-native non-invasive and non-native invasive species.

Results & Discussion: The findings from 2023 confirm the continued development of Phase 1 "tidal salt and brackish marsh" habitat and substantiate that this habitat complex does satisfy the respective final minimum area success threshold in what is scheduled to be the final monitoring year for that specific SRERP habitat. The total vegetative cover continues to remain fairly stable throughout portions of the SRERP area sampled, with all mean cover estimates exceeding 92%. The lowest total

vegetative cover estimate recorded in 2023 was observed in the active channel sampling region of the Phase 2B (Middle) restoration area (Table 3). This is neither surprising nor concerning given the dynamic nature of that sampling region.

Native Vegetation – In 2023, native vegetation cover fell below the minimum success thresholds in all sampled regions except the high marsh ecotone of Phase 1, which exceeded the 60% threshold at 72.2% (Table 3). Deficiencies were observed in the Phase 1 salt marsh *sensu stricto* and Phase 2B (Middle) Salt River channel wetlands, where 2023 was the final monitoring year. The salt marsh *sensu stricto* had a cover of 47.0%, below the 60% threshold (Table 3). In Phase 2B, both the active channel and active bench failed to reach the 50% threshold. Notable native plants in these regions included *Distichlis spicata*, “salt grass”, *Salicornia pacifica*, “pickleweed”, *Eleocharis macrostachya*, “spikerush”, and *Deschampsia cespitosa*, “tufted hair grass”. In riparian planting zones, native vegetation cover fell short of the 40% threshold in 2023, but the replanted riparian forest showed increased abundance compared to 2021.

Non-Native Non-Invasive Vegetation – In 2023, non-native non-invasive vegetation stayed below the 15% threshold in most regions, meeting success criteria in Phase 1 areas. However, the active bench of Phase 2B exceeded the threshold at 19.9% (Table 3). Notable species included *Trifolium repens* and *Festuca perennis*. 2023 was the last year for sampling in this area. Other regions had percent cover ranging from 6.2% to 10.5%.

Invasive Vegetation – In 2023, the mean estimated cover of invasive vegetation exceeded the final maximum threshold (<5% cover) in all sampling regions, including the Phase 1 and Phase 2B (Middle) restoration areas. The high marsh ecotone in Phase 1 had the lowest observed cover at 17.3%, while the salt marsh *sensu stricto* had 44.7%. In Phase 2B, invasive vegetation cover ranged from 46.0% to 67.3% across different sampling regions (Table 3). Two dominant suites of invasive vegetation, associated with specific species *spartina densiflora* (“dense-flowered cordgrass”) or *Phalaris arundinacea* (“reed canary grass”), were observed. *Spartina densiflora* was the most abundant in Phase 1, while *Phalaris arundinacea* dominated Phase 2B.

Recommendations include initiating immediate efforts to reduce and/or eradicate invasive vegetation across the project area.

Table 3: Summary of 2023 SRERP Quantitative Vegetation Percent Cover Sampling Results & Respective Success Criteria. Mean percent cover estimates are in bold and associated 95% confidence intervals follow in brackets.

SRERP Habitat Sampling Area	Mean Percent Cover for Vegetation Categories of Interest					
	Total Vegetation ¹	Native Vegetation		Non-Native Non-Invasive Vegetation		Invasive Vegetation
	Observed	Observed	2023 Success Criteria ²	Observed	Final Success Criteria ³	Observed
Phase 1 — Riverside Ranch Tidal Marsh Restoration Area						
Salt Marsh <i>Sensu Stricto</i> (n=35)	98.1 [96.0, 99.2]	47.0 [37.4, 56.6]	≥60%	6.4 [3.7, 10.5]	<15%	44.7 [35.0, 55.1] <5%
High Marsh Ecotone (n=20)	96.3 [91.5, 98.3]	72.2 [61.0, 79.8]	≥60%	6.8 [3.8, 10.5]	<15%	17.3 [9.7, 28.1] <5%
Phase 2 — Salt River Corridor Restoration Area						
Phase 2B (Middle) — Salt River Channel Wetlands						
Active Channel (n=25)	92.8 [86.0, 96.6]	40.6 [32.1, 50.2]	≥50%	6.2 [3.6, 9.6]	<15%	46.0 [36.9, 54.8] <5%
Active Bench (n=25)	94.4 [90.4, 97.0]	20.6 [11.1, 33.8]	≥50%	19.9 [12.9, 29.0]	<15%	53.9 [41.9, 65.7] <5%
Phase 2B (Middle) — Riparian Planting Zones						
Replanted Riparian Forest (n=20)	100.0 [N/A]	37.0 [26.3, 51.3]	≥40%	10.5 [5.3, 19.6]	<15%	52.4 [39.3, 64.5] <5%
Active Riparian Berm (n=20)	100.0 [N/A]	22.6 [12.2, 36.4]	≥40%	10.1 [5.7, 16.0]	<15%	67.3 [54.1, 78.4] <5%

VEGETATION

Monitoring Task: Arborescent Riparian Vegetation Basal Area Assessment

Agencies/Acts: Coastal Commission

Compliance Documents: Coastal Development Permit- Special Conditions; SRERP Habitat Mitigation and Monitoring Plan and the Adaptive Management Plan

Description: To further assess the structural development of vegetation within specific replanted portions of the Phase 2 — Salt River Corridor restoration Area.

Goals: Replanted riparian vegetation zones of Phase 2B basal area must demonstrate a statistically significant increasing trend.

Report: 2023 Annual Habitat Monitoring Report - Salt River Ecosystem Restoration Project, Prepared for the Humboldt County Resource Conservation District by J.B. Lovelace & Associates

Methods: Arborescent basal area sampling was conducted on August 2, 2023. During this period, resampling of previously established basal area sampling plots within the Phase 2B (Middle) restoration area replanted with woody riparian plant species were evaluated for the extent of change since the previous sampling effort in 2021.

Sampling plots for basal area plots were located in the field by accessing a previously-created ArcGIS Online webmap using the same mobile device, software, and GNSS technology previously described. Basal-area-specific field data forms were created

using ESRI's ArcGIS Survey123Connect desktop software. Data forms were uploaded to ESRI's ArcGIS Survey123 web application for subsequent export, management, and analysis. These customized data forms allowed for the collection of diameter-at-breast-height (DBH), species, and geographic coordinates. Diameter measurements were obtained for all tree stems at 4.5 feet above ground level. Data was only collected for trees within the area of overlap between the sampling plot and the target habitat. All trees outside of the combined area of overlap or in areas where the basal area sampling plants extended into adjacent retained "Existing Riparian Forest", were ignored and no data was collected. ArcMap was used to calculate the relativized tree-basal-area-per-unit-area-sampled ("BAPA") which was then used in generating summary statistics and comparative analyses. All DBH measurements collected during fieldwork were converted to values of basal area using the formula $\text{Basal area} = \text{DBH}^2 \times 0.005454$.

Hypothesis Test – Due to highly skewed BAPA data a significant Shapiro-Wilks test suggested that hypothesis testing methods were not appropriate. For this reason, no paired t-test was performed in 2023, and instead permutation tests as in previous SRERP habitat monitoring years was used to analyze the 2023 replanted riparian forest BAPA results in the Phase 2B (Middle) restoration reach.

Results & Discussion: In 2023, a 12% (0.67 acres) resampling of the total combined (5.6 acres) Phase 2B (Middle) replanted riparian forest, active riparian berm, and active bench sampling regions was conducted as the second of three scheduled basal area sampling events for SRERP. The results confirmed the poor establishment of woody riparian vegetation in the Phase 2B (Middle) restoration area. Basal-area-per-unit-area-sampled increased slightly in each of the three Phase 2B (Middle) regions from 2021 to 2023, with a statistically significant combined increase of 0.38 ft²/acre. The greatest increase occurred in the replanted riparian forest (0.81 ft²/acre), followed by the active riparian berm (0.26 ft²/acre), and a minor increase in the active bench (0.08 ft²/acre) (Table 4). However, at the individual plot level, only 60% exhibited small increases, with some plots showing no establishment or a decrease in woody riparian vegetation. The species composition was relatively low in diversity, with notable contributions from *Salix sitchensis* ("Sitka willow"), *Alnus rubra* ("red alder"), and *Salix lasiandra* ssp. *lasiandra* ("Pacific willow").

Table 4: Sample Plot-Level Changes in Basal Area-per-Unit-Area-Sampled (“BAPA”) in Phase 2B (Middle) Sampling Regions During the Period from 2021–2023. The Greek symbol, delta (Δ), indicates change.

Phase 2B (Middle) Basal Area Sample Plots		BAPA (ft ² /acre)		Δ
		2021	2023	
Replanted Riparian Forest				
P2BMRForest01	0.8009	3.9863	3.1854	
P2BMRForest02	0	0	0	
P2BMRForest03	0	0.6301	0.6301	
P2BMRForest04	0.0035	0	−0.0035	
P2BMRForest05	0.0746	0.3274	0.2528	
Active Riparian Berm				
P2BMBerm01	0	0	0	
P2BMBerm02	0.0179	0.0608	0.0429	
P2BMBerm03	0.0078	0	−0.0078	
P2BMBerm04	0.0755	0.3712	0.2957	
P2BMBerm05	0.0784	1.0380	0.9596	
Active Bench				
P2BMBench01	0.0170	0.0553	0.0383	
P2BMBench02	0	0	0	
P2BMBench03	0.0301	0.3042	0.2741	
P2BMBench04	0	0.0745	0.0745	
P2BMBench05	0	0	0	

WILDLIFE

Monitoring Task: Salmonid and Tidewater Goby Monitoring

Agencies/Acts: Coastal Commission

Compliance Documents: Coastal Development Permit- Special Conditions 12, 13; SRERP Habitat Mitigation and Monitoring Plan and the Adaptive Management Plan

Description: Survey for presence of salmonids across the constructed SRERP and tidewater gobies on Phase 1 and 2 in the spring through summer months.

Goals:

- Surveys will show that salmonids and tidewater gobies will utilize the restored Salt River main channel and the tidal slough networks.

Report: Salt River Ecosystem Restoration Project Spring-Summer Fish Monitoring Program, 2023. Results of Fish Species Presence and Distribution Monitoring Conducted From April to June 2023 within the Salt River, Eel River Estuary, Phase 1 & 2 Project Area, Humboldt County California Prepared by HCRCD. August 2023.

Methods: The California Department of Fish and Wildlife and the Humboldt County Resource Conservation District led and/or participated in the 2023 fish monitoring program.

A fish sampling program was developed in the spring of 2014 and is conducted annually across the constructed reaches of the SRERP. However, from 2020 to 2021, fish sampling monitoring did not occur due to the worldwide pandemic (COVID 19). In 2022, fish sampling monitoring resumed. During the 2023 monitoring season, eleven sites were selected across the project footprint (Figure 2). The site selection was based on environmental conditions at each site (e.g., the presence of water and depth of water). The monitoring sites were selected across the Phase 1 and 2 project footprints as required by monitoring documents.

In 2023, once a month, from April to June, sites across the restored portions of Phase 1 & 2 (Figure 2) of the Salt River Ecosystem Restoration Project were surveyed for salmonids and tidewater gobies during low tide periods. Eleven (11) sites on constructed portions of the Phase 1 & 2 restoration areas were selected and surveyed for fish presence and species distribution. In 2023 sites included: 3, 4, 10, 15, 19, 20, 24, 25, 26, 27, and 29. These sites represent the diversity of channel size and habitats in the main Salt River channel and Francis Creek. Sites where the channel was wide enough were sampled using a 1/8th inch mesh pole seine net. Typically, a single pass with an 1/8-inch seine was made at each site. Non-seined sites were solely sampled by minnow traps which were deployed for at least an hour.

Captured fish were held in aerated buckets, identified to species, counted, and released back into the waterway. Additionally, juvenile salmonids were measured, held in a recovery bucket, and then released back into the waterway. Captured non-native pike minnow were enumerated into 100 millimeter size classes by visual estimation, and were humanely euthanized and buried via permit requirement. A start time, end time, air and water temperatures were measured by thermometer, and recorded for each minnow trap and seine deployment. In previous years, minnow traps were deployed at each site, but results did not significantly add further information to the seining effort, thus minnow trapping has since been limited to sites 24, 25, 26, 27, 29.

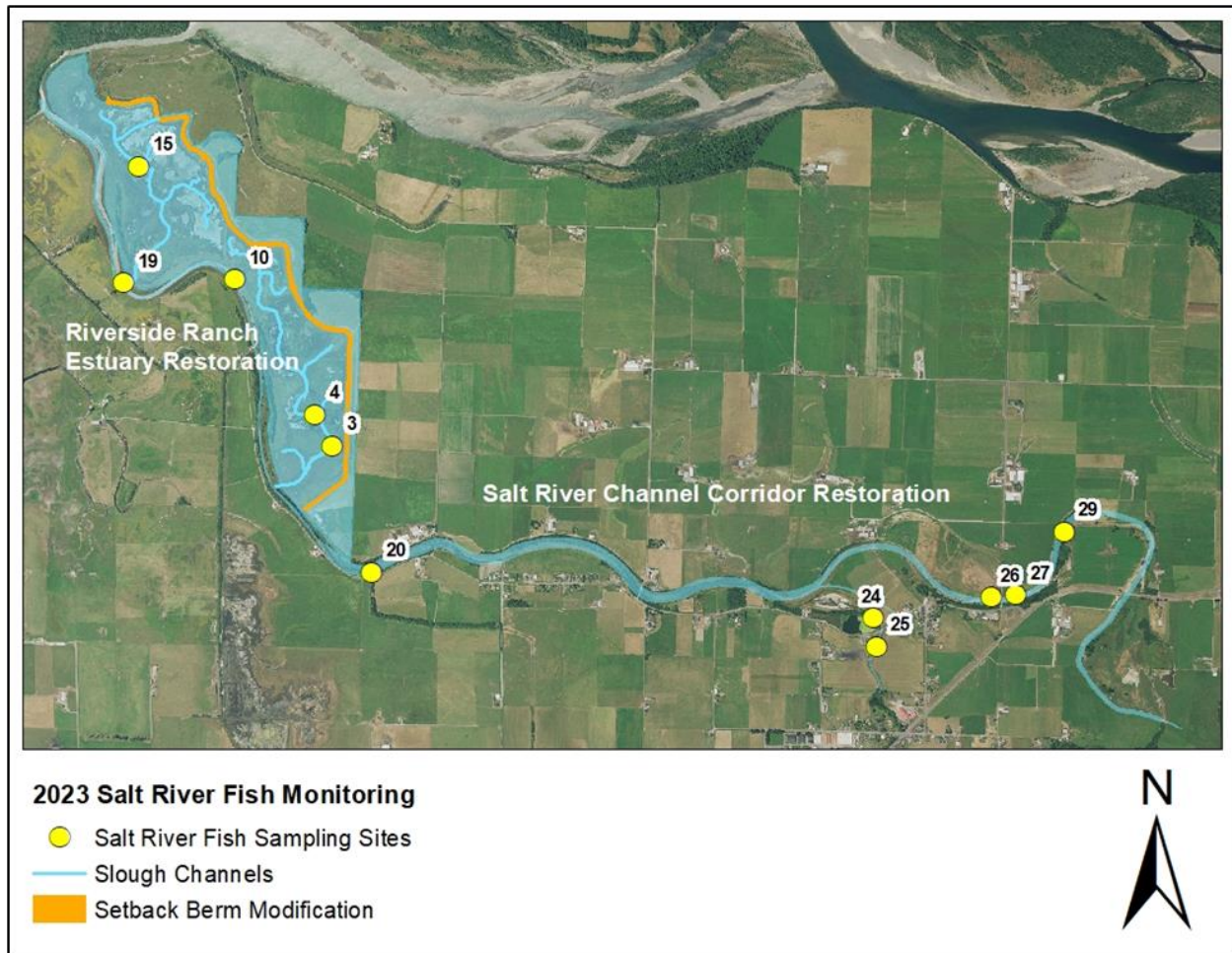


Figure 2: Fish Monitoring Sites Across Phase 1 & 2 of the Salt River Ecosystem Restoration Project

Results and Discussion: Concurrent with the fish seining and trapping, water quality measurements were taken. Over the three month sampling period, water temperatures ranged between a maximum of 25.4°C (June) and a minimum of 10.3°C (April).

Seining and minnow trapping efforts at the seven fisheries monitoring sites identified the presence of 13 known species. Approximately 2,224 individuals were captured (approximate numbers in 2023 were often estimated during the capture of large numbers of three-spined stickleback). The following table (Table 4) presents the total number of fish and marine invertebrates sampled from April to June in 2023.

Table 4. Number of Individual Fish Captured by Each Month's Fish Survey efforts in Salt River Ecosystem Restoration Project, Phase 2 Area, in 2022

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

Salmonid Species:

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

Non-Salmonid Species:

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

Fish are utilizing the restored length of Salt River channel. The past 10 years of fish surveys have shown that, overall, the Salt River Ecosystem Restoration Project has been successful for native fish species.

GEOMORPHIC

Monitoring Task: Restoration Documentation Photos

Agencies/Acts: Coastal Commission

Compliance Documents: SRERP Habitat Mitigation and Monitoring Plan

Description: Perform qualitative documentation of the restoration project with feature and landscape photos such as stream profile, floodplain, and riparian conditions.

Goals:

- Photo point monitoring will be used to qualitatively document pre- and post-project visual changes at restoration sites.

Report(s): Salt River Ecosystem Restoration Project – Photo Monitoring - 2023.
Prepared by HCRCD.

Methods: Photo monitoring was performed across the Phase 1 and the completed Phase 2 footprint by a staff member of the HCRCD.

Five photo monitoring sites were established across Phase 1 and ten sites across the completed Phase 2 channel corridor (Figure 3). Photos were taken prior to construction and annually post-construction. The compass direction of the photo was recorded and aligned with previous photo elements. Post-project photos will be taken during the same season or month as pre-project photos (Fall/Winter - November/December).

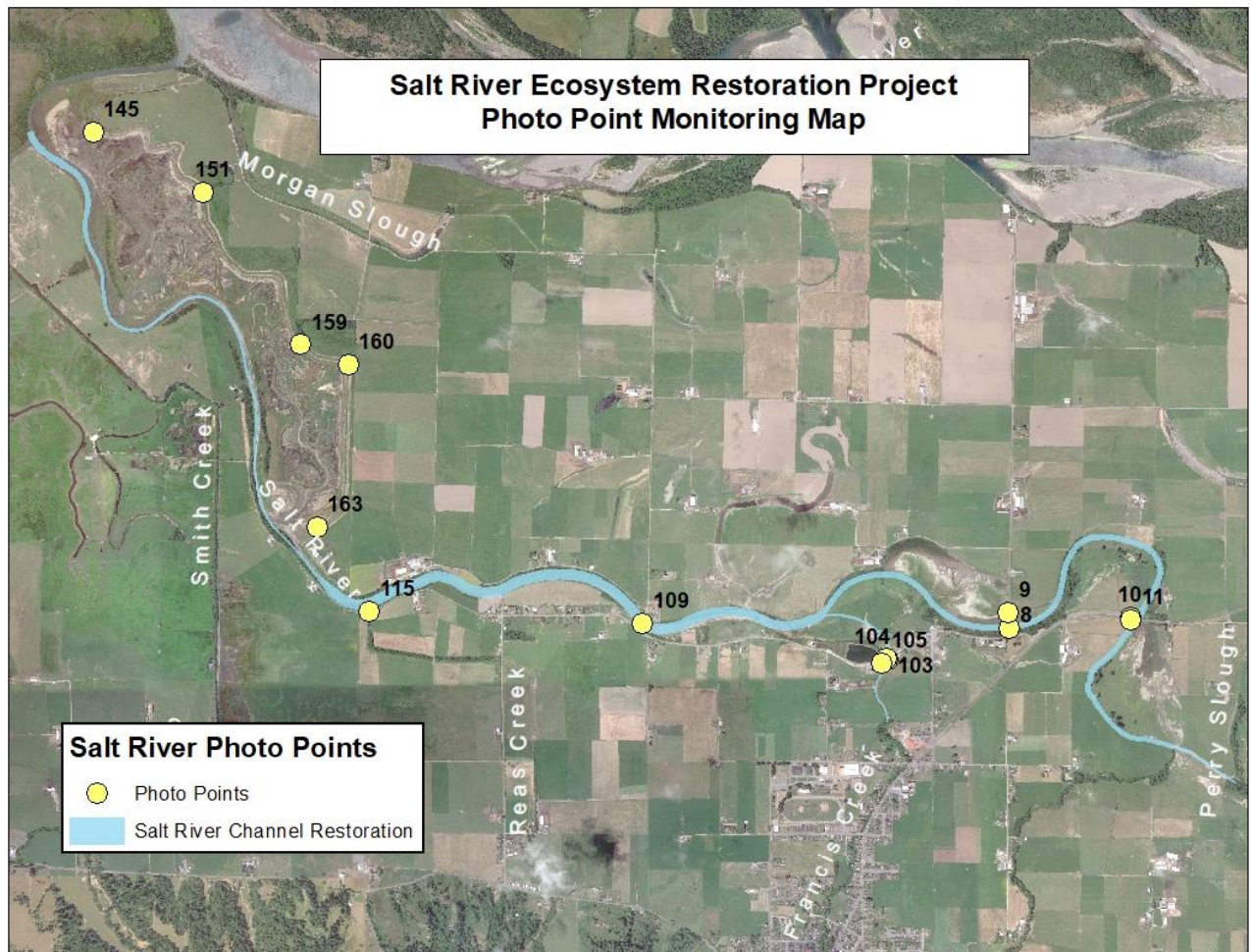


Figure 3: Photo Monitoring Points for the Constructed Footprint - 2023

Results and Discussion: A total of 14 photo point sites were established across Phase 1 and the completed portion of the Phase 2 project area. Pre-construction and post-construction photos have been recorded. The following six photo points are a sample of the 14 sites.



PP145 – SW – July 2011



Dec 2017



Nov 2023



PP159 – SW Tidegates – July 2011



Nov 2015



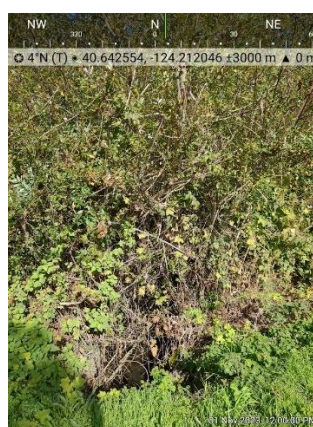
Nov 2023



PP115 – Reas Ck – Jul 2011



Jan 2018



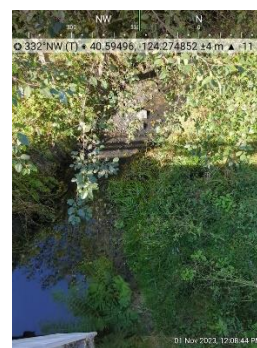
Nov 2023



PP109 – Dillon Br Dwn – July 2011



Nov 2015



Dec 2023



PP103 – Up Strm – Apr 2017



Dec 2017



Nov 2023



PP9 – Fulmor Br E – Oct 2018



Oct 2020



Dec 2023

Photo documentation indicates that vegetation continues to establish in Phase 1 and 2 where seed mixes are persisting and natural recruitment of natives, non-natives, and invasives are evolving. Some sites are experiencing increasing canopy cover.

GEOMORPHIC

Monitoring Task: Cross-Sectional and Longitudinal Surveys – Riverside Ranch – Phase 1 - Erosion and Sediment Deposition Surveys

Agencies/Acts: Coastal Commission, and California Environmental Quality Act (CEQA)

Compliance Documents: Coastal Development Permit- Special Conditions; Salt River Ecosystem Restoration Project Final Environmental Impact Report (FEIR); and Salt River Ecosystem Restoration Project Adaptive Management Plan

Description: Cross-sectional and longitudinal profile surveys are performed across and along the main channel Salt River at established sites on the interior northern and southern slough channels.

Goals:

- Cross-sectional and longitudinal surveys will describe how the channel is remaining consistent with restoration designs or if areas are aggrading or eroding to the point of intervention.

Report: DUE LIMITED FUNDING AND THE LACK OF A QUALIFIED SURVEYOR, A PHASE 1 GEOMORPHIC SURVEY WAS NOT PERFORMED IN 2023.

GEOMORPHIC

Monitoring Task: Cross Sectional and Longitudinal Surveys-Salt River Channel Corridor –Phase 2 - Erosion and Sediment Deposition Surveys

Agencies/Acts: Coastal Commission, and California Environmental Quality Act (CEQA)

Compliance Documents: Coastal Development Permit- Special Conditions; Salt River Ecosystem Restoration Project Final Environmental Impact Report (FEIR); and Salt River Ecosystem Restoration Project Adaptive Management Plan

Description: Cross-sectional and longitudinal profile surveys are performed across and along the main channel of the Salt River.

Goals:

- Cross-sectional and longitudinal surveys will describe how the channel is remaining consistent with restoration designs, or if areas are aggrading or eroding to the point of intervention.

Report: N/A

Methods: In previous years, channel monitoring consisted of performing elevational surveys at four established cross-sections and within the entire constructed 3.5-mile length of the Phase 2 channel by an experienced surveyor or engineer. However, starting in 2022, due to funding constraints and limited availability of surveyors and engineers, elevational surveys were not performed. As a substitute for these surveys, Humboldt County Resource Conservation District staff members perform an annual creek walk to check for the channel's geomorphic conditions (Figure 4). This year due to weather constraints and staff availability the creek walk will be completed in early January 2024.

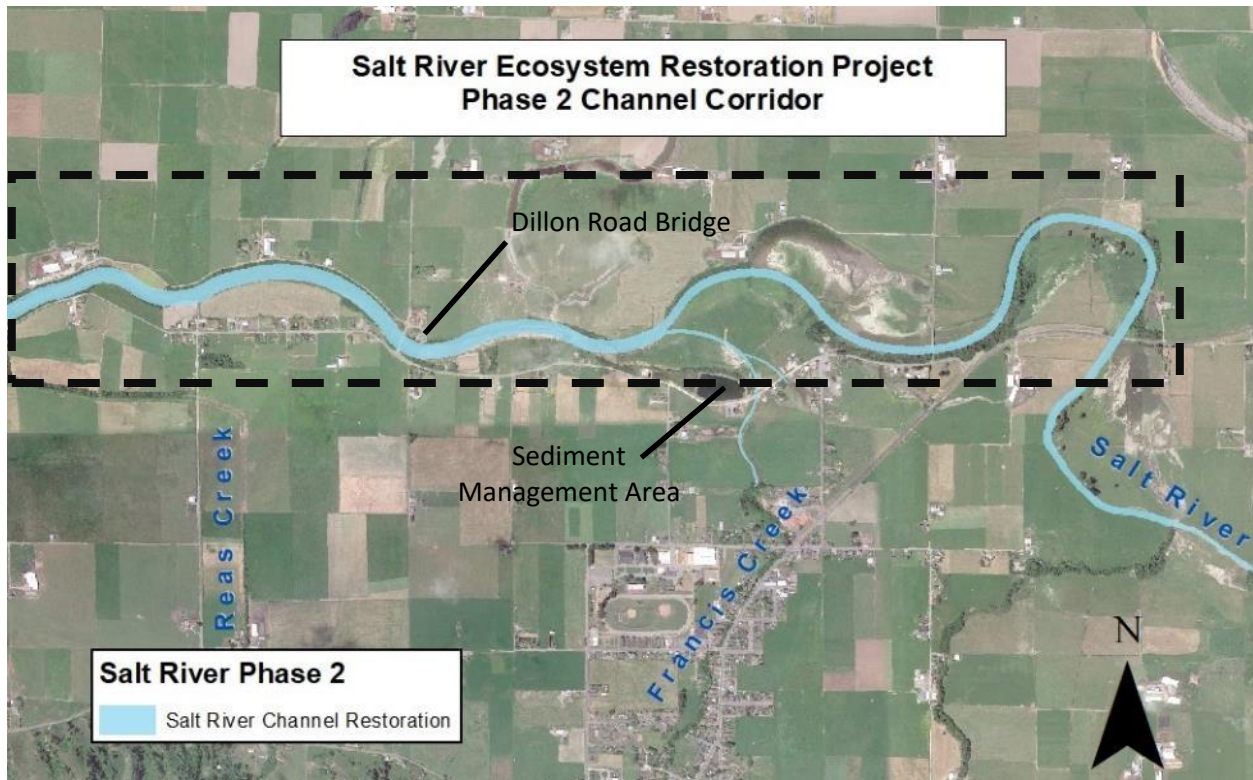


Figure 4: Salt River Phase 2 Channel Corridor. Dashed box delineates the Phase 2 channel that is constructed and surveyed.

Results and Discussion: Although the creek walk was not completed in 2023, HCRCD did check all culverts, tide gates, and bridges along the Project and found them all to be functioning properly. No concerns about the channel or floodplains were received from participating Project landowners. Furthermore, HCRCD staff and consulting engineers did not note any concerns when discrete areas of the Salt River and Francis Creek were observed.

Recommendations: Continue to perform geomorphic or observational surveys in the Salt River channel corridor.

LIST OF AVAILABLE REPORTS

H. T. Harvey with Winzler and Kelly. 2012. Salt River Ecosystem Restoration Project Habitat Mitigation and Monitoring Plan. Prepared for the Humboldt County Resource Conservation District. Eureka, California

Humboldt County Resource Conservation District. 2022. Salt River Ecosystem Restoration Project – Photo Monitoring - 2023. Eureka, California.

Humboldt County Resource Conservation District. 2023. Salt River Ecosystem Restoration Project Spring-Summer Fish Monitoring Program, 2023. Results of Fish Species Presence and Distribution Monitoring Conducted From April to June 2023 within the Salt River, Eel River Estuary, Phase 2 Project Area, Humboldt County California Prepared by HCRCD. August 2023.

J.B. Lovelace & Associates. 2023. 2023 Annual Habitat Monitoring Report - Salt River Ecosystem Restoration Project. Prepared for the Humboldt County Resource Conservation District.