

# Salt River Ecosystem Restoration Project



## Adaptive Management Plan Monitoring Report 2022

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## EXECUTIVE SUMMARY

The Salt River Ecosystem Restoration Project (Project) has been developed in collaboration with landowners and resource and regulatory agencies for over 30 years. 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 bounded 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 flows across the 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 and fish and wildlife habitat in the Salt River watershed. The Project area includes the main stem of the Salt River, five Salt River tributaries originating in the Wildcat Hills above the town of Ferndale (Coffee, 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 in private ownership.

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 divided into the tidal salt marsh restoration area (Phase 1) and the riverine corridor restoration area (Phase 2). Within the two restoration areas, the Project is further broken down in to 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 improve 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.

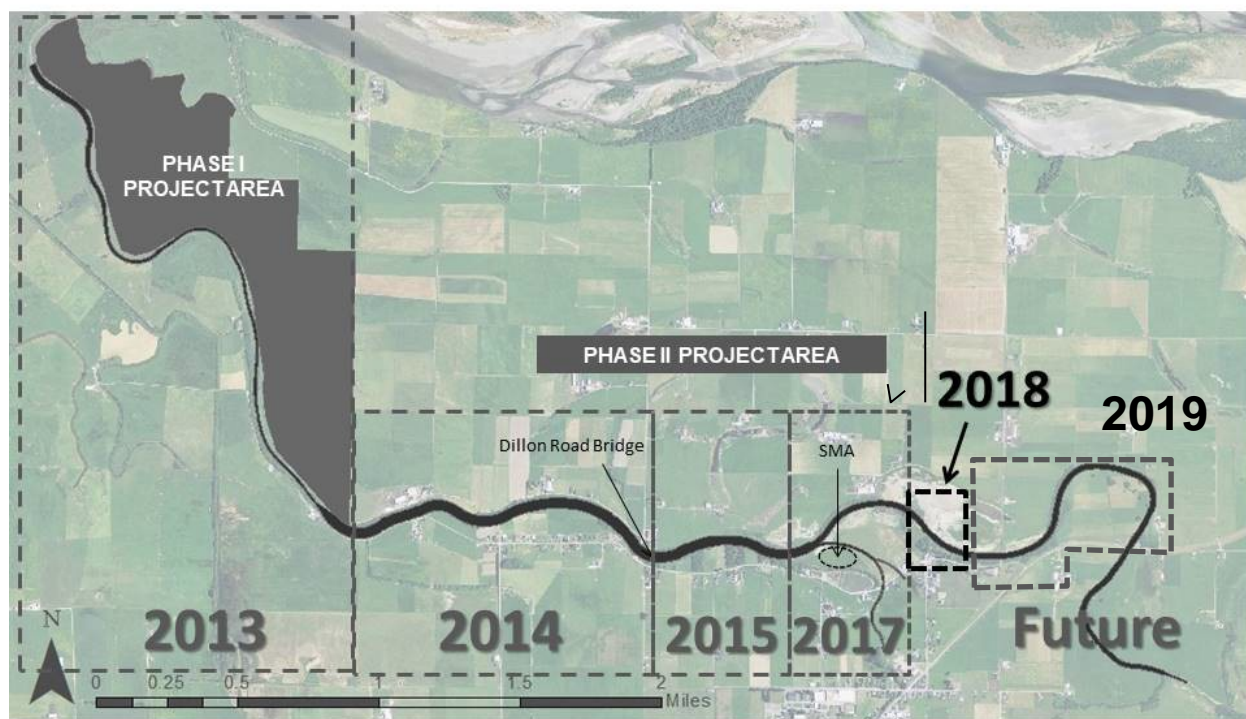
In 2013, restoration of Riverside Ranch (Phase 1 of the Project) restored 330 acres of pasture land back to intertidal wetland habitat, while also preserving approximately 70 acres that is be agriculturally managed to provide short-grass habitat for Aleutian cackling geese and other wetland-associated 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 a setback berm were constructed to create a boundary between the tidal area and the retained agricultural area, and 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 represents the Salt River “corridor restoration” portion of the larger project. Within Phase 2, 4.5 miles of the Salt River channel and its adjacent floodplain are being constructed and restored. Wetlands and riparian corridors are being re-vegetated with a diverse palette of native plants. Fish passage is being restored to three watershed tributaries – Reas, Francis and Williams Creeks.

Across the years of 2013, 2014, 2015, 2017, 2018, and 2019 a total of 6.2 miles of Salt River channel and floodplain were constructed and re-vegetated. These construction efforts also reconnected two tributaries (Reas and Francis Creek). The 2017 construction season also restored 0.5 miles of the channel and floodplain in Francis Creek. Approximately 1.2 miles of the Phase 2 construction remains to be constructed (Figure 1).

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## Salt River Ecosystem Restoration Project Permitted Project Area & Implementation Status



**Figure 1: Salt River Ecosystem Restoration Construction Timeline as of 2020**

Upon completed portions of the Project, monitoring is performed under 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) and the Adaptive Management Plan (AMP). This report provides information on data collected for monitoring tasks pertaining to the AMP 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 3 (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 2022 monitoring results provide a point of reference on how the restoration activities completed in 2013, 2014, 2015, 2017, 2018, and 2019 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 2020/2021 hydrologic year experienced 22.59 inches of precipitation, which is nearly 23 inches below average (45 inches/year) rain totals.

The following is a brief summary of the findings of the various monitoring efforts under the identified Adaptive Management Plan's monitoring categories. Please reference individual reports listed at the end of this report for more detailed findings.

### *Erosion, Sediment Deposition, and Geomorphic Condition Monitoring and Adaptive Management for Salt River Corridor*

Previous cross-section surveys on Phase 2 of the Salt River corridor indicate that the Salt River channel is adjusting to the environmental conditions and is trending toward a scour process where the channel bottom elevation is decreasing overall. Tidal exchange and water quality monitoring was required for the first three years after Project construction in tidally influenced regions and was concluded in its entirety across all phases in the Salt River Ecosystem Restoration Project in 2016. Monitoring indicated that water quality parameters achieved ranges appropriate for salmonids at sampling sites and the restored tidal prism reached the predicted extent in the restoration area. Other monitoring under this heading included observing the function of bridges and culverts. For the 2022 monitoring period, existing Dillon Road Bridge and replaced Port Kenyon Road Bridges located within the constructed project footprint were functioning normally as well as one installed private agricultural bridge on Francis Creek and another private agricultural bridge on Salt River. No culverts were installed during the Phase 2 construction, though adjacent culverts are present along the Project footprint at Reas Creek, the Boynton swale, and Bush Street. These were found to be unimpeded. Geomorphic surveys in the Sediment Management Area (SMA) indicate that it captured approximately 11,500 cubic yards over two winters since 2019.



### *Erosion, Sediment Deposition, and Geomorphic Condition Monitoring and Adaptive Management for Riverside Ranch*

Previous surveys indicate this tidally influenced Phase of the Salt River Ecosystem Restoration Project is highly dynamic with channel capacity fluctuating between years. Past geomorphic surveys revealed deposition and scour in anticipated areas. Additional general visual inspections of the Phase 1 elements include the setback berm, outboard ditches, and tide gates. The setback berm is structurally stable, and no significant changes were observed. The outboard ditches are functioning as designed. All three tide gates are functioning normally with typical leakage and doors have not been observed to have any obstructions.

### *Water Quality Monitoring and Adaptive Management for the Salt River Corridor and Riverside Ranch*

Water quality monitoring was required for the first three years after Project construction in tidally influenced regions. Water quality monitoring was concluded in its entirety across all phases in the Salt River Ecosystem Restoration Project in 2016. Monitoring indicated that water quality parameters achieved ranges appropriate for salmonids at sampling sites and restored tidal prism reached the predicted extent in the restoration area.

### *Habitat Development, Vegetation and Invasive Species Monitoring, and Adaptive Management for Salt River Corridor and Riverside Ranch*

A variety of monitoring and management actions are included under this category, primarily relating to fish and vegetation. An annual spring and summer fish sampling program has been established since 2014 in constructed phases of the Project. After a two-year hiatus, due to COVID-19 restriction, the California Department of Fish and Wildlife led fish monitoring efforts from April to June in 2022. Over 40 salmonids were sampled across the Salt River and Francis Creek restoration area. Other native fish species were sampled that include: three-spined stickleback, staghorn sculpin, prickly sculpin, and starry flounder.

The Phase 1 tidal marsh and high marsh ecotone was not scheduled to be monitored for vegetative mapping or percent cover in 2022. Phase 2 vegetative monitoring indicated that invasive species are exceeding maximum percent cover allowances. Some invasive species control occurred throughout the project footprint. A three acre grazing management pilot project was initiated in the fall of 2021 and continued in 2022 where non-native and invasive species were trampled and browsed by

lightweight cows. Woody vegetation maintenance was performed along roads, the setback berm, at rocked entrances, and along fence lines on Francis Creek.

## INTRODUCTION

The Salt River Ecosystem Restoration Project (SRERP) took some 30 years to develop and drew upon several studies and assessments completed during that time that 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 Adaptive 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 a period of ten years, post-implementation. Monitoring was conducted prior to beginning Project 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 reports are available from the Humboldt County Resource Conservation District upon request or can be accessed on the website (<http://humboldtrcd.org/resources/reports-and-documents/>).

This 2022 Adaptive Management Plan Monitoring report is structured and provides findings related to the monitoring requirements in the four identified categories:

- *Erosion, Sediment Deposition, and Geomorphic Condition Monitoring and Adaptive Management for Salt River Corridor*
- *Erosion, Sediment Deposition, and Geomorphic Condition Monitoring and Adaptive Management for Riverside Ranch*
- *Water Quality Monitoring and Adaptive Management for the Salt River Corridor and Riverside Ranch*
- *Habitat Development, Vegetation and Invasive Species Monitoring, and*



*Adaptive Management for Salt River Corridor and Riverside Ranch*

Within each category is a description that identifies 1) the discrete task called for, 2) the agency requiring the task, 3) the reference document, 4) 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.

*Erosion, Sediment Deposition, and Geomorphic Condition Monitoring  
and Adaptive Management for Salt River Corridor*

**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

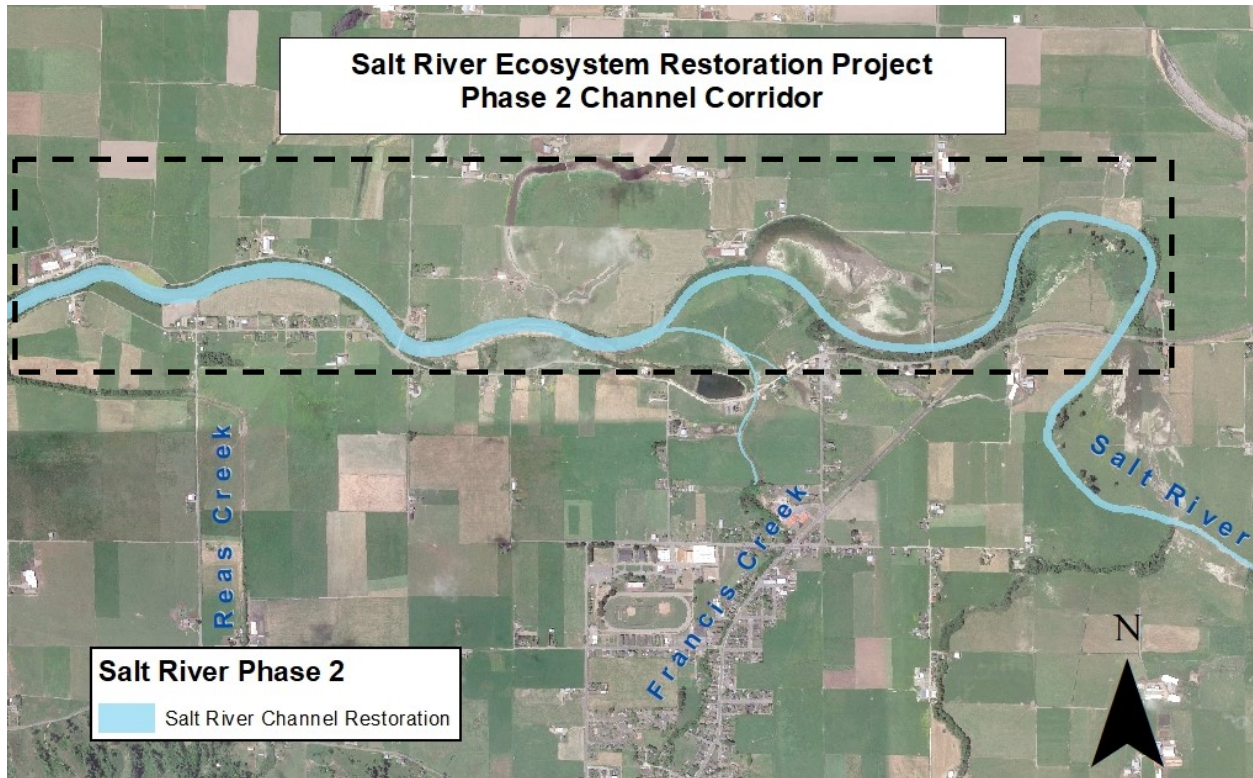
**Description:** Cross-sectional and longitudinal profile surveys are performed across and along the main channel of the Salt River.

**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 the previous four 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, 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 noted observations of the channel's geomorphic condition when out in the corridor throughout the 2022 year (Figure 2).



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

**Results and Discussion:** The observational survey noted water presence throughout the Salt River Phase 2 active channel from Reas Creek to Francis Creek, where tidal influence was seen up to the Dillon Road Bridge area. Limited river flow occurred during wet winter months in the Salt River channel above the Francis Creek confluence, but was primarily dry in the summer and fall months, as no consistent flow input exists in this upstream area.

Established reaches of the Salt River channel (below the confluence of Francis Creek) were seen to have a channel bottom with a naturally formed thalweg, some undercut banks, and vegetated banks. The Salt River channel above the Francis Creek confluence is retaining its constructed channel trapezoidal geometry. Further observations gathered during the entire channel walk did not indicate substantial changes in the channel geometry from previous surveys. No new bank slumping, erosion, scour, or deposition were observed in or along the channel.

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

*Erosion, Sediment Deposition, and Geomorphic Condition Monitoring and Adaptive Management for Salt River Corridor*

**Monitoring Task:** Bridges and Culvert Inspections on Salt River Corridor

**Agencies/Acts:** Coastal Commission

**Compliance Documents:** Coastal Development Permit- Special Conditions; Salt River Ecosystem Restoration Project Adaptive Management Plan

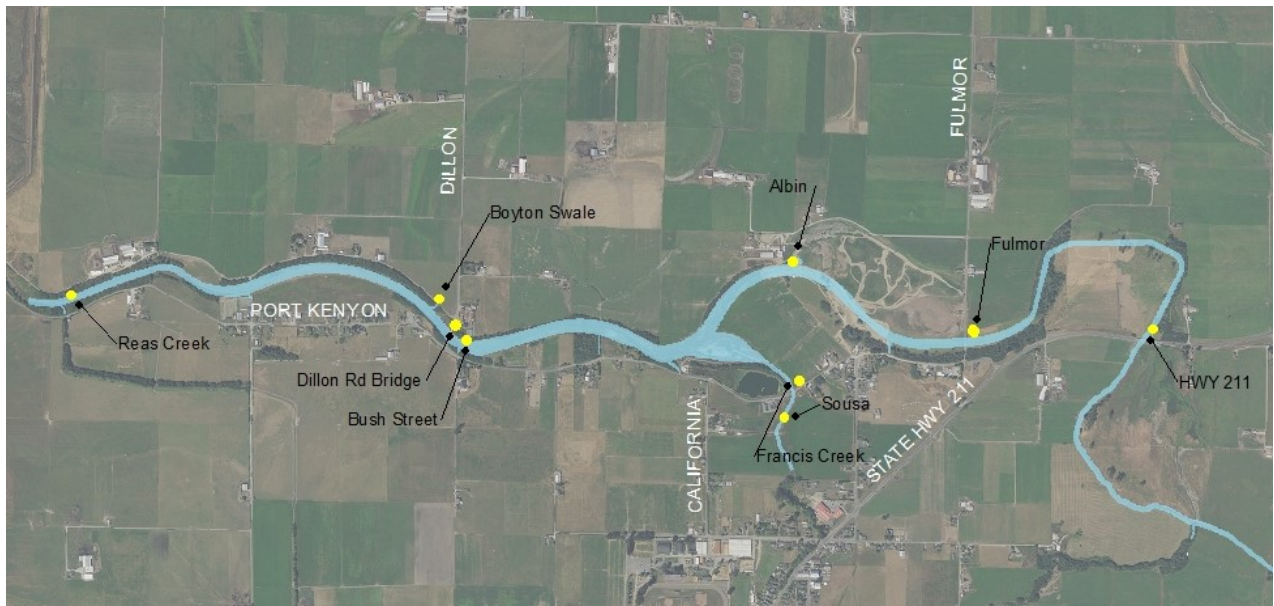
**Description:** Annual visual inspection of culverts and bridges in the restored Salt River corridor.

**Goals:**

- All culverts and bridges on the restored Salt River corridor are to remain unobstructed and functional.

**Report:** N/A.

**Methods:** All culverts and bridges will be visually inspected upstream and downstream, inlet/outlet, at low and high water flows to determine that these structures are functioning as intended and not being occluded by debris or sediment deposition. Erosion factors will also be noted. Dillion Road, Sousa, Albin, Francis Creek, and Fulmor Road Bridges span the restored Salt River since 2019. Existing and adjacent culverts at Reas Creek, Boynton Swale, and Bush Street deliver flows to the Salt River (Figure 3).



**Figure 3: Bridges and Culverts Locations on the Salt River restored corridor**

**Results and Discussion:** Four bridges (Dillion Road, Albin, Sousa, Francis, and Fulmor) span the restored Salt River channel. The Albin, Sousa, and Francis bridges were replaced or constructed as part of the Salt River restoration. Bridges were observed during variable flows throughout 2022 and no debris in the channel or flood plain are racking up on the bridge abutments or along banks. Erosion around the footings is not occurring. The Reas Creek, Boynton Swale, and Bush Street culverts have been functioning during high and low flows and appear to be functioning normally. Further follow up on the Bush Street culvert is merited due to dense vegetation obscuring visual observation and possibility that vegetation will eventually impede the opening of the flap gate on the outlet of the culvert.

**Recommendation:** Continue to monitor bridges and culverts at high and low flows.

*Erosion, Sediment Deposition, and Geomorphic Condition Monitoring and Adaptive Management for Salt River Corridor*

**Monitoring Task:** Inspection of the Sediment Management Area

**Agencies/Acts:** Coastal Commission

**Compliance Documents:** Coastal Development Permit- Special Conditions; Salt River Ecosystem Restoration Project Adaptive Management Plan

**Description:** Annual inspection of the sediment management area at the confluence of Francis Creek and the Salt River.

**Goals:**

- Sustain hydraulic conveyance and ecological function.
- Minimize sediment management maintenance activities.

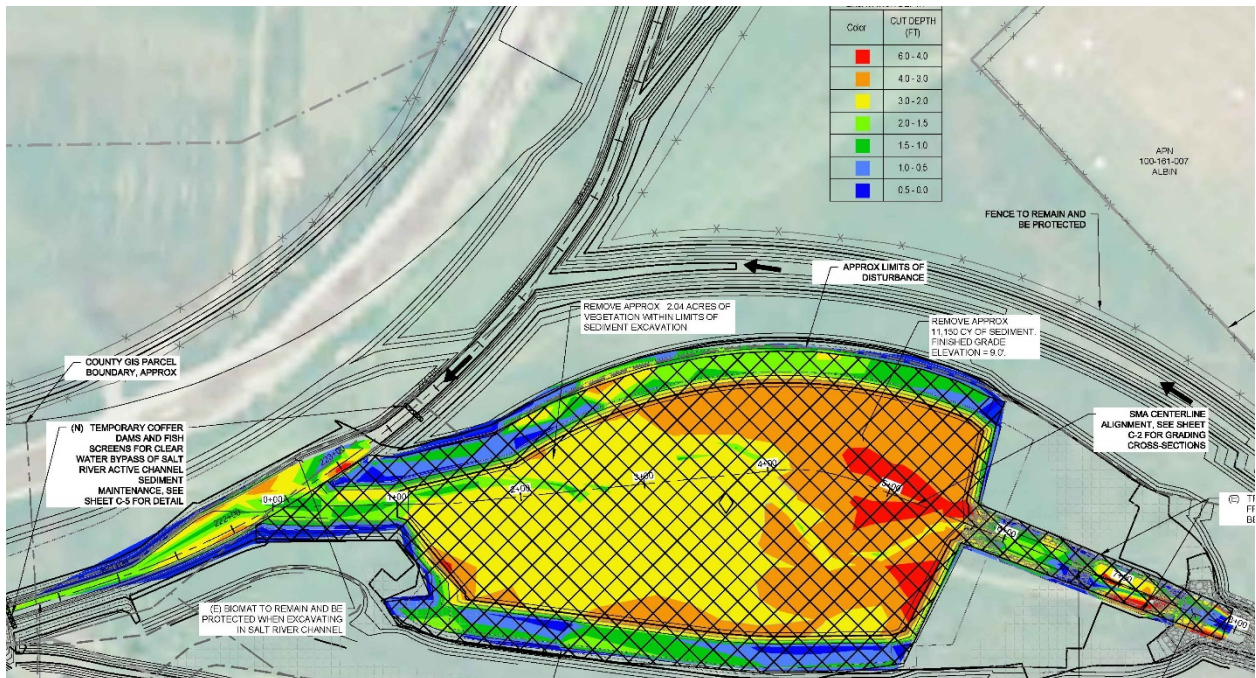
**Report:** N/A

**Methods:** Observational assessment in late spring determined the need for sediment removal. Topographic elevational points were taken across the surface of the sediment management area in July 2022 by a GHD engineer. Sediments in the sediment management area were dry and solid enough to accommodate access by foot.

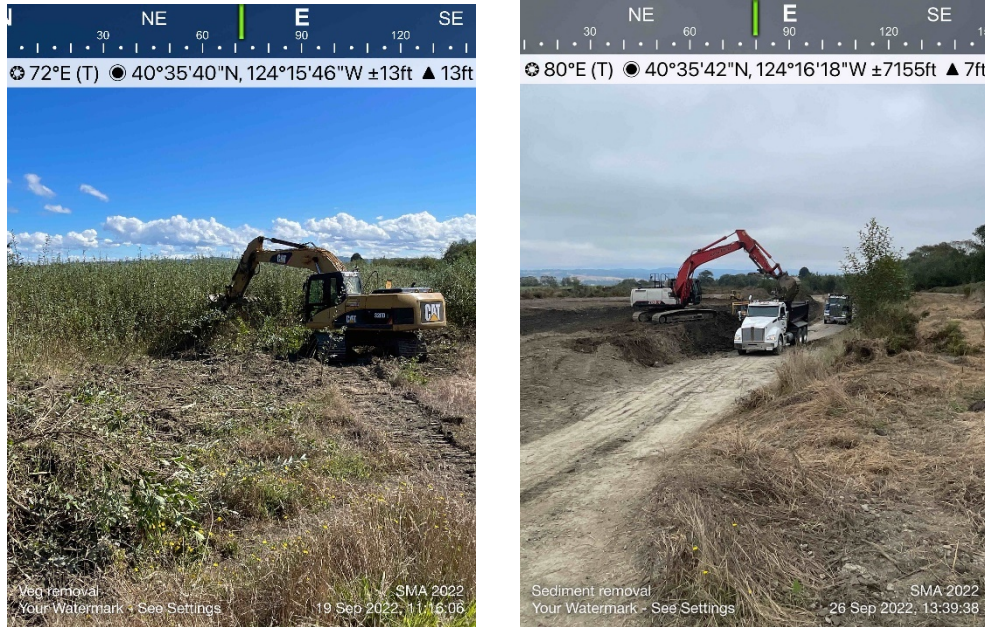
**Results & Discussion:** The active sediment management area was observationally evaluated in early summer, when surface water was confined to an established channel through the SMA. Observations determined that the SMA warranted the removal of captured sediment. A portion of the Francis Creek



channel from the SMA diversion structure to the confluence of the Salt River was defished by CDFW in mid-June and flow was diverted from the SMA into the SMA diversion channel. In July 2022, topographical surveys calculated that SMA captured approximately 11,500cy of sediment (the SMA can accommodate up to 15,000cy) (Figure 4). Funding was secured for the excavation of sediments and delivery of sediments to approved application areas. A bid announcement and contracting activities secured a construction contractor in September. Vegetation (willow) had densely grown in the SMA over the course of two years (Figure 5a). Therefore, the removal of vegetation occurred prior to sediment removal. The SMA clean out occurred from mid-September to the end of October, 2022 (Figure 5b). Removed vegetation was disposed off site. Excavated sediment was applied to agricultural fields and facilities.



**Figure 4. Results of 2022 topographic survey indicating that approximately 11,500 cy of sediment was captured in the sediment management area.**



**Figure 5a (left) 2023 Removal of vegetation in the SMA. Figure 5b (right) 2023 Removal of sediment from the SMA.**

**Recommendation:** Perform vegetation control measures in summer 2023 if no clean out occurs. Perform visual evaluation in May 2023 to determine if sediment removal activities are required in fall of 2023.

*Erosion, Sediment Deposition, and Geomorphic Condition Monitoring and Adaptive Management for Riverside Ranch*

**Monitoring Task:** Cross Sectional and Longitudinal Surveys- Phase 1 - Riverside Ranch 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 and 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:** THE LACK OF A QUALIFIED SURVEYOR A PHASE 1 GEOMORPHIC SURVEY WAS NOT PERFORMED IN 2022.

Considering the limited winter flow input due to drought conditions and the relatively stable geometry of the constructed Salt River channel and interior slough channels over the past eight years, the Humboldt County Resource Conservation District feels confident that no significant changes in channel functionality is occurring that would merit intervention.

**Recommendation:** Perform geomorphic or observational monitoring in 2023.

*Erosion, Sediment Deposition, and Geomorphic Condition Monitoring and Adaptive Management for Riverside Ranch*

**Monitoring Task:** Culvert and Tide Gate Inspections on Riverside Ranch

**Agencies/Acts:** Coastal Commission

**Compliance Documents:** Coastal Development Permit- Special Conditions; Salt River Ecosystem Restoration Project Adaptive Management Plan

**Description:** Annual inspection of tide gates, culverts, and outboard drainage ditch.

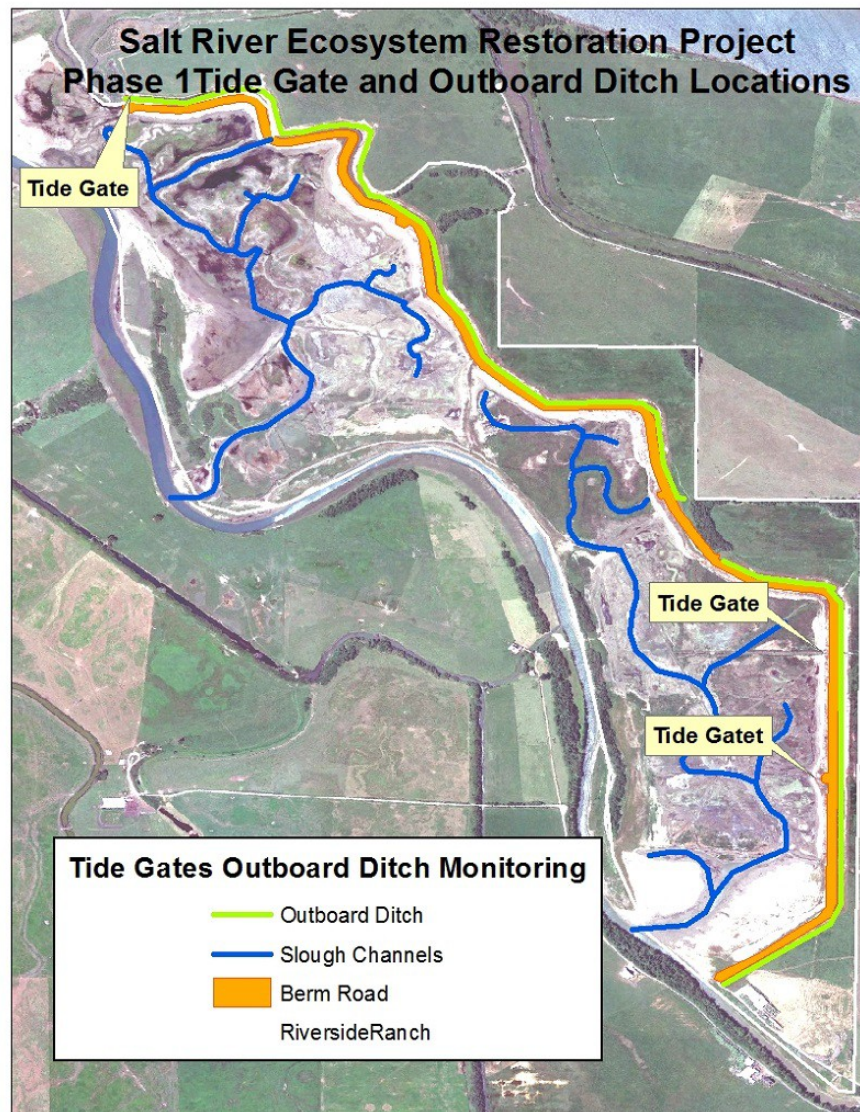
**Goals:**

- All tide gates and remaining culverts on Riverside Ranch remain unobstructed and operational.
- The Riverside Ranch outboard ditch will be monitored for flow and erosion impacts and maintained.

**Report:** N/A.

**Methods:** Any culverts or tide gates remaining or installed in Riverside Ranch (Figure 6) as part of the restoration design will be inspected annually and regularly maintained to ensure that they are functioning as designed. Annual reconnaissance of the outboard drainage ditch adjacent to the Riverside Ranch berm will also be conducted to identify areas of impacted flow conveyance and/or erosion and any maintenance recommendations.

HCRCD staff monitored the above items periodically to ensure tide gates and the outboard ditch were working properly to prevent high salinity water from encroaching onto neighboring lands.



**Figure 6: Tide Gates and Outboard Ditch Locations**

**Results and Discussion:** The Phase 1 (Riverside Ranch) project area is monitored for various items, which include the three tide gates and the outboard ditch. The 2022 monitoring was conducted on a periodic basis. The installed tide gates are functioning as expected. No debris has been observed to obstruct the closing or opening of the tide gates. Vegetation in the outboard ditch is managed through grazing activities by the agricultural lessee.

**Recommendation:** Continue to perform culvert and tide gate inspections on Riverside Ranch.

*Erosion, Sediment Deposition, and Geomorphic Condition Monitoring and Adaptive Management for Riverside Ranch*

**Monitoring Task:** Setback Berm Inspection

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

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

**Description:** Visual inspections for evidence of erosion and/or cracks after major storm events and high tides.

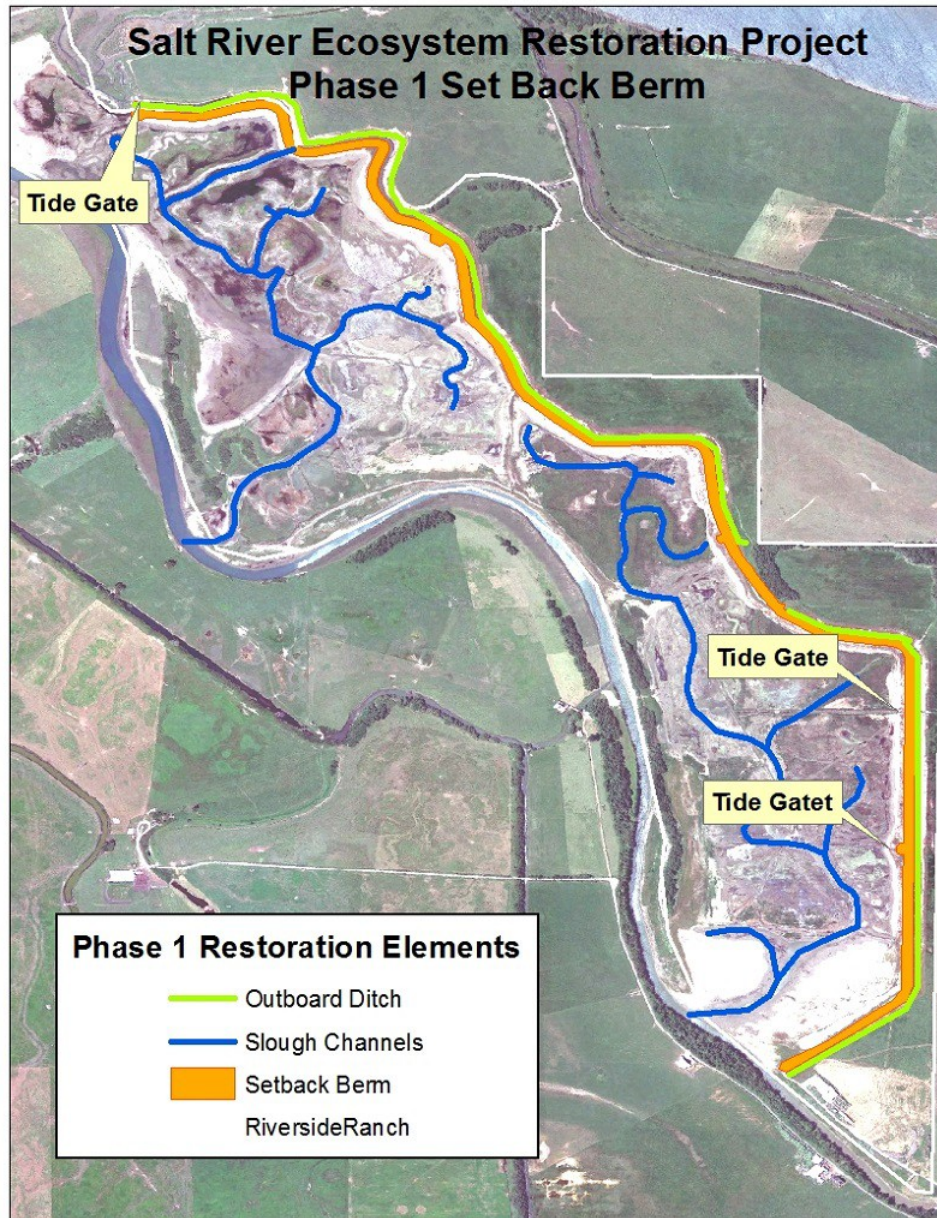
**Goals:**

- Determine if any annual maintenance is needed on the setback berm (berm road).

**Report:** N/A.

**Methods:** Monitoring will consist of qualitative monitoring including visual inspections performed annually and after major storm and high tide events. Monitoring will look for evidence of obvious erosion caused by flooding or erosion resulting from wind generated waves. If significant erosion or signs of potential failure are observed, engineering evaluations will be performed to determine whether any structural repairs are needed.





**Figure 7: Setback Berm Location**

**Results and Discussion:** Observations of the setback berm and the berm road (Figure 7) were performed periodically in 2022. Minor rills are observed on the estuary side of the berm and have been stable since 2016. Some previous minor erosion caused by wind wave fetch during large winter events is also evident on the northern end of the berm on the estuary side. The road that leads up to the berm from the barn was impacted by a large Eel River flood event in February 2021, where all gravel and road base material were washed away. California Department of Fish and Wildlife (Riverside Ranch landowner) intends to repair the impacts to the road.

Evaluation of the setback berm occurred during 2021 following the initial assessment of potentially modifying the setback berm to alleviate large flood impacts. A topographic survey of the setback berm indicates that the berm has not settled as anticipated and is approximately the same construction height as in 2013 (GHD and Michael Love & Associates 2021). In 2022, further extensive hydrologic analysis also indicates that the setback berm and the associated outboard ditch could be modified to increase drainage and alleviate large flood impacts. In early 2023, funding was secured to finalize plans, confirm permitting, and implement modifications. It is anticipated that construction could occur in the fall of 2023.

**Recommendation:** Continue to perform annual setback berm inspections. Move forward with berm modification planning, permitting, and implementation.

*Water Quality Monitoring and Adaptive Management for the Salt River Corridor and Riverside Ranch*

**Monitoring Task:** Tidal Exchange and Water Quality

**Agencies/Acts:** Coastal Commission

**Compliance Documents:** Coastal Development Permit- Special Conditions; Salt River Ecosystem Restoration Project Adaptive Management Plan

*\*Water level and water quality parameters within the tidally influenced areas of the restored project were required to be conducted for the first three years post-construction. The 2016 monitoring effort marked the end of water level and water quality monitoring. Therefore, water level or water quality monitoring data was not produced for this monitoring report. Additional water quality spot measurements are taken monthly from spring to summer during fish surveys at each monitoring site and indicate appropriate water quality parameters for healthy fish habitat are being met.*

**Recommendation:** Discontinue water quality monitoring as this monitoring task is complete.

*Habitat Development, Vegetation and Invasive Species Monitoring, and Adaptive Management for Salt River Corridor and Riverside Ranch*

**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 throughout the project footprint and for tidewater gobies on Phase 1 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, 2022. Results of Fish Species Presence and Distribution Monitoring Conducted From April to June 2022 within the Salt River, Eel River Estuary, Phase 2 Project Area, Humboldt County California Prepared by HCRCD. February 2023.

**Methods:** The California Department of Fish and Wildlife and the Humboldt County Resource Conservation District led and/or participated in the 2022 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 this monitoring season, project monitoring documents only required that the Phase 2 river corridor be monitored for fish presence and distribution (i.e., Phase 1 was NOT included in the 2022 monitoring effort).

In 2022, once a month, from April to June, sites across the restored portions of Phase 2 (Figure 8) of the Salt River Ecosystem Restoration Project were surveyed for salmonids and tidewater gobies during low tide periods. Seven (7) sites on constructed portions of the Phase 2 restoration areas were selected and surveyed for fish presence and species distribution. The 2022 sites included sites #20, #24, #25, #26, #27, #29, and #31. 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, and air and water temperatures, measured by thermometer, were 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 specific sites.



**Figure 8: Fish Monitoring Sites Across Phase 2 of the Salt River Ecosystem Restoration Project**

**Results and Discussion:** Concurrent with the fish seining and trapping, water quality measurements were taken for temperature. Over the three month sampling period, water temperatures ranged between a maximum of 17.5°C (June) and a minimum of

10.8.0°C (April).

Seining and minnow trapping efforts at the seven fisheries monitoring sites identified the presence of 15 known species. Approximately 2,699 individuals were captured (approximate numbers in 2022 were often estimated during the capture of large numbers of three-spined stickleback). The following table (Table 1) presents the total number of fish and marine invertebrates sampled from April to June in 2022.

**Table 1. 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	2022			
	April	May	June	Total
Coho Salmon	28	1	0	29
Steelhead	8	7	8	23
Green Sunfish	1	0	0	1
Larval Sculpin	0	13	0	13
Bullfrog larvae	0	17	0	17
California Roach	31	0	0	31
Lamprey Sp.	13	1	0	14
Chorus Frog Larvae	0	0	5	5
Prickly Sculpin	21	17	34	72
Three-Spined Stickleback	104	1109	1032	2245
Sacramento Pikeminnow	98	77	0	175
Staghorn sculpin	30	24	4	58
Starry Flounder	0	0	1	1
Northern Red-Legged Frog larvae	0	3	12	15

<b>TOTAL</b>	<b>334</b>	<b>1269</b>	<b>1096</b>	<b>2699</b>
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**Salmonid Species:**

Twenty-eight juvenile Coho salmon (*Oncorhynchus kisutch*) were present during the April sampling; 12 were captured at site #24, 15 were captured at site #31, and 1 at site #25. Eight Steelhead (*Oncorhynchus mykiss*) juvenile were sampled at site #24.

**Non-Salmonid Species:**

Fish species sampled in 2022 included the following: Three-spined stickleback (*Gasterosteus aculeatus*) continue to be captured in high numbers. Fifty-eight Staghorn sculpin (*Leptocottus armatus*), 31 California Roach, 72 prickly sculpin, and 14 unidentified lamprey species were also sampled. The number of captured Sacramento pikeminnow (*Ptychocheilus grandis*) (175 individuals) has greatly increased from the 2019 sampling effort (65 individuals); though a majority of the 2022 pikeminnow sampled was at site 31, this site did not exist in 2019 during that year's sampling effort.

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.

**Recommendations:** Continue spring-summer salmonid and tidewater goby fish surveys.

*Habitat Development, Vegetation and Invasive Species Monitoring, and Adaptive Management for Salt River Corridor and Riverside Ranch*

**Monitoring Task:** Aleutian Goose Short-Grass Habitat Monitoring

**Agencies/Acts:** California Department of Fish and Wildlife (CDFW)

**Compliance Documents:** Salt River Ecosystem Restoration Project Adaptive Management Plan

**Description:** Approximately 72 acres of land retained on Phase 1 (Riverside Ranch) of the Salt River Ecosystem Restoration Project will be agriculturally managed. Agricultural activities will follow CDFW protocols in order to achieve short-grass habitat for migrating flocks of Aleutian cackling geese and other

wetland-associated birds.

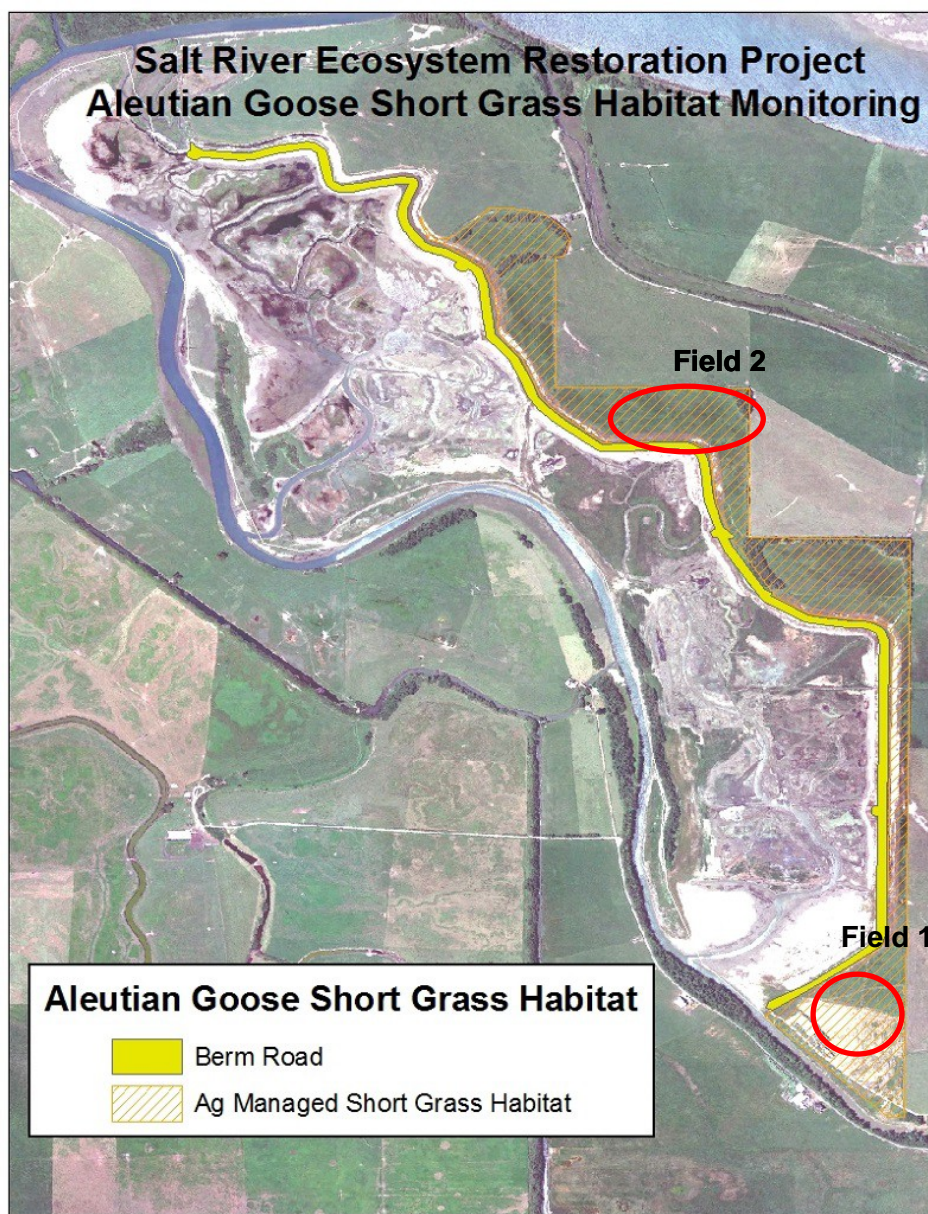
**Goals:**

- Develop a pasture management plan on Phase 1.
- Annual evaluation of vegetation on Phase 1.
- Provide short-grass habitat for Aleutian Cackling Geese.

**Report:** 2022 Aleutian Goose Habitat Evaluation – Riverside Ranch – Salt River ecosystem Restoration Project – Memorandum. Prepared for and by the Humboldt County Resource Conservation District. December 2022.

**Methods:** To evaluate pasture vegetation for Aleutian Cackling geese habitat, two fields were chosen which provided the highest opportunity for access for geese (Figure 9). The criteria for these areas primarily included open habitat with little or no hedgerows or trees where predators could roost. Grass and other vegetative species were identified in each field. Sward heights were measured at 5 sites across each field and the average was determined. Other observations were considered such as the presence of standing water and density of pasture vegetation.





**Figure 9: Managed Short-Grass Habitat on Phase 1**

### **Results and Discussion:**

The 72 acres of agricultural lands (Figure 9) on Riverside Ranch are managed by California Department of Fish and Wildlife (CDFW) as a Wildlife Management Area (WMA). The 72 acres are grazed by an agricultural lessee. CDFW approved the lessee's submitted agricultural management practices for Riverside Ranch which includes rotational grazing of 40 to 200 heifers, depending on grass height, with the option to hay after August 15<sup>th</sup> to maintain desired grass height.

Aleutian and Canada geese were present in the larger Salt River watershed, however, no geese were observed on the agricultural fields of Riverside Ranch. Results for sward height and habitat features are shown in Table 2:

**Table 2: Short grass habitat monitoring results for Riverside Ranch – February 2021**

FIELD	MONTH	AVERAGE SWARD HEIGHT (inches)	CDFW SWARD HEIGHT CRITERIA (Dec to March) (inches)	VEGETATION AND FEATURES
1	Feb	4.2	1.5 to 3	Dominant rye grass, sparse bent grass, and sparse clover. Dense green pasture.  Small ponds of standing water.
2	Feb	2.8	1.5 to 3	Sparse bent grass, sparse clover, sparse rye, undesirable wetland species such as juncus.  Frequent bare ground and some small ponds of standing water.

Riverside Ranch fields were sampled on February 4, 2022, prior to spring turnout. The fields were agriculturally managed by grazing with light weight cows (heifers). Cows were removed from the pastures in late winter. Grass sward heights were sampled across two fields where biologists determined geese would prefer to forage, as shrub and tree vegetation was minimal or absent. Sward heights were averaged and the values were 4.2 inches and 2.8 inches in the respective fields. CDFW recommends that sward height be in the range of 1.5 inches to 3 inches from December to March. The average sward height in field 1 (4.2 inches) exceeds the criteria range. However, field 1 appeared to have productive grass habitat and small water features that are more desirable to geese. Average sward height in field 2 (2.8 inches) falls within the range of the December-March criteria, however, the vegetation composition is not as desirable (sparse rye grass with wetland species) and frequent bare ground was observed (Figures 10a and 10b).





**Figure 10a: Field 1 shows lush pastures with water features. Figure 10b: Field 2 shows sparse pasture with juncus clumps, bare ground, and water features.**

Overall, the agricultural fields provide habitat for migrating geese and other species.

**Recommendation:** Continue grazing management regime with lessee and annual monitoring efforts.

*Habitat Development, Vegetation and Invasive Species Monitoring, and Adaptive Management for Salt River Corridor and Riverside Ranch*

**Monitoring Task:** Salt Marsh, Riparian, and High Marsh Ecotone Vegetation Percent Cover Survey on Riverside Ranch

**Agencies/Acts:** Coastal Commission

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

**Description:** Estimate percent cover of vegetation in the salt marsh, riparian, and high marsh ecotone habitats on Riverside Ranch.

**Goals:** Achieve Native Vegetation Percent Cover of  $\geq 50\%$  in Phase 1 tidal marsh

**Report:** THE RIVERSIDE RANCH SALT MARSH, RIPARIAN, AND HIGH MARSH ECOTONE VEGETATION PERCENT COVER SURVEYS WERE NOT REQUIRED IN 2022.

**Recommendation:** Continue to monitor percent cover in the salt marsh, riparian, and high marsh ecotone habitats on Riverside Ranch when monitoring schedule dictates.

*Habitat Development, Vegetation and Invasive Species Monitoring, and Adaptive Management for Salt River Corridor and Riverside Ranch*

**Monitoring Task:** Woody Vegetation Management

**Agencies/Acts:** Coastal Commission

**Compliance Documents:** Coastal Development Permit- Special Conditions; SRERP Adaptive Management Plan

**Description:** Perform woody vegetation management (e.g. removal or planting of woody vegetation) to ensure the hydrologic function of the Salt River channel.

**Goals:**

- Woody vegetation will be managed consistent with the goal to maintain structure and function of the Salt River corridor.
- Manage situations that impede channel function.
- Woody vegetation management cannot contribute to bank or channel erosion.

**Report:** N/A

**Methods:** The HCRCD engaged the California Conservation Corps (CCCs) multiple times throughout 2022 to manage woody vegetation across several sites on the Salt River project footprint.

**Results and Discussion:** The CCCs cleared woody and herbaceous vegetation from access areas to the project site that included: rocked entrances, Riverside Ranch entrance road, and the top of the Riverside Ranch berm road. Limbs of larger alders were trimmed from fence lines on Francis Creek. Large arroyo willow branches growing into the Salt River channel in the 2017 construction area were removed.

**Recommendation:** Continue to disseminate and collect landowner maintenance forms to determine woody vegetation maintenance needs.

*Habitat Development, Vegetation and Invasive Species Monitoring, and Adaptive Management for Salt River Corridor and Riverside Ranch*

**Monitoring Task:** Weed Abatement

**Agencies/Acts:** Coastal Commission

**Compliance Documents:** Coastal Development Permit- Special Conditions; SRERP Adaptive Management Plan

**Description:** After 3 years post construction – weed abatement shall be performed using a variety of methods

**Goals:**

- Limit colonization of weedy species within the restoration area.
- Ensure that weedy species do not dominate the restoration area or expand onto adjacent properties.
- Weedy species do not present a detriment toward maintaining a self-sustaining riparian forest or tidal salt marsh.

**Reports:**

- 2022 Annual Habitat Monitoring Report - Salt River Ecosystem Restoration Project, Prepared for the Humboldt County Resource Conservation District by J.B. Lovelace & Associates
- Salt River Flash Grazing Assessment 2022. Prepared by the Humboldt County Resource Conservation District. Eureka, CA

**Methods:** Review vegetation/habitat monitoring report for non-native non-invasive and invasive findings to determine location and percent cover of weed species. Additional observations of invasive vegetation by Humboldt County Resource Conservation staff or other stakeholders will be considered. Weed abatement may include mechanical or manual control by paid staff, contractors, or volunteers. Controlled and limited flash grazing may also be used to control weeds.

**Results & Discussion:** Staff observation and the vegetation/habitat monitoring effort have found that numerous weedy species exist and are becoming prolific in the restored portions of the project area. Much of the weed species include invasive species such as *Spartina densiflora* in Phase 1 (tidal estuary), and *Agrostis stolonifera* (creeping bent grass), *Phalaris arundinacea* (reed canary grass), and a variety of thistles (*Helminthotheca echinoides* and *Cirsium vulgare*) in Phase 2 (channel corridor).

No formal project wide weed abatement efforts were made on the restored project footprint. However discrete areas were targeted. Pampas grass (*Cortaderia selloana*) was removed on the Riverside Ranch berm and through portions of the

Phase 2 river corridor. Thistles encountered were removed or mowed during cage removal around planted riparian species. If tansy (*Tanacetum vulgare*) were observed, HCRCD staff dug up and removed flower heads.

A grazing pilot project to control vegetation across approximately three acres in the riparian corridor (at the Salt River Watershed Council Port Kenyon property) was continued in 2022. The three acres were divided into two paddocks on the floodplain bench that were grazed sequentially in October; the first paddock was grazed for 5 days and the second paddock was grazed for 3 days. Approximately 50 head of light weight livestock (1 to 2 year old heifers) had access to a paddock for up to eight days each. Grazing forage in the paddocks was limited, though stalks of invasive reed canary grass were trampled down, revealing planted riparian vegetation. After livestock were removed, the paddocks were assessed for effectiveness of grazing management. The livestock grazed or trampled undesirable vegetation well. The limited time of animals in each paddock prevent excessive browsing on planted riparian species.

It has been recommended by re-vegetation experts that much of the reed canary and creeping bent grasses will eventually be controlled when woody riparian species achieve a shaded canopy in the river corridor. Funding proposals are periodically submitted for *Spartina densiflora* treatment, however no awards were received.

**Recommendations:** Perform weed vegetation treatment when funding and timing allows. Continue grazing management on the Salt River Watershed Council's property and increase number of treatments per year, up to three times.

*Habitat Development, Vegetation and Invasive Species Monitoring, and Adaptive Management for Salt River Corridor and Riverside Ranch*

**Monitoring Task:** Invasive Species Management – Vegetation

**Agencies/Acts:** Coastal Commission

**Compliance Documents:** Coastal Development Permit- Special Conditions; SRERP Adaptive Management Plan

**Description:** Monitor invasive vegetation species during vegetative surveys required by the Habitat Mitigation and Monitoring Plan for the Salt River Ecosystem Restoration Project. Treat identified areas.

**Goals:**

- Total invasive plant species (dwarf eel grass, *Spartina densiflora*, and reed canary grass) within sampling areas will not exceed a percent cover of 5%.

**Report:** 2022 Annual Habitat Monitoring Report - Salt River Ecosystem Restoration Project, Prepared for the Humboldt County Resource Conservation District by J.B. Lovelace & Associates

**Methods:** Review vegetation/habitat monitoring report for invasive findings to determine location and percent cover of weed species. Additional observations of invasive vegetation by Humboldt County Resource Conservation staff or other stakeholders will be considered. Weed abatement may include mechanical or manual control by paid staff, contractors, or volunteers. Controlled and limited flash grazing may also be used to control weeds.

**Results & Discussion:** The 2022 Annual Habitat Monitoring Report reveals that all areas of the restored Salt River experiences invasive species presence that exceeds the 5% maximum criteria and recommends that action take place. Much of the invasive species that are present include *Spartina densiflora* in Phase 1 (tidal estuary), while *Agrostis stolonifera* (creeping bent grass) and *Phalaris arundinacea* (reed canary grass) are dominant in Phase 2 (channel corridor).

No formal project wide weed abatement efforts were made on the restored project footprint. However discrete areas were targeted. Pampas grass (*Cortaderia selloana*) was removed on the Riverside Ranch berm and through portions of the Phase 2 river corridor. Thistles encountered were removed or mowed during cage removal around planted riparian species. If tansy (*Tanacetum vulgare*) were observed, HCRCD staff dug up and removed flower heads.

A grazing pilot project to control vegetation across approximately three acres in the riparian corridor (at the Salt River Watershed Council Port Kenyon property) was continued in 2022. The three acres were divided into two paddocks on the floodplain bench that were grazed sequentially in October; the first paddock was grazed for 5 days and the second paddock was grazed for 3 days. Approximately 50 head of light weight livestock (1 to 2 year old heifers) had access to a paddock for up to eight days each. Grazing forage in the paddocks was limited, though stalks of invasive reed canary grass were trampled down, revealing planted riparian vegetation. After livestock were removed, the paddocks were assessed for effectiveness of grazing management. The livestock grazed or trampled

undesirable vegetation well. The limited time of animals in each paddock prevent excessive browsing on planted riparian species.

It has been recommended by re-vegetation experts that much of the reed canary and creeping bent grasses will eventually be controlled when woody riparian species achieve a shaded canopy in the river corridor. Funding proposals are periodically submitted for *Spartina densiflora* treatment, however no awards were received.

**Recommendations:** Perform vegetative invasive species vegetation treatment when funding and timing allows. Continue grazing management on the Salt River Watershed Council's property and implement flash grazing two to three times during the growing season.

*Habitat Development, Vegetation and Invasive Species Monitoring, and Adaptive Management for Salt River Corridor and Riverside Ranch*

**Monitoring Task:** Invasive Species Management - Pikeminnow

**Agencies/Acts:** Coastal Commission

**Compliance Documents:** Coastal Development Permit- Special Conditions; SRERP Adaptive Management Plan

**Description:** Attempt to control pikeminnow (*Ptychocheilus grandis*) populations.

**Goals:**

- Reduce occupation of pikeminnow in newly created habitat.
- Increase occupation by native fish species in newly created habitat.

**Report:** N/A

**Methods:** The California Department of Fish and Wildlife, Humboldt State University, and the Humboldt County Resource Conservation District developed a fish monitoring program in early 2014. During the development of this program, participants determined that pikeminnow populations cannot be eradicated or controlled in the Salt River watershed. However, a standard practice was adopted for all pikeminnow encountered during fish monitoring will be humanely euthanized. Additionally, if pikeminnow individuals are longer than 10 inches, those individuals will be measured and the stomach contents examined for evidence of piscivory and findings recorded.



**Results & Discussion:** During the 2022 fish monitoring effort, 175 Sacramento pikeminnow were captured and euthanized. A majority of the pikeminnow were captured in the terminal end of the constructed project where a large rocked pool is located (Site #31, i.e. rock grade control structure) and in the Reas Creek step pools (Site # 20).

**Recommendation:** Continue to implement invasive Sacramento pikeminnow control during fish sampling efforts.

## **SUMMARY OF ADAPTIVE MANAGEMENT RECOMMENDATIONS**

- Perform visual assessment of sediment accumulation in the Sediment Management Area in late spring. If no excavation of sediment will occur in 2023, consider vegetation control after nesting bird season ends (August 15).
- Move forward with Riverside Ranch setback berm modification planning, permitting, and implementation.
- Perform non-native and invasive vegetation treatment when funding and timing allows; including instream cattail beds.
- Continue grazing management on the Salt River Watershed Council's property and increase number of treatments to two to three times a year.
- Continue to disseminate and collect landowner maintenance forms to determine channel maintenance needs.
- Continue grazing management regime on Riverside Ranch with lessee and monitoring efforts.
- Continue to perform annual established monitoring tasks.

## **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

GHD and Michael Love & Associates. 2021. Riverside Ranch Hydraulic Assessment. Prepared for the Humboldt County Resource Conservation District. Eureka, CA. November 18, 2021.

Humboldt County Resource Conservation District. 2021. 2022 Aleutian Goose Habitat Evaluation – Riverside Ranch – Salt River ecosystem Restoration Project – Memorandum. Prepared for and by the Humboldt County Resource Conservation District. December 2022.

Humboldt County Resource Conservation District. 2022. Salt River Flash Grazing Assessment 2022. Prepared by the Humboldt County Resource Conservation District. Eureka, CA.

Humboldt County Resource Conservation District. 2023. Salt River Ecosystem Restoration Project Spring-Summer Fish Monitoring Program, 2022. Results of Fish Species Presence and Distribution Monitoring Conducted From April to June 2022 within the Salt River, Eel River Estuary, Phase 2 Project Area. Prepared by HCRCD. February 2023.

J.B. Lovelace & Associates. 2023. 2022 Annual Habitat Monitoring Report - Salt River Ecosystem Restoration Project, Prepared for the Humboldt County Resource Conservation District.