Salt River Ecosystem Restoration Project

Adaptive Management Plan
Monitoring Report 2018

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Prepared by the Humboldt County Resource Conservation District
5630 South Broadway
Eureka, CA 95503
707.442-6058 ext. 5
hcrcd@gmail.com

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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 historically flowed 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, four Salt River tributaries originating in the Wildcat Hills above the town of Ferndale (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 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 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 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, 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.

The design of Phase 1 was intended to strike a balance between creating significant amounts of new tidal marsh habitat, retaining and enhancing some of the important existing upland and riparian features, preserving sufficient acreage to manage for short-grass habitat for Aleutian cackling geese, minimizing long-term site maintenance, and incorporating design features that accommodate sea-level rise. Earthwork on Phase 1 was balanced on site, with excavated materials all being utilized to construct a range of habitat features at varying elevations and to construct the 2-mile setback berm.

Phase 2 represents the Salt River “corridor restoration” portion of the larger project. Within Phase 2, design plans call for 4.5 miles of the Salt River channel and its adjacent floodplain to be excavated. Wetlands and riparian corridors will be re-vegetated with a diverse palette of native plants. Fish passage would be restored to three watershed tributaries – Reas, Francis and Williams Creeks.

Across the years of 2013, 2014, 2015, 2017, and 2018, a total of 5.1 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 (Figure 1). It is anticipated that future Phase 2 construction will occur in 2019 and 2020, completing the Salt River corridor restoration.

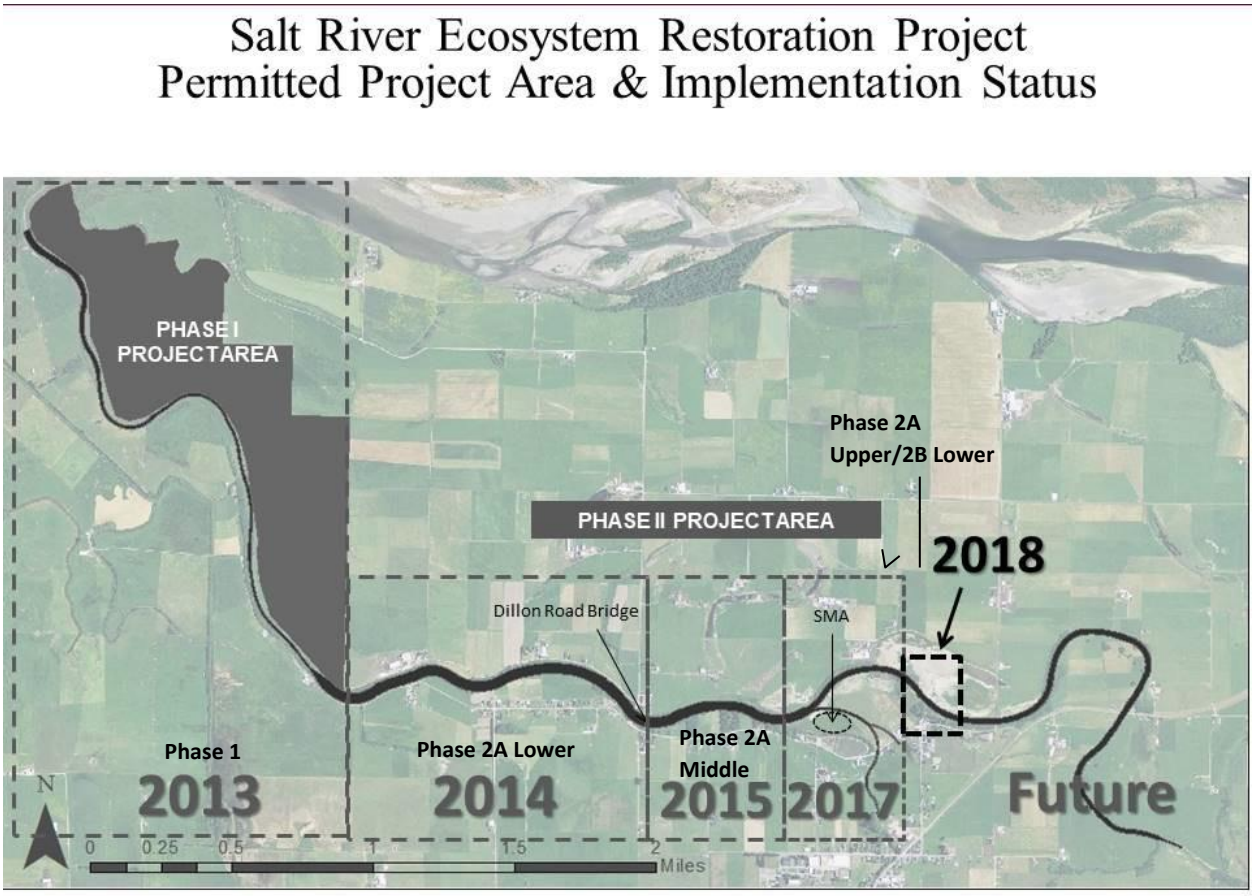

Figure 1: Salt River Ecosystem Restoration Construction Timeline as of 2018

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 5 (post construction 2013)
- Phase 2: Year 4, Year 3, Year 1 (post construction 2014, 2015, 2017 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 2018 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), and 2017 (Phase 2A Upper/2B Lower) 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 2017/2018 hydrologic year experienced a La Nina event which included greater than normal wet and dry periods. Approximately 49 inches of rain fell across the north coast (Eureka NOAA station) from October to April, with 10 days that experienced a one-inch or greater rain storm. That can be compared to an annual average of 40 inches with 8 days that exceed a 1 inch rain event on the northern coast of Humboldt County.

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 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

The cross-section surveys on Phase 2 of the Salt River corridor indicate that the Salt River is adjusting to the variation of annual environmental conditions where the active channel capacity has both increased and decreased at individual sites with some potential floodplain aggradation. Tidal exchange and water quality monitoring was required for the first three years after Project construction in tidally influenced regions. This 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 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 2018 monitoring period, Dillon Road and Port Kenyon Road Bridges exist within the constructed project footprint and were functioning normally as well as one installed private agricultural bridge on Francis Creek. 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, and were found to be unimpeded. Geomorphic surveys for the Sediment Management Area (SMA) in 2018 determined that the SMA was overly efficient at capturing fine sediments (SMA is designed to capture larger heavier sediments) where approximately 3,000 cubic yards of sediment settled in the 8' elevation basin. Project engineers recommended that the SMA be excavated to 9' in elevation, where approximately 600 cubic yards were removed and reused in appropriate areas.

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

Cross-section surveys on Phase 1 (Riverside Ranch) indicate that the Salt River channel and slough channels are adjusting to varying annual environmental conditions where channel capacity has both increased and decreased at individual sites. Additional monthly general visual inspections of the Phase 1 elements include the setback berm, outboard ditches, and tide gates. The setback berm has experienced minor erosion located in the northern hemisphere portion of the Salt River estuary, primarily due to significant flood events in January 2017. The outboard ditches are functioning as designed. Previous heavy vegetation growth occurring within the outboard ditch was removed through active vegetation management by an agricultural lessee. 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. Additional water quality spot measurements are taken monthly in spring and summer during fish surveys at each monitoring site and indicate appropriate water quality parameters for healthy fish habitat are being met.

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. In collaboration with CDFW, National Oceanic and Atmospheric Administration/National Marine Fisheries Service (NOAA/NMFS), and Humboldt State University, a fish sampling program has been ongoing since 2014 in

constructed phases of the Project. The 2018 sampling effort took place from April to July at 13 sites. Fifteen anadromous, freshwater, and marine species were captured in 2018. Salmonids were captured in April, May, and July of the sampling season. Tidewater gobies were captured May through July in the tidally influenced reaches during the entire sampling season. With presence confirmed, the 2018 fish sampling effort, once again, proved that the Project is a success for fish species. The vegetation percent cover survey for the Phase 1 High Marsh Ecotone was not due to be performed in 2018; however, previous surveys indicate that the area is meeting and exceeding the success criteria. Woody vegetation surveys were performed in the 2015 Project area to establish baseline average tree basal area. Woody management within the channel near Dillon Bridge was performed due to substantial alder tree densities in the corridor. A formal weed abatement effort was not performed within the Project footprint, however Pampas grass (*Cortaderia selloana*) removal was completed in the 2014 Project area. Non-native non- invasive species and invasive species vegetative percent cover exceeded recommended limits throughout the Project footprint. Some of these species are colonizer species and may decrease in the following years as a riparian canopy develops. Reed canary grass is present in the agricultural fields of Phase 1 and in the Phase 2 channel and accounts for a large proportion of the invasive species percent cover value. Reed canary grass is currently considered a native species by Cal-IPC (California Invasive Plant Council) and the Humboldt Weed Management Area. Nonetheless, Project documents and subsequent Project monitoring biologists consider reed canary grass as an invasive species as it is aggressive and compromises habitat development. *Spartina densiflora* is an invasive species that is present on Phase 1 and is establishing upstream in Phase 2 from the tidal restoration area. HCRCD and partners continue to seek funding opportunities to control/eradicate *Spartina*. Management of invasive wildlife species, namely Sacramento pikeminnow (*Ptychocheilus grandis*), is currently being implemented during fish surveys where all captured pikeminnow individuals are humanely euthanized.

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/salt_river_ecosystem_restoration_project/reports_and_documents).

This report is structured and provides findings related to the monitoring requirements in the four identified Adaptive Management Plan 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 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: *No report submitted. Data results were submitted to the Humboldt County Resource Conservation District. Data will be presented in a forthcoming Humboldt State University student's Master's Thesis.*

Methods:

Cross-sectional surveys in the Phase 2 portion of the SRERP on the Salt River (SR) channel span a distance of 2.2 km from upstream of Reas Creek to downstream of the sediment management area at the Francis Creek confluence. Cross-section site locations were previously determined within distinct hydraulic units that experience different flow regimes - intertidal, a combination of intertidal and supratidal, and exclusively freshwater flows (Medel 2015). Only the monument for cross-section seven was reoccupied in 2018; locations for cross-sections one and five were approximated using a handheld Garmin Global Position System (GPS) with an accuracy of ± 10 m.

Elevation points were collected using a Nikon DTM 322 Total Station, tripod, prism pole and reflector in the 1988 North American Datum (NAD88). Two temporary benchmarks were monumented at each cross-section by 2-foot wooden stakes with a 1/16-inch flathead nail pounded into the center to enable total station orientation and a closed loop traverse at each site. Horizontal and vertical benchmark locations were determined using a Trimble Model XX Real-time kinematic GPS calibrated to SRERP control point SR11.

Data for cross-sectional profiles were collected in July 2018 with measurements spanning approximately 200-feet across the channel corridor, including the main channel, with a maximum resolution of 6 meters. Higher densities were collected in the side channel, main channel, active bench and major breaks in slope in order to illustrate morphological complexity. The main channel had the highest resolution and included an elevation point for the thalweg, vegetation edge, waters' edge, and at least one mid-bank elevation point in between vegetation and waters' edge to capture slumps and/or

changes in channel slope. NAD88 point cloud data was imported into ESRI ArcMap and horizontal positions were calculated in order to make data comparable to the North American Vertical Datum 1988.

Figure 2: Salt River Phase 2 Cross-Section Sites

Results and Discussion: Nine cross-sections sites were reoccupied and surveyed in the 1.5 miles of the 2014 and 2015 restored reach of the Salt River (Figure 2). The nine sites are divided into three groups or “Units”, each Unit consisting of three sites. Unit 1 contains sites 1, 2, and 3 (tidally influenced); Unit 2 contains sites 4, 5, and 6 (tidally influenced); and Unit 3 contains 7, 8, and 9 (freshwater).The following graphs (Figures 3 to 5) show cross-sections from years 2015, 2016, 2017, and 2018 of sites 1, 5, and 7.

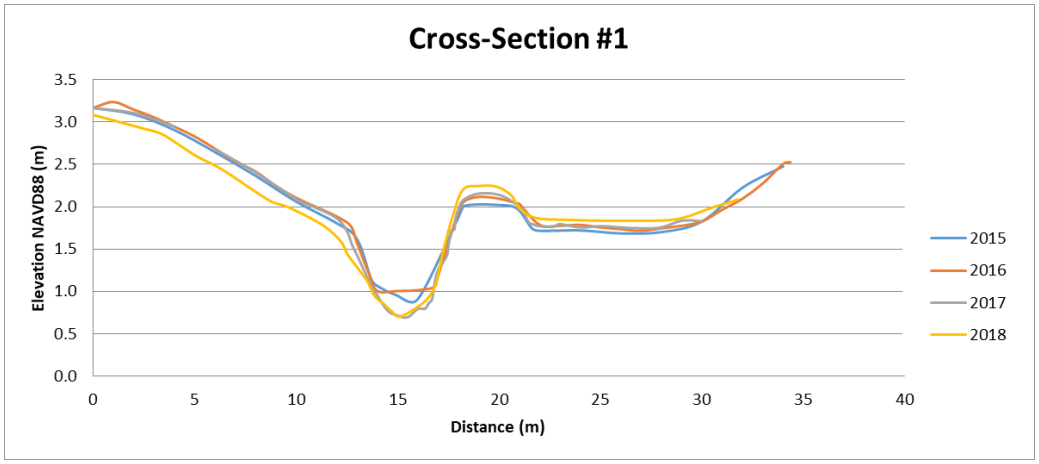

Figure 3: Unit 1 - Site 1 from 2015 to 2018

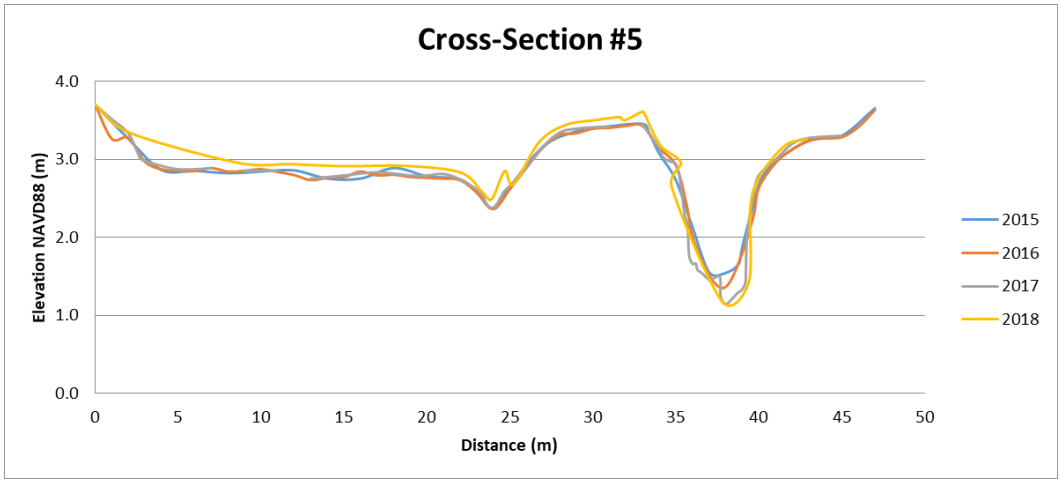

Figure 4: Unit 2 – Site 5 from 2015 to 2018

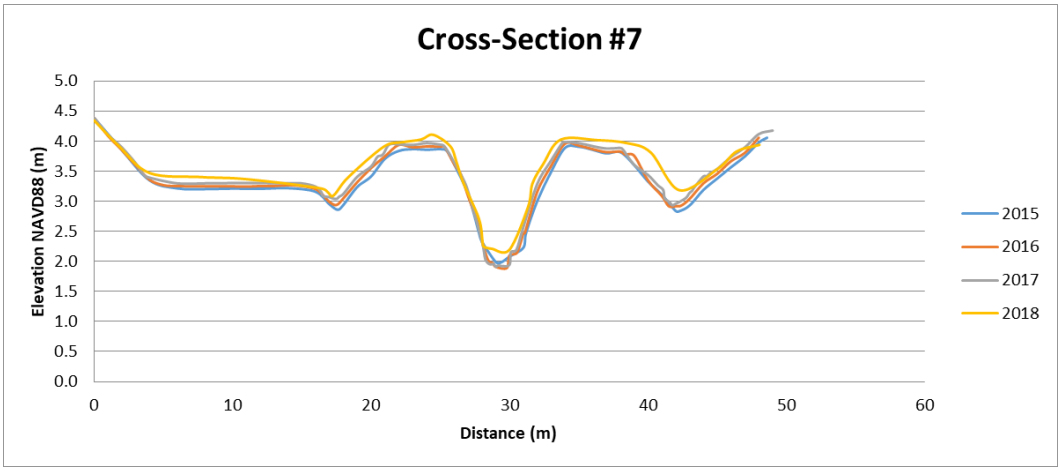

Figure 5: Unit 3 – Site 7 from 2015 to 2018

Comparing the cross-sectional graphs provides a visual indication on how the channel responds to winter periods. The 2015/16 winter was relatively mild, yet typical with a flood event. The 2016/17 winter was extremely wet winter in northern California (NOAA 2017), which included multiple large flood events. This past year's 2017/18 winter was wetter than the average year by nine inches. In the graphs above, each year's cross-section is compared to the previous.

In the cross-sectional graphs above, elevations differences are noticeable when comparing portions of the recent 2018 cross-section to the previous years' cross-sections. This variability could have resulted from multiple factors. Heavy growth of ground vegetation in the floodplain and on the active berm played a role but measurement variability is likely the main factor. Uncertainty was more likely introduced because: (1) not all cross-section monuments were located, therefore a handheld GPS was used to locate end points which may not have been absolutely accurate; and (2) the data was collected in NAD83 and had to be converted to the vertical datum of NAVD88 that was used in previous years.

The active channel bottom elevation in cross-section unit 1 (Figure 3) appears to be at the same elevation as in 2017. The measured elevation of the bank descending down from the left-hand side of the graph likely diverges from previous years' measurements due to measurement or conversion error, rather than erosion. The elevations of the active berm and floodplain on the right-hand side are likely increased due to measurement error or heavy vegetation. Capacity of the active channel has increased by approximately 26%. Though this increase is above the 10% trigger point, the increase in channel capacity appears to be stable since 2016. The recommendation is to continue monitoring, since the upper portion of channel restoration is incomplete and is still awaiting the connection of the watershed's largest tributary.

In cross-section site 5 (Figure 4), the active channel bottom elevation appears to remain at the same elevation as in 2017. The lack of measured elevational points from the thalwag up the left-hand side of the active channel bank may have inadvertently reduced the capacity of the active channel on the graph (i.e. not enough resolution in the area). Secondary channel deposition is identified in the cross-section. This deposition was not present in 2017, but a similar deposition pattern occurred in 2017 in cross-section 8 (within the same unit). The floodplain portion of the graph indicates a rise in elevation, however vegetation and minimal number of cross-section points may have factored into that variability. Capacity of the active channel has increased by approximately 1%. No action is merited given it is below the 10% trigger level, though the secondary channel in this reach of the floodplain should be inspected for deposition.

Cross-section site 7's active channel (Figure 5) appears to have experienced approximately 0.25 meters of deposition, thus increasing the channel bottom elevation.

However, the limited number of measured elevational points taken within the channel bottom may have led to that increase in elevation (i.e. not enough resolution of the channel bottom). But consideration should be given to the fact that cross-section 7 is downstream and in close proximity to the confluence of Francis Creek and Salt River. Francis Creek carries a heavy sediment load and the 2017/18 winter was the first time Francis Creek entered the Salt River since monitoring began. However, much of the heavier Francis Creek sediments were captured in a sediment management area. The 2018 secondary channel elevations are also elevated indicating deposition. Capacity of the active channel has decreased by approximately 21%. Though this increase is above the 10% trigger point, the decrease in channel capacity appears to be due to the lack of channel bottom resolution. The recommendation is to verify deposition in the floodplain and continue monitoring since the upper portion of channel restoration is incomplete and is still awaiting the connection of the watershed's largest tributary.

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. Observational data sheets are available upon request.

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 Bridge is the only bridge spanning the restored Salt River as of 2018 monitoring season. Existing and adjacent culverts at Reas Creek, Boynton Swale, and Bush Street deliver flows to the Salt River (Figure 6).

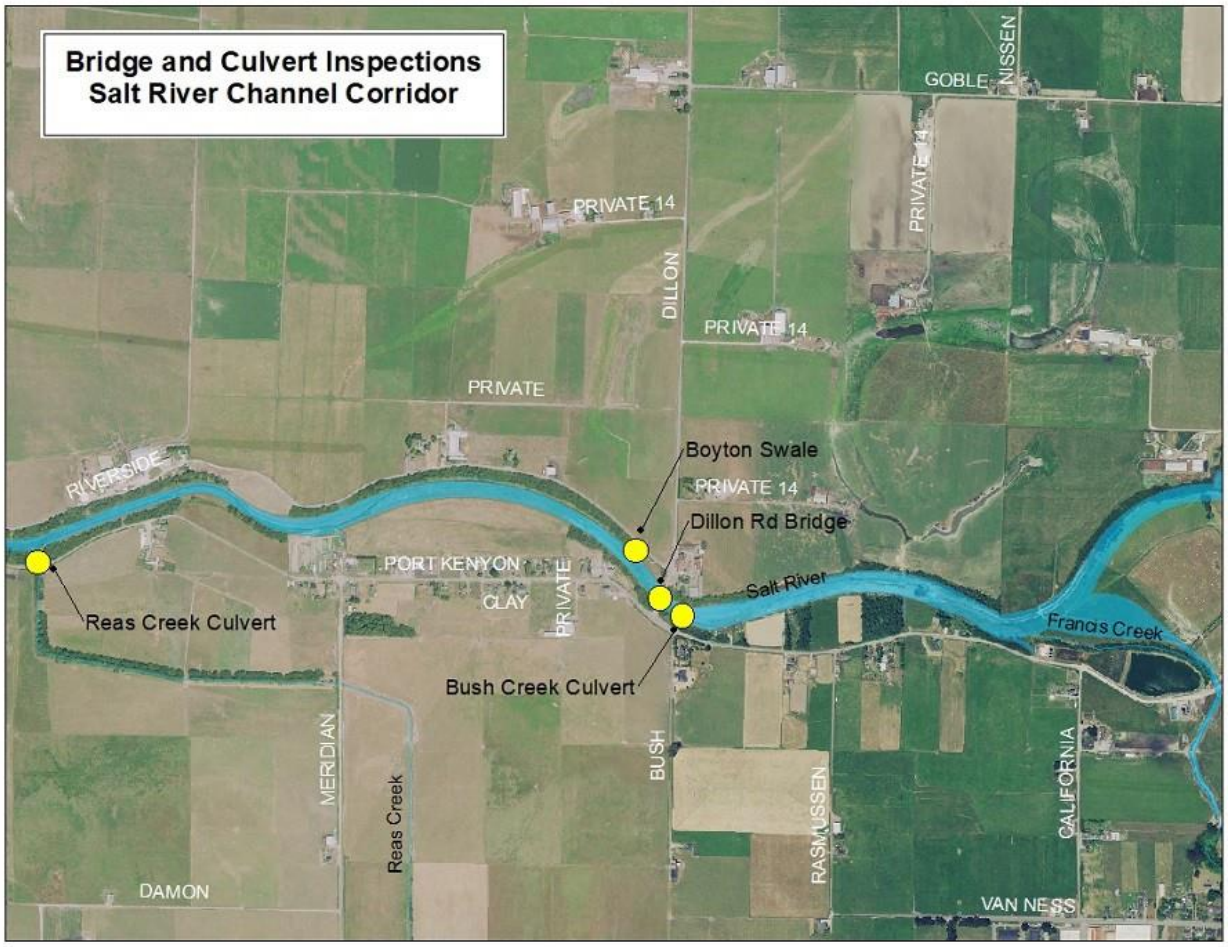

Figure 6: Bridges and Culverts Locations on the Salt River restored corridor

Results and Discussion: No culverts or bridges were constructed within the Salt River corridor as of the 2018 monitoring period. However, one bridge and three culverts remain along the Salt River post-project construction. Dillon Road Bridge spans the Salt River at its upper tidal prism extent. It has been observed during low and high flows and no debris in the channel or flood plain are racking up on the bridge abutments. Erosion around the footings is not occurring. Some individual red alder (*Alnus rubra)* saplings are growing close to the bridge deck and should be considered for removal. The Reas Creek, Boynton Swale, and Bush Street culverts have been observed during high and low flows and appear to be functioning normally.

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

Monitoring Task: Inspection of Sediment Management Areas

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 as well as passive sediment management areas in the restored Salt River corridor.

Goals:

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

Report: N/A

Methods: Methods to determine sediment deposition in the active and passive sediment management areas include topographic surveys.

Visual inspections of the active sediment management area (SMA) at the confluence of Francis Creek and Salt River are performed annually in the late spring. Two staff plates are installed at the west and east ends areas of the SMA. If staff plates indicate that significant sediment appears to be deposited in the SMA, sediment deposition will be measured. A dense topographic survey was performed to develop an elevational map within the SMA. Resulting elevations were compared to 8.0 feet and 9.0 feet elevations (NAVD88) and a volumetric analysis was completed. If the SMA capacity is reduced by 25%, sediment removal shall be considered.

Cross-sectional surveys and visual inspections of connection points of passive sediment management areas (floodplains) to the main stem Salt River are also used as an evaluation method for site specific deposition. Visual assessments of vegetation growth within sediment management areas will determine whether present vegetation affects flow and deposition.

Results & Discussion: The active sediment management area at the confluence of Francis Creek and Salt River was constructed in the fall of the 2017 and experienced one winter. By the end of the 2017/18 winter, the SMA noticeably captured sediment. Though visually, it appeared that the capacity of the SMA had not reached the “25% reduction in capacity” trigger, the HCRCD performed topographic surveys and a volumetric analysis to determine the efficiency of the SMA at capturing Francis Creek sediments. In order to allow for topographic surveys to occur, the SMA was completely dewatered and allowed to dry out. Prior to dewatering and under the direction of CDFW, fish relocation efforts were implemented throughout the SMA and upstream on Francis Creek to the SMA’s associated water diversion structure at the end of July. An earthen

dam was created at the diversion structure to block Francis Creek flow from entering the SMA. Flow was diverted into a diversion channel which allowed Francis Creek water to flow to the Salt River as well as provide continued fish passage. Water was blocked from entering the SMA through its outlet and the remaining water in the SMA evaporated until mid-September. At that point, the bottom of the SMA was walkable and topographic surveys were performed. Data from the topographic survey informed a volumetric analysis which determined that approximately 3,000 cy of sediment was captured over the winter. A grain size analysis showed that a range of coarse to fine sediments were captured; however, far more fine sediments were captured, thus indicating the SMA was too efficient at capturing sediments. The SMA's design goal is to capture coarser and heavier sediments, allowing finer suspended sediments to travel downstream and exit to the Eel River. Therefore, since the SMA was too efficient, project engineers determined that the captured sediments in the SMA should not be excavated to the original SMA design bottom elevation of 8.0' (NAVD88), but to a shallower elevation of 9.0' (NAVD88).

The construction contractor who was onsite restoring the 2018 phase of the Project (Mercer Frasier) was contracted to excavate the SMA sediments to an elevation of 9.0' (NAVD88). Approximately 770 cy of sediment was removed from the SMA (with an additional 5 cy of vegetation that grew in the SMA). At most, 750 cy of SMA sediments were appropriate for, and applied to, approved agricultural fields. Approximately 20 cy of coarser sediments were spread on the SMA access roads and parking area. The HCRCD hopes to involve area landowners to perform sediment excavation of the SMA in the future.

In previously restored portions of the Phase 2 channel corridor, passive sediment management areas are identified as specific constructed floodplain features. Cross-sectional surveys of the floodplains show varying deposition since 2015 (see Figures 3 - 5 above). Some floodplain topographic surveys took minimal measurements, therefore resolution of the floodplain features were not detailed enough to determine if deposition actually occurred (see "*Monitoring Task: Cross Sectional and Longitudinal Surveys-Salt River Channel Corridor –Phase 2 - Erosion and Sediment Deposition Surveys*" above). Visual vegetative assessments at the inlets indicate that vegetation should be managed at some of these sites.

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 and 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: Salt River Ecosystem Restoration Project Post-Construction Geomorphic Channel Survey Report, Phase 1, Year 5 - 2018, prepared by Daniel O'Shea and Melissa Kobetsky

Methods: The following is an excerpt from the 2018 Geomorphic Channel Survey Report:

For the 2018 survey, "*…a Nikon DTM-352 Total Station laser theodolite, tripod, prism pole and single prism were used. Elevations are geo- referenced, in feet, to the 1988 North American Vertical Datum (NAVD88) based on corrected positions from survey benchmarks SR11 and SR14 (Appendix VIII). Horizontal locations were determined using GPS North American Datum 1983 (NAD83) in decimal degrees.*

A total of nine cross-section survey transects and benchmarks were established in 2014, with 3 profiles on the main stem Salt River (SR), the North slough channel (NC), and the South slough channel (SC). Data for cross-section transects has been collected annually from 2014 to 2018. All cross sections are GPS referenced (NAD83) to the survey benchmarks and original endpins (e.g. SR1, SC1, NC1, etc.) are monumented with ½" rebar and orange caps. Due to disturbance, biofouling and/or burial, several endpins were not re-occupied and transects were located using GPS coordinates and True north azimuth direction (14.5°E declination). Endpins and locations that were determined by GPS were marked with three foot wooden stakes to facilitate exact re-location in future surveys.

Cross-section elevations and distances were collected across the flood plain, channel slope, vegetation edge, water's edge, thalweg and channel- with a minimum of eight points within the channel between vegetation edges. Between 15 and 32 elevation

points were collected per cross section depending on the size and morphological complexity of the channel, floodplain and banks. Flood plain measurements were collected up to 200-feet on either side of the main channel, with the exception of the south bank of SR3 due to dense vegetation and restricted access to private land. Cross section profiles are viewed from the west (or north) with the zero-point on the left-side of the graph and extending up to 400 feet toward the south (and east). The discussion refers to left bank and right bank when viewed looking downstream.

Longitudinal profiles extended parallel to channel flow following the thalweg and were conducted on the main-stem Salt River (SRL), the North slough channel (NCL), and of the South slough channel (SCL). The prism pole was placed in the thalweg approximately every 200-feet along the survey length. The SRL extended 12,000ft from cutoff slough to the Phase 1 excavation boundary near the Riverside Ranch barn. NCL and SCL profiles began at the confluence of the main-stem Salt River and extended upstream 2,000ft and 4,800ft respectively" (Figure 7).

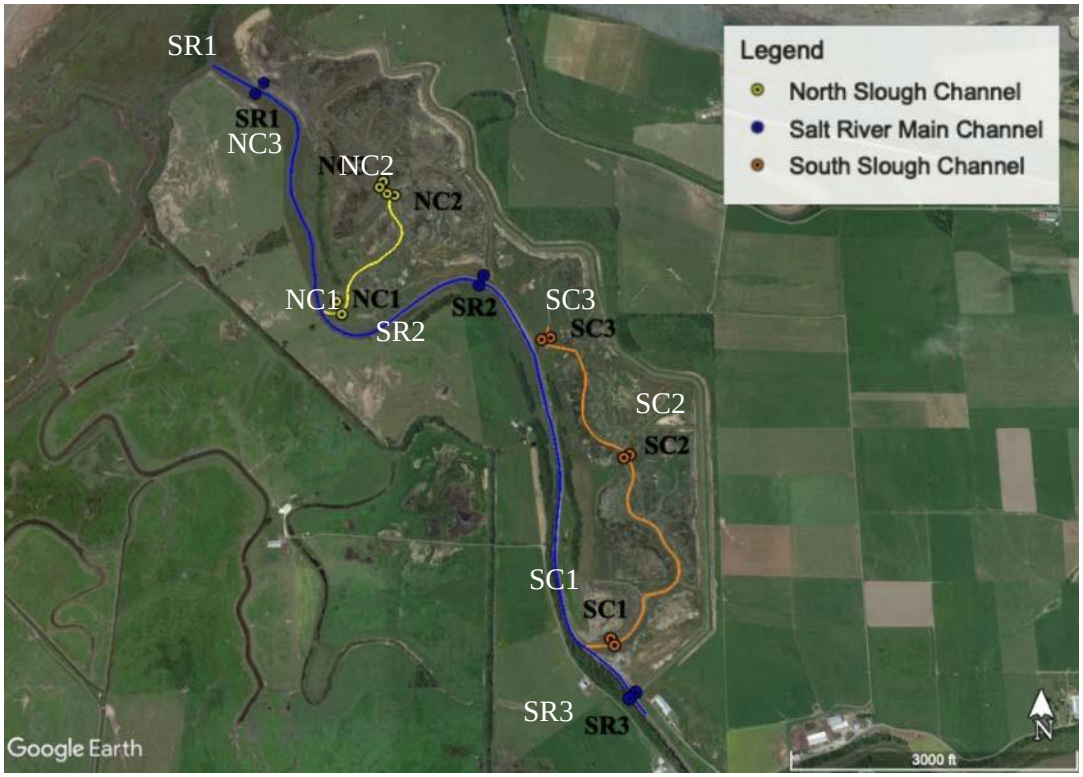

Figure 7: Location of the cross section and longitudinal profiles on Phase 1 for Salt River Ecosystem Restoration Survey Project, 2018.

Results and Discussion: Results are summarized from the monitoring report in the following narrative and in Figures 8 – 17. Cross-sections determine the width and depth of the channels. The following are the cross-sectional and longitudinal profiles for the

Salt River main channel and the southern and northern slough channel network from the designed channel in 2013 to the adjusted channel profiles from 2014 to 2018.

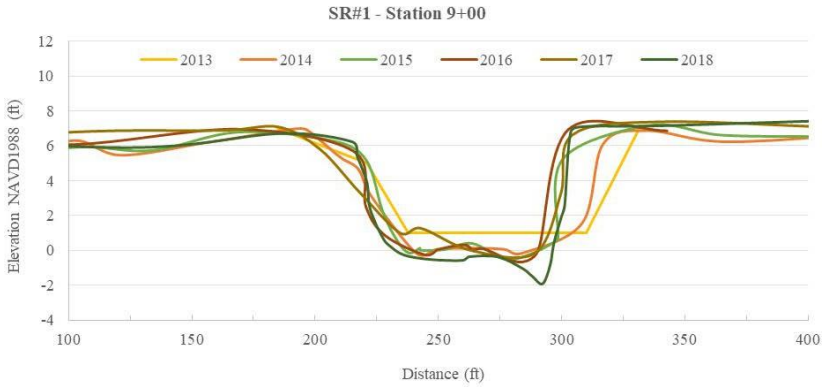

Figure 8: Salt River Cross-Section #1 (SR1)

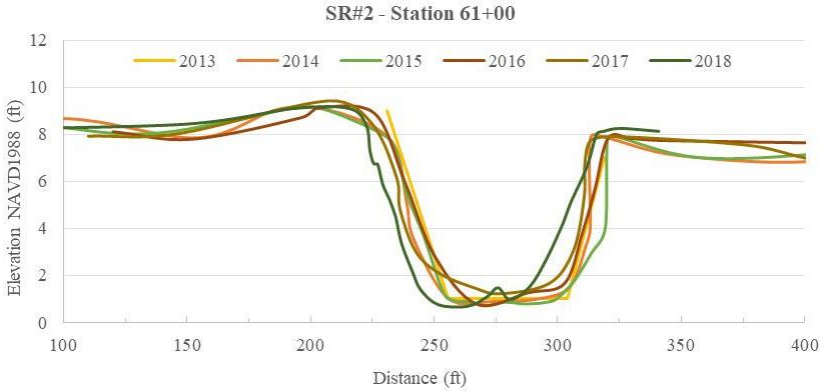

Figure 9: Salt River Cross-Section #2 (SR2)

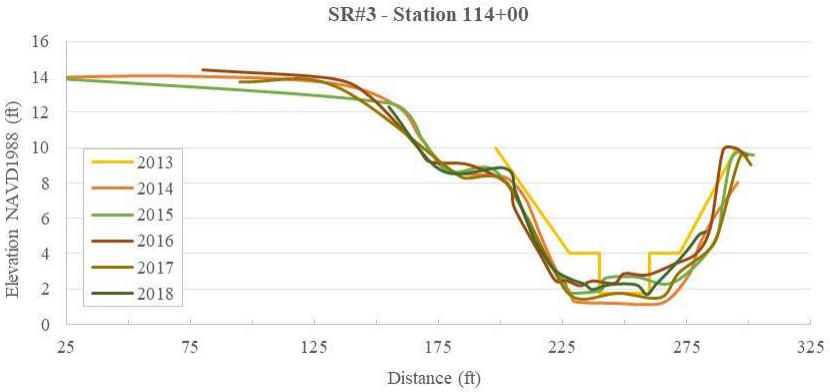

Figure 10: Salt River Cross-Section #3 (SR3)

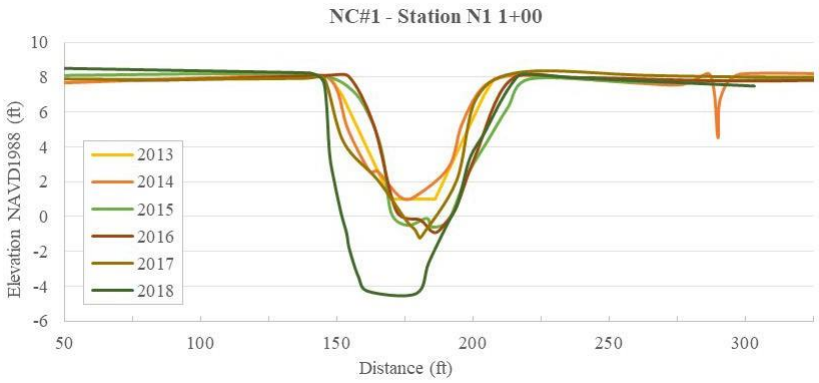

Figure 11: Slough North Channel Cross-Section #1 (NC1)

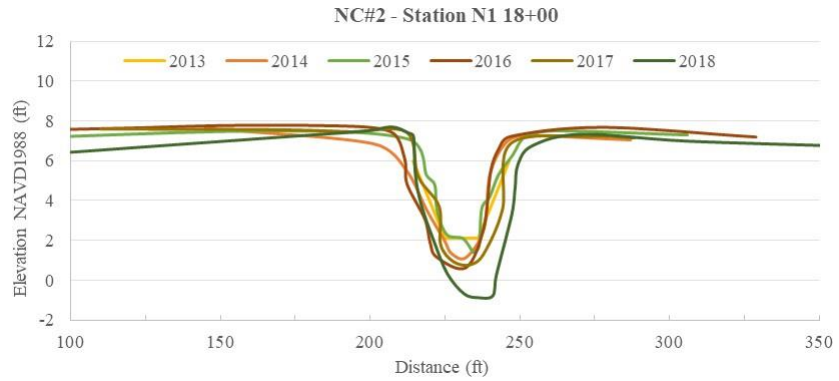

Figure 12: North Slough Channel Cross-Section #2 (NC2)

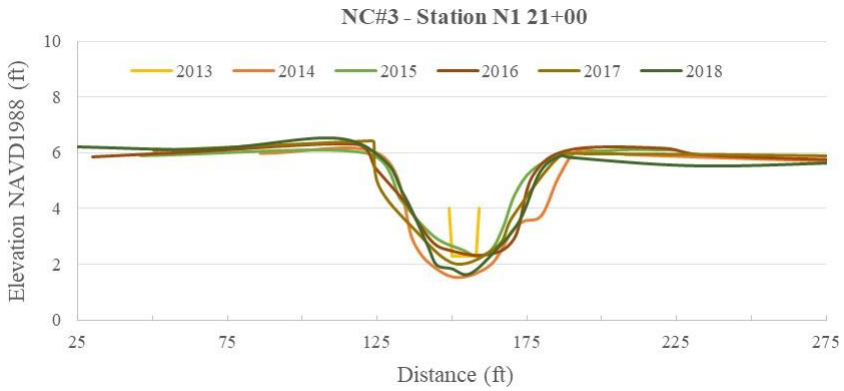

Figure 13: North Slough Channel Cross-Section #3 (NC3)

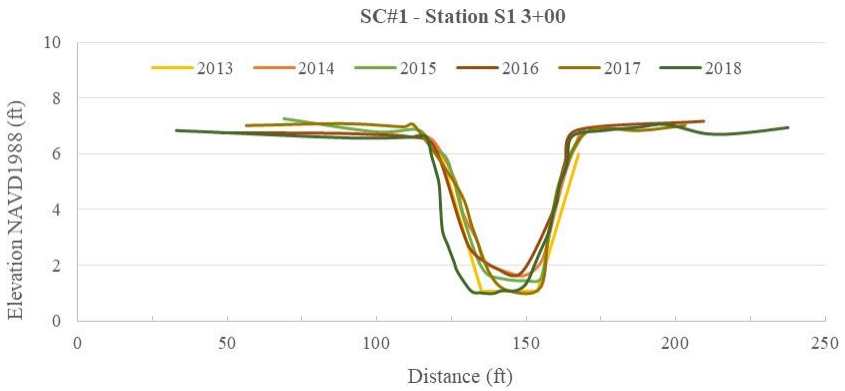

Figure 14: South Slough Channel Cross-Section #1 (SC1)

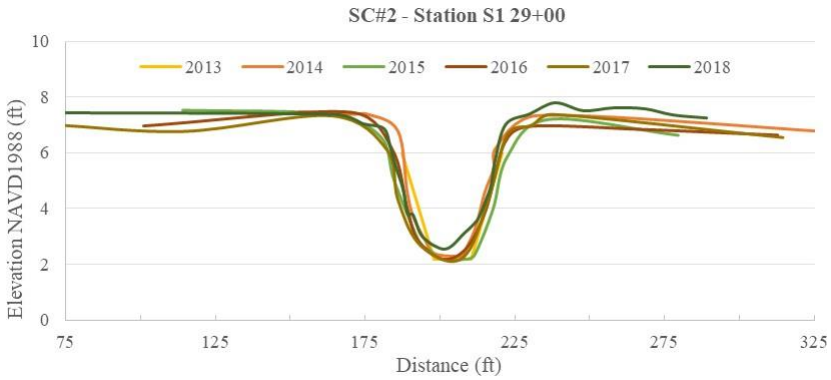

Figure 15: South Slough Channel Cross-Section #2 (SC2)

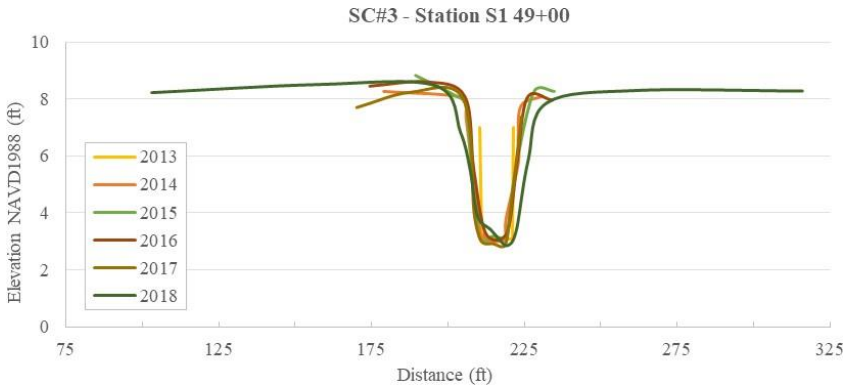

Figure 16: South Slough Channel Cross-Section #3 (SC3)

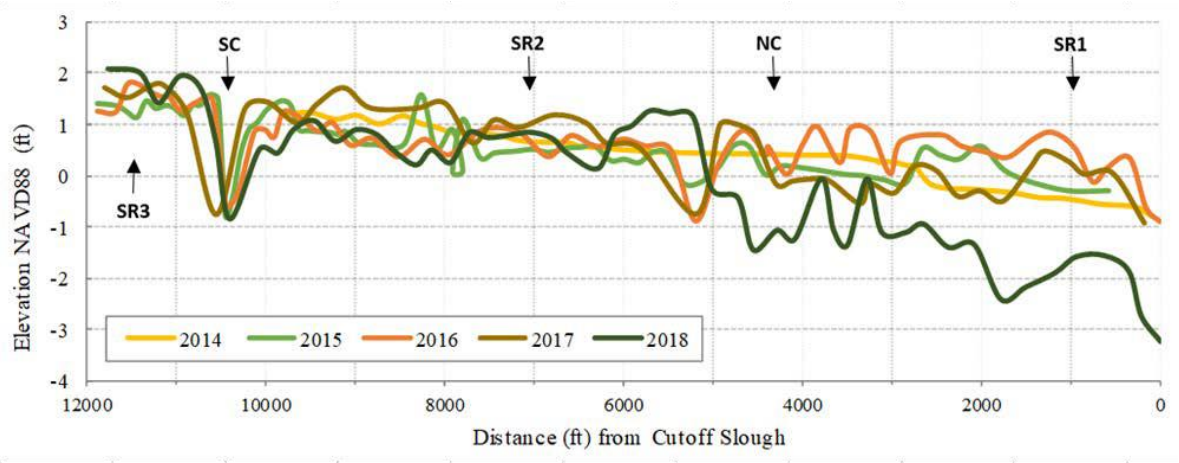

Figure 17: 2018 Salt River Longitudinal Profile - SR1, SR2 and SR3 are locations of cross sections; NC and SC are the approximate locations of the confluence with the North and South slough channels, respectively.

The 2018 cross-sectional and longitudinal surveys indicate trends of decreased channel elevation and net sediment transport out of the channel reaches, which is similar to past survey results. Results primarily indicate that channel geometries occurred vertically rather than laterally as the data show smaller variation in cross-sectional channel widths compared to channel depths.

Salt River Main Channel - Prominent channel bed erosion continues in the lower main stem Salt River (SR) below the northern slough channel (NC) confluence and immediately below the southern slough channel (SC) confluence, with up to 1.5 feet of elevation loss near Cutoff Slough. Deposition continues to occur in the upper reaches of the Salt River. All cross-sections indicate a formation of a mid-channel bar while elevations are lower near the toes of the bank. SR3 experienced an average of 4.5 inches of uniform deposition across the wetted width of the channel.

Northern Slough Channels – The downstream NC1 cross-sectional area experienced considerable channel bottom erosion as well as bank sloughing of the outside bend on river left. Bank erosion and channel deepening also occurred at NC2 with erosion around an installed log structure. NC3 had both minor erosion and deposition.

Southern Slough Channels - Scour is consistent through the southern slough channel. Average elevation loss in the longitudinal profile was 4 inches with more pronounced degradation in the upstream half of the reach. SC1 channel bottom elevation appears to be relatively stable, though lateral migration of the west bank occurred; likely due to bank slumping. SC2 had an approximate 5 inches of uniform deposition across the channel bottom while channel width and bank slope remained stable. SC3 experienced little change in channel dimension, though had an average of 2 inches of deposition from mid-channel to left bank.

Salt River Longitudinal Profile - The total relief on the 11,900-foot longitudinal profile section of the main Salt River channel surveyed in 2018 was 3.672 feet, yielding an average gradient of 0.3% per thousand feet, which is a 0.01% increase from 2017. The dominant trend in the main channel longitudinal profile was scouring, most notably between 0 and 3,000ft which had a 1.41ft lower average elevation than 2017. In contrast, an average of 1ft of deposition occurred from 5,000 to 6,000ft upstream from Cutoff Slough. Considerable channel deepening was observed at 4,500ft near the NC confluence, which has consistently scoured since the beginning of surveying in 2014.

The SRERP's Adaptive Management Plan identifies a 10% change in channel capacity as a trigger level for potential management actions. Six of the nine cross-sections have experienced over a 10% change in channel capacity as compared to the base channel geometry of 2014 (Table 1), three of which (NC1, NC2, and SC3) are over 5 times the trigger level. However, it is prudent to review past years' percent changes in channel capacity and recognize the dynamics of the system. Starting at the most downstream site, SR1, on the main channel Salt River near the confluence of Cutoff Slough, has experienced a 13% reduction in channel capacity but has been steadily increasing its capacity to a level that is similar to 2014's capacity. The capacity of SR2 has fluctuated from an increase to a decrease of capacity from 2015 to 2018.
SR3 has also fluctuated in capacity over the years, though in 2018, it experienced its largest decrease in capacity. SR3 is just downstream of Reas Creek which provides heavy sediment inputs. Francis Creek was also connected to the Salt River channel for the first time in 2017; those sediments may contribute to the deposition at this site. The majority of the lower reach in the main northern slough channel network has steadily increased in capacity, or fluctuated with an increasing trend. NC1 is significantly adjusting to a larger capacity size over the years with channel bottom scour and bank erosion on the outside channel bend. NC2 has fluctuated across the years with considerable increases and decreases in channel capacity since 2014; however, NC2 has significantly increased by 55% since 2017 with channel bottom scour and migration of the right bank. NC3 has fluctuated from a drastic decrease in channel capacity in 2015, then increased across 2016 and 2017, and again decreased slightly in 2018. In the southern slough channel network, the SC1 site has increased in capacity over the last three years, though it experienced a notable 27% increase from 2017 to 2018 with erosion of the left lower bank. This site experiences small to large fluctuations in capacity size across the years, and it doesn't seem to be dependent on the severity of the hydrologic year. The SC2 experienced a large capacity increase in 2015 and has steadily decreased in capacity since then and is nearly the same capacity as in the 2014 base year. SC3 has increased its capacity across the last 3 years, but 2018 experienced a large increase with both banks shifting laterally outward. Ultimately, the Salt River main channel appears to fluctuate mildly each year. The interior slough channels are continually adjusting yet still remain hydraulically functional, though it

would be prudent to keep an eye on the northern slough channel network, especially at its confluence with the Salt River; specifically observing the south bank of the Salt River and noting if excessive erosion is occurring due to the change of the slough channel outflow.

Table 1. Change in Channel Capacity Since 2014

	Percent Change in Capacity (+/-)*			
Cross Section	**2015**	**2016**	**2017**	**2018**
SR1	- 13	- 13	- 11	- 4
SR2	+ 5	- 9	+ 9	- 4
SR3	- 8	- 9	+ 3	- 16
NC1	+ 20	+ 21	+ 31	+ 128
NC2	+ 5	+ 20	+ 8	+ 63
NC3	- 31	- 19	- 12	- 17
SC1	- 20	+ 1	+ 5	+ 32
SC2	+ 43	+ 16	+ 25	+ 5
SC3	- 7	- 1	+ 2	+ 51

* A negative (-) value denotes a decrease in channel capacity compared to the 2014 channel geometry. A positive (+) value denotes an increase in channel capacity compared to the 2014 channel geometry.

Though this is the fifth year of surveys on Phase 1, Riverside Ranch, of the Salt River Ecosystem Restoration Project, sediment erosion, transport, and deposition have not equalized. They are likely to continue to evolve in response to the implementation of upstream restoration that will introduce more sediment inputs into the system, while at the same time bringing in larger volumes of water as the project connects the last remaining and largest upstream tributary.

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. Observational data sheets are available upon request.

Methods: Any culverts or tide gates remaining or installed in Riverside Ranch (Figure 18) 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.

Although the SRERP's Adaptive Management Plan calls for annual monitoring, during 2018, HCRCD staff monitored the above items at least monthly to ensure tide gates and the outboard ditch were working properly to prevent high salinity water from encroaching onto neighboring lands. A site-check form has been developed to help monitor various elements on Riverside Ranch. The form includes observations pertaining to the tide gates, outboard ditch, pasture conditions, fencing, wildlife, roads, structures, etc. The forms are reviewed by the HCRCD Project Manager to determine any issues that need to be addressed.

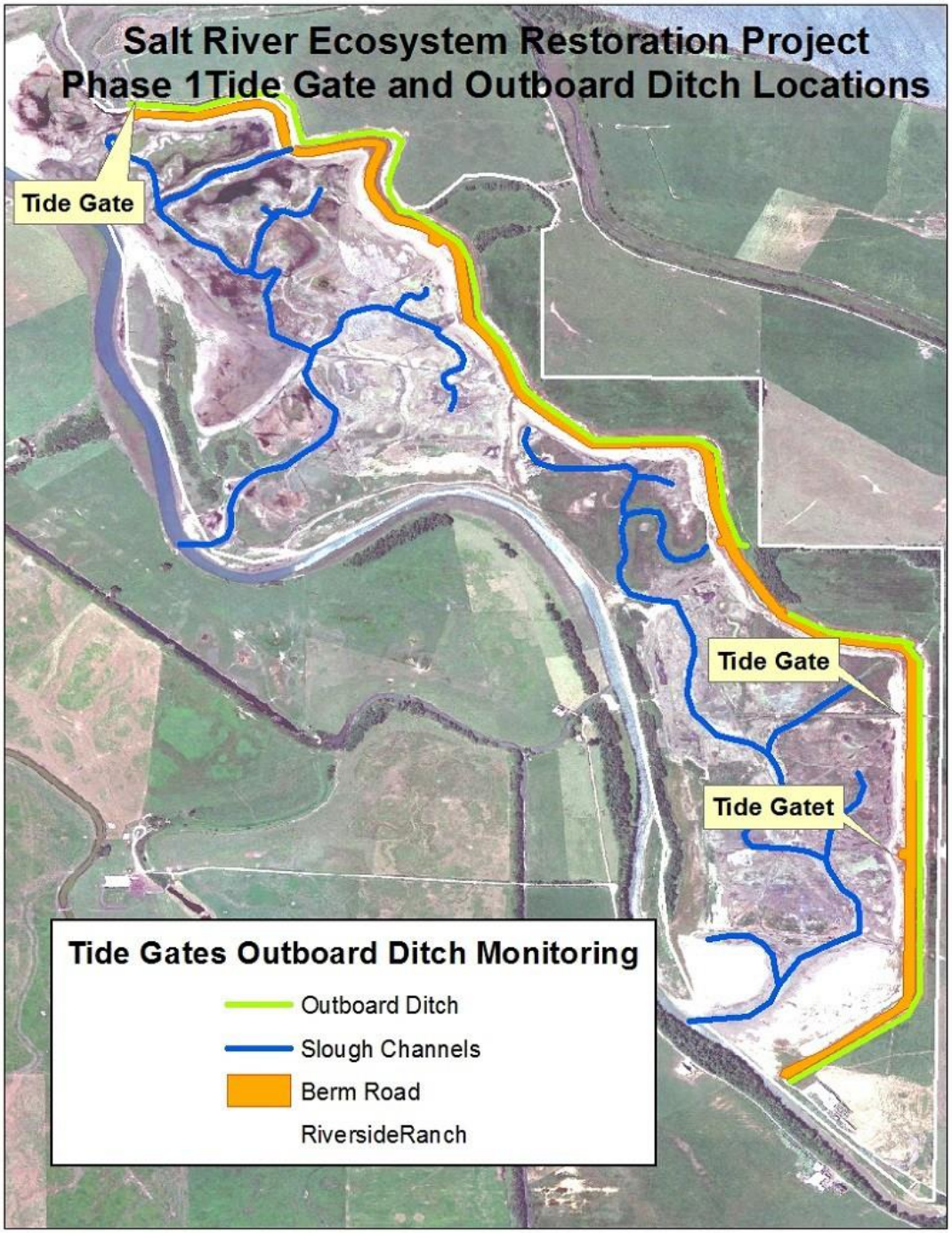

Figure 18: Tide Gates and Outboard Ditch Locations

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. Monitoring is conducted on a nearly monthly basis. No culverts remain on Riverside Ranch; all culverts were removed during construction. The installed tide gates are functioning as expected. No debris has been observed to obstruct the closing or opening of the tide

gates thus far. However, the southernmost tide gate was observed to leak more than the other two during higher tide events and in the summer of 2018, the tide gate door was adjusted to reduce leakage. During winter months, the outboard ditch accommodates average rain fall events, though during persistent rain periods and rain events of over 1" in 24 hours can cause water to back up in adjacent agricultural ditches and partially inundate agricultural fields when tide gates remain closed. Previously, vegetation has been observed within most of the area of the outboard ditch. Since the leasing of the agricultural lands adjacent to the outboard ditch, vegetation is being controlled through active grazing.

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. Observational data sheets are available upon request.

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.

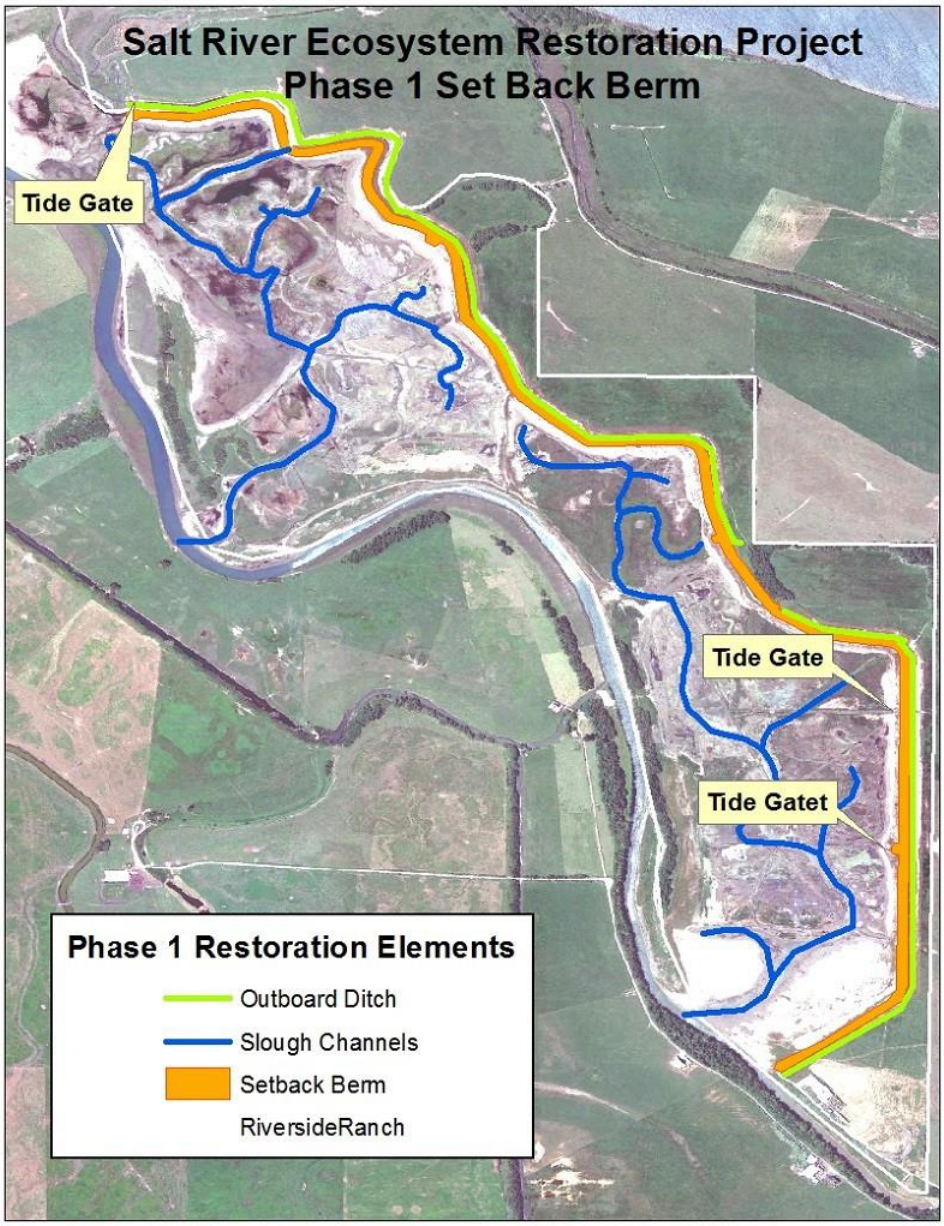

Figure 19: Setback Berm Location

Results and Discussion: The HCRCD makes monthly observations on the various elements on Riverside Ranch. Observations on the setback berm and the berm road (Figure 19) are included in the visual inspections. Minor rills are observed on the estuary side of the berm and appear to be stable. Some 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 January 2017, where all gravel and road base material were washed away. In the summer of 2018, CDFW provided gravel to repair the road

and the adjacent dairy owner volunteered his time and equipment to grade and spread gravel on the road.

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 2018 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.

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 and 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 Fish Monitoring Program 2018. Results of fish species presence and distribution monitoring conducted from April to July, 2018 within the Salt River, Eel River Estuary, Phase 1 and 2 Project areas, Humboldt County California. Prepared By Doreen Hansen of the Humboldt County Resource Conservation District.

Methods: Field fisheries biologists from the California Department of Fish and Wildlife and Humboldt State University led the fish monitoring program.

Once a month, from March to July 2018, sites across the restored portions of Phase 1 and Phase 2 (Figure 20) of the Salt River Ecosystem Restoration Project were surveyed for salmonids and tidewater gobies during low tide periods. Thirteen sites on the Salt River Phase 1 and constructed portions of the Phase 2 restoration area were selected for fish presence and distribution monitoring to represent the diversity of channel size and habitats in the main Salt River channel in the slough network. Each tidally influenced site was sampled using a 1/8th inch mesh pole seine net. Typically a single 1/8th inch mesh pole seine pass was made through each site. Sites located further up the river channel were sampled by minnow traps deployed for at least an hour. These sites were not seined if it was determined ineffective due to narrow channel size.

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 pikeminnow were enumerated into 100 millimeter size classes by visual estimation, and the non- native pikeminnow were humanely euthanized and buried via permit requirements. 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.

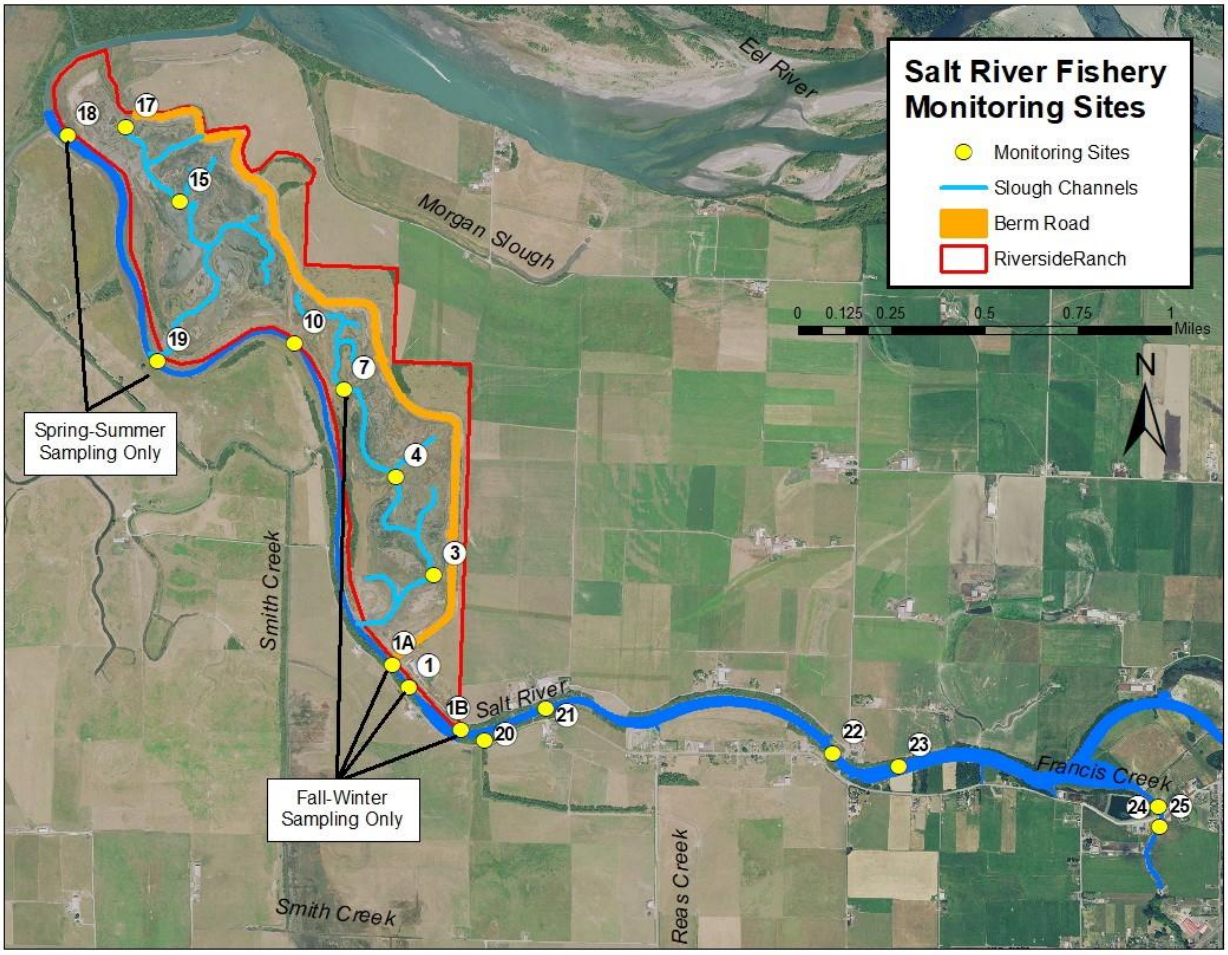

Figure 20: Fish Monitoring Sites Across Phase 1 and 2 of the Salt River Ecosystem Restoration Project (2018)

Results and Discussion: Over the five month sampling period, water temperatures ranged between a maximum of 22.8°C (June) and a minimum of 9.7°C (April). Availability of a water quality meter limited salinity measurements to June and July. Average salinity was 24.8 ppt in the estuary and 0.2 ppt upstream of Reas Creek. Dissolved oxygen was also measured during the surveys and each month's average ranged between a maximum of 14.7 ppm and a minimum of 7.0 ppm (100% oxygen saturation is 10.0 ppm). The dissolved oxygen maximum value is beyond a maximum level, though dissolved oxygen probes are notorious for reading above 10.0 ppm.

Seining and minnow trapping efforts at the 13 fisheries monitoring sites identified the presence of 15 species. Approximately 6,903 individuals were captured (approximate numbers in 2018 were often estimated during the capture of large numbers of three-spined stickleback, staghorn sculpin, topsmelt, and unidentified shrimp). The following table (Table 2) presents the total number of fish and marine invertebrates sampled from April to July in 2018 (Ross Taylor and Associates completed the March survey and

those results are presented in the fall-winter report “Fisheries Sampling in the Lower Salt River during the Fall and Winter of 2017-2018” (Taylor 2018)).

Eight Coho salmon (*Oncorhynchus kisutch)* juveniles were present during the April and July monitoring efforts and two Chinook salmon (*Oncorhynchus tshawytscha*) were captured in May. Salmonids were captured in the tidal marsh area and in the main channel Salt River. In July, a juvenile Coho salmonid was captured in a deep pool in Francis Creek.

Table 2: Number of individual fish captured by each month’s fish survey efforts in 2018

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

In previous years immediately after construction of the tidal marsh in 2013, tidewater gobies (*Eucyclogobius newberryi)* were abundant at the southern slough channel terminal arms, where over a hundred individuals would be caught in one sampling

period (month). In 2018, only 5 tidewater goby individuals were sampled during the sampling season (down from 15 individuals in 2017). The low numbers are likely due to degraded or loss of backwater habitat, caused by anticipated tidal regime impacts of sedimentation and/or erosion of channel features within the created slough channels at three sites. These sites previously held high concentrations of tidewater goby and have now been abandoned as fish sampling sites. The 2018 captured tidewater gobies occurred at sites 15 and 17.

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

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

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 is retained on Phase 1 (Riverside Ranch) of the Salt River Ecosystem Restoration Project to 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: N/A

Methods: Monitoring methods will verify procedures identified in the submitted and contracted annual management plan from the agricultural lessee to CDFW as well as performing an annual evaluation of vegetative composition.

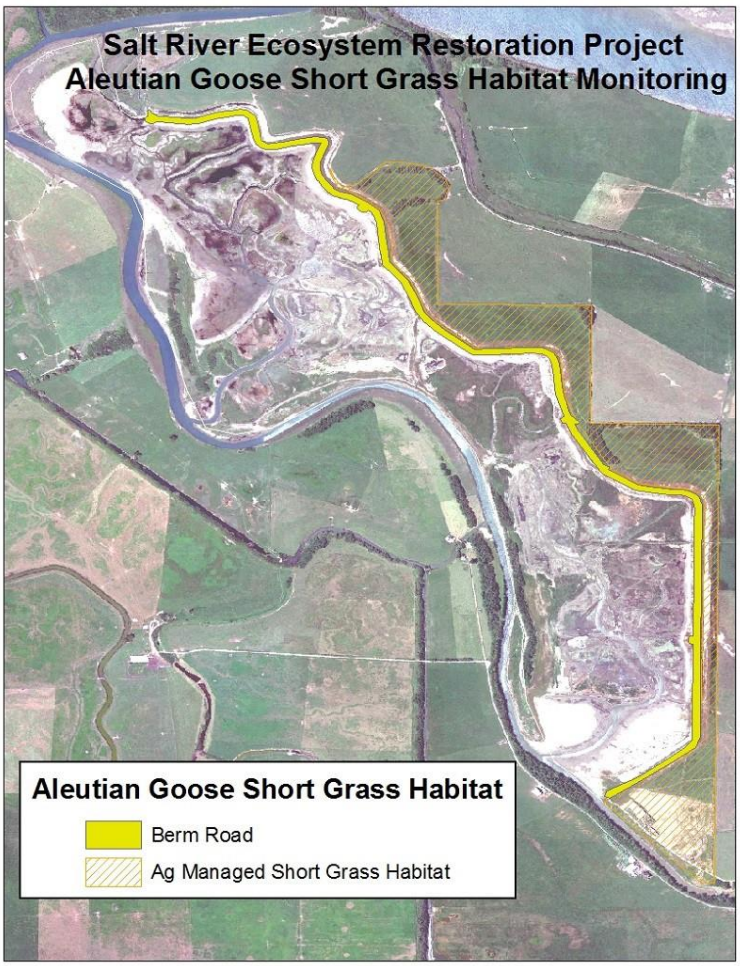

Figure 21: Proposed Managed Short-Grass Habitat on Phase 1

Results and Discussion: From 2001 through 2012, a Memorandum of Understanding (MOU) between the HCRCD and the California Department of Fish and Wildlife (CDFW) allowed for the HCRCD to manage leases and oversee agricultural activities on several

CDFW-owned Wildlife Management Areas (WMAs). The purpose of these types of activities was to achieve a variety of wildlife habitat goals through well-managed agricultural practices. Livestock grazing and/or other agricultural management techniques are used to create, maintain and/or enhance habitat for plants, wetland associated birds such as Canada Goose, Aleutian cackling goose, waterfowl, shorebirds, or wading birds and other wildlife. To this end, CDFW and HCRCD jointly developed the *Protocol for Prescribing Agricultural Activities on Lands Within the North Coast Wildlife Area Complex,* to outline the process to determine and monitor specific agricultural activities, such as livestock grazing, haying, mowing, irrigation, fertilizing and seeding on all CDFW WMAs in Humboldt County, including Riverside Ranch.

Under the MOU, HCRCD provided ongoing monitoring and oversight and made recommendations for agricultural practices to be adjusted as needed to achieve CDFW goals. This successful model was utilized by CDFW up and down the State until it was ended in late 2012 when an internal CDFW audit revealed that the practice of allowing RCDs to manage lands and lease payments for CDFW conflicted with State regulations. Due to these findings, all agricultural activities on WMAs were suspended in 2013/2014. Therefore, the 72 acres of pasture on Phase 1 (Figure 21) reserved for short-grass habitat had not been managed to promote optimal forage for Aleutian geese from 2013 to spring of 2018.

Since 2014, the pasture land has sporadically been managed. In 2014, the HCRCD used its own funding to twice mow the pastures during the summer growing season to control weeds and manage the grass and a CDFW contract allowed for the forage to be removed once in the fall; however, this did not provide short-grass habitat in the winter of 2014/15. Again in 2015, the HCRCD worked closely with the regional CDFW office to develop a haying contract in late fall to have the overgrown forage removed. However, a single haying activity that occurs in the late summer or early fall season does not promote the short-grass habitat that Aleutian geese prefer. In 2016, CDFW released a Request for Proposals (RFP) for vegetation management (grazing) for their north coast wildlife management areas. Phase 1/Riverside Ranch was one of these areas. In 2016, and due to the RFP's application criteria and local level of interest, CDFW did not receive any applications for Phase 1/Riverside Ranch. In March 2018, CDFW released another Request for Proposals for Permit for Excess Vegetation Disposal on the Salt River Unit of the Eel River Wildlife Area (aka Phase 1/Riverside Ranch). An adjacent dairy producer was awarded the lease and began management practices in the summer of 2018. CDFW approved the dairy producer'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 15th to maintain desired grass height.

Agricultural managed short-grass habitat status on Phase 1/Riverside Ranch was not achieved during the winters of 2014/15, 2015/16, 2016/17, or 2017/18.
Additional "prime agricultural" status is also required through the project's Coastal Development permit, which has not been achieved since restoration activities occurred.
Monitoring of 2018/19 agricultural practices in the spring and summer of 2019 will determine whether the Riverside Ranch agricultural fields have met requirements for short-grass habitat and "prime agricultural" status.

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

Monitoring Task: High Marsh Ecotone Vegetation Percent Cover Survey

Agencies/Acts: Coastal Commission

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

The High Marsh Ecotone vegetation percent cover was not scheduled to be performed in 2018.

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: Refer to:

- 2018 Annual Habitat Monitoring Report - Salt River Ecosystem Restoration Project, Prepared for the Humboldt County Resource Conservation District by J.B. Lovelace & Associates
- Monitoring Task: Cross Sectional and Longitudinal Surveys-Salt River Channel Corridor –Phase 2 - Erosion and Sediment Deposition Surveys (above)
- Salt River Ecosystem Restoration Project Post-Construction Geomorphic Channel Survey Report, Phase 1, Year 5 - 2018, prepared by Daniel O'Shea and Melissa Kobetsky

Methods: Review results of the vegetation monitoring and cross-sectional & longitudinal surveys to determine if channel hydrologic function is being affected by the presence or removal of woody vegetation.

Results & Discussion: Results from the geomorphic surveys indicate that although discreet channel sites are experiencing some sedimentation and erosion, these situations are not caused by woody vegetation that is growing, has fallen, or been removed in or along the channel. The vegetation tree basal area monitoring across the restored Phase 1 (2013), 2014, and 2015 Project areas indicate that planted and naturally recruited woody vegetation is not anticipated to impact the channel in the near future. However, naturally recruited 3-year-old red alder (*Alnus rubra),* in close vicinity of Dillon Road bridge, was deemed to be considerably dense; therefore trees with less than 4" diameter (at breast height) were thinned, leaving trees with greater 4" diameters approximately 6' apart. Additionally, one to two downed existing alders have fallen into the larger Salt River channel within the Phase 1 footprint, have been observed over the past three years and do not appear to be adversely impacting channel function or the banks.

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.

Report: Refer to:

- 2018 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 report for non-native non-invasive and invasive findings to determine location and percent cover of weed species. 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 monitoring effort have found that numerous weedy species exist and are becoming prolific in the restored portions of the project area. *Spartina densiflora*, reed canary grass (*Phalaris arundinacea)*, creeping bent grass (*Agrostis stolonifera)*, and a variety of thistles (*Helminthotheca echioides and Cirsium vulgare)* are present and need to be addressed.

No formal reach wide weed abatement efforts were made on the restored project footprint. However, a multi-day removal of Pampas grass (*Cortaderia jubata)* on Phase 1 and the Phase 2 channel corridor (2014 Project area) were removed. It has been recommended by re-vegetation experts that much of the reed canary and creeping bent grasses will eventually be controlled when wood riparian species achieve a shaded canopy in the river corridor.

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 desiflora,* and reed canary grass) within sampling areas will not exceed a percent cover of 5%.

Report: 2018 Annual Habitat Monitoring Report - Salt River Ecosystem Restoration Project, Prepared for the Humboldt County Resource Conservation District by J.B. Lovelace & Associates

Methods: Our categorization of plant species as being native, non-native non-invasive, and invasive is consistent with that used in previous SRERP habitat monitoring efforts (H.T. Harvey & Associates 2014 & 2015; J.B. Lovelace & Associates 2017) in an attempt to maintain consistency throughout the duration of the entire SRERP monitoring period. Non-native invasive plants are defined by the California Invasive Plant Council (Cal-IPC 2017) as non-native species threatening wildlands by displacing and/or hybridizing with native species and/or likely to "alter biological communities, or alter ecosystem processes."

Except as noted otherwise, plant species are regarded as being "invasive" if they are assigned a "high" invasive rating by the Cal-IPC (2017), are listed as "noxious weeds" by the California Department of Food & Agriculture (CDFA 2017), are listed as "federal noxious weeds" (USDA 2017), are considered invasive in the Humboldt County Weed Management Area (HWMA) (2010), or otherwise warrant concern based on known or perceived potential for preventing the establishment of intended vegetation in the SRERP restoration area. Although some non-native plants detected in the current monitoring fieldwork regarded by the Cal-IPC (2017) as having "moderate" or "limited" invasive potential were considered invasive in the context of the SRERP restoration goals, it is also true that other species classified similarly were not considered problematic in the context of the current effort, based on local species observations.

We used a stratified, randomized sampling approach to characterize the abundance, species composition, and structural composition of existing vegetation in each vegetation sampling area. The goal of such a sampling approach is to sufficiently distribute the collection of vegetation data throughout sampling areas to provide the most accurate, quantitative characterization of the vegetative categories of interest throughout the site, while minimizing any preconceived bias on the part of the observer. Based on power analyses of 2017 SRERP vegetation sampling data (J.B. Lovelace & Associates 2018), we used a sample size (n=32) that was determined to be sufficient to detect a "medium" effect size of 0.5 standard deviations (following Cohen 1988)

between the observed sample means and their respective success criteria using a two-sided t-test, and assuming both 95% confidence and a statistical power of 80%.

Using updated SRERP habitat GIS data and ArcMap® software, each phase and sub-phase of the restoration area was partitioned into ecologically distinct vegetation sampling areas of perceived relative homogeneity based on project reach, restoration habitat design components, revegetation prescriptions, and elevation strata. ArcMap® software was then used to randomly distribute 32 sampling plots throughout each of these sampling areas. Given that each sampling area is composed of multiple, geographically separated polygons, the 32 sample plots were randomly allocated throughout each sampling area, in quantities proportionate to the size (i.e., area) of each polygon. Geographic coordinates for each randomly assigned sample plot location were then appropriately corrected and uploaded to the aforementioned GPS unit for location during fieldwork. Once sample plots were located in the field, a 1m2 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.

Results & Discussion: Vegetation surveys across all phases of the constructed project footprint determined percent cover for invasive species. Project documents set the limit of invasive species presence below 5%. All restoration areas exceeded the invasive species limit (Table 3). *Spartina densiflora* is becoming dominant in large areas of Phase 1 and a suite of *Phalaris arundinacea* (“reed canary grass”), *Agrostis stolonifera* (“creeping bent”), *Ranunculus repens* (“creeping buttercup”), *Lotus corniculatus* (“bird’s-foot trefoil”), *Helminthotheca echioides* (“bristly ox-tongue”), and *Cirsium vulgare* (“bull thistle”) are found throughout the Phase 2 footprint. Recommendations include the continuation of monitoring and instituting a robust invasive species control program.

Results indicate increasing trends in the abundance of invasive vegetation in all sampled habitats, with the exception of the active channel habitat in the 2015 (Middle Phase 2A) restoration reach. It is recommend that immediate and aggressive invasive vegetation management efforts be initiated and repeated as necessary until future monitoring results demonstrate a sustained decreasing trend in the observed extent and abundance of invasive species throughout the SRERP restoration area to a level that will meet established respective success criteria. It has been recommended by re-vegetation experts that much of the reed canary and creeping bent grasses will eventually be controlled when wood riparian species achieve a shaded canopy in the river corridor.

Table 3: Summary of 2018 SRERP Quantitative Vegetation Percent Cover Sampling Results & Respective Success Criteria. (Mean percent cover estimates are in bold and associated 95% confidence intervals follow in parentheses.)

	Mean Percent Cover for Vegetation Categories of Interest								
	Total Vegetation[1]	Native Vegetation		Non-Native Non-Invasive Vegetation		Invasive Vegetation		Sterile Hybrid Wheatgrass[1]	
SRERP Habitat Sampling Area	Observed	Observed	2018 Success Criteria[2]	Observed	Final Success Criteria[3]	Observed	Final Success Criteria[3]	Observed	
Phase 1 – Riverside Ranch Tidal Marsh Restoration Area									
Salt Marsh *sensu stricto* (n=32)	**94.5** (92.2, 96.6)	**58.0** (49.7, 65.7)	≥30%	**8.2** (4.9, 13.7)	<15%	**28.7** (21.7, 36.7)	<5%	**0.0** (NA)	
Phase 2 – Salt River Corridor Restoration Area									
Phase 2A (Middle) – Salt River Channel Wetlands									
Active Channel (n=32)	**100.0** (NA)	**90.1** (85.9, 93.6)	≥30%	**2.6** (1.1, 4.9)	<15%	**7.2** (4.3, 10.9)	<5%	**0.0** (NA)	
Active Bench (n=32)	**96.3** (92.6, 98.0)	**59.7** (48.9, 69.6)	≥30%	**13.1** (7.1, 21.9)	<15%	**23.5** (16.3, 32.6)	<5%	**0.0** (NA)	
Phase 2A (Middle) – Riparian Planting Zones									
Replanted Riparian Forest (n=32)	**98.9** (96.7, 99.7)	**51.0** (40.5, 62.2)	≥30%	**9.1** (4.9, 17.6)	<15%	**38.8** (28.6, 50.0)	<5%	**0.0** (NA)	
Active Riparian Berm (n=32)	**99.4** (96.8, 99.8)	**68.9** (59.8, 76.7)	≥30%	**8.1** (4.3, 15.5)	<15%	**22.4** (16.8, 28.9)	<5%	**0.0** (NA)	
Phase 2A (Upper)/Phase 2B (Lower) – Salt River Channel Wetlands									
Active Channel (n=32)	**93.0** (86.8, 96.3)	**43.0** (33.7, 52.6)	≥10%	**20.2** (14.7, 26.6)	<15%	**26.1** (20.1, 33.7)	<5%	**3.7** (2.3, 5.4)	
Active Bench (n=32)	**85.0** (79.0, 89.2)	**28.5** (21.7, 36.7)	≥10%	**31.7** (24.2, 40.3)	<15%	**21.6** (16.3, 27.7)	<5%	**3.2** (1.8, 5.0)	
Phase 2A (Upper)/Phase 2B (Lower) – Riparian Planting Zones									
Replanted Riparian Forest (n=32)	**95.8** (92.5, 97.7)	**28.9** (21.1, 38.1)	≥10%	**37.3** (28.3, 46.2)	<15%	**23.6** (18.0, 31.0)	<5%	**6.0** (4.0, 9.1)	
Active Riparian Berm (n=32)	**84.8** (79.0, 89.5)	**24.2** (19.6, 29.5)	≥10%	**20.1** (14.7, 26.3)	<15%	**25.0** (18.1, 34.0)	<5%	**15.5** (11.7, 21.4)	

[1] No specific success criteria are indicated in the HMMP (H.T. Harvey & Associates with Winzler & Kelly 2012).

[2] Adapted from Tables 8-10 of the HMMP (H.T. Harvey & Associates with Winzler & Kelly 2012).

[3] Must be achieved by the final monitoring year for each respective habitat sampling area (i.e., Year 5 for Salt River Channel Wetlands or Year 10 for all others) (H.T. Harvey & Associates with Winzler & Kelly 2012).

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: Refer to:

- Salt River Ecosystem Restoration Project Fish Monitoring Program 2018. Results of fish species presence and distribution monitoring conducted from April to July, 2017 within the Salt River, Eel River Estuary, Phase 1 and 2 Project areas, Humboldt County California. Prepared By Doreen Hansen of the Humboldt County Resource Conservation District

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 to 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 2018 spring-summer fish monitoring effort, 174 pikeminnow were captured and euthanized (>100 mm), down from over a 1,000 individuals in 2017. All pikeminnow were captured using a seine net. All but two pikeminnow were captured in fresh water reaches of the project footprint (site #20). Only two pikeminnow were captured at site 4, in the estuary, during the month of April when salinities were likely low.

Fish monitoring efforts will continue to capture and euthanize Sacramento Pikeminnow to reduce their occupation in newly created and restored habitats.

LIST OF AVAILABLE REPORTS

J.B. Lovelace & Associates. 2018. Annual Habitat Monitoring Report - Salt River Ecosystem Restoration Project, Prepared for the Humboldt County Resource Conservation District.

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

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

O’Shea, Daniel and Melissa Kobetsky. Salt River Ecosystem Restoration Project Post-Construction Geomorphic Channel Survey Report, Phase 1, Year 5 – 2018. Prepared for the Humboldt County Resource Conservation District. Eureka, California.

Salt River Ecosystem Restoration Project - Fish Monitoring Program 2018. Results of fish species presence and distribution monitoring conducted from March to August, 2018 within the Salt River, Eel River Estuary, Phase 1 and 2 Project areas, Humboldt County California. Prepared By Doreen Hansen of the Humboldt County Resource Conservation District. Eureka, California.