Salt River Ecosystem Restoration Project

Phase 1 – Year 1 Monitoring Report 2014

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Humboldt County
RESOURCE
CONSERVATION DISTRICT

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Salt River Ecosystem Restoration Project has been developed in collaboration with landowners and resource and regulatory agencies over a number of 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 Hills, 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 about 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 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 acquired Riverside Ranch from a willing seller and 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). Both phases include 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:

- **Erosion control:** Work with willing landowners to implement upslope erosion control activities in the upper portions of the Francis and Williams 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.
- **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.
- **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.

- **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) re-converted some 300 acres of pasture back to intertidal wetland habitat, while also preserving some 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 tidewater goby and other fish 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 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 two miles of the tidally-influenced portion of the Salt River channel; increasing tidal exchange and greatly improving fish passage and fish habitat in the lower Salt river channel.

The design of Phase 1 is 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.

Year 1 monitoring was performed under direction of the Humboldt County Resource Conservation District and complies with requirements generated during the development of the project. This report provides information on baseline data collected during the first year post construction of the first phase of the Salt River Ecosystem Restoration Project. As discussed in the General Conclusions section of this report, first year monitoring results demonstrate the project is performing successfully and largely meeting project goals.

SUMMARY OF CONCLUSIONS

As detailed in this report, Phase 1 -Year 1 monitoring results provide a point of reference on how the restoration has responded to the area's environmental conditions during its first year after construction. As of Year 1, the project has largely met its monitoring goals.

Water Quality

Continuous water sampling on the Phase 1 project area proved challenging. The water conditions almost immediately fouled the sensors on the deployed monitoring equipment, which consequently provided unusable data. However, spot sampling for salinity, temperature, and DO during fish sampling surveys provided monthly data parameters that suggests that the habitat is conducive to the requirements of aquatic species.

Vegetation

Though the 2013/2014 drought conditions made it unsuitable to re-vegetate with riparian species in Phase 1, the seeding and natural recruitment of native species in High Marsh Ecotone area proved to be successful after the first year. This area exceeded the Year-1 percent coverage success criteria described in the project's documents.

Non-native and invasive vegetative species have occupied areas of the Phase 1 project area. Fat hen, a seral plant, tends to inhabit newly disturbed areas and may diminish as the site stabilizes. *Spartina densiflora* is a non-native invasive cord grass that has occupied the Eel River Delta and Humboldt Bay. Mature Spartina is found along the north western edge of Phase 1, and small areas around the southern slough channel and High Marsh Ecotone have sprouting plants. Future hand removal will be implemented in the late winter and early spring of 2015, though seed sources on adjacent lands are nearby which will make invasive species management a long term investment.

Eelgrass beds have reached the project's stated area extent goals. However, average shoot densities in the new recruited areas are still below the stated goals.

Wildlife

Monitoring fish utilization of the Phase 1 project area was the primary "wildlife" focus of the Year 1 monitoring. In collaboration with CDFW, NOAA/NMFS, Humboldt State University, and Ducks Unlimited, a fish sampling program was created. The sampling effort that took place from March to July proved that habitat restoration efforts in the Eel River Delta benefitted fish species. The area was utilized by Coho and Chinook juvenile

salmonids in the early spring. Tidewater gobies also found their way to the restoration area. Numerous marine species also utilized the increased habitat capacity of the site. Overall, Year 1 proved that the project is a success for fish species.

Geomorphic

The monitoring tasks under the Geomorphic heading show that the site is stabilizing. The photo documentation not only visually records the dramatic differences between pre-construction to post-construction conditions, but records the vegetation recruitment and tidal effects. The cross-section surveys indicate that the Salt River channel and slough channels are naturalizing. Comparing bottom elevations, from As-Built surveys and the Year 1 surveys shows that elevations are relatively the same in the main Salt River channel and slough channels (see below Table). Though it must be reported that the sediments in all the excavated and restored channels have significantly soften and expanded, compared to the As-Built dimensions, due to the diurnal tidal inundation. These conditions make it difficult to find a solid purchase for the stadia rod; the measuring device either settles on expanded sediments or sinks deeply in the channel bed. Therefore the elevations should be compared from year to year with the reference year being Year 1, rather than the As-Built elevations.

Comparison of Bottom Elevations in the Salt River and Slough Channels

Location	Cross Section	As-Built Elevation (NAVD88)	Year 1 Elevation (NAVD88)
Salt River	SR1	1.0	0.70
	SR2	1.0	0.89
	SR3	2.43	1.14
Northern Slough Channel	NC1	1.2	1.10
	NC2	2.2	0.74
	NC3	2.3	1.53
Southern Slough Channel	SC1	1.17	1.62
	SC2	2.28	3.29
	SC3	3.17	4.02

Weekly general visual inspection of the Phase 1 area determined that the setback berm, outboard ditches, and tide gates are functioning as expected.

INTRODUCTION

The Salt River Ecosystem Restoration Project (SRERP) took some 20 years to develop and drew upon several studies and assessments completed during that time looking at 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.

A variety of monitoring tasks are required to be conducted to demonstrate achievement of project goals and objectives. 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. Monitoring during construction was also conducted to assure that construction activities conformed to approved design plans and specifications and to protect identified plants and wildlife. Post-implementation monitoring is being conducted as required by the projects various funders, permit requirements, and environmental compliance documents. Many of the individual reports are available from the Humboldt County Resource Conservation District upon request.

The report is presented in four, broad sections:

1. Water Quality,
2. Vegetation,
3. Wildlife, and
4. Geomorphic.

Within each section is a discussion that identifies 1) the discrete task called for, 2) the agency requiring the task, 3) the reference document, and 4) results and discussion.

WATER QUALITY

Monitoring Task: Tidal Exchange and Water Level Monitoring

Agencies: NCIRWM Plan and Consolidated Grants Program; Coastal Commission

Documents: Salt River Monitoring Plan 2008; Coastal Development Permit- Special Conditions 2.6, 2.7; SRERP Adaptive Management Plan

Description: Monitor for water level, salinity, temperature, and dissolved oxygen at specific sites on Phase 1.

Goals:

- To determine areas of saline, brackish, and freshwater marsh habitat in the Salt River Corridor and in the restored estuary of Riverside Ranch;
- To determine areas of increased tidal prism, which helps maintain the Salt River channel geomorphology and conveyance;

Methods: A network of 4 multi-parameter recorders was deployed across the Phase 1 project area as follows and shown on Map on next page:

1) in the Salt River immediately downstream of the confluence of the northern slough channel (Eel River Estuary);

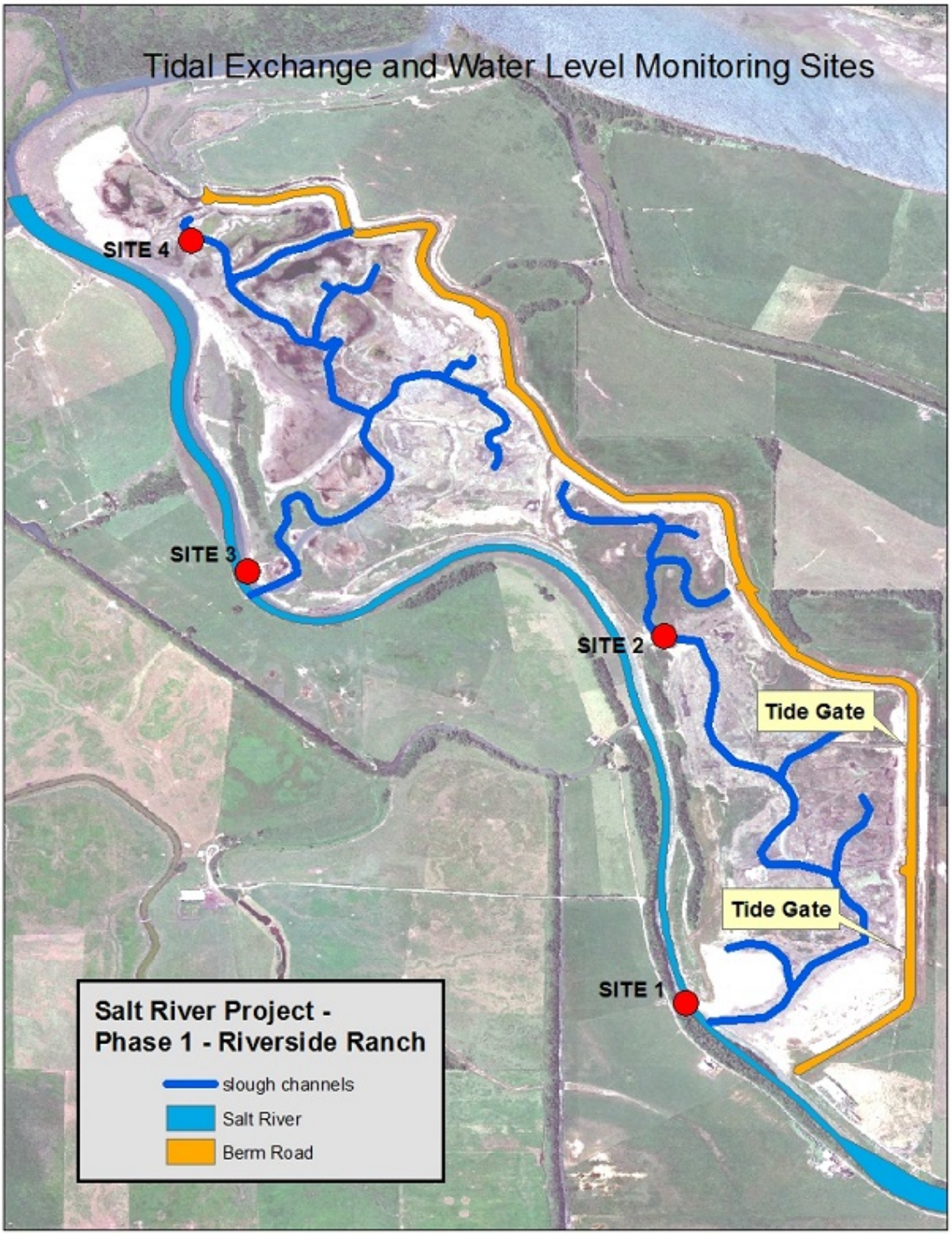
2) in the Salt River immediately downstream of the confluence of the southern slough channel;

3) in the interior of the northern slough channel network;

4) in the interior of the southern slough channel network.

Tidal exchange monitoring occurs for 4 to 6 months during the dry season. This Year 1 effort recorded data from July to the end of October. Recorders were set to sample every 2 hours, which sampled within a one hour window of a high tide.

Map:


Tidal Exchange and Water Level Monitoring Sites
SITE 4
SITE 3
SITE 2
SITE 1
Tide Gate
Tide Gate
Salt River Project -
Phase 1 - Riverside Ranch
slough channels
Salt River
Berm Road

Results and Discussion:

During the day of retrieval of the data recorders, it was observed that the two sampling sites in the main Salt River (sites #1 and #3) no longer had the PVC housings in which the monitoring equipment was placed. Upon inspection, all recording devices and housing were missing. A thorough search of the surrounding area was made with no success. Investigators noted increased boating activity in the Salt River channel adjacent to Riverside Ranch in mid-October for duck hunting season. Investigators surmise this may have contributed to the disappearance of the data recording equipment. However, sites #2 and #4 were intact and these data are presented below.

Salt River Phase 1 Water Level and Quality Parameters for Sites #2 and #4 - 2014

	Water Parameters							
	Site #2				Site #4			
	Water Level	Temp	Salinity	Dissolved Oxygen	Water Level	Temp	Salinity	Dissolved Oxygen
	(ft)	(°F)	(ppt)	(mg/L)	(ft)	(°F)	(ppt)	(mg/L)
Maximum	5.9	80.6	38.3	17.8	5	84.3	31.4	27.3
Minimum	0.6	51.7	2.4	-0.03	1.1	50.1	12.4	-0.04
Average	2.6	65.3	16.2	5	2.2	63.3	23.3	4.7

Water-Level

Due to the diurnal tidal inundation of Phase 1 (Riverside Ranch), it is expected to see large fluctuations in the level of water given that the site receives nearly 100 percent of tidal water (a small tributary contributes very little fresh water volume). The tides are muted at the sites compared to actual ocean conditions, and more muted at site 4 than at site 2. At site 4, the low tide water level is additionally affected due to a channel feature that retains water in the site area at low tide (this feature was built to enhance tidewater goby habitat). It is observed that the maximum water level during the sampling period (July through October) reached 5.9 feet and decreased to the minimum to 0.6 feet, with an average 2.6 feet at site 2. Unfortunately, the extreme low water levels would have impacted the other water quality parameter recorders as they were more than likely out of the water column. The maximum water level during the sampling period reached 5.0 feet and the minimum decreased to 1.1 feet, with an average 2.2 feet at site 4. Unlike Site 2, Site 4 does not completely drain during a low tide.

Temperature

Temperature readings were collected from the water level recorder. The site 2 recording device was likely exposed to air temperature during lower tides. The average temperature during the sampling period is 65.3 °F. The maximum temperature of 80.6 °F occurred on a July 19th 2014; which had a typical daily temperature of 63 °F, however the water level was 0.79 ft. The low water level around the recorder, along with the temperature of the PVC housing, would have increased temperatures dramatically.

Site 4's average calculated temperature for the sampling period was 63.3 °F. The maximum temperature of 84.3 °F occurred on August 9th 2014; which had a typical daily temperature of 60 °F, however the water level was 1.51 ft. The low tide and the temperature of the PVC housing may have increased temperatures significantly.

Salinity

Reviewing the salinity data from both recorders revealed that the data collected soon after deployment became compromised. The data showed that salinity level decreased rapidly or gradually with no additional fresh water inputs during the sampling period. After some consultation with others who have deployed water quality monitoring devices in tidal environments, it is said that the recorder's sensors quickly become fouled, thus not allowing the device to take accurate measurements. This is likely the case for the recorders at sites 2 and 4. The sites have high suspended sediments and are in areas with slow water movement, thus sediment and algae progressively collected on the sensor. This was indeed the case when the recorder was retrieved. The salinity of the area is nearly the same as ocean water (~35 ppt). This is corroborated with spot salinity samples taken during deployment (29.0 ppt to 30.4 ppt) and fish sampling events.

Dissolved Oxygen

The dissolved oxygen (DO) data fluctuated dramatically between >8.0 mg/L (100% saturation) to just below 0 mg/L (0% saturation). During periods of lower water levels, when the recorder was likely exposed to air, the DO levels primarily reach above >8 mg/L. At times when the device was submerged the recorded data often read between 4.0mg/L to 8 mg/L. However, the longer the recorder was left at the site, the data became erratic. Again, it appears that due to the suspended sediments and algal growth the sensors began to foul after only 5 days of deployment. In fact, after retrieval of the unit, it was observed that a colony of bryophytes grew over the sensor area along with habitation by polychaete worms.

Spot sampling at site 2 during June and July fish surveys were 11.8 mg/L and 4.5 mg/L respectively, where hundreds, if not thousands, of stickleback, juvenile smelt, and

sculpin were sampled. Site 4's June and July fish surveys were 6.2 mg/L and 5.3 mg/L respectively, where hundreds, if not thousands, of stickleback and sculpin were sampled. The presence of a diverse fish assemblage indicates that the sites have DO levels that sustain fish habitation.

* The full Tidal Exchange and Water Quality Report, provided by the HCRCD in December 2014, is available upon request

VEGETATION

Monitoring Task: High Marsh Ecotone Mapping and Monitoring

Agencies: Coastal Commission

Documents: Coastal Development Permit- Special Conditions 2.8; SRERP Habitat Mitigation and Monitoring Plan and the Adaptive Management Plan

Description: Map and monitor quantitative vegetative growth in the high marsh ecotone habitat type in Year 1 on Phase 1 of the Salt River Ecosystem Restoration Project.

Goals:

- Reach a goal of creating 12 acres of high marsh ecotone habitat
- To reach success criteria of 5% cover of high marsh species in Year 1 as stated in SRERP's Habitat Mitigation Monitoring Plan.
- To meet a non-invasive, non-native species cover criteria of 15% or less in Year 10
- To meet an invasive-non-native species cover criteria of 5% or less in Year 10

Methods:

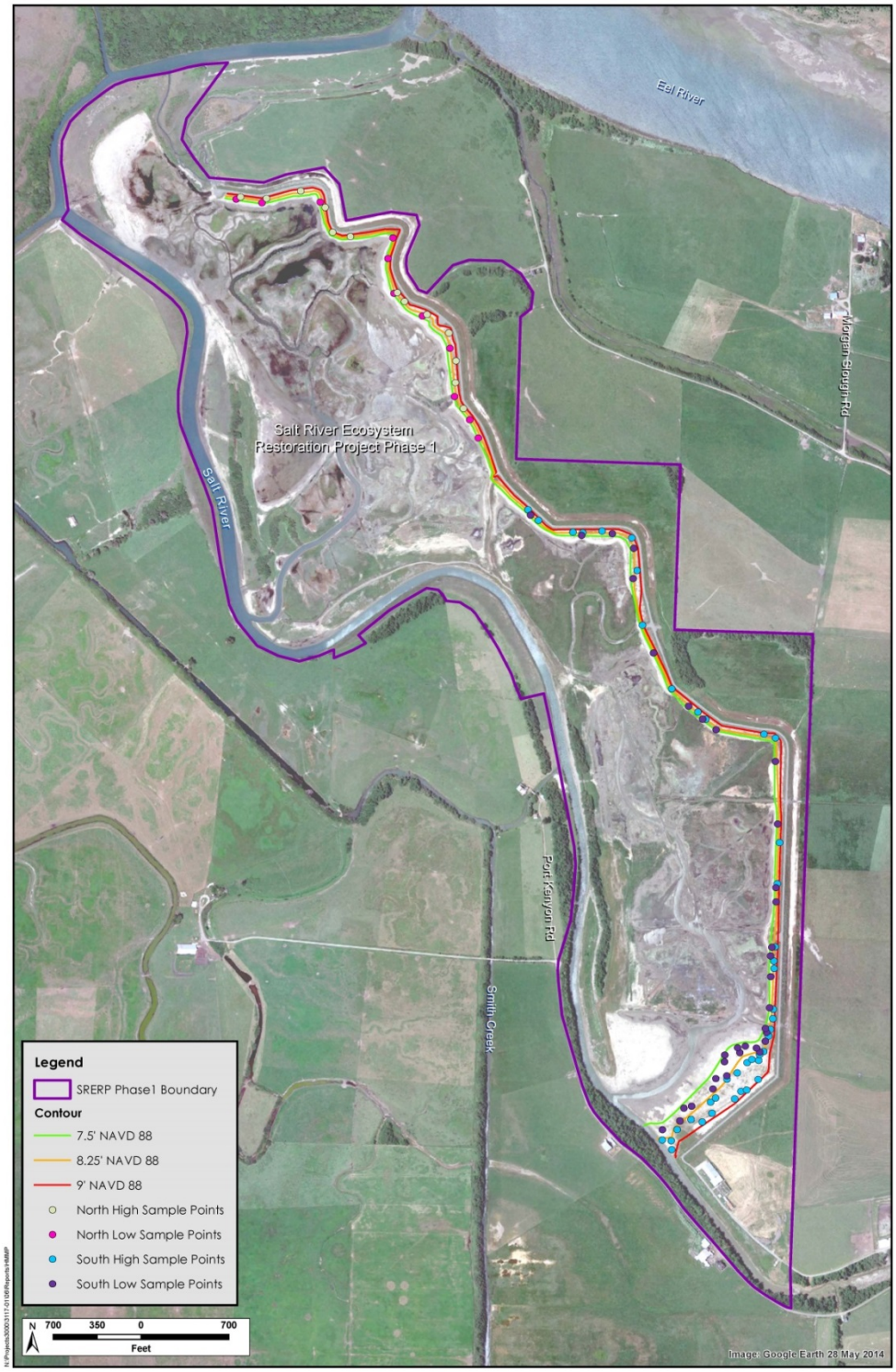
A map depicting the current extent of high marsh ecotone habitat at SRERP Phase 1 was created based on a combination of aerial photointerpretation, ground-truthing, and projections based on elevation range for this habitat type. Existing post-construction satellite imagery (Google Earth 28 May 2014) and Geographic Information Systems (GIS) software for both field mapping and preparation of the map were employed. Based on the restoration design, it was projected that high marsh ecotone habitat would occupy elevations between 7.5–9 ft. Acreage of the verified high marsh ecotone area was calculated using GIS software.

Percent cover data were collected using plot-based field sampling methods. Plots were placed in a spatially stratified random manner within geographic and elevational strata.

Stratification was used to ensure that plots were distributed over the sample frame (i.e., sampling boundary) in a representative and un-biased manner. It was not a purpose of this stratification to analyze potential differences in vegetation among the strata. Two geographic strata and two elevational strata were used, resulting in four sample strata. HCRCD recognizes North and South sections of SRERP Phase 1, divided by an access road at the approximate center of the site, this division to create the two geographic strata. For elevational strata, high and low zones were established, separated by an interpolated 8.25 ft contour line. One hundred random sample points were generated using GIS software. The points were spatially distributed among the four sample polygons in the same ratio as surface area, with the points set to occur a minimum distance of 32.8 ft (10 meter [m]) apart from one another. A power analysis was performed on the initial data collected to determine if 100 samples were a sufficient representation of the site.

All plant species encountered in sample plots were categorized as either native, non-native non-invasive, or invasive. The purpose of the categorization was to serve as a basis of comparison of current site conditions with the HMMP's success criteria for minimum cover by native plants and maximum cover by non-native non-invasive plants and by invasive plants. Native plants are defined as plants that are believed to occur in the region naturally. Non-native plants have been introduced either as a direct or indirect result of human activity. Invasive plants are defined by the California Invasive Plant Council (Cal-IPC) as non-native plants that threaten wildlands by displacing native species, hybridizing with native species, altering biological communities, or altering ecosystem processes (Cal-IPC 2014).

Map:



H.T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 2: Sample Plot Layout
Salt River Ecosystem Restoration Project
Vegetation Monitoring for the High Marsh Ecotone (Year 1) (3117-10)
November 2014

Results and Discussion:

Habitat Mapping

The high marsh ecotone occurs as a linear band on the tidal side of the new setback levee. The high marsh ecotone is a transitional habitat that is inherently separate yet contiguous with both the tidal marsh and the terrestrial upland habitat on the levee. The first growing season following the re-introduction of tidal inundation, some degree of vegetation zonation is apparent though not yet well-defined enough to use as a primary basis for mapping the boundaries of the high marsh ecotone. The lower boundary of the ecotone appears generally consistent with the 7.5 ft contour line and the upper boundary with the 9.0 ft contour line. For much of its length, the width of the ecotone averages about 45–50 ft, having a slope of about 30:1 (Horizontal (H):Vertical (V)) from levee to marsh. At the south end of the Phase 1 project area, the high marsh ecotone is much broader, extending out to widths of 250–350 ft, with slopes of 160H:1V to 230H:1V. Calculations determine that 17 acres of high marsh ecotone has been created. This value exceeds the projected 12 acres by 47% (see below table).

Land Use and Habitat Projections (all units in acres)

	Phase 1 - Riverside Ranch				
Habitat Type	**Pre - Construction**	**Removed**	**Project Created**	**Total Created (Project Goal)**	**Year-1**
High Marsh Ecotone	0	0	12	12	**17**

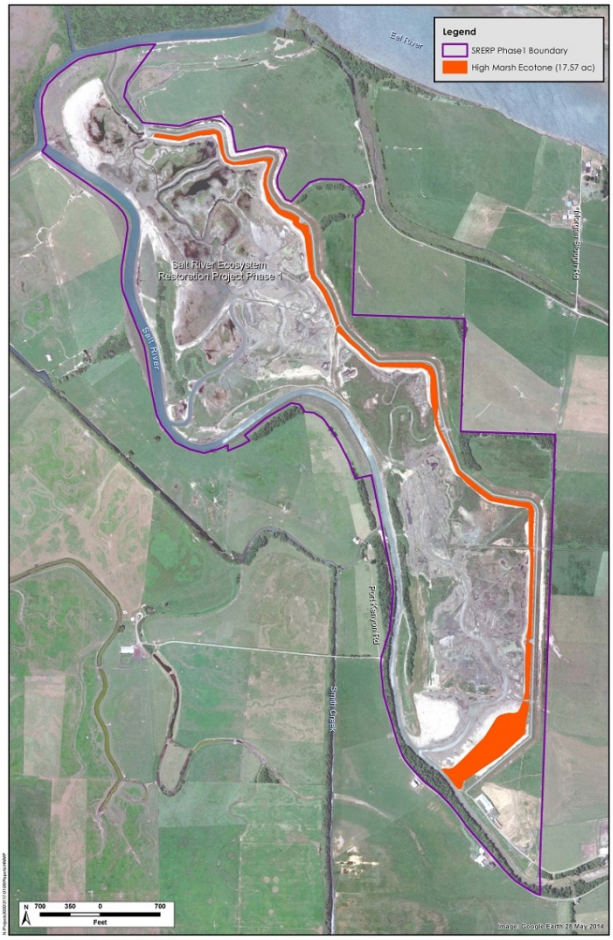


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Figure 4: Year 1 High Marsh Ecotone Habitat
Salt River Ecosystem Restoration Project
Vegetation Monitoring for the High Marsh Ecotone (Year 1) (3117-10)
November 2014

Habitat Success Criterion

The mean cover by native plant species in the high marsh ecotone was estimated to be 24.1% and exceeds the Year-1 success criterion of 5% cover. The results of our power analysis indicated that we had a sufficiently robust sampling level to determine that this cover estimate is significantly greater than the minimum 5% cover set as a Year 1 success criterion. Additionally, 95% confidence limits shown in the below table provide a measure of how reliable the estimated mean cover value is based on the variance in the data; the lower bounds of the 95% confidence interval is greater than the Year-1 success criterion (5%). The two species with the highest cover were meadow barley (9.7%) and tufted hairgrass (9.4%), both components of the hydroseed mix. Natural recruitment by the halophyte perennial pickleweed contributed 3.8% cover. The other eight native plant species occurring in sample plots each had < 1% cover. A maximum

of 5% cover by invasive plant species and a maximum of 15% cover by non-native non-invasive plant species by Year 10 have been set as success criteria for restored tidal wetland habitats (comprising over 300 ac of salt marsh in addition to the high marsh ecotone). In Year 1, the mean cover by non-native non-invasive plant species in the high marsh ecotone was 18.5%. Most of this cover was attributable to fat-hen (16.2%), occurring in 79% plots, with up to 97.5% cover and an overall mean cover of 16.2%. The other 10 non-native non-invasive plant species each had < 1%. The mean cover by invasive plant species was 1.1%

Percent Cover Assessment for the High Marsh Ecotone, Year 1

Plant Species Category	Mean Percent Cover (n=100)	95% Confidence Intervals	
		Lower Limit	Upper Limit
Native species	24.1	19.7	28.4
Non-native non-invasive species	18.5	13.6	24.1
Invasive species	1.1	0.7	1.5
Sterile hybrid wheatgrass	2.8	N/A	N/A
Total	46.5		

In conclusion, a mean cover of 24.1% by native plant species in the high marsh ecotone was significantly greater than the minimum 5% cover set as a Year 1 success criterion for this habitat type. This was largely due to the successful establishment of two native grasses, tufted hairgrass and meadow barley, both of which were components of the hydroseed mix applied as part of the restoration effort. Additionally, it is encouraging that natural recruitment by a number of native marsh species was observed in the created high marsh ecotone habitat.

Total cover by invasive plant species was 1.1%. The presence of *Spartina*, despite low abundance at this time, is a trigger for management action as discussed in the following section. Total cover by non-native non-invasive plants was 18.5%. Most of this cover is attributable to fat-hen, an early seral plant that may decline over time as other species become established.

* The High Marsh Ecotone Report, 2014, prepared by H.T. Harvey is available upon request. Results are summarized from the report.

VEGETATION

Monitoring Task: Salt Marsh Habitat Mapping

Agencies: Coastal Commission

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

Description: Map the salt marsh habitat acreage on Phase 1 of the Salt River Ecosystem Restoration Project

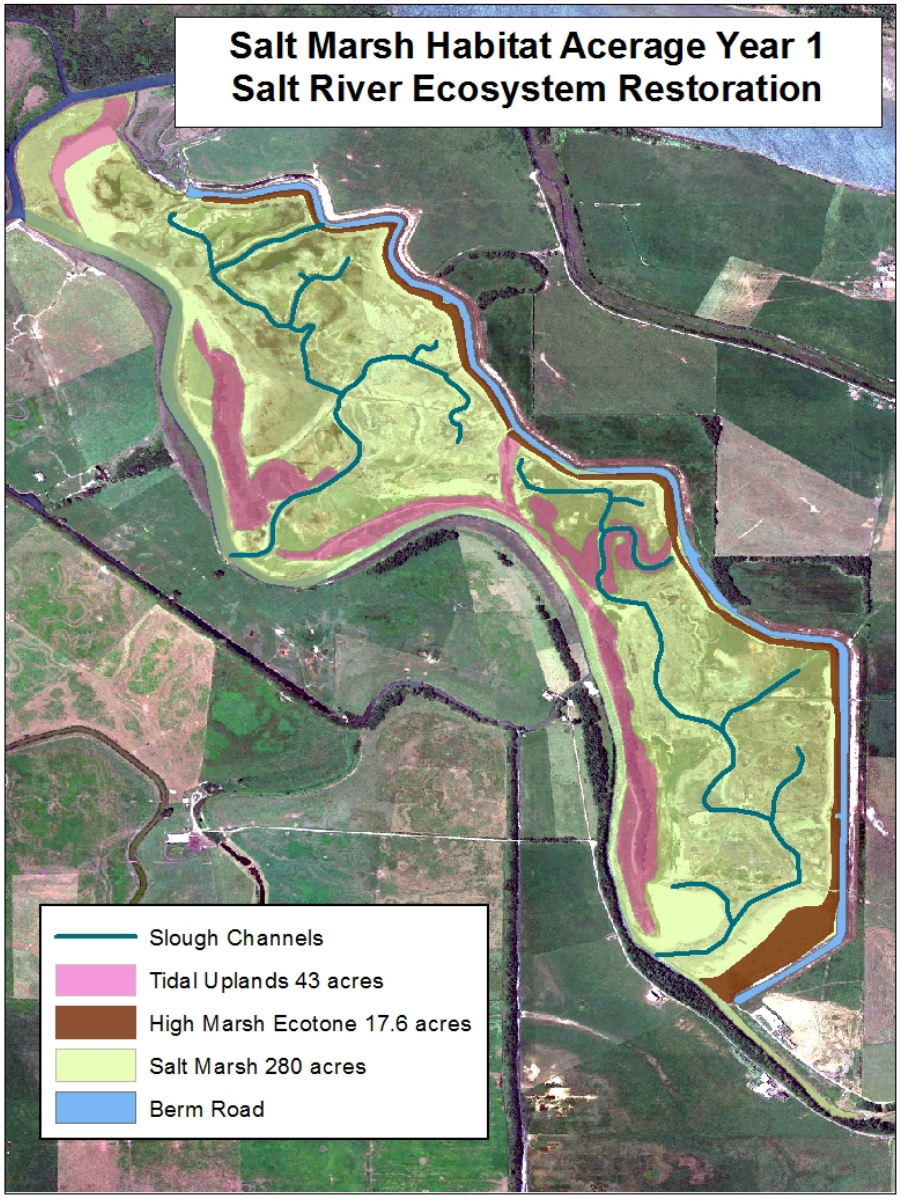
Goals:

- Reach a predicted 322 acres of salt marsh habitat

Methods:

The Humboldt County Resource Conservation District prepared a map depicting the current extent of salt marsh area on Phase 1 of the SRERP. Estimated acreage of tidal salt marsh habitat is based on a combination of aerial photo-interpretation, design plans, As-Built elevations, USGS 1-ft contours, estimated slough channel area, riparian acreage, and an earlier habitat acreage analysis performed for the high marsh ecotone (HT Harvey 2014). Satellite imagery (Google Earth 28 May 2014) and Geographic Information Systems (GIS) software were tools employed for the development of the map. Based on the restoration design, it was projected that the salt marsh habitat would occupy elevations below 7.5 feet (HT Harvey and Winzler & Kelly 2012). Based on the above imagery and elevations, supported by site observations, the salt marsh acreage in the tidal portion of Phase 1 was calculated using GIS software.

Map:



Results & Discussion:

In the Project's HMMP document, created for the Salt River Ecosystem Restoration Project, indicates that 36 acres of tidal salt marsh existed prior to restoration construction. The HMMP projected that 322 acres of tidal salt marsh would be developed on Phase 1. The post construction Year 1 estimation of tidal salt marsh acreage is calculated to be 280 acres; 42 acres short of the projected area (see below table).

Land Use and Habitat Projections (all units in acres)

	Phase 1 - Riverside Ranch				
Habitat Type	**Pre - Construction**	**Removed**	**Project Created**	**Total Created (Project Goal)**	**Year-1**
Tidal Salt Marsh	36	14	300	322	**280**

Subsequent vegetation monitoring in the following years will determine if the higher elevations in the tidal area of Phase 1 will develop into salt marsh habitat. Much of the fringes of the mapped tidal uplands often becomes inundated with higher high tide cycles and may recruit with salt marsh plant species such as salt grass and pickle weed.

VEGETATION

Monitoring Task: Riparian and Wetland Species Mapping and Monitoring

Agencies: Coastal Commission

Documents: Coastal Development Permit- Special Conditions; SRERP Habitat Mitigation and Monitoring Plan

Description: Map the average percent cover native wetland plant, trees, shrubs, and herbaceous species in the Salt River corridor.

Goals:

- To reach success criteria of 10% cover of wetland species in Year 1 as stated in SRERP's Habitat Mitigation Monitoring Plan.
- To meet a non-invasive, non-native species cover criteria of 15% or less in Year 10 in planted areas.
- To meet an invasive-non-native species cover criteria of 5% or less in Year 10 in planted areas.
- Map planted riparian species for Year 1. A percent cover criteria is not established for Year 1.

**** Not Completed** Due to significant drought conditions at the end of the construction period in 2013, a consensus was formed that no re-vegetation would occur on Phase 1 of the Salt River project until a suitable wet season is predicted.

VEGETATION

Monitoring Task: Rare Plant Survey - Eelgrass

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

Documents: Coastal Development Permit- Special Condition 11; Salt River Ecosystem Restoration Project Final Environmental Impact Report (FEIR) (Mitigation Measure 3.3.1-6) and Salt River Ecosystem Restoration Project Rare Plant Mitigation and Monitoring Plan.

Description: Monitoring the natural recruitment of eelgrass and locate invasive eelgrass species. Map extent, percent coverage, density of eelgrass beds in the main stem Salt River channel.

Goals:

- The Salt River Ecosystem Restoration Project will provide suitable habitat for replacing impacted populations native eelgrass; a plant species considered rare or threatened by the California Native Plant Society (CNPS 2010).
- Eelgrass recruitment shall have an extent of vegetative cover equal to at least 1.2 times the impacted area and have an average density equal to the pre-construction average density three years after construction.

Methods:

Surveys are to be performed between May and July during minus tides. Surveys shall be repeated annually during the same month(s) each year. Dates included a reference site.

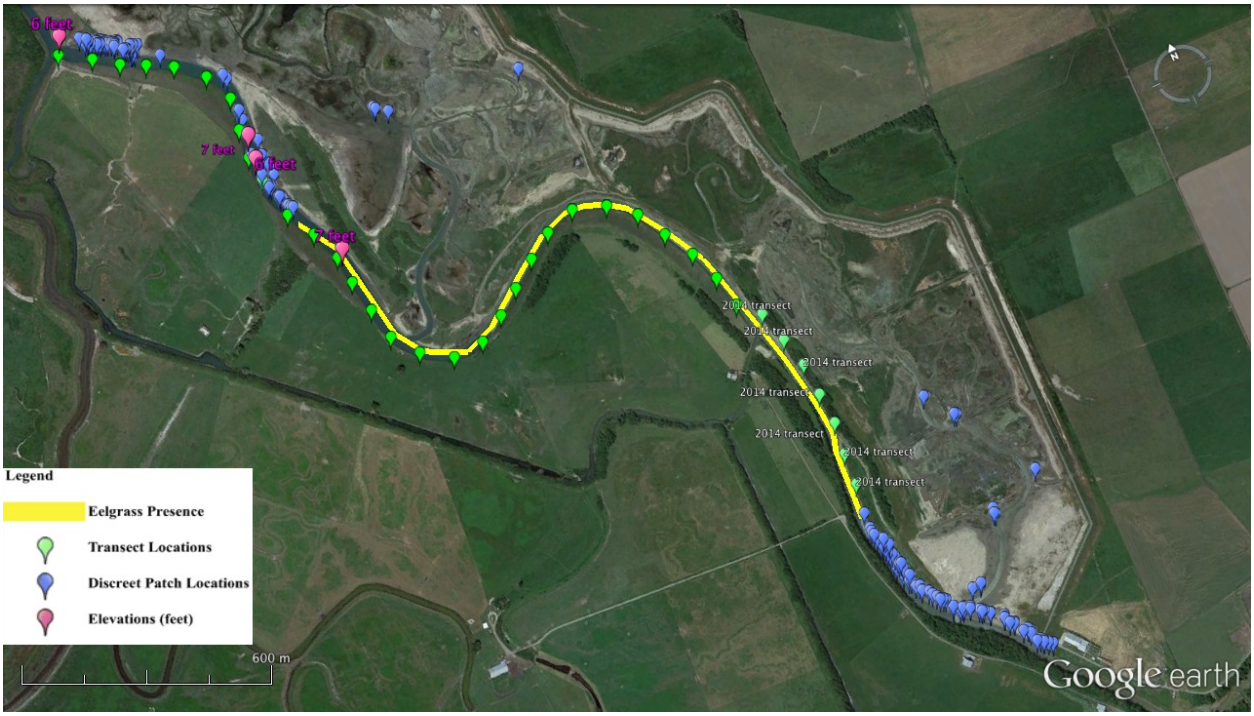
Extent – Identify discreet patches of eelgrass in the main stem. Discreet eelgrass patch location and number of shoots/patch will be recorded. Discreet patches are areas of eelgrass separated by at least a meter from surrounding eelgrass. Length and location of continuous beds of eelgrass are to be recorded and mapped. Perform in May.

Percent Cover - Bottom percent cover is visually estimated by measuring how much of the substrate was covered by eelgrass. Percent bottom cover is defined as total plant cover/total bed area.

Density - Shoot density is defined as number of shoots/m^2. Eelgrass percent cover and shoot density can vary according to channel depth; therefore, percent cover and density measurements will be spaced evenly across the channel. The channel can be divided evenly into four cross-sectional zones: 1) north right bank to north mid slope, 2) north

mid slope to north low slope, 3) south low slope to south mid slope, 4) south mid slope to south bank.

Map:



Results and Discussion:

As part of the Salt River Ecosystem Restoration Project (SRERP), seasonally appropriate rare plant surveys are conducted to determine the existence of special-status plant species (i.e., rare, threatened or endangered) within the project area. As part of the rare plant surveys, eelgrass surveys were performed prior to construction activities.

In 2013, Phase 1 of the SRERP restored 2.5 miles of main stem Salt River channel. Prior to construction, an observational survey estimated that eelgrass beds were present along a continuous 0.91 to 1.2 meter wide band on either side of the Salt River main stem within the lower 2,286 meters (1.4 miles) of the project area. To widen the channel, restoration excavation removed the western side of the channel, thus disturbing one side of the associated eelgrass beds (the eastern eelgrass beds were not impacted).

The expansion of the newly excavated channel provides approximate 5.6 acres of new potential eelgrass habitat in the main channel. In addition, an internal tidal slough

network was created on the Riverside Ranch which shares similar hydraulic and geomorphic characteristics of the existing Salt River channel, thus providing suitable eelgrass habitat. The extent of the proposed internal tidal slough network and projected eelgrass habitat created is approximately 8.7-acres.

Year 1, 2014, surveys were performed between May and July during minus tides. Dates included a reference site. Survey results are summarized from the 2014 Salt River Ecosystem Restoration Project Eelgrass Survey (Manning 2014).

Extent - In 2014, 161 discrete patches of *Z. marina* were observed in the Salt River, and the newly excavated slough channels. The range of *Z. marina* within the main channel of the Salt River, and newly formed slough channels increased by 2,900 meters from the pre-construction extent survey. The eelgrass extent discussed below is defined as the length of channel where *Z. marina* was observed within the range of the project area including both continuous, and discrete patches.

In 2013, there were 35 discrete patches of *Z. marina* in the Salt River. Within these patches, there were an approximate total of 388 individual *Z. marina* shoots. In 2014, there were 161 discrete patches of *Z. marina* in the Salt River and the newly formed slough channels. Within these patches, there were an approximate total of 833 individual *Z. marina* shoots. Within the discrete patches, there were significantly more shoots in 2014 than in 2013 ($p = 0.029$, $t = 2.26$, $df = 38$). In 2013, the total length of continuous *Z. marina* beds in the Salt River was 2,053 meters. In 2014, the total length of continuous *Z. marina* beds in the Salt River was 2,060 meters.

Percent Cover - The 2014 average *Z. marina* percent cover of the Salt River sampled areas was: Zone 1 (Z1) = 0.87 %; Zone 2 (Z2) = 0.77 %; Zone 3 (Z3) = 1.5 %; and Zone 4 (Z4) = 3.86 %. *Z. marina* percent cover for each zone in the Salt River project area is summarized in Table 1. For comparison, 2013 *Z. marina* percent cover for each zone in the Salt River is summarized in in the following Table. Out of the 37 sample quadrats along the main Salt River channel, 3 plots from Zone 1, and 10 plots from Zone 4, were cut banks, or eroded, so that measurements were impossible. The location of each of the 37 Salt River transect locations where *Z. marina* percent cover and density measurements were measured are shown in following Table. The same transects were used from the pre-construction 2013 survey and an additional 7 new transects were added to cover the recruitment of *Z. marina* upstream.

2014 *Z. marina* percent cover within the Salt River project area. Estimated percent cover/m^2 represents percent cover of the sampled area extrapolated over the total project area. The combined estimated percent cover is a mean of the four zones.

Zone	# of Samples	Sampled Area (m^2)	% Cover	Total Area (m^2)	Estimated Total Cover	Std. Dev. of Total Cover	Est. % Cover/m^2
1	34	2.13	1.9	23750	20709	28212	0.9
2	37	2.31	1.8	23750	18320	21534	0.8
3	37	2.31	3.5	23750	35530	51952	1.5
4	27	1.69	6.5	23750	91742	73065	3.9
Combined	135	8.44	13.6	95000	166301	174764	1.8

2013 *Z. marina* percent cover within the Salt River project area.

Zone	# of Samples	Sampled Area (m^2)	% Cover	Total Area (m^2)	Estimated Total Cover	Std. Dev. of Total Cover	Est. % Cover/m^2
1	24	1.50	4.7	4514	14044	26271	3.1
2	30	1.88	30.8	4514	74230	67096	16.4
3	30	1.88	27.4	4514	66045	69239	14.6
4	22	1.38	4.5	4514	14624	17958	3.2
Combined	106	6.63	67.4	18056	168942	180564	9.4

Z. marina percent cover in the Salt River was significantly higher in zones 2 and 3 in 2013 than it was in 2014 (p = 0, 0; t = 5.70, 4.51, df = 29, 30). Salt River *Z. marina* percent cover in zones 1 and 4 did not differ significantly between 2013 and 2014 (p = 0.137, 0.186; t = 1.54, 1.34, df = 26, 44). Likewise, *Z. marina* percent cover in Morgan Slough was significantly higher in zones 2 and 3 in 2013 than it was in 2014 (p = 0.013, 0; t = 2.61, 5.05; df = 40, 40). Morgan Slough percent cover in zones 1 and 4 did not differ significantly between 2013 and 2014 (p = 0.091, 0.546; t = 1.72, 0.611; df = 46, 27).

Shoot Density - The 2014 average *Z. marina* shoot density in the Salt River sampled area was: Z1 = 25.9; Z2 = 23.4; Z3 = 35.5; and Z4 = 87.1. The *Z. marina* shoot density for each zone in the Salt River project area is summarized in the below tables. For comparison, 2013 *Z. marina* shoot density for each zone in the Salt River is summarized in Table below. Post-construction *Z. marina* shoot density for the entire population within the project area was 43.0 +/-0.23 shoots/m^2.

2014 *Z. marina* shoot density within the Salt River project area.

Zone	# of Samples	Sampled Area (m^2)	Shoot #	Total Area (m^2)	Estimated Shoot #	Std. Dev. Of Total Shoots	Est. Density (Shoots/m^2)
1	34	2.13	55	23750	614706	6490	26
2	37	2.31	54	23750	554595	5296	23
3	37	2.31	82	23750	842162	7610	35
4	27	1.69	147	23750	2068889	12123	87
Combined	135	8.44	338	95000	4080352	31520	43

2013 *Z. marina* shoot density within the Salt River project area.

Zone	# of Samples	Sampled Area (m^2)	Shoot #	Total Area (m^2)	Estimated Shoot #	Std. Dev. Of Total Shoots	Est. Density (Shoots/m^2)
1	24	1.50	94	4514	282877	14361	63
2	30	1.88	388	4514	934097	29268	207
3	30	1.88	375	4514	902800	28914	200
4	22	1.38	115	4514	377535	16145	84
Combined	106	6.63	972	18056	2497309	88687	138

Z. marina shoot density in Salt River was significantly higher in zones 1, 2 and 3 in 2013 than it was in 2014 ($p = 0.03, 0, 0$; $t = 2.31, 5.11, 4.58$; $df = 23, 30, 32$). Salt River *Z. marina* shoot density in zone 4 did not differ significantly between 2013 and 2014 ($p = 0.862$, $t = 0.175$, $df = 36$). *Z. marina* shoot density in Morgan Slough was significantly higher in zone 3 in 2013 than it was in 2014 ($p = 0.015$, $t = 2.551$, $df = 40$). Morgan Slough shoot density did not differ in zones 1, 2 and 4 between 2013 and 2014 ($p = 0.146, 0.331, 0.471$; $t = 1.494, 0.985, 0.737$; $df = 29, 40, 18$).

Non-Native Eelgrass - In 2013, eight shoots of *Z. japonica*, the non-native eelgrass, were found in one patch in the Salt River. The GPS location of the patch was 40°37’7.20”N, 124°18’56.34”W. *Z. japonica* was not observed in the Morgan Slough control area. *Z. japonica* was not found in the Salt River or Morgan Slough in 2014.

Recruitment

The Project’s Coastal Development Permit states that eelgrass recruitment shall have an extent of vegetative cover equal to at least 1.2 times the impacted area and have an

average density equal to the pre-construction average density three years after construction.

Utilizing data from the 2013 and 2014 surveys, 0.53 acres were impacted by restoration efforts. Applying the recruitment criteria of 1.2 times the impacted area (0.53 acres) gives the project a goal of reaching an eelgrass bed total area of 0.64 acres. In 2014, the calculated area of eelgrass beds was surveyed to be 1.07 acres. Therefore the project achieved and exceeded the 0.64 acres extent of eelgrass vegetative cover. However, the average pre-construction density of the impacted eelgrass beds was approximately 157shoots/m^2, while the post-construction Year 1 density averaged 28 shoots/m^2. The report findings feel that the project will meet pre-construction densities by Year 2.

*The Post-Construction Eelgrass Survey Report – Year 1 – 2014, prepared by Susannah Manning and Daniel O'Shea, is available upon request. The rusults are a summary of the report.

VEGETATION

Monitoring Task: Invasive Species Mapping and Monitoring

Agencies: Coastal Commission

Documents: Coastal Development Permit- Special Conditions; Salt River Ecosystem Restoration Project Habitat Mitigation and Monitoring Plan

Description: Invasive plant species will be mapped during the spring and fall. Locations of invasive species will be identified.

Goals:

- Maps will be provided for distribution for maintenance contactors
- Invasive plant species will not establish in the restoration area

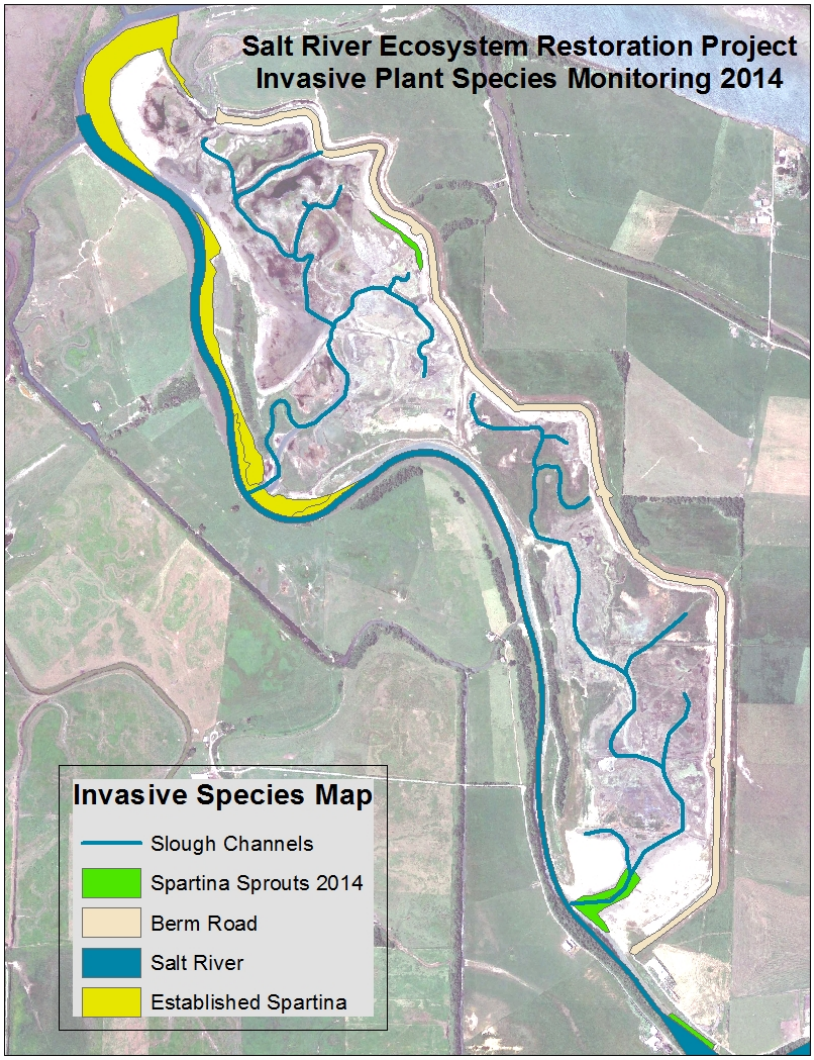
Methods:

Spartina densiflora, a non-native invasive perennial, is the primary invasive plant species that will colonize the estuary portion of the (SRERP). On Phase 1 of the Salt River Ecosystem Restoration Project (SRERP), the main channel and slough channel areas were surveyed (observational) for Spartina in early spring and late summer.

Locations of detected Spartina were noted on a map of Phase 1. Spartina was categorized as “established” plants and “sprouts” (sprouted) plants.

Observational findings were then translated electronically into a GIS mapping system.

Map:



Results and Discussion:

Spartina densiflora, a non-native invasive perennial, is the primary invasive plant species that will colonize the estuary portion of the (SRERP). Spartina was present on Phase 1 prior to restoration activities. All *Spartina* within the excavation footprint was mowed, removed, and buried according project specifications. Areas where excavation

did not occur, the establish *Spartina* areas were mowed to prevent that year's seed production. However, *Spartina* is present on private land across the main Salt River channel and throughout the Eel River Estuary. Therefore, *Spartina* from these adjacent areas provides the seed source that will invade the SRERP Phase 1 site.

Approximately 17acres of established *Spartina* remains on Phase 1. New sprouts were observed near the entrance of the southern slough channel network and in sporadic areas in the high marsh ecotone (the bottom of the berm road prism on the estuary side) and along the southern portion of the main Salt River corridor. These new sprouts cover approximately 5 acres in the estuary portion of Phase 1 and vary in density.

A regional management plan for *Spartina densiflora* is currently being prepared by the California Coastal Conservancy and its partners for invasive *Spartina* in Humboldt Bay, the Eel River Delta, and the Mad River Estuary. The methods developed in that plan shall be used to eradicate dense-flowered cordgrass during long term monitoring. Currently the project is attempting to remove the Spartina sprouts by manual methods as the sprouts can be easily shoveled loose, hand pulled, and removed from the site. Approximately 0.25 acres have been treated, and early spring 2015 efforts are planned. After consulting with an invasive species expert, it was determined that accessible established *Spartina* on Phase 1 should be mowed prior to seed set as feasible until an efficient method of removal is developed.

VEGETATION

Monitoring Task: Aleutian Goose Short-Grass Habitat Monitoring

Agencies: California Department of Fish and Wildlife (CDFW)

Documents: Salt River Ecosystem Restoration Project Adaptive Management Plan

Description: Approximately 72 acres of agriculturally managed land is retained on Phase 1 of the Salt River Ecosystem Restoration Project. Agricultural activities will follow CDFW protocols on the 72 acres where short-grass habitat will be achieved suitable 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 Geese

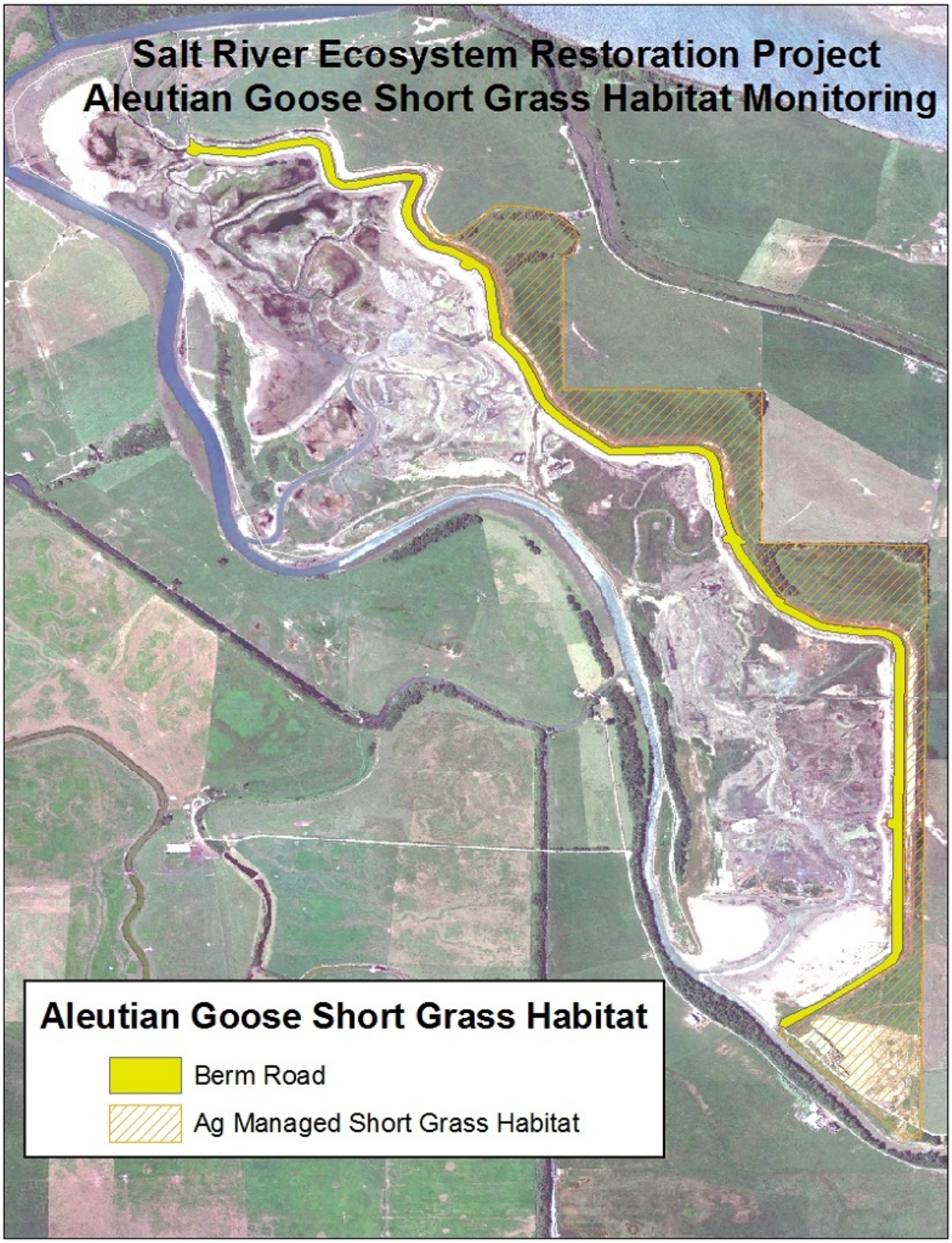
Methods:

From 2001 through 2012 Humboldt County Resource Conservation District (HCRCD) had a Memorandum of Understanding (MOU) with the California Department of Fish and Wildlife (CDFW) to manage leases and oversee agricultural activities on CDFW-owned wildlife areas. The purpose of these types of activities was to achieve a variety of wildlife habitat goals through well-managed agricultural activities. 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 geese, Aleutian cackling geese, 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-owned wildlife areas in Humboldt County, including Riverside Ranch; the site of the Phase 1 tidal marsh restoration.

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 CDWF 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 CDWF conflicted with State regulations.

HCRCD is continuing to work collaboratively with CDFW to develop a state-approved process to utilize agricultural activities to provide short-grass habitat on the retained agricultural lands in Phase 1. Once this process has been established, monitoring methods will be confirmed.

Map:


Salt River Ecosystem Restoration Project
Aleutian Goose Short Grass Habitat Monitoring
Aleutian Goose Short Grass Habitat
Berm Road
Ag Managed Short Grass Habitat

Results and Discussion:

Due to findings of a CDFW internal audit of all Wildlife Management Areas (WMAs) in California, all agricultural activities on WMAs were suspended in 2013/2014. Therefore the 72 acres of pasture reserved for shortgrass habitat was not managed in a way to promote optimal forage for Aleutian Geese during the winter of 2013 nor the spring of 2014. The HCRCD used its own funding to mow the pastures twice during the summer growing season to control weeds and manage the grass. The HCRCD also worked closely with the regional CDFW office to develop a haying contract in late fall to have the overgrown forage removed. Though several months of spent forage was removed, the pastures have grown beyond the "short grass" condition that Aleutian Geese prefer. Therefore, the agricultural managed short grass habitat and the "prime agricultural" status on Phase 1 has been compromised for the winter of 2014 and spring of 2015. Needless to say, a pasture management plan was not developed for Phase 1, nor has any monitoring or evaluation of the habitat has taken place. The HCRCD will continue to work with CDFW in hopes that a satisfactory solution for pasture management will be implemented by 2016.

WILDLIFE

Monitoring Task: Fish Entrainment Monitoring – Phase 1

Agencies: California Environmental Quality Act (CEQA)

Documents: SRERP's Final Environmental Impact Report (FEIR)

Description: Monitor Riverside Ranch tidal marsh for fish being trapped or disconnected from the main stem of the Salt River channel when tides recede.

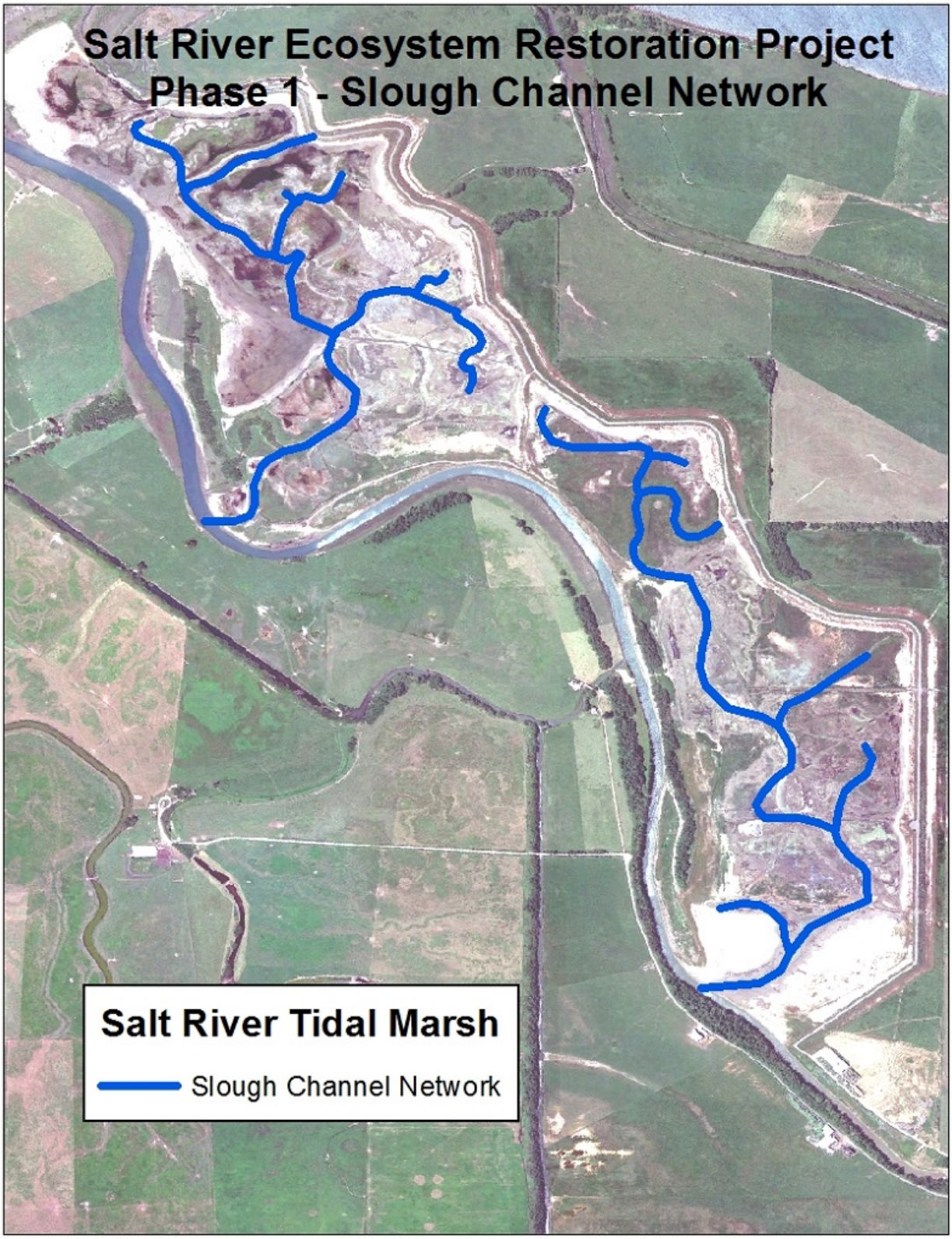
Goals:

- Determine that slough channel configurations are conducive to ingress and egress of fish during low tides.

Methods:

During the lowest daytime low tide, the slough channels will be walked to observe if fish are trapped in low depressions. GPS coordinates will be taken at areas where the channels appear to hold fish. Number of fish and life stage will be noted.

Map:


Salt River Ecosystem Restoration Project
Phase 1 - Slough Channel Network
Salt River Tidal Marsh
Slough Channel Network

Results and Discussion:

The southern slough network of Phase 1 was observed in February 2014 during a 1.3 low tide (Humboldt Bay – North Spit). Adjacent areas with ponded water were also surveyed. The northern slough channel network was similarly surveyed in April 2014 during a 0.7 low tide. The observers walked along the sides of the slough channels looking for: isolated depressions of water where fish could be trapped; exposed channel bottoms; and marooned fish. Observations indicated that no fish were being trapped or marooned; nor were channel bottoms completely exposed with adjacent low depressions. Additionally, two adult Coho were observed in a slack water area in the southern slough network.

*The Fish Entrainment/Trapped Monitoring Memo, 2014, prepared by HCRCD, is available upon request

WILDLIFE

Monitoring Task: Salmonid and Tidewater Goby Monitoring

Agencies: Coastal Commission

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:

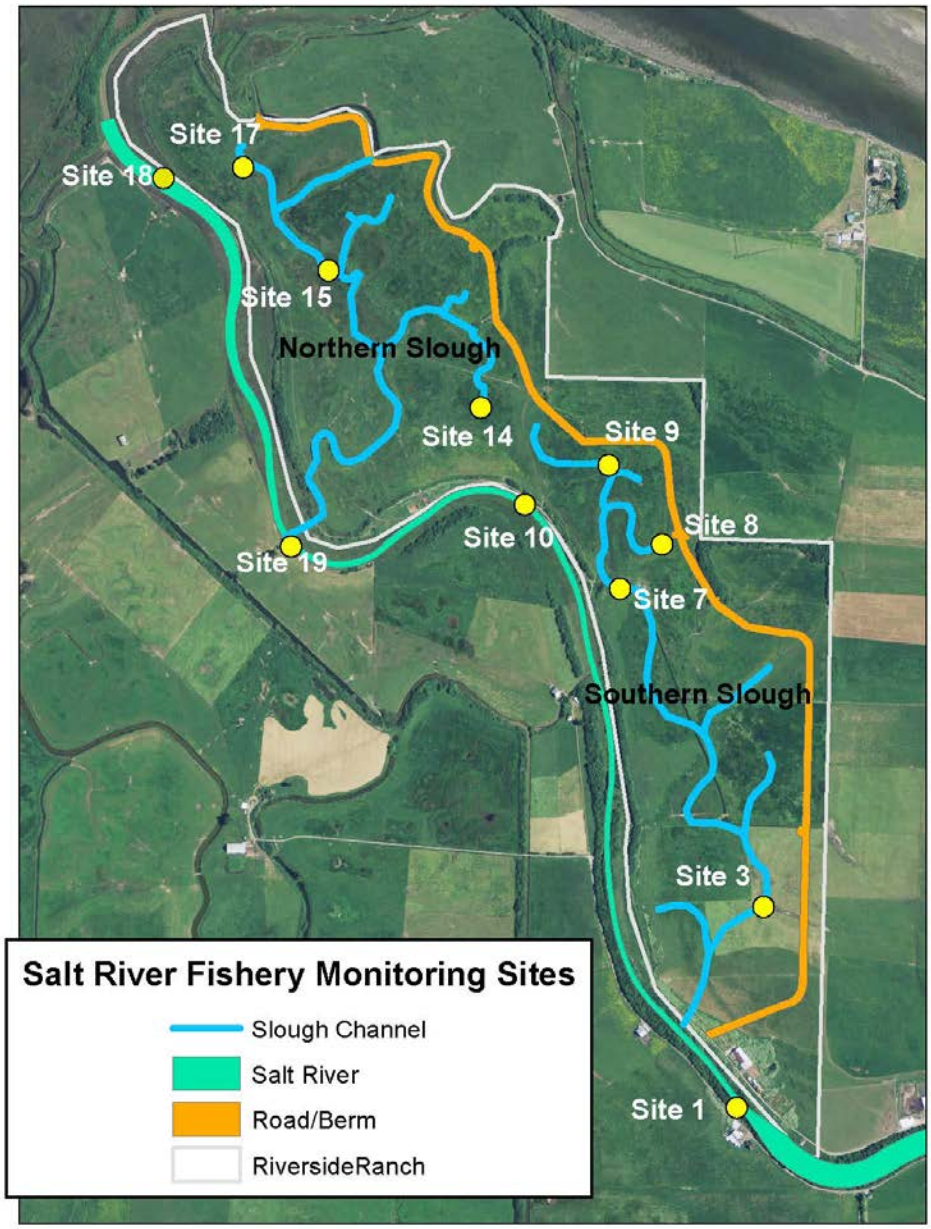
- Surveys will show that salmonids and tidewater gobies will utilize the restored Salt River main channel and the tidal slough networks.

Methods:

Once a month, during low tide periods, sites across the Phase 1 portion of the Salt River Ecosystem project were surveyed for salmonids and tidewater gobies from March to July. Eleven sites on the Salt River Phase 1 restoration project area were selected for fish presence and distribution monitoring to represent the diversity of channel size and habitats in the main Salt River channel in the slough network. Each site is sampled using a 1/8th inch mesh pole seine net and a baited minnow trap. Minnow traps are baited with a 2 cm diameter ball of certified disease free salmon roe and deployed at sites for no less than one hour. Typically a single 1/8th inch mesh pole seine pass is

made through each site. Captured fish are held in aerated buckets, identified to species, counted, and released back into the waterway. Additionally, juvenile salmonids are measured, held in a recovery bucket, and then released back into the waterway. Captured pike minnow are enumerated into 100 millimeter size classes by ocular estimation, and the non-native pike minnow are humanely euthanized and buried via permit requirement. A start time, end time, and air and water temperature, measured by thermometer, are recorded for each minnow trap and seine deployment. Start and end water salinity and dissolved oxygen measurements are also recorded for each minnow trap and seine deployment.

Map:



Results and Discussion:

The following total number of fish sampled over five months (March to July) at 11 survey sites, are provided below:

Fish Type	Number Sampled
Coho (juvenile)	40
Chinook (juvenile)	6
Tidewater Goby	327
Sticklebacks	25,975
Sculpin	1,753
Smelt (unidentified juvenile)	1,026
Top Smelt	929
Surf Smelt	29
Night Smelt	183
Pipefish	17
Pike Minnow	34
Shiner Perch	6
Copper Rock Fish	1
Starry Flounder	3
Dungeness Crab	8
Jellyfish	5
Pacific Herring	5
Gunnel	8
Surf Perch	8

Both salmonid juveniles (Coho and Chinook) were only present during the months of March and April, and primarily located in the northern main channel and northern slough channels. The tidewater gobies were present during the entire sampling season, though more abundant during the summer months. The gobies were sampled across most locations on Phase 1, though most abundant at the terminal ends of the southern slough channel network (sites 7, 8, and 9) and associated with specially designed backwater features.

*Full monthly Salt River Restoration Project Fisheries Monitoring Reports, 2014, prepared by CDFW, are available upon request.

GEOMORPHIC

Monitoring Task: Restoration Documentation Photos

Agencies: NCIRWM Plan and Consolidated Grants Program

Documents: Salt River Monitoring Plan 2008

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

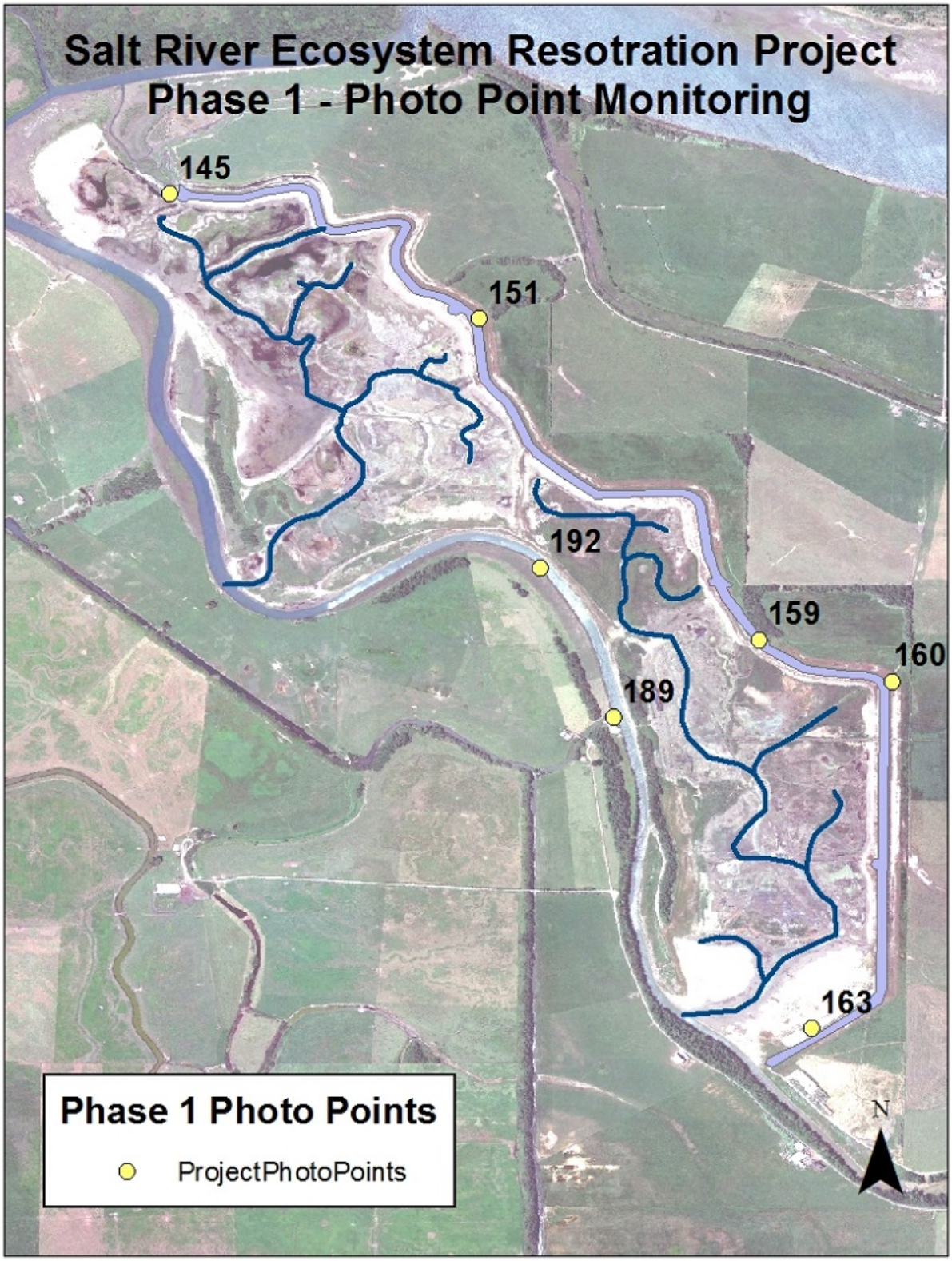
Goals:

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

Methods:

Seven photo monitoring sites were established across Phase 1during the pre-construction period. These same sites are used post-construction. Handheld GPS units are used to navigate to photo point sites. The compass direction of the photo is recorded and aligned with previous photo elements. Post-project photos will be taken during the same season or month as pre-project photos (Fall/November).

Map:


Salt River Ecosystem Resotration Project
Phase 1 - Photo Point Monitoring
145
151
192
159
160
189
163
Phase 1 Photo Points
ProjectPhotoPoints
N

Results and Discussion:

Seven photo point sites are established across the Phase 1 project area. Pre-construction, As-Built, and Year 1 post-construction photos have been taken to date. The following four photos points are a sample of the seven sites.

Photo Point 145

PP145 – SW – July 2011

PP145 – SW – November 2013

PP145 – SW – November

Photo Point 160

PP160 – West – July 2011

PP160 – West – November 2013

PP160 – West – November 2014

Photo Point 189

PP189 – Down Stream – Sept 2011

PP189 – Down Stream – Nov 2013

PP189 – Down Stream – Nov 2014

Photo Point 192

PP192 – SE – Sept 2011

PP192 – SE – Nov 2013

PP192 – SE – Nov 2014

A mild winter has helped the project's channel and vegetation stabilize over the first year. The project will continue to equalize over the years.

*The complete SRERP – Phase 1, Photo Monitoring – Year 1, 2014 document, prepared by the HCRCD, is available upon request

GEOMORPHIC

Monitoring Task: Cross Sectional and Longitudinal Surveys/Riverside Ranch Erosion and Sediment Deposition Surveys

Agencies: NCIRWM Plan and Consolidated Grants Program, Coastal Commission, and California Environmental Quality Act (CEQA)

Documents: Salt River Monitoring Plan 2008; 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.

Methods:

The cross-sectional surveys were conducted on the main channel of the lower Salt River, and of the newly excavated slough channels, in both the northern and southern regions that were excavated during the Summer of 2013. A longitudinal survey was conducted of the lower main Salt River channel from Cutoff Slough to the Riverside Ranch barn. This effort concentrates on Phase One of the restoration Project in the Estuarine and Salt Marsh portions. All elevations are geo-referenced in feet to the 1988 North American Vertical Datum (NAVD88).

Three cross-sectional profiles of the main Salt River channel, and three cross-sections in each of the northern and southern slough channels, were collected using a CTS/berger automatic level, tripod and stadia rod along the lower, middle and upper sections of the main Salt River channel. (Documents entail that surveys perform six cross-sectional surveys in each of the slough channel networks, however, with low tide coinciding with late evening darkness over two months, the project opted for three cross-sectional surveys in each of the slough channel networks.) Permanent, rebar monuments were set on both sides of the main channel and referenced to the Salt River Ecosystem Restoration Project's survey control points SR12, SR14 and SR11. The cross-sectional monuments were established using 4-foot lengths of ½"-rebar pounded into the substrate, leaving 3-inches exposed, and topped with labeled end caps. GPS (Garmin GPSMAP 62s) locations were recorded for each monument, along with photo documentation.

Elevations and distances were collected at each major break in slope, vegetation edge (dotted line), water's edge, mid-channel, and at least 2 locations on either side of mid-channel. These are indicated by the tick marks (+) on the cross-section graphs. Flood plain measurements were collected approximately 200-feet on either side of the main channel. The only exception was cross-section three, the upper most section, where dense vegetation obscured visibility on the south side of the channel.

The longitudinal profile survey of the main Salt River channel from Cutoff Slough to the Riverside Ranch barn was collected using a Nikon DTM-352 Total Station laser theodolite, tripod, stadia rod, prism pole and single prism. Due to the aforementioned adverse surveying conditions, wetsuits and a standup paddleboard were used to locate the thalwag during the 2-day survey. The prism pole was secured to the stadia rod at a height of 10.28 feet to account for the deep-water conditions at the time of the survey. The prism pole was placed in the thalwag approximately every 200-feet with the total station located at one of four locations along the north bank of the main Salt River channel and geo-referenced to the project's survey control points SR11, SR 14 and SR 12. A total of 48 measurements were taken along the Salt River. All elevations are reported in feet using the NAVD88 vertical datum.

Map:

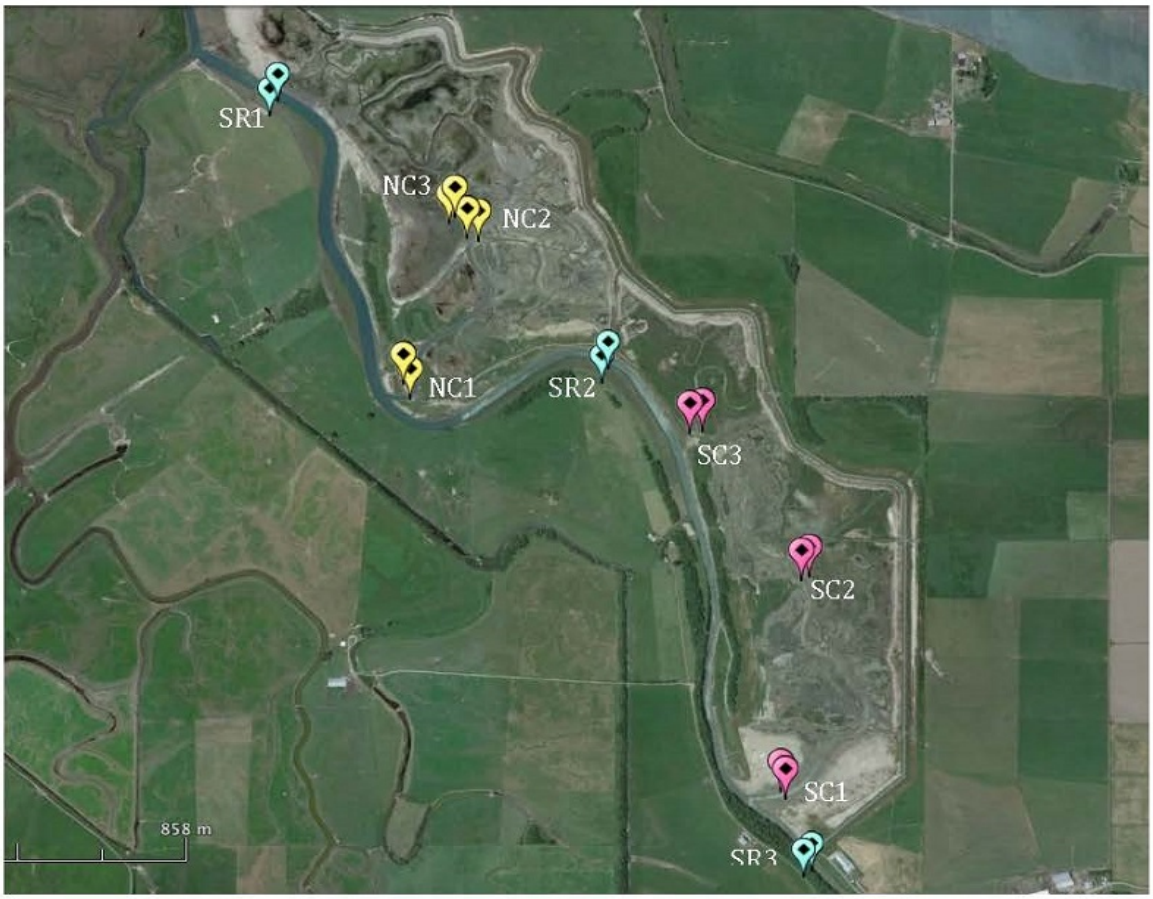


Figure 1: Location of the cross-section profiles for Salt River Ecosystem Restoration Survey Project, Fall 2014. SR = Salt River cross-sections; NC= new North Channels cross-sections; SC= new South Channel cross-sections.

Results and Discussion:

Results of the cross-sections determine the width and depth of the channels. These values will be used as a reference for future surveys to determine aggradation or erosion in the channel structure. The following are the cross-sectional and longitudinal profiles for the Salt River main channel and the southern and northern slough channel network.

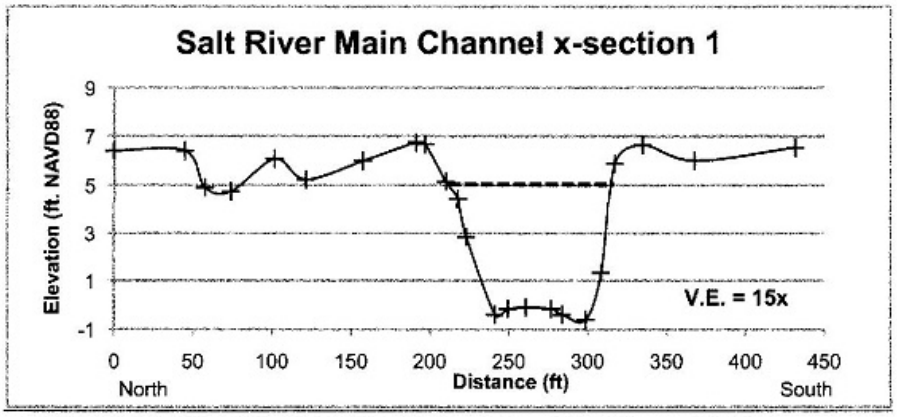


Figure 5A: Salt River Main Channel cross-section SR1. V.E. is the vertical exaggeration.

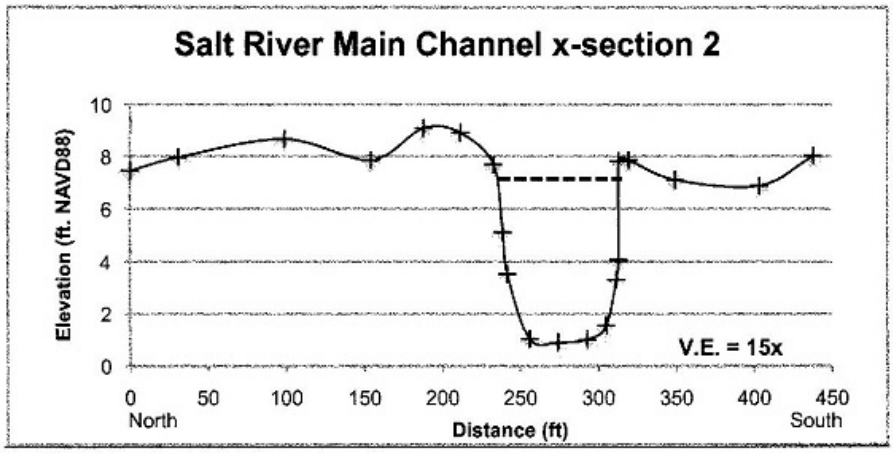


Figure 5B: Salt River Main Channel cross-section SR2.

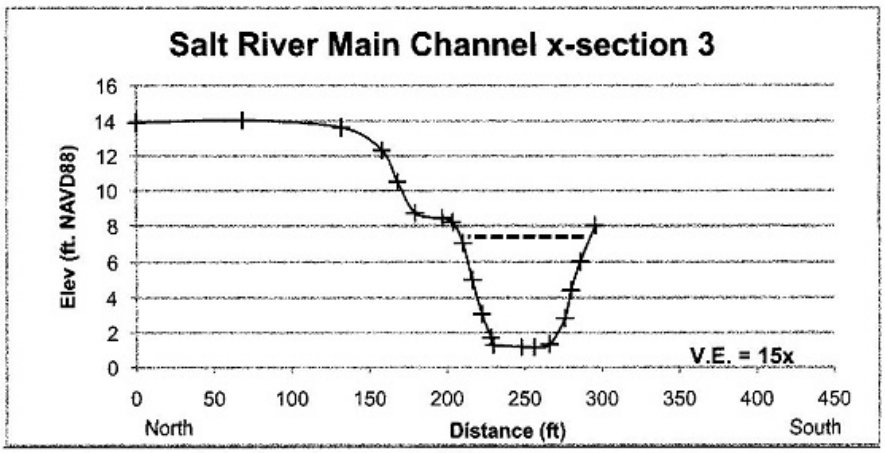


Figure 5C: Salt River Main Channel cross-section SR3.

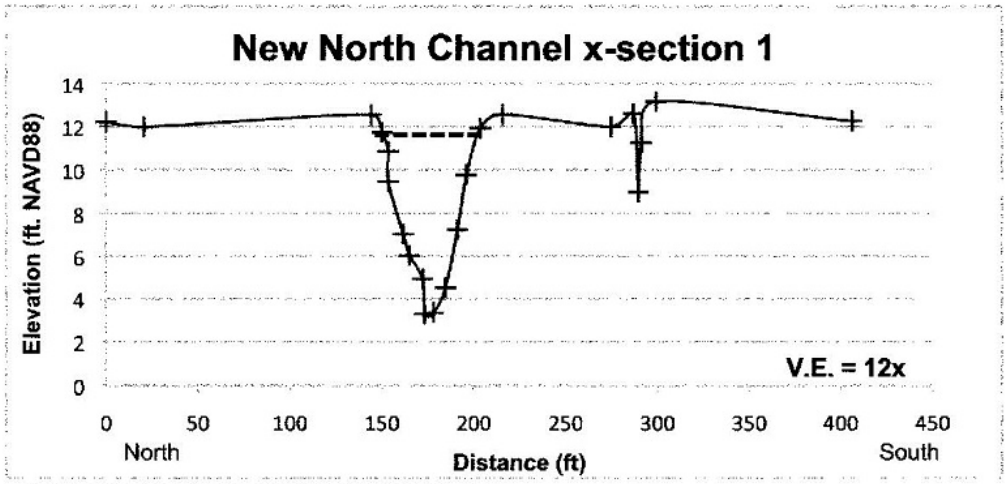


Figure 7A: New North Channel cross-section NC1

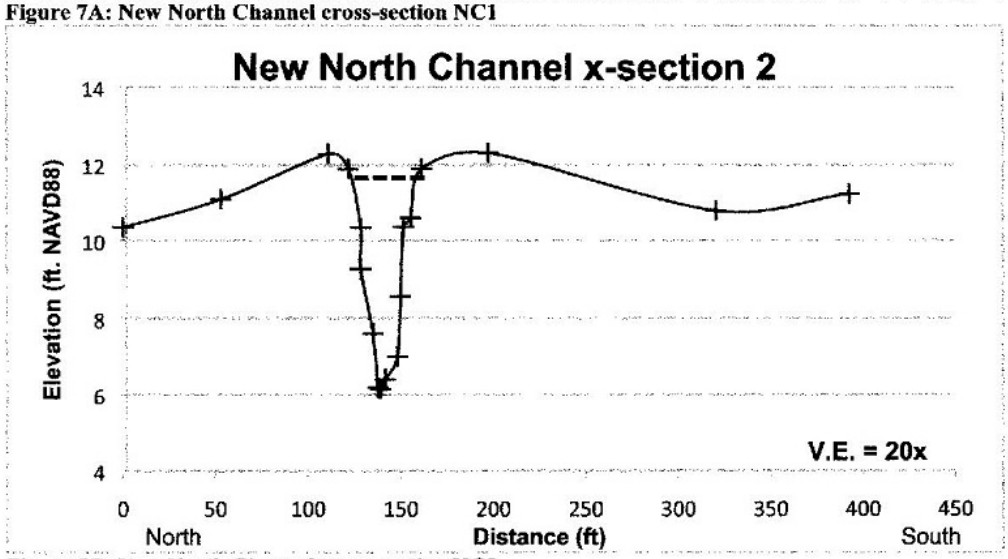


Figure 7B: New North Channel cross-section NC2

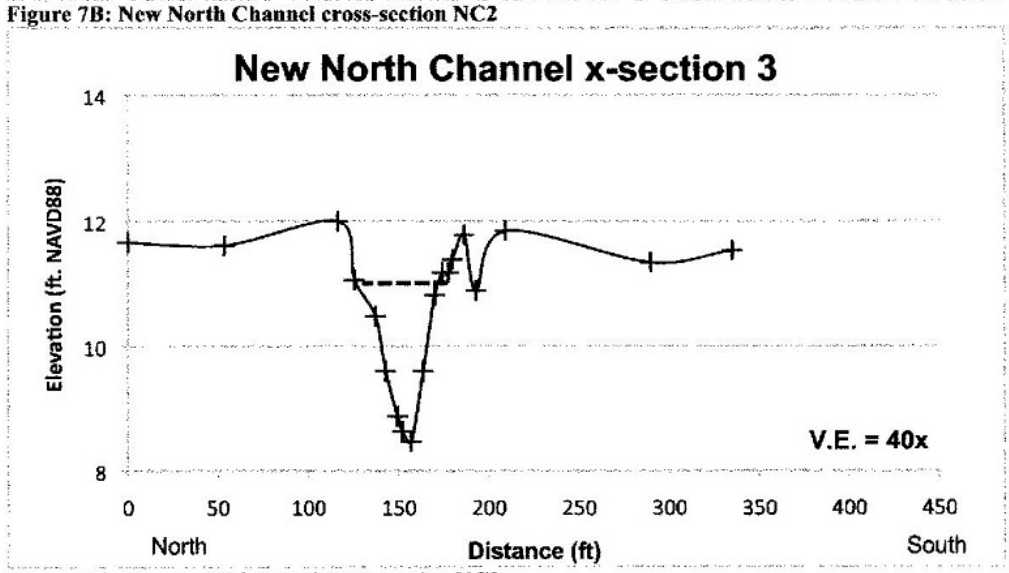


Figure 7C: New North Channel cross-section NC3

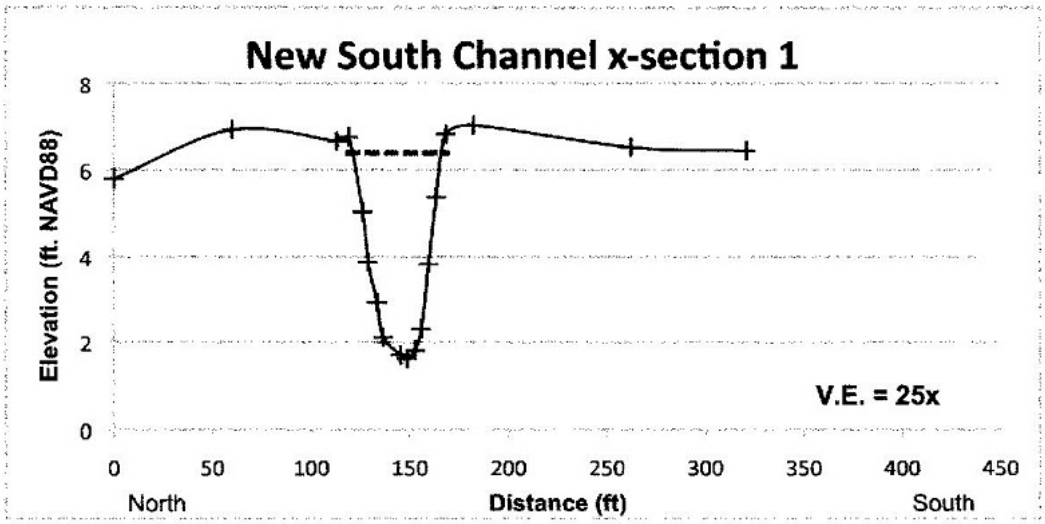


Figure 8A: New South Channel cross-section SC1

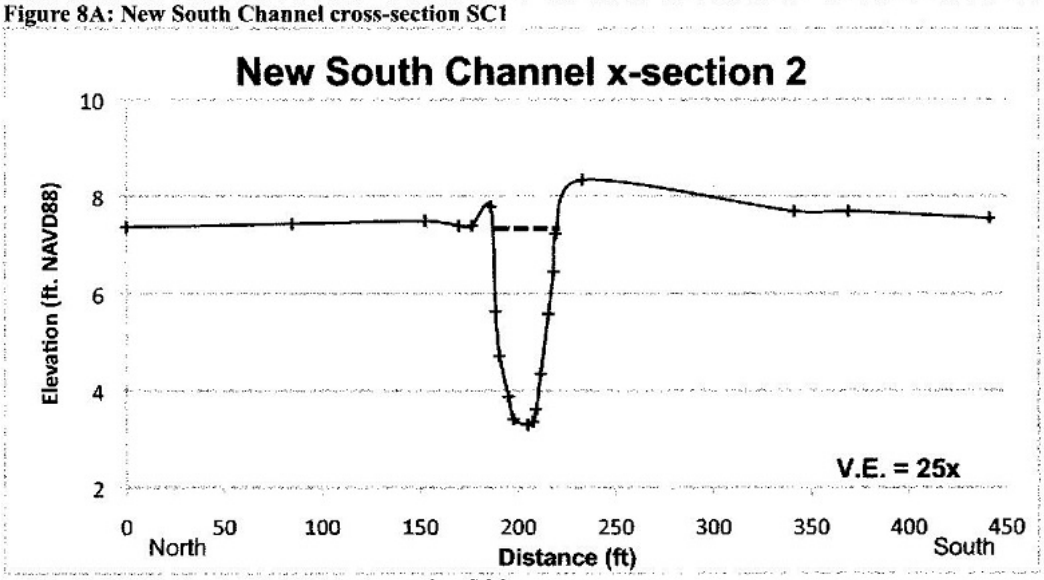


Figure 8B: New South Channel cross-section SC2

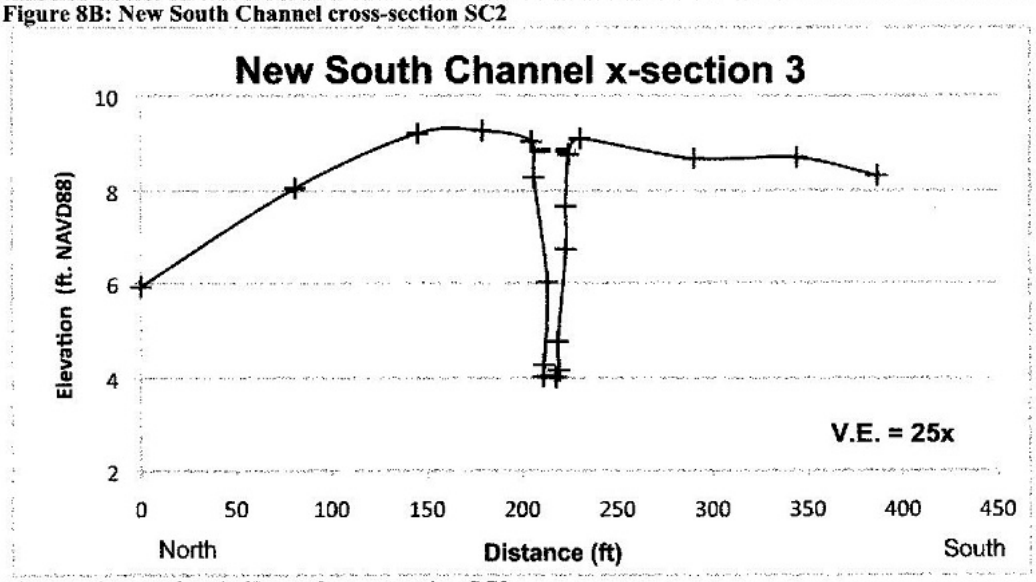


Figure 8C: New South Channel cross-section SC3

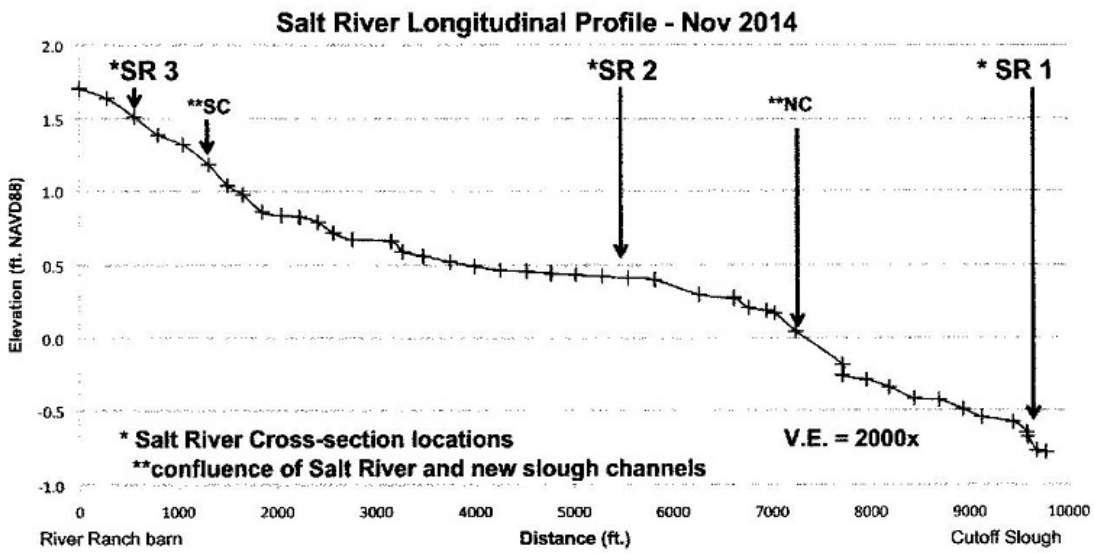


Figure 10: Longitudinal profile of the main channel of the Salt River – November 2014 from River Ranch barn to Cutoff Slough. The locations of Salt River main channel cross sections, and the confluence with the new South Channel (SC) and North Channel (NC) are indicated.

The 9,775 foot longitudinal profile in the Salt River main channel from the Riverside Ranch barn to the confluence of Cutoff slough shows a 2.5' drop in elevation. The southern and northern slough channels did not have longitudinal profiles formally performed. However based on the three cross-sectional surveys in each slough channel network, the northern slough channel has a relief of 5.2'; the southern slough channel drops 2.4' in elevation.

* The Post-Construction Channel Monitoring of Salt River, Phase One, 2014, prepared by Susannah Manning and Daniel O'Shea, report is available upon request.

GEOMORPHIC

Monitoring Task: Culvert and Tide Gate Inspections on Riverside Ranch

Agencies: Coastal Commission

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

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

Goals:

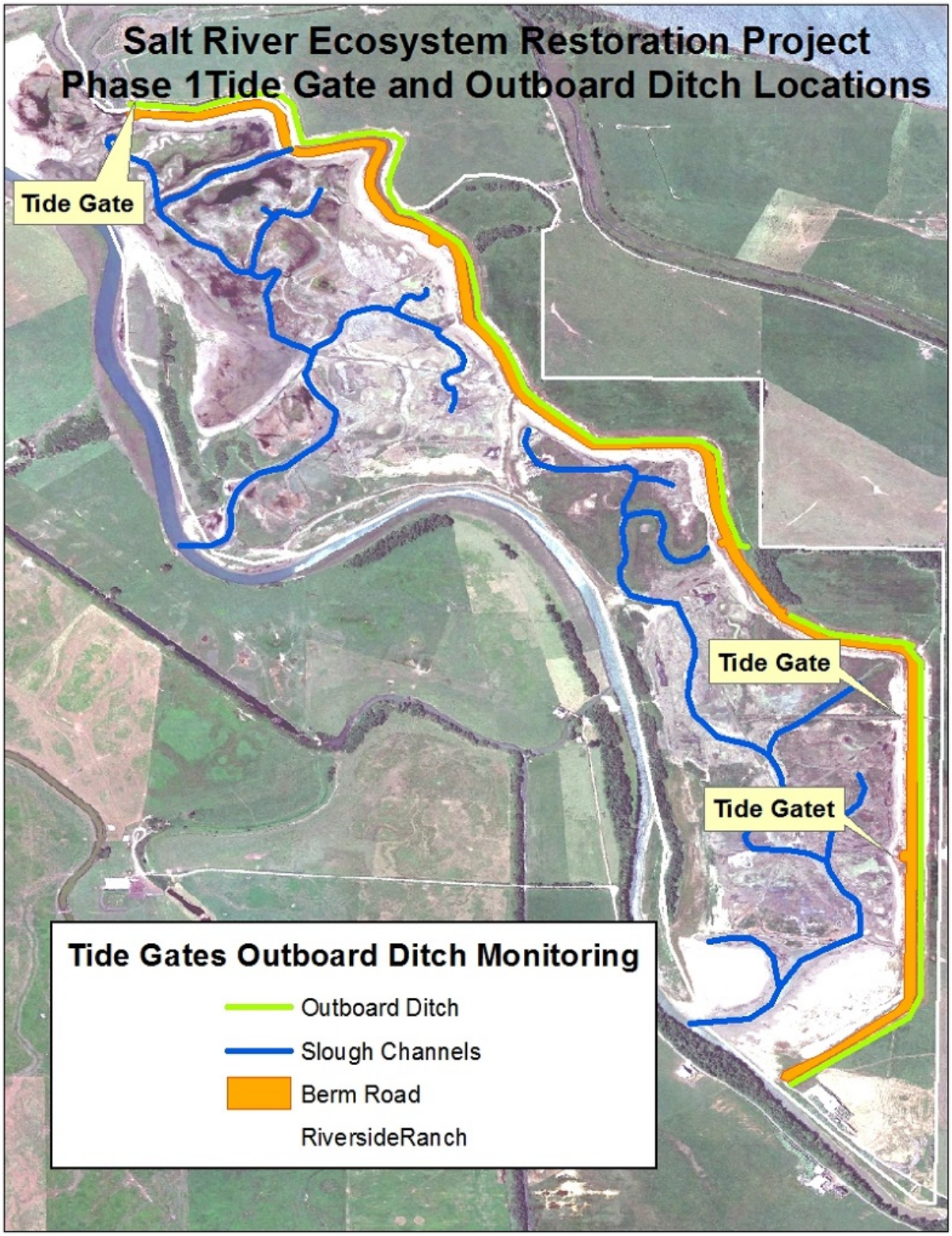
- All tide gates and remaining culverts on Riverside Ranch remain unobstructed and operational.
- The Riverside Ranch outboard ditch will be monitored for flow and erosion impacts and maintained

Methods:

Any culverts or tide gates remaining or installed in Riverside Ranch 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 new 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 outlines that monitoring take place annually, during 2014 HCRCD staff monitored the above items at least weekly to ensure tide gates and the outboard ditch are working properly to not allow high salinity water to encroach 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 condition, fencing, wildlife, roads, structures, etc. The forms are reviewed by the Project Manager to determine any issues that need to be addressed. Monthly reports are forwarded to CDFW Lands Division staff.

Map:



Results and Discussion:

At least weekly, the Phase 1 (Riverside Ranch) project area is monitored for various items. These items include the three tide gates and an outboard ditch. No culverts remain on Riverside Ranch; all culverts were removed during construction. The 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 has been observed to leak more than the other two during higher tide events. The outboard ditch has more than accommodated the excess water during the summer and fall months. During this year's (2014) largest storm event, 3" of precipitation and the Eel River reaching 17.0', the outboard ditch was overwhelmed with rainfall, water sheeting towards Riverside Ranch from adjacent properties, and the tide gates unable to open and drain due to extreme high tides. However, once the Eel River dropped and low tides coincided, the adjacent lands and outboard ditch drained to normal levels within three days.

In addition, the outboard ditch has been mowed/hayed in the summer and winter to reduce any vegetation impacts.

GEOMORPHIC

Monitoring Task: Setback Berm Inspection

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

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.

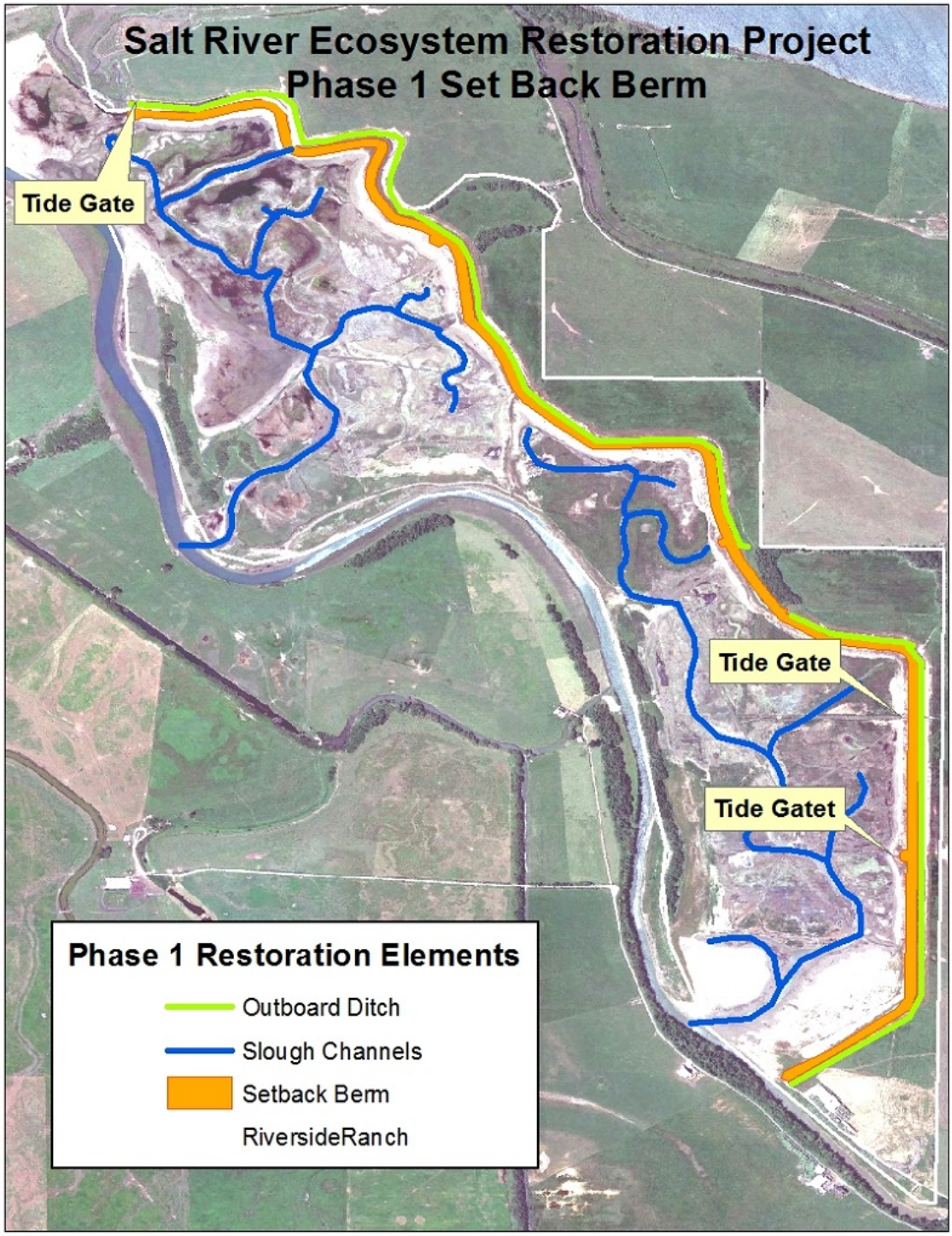
Goals:

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

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 flooding and erosion 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.

Map:


Salt River Ecosystem Restoration Project
Phase 1 Set Back Berm
Tide Gate
Tide Gate
Tide Gatet
Phase 1 Restoration Elements
Outboard Ditch
Slough Channels
Setback Berm
RiversideRanch

Results and Discussion:

As described previously, the HCRCD makes weekly observations on the various elements on Riverside Ranch. Making observations on the setback berm and the berm road are included in the visual inspections. No erosion or cracking has been observed on the setback berm since conclusion of construction activities in 2013. The 2013/2014 hydrologic year is considered a drought year, thus the project site was not impacted with normal rainfalls or storm events. However, the site has experienced king tides with coinciding large storm events in late 2014. Weekly visual inspections will continue, along with a concentrated inspection of the berm in the summer of 2015.

LIST OF AVAILABLE REPORTS

Fish Entrainment/Trapped Monitoring Memo. 2014. Prepared by the HCRCD

High Marsh Ecotone Report. 2014. Prepared by H.T. Harvey

Tidal Exchange and Water Quality Report. 2014. Prepared by the HCRCD

Salt River Ecosystem Restoration Project – Phase 1, Photo Monitoring – Year 1, 2014. Prepared by the HCRCD

Salt River Restoration Project Fisheries Monitoring Report. 2014. Prepared by CDFW. Monthly reports from March to July of 2014 available.

Post-Construction Eelgrass Survey Report, Year 1 – 2014. Prepared by Susannah Manning and Daniel O'Shea,