H. T. HARVEY & ASSOCIATES
ECOLOGICAL CONSULTANTS

SALT RIVER ECOSYSTEM RESTORATION PROJECT
RARE PLANT
MITIGATION AND MONITORING PLAN

Prepared by:

H. T. HARVEY & ASSOCIATES
with
Winzler & Kelly

Prepared for:

Donna Chambers, Executive Director
Humboldt County Resource Conservation District
Agricultural Center
5630 South Broadway
Eureka, California 95503

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983 University Avenue, Building D • Los Gatos, CA 95032 • Ph: 408.458.3200 • F: 408.458.3210

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LIST OF PREPARERS

Daniel Stephens, B.S., Principal
John Bourgeois, M.S., Associate Ecologist
Donna Ball, M.S., Senior Restoration Ecologist
C. Ellery Mayence, Ph.D., Restoration Ecologist
Seth Lancaster, B.S., Senior Environmental Scientist

SYNTHESIS

This Rare Plant Mitigation and Monitoring Plan has been prepared per the DEIR (Mitigation Measure 3.3.1-6) under the requirements of CEQA. Sensitive plant species surveys were conducted within the Salt River Ecosystem Restoration project area and the only plants detected during those surveys were the Humboldt Bay owl's clover (*Castilleja ambigua* ssp. *humboldtiensis*), Lyngbye's sedge (*Carex lyngbyei*) and eelgrass (*Zostera marina*). This Rare Plant Mitigation and Monitoring Plan establishes a framework for the conservation of these 2 rare plant species known to exist within the Salt River Ecosystem Restoration Project area in addition to eelgrass (eelgrass) which was found during surveys within the project area. Mitigation measures are also included for one additional plant species, Point Reyes bird's beak (*Cordylanthus maritimus* ssp. *palustris*) which was not found during surveys within the project area but which is known to exist within the greater region

This document identifies restoration objectives and plant ecological characteristics, as well as managerial and technical aspects to be considered for both preservation and post-construction reintroduction. The projected natural recruitment areas for these species will be determined during development of the 75% revegetation design when the elevations for the low, mid, and high marsh are finalized to ensure that the re-establishment sites are located at the appropriate elevations. The multi-tiered conservation approach for this project includes: (1) avoidance of disturbance to current populations of these species (predominantly Humboldt Bay owl's clover) to the extent practicable to maintain viable population structure and genetic diversity; (2) collecting seed from existing populations of these species (predominantly Humboldt Bay owl's cover) to provide locally-sourced material for nursery propagation and reintroduction post-project construction; (3) preparation of sites within the project area suitable for reintroduction and/or natural recruitment of each of these species; and (4) long-term monitoring of the project area post construction to provide documentation of performance and success, provide remedial recommendations if deemed necessary, and ensure that species-specific quantitative mitigation goals are achieved.

Humboldt Bay owl's clover presents an interesting conservation scenario because of its hemiparasitic biology. A total of 3 populations (totaling 58 individuals) have been identified within the project area, with at least one population existing in an area that will likely be directly impacted by construction.

This Plan was revised by Winzler and Kelly in December of 2011, pursuant to the special conditions of approval for the California Coastal Commission coastal development permit (CDP No. 1-10-32) for the project. Special conditions include modifications to the eelgrass mitigation and monitoring protocol.

The following are key components of the conservation and re-introduction process for the 3 rare plants and for eelgrass:

- Emphasis on minimizing impacts to the extent possible to current populations of each of the 4 species;
- For the most threatened species (i.e., Humboldt Bay owl's clover and Point Reyes bird's beak), emphasis is on identifying suitable seed collection opportunities, and storage and propagation techniques to facilitate successful post-construction reintroduction;
- For each of the 4 species, the creation and/or potential for development of abiotic (e.g., hydrologic and edaphic) and biotic (e.g., suitable host plants) conditions for re-introduction (whether intentionally planted or naturally recruited);
- Development of species-specific monitoring protocols for assessing establishment and growth trajectories relative to both agreed upon vegetative timelines and reference conditions.

INTRODUCTION

PROJECT DESCRIPTION

The Salt River Ecosystem Restoration Project is a watershed-based, ecosystem-scale project with multiple objectives and benefits. The proposed project is composed of 4 main components: 1) Salt River channel and riparian floodplain corridor restoration, 2) Riverside Ranch tidal marsh restoration, 3) channel and riparian floodplain sediment maintenance, and 4) upslope sediment reduction. The project encompasses the lower reaches of the Salt River and parts of the tributaries that flow into the Salt River downstream to Cutoff Slough just upstream from the confluence with the Eel River. The Eel River feeds the 6th largest estuary on the west coast in Humboldt County, California (Figure 1, Project Vicinity).

The overall goals of the Salt River Ecosystem Restoration Project include the following:

- Restore the Salt River channel and adjacent riparian floodplain by increasing hydraulic conveyance and constructing habitat features that re-establish ecological processes beneficial to fish and other native species;
- Restore historic estuarine habitat and tidal connectivity within the lower Salt River;
- Improve water quality and drainage efficiency across the floodplain;
- Manage excess sediment loads by maximizing fluvial and tidal channel sediment transport capacity and designing instream (passive) and engineered sediment management areas;
- Initiate a long-term corridor adaptive management process that maximizes ecological restoration success in a working landscape by:
    - reducing headwater erosion and sediment delivery to the Salt River floodplain;
    - increasing the volume and efficiency of clear water drainage from the upstream watershed and adjacent agricultural land, and;
    - providing and maintaining sediment management areas that minimize impacts to land use and ecological function.

Channel Restoration

The first element of the Salt River Ecosystem Restoration Project is the Salt River channel and riparian floodplain corridor restoration. This component will re-establish a defined channel and riparian corridor from the Salt River confluence with Williams Creek downstream to the confluence of the Salt River with Cutoff Slough, a total corridor length of approximately 7.4 miles (mi). The corridor design is intended to re-establish a functioning channel and floodplain corridor that integrates long-term sediment management and regional drainage needs while restoring significant habitat value and ecologic function to the project area.

The project also includes reuse of excavated channel materials for various beneficial reuse opportunities. Beneficial reuse opportunities include: creation of re-contoured floodplain fill areas; Riverside Ranch berms to facilitate tidal restoration; and application on nearby agricultural lands.

Restoration of Riverside Ranch

In order to achieve the complementary goals of increasing the tidal prism (the volume of water exchanged on each tidal cycle) into the Salt River to resemble historical conditions and expanding and restoring wetland and salt marsh habitat in the lower Salt River, the Riverside Ranch, an approximately 400-acre (ac) property with over 2.5 mi of frontage adjacent to the lower Salt River was acquired by the Western Rivers Conservancy (Conservancy). Supported by funding from the State Coastal Conservancy, U.S. Fish & Wildlife Service (USFWS), and Wildlife Conservation Board, Riverside Ranch will eventually be transferred from the Conservancy to the CDFG for long-term management.

The Riverside Ranch restoration will re-establish intertidal wetland habitat to the Eel/Salt River Estuary. The increase in tidal exchange associated with a restored marsh will also help sustain a restored Salt River channel. Restoring tidal prism to the lower Salt River, (i.e., increasing the volume of water exchanged on each tidal cycle) increases channel scour and helps maintain the width and depth of the channel.

The objectives of the Riverside Ranch Tidal Marsh Restoration include the following specific items to help attain the overall project goals of the Salt River Ecosystem Restoration Project.

- Use the increase in tidal prism to help maintain the constructed Salt River channel geomorphology and conveyance and improve drainage and water quality in the lower Salt River and Eel/Salt River estuary.
- Restore tidal connectivity to historic tidal wetlands to allow for the natural evolution of diverse and self-sustaining salt- and brackish water tidal marshes, intertidal mudflat and shallow water habitats.
- Restore the marsh to include and expand the transition zone between tidal wetland and upland.
- Create a template for the natural evolution of a complex tidal drainage network. The network will maximize subtidal and intertidal habitats beneficial to target fish and wildlife species. This includes the enhancement of rearing and migration conditions for estuarine-dependent species including: coho salmon, Chinook salmon, steelhead trout, coastal cutthroat trout, tidewater goby, and commercially and recreationally valuable species such as redtail perch.
- Retain approximately 70-ac where agricultural management techniques can be used for short-grass Aleutian cackling goose habitat.
- Provide wintering habitat for migratory waterfowl and shorebirds.
- Provide public access to the extent feasible without compromising the physical and biological project objectives.
- Avoid adverse impacts to the existing drainage of adjacent parcels.
- Design site components that can support natural geomorphic response to sea-level rise over the 50 years of the project design horizon.

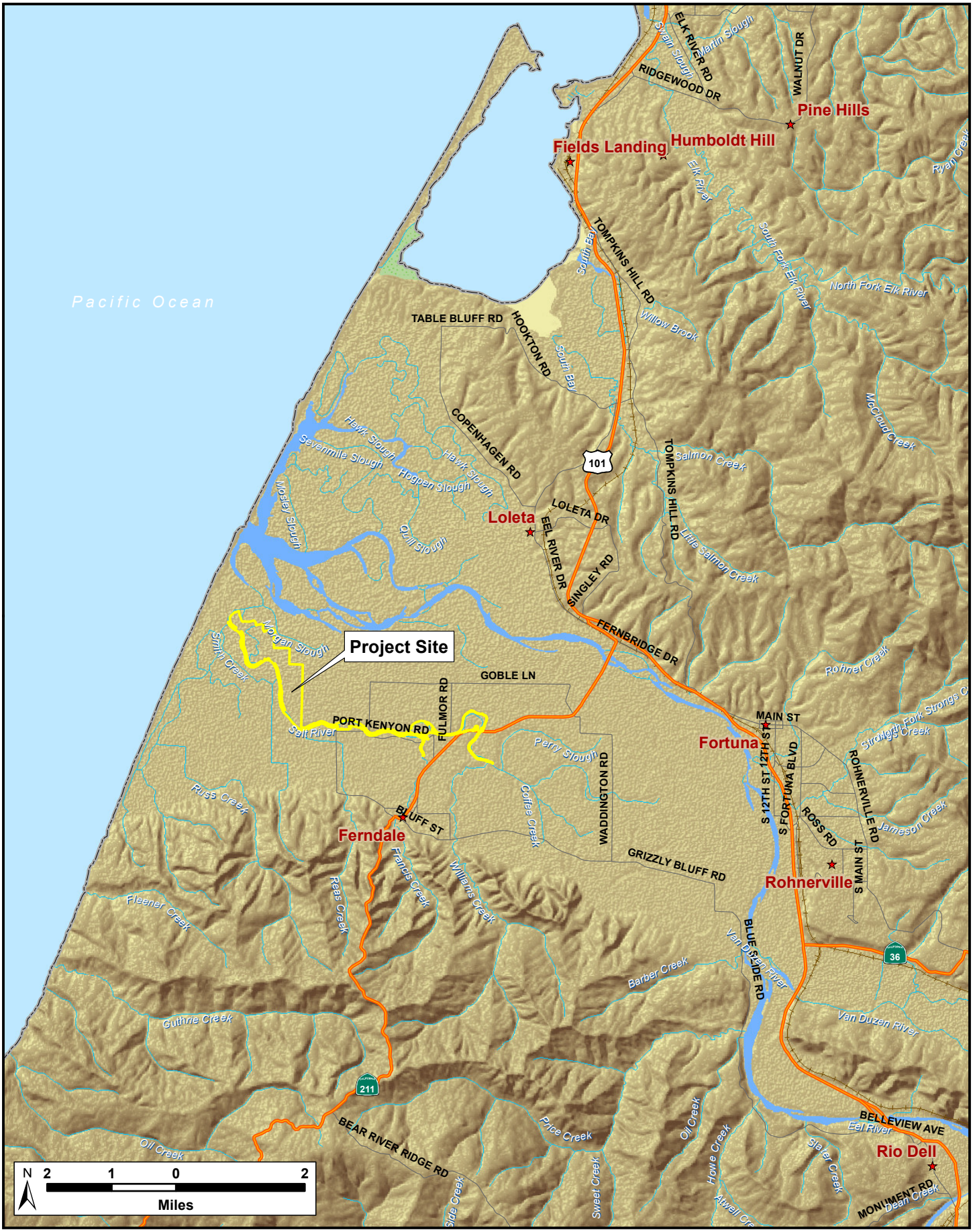

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Figure 1: Salt River and Riverside Ranch Vicinity Map

Salt River Ecosystem Restoration Project Rare Plant Mitigation and Management Plan (3117-05)

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Restoration of Riverside Ranch is intended to strike a balance between creating significant amounts of new tidal marsh habitat, retaining and enhancing some of the important existing upland features, preserving sufficient acreage for creation of short grass habitat, minimizing long-term site maintenance, and incorporating design features that accommodate sea-level rise.

Rare Plant Survey

As part of the Salt River Ecosystem Restoration Project, seasonally-appropriate rare plant surveys were conducted to determine the existence of special-status plant species (i.e., rare, threatened or endangered) within the project area. The purpose of identification of existing populations of special-status plant species is to ensure components of the existing ecosystem and the associated ecological benefits are accounted for and included in the restoration design.

The Salt River Ecosystem Restoration Project rare plant surveys were conducted on May 24, 25 and 28, June 22 and July 23, 2010 over the entire length of the project area (Winzler and Kelly, 2010). Surveys were conducted along riparian edges, riparian interiors and pastures, with particular attention to salt marsh habitat. Salt marsh habitat is one of the primary target habitat types being created as part of the Salt River Ecosystem Restoration Project (H. T. Harvey & Associates, 2010).

During the rare plant surveys, 2 species recognized by the California Native Plant Society (CNPS) and the California Department of Game and Fish (DFG), Humboldt Bay owl's clover (Humboldt Bay owl's clover) and Lyngbye's sedge (*Carex lyngbyei*), were mapped in the Salt River Restoration Project corridor, within salt marsh habitat (Table 1). A third species, Point Reyes bird's beak (*Cordylanthus maritimus* ssp. *Palustris*), was not identified within the project corridor, but is known to occur in salt marsh habitat in the greater Humboldt region (Table 1). Because salt marsh habitat within the project vicinity is known to support Point Reyes bird's beak, precautionary measures and mitigation and monitoring procedures, if deemed necessary, have been included herein in the event that this species is encountered before and/or during site construction.

The CNPS List Status for each of these 3 species is shown in Table 1. CNPS List Status 1B.2 refers to plants that are fairly threatened in California with a moderate degree or immediacy of threat (CNPS 2010). CNPS List Status 2.3 refers to plants that are rare to endangered in California but are common elsewhere with a low degree or immediacy of threat or no threat currently known (CNPS 2010). CNPS has no jurisdictional authority, but their listing status for special-status plant species is typically recognized in CEQA analyses as a valid standard by which to establish thresholds of significance. None of the plants identified in this report are state or federally listed.

Table 1. Scientific Name, Common Name and CNPS List Status for each of the Three Rare Plants Associated with the Salt River Ecosystem Restoration Project.

SPECIES	COMMON NAME	CNPS LIST STATUS
Castilleja ambigua ssp. *humboldtiensis*	Humboldt Bay owl's clover	1B.2*
Carex lyngbyei	Lyngbye's sedge	2.3†
Cordylanthus maritimus ssp. *palustris*	Pt. Reyes bird's beak	1B.2*

*List Status1B.2 refers to plants that are fairly threatened in California with moderate degree or immediacy of threat (CNPS 2010);

†List Status 2.3 refers to plants that are rare to endangered in California but common elsewhere with a low degree or immediacy of threat or no threat currently known (CNPS 2010).

In addition, eelgrass (*Zostera marina*) was found during surveys in the Salt River channel from the confluence of Cut-Off Slough up to the confluence of Smith Creek. Observations of eelgrass were made from the channel banks during low tidal periods. The width of the eelgrass varied from 3 to 4 feet (ft) wide on either side of the channel. Density of individual plants varied from 3 to 5 plants per square meter. Eelgrass was also absent in some sections. Recently completed bathometric surveys of the Salt River between Cut-off Slough and the confluence of Smith Creek indicated the eelgrass beds persist at elevations ranging from 0 to 4 feet (NAVD88). Although it does not have a formal listing as a state or federal endangered, rare, or sensitive species, the California Department of Fish and Game, U.S. Fish and Wildlife Service, and the National Marine Fisheries Service recognize eelgrass as an important protected resource and have defined measures to mitigate for potential eelgrass habitat losses. These measures are defined in the Southern California Eelgrass Mitigation Policy (National Marine Fisheries Service [NMFS] 1991. Therefore, eelgrass is included in this Rare Plant Mitigation and Monitoring Plan.

RARE PLANT SPECIES DESCRIPTIONS AND ECOLOGY

- **Humboldt Bay owl's clover**:

  Listing Status

  Federal Listing Status: None; State Listing Status: None; CNPS List: 1B.2 (CNPS 2010).

  Morphology and Flowering

  Humboldt Bay owl's clover is an annual, green-root hemiparasitic herb (dicot) in the figwort family (Scrophulariaceae). Leaves: 10-50 mm, lanceolate to ovate, lobes 0 to 5; inflorescences: 3 to 12 cm in length, 3 to 4 cm wide, often dense; bracts: 15 to 25 mm in length, oblong to ovate, tipped pink to rose purple, rounded to truncate; flower: calyx 12 to 20 mm, divided ½ in front and on sides,⅔ in back, lobes linear; corolla: 14 to 25 mm, pale yellow or rose purple, beak 4 to 5 mm, straight, puberulent, lower lip 3 to 4 mm, pouches 3 to 7 mm wide, 1 to 2 mm deep, generally purple-dotted at base, teeth 2 to 3 mm; stigma generally ± exserted; fruit: 8 to 12 mm (Hickman, 1993).

  Humboldt Bay owl's clover generally flowers from spring to mid-summer (mid-May through mid-June)(Pickart 2001) August).

Habitat, Distribution and Ecology

Humboldt Bay owl's clover is endemic to California, and although more common historically, is currently known to exist only in Marin, Humboldt and Mendocino counties in coastal salt marshes and swamps at elevations from 0 to 34 ft.

Humboldt Bay owl's clover does not appear to be host-specific, as it grows in conjunction with several common salt marsh plants including: pickleweed (*Sarcocornia pacifica*), salt grass (*Distichlis spicata*) and fleshy jaumea (*Jaumea carnosa*). It may also be found in conjunction with invasive cordgrass (*Spartina densiflora*), although it remains unclear whether this relationship is the result of parasitism or simply happenstance. Because Humboldt Bay owl's clover is a green-root hemiparasite, it requires sufficient vegetative cover by suitable host species to facilitate establishment and maintenance of viable populations.

Reproduction and Propagation

Humboldt Bay owl's clover exhibits only sexual reproduction (i.e., reproduction via seed). Therefore, propagation is limited to seed collection and germination. Seed collection should occur in the late summer after seeds reach maturity but before seed drop occurs. Mature seed pods are dark brown in appearance, while the seeds themselves are grey to brown, small and slightly spongy at maturity. Seed pods should be rubbed over a screen to separate seeds from pod debris. Resultant seeds should be stored under cool dry conditions until ready for germination.

Threats

Non-native plant invasion and loss of salt marsh habitat threaten existing populations of Humboldt Bay owl's clover.

- **Lyngbye's sedge**:

Listing Status

Federal Listing Status: None; State Listing Status: None; CNPS List: 2.3 (CNPS 2010).

Morphology and Flowering

Lyngbye's sedge is a perennial rhizomatous herb (monocot) in the sedge family (Cyperaceae). Stem: generally sharply 3-angled and solid, 30 to 90 cm high; leaf: blades flat, 2 to 10 mm wide, basal minute; inflorescence: lateral spikelets 1.8 to 8 cm, 5 to 8 mm wide, stiff, straight on long nodding stalks, tip generally staminate, base ± truncate; lowest spikelet bract > inflorescence; staminate: pistillate, flower bract tip often white, awned; fruit: perigynium ascending to spreading, 2.2 to 4 mm, 1.5 to 2.8 mm wide, ± veined, papillate, brown, dull, wall very thick, very tough, beak 0 to 0.3 mm, tip glabrous,

notch shallow or 0; fruit indented 1.7 to 2.5 mm, 1.2 to 1.8 mm wide, often deeply indented on 1 or both sides, wide-stalked (Hickman 1993).

Lyngbye's sedge generally flowers from early to mid-summer (May to August).

Habitat, Distribution and Ecology

Lyngbye's sedge occurs in coastal salt and brackish marshes and freshwater marshes and swamps at elevations from 0 to 34 ft, preferring regularly flooded and drained areas. Optimum elevation is generally between mean low high water (MLHW) and mean high high water (MHHW). Lyngbye's sedge prefers salinities ranging from 0 to 20 parts per thousand (ppt) and fine-grained sand and silt substrates (although it has been observed growing vigorously in cobble and gravel-dominated coastal substrates). Lyngbye's sedge is an early successional, pioneer species and is predisposed to forming monocultures in high marsh settings because its greater biomass and height make it a superior competitor for light.

Lyngbye's sedge is documented in 14 USGS quadrangles in Del Norte, Humboldt, Mendocino, Marin and Monterey counties in California, and known to exist in similar habitats in Oregon, Washington, Alaska and internationally.

Lyngbye's sedge may be observed growing in association with the following plant species: Kamchatka spikerush (*Eleocharis kamtschatica*), common spikerush (*E. palustris*), blue flag iris (*Iris setosa*), Baltic rush (*Juncus balticus*), Pacific silverweed (*Potentilla pacifica*) and tufted hairgrass (*Deschampsia caespitosa*).

Reproduction and Propagation

Lyngbye's sedge reproduces both sexually and asexually (i.e., vegetatively). As a result, Lyngbye's sedge can be propagated by division, rhizome cuttings and by seed. Germination time varies with site salinity, but is generally greater under low-salinity conditions following after-ripening. Vegetative offshoots tend to perform poorly when transplanted into soils with salinities greater than that of the donor site.

Threats

Loss of salt marsh habitat throughout its range and competition with invasive plant species significantly restricts the prevalence of Lyngbye's sedge.

- **Point Reyes bird's beak**

Listing Status

Federal Listing Status: None; State Listing Status: None; CNPS List: 1B.2 (CNPS 2010).

Morphology and Flowering

Point Reyes bird's beak is an annual, green-root hemiparasitic herb (dicot) in the figwort family (Scrophulariaceae). Plant: 10-40 cm in height, gray-green, glaucous, often tinged purple and salt-encrusted, generally ± short-hairy; stem: branches 0 to few, ascending,≤ central spike; leaf: 5 to 25 mm ± linear-lanceolate, entire; inflorescence: spike, 20 to 90 mm, many flowered and dense, outer bract leaf-like, inner bract notched 15 to 30 mm; flower: calyx 15 to 25 mm corolla 15 to 25 mm, white to cream, puberulent, lips pale to brownish or purplish red, middle lobe of lower lip erect, stamens 4, anther sacs 2 (lower pair) or 1 (upper pair); seeds: 10 to 20, 2 to 3 mm ± reniform, deeply netted, dark brown (Hickman 1993).

Point Reyes bird's beak generally flowers from June to mid-September (Brian 2001).

Habitat, Distribution and Ecology

Point Reyes bird's beak prefers salt marsh habitats slightly above the mean high tide mark. Preferential habitats are generally sandy substrates covered by a layer of organic silt, soil salinities within the range 34 to 55 ppt and ≥ 70% vegetative cover (CPC 2010).

Point Reyes bird's beak occurs only in coastal salt marshes and swamps at elevations of 0 to 34 ft. It was once common along the coastal regions of California, but is now confined to 23 USGS quadrangles in Humboldt, Marin, San Francisco and Sonoma counties, listed as endangered in Oregon and presumed extirpated from Alameda, Santa Clara and San Mateo counties in California.

Point Reyes bird's beak does not exhibit host specificity but it is generally associated with the following plant species: pickleweed (*Sarcocornia pacifica*), salt grass (*Distichlis spicata*), Western marsh rosemary (*Limonium californicum*), tufted hairgrass (*Deschampsia cespitosa*) and fleshy jaumea (*Jaumea carnosa*) (Kaye et al. 1991). Therefore, maintaining a high degree of vegetative cover by the before-mentioned species is necessary for establishing and maintaining viable populations of Point Reyes bird's beak.

Reproduction and Propagation

Point Reyes bird's beak exhibits only sexual reproduction. Therefore, propagation is limited to seed collection and germination. In its natural habitat, seeds germinate after winter rains have reduced local soil salinities below 12 ppt (CPC 2010). The potential exists, as a result, for germination success to be increased when soil salinities are significantly less than what may be associated with populations of adult plants. Under controlled (greenhouse) conditions, Point Reyes bird's beak can be successfully grown using *Helianthus annuus* (sunflower) as a host (Chuang and Heckard 1971), but as with other hemiparasitic species, a host is not required for germination. However, it is unknown how long after germination that Point Reyes bird's beak requires a connection with live roots of a host plant (Kaye 1991).

Threats

Non-native plant invasion, changes in local hydrologic regime, livestock grazing, off-road vehicular traffic and trampling from foot traffic threaten existing populations of Point Reyes bird's beak (CNPS 2009).

- **Eelgrass:**

Listing Status

Federal Listing Status: None; State Listing Status: None; CNPS List: none).

Morphology and Flowering

Eelgrass is a perennial aquatic grass (monocot) in the eel-grass family (Zosteraceae). Leaves: 1.5 - 12 mm wide, tip generally obtuse; sheath tubular, rupturing with age, 5-20 cm, membranous flaps absent,; blade to 110 cm, 2-12 mm, apex round-obtuse, or slightly mucronate; veins 5-11. Inflorescences: peduncles with adnate portion 15-100, free portion 2-3 cm; spathes 10 or more, sheath 4-8 cm; blade 5-20 cm; spadix linear; staminate flowers 1-20; pistillate flowers 1-20, apex acute or mucronate. Staminate flowers: bracts absent or rarely 1 subtending most proximal flower; pollen sacs 4-5, 1mm. Pistillate flowers: ovary 2-3 mm, style 1-3 mm; fruit: nutlet, ellipsoid to ovoid, 2-5 mm, often beaked (Hickman, 1993; Flora of North America 1993+).

Eelgrass generally flowers in March to July and fruits in May and June (Hickman 1993, Phillips 1984).

Habitat, Distribution and Ecology

Eelgrass occurs in intertidal and subtidal areas of nearshore environments along the temperate coasts of the North Pacific and North Atlantic, with large stands along the Pacific Northwest coast found in Padilla Bay and Willapa Bay, Washington and Humboldt Bay, California. The plant is typically found in sheltered waters on unconsolidated substrate (from dense sand to soft mud) and where currents do not exceed 3.5 knots. Eelgrass tolerates temperatures between 21ºF and 104.9ºF. It can grow in a wide range of salinities (10-30 ppt), but does not tolerate persistent fresh water (CDFG 2010). Eelgrass provides direct and indirect food sources for marine species and also provides structural habitat for resident bay and estuarine species, predation refuge, and nursery area for many commercially and recreationally important fish and shellfish species (Phillips 1984, NMFS 1991).

Reproduction and Propagation

Eelgrass has a thick creeping rhizome 2 to 5 mm thick; roots numerous, 5-20 at each node; leaf at nodes spaced 1 to 3.5 cm apart.

Eelgrass reproduces both sexually and asexually. Asexual reproduction occurs via growth and elongation of the rhizome and by formation of turions (shoots). Sexual reproduction occurs via seed production, with flowering occurring in May and June. Eelgrass is monecious and fertilization of flowers occurs by drifting pollen. Male and female flowers mature at different times on the same plant to prevent self-fertilization. Seed production generally occurs from August to October (Phillips 1984). After fertilization, the flowers develop into seed-bearing shoots that eventually break off and float to the surface, at which time the shoots release their seeds as they drift.

Numerous methods of propagation are described in the literature and each exhibits varying degrees of success, depending on local conditions (substrate, light and nutrient dissolved oxygen availability). Brief descriptions of these methods are provided here.

Propagation from Seed.

A number of seeding methods have been used with varying degrees of success. It is often difficult to select locations for seeds to establish because of the effect of tides, waves, and currents (Thom et al 2008). Propagation from seed requires flowering shoots to be collected and placed in tanks to allow mature seeds to drop, which can then be collected and broadcast manually. A recently developed seeding method involves placing harvested shoots in mesh bags on a line anchored with a cinder block and floated above the targeted restoration area using a buoy (Cite Picerell et al 2005 –from Goals project). This method allows the seeds to be distributed naturally as they mature. It also allows for the shoots to be collected and placed at the restoration site on the same day, thus eliminating the need for special facilities for seed collection and storage.

Natural Recruitment.

Eelgrass is more dependent on tides, water temperature, light availability substrate, and wave conditions than most terrestrial species. Seeds of terrestrial species typically have the opportunity to remain on the substrate for a period of time between tidal cycles, thus allowing them to establish easier. Eelgrass seeds need to settle to the bottom of the water column to establish. Therefore, natural recruitment of seed from nearby meadows can be unpredictable.

Propagation Using Bare Root Shoots

A common method used for restoration of eelgrass beds involves transplantation of bare root vegetative shoots. Shoots are collected from existing beds using flat-blade shovel. Shoots are then planting individually or in bunches, with or without anchors which may include nails, u-shaped metal sod staples or steel reinforcing bar (Phillips 1990 as cited in Draft Subtidal Goals Report 2010). Biodegradable anchors may include bamboo skewers or popsicle sticks. For this method 2 shoots with rhizome are attached in opposite directions on the anchor. Prepared shoots should be transported between the collection site and the installation site in coolers filled with seawater (Grette Associates et al 2008).

Planting over a large area entails the use of planting frames which are anchored into the substrate using steel pins. Vegetative shoots are attached to a rigid frame using paper ties, which hold the plants in place so that frames can be placed at the restoration site. The frames and held in place with bricks or some other heavy material that ensure that the roots of the plants are in contact with the substrate surface until they establish, which may take 4-6 weeks. After the plants have successfully rooted, the plant frames are removed. The Southern California Eelgrass Mitigation Policy (NMFS 1991) recommends transplanting bare root bundles of 8-12 individual shoots, with spacing at the discretion of the restoration practitioner.

Threats

Natural threats to eelgrass include storms, sedimentation, habitat loss due to invasive species, disease, and overgrazing by waterfowl such as Brant (*Branta bernicla*) or Canada geese (*Branta canadensis*) (Williamson 2006). Anthropogenic habitat loss may be tied to climatic changes and human disturbance leading to eutrophication and decreased water quality (temperature, turbidity, dissolved oxygen and salinity) (PSAMP 2010, K. Williamson 2006).

CONSERVATION AND REINTRODUCTION PLAN

The conservation and reintroduction strategy for the Salt River Ecosystem Restoration Project Rare Plant Mitigation and Monitoring Plan is species-specific not only because of the unique nature of each of the species of concern (i.e., Humboldt Bay owl's clover, Lyngbye's sedge and Point Reyes bird's beak),variability in local abundance, but also because Lyngbye's sedge and eelgrass each differ in reproductive strategy and propagation from the other 2, Humboldt Bay owl's clover and Point Reyes bird's beak, which are hemiparasitic.

- **Humboldt Bay owl's clover**:

  (1) Three populations of Humboldt Bay owl's clover (totaling 58 individuals) were mapped within the project area during 2010 sensitive species surveys (Winzler & Kelly, 2010). Of these 3 populations, only 1 population occurs in a location where project construction impacts are presumed unavoidable (Figure 2). This population consisted of <10 individuals within an area of approximately 1 square foot. Salvage of this single population was considered, however, the salvage process would require collecting the plant and the surrounding soil in order to adequately capture the seed bank. Because this population is growing in an area dominated by a thick growing cover of dense-flowered cordgrass (*Spartina densiflora*), salvage was therefore discounted as an option. Dense-flowered cordgrass is an invasive perennial that competes with native salt marsh species and typically invades salt marsh habitats to form dense monospecific stands. It can spread both by seed and by vegetative means and is difficult to eradicate once it establishes. A control plan for *Spartina densiflora* is currently being prepared by the California Coastal Conservancy and its partners to eradicate *Spartina densiflora* in Humboldt Bay, the Eel River Delta, and the Mad River Estuary. In an effort to support regional efforts to eradicate *Spartina densiflora* and to refrain from spreading it to other areas of the restoration site, this one population of Humboldt Bay owl's clover will not be salvaged. The following restoration strategies will be employed for the populations not directly impacted by construction.

  <u>Strategy</u>

  To increase the likelihood that existing populations of Humboldt Bay owl's clover persist through site construction, and to re-establish impacted or extirpated populations post construction, a multi-tiered approach is prescribed:

  (1) Avoiding disturbance to existing populations of Humboldt Bay owl's clover to maintain functioning population structure and genetically-diverse source material for the recovery of impacted populations post construction. Avoidance measures include avoiding direct impacts during project planning and avoiding construction staging and access in areas of known populations wherever feasible. Environmentally sensitive area (ESA) fencing should be

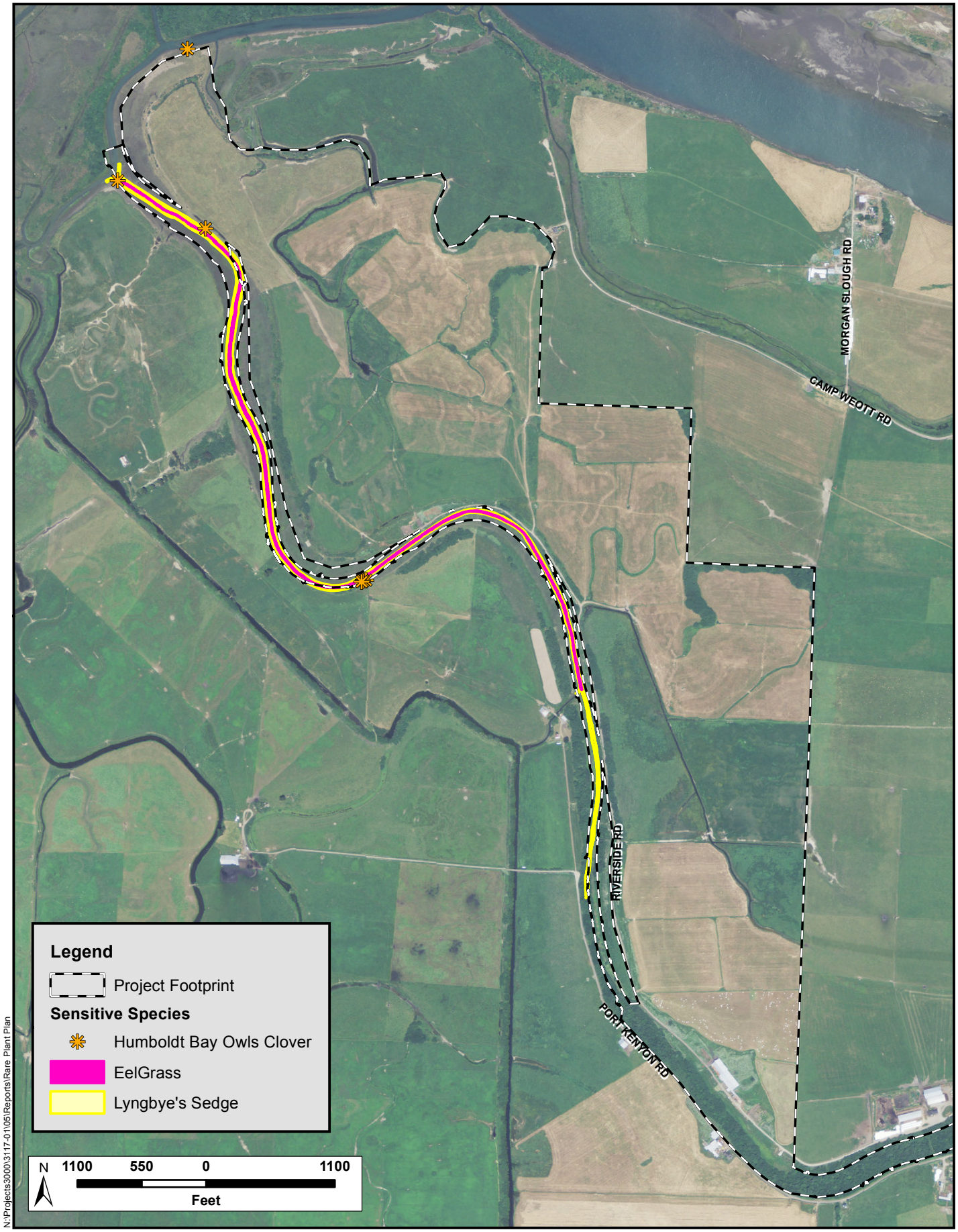
installed around the perimeter of the known population onsite and within 100 ft of known populations that will not be directly impacted.

(2) Collection of seed from known populations of Humboldt Bay owl's clover to provide locally-sourced material for nursery propagation and reintroduction post-construction. Seed should be collected at maturity in late summer and stored under appropriate conditions until ready for propagation. Adequate seed will be left from collecting areas to maintain the existing population. Because of the need for multiple growing seasons to establish sufficient host species cover and also due to variability in annual seed viability, it is recommended that seed be collected from remaining populations during multiple growing seasons if deemed necessary to ensure that adequate and viable seed is available for propagation and reintroduction. Propagated replacement plants can be used to establish in-kind replacement population at similar sites in the project vicinity, or once the vegetative state of the impact site attains sufficient vegetative cover for Humboldt Bay owl's clover; the species can then be reintroduced within the immediate area of impact. Suitable host plants growing at or above 7.5 ft MLLW in the Riverside Ranch portion of the project will need to be identified prior to the planting of any seedlings to increase the potential for individual plant success. Once suitable marsh elevations and host plants are established, 60% of the seedlings will be planted in Riverside Ranch and 40% will be held in the nursery as a contingency. If the planted seedlings establish and are doing well after the first year, the remaining nursery seedlings will be installed. If planted seedlings do not successfully establish the plants held in reserve will be used as replacement plantings

(3) Identification of sites within the project area with suitable, elevations and tidal exchange for Humboldt Bay owl's clover reintroduction and/or natural recruitment.

(4) Sufficient vegetative cover of salt marsh host plants is required for establishing Humboldt Bay owl's clover; realizing that it may take approximately 2 to 5 years for such vegetative cover to establish within the immediate area of impact in the restored marsh at Riverside Ranch, Humboldt Bay owl's clover may be propagated with a range of possible salt marsh host plants that also typically occur at or above 7.5 ft MLLW to increase the likelihood for successful establishment once field conditions are suitable for reintroduction. Assumed host plants could include pickleweed and salt grass.

(5) Active replanting/reintroduction of Humboldt Bay owl's clover in areas located in high marsh at or above 7.5 ft MLLW (Eicher 1987). Areas of known occurrence impacted during site construction, as well as areas where Humboldt Bay owl's clover exists but which will not be impacted by site construction, should serve as reference areas.



N:\Projects3000\3117-01\05\Reports\Rare Plant Plan

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ECOLOGICAL CONSULTANTS

Figure 2: Rare Plant Locations
Salt River Ecosystem Restoration Project Rare Plant Mitigation and Monitoring Plan (3117-05)
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- **Lyngbye's sedge**:

  Lyngbye's sedge is widely distributed across the project area both in locations to be impacted by site construction and in locations not to be impacted by site construction. In Humboldt Bay, Lyngbye's sedge, typically colonizes easily along the edges of slough, at the mouths of streams as they enter salt marsh areas, and at the high ends of sloughs (Personal communication, Andrea Pickart, 2010). It is anticipated that remaining populations of Lyngbye's sedge not impacted by site construction, as well as populations of Lyngbye's sedge existing beyond the perimeter of the project site, will provide viable seed for natural re-establishment across the project area. Because this is an early successional, pioneer species, Lyngbye's sedge is likely to be one of the initial plants to establish on the site post-construction. Lyngbye's sedge is expected to form mono-specific stands on disturbed portions of the site and depending on local disturbance events, these populations may persist for several years post-construction. Rapid colonization by Lyngbye's sedge would be viewed as beneficial from the perspective of bare soil stabilization and habitat creation.

  Strategy

  (1) Minimizing disturbance to existing populations of Lyngbye's sedge to the extent possible to retain functioning population structure and localized genetic source material for the recovery of those populations impacted as a result of project construction;

  (2) Collect seed from existing and/or non-impacted populations of Lyngbye's sedge within the project area to serve as secondary source material in the event that actual natural recruitment post-construction is less than expected. Seed collection should occur when the seeds have ripened (July to September). It may also be advisable to collect a specified amount of seed annually post-construction to ensure the availability of viable seed throughout the mitigation and monitoring period;

  (3) Monitor impacted areas and areas where Lynbgbye's sedge is expected to recruit to determine level of natural recruitment.

  (4) The option of transplanting Lyngbye's sedge during construction was considered. However, this would involve removing specific sections of plants, transporting the removed plants to an onsite location or a nursery while the channel was constructed, and then moving the plants back to the reconstructed channel for replanting. After considering the potential for plant mortality, the feasibility and the cost of this option, and the potential for the spread of *Spartina densiflora* during replanting, this alternative was not included as a recommendation.

- **Point Reyes bird's beak**

  Point Reyes bird's beak, unlike the 2 prior-discussed species, was not observed within the Salt River Ecosystem Restoration Project area during the rare plant surveys conducted by Winzler and Kelley (2010). However, because Point Reyes bird's beak has the potential to occur within the project area, and it is fairly threatened in California with a moderate degree or immediacy of threat, this species is included in this rare plant mitigation and monitoring plan. Because Point Reyes bird's beak is a green-root hemiparasite like Humboldt Bay owl's clover, the protocol for conservation of the former is similar, notably the need for salvaging and relocating populations identified within areas with definite project construction impacts. If this species is discovered on the project site during pre-construction surveys, the conservation strategy would be similar to that of Humboldt Bay owl's clover.

  Strategy

  (1) Minimize disturbance to any existing populations of Point Reyes bird's beak that are discovered during construction. Minimize direct impacts during project planning and construction.

  (2) Minimize disturbance to existing populations of Point Reyes bird's beak to maintain functioning population structure and genetically-diverse source material for the recovery of impacted populations post construction. Minimize direct impacts during project planning and avoiding construction staging and access in areas of known populations wherever feasible. Environmentally sensitive area (ESA) fencing should be installed within 100 ft of known populations that will not be directly impacted.

  (3) Salvage individuals and populations in areas with definite construction impacts. As part of the salvaging process, as much adjacent soil as possible should be captured to minimize transplant stress and to retain naturally-deposited seed bank. The soil captured in the salvage process should be monitored periodically so that seed-bank recruits can be adequately maintained either for containerized seedling transplants or grown to maturity for subsequent seed production;

  (4) Identify sites within the project area with suitable, elevation and tidal regime for Point Reyes bird's beak reintroduction and/or natural recruitment. Such areas would likely include areas of known occurrence impacted during site construction, as well as areas where Point Reyes bird's beak exists (including nearby sites that do not lie within the project area). Suitable host plants will need to be identified prior to the planting out of seedlings to increase the potential for re-introduction success;

  (5) Because sufficient vegetative cover is required for establishing Point Reyes bird's beak, and realizing that it may take approximately 2 to 5 years for such

vegetative cover to establish, it would be useful for the plant propagation specialists to propagate Point Reyes bird's beak with a range of possible salt marsh host plants to increase the likelihood for successful establishment once field conditions are sufficient for reintroduction;

(6) In the event that Point Reyes bird's beak is not observed during or prior to project construction, but the project wishes to include it in the long-term re-vegetation plan purely out of conservation interest, seed collection and propagation methodologies similar to that described for Humboldt Bay owl's clover should be implemented and followed.

- **Eelgrass**:

Eelgrass was observed along a continuous 3 to 4 foot wide band on either side of the Salt River channel along the lower 7,500 feet reach of the project area. Based on bathometric surveys of the Salt River channel, eelgrass beds are understood to exist at elevations ranging from 0 to 4 feet (NAVD88) or -1.5 to 2.5 feet (MLLW). In Humboldt Bay, eelgrass typically colonizes between -1.5 to 1 (MLLW) in muddy to fine-sand substrates. Approximately 1.2 acres of eelgrass will be disturbed during construction of the Salt River channel. The internal slough network proposed as a component of the Riverside Ranch tidal marsh restoration will create tidal slough channels that will share similar hydraulic and geomorphic characteristics of the existing Salt River channel and assumed suitable eelgrass habitat. Figure 3 depicts the extent of the proposed internal tidal slough network and projected eelgrass habitat created will be approximately 8.7-acres. The following measures are proposed to ensure the establishment of native eelgrass in the created habitat.

<u>Strategy</u>

(1) Minimize disturbance to existing eelgrass populations not within the construction footprint to the extent possible, to retain functioning population structure and localized genetic source material for the recovery of impacted eelgrass population.

(2) Monitor natural recruitment for three years, as described in eelgrass monitoring, below, to determine whether eelgrass mitigation area has obtained at least 1.2 times the impacted area and has an average density equal to the pre-construction average density.

(3) If eelgrass does not meet natural recruitment goal in the first three years after construction, actively plant eelgrass pursuant to an approved remediation plan, as discussed in eelgrass monitoring, below.

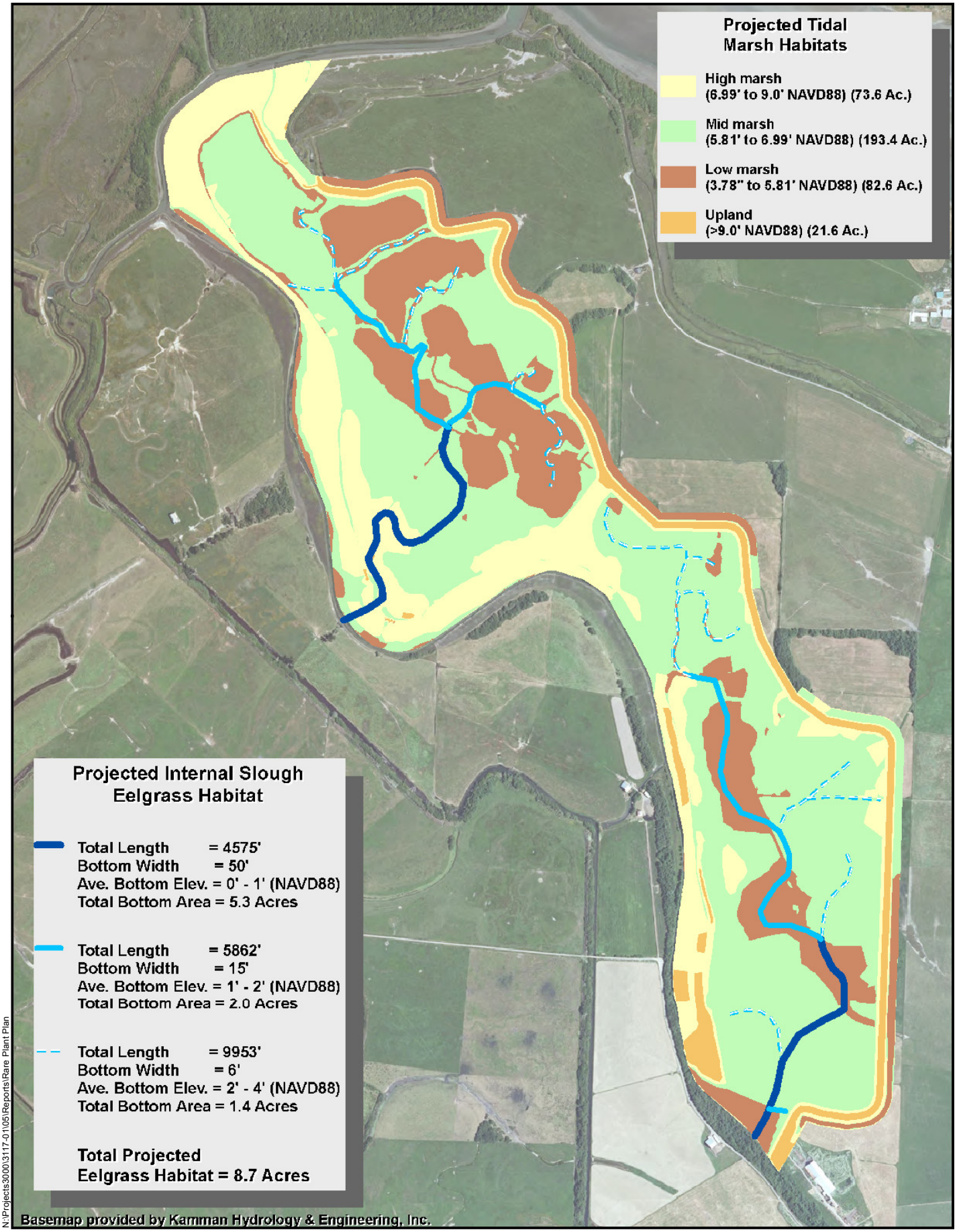

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Figure 3: Projected Tidal Marsh Habitat
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PLANT PROPAGATION AND CULTURE

If plant propagation is conducted, Table 2 contains a partial list of greenhouse operators for whom may be capable of providing plant propagation.

Table 2. Potential Plant Propagation Specialists for the Salt River Ecosystem Restoration Rare Plant Mitigation and Monitoring Plan.

NAME	CONTACT INFORMATION	POINT OF CONTACT
Freshwater Farms, Inc.	5851 Myrtle Avenue, Eureka, CA 95503 (707) 834-4379	Cindy Pemberon, Nursery Manager
Samara Restoration	PO Box 4586 Arcata, CA 95518 (707) 601-3478	Eric Johnson, Humboldt Restoration Manager/Co-Owner
Humboldt Fish Action Council Nursery	1280 Hatchery Rd. Blue Lake, CA 95525 (707) 498-2123	Suzanne Isaacs, Manager
Living Earth Landscapes	5307 Boyd Rd. Arcata, CA 95521 (707) 822-7663	Keith Hamm, Owner
College of the Redwoods Farm	7351 Tompkins Rd. Eureka, CA 95501 (707) 722-4640	Call for point of contact
Humboldt Botanical Garden	PO Box 6117 Eureka, CA 95502 (707) 442-5139	Call for point of contact

MONITORING PLAN

INTRODUCTION

CNPS Species

Monitoring for both the Salt River Ecosystem Restoration Project (H. T. Harvey & Associates 2010) and this Rare Plant Mitigation and Monitoring Plan will be performed annually for a 10-year period following mitigation implementation to determine if the project is fulfilling its mitigation obligations. Specifically, monitoring by a qualified biologist will determine if the project is meeting its commitments to provide suitable habitat for replacing impacted populations of Humboldt Bay owl's clover and Lyngbye's sedge and possibly Point Reyes bird's beak, 3 plant species considered rare or threatened by the California Native Plant Society (CNPS 2010).

The mitigation areas for the rare plants described in this plan occur primarily within the Riverside Ranch portion of the project. New habitat areas for Lyngbye's sedge may occur along the Salt River Channel upstream of Riverside Ranch, with the projected upstream expansion of the tidal prism. Additional habitat will be created that will support salt marsh species that will server as host species for Humboldt Bay owl's clover in the restored high marsh in riverside Ranch. The restored channel and newly created tidal channels in Riverside Ranch are expected to provide extensive areas for natural recruitment of eelgrass. By the end of the 10-year monitoring period, the mitigation areas for rare plants within the greater Salt River Ecosystem Restoration Project site should be sufficiently achieving the long-term goals outlined in this plan with little chance of failure. The results of the annual monitoring will be compared with the annual success criteria to determine either if the mitigation obligations have been met, or if the trajectory is on course for the mitigation obligations to be met. In the event that the final success criteria have not been met by the end of Year 10, monitoring will continue until the criteria have been achieved.

Eelgrass

Success criteria and monitoring methods for eelgrass mitigation follow the California Coastal Commission special conditions for CDP 1-10-32.

SUCCESS CRITERIA

Humboldt Bay owl's clover and Point Reyes bird's beak. The presence of established and functioning populations of Humboldt Bay owl's clover and Point Reyes bird's beak equal to or exceeding the population size existing within the project area prior to construction will be used as the primary indicators of successful rare plant mitigation within the Salt River Ecosystem Restoration Project area. If Point Reyes bird's beak is not found during project pre-construction monitoring, then monitoring and the associated success criteria will not be required for this species.

Lyngbye's sedge. Percent cover by Lyngbye's sedge will be measured throughout the project area where the hydrologic setting is such that this species is expected to colonize. Monitoring efforts will be directed in the relatively narrow band of inter-tidal habitat along the Salt River

corridor at the lower limit of the low marsh. It is anticipated that any populations of Lyngbye's sedge not impacted by project construction will serve as reference populations when assessing the colonization and establishment of populations post-construction. The final success criteria for Lyngbye's sedge total cover shall be a minimum of 50% within the areas of suitable hydrology and elevation for plant establishment.

Native eelgrass. Within three years of completion of the project (completion of both phases scheduled for 2013), the entire pre-construction eelgrass impact area plus the restored areas suitable for 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. If success criteria are not met, the area shall be remediated as described below.

PERFORMANCE CRITERIA

CNPS Species

Trend characteristics will be used to monitor and evaluate the extent to which Humboldt Bay owl's clover, Lyngbye's sedge and Point Reyes bird's beak have successfully established within designated areas of the Salt River Ecosystem Restoration Project area. Trend characteristics for Lyngbye's sedge, including plant cover and natural recruitment, will be monitored in Years 1, 3, 5, 7 and 10. Similarly, trend characteristics for Humboldt Bay owl's clover and Point Reyes bird's beak, including plant presence/absence and natural recruitment, will be qualitatively documented in Years 1, 3, 5, 7 and 10 for pre-existing populations (and after the establishment of suitable host plants for all non-preexisting populations). The results of the trend characteristics monitoring will aid in the maintenance and management of the rare plant mitigation areas within Riverside Ranch and will help to ensure mitigation success.

Eelgrass

Natural recruitment will be monitored pursuant to Eelgrass Monitoring Methods, listed below, for the first three years following the completion of construction. If the impacted eelgrass areas have not met the natural recruitment success criteria in three years, the areas shall be remediated within one year of a determination by the permittee or the Executive Director that monitoring results indicate that recovery has not taken place;

1. A detailed remediation plan shall be included that provides for mitigation site identification, planting methods, monitoring methods, and schedule. Specific success and monitoring criteria are as follows:
    a. A minimum of 70 percent aerial coverage and 30 percent density in the mitigation area after the first year;
    b. A minimum of 85 percent aerial coverage and 70 percent density in the mitigation area after the second year;
    c. A minimum of 100 percent aerial coverage and 85 percent density in the mitigation area after the third year.

MONITORING METHODS

CNPS Species Monitoring Methods

Record Drawings

Within 8 weeks of the completion of site construction, a qualified restoration ecologist will inspect the Salt River Ecosystem Restoration Project site and consult with a project engineer to ensure that any necessary changes to planting specifications for rare plants and eelgrass are documented in the record drawings created for the project. The record drawings will illustrate significant deviations from the final constructions plans and specifications for the site. Deviations that will be documented are primarily changes in channel dimensions and elevation, which would subsequently affect the location and amount of potential salt marsh habitat. These record drawings create a basis for future analysis of the mitigation site.

Plant Presence/Absence

The presence/absence of Humboldt Bay owl's clover will be determined by counting the number of individuals occurring in the 2 existing populations documented prior to site construction and in populations planted (i.e., re-introduced) or recolonizing post-construction. A similar strategy will be employed for Point Reyes bird's beak in the event it is observed prior to or during site construction. Once host plant vegetative cover is sufficient to support the re-introduction and/or natural colonization of Humboldt Bay owl's clover and Point Reyes bird's beak, monitoring should include counts of known populations at the project site, including pre-existing, re-introduced, and naturally colonized.

Plant Cover

Plant cover by Lyngbye's sedge should be determined by employing a scientifically acceptable methodology (e.g., quadrat sampling using 1-square meter quadrats). This will be achieved by randomly establishing sampling locations along impacted portions of the Salt River where the elevation and hydrologic regime are suitable for the establishment of this species by natural recruitment. As noted, and based on field observations, it is anticipated that that the primary sampling area will consist primarily of a narrow band of inter-tidal in between open MLLW and MHHW. Sampling efforts will strive to document representative Lyngbye's sedge cover over a minimum of 1% of the anticipated Lyngbye's sedge natural recruitment area, noting however, that the total area sampled will depend on the actual amount of habitat created during project construction.

Adequate sample size of Lyngbye's sedge will be determined using the method found in Kershaw (1973). The relationship between cumulative average percent cover and quadrat number will be evaluated in the field during the first sampling. This is accomplished by graphing the cumulative average percent cover on the Y-axis against the number of quadrats on the X-axis during the first sampling. The point at which the slope approaches zero indicates a sufficient sample size (i.e. number of quadrats). Quadrats will be located throughout the site in a stratified-random design along permanently marked transects.

Natural Recruitment

Natural recruitment will be qualitatively assessed by a trained botanist or restoration ecologist throughout the rare plant mitigation area in Years 1, 3, 5, 7 and 10. The presence of native and non-native grass and forb species recruits, including exotic invasive plants, will be assessed and reported. Of particular concern are exotic invasive species that may inhibit the establishment and/or health and vigor of Lyngbye's sedge, Humboldt Bay owl's clover, and Point Reyes bird's beak.

Photo-documentation

Photo-documentation for the Salt River Ecosystem Restoration Project Rare Plant Mitigation and Monitoring Plan will be conducted from a number of fixed locations in Years 1, 3, 5, 7 and 10. Photographs will also be taken to record notable events such as fire, flood, vandalism or erosion that may significantly affect mitigation success. The locations of the photo-documentation points will be selected when the record drawings are developed. Key locations will include: (1) salvaged and/or re-introduced populations of Humboldt Bay owl's clover, Point Reyes bird's beak, (2) non-impacted populations of Lyngbye's sedge, Humboldt Bay owl's clover that are non-impacted during project construction, (3) locations deemed suitable by a qualified restoration ecologist for the establishment of Lyngbye's sedge and once vegetative cover is sufficient, also Humboldt Bay owl's clover and Point Reyes bird's beak, (4) locations seeded or planted with any of the 3 before-mentioned species, and (5) any naturally-recruited populations of Humboldt Bay owl's clover, Point Reyes bird's beak.

Management Recommendations

Based on the data collected and the observations made during annual monitoring, modifications to site management such as weed control, re-seeding or re-planting may be included in each monitoring report. Recommendations will identify potential impediments to restoration and conservation efforts, and where appropriate, will propose adaptive solutions to problems encountered on-site.

Eelgrass Monitoring Methods

1. A pre-construction eelgrass survey shall be completed during the months of May through August. The pre-construction survey shall be completed prior to the beginning of construction and shall be valid until the next period of active growth.
2. A post-construction eelgrass survey shall be completed in the same month as the pre-construction survey during the next growing season immediately following the completion of all construction.
3. If post-construction eelgrass surveys indicate any decrease in eelgrass density or cover, then the site shall be monitored consistent with the approved final mitigation and monitoring plan until the performance criteria have been met. If post-construction survey results demonstrate to the satisfaction of the Executive Director of the Coastal Commission that eelgrass densities have not decreased at

all and there has been no loss of extent of vegetated cover, then no further monitoring or mitigation is required.

4. Adverse impacts to eelgrass shall be measured as the difference between the pre-construction and post-construction estimates of eelgrass cover and density. The extent of vegetated cover is defined as that area where eelgrass is present and where gaps in coverage are less than one meter between individual turion clusters. Density is defined as the average number of turions per unit area.

5. Density and extent of vegetative cover shall be estimated at control areas during pre-construction surveys, post-construction surveys, and during annual monitoring. Changes in density and extent of vegetated cover of the control areas shall be used to account for natural variability. Selection of an appropriate control site shall be performed in consultation with the Department of Fish and Game and NOAA-Fisheries staff.

6. Monitoring methods shall include mapping and random sampling of the eelgrass areas using a sampling size adequate to obtain representative qualitative data for the entire project site to determine percent cover and shoot density as defined in subsection (4) above.

MONITORING SCHEDULE

CNPS Species

A qualified biologist will monitor the rare plant mitigation area during Years 1, 3, 5, 7 and 10 for Humboldt Bay owl's clover, Lyngbye's sedge, and Point Reyes bird's beak. In addition, a qualified restoration ecologist will monitor the project during construction to ensure that the mitigation area is installed as described in this plan. The restoration ecologist will also oversee the removal and reinstallation (re-introduction) of populations of hemiparasitic plants (e.g., Humboldt Bay owl's clover and Point Reyes bird's beak) that may be salvaged or relocated prior to and/or during project construction.

The proposed monitoring schedule for the rare plant mitigation area is presented in Table 3. Monitoring will be conducted in the mid to late summer (July through August) of Years 1, 3, 5, 7 and 10 when Lyngbye's sedge, Humboldt Bay owl's clover and Point Reyes bird's beak have reached maturity and are in flower and more easily identified. Table 3 lists the years in which each attribute will be monitored. It is unlikely that vegetation establishment will occur in Year 1, however the site will be monitored in the event that any of these 3 species naturally reestablishes in order to ensure their protection. CNPS species monitoring reports will be prepared in Years 1, 3, 5, 7 and 10 following data collection and analysis and will be submitted to the Humboldt County Resource Conservation District (HCRCD).

Table 3. CNPS Species Monitoring Schedule for the Salt River Ecosystem Restoration Project Rare Plant Mitigation and Monitoring Plan.

MONITORING TASK	EIGHT WEEKS POST-PROJECT CONSTRUCTION	**6 MONTHS**[2]	**Year 1**[1]	**Year 3**[1]	**Year 5**[1]	**Year 7**[2]	**Year 10**[2]
Record Drawings	X[1]						
Plant Presence/			X	X	X	X	X

Absence							
Plant Cover		X	X	X	X	X	X
Natural Recruitment		X	X	X	X	X	X
Photo-documentation		X	X	X	X	X	X

[1] Monitoring to occur for all 4 species
[2] Monitoring to occur for only Humboldt Bay owl's clover, Lyngbye's sedge and Point Reyes birds beak

Eelgrass
Pursuant to the eelgrass monitoring methods described above, a post-construction eelgrass survey shall be completed in the same month as the pre-construction survey during the next growing season immediately following the completion of construction. Monitoring for natural eelgrass recruitment shall continue annually for years 1, 2, and 3 following the completion of construction. If natural recruitment does not meet success criteria and the approval of the Coastal Commission, annual monitoring shall continue through year 4, 5, and 6, under a schedule to be specified in an approved remediation plan.

DATA ANALYSIS AND REPORTING

Data analysis for the rare plant mitigation area will be conducted as soon as possible following collection of field data. Minimizing delays between data collection and data analysis provides an opportunity to return to the site to follow up on any discrepancies encountered in the original data set. The yearly monitoring results will be compared with results from previous years to evaluate the progress of the rare plant mitigation area.

Monitoring report will be prepared based on the schedule above and submitted to the HCRCD, Executive Director of the Coastal Commission, DFG, and NOAA-Fisheries within 30 days of completion of each required monitoring period. Reports will include an introduction, methods, results, discussion, management recommendations, and photo-documentation sections. The Year-10 report will summarize the rare plant mitigation area, evaluate the site's overall performance, and provide final maintenance recommendations. Monitoring of CNPS species will cease when the site has met its success criteria or when it is expected to meet the success criteria with little chance of failure. Monitoring of eelgrass will cease upon approval of mitigation completion from the Executive Director of the Coastal Commission.

Final Approval

CNPS Species
It is anticipated that monitoring will be conducted for up to 10 years. At the end of the monitoring period, a final monitoring report will be prepared to establish whether the rare plant mitigation area has achieved its final success criteria. If the mitigation site has successfully met its success criteria, a letter will be sent to the HCRCD acknowledging the condition of the site. It is anticipated that the project will be considered a success when the performance criteria are met in Year 10. If populations of the species of concern are thriving well beyond the final success criteria by Year 7, a request for early sign-off may be considered.

Eelgrass

If post-construction eelgrass survey results demonstrate adequate natural recruitment to the satisfaction of the Executive Director, or if remediation plan success criteria are met, a mitigation completion letter report shall be provided to the Executive Director of the Coastal Commission, DFG, and NOAA-Fisheries. If the eelgrass performance criteria, above, have not been met at the end of the three-year remediation period, the permittee shall submit an application for an amendment to Coastal Development Permit No. 1-10-032 proposing additional mitigation to ensure all performance criteria are satisfied consistent with all terms and conditions of this permit.

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