

Specific Resource Plan

Phase 1

Enhancement and Protection of Terrace Lands at Younger Lagoon Reserve

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This document was a collaborative effort among UCSC Staff and the Younger Lagoon Reserve Scientific Advisory Committee.

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INTRODUCTION

On January 7, 2009 the California Coastal Commission (CCC) certified UCSC's Coastal Long Range Development Plan (CLRDP) for its Marine Sciences Campus (MSC). The CLRDP is a comprehensive physical development and land use plan that governs development, land use and resource protection at the MSC, including Younger Lagoon Reserve (YLR).

The CLRDP states that all "natural areas" outside of the Campus Development Zone on the MSC are to be incorporated into Younger Lagoon Reserve, restored, and preserved in perpetuity (CLRDP 2009). On July 24, 2008 the University of California Natural Reserve System (UCNRS) and UCSC Campus Administration signed an agreement incorporating the approximately 42 ac (17 ha) of natural areas (CLRDP 2009) into the University of California Natural Reserve System (UCNRS) as part of UCSC's Younger Lagoon Reserve (YLR now encompasses approximately 67 ac [27 ha]). In this document, these additional Natural Areas will be collectively referred to as the Terrace Lands. The agreement outlines the commitment by the NRS and campus to comply with restoration, management, and research on all YLR lands.

The Resource Management Plan (RMP) within the CLRDP provides a broad outline with general recommendations and specific guidelines for resource protection, enhancement, and management of all areas outside of the mixed-use research and education zones on the MSC site (areas that will remain undeveloped). A critical component of the CLRDP is the creation of a Specific Resource Plan (SRP) for each phase of restoration guided by a Scientific Advisory Committee (SAC). Thus, the intent of the RMP is for the SAC to use it as an initial framework for development of more detailed SRP for implementation. The subsequent SRP's may be adapted to address the current physical and ecological conditions, current understanding of biological and ecological processes, and current approaches to habitat re-vegetation, restoration, and enhancement. Although the SRP's are meant to be consistent with the performance standards set forth in the RMP, they may be adapted periodically based on findings from ongoing restoration work or input from the SAC. As such, the RMP goals and performance standards are not static requirements per se so much as initial guidelines that may be refined during the SAC process so long

as such refinement is consistent with current professional restoration, enhancement, and management goals and standards, and with achieving high quality open space and natural habitat in perpetuity and consistent with the CLRDP.

Although the SRP's provide specific methodology and criteria for restoration and enhancement of the Terrace Lands within YLR it is important to note that other education and research endeavors will occur throughout YLR. These education, research, and outreach projects are concurrent with UCNRS's mission to "*contribute to the understanding and wise management of the Earth and its natural systems by supporting university-level teaching, research, and public service at protected natural areas throughout California.*" Interpretive signs will be placed throughout the Terrace Lands and student and faculty users will conduct a wide range of projects ranging from observational studies of vertebrates to manipulative experiments focused on evaluating various restoration strategies and techniques to studies of wetland hydrology on coastal wetland species. These educational and research endeavors will help train students, inform the public, provide insight into the natural world, and help guide future restoration and management efforts at YLR and other similar habitats. In fact, undergraduate student investigators contributed greatly to this SPR both through background research and initial vegetation mapping efforts. Thus, restoration efforts outlined below in the SRP, combined with future uses consistent with the UCNRS mission, will provide a unique opportunity for researchers, students, and the public to participate in, and observe, restoration and to use the reserve as an outdoor classroom and living laboratory.

The following document provides the SRP for the Phase 1 of the restoration of the Terrace Lands within YLR. There are approximately 42 ac (17 ha) outside of the development zone that will be restored over the next 20 years; thus, approximately 14 ac (5.5 ha) will be restored during each of the three phases. At the conclusion of Year 7 another SRP will be written for Phase II (years 7-14), and after year 14 the final SRP will be written for Phase III (years 14-21).

Complete SRP guidelines are included as Appendix 1. Mitigation and monitoring program requirements under the California Environmental Quality Act (CEQA) are included as Appendix 2.

BASELINE ASSESSMENT (SRP 1)

This SRP applies to Phase 1 restoration of the Younger Lagoon Reserve Terrace Lands, located on UCSC's Marine Science Campus. The MSC is located on the coast at the western edge of the City of Santa Cruz. It encompasses, among other things, the laboratory complex known as Joseph M. Long Marine Laboratory (LML), a flat, gently southward-sloping coastal terrace that ends at a bluff approximately 35 ft (10.5 m) above the waters of the Monterey Bay National Marine Sanctuary, and the University of California's Younger Lagoon Reserve. The site is located within the coastal zone of the City of Santa Cruz.

The MSC is bordered by a variety of land uses. Agricultural land lies to the west of the site along the western boundary of YLR. The northern boundary of the campus is formed by the Union Pacific Railroad tracks beyond which is an industrial area. Shaffer Road runs along the eastern boundary of the site north of Delaware Avenue. East of Shaffer Road is undeveloped land that is currently vacant except for a community garden. Antonelli Pond lies to the east of this area. South of Delaware Avenue the MSC is bounded on the east by the De Anza Mobile Home Park. The Pacific Ocean forms the site's southern boundary.

The approximate 96-acre (39 hectare) Marine Science Campus site brings together the Campus Development Zones (approximately 29 ac [12 ha]), including the original 15.70 acre (6.3 hectare) LML site, the original YLR (approximately 25 ac [10 ha]), and YLR Terrace Lands (approximately 42 ac [17 ha]). The upland terrace, which encompasses both the Campus Development Zone and the YLR Terrace Lands, stretches from the coastal bluff area northward to the Union Pacific Railroad tracks at the site's northern boundary. The majority of the site was used for agriculture and produced Brussels sprouts until 1987. Since 1987 the area has remained fallow. As described more fully below, the coastal bluff and terrace support a mix of native and non-native vegetation, most of which is characterized as non-native grassland and coyote brush scrub-grassland.

Seasonal freshwater wetlands are also present on the terrace. A narrow intertidal rock shelf exists at the base of the bluff.

YLR is part of the University of California Natural Reserve System managed for research and other educational activities. Younger Lagoon lies along the western edge of the site. The reserve includes the lagoon itself as well as portions of tributary drainages and adjacent upland habitats. YLR contains known and potential habitat for several special-status wildlife species. No special-status plant species are known to occur on the reserve.

Several areas in YLR meet the definition of environmentally sensitive habitat area (ESHA) under the California Coastal Act. An ESHA is defined as any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments. At the time of CLRDP certification portions of the original YLR qualified as ESHA, as did seasonal wetlands on the Terrace and the rocky intertidal zone.

The terrace and bluff are part of the lowest and southernmost of a series of marine terraces along the Santa Cruz coastline. The terrace is essentially flat, with a 1-2% slope to the south. Its elevation ranges from 51 ft (15.5 m) above sea level at the northern edge to 37 ft (11 m) above sea level at the bluff top; its southern boundary. The southwestern edge of the terrace, between the original LML and Younger Lagoon, is partially edged by an artificial berm approximately 10 to 12 ft (3 to 3.5 m) high and 40 to 50 ft (12 to 15 m) wide.

The site is subject to a Mediterranean climate with wet cool winters and dry warm summers with little rainfall. This pattern helps to account for the mostly seasonal nature of the site's wetlands. Summer fog is present on 30% to 40% of the days. Prevailing winds are from the northwest in the summer and winter storm winds are generally from the south. Total rainfall averages approximately 30 inches (76 cm) per year. The site is exposed and subject to relatively high wind velocities, coastal fog, and salt spray compared to more protected areas to the east.

Soils on the terrace exhibit generally poor drainage, with portions of the site experiencing saturated soil conditions and temporary shallow inundation during the wet season (November through March). Soils fall into three soil series, Elkhorn Sandy Loam, 0-2% slope; Elkhorn Sandy Loam, 2-9% slope; and Watsonville Loam, thick surface, 0-2% slope (Soil Conservation Service 1980). These soils were formed from alluvial fans and marine deposits and tend to be deep with loamy textures and slow runoff. The 0-2% slope soils are categorized by the Natural Resource Conservation Service as hydric soils for Santa Cruz County (Natural Resource Conservation Service 1992). The soils are underlain by Santa Cruz Mudstone, with the water table generally 2 to 10 ft (0.6 to 3 m) below the surface depending on time of year (Philip Williams and Associates 1995).

Surface water primarily enters the property from a culvert at the railroad tracks near the northwest corner of the site, through on-site precipitation and by site runoff (Huffman-Broadway Group, Inc. 2004). The watershed above the Terrace Lands is significantly restricted by HWY 1 which diverts potential (and likely historical) runoff that would have ended up in Younger Lagoon over to Wilder Ranch State Park (West) or Antonelli Pond (East). Thus, the approximate size of the watershed that flows into the upper Terrace area is only approximately 50 ac (20 ha). Water leaves the site through evaporation and evapotranspiration, as well as drainage to Younger Lagoon, De Anza Mobile Home Park, and the ocean. Natural drainage patterns have been altered by LML and related Campus development as well as ditches and surface reconveyance from past farming activities. Subsurface seeps on the coastal bluff and YLR slopes also indicate that near surface perched groundwater exits on the site at these locations. Extensive burrowing activity by rodents is evident throughout the Terrace and may have loosened the upper portions of the soil profile and aerated the soils. This may be improving soil drainage characteristics and increasing vertical and horizontal water movement through the site (Huffman-Broadway Group, Inc. 2004).

Development zones

The built environment is organized into four primary zones of development, one each in the lower (approximately 7 ac [3 ha]), middle (approximately 20 ac [8 ha]), and upper portions of the site (approximately 1.4 ac [0.6 ha]), and one at the Campus entrance (approximately 0.5 ac [0.2 ha]), referred to in the CLRDP as Lower Terrace, Middle Terrace, Upper Terrace, and Campus Entrance development zones (Figure 1). Each development zone is intended to include a mix of marine research and education uses, except for the Campus Entrance zone, which is intended for more general support facilities such as parking and an entrance kiosk (University of California Santa Cruz 2008).

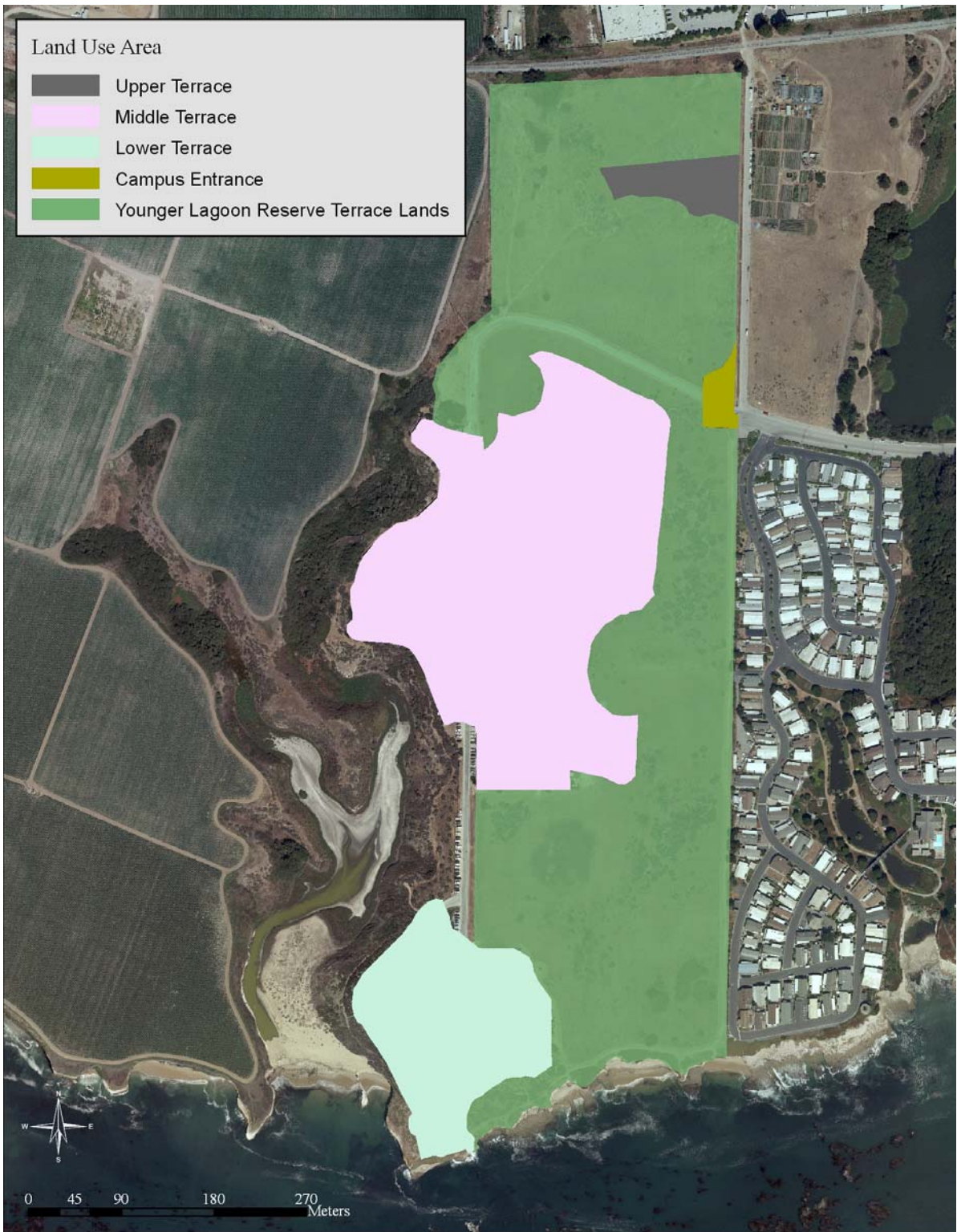


Figure 1. Campus Development Zones and YLR Terrace Lands.

Natural areas outside of the MSC Development Zones (YLR Terrace Lands)

Below, the baseline conditions of YLR Terrace Lands is described.

Non-native grassland

Non-native grassland is one of two dominant vegetation types, along with coyote brush scrub, (*Baccharis pilularis*) on the terrace and currently covers approximately 31 ac (12.5 ha) of the Terrace Lands. It became firmly established after farming ceased in 1987 and is now composed almost entirely of weedy non-native and mostly annual species. The dominant species include ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), six-weeks fescue (*Vulpia bromoides*), slender wild oat (*Avena barbata*), hare barley (*Hordeum murinum* ssp. *leporinum*), and Italian ryegrass (*Lolium multiflorum*). Herbs include wild radish (*Raphanus sativus*), cut-leaved geranium (*Geranium dissectum*), bristly ox-tongue (*Picris echioides*), and Bermuda-buttercup (*Oxalis pes-caprae*). The abundance of Bermuda-buttercup, which reproduces by vegetative bulblets, likely results from past cultivation and tilling activities.

Coyote-brush scrub

Coyote-brush scrub is currently the second dominant vegetation community on the terrace and is sparsely distributed over approximately 7 ac (3 ha) on the Terrace Lands (Figure 2). It is characterized by patches of coyote brush of various sizes interspersed with open grassland areas. It is similar in composition to the non-native grassland and also includes scattered patches of Douglas' baccharis (*Baccharis douglasii*). Many coyote brush individuals are very tall, reaching 10 ft (3 m) or more. Bermuda-buttercup is generally abundant under the coyote brush.

Ruderal

Areas identified as ‘ruderal’ in the CLRDP are included in this SRP as either part of the non-native grassland or coyote-brush scrub categories. Restoration activities in “ruderal” areas will be the same as in the adjacent non-native grassland and coyote-brush scrub areas. The ruderal designation included an area that supports a linear (north-south) underground utility corridor (University of California Santa Cruz 2008). All vegetation was removed during construction and the area is now colonized by a dense cover of the weedy, non-native herb bur-clover (*Medicago polymorpha*). Other species include non-native weeds such as white-stemmed filaree (*Erodium moschatum*), Cretan lavatera (*Lavatera cretica*), Jubata grass (*Cortaderia jubata*), poison hemlock (*Conium maculatum*), and non-native annual grasses.

Coastal bluffs

Current coastal bluff vegetation can be classified into two groups: mixed and ice plant (*Carpobrotus edulis*). The coastal bluff area is exposed to salt spray and ocean winds and is represented as a narrow zone along the top of bluff at the Terrace’s southern end just south of LML (Figure 3). The perennial grass creeping wild rye (*Leymus triticoides*) is the most abundant native species; other natives include the herbaceous perennials lizard tail (*Eriophyllum staechadifolium*), coast buckwheat (*Eriogonum latifolium*), seaside daisy (*Erigeron glaucus*), yarrow (*Achillea millefolium*) and sea lettuce (*Dudleya caespitosa*). The history of these species on the Terrace is unclear; they may be indigenous to the site or may have established from native plant garden seed dispersal. The non-native wild radish, Bermuda-buttercup, Cretan lavatera, and ripgut brome are also abundant. Ice plant extends along much of the eastern boundary of site by the De Anza Mobile Home Park. Overall, this area dominated by ice plant and non-native grasses and is highly degraded.



Figure 2. Map of creeping wild rye, coyote brush, and arroyo willow on the Terrace Lands. Plants were digitized using a 2007 ortho-image as a background (small patches of *L. triticoides* in coastal bluff area not mapped).

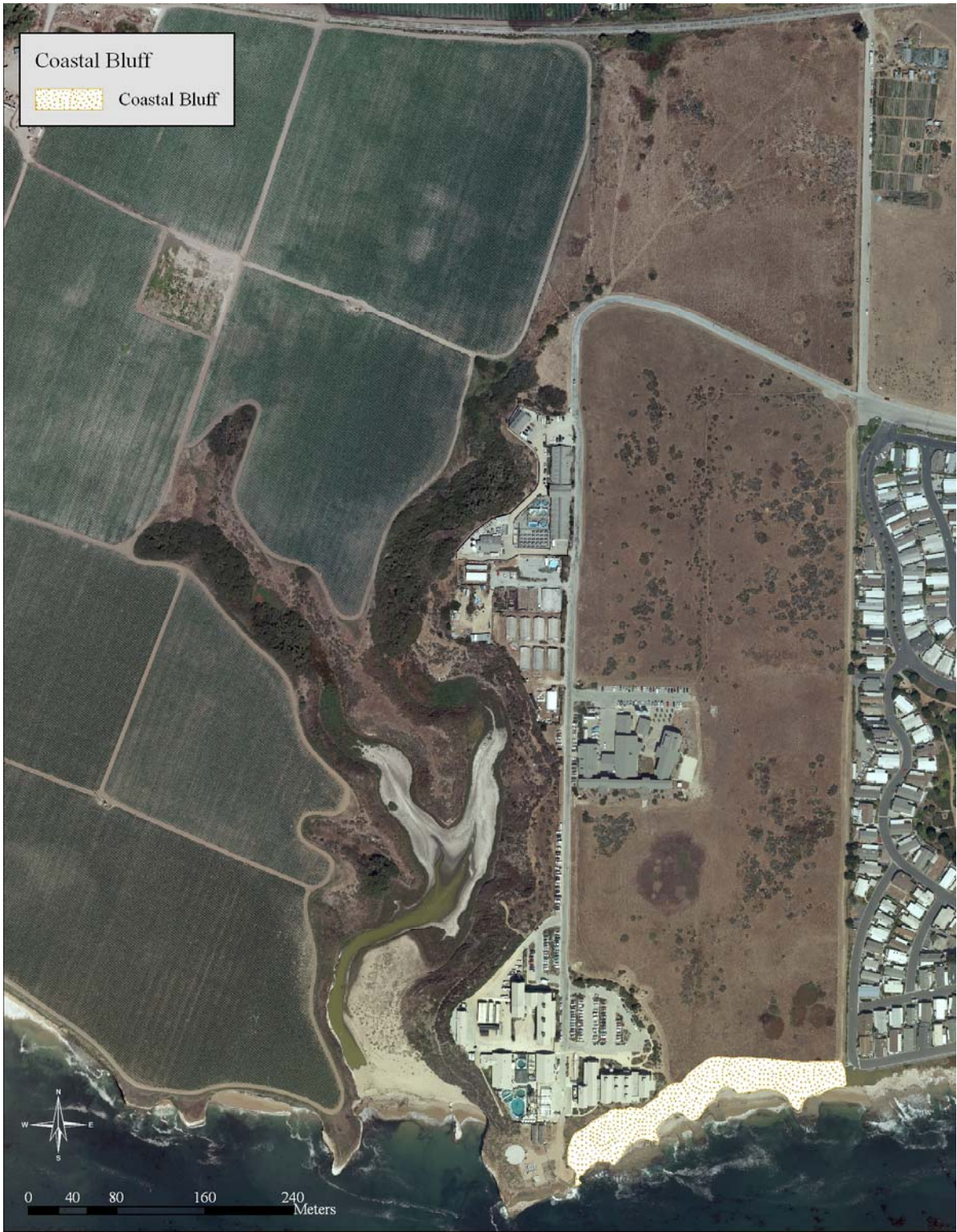


Figure 3. Coastal bluff area.

Wetlands

The CLRDP cites 12 wetlands (W) on the Terrace Lands (Figure 4; Huffman-Broadway Group, Inc. 2004). These wetlands support six vegetation types: seasonal ponds, freshwater marsh-coastal terrace, willow herb-Douglas' baccharis, moist meadow, willow riparian forest, and annual grassland (University of California Santa Cruz 2008, EcoSystems West 2002). In addition, some wetland indicator species (e.g. Italian ryegrass and Douglas' baccharis) are patchily distributed outside of the 12 delineated wetlands (Huffman-Broadway Group, Inc. 2004).

W1 is the drainage channel along the northwestern boundary of the property (approximately 0.14 ac [0.05 ha]). W2 is a flatter wetland swale in the northwestern portion of the property (it connects with W1 at its northern and southern ends). W3 is a large ponded area adjacent to the intersection of Delaware Avenue and Shaffer Road. W2 and W3 combined are approximately 4.57 ac (1.85 ha). W4 is a seasonal wetland swale in the eastern portion of the site (approximately 0.42 ac [0.17 ha]). W5 is a seasonal pond in the depression area immediately south of the NOAA building (approximately 2.21 ac [0.89 ha]). W6 is an isolated wetland complex just north of the California Department of Fish and Game (CDFG) building (approximately 0.09 ac [0.036 ha]). W8 is an isolated wetland immediately south of Delaware Avenue Extension (approximately 0.01 ac [0.004 ha]). W9 is an isolated wetland approximately 200 ft² (61 m²) south southeast of the road bend where Delaware Avenue Extension turns south to become McAllister Way (87 ft², 8 m²). W10 is an isolated wetland south of the DeAnza drainage adjacent to the eastern property boundary (four ft², 0.37 m²). W11 is a drainage channel that extends westward from McAllister Way (115 ft², 10.6 m²). W12 is a complex of wetlands south and east of the W5 (approximately 0.21 ac [0.085 ha]). Other than wetland W7, all wetlands qualify as ESHAs and together total approximately 7.65 ac. Each of these is described in more detail below.



Figure 4. Wetlands.

In addition to finding wetlands that qualified as ESHA on the Marine Science Campus, the Huffman-Broadway Group (2004) found one area that qualified as wetland but that did not qualify as ESHA. This is designated as Wetland W7. Wetland W7 was determined to have no plant or animal life or habitat that was either rare or especially valuable because of its role in the ecosystem. Wetland W7 is approximately 43 ft² (4 m²) and is located in the northeast corner of the site approximately 150 ft (46 m) south of the northern property line.

Wetland Vegetation Types

EcoSystems West (2002) described five wetland vegetation types on the Terrace Lands based on vegetation characteristics. These include seasonal pond, freshwater marsh-coastal terrace, herb community dominated by willow-herb and Douglas' baccharis, moist meadow, and central coast arroyo willow riparian forest. EcoSystems West (2002) characterized Italian ryegrass (*Lolium multiflorum*) as an upland vegetation type. However, at the time that the U.S. Fish and Wildlife Service (USFWS) issued its 1988 list of species that grow in wetlands, Italian ryegrass was considered synonymous with perennial ryegrass (*L. perenne*), a hydrophyte with a wetland designation of "FAC" (equally likely to occur in uplands or wetlands). Although the 1996 USFWS list does not include Italian ryegrass (the perennial ryegrass is now considered by many to be a separate species), in California it occurs in the same habitat conditions as its congener. On the Terrace Lands Italian ryegrass grows in locations that are continuously inundated for months as well as in areas with upland hydrology. As such, the species is considered a FAC species and a sixth wetland vegetation type (Grassland dominated by Italian ryegrass) is suggested to be included on the Terrace Lands (Huffman-Broadway Group, Inc. 2004). The following six wetland vegetation types exist on the Terrace Lands:

1. Seasonal ponds—Located within the grasslands south of the NOAA building in the southwestern portion of the terrace (Wetland W5). Patches of prairie bulrush (*Scirpus maritimus*) dominate the central pond, along with smaller dense patches of pale spike-rush (*Eleocharis macrostachya*). Scattered on the pond bed are

patches of the coastal salt marsh species such as pickleweed (*Salicornia virginica*) and non-native brass buttons (*Cotula coronopifolia*), swamp grass (*Crypsis schoenoides*), and biennial sagewort (*Artemisia biennis*). An annual native herb, water starwort (*Callitriche marginata*), is abundant along the pond margins where the vegetation is not otherwise sharply distinct from that of the adjacent non-native grassland. Douglas' baccharis and Italian ryegrass also grow in the transitional areas.

2. Freshwater marsh—Found in three areas throughout the Terrace. The first area is near the western boundary of the site just north of the sharp curve where Delaware Avenue Extension curves to the south near the southwest corner of Wetland W2. The marsh is in a small topographic depression, dominated by a dense patch of California tule (*Scirpus californicus*). Water smartweed (*Polygonum punctatum*) and willow-herb (*Epilobium* spp.) occur around the edges along with a small arroyo willow (*Salix lasiolepis*).

The second area of freshwater marsh-coastal terrace is just south of the railroad tracks in the northwestern corner of the property at the northwest end of Wetland W2 at its intersection with W1. Dominated by a large arroyo willow in the center, the marsh also supports a dense colony of broad-leaved cattail, (*Typha latifolia*), floating marsh-pennywort (*Hydrocotyle ranunculoides*), water smartweed, willow-herb, and prairie bulrush. Saltgrass (*Distichlis spicata*) occurs in dense patches along the marsh margins.

The third location of freshwater marsh-coastal terrace is in the small wetland complex in the northwestern area of the terrace north of the CDFG building. This marsh drains into the eastern arm of Younger Lagoon. Prairie bulrush and willow-herb grow along the margins of the marsh, which can have open water as late as May. Willow-herb, prairie bulrush, and tall cyperus (*Cyperus eragrostis*) are the dominant species in the drainage way.

3. Herb community—This type is dominated by willow-herb and Douglas' baccharis as well as non-native cut-leaved geranium and bristly ox-tongue. Although these

species occur elsewhere on the property, only a small area in the east-portion of W4 supports this specialized vegetation type.

4. Moist meadow habitat—Occurs at the northern end of the W6 wetland complex and to the north of the freshwater marsh-coastal terrace from which it is separated by an area of non-native grassland. The moist meadow intergrades with the non-grassland habitat, but is floristically distinct and its soil retains moisture until relatively late in the season. It is dominated by the non-native velvet grass (*Holcus lanatus*) which is a perennial that indicates at least seasonally moist conditions. The native Pacific silverweed (*Potentilla anserina* ssp. *pacifica*) is an abundant associate. Other species include willow-herb, cut-leaved geranium, wild radish (*Raphanus sativa*), prickly sow-thistle (*Sonchus asper*), and bristly ox-tongue.
5. Central coast arroyo willow riparian forest—Although abundant in Younger Lagoon, this habitat is found in only one location on the Terrace. Beyond the freshwater marsh-coastal terrace and moist meadow habitats, arroyo willow riparian forest also occurs near W6 and in one small patch at the southeast end of the freshwater marsh-coastal terrace. It is dominated by arroyo willow with no other arborescent species present and little understory.
6. Grassland dominated by Italian ryegrass—This habitat is a significant part of the vegetation in wetlands W2, W3, W4, W5, W8, W9, W10, and W12.

Description of wetlands

Below are more detailed descriptions of specific characteristics of each wetland that occurs on the Terrace Lands.

Wetland W1

W1 and W2 both receive water from the culvert beneath the berm at the railroad tracks near the northwestern corner of the Terrace Lands. A small bermed area separates the wetland from adjacent agricultural lands to the west. Water flows in a north to south direction along the northwestern property boundary, then veers to the southwest before discharging to the eastern arm of Younger Lagoon. W1 was originally a drainage channel constructed to prevent inundation and allow agricultural cultivation in the northern portion of property. At present, it provides a major source of freshwater to Younger Lagoon. Sediment accumulation along portions of the channel has caused small ponds to form in some areas.

W1 is dominated by arroyo willow (*Salix lasiolepis*), willow-herb (*Epilobium ciliatum* ssp. *watsonii*), and the non-native curly dock (*Rumex crispus*). A non-native weeping willow (*Salix babylonica*) and the weedy invasive Jubata grass (*Cortaderia jubata*) also grow in W1. Poison hemlock (*Conium maculatum*) grows along its upper banks.

Wetland W1 and adjacent upland habitat provide an opportunity for wildlife to travel between Younger Lagoon and Antonelli Pond/Moore Creek (and along the railroad tracks to the west more generally).

Wetland W2

W2 shares a water source with W1 and also receives sheet flow from upland areas to the east. Historical aerial photographs show that W2 previously included a man-made drainage ditch feature but active management of the ditch apparently stopped in the early 1980s. The channel gradually filled in with sediment and W2 no longer contains a clearly defined bed and bank, making it difficult to define its lateral boundaries. As delineated in 2001, it diverges from its origin near the culvert into two narrow bands, one extending south to just north of Delaware Avenue Extension and the other extending west and east along the northern Campus boundary. The Delaware Avenue Extension road grade promotes flooding, ponding, and surface soil saturation during the wet season and through early spring. This results in some recharge of the shallow water table as well as settling of suspended solids and associated pollutants.

Wetland W2 supports both Italian ryegrass and two locations of freshwater marsh-coastal Terrace habitat (one in the southwest corner and the other in the northwest corner). This habitat contains California tule, water smartweed, willow-herb, and arroyo willow. The non-native grassland in W2 is not sharply distinct in species composition from the adjacent upland. The lowest portion of the area is overwhelmingly dominated by Italian ryegrass. Several large patches of the non-native herb green dock (*Rumex conglomeratus*) occur in the northern portion of the site, along with two patches of Douglas' baccharis at the margin of the wetland.

Wildlife habitat in W2 includes seasonal aquatic habitat in areas of ponded water and California Red-legged Frogs have been sighted in a small pond in the northwest corner of W2 in 1997 (Mori 1997, EcoSystems West 2002). Pacific tree frogs also use the seasonal wetland habitat for breeding as do many aquatic invertebrates which serve as prey for amphibians, reptiles, birds, and small mammals.

Wetland W3

W3 is located just north of Delaware Avenue Extension and east of the southern boundary of W2. It is slightly lower in elevation than its surroundings and as a result water ponds after significant rainfall events. W3 receives overland flow from adjacent areas to the north and west; historical aerial photos indicate it was once part of a larger drainage that flowed from west to east and eventually discharged into Antonelli Pond. This drainage pattern was altered by agricultural activities and installation of the Campus access road that extends from the end of Delaware Ave Extension.

Mapped as non-native grassland, W3 is not sharply distinct in species composition from the surrounding areas except that it contains algal mats, reflecting the seasonally flooded condition. Two large patches of the native creeping wild rye occur at the south-east corner of W3. The vegetation is otherwise overwhelmingly dominated by Italian ryegrass with scattered patches of curly dock.

Wetland W4

W4 is a seasonal drainage swale that originates in the central part of the Terrace Lands (approximately 300 ft [91.5 m] northeast of the NOAA parking lot). During rainfall events water accumulates in the upper portion of the swale and then flows eastward to a corrugated metal pipe culvert near the eastern Campus boundary. Historical aerial photos indicate this was once part of a continuous drainage that flowed to Natural Bridges Lagoon until an underground culvert was installed to accommodate construction of De Anza Mobile Home Park. The upper portion of the remnant swale has been disturbed by agricultural plowing, leaving no clearly defined channel, but a clearly defined drainage way does exist in the lower portion of the swale. The wetland likely functions to improve water quality through settling of suspended solids and associated pollutants while ponded.

The upper portion of the swale is dominated by hydrophytic species, such as willow-herb, Douglas' baccharis, non-native annual rabbit's foot grass (*Polypogon monspeliensis*) and curly dock. The central portion is not sharply distinct in species composition from the adjacent upland non-native grassland. The lower portion of the drainage is dominated by Italian ryegrass with scattered curly dock and wild radish. Patches of brown-headed rush (*Juncus phaeocephalus*) and Douglas' baccharis also occur in the lower portion.

Wetland W5

This wetland is a seasonal pond that forms in a small topographic depression in the southern portion of the Terrace immediately south of the NOAA building and is the wettest portion of the Terrace Lands. Historical aerial photos show this wetland has been a persistent feature on the terrace since at least the 1950s. The hydroperiod and depth of ponding depends on rainfall and ranges from two to five months and up to approximately 16 inches (40.5 cm) deep. In the early 1900s, a small channel was excavated to drain water from the pond to the ocean bluffs; however, after this ditch ceased to be maintained it rapidly filled in with sediment, limiting drainage to the ocean from the ponded area. The channel exhibited wetland characteristics in 1993 but by 2002 the channel had disappeared except for a linear wetland corridor extending south approximately 200 ft (61 m). A storm drain outlet was constructed from the NOAA site near the pond's northern

end to allow water to flow into the pond when the NOAA underground detention/percolation system reaches capacity. A pre-existing outlet near McAllister Way functions as a hydrologic control and limits lateral expansion of surface water within the pond.

W5 is characterized by the seasonal pond vegetation type. Sedges, broad-leaved cattail, pale spikerush, and pickleweed occur in the wetter areas with Douglas' baccharis and Italian ryegrass dominating the transitional areas that merge with the surrounding non-native grassland habitat.

The pond supports many aquatic and benthic invertebrate species which provide a food source for amphibians, reptiles, and birds. Pacific tree frogs have been observed at W5 and likely breed at this site. The open water area provides habitat for migratory waterfowl and shorebirds to rest and forage. The pond is used recreationally by bird watchers.

Wetland W6

W6 is a small isolated wetland complex, occupying a low-lying area in the northwestern portion of the site north of the CDFG building along the western edge of McAllister Way. This area may have been used to retain irrigation water when the area was farmed. A partial berm that prevents the area from draining into the adjacent stream habitat of Younger Lagoon is still visible. Although the area mapped as W6 includes only moist meadow habitat, other wetland vegetation types (e.g. freshwater marsh-coastal terrace and central coast arroyo willow riparian forest) occur nearby separated by non-native grassland. These areas are treated together in this SRP. The marsh can contain open water through mid-May or later, and the moist meadow retains moisture much later in the season than the non-native grassland habitat.

Wildlife habitat in W6 includes seasonal aquatic habitat in areas of ponded water and California Red-legged Frogs and Western Pond Turtle have been sighted in a small pond under the W6 willow thicket in 2010 (Glinka, 2010).

W6 and the adjacent upland habitat likely facilitate wildlife movement between YLR and Antonelli Pond/Moore Creek (as well as up the coast along the railroad track corridor) and the relatively dense arroyo willow stand offers screening and escape cover.

Wetland W7

W7 is a small isolated wetland located in the northeast corner of the Campus approximately 150 ft (45.72 m) south of the northern Campus property line at the railroad right-of-way.

Wetland W8

This seasonal wetland just south of Delaware Avenue Extension occupies a low-lying area immediately adjacent to the roadbed. Vegetation primarily consists of non-native grassland, and is subject to (and probably formed by) periodic disturbance by passing vehicles whose tires leave the paved roadbed. The depressional area supports wetland hydrologic conditions during the rainy season (particularly within the tire ruts) but is hydrologically isolated from other wetlands on the site due to the presence of Delaware Avenue Extension. This wetland is not subject to Section 404 of the Clean Water Act because of its hydrologic isolation, but is subject to California Coastal Act protection policies because hydrology and soil criteria are met.

Wetland W9

W9 is a small isolated wetland located northeast of the CDFG facility approximately 200 ft (61 m) south southeast of the road bend where Delaware Avenue Extension turns south to become McAllister Way.

Wetland W10

W10 is a small isolated wetland located south of the DeAnza drainage adjacent to the Campus's eastern boundary.

Wetland W11

W11 is a small drainage extending west from McAllister Way into YLR.

Wetland W12

W12 is a complex of wetlands immediately south and east of W5 and is similar in characteristics to the southern reaches of W5 which formed around the small channel that was dug long ago to drain water from W5.

Wetland buffers

Wetland Buffers do not constitute a specific habitat type in themselves and at the time of CLRDP certification they included mostly non-native grassland, coyote brush scrub-grassland, and ruderal vegetation types (Figure 5). Their principal function will be to buffer fauna that use wetland habitat from potential anthropogenic disturbances.



Figure 5. Wetland buffer areas.

Non-Native weeds

Non-native weeds on the Terrace Lands are categorized into four categories for removal according to life-history characteristics, current distribution on the Terrace Lands, feasibility of control, and potential for spread (Table 1). The highest removal rating (Priority one) is given to large stature, slow moving exotic plants that are capable of invading and out-competing native plants in established plant communities. These plants are typically perennial or biennial and are generally straightforward to eliminate from an area. The distribution of three species of Priority one weeds on the YLR Terrace Lands is shown in Figure 6. Equal (if not greater) importance is given to the prevention of the introduction of new weeds that are known or suspected to be invasive but do not currently exist on the Terrace Lands (Watch List weeds). These classifications reflect current research on exotic invasives and concur with the California Native Plants Society’s definition of an exotic invasive plant: "*a plant which is able to proliferate and aggressively alter or displace indigenous biological communities*" (California Native Plant Society 1996).

Table 1. Known non-native weeds on YLR Terrace and adjacent lands.

<i>Common Name</i>	<i>Scientific Name</i>	<i>Priority Rating* for Removal</i>
Blackwood acacia	<i>Acacia melanoxylon</i>	W
Everblooming acacia	<i>Acacia retinodes</i>	W
Crofton weed	<i>Ageratina adenophora</i>	W
European beachgrass	<i>Ammophila arenaria</i>	W
Giant reed	<i>Arundo donax</i>	W
Mediterranean Linseed	<i>Bellardia trixago</i>	W
Red valerian	<i>Centranthus ruber</i>	W
Portuguese Broom	<i>Cytisus multiflorus</i>	W
Scotch broom	<i>Cytisus scoparius</i>	W
Purple awned wallaby grass	<i>Danthonia pilosa</i>	W
Pepperweed	<i>Lepidium latifolium</i>	W
Yellow parentucellia	<i>Parentucellia viscosa</i>	W
Fountain grass	<i>Pennisetum setaceum</i>	W

<i>Common Name</i>	<i>Scientific Name</i>	<i>Priority Rating* for Removal</i>
Spanish broom	<i>Spartium junceum</i>	W
Ice plant	<i>Carpobrotus edulis</i>	1
Jubata grass	<i>Cortaderia jubata</i>	1
Monterey cypress	<i>Cupressus macrocarpa</i>	1
Cape ivy	<i>Delairea odorata</i>	1
Panic veldgrass	<i>Ehrharta erecta</i>	1
Fennel	<i>Foeniculum vulgare</i>	1
French broom	<i>Genista monspessulana</i>	1
Harding grass	<i>Phalaris aquatica</i>	1
Monterey pine	<i>Pinus radiata</i>	1
Himalayan blackberry	<i>Rubus discolor</i>	1
Wild oat	<i>Avena barbata</i>	2
Oat	<i>Avena fatua</i>	2
Common mustard	<i>Brassica rapa</i>	2
Rescue grass	<i>Bromus catharticus</i>	2
Ripgut brome	<i>Bromus diandrus</i>	2
Soft chess	<i>Bromus hordeaceus</i>	2
Italian thistle	<i>Carduus pycnocephalus</i>	2
Bull thistle	<i>Cirsium vulgare</i>	2
Bermuda grass	<i>Cynodon dactylon</i>	2
Poison hemlock	<i>Conium maculatum</i>	2
Black mustard	<i>Hirschfeldia incana</i>	2
Velvet grass	<i>Holcus lanatus</i>	2
Farmer's foxtail	<i>Hordeum murinum</i> ssp. <i>leporinum</i>	2
Prickly lettuce	<i>Lactuca serriola</i>	2
Wild lettuce	<i>Lactuca virosa</i>	2
Italian ryegrass	<i>Lolium multiflorum</i>	2
Perennial ryegrass	<i>Lolium perenne</i>	2
Mallow	<i>Malva parviflora</i>	2
Sourgrass	<i>Oxalis pes-caprae</i>	2
Bristly ox-tongue	<i>Picris echioides</i>	2
Rabbitsfoot grass	<i>Polypogon monspeliensis</i>	2
Wild radish	<i>Raphanus sativus</i>	2
Curly dock	<i>Rumex crispus</i>	2

<i>Common Name</i>	<i>Scientific Name</i>	<i>Priority Rating* for Removal</i>
Prickly sow thistle	<i>Sonchus asper</i>	2
Sow thistle	<i>Sonchus oleraceus</i>	2
Scarlet pimpernel	<i>Anagallis arvensis</i>	3
Pineapple weed	<i>Chamomilla suaveolens</i>	3
Lambs quarters	<i>Chenopodium album</i>	3
Nettle-leaved goosefoot	<i>Chenopodium murale</i>	3
Brass buttons	<i>Cotula coronopifolia</i>	3
Filaree	<i>Erodium moschatum</i>	3
Cut-leaved geranium	<i>Geranium dissectum</i>	3
Rough cat's ear	<i>Hypochaeris radicata</i>	3
Loosestrife	<i>Lythrum hyssopifolium</i>	3
Bur clover	<i>Medicago polymorpha</i>	3
Cut-leaved plantain	<i>Plantago coronopus</i>	3
English plantain	<i>Plantago lanceolata</i>	3
Annual bluegrass	<i>Poa annua</i>	3
Common knotweed	<i>Polygonum arenastrum</i>	3
Sheep sorrel	<i>Rumex acetosella</i>	3
Common groundsel	<i>Senecio vulgaris</i>	3
Chickweed	<i>Stellaria media</i>	3
Rattail fescue	<i>Vulpia myuros</i>	3

Notes: *Priority rating:

W. Watch List. These weeds are currently undetected at YLR Terrace Lands but are known to exist on nearby lands. Reserve staff will actively patrol for these weeds and eliminate them as soon as they are detected as part of YLR's Early Detection Rapid Response (EDRR) program (outlined in SRP 3).

1. High priority. These weeds are capable of invading and out-competing native plants in established plant communities. They are typically large stature, slow spreading perennial or biennials. Effective removal techniques for these weeds are generally well documented, and reserve staff will actively work to eliminate these weeds from YLR Terrace Lands. Once eliminated, on-going monitoring for reemergence of these weeds will take place in conjunction with patrols for Watch List weeds.
2. Medium priority. These weeds are mostly biennial or annual and are ubiquitous on YLR Terrace Lands. They are typically smaller in stature than Priority 1 weeds and more difficult to control. Weed control efforts for Priority 2 weeds will take place in conjunction with active restoration projects (e.g. planting), but P2 weeds are not expected to be eliminated from YLR Terrace Lands.
3. Low priority. These weeds are mostly annuals and are ubiquitous on YLR Terrace Lands. They are typically smaller in stature than Priority 1 weeds and more difficult to control. While many can effectively compete with natives once they are established, they typically do not aggressively push out native s. Most are commonly associated with native and non-native grasses and forbs in grasslands. Incidental weed control efforts for Priority 3 weeds may take place in conjunction with active restoration projects (e.g. planting), but P3 weeds are not expected to be eliminated from YLR Terrace..

Source: Modified from John Gilcrest and Associates and Environmental Hydrology 1998.

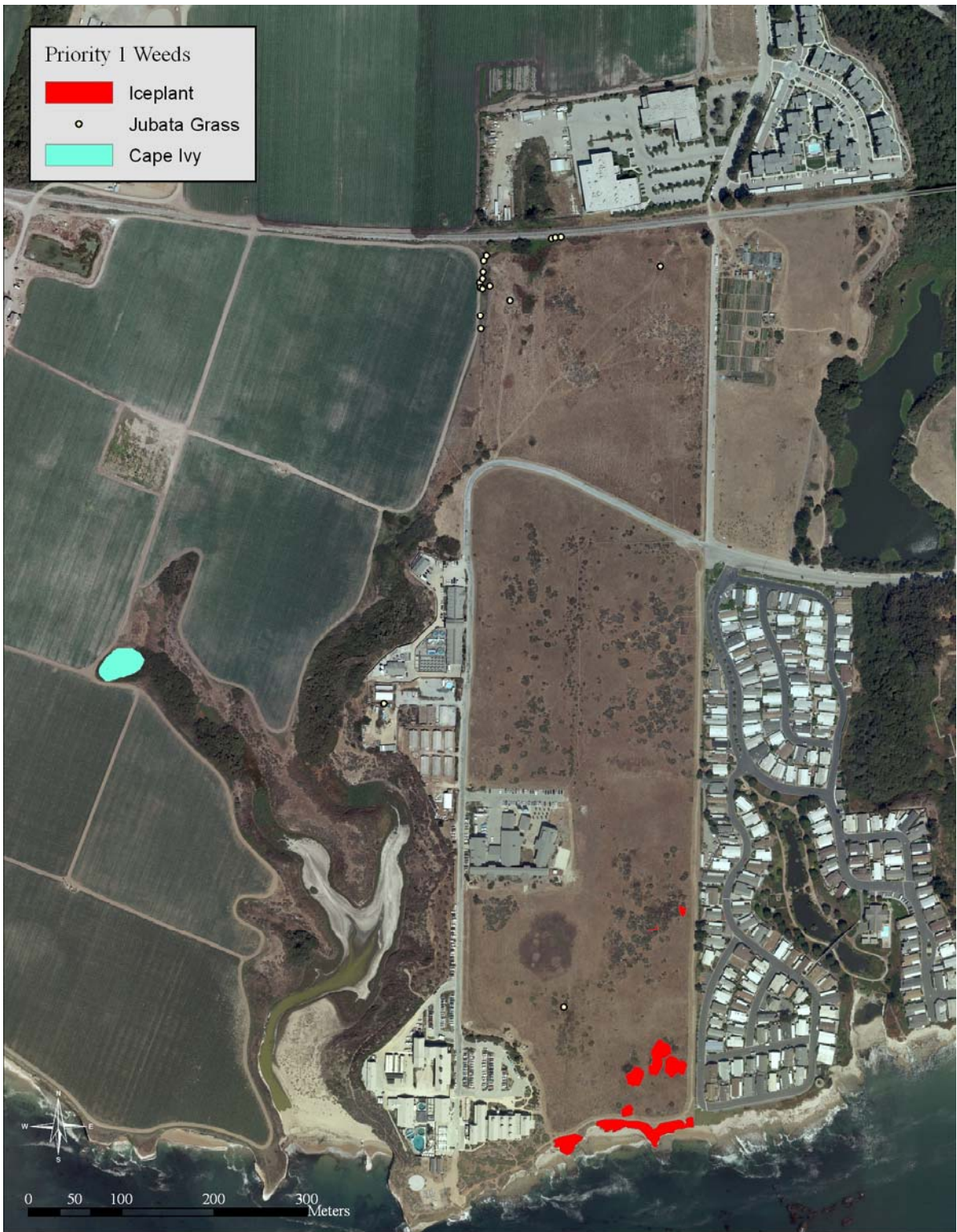


Figure 6. Distribution of three species of priority one weeds.

Native vegetation—Other

Beyond the scattered patches of coyote brush there are smaller patches of two native species - Creeping wildrye and Douglas' baccharis - throughout the Terrace Lands.

Creeping wildrye is largely restricted to the south-east corner of upper terrace (Figure 2); however, there are scattered individuals throughout the site with some relatively dense patches along the coastal bluff.

The U.S. Fish and Wildlife Service considers creeping wildrye in California to be a Facultative species, meaning that it is equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%) (U.S. Fish and Wildlife Service 1988).

Dense patches of Douglas' baccharis are found throughout the Terrace Lands both within and outside of delineated wetlands (Figure 2).

The U.S. Fish and Wildlife Service considers Douglas' baccharis in California to be an Obligate Wetland species meaning that under natural conditions it occurs almost always (estimated probability 99%) in wetlands (U.S. Fish and Wildlife Service 1988).

Phase one restoration areas

The CLRDP states that 1/3 of the Terrace Lands (~14 ac [5.67 ha]) need to meet the criteria outlined in section SRP 7 (Tables 3-6) after 7 years (Phase I). Conceptual goals for habitat restoration for the entire project area over the 20 year restoration period are discussed in detail below in SRP 2. Spatial localities for the various target vegetation communities may change based on site conditions, hydrology, etc. overtime if adaptations are deemed necessary/appropriate by the SAC. Phase I of the enhancement effort (this SRP) will focus on six areas: coyote-brush scrub-grassland, grassland, coastal bluff scrub expansion, and central wetland habitat in wetlands 1, 2, 3, 4, 5, and 6 (Figure 7) as well as priority one weed patches. These restoration areas total approximately 16 ac (6.5 ha). Wetlands 1 and 2 will be hydrologically connected. Although efforts will primarily focus on these areas during Phase I, enhancement and protection of other areas will also take place. Existing vegetation is dominated primarily by non-native

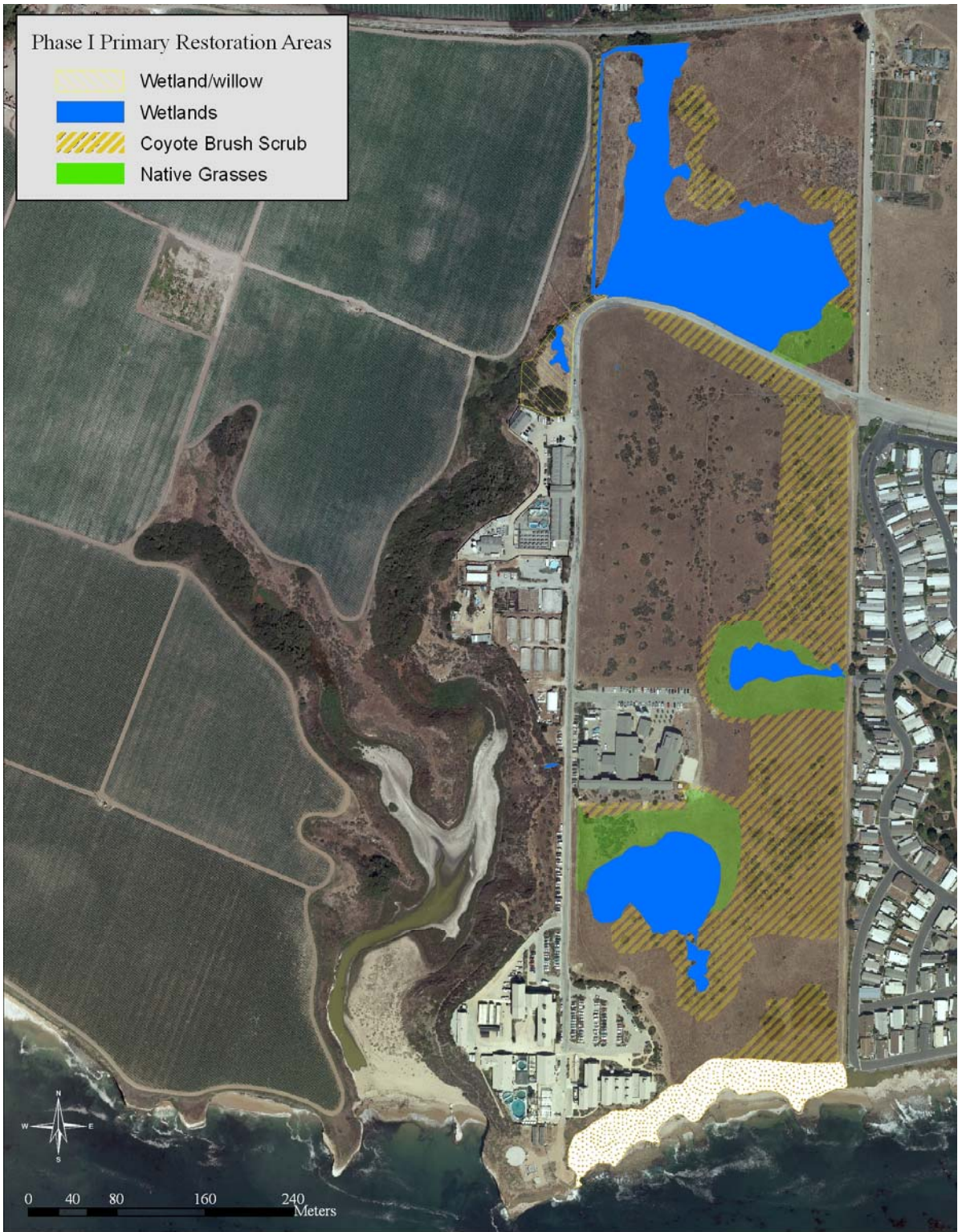


Figure 7. Primary restoration areas for Phase I.

grasses and coyote brush. This section briefly describes the locations and baseline conditions of the enhancement areas for Phase I.

Coyote Brush Scrub-Grassland

During Phase I enhancement and protection of coyote brush scrub-grassland areas will primarily take place across approximately 11 ac (4.5 ha) in areas where coyote brush is already patchily distributed (Figure 7); thus, the enhancement efforts will focus on filling in grassy interstitial spaces between existing coyote brush plants and patches in the middle and lower terrace. Although shrub species besides coyote brush will be the primary type of vegetation planted, native grasses will also be planted to create patches of native grassland within the Coyote Brush Scrub-Grassland areas. Vegetation in these areas is currently dominated by non-native grasses and coyote brush.

Grasslands

Native grasses will be planted in relatively dense patches throughout approximately 2 ac (0.8 ha) of wetland buffer regions for W4 and W5. Although wetland buffers 4 and 5 will comprise the most intensive grassland restoration for Phase I, native grasses will also be planted throughout the Terrace Lands.

Coastal Bluff Expansion

The coastal bluff scrub area covers approximately 1.5 ac (0.61 ha) and will ultimately extend to 100 ft (30.5 m) from bluff edge and merge with the restored area south of the SMDC. This area will blend into the adjacent coyote brush scrub-grassland area to the north. The CLRDP includes the maintenance of an existing coastal bluff trail as well as the enhancement of a viewpoint. Construction of the enhanced viewpoint will occur during Phase I of the restoration effort. Vegetation within the coastal bluff area is currently dominated by ice plant and non-native grasses.

Wetland Willow

The wetland willow restoration area is an approximately 1 acre (0.4 hectare) area at the top of the eastern arm of Younger Lagoon (Figure 7) that encompasses W6 and its buffer. This area is currently dominated by non-native grasses and willow. This area will be planted with native willow, grasses, and shrubs.

Wetland Buffers (Figure 5)

Wetland buffers represent prescribed distances from wetland edges (100 ft [30.5 m] for all wetlands with the exception of W5 which has a 150 ft [45.7 m] buffer). During Phase I, primary restoration efforts in wetland buffers will focus on approximately 1 acre (0.4 ha) of buffer area in buffers 4 and 5; however, other buffer areas will also be planted. Soil conditions within and among wetland buffer areas differ greatly and thus significantly influence the potential plant species that can inhabit a particular location. As such, wetland buffer areas are currently composed primarily of non-native grasses, coyote brush, Douglas' baccharis, and willow.

Wetlands 1 and 2

Current vegetation in Wetlands 1 and 2 is comprised primarily of non-native grasses, *Rumex* spp., Douglas' baccharis, small patches of creeping wild rye, and coyote brush. In addition to Priority 1 weed control, active vegetative enhancement in these areas may consist of weed whipping, herbicide application, and/or grazing, as well as enhancement of existing native vegetation with small-scale plantings and collection of seeds and cuttings for propagation. The primary focus during Phase I will be to hydrologically connect Wetlands 1 and 2 in order to reconnect the two wetlands as per the requirements of the CLRDP. Details are provided in below in section SRP 7.

Central Areas of Wetlands 4 and 5

Wetland 4 (Figure 4)

The central area of W4 is approximately 0.5 ac (0.2 ha). Phase 1A restoration activities in W4 will include weed control, enhancement of existing native vegetation with small-scale plantings and collection of seeds and cuttings for propagation.

Wetland 5 (Figure 4)

The central area of W5 is approximately 2.5 ac (1 ha). Phase 1 restoration activities in W5 will include weed control, enhancement of existing native vegetation with small-scale plantings and collection of seeds and cuttings for propagation.

Priority One Weed Patches

Discrete patches of priority one weeds are located throughout YLR Terrace Lands and MSC (Figure 6). The patch boundary for jubata grass extends beyond the MSC property line. Effective removal/control of these species will require cooperation among reserve staff, UC grounds keepers, and adjacent property owners. Phase I restoration activities will include removal of these species.

DESCRIPTION OF PLAN GOALS (SRP 2)

The goal of the restoration project is to create and protect a mosaic of rare habitats that provide substantial ecosystem services including the preservation of biodiversity, habitat for special status species, and buffering of stormwater runoff. These habitats include coastal bluff, coastal prairie, seasonal wetlands, forested wetlands and grasslands. Additionally, because the site is a UC Natural Reserve, research focused on restoration and native flora and fauna will provide opportunities to guide future restoration in similar habitats and provide educational and outreach material for Reserve users. This section of the SRP defines restoration goals for Phase I of the restoration effort; conceptual goals for the entire 20 year restoration plan (Figure 8).

Phase I activities will primarily focus on the six distinct restoration projects discussed above: Coyote-brush scrub infill, coastal bluff restoration, native grassland establishment,

central wetland habitat in wetlands 1, 2, 4 and 5, control of priority one weeds, and hydrological modification of Wetlands 1 and 2.

Phase 1 will be divided into two sub-phases. SRP Phase 1A would focus on enhancement of six habitat areas within the Terrace Lands: coyote-brush scrub-grassland, grassland, coastal bluff scrub expansion, and central wetland habitat in wetlands 1, 2, 4 and 5 (Figure 7) as well as priority one weed patches. Phase 1A would include hand planting in central wetland habitat in wetlands W1, W2, W4 and W5, consistent and implementing the goals set forth in the previously-approved RMP. Phase 1A also addresses control and removal of Priority 1 weeds throughout the Terrace Lands. About 14 acres of the Terrace Lands would be subject to restoration during Phase 1; enhancement and protection of vegetation in other natural areas of the Terrace Lands will also take place as opportunities arise. Phase 1B would propose minor hydrologic modifications to improve wetland functioning and enhance plant and wildlife habitat in wetlands W1 and W2. The campus has completed CEQA analysis for Phase 1A, and 1A work is proposed for immediate implementation. Phase 1B would focus primarily on wetland work and potentially will be subject to Clean Water Act and other permitting, and related agency consultation regarding potential effects to California red-legged frogs. The extent of wetland work and exactly how it would be carried out cannot be determined prior to this consultation. For this reason, SRP Phase 1B work is not proposed for immediate implementation. Further plans for Phase 1B work will be prepared during the course of, and with input from, agency consultation and SAC members. A separate NOID will be filed for Phase 1B when project plans for this phase of work are finalized through regulatory agency consultation and following the preparation of additional CEQA documentation.

The overarching goal for Phase I is to meet success criteria for 1/3 of the Terrace Lands natural habitats. Success criteria for Phase I restoration activities are described in detail below in SRP 2. Specific success criteria were established based on setting goals that are achievable within the context of the site and are realistic objectives that will enhance ecological functions of the area. Although restoration efforts during Phase I will be primarily focused on areas identified in Figure 7, planting and weed control will be

conducted throughout the entire site (following specific guidelines outlined below), including testing methodologies to be used in Phase II and III. Below, the restoration goals for each habitat type are outlined in greater detail.

Trails and signs

As the Marine Science Campus develops, some of the University's future NOIDs will include Reserve related items (e.g. sign packages, trail development, overlooks, etc.). These projects will be administered by Physical Planning and Construction in coordination with Reserve staff and are anticipated to have little impact on the restoration of the Terrace lands. However, it is important to highlight that this SRP recommends trails be limited primarily to the perimeter of the Reserve. This concept has incorporated into the preliminary conceptual design of the Marine Science Campus (see Appendix 3). Doing so balances public access with resource protection by providing viewing opportunities while reducing fragmentation of the Reserve, increasing native habitat (i.e. trails reduce native habitat), and distancing people from sensitive wetland habitats.

Coyote brush scrub-grassland restoration goals (Phase 1A)

Restoration within Coyote brush scrub-grassland areas will focus on increasing native plant species richness and percent cover (see Table 2 for restoration palette) and decreasing non-native plant cover. Species richness and percent cover goals are outlined in Table 3. Although scrub species will be the primary focus for these areas, native grasses will also be planted throughout. It is anticipated that there will be patches within the scrub that will remain relatively open. There will be no change in topography and/or hydrology.

Non-native grassland restoration goals (Phase 1A)

Restoration within non-native grassland areas will focus on increasing native grass species (see Table 2 for restoration palate) and decreasing non-native plant cover. Species richness and percent cover goals are outlined in Table 3. Although the primary effort will be to increase native grass cover and species richness, other native shrubs will be scattered throughout these areas through natural recruitment. There will be no change in topography and/or hydrology.

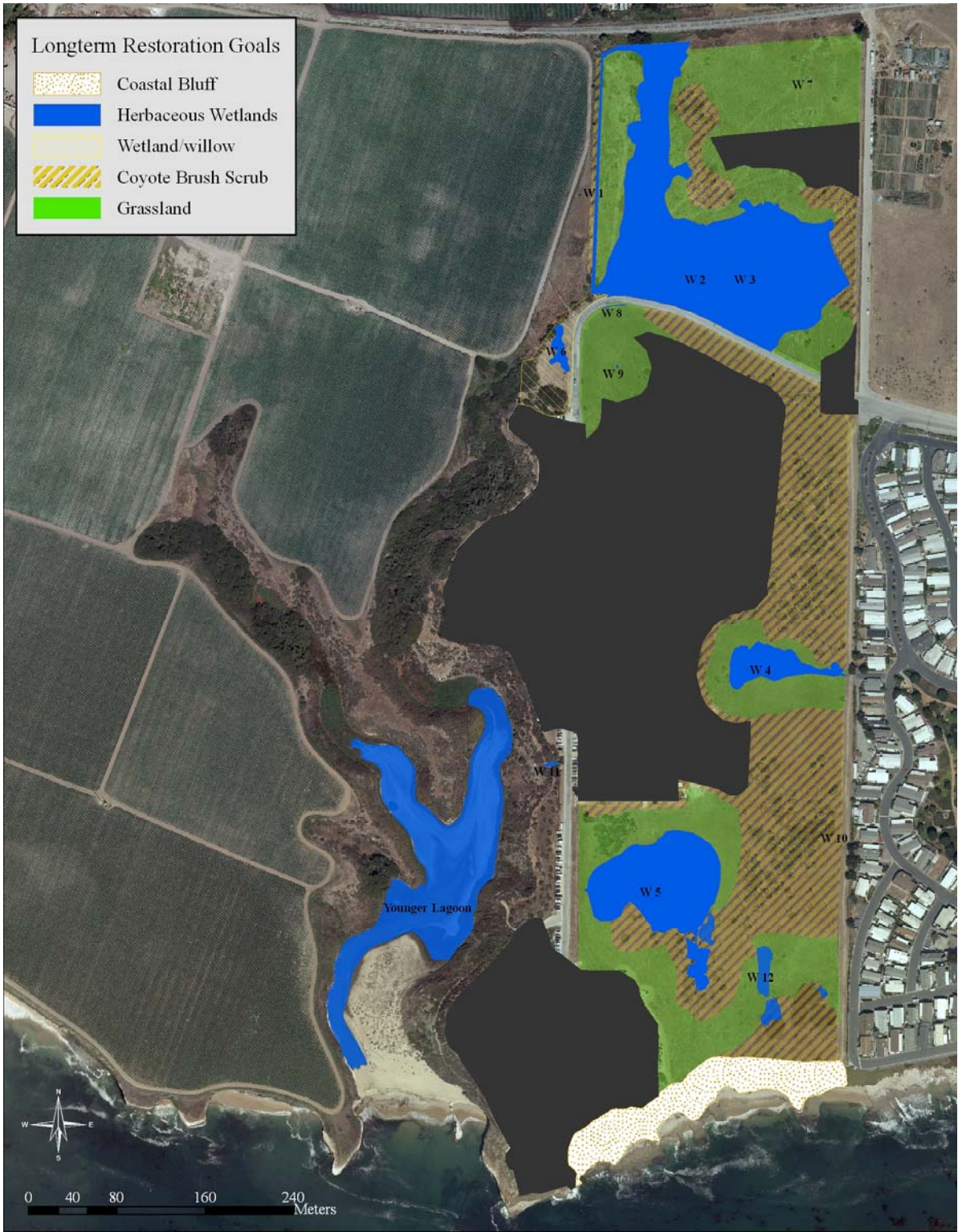


Figure 8. Twenty year restoration goal for Terrace Lands.

Coastal bluffs restoration goals (Phase 1A)

Restoration within coastal bluff habitat will focus on continuing restoration of native plant species richness and percent cover (see Table 2 for restoration palate) and decreasing non-native plant cover. Species richness and percent cover goals are outlined in Table 4. There will be no change in topography and/or hydrology. These efforts will “connect” the coastal bluff restoration area immediately adjacent to the west within the SMDC and YLR.

Central areas of wetlands 4 and 5 restoration goals (Phase 1A)

Restoration within the central areas of wetlands 4 and 5 will focus on increasing native plant species richness and percent cover (see Table 2 for restoration palate) and decreasing non-native plant cover. Species richness and percent cover goals are outlined in Table 5. There will be no change in topography and/or hydrology.

Wetland buffer restoration goals (Phase 1A)

Restoration efforts in wetland buffers will focus on increasing native plant species richness and percent cover (see Table 2 for restoration palate) and decreasing non-native plant cover. Plants used in the wetland buffers will vary depending upon soil conditions. Buffer areas throughout the Terrace Lands differ drastically depending upon the distance from each particular wetland and moisture content of the soil. As such, species richness and percent cover goals will vary (e.g. some areas will likely be dominated by grasses while others will be dominated by shrubs). Table 6 provides an overview of success criteria for wetland buffer areas. There will be no change in topography and/or hydrology.

Wetland 1 and 2 hydrologic regime change goals (Phase 1B)

As noted above, Phase 1B of the SRP is described here to the extent it has been developed to date. Implementation details will be subject to agency consultation and permitting and likely will vary, at least in some details, from the conceptual outline provided here. The implementation of SRP Phase 1B is independent of the implementation of Phase 1A, although results of both would be monitored and reported at the end of SRP Phase 1. Due to the uncertainty related to the Phase 1B elements and implementation criteria it would be too speculative to evaluate the environmental effects of Phase 1B implementation at this time.

The restoration program for W1 and W2 will address historical modifications to site hydrology that served to drain wetlands on the site (e.g. drainage ditch at site W1). However, the restoration efforts will leave intact historic modifications that may have increased the extent and duration of inundation of wetlands (e.g. roadway). Management of site hydrology will advance several objectives, specifically, increasing the cover of native wetland plant species, potentially enhancing breeding habitat for amphibians, maintaining raptor foraging habitat, and improving water quality of inputs to YLR. Furthermore, restoration of both hydrology and vegetation will create a continuous north-south area for wildlife movement to YLR.

Once the hydrology of the area is altered by the diversion of water from W1 (that currently serves as a drainage ditch) and the placement of a partial diversion at the culvert area (see Figure 10) it is likely the vegetation composition of W1 and W2 will change. Thus, specific success criteria for the restoration of this area will be deferred until Phase II or III. Enhancement of existing native vegetation in W1 and W2 with small-scale plantings and collection of seeds and cuttings for propagation as well as weed control activities will take place during Phase 1A. The area to the west of W1 will be replanted with shrubs and serve as a buffer between the agricultural land and W1/W2 (the “living fence”). Presently the buffer includes land that is not being farmed on the adjacent agricultural lands; thus, increasing the extent of the buffer. Over time it is possible that

the unfarmed lands on the adjacent parcel may be put back into production; thus, decreasing the overall extent of the buffer to the west of W1.

Slight modifications to topography will likely occur when diversion structures are put into place (see Figure 10).

Priority one weed removal goals (for all P1weeds)

All priority-one weeds (see Table 2) will be controlled as they are detected throughout the Terrace Lands. Elimination of reproductive individuals is the goal, however YLR is surrounded by priority-one weed seed sources and it is likely that there will always be some level of priority-one weeds persisting on the terrace.

SITE AREA PREPARATION AND INVASIVE PLANT REMOVAL (SRP 3)

Early Detection Rapid Response (EDRR)

Preventing the introduction of new invasive species is the first line of defense against new invasions. However, even the best prevention efforts will not stop all invasive species introductions, particularly at a small urban reserve like YLR which is surrounded by potential weed sources. Besides prevention, the most time and cost-effective way to manage the potential negative impacts of new invasive plants is through EDRR efforts.

EDDR focuses on surveying and monitoring at-risk areas to find infestations at their earliest stages of invasion and then rapidly beginning the control of these species. These efforts greatly increase the likelihood that new invasions will be addressed successfully and new weeds will be prevented from becoming established and widespread in a given area. Along with prevention this method is the most successful, cost effective, and least environmentally damaging means of control (National Invasive Species Council 2008).

After initial introduction of a new invasive plant there is a short period of opportunity for eradication or containment. Once permanently established a new invader becomes a long-term management problem. The costs associated with catching weeds before they become established are also drastically less than those of long-term invasive species management for noxious weeds that have already become widespread. Therefore, any low incidence weed known or suspected to be invasive (and feasible to control) will be removed when detected.

Weeds that are currently undetected on YLR Terrace Lands, but known to exist nearby (W – see Table 1) will be actively patrolled for and eliminated as soon as they are detected. High priority (P1 – see Table 1) weeds will be eliminated from YLR Terrace Lands. Once eliminated, on-going monitoring for reemergence of these weeds will take place in conjunction with patrols for watch-listed weeds. Control efforts for medium priority (P2 – see Table 1) weeds will take place in conjunction with active restoration projects (e.g. planting), but P2 weeds are not expected to be eliminated from YLR Terrace Lands. Incidental control efforts for low priority (P3 – see Table 1) weeds may take place in conjunction with active restoration projects (e.g. planting), but P3 weeds are not expected to be eliminated from YLR Terrace Lands.

Site area preparation and invasive plant removal techniques will vary from site to site as needed, but will draw from a set of standard methods for weed control, outlined below.

Priority one weed control

Removal techniques for priority one weeds may include one or more of the following: hand pulling / mechanical control, clipping / weed whacking, flaming, solarization, burning, grazing, and herbicide application. When herbicide is applied all listed safety instructions will be followed to protect surrounding biological resources and will follow campus policy on pesticide applications. Due to their potential to re-invade, all priority one weeds with viable propagules will either be solarized and composted on site or bagged after removal and disposed of offsite. Some priority one weed control activities

will be ongoing throughout the year. Other activities will be restricted to the winter and spring months (exact timing will be dependent on soil moisture conditions and seed-set).

In addition to the above removal techniques, modifications to Wetlands 1 & 2 will likely alter species composition in these areas. The expected increase in inundation time in wetlands 1 & 2 may decrease the viability of many of the non-native plants that exist within these areas.

The distribution of priority-one weed species on YLR Terrace Lands and possible weed control methods for each is described below.

Ice plant (Carpobrotus edulis). Family: Aizoaceae

Extent of Ice plant on YLR Terrace Lands—Ice plant is primarily found along the coastal bluffs, with some scattered patches present throughout the lower terrace (Figure 6).

Methods of Control for Ice plant on YLR Terrace Lands —Ice plant can be controlled by manual methods (hand or tractor pulling), solarization, and herbicide application (glyphosate) (Bossard et al. 2000). When hand removal is employed all above-ground plant material will be removed and the soil will be raked in order to expose and remove any remaining roots or stolons. When solarization is employed, black agricultural plastic held in place by sandbags will be used to tarp Ice plant patches for 3-6 months. After solarization or herbicide application, dead ice plant may be left in place to prevent erosion and control weeds; dead ice plant can serve as ‘mulch’ that can be planted into.

Jubata grass (Cortaderia jubata). Family: Poaceae.

Extent of Jubata grass on YLR Terrace Lands—Jubata grass is restricted almost entirely to the upper Terrace primarily along the northern and western property lines (Figure 6).

Methods of Control for Jubata grass on YLR Terrace Lands —Jubata grass is effectively controlled by mechanical means (hand pulling / grubbing), and herbicide application (glyphosate) (Bossard et al. 2000). When hand removal is employed, all above ground jubata grass material will be removed before seed set, and then the root mass will be removed. When winching is employed the root mass will be removed from the ground.

As the jubata grass on YLR Terrace Lands is part of a population that extends beyond the northern and western property lines (Figure 6), effective control of jubata grass will require cooperation between adjacent land owners and reserve staff.

Monterey cypress (Cupressus macrocarpa). Family: Cupressaceae.

Monterey cypress is native to the Monterey coast area, but is considered moderately invasive in other parts of California (including Santa Cruz County) where it spreads via seed from planted windbreaks or hedgerows.

Extent of Monterey cypress on YLR Terrace Lands—All of the Monterey cypress trees that currently exist on YLR Terrace Lands are ‘volunteers’ that have grown from seeds that were either brought to the site in landscaping mulch or that blew into the reserve from MSC landscaping plantings.

Methods of Control for Monterey cypress on YLR Terrace Lands—Mature Monterey cypress trees will be controlled by cutting the above ground material from the root. Seedlings will be controlled by hand pulling/digging. In addition to removal efforts on Terrace Lands, collaborative efforts among UCSC staff and other MSC groups (e.g. NOAA/NMFS, CDFG, and Island Conservation) will be initiated to limit the transport of Monterey cypress to the site.

Cape ivy (Delawarea odorata). Family: Asteraceae.

Extent of Cape ivy on YLR Terrace Lands—Cape ivy is not present on the Terrace Lands; however, it is established in a patch on the northwest border of Younger Lagoon (Figure 6). The patch is located on a shady west facing slope. Cape ivy has overrun the herbaceous understory of the area and is beginning to climb into the Arroyo willow canopy.

Methods of Control for Cape ivy on YLR Terrace Lands —Cape ivy is difficult to eliminate for two reasons: stolons and underground parts readily fragment while being

removed and plants will grow from almost any remaining fragment. Therefore, frequent post removal monitoring and maintenance is necessary if removal efforts are to be successful. Cape ivy can be controlled through mechanical means or herbicide application (glyphosate and triclopyr or Transline) (Bossard et al. 2000). When hand removal is employed, all above ground plant material (both native and non-native plants, except native trees) will be removed in the infested area. After the removal of above ground material soil will be raked to expose and remove any remaining roots or stolons.

Panic veldgrass (*Ehrharta erecta*). *Family: Poaceae.*

Extent of Panic veldgrass on YLR Terrace Lands – Panic veldgrass on YLR Terrace Lands is currently restricted to several small patches located adjacent to SMDC.

Methods of Control for Panic veldt grass on YLR Terrace Lands —Once established panic veldgrass is extremely difficult to control / eliminate. Mechanical means of control (hand pulling / grubbing), and herbicide application (Fusilade, and glyphosate) have had mixed results (Bossard et al. 2000). Therefore, the highest priority must be given to preventing the further spread of this weed and eliminating it while it is still at a low incidence. When hand removal is employed, the entire plant will be removed from the ground (including the root mass).

Fennel (*Foeniculum vulgare*). *Family: Apiaceae.*

Extent Fennel on YLR Terrace Lands – Fennel is currently limited to a few scattered individuals on the west side of the middle and upper terrace.

Methods of Control for Fennel on YLR Terrace Lands —Fennel is effectively controlled by mechanical means (hand pulling / grubbing), and herbicide application (triclopyr and glyphosate) (Bossard et al. 2000). When hand removal is employed all above ground fennel material will be removed before seed set (root mass will also be removed).

French broom (*Genista monspessulana*). *Family: Fabaceae.*

Extent of French broom on YLR Terrace Lands—French broom was not detected on YLR Terrace Lands in 2009. However, it has previously been sighted in the middle terrace Development Zone near the greenhouses. In addition, an extremely large French broom population is located north of the reserve in the City of Santa Cruz Moore Creek Preserve making future re-infestations likely.

Methods of Control for French broom on YLR Terrace Lands —French broom is effectively controlled by hand pulling (weed wrenching), prescribed burning, flaming of seedlings, grazing by goats, herbicide application, or a combination (Bossard et al. 2000). Weed wrenches will be used to remove entire plants before seed set. Seedlings will be removed by flaming or manual methods.

Harding grass (Phalaris aquatica) Family: Poaceae

Extent of Harding grass on YLR Terrace Lands – Harding grass on the Terrace Lands is currently limited to a few scattered individuals on the west side of the middle and upper terrace.

Methods of Control for Harding grass on YLR Terrace Lands —Harding grass is effectively controlled by mechanical means (hand pulling / grubbing), and herbicide application (glyphosate) (Bossard et al. 2000). When hand removal is employed all above ground material will be removed before seed set (the root will also be removed).

Monterey pine (Pinus radiata). Family: Pinaceae.

Monterey pine is the most widely planted commercial timber tree in the world (Bossard et al, 2000). However, in its native range, consisting of five populations in California and Baja California, Mexico, the species is threatened by development, human-dispersed plant pathogens, non-native herbivores, etc (Bossard et al, 2000). Our classification of Monterey pine as a Priority one weed on the YLR Terrace Lands is specifically based on the fact that the Monterey pines on the YLR Terrace Lands became established on the site due to human introduction. Once established, Monterey pines can displace and shade

out native vegetation and alter fire regimes. Monterey pines produce thousands of light winged seeds that are easily wind dispersed.

Extent of Monterey pine on the YLR Terrace Lands – Monterey pine on the YLR Terrace Lands is currently limited to a few scattered individuals.

Methods of Control for Monterey pine on YLR Terrace Lands—Mature Monterey pine trees will be controlled by cutting the trunk at ground level. Seedlings will be controlled by hand pulling/digging. In addition to removal efforts on Terrace Lands, collaborative efforts among UCSC staff and other MSC groups (e.g. NOAA/NMFS, CDFG, and Island Conservation) will be initiated to limit the transport of Monterey pines to the site.

Himalayan blackberry (*Rubus discolor*). *Family: Roseaceae.*

Extent of Himalayan blackberry on YLR Terrace Lands – Himalayan blackberry is found at low incidence throughout YLR Terrace Lands.

Methods of Control for Himalayan blackberry on YLR Terrace Lands — Himalayan blackberry is effectively controlled by mechanical means (hand digging /weed wrenching). All above ground Himalayan blackberry material will be removed before seed set (roots will also be removed).

Medium and low priority grassland weed control

Although mowing, grazing, herbicide application, scraping, and burning are effective methods for reducing annual seed set and thatch in non-native grasslands, managing to reduce exotic grasses without seeding or planting natives is relatively ineffective in restoring natives because it simply shifts the species composition to low stature exotic forbs (DiTomasso 2000, Hayes and Holl 2003a, Hayes and Holl 2003b, Stromberg et al. 2007). Therefore medium and low priority weeds will not be controlled until active restoration projects (e.g. planting) are taking place in a site. Once active restoration has begun, a combination of weed control techniques will be implemented. Additionally, an

experimental approach to non-native grass control may be used to evaluate emerging techniques with the goal of incorporating promising methodologies into management activities.

Some non-native grassland control activities will be ongoing throughout the year. Other activities will be restricted to the winter and spring months (their exact timing dependent on soil moisture conditions and seed-set).

PLANTING PLAN (SRP 4)

The planting plan is composed of the following key components for successful restoration, plant palette and selection, planting design (plant mix and spacing), local plant material source, plant installation, erosion control, irrigation, and remediation. The planting palette is made up exclusively of native taxa that are appropriate to the habitat and region. Seed and/or vegetative propagules will be obtained from local natural habitats so as to protect the genetic makeup of natural populations. Horticultural varieties will not be used.

The use of locally collected seeds and cuttings in restoration projects reduces the risks of introducing non-local genes into the population; potentially decreasing species fitness. In order to maintain the genetic integrity of the rich assemblage of plants found along the central coast of California, all seeds and cuttings will be collected from coastal Santa Cruz and San Mateo Counties. However, the collection zone (within approximately one mile [1.6 km] of the Marine Science Campus and seaward of Highway 1) as outlined by the CLRDP is too small to meet CLRDP restoration goals. The prescribed collection zone is bounded by Hwy 1 to the north, the ocean to the south, Fair Ave to the east, and Coast Rd to the west (Figure 9). Much of this area is highly disturbed by urban and agricultural development, and is of limited value for collection. Although a portion of the botanically rich Wilder Ranch Beach and Lagoon and YLR itself are included in the collection zone, it is unlikely that a high enough quantity and diversity of seeds can be collected in this restricted geographic area. Therefore, the size of the seed collection zone will be expanded to include similar habitats along the coast of western Santa Cruz county and southern San Mateo County (first and lower reaches of the second marine terraces).

The restoration planting palate (Table 2) is comprised of possible revegetation species for each habitat type. If other species appropriate for restoration are identified they will be added to the restoration palate.

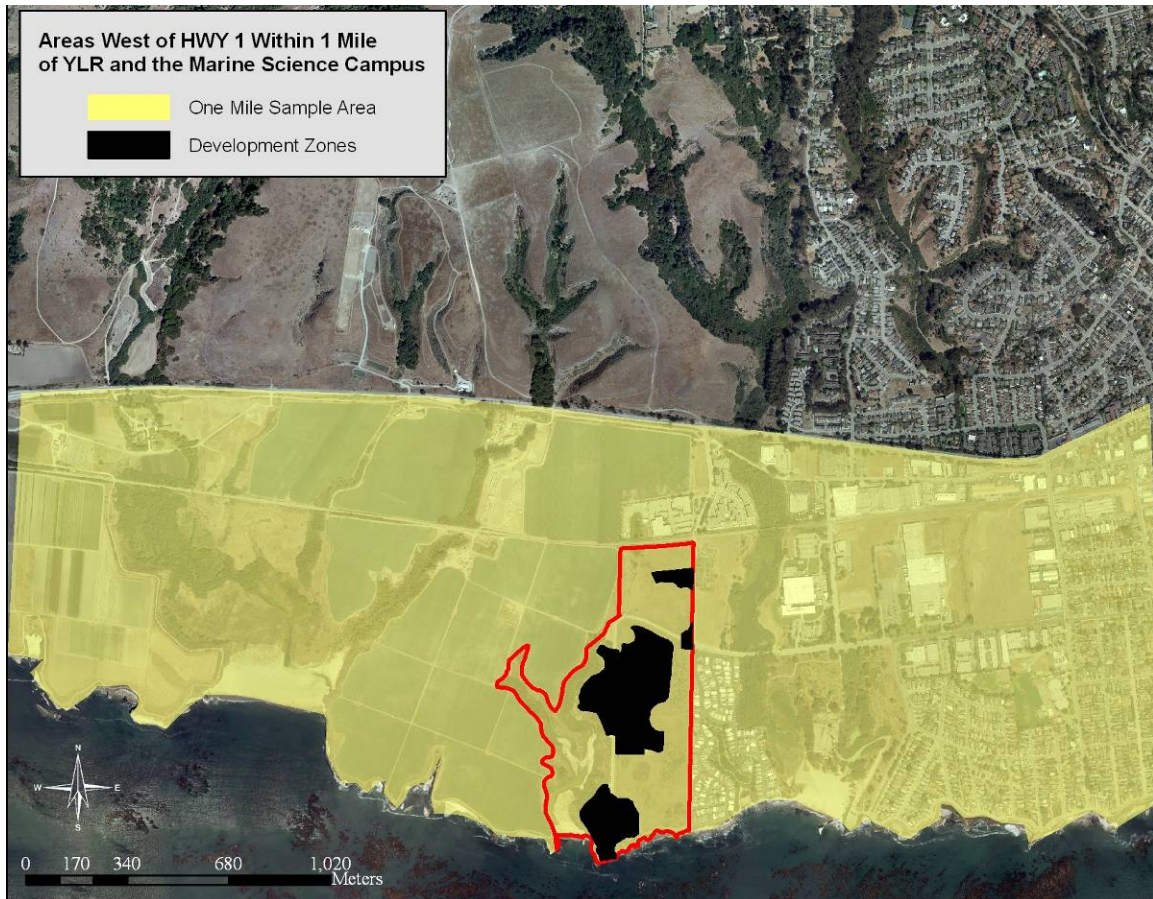


Figure 9. Seed collection area as defined by the CLRDP.

Table 2. Possible revegetation species.

<i>Common Name</i>	<i>Scientific Name</i>	<i>Grassland/ Erosion Control</i>	<i>Coastal Bluff</i>	<i>Wetland/ Riparian</i>	<i>Wildlife Corridor</i>	<i>Upland Buffer</i>	<i>Coastal Scrub</i>
Trees							
California box elder	<i>Acer negundo</i> var.			x	x		

<i>Common Name</i>	<i>Scientific Name</i>	<i>Grassland/ Erosion Control</i>	<i>Coastal Bluff</i>	<i>Wetland/ Riparian</i>	<i>Wildlife Corridor</i>	<i>Upland Buffer</i>	<i>Coastal Scrub</i>
	<i>californicum</i>						
California buckeye	<i>Aesculus californica</i>				X	X	
Coast live oak	<i>Quercus agrifolia</i>				X	X	
Wax myrtle	<i>Myrica californica</i>			X	X		
Arroyo willow	<i>Salix lasiolepis</i>			X	X		

Shrubs and Subshrubs

California sagebrush	<i>Artemisia californica</i>		X		X	X	X
Mugwort	<i>Artemisia douglasiana</i>		X	X			
Douglas' baccharis	<i>Baccharis douglasii</i>			X			
Coyote brush	<i>Baccharis pilularis</i>		X		X	X	X
Blue blossom ceanothus	<i>Ceanothus thyrsiflorus</i>				X		
California goldenbush	<i>Ericameria ericoides</i>		X				X
Seaside daisy	<i>Erigeron glaucus</i>		X			X	
Coast buckwheat	<i>Eriogonum latifolium</i>		X			X	X
Lizardtail	<i>Eriophyllum staechadifolium</i>		X			X	X
Oceanspray	<i>Holodiscus discolor</i>				X	X	X
Deerweed	<i>Lotus scoparius</i>	X					X
Yellow bush lupine	<i>Lupinus arboreus</i>		X		X	X	
Bush monkeyflower	<i>Mimulus aurantiacus</i>		X		X	X	X
Wax myrtle	<i>Myrica californica</i>				X		X
Coffeeberry	<i>Rhamnus californica</i>				X		X
California wild rose	<i>Rosa californica</i>	X		X		X	X
California blackberry	<i>Rubus ursinus</i>			X		X	X
Red elderberry	<i>Sambucus racemosa</i> var. <i>racemosa</i>			X	X	X	X

Forbs

Yarrow	<i>Achillea millefolium</i>		X	X		X	X
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<i>Common Name</i>	<i>Scientific Name</i>	<i>Grassland/ Erosion Control</i>	<i>Coastal Bluff</i>	<i>Wetland/ Riparian</i>	<i>Wildlife Corridor</i>	<i>Upland Buffer</i>	<i>Coastal Scrub</i>
Sea pink	<i>Armeria maritima</i>		x				
California aster	<i>Aster chilensis</i>	x	x	x			
Fat hen	<i>Atriplex triangularis</i>			x			
Beach saltbush	<i>Atriplex leucophylla</i>			x			
Sun cup	<i>Camissonia ovata</i>	x					
Wight's indian paintbrush	<i>Castilleja wightii</i>		x				x
Soap plant	<i>Chlorogalum pomeridianum</i>	x					x
Brownie thistle	<i>Cirsium quercetorum</i>	x	x				
American wild carrot	<i>Daucus pillus</i>	x	x				
Sea lettuce	<i>Dudleya farinosa</i>		x				
Western goldenrod	<i>Euthamia occidentalis</i>		x				
Beach strawberry	<i>Fragaria chiloensis</i>		x				
Gum plant	<i>Grindelia stricta</i>		x	x			x
Cow parsnip	<i>Heracleum lanatum</i>		x			x	
Douglas' iris	<i>Iris douglasiana</i>	x	x				
Coast trefoil	<i>Lotus formosissimus</i>	x					
Sky lupine	<i>Lupinus nanus</i>	x	x		x	x	
Lindley's varied lupine	<i>Lupinus variicolor</i>	x	x		x	x	
Wild cucumber	<i>Marah fabaceus</i>					x	
Pacific oenanthe	<i>Oenanthe sarmentosa</i>			x			
California polypody	<i>Polypodium californicum</i>					x	x
Pacific silverweed	<i>Potentilla anserina</i> ssp. <i>pacifica</i>			x			
Self heal	<i>Prunella vulgaris</i>	x	x				
California buttercup, coastal form	<i>Ranunculus californicus</i>	x		x		x	
Pacific sanicle	<i>Sanicula crassicaulis</i>				x		x

<i>Common Name</i>	<i>Scientific Name</i>	<i>Grassland/ Erosion Control</i>	<i>Coastal Bluff</i>	<i>Wetland/ Riparian</i>	<i>Wildlife Corridor</i>	<i>Upland Buffer</i>	<i>Coastal Scrub</i>
California bee plant	<i>Scrophularia californica</i>			x			x
Blue-eyed grass	<i>Sisyrinchium bellum</i>	x		x			
Coast hedge nettle	<i>Stachys bullata</i>			x			
Rushes/Sedges							
Baltic rush	<i>Juncus balticus</i>			x			
Western rush	<i>Juncus occidentalis</i>			x			
Common rush	<i>Juncus patens</i>			x			
Brown-headed rush	<i>Juncus phaeocephalus</i>			x			
Three-square	<i>Scirpus americanus</i>			x			
California tule	<i>Scirpus californicus</i>			x			
Low club rush	<i>Scirpus cernuus</i>			x			
Grasses							
Bent grass	<i>Agrostis pallens</i>	x	x	x	x	x	
California brome	<i>Bromus carinatus</i>	x		x	x	x	x
California oatgrass	<i>Danthonia californica</i>	x		x			x
Tufted hairgrass	<i>Deschampsia cespitosa</i>	x		x			
Saltgrass	<i>Distichlis spicata</i>		x				
Western ryegrass	<i>Elymus glaucus</i>				x		
Meadow barley	<i>Hordeum brachyantherum</i>			x			
Creeping wildrye	<i>Leymus triticoides</i>			x	x	x	
Foothill needlegrass	<i>Nassella lepida</i>	x			x	x	
Purple needlegrass	<i>Nassella pulchra</i>	x	x		x	x	x

Plants will be installed approximately 12 to 36 inches (30 to 90 cm) on center, depending on species. Smaller stature plants will be grouped and spaced closer together, while larger stature plants will be spaced further apart. In general, plants will be placed in non-linear arrangements to mimic plant distribution patterns observed in nature.

Seeds will be collected from local sources and grown by UCSC staff and students at the UCSC Arboretum, UCSC Teaching Greenhouses, and YLR. Some species may be grown by local restoration contractors.

With the exception of trees, all plants will be grown in Ray Leach ‘Conetainers’ or similar sized pots. Trees will be grown in ‘tree pots’. These containers will maximize utilization of greenhouse space and minimize per plant costs while producing relatively large plants with well developed root systems. Installation will begin after the first winter rains.

Erosion control

Because the Terrace Lands are essentially flat erosion is not likely to be a concern. If following planting or weeding efforts erosion control is required, appropriate materials (e.g. wood-chip mulch, jute netting, etc.) will be installed.

Irrigation

Ideally, plant installation will commence after the first winter rain and end well before the rains stop, ensuring that plants are naturally watered in and established before the summer drought. However, if supplemental irrigation is needed, plants will be watered using one or all of the following methods: vehicle application, drip hose, and/or overhead sprinkling. Water will be obtained from MSC infrastructure or other sources (e.g. rain, reclaimed water, etc.).

Remediation (maintenance / replacement plantings)

It is anticipated that plant mortality will likely be in the 10-40% range due to herbivory, desiccation, and/or trampling (by volunteers during planting and monitoring). Thus, plants will be installed at relatively high densities. If mortality is lower than anticipated, plants will be removed as necessary to ensure successful growth and reproduction and future planting densities will be adjusted. If a particular planting effort fails, plants will either be replanted that season or the following year if failure occurs after the rainy / planting season. Additionally, an alternative planting palette may be considered.

REPORTING ON IMPLEMENTATION ACTIVITIES (SRP 5)

A plan for documenting and reporting the physical and biological “as built” condition of the site will be prepared at the completion of the initial plan implementation activities. This report will describe the field implementation of the approved resource plan in narrative and photographs and report any problems in the implementation and their resolution.

The YLR manager will be on-site during restoration activities to take notes, photos, and to direct crews. After the end of the busy spring/summer restoration project season, she/he will compile notes and photos into a simple report describing the physical and biological “as built” condition of the site areas. This report will be submitted annually as an appendix to the YLR annual monitoring report.

INTERIM MONITORING AND MAINTENANCE (SRP 6)

Monitoring of restored areas on the Terrace Lands will provide data on coverage and richness of native species and thus gauge the “success” of restoration efforts. Specific monitoring methodologies, timing, and discussion of performance standards are included below in sections SRP 7 and SRP 8. Timing and methods for planting and weeding

(maintenance) are detailed in sections SRP 4 and SRP 5 above. Data from annual monitoring efforts will be used to assess whether restoration efforts are proceeding in the desired trajectory (e.g. increased coverage and richness of natives and decreased coverage of non-natives). Interim success criteria and remediation measures are specified in Tables 3-6 for each habitat type. A report on the progress towards both interim and final success criteria (as per SRP 7 below) will be compiled.

Data compiled from monitoring and maintenance activities will be included in an annual report that will be provided to the UC Santa Cruz Planning Director and the SAC by December 31st of each year following year one of the project period in which monitoring has been conducted. Each report will be cumulative (building upon previous efforts), will summarize monitoring results, and include a “Performance Evaluation” section where data will be summarized and used to evaluate restoration efforts. In order to remedy potential deficiencies in meeting success criteria each report will also include a “Recommendations” section that will discuss solutions and/or adaptive strategies to tackle unforeseen circumstances or new findings that require a change in restoration practices, maintenance, monitoring, or success criteria.

SUCCESS CRITERIA FOR HABITAT TYPES (SRP 7)

The SAC has defined final success criteria for species richness and coverage as well as remediation actions if criteria are not met. Success criteria will be evaluated by the SAC and may be changed if need be. Final success criteria will be evaluated only after a period of at least 3 years wherein the study site has been subject to no remediation or maintenance activities other than weeding. This section provides information on success criteria for each habitat type and a general overview of methods used to achieve these goals. Specific details regarding planting, site preparation, and weeding are included in sections SRP 2 (restoration and weeding goals), SRP 3 (site preparation), and SRP 4 (planting plan) above.

Ruderal, coyote brush scrub-grassland, and grassland areas

Enhancement and protection goals for ruderal, coyote brush scrub-grassland, and grassland are to maintain open space areas, protect and enhance the grassland, ruderal, and coyote brush scrub-grassland areas through eliminating priority one weeds, controlling to the extent possible lower priority weeds, promoting the abundance and diversity of native plant species (through weed abatement and phased revegetation), and preventing unauthorized trail development. During Phase 1 infilling/restoration/enhancement of ruderal, coyote brush scrub-grassland, and grassland will primarily be focused in areas where coyote brush habitat is currently present (see Figure 2); however, restoration efforts will also take place throughout the entire site as needed (e.g. weed abatement efforts, small scale planting, experimental manipulations, etc.). Interim and long-term goals for restoration of ruderal, coyote brush scrub-grassland, and grassland are included in Table 3.

Coyote Brush Scrub-Grassland enhancement in the northwestern region of the upper terrace (Figure 7) will focus on revegetating an earthen berm to create a “living fence” between the agricultural lands to the west and the upper Terrace. This habitat will provide cover for animals moving from the upper Terrace into Younger Lagoon.

Table 3. Summary of restoration activities, success criteria, and implementation actions for ruderal, coyote brush scrub-grassland, and grassland areas.

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
RMP PS 1 Priority 1 weeds	Eliminate on Terrace Lands	Year 3 and annually thereafter	No priority 1 weeds surviving to reproduction each year	Continue weed monitoring and control

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
			Priority 1 weeds reproducing on site	Increase frequency of monitoring and weed control; consider alternative control methods
RMP PS 2 Priority 2 Weeds	Reduce weedy seed set after planting efforts are initiated.	Timed to correspond with planting efforts.	Planted plants are established	Continue weeding program
			Annual weeds out-competing native plants.	Change weeding schedule or evaluate alternative methods.
RMP PS 2 Priority 3 Weeds	Incidental weed control efforts during active restoration projects (e.g. planting).	Timed to correspond with planting efforts.	Planted plants are established	Continue weeding program
			Annual weeds out-competing native plants.	Change weeding schedule or evaluate alternative methods.

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
RMP PS 3 Native plant species richness in Phase 1 grassland, ruderal, and coyote brush scrub-grassland areas	8 native plant species appropriate for habitat established in restoration areas.	Year 3--two years after planting**	6 or more native plant species established. <i>and</i> 10% cover (shrubs), 5% cover (non-shrubs), and evidence of natural recruitment present.	Continue monitoring
	40% cover of shrubs in ruderal, coyote brush scrub-grassland where coyote brush scrub is the primary target. 25% cover of non-shrubs (grasses, herbs, etc.) in grassland areas where grassland restoration is the primary target.		Fewer than 6 native plant species present. <i>or</i> < 10% cover (shrubs), < 5% (non-shrubs) or no evidence of natural recruitment present	Perform supplemental planting using different species, propagule type, soil preparation methods, irrigation, and/or weed abatement methods

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
		Year 5	<p>6 or more native plant species established.</p> <p><i>and</i></p> <p>≥ 25% cover (shrubs) >15% cover (non-shrubs) and evidence of natural recruitment present</p>	Continue monitoring
			<p>Fewer than 6 native plant species</p> <p><i>or</i></p> <p>< 25% cover (shrubs) and <15% cover (non-shrubs)</p> <p><i>or</i></p> <p>no evidence of natural recruitment present</p>	Perform supplemental planting using different species, propagule type, soil preparation methods, irrigation, and/or weed abatement methods

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
		Year 7 and every 5 years thereafter **	8 or more native plant species present comprising \geq 40% cover (shrubs) and >25% cover (non-shrubs) <i>and</i> evidence of natural recruitment present	Continue monitoring
			Fewer than 8 native plant species or < 40% cover (shrubs) and <25% cover (non-shrubs) of native species <i>or</i> no evidence of natural recruitment present	Perform supplemental planting using different species, propagule type, soil preparation methods, irrigation, and/or weed abatement methods. Consult SAC.
RMP PS 4 Native plant richness in Phase 2 and Phase 3 grassland, ruderal, and coyote brush scrub-grassland areas	Same criteria as for Phase 1 as adjusted by SAC.	Same criteria as for Phase 1 as adjusted by SAC.	Same criteria as for Phase 1 as adjusted by SAC.	Same criteria as for Phase 1 as adjusted by SAC.

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
RMP PS 5 Protection of revegetation in progress	No disturbance to revegetation plantings	Ongoing until revegetation is successful	Plantings undisturbed	Continue monitoring until revegetation is successful
			Plantings disturbed (plants broken, trampled, dislodged, removed)	Install signs or low fencing as appropriate and consistent with the CLRDP.

Coastal bluff

Enhancement and protection of coastal bluff habitat will be achieved by eliminating priority one weeds, promoting the abundance and diversity of native plant species through plantings, preventing unauthorized trail development, and increasing the extent of coastal bluff vegetation. Restoration of all coastal bluff habitat will begin during Phase I of the project. Interim and long-term goals for restoration of coastal bluff habitats are provided in Table 4.

Table 4. Summary of restoration activities, success criteria, and implementation actions for coastal bluff habitat.

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
RMP PS 6 Priority 1 weeds except	Eliminate on coastal bluff	Year 3 and annually thereafter	No priority 1 weeds surviving to reproduction	Continue weed monitoring and control

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
iceplant			Priority 1 weeds reproducing on site	Use different species weed abatement methods or frequency
RMP PS 7 Iceplant removal	Eliminate on coastal bluff	Prior to first rainy season following initiation of construction for first development project in Lower Terrace development zone	No iceplant on coastal bluff	Continue monitoring and control
			Iceplant growing on coastal bluff	Use different species, weed abatement methods or frequency
RMP PS 8 Native plant revegetation	8 native plant species appropriate for coastal bluff habitat. 40% cover of native species.	2 years after planting	4 or more native plant species established comprising \geq 20% cover within bluff areas <i>and</i> evidence of natural recruitment present	Continue monitoring

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
			<p>Fewer than 4 native plant species or < 20% cover of native species in bluff areas</p> <p><i>or</i></p> <p>no evidence of natural recruitment present</p>	<p>Perform supplemental planting using different species, propagule type, soil preparation methods, irrigation, and/or weed abatement methods</p>
		5 years after planting	<p>8 or more native plant species established comprising \geq 30% cover within bluff areas</p> <p><i>and</i></p> <p>evidence of natural recruitment present</p>	<p>Continue monitoring</p>
			<p>Fewer than 8 native plant species or < 30% cover of native species in bluff areas</p> <p><i>or</i></p> <p>no evidence of natural recruitment present</p>	<p>Perform supplemental planting using different species, propagule type, soil preparation methods, irrigation, and/or weed abatement methods</p>

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
		10 years after planting and every 5 years thereafter	8 or more native plant species established comprising \geq 40% cover within bluff areas <i>and</i> evidence of natural recruitment present	Continue monitoring
			Fewer than 8 native plant species or < 40% cover of native species in bluff areas <i>or</i> no evidence of natural recruitment present	Perform supplemental planting using different species, propagule type, soil preparation methods, irrigation, and/or weed abatement methods. Consult SAC.
RMP PS 9 Protection of coastal bluff vegetation	No disturbance to coastal bluff vegetation	Ongoing	Vegetation undisturbed	Continue monitoring
			Vegetation disturbed (plants broken, trampled, dislodged, removed)	Install additional signs or low fencing as appropriate

Wetlands

Enhancement and protection goals for wetlands include increasing surface water flow, controlling weeds, promoting the abundance and diversity of native plant species, creating buffers, and controlling access by humans and non-native animals. Maintaining trails primarily along the perimeter of the Terrace area (i.e. eliminating trails that bisect the Reserve from East to West) will reduce the potential impact humans have on wildlife in wetland habitats. Table 5 highlights the performance standards and enhancement activities for wetlands across the entire project area and for the 20 year duration. The primary focal areas for wetland restoration during Phase 1 of the project will include PS 10, 12, 13, 16, and 17 (as per Table 5) as well as planting in the core areas of wetlands 1, 2, 4 and 5. Implementation efforts focused on hydrologically reconnecting Wetlands 1 and 2 will be initiated subsequent to Commission approval of the SRP Phase 1B NOID.

Plans for hydrologically reconnecting Wetlands 1 and 2 are described below to the extent it has been developed to date. Implementation details will be subject to agency consultation and permitting and likely will vary, at least in some details, from the conceptual outline provided here. The implementation of SRP Phase 1B is independent of the implementation of Phase 1A, although results of both would be monitored and reported at the end of SRP Phase 1. Due to the uncertainty related to the Phase 1B elements and implementation criteria it would be too speculative to evaluate the environmental effects of Phase 1B implementation at this time.

Initial efforts to reconnect W1 and W2 during Phase IB of the restoration will focus on modifying the flow pattern of Wetland 1 by installing an earthen dam, or other appropriate structure, at both the upstream and/or downstream end of Wetland 1 and/or a flash dam at the southern end of W1 (Figures 10 and 11).

The earthen dam, or other appropriate structure, at the head of W1 is expected to decommission the drainage ditch, diverting surface water into W2. The extent of W1 is unlikely to change significantly because of the steep side slopes and subsurface flow. Additional diversion structures in W1 may be considered to direct more surface flow into

W2. Water pooled in W1 behind these dams may provide amphibian breeding habitat. This approach of plugging the ditch will likely create small open water pool habitats. If the diversion structures at W1 prove successful, they will be rebuilt in a permanent manner. If they do not meet anticipated goals additional design and planning will occur during Phase II of the restoration project.

The broad geometry and dense vegetation of W2 is expected to spread the water that formerly flowed through W1 over a much greater area. This is expected to facilitate weed control, improve water quality, and may increase the extent of W2. It is also expected to promote infiltration and the subsurface storage of winter runoff, which will lengthen the duration of inundation in the spring.

The diversion structure at the southern end of W1 will be constructed by modifying an existing water control structure that consists of two short culverts in a concrete headwall. A flashboard dam in this location will enable management of wetland hydrology in the lower portion of W2. The structure is expected to increase the extent and duration of inundation in W2 without adversely affecting the other uses or the roadway, with benefits similar to those described above.



Figure 10. Hydrology of wetlands 1 and 2.

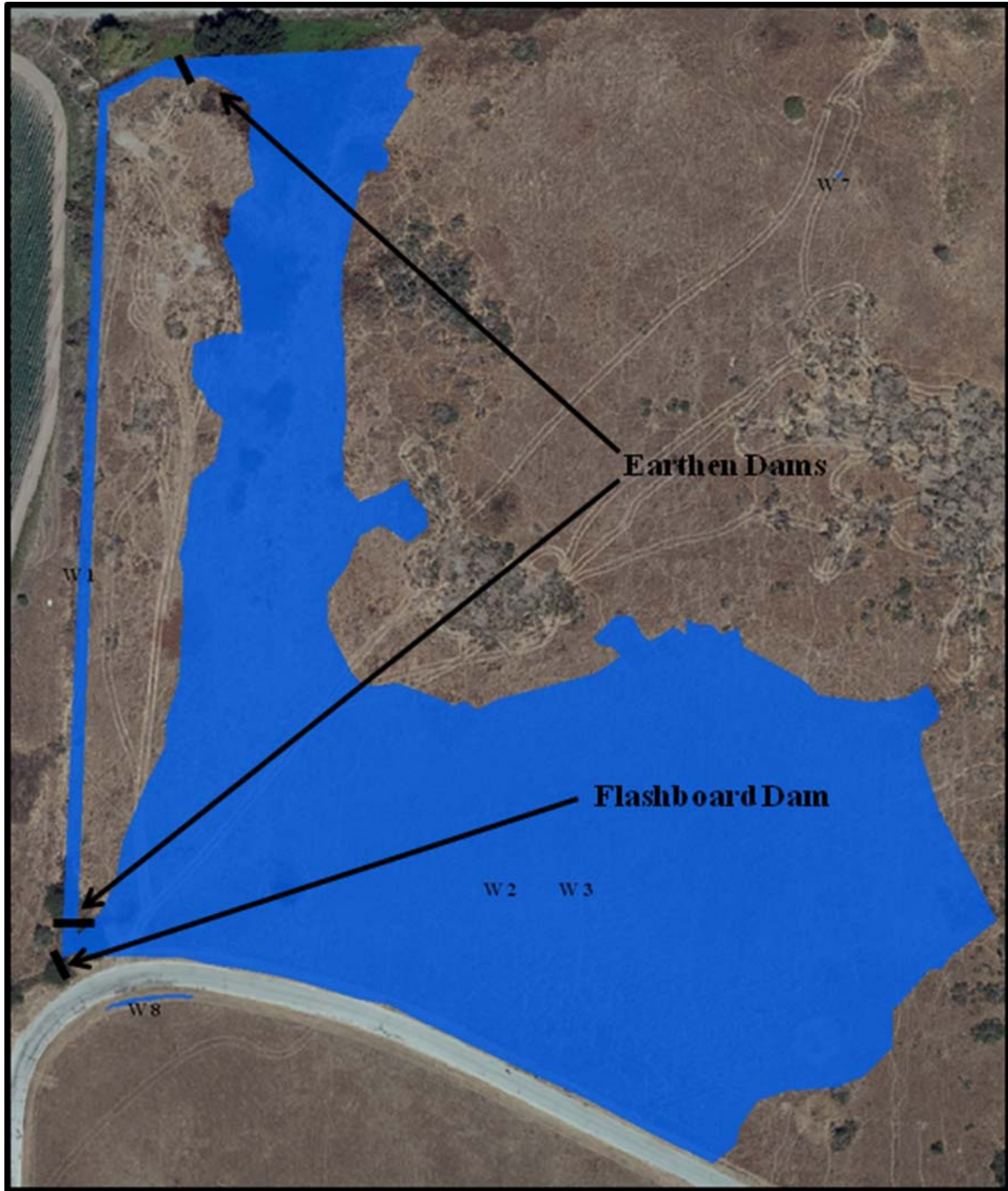


Figure 11. Potential modifications to Wetland 1.

Table 5. Summary of restoration activities, success criteria, and implementation actions for wetland areas.

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
RMP PS 10. Wetland 2 - flow diversion from Wetland 1	Wetland functioning as expected per design	1, 2, and 3 years after diversion completed	Structure remains intact Water diversion functioning as expected	Continue monitoring
			Structure fails Water diversion not functioning as expected	Fix with better structure Develop and implement plans to correct functioning; continue monitoring
RMP PS 11. Combined Wetland W1/W2 – creation of willow riparian corridor and restoration plantings west and east of the	3 native plant species appropriate for habitat established in planted areas to comprise 30% cover (e.g. Coyote brush, willow, etc.).	3 years after planting**	3 or more native plant species established comprising \geq 20% cover within planted areas <i>and</i> evidence of natural recruitment present	Continue monitoring

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
combined W1/W2 hydrologic corridor			Fewer than 3 native plant species <i>or</i> < 20% cover of native species established within planted areas or no evidence of natural recruitment present	Perform supplementa l planting using different species, propagule type, soil preparation methods, irrigation, and/or weed abatement methods
		10 years after planting** and every 5 years thereafter	3 or more native plant species established comprising \geq 30% cover within planted areas <i>and</i> evidence of natural recruitment present	Continue monitoring

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
			Fewer than 3 native plant species <i>or</i> < 30% cover of native species established within planted areas or no evidence of natural recruitment present	Perform supplemental planting using different species, propagule type, soil preparation methods, irrigation, and/or weed abatement methods. Consult SAC.
RMP PS 12. Priority 1 weeds	Eliminate in wetlands	Year 3 and annually thereafter	No priority 1 weeds surviving to reproduction	Continue weed monitoring and removal as necessary
			Priority 1 weeds reproducing on site	Increase frequency of monitoring and weed removal efforts; consider alternative control methods
RMP PS 13 Priority 2 Weeds	Reduce weedy seed set after planting efforts are initiated.	Timed to correspond with planting efforts.	Planted plants are not established	Continue weeding program

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
			Annual weeds out-competing native plants.	Change weeding schedule or evaluate alternative methods.
RMP PS 13 Priority 3 Weeds	Incidental weed control efforts during active restoration projects (e.g. planting)	Timed to correspond with planting efforts.	Planted plants are not established	Continue weeding program
			Annual weeds out-competing native plants.	Change weeding schedule or evaluate alternative methods.
RMP PS 14. Native plant revegetation	4 native plant species appropriate for habitat established in planted areas to comprise 30% cover within selected areas	2 years after planting**	Fewer than 4 native plant species <i>or</i> <10% cover of native species established in planted areas or no evidence of natural recruitment present	Perform supplemental planting using different species, propagule type, soil preparation methods, irrigation, and/or weed abatement methods

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
			4 or more native plant species established comprising \geq 30% cover within planted areas <i>and</i> evidence of natural recruitment present	Continue monitoring
		5 years after planting** and every 5 years thereafter	Fewer than 4 native plant species <i>or</i> < 25% cover of native species established in planted areas <i>or</i> no evidence of natural recruitment present	Perform supplemental planting using different species, propagule type, soil preparation methods, irrigation, and/or weed abatement methods. Consult SAC.
			Plantings undisturbed	Continue monitoring until revegetation is successful

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
RMP PS 15. Protection of revegetation in progress	No disturbance to revegetation plantings	Ongoing until revegetation is successful	Plantings disturbed (plants broken, trampled, dislodged, removed)	Determine cause; develop appropriate solution
			Wetlands undisturbed	Continue monitoring
RMP PS 16. Protection of wetlands	No unauthorized human disturbance to wetlands	Ongoing	Vegetation disturbed (plants broken, dislodged, trampled, removed); soils disturbed or compacted; other signs of trespass present	Install additional signs or low fencing as appropriate and per CLRDP specifications
			Wetlands undisturbed	Continue monitoring
RMP PS 17. Minimize anthropogenic changes to existing	Minimal changes to surface topography from management	Ongoing	Substantial changes to surface topography and/or drainage patterns evident	Determine cause; correct as necessary

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
surface drainage patterns in open space areas (except for W1/W2 hydrologic integration)	activities; no changes to surface topography due to unauthorized activities			

Wetland buffers

Enhancement and protection goals for wetland buffer areas (Figure 5 and 7) are to protect wetlands from adverse impacts due to weeds, noise, human and non-native animal intrusion, lighting, predation, and sedimentation. During Phase 1, restoration of wetland buffer habitat will be conducted primarily in the Wetlands 4, 5 and 6 buffers, but will also occur throughout other wetland buffer areas at a less intensive effort. Wetland buffers are delineated as 100 ft (30.5 m) beyond classified wetland habitat (with the exception of Wetland 5 which has a 150 ft [45.7 m] buffer area). Because conditions within wetland buffer areas vary, within and among wetlands, plant species used in revegetation efforts will be largely dependent upon soil conditions. In order to achieve the goal of “insulating” wetland habitat from noise and intrusion (both physical and visual) by people, planting efforts will include shrubs near the outer edge of the wetland buffer areas and adhere to interim and long-term goals for restoration of ruderal, coyote brush scrub-grassland, and grassland (see Tables 3 and 6).

Table 6. Summary of restoration activities, success criteria, and implementation actions for wetland buffer areas.

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
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<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
RMP PS 18. Reduce disturbance from automobile traffic	Construct new campus access road that diverts traffic between the Delaware Avenue/Shaffer Road intersection and the CDFG facility and abandon former access road (see management measures above)	See Table A.12 of CLRDP.	Roadway realigned and former roadway improved/restored	Maintain new roadway and trail/restoration areas of former roadway thereafter. Breaking up and removing pavement and then planting with native shrubs will enhance corridor along wetland 1.
RMP PS 19. Priority 1 weeds	Eliminate in buffer areas	Year 3 and annually thereafter	No priority 1 weeds surviving to reproduction	Continue weed monitoring and removal as necessary
			Priority 1 weeds reproducing on site	Increase frequency of monitoring and weed removal efforts; consider alternative control methods
RMP PS 20 Priority 2 Weeds	Reduce weedy seed set after planting efforts are initiated.	Timed to correspond with planting efforts.	Planted plants are not established	Continue weeding program

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
			Annual weeds out-competing native plants.	Change weeding schedule or evaluate alternative methods.
RMP PS 20. Priority 3 weeds	Incidental weed control efforts during active restoration projects (e.g. planting).	Timed to correspond with planting efforts.	Planted plants are established	Continue weeding program
			Annual weeds out-competing native plants.	Change weeding schedule or evaluate alternative methods
RMP PS 21. Creation of vegetated berm at periphery of the buffer for wetland W5 (seasonal pond); see also management measures above	Establish vegetated berm (note: weed removal and planting requirements for the berm shall be the same as for the remainder of the weed removal and planting performance standards specified in this table)	See Table A.12 of CLRDP.	Vegetated berm established <i>and</i> weed control/planting successful per this table	Monitor and maintain in its design state thereafter
			Vegetated berm not established <i>and/or</i> weed control/planting not successful per this table)	Establish berm, and pursue remedial planting actions per this table.

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
RMP PS 22. Native plant revegetation	8 native plant species appropriate for habitat established to comprise 40% cover within buffer areas that will be planted with shrubs and 25% cover in areas that will be planted with grasses and herbaceous plants.	2 years after planting**	4 or more native plant species established comprising \geq 10% cover within buffer areas <i>and</i> evidence of natural recruitment present	Continue monitoring
			Fewer than 4 native plant species or < 10% cover of native species established in buffer areas <i>or</i> no evidence of natural recruitment present	Perform supplemental planting using different species, propagule type, and/or soil preparation methods

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
		5 years after planting**	<p>6 or more native plant species established comprising \geq 25% cover for shrubs and 15% cover for grasses and herbs within buffer areas</p> <p><i>and</i></p> <p>evidence of natural recruitment present</p>	Continue monitoring thereafter
			<p>Fewer than 6 native plant species or < 25% cover for shrubs and 15% cover for grasses and herbs of native species established in planted areas</p> <p><i>or</i></p> <p>no evidence of natural recruitment present</p>	Perform supplemental planting using different species, propagule type, and/or soil preparation methods

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
		7 years after planting** and every 5 years thereafter	8 or more native plant species established comprising \geq 40% cover (shrubs) and 25% cover (grasses/herbs) within buffer areas <i>and</i> evidence of natural recruitment present	Continue monitoring thereafter
			Fewer than 8 native plant species or < 40% cover (shrubs) and 25 % cover (grasses/herbs) of native native established in buffer areas <i>or</i> no evidence of natural recruitment present	Perform supplemental planting using different species, propagule type, and/or soil preparation methods. Consult SAC.
RMP PS 23. Protection of revegetation in progress	No human disturbance to revegetation plantings	Ongoing until revegetation is successful	Plantings undisturbed	Continue monitoring until revegetation is successful

<i>Feature</i>	<i>Goal</i>	<i>Time Period*</i>	<i>Result</i>	<i>Action</i>
			Plantings disturbed (plants broken, trampled, dislodged, removed)	Install signs or low fencing as appropriate
RMP PS 24. Protection of buffer areas	No unauthorized human disturbance to buffer areas	Ongoing	Buffer areas undisturbed	Continue monitoring
			Buffer areas disturbed (plants broken, dislodged, trampled, removed); soils disturbed or compacted; other signs of damage present	Install additional signs or low fencing as appropriate and per the CLRDP requirements
RMP PS 25. Minimize anthropogenic changes to existing surface drainage patterns (except for those contemplated by and consistent with the CLRDP, including the Drainage Concept Plan (Appendix B)).	Minimal changes to surface topography from management activities; no changes to surface topography due to unauthorized activities	Ongoing	Wetlands/buffers undisturbed	Continue monitoring and work with Campus Planning and Construction to ensure potential temporary impacts from construction are not having long-term impacts on wetland buffer habitats.

SUCCESS CRITERIA (SRP 8)

Detailed success criteria for each habitat type are described in SRP 7 above. These criteria set an initial threshold of species richness and cover for specific habitat types throughout the restoration area. However, during the spring of 2010 species richness and cover data will be collected for grassland, scrub, and wetland habitats at five “Reference Sites.” Possible reference Sites include Franklin Point, coastal prairies near Gualala (Sea Ranch), Lighthouse field, Point Lobos State Park, Arana Gulch, Twin Lakes, Eliccott Slough, and Pogonip. These sites will be surveyed using the same methodologies described below in SRP 9. Results from surveys of Reference Sites will be presented to the SAC and used to assess whether the success criteria outlined in Tables 3-6 should be modified. Data from these areas will be used as a guideline and will not necessarily dictate specific success criteria. Thus, determination of whether enhancement and restoration efforts have met pre-determined goals will be measured by comparing percent cover and species richness of native species to the criteria outlined above in section SRP 7 or, depending upon guidance from the SAC, from data collected at the local Reference Sites. If success criteria are not achieved, the SAC will evaluate potential causes for the lack of success and recommend future adaptive management strategies to obtain desired goals.

MONITORING (SRP 9)

This section of the SRP defines the monitoring approach that will be used to evaluate whether success criteria for native plant cover and richness is being met. In order to assess the progress towards meeting defined success criteria, monitoring efforts will focus on Phase I target restoration/enhancement areas (Figure 7). The ultimate goal of Phase I is to meet success criteria for 1/3rd of the Terrace Lands (approximately 15 ac [6 ha]). The methodologies outlined below describe survey methods; however, a pilot study will be conducted in Spring of 2010 to refine methodologies and assess the appropriate number of plots necessary to ensure an adequate sample size that will enable cover to be estimated within 10% (confidence interval of 0.10) of actual cover values with an 80% confidence level ($\alpha = 0.20$). At a minimum, vegetation monitoring will be conducted in

years 1, 4, and 7. However, if extreme weather events occur in these years additional monitoring may be required. Monitoring will occur in the spring when species are blooming and readily identifiable. Percent cover and species richness will be calculated as described below; data will be compared to success criteria outlined in Tables 3-6.

Hydrological monitoring

Water levels in each major wetland (1, 2, 4, and 5) will be recorded monthly at a series of staff plates positioned strategically throughout the wetlands. The area with water at the ground surface will be mapped at least monthly during the rainy season by walking its periphery with a GPS and entering the data into a GIS. Rainfall data will be collected at a nearby weather station located at Long Marine Laboratory.

Coyote brush shrub-grassland, coastal bluff, willow riparian, and ruderal areas

These areas are dominated by shrub species. The line intercept method will be used to assess cover in Coyote brush shrub-grassland, coastal bluff, willow riparian, and ruderal areas. Each transect will be 164 ft (50 m) in length and distributed throughout the Phase I restoration areas within each habitat type. The first starting point will be randomly selected within each specific habitat type and additional transects will be established at fixed intervals of 246 ft (75 m) in a north south direction. Specific start locations of each transect will be permanently established; however, orientation of every transect will be randomly selected each time a transect is surveyed (i.e. in different years). This method establishes random transect points while ensuring adequate coverage of the entire restoration area. If transects extend beyond the target habitat type into either developed areas or different habitats, the random orientation or starting point will be reselected in order to ensure sampling occurs within the target habitat. Shrub cover will be quantified by recording the length each shrub species is observed under the transect tape to the nearest 2 in (5 cm); herbaceous and grass cover will not be quantified in areas where shrubs intersect with the transect.

For areas within Coyote brush shrub-grassland, coastal bluff, willow riparian, and ruderal areas that lack shrubs (i.e. interstitial open areas), herbaceous plants and grasses will be quantified using 2.69 ft² (0.25 m²) rectangular quadrats 0.82 x 3.28 ft (0.25 m x 1.0 m). Quadrats will be placed every 16.4 ft (5 m) perpendicular to the transect with the first quadrat placed randomly between (0-5 m). Quadrats will alternate between the right and left side of the transect (first placement selected randomly) unless only one side contains an open grassy area, in those cases the open area will be chosen. Percent cover of native and non-native species will be determined by estimating total cover of each species within each quadrat.

To adequately survey species richness, additional species (not found in transects or quadrats) that are observed in a 13 ft (4 m) wide belt transect along the line transect (6.5 ft [2 m] to either side of the line) will be recorded. Natural recruitment of native species will be noted in the line intercept and quadrat surveys by tallying the number of recruits per transect and/or quadrat. Recruits will be averaged across transects and quadrats.

Open Grassland Areas

These areas are dominated by grasses and forbs. Transects will be established as per methodologies described above in Coyote-brush shrubland, coastal bluff, willow riparian, and ruderal areas and serve as a backbone for quadrat surveys. Grasses and herbaceous cover will be quantified using 2.69 ft² (0.25 m²) rectangular quadrats (0.82 x 3.28 ft [0.25 m x 1.0 m]). Quadrats will be placed every 16.4 ft (5 m) perpendicular to the transect with the first quadrat placed randomly between (0-5 m). Quadrats will alternate between the right and left side of the transect (first placement selected randomly) unless only one side contains an open grassy area, in those cases the open area will be chosen. Percent cover of native and non-native species will be determined by estimating total cover of each species within each quadrat.

To adequately survey species richness, additional species (not found in quadrats) that are observed in a 13 ft (4 m) wide belt transect along the line transect (6.5 ft [2 m] to either side of the line) will be recorded. Natural recruitment of native species will be noted in

the belt transect and quadrat surveys by tallying the number of recruits per transect and/or quadrat. Recruits will be averaged across transects and quadrats.

Wetland Vegetation

Rectangular quadrats 2.69 ft² (0.25 m²) will be used to evaluate cover of grass, forb, sedge, and rush species in the wetland areas during Phase I (Figure 7). Quadrat size will be 0.82 x 3.28 ft (0.25 m × 1.0 m). A series of sampling locations will be determined by randomly assigning starting points at the edge of each wetland (determined by vegetation). At each starting point a transect tape will be extended across the wetland at a randomly chosen orientation to the opposite edge of the wetland. If the random orientation results in the transect being outside of the wetland area another orientation will be randomly selected. Quadrats will alternate between the right and left side of the transect (first placement selected randomly) falls within the wetland, in those cases the wetland area will be chosen. Percent cover of native and non-native species will be determined by estimating total cover of each species within each quadrat.

To adequately survey species richness, additional species (not found in quadrats) that are observed in a 13 ft (4 m) wide belt transect along the line transect (6.5 ft [2 m] to either side of the line) will be recorded. Natural recruitment of native species will be noted in the belt transect and quadrat surveys by tallying the number of recruits per transect and/or quadrat. Recruits will be averaged across transects and quadrats.

GIS and GPS Vegetation Surveys

Beyond on-the-ground transect and quadrat surveys described above, percent cover of large shrubs across the entire site will be calculated by digitizing the perimeters of shrubs occurring in Phase I restoration areas and throughout the Terrace Lands using GIS of recent aerial imagery (see for example Figure 2). Once plants are digitized, area and percent coverage can be calculated using spatial analysis, thus providing an additional

measure of cover for large shrubs. Aerial imagery analysis and on-the-ground GPS mapping will provide a thorough estimate of total coverage of patchily distributed species such as coyote brush, creeping wild rye, Douglas' baccharis, and wetland species (rushes, and sedges) that can be accurately be identified from aerial imagery. Digitizing of aerial imagery will be used when orthoimagery is updated and available (likely every 2-5 years).

Photo monitoring

On-the-ground photo monitoring will be conducted annually and be timed to correspond when plants are blooming and more easily identified (spring/early summer). Photos will be oriented to capture large scale changes over time and taken at permanent photo points established throughout the project area. Figure 12 identifies several photo points; however, additional points will likely be created over time in order to capture specific areas within the restoration site and ensure growing vegetation does not preclude adequate coverage. Each point has coordinate and bearing in order to ensure repeatability over time. Monitoring information collected for each photo point will include:

1. Photo point number
2. Date
3. Name of photographer
4. Bearing
5. Camera and lens size
6. Coordinates
7. Other comments

All on-the-ground photos will be included in the monitoring reports.



Figure 12. Photo monitoring points.

Monitoring study report and schedule

Results from monitoring efforts will be included in the reports (as per SRP 6) that will be submitted by December 31st of each year to UCSC, CCC, and the SAC. Reports will include a summary of restoration activities as well as an evaluation of whether success criteria are being achieved. The report will also discuss any corrective actions or adjusted protocols that may be required.

FINAL MONITORING REPORT (SRP 10)

The final monitoring report will be submitted to the UCSC Planning Director, Scientific Advisory Committee, and California Coastal Commission at the end of the final monitoring period of Phase I. The report will evaluate whether the site area conforms to the goals and success criteria set forth in the approved final resource plan.

PROVISION FOR POSSIBLE FURTHER ACTION (SRP 11)

If the final report (SRP 10) indicates that the project has been unsuccessful, in part or in whole, based on the approved success criteria, then the final report shall identify remediation measures to be implemented to compensate for those portions of the original plan that did not meet the approved success criteria.

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APPENDICES

Appendix 1. CLRDP A.6.1: Specific Resource Plan requirements

A.6.1 Specific Resource Plans Required

The RMP provides a fairly broad outline with general recommendations and specific guidelines for resource protection, enhancement, and management on the Marine Science Campus site. The intent is that the Scientific Advisory Committee (SAC) uses the RMP as the initial framework for development of more detailed and specific resource plans for RMP implementation. These may be adapted to address the current physical and ecological conditions, current understanding of biological and ecological processes, and current approaches to habitat revegetation, restoration, and enhancement, provided that the overall intent of the RMP is carried out, including the level of resource protection and the timing guidelines. For example, the RMP performance standards provide suggestions for standards of biodiversity and vegetative cover, but these might be altered in a detailed plan based on new research or revegetation experience at this site. Adjustments to the performance standards that are more protective of the resources and more responsive to the site conditions based on management experience over time are encouraged.

Therefore, implementation of the requirements of this RMP shall be based on more detailed resource plans. Some of these more detailed resource plans will be developed during the course of projects that emanate from the CLRDP building program that require certain mitigations and capital improvements as part of them, but others may be developed irrespective of the building program (see also Approvals section below). Implementation of the RMP shall be guided by the SAC composed of three to four native restoration professionals and academicians appointed by the UCSC Chancellor and selected in consultation with the Executive Director of the California Coastal Commission. This committee shall meet on an annual basis at a minimum (more frequently as needed), and provide overall direction for resource plan preparation, revegetation installation, long-term maintenance and monitoring.

Appendix 1. CLRDP A.6.1: Specific Resource Plan Requirements

Specific Resource Plans shall be prepared per 1M 3.2.10 by a qualified restoration ecologist under the guidance of the SAC, and will follow the guidelines below, as appropriate:

1. A baseline assessment, including photographs, of the current physical and ecological condition of the proposed restoration, enhancement, and/or management site area. As appropriate, this may be based on available historical information or include current surveys addressing wetland delineation (conducted according to the definitions in the Coastal Act and the Coastal Commission's Regulations), a description and map showing the area and distribution of vegetation types, and a map showing the distribution and abundance of sensitive species, if any. Existing vegetation, wetlands, and sensitive species shall be depicted on a map that includes the footprint of the proposed site area.
2. A description of the goals of the resource plan, including, as appropriate, topography, hydrology, vegetation, sensitive species, and wildlife usage.
3. A description of planned site area preparation and invasive plant removal.
4. A planting plan including the planting palette (seed mix and container plants), planting design, source of plant material, plant installation, erosion control, irrigation, and remediation. Except for the planting of Monterey cypress, the planting palette shall be made up exclusively of native taxa that are appropriate to the habitat and region. Seed and/or vegetative propagules shall be obtained from local natural habitats so as to protect the genetic makeup of natural populations. Horticultural varieties shall not be used. Materials should be collected from coastal habitats that are located within approximately one mile of the Marine Science Campus and seaward of Highway 1 (Morgan 2002).
5. A plan for documenting and reporting the physical and biological "as built" condition of the site area within 30 days of completion of the initial plan implementation activities. This simple report will describe the field implementation of the approved resource plan in narrative and photographs, and report any problems in the implementation and their resolution.
6. A plan for interim monitoring and maintenance, including:
 - a. A schedule.
 - b. Interim performance standards keyed to final success criteria (#7, below).
 - c. A description of field activities, including monitoring studies (#8, below).
 - d. The monitoring period.

Appendix 1. CLRDP A.6.1: Specific Resource Plan Requirements

- e. Provision for submission of annual reports of monitoring results to the Planning Director for the duration of the required monitoring period, beginning the first year after submission of the “as-built” report. Each report shall be cumulative and shall summarize all previous results. Each report shall document the condition of the site area with photographs taken from the same fixed points in the same directions. Each report shall also include a “Performance Evaluation” section where information and results from the monitoring program are used to evaluate the status of the project in relation to the interim performance standards and final success criteria. To allow for an adaptive approach to management, each report shall also include a “Recommendations” section to address changes that may be necessary in light of study results or other new findings.
7. Final success criteria for each habitat type, including, as appropriate:
 - a. Species diversity, including total number of taxa, number of native taxa, and number of invasive non-native taxa.
 - b. Vegetation coverage, including total vegetation, native vegetation, invasive non-native taxa, and dominant species.
 - c. Wildlife usage.
 - d. Erosion control and functional hydrology.
 - e. Control of invasive non-native plant taxa.
 - f. Maintenance of suitable habitat, and presence/abundance, for sensitive species or other individual “target” species.
 - g. A requirement that success be determined after a period of at least three years wherein the study site has been subject to no remediation or maintenance activities other than weeding.
 8. The method by which “success” will be judged, including, as appropriate:
 - a. Type of comparison. Possibilities include comparing a census of the site area to a fixed standard derived from literature or observations of natural habitats, comparing a census of the site area to a sample from a reference site, comparing a sample from the site area to a fixed standard, or comparing a sample from the site area to a sample from a reference site.
 - b. Identification and description, including photographs, of any reference sites that will be used.
 - c. Test of similarity. This could simply be determining whether the result of a census was above a predetermined threshold. Generally, it will entail a one- or two-sample t-test.

Appendix 1. CLRDP A.6.1: Specific Resource Plan Requirements

- d. The field sampling design to be employed, including a description of the randomized placement of sampling units and the planned sample size.
 - e. Detailed field methods; not simply a citation of a publication or standard methodology.
 - f. Specification of the maximum allowable difference between the restoration value and the reference value for each success criterion.
 - g. Where a statistical test will be employed, a statistical power analysis to document that the planned sample size will provide adequate statistical power to detect the maximum allowable difference. Generally, sampling should be conducted with sufficient replication to provide 90% power with $\alpha=0.10$ to detect the maximum allowable difference. This analysis will require an estimate of the sample variance based on the literature or a preliminary sample of a reference site.
 - h. A statement that final monitoring for success will occur after at least 3 years with no remediation or maintenance activities other than weeding.
9. Monitoring study design for each habitat type, including, as appropriate:
- a. Goals and objectives of the study.
 - b. Field sampling design.
 - c. Study sites, including experimental/revegetation sites and reference sites.
 - d. Field methods, including specific field sampling techniques to be employed. Photomonitoring of experimental/revegetation sites and reference sites shall be included.
 - e. Data analysis methods, including descriptive and inferential statistics with specified acceptable variance and significance levels to examine sample size, univariate and multivariate comparisons, and/or other param as appropriate and necessary to assess progress toward and meeting of success criteria.
 - f. Presentation of results.
 - g. Assessment of progress toward meeting success criteria.
 - h. Recommendations.
 - i. Monitoring study report content and schedule.
10. Provision for submission of a final monitoring report to the UCSC Planning Director and Scientific Advisory Committee at the end of the final monitoring period. The final report must be prepared by a qualified restoration ecologist. The report must

Appendix 1. CLRDP A.6.1: Specific Resource Plan Requirements

evaluate whether the site area conforms to the goals and success criteria set forth in the approved final resource plan.

- 11.** Provision for possible further action. If the final report indicates that the project has been unsuccessful, in part or in whole, based on the approved success criteria, then the final report shall identify remediation measures to be implemented to compensate for those portions of the original plan that did not meet the approved success criteria.

Appendix 2. Mitigation and monitoring requirements under CEQA

Appendix 2. Mitigation and monitoring program requirements under CEQA.

Measure #	Measure Text	Monitoring and Reporting Procedure	Monitoring and Reporting Responsibility	Timing
<p>CLRDP Policy 3.2</p>	<p>Protection and Restoration of Habitat Areas: The biological productivity and the quality of coastal waters, streams, and wetlands, appropriate to maintain the optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through among other means minimizing adverse effects of wastewater discharges, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging wastewater reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural watercourses. Campus natural areas (i.e., areas outside of defined development zones) shall be protected, restored, enhanced, and managed as high-quality open space and natural habitat areas.</p>	<p>Implemented through development of this SRP and, for SRP, through implementation of MM 4.4-1, 4.4-2 and 4.5-1, below; reporting as described in specific mitigation measures, below.</p>	<p>PP&C</p>	<p>Prior to and during construction</p>
<p>CLRDP MM 4.4-1</p>	<p>CA Red-legged Frog: For all projects proposed in the upper terrace under the CLRDP, the University will implement the following:</p>	<p>Conduct survey. Document results.</p>	<p>Prior to construction, of projects in upper terrace</p>	<p>PP&C</p>

Appendix 2. Mitigation and monitoring requirements under CEQA

Measure #	Measure Text	Monitoring and Reporting Procedure	Monitoring and Reporting Responsibility	Timing
	<p>A preconstruction survey for CRLF will be conducted of all areas proposed for grading and construction by a qualified biologist, approved by the USFWS. If CRLF are observed, grading activities shall be postponed and USFWS shall be consulted to determine appropriate actions to avoid impact. Consultation with the USFWS will result in either a determination of the need to obtain a permit or in the identification of measures to avoid take of the individual(s).</p> <p>The biological monitor shall also conduct meetings with the contractor(s) and other key construction personnel to describe the importance of the species, the need to restrict work to designated areas, and to discuss procedures for avoiding harm or harassment of wildlife encountered during construction.</p>	<p>If CRLF are observed, consult with USFWS.</p> <p>Conduct meetings with contractor(s) and construction personnel. Include mitigation specifications in construction contract.</p>	<p>Prior to construction, if CRLF are observed</p> <p>Before beginning construction</p>	
<p>CLRDP MM 4.4-2</p>	<p>Nesting Birds: UCSC shall ensure that construction activities avoid disturbing nests of raptors (and other special-status birds). If ground-disturbing activities are scheduled to occur during the breeding season (February 1 through August 31), the following measures are required to avoid potential adverse effects on nesting special-status raptors and</p>	<p>Conduct survey. Document results.</p> <p>Create no-disturbance buffer in</p>	<p>Before beginning construction on each project</p> <p>Before beginning construction, if active raptor nests</p>	<p>PP&C</p>

Appendix 2. Mitigation and monitoring requirements under CEQA

Measure #	Measure Text	Monitoring and Reporting Procedure	Monitoring and Reporting Responsibility	Timing
	<p>other birds:</p> <p>A qualified wildlife biologist will conduct preconstruction surveys of all potential nesting habitat. For burrowing owls, such surveys will follow the most recent CDFG Burrowing Owl Survey Protocol and Mitigation Guidelines.¹</p> <p>If active raptor nests are found during preconstruction surveys, a no-disturbance buffer acceptable in size to CDFG will be created around active raptor nests and nests of any other special-status birds during the breeding season, and maintained until it is determined that all young have fledged. Raptor or other bird nests initiated during construction are presumed to be unaffected, and no buffer is necessary. However, the “take” of any individuals will be prohibited.</p> <p>If preconstruction surveys indicate that nests are inactive or potential habitat is unoccupied during the construction/restoration period, no further mitigation is required. Trees and shrubs that have been determined to be unoccupied by special-status birds or that are located</p>	<p>consultation with qualified biologist. Include mitigation specifications in construction contract.</p>	<p>are found</p>	

¹ California Department of Fish and Game, *Staff Report on Burrowing Owl Mitigation*, The Resources Agency, October 17, 1995.

Appendix 2. Mitigation and monitoring requirements under CEQA

Measure #	Measure Text	Monitoring and Reporting Procedure	Monitoring and Reporting Responsibility	Timing
	outside the no-disturbance buffer for active nests may be removed.			
CLRDP MM 4.5-1	Human Remains: If human remains are discovered during the construction of a development project under the CLRDP, the University and/or its employees shall notify the Santa Cruz County Coroner’s Office immediately. Upon determination by the County Coroner that the remains are Native American, the Coroner shall contact the California Native American Heritage Commission, pursuant to subdivision (c) of Section 7050.5 of the Health and Safety Code, and the County Coordinator of Indian Affairs and appropriate Native American consultation shall be conducted, as outlined by PRC 5097.98. Implementation Measure 3.9.1, Construction Monitoring, as identified in the CLRDP, shall also apply. UCSC will be responsible for implementing this mitigation measure.	<p>Include in construction contract the requirement that the University be notified if suspected human bone is discovered.</p> <p>Contact archaeologist and County Coroner in the event of discovery of suspected human bone. Contact California Native American Heritage Commission and conduct Native American consultation if Coroner determines the remains are Native American.</p>	<p>Before beginning construction</p> <p>During construction</p>	PP&C

Appendix 2. Mitigation and monitoring requirements under CEQA

Measure #	Measure Text	Monitoring and Reporting Procedure	Monitoring and Reporting Responsibility	Timing
<p>CLRDP IM 3.9.1</p>	<p>Cultural Resources Construction Monitoring: Should archaeological and/or paleontological resources be encountered during any construction on the Marine Science Campus, all activity that could damage or destroy these resources shall be temporarily suspended until qualified archaeologist/paleontologists and Native American representatives have examined the site and mitigation measures have been developed that address and proportionately offset the impacts of the project on archaeological and/or paleontological resources. Development shall incorporate measures to address issues and impacts identified through any archaeologist/ paleontologist and/ or Native American consultation.</p>	<p>Include in construction contract the requirement that work be suspended if archaeological resources are disclosed.</p> <p>Contract with qualified archaeologist to develop appropriate mitigation measures.</p>	<p>Before beginning construction</p> <p>If archaeological resources are disclosed</p>	<p>PP&C</p>
<p>CLRDP IM 3.10.1</p>	<p>Use, Containment and Cleanup of Hazardous Materials. The University, through the Office of Environmental Health and Safety, will manage the use, and in the event of spillage, the containment and cleanup of, hazardous materials and petroleum on the UCSC Marine Science Campus in compliance with federal and state regulations related to the storage, disposal, and transportation of hazardous substances.</p>	<p>For UC entities, continue to implement UCSC Environmental Health and Safety programs involving oversight of individual units' compliance efforts and advising on improvements in procedures related to storage, disposal, and transportation of hazardous substances.; document activity of relevant EH&S programs</p>	<p>Ongoing, frequency varies with the type and quantity of hazardous materials; document annually</p>	<p>UCSC EH&S</p>

Appendix 2. Mitigation and monitoring requirements under CEQA

Measure #	Measure Text	Monitoring and Reporting Procedure	Monitoring and Reporting Responsibility	Timing
<p>CLRDP Policy 7.1</p>	<p>Productivity and Quality of Coastal Waters. The Marine Science Campus shall be developed and used in a manner that shall sustain and, where feasible, enhance and restore, the biological productivity and quality of coastal waters on and adjacent to the Campus through controlling, filtering, and treating runoff and other non-point sources of pollution, preventing depletion of groundwater supplies and substantial interference with surface water flow, encouraging wastewater reclamation, and maintaining natural vegetation buffer areas that protect riparian habitats.</p>	<p>Implement Resource Management Plan as described in this SRP Construction practices consistent with Stormwater Concept Plan</p>	<p>Throughout construction</p>	<p>PP&C</p>
<p>CLRDP IM 7.1.8</p>	<p>Irrigation and Use of Chemicals for Landscaping. Any water used for landscape irrigation on the Marine Science Campus shall not be applied in a manner that would cause significant erosion. Any use of chemicals for fertilizer and/or weed and pest control shall be minimized to the degree feasible, including as required by the Drainage Concept Plan, and any chemicals unavoidably used shall not enter habitat areas or the ocean in concentrations sufficient to harm wildlife and/or to degrade habitat.</p>	<p>Establish polices for irrigation and use of chemicals in landscaping to minimize erosion potential and runoff into habitat areas or the ocean.</p>	<p>Before occupancy of first project developed under the CLRDP</p>	<p>Physical Plant</p>

Appendix 3. Conceptual Location of Perimeter Trail.



Figure is replicated from the UCSC Marine Science Campus Area Plan (2008). The figure includes conceptual design and buildout of the Marine Science Campus. This figure is included here simply to identify the approximate location of trails (denoted in yellow) within the YLR Terrace area.