

ANNUAL MONITORING REPORT

NORTHERN REGIONAL LIBRARY FACILITY, PHASE IV MITIGATION
UNIVERSITY OF CALIFORNIA, BERKELEY (RICHMOND BAY CAMPUS)
RICHMOND FIELD STATION
RICHMOND, CA



Prepared for:
John Fiske
Project Manager, Capital Projects
1936 University Avenue, 2nd Floor
Berkeley, CA 94704
Prepared By:



27875 Berwick Drive, Suite A
Carmel, CA 93923

December 28, 2021

Table of Contents

1.0	INTRODUCTION	1
1.1	SITE LOCATION	1
1.2	DESCRIPTION OF REVEGETATION AREA	1
1.3	INITIAL RESTORATION	2
2.0	MAINTENANCE ACTIVITIES	3
2.1	QUARTERLY MAINTENANCE VISITS	3
2.2	ESTABLISHMENT IRRIGATION.....	3
2.3	WEED CONTROL	4
3.0	DISCUSSION	4
4.0	RECOMMENDATIONS	5
4.1	SUPPLEMENTAL PLANTING.....	5
5.0	REFERENCES	6

MAPS

Map 1 –Vicinity Map

Map 2 – Site Plan and Restoration Area

Map 3 – Current Conditions of the Restoration Area

APPENDICES

Appendix A – Maintenance Log

Appendix B – Plant Species List

Appendix C - Photos

1.0 INTRODUCTION

The Northern Regional Library Facility (NRLF) is located on the University of California, Berkeley Richmond Bay Campus (RBC), now referred to as UC Berkeley's Richmond Field Station (RFS). The NRLF is a complex of buildings that store millions of low-use library materials. In order to meet increased storage demand, a climate-controlled building (Phase IV) was built to store an additional 3.1 million volumes.

The NRLF is situated immediately adjacent to an important occurrence of remnant coastal terrace prairie known as Big Meadow. Big Meadow has been evaluated and described in several previous technical reports prepared for the RFS and is also periodically studied by UC Berkeley students. The Richmond Bay Campus Coastal Terrace Prairie Management Plan (Management Plan) (Stromberg, 2014) was prepared in order to provide guidelines for protecting and restoring coastal prairie resources at the RFS in accordance with the goals of the University's 2014 Long Range Development Plan (LRDP) and the associated mitigation requirements of the LRDP Environmental Impact Report (Tetra Tech, 2014). The Management Plan identifies Big Meadow as one of the core coastal prairie areas at the RFS that is to be protected, enhanced, and monitored in the future. Additionally, the LRDP and EIR designate the majority of Big Meadow as a Natural Open Space.

The development of the Phase IV building resulted into 5,530 square feet of impact to coastal terrace prairie at Big Meadow. As mitigation to the development a 1:1 mitigation ratio was established, and 5,530 square feet of degraded coastal prairie adjacent to Big Meadow was restored. The mitigation site was installed during fall 2020 and included soil preparation by a construction contractor, and seeding, planting and temporary irrigation installation by RANA.

The following subsections provide details of the revegetation and maintenance work performed during the first year of the 2-year establishment period, and recommendations for future establishment work.

1.1 Site Location

The NRLF at the RFS is located immediately south of Regatta Boulevard in the city of Richmond, Contra Costa County, California (**Map 1**). The mitigation site is bordered on the west and southwest sides by Big Meadow, the east is bordered by a bioswale and the north by various buildings associated with the NRLF. Tidal marsh and the edge of San Francisco Bay lie approximately 0.6 kilometers towards the south (**Map 2**).

1.2 Description of Revegetation Area

Prior to restoration, the revegetated area consisted of non-native grasslands dominated by non-native herbaceous species including Harding grass (*Phalaris aquatica*), wild oats (*Avena fatua*), black mustard

(*Brassica nigra*), bristly oxtongue (*Helminthotheca echioides*), cheeseweed (*Malva parviflora*), Ribwort plantain (*Plantago lanceolata*), musk stork's-bill (*Erodium moschatum*), bur clover (*Medicago polymorpha*), etc.

1.3 Initial Restoration

Initial restoration activities included the spreading of excavated soil and ripping the restoration area performed by others in fall 2020, and the installation of a temporary irrigation system, seeding, planting and mulching performed by RANA between October 2020 and December 2020 (fig 1) (table 1 and 2).



Figure 1. Seeded, strawed, and mulched mitigation site (December 2020).

Table 1. Plant list for NRLF coastal terrace prairie mitigation.

PLANT LIST

Botanical Name	Common Name	Type		Bloom Period	Container Size	Square Feet	Acres	Spacing (inches)	Percent	Quantity
<i>Danthonia californica</i>	California oat grass	grass	perennial	February-May	1-gal	5,530	0.13	24	20%	277
<i>Grindelia hirsutula</i>	hairy gum plant	herb	perennial	June-Sept	D16	5,530	0.13	36	10%	62
<i>Juncus occidentalis</i>	Western rush	rush	perennial	May-August	D16	5,530	0.13	24	20%	277
<i>Sisyrinchium bellum</i>	blue eyed grass	herb	perennial	March-May	D16	5,530	0.13	24	20%	277
<i>Stipa pulchra</i>	purple needlegrass	grass	perennial	March-May	PLUG	5,530	0.13	12	30%	1,659
									100%	2,552

Table 2. Seeds for NRLF Coastal Terrace Prairie Mitigation

Botanical Name	Common Name	Quantity
<i>Danthonia californica</i>	California oat grass	4.8 lbs
<i>Wyethia angustifolia</i>	Narrow leaf mules ear	1.9 lbs
<i>Juncus tenuis</i>	slender rush	2.0 lbs
<i>Juncus patens</i>	spreading rush	3.9lbs
<i>Hordeum brachyantherum</i>	meadow barley	4.5lbs

2.0 MAINTENANCE ACTIVITIES

2.1 Quarterly Maintenance Visits

Maintenance activities occur once per quarter for the duration of a two-year establishment period. Maintenance activities include site inspections, weed control, and irrigation system inspections, repair, and adjustments. At the appropriate time, maintenance also includes removal of the temporary irrigation system. A maintenance log for 2021 can be found as **Appendix A**.

2.2 Establishment Irrigation

The restoration area is irrigated by a temporary irrigation system. Soils at the site drain poorly and weather conditions during most of the year tend to be cool and dry. The irrigation system was used during the dry months of Year 1 (three times per week). The irrigation system was turned off in October and will remain off until seasonal rains stop and the soil begins to dry (**fig 2**).



Figure 2. Temporary irrigation at mitigation site

2.3 Weed Control

Weed control is the most critical aspect of revegetation at the project site. At each site visit and maintenance event, non-native weeds are identified and removed prior to seed production. The focus of weed removal centers on species that are listed by the Cal-IPC as 'medium' or 'high' invasiveness. Target Invasive Weeds removed include black mustard (*Brassica nigra*), stinkwort (*Dittrichia graveolens*), fennel (*Foeniculum vulgare*), cat's ear species (*Hypochaeris* spp.), and Harding grass (*Phalaris aquatica*). Cal-IPC 'limited' species bur clover (*Medicago polymorpha*), English plantain (*Plantago lanceolata*), prickly ox-tongue (*Picris echinoides*), *Rumex* spp., and sow thistle (*Sochus* spp.) were also removed during maintenance visits (**fig 3**).

During spring and early summer maintenance visits, non-native annual grasses were cut down to less than three inches with string trimmers in order to reduce competition with the desirable native species.



Figure 3. Removal of black mustard and cat's ear species at the mitigation site.

3.0 DISCUSSION

There are no performance criteria associated with the coastal prairie mitigation for the Phase IV development. However, we would like to see native coastal prairie species throughout the restoration area with greater than 20% cover. Qualitative observation during maintenance visits found that coverage of native vegetation in a quarter of the restoration site have greater than 30% cover. Around half of the site has native vegetation at approximately 10% and a quarter of the site has around 1% native vegetation (**Map 3**). Areas with high native cover are at the north of the site while areas with reduced cover are to the south.

Planted purple needle grass (*Stipa pulchra*) plants have become established throughout the restoration area. While many of the gallon sized California oat grass (*Danthonia californica*) plants did not survive. We recommend planting additional grass plugs (*S. pulchra* and *D. californica*) as well as additional coastal terrace prairie forbs throughout the mitigation site in order to increase native cover.

Additional maintenance visits may occur in the spring and summer months to control non-native species and help with the establishment of native species.

4.0 RECOMMENDATIONS

Based on the results of qualitative monitoring, quarterly site inspections and maintenance visits, Rana Creek recommends the following for Year 2 of the establishment period:

- Plant additional coastal terrace prairie plants throughout restoration site (see section 4.1).
- Continue with quarterly maintenance activities, with potential additional maintenance visit scheduled for late spring in order to ensure non-native plants remain under control.
- Focus maintenance visits on weed removal on southern portion of the site.
- Discontinue use of the temporary irrigation system in late summer to demonstrate that vegetation is self-sustaining.
- Remove temporary irrigation during the final maintenance visit.

4.1 Supplemental Planting

We recommend planting additional coastal terrace prairie species throughout the restoration area with a majority of the plants designated to the southern portion of the site. A supplemental planting pallet can be found in **Table 3**. All container stock will be propagated from site-specific seed.

Table 3. Supplemental Planting Pallet

Botanical Name	Common Name	Size	Quantity
<i>Danthonia californica</i>	California oat grass	Plug	400
<i>Grindelia hirsutula</i>	hairy gum plant	plug	300
<i>Sisyrinchium bellum</i>	blue eyed grass	plug	400
<i>Stipa pulchra</i>	purple needlegrass	plug	1000
Total			2200

5.0 REFERENCES

EHDD. 2017. U.C. NRLF Phase IV Detailed Project Program, 100% Submittal. Prepared for University of California Berkeley.

Stromberg, M.R. 2014. Richmond Bay Campus Coastal Terrace Prairie Management Plan. Prepared for University of California Berkeley.

Tetra Tech Inc. 2014. Final Environmental Impact Report, Richmond Bay Campus Long Range Development Plan. Prepared for University of California.

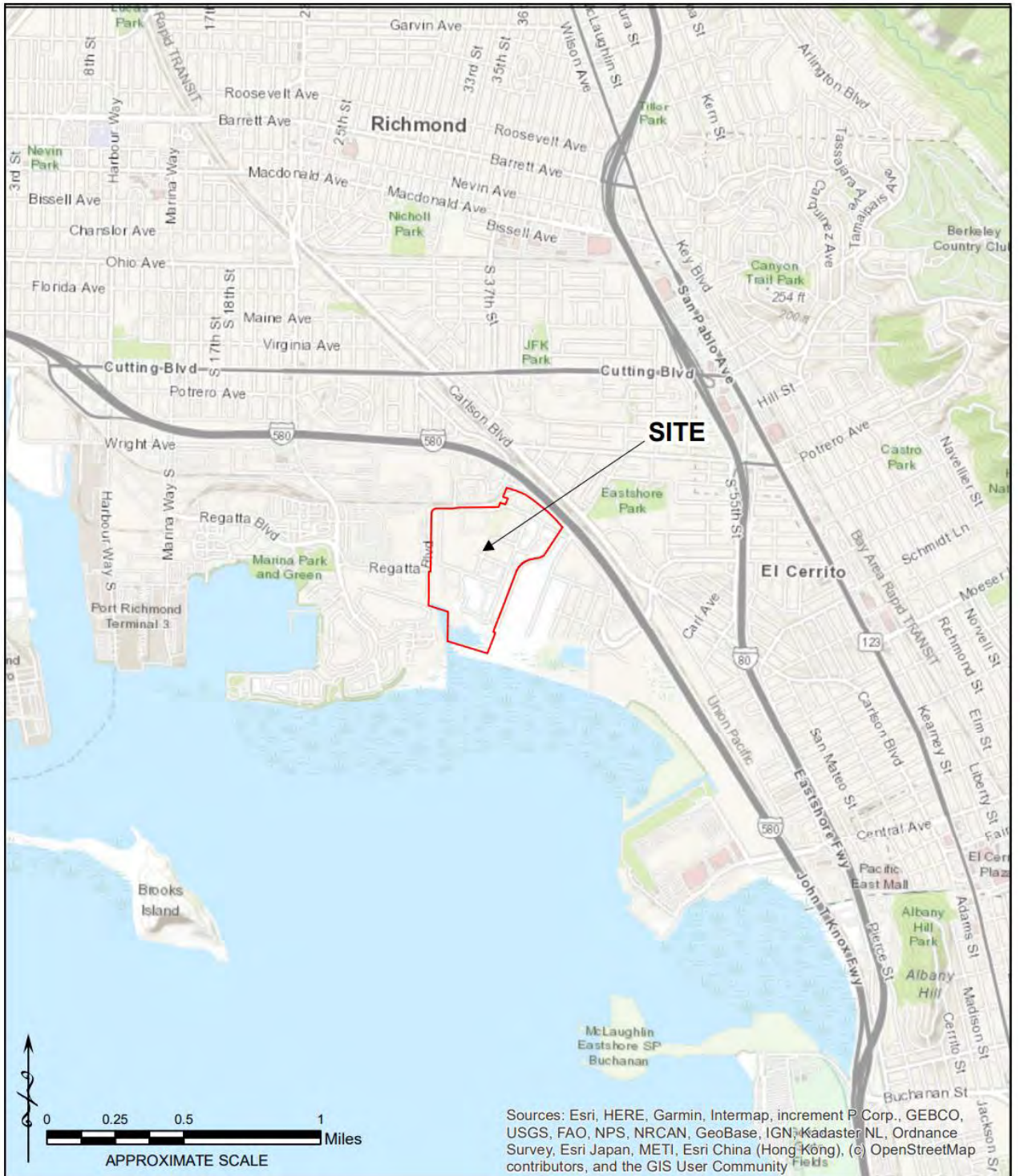
URS. 2007. Final Botanical Survey Report, Richmond Field Station. Prepared for University of California Berkeley, Richmond Field Station.

MAPS

MAP 1 VICINITY MAP

MAP 2 RESTORATION AREA

MAP 3 PERCENT NATIVE COVER OF RESTORATION AREA



UC BERKELEY
 RICHMOND FIELD STATION
 SOLAR PV ARRAY

MAY 2021
 PREPARED BY: RANA

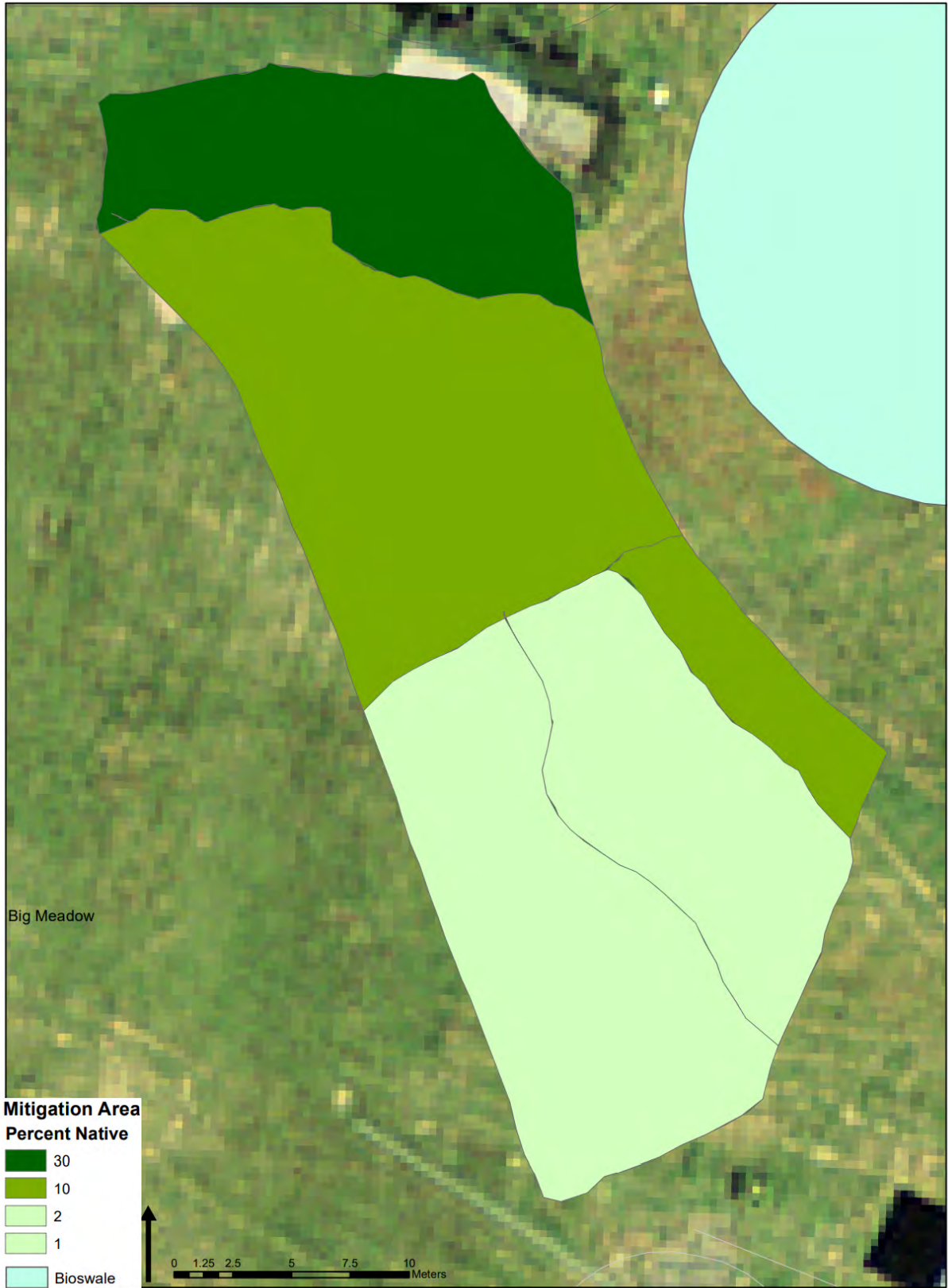
**MAP 1
 VICINITY MAP**



Bioswale Mitigation Area Phase IV

0 5 10 20 30 40
Meters

Map 2. Restoration Area



Map 3. Percent Native Cover of Restoration Area

APPENDICES

APPENDIX A – MAINTENANCE LOG
APPENDIX B – PLANT SPECIES LIST
APPENDIX C - PHOTOS

**UC Berkeley Richmond Field Station
NRLF Coastal Prairie Mitigation Site
2-Year Maintenance Log**

Prepared by: Rana
27875 Berwick Drive
Carmel, CA 93923

Date	Activity	Notes
10/15/2020	Completion of Initial Installation	Initial installation of temporary spray irrigation system, seeding, rice straw mulching, container stock planting, and temporary rope fence completed. Irrigation system operating due to dry weather conditions. (Initial installation contract)
12/3/2020	Inspection	Inspection of mitigation area to review irrigation system function, germination and establishment. Irrigation system turned on due to dry weather. Container stock appears healthy and seed germination as well as weed seed germination from the seed bank is evident. (Initial installation contract)
2/5/2021	Weed control	Turned off irrigation system due to recent heavy rainfall. Manual weeding of emerging annual weeds from around planted container stock. (Maintenance visit performed under initial installation contract)
3/25/2021	Weed control	Irrigation system turned off. Manual weeding of yellow sour clover and other annual weeds around planted container stock. Manual removal of several Harding grass plants along perimeter of mitigation area. Container stock is currently in good condition, although California oatgrass is showing some stress.
4/16/2021	Weed control	Irrigation system turned on. Manual weeding of yellow sour clover and other annual weeds around planted container stock. Cut other annual weeds to a height of 4-inches using string trimmers. Survival rate of California oatgrass appears poor. Stipa pulchra planted from leach cones are small but surviving.
5/15/2021	Weed Control	Manual weeding of yellow sour clover and other annual weeds around planted container stock. Cut other annual weeds to a height of 4-inches using string trimmers.
8/10/2021	Weed Control	Manual weeding of yellow sour clover, black mustard, raphnus and other weeds. Removed other weeds using string trimmers.
10/14/2021	Weed Control	Octobers visit focused on manual removal of weeds, including: dittrichia (stinkwort), black mustard, small melilot, white stemmed filaree, bur clover, bristly oxtongue and Harding grass. Irrigation was adjusted to two days per week. Areas of dense needle grass establishment. Gopher activity observed.
10/20/2021	Irrigation Adjustment	Irrigation was turned off due to forcasted rain events.
12/13/2021	Weed Control	This visit focused on manual removal of weeds including: black mustard, small melilot, white stemmed filaree, bristly oxtongue, ribwart plantain, etc. The northern portion of the site has dence native cover. The southern portion of the site have very little native cover.

U.C. Berkeley, Richmond Field Station
Plant Species List
2021

Species Name	Common Name	Native	Cal-IPC Rating
<i>Aira caryophyllea</i>	silver hairgrass	n	na
<i>Anagallis arvensis</i>	scarlet pimpernel	n	
<i>Avena barbata</i>	slender wild oats	n	moderate
<i>Bellardia trixago</i>	Mediterranean linseed	n	limited
<i>Brassica nigra</i>	black mustard	n	moderate
<i>Bromus diandrus</i>	ripgut brome	n	moderate
<i>Bromus hordeaceus</i>	soft chess brome	n	limited
<i>Camissonia ovata</i>	sun cup	y	
<i>Castilleja exserta</i> ssp. <i>exserta</i>	purple owl's clover	y	
<i>Danthonia californica</i> var. <i>californica</i>	California oatgrass	y	
<i>Dipsacus fullonum</i>	teasel	n	moderate
<i>Dittrichia graveolens</i>	stinkwort	n	high, ALERT
<i>Erodium cicutarium</i>	red-stemmed filaree	n	limited
<i>Festuca myuros</i>	rat tail fescue	n	
<i>Festuca perennis</i>	Italian ryegrass	n	
<i>Foeniculum vulgare</i>	sweet fennel	n	high
<i>Geranium molle</i>	dove's foot geranium	n	na
<i>Grindelia hirsutula</i> var. <i>hirsutula</i>	hairy gumplant	y	
<i>Hemizonia congesta</i>	hayfield tarplant	y	
<i>Hordeum brachyantherum</i>	meadow barley	y	
<i>Hordeum murinum</i> ssp. <i>leporinum</i>	foxtail barley	n	
<i>Hypochaeris glabra</i>	smooth cat's ears	n	limited
<i>Hypochaeris radicata</i>	hairy cat's-ears	n	moderate
<i>Linum bienne</i>	narrowleaf flax	n	
<i>Lotus corniculatus</i>	bird's foot trefoil	n	
<i>Madia sativa</i>	coast tarweed	y	
<i>Medicago polymorpha</i>	bur clover	n	limited
<i>Phalaris aquatica</i>	Harding grass	n	moderate
<i>Picris echioides</i>	bristly ox-tongue	n	limited
<i>Plantago lanceolata</i>	English plantain	n	limited
<i>Ranunculus californicus</i>	California buttercup	y	
<i>Rumex acetosella</i>	sheep sorrel	n	moderate
<i>Rumex crispus</i>	curly dock	n	limited
<i>Sisyrinchium bellum</i>	blue-eyed grass	y	
<i>Sonchus asper</i>	prickly sow thistle	n	na
<i>Sonchus oleraceus</i>	common sow thistle	n	
<i>Stipa pulchra</i>	purple needlegrass	y	
<i>Tragopogon porrifolius</i>	salsify	n	
<i>Trifolium dubium</i>	hop clover	n	
<i>Triteleia hyacinthina</i>	white brodiaea	y	
<i>Vicia sativa</i> ssp. <i>sativa</i>	spring vetch	n	
<i>Wyethia angustifolia</i>	narrow mule's ear	y	

UC Berkeley Richmond Field Station
Northern Regional Library Facility
Coastal Prairie Mitigation Area



Mitigation area. December 3, 2020



Irrigation test. December 3, 2020



Mitigation area. December 3, 2020



California oatgrass. December 3, 2020

UC Berkeley Richmond Field Station
Northern Regional Library Facility
Coastal Prairie Mitigation Area



Mitigation area, March 25, 2021



Mitigation area, March 25, 2021



Mitigation area, March 25, 2021



California oatgrass, March 25, 2021

UC Berkeley Richmond Field Station
Northern Regional Library Facility
Coastal Prairie Mitigation Area



Mitigation area, October 14, 2021



Purple needle grass, October 14, 2021



Gopher activity, October 14, 2021



Mitigation area, October 14, 2021

UC Berkeley Richmond Field Station
Northern Regional Library Facility
Coastal Prairie Mitigation Area



Stipa pulchra in northern side of mitigation area, December 9, 2021



Bunch grasses in mitigation area, December 9, 2021



Weeds in southern portion of mitigation area, December 9, 2021



Maintenance vist, December 9, 2021