

**West Stege Marsh Upland Revegetation Plan (2003-5)  
U.C. Berkeley Field Station**

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Prepared for Blasland, Bouck & Lee, INC.

By

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## 1. INTRODUCTION

Current remediation efforts at the West Stege Marsh have provided an opportunity to enhance the native plant community diversity through revegetation of the ecotone and upland areas following fill removal. One goal of the revegetation project detailed below is to promote species diversity within the regraded marsh upland habitat. It will also indirectly address the following goal set forth in the Biological Assessment (Blasland, Bouck and Lee, 2003): “habitat enhancement by removing invasive/exotics plant species from the coastal scrub habitat” by establishing native coastal scrub to reduce colonization and competition from invasive plant species such as pampas grass (*Cortaderia jubata*), fennel (*Foeniculum vulgare*) and Harding grass (*Phalaris aquatica*) in recently graded areas.

Actions covered in this plan will also directly address a second goal articulated in the Biological Assessment: “Create an ecotone from high marsh to upland to improve California clapper rail upland refugial access.” This will be accomplished by establishing native vegetation cover and structure in the upland areas that will provide suitable refugia for the California clapper rail (*Rallus longirostris obsoletus*) and other marsh birds from predators during high tide events.

The plan is also consistent with the goals set forth by the Bay Area Wetland Ecosystem Habitat Goals Project plan which state that “restoration opportunities which link tidal marshes to upland and alluvial soils, seeps, drainages should be given high priority in restoration planning” because “most floristic diversity in tidal marshes was concentrated along the upper marsh edge, where transitions between high tidal marsh and local soils, seeps, and drainages created ecologically important variation in environmental conditions.” The Project also recommends that “opportunities to restore sites which connect tidal marshes to upland soils, creeks, seeps, be given at least as much priority as marsh restoration sites located adjacent to tidal sloughs.” (Goals Project, 1999)

The University of California at Berkeley (UCB) Richmond Field Station (RFS) supports grassland and wetland habitat of high ecological value. The RFS occupies approximately 72 acres of marsh and mudflat, and 23 acres of upland habitats. Included within these areas are a diversity of habitat types that support a number of native vegetation communities including salt and brackish marsh, freshwater meadow and seep associations, and coastal scrub. Many of these habitats have been disturbed through the introduction of fill materials, the invasion of non-native plant species, increased development, and the impacts of past industrial operations from on (and off) site sources. Today, these habitats support more than 62 native plant species, including some that are considered locally rare. In addition West Stege marsh supports a diversity of wildlife species including the federally endangered (California clapper rail).

## 2. REVEGETATION PLANT PALETTE

### **Species Selection**

The species selected for the upland areas of the marsh were chosen by referencing the native species observed on the RFS and within adjacent upland areas as well as other local native grasslands and upland scrub plant communities. This was used to generate a general list of upland native species which is guiding propagule collection (seed and cuttings) for outplanting next year (see Table 1 for list). Additional species may be added to this list after a more extensive review of early botanical and herbarium records.

Table 1 identifies of the native species proposed for revegetation on the upland areas at the West Stege Marsh restoration site.

**Table 1**

| <b>Scientific Name</b>                                  | <b>common name</b>                   | <b>Family</b>    |
|---|--------------------------------------|------------------|
| <i>Achillea millefolium</i>                             | Yarrow                               | Asteraceae       |
| <i>Allium dichlamydeum</i>                              | Coast Red Onion                      | Liliaceae        |
| <i>Anaphalis margaritacea</i>                           | Pearly Everlasting                   | Asteraceae       |
| <i>Artemisia californica</i>                            | California sagebrush                 | Asteraceae       |
| <i>Artemisia douglasiana</i>                            | mugwort                              | Asteraceae       |
| <i>Aster chilensis</i>                                  | California Aster                     | Asteraceae       |
| <i>Astragalus gambellianus</i>                          | Milkvetch, Dwarf Loco Weed           | Fabaceae         |
| <i>Baccharis douglasii</i>                              | Marsh baccharis                      | Asteraceae       |
| <i>Baccharis pilularis</i>                              | Coyote brush                         | Asteraceae       |
| <i>Brodiaea elegans</i>                                 | Harvest Brodiaea                     | Liliaceae        |
| <i>Bromus carinatus</i> ssp. <i>carinatus</i>           | California Brome                     | Poaceae          |
| <i>Bromus carinatus</i> ssp. <i>maritimus</i>           | Seaside Brome                        | Poaceae          |
| <i>Calandrinia ciliata</i>                              | Red Maids                            | Portulacaceae    |
| <i>Castilleja densiflora</i>                            | Owl's Clover                         | Scrophulariaceae |
| <i>Castilleja</i> sp.?                                  | Indian Paintbrush                    | Scrophulariaceae |
| <i>Chlorogalum pomeridianum</i> var. <i>divaricatum</i> | Soap Plant                           | Liliaceae        |
| <i>Danthonia californica</i> var. <i>california</i>     | California Oatgrass                  | Poaceae          |
| <i>Deschampsia cespitosa</i> ssp. <i>Holciformis</i>    | Tufted hairgrass                     | Poaceae          |
| <i>Dichelostemma capitatum</i>                          | Blue Dicks, Wild Hyacinth            | Liliaceae        |
| <i>Dichondra donelliana</i>                             | Dichondra                            | Convolvulaceae   |
| <i>Distichlis spicata</i>                               | Saltgrass                            | Poaceae          |
| <i>Elymus glaucus</i>                                   | wild rye                             | Poaceae          |
| <i>Eriogonum latifolium</i>                             | Coast buckwheat                      | Polygonaceae     |
| <i>Eriophyllum staechadifolium</i>                      | Lizard-tail, Seaside wooly sunflower | Asteraceae       |
| <i>Eschscholzia californica</i> var. <i>maritime</i>    | California coastal poppy             | Papaveraceae     |
| <i>Festuca rubra</i>                                    | Red fescue                           | Poaceae          |
| <i>Fragaria chiloensis</i>                              | Beach or Dune Strawberry             | Rosaceae         |
| <i>Grindelia stricta</i>                                | Gumweed                              | Asteraceae       |
| <i>Hordeum brachyantherum</i>                           | Meadow barley                        | Poaceae          |
| <i>Iris douglasiana</i>                                 | Douglas Iris                         | Iridaceae        |
| <i>Iris longipetala</i>                                 | Coast iris                           | Iridaceae        |
| <i>Koeleria macrantha</i>                               | June Grass                           | Poaceae          |
| <i>Lasthenia californica</i>                            | Goldfields                           | Asteraceae       |
| <i>Layia platyglossa</i>                                | Tidy Tips                            | Asteraceae       |
| <i>Leymus triticoides</i>                               | Valley Wild-rye                      | Poaceae          |
| <i>Lomatium caruifolium</i>                             | Lomatium                             | Apiaceae         |
| <i>Lomatium dasycarpum</i>                              | Wooly Parsnip                        | Apiaceae         |
| <i>Lotus scoparius</i>                                  | Deer Weed, California Broom          | Fabaceae         |

| <b>Scientific Name</b>                           | <b>common name</b>           | <b>Family</b>    |
|--|------------------------------|------------------|
| <i>Lupinus arboreus</i>                          | Yellow Bush Lupine           | Fabaceae         |
| <i>Lupinus bicolor</i>                           | annual lupine                | Fabaceae         |
| <i>Lupinus nanus</i>                             | Sky Lupine                   | Fabaceae         |
| <i>Lupinus variicolor</i>                        | Varicolored Lupine           | Fabaceae         |
| <i>Marah fabaceus</i>                            | Man-root, Wild Cucumber      | Cucurbitaceae    |
| <i>Melica californica</i>                        | California Melica            | Poaceae          |
| <i>Mimulus aurantiacus</i>                       | Sticky or Bush Monkey Flower | Scrophulariaceae |
| <i>Monardella villosa</i>                        | Western Pennyroyal           | Lamiaceae        |
| <i>Nassella lepida</i>                           | Foothill Needlegrass         | Poaceae          |
| <i>Nassella pulchra</i>                          | Purple Needlegrass           | Poaceae          |
| <i>Navarretia squarrosa</i>                      | Skunkweed                    | Polemoniaceae    |
| <i>Perideridia kelloggii</i>                     | Yampah                       | Apiaceae         |
| <i>Phacelia californica</i>                      | California coast phacelia    | Hydrophyllaceae  |
| <i>Phacelia distans</i>                          | wild heliotrope              | Hydrophyllaceae  |
| <i>Phalaris californica</i>                      | California Canary Grass      | Poaceae          |
| <i>Plantago erecta</i>                           | drarf plantain               | Plantaginaceae   |
| <i>Polypodium californicum</i>                   | California Polypody          | Polypodiaceae    |
| <i>Pteridium aquilinum</i> var. <i>pubescens</i> | Bracken Fern                 | Dennstaedtiaceae |
| <i>Ranunculus californicus</i>                   | California Buttercup         | Ranunculaceae    |
| <i>Rhamnus californica</i>                       | California Coffeeberry       | Rhamnaceae       |
| <i>Sanicula arctopoides</i>                      | Footsteps-of-Spring          | Apiaceae         |
| <i>Sanicula bipinnatifida</i>                    | Purple Sanicle               | Apiaceae         |
| <i>Sanicula crassicaulis</i>                     | pacific snakeroot            | Apiaceae         |
| <i>Satureja douglasii</i>                        | Yerba Buena                  | Lamiaceae        |
| <i>Scrophularia californica</i>                  | California Figwort           | Scrophulariaceae |
| <i>Sidalcea malvaeflora</i>                      | Checkerbloom, Wild Hollyhock | Malvaceae        |
| <i>Sisyrinchium bellum</i>                       | Blue-Eyed Grass              | Iridaceae        |
| <i>Solidago californica</i>                      | California Goldenrod         | Asteraceae       |
| <i>Trifolium willdenovii</i>                     | Tomcat Clover                | Fabaceae         |
| <i>Trifolium wormskioldii</i>                    | Cow Clover, Coast Clover     | Fabaceae         |
| <i>Triphysaria pusilla</i>                       | Dwarf Owl's Clover           | Scrophulariaceae |
| <i>Triteleia laxa</i>                            | Ithuriel's spear             | Liliaceae        |
| <i>Viola adunca</i>                              | Blue or Western Dog violet   | Violaceae        |
| <i>Wyethia angustifolia</i>                      | Narrow-leaf mule's ears      | Asteraceae       |

### **Propagule Collection Site Selection**

Because the West Stege Marsh restoration site does not support all of the species outlined in Table 1, collection sites have been chosen outside of the restoration footprint. It is anticipated that plant materials collected from local off-site areas will share genetic links to historic plant populations or originate from sites with conditions similar to the West Stege marsh and uplands. To achieve these, the following factors were considered when selecting propagule collection sites:

- 1) ecological habitat similarity
- 2) natural species dispersal vectors;
- 3) proximity to the introduction site.

### 3. NURSERY PROPAGATION AND OUTPLANTING GOALS

#### **Determination of Propagation Goals**

The native upland plant species will be planted at a density of a plant every 4 sq. ft. or on four foot centers. This density is needed to establish full native plant cover within several years of revegetation and prevent the reinvasion of aggressive non-natives such as pampas grass and fennel..

For the marsh upland revegetation component of the environmental remediation effort, all plantings will occur above 6 ft. NGVD elevation. The upland areas have been divided into four discrete revegetation areas/subsites (Figure 1). Each area will support a slightly different plant palette designed to match the subtle differences in soil, hydrology, aspect, drainage and need for the upland vegetation to act as high tide refugia for the clapper rail and other marsh birds. Below is a list of the four upland sub-sites:

#### Sub-sites:

- 1.) the island(s) above the 6 ft NGVD level at 0.4 acres,
- 2.) the fill slope that is the south boundary of the marsh from the bridge to the site's south-east corner or the East Bay Regional Parks District property at 0.4 acres,
- 3.) the upland, north of the regraded marsh at 2.5 acres<sup>1</sup>, and
- 4.) the area referred to as the bulb at the north-west of the regraded marsh above the 6 foot NGVD elevation at 2.2 acres.

Blasland, Bouck & Lee, Inc. estimated the total upland planting areas to be approximately 5.5 acres<sup>2</sup>.

Propagation ratios for the coastal scrub were developed to generally mimic native scrub plant communities. Relative species assemblage proportions were based on soil types present, field observations of similar local assemblages, past project experience and the goal of providing upland vegetated refugia for the California clapper rail and other marsh birds.

Propagation goals for the grasslands areas were developed to assist in continued propagule collection 2004. Initial goals were determined using URS's inventory data (2003), and ESTP vegetation inventory data (AOI, 2003). These will be refined through further analysis of data collected in investigation of local grassland remnants. Grassland revegetation will focus on mitigating the impacts to the grassland habitat that was lost as a part of the remediation staging facilities. Once the location of the grassland mitigation project is determined, revegetation goals will be refined. Grassland propagation collection began in Spring 2003, and will continue throughout 2004. It is anticipated that additional outplanting will occur in 2005 to address mortality and outplant species with limited propagule sources. Propagation goals for all four sub-sites are listed in Appendix 1.

The propagation goals for sub-site # 3 (the north upland) and sub-site #4 (the upland bulb), (Tables 4,5,6) were generated with half the area to be restored to native coastal scrub and the other half to native grassland. The density for these two vegetation types will be planted on 4 foot centers for scrub and 2 foot centers for grasslands, due to the differences in the size of adult plants among these two native plant communities.

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<sup>1</sup> While this plan calculates revegetation goals assuming an upland acreage of 2.5 acres, it is recognized that future land use planning could reduce this area, and therefore the propagation goals.

<sup>2</sup> See above footnote

It is important to note, that the proposed propagation goals may be adjusted based upon limited propagule availability, high levels of natural recruitment of one or more species, or a determination from the project manager (BBL Inc.). However, unless otherwise determined by the project manager, the total number of plants grown for revegetation purposes will remain the same.

#### 4. PROPAGULE COLLECTION

##### Guidelines

Propagule collection will be performed by AOI staff with support from UC Berkeley ESTP students and community volunteers. Upland marsh species propagule collection began during summer 2003, and will continue through fall 2004-5.

Seeds will be collected by hand in paper envelopes or grocery bags. To protect propagule resources, no more than 10% of the seeds from any 1 population or individual plant will be collected throughout the season. Seeds will be collected from each species throughout its ripening season in order to include a diverse range of flowering times in the collection pool. Divisions will be extracted using flat-bladed shovels. Records pertaining to propagule collection will be recorded, and included in a final revegetation report.

##### Propagule collection permits and records

Permits have either been acquired, or requested from the collection sites to secure propagules for the West Stege Marsh restoration efforts. A list of collection sites and propagules collected will be included in the final revegetation report. Propagules for a number of locally rare species will be collected over several years as they have limited population sizes and distribution. These species will be planted during the first two years of the project.

#### 5. OUTPLANTING DESIGN

Figure 1 includes a map of the final grading plan with the specific upland areas designated. This map was used to develop the outplanting design and propagation goals.

##### **Planting Design**

No larger species such as toyon (*Heteromeles arbutifolia*) and California wax myrtle (*Myrica californica*) will be planted as a part of this upland restoration project, so as to not introduce possible perching habitat for species that may prey on clapper rails. Most scrub species and all the sub-shrubs and grasses will be planted in clusters of 3 to 7 individuals to mimic natural patchiness. Clusters of the remaining individual species will be randomly distributed within the planting areas.

In the sub-sites where both grassland and scrub species will be revegetated (#3 and #4), scrub species will generally be planted along the upland margins of the marsh to act as high tide refugia for the California clapper rail and other birds and the native grassland species will be planted in the flatter upland areas. The planting design will incorporate patches of grassland habitat connected to marsh ecotone for biodiversity with a buffer of scrub around the outer edges of the grassland areas to act as a natural buffer to plant invasion and off-trail foot traffic across the restored grassland. The few scrub oaks proposed for revegetation will be planted away from the marsh along the fence line of the field station facilities.

**Outplanting**

Outplanting will be phased over three years with the majority of the outplantings occurring in the first 2 years. Outplanting will begin in November 2004 and continue through February 2006. The timing of planting will coincide with the beginning of the winter rains (November - January) to provide a critical period of soil moisture to allow for plant establishment.

Temporary irrigation may be needed to establish the upland scrub species, and will need to be designed and coordinated with UC Berkeley if it is required.

Fertilization will be needed particularly on the rocky fill slope areas that is the upland southern edge of the marsh (EBRP's land). Fertilization for the individual plants will be accomplished through the insertion of several time released fertilizer ozmocote granules into each individual planting hole prior to outplanting.

## 6. SITE PREPARATION AND MAINTENANCE

All erosion control measures will be installed as part of the site remediation. Any significant erosion problems that occur will be addressed by UC Berkeley. If regraded areas are compacted to the point that they may impede plant establishment, alternative actions such as ripping the compacted soils before outplanting will be discussed with UC Berkeley staff.

The upland areas will be weeded consistent with the Invasive Plant Species Management Plan.

## 7. REFERENCES

Goals Project. 1999. Baylands Ecosystem Habitat Goals. A report of the habitat recommendations. U. S. Environmental Protection Agency, San Francisco, CA.

Biological Assessment, Richmond Field Station Remediation Project Report. 2003. Blasland, Bouck & Lee, Inc.

California Environmental Quality Act, Initial Study - Richmond Field Station Remediation Project. 2003 URS Corporation.

**APPENDIX I**  
**PROPAGATION GOALS FOR RFS SUBSITES**



Table 1. identifies revegetation goals for sub-site #1: the marsh islands. (total area – 0.4 acres)

**Table 1.**

| <b>Scientific Name</b>                        | <b>common name</b>                   | <b>%</b> | <b># of plants on</b>                 |
|---|--------------------------------------|----------|---------------------------------------|
|   |                                      |          | <b>planting 4 ft. centers density</b> |
| <i>Achillea millefolium</i>                   | Yarrow                               | 5        | 54                                    |
| <i>Anaphalis margaritacea</i>                 | Pearly Everlasting                   | 3        | 33                                    |
| <i>Artemisia californica</i>                  | California sagebrush                 | 10       | 109                                   |
| <i>Aster chilensis</i>                        | California Aster                     | 7        | 76                                    |
| <i>Baccharis pilularis</i>                    | Coyote brush                         | 15       | 163                                   |
| <i>Bromus carinatus</i> ssp. <i>maritimus</i> | California Brome, Seaside Brome      | 3        | 33                                    |
| <i>Ceanothus thyrsiflorus</i>                 | Coast Blue Blossom, California Lilac | 3        | 33                                    |
| <i>Elymus glaucus</i> ssp. <i>glaucus</i>     | Blue wild rye, Western Wild Rye      | 3        | 33                                    |
| <i>Eriogonum latifolium</i>                   | Coast buckwheat                      | 5        | 54                                    |
| <i>Eriophyllum staechadifolium</i>            | Lizard-tail, Seaside wooly sunflower | 10       | 109                                   |
| <i>Eschscholzia californica</i>               | California poppy                     | seed     |                                       |
| <i>Festuca rubra</i>                          | Red fescue                           | 5        | 54                                    |
| <i>Fragaria chiloensis</i>                    | Beach or Dune Strawberry             | 3        | 33                                    |
| <i>Grindelia stricta</i>                      | Gumweed                              | 2        | 22                                    |
| <i>Hordeum brachyantherum</i>                 | Meadow barley                        | 5        | 54                                    |
| <i>Leymus triticoides</i>                     | Valley Wild-rye                      | 3        | 33                                    |
| <i>Lotus scoparius</i>                        | Deer Weed, California Broom          | 7        | 76                                    |
| <i>Lupinus arboreus</i>                       | Yellow Bush Lupine, Tree Lupine      | seed     |                                       |
| <i>Mimulus aurantiacus</i>                    | Sticky or Bush Monkey Flower         | 3        | 33                                    |
| <i>Nassella pulchra</i>                       | Purple Needlegrass                   | 5        | 54                                    |
| <i>Solidago californica</i>                   | California Goldenrod                 | 3        | 33                                    |
|   |                                      | total    | 100 1035                              |

Table 2 identifies revegetation goals for sub-site #2: the fill slope. (total area - 0.4 acres)

**Table 2.**

| <b>Scientific Name</b>      | <b>common name</b>                   | <b>%</b>        | <b># of plants on</b> |
|-----------------------------|--------------------------------------|-----------------|-----------------------|
|                             |                                      | <b>planting</b> | <b>4 ft. centers</b>  |
|                             |                                      | <b>density</b>  |                       |
| Achillea millefolium        | Yarrow                               | 7               | 76                    |
| Artemisia californica       | California sagebrush                 | 13              | 142                   |
| Aster chilensis             | California Aster                     | 5               | 54                    |
| Baccharis pilularis         | Coyote brush                         | 15              | 163                   |
| Nassella pulchra            | Purple Needlegrass                   | 5               | 54                    |
| Eriogonum latifolium        | Coast buckwheat                      | 5               | 54                    |
| Eriophyllum staechadifolium | Lizard-tail, Seaside wooly sunflower | 15              | 163                   |
| Grindelia stricta           | Gumweed                              | 2               | 22                    |
| Lotus scoparius             | Deer Weed, California Broom          | 7               | 76                    |
| Lupinus arboreus            | Yellow Bush Lupine, Tree Lupine      | seed            |                       |
| Mimulus aurantiacus         | Sticky or Bush Monkey Flower         | 5               | 54                    |
| Solidago californica        | California Goldenrod                 | 2               | 22                    |
|                             |                                      | 100             | 882                   |

Table 3 identifies revegetation goals for sub-site #3: the north upland. (total area – 1.25 acres)

**Table 3.**

| <b>Scientific Name</b>                        | <b>common name</b>                   | <b>%<br/>planting<br/>density</b> | <b># of plants<br/>on<br/>4 ft. centers</b> |
|---|--------------------------------------|-----------------------------------|---|
| <i>Achillea millefolium</i>                   | Yarrow                               | 2                                 | 68  |
| <i>Anaphalis margaritacea</i>                 | Pearly Everlasting                   | 2                                 | 68  |
| <i>Artemisia californica</i>                  | California sagebrush                 | 10                                | 340   |
| <i>Artemisia douglasiana</i>                  | mugwort                              | 2                                 | 68  |
| <i>Aster chilensis</i>                        | California Aster                     | 5                                 | 170   |
| <i>Baccharis pilularis</i>                    | Coyote brush                         | 10                                | 340   |
| <i>Bromus carinatus</i> ssp. <i>maritimus</i> | California Brome, Seaside Brome      | 1                                 | 34  |
| <i>Elymus glaucus</i> ssp. <i>glaucus</i>     | Blue wild rye, Western Wild Rye      | 3                                 | 102   |
| <i>Eriogonum latifolium</i>                   | Coast buckwheat                      | 5                                 | 170   |
| <i>Eriophyllum staechadifolium</i>            | Lizard-tail, Seaside wooly sunflower | 7                                 | 238   |
| <i>Eschscholzia californica</i>               | California poppy                     | seed                              |   |
| <i>Festuca rubra</i>                          | Red fescue                           | 3                                 | 102   |
| <i>Fragaria chiloensis</i>                    | Beach or Dune Strawberry             | 3                                 | 102   |
| <i>Gnaphalium ramosissimum</i>                | fragrant cudweed                     | seed                              |   |
| <i>Grindelia stricta</i>                      | Gumweed                              | 1                                 | 34  |
| <i>Hordeum brachyantherum</i>                 | Meadow barley                        | 3                                 | 102   |
| <i>Leymus triticoides</i>                     | Valley Wild-rye                      | 2                                 | 68  |
| <i>Lotus scoparius</i>                        | Deer Weed, California Broom          | 5                                 | 170   |
| <i>Lupinus arboreus</i>                       | Yellow Bush Lupine, Tree Lupine      | seed                              |   |
| <i>Marah fabaceus</i>                         | Man-root, Wild Cucumber              | seed                              |   |
| <i>Mimulus aurantiacus</i>                    | Sticky or Bush Monkey Flower         | 5                                 | 170   |
| <i>Nassella pulchra</i>                       | Purple Needlegrass                   | 3                                 | 102   |
| <i>Phacelia californica</i>                   | California coast phacelia            | 2                                 | 68  |
| <i>Phacelia distance</i>                      | wild heliotrope                      | seed                              |   |
| <i>Rhamnus californica</i>                    | California Coffeeberry               | 6                                 | 204   |
| <i>Satureja douglasii</i>                     | Yerba Buena                          | 3                                 | 102   |
| <i>Scrophularia californica</i>               | California Figwort                   | 5                                 | 170   |
| <i>Solidago californica</i>                   | California Goldenrod                 | 2                                 | 68  |
|   |                                      | 100                               | 2995  |

Table 4 identifies grassland revegetation goals for the north upland area.

**Table 4.**

| <b>Species Name</b>   | <b>Common Name</b>               | <b>%</b>         | <b>grassland plant #</b> |
|---|----------------------------------|------------------|--------------------------|
|   |                                  | planting density | # on 2ft. centers        |
| *The following species are combined to make up a total of 15% of species planted. Each species planting density will be based upon propagule availability and may be outplanted as divisions, bulbs or seeds. |                                  | 15               | 2042                     |
| Achillea millefolium  | Yarrow                           | 1                | 136                      |
| Allium dichlamydeum   | Coast Red Onion                  | 1                | 136                      |
| Anaphalis margaritacea  | Pearly Everlasting               | 1                | 136                      |
| Aster chilensis   | California Aster                 | 2                | 272                      |
| Astragalus gambellianus   | Milkvetch, Dwarf Loco Weed       | *                |                          |
| Brodiaea elegans  | Harvest Brodiaea                 | *                |                          |
| Bromus carinatus ssp. carinatus   | California Brome, Mountain Brome | 5                | 681                      |
| Calandrinia ciliata   | Red Maids                        | seed             |                          |
| Castilleja densiflora   | Owl's Clover                     | seed             |                          |
| Castilleja sp.?   | Indian Paintbrush                | 2                | 272                      |
| Chlorogalum pomeridianum var. divaricatum   | Soap Plant                       | 2                | 272                      |
| Claytonia perfoliata  | Miner's Lettuce                  | seed             |                          |
| Danthonia californica var. californica  | California Oatgrass              | 7                | 953                      |
| Deschampsia cespitosa ssp. holciformis  | Tufted hairgrass                 | 2                | 272                      |
| Dichelostemma capitatum   | Blue Dicks, Wild Hyacinth        | 1                | 136                      |
| Dichondra donelliana  | Dichondra                        | *                |                          |
| Elymus glaucus  | wild rye                         | 5                | 681                      |
| Eriogonum latifolium  | Coast buckwheat                  | 3                | 408                      |
| Eschscholzia californica var. maritima  | California coastal poppy         | seed             |                          |
| Festuca rubra   | Red fescue                       | 5                | 681                      |
| Fragaria chiloensis   | Wild Strawberry                  | 5                | 681                      |
| Hordeum brachyantherum  | Meadow barley                    | 5                | 681                      |
| Iris douglasiana  | Douglas Iris                     | 2                | 272                      |
| Koeleria macrantha  | June Grass                       | 3                | 408                      |
| Lasthenia californica   | Goldfields                       | seed             |                          |
| Layia platyglossa   | Tidy Tips                        | seed             |                          |
| Leymus triticoides  | Valley Wild-rye                  | 2                | 272                      |
| Lomatium caruifolium  | lomatium                         | *                |                          |
| Lomatium dasycarpum   | Wooly Parsnip                    | *                |                          |
| Lupinus bicolor   | Miniature Lupine, Annual Lupine  | seed             |                          |

| <b>Species Name</b>                | <b>Common Name</b>                   | <b>%</b> | <b>grassland<br/>plant #</b> |
|------------------------------------|--------------------------------------|----------|------------------------------|
| Lupinus nanus                      | Sky Lupine                           | seed     |                              |
| Lupinus variicolor                 | Varicolored Lupine, Varied<br>Lupine | 5        | 681                          |
| Melica californica                 | California Melica                    | 5        | 681                          |
| Monardella villosa                 | Western Pennyroyal                   | *        |                              |
| Nassella lepida                    | Foothill Needlegrass                 | 5        | 681                          |
| Nassella pulchra                   | Purple Needlegrass                   | 5        | 681                          |
| Navarretia squarrosa               | Skunkweed                            | seed     |                              |
| Perideridia kelloggii              | Yampah                               | *        |                              |
| Phacelia californica               | California coast phacelia            | *        |                              |
| Phalaris californica               | California Canary Grass              | *        |                              |
| Plantago erecta                    | drarf plantain                       | seed     |                              |
| Pteridium aquilinum var. pubescens | Western Bracken, Bracken Fern        | *        |                              |
| Ranunculus californicus            | California Buttercup                 | 2        | 272                          |
| Sanicula arctopoides               | Footsteps-of-Spring                  | *        |                              |
| Sanicula bipinnatifida             | Purple Sanicle                       | *        |                              |
| Satureja douglasii                 | Yerba Buena                          | 3        | 408                          |
| Sidalcea malvaeflora               | Checkerbloom, Wild Hollyhock         | 2        | 272                          |
| Sisyrinchium bellum                | Blue-Eyed Grass                      | 2        | 272                          |
| Trifolium willdenovii              | Tomcat Clover                        | seed     |                              |
| Trifolium wormskioldii             | Cow Clover, Coast Clover             | *        |                              |
| Triphysaria pusilla                | Owl's Clover, Dwarf Owl's Clover     | seed     |                              |
| Triteleia laxa                     | Ithuriel's spear                     | 2        | 272                          |
| Viola adunca                       | Blue or Western Dog violet           | *        |                              |
| Wyethia angustifolia               | Narrow-leaf mule's ears              | seed     |                              |
|                                    |                                      | total    | 13613                        |

Appendix 5 identifies scrub revegetation goals for sub-site #4: the upland bulb area. (total area - 1.1 acres)

## Appendix 5

| Scientific Name                           | common name                          | coastal scrub      |                              |
|---|--------------------------------------|--------------------|------------------------------|
|   |                                      | % planting density | # of plants on 4 ft. centers |
| <i>Achillea millefolium</i>               | Yarrow                               | 3                  | 90                           |
| <i>Anaphalis margaritacea</i>             | Pearly Everlasting                   | 2                  | 60                           |
| <i>Artemisia californica</i>              | California sagebrush                 | 13                 | 389                          |
| <i>Aster chilensis</i>                    | California Aster                     | 5                  | 150                          |
| <i>Baccharis pilularis</i>                | Coyote brush                         | 13                 | 389                          |
| <i>Elymus glaucus</i> ssp. <i>glaucus</i> | Blue wild rye                        | 2                  | 60                           |
| <i>Eriogonum latifolium</i>               | Coast buckwheat                      | 3                  | 90                           |
| <i>Eriophyllum staechadifolium</i>        | Lizard-tail, Seaside wooly sunflower | 10                 | 299                          |
| <i>Eschscholzia californica</i>           | California poppy                     | seed               |                              |
| <i>Festuca rubra</i>                      | Red fescue                           | 2                  | 60                           |
| <i>Fragaria chiloensis</i>                | Beach or Dune Strawberry             | 3                  | 90                           |
| <i>Gnaphalium ramosissimum</i>            | fragrant cudweed                     | seed               |                              |
| <i>Grindelia stricta</i>                  | Gumweed                              | 1                  | 30                           |
| <i>Hordeum brachyantherum</i>             | Meadow barley                        | 2                  | 60                           |
| <i>Lotus scoparius</i>                    | Deer Weed, California Broom          | 5                  | 150                          |
| <i>Lupinus arboreus</i>                   | Yellow Bush Lupine, Tree Lupine      | seed               |                              |
| <i>Marah fabaceus</i>                     | Man-root, Wild Cucumber              | seed               |                              |
| <i>Mimulus aurantiacus</i>                | Sticky or Bush Monkey Flower         | 7                  | 210                          |
| <i>Phacelia californica</i>               | California coast phacelia            | 2                  | 60                           |
| <i>Phacelia distance</i>                  | wild heliotrope                      | seed               |                              |
| <i>Rhamnus californica</i>                | California Coffeeberry               | 5                  | 150                          |
| <i>Satureja douglasii</i>                 | Yerba Buena                          | 2                  | 60                           |
| <i>Scrophularia californica</i>           | California Figwort                   | 5                  | 150                          |
| <i>Solidago californica</i>               | California Goldenrod                 | 2                  | 60                           |
|   |                                      | total              | 100                          |
|   |                                      |                    | 2515                         |

Appendix 6 identifies grassland revegetation goals for sub-site #4: the upland bulb area. (total area - 1.1 acres)

## Appendix 6

| Species Name  | Common Name                      | %<br>planting<br>density | grassland<br>plant #<br>on 2 ft.<br>centers |
|---|----------------------------------|--------------------------|---|
| *The following species are combined will make up a total of 15% of species planted. |                                  | 15                       | 1797  |
| Each species planting density will be based upon propagule availability.            |                                  |                          |   |
| Achillea millefolium  | Yarrow                           | 1                        | 120   |
| Allium dichlamydeum   | Coast Red Onion                  | 1                        | 120   |
| Anaphalis margaritacea  | Pearly Everlasting               | 1                        | 120   |
| Aster chilensis   | California Aster                 | 2                        | 240   |
| Astragalus gambellianus   | Milkvetch, Dwarf Loco Weed       | *                        |   |
| Brodiaea elegans  | Harvest Brodiaea                 | *                        |   |
| Bromus carinatus ssp. carinatus   | California Brome, Mountain Brome | 5                        | 599   |
| Calandrinia ciliata   | Red Maids                        | seed                     |   |
| Castilleja densiflora   | Owl's Clover                     | seed                     |   |
| Castilleja sp.?   | Indian Paintbrush                | 2                        | 240   |
| Chlorogalum pomeridianum var. divaricatum   | Soap Plant                       | 2                        | 240   |
| Claytonia perfoliata  | Miner's Lettuce                  | seed                     |   |
| Danthonia californica var. californica  | California Oatgrass              | 7                        | 839   |
| Deschampsia cespitosa ssp. holciformis  | Tufted hairgrass                 | 2                        | 240   |
| Dichelostemma capitatum   | Blue Dicks, Wild Hyacinth        | 1                        | 120   |
| Dichondra donelliana  | Dichondra                        | *                        |   |
| Elymus glaucus  | wild rye                         | 5                        | 599   |
| Eriogonum latifolium  | Coast buckwheat                  | 3                        | 359   |
| Eschscholzia californica var. maritima  | California coastal poppy         | seed                     |   |
| Festuca rubra   | Red fescue                       | 5                        | 599   |
| Fragaria chiloensis   | Wild Strawberry                  | 5                        | 599   |
| Hordeum brachyantherum  | Meadow barley                    | 5                        | 599   |
| Iris douglasiana  | Douglas Iris                     | 2                        | 240   |
| Koeleria macrantha  | June Grass                       | 3                        | 359   |
| Lasthenia californica   | Goldfields                       | seed                     |   |
| Layia platyglossa   | Tidy Tips                        | seed                     |   |
| Leymus triticoides  | Valley Wild-rye                  | 2                        | 240   |
| Lomatium caruifolium  | lomatium                         | *                        |   |

| <b>Species Name</b>                | <b>Common Name</b>  | <b>%</b> | <b>grassland<br/>plant #</b> |
|------------------------------------|---|----------|------------------------------|
| Lomatium dasycarpum                | Wooly Parsnip   | *        |                              |
| Lupinus bicolor                    | Miniature Lupine, Annual<br>Lupine                              | seed     |                              |
| Lupinus nanus                      | Sky Lupine  | seed     |                              |
| Lupinus variicolor                 | Varicolored Lupine, Varied<br>Lupine                            | 5        | 599                          |
| Melica californica                 | California Melica   | 5        | 599                          |
| Monardella villosa                 | Western Pennyroyal  | *        |                              |
| Nassella lepida                    | Foothill Needlegrass  | 5        | 599                          |
| Nassella pulchra                   | Purple Needlegrass  | 5        | 599                          |
| Navarretia squarrosa               | Skunkweed   | seed     |                              |
| Perideridia kelloggii              | Yampah  | *        |                              |
| Phacelia californica               | California coast phacelia                                       | *        |                              |
| Phalaris californica               | California Canary Grass   | *        |                              |
| Plantago erecta                    | drarf plantain  | seed     |                              |
| Pteridium aquilinum var. pubescens | Western Bracken, Bracken<br>Fern                                | *        |                              |
| Ranunculus californicus            | California Buttercup  | 2        | 240                          |
| Sanicula arctopoides               | Footsteps-of-Spring   | *        |                              |
| Sanicula bipinnatifida             | Purple Sanicle  | *        |                              |
| Satureja douglasii                 | Yerba Buena   | 3        | 359                          |
| Sidalcea malvaeflora               | Checkerbloom, Wild Hollyhock                                    | 2        | 240                          |
| Sisyrinchium bellum                | Blue-Eyed Grass   | 2        | 240                          |
| Trifolium willdenovii              | Tomcat Clover   | seed     |                              |
| Trifolium wormskioldii             | Cow Clover, Coast Clover<br>Owl's Clover, Dwarf Owl's<br>Clover | *        |                              |
| Triphysaria pusilla                |   | seed     |                              |
| Triteleia laxa                     | Ithuriel's spear  | 2        | 240                          |
| Viola adunca                       | Blue or Western Dog violet                                      | *        |                              |
| Wyethia angustifolia               | Narrow-leaf mule's ears   | seed     |                              |
|                                    |   |          | 11979                        |



Appendix 7 identifies the plant species propagule availability and gathering time.

## Appendix 7

| Scientific Name   | Seed gathering window |     |
|---|-----------------------|-----|
| <i>Achillea millefolium</i>                             | Jun                   | Nov |
| <i>Allium dichlamydeum</i>                              | Jun                   | Sep |
| <i>Anaphalis margaritacea</i>                           | Jul                   | Nov |
| <i>Artemisia californica</i>                            | Nov                   | Nov |
| <i>Artemisia douglasiana</i>                            | Oct                   | Nov |
| <i>Aster chilensis</i>                                  | Aug                   | Nov |
| <i>Astragalus gambellianus</i>                          | May                   | Jun |
| <i>Brodiaea elegans</i>                                 | Sep                   | Oct |
| <i>Bromus carinatus</i> ssp. <i>Carinatus</i>           | May                   | Jul |
| <i>Bromus carinatus</i> ssp. <i>Maritimus</i>           | May                   | Sep |
| <i>Calandrinia ciliata</i>                              | Mar                   | Jun |
| <i>Castilleja densiflora</i>                            | Jul                   | Sep |
| <i>Castilleja</i> sp.?                                  |                       |     |
| <i>Ceanothus thyrsiflorus</i>                           | Jun                   | Jul |
| <i>Chlorogalum pomeridianum</i> var. <i>divaricatum</i> | Jun                   | Nov |
| <i>Danthonia californica</i> var. <i>california</i>     | Jun                   | Jul |
| <i>Deschampsia cespitosa</i> ssp. <i>Holciformis</i>    | Jun                   | Aug |
| <i>Dichelostemma capitatum</i>                          | May                   | Oct |
| <i>Dichondra donelliana</i>                             |                       |     |
| <i>Distichlis spicata</i>                               | Sep                   | Nov |
| <i>Elymus glaucus</i>                                   | May                   | Oct |
| <i>Eriogonum latifolium</i>                             | Jun                   | Nov |
| <i>Eriophyllum staechadifolium</i>                      | Jul                   | Nov |
| <i>Eschscholzia californica</i>                         | May                   | Oct |
| <i>Eschscholzia californica</i> var. <i>maritime</i>    | May                   | Oct |
| <i>Festuca rubra</i>                                    | Apr                   | Jun |
| <i>Fragaria chiloensis</i>                              | divisions             |     |
| <i>Grindelia stricta</i>                                | Jul                   | Nov |
| <i>Hordeum brachyantherum</i>                           | May                   | Sep |
| <i>Iris douglasiana</i>                                 | Jul                   | Oct |
| <i>Iris longipetala</i>                                 | Jun                   | Jul |
| <i>Koeleria macrantha</i>                               | Jun                   | Sep |
| <i>Lasthenia californica</i>                            | Apr                   | Jun |
| <i>Layia platyglossa</i>                                | Apr                   | May |
| <i>Leymus triticoides</i>                               | Divisions             |     |
| <i>Lomatium caruifolium</i>                             | Apr                   | Jun |
| <i>Lomatium dasycarpum</i>                              | Jun                   | Jun |

| <b>Scientific Name</b>             | <b>Seed gathering window</b> |     |
|------------------------------------|------------------------------|-----|
| Lotus scoparius                    | Jul                          | Oct |
| Lupinus arboreus                   | Jul                          | Aug |
| Lupinus bicolor                    | May                          | Jun |
| Lupinus nanus                      |                              |     |
| Lupinus variicolor                 | Jul                          | Sep |
| Marah fabaceus                     | Jun                          | Sep |
| Melica californica                 | May                          | Jun |
| Mimulus aurantiacus                | Jun                          | Nov |
| Monardella villosa                 | Jul                          | Sep |
| Nassella lepida                    | May                          | Jun |
| Nassella pulchra                   | Mar                          | Jun |
| Navarretia squarrosa               | Aug                          | Nov |
| Phacelia californica               | May                          | Sep |
| Phacelia distans                   | Jul                          | Sep |
| Phalaris californica               | May                          | Jun |
| Plantago erecta                    | Apr                          | Jul |
| Polypodium californicum            | Divisions                    |     |
| Pteridium aquilinum var. pubescens | Divisions                    |     |
| Rhamnus californica                | May                          | Jun |
| Sanicula arctopoides               | Mar                          | Jun |
| Sanicula bipinnatifida             | May                          | Jul |
| Sanicula crassicaulis              | May                          | Aug |
| Satureja douglasii                 | Jul                          | Sep |
| Scrophularia californica           | May                          | Nov |
| Sidalcea malvaeflora               | May                          | Jun |
| Sisyrinchium bellum                | Jun                          | Sep |
| Solidago californica               | Sep                          | Oct |
| Trifolium willdenovii              | May                          | Jun |
| Trifolium wormskioldii             | Jun                          | Jul |
| Triphysaria pusilla                | Apr                          | Apr |
| Triteleia laxa                     | Jul                          | Oct |
| Viola adunca                       | May                          | May |
| Wyethia angustifolia               | Jun                          | Jul |