Chapter 2. Botanical Resources

Review Conducted by:

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SUMMARY

I reviewed the impacts of the Phase II expansion project and the proposed mitigation for flora and plant communities of the Landfill area. The primary effect of Landfill expansion on vegetation is the permanent loss of approximately 178 acres of grassland habitat and approximately 3 acres of wetlands. The Phase II expansion area provides habitat for 68 native and 80 non-native plant species; however, non-natives greatly predominate in percent cover. Half of the native species are perennials, indicating favorable habitat conditions. Despite the greater area of affected upland habitats, other than land acquisition, mitigation measures in the Project EIR and MMP focus almost entirely on compensation for impacts to wetlands and wildlife habitats. My analysis demonstrates the following key points:

Richness of native species at the Phase II expansion area is high in comparison with other parcels. The loss of 178 acres of grassland habitat should be considered permanent; the grassland that would be re-established on the landfill surface when the cells are closed would be different from that lost because the geological substrata, topography, and hydrology would be different. I developed recommendations describing how this loss might be compensated and a new numerical measure of the adequacy of mitigation.

Stock ponds in the project area are dominated by non-native species and do not support vernal pool species. No mitigation for impacts on stock pond flora or vegetation is necessary. However, the loss of stock pond habitats in the Phase II expansion area warrants mitigation for the loss of hydrological functions and wildlife values.

The MMP should elaborate on the target ecosystems toward which the management is oriented and should broaden its consideration of potential and desirable vegetation conditions. Beyond management of existing vegetation resources, mitigation should consider restoration of native plant communities and re-introduction of species documented to have occurred in the area.

INTRODUCTION

According to the EIR and MMP, Phase II of the Landfill expansion encompasses 241.9 acres of land and will affect 2.42 acres of Section 404 jurisdictional wetlands and other waters of the United States, 0.076 acre of isolated waters of the state, and 0.61 acre of pond habitat. The vast majority of affected land (238.8 acres) is upland grassland. The Landfill comment letter Appendix B2) states that "PHLF carefully reconsidered the size of the project's footprint and has determined that the actual impact area will be reduced from 238 acres to 179 acres; the proposed project would include a 136.9-acre landfill footprint, a permanent road area of 26.3-acres, a 6-acre sedimentation basin located north of the valley area, a 9.5-acre power station area" (memorandum: page 7; 1st paragraph). I received clarification from the Technical Manager Dan Airola that the footprint for the landfill and associated facilities did not change but that the acreage amount (179 acres) was correct for this footprint. Subsequently, the power plant was moved from its proposed site to within the Phase 1 footprint.

Negative impacts to these habitats and resources will be mitigated according to the criteria established in the Project EIR and by permit requirements of BCDC, the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service (USFWS), and California Department of Fish and Game (DFG).

The purposes of this review are to:

- Identify specific issues related to the impacts of the proposed Landfill expansion on grassland and wetland vegetation,
- Evaluate the effectiveness of proposed mitigation activities, and
- Develop recommendations on potential changes to the project or mitigation measures that could reduce the impact of the landfill expansion on the site's natural resources.

METHODS

I reviewed the project description and biological survey results, and the impacts and mitigation sections of the Project EIR; the MMP; the Grassland Management Plan; and other information provided by the applicant and BCDC staff. In addition, I reviewed the existing information/ literature on vernal pool and grassland ecology and habitat creation, restoration, and mitigation as it relates to Potrero Hills (and other sites with similar habitats in northern California). I also reviewed the relevant portions of DFG's Fish and Wildlife Element of the Suisun Marsh Protection Plan's background report (DFG 1975).

My field work included a visit to the proposed expansion area and the mitigation sites to obtain a better understanding of the areas impacted by the project. Limited field surveys of vernal pool, stock pond, and grassland flora and vegetation were conducted to verify the results of previous fieldwork detailing the floristic composition of grasslands and ephemeral wetlands, and to evaluate the effectiveness of proposed mitigation measures. Field observations of flora and

vegetation on the Landfill expansion area and parcels proposed for mitigation were conducted during three surveys on May 23 and 26, and July 11, 2006.

Grassland Characterization

As verification of previous surveys, I sampled two grassland plots 10 x 10 meters (m) each were sampled on the Phase II expansion land. Plots were placed on visually homogeneous and not obviously disturbed vegetation stands. A list of species and their percent cover were recorded at each plot. Additional data taken for each plot included Global Positioning System coordinates; elevation; cover of herbs, litter, and bare soil; and average and maximum height of herbs. Herbarium collections were taken for identification when necessary.

Species were categorized by origin and growth form (native perennial grasses, native legumes, other native forbs, exotic annual grasses, exotic legumes, and exotic forbs). Nomenclature of vascular plants follows Hickman (1993). Species richness and percent cover were calculated for each of these groups. Similar data were collected at stock ponds 1, 3, 5, and 7 (see pond numbers and locations in the MMP), grasslands and meadow (one plot each) located in the Southern Hills parcel, and 10 plots of vernal pool vegetation at the Director's Guild parcel. I used this information to evaluate and compare floristic and ecological data for the areas to be affected by the proposed Landfill expansion, the proposed mitigation sites, and other comparable areas of northern California.

Stock Pond Surveys

To verify previous floristic surveys of stock ponds reporting the absence of vernal pool species, I conducted additional floristic surveys. Flora and vegetation of the largest stock ponds (1, 3, 5, and 7) were surveyed in spring and summer 2006. Pools were visited on May 23 and 26, and were sampled on July 11, 2006.

IMPACT EVALUATION

Characterization of Plant Conditions

A botanical survey of the study area was conducted by LSA Associates and Jane Valerian Environmental Consulting (JVEC) in June 1998, July 2003, and spring and summer 2001 and 2004. The results of these surveys are reported in the Project EIR, Special-Status Plants and Sensitive Communities/Habitats Survey (ESP 2002), and MMP. Phase II of the landfill expansion area (Figure 2-1) provides habitat for 148 species of plants (including subspecies and varieties), among which 68 (46 percent) are natives and 80 (54 percent) are introduced (Figure 2-2). Half of the native species are perennials, and half are annuals. The high percentage of native perennial species indicates relatively favorable habitat conditions. It is likely that, prior to conversion to annual exotic grassland, native perennials were a more important component of the vegetative cover. Non-native annuals now predominate on the Phase II area (Figure 2-2).

Figure 2-1. Views of Upland Grasslands at the Phase II Expansion Area

Note: Photo taken May 5, 2006.

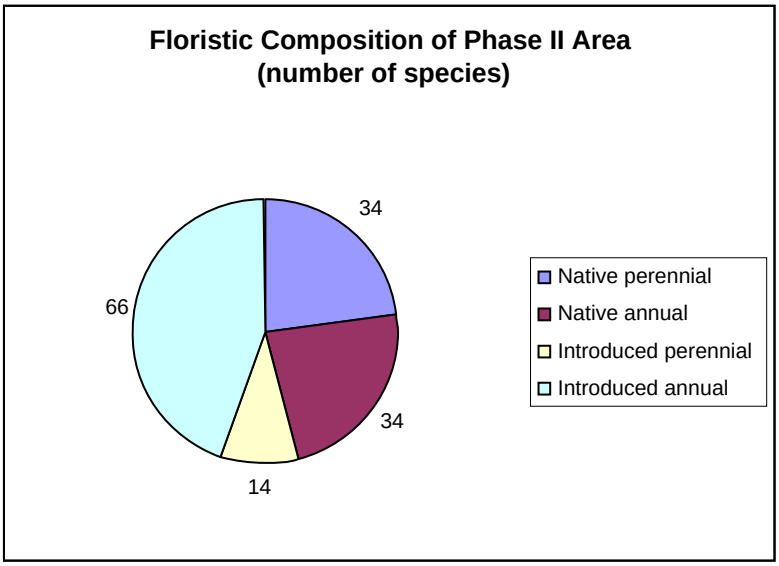


Figure 2-2. Number of Native and Introduced Annual and Perennial Species within the Potrero Hills Landfill Phase II Expansion Area

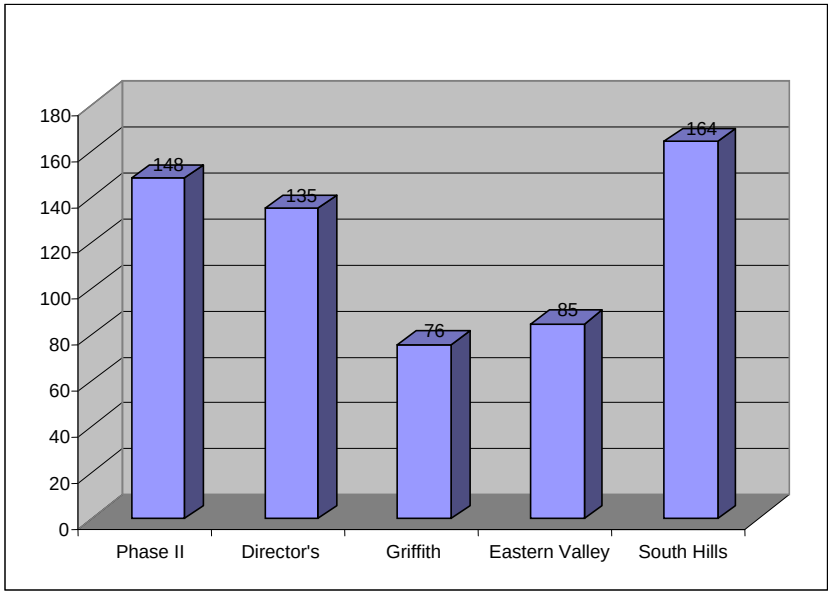


Figure 2-3. Total Number of Vascular Plant Species within the Potrero Hills Landfill Phase II Expansion Area and Proposed Mitigation Properties

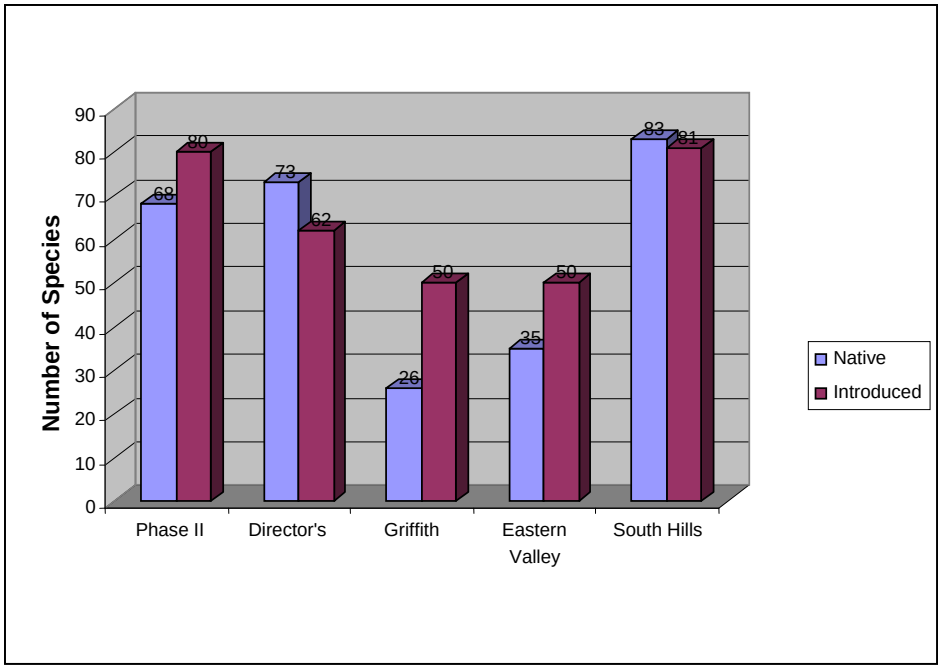


Figure 2-4. Number of Native and Introduced Species in the Potrero Hills Landfill Phase II Expansion Area and Proposed Mitigation Properties

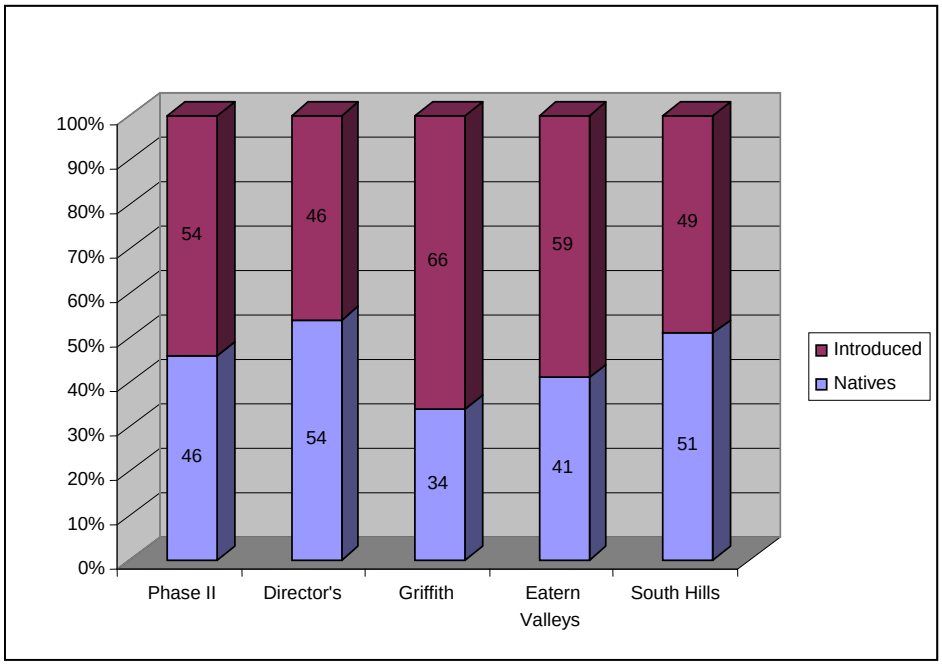


Figure 2-5. Percentage of Native and Introduced Species in the Potrero Hills Landfill Phase II Expansion Area and Proposed Mitigation Properties

The total number of species at the Landfill expansion area is higher than at three other areas proposed for mitigation purposes. Only the Southern Hills parcel contains more species than the Phase II area (Figure 2-3). As shown in Figure 2-4, the number of native species on the Phase II area (68) is considerably higher than those found on the Griffith Ranch (26) and Eastern Valley (35) parcels, and almost as high as at the Director's Guild parcel (73). The Southern Hills parcel contains the highest number of natives (83 species).

Figure 2-5 shows the percentage of native and introduced species in all parcels of the Landfill. The highest percentage of native species was found in the Director's Guild (54 percent) and Southern Hills (51 percent) parcels, where native species are more numerous than exotics. The percentage of introduced species on the Phase II, Eastern Valley, and Griffith parcels was 46 percent, 41 percent, and 34 percent, respectively, indicating a gradient of anthropogenic transformation of flora on these parcels.

Based on my recent studies of grasslands in protected areas elsewhere in Yolo, Solano, and Sacramento Counties (Solomeshch unpublished data), the grasslands at the Phase II area contain a higher percentage of exotic species and therefore can be considered as highly affected (Figure 2-6A). However, the total number of native species at the Phase II area is higher than in all other sites (Figure 2-6B). The higher number of natives at the Phase II area is difficult to interpret. It is partly a result of the inclusion of both grassland and non-grassland species in the Phase II species list, while in other areas only flora of pure grassland stands was sampled. Consequently, the percentage of native and invasive species (Figure 2-6A) provides a better estimate of the degree of anthropogenic transformation of these local floras. Nonetheless, the total number of native species on Phase II expansion land is high (Figure 2-6B).

The two grassland plots 100 m^2 each sampled on the Phase II expansion land consisted of 22 and 16 species. Total plant cover was 60 percent and 90 percent. Cover of native species was estimated at 8 percent and 18 percent. Dominant exotics were *Lolium multiflorum, Bromus hordeaceus, Vulpia bromoides, Hordeum marinum* ssp. *gussoneanum, Centaurea calcitrapa, C. solstitialis, Trifolium dubium, Taeniatherum caput-medusae, Bellardia trixago,* and *Rumex pulcher*. The most common native species were *Hemizonia congesta* ssp. *luzulifolia, Juncus bufonius, Eremocarpus setigerus, Castilleja attenuate,* and *Psilocarphus oregonus* (Figure 2-7).

Grassland Habitat Losses

Landfill expansion will result in the loss of 179 acres of grasslands. Vegetation sampling during spring and summer 2006 showed that cover of native species in grasslands of the Phase II expansion area varies from 8 to 20 percent. If the average cover of natives is 14 percent, the loss of this grassland will be equivalent to the loss of 25 acres of area covered by pure stands of native species. Re-establishment of vegetation on the Landfill surface after cells are closed is essential to control erosion and to prevent potential negative impacts of the Landfill on the surrounding landscape, especially on Suisun Marsh. However, no evidence has been provided to support the conclusion that the re-vegetated surface of the Landfill will provide habitat of equal value to the areas that will be lost. Additionally, the MMP does not contain specific descriptions of the kind of re-vegetation that will be performed on the closed landfill cells. Even if re-vegetation efforts are successful, the habitat will have different geology, hydrology, and soils. My observations from other landfills indicate that non-native rather than native species tend to

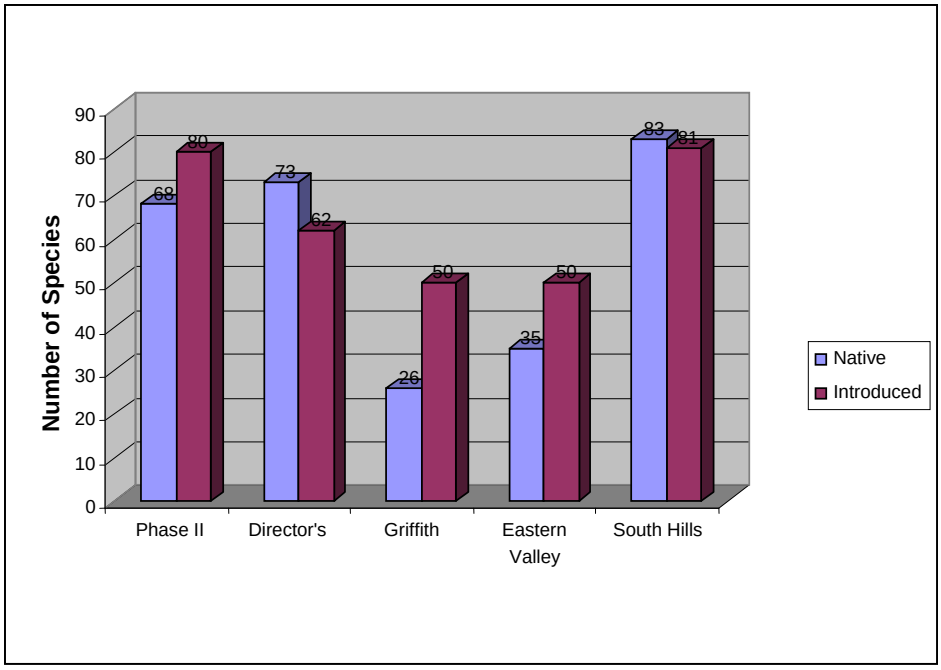


Figure 2-4. Number of Native and Introduced Species in the Potrero Hills Landfill Phase II Expansion Area and Proposed Mitigation Properties

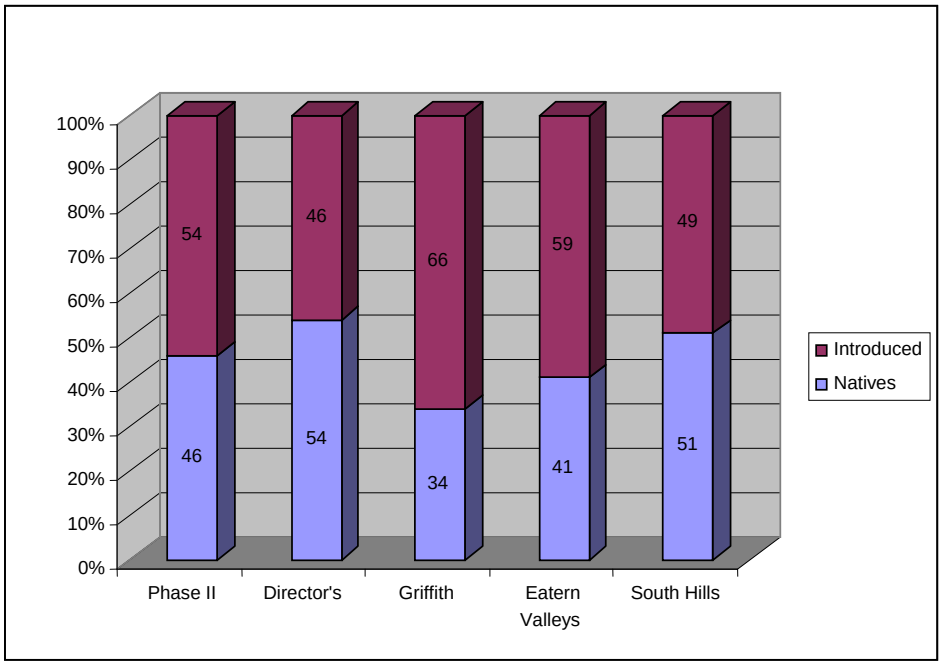
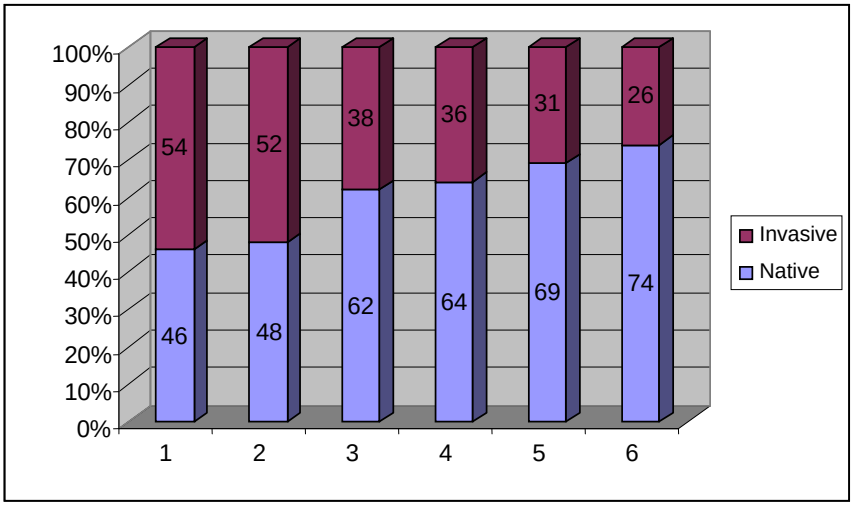


Figure 2-5. Percentage of Native and Introduced Species in the Potrero Hills Landfill Phase II Expansion Area and Proposed Mitigation Properties

A



B

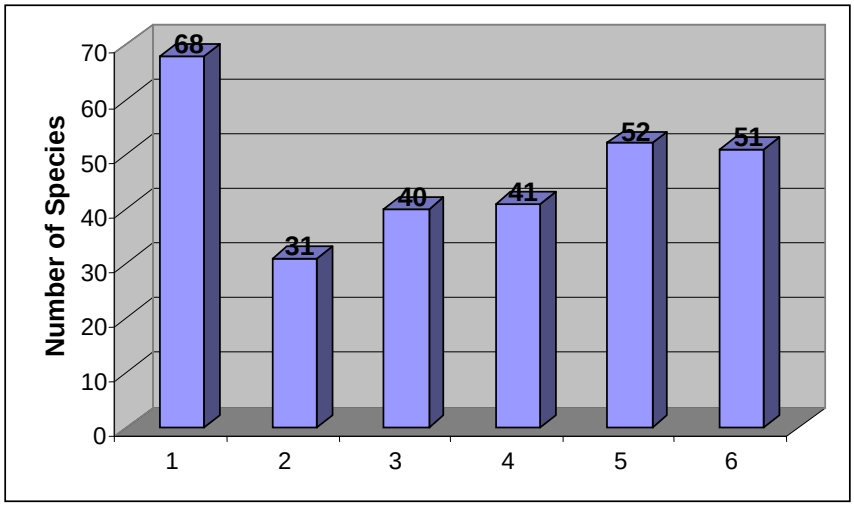


Figure 2-6. Comparison of Flora in the Potrero Hills Landfill Phase II Expansion Area with Flora at Five Protected Grassland Areas within Solano and Nearby Counties

Notes:

(A) Percentage of native and invasive species.

(B) Total number of native species. Study sites:
1 – Potrero Hills Landfill Phase II expansion area.
2 – Phoenix Park (Sacramento County)
3 – Wilcox Ranch (Solano County)
4 – Gridley Ranch – hillock tops (Solano County)
5 – Glide Ranch at Yolo Bypass (Yolo County)
6 – Gridley Ranch – hillock slopes (Solano County)

Photos were taken July 11, 2006.

Source: Solomenshch unpublished data.

Figure 2-7. Annual Grassland in the Potrero Hills Landfill Phase II Expansion Area

Notes:

Cover of herbs varies from 60 to 90 percent. Dominant exotics are *Lolium multiflorum*, *Bromus hordeaceus*, *Vulpia bromoides*, *Hordeum marinum* ssp. *gussoneanum*, *Centaurea calcitrapa*, *C. solstitialis*, *Trifolium dubium*, *Taeniatherum caput-medusae*, *Bellardia trixago*, and *Rumex pulcher*.

Cover of natives varies from 8 to 18 percent. The most common native species are *Hemizonia congesta* ssp. *luzulifolia*, *Juncus bufonius*, *Eremocarpus setigerus*, *Castilleja attenuate*, and *Psilocarphus oregonus*.

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re-establish on re-vegetated landfill surfaces. Consequently, the loss of natural habitat should be considered permanent. This loss should be compensated by increasing the native species cover on other parcels (see "Mitigation Evaluation and Recommendations" below).

Impacts to Special-Status Plant Species

The Phase II expansion area provides habitat for two sensitive plant species: San Joaquin saltbush (*Atriplex joaquiniana* – California Native Plant Society [CNPS] List 1B) and crownscale (*Atriplex coronata* var. *coronata* - CNPS List 4). *Atriplex joaquiniana* was found on the Phase II area in June 1998, and *Atriplex coronata* var. *coronata* was found during a survey in 2001. Neither species was found during the 2003 botanical survey. Regarding *Atriplex joaquiniana*, the Project EIR states on page 4.2-18: "Because this plant has not been identified on the site since 1998, it is assumed to no longer be present. Therefore, the proposed project is assumed to have no impact on special-status plant species." It also was assumed that the absence of *A. coronata* var. *coronata* during 2003 and the small size of the population found during the 2001survey likely indicated an insufficient population size to maintain its viability (Project EIR, Appendix B, page 1). It was concluded that "No mitigation is necessary for this impact" for direct impacts or the loss of habitat for these two sensitive species (Project EIR, page 4.2-18).

Both of these sensitive species are annual forbs that survive unfavorable environmental conditions by remaining dormant in the seed bank and do not necessarily germinate every growing season. Small populations or the absence of these species might indicate unfavorable conditions for the particular year in which surveys were conducted. Likewise, the fact that these species are present in some years indicates that Phase II contains habitats appropriate for these two special-status species. The loss of these habitats would be considered a significant impact that should be mitigated.

The Landfill comment letter (Appendix B2, page 4: paragraph 7) states that "Regardless of the conclusions of the EIR, the Potrero Hills Landfill proposes to amend the proposed Mitigation Plan to include two mitigation measures that address these Atriplex issues." I strongly support this decision. At the same time, a specific protocol for implementing these mitigation measures must be developed. Description of the mitigation for two sensitive species takes only 12 lines on pages 4 and 5 of the comment letter, and it is not clear how the mitigation will be performed. I have two suggestions: First, the fact that two sensitive *Atriplex* species do not occur on the Southern Hills parcel might indicate that habitat conditions are not favorable for them. If so, plants transplanted from the populations at the Phase II expansion area will not re-establish, and these populations will be lost. I recommend considering an analysis of soil chemistry when choosing appropriate sites for transplanting and to transplant these species to several sites in order to increase the probability of success. Second, if it is not possible to collect seeds from the populations that had been last seen on the Phase II expansion area in 1998 and 2001, seeds of these species from another nearby location should be used for mitigation.

Impacts of Landfill Expansion on Stock Pond Flora

Seven stock ponds on the Landfill lands were created by ranchers over the years to facilitate grazing management of the area. The locations of these ponds are shown in Exhibit 4.2-1 of the Project EIR and in Figure 7 of the MMP. The berm of one of these ponds (pond 4) was removed

in 2000, and this pond no longer exists. Currently, only six stock ponds are present. Ponds 1 and 5 are located within the boundaries of the Phase II expansion area. Ponds 2, 3, and 6 are located outside of the expansion area but within the same valley and close to the eastern end border of the Phase II expansion area. Pond 7, which is the largest one, is located at the Southern Hills mitigation area. Although artificially created, stock ponds are ephemeral wetlands and provide habitats for plants and wildlife.

Two animal species typical of vernal pool habitats, California linderiella (*Linderiella occidentalis*) and California tiger salamander (*Ambystoma californiense*), are known to occur in stock ponds at the Landfill (Project EIR, Chapter 4.2). Vegetation studies of stock pond habitats conducted by LSA and JVEC (ESP 2002, Valerius 2003), however, did not report the presence of any special-status plant species nor of any common vernal pools species. To understand the reason for the presence of vernal pool wildlife species and the absence of plant species, I conducted additional floristic surveys in spring and summer 2006 (see "Methods").

Stock pond 1 (Figure 2-8) is located within the boundaries of the Phase II expansion area in its northern part. The pond was flooded from May through July. No vegetation was observed in the water. The dry edge of the stock pond was mostly covered by bare ground. In total, nine species were found on the pool edge—four natives (*Salix laevigata*, *Juncus bufonius*, *Cyperus eragrostis*, and *Eleocharis macrostachya*) and five exotics (*Cynodon dactilon, Hordeum marinum* ssp. *gussoneanum, Polygonum monspeliense, Lolium multiflorim*, and *Lythrum hyssopifolium).* Only willow (*S. laevigata*) was abundant, while all the others were supported with very low percent cover. No vernal pool endemics were present.

Stock pond 3 (Figure 2-9) is located east of the Phase II expansion area in the Eastern Valley, close to the eastern boundary of the Phase II expansion area. Fifteen species were found on the pool edge, of which three were native (*Hemizonia congesta* ssp. *luzulifolia, Eremocarpus setigerus*, and *Malvella leprosa*). Pond 3 does not maintain water as long as other ponds; it was completely dry at the time vegetation was sampled on July 11. Plants do not grow in the pond center. Exotic species (i.e., *Xanthium spinosum, X. strumarium, Polypogon monspeliensis,Lolium multiflorum, Crypsis schoenoides*, and *Convolvulus arvensis)* were present on the pond edge. None of these 15 species is a vernal pool species or wetland indicator.

Stock pond 5 (Figure 2-10) is located within the boundaries of the Phase II expansion area on its southeastern end. The area around the pond is heavily disturbed by cattle. Eight species were found on the pond edges, among which only one (*Malvella leprosa*) was native. Exotic plants were represented by *Xanthium spinosum, Polypogon monspeliensis, Lolium multiflorum, Centaurea calcitrapa, Trifolium fragiferum, Crypsis schoenoides,* and *Lactuca saligna*. Plant species typical of vernal pool habitats were not found.

Stock pond 7 (Figures 2-ll and 2-12) is located outside the expansion area on the Southern Hills parcel. This pond is the largest of all ponds within the Phase II expansion area and proposed mitigation lands. Nineteen species of vascular plants were found on the pond edge and in the water. Six species were native, including five typical vernal pool species (*Eleocharis macrostachya, Eryngium vaseyi, Plagiobothrys stipitatus* ssp. *micranths, Elatine californica,* and *Juncus bufonius*). All of these species were present in low abundance, and only common spikerush (*E. macrostachya*) was abundant in the water. Exotics species spiny cocklebur

A

B

Figure 2-8. Stock Pond 1

Notes:

(A) Most of the pond area was flooded.

(B) The dry edge of the stock pond was mostly covered by bare ground. Nine species were found on the pool edge: four natives (*Salix laevigata*, *Juncus bufonius*, *Cyperus eragrostis*, *Eleocharis macrostachya*) and five exotics (*Cynodon dactilon*, *Hordeum marinum* ssp. *gussoneanum*, *Polygonum monspeliense*, *Lolium multiflorim*, *Lythrum hyssopifolium)*. Only willow (*S. laevigata*) was abundant, while all the others were present with very low cover. Vernal pool endemics were not present.

GPS 10S 0590341 UTM 4229997: Photos were taken July 11, 2006.

A

B

C

Figure 2-10. Stock Pond 5

Notes:

(A) The area around the pond is heavily affected by cattle. Eight species were found on the pool edge, of which only one (*Malvella leprosa*) was native.

(B) Exotic plant spiny cocklebur (*Xanthium spinosum*) was abundant on the pond edge.

(C) Patch of *Polypogon monspeliensis*, *Trifolium fragiferum*, and *Malvella leprosa* on the pond edge. No typical vernal pool plant species were found.

GPS 10S 0591094 UTM 4229182: Photos were taken July 11, 2006.

Figure 2-11. Stock Pond 7

Notes: Stock pond 7 on the Southern Hills mitigation property is the largest pond in the Potrero Hills Landfill Phase II expansion area.
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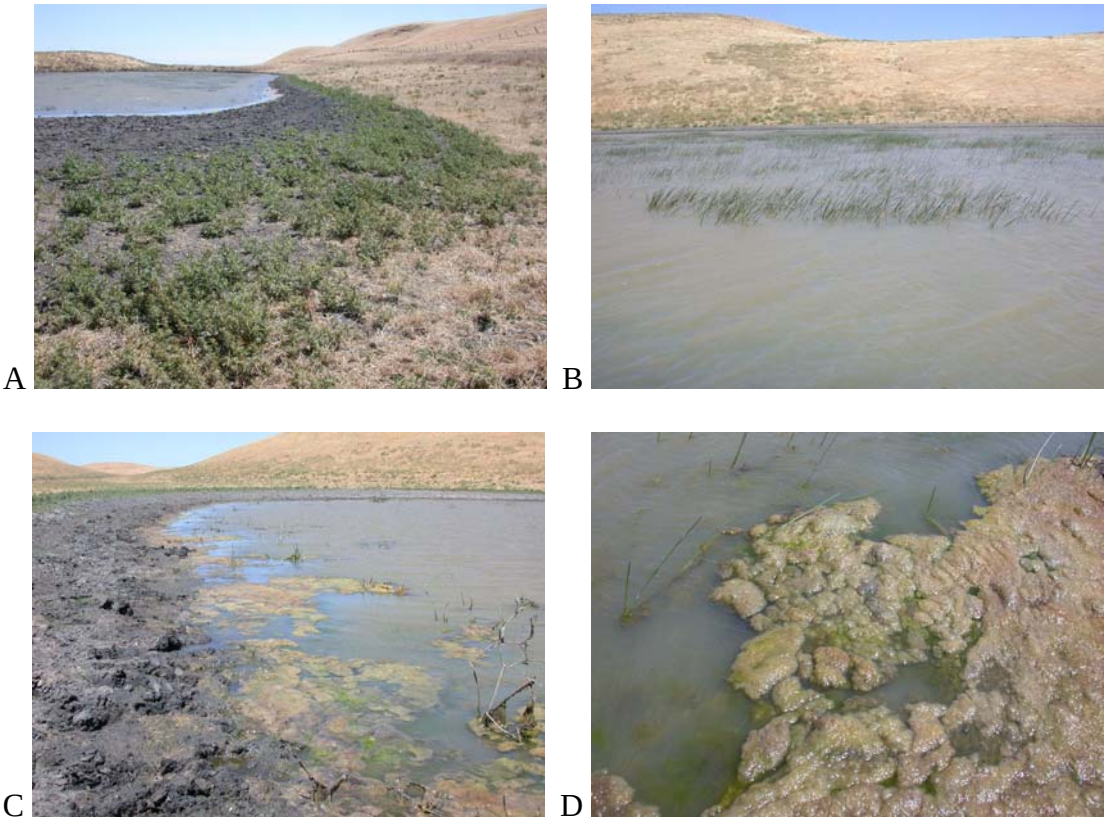

Figure 2-12. Stock Pond 7

Notes:

Nineteen species of vascular plants were found on the pond edge and in the water. Exotics species spiny cocklebur (*Xanthium spinosum*) and swamp grass (*Crypsis schoenoides*) were the most abundant. Six of nineteen species were native, of which five were typical vernal pool species (*Eleocharis macrostachya*, *Eryngium vaseyi*, *Plagiobothrys stipitatus* ssp. *micranths*, *Elatine californica*, and *Juncus bufonius*). Among them, only *Eleocharis macrostachya* was common, while all others were rare.

(A) Exotic plant spiny cocklebur (*Xanthium spinosum*) was abundant on the pond edge.

(B) The native perennial species common spikerush (*Eleocharis macrostachya*) was abundant on the pond bottom.

(C) Algae in the water on the pond edge.

GPS 10S 0591679 UTM 4228712: Photos were taken July 11, 2006.

(*Xanthium spinosum*) and swamp grass (*Crypsis schoenoides*) were the most common. Large colonies of algae were present in shallow water.

Vernal pool species were absent in three of the four surveyed ponds. Five vernal pool species were present in pond 7. However, abundant growth of algae indicates euthrophic (i.e., nutrient-rich) water conditions, which are not appropriate for true vernal pool species. Those vernal pool species found in pond 7 have a relatively broad ecological range and can occur in habitats other than vernal pools (Solomeshch pers. obs.). Thus, the stock ponds on the Landfill cannot be considered as vernal pool habitat. They contain nitrophillous (i.e., nitrogen-loving) exotic species and cannot support true vernal pool flora, which mostly favor oligothrophic conditions (low in nutrients) (Solomeshch, Barbour, and Holland 2007). No mitigation is necessary for impacts on stock pond flora. However, the losses of stock pond habitats on the Phase II expansion lands warrant mitigation for the loss of hydrological function and wildlife values.

MITIGATION EVALUATION AND RECOMMENDATIONS

Because of the number of mitigation measures addressed in this chapter, I have combined the discussion of adequacy of individual mitigation and management measures with recommendations for each measure. For each measure, I discuss the provision for the measure, present my analysis of its effectiveness or deficiencies, and provide recommendations to improve the measures.

In general, mitigation measures in the Project EIR focus almost entirely on compensation for impacts to wetlands and wildlife habitats (pages 4.2-18–4.2.-29). The impact to uplands, which encompass the vast majority of the affected area, was not specified and sufficiently quantified. The following sections suggest a number of mitigation measures for impacts to grassland habitats.

Mitigation for Adverse Impacts on Special-Status Plants

As noted above under "Impacts to Special-Status Plants," the conclusions that San Joaquin saltbush (*Atriplex joaquiniana*) and crownscale (*Atriplex coronata* var. *coronata*) are no longer present within the Phase II project area are not supportable.

Recommendation 1. Mitigation should be developed and applied for these species. Appropriate mitigation measures include planting seeds and monitoring populations of these species on appropriate habitats within the mitigation properties. A protocol should be developed for identifying appropriate habitats and for implementing effective mitigation and monitoring for the loss of these species and their habitat.

Mitigation for Adverse Impacts on Sensitive Plant Communities/Habitats

Four sensitive plant communities/habitats have been recognized at the Landfill properties: Wildflower Field, Valley Needlegrass grassland, Elderberry shrubs, and Northern Claypan Vernal Pool (see the MMP). Species typical of the first three of these plant communities were found on the Phase II Landfill expansion area, although their condition is degraded due to heavy

grazing and other anthropogenic impact and invasion by exotic species. Native species in these communities currently are suppressed by more abundant exotic species. Landfill expansion will result in the permanent loss of 179 acres of grassland habitats, which are potentially appropriate for sensitive plant communities.

The communities of "Wildflower Fields" and "Valley Needlegrass" are identified by the cover of native forbs and bunchgrasses, respectively. Cover of these plant species is reduced because of unsustainable past management practices of this area that continue at present. Despite low cover, however, the diversity of wildflowers and bunchgrasses is high, indicating that the Phase II expansion area is a potential habitat for these communities.

Under current law, mitigation of losses of potential habitats of sensitive communities and even listed plant species is not required. This situation may change in the future because it is required by "biological" sense. Presently, the Landfill is not legally required to compensate for the loss of these biologically valuable but unprotected habitats. As an ecologist, I suggest to the Landfill and BCDC that it is possible to compensate for negative impacts on these habitats. If conducted properly, mitigation would not be very expensive. Such action will demonstrate the good will and long-term vision of the Landfill and will help the Landfill to be perceived by public as a "green" and "environmentally friendly" company.

Elderberry shrubs occur on the Phase II expansion area on the middle part of the slopes. In the absence of field benchmarks at the project site that would clearly indicate the boundary of the Phase II expansion area, it was difficult to understand whether the existing elderberry shrubs will be buried under the Landfill or whether they will remain near the Landfill edge. Even if the project will not directly disturb the shrubs, the proximity of the Landfill will affect the quality of their habitat. The presence of this shrub on the slopes indicates that lower parts of slopes and the valley bottom likely are potential habitat for elderberry shrub, and that they likely were displaced from these areas by heavy grazing. Changing the quality of habitat for the remaining shrubs and the loss of potentially appropriate habitats at the valley floor might easily be mitigated at minimal cost because the species is easy to propagate.

Recommendation 2. Vegetation sampling during spring and summer 2006 showed that cover of native species varies from 8 to 20 percent in grasslands of the Phase II expansion area. If the average cover of natives is 14 percent, the loss of 179 acres of this grassland will have an effect equivalent to the loss 25 acres of area of pure stands (100 percent cover) of native species. The loss of native species from Phase II expansion lands should be compensated by increasing the cover of native species on mitigation properties. To achieve this goal, management of the mitigation properties area should focus on restoration and active improvement of existing native vegetation. Because achieving 100 percent native cover is unrealistic, the mitigation goal should be set as achieving an increase in native species abundance on mitigation lands to offset losses on Phase II expansion lands. This could be quantified both for the impact area and the mitigation areas as: Native species component (NSC) = [(# acres) x (percent native species cover). Calculations of NSC for the project area and each mitigation area provides a numerical estimate to determine whether changes in management have increased the percent native species cover sufficiently to offset losses. Similar calculations, if made separately for the most common native plant species and all sensitive species, will considerably improve the accuracy of monitoring mitigation results.

Recommendation 3. The recommendation to use 25 acres of 100 percent native grassland as a measurement of mitigation success to offset the impacts of the proposed expansion on grasslands is based on the estimate that grasslands on the Phase II area have 14 percent cover of native species. This estimate is based on limited observations and an ocular estimate of species cover. Cover estimates should be measured more thoroughly based on a statistically defendable number of observations, as well as more objective measurements of species cover. This recommendation is an innovative environmental mitigation technology that can be applied to many other projects in California and other states.

Recommendation 4. Restoration and management protocols that will reduce cover of exotic species and enhance natives should be developed. The protocols described in Sections 6.1.2, 6.2.1, and 6.2.2 of the MMP should be made more specific and clarified. For example, the seed mixtures described in the plan include both upland (*Trifolium wilddenovii, Plagiobothrys nothofulvus*) and wetland (*Alopecurus saccatus, Pleuropogon californicum*) species. These species do not occur together because they have different ecological requirements. Seeds of these species from appropriate gene pools are expensive; therefore, seed mixtures and appropriate areas where different species mixes should be applied should be clearly identified in the MMP.

Grassland Management Plan

The Grassland Management Plan focuses on estimating rangeland carrying capacity for livestock but does not address the effect of grazing on native species. The plan does not show that grazing will enhance the percentage or cover of native species, or indicate a desire to do so. Studies in California's inner northern Coast Ranges (Safford and Harrison 2001) showed that grazing effects on floristic composition depends on soil fertility. On fertile soils, grazing increased the proportion of exotic species, whereas grazing on serpentine soils with low fertility increased the proportion of native species. Soils in the Landfill grasslands are not serpentine, and the high abundance of the non-native *Avena fatua, A. barbata, Bromus diandrus, Hordeum murinum* ssp. *leporinum*, and *Lolium multiflorum* typical of rich soils indicates high soil fertility in the mitigation sites. Therefore, we can expect that, in Landfill grasslands, continuation of existing grazing practices will maintain the existing dominance by exotic species and will not increase native species composition. Thus, I am not convinced that, in this case, grazing alone is an adequate tool for mitigation.

Recommendation 5. To increase the likelihood of enhancing the native vegetation component on mitigation lands, grazing should be used as only one management and restoration tool, and other tools—such as burning, mowing, control of noxious weeds through appropriate management techniques, and plant seeding—also should be considered.

Impacts of Habitat Conversion for Mitigation Uses

According to the MMP, some upland habitats will be converted to wetlands as part of the proposed mitigation, making those areas unavailable for upland species. It is not clear from the description in the MMP where the 3.78-acre seasonal wetland will be excavated. Explanation provided in the Landfill comment letter (Appendix B2) still does not clarify its location. The MMP states that location as "the 3.78-acre Seasonal Wetland 4 upstream of Pond 7" within the

Southern Hills Parcel (MMP: page 50; 1st paragraph). The Landfill comment letter states "the location of the 3.78-acre wetland area in the northeastern corner of the Griffith Ranch" and refers to Figure 14, which shows the Griffith Ranch area. To explain the locations of the proposed excavations at the Southern Hills parcel, the Landfill comment letter refers to Figure 13, which shows 0.35 acre within Pond 7 (page 9, paragraphs 4-5). The location of the 0.35-acre excavation area is clear, but the location of the 3.78-acre stock pond that will be created is unclear. I emphasize this point because a valuable wetland (wet meadow) is located within the Southern Hills parcels not far from Pond 7. The impact of this habitat conversion can be evaluated only when the exact locations of new wetlands and ponds are identified.

Recommendation 6. The applicant should more precisely identify the location of created stock ponds within this parcel. It is especially important that the wetter meadow in the center of the Southern Hills parcel (Figure 2-13) not be converted to a stock pond and that pond creation not deprive this wetland of any substantial portion of its water source (see "Mitigation at the Southern Hills Parcel" below).

Recommendation 7. Topsoil from existing stock ponds should not be used for inoculating plant species in new pools because it does not have seeds of vernal pool species. Moving topsoil from existing ponds might be important, however, for inoculating crustaceous species. This question requires additional study, in which an expert on invertebrate fauna should be involved.

Mitigation at Director's Guild

The proposed restoration and enhancement activities at the Director's Guild property (MMP, Section 6.1.2.) likely will improve habitat conditions for vernal pool species. However, the aquatic habitats at the Director's Guild parcel are very different from those at the Phase II expansion parcel, and thus the mitigation is out of kind rather than in kind. These differences highlight the tradeoff in evaluating vernal pool habitat on the Director's Guild and seasonal wetlands on the Phase II area. I believe that, to a considerable degree, this tradeoff is appropriate and thus adequate for mitigation because of the relative scarcity and importance of botanical resources on the Director's Guild property (i.e., a substantial and healthy population of the federally endangered, CNPS List 1B Contra Costa goldfields [*Lasthenia conjugens*]).

Recommendation 8. While I support the use of the Director's Guild parcel as mitigation, the rationale for using the Director's Guild as mitigation for the Phase II expansion should be clearly articulated and justified. Estimation of functional ecosystem values for out-of-kind mitigation is a complex process that involves comparison of ecologically dissimilar habitats, determination of compensatory efforts, and success criteria (Barnett et al. 1994, Hymanson et al. 1995, Zedler 1996). Functional value should be evaluated on a unit-per-unit basis, and mitigation ratios should be calculated. The high value of the habitats appropriate for growth of federally endangered vernal pool plant species and the value of stock ponds as a breeding ground for federally endangered tiger salamander might be considered as a basis for determination of the mitigation ratios. Measurement of the mitigation success in this case should be specifically identified.

Figure 2-13. Southern Hills Parcel

Notes: View of the meadow on the valley floor. Plants on the valley bottom in July are still green, indicating a better hydrologic regime in comparison with hill slopes. Photo was taken on July 11, 2006.

Mitigation at Southern Hills Parcel

The proposed Southern Hills mitigation parcel contains wetlands (Figure 2-13), which provide habitat for many native species that require longer inundation and a permanent water supply during summer. These species largely do not occur on other parcels. Vegetation of this moist meadow wetland is dominated by such native perennial herbaceous species as *Rorippa nasturtium-aquaticum*, *Scirpus robustus*, *Juncus balticus*, *Hordeum brachyantherum*, and *Agrostis exerata*. This valley bottom wetland is recognizable from the distance by its green color, even in July when all surrounding grasslands are dry and yellow (Figure 2-13).

It was not clear in the MMP where the proposed new ponds will be constructed and whether they could affect this wetland area.

Recommendation 9. Maintenance of this wetland should be added to the MMP and Grassland Management Plan. It should include measurements to control exotic species (i.e., *Trifolium fragiferum, Lolium multiflorum, Polypogon monspeliensis, Hordeum marinum* ssp. *gussonianum, Lotus corniculatus,* and *Centaurea calcitrapa)* that are present. This wetland should not be used as a site for creation of a new stock pond because of its high value for maintenance of local biodiversity within the Potrero Hills landscape. I recommend developing a restoration and management plan for this meadow to enhance its native species component; the meadow could be used for out-of-kind mitigation of native species loss on the Phase II expansion parcel. The value of this meadow as a potential habitat for regionally uncommon plant species should be considered.

Recommendation 10. The relatively narrow bottom of the valley in the Southern Hills parcel is covered mostly by non-native species, has bare ground along the cattle paths, and is quite obviously eroded. Thes indicators confirm that the area has been overgrazed and eroded by storm water. The bottom of this valley most likely represents a temporal stream habitat that formerly supported riparian vegetation, including trees and shrubs. I did not have the resources and opportunity to conduct a special study to address this question, or how to restore and manage this area. I believe that such study is necessary and should be conducted to provide scientific background for sustainable management practices that can support establishment of native vegetation.

Control of Noxious Weeds

The noxious weeds *Carduus pycnocephalus, Centaurea calcitrapa, C.solstitialis, Convolvulus arvensis, Cynodon dactylon, Malvella leprosa*, and *Taeniatherum caput-medusae* are common and abundant on the Landfill lands. Control of these weeds requires complex measures, including controlled burning, mowing, hand pulling, and application of herbicides. Weed control measures were addressed in the MMP, but specific protocols and implementation plans were not specified.

Recommendation 11. An exotic species control plan should be developed for all mitigation area, and for the existing Landfill and Phase II expansion areas, to increase post-operation habitat values and reduce seed sources that could affect adjacent mitigation and non-project lands. Special attention in this plan should be given to re-vegetation of open ground that will be created

when the vertical height of the landfill will be increased. Open ground located at a higher elevation than the surrounding landscape increases the potential threat for spread of noxious weed species. Measures for controlling weeds on newly disturbed areas should be directly and clearly addressed in the MMP or subsequent implementation plans.

Installation of Sediment Control Basin

The sediment control basin (Figure 1-2) represents a potential threat to the vernal pool located downslope at the Director's Guild parcel, which contains a large and healthy population of a federally Endangered species, *Lasthenia conjugens* (see report cover photo*)*. Vernal pools are oligotrophic ecosystems that are flooded by distilled rain water. Adding water that contains nutrients and other components could change the chemical balance of the pool and destroy the vernal pool ecosystem. The likely addition of nutrients from runoff from the landfill surface will trigger succession when nitrophilous native and non-native species, which will displace vernal pool flora.

Recommendation 12. A sedimentation control basin or any other modification with even a remote possibility of modifying the hydrology or water quality of the vernal pool on the Director's Guild parcel should be avoided. An alternative location for the sedimentation basin is within the valley adjacent to the Phase II expansion area.

Goals and Targets for Restoration and Management

The MMP addresses impacts to jurisdictional waters of the United States, waters of the state, and special-status species and habitats. The plan focuses almost entirely on new wetland creation, management, and monitoring. Management of upland habitats is addressed in the Grassland Management Plan, which assumes that the grassland is the only ecosystem that should be maintained on the upland area.

During my visits of the Landfill area, I found that, despite the dominance of exotic species, upland habitats still maintain various assemblages of native species, which indicate the diversity of plant communities that once occupied the Potrero Hills landscape (see Figures 2-4 and 2-5). The floristic composition of plant communities differs between south- and north-facing slopes, as well as between upper and lower hill slopes. The native and exotic species on the valley floor often were different from those that occurred on slopes. These differences suggest that management objectives should be site specific and defined on a finer scale.

The area is located within a climatic zone that is potentially appropriate for trees. The presence of eucalyptus trees (*Eucalyptus globulus*) and native trees and shrubs, including blue elderberry (*Sambucus mexicana*), poison oak (*Toxicodendron diversilobum*), and red willow (*Salix laevigata*), demonstrates that non-herbaceous species can grow in this landscape. It is likely that, in some sites, woody or shrubby vegetation used to grow prior to the time when intensive grazing management was established.

Recommendation 13. The management plan should elaborate on the target ecosystems toward which the management is oriented, and should broaden its consideration of potential and desirable vegetation conditions. Application of management regimes that largely maintain

existing vegetation conditions, which predominantly support non-native species, will not increase the proportion of native species on mitigation sites and therefore will not adequately mitigate for their losses in the Phase II expansion area. Continuation of the existing grazing program alone will not support regeneration of native trees and shrubs. Beyond management of existing vegetation resources, mitigation should consider restoration of native plant communities and re-introduction of species documented to have occurred formerly or that are reasonably certain to have occurred historically.

Loss of habitats for natural plant communities is an unavoidable result of the Landfill expansion. The only way to mitigate this loss is to improve and restore mitigation lands to more natural conditions. The proposed grazing management program will only maintain the existing vegetation condition, which has resulted from grazing over the last 130 years; it will not shift vegetation towards its natural conditions. I recommend conducting research that will identify natural vegetation for the mitigation area and compiling lists of additional species that likely were present historically and have been eliminated. This information can help define the targets for ecological restoration and management for mitigation areas. Such an approach would allow adequate mitigation to be developed for the loss of biodiversity due to the Landfill expansion.

Defining restoration targets should be considered as an initial and basic stage of mitigation activity. This approach will reduce the price of mitigation and make it more successful in providing habitats for native species, including sensitive species and plant communities. This study would be aimed to improve the effectiveness of mitigation for the permanent loss of 178 acres of grassland habitats. It is not something "additional" to the MMP and should be funded by the Landfill as a part of mitigation activities.