RESOURCE MANAGEMENT PLAN
APPENDICES

Puente Hills Landfill
Native Habitat Preservation Authority

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Park Visitor User Survey

Presented to:

The Puente Hills Landfill Native Habitat Preservation Authority

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Executive Summary

Methodology and objectives

This report presents the results of a study conducted for the Puente Hills Landfill Native Habitat Preservation Authority (hereafter Habitat Authority). A survey was carried out in the Puente Hills during two weekdays and two weekend days during the month of October 2005. The survey was conducted among park users, in addition, user counts were conducted by interviewers in five park entrances – Hacienda Hills Trailhead, Arroyo Pescadero, Turnbull Canyon, Powder Canyon, and Hellman Park. A total of 371 surveys were completed over a total count of 916 users, providing a users "n" of 6870, a margin of error of 5%, a confidence of 95% over a p-q=0.5. The surveys were complemented by a counting exercise performed by interviewers using a "count form" instrument. This instrument helped determine whether particular activities, races (white or non-white), or gender were underrepresented in the surveys. It also provided an accurate number of actual users per day, per entrance, and per activity.

The main objectives of the survey were to collect information on user demographics, attitudes towards nature and the park, towards park uses and management, and about trail use, particularly activities performed, number of users per trail, and interaction among users.

Data collected

Demographics
Demographic results show a high gender imbalance in the use of the park with a majority of male users, particularly in Turnbull Canyon where the main activity of those using this trailhead is mountain biking. A majority of the users are either white (around 40%) or Hispanic (around 40%), with Asians coming next with less than 10%.

Activities
Hiking is the most prevalent activity in the park. However, depending on which trailhead one is using, the prevalence of one type of activity or the other might differ. Biking for example was the main activity in Turnbull Canyon, but hiking was by far the most practiced activity in Arroyo Pescadero and Hacienda Hills Trailhead. In terms of reasons to visit the park the most common ones are "to exercise" and "to be outdoors".

Trail use
Regarding trail use, the most common reasons for choosing a particular trail are its length, the scenic views and the trailhead location. More than 60% of the users either always or most of the time use the same trail. In terms of management options for the trails, there is a relative support for temporary trail closure for wildlife conservation, but also a relative opposition to permanent closure proposed for the same conservation objective.

Attitudes
Attitudes towards nature and park management are relatively positive towards conservation over recreational use. This however differs by trailhead and age group for example, and it will very much depend on the type of management to be conducted and on the communication strategies. A majority of users consider that conservation should be a priority over recreation. Moreover, perceptions of nature are generally positive, users enjoy their interactions with wildlife in the park and would support conservation and restoration efforts.

Sources of information
Observation, living in the area and previous visits are regarded as the most important sources of knowledge about the park. Related to the last point – previous visits – is the importance given to park signs as sources of knowledge, which comes after observation, living in the area and previous visits, and before any of the written and oral information sources – including friends, internet, brochures, newspapers, etc. Regarding knowledge of rules, most users (78%) state they know the park rules.

Users interaction
Interaction between users goes mostly without frictions. Only 42% answered that other users' activities affect – positively or negatively – their use of the park. Among this 42%, perceptions of joggers and hikers are mostly positive, and only bikers, dog walkers, and to lesser extent horseback riders seem to negatively affect other users' enjoyment of the park. The main reasons why perceptions are negative are litter, animal wastes and risk of collision with other users. Coping mechanisms are already in place for half of that 42%. They vary from taking extra precaution (main response) to change time, day of frequency of park use. It is important for management authorities to remain informed about these trends to avoid adaptation that would cover future changes in use of the park.

Transportation
A high percentage (more than 70%) of users travel to the park by private automobile. However, and relative to other parks like the Santa Monica Mountains for example, a significant percentage (almost 25%) either bikes, walks or jogs to the park. This at the same time highlights the importance of the park for local residents who are able to enjoy the trails and contact with nature (among the main reasons) without having to get into their cars.

Barriers
A relatively high percentage of users (26%) stated they have experienced barriers in accessing the park. Powder Canyon and Arroyo Pescadero are the entrances with higher numbers of users stating they have experienced barriers. These perceived barriers might be related to the need to close gates after heavy rain in the park.

Recommendations

Support for conservation measures inside the park is relatively strong, even if they imply restricting some of the recreational uses. These restrictions should be carefully managed and communicated, with conservation biology reasons being an important part of the communication strategy.

Regarding means of communication, direct contact with users appears to be the most effective outreach strategy. Due to restrictions on rangers' time, park signs are an important source of information that needs to be further explored and exploited.

The park has an important percentage of users who visit it for some kind of solitude. Although the data does not provide information on trends, it is important to remain vigilant regarding coping mechanisms that seem to exist and could affect visitors' experience of the park.

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Introduction and literature review

Literature Review

Importance of urban conservation

The Puente-Chino Hills represent a peninsula of natural habitat that extends into the urbanized Los Angeles Basin. The region still supports top predators (e.g., puma, bobcat) and other sensitive bird and mammal species (Spencer 2005) in a context that is accessible to recreational visitors. It would play an important role in connecting habitats along the San Gabriel River to larger blocks of wilderness to the east. Cooper (2002) documented a number of sensitive bird species that are currently in decline, and found habitat specialists still present even in the more urbanized western portion of the hills, including threatened California gnatcatchers. Emerging research by Fernandez-Juricic and others discussed above raises the question of how much recreational use would be compatible with the persistence of these important species.

Habitat destruction and fragmentation are major concerns in conservation biology and are the main causes of biodiversity loss (Wilcox and Murphy 1985). Habitat fragmentation becomes a major challenge for conservation biologists because of its intensity in urban areas and the composition of the urban matrix. Efforts to assess the quality and degree of isolation of remaining patches, and to improve connectivity among them, should therefore be an urban conservation priority. Fragmentation can also be a concern inside reserves (e.g. recreational paths), and it is important to understand and assess its impacts.

Urban reserves sometimes represent crucial elements for conservation at both local and regional scales. Studies in urban areas highlight the importance of managing the local and regional scale for effective conservation biology (Fernandez-Juricic and Jokimaki 2001; Melles *et. al.* 2003). "Multiple elements of the landscape mosaic at both local and landscape scales are important in determining the distribution of birds in urban areas, so parks and areas surrounding parks and reserves should be integrated into urban planning and development designs" (Melles *et. al.* 2003: n/p). Moreover, small urban parks that might not be suitable as functional habitat could work as stepping stones between suitable habitat (Fernandez-Juricic and Jokimaki 2001, but see Kondo and Nakagoshi 2002 who conclude that some birds prefer continuous small forests over stepping stones, even if it is a longer route).

Perceptions of nature

There is ample literature related to perceptions of nature and parks, and much of it highlights the importance of understanding these perceptions to effective management (Durbin and Ralambo

1994; Raval 1994; Richards 1996; Burger 1998; Murombedzi 1999; Mehta and Heinen 2001; Rao *et. al.* 2003; Anthony *et. al.* 2004).

Perception, preferences and use of nature, parks and recreational activities are influenced by gender, age, income, education, childhood, and ethnicity (Dwyer and Hutchinson 1990; Irwin *et. al.* 1990; Wallace and Witter 1992; Tunstall and Penning-Rowsell 1998; Virden and Walker 1999; Bixler *et. al.* 2002; Priskin 2003; Wolch and Zhang 2004).

Impacts of trail use on wildlife can vary depending on intensity and type of use. A thorough knowledge of the number of users and type of recreational activities inside the park is essential for planning and management of biological and recreational aspects inside the park. Also important is to understand users' perceptions of nature and the park itself.

Conflicts

The source of diverse perceptions of nature and use preferences can at the same time be a source of conflict. Different ethnicities might have different levels of tolerance towards crowding, or regard ideal park conditions in different ways. Dwyer and Hutchison (1990) for example, found that Anglos preferred parks with fewer facilities than African Americans. In some cases conflicts may arise from different types of uses or approaches to recreation, the cases of snowmobiles and cross-country skiers (Vitterso *et. al.* 2004), or jet-ski and other beach users (Roe and Benson 2001) are clear examples.

Some conflicts might be less evident or less vocal, but it is nevertheless important to find out if users have developed a coping mechanism that allows them to continue using a shared open space resource. Coping with crowding, for example, could discourage use, but be undetected as user numbers may not decline. The incoming or remaining users will be more resilient to crowding than the previous ones, so while user numbers might not decline the facility's function might be changing and/or many of its users might be dealing with stressful crowding conditions (Manning and Valliere 2001).

This report is designed as an aid to better understand park users' perceptions of trails, park, park management, and nature. Park management strategies, both social and ecological, can benefit from knowing, for example, why people visit certain areas instead of others, or what kind of expectations they have when they visit the Preserve. Due to the park's diversity and complexity, with several different entrances and types of users, the report also provides an analysis per trailhead to allow a more in-depth understanding of a heterogeneous mix of trails and users.

Methodology

In this section we describe the methodology used for the surveys. The survey instrument was developed by the Center for Sustainable Cities in consultation with the Habitat Authority and its rangers. The survey instrument and methodology were reviewed and approved by the University of Southern California's Institutional Review Board.

Survey instrument

The main objectives of the survey instrument (attached in appendix 1) were to obtain information on the following:

- Demographics
- Attitudes
    - Towards park and nature
    - Towards park uses
    - Towards management
- Trail use
    - Related to current data on vegetation and wildlife
    - Related to activities
    - Numbers
    - Possible impacts

The demographic information collected included, gender, age, race, household income, nationality, language, and education. All demographic information was "cross-tabbed" with information on attitudes and trail use to analyze potential correspondences.

Information on attitudes and perceptions was collected using different techniques inside the survey instrument. Most of the questions have been used and validated in previous studies. The main objective of these questions was to understand perceptions of nature, particularly related to the Puente Hills area. Questions to clarify perceptions of park management were included specifically relating to "attitudes" and to "trail use". Perceptions questions were complemented with the use of trail pictures provided by the Habitat Authority. These were designed to obtain information on trail preferences. We used 3 sets of 6 pictures (see appendix 3), Set A had wide trails without dense vegetation, set B had relatively narrow trails with vegetation, and set C had relatively wide trails with vegetation.

Trail use questions where complemented with a map for each trailhead. This map was used to obtain information on intensity of trail use, type of use per trail and to test potential opposition to closure of certain trails.

Count form

A “counter form” (see appendix 2) was developed in order to obtain the number of users, and information of non-respondents. The form was filled out by observers and designed to be easy and fast to fill up in order to obtain basic important information during peak use hours. Information obtained with the counter form included response/non-response when asked to complete the survey, gender, race (white or non-white), approximate age, type of use, and time of visit. The count form also included a “calibration” mechanism (described in “counter form administration” section).

In the “response rate” section we provide non-response information obtained with the counter forms. Graphs with all the results obtained from the counter form are included in appendix 4.

Survey instrument administration

Surveys where performed on four different days during the month of October 2005: Friday the 14th, Saturday the 15th, Friday the 21st and Sunday the 23rd. On Friday the 14th and during the morning of Saturday the 15th we had interviewers placed on a 6th entrance, but because not a single person visited the trailhead during that time we decided to relocate the interviewers to other entrances. Surveys on Friday the 14th started a 8:30-9:00AM and ended at 6:00PM, the rest of the days we had at least one interviewer on all entrances from 6:00AM to 7:00PM. Friday the 21st was the first day the park opened its gate after a 48-hour closure due to rain. Sunday the 23rd started with some dense fog patches in parts of the hills. The rest of the days where sunny and relatively hot.

Each trailhead had two persons at all time, one in charge of interviewing and the other as observer to fill up the counter form, in some of the trailheads the observer would help with the interviews if it was necessary to ask everyone entering the park to fill up the survey. The only trailhead that required an observer at full capacity was Turnbull Canyon during the early morning hours of the weekends and Hacienda Hills Trailhead at peak times. These entrances had three or four people interviewing at peak hours.

Interviewers identified themselves as USC students conducting a survey on park use and explained it was not mandatory to complete the survey. Users under 18 were not interviewed, when in doubt about the age interviewers would ask visitors before giving the survey.

Whenever it was possible, and that is most of the time except peak morning hours in Turnbull Canyon, everyone entering the park was asked to participate in the survey. Neither money nor “treats” were given to complete the survey, but DVDs and magnets from the Habitat Authority were given away to respondents. There where many respondents who requested to have the trail maps used for the survey, as much as it was possible we explained we had limited numbers and that they should contact the Habitat Authority to obtain information on the trails.

The survey was self administered by park users that agreed to complete it. They were also assisted by the interviewers since some of the questions required the interviewee to observe a set of trail images and one question included highlighting the used/to be used trail on a map. Interviewers had a map with the location of the trailhead and were provided a highlighter to show the trails they had just visited or they were planning to visit. Some interviewees complained about the length of the survey, but very few withdrew before completing the entire questionnaire.

Counter form administration

As explained above, each trailhead had at least two persons working, one interviewer in charge of administering the survey and one observer in charge of administering the counter form. The observer would fill up the form as users exited the park. The information required was basic and the form easy to fill up. It proved to be a valuable tool at peak hours, particularly at Turnbull Canyon.

In order to verify the accuracy of the age and race observation, observers would fill up the form and after then consult with the interviewer after an interview was completed. The observer would verify if his/her observations were correct or incorrect by looking at the age, activity and race questions in the survey instrument. This was done as often as possible. Accuracy in race observations was over 80% and age over 70%.

Data entry and analysis

Completed questionnaires were collected every day and taken back to USC. After the four days of surveying a day for data entry was determined and interviewers entered the data into Excel. This was the database software familiar to most interviewers. A few questionnaires were entered on a later date by selected interviewers. The data was then transferred to SPSS software and analyzed with that software. SPSS is commonly used in sociological research and statistics.

Maps were developed based on GIS trail data provided by the Habitat Authority and using data mainly from questions 6 and 7 – trail used and closure opposition respectively. Maps were created using ARCGIS from ESRI.

Survey results and analysis

In this section we start by describing the results of the survey. To describe response rate and trail use data we use information obtained from the survey instrument and the counter form. Then we present descriptive results from the survey and, finally, we analyze the data using cross tabulations and comparative descriptions per entrance.

Response rate

Over the four days 916 users were counted in all five trailheads. A total of 371 completed surveys were obtained. Tables 1 and 2 show the number of surveys obtained at each trailhead and the number of completed surveys obtained each day. Table 3 presents the number of users per trailhead and the percentage of users interviewed at each trailhead.

Table 1
Number of surveys per trailhead

Survey site	Count	Percent
Turnbull Canyon	127	34.2
Arroyo Pescadero	82	22.1
Hacienda Hills Trailhead	72	19.4
Hellman Park	53	14.3
Powder Canyon	37	10
Total	371	100

Table 2
Number of surveys per survey date

Date	Count	Percent
1st Friday	47	12.7
Saturday	134	36.1
2nd Friday	62	16.7
Sunday	128	34.5
Total	371	100

Table 3
Total counts and % of interviews per trailhead

	Arroyo Pescadero	Hacienda Hills Trailhead	Hellman Park	Powder Canyon	Turnbull Canyon
Total count 4 days	176	221	163	64	292
Total surveys	82	72	53	37	127
% of users interviewed	47%	34%	33%	58%	44%

Turnbull Canyon is clearly the trailhead with the most traffic in the park. At the beginning of the survey we decided to interview users entering or exiting the trailhead, but to count only those exiting to avoid double counting – as people can remind you they have filled the interview already, but they are not aware they are being counted. Actual use of Turnbull Canyon might be higher than our numbers show. The rest of the trailheads have a clearly defined entrance and most users enter and exit through the same place. This is not the case with Turnbull Canyon, where many users, mainly mountain-bikers use the entrance but exit on different parts of the park.

The higher response rate obtained at Powder Canyon quite likely responds to the low traffic. It was very easy for interviewers to approach users and probably very hard for users to say no to interviewers who had been waiting for some time to get interviewing candidates.

The second and third columns of tables 4 to 8 show data obtained from the survey instruments, the fourth and fifth columns show non-respondents data obtained using the counter forms. In general non-respondents do not differ based on gender, race or activity. There are however a few exemptions (in light orange) with under-representation of non-whites in Arroyo Pescadero, males in Hacienda Hills Trailhead, dog walkers in Powder Canyon and bikers in Turnbull Canyon. This last is probably due to the high peak volume at the early hours of the weekends, which was mainly composed of bikers. Even though we had up to five interviewers at the site, it was hard to approach every user entering the park at the time.

Table 4
Arroyo Pescadero – Non-respondents data

			Non-respondents	
Gender	**Count**	**%**	**Count**	**%**
Male	102	57.95	49	56.98
Female	74	42.05	36	41.86
Race	**Count**	**%**	**Count**	**%**
White	108	61.36	47	54.65
Non white	68	38.64	39	45.35
Activity	**Count**	**%**	**Count**	**%**
Hiking	136	77.27	68	79.07
Running	14	7.95	9	10.47
Biking	1	0.57	1	1.16
Dog Walk	25	14.20	8	9.30

Table 5
Hacienda Hills Trailhead – Non-respondents data

			Non-respondents	
Gender	**Count**	**%**	**Count**	**%**
Male	148	66.97	88	77.88
Female	73	33.03	27	23.89
Race	**Count**	**%**	**Count**	**%**
White	71	32.13	33	29.20
Non white	148	66.97	82	72.57
Activity	**Count**	**%**	**Count**	**%**
Hiking	164	74.21	86	76.11
Running	18	8.14	14	12.39
Biking	6	2.71	4	3.54
Dog Walk	26	11.76	8	7.08

Table 6
Hellman Park – Non-respondents data

			Non-respondents	
Gender	**Count**	**%**	**Count**	**%**
Male	122	75.78	31	72.09
Female	39	24.22	12	27.91
Race	**Count**	**%**	**Count**	**%**
White	91	56.88	24	57.14
Non white	69	43.13	18	42.86
Activity	**Count**	**%**	**Count**	**%**
Hiking	103	64.38	26	60.47
Running	11	6.88	2	4.65
Biking	31	19.38	10	23.26
Dog Walk	15	9.38	5	11.63

Table 7
Powder Canyon – Non-respondents data

			Non-respondents	
Gender	**Count**	**%**	**Count**	**%**
Male	45	70.31	12	66.67
Female	19	29.69	6	33.33
Race	**Count**	**%**	**Count**	**%**
White	44	67.69	11	61.11
Non white	21	32.31	7	38.89
Activity	**Count**	**%**	**Count**	**%**
Hiking	28	50.00	7	46.67
Running	11	19.64	5	33.33
Biking	10	17.86	3	20.00
Dog Walk	7	12.50	0	0.00

Table 8 Turnbull Canyon – Non-respondents data				
			Non-respondents	
Gender	**Count**	**%**	**Count**	**%**
Male	229	78.42	98	72.59
Female	63	21.58	37	27.41
Race	**Count**	**%**	**Count**	**%**
White	129	44.64	63	47.73
Non white	160	55.36	69	52.27
Activity	**Count**	**%**	**Count**	**%**
Hiking	76	27.14	40	32.52
Running	64	22.86	36	29.27
Biking	115	41.07	36	29.27
Dog Walk	25	8.93	11	8.94

Results confidence

We had a total of 916 park users counted during the 4 days of surveying and counting. Assuming that we can project those days to the rest of the month we reach a number of users per month (N) of 6870. Projecting the month this way gives us a higher N number of users than projecting the 2 weekdays data to 20-22 and the 2 weekend days data to 8-10 and is therefore safer. Projecting it the way we did we obtain an artificially higher number, and even with this number (6870) we obtain a 5% margin of error 95% of the time (see table 9).

Table 9 Confidence								
			Confidence	**PROPORTION (p-q)**				
E	**N**			0.9	0.8	0.7	0.6	0.5
5%	**6870**							
			99%	225	389	502	568	590
			95%	136	237	308	350	364

Results

In this section we will present the results in an order similar to the survey instrument, that is, we start with general park use and trail use questions and then we describe attitudes towards the park and demographics. Demographics are also introduced in relation to each question when statistical significance was found between responses and particular demographics. In terms of trailheads, we start describing the results for the entire park and then we analyze some significant results per trailhead, nevertheless, we introduce comments and comparisons between entrances when it is particularly relevant to one question being analyzed.

Frequency and duration of visits

Tables 10 and 11 show, respectively, percentage of first time users and time spent in the park. A few times a year can be 2 visits per month or 20 visits per month. The number of first time users is relatively high (44%) if we consider that, as table 12 shows, 65% of the users visit the park 10 or more times per month. Those that use the park do so quite often, the mean obtained is 9.1 visits per month. Time spend in the park is also interestingly high, with a mean of 1.83 hours spent in the park and almost 40% of users spending 2 hours or more inside the park.

Table 10
Q1. How often do you visit the park?

	Count	Percent
Few times a year	75	56
First time	59	44
Total	134	100

Table 12
Visits/month

	Frequency	Percent	Mean
1 to 9	106	60.4	9.10
10 to 30	91	39.6	

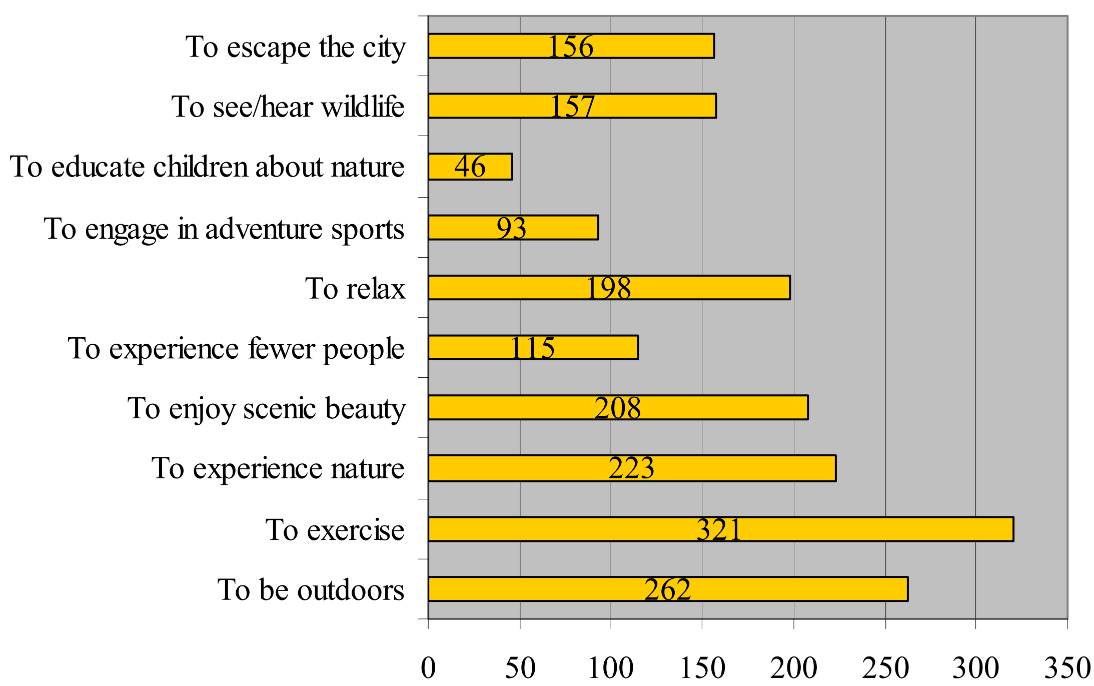
Table 11
Q2. How long did/will you spend on the park today (hours)

Hours	Count	Percent	Mean
0.1	1	0.3	1.83
0.3	3	0.8	
0.3	1	0.3	
0.5	46	12.8	
0.7	1	0.3	
0.8	15	4.2	
1	112	31.3	
1.3	1	0.3	
1.3	1	0.3	
1.5	45	12.6	
2	74	20.7	
2.5	10	2.8	
3	29	8.1	
3.5	2	0.6	
4	10	2.8	
4.5 >	7	2.1	
Total	358	100	

Activities

Most visitors claimed they had visited the park to exercise and to be outdoors. A majority (85%) of visitors who went to the park to exercise went hiking, less than 30% went either jogging or biking. Nature and solitude are two other park magnets. More than 60% of the users went there to be outdoors and experience nature, and almost 30% were there to escape the city and/or experience fewer people. Moreover, a large percentage also visited the park to relax. It is therefore important to analyze, as we do in question 19, how users interact and what kind of coping mechanisms they are using. Finally, wildlife is also an important reason for choosing the park, around 30% of the visitors attend the park to see or hear wildlife.

Figure 1
Q3. Why did you choose to visit the park?



Tables 13a to 13c below show how age influences the reasons why visitors go to the park. Neither "being outdoors" nor "experiencing nature" are important a reason for visiting the park for the youngest and oldest in the survey (table 13a). As table 13c shows, "practicing sports" as a reason for visiting the park decreases with age, starting at 42% in the youngest group and going all the way to 0% in the oldest one. This could also relate to the perception of "sport" at different age groups. Other factors related to demographics and reasons for visiting the park will be highlighted below.

Table 13a
Question 3, being outdoor as reason for visiting the park and Age

			Age					Total
			18 a 25	26 a 40	41 a 55	56 a 70	71+	
Q3_OUTDO	No	Count	21	25	37	14	8	105
		% within Age	38.2%	22.7%	29.1%	28.0%	88.9%	29.9%
	Yes	Count	34	85	90	36	1	246
		% within Age	61.8%	77.3%	70.9%	72.0%	11.1%	70.1%
Total		Count	55	110	127	50	9	351
		% within Age		100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.558(a)	4	.001
Likelihood Ratio	18.438	4	.001
Linear-by-Linear Association	.974	1	.324
N of Valid Cases	351		

a 2 cells (20.0%) have expected count less than 5. The minimum expected count is 3.62.

Table 13b
Question 3, experiencing nature as reason for visiting the park and Age

			Age					Total
			18 a 25	26 a 40	41 a 55	56 a 70	71+	
Q3_NATU	No	Count	27	48	43	15	8	141
		% within Age	49.1%	43.6%	33.9%	29.4%	88.9%	40.1%
	Yes	Count	28	62	84	36	1	211
		% within Age	50.9%	56.4%	66.1%	70.6%	11.1%	59.9%
Total		Count	55	110	127	51	9	352
		% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.833(a)	4	.003
Likelihood Ratio	16.375	4	.003
Linear-by-Linear Association	1.303	1	.254
N of Valid Cases	352		

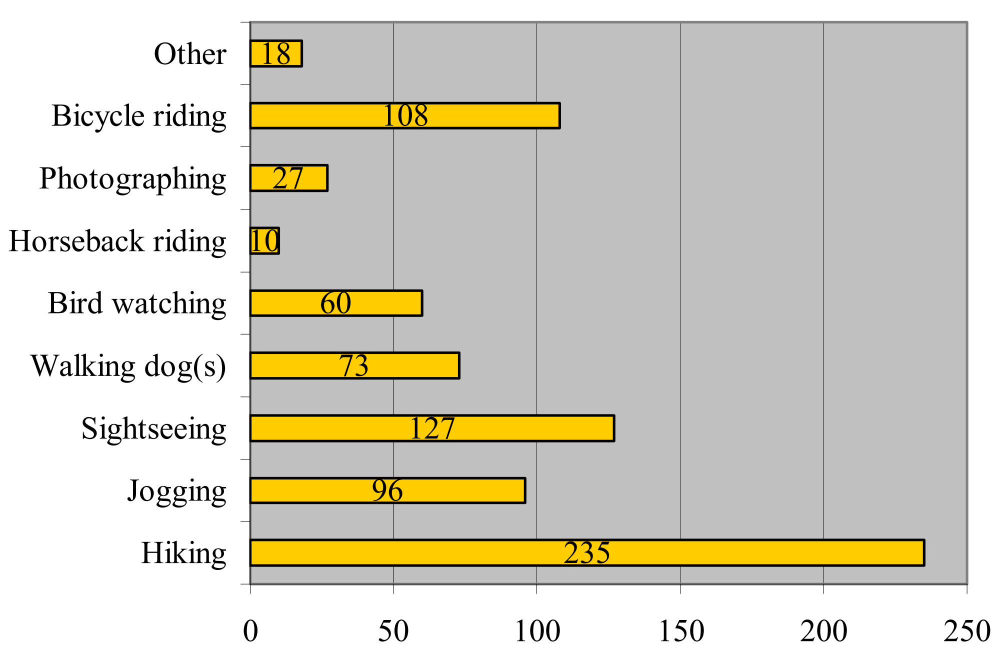
a 2 cells (20.0%) have expected count less than 5. The minimum expected count is 3.62.

Table 13c Question 3, practicing sports as reason for visiting the park and Age								
			Age					Total
			18 a 25	26 a 40	41 a 55	56 a 70	71+	
Q3_SPORT	No	Count	31	74	100	47	9	261
		% within Age	57.4%	67.3%	78.7%	92.2%	100.0%	74.4%
	Yes	Count	23	36	27	4	0	90
		% within Age	42.6%	32.7%	21.3%	7.8%	.0%	25.6%
Total		Count	54	110	127	51	9	351
		% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	23.891(a)	4	.000
Likelihood Ratio	27.409	4	.000
Linear-by-Linear Association	23.680	1	.000
N of Valid Cases	351		
a 2 cells (20.0%) have expected count less than 5. The minimum expected count is 3.62.			

In terms of activities, 65% of park users are engaged in hiking, while around 25% of park users are engaged in either jogging or mountain biking. Other popular activities, listed in order of user numbers, are sightseeing, dog walking and bird watching (Figure 2).

Figure 2
Q4. Which activities did you engage in?



Tables 14a and 14b show how age has some influences on at least two type of activities performed at the park. Dog walkers tend to be older and bikers tend to be younger. Interestingly, as we shall see below, these two activities are the ones less well regarded by park users due to several reasons. As was the case with question 3, more information related to this question will be provided in the demographic and trail entrances sections.

Table 14a
Question 4, walking dog as activity while in park and Age

			Age					Total
			18 a 25	26 a 40	41 a 55	56 a 70	71+	
Q3_WALK DOG	No	Count	47	93	101	41	3	285
		% within Age	85.5%	84.5%	79.5%	80.4%	33.3%	81.0%
	Yes	Count	8	17	26	10	6	67
		% within Age	14.5%	15.5%	20.5%	19.6%	66.7%	19.0%
Total		Count	55	110	127	51	9	352
		% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.065(a)	4	.005
Likelihood Ratio	11.627	4	.020
Linear-by-Linear Association	5.782	1	.016
N of Valid Cases	352		

a 2 cells (20.0%) have expected count less than 5. The minimum expected count is 3.62.

Table 14b
Question 4, biking as reason for visiting the park and Age

			Age					Total
			18 a 25	26 a 40	41 a 55	56 a 70	71+	
Q3_BIKE	No	Count	37	67	91	42	9	246
		% within Age	67.3%	60.9%	72.2%	82.4%	100.0%	70.1%
	Yes	Count	18	43	35	9	0	105
		% within Age	32.7%	39.1%	27.8%	17.6%	.0%	29.9%
Total		Count	54	55	110	126	51	9
		% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.402(a)	4	.015
Likelihood Ratio	15.134	4	.004
Linear-by-Linear Association	8.329	1	.004
N of Valid Cases	351		

a 2 cells (20.0%) have expected count less than 5. The minimum expected count is 3.62.

Trail preferences and uses

In terms of trail preferences, more than 60% of visitors use the trail always or most of the time. In many cases (around 40%) this is due to convenient access to the trailhead. Other important reasons for choosing the trailheads are scenery and trail length (around 45%), naturalness, solitude, and width of trail (25%). Width of trail as a reason for choosing the trailhead is related to survey site. As table 15 shows, those who visit Powder Canyon and Turnbull Canyon tend to give more importance to width of trail. This information is neither confirmed nor denied by the results of the picture set analysis. Given that these trailheads experience the highest numbers of horseback riders and mountain bikers, it is likely that they prefer wider trails for their activities. Information on type of trail is complemented in responses to question 11 below.

Figure 3
Q5 Do you use this trail head...?

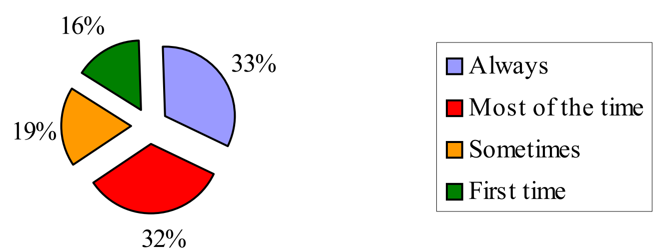


Table 15
Width of trail as factor for trail preference and survey site

			Survey site					
			Powder Canyon	**Turnbull Canyon Trailhead**	**Hacienda Hills**	**Arroyo Pescadero**	**Hellman Park**	**Total**
Width	**No**	**Count**	24	78	59	64	46	271
		% of site	64.9%	62.4%	85.5%	79.0%	86.8%	74.2%
	Yes	**Count**	13	47	10	17	7	94
		% of site	35.1%	37.6%	14.5%	21.0%	13.2%	25.8%
Total		**Count**	37	125	69	81	53	365
		% of site	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

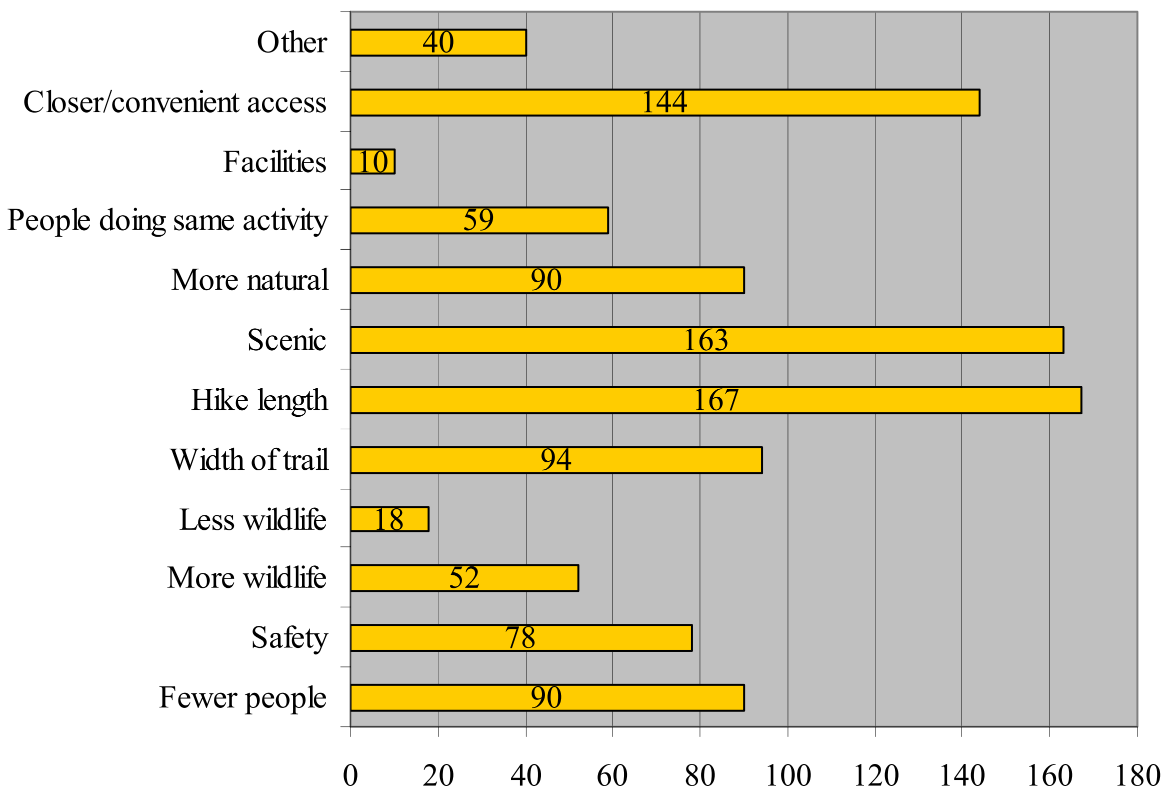
Chi square

	Value	df	Significance (bilateral)
Pearson Chi square	20.778(a)	4	.000
N of valid cases	365		

a 0 cells (.0%) have an expected frequency less than 5. Minimum expected frequency is 9.53.

Another important point regarding trail preferences is that very few respondents (less than 3%) consider facilities as a determining factor when choosing trailheads. This is consistent throughout the trailheads, with only Powder Canyon having a higher (8%), but not statistically significant, preference. In the case of Powder Canyon this could be related to the existence of facilities for horseback riding.

Figure 4
Q8. Why did you choose that route/trail?



Trail use maps and opposition to closure[1]

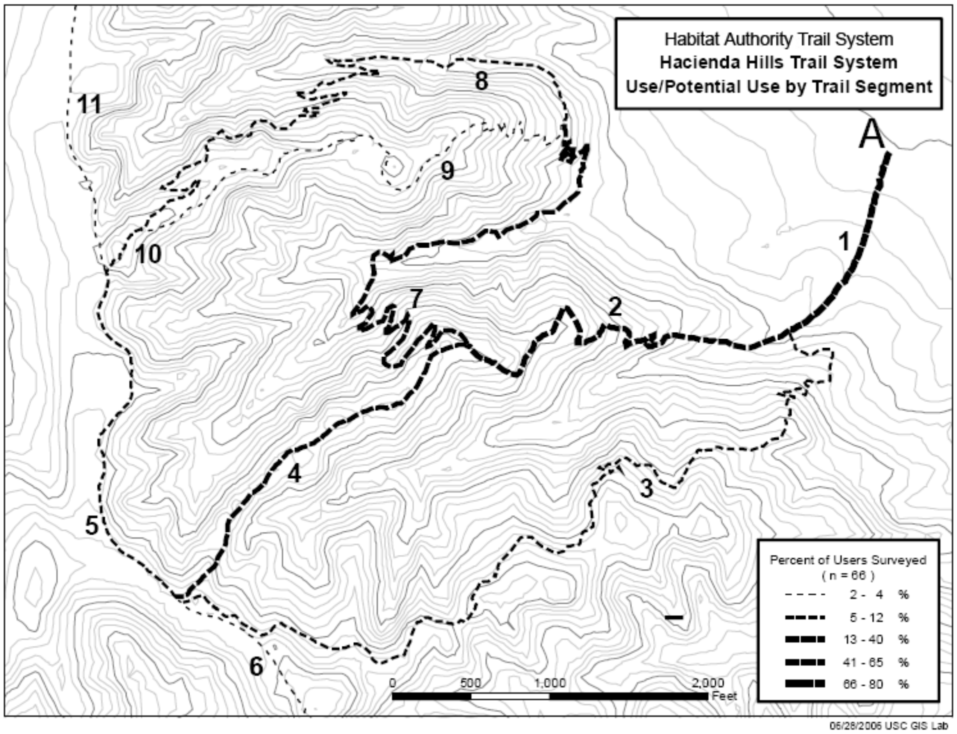
Topographic maps with park trails were included in the survey and every user interviewed was asked to show the route they intended to use or they had use in this visit, plus which trails' closure they would oppose. The maps included below show the percentage of users that use each trail segment. Some of the trips were "round trips" but only accounted as one, so the percentage is per user not per transit. This is an important distinction to consider if results are being considered for conservation management that includes disturbance to native species. For a bird

[1] Maps were developed by Gregory Elwood at the USC GIS Lab.

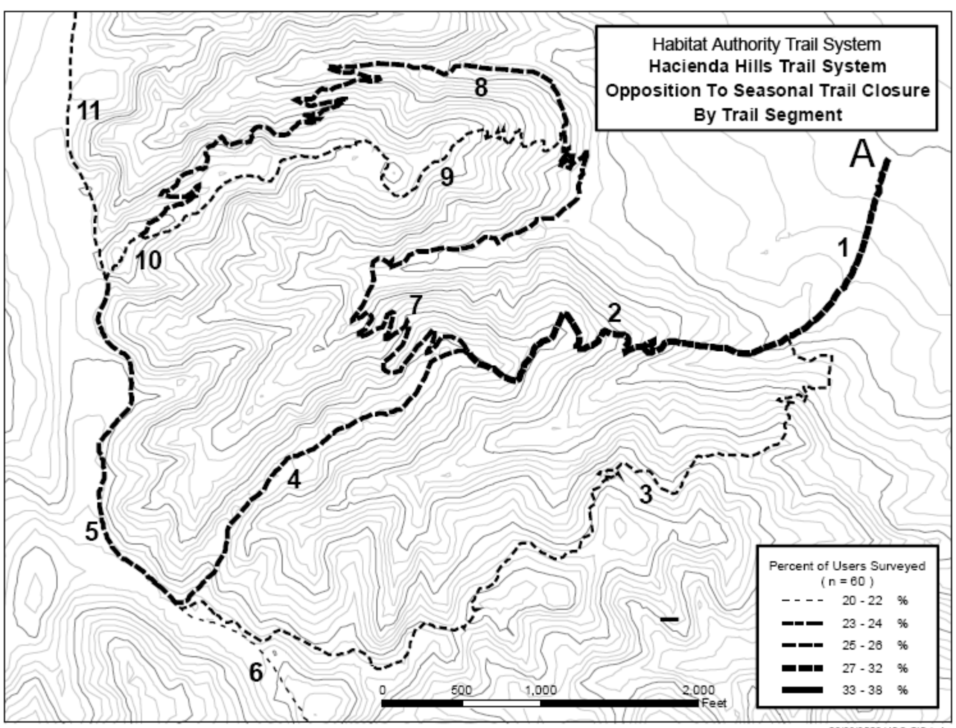
being disturbed by a hiker, for example, it does not make a difference if one person walks twice or two persons walk once through the area. Finally, although rare, some of the trips started in one trail map and finished in another one, this happened mainly with bikers.

The trail segments are symbolized to reflect the survey results. A thicker, bolder line represents a greater percentage of positive user response to the two questions ("Yes, I am using/going to use the trail segment" and "Yes I am opposed to seasonal closure of the trail segment").

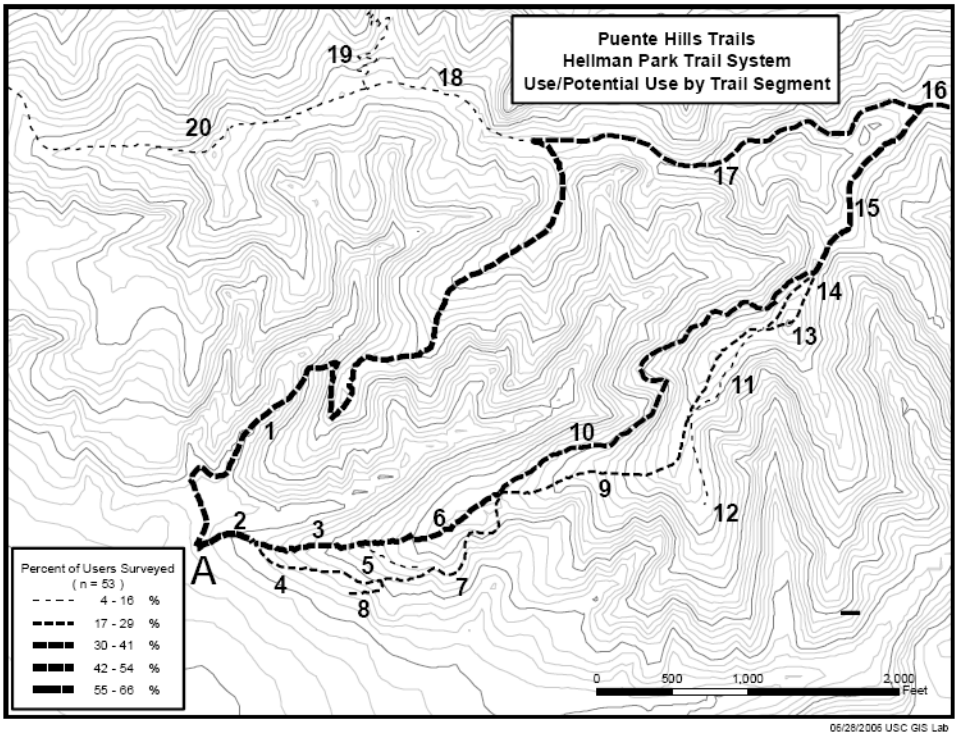
The statistical classification of the response numbers is not the same across the entire series of maps – in order to avoid having all thin lines and only one bold line, or vice-versa. The classification breaks were set to optimize the range of symbols appearing in each map. These maps are intended to show use and opposition to closure for each of the five survey areas individually.



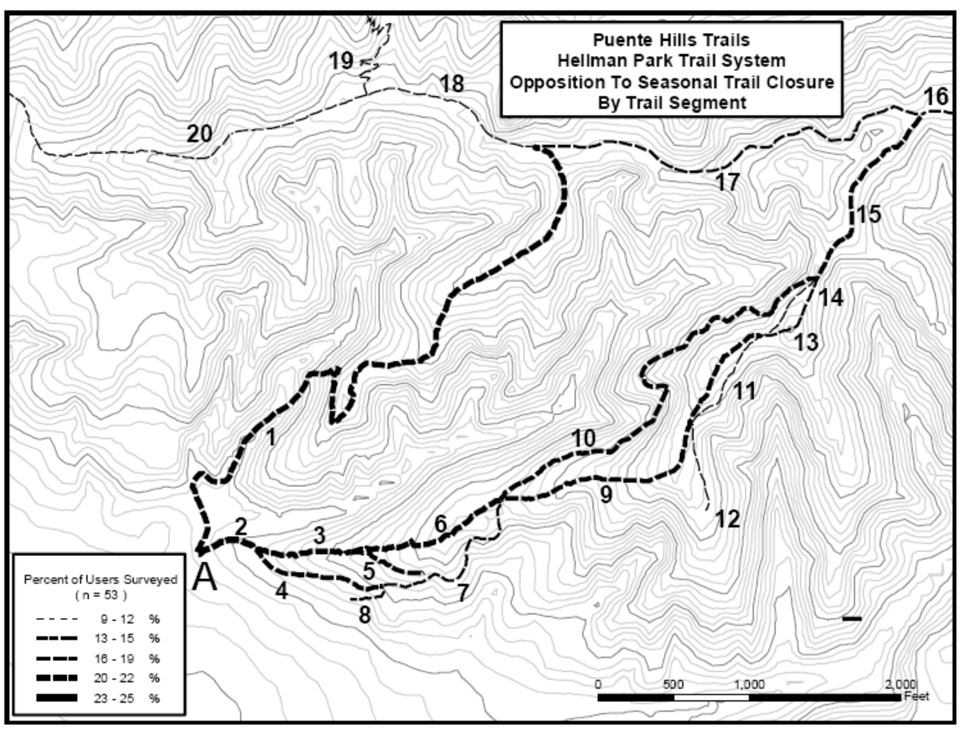
Map 1. Hacienda Hills Trail Use



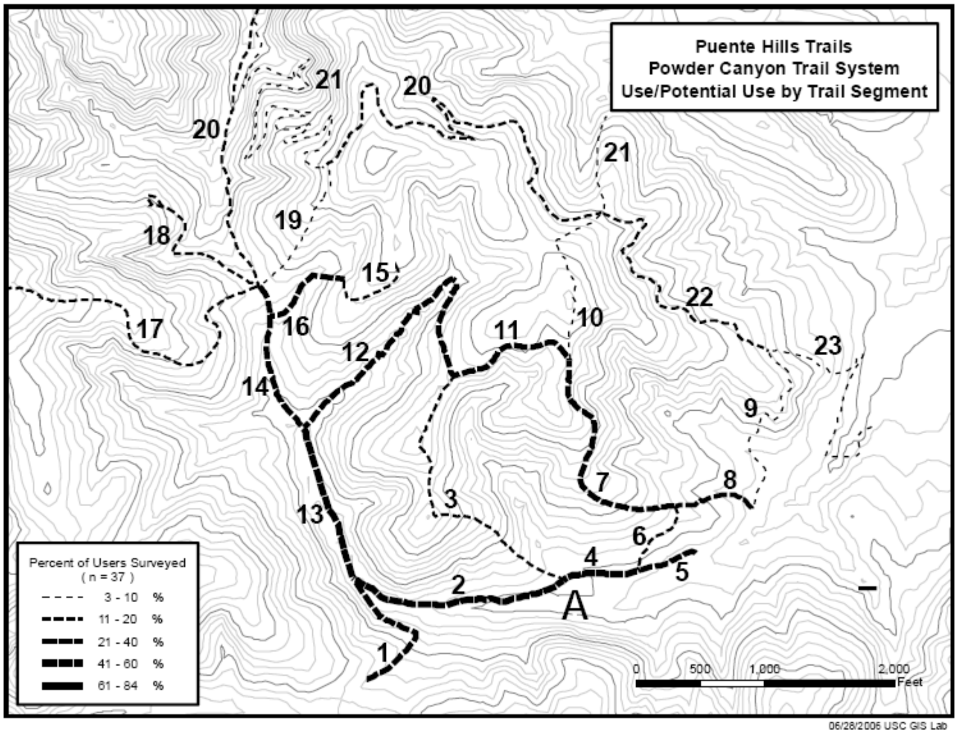
Map 2. Hacienda Hills Trail Opposition to Closure



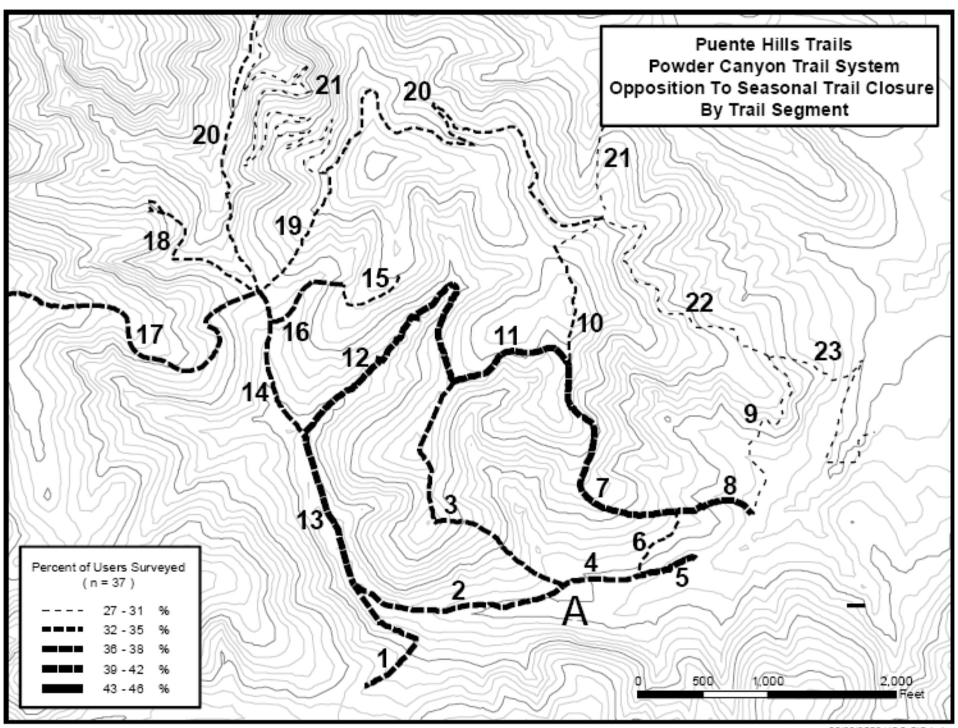
Map 3. Hellman Park Trail Use



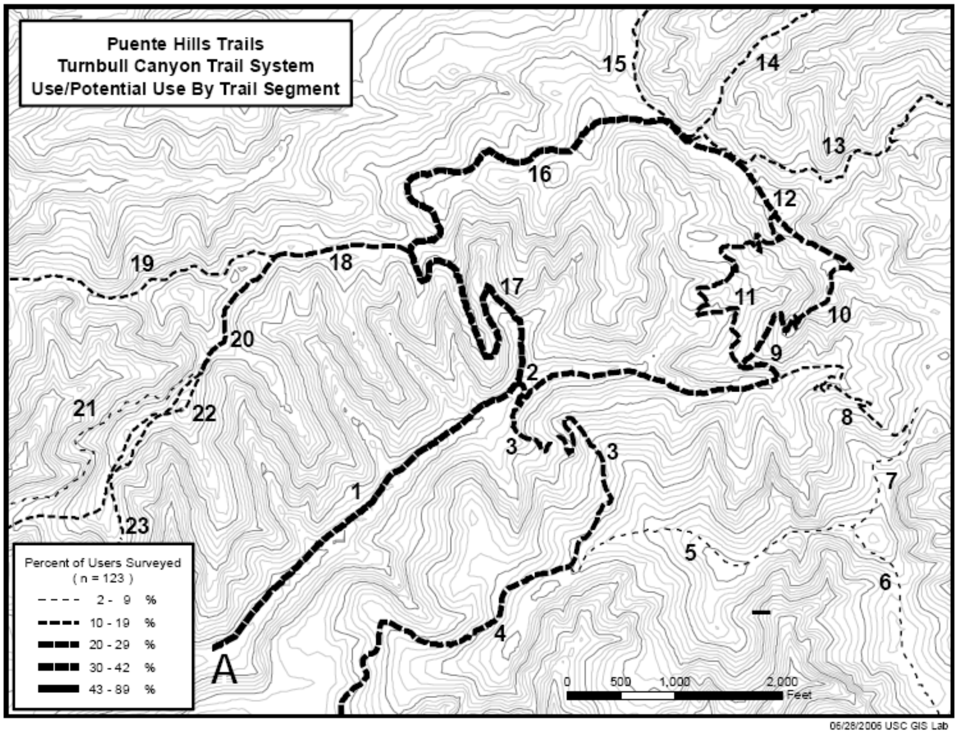
Map 4. Hellman Park Trail Opposition to Closure



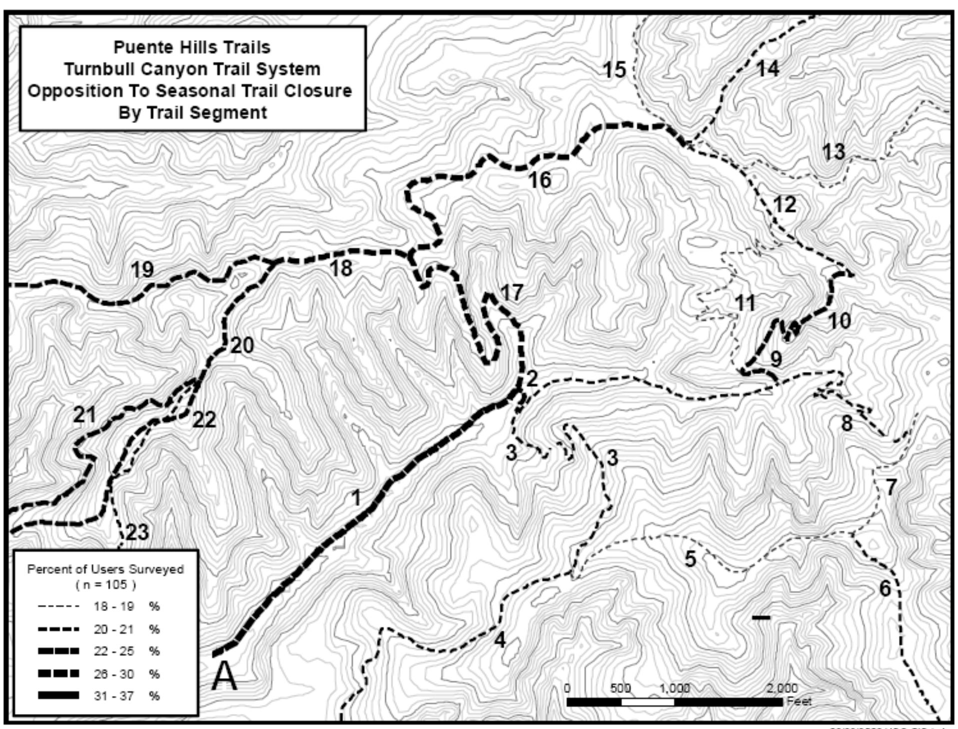
Map 5. Hellman Park Trail Use



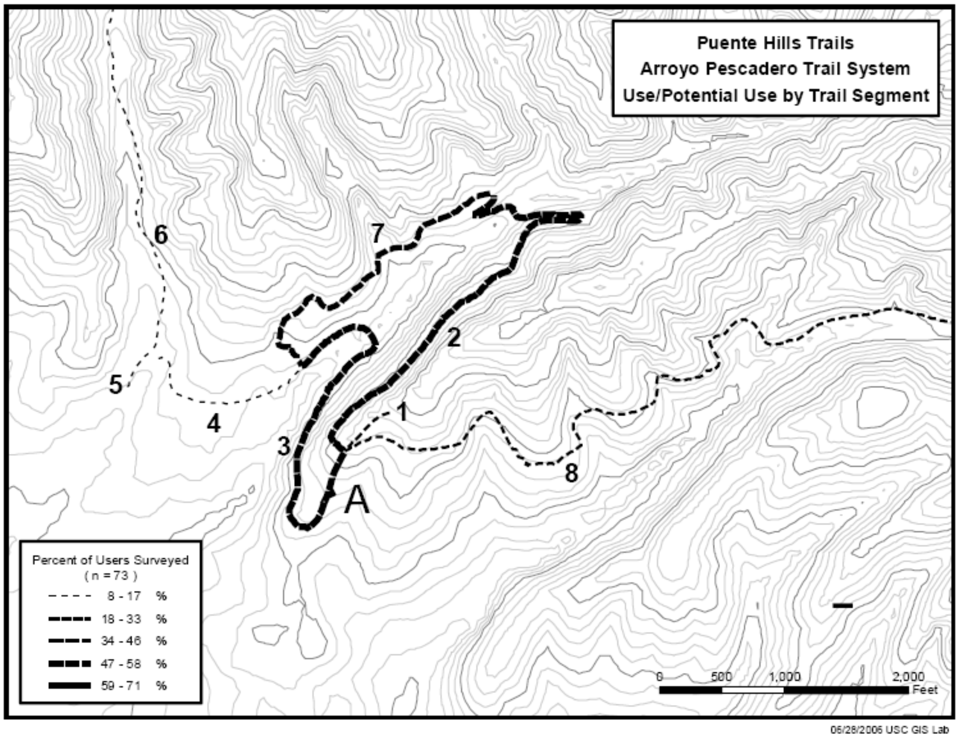
Map 6. Hellman Park Trail Opposition to Closure



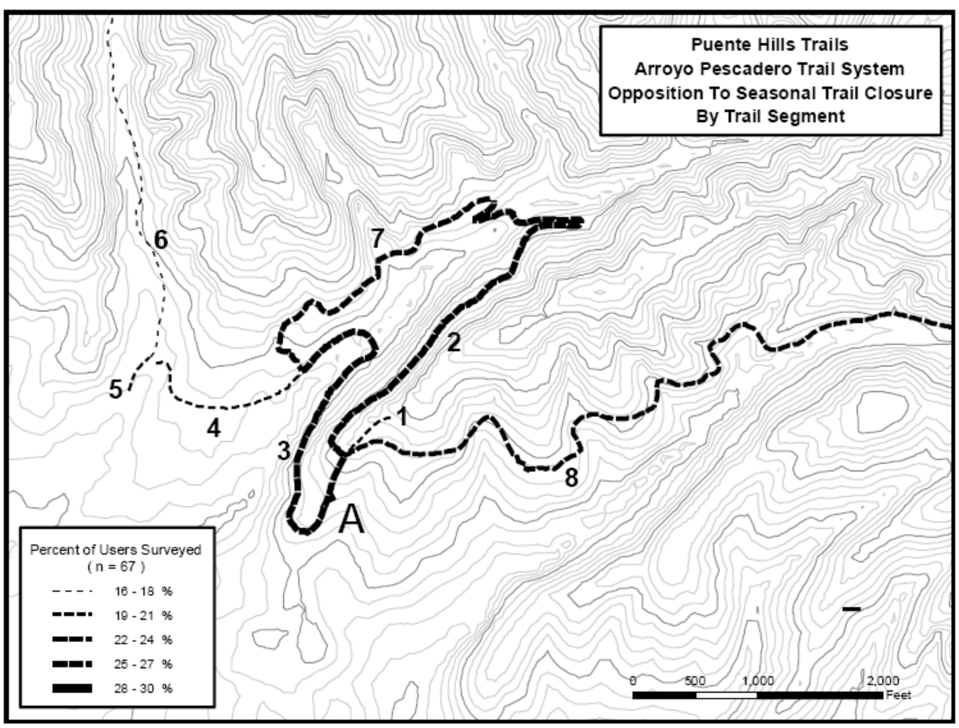
Map 7. Hellman Park Trail Use



Map 8. Hellman Park Trail Opposition to Closure



Map 9. Arroyo Pescadero Trail Use

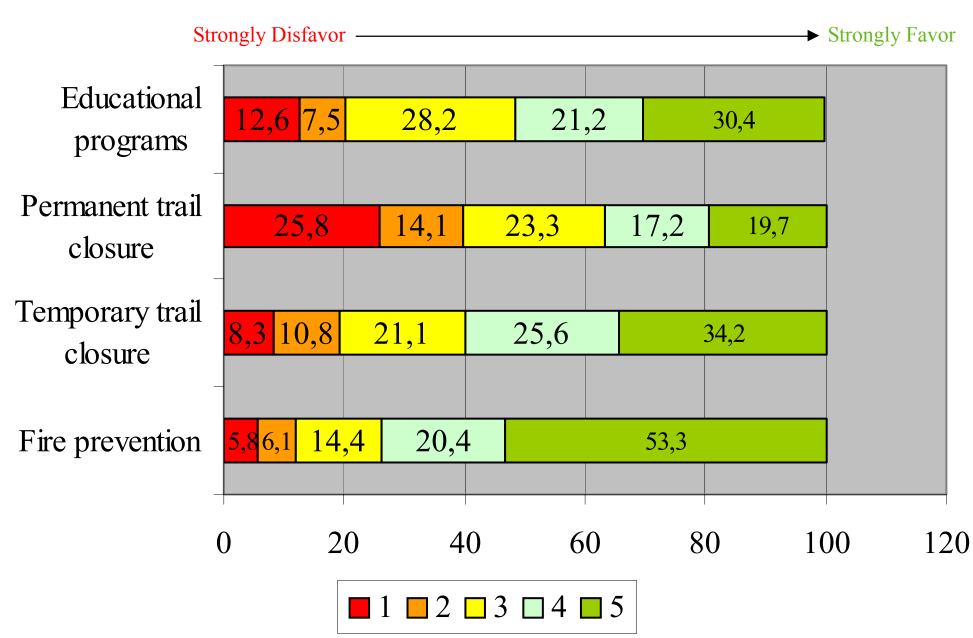


Map 10. Arroyo Pescadero Trail Opposition to Closure

Management options

Information regarding 4 different management options was collected with the surveys. Due to the heavy recreational use and the high number of trails existing in the park, trail management is one of the most delicate issues. During the administration of the survey, question 7, related to opposition to closure of particular trails, was the one that sparkled more questions from interviewees. When considering trail management options, both permanent and temporary closures are possible depending on the objective of the closure. Temporary closure can be used to protect certain breeding habitat in certain seasons, but permanent closure is sometimes necessary to protect particularly sensitive species. As Figure 5 shows, there is a relatively high opposition to permanently closing trails, and relative support to temporary closure to restore native vegetation or protect wildlife. Support for temporary closures can turn to opposition if the trails are closed permanently. In terms of activities, those that go to the park to hike, sightsee and bird-watch have a more favorable position towards both temporary and permanent closure. Support for permanent closure is lower for all activities, except for bird-watchers which still show a relatively high support for permanent closures for conservation. Finally, table 16 shows that users of one particular trailhead (Turnbull Canyon) particularly disfavor management that includes permanent trail closures.

Figure 5
Q10. Opinion about management options (%)



While educational programs such as ranger lead hikes receive a moderate support, fire prevention mechanisms such as clearing vegetation receive a very high support (Figure 5). Interest on ranger hikes is quite low. Results from question 17 show that a low percentage of

Table 16 Permanent trail closure acceptance per trailhead								
			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
Q10_B	1	% of trailhead	5.4%	13.5%	4.5%	5.1%	7.7%	8.3%
	2	% of trailhead	10.8%	15.1%	6.1%	11.4%	5.8%	10.8%
	3	% of trailhead	27.0%	23.8%	13.6%	15.2%	28.8%	21.1%
	4	% of trailhead	18.9%	23.8%	27.3%	32.9%	21.2%	25.6%
	5	% of trailhead	37.8%	23.8%	48.5%	35.4%	36.5%	34.2%

Chi square			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi square	28.015(a)	16	.031
Likelihood Ratio	28.245	16	.030
Linear-by-Linear Association	4.119	1	.042
N of Valid Cases	360		
a 3 cells (12.0%) have an expected count less than 5. The minimum expected count is 3.08.			

Table 17 Level of education and information obtained from rangers								
			Education					Total
			High school student	No high school diploma or GED	High school graduate or GED	College or University Student	University Graduate	
Ranger	No	Count	14	14	47	111	93	279
		% of education	66.7%	63.6%	85.5%	87.4%	79.5%	81.6%
	Yes	Count	7	8	8	16	24	63
		% of education	33.3%	36.4%	14.5%	12.6%	20.5%	18.4%
Total		Count	21	22	55	127	117	342
		% of education	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.576(a)	4	.021
Likelihood Ratio	10.639	4	.031
Linear-by-Linear Association	2.419	1	.120
N of Valid Cases	342		
a 2 cells (20.0%) have expected count less than 5. The minimum expected count is 3.87			

Table 18 Acceptance of education ranger lead hikes and survey site									
			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
Q10_C	1	% of trailhead	13.5%	17.5%	6.2%	11.4%	9.8%	12.6%
	2	% of trailhead	.0%	9.5%	6.2%	8.9%	7.8%	7.5%
	3	% of trailhead	51.4%	27.8%	23.1%	22.8%	27.5%	28.2%
	4	% of trailhead	10.8%	16.7%	21.5%	32.9%	21.6%	21.2%
	5	% of trailhead	24.3%	28.6%	43.1%	24.1%	33.3%	30.4%

Chi square			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi square	30.644(a)	16	.015
Likelihood Ratio	31.868	16	.010
Linear-by-Linear Association	2.481	1	.115
N of Valid Cases	358		
a 4 cells (16.0%) have an expected count less than 5. The minimum expected count is 2.79.			

users actually get information from rangers, and as table 17 shows, those that do get information from rangers are either in high school or have no high school diploma. Table 18 shows there is a relation between acceptance of ranger lead educational hikes and trailheads. The trailheads that show higher support for such programs are Hellman Park, Arroyo Pescadero and Hacienda Hills Trailhead. Another interesting crosstab is the relationship between support to ranger hikes and perception of wildlife as dangerous. There is a higher tendency to support ranger lead hikes among those who perceive wildlife as dangerous. The interest on these hikes might be sparkled more from a need of perceived safety while in the park than from an interest in learning more about the park.

More trail information

As described in the methodology section, three sets of pictures were put together in order to analyze particular trail preferences among users. Set A had wide trails with almost no vegetation, set B had relatively narrow trails with vegetation, and set C had relatively wide trails with vegetation of different types. Interviewees were asked to individually rate the sets of trails from 1 to 5. Results are presented in Figure 6 and show a stronger preference for sets B and C, both of which include vegetation cover of various degrees. Although a quarter of park users mention trail width as a factor when choosing trails, it appears that vegetation cover, in particular the existence of bushes and trees have a greater influence in trail preference. It should be noted that users were asked to rate the set of trails they liked the most, scenic beauty value might be different than use value, that is, users might consider some trails nicer to watch, but would rather use a different one. In general, trail width does not seem to be considered as important as vegetation cover.

Figure 6
Q11. Opinion about the photo sets of trails (percentage)

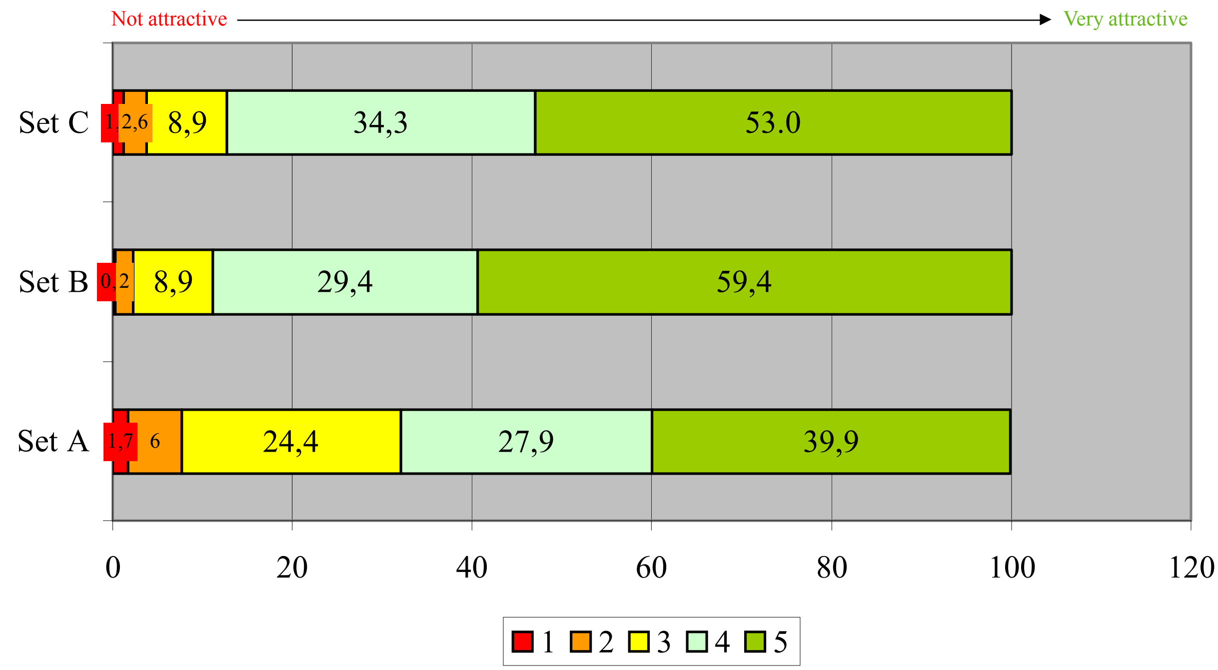
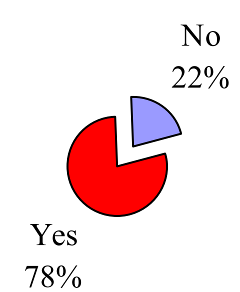


Figure 7
Q12. Do you know the park rules?



Park rules

Almost 80% of park users claim to know park rules. Although it is a high percentage, it is expected that many users would not like to confess they do not know the rules or are unaware of the existence of park rules. Table 19 shows that Powder Canyon users appear to be the most knowledgeable of park rules with almost 95%. Table 20 shows that university students or graduates are the least knowledgeable of park rules – or the most open to admit so.

Table 19
Rules knowledge per entrance

	Arroyo Pescadero	Hacienda Hills Trailhead	Hellman Park	Powder Canyon	Turnbull Canyon
Responded yes to question on rules knowledge	70.8%	76.2%	76.1%	94.4%	78.4%

Table 20
Knowledge of park rules and education

			Education					Total
			High school student	No high school diploma or GED	High school graduate or GED	College or University Student	University Graduate	
Rules	No	Count	5	5	16	28	15	69
		% of education	22.7%	23.8%	32.0%	24.3%	14.0%	21.9%
	Yes	Count	16	16	34	87	92	245
		% of education	72.7%	76.2%	68.0%	75.7%	86.0%	77.8%
Total		Count	22	21	50	115	107	315
		% of education	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

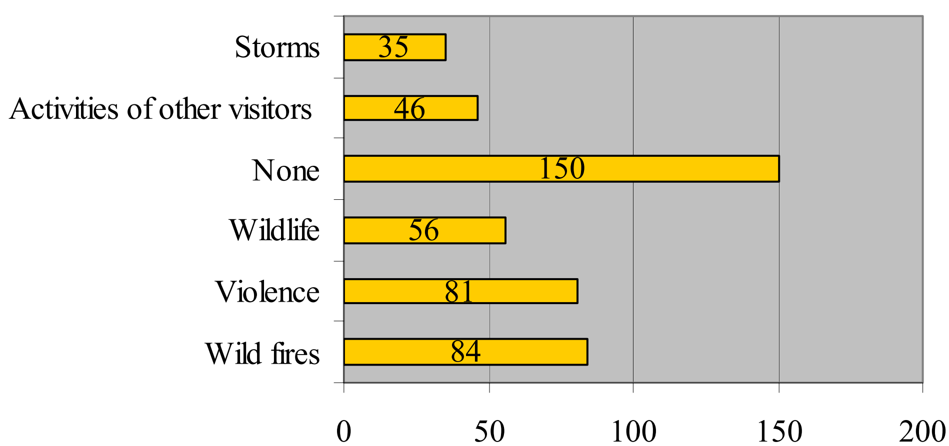
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.723(a)	8	.008
Likelihood Ratio	12.872	8	.116
Linear-by-Linear Association	.453	1	.501
N of Valid Cases	315		

a 7 cells (46.7%) have expected count less than 5. The minimum expected count is .07.

Safety perception inside the park

Question 13 in the survey instrument, presented in Figure 8 below, shows that almost 50% of park users do not feel unsafe at all while being in the park. Things that make users feel unsafe can be equally divided in “natural” and “human” elements. “Wildfires” and “wildlife” on one side, and “activities of other users” and “violence” on the other, make around 30% of users feel unsafe. Despite its relative isolation, or perhaps due to it, Powder Canyon is perceived as the safest for all of the options suggested in question 13. On the other hand, Hacienda Hills Trailhead had the highest percentage of perceived un-safety for all options related to natural hazards – wildfire, wildlife, and storms.

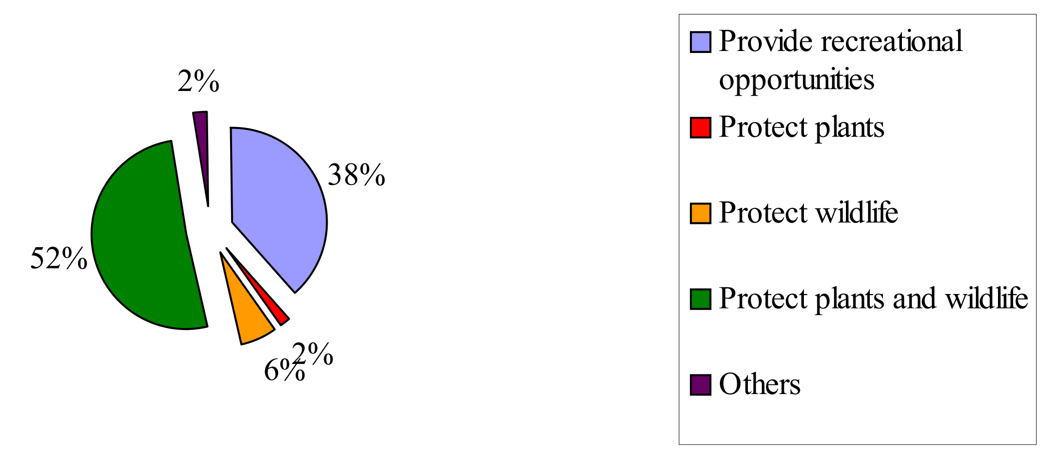
Figure 8
Q13. Do any of the following things make you feel unsafe about being in the park or in the park proximity?



Nature and park: perceptions and management

Questions 14 to 16, presented in Figures 9 to 11 below, were directed towards understanding users' perceptions of nature and of park management. When forced to choose between one option or the other, more than 50% of park users state that protecting plants and wildlife is more important than providing recreational opportunities. The percentage climbs to 60% if we add the options of protecting wildlife and protecting plants individually. Although the numbers are small to infer statistical significance, protection of wildlife is seen as more important than protection of plants on a 3:1 ratio (Figure 9).

Figure 9
Q14. The most important reason to protect the park is...



Results related to what should be the park's objective are reinforced in question 15 (Figure 10), where more than 50% disagree with the statement "recreation should be a higher priority than wildlife conservation in park management", and only 15% agree. Regarding wildlife, although almost a quarter of park users agree that "park wildlife can be dangerous" – and almost 50% disagree – it must be noted that more than 85% state agree that they "enjoy sharing the park with wildlife". It was outside the scope of this study, but it would be interesting to find out what would happen to these percentages if we interviewed people in the park's vicinity, and ask them about sharing the area with wildlife, a necessary fact if they enjoy sharing the park with wildlife that is not aware of the location of park limits. After looking at the results from question 15_d there is some hope that park users are willing to share spaces with wildlife. Only 6% of park users agree with the statement "park wildlife can be a nuisance", and almost 85% disagree with it, with 70% strongly disagreeing. Given the particular relationship neighbors have with wildlife, it would be interesting to find out if that relationship is different between park users and non users.

Figure 10
Q15. Do you agree or disagree with the following statement

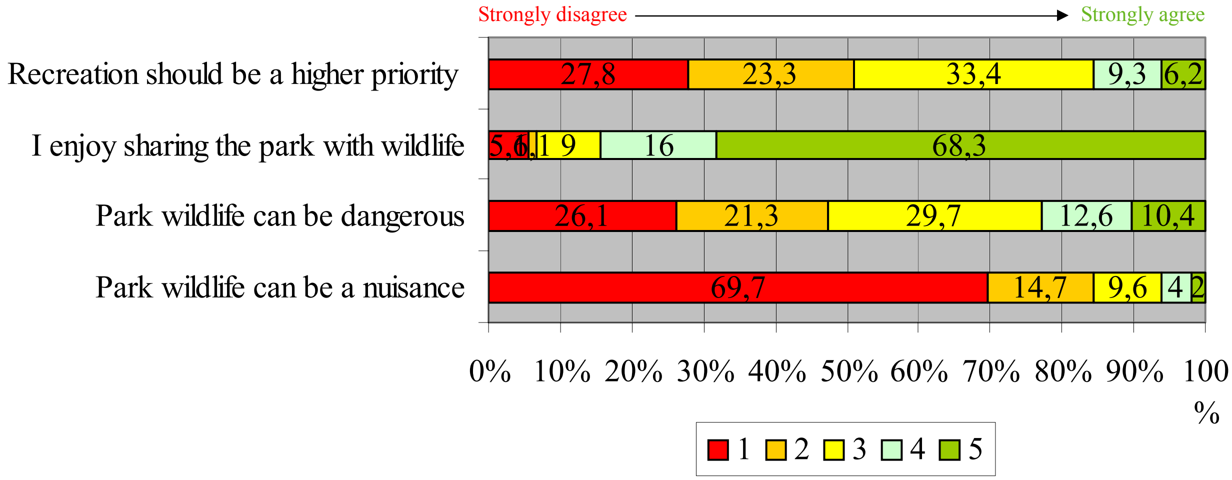
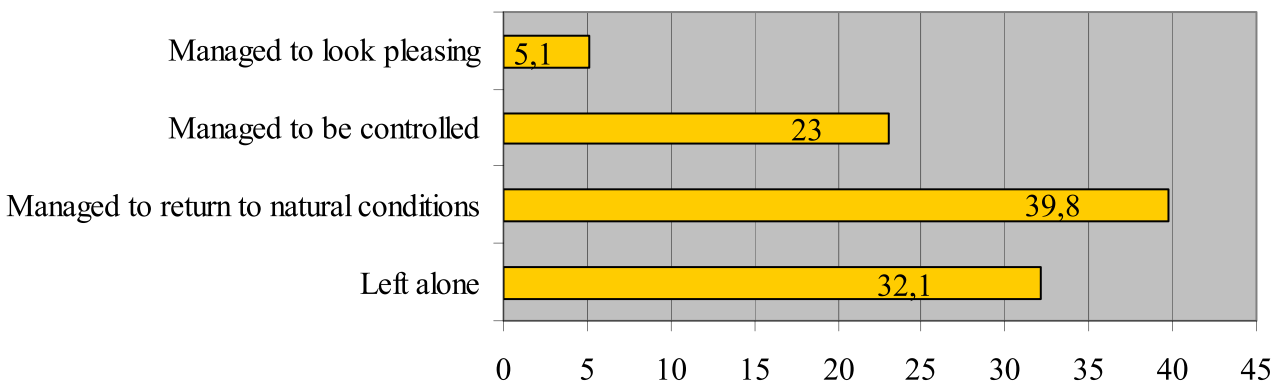


Figure 11
Q16. In your opinion, nature inside the park should be...



Encouraging Figures keep coming when we look at the results from question 16 (Figure 11). More than 70% of park users believe nature in the park should be managed to return to natural conditions, or left alone, which in many ways equals to a type of management conducted to letting "nature" return to "natural conditions".

Still, almost a quarter of park users consider that the park should be managed to be controlled and only 5% consider it should be managed to look pleasing. Cross tabulation of question 16 with trailheads shows that although all trailheads have the same percentage (around 70%) of agreement with "left alone" and "managed to return to natural conditions", Hacienda Hills

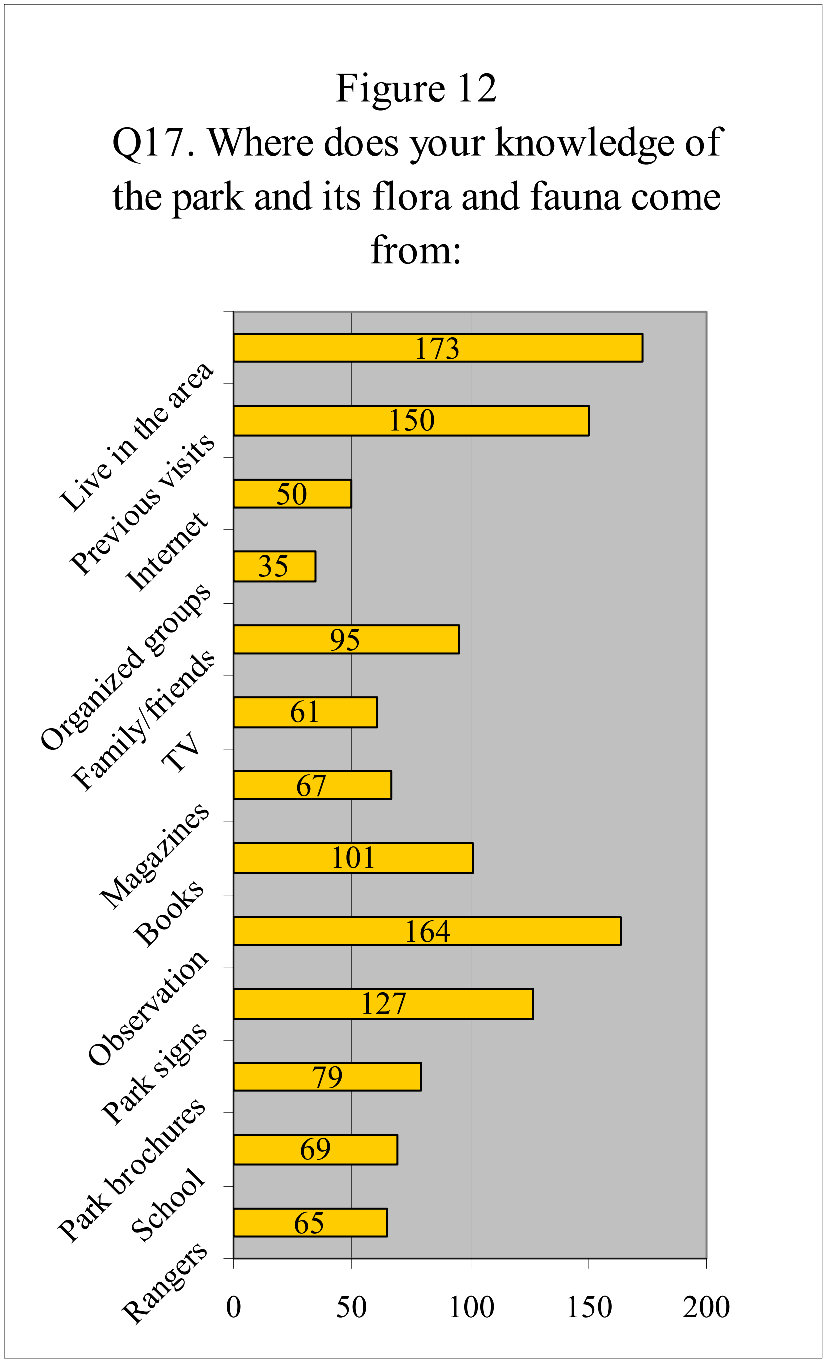
Trailhead has a higher percentage of users trying to return the park to natural conditions by way of management. It should be noted that chi square test showed no statistical significance for this cross tabulation (pearson chi square 0.324).

Table 21
Perceptions of park management by trailhead

			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
Q 16	Left alone	Count	15	44	13	25	16	113
		% of survey site	40.5%	35.5%	19.7%	32.9%	32.7%	32.1%
	Manage to natural conditions	Count	11	40	33	33	23	140
		% of survey site	29.7%	32.3%	50.0%	43.4%	46.9%	39.8%
	Manage to control	Count	10	33	16	15	7	81
		% of survey site	27.0%	26.6%	24.2%	19.7%	14.3%	23.0%
	Manage to please	Count	1	7	4	3	3	18
		% of survey site	2.7%	5.6%	6.1%	3.9%	6.1%	5.1%
Total		Count	37	124	66	76	49	352
		% of survey site	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Sources of knowledge

In question 17 we intended to find out what are the main sources from which park users obtain information about the park and its flora and fauna. This type of information can be a valuable tool for park management. Here we will describe the results from question 17 and analyze them with information from demographic statistics.



The main sources of information come from direct experience, either from the park users or from their peers. Living in the area, observation, and previous visits are, respectively, the three main sources of knowledge. Park signs seem to be the most effective institutional sources of information, brochures, and rangers come after. Printed information in the form of books and magazines are sources of information for 25% and 19% of park users respectively. In table 22 (a to d) we present cross tabulation with demographics that showed significant association with sources of information. Table 22a shows that observation as source of information is related to age, the older the users the more they seem to consider observation as a valuable source of information about the park. Very similar results are obtained when we cross tabulate previous visits (table 22d). Magazines and organized groups are important sources of information only to those 71 + (Tables 22b and 22c).

Table 22a
Observation as source of information and Age

			Age					Total
			18 a 25	26 a 40	41 a 55	56 a 70	71+	
Observation	Yes	Count	15	44	72	24	7	162
		% within Age	27.8%	41.1%	57.1%	47.1%	77.8%	46.7%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.121(a)	4	.001

Table 22b
Magazines as source of information and Age

			Age					Total
			18 a 25	26 a 40	41 a 55	56 a 70	71+	
Magazines	Yes	Count	9	17	28	7	5	66
		% within mag.	16.7%	15.9%	22.2%	13.7%	55.6%	19.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.442(a)	4	.034

Table 22c
Organized groups as source of information and Age

			Age					Total
			18 a 25	26 a 40	41 a 55	56 a 70	71+	
Organized group	Yes	Count	4	8	12	6	4	34
		% within org group	7.4%	7.5%	9.5%	11.8%	44.4%	9.8%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.459(a)	4	.009

Table 22d Previous visits as source of information and Age								
			Age					**Total**
			18 a 25	**26 a 40**	**41 a 55**	**56 a 70**	**71+**	
Previous visits	**Yes**	**Count**	16	37	66	23	6	148
		% within prev visits	29.6%	34.6%	52.4%	45.1%	66.7%	42.7%

Chi square			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	13.717(a)	4	.008

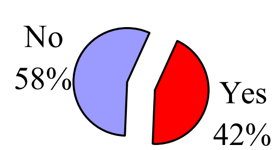
Trail use interactions

In this section we report the results of questions 18 to 21, which were intended to understand interactions between different trail users, perceptions of each other, and possible coping mechanisms already in effect in the park. Those interviewees who responded no to question 18 (Figure 13) did not complete questions 19 to 21. Moreover, not everyone who responded yes to question 18 had an opinion about every other user type, but they at least had an opinion about one user type. Therefore n in this case is low and it limits the statistical significance of chi square tests in cross tabulations between question 19 and other question. A total of 42% stated that the activities of other users affected, positively or negatively, their experience of the park. In Figure 14 we describe how park users describe the impact of other users on their experience. Results are discriminated by type of activity.

Opinions about dog walking and mountain biking where the most frequent. Mountain biking and dog walking, in that order, were also the activities that most negatively affected park users. Hikers are by far the group that most positively affected other users' experience.

The reasons why users reported their experience being negatively affected by other park users are presented in Figure 15. As stated, due to low number of respondents we cannot relate particular problems with particular activities.

Figure 13
Q18. Do the activities or behaviors of other trail users affect your experience at the park?



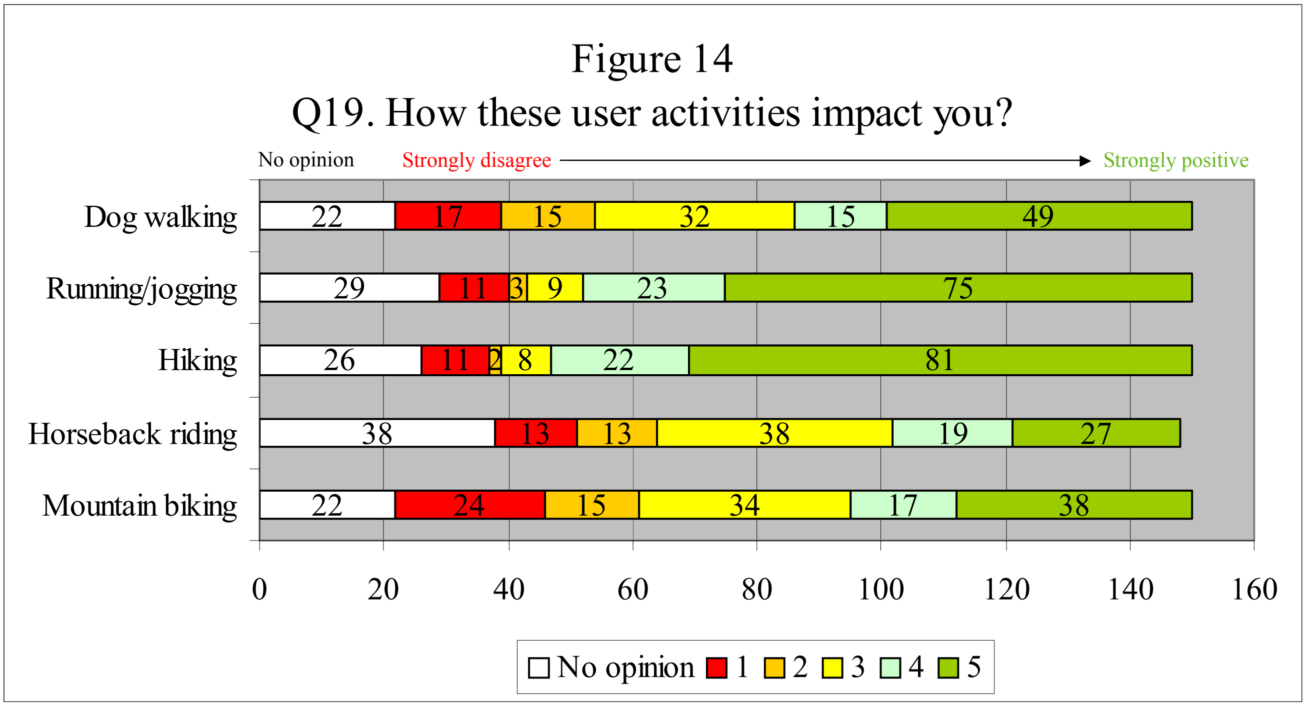


Figure 14
Q19. How these user activities impact you?
No opinion
Strongly disagree
Strongly positive
Dog walking
22
17
15
32
15
49
Running/jogging
29
11
3
9
23
75
Hiking
26
11
2
8
22
81
Horseback riding
38
13
13
38
19
27
Mountain biking
22
24
15
34
17
38
0
20
40
60
80
100
120
140
160
No opinion
1
2
3
4
5

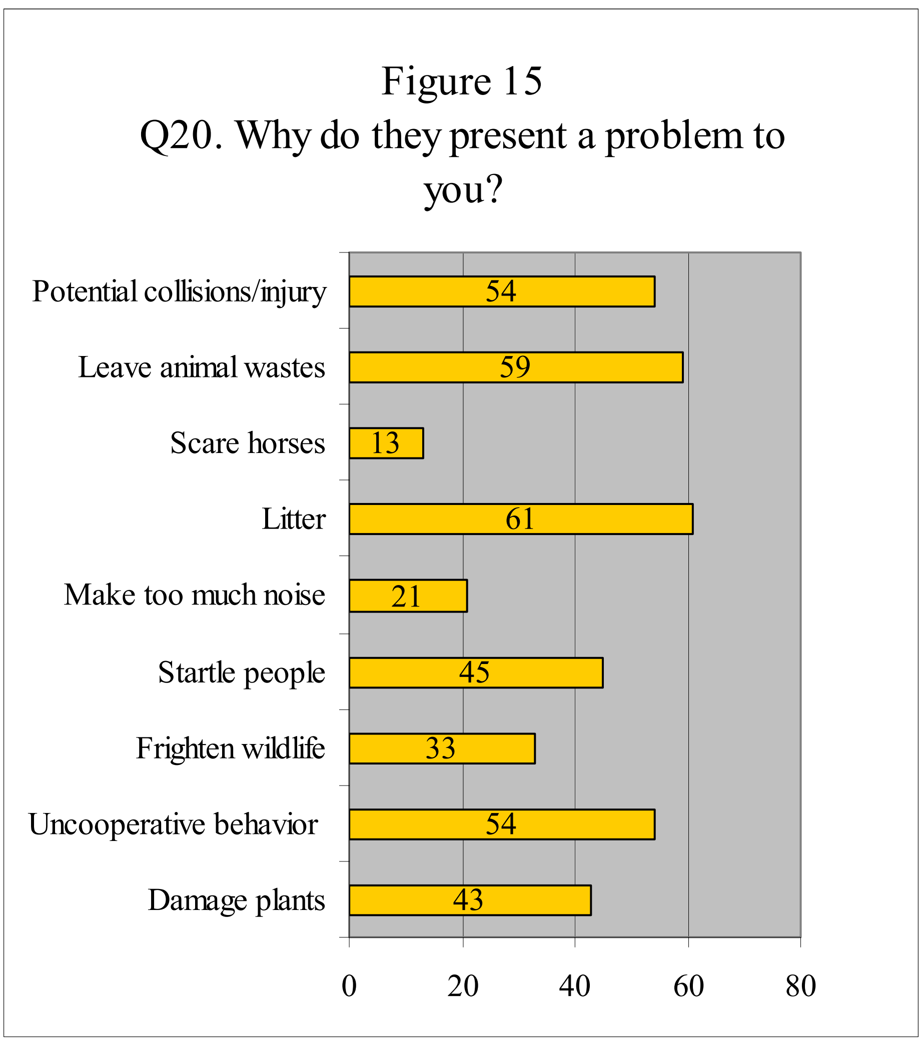


Figure 15
Q20. Why do they present a problem to you?
Potential collisions/injury
54
Leave animal wastes
59
Scare horses
13
Litter
61
Make too much noise
21
Startle people
45
Frighten wildlife
33
Uncooperative behavior
54
Damage plants
43
0
20
40
60
80

However, it is likely that "potential collisions" is a cause of friction between other users and mountain bikers and mountain bikers and other users. Following the same reasoning we can expect that "leave animal wastes" is related to dog walking users and scare horses comes from horseback riders. In this last case, 13 responses is significantly high if we consider that 10 users reported visiting the park to participate in horseback riding as an activity (Figure 2). Litter is the major source of complaint towards other users' activities with uncooperative behavior coming next. In terms of conflicts per trailhead, tables 23 and 24 show significant relations with startle at people and uncooperative behavior.

Table 23
Question 20 and trailhead

			Survey site					
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	Total
Q_20 Startle at people	No	Count	12	44	18	20	7	101
		% of trailhead	85.7%	78.6%	64.3%	71.4%	35.0%	69.2%
	Yes	Count	2	12	10	8	13	45
		% of trailhead	14.3%	21.4%	35.7%	28.6%	65.0%	30.8%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi square	15.451(a)	4	.004
Likelihood Ratio	14.784	4	.005
Linear-by-Linear Association	11.223	1	.001
N of Valid Cases	146		

a 1 cells (10.0%) have an expected count less than 5. The minimum expected count is 4.32.

Table 24
Question 20 and trailhead

			Survey site					
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	Total
Q_20 Bad behavior	No	Count	11	41	15	16	9	92
		% of trailhead	78.6%	73.2%	53.6%	57.1%	45.0%	63.0%
	Yes	Count	3	15	13	12	11	54
		% of trailhead	21.4%	26.8%	46.4%	42.9%	55.0%	37.0%

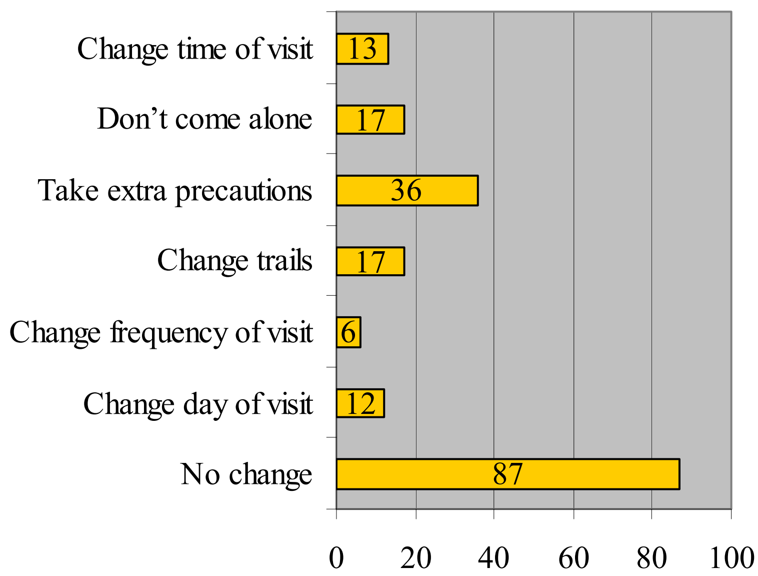
Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi square	8.224(a)	4	.084
Likelihood Ratio	8.319	4	.081
Linear-by-Linear Association	6.988	1	.008
N of Valid Cases	146		

a 0 cells (0.0%) have an expected count less than 5. The minimum expected count is 5.18.

In terms of coping behaviors due to other activities affecting the enjoyment of the park, we found that around 40% of those who answered yes to question 18, or about 15% of park users, have altered the way they use the park due to other users' behavior (Figure 16). The most frequent coping mechanism has been "taking extra precautions", but a few users have reportedly changed the day or time of visits or stopped coming alone.

Figure 16
Q21. In order to avoid any of the trail users mentioned above, have you altered your use of the park?



Transportation

Transportation to trailheads usually is not done from great distances. In all trailheads but Turnbull Canyon 4 or 5 zip codes provided by users are local and amount to more than 65% of the traffic. However, transportation is still mostly by private vehicle, mainly car (75%). Almost 10% travel to the park by bicycle and 14% walk or jog to the park. It is interesting to note that there is a strong relation between trailhead and type of transportation used to get to the park. As table 25 shows, most of those that walk or jog to the park use either Hacienda Hills Trailhead (46% of that trailhead users), or Hellman Park, and almost 80% of those that bike to the park use Turnbull Canyon as a trailhead, compromising 23% of Turnbull Canyon users. As expected, only Powder Canyon receives users that travel by horse.

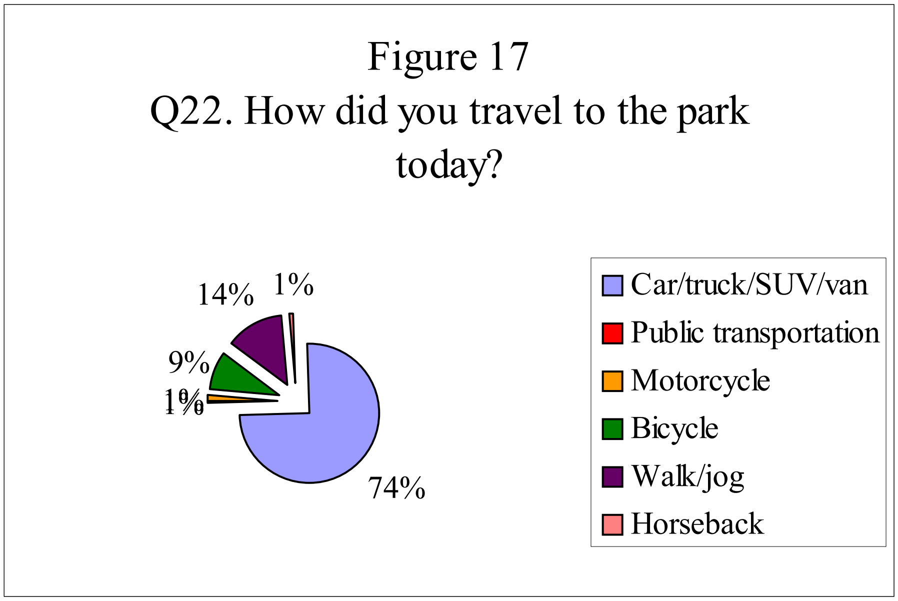


Table 25
Means of transportation to the park by trailhead

			Survey site					
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	Total
Q_22	Car/truck SUV/van	Count	34	88	33	76	35	266
		% of trailhead	91.9%	71.0%	49.3%	96.2%	68.6%	74.3%
	Pulic trans-portation	Count	0	0	0	0	2	2
		% of trailhead	.0%	.0%	.0%	.0%	3.9%	.6%
	Motorcycle	Count	0	0	3	0	1	4
		% of trailhead	.0%	.0%	4.5%	.0%	2.0%	1.1%
	Bicycle	Count	0	28	0	1	4	33
		% of trailhead	.0%	22.6%	.0%	1.3%	7.8%	9.2%
	Walk/jog	Count	0	8	31	2	9	50
		% of trailhead	.0%	6.5%	46.3%	2.5%	17.6%	14.0%
	Horseback	Count	3	0	0	0	0	3
		% of trailhead	8.1%	.0%	.0%	.0%	.0%	.8%
Total		Count	37	124	67	79	51	358
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	167.807(a)	20	.000
Likelihood Ratio	147.999	20	.000
Linear-by-Linear Association	.222	1	.637
N of Valid Cases	358		

a 7 cells (46.7%) have expected count less than 5. The minimum expected count is .07.

Demographics

In this section we present demographic data from questions 25 to 33. We first introduce descriptive statistics for each question and then describe with cross tabulation some of the other variables from the survey we have found that are related to demographic variables.

Age

In Figure 18 we present age data from question 25. From a comparison with table 26 we can conclude that besides an overrepresentation of age group 41-55, we where able to capture adequate numbers of surveys from each group age. In order to obtain more reliable information from the group age 71+ we should had performed a stratified sample. Following we present cross tabulations between age and other variables that have been found related to this variable.

Figure 18
Q25. Age

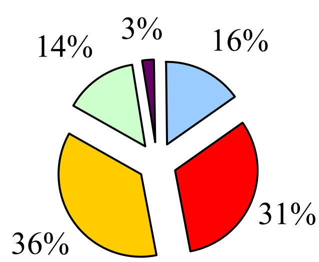


Table 26 User count – Age results		
Age	**Count**	**%**
18-25	176	19.28
26-40	268	29.35
41-55	194	21.25
56-70	110	12.05
71+	10	1.10

Table 27 shows that selection of trail based on safety progressively goes up with, reaching a peak of 50% for users age 71+. Safety, as we shall see in the gender section is also an important factor at the time of weighting safety into trail selection.

Table 28 below shows a similar tendency as table 27. The older the users the greater chances they will choose a trail due to the scenic beauty of it.

Table 27
Security as reason to choose trail and age

			Age					Total
			18 a 25	26 a 40	41 a 55	56 a 70	71+	
Safety	No	Count	45	94	96	38	4	277
		% within Age	83.3%	87.0%	76.2%	74.5%	50.0%	79.8%
	Yes	Count	9	14	30	13	4	70
		% within Age	16.7%	13.0%	23.8%	25.5%	50.0%	20.2%
Total		Count	54	108	126	51	8	347
		% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.248(a)	4	.036
Likelihood Ratio	9.661	4	.047
Linear-by-Linear Association	6.556	1	.010
N of Valid Cases	347		

a 1 cells (10.0%) have expected count less than 5. The minimum expected count is 1.61.

Table 28
Scenic trail as reason to choose trail and age

			Age					Total
			18 a 25	26 a 40	41 a 55	56 a 70	71+	
Scenic	No	Count	33	66	71	19	1	190
		% within Age	61.1%	61.1%	56.3%	37.3%	12.5%	54.8%
	Yes	Count	21	42	55	32	7	157
		% within Age	38.9%	38.9%	43.7%	62.7%	87.5%	45.2%
Total		Count	54	54	108	126	51	8
		% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.841(a)	4	.005
Likelihood Ratio	15.374	4	.004
Linear-by-Linear Association	10.152	1	.001
N of Valid Cases	347		

a 2 cells (20.0%) have expected count less than 5. The minimum expected count is 3.62.

Gender

There is a large gender imbalance in use of the park, 70% of park visitors are males and only 30% females (Figure 19). Although it is unlikely the data will show the reasons behind this gender disparity – it is out of its scope – gender is one of the variables that relates to most other non-demographic variables. Information on this regard is presented on tables 29a to 33.

Figure 19
Q26. Gender

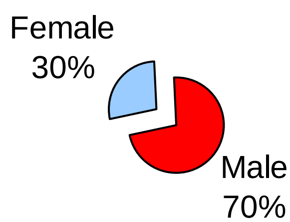


Table 29a
Perceptions of park management by gender

			Gender		Total
			Male	Female	
Q 16	Left alone	Count	91	21	112
		% within gender	37.0%	20.6%	32.2%
	Manage to natural conditions	Count	82	55	137
		% within gender	33.3%	53.9%	39.4%
	Manage to control	Count	59	22	81
		% within gender	24.0%	21.6%	23.3%
	Manage to please	Count	14	4	18
		% within gender	5.7%	3.9%	5.2%
Total		Count	37	246	102
		% of gender	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.409(a)	3	.002
Likelihood Ratio	14.537	3	.002
Linear-by-Linear Association	1.031	1	.310
N of Valid Cases	348		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.28

Table 29b Agreement to recreation higher than conservation by gender					
			Gender		Total
			Male	Female	
Q15_D	1	Count	58	40	98
		% within gender	23.4%	38.5%	27.8%
	2	Count	57	24	81
		% within gender	23.0%	23.1%	23.0%
	3	Count	94	24	118
		% within gender	37.9%	23.1%	33.5%
	4	Count	24	9	33
		% within gender	9.7%	8.7%	9.4%
	5	Count	15	7	22
		% within gender	6.0%	6.7%	6.3%
Total		Count	248	104	352
		% within gender	100.0%	100.0%	100.0%

Chi square			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.922(a)	4	.027
Likelihood Ratio	10.934	4	.027
Linear-by-Linear Association	4.787	1	.029
N of Valid Cases	352		
a 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.50.			

Table 29a shows that perceptions of park management are influenced by gender. Of particular interest from the results shown in table 29a is the fact that although around 70% of males and females believe the park should return to natural conditions, males want to do it by leaving nature alone and females by managing it. On the same vein, females and males both reject the proposition “recreation should be a higher priority than wildlife conservation” in question 15D, however, as shown in table 29b, females disapproval is stronger.

Tables 30a to 30c refer to the relation between gender and question 4 variables – activities involved in at the park. Table 30a shows the association between gender and hiking. 77% of females go hiking to the park while 57% of males answered they do so.

Table 30b shows that there is a larger proportion of females walking dogs.

Table 30c highlights how low women’s involvement in biking is in the park. 93% of females do not engage in biking while visiting the park, against 61% of men. This might be one of the reasons why, as shown in table 31, males have better perception of mountain biking than women do.

Table 30a Question 4, hiking activity and Gender					
			Gender		Total
			Male	Female	
Q4_HIKING	No	Count	108	24	132
		% within gender	42.7%	22.6%	36.8%
	Yes	Count	145	82	227
		% within gender	57.3%	77.4%	63.2%
Total		Count	253	106	359
		% within gender	100.0%	100.0%	100.0%

Chi square			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.912(b)	1	.000
Likelihood Ratio	13.536	1	.000
N of Valid Cases	359		
a Computed only for a 2x2 table			
b 0 cells (.0%) have expected count less than 5. The minimum expected count is 38.97.			

Table 30b Question 4, walking dog activity and Gender					
			Gender		Total
			Male	Female	
Q4_WALKING DOG	No	Count	213	78	291
		% within gender	84.2%	73.6%	81.1%
	Yes	Count	40	28	68
		% within gender	15.8%	26.4%	18.9%
Total		Count	253	253	106
		% within gender	100.0%	100.0%	100.0%

Chi square			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.472(b)	1	.019
Likelihood Ratio	5.225	1	.022
N of Valid Cases	359		
a Computed only for a 2x2 table			
b 0 cells (.0%) have expected count less than 5. The minimum expected count is 20.08.			

Table 30c
Question 4, biking activity and Gender

			Gender		Total
			Male	Female	
Q4_BIKING	No	Count	154	99	253
		% within gender	61.1%	93.4%	70.7%
	Yes	Count	98	7	105
		% within gender	38.9%	6.6%	29.3%
Total		Count	253	252	106
		% within gender	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	37.522(b)	1	.000
Likelihood Ratio	44.865	1	.000
N of Valid Cases	358		

a Computed only for a 2x2 table

b 0 cells (.0%) have expected count less than 5. The minimum expected count is 31.09.

Table 31
Perceptions of mountain biking according to gender

			Gender		Total
			Male	Female	
Q_19 MTNBIKE	0	Count	16	6	22
		% within gender	15.5%	13.3%	14.9%
	1	Count	16	7	23
		% within gender	15.5%	15.6%	15.5%
	2	Count	4	11	15
		% within gender	3.9%	24.4%	10.1%
	3	Count	25	9	34
		% within gender	24.3%	20.0%	23.0%
	4	Count	13	3	16
		% within gender	12.6%	6.7%	10.8%
	5	Count	29	9	38
		% within gender	28.2%	20.0%	25.7%
Total		Count	103	45	148
		% within gender	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.252(a)	5	.009
Likelihood Ratio	14.030	5	.015
Linear-by-Linear Association	1.303	1	.254
N of Valid Cases	148		

a 2 cells (16.7%) have expected count less than 5. The minimum expected count is 4.56.

Table 32 presents information on perceived un-safety of the park. as expected perception of safety is strongly related to gender. More women than men responded that violence makes them feel unsafe in the park – 36% of women responded yes to violence as a factor of un-safety in the park and only 17% of men.

Table 32
Perception of violence and gender

			Gender		Total
			Male	**Female**	
VIOLENCE	**No**	**Count**	204	67	271
		% within gender	83.3%	63.8%	77.4%
	Yes	**Count**	41	38	79
		% within gender	16.7%	36.2%	22.6%
Total		**Count**	245	105	350
		% within gender	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.919(b)	1	.000
Likelihood Ratio	15.075	1	.000
Linear-by-Linear Association	15.874	1	.000
N of Valid Cases	350		

a Computed only for a 2x2 table

b 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.70.

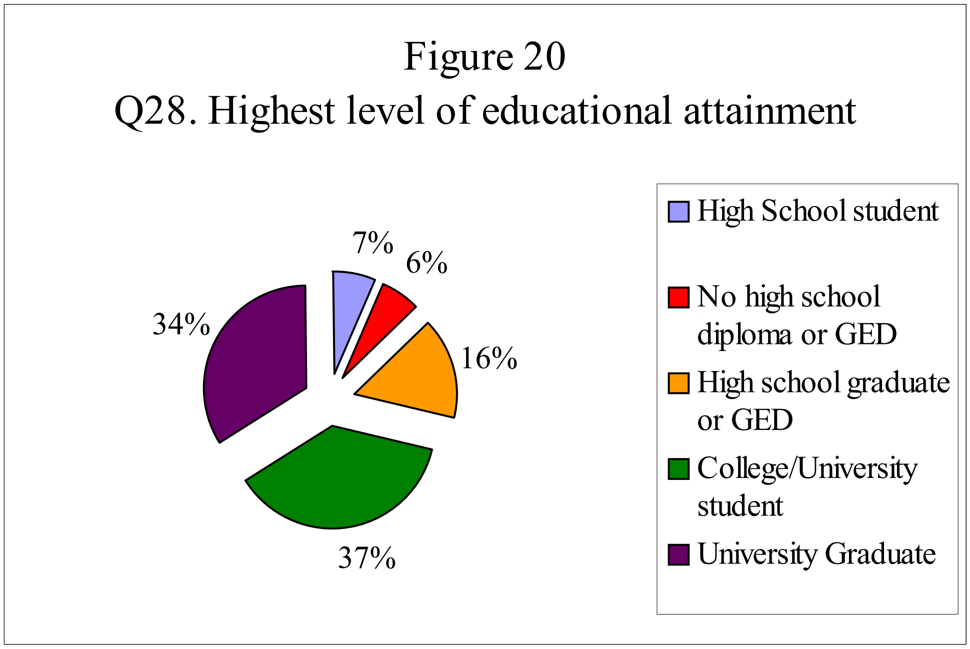
Table 33 Survey sites and distribution of gender					
			Gender		Total
			Male	Female	
Survey site	Powder Canyon	Count	25	12	37
		% within gender	9.9%	11.3%	10.3%
	Turnbull Canyon	Count	108	17	125
		% within gender	42.7%	16.0%	34.8%
	Hacienda Hills Trailhead	Count	37	30	67
		% within gender	14.6%	28.3%	18.7%
	Arroyo Pescadero	Count	50	29	79
		% within gender	19.8%	27.4%	22.0%
	Hellman Park	Count	33	18	51
		% within gender	13.0%	17.0%	14.2%
Total		Count	253	106	359
		% within gender	100.0%	100.0%	100.0%

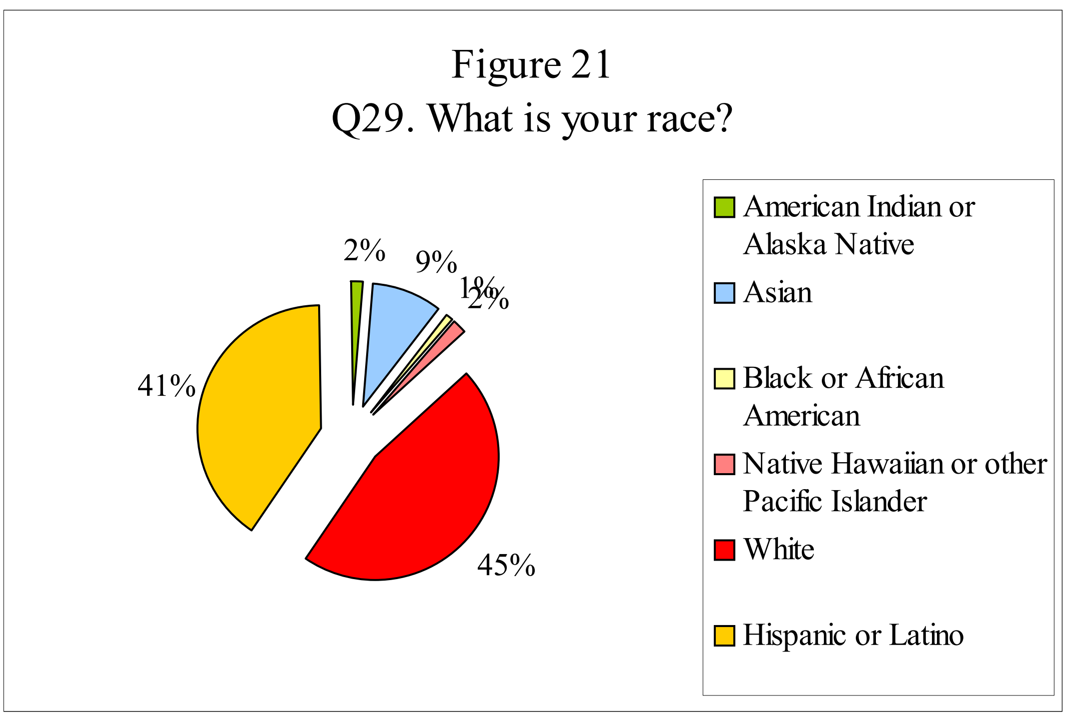
Chi square			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.649(a)	4	.000
Likelihood Ratio	27.406	4	.000
Linear-by-Linear Association	7.419	1	.006
N of Valid Cases	359		
a 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.92.			

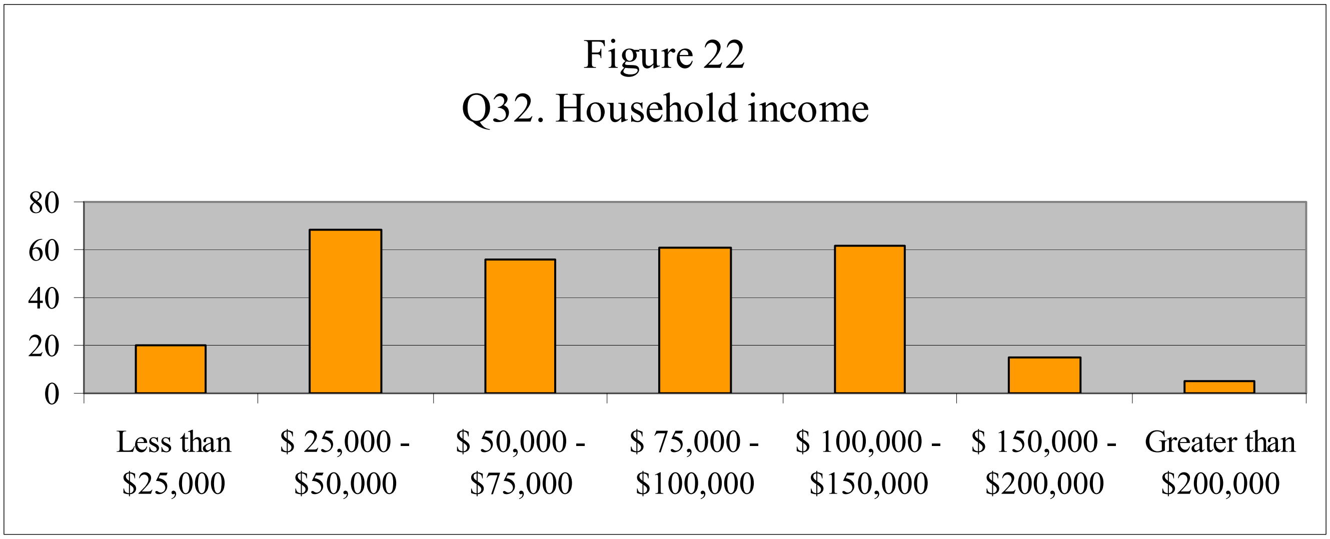
In terms of visits to different trailheads, Turnbull Canyon concentrates male population while Hacienda Hills Trailhead and Arroyo Pescadero concentrate female population (table 33). The concentration of males in Turnbull Canyon is likely related to the high mountain bike activity in that entrance.

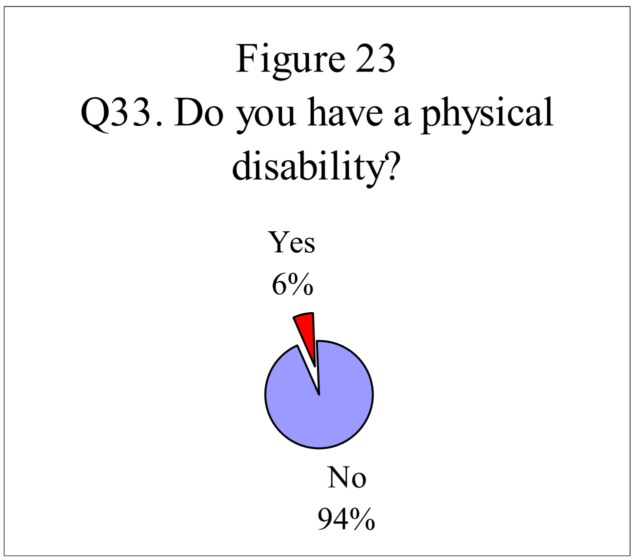
Education, race and income

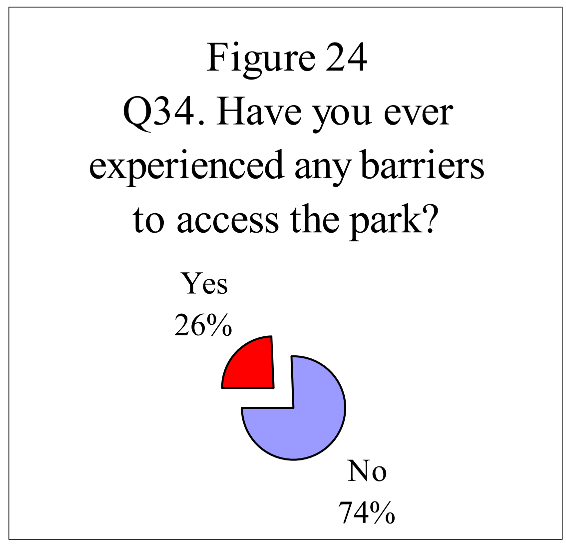
The final 3 demographic questions refer to education, race, and income. They are described in Figures 20 to 22. Their relation to other variables has been described with those variables above, or will be described below in the section devoted to a per trailhead analysis.











Physical disability

Figure 23 shows question 33, regarding physical disability – 6% of park users report having a physical disability. Crosstabulations don't show relation between physical disability and experienced barriers to enter the park (question 34), however, because 6% of the total n is low we can infer statistical significance.

Analysis per trailhead

In this section we present tables and Figures related to found differences between trailheads. They refer to differences in users demographics, perceptions, or activities. Some of these aspects have been already developed above, and some are of particular interest for analysis between trailheads in this section.

Q3 Why did you choose to visit the park today?

The order in the percentages of people choosing parks for solitude is very similar to the number of users per counted per park, that is, from low to high, Powder Canyon, Hellman Park, Hacienda Hills Trailhead, Arroyo Pescadero and Turnbull Canyon. Powder Canyon and Hellman Park are the trailheads more used by people who have solitude as one of the reasons for visiting the park.

Table 34 Response "fewer people" to question 3 by trailhead									
			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
Q3_FEWER PEOPLE	No	Count	19	94	51	60	32	256
		% of trailhead	51.4%	74.0%	70.8%	73.2%	60.4%	69.0%
	Yes	Count	18	33	21	22	21	115
		% of trailhead	48.6%	26.0%	29.2%	26.8%	39.6%	31.0%
Total		Count	37	127	72	82	53	371
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.504(a)	4	.050
Likelihood Ratio	9.104	4	.059
Linear-by-Linear Association	.008	1	.930
N of Valid Cases	371		
a 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.47			

When it comes to adventure sports Turnbull Canyon is by far the most popular site, this is quite likely related to mountain biking activity in this trailhead. On the other hand, Arroyo Pescadero is the least visited by users willing to engage in adventure sports. As we shall see in table 42 below, Turnbull Canyon is the trailhead with more mountain bikers and Arroyo Pescadero the one with less.

From the results on table 36 it can be inferred that there is a relationship between trailhead selection and educating children about nature as the reason for visiting the park. Hacienda Hills Trailhead is the trailhead with most visitors using the park for such reason. If we had interviewed minors, we would have had to take such numbers with some caution. A group such as a class of 10-15 visiting the area for educational purposes would have been enough to place Hacienda Hills Trailhead so high and influence the significance of the Pearson chi square results.

Table 35 Response "adventure sports" to question 3 by trailhead									
			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
Q3_SPORT	No	Count	29	71	63	76	38	277
		% of trailhead	78.4%	56.3%	87.5%	92.7%	71.7%	74.9%
	Yes	Count	8	55	9	6	15	93
		% of trailhead	21.6%	43.7%	12.5%	7.3%	28.3%	25.1%
Total		Count	37	126	72	82	53	370
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	43.424(a)	4	.000
Likelihood Ratio	45.616	4	.000
Linear-by-Linear Association	9.552	1	.002
N of Valid Cases	370		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.30

Table 36 Response "educate children about nature" to question 3 by trailhead									
			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
Q3_EDUCATE	No	Count	35	114	54	73	47	323
		% of trailhead	94.6%	91.2%	75.0%	89.0%	88.7%	87.5%
	Yes	Count	2	11	18	9	6	46
		% of trailhead	5.4%	8.8%	25.0%	11.0%	11.3%	12.5%
Total		Count	37	37	125	72	82	53
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.826(a)	4	.008
Likelihood Ratio	12.380	4	.015
Linear-by-Linear Association	.876	1	.349
N of Valid Cases	369		

a 1 cells (10%) have expected count less than 5. The minimum expected count is 4.61

Table 37 shows that Powder Canyon and Arroyo Pescadero are the preferred trailheads of those who visit the park to see/hear wildlife. Although the numbers in Turnbull Canyon, Hacienda Hills Trailhead and Hellman Park are a bit lower (around 35-40%), these are still large percentages of people whose reason to visit the park is to interact with wildlife.

Table 37
Response "see/hear wildlife" to question 3 by trailhead

			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
Q3_WILDLIFE	No	Count	16	82	44	40	32	214
		% of trailhead	43.2%	64.6%	61.1%	48.8%	60.4%	57.7%
	Yes	Count	21	45	28	42	21	157
		% of trailhead	56.8%	35.4%	38.9%	51.2%	39.6%	42.3%
Total		Count	37	37	127	72	82	53
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.826(a)	4	.008
Likelihood Ratio	12.380	4	.015
Linear-by-Linear Association	.876	1	.349
N of Valid Cases	369		

a 1 cells (10%) have expected count less than 5. The minimum expected count is 4.61

Q4 Which activities did you engage in today?

Results of question 4 show that type of activity is one of the variables that most influences trailhead selection. From the 8 options provided, 6 show statistically significant relations with trailhead (Pearson 0.019 being the lowest).

Powder Canyon and Arroyo Pescadero have the highest percentage of users responding they visit the park to enjoy scenic beauty, these are the same trailheads to which people go in order to see/hear wildlife. Turnbull Canyon ranks the lowest in terms of visitors using the trailhead to enjoy scenic beauty.

Dog walkers are more evenly distributed than other activities described here, however, Powder Canyon and Hacienda Hills Trailhead have the highest percentage of them. Interestingly, although Arroyo Pescadero is the park with the highest percentage of hikers it does not rank as high as Powder Canyon and Hacienda Hills Trailhead, it is however the park most preferred by those choosing it for scenic reasons.

Table 38
Response "Hiking" to question 4 by trailhead

			Survey site					
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	Total
Q4_HIKING	No	Count	13	74	16	14	19	136
		% of trailhead	35.1%	58.3%	22.2%	17.1%	35.8%	36.7%
	Yes	Count	24	53	56	68	34	235
		% of trailhead	64.9%	41.7%	77.8%	82.9%	64.2%	63.3%
Total		Count	37	37	127	72	82	53
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	45.600(a)	4	.000
Likelihood Ratio	46.628	4	.000
Linear-by-Linear Association	14.121	1	.000
N of Valid Cases	371		

a 1 cells (10%) have expected count less than 5. The minimum expected count is 13.56

Table 39
Response "Jogging" to question 4 by trailhead

			Survey site					
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	Total
Q4_JOGGING	No	Count	36	93	53	58	35	275
		% of trailhead	97.3%	73.2%	73.6%	70.7%	66.0%	74.1%
	Yes	Count	1	34	19	24	18	96
		% of trailhead	2.7%	26.8%	26.4%	29.3%	34.0%	25.9%
Total		Count	37	37	127	72	82	53
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.721(a)	4	.013
Likelihood Ratio	17.313	4	.002
Linear-by-Linear Association	6.848	1	.009
N of Valid Cases	371		

a 1 cells (10%) have expected count less than 5. The minimum expected count is 9.57

Table 40 Response "enjoy scenic beauty" to question 4 by trailhead								
			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
Q4_SCENIC	No	Count	21	108	44	39	32	244
		% of trailhead	56.8%	85.0%	61.1%	47.6%	60.4%	65.8%
	Yes	Count	16	19	28	43	21	127
		% of trailhead	43.2%	15.0%	38.9%	52.4%	39.6%	34.2%
Total		Count	37	37	127	72	82	53
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	35.736(a)	4	.000
Likelihood Ratio	38.088	4	.000
Linear-by-Linear Association	11.519	1	.001
N of Valid Cases	371		
a 1 cells (10%) have expected count less than 5. The minimum expected count is 9.57			

Table 41 Response "walking dog" to question 4 by trailhead								
			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
Q4_WALK DOG	No	Count	26	108	51	65	48	298
		% of trailhead	70.3%	85.0%	70.8%	79.3%	90.6%	80.3%
	Yes	Count	11	19	21	17	5	73
		% of trailhead	29.7%	15.0%	29.2%	20.7%	9.4%	19.7%
Total		Count	37	37	127	72	82	53
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.832(a)	4	.019
Likelihood Ratio	11.972	4	.018
Linear-by-Linear Association	1.453	1	.228
N of Valid Cases	371		
a 1 cells (10%) have expected count less than 5. The minimum expected count is 7.28			

Table 42 shows that Hellman Park stands out as a trailhead used by photographers, however, taking into consideration the warnings made for table 35, we must state that one group of photographers using the trailhead and answering the surveys might have been enough to show this significance.

Table 42
Response "photographing" to question 4 by trailhead

			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
Q4_PHOTO	No	Count	33	119	69	80	43	344
		% of trailhead	89.2%	93.7%	95.8%	97.6%	81.1%	92.7%
	Yes	Count	4	8	3	2	10	27
		% of trailhead	10.8%	6.3%	4.2%	2.4%	18.9%	7.3%
Total		Count	37	37	127	72	82	53
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.293(a)	4	.004
Likelihood Ratio	13.333	4	.010
Linear-by-Linear Association	1.254	1	.263
N of Valid Cases	371		

a 2 cells (20%) have expected count less than 5. The minimum expected count is 2.69

Table 43
Response "bicycle riding" to question 4 by trailhead

			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
Q4_BIKE	No	Count	29	50	66	78	39	262
		% of trailhead	78.4%	39.4%	91.7%	96.3%	73.6%	70.8%
	Yes	Count	8	77	6	3	14	108
		% of trailhead	21.6%	60.6%	8.3%	3.7%	26.4%	29.2%
Total		Count	37	37	127	72	81	53
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	102.567(a)	4	.000
Likelihood Ratio	109.764	4	.000
Linear-by-Linear Association	28.518	1	.000
N of Valid Cases	370		

a 0 cells (0%) have expected count less than 5. The minimum expected count is 10.80

Table 43 confirms what is already evident, that Turnbull Canyon is the main trailhead used by bikers. Hellman Park and Powder Canyon also have an important percentage of bikers (around 25%), but are far from the 60% shown for Turnbull Canyon. Arroyo Pescadero and Hacienda Hills Trailhead are seldom used by bikers.

Figures 25 to 29 show each trailhead users' opinion about different management options. Support for ranger lead hikes is particularly high in Hacienda Hills Trailhead and similarly lower in Powder Canyon and Arroyo Pescadero. Temporary and permanent closures also receive a relatively high support in Hacienda Hills Trailhead, and a particularly high opposition to permanent closures is found in Turnbull Canyon and Hellman Park.

Figure 25
HACIENDA Management Options

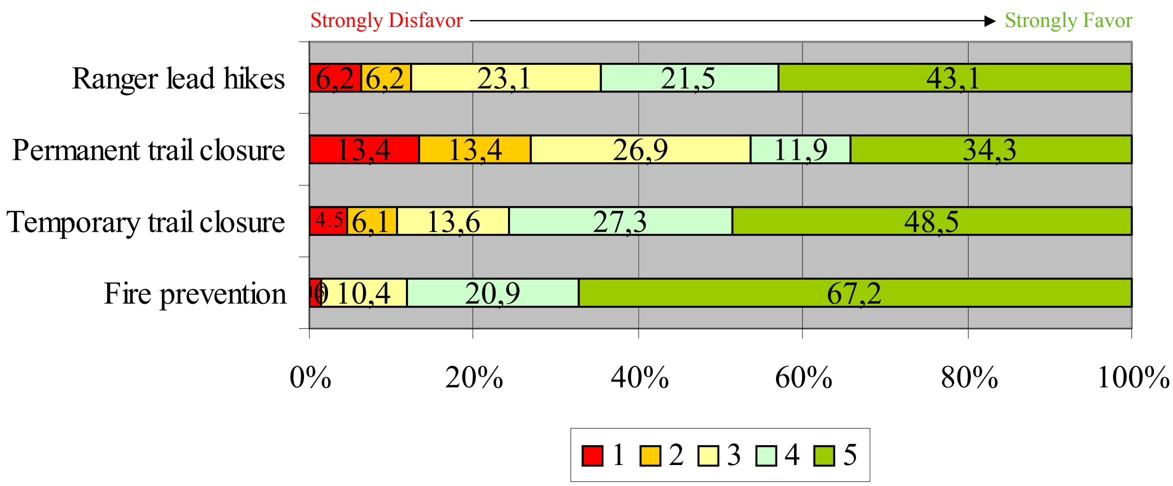
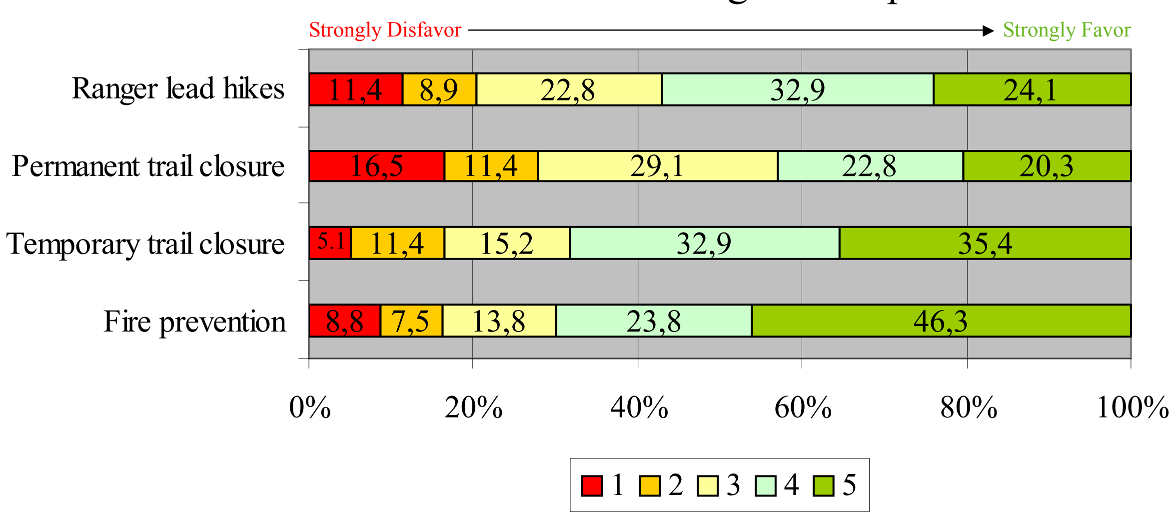


Figure 26
ARROYO PESCADERO Management Options



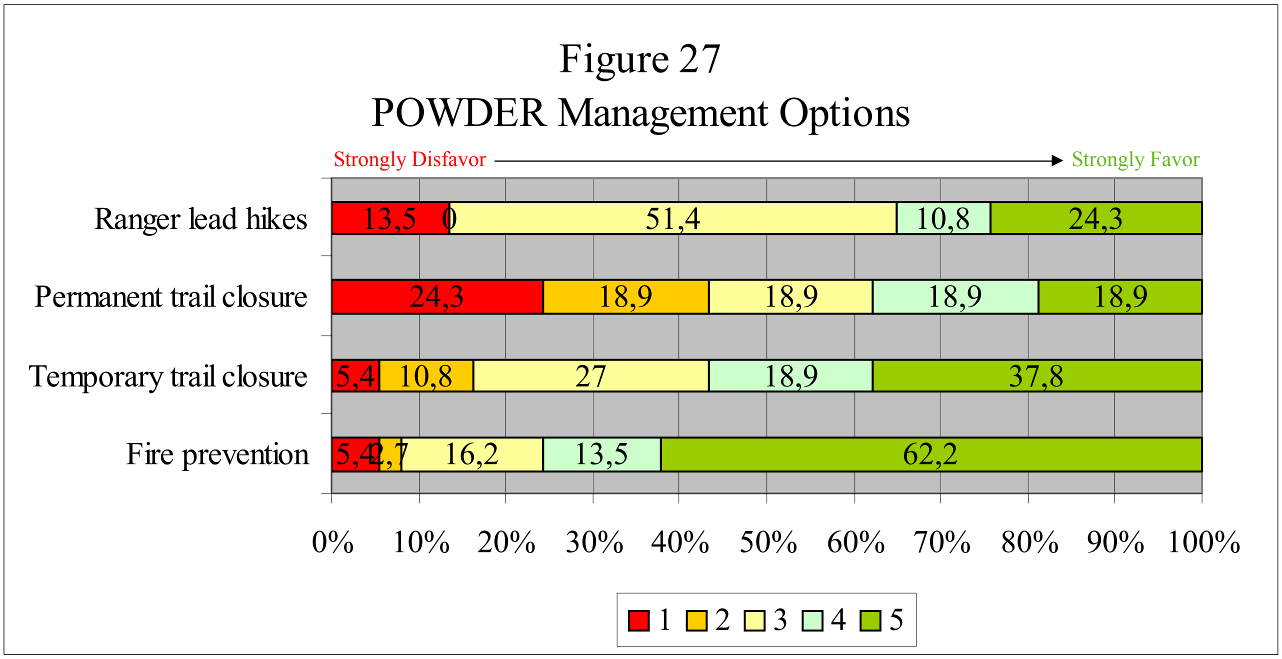


Figure 27
POWDER Management Options
Strongly Disfavor
Strongly Favor
Ranger lead hikes
Permanent trail closure
Temporary trail closure
Fire prevention
13,5
0
51,4
10,8
24,3
24,3
18,9
18,9
18,9
18,9
5,4
10,8
27
18,9
37,8
5,4
2,7
16,2
13,5
62,2
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70%
80%
90%
100%
1
2
3
4
5

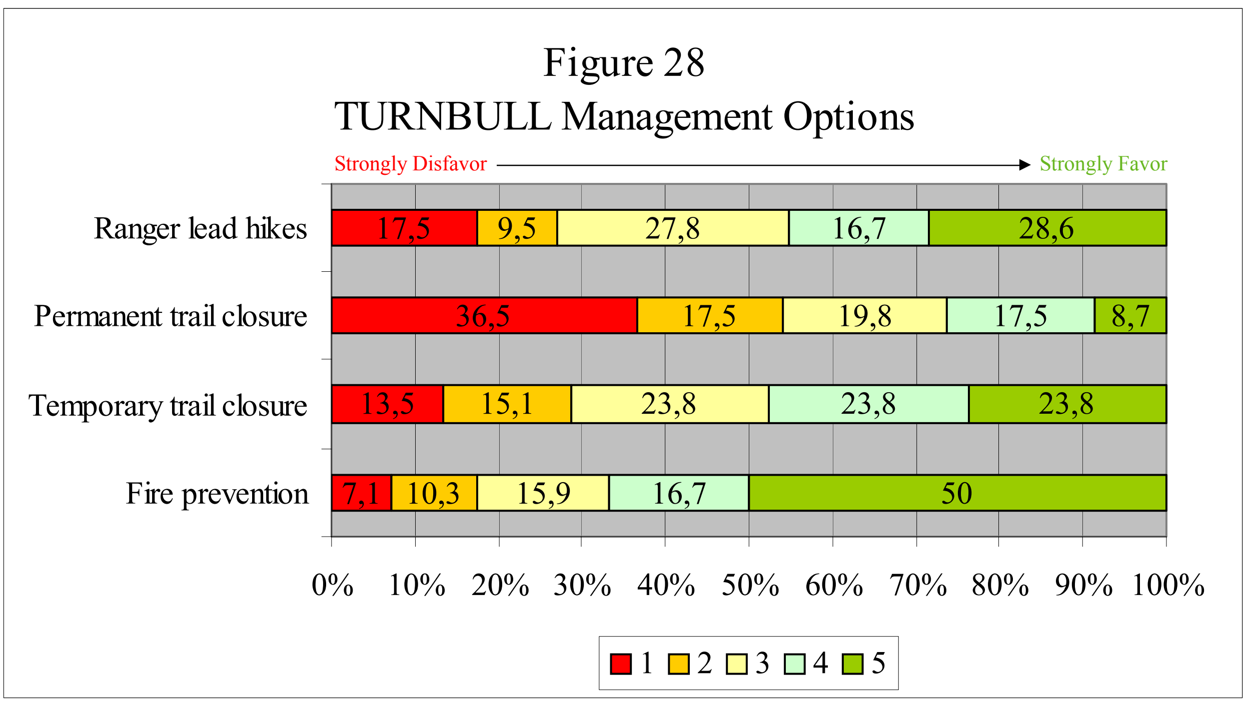
Figure 28
TURNBULL Management Options
Strongly Disfavor
Strongly Favor
Ranger lead hikes
Permanent trail closure
Temporary trail closure
Fire prevention
17,5
9,5
27,8
16,7
28,6
36,5
17,5
19,8
17,5
8,7
13,5
15,1
23,8
23,8
23,8
7,1
10,3
15,9
16,7
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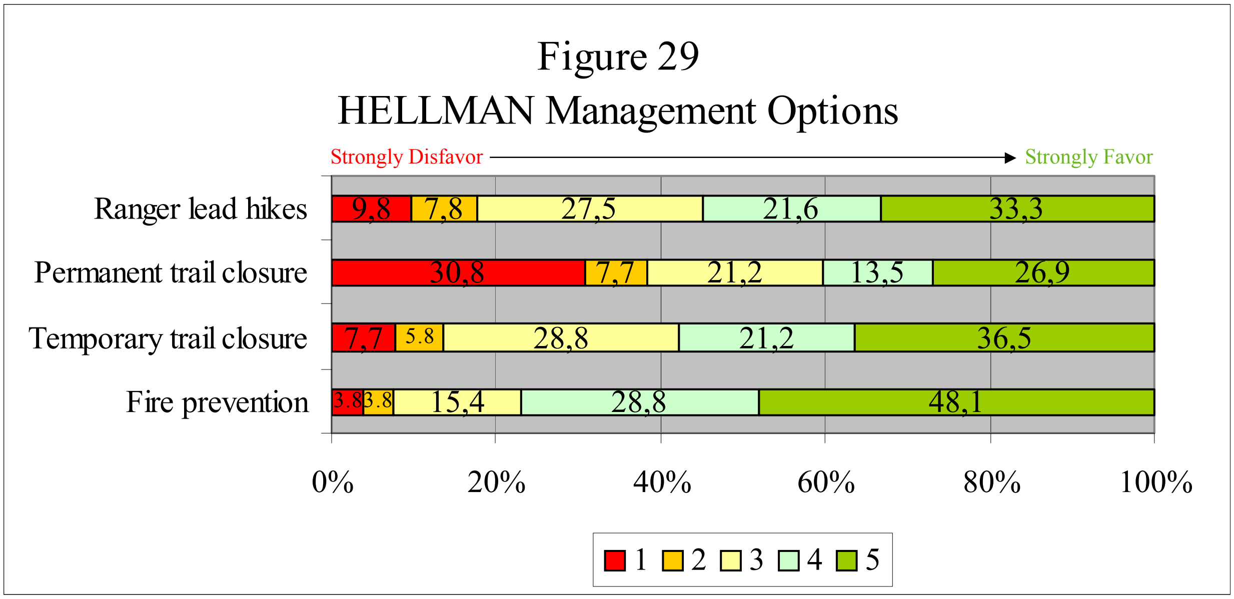
100%
1
2
3
4
5



Activities perception

In table 44 we analyze question 19 from a different perspective. The responses were given on a 1 to 5 scale, one being a strongly negative opinion on an activity and 5 a strongly positive one. We took the mean for each activity and the mean for each activity by trailhead.

Table 44
Mean perception of activities by trailhead

Activity	Survey site					All Park
	Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
Biking	2.6	3.5	2.7	2.0	2.1	2.8
Horseback Riding	3.2	2.4	2.8	2.3	2.0	2.5
Hiking	3.6	3.8	3.3	3.4	3.2	3.5
Jogging	3.5	3.7	3.1	3.2	3.1	3.4
Dog Walking	3.1	3.1	3.2	2.7	2.7	3.0
All Activities	3.2	3.3	3	2.7	2.6	3.0

Horseback riding is the least popular activity, even in trailheads in which we did not register any horseback riding activity. The only exception is Powder Canyon, where horseback riding is practiced more often and to an extent Hacienda Hills Trailhead. Biking is not a popular activity either, particularly in Arroyo Pescadero and Hellman Park. It is obviously popular in Turnbull Canyon were the majority of the users practice this activity. Even so, views of hiking and jogging are more positive than biking in Turnbull Canyon, and all other trailheads. Dog walking is right at the average with the other activities, it is only higher than the average in Hacienda

Hills Trailhead, where the major percentage of dog walkers concentrate (see table 40). Finally, Arroyo Pescadero and Hellman Park are the trailheads in which users have less positive perception of other activities, being .3 and .4 below the mean for all parks.

Rules

Table 45 shows the results of stated rules knowledge by trailhead. It is to be expected that not everyone that answered yes to question 12 actually knows the rules, but this table still provides an approximation to which trailhead users know more about park rules or even the existence of such rules. Almost 95% of Powder Canyon users state they know the rules, at the other extreme is Arroyo Pescadero with around 70% of its users stating knowledge of the rules.

Table 45
Rules knowledge by trailhead

			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
REGLAS	No	Count	2	24	15	20	11	72
		% of trailhead	5.6%	21.6%	23.8%	27.8%	23.9%	22.0%
	Yes	Count	34	87	48	51	35	255
		% of trailhead	94.4%	78.4%	76.2%	70.8%	76.1%	77.7%
Total		Count	36	111	63	72	46	328
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 46
Experienced barriers to access the park by trailhead

			Survey site					Total
			Powder Canyon	Turnbull Canyon Trailhead	Hacienda Hills	Arroyo Pescadero	Hellman Park	
DIFFICULT ACCESS	No	Count	20	99	52	50	33	254
		% of trailhead	57.1%	82.5%	80.0%	66.7%	71.7%	74.5%
	Yes	Count	15	21	13	25	13	87
		% of trailhead	42.9%	17.5%	20.0%	33.3%	28.3%	25.5%
Total		Count	35	120	65	75	46	341
		% of trailhead	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi square

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.231(a)	4	.010
Likelihood Ratio	12.906	4	.012
Linear-by-Linear Association	.349	1	.555
N of Valid Cases	341		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.93

Barriers

A quarter of park users stated they have experienced some barriers to access the park. In this case is of particular important to know the numbers by trailhead. Table 46 shows that more than 40% of Powder Canyon users, and more than 30% of Arroyo Pescadero users claim to have experienced barriers to access the park.

Conclusions and policy recommendations

Some of the results obtained with the survey and presented above can help guide communication between park managers and users, as well as assist in future decision making.

Results from opposition to temporary and permanent trail closures might open the door to "temporarily" trail closures for long periods of time until it ends up being a permanent closure. Although this measure is likely to receive less opposition from visitors, in the long term, support for needed real temporary closures might be hard to obtain. It is therefore recommended that trail closures are decided based on ecological data in conjunction with data on trail use and in consultation with users. This survey shows that a majority of visitors are interested in nature preservation, naturalness, sharing the park with wildlife, and don't consider that recreation should take priority over conservation, therefore convincing the public about trail closure is not necessarily an impossible task. If it becomes important to permanently close a particularly popular trail, it appears that fire prevention is one of the reasons users consider important and would oppose less to.

Support for management focused on conservation rather than on recreation is relatively high, and perceptions of wildlife would help support a type of management that puts wildlife first. Implementation is obviously a different story and a single incident of negative wildlife – human interaction can turn support to opposition. It is important to rely on these results not as a justification for management options but as tools to build policy and management options that will resonate with park users and therefore help in the education/participation process.

An example of what we stated in the previous paragraph can be built from the 32% support for "leaving nature alone" as a park management option. This percentage might drastically fall with the occurrence of one drastic wildfire. At the same time, the fact that 32% believe nature should be left alone does not mean that the same percentage will support closing most trails in order to do so. However, having this information allows us to build policy and outreach strategies that, taking this fact into account, will justify and negotiate the closure of important trails based on wildlife's best interest and natural processes conservation.

Figure 1 shows that an important number of people visit the park with reasons related to solitude (escape the city; experience fewer people, etc). This is a fact to bear in mind when planning trail closures that might intensify users' interactions.

As we saw in tables 14a to 14c, younger generations do not value the experiencing nature or being outdoors part of their park experience as much as older ones. Unless their "experiencing of nature" is defined in different terms, this should be a factor of concern for future park management and be tackled at the environmental education level.

In terms of reaching users to educate them and make them participants in park management, although the number of new users is higher than expected, complicating outreach by park management authorities, the mean number of visits per month and the concentration of house zip codes will make outreach less of a challenge. It is important to note that in Hacienda Hills Trailhead, Hellman Park and Arroyo Pescadero education trail hikes lead by rangers have relatively high support.

Given the results over sources of information, it appears as if the most effective outreach will come out of direct contact with users. Rangers can play an important role on this, but their numbers and time is limited. Moreover, formal trail hikes do not seem to sparkle much interest in users. A more informal outreach approach carried by rangers could be an option, but it would require higher presence and interaction. Park signs are another important source of information that should be explored, as it can be cost effective and flexible.

Coping mechanisms are already being used by at least 15% of park users. Although most refer to small changes in park use, we do not have previous data to establish a trend. Neither can we establish a trend with regards to interactions between mountain bikers and other activities, but given the sport is relatively new we can only expect this one to be increasing. Management options might need to be disguised to prevent an increase in conflicts between uses. Park signs could be effective, but zoning activities might need to be considered, and trail maps provided would be an aid to find the best location for this zoning both in terms of use and conservation. One of the negative sides of zoning is the need for enforcement, which has a cost and if not done properly could also derive in conflict with some activity users. Whichever the management choice, it is vital to keep an eye on coping mechanism trends to avoid adaptation that would make it hard to find coping mechanisms in the future. This issue becomes more important when we consider that solitude and being in contact with nature are prominent among the reasons for visiting the park.

The male to female park use ratio is almost 4:1. Security could influence this ratio, but is not the reason for having such a difference in usage. Although park authority has little to do to alter societal trends of park use, management options should look at ways of “inviting” females to use the park, even if only because females are more supportive of park management for conservation rather than recreation and increasing their use will facilitate some management decisions in the future.

The purpose of this research was to better understand trail use as well as users’ perceptions of the park and its management. This report should enable the Habitat Authority to make informed decisions on future trail management options and provide valuable background in which to base future outreach alternatives.

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Appendices

Appendix 1

Appendix 2

Appendix 3

Set A

Set B

Set C

Appendix 4

The Puente Hills Landfill Native Habitat Preservation Authority Survey Form

TO BE FILLED BY INTERVIEWER Interviewer: [ ]

Survey site: ____

Date of interview: ________________________ Time of interview: ____________________

1. How often do you visit the park?
□First time □Few times a year ____ visits/month.

2. How long did/will you spend on the park today? _____hrs

3. Why did you choose to visit the park today? *Check all that apply*

□To be outdoors
□To exercise
□To experience nature
□To enjoy scenic beauty
□To experience fewer people
□To relax
□To engage in adventure sports
□To educate children about nature
□To see/hear wildlife
□To escape the city

4. Which of the following activities will you engage in, or have you engaged in, during your visit today?
Check all that apply

□Hiking
□Jogging
□Sightseeing
□Walking dog(s)
□Bird watching
□Horseback riding
□Photographing
□Bicycle riding
□Other ________________________________

5. Do you use this trail head:
□Always □Most of the time □Sometimes □First time

6. In order to keep the park safe and/or protect sensitive species, some trails might need to be closed temporarily. Would you oppose seasonal closures to some of these trails? If yes please ask the interviewer for the map and show them to him/her.
INTERVIEWER USE ONLY 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 ?

7. Ask the interviewer to show you the trail maps and show him/her the segments of the trail(s) used/to be used during your visit today
INTERVIEWER USE ONLY 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 ?

8. Why did you choose that route/trail? *Check all that apply*

□Fewer people
□Safety
□More wildlife
□Less wildlife
□Width of trail
□Hike length
□Scenic
□More natural
□People doing same activity
□Facilities
□Closer/convenient access
□Other ______________

9. From the above, which are the MAIN 2 reasons for choosing that route/trail

1st. ____________________________
2nd.____________________________

10. Park managers use a variety of approaches to provide a safe recreational environment for park users, and to protect and restore nature in the park. What is your opinion about the following types of management activities? 1 being strongly disfavor and 5 strongly favor. *Circle around one number in each*

	Strongly Disfavor	→			Strongly Favor
10a. Fire prevention that includes clearing some vegetation and trees	1	2	3	4	5
10b. Temporary trail closure to protect wildlife or sensitive vegetation, or to protect visitors	1	2	3	4	5
10c. Permanent trail closure for restoration of native vegetation or to protect wildlife	1	2	3	4	5
10d. Ranger lead hikes and other programs to educate visitors	1	2	3	4	5

11. Please ask the interviewer to show you the photo sets of trails and rate EACH SET from 1 to 5. 1 being not attractive and 5 being very attractive. *Please rate each set by circling one number in each*

	Not attractive	→			Very attractive
SET A	1	2	3	4	5
SET B	1	2	3	4	5
SET C	1	2	3	4	5

12. Do you know the park rules?
□Yes □No

13. Do any of the following things make you feel unsafe about being in the park or in the park proximity? *Check **ALL** that apply*

□Wild fires
□Violence
□Wildlife
□None
□Activities of other visitors
□Storms
□Other______________________________

14. In your opinion, the most important reason to protect the park is: *Check **ONE** only*
□To provide recreational opportunities
□To protect plants
□To protect wildlife
□To protect plants and wildlife
□Other__________________________

15. Do you agree or disagree with the following statements? 1 being strongly disagree and 5 strongly agree

	Strongly disagree	→			Strongly agree
15.a Park wildlife can be a nuisance	1	2	3	4	5
15.b Park wildlife can be dangerous	1	2	3	4	5
15.c I enjoy sharing the park with wildlife	1	2	3	4	5
15.d Recreation should be a higher priority than wildlife conservation in park management	1	2	3	4	5

16. In your opinion, nature inside the park should be: *Check* ***ONE*** *only*
□Left alone
□Managed by the authorities to return to natural conditions
□Managed by the authorities to be controlled
□Managed by authorities to look pleasing

17. Where does your knowledge of the park and its flora and fauna come from: *Check* ***ALL*** *that apply*

□Rangers	□TV
□School	□Family/friends
□Park brochures	□Organized groups
□Park signs	□Internet
□Observation	□Previous visits
□Books	□Live in the area
□Magazines	□Other ______________

18. Do the activities or behaviors of other trail users affect your experience at the park?
□Yes
□No

IF YOU ANSWERED NO TO QUESTION 18 PLEASE GO TO QUESTION 22

19. If the activities or behaviors of other trail users do affect your experience, identify how these user activities impact you. *Please check one box for each activity.*

	No opinion	Strongly Negative	→			Strongly positive
Mountain biking	□	1	2	3	4	5
Horseback riding	□	1	2	3	4	5
Hiking	□	1	2	3	4	5
Running/jogging	□	1	2	3	4	5
Dog walking	□	1	2	3	4	5
Others_________________	□	1	2	3	4	5

20. For any user activities you selected in Question 18 as having a negative impact on your experience, why do they present a problem to you?

□Damage plants
□Uncooperative behavior (rude, obstructing trail, etc)
□Frighten wildlife
□Startle people
□Make too much noise
□Litter
□Scare horses
□Leave animal wastes
□Potential collisions/injury
□Other ____

21. In order to avoid any of the trail users mentioned above, have you altered your use of the park? *Check **ALL** that apply*

□No change
□Change day of visit
□Change frequency of visit
□Change trails
□Take extra precautions
□Don't come alone
□Change time of visit
□Other ______________________

22. How did you travel to the park today? *Select one only*
□Car/truck/SUV/van
□Public transportation
□Group transportation
□Motorcycle
□Bicycle
□Walk/jog
□Horseback
□Other_________________

23. How long did it take you to get to the park? _____hour(s) and _____minutes

24. What is your residential zip code? __________ What is the closest intersection to your house? ___________________ and ____________________

25. What is your age?_________

26. What is your sex? □Female □Male

27. How many children under 18 live in your house? ______

28. What is your highest level of educational attainment? *Select one only*
□High School student
□No high school diploma or GED
□High school graduate or GED
□College/University student
□University Graduate
□Do not wish to answer

29. What is your race/ethnicity?
□American Indian or Alaska Native

□Asian
□Black or African American
□Native Hawaiian or other Pacific Islander
□White
□Hispanic or Latino
□Do not wish to answer

30. What is your country of origin? ______________________________

31. What language do you speak at home? ________________________

32. What is your household income?
□Less than $25,000
□$ 25,000 - $50,000
□$ 50,000 - $75,000
□$ 75,000 - $100,000
□$ 100,000 - $150,000
□$ 150,000 - $200,000
□Greater than $200,000
□Do not wish to answer

33. Do you have a physical disability? □Yes □No

34. Have you ever experienced any barriers to access the park □Yes □No

35. If yes to question 34, please describe the barriers and location.
____

____

____

That's all the questions in the survey. Do you have any questions? Thank you very much for your time and participation. Enjoy your visit.

TRAILHEAD

		Gender			Age					Race			
NR	Num	M	F	0	1	2	3	4	5	W	NW	Activity	Time
DATE													
TOTAL													

Time code: 1=8-10 **2**=10-12 **3**=12-14 **4**=14-16 **5**=16-18

Age code: 0= 1-17 | **1**=18-25 | **2**=26-40 | **3**=41-55 | **4**=56-70 | **5**=71+

Race %
Age %

Gender	**Count**	**%**	**Non-respondents**
Male			
Female			

Race	**Count**	**%**	**Non-respondents**
White			
Non white			

Activity	**Count**	**%**	**Non-respondents**
Hiking			
Running			
Biking			
Dog Walk			

Age	**Count**	**%**
0		
1		
2		
3		
4		

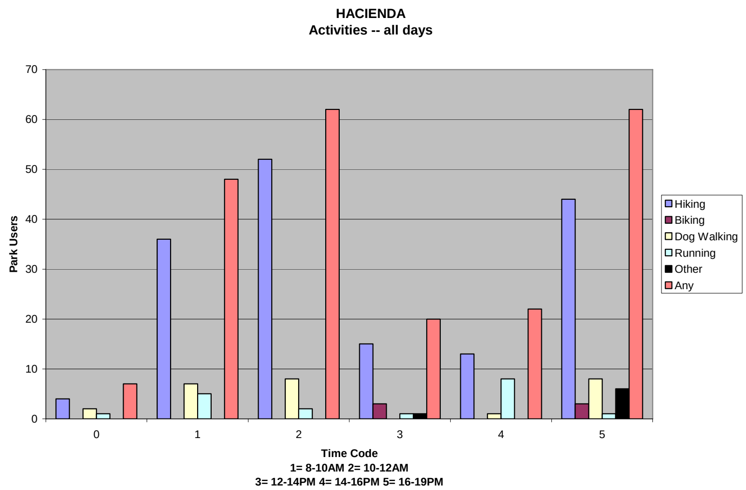
TOTAL COUNT 4 DAYS
TOTAL SURVEYS
PERCENTAGE OF USERS INTERVIEWED

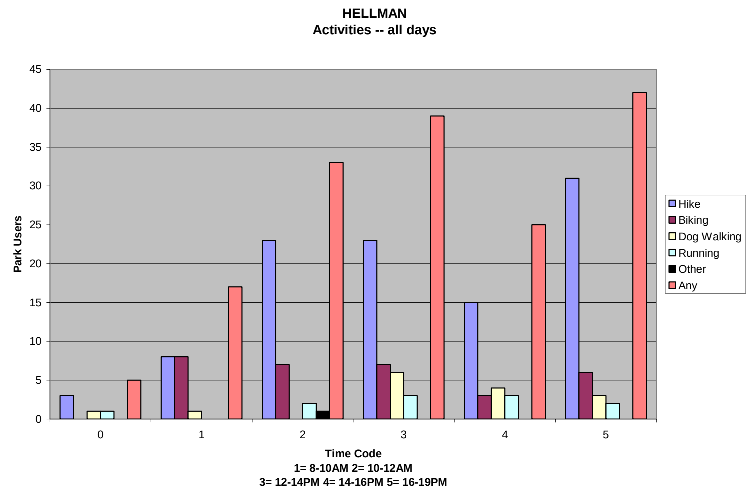
SET A

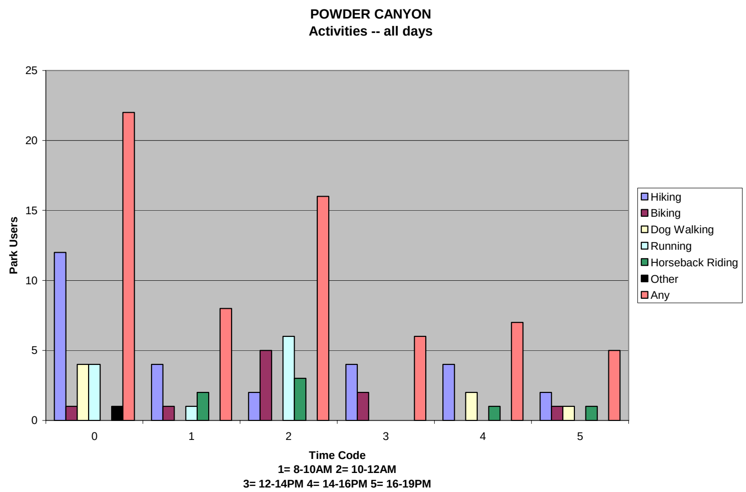
SET B

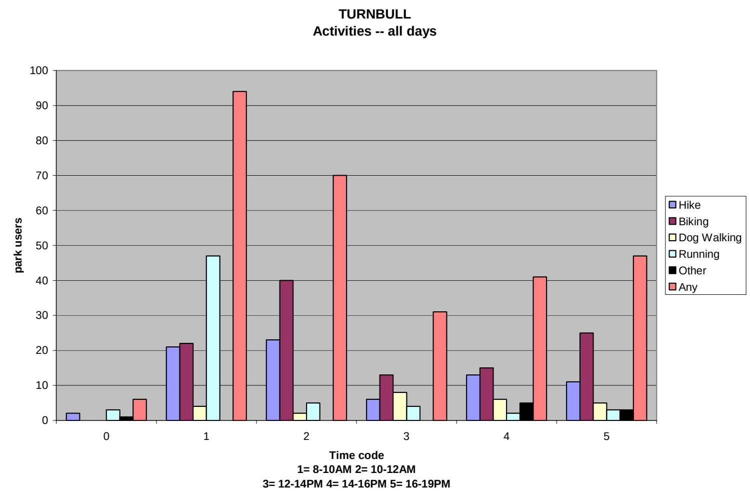
SET C

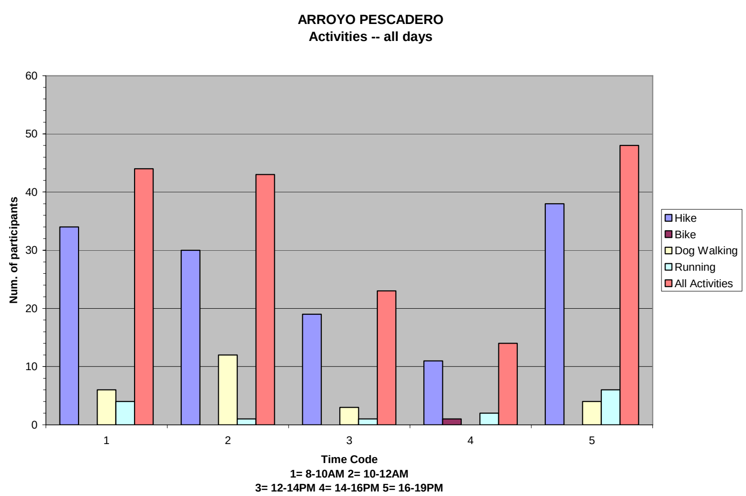
Activities and time - all days



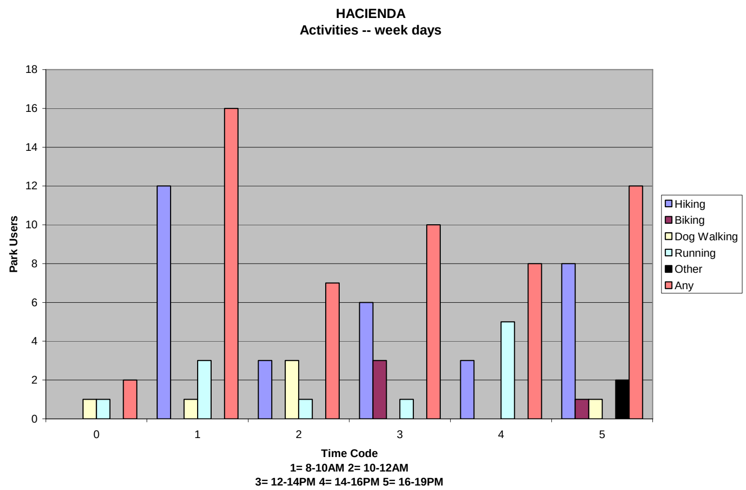


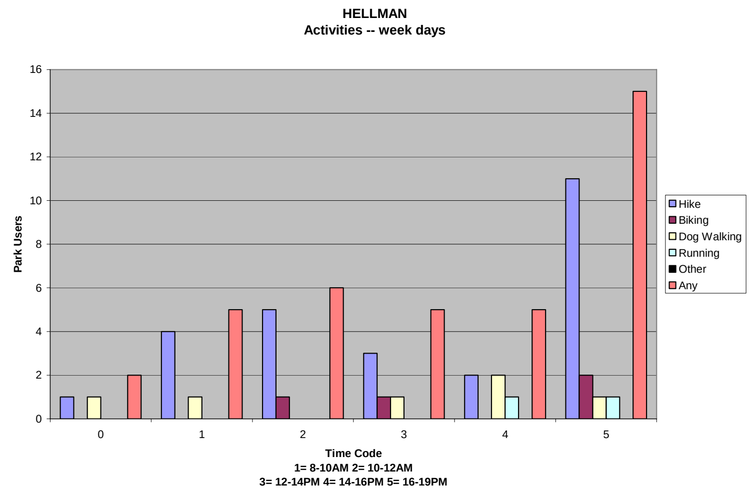


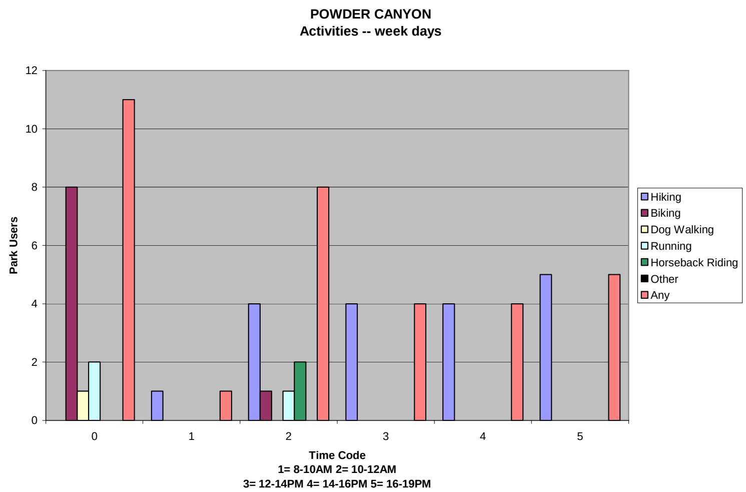


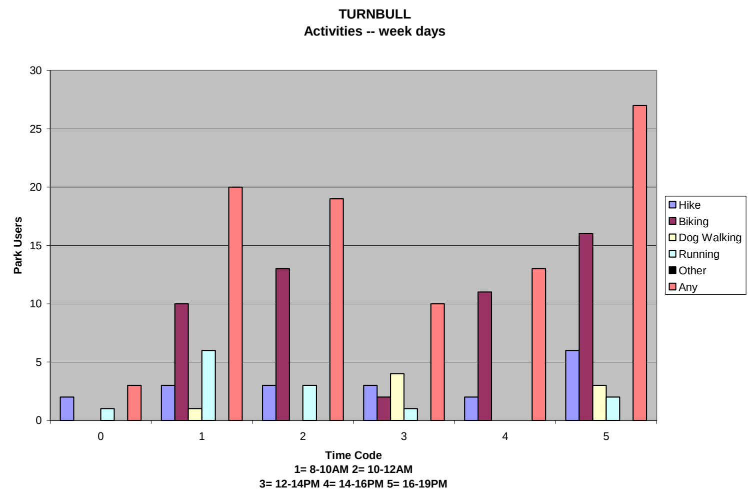


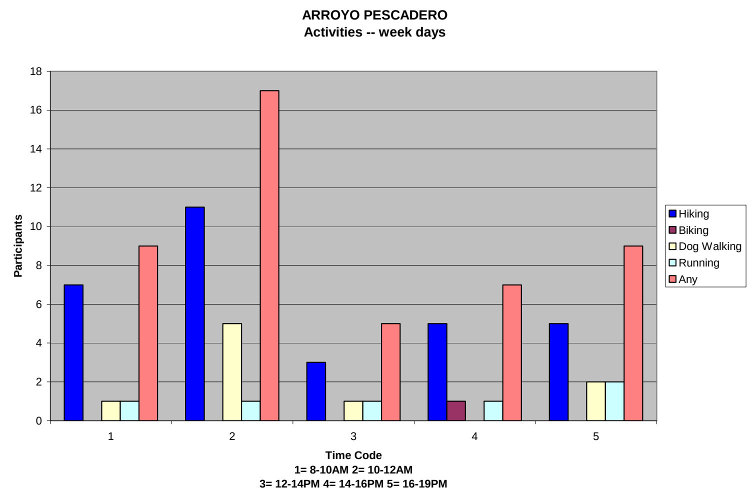
Activities and time - week days



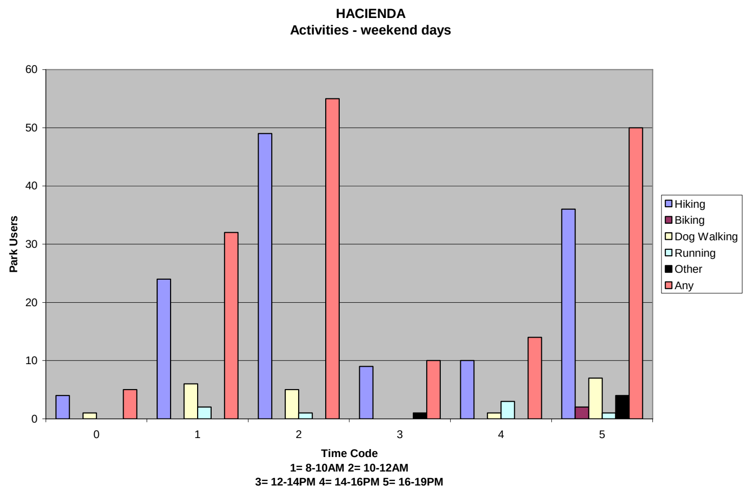


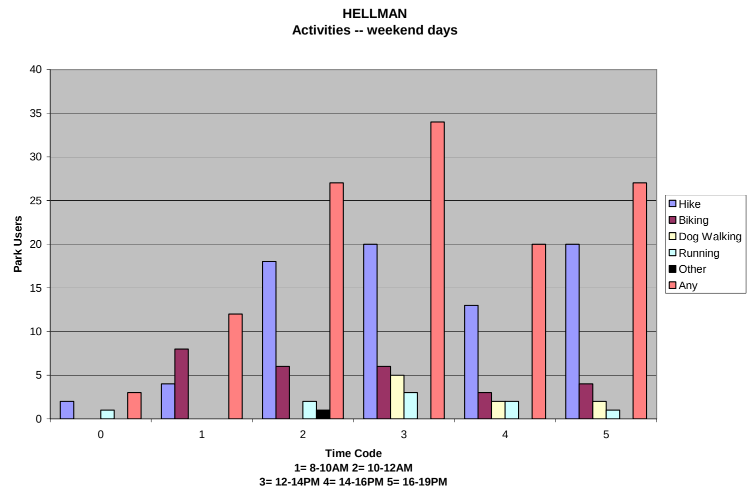


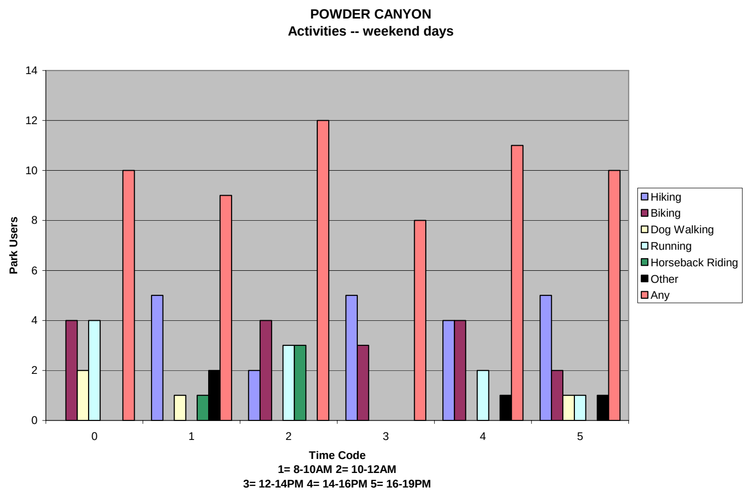


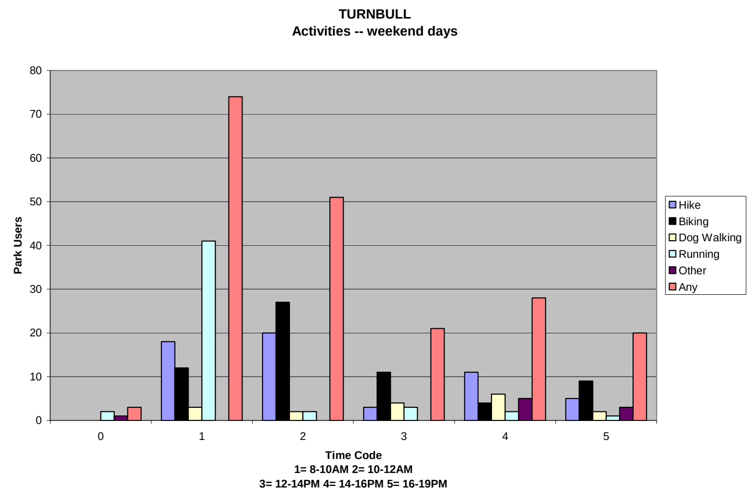


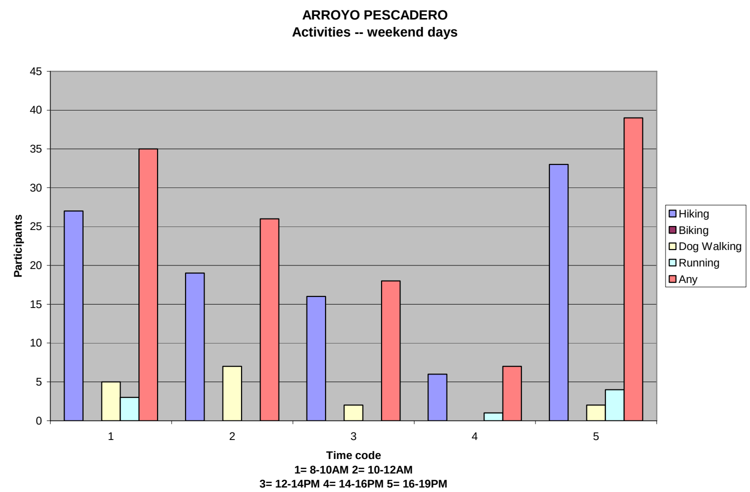
Activities and time - weekend days



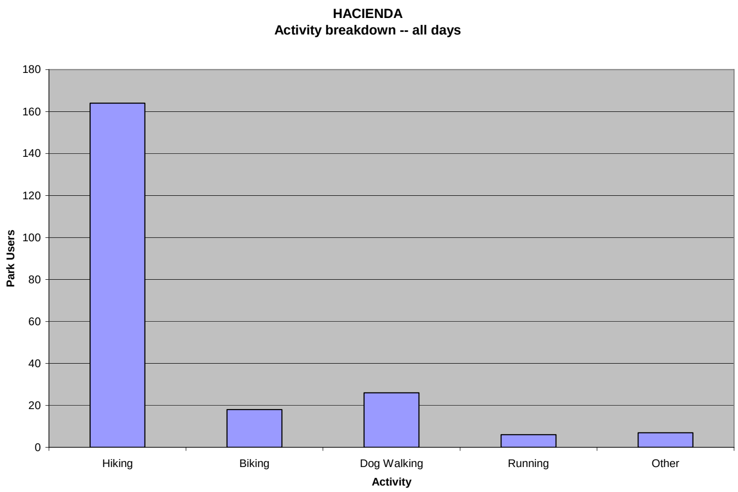


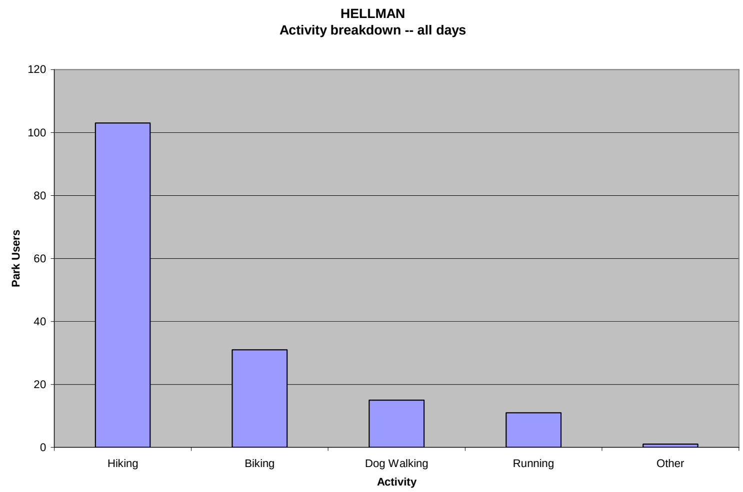


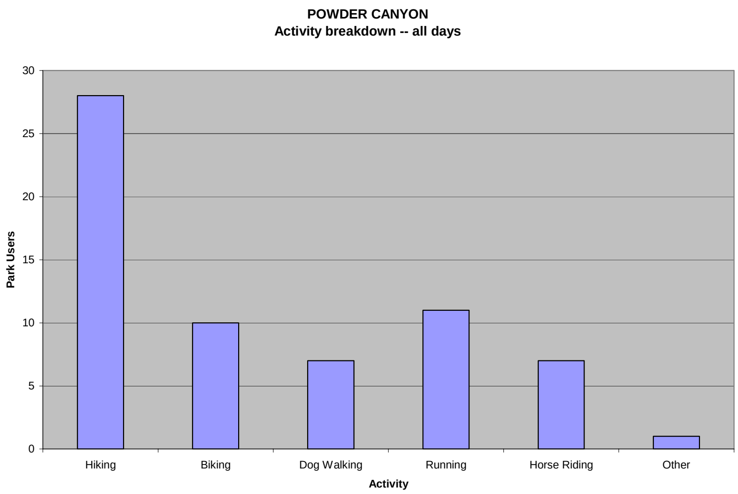


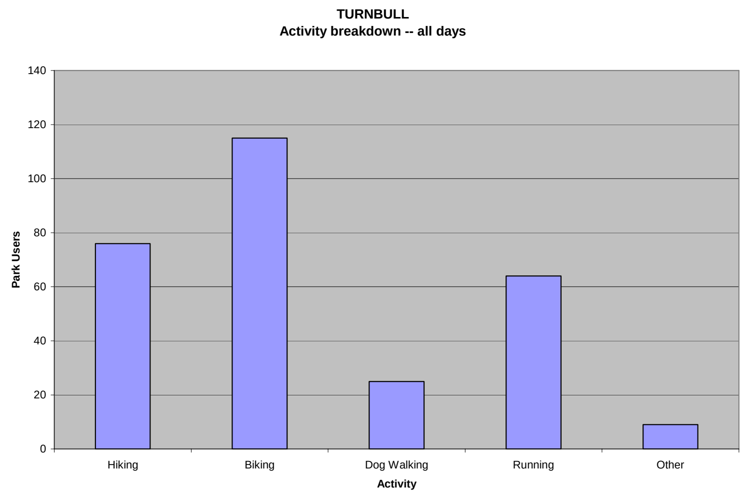


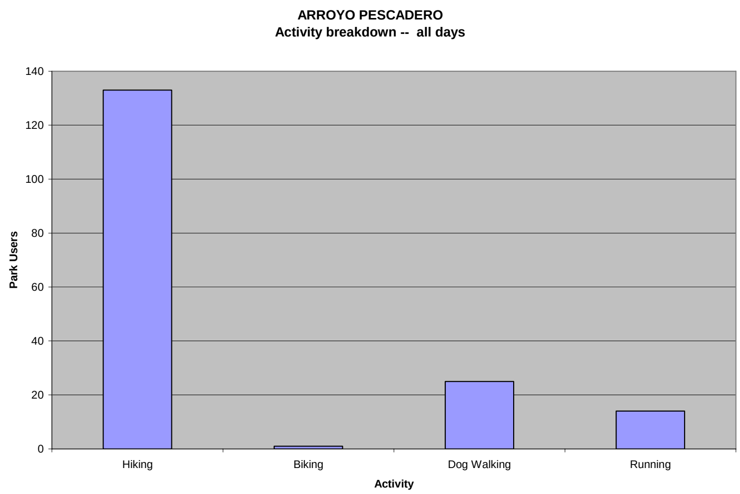
Activities breakdown – all days



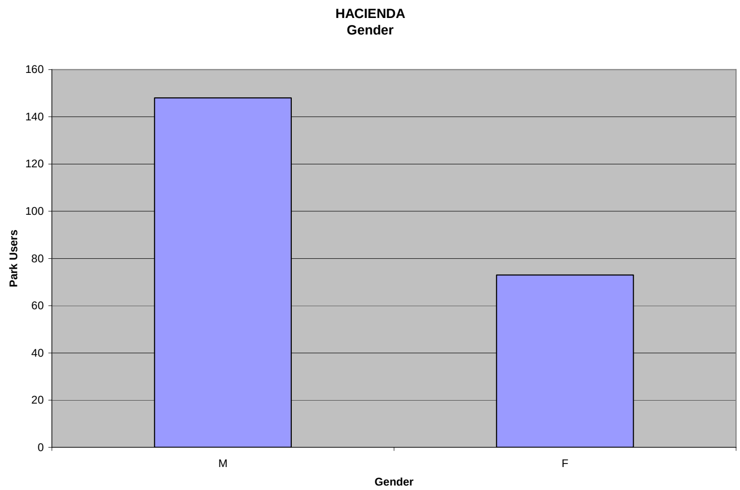


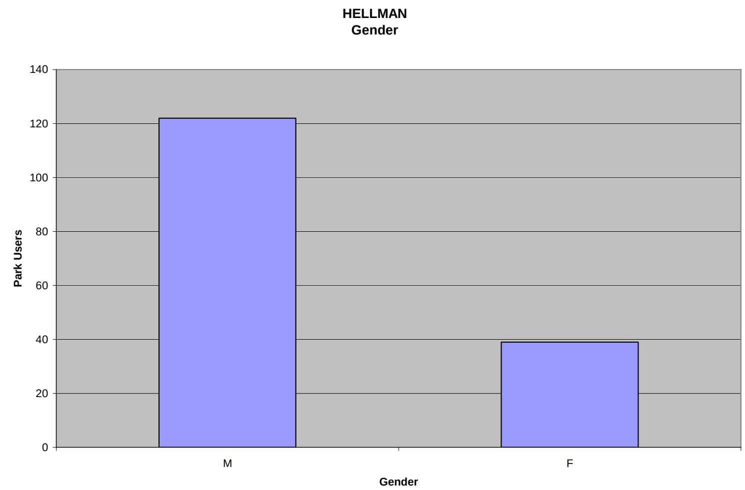


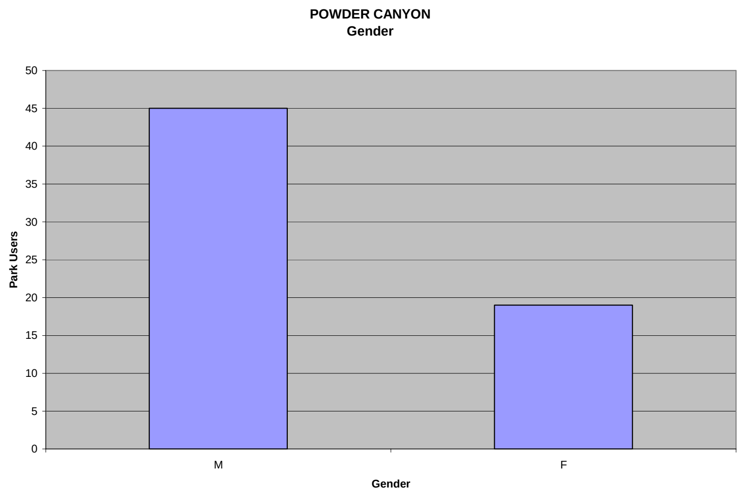


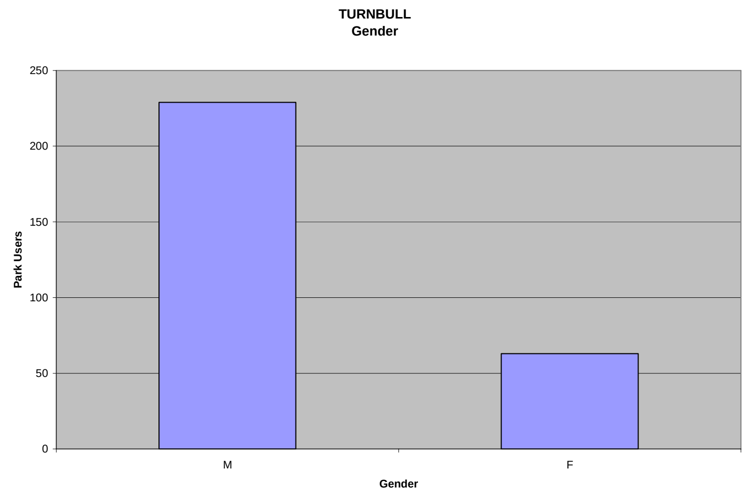


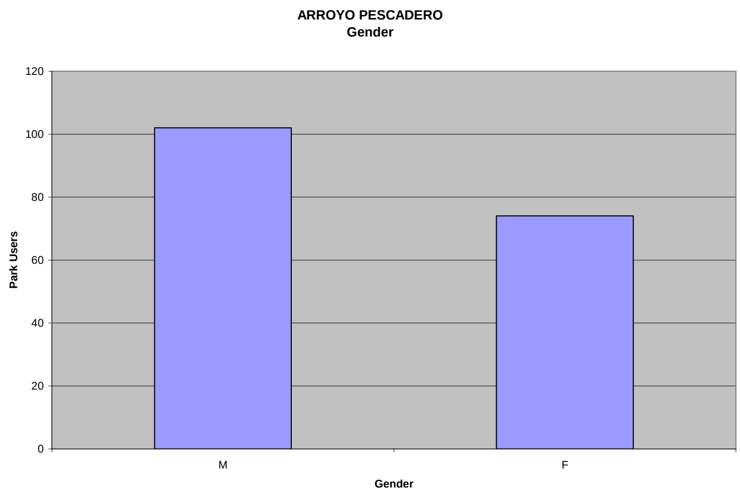
Users by gender





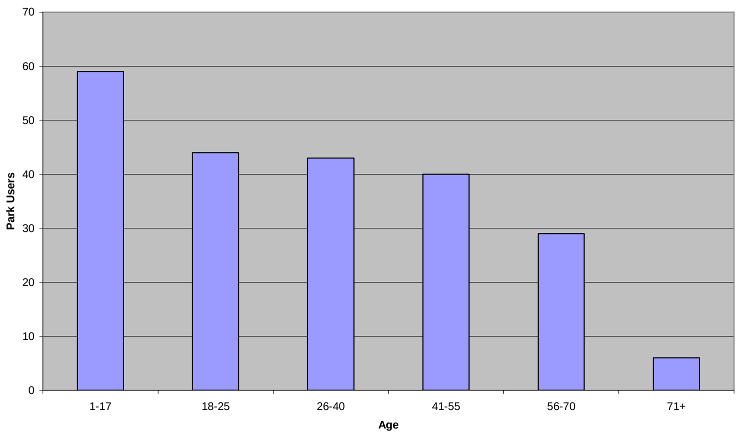




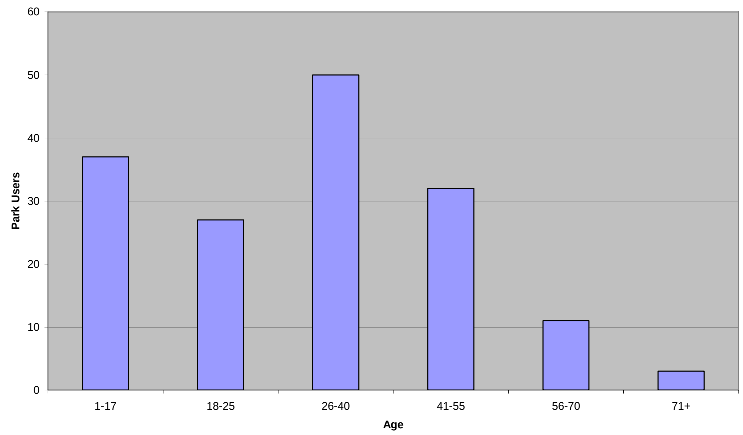


Users by age

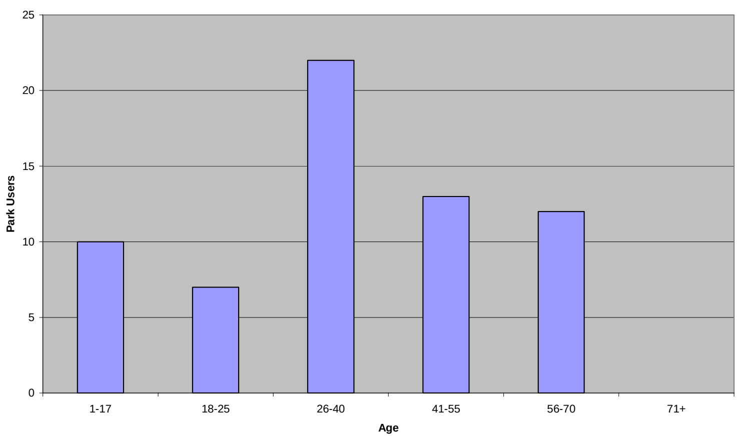
HACIENDA
Age



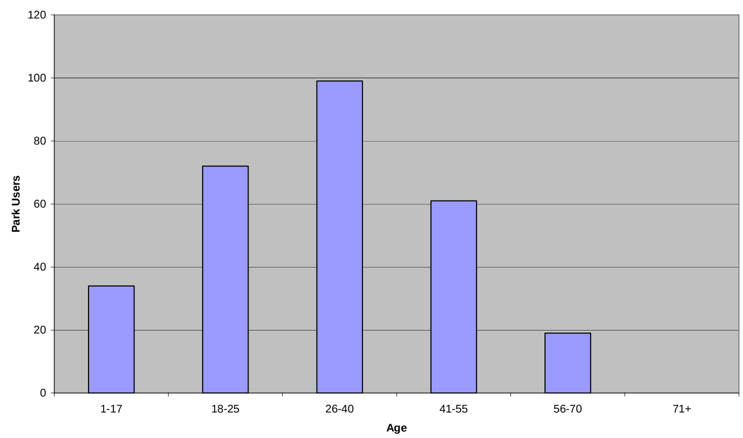
HELLMAN
Age



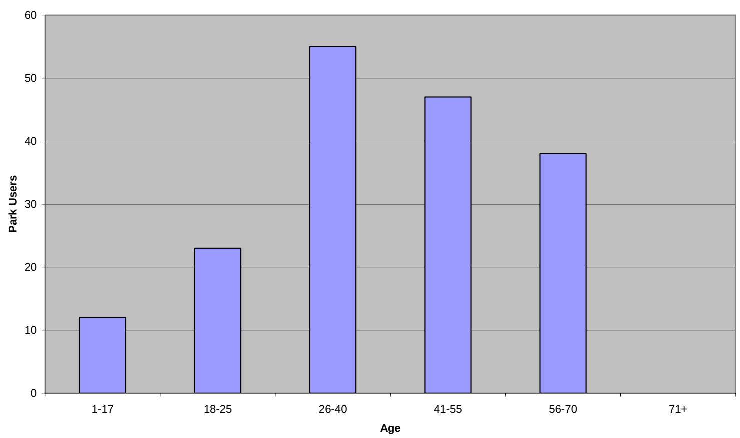
POWDER CANYON
Age



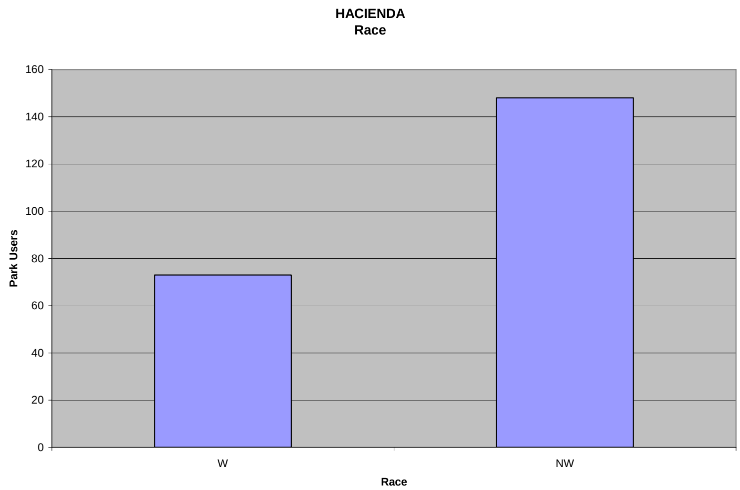
TURNBULL
Age

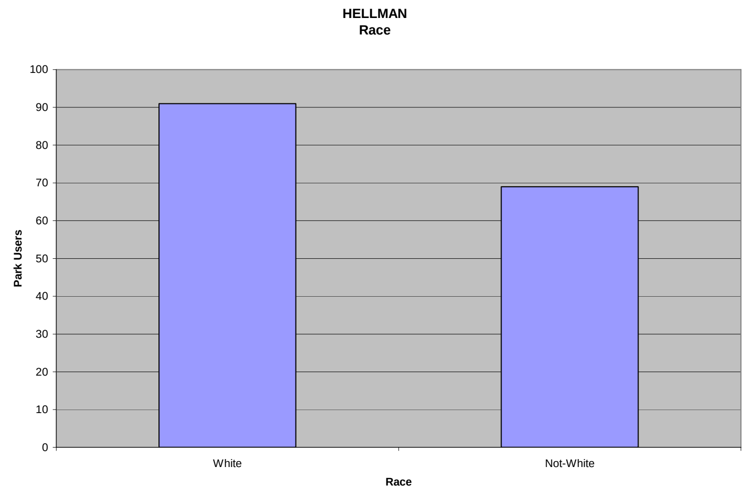


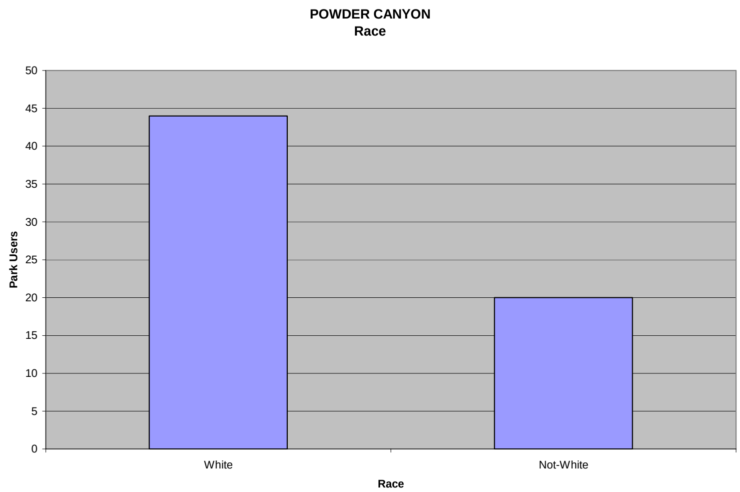
ARROYO PESCADERO
Age

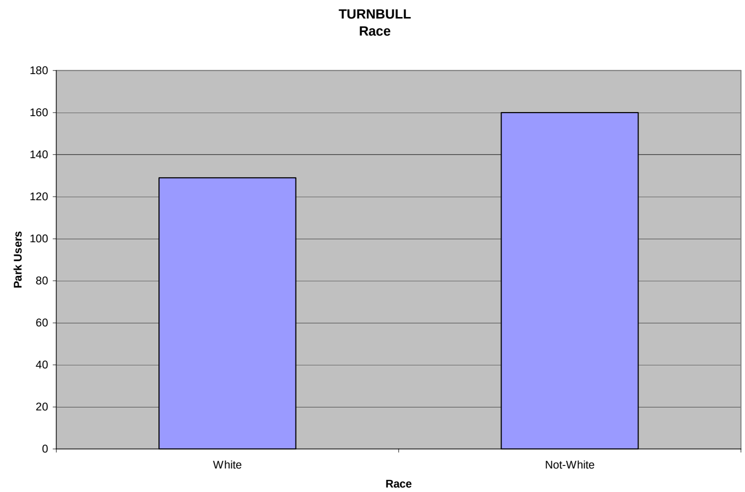


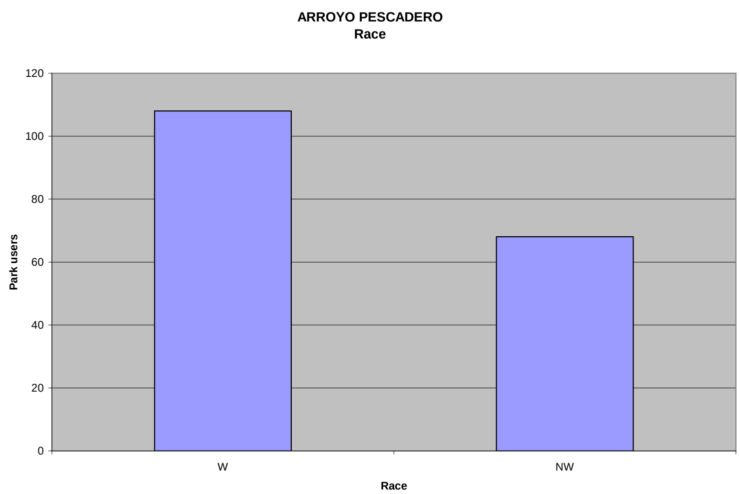
Users by race (white or non-white)











APPENDIX B, SOIL TAXONOMY AND ANALYSIS

APPENDIX B

SOIL TAXONOMY AND ANALYSIS

FIELD PROTOCOLS

The soil maps of the area and LSA's field reconnaissance indicate that soils throughout the Preserve are relatively homogenous across polygons with annual grasses and ruderal species. Most of the soils are of the San Andreas-San Benito Association and the Altamont-Diablo Association.

In areas of relatively uniform soil, few tests will be required. However, if a polygon varies with weed species, soil type, aspect, or slope, samples in distinct areas will be taken. Each soil sample will be comprised of a composite of subsamples at different depths, as necessary. The tests results will show an average of all subsamples for particular polygons. Soil characteristic data for the soil samples within each predetermined weed polygon will be taken as follows:

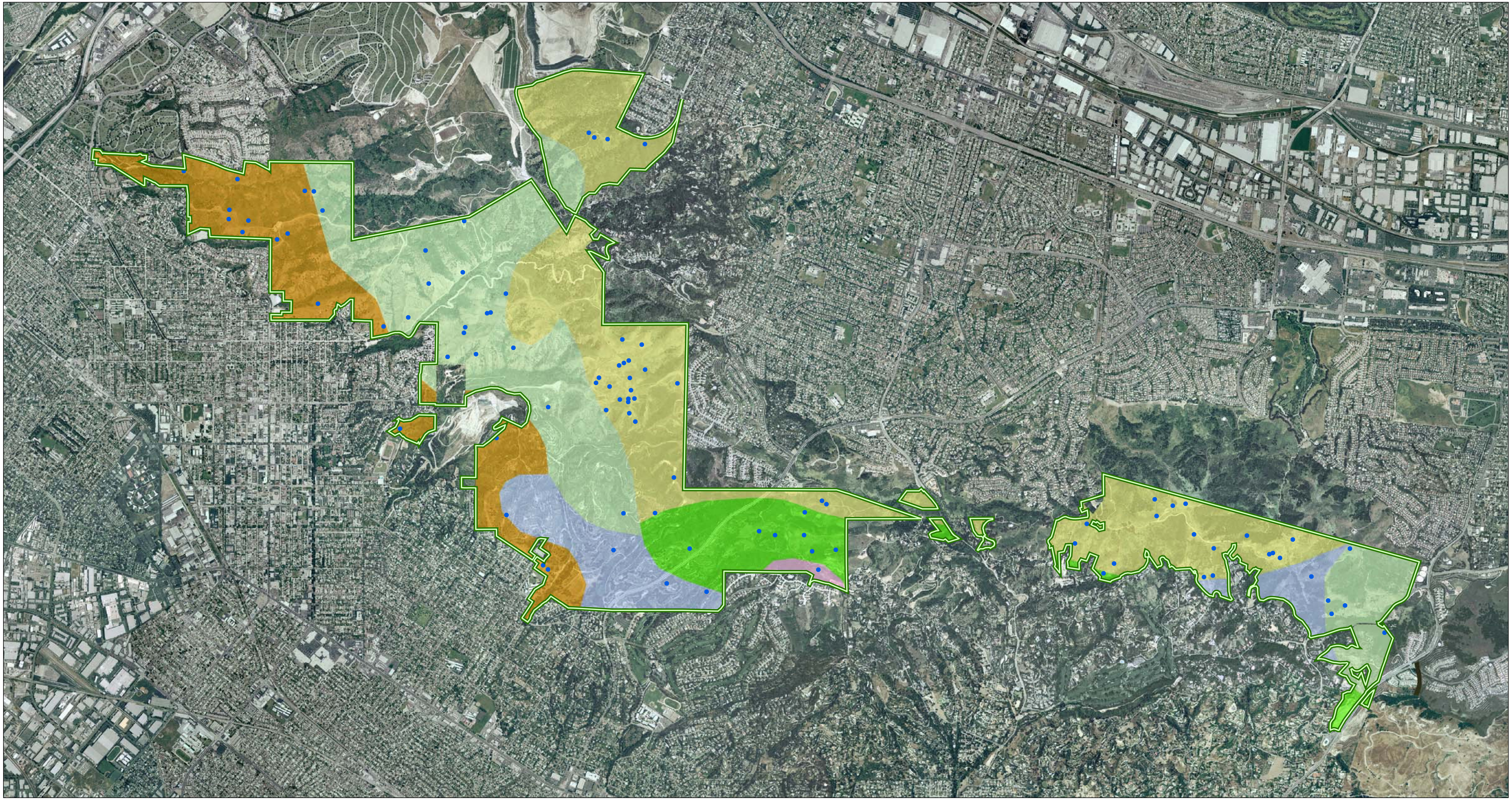
- The condition of surface soil will be noted for cracks that indicate clays.
- The presence of gravels and rocks will be noted.
- Initial field reconnaissance has shown that the 1969 Soil Survey is fairly accurate. Therefore, it will be more important to obtain a better understanding of each soil association in combination with weedy and native vegetation type. Soil samples will be collected within polygons in representative areas for each soil association and general vegetation type. Samples will be pooled over homogenous soil and dominant weed types with three samples pooled across vegetation types.
- Soil texture and color determinations will be noted in the field using a soil textural triangle and a Munsell Soil Color Chart.
- Five soil compaction tests will be conducted in the area of each soil subsample using a Dickey-John probe. The average depth to compaction of the 15 total compaction readings from the 3 subsamples will be noted for the soil sample site.
- Pooled soil samples will be labeled and sent to the lab for basic agricultural suitability testing, which will analyze major elements (i.e., nitrate, nitrogen, ammonium nitrogen, phosphate, phosphorus, potassium, calcium, and magnesium), micronutrients (i.e., copper, zinc, manganese, iron, sulfate, sodium, and boron), pH, half saturation percentage, saturation extract, salinity, sodium absorption ratio, organic content, and USDA particle size.
- Ninety-three pooled samples for mycorrhizal infectivity tests will be taken from representative weed polygons. Representative samples will be determined from areas of similar soil type and dominant vegetation species. Samples will be taken from the top six inches of soil, where roots are more common. Samples will be transported to the lab each evening and stored in the refrigerator for approximately two weeks before testing.

SOIL TAXONOMY AND ANALYSIS

The Preserve contains several soil series that support different types of vegetation. To understand the relationship between soil type and plant communities, representative soils within the Preserve were analyzed to determine any correlation between soil type and habitats, including weedy, exotic plant communities. The analysis was necessary to determine appropriate habitat restoration in the areas that had been disturbed by historic cattle and sheep grazing, agriculture, oil production, and for those that lack clear indications of the pre-European native vegetation condition. Restoration and future management will be based, in large part, on the soil analysis information. Soil/plant community relationships will provide land managers with the necessary insight for appropriate habitat restoration of the impacted land.

Analysis of the soils occurring in the Preserve began with a review of the Natural Resources Conservation's Soil Taxonomy (1999) and Report and General Soil Map, Los Angeles County (1969). The General Soil Map was verified in the field first by a reconnaissance drive-through of the Preserve for an examination of surface soil characteristics. It should be noted that the General Soil Map designates associations of two or more soil series. A soil association is a group of defined and named taxonomic soil units occurring together in a characteristic pattern in a geographic area. See Figure A-1 for a map of the specific soil associations within the Preserve. This general soil map delineating soil associations differs from more specific soil surveys that map areas to individual soil series and phases within those soil series. Therefore, there is no existing map for each soil series and phase to overlay the various native habitats and exotic dominated areas within the Preserve. Because the map depicts general associations of two or more soil series, the precise designation of soil series within all native and weedy vegetation types is beyond the scope of this study.

Based on the field review of the General Soil Map, soil characterization was undertaken in each of the different mapped soil associations and different representative vegetation types to determine general soil/plant relationships. Ninety-three soil samples were collected for analysis. Figure A-1 shows the general location of the soil samples. Figure A-2 shows vegetation and soil sampling locations across soil associations. Determination of soil sample locations was based on soil association, existing vegetation, and landscape position. Several samples were taken in each soil association to determine the soil/plant community relationships, including weedy areas. The number of soil samples was determined by budget and resulted in trying to maximize the amount of information by selecting areas that were thought to be representative. The samples focused on weedy areas with 71 samples across soil associations and dominant weed species and 22 samples across soil associations and native communities. The soil was sampled for arbuscular mycorrhizal fungal infectivity in the top six inches of soil. Agricultural suitability samples were taken from the soil in the first 12 inches. Additionally, characteristics of dominant vegetation, soil color, texture, and compaction were recorded. The 93 samples were analyzed for standard constituents by Wallace Laboratories. The following sections summarize the taxonomy of the soil associations, and the specific results of soil lab analyses and data in relation to existing vegetation, both native and exotic, within the Preserve.



Prepared By: LSA

* Some parcels without data are new properties acquired after soil surveys were completed.

FIGURE A-1

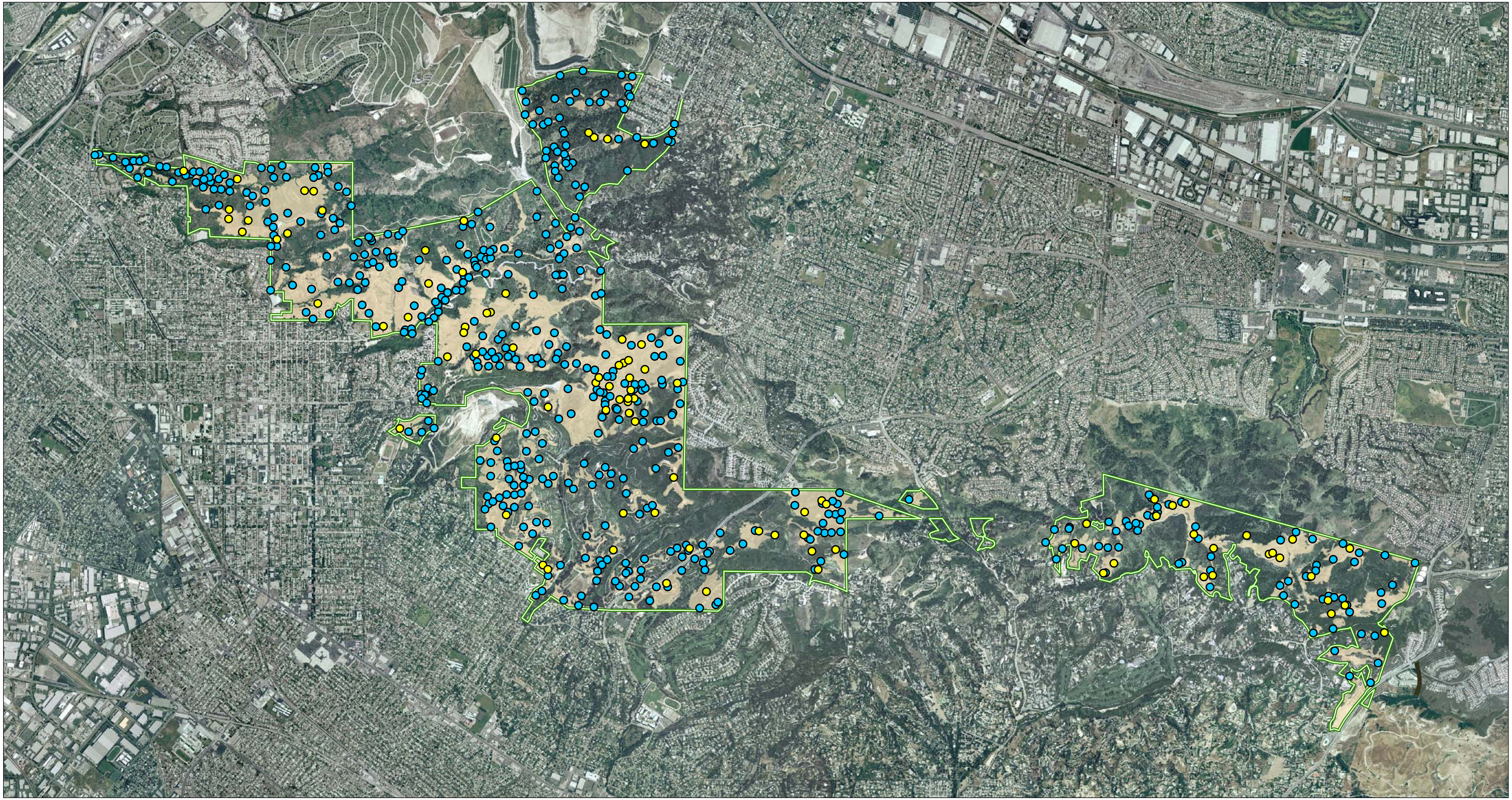
Puente Hills Landfill Native Habitat Preservation Authority

Resource Management Plan

Soil Types and Soil Sampling Locations

SOURCE: Image-EagleAerial (2003)

I:\PUE430\GIS\Maps\Draft RMP\Appendices\FigA-1_SoilType_Sampling.mxd (03/05/2007)



Prepared By: LSA

FIGURE A-2

N

0 1,500 3,000
FEET

Preserve Boundary
Weed Dominated Lands
Vegetation Sampling Locations
Soil Sample Locations

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Vegetation and
Soil Sampling Locations

SOURCE: Image-EagleAerial (2003)

* Some parcels without data are new properties acquired after vegetation and soil surveys were completed.

I:\PUE430\GIS\Maps\Draft RMP\Appendices\FigA-2_Soil_Veg_Points.mxd (03/05/2007)

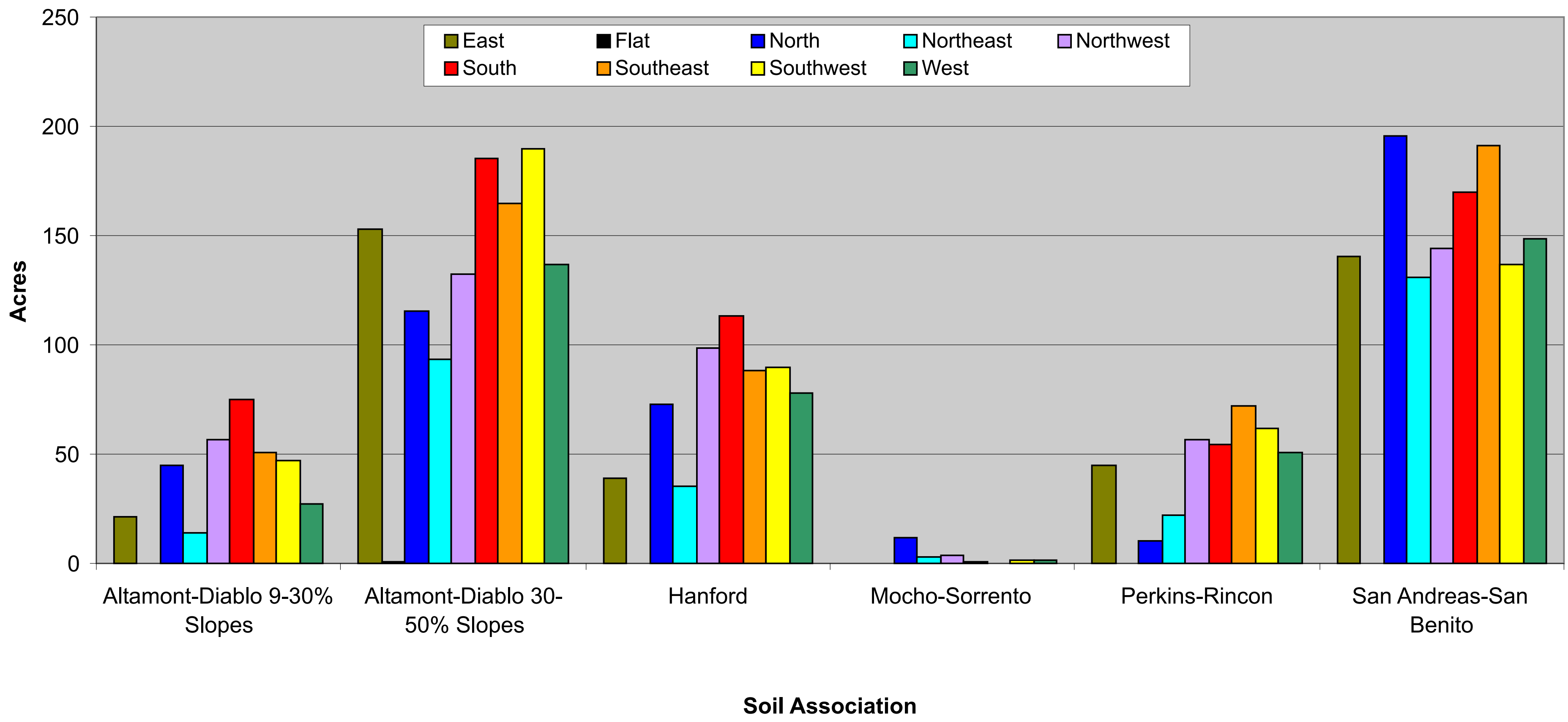
Soil Associations and Soil Taxonomy

Thirteen specific soil series occur in the Preserve within six soil associations described by the General Soil Map. As previously discussed, each soil series has not been mapped specifically in the Preserve; rather, broad areas have been defined that contain an association of soil series. Thus, we can discuss the mapped soil associations only in general terms with regard to their component soil series. Table A-A presents the acreage of each soil association within the Preserve. Graph A-1 shows the acreage of each soil association across aspect within the Preserve. No apparent pattern exists between soil association and aspect.

Table A-A: Soil Association Acreage within the Preserve

Soil Association	Soil Association Total Acres
San Andreas-San Benito (30–70 percent slope)	1,266
Hanford	618
Mocho-Sorrento	16
Perkins-Ricon	374
Altamont-Diablo (9–30 percent slope)	341
Altamont-Diablo (30–50 percent slope)	1,175

Table A-B shows the six soil associations and the soil series that make up the mapped associations, as well as the approximate percentage of each soil series within the general soil association. These soil series are classified within five soil orders: Mollisols, Alfisols, Vertisols, Inceptisols, and Entisols. There are several categories of classification in soil taxonomy, and these categories are hierarchical because the lower categories fit within the higher categories for diagnostic soil characteristics (Brady and Weil 1999). The categories of soil classification are: (1) order, (2) suborder, (3) great group, (4) subgroup, (5) family, and (6) series. The broad soil orders are defined by formative elements, especially for the presence or absence of major diagnostic horizons, and the suborders reflect major environmental controls on current soil-forming processes such as moisture regime. Great groups are subdivisions of suborders based on the presence or absence of diagnostic horizons and their arrangements. Subgroups are subdivisions of the great groups, with one central concept, a typical subgroup that defines the great group with other subgroups having soil characteristics that intergrade with other orders, suborders, or great groups that are not typical of the specific great group. *Family* identifies a subset of a subgroup that is similar in soil texture, mineral composition, and mean soil temperature at a depth of 50 cm. Soil series within a family are named after a geographic feature near where they were first recognized and described.



Prepared By: LSA

GRAPH A-1

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Soil Association in Acres Across Aspect

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Table A-B: Soil Associations within the Preserve

Altamont-Diablo 9–30 Percent Slopes		Altamont-Diablo 30–50 Percent Slopes		Hanford		Mocho-Sorrento		Perkins-Rincon		San Andreas-San Benito 30–70 Percent Slopes	
Soil Series	**% area**	**Soil Series**	**% area**	**Soil Series**	**% area**	**Soil Series**	**% area**	**Soil Series**	**% area**	**Soil Series**	**% area**
Altamont	60	Altamont	60	Hanford	85	Mocho	50	Perkins	50	San Andreas	50
Diablo	30	Diablo	30	Yolo	10	Sorrento	40	Rincon	50	San Benito	30
San Benito	10	San Benito	10	Hesperia	5	Yolo	10			Balcom	5
										Casatic	5
										Diablo	5
										Saugus	5

All soils in the Preserve were formed under the xeric moisture regime of southern California where the Mediterranean climate has cool, moist winters and the warm, dry summers. Since moisture levels fall during times of lowest evapotranspiration rates, this is conducive for soil leaching. The mean annual soil temperature is lower than 22 degrees Celsius (C). At a depth of 50 cm from the soil surface, the mean annual summer and winter soil temperatures differ by 6 degrees C or more. By definition, xeric soil is dry for at least 45 consecutive days in the summer and is moist for at least 45 consecutive days in the winter (NRCS 1999).

It is important to remember that the mapped soil associations are not in themselves soil classifications, but they represent a coarse mapping effort that identified that particular soil series occur together in specific geographic areas. However, dominant soil series for each mapped soil association in the Preserve belong to the same soil order. In some of the identified soil associations, between 10 and 20 percent of the soil within a specific soil association is made up of one or more soil series that belong to different soil orders. The classification and key features of each soil order down to soil series is described below.

Mollisols. Soil associations in the Preserve that are classified as mainly in the order Mollisols are the San Andreas-San Benito 30–70 percent slopes Association and the Mocho-Sorrento Association. Mollisols are mineral soils that are characterized by the accumulation of organic matter that is rich in calcium. Most Mollisols found in the southern California region have a dark surface organic horizon (mollic epipedon) that is formed from the accumulation and decomposition of the dense root systems of the vegetation they support. This layer is generally high in calcium and magnesium, which can give it a cation exchange capacity of more than 50 percent saturated with base-forming cations.

The soil is not hard even when dry, which is a key characteristic of the mollic epipedon. The high organic matter content and the presence of swelling-type clays prevent hardening of the soil even when it is dry. Mollisols in the Preserve occur mainly in steep slopes in the San Andreas-San Benito 30–70 percent slope Association, but are also found in other landscape positions, such as the lowlands and gentle slopes in the Mocho-Sorrento Association, and as minor components (San Benito series) of the Altamont-Diablo Associations.

The one suborder of Mollisols occurring in the Preserve is Xerolls, which occur in xeric moisture regimes as previously described for a Mediterranean climate. The one great group found in the Preserve is Haploxeroll. Diagnostic characteristics of Haploxerolls are soils with a relatively thick mollic epipedon, a subsurface horizon of loamy fine sands that lack cementation (a cambic horizon) (NRCS 2003).

Four soil series classified as Haploxerols predominate in two soil associations: the San Andreas series, San Benito series, Mocho series, and the Sorrento series. The San Andreas-San Benito 30–70 percent slopes Association accounts for approximately one-third (1,266 acres) of the Preserve on moderate to steep slopes. The main vegetation types found within this soil association are chaparral and scrub, annual grasses and mustard, and oak woodland. The Mocho-Sorrento Association accounts for only 15 acres and supports mainly scrub, chaparral, and annual grasses.

San Andreas. San Andreas soils are 24–36 inches deep, and they are well drained with moderately slow subsoil permeability. The soils have a fine sandy loam surface layer to approximately 15 inches, with a grayish-brown fine sandy loam subsoil approximately 13 inches thick underlain by sandstone. Available water-holding capacity is very low at 2.5–3.5 inches.

San Benito. San Benito soils are 36–48 inches deep and are well drained with a moderately slow subsoil permeability. They have dark grayish-brown, neutral clay loam surface layers to about 28 inches with moderately alkaline, calcareous clay loam subsoil. The subsoil is calcareous sandy shale. Water-holding capacity is moderate at 6.5–8.5 inches.

Mocho. Soils of the Mocho series are well-drained loams and are found on alluvial fans and flood plains. Formation of the soils is from alluvium derived from sedimentary rocks. The soils occur on slopes ranging from 0 to 9 percent and are at elevations of 50–700 feet. Throughout the profile, the soil is moderately alkaline and calcareous. Permeability is moderate, and the effective rooting depth is 60 inches or greater. Water-holding capacity is moderate at 8.5–10 inches.

Sorrento. Soils of the Sorrento series are well-drained loams and are found on alluvial fans and flood plains. Formation of the soils is from alluvium derived from sedimentary rocks. The soils are found on slopes ranging from 0 to 9 percent at elevations of 50–700 feet. In the upper six inches, the soil is neutral and becomes moderately alkaline and calcareous below. Permeability is moderate and the effective rooting depth is 60 inches or more. The water-holding capacity is moderate at 8.5–10 inches.

Vertisols. Soil associations that are classified as mainly in the Vertisols order are the Altamont-Diablo 9–30 percent slope Association and the Altamont-Diablo 30–50 percent slope Association. Vertisols are mineral soils that have a high content of clay, in particular clays that are sticky and the swelling- and shrinking-type clays to a depth of one meter or more in the soil. The clays shrink and swell during periods of drying and wetting based on their silica clay lattice structure. Almost all Vertisols are dark in color to a depth of one meter, but this dark color is not indicative of high organic matter content. Deep, wide cracks form due to the periods of shrinking and swelling and are a key characteristic to defining the soil. Vertisols generally occur in climates that allow for a dry period of several months, such as in southern California. Typical vegetation growing on Vertisols in the Preserve are annual and perennial grassland as well as shrub vegetation such as toyon-sumac chaparral, coyote bush scrub, and purple sage scrub.

The one suborder found in the Preserve is Xererts, and the one great group is Haploxererts. Soils in the Haploxererts are in xeric areas, and there is relatively minimal development of horizons. Two Haploxererts in the Preserve make up the majority of two soil associations, the Altamont-Diablo 9–30 percent slope Association and the Altamont-Diablo 30–50 percent slope Association, that account for over one-third (1,516 acres) of the Preserve. The dominant soils in these two associations are the Altamont series and the Diablo series. Approximately 10 percent of the soils in both of these Altamont-Diablo Associations is the San Benito series, in the Haploxerols (Mollisols) described previously.

Altamont Series. Altamont series consists of deep, well-drained fine soils that formed materials weathered from fine-grained sandstone and shale. These soils are gently sloping to very steep uplands. These soils are silica clay materials that have a lattice structure that allows shrinking and swelling, or smectitic characteristics, resulting in large cracks in the dry season. Water-holding capacity is low at 3–4.5 inches, typical of clays from a Mediterranean climate.

Diablo Series. Diablo series is similar to the related Altamont series. Diablo series consists of deep, well-drained fine soils that have dark-gray, neutral, and mildly alkaline silty clay upper A-horizons. The lower A-horizons are gray and olive-gray, calcareous, silty clay. The silty clay AC- and C-horizons rest on shale. These soils are on gently sloping to very steep uplands. These soils also have shrinking and swelling characteristics resulting in large cracks in the dry season. Water-holding capacity of this clay is also low at 2.5–5.5 inches.

Alfisols. Soil associations classified in the Alfisols order within the Preserve are the Perkins-Rincon Association. Alfisols are the most strongly weathered of all the soil orders present in the Preserve. Alfisols typically have an ochric epipedon[1]. A key characteristic of Alfisols is in the subsurface diagnostic horizon in which there are signs of clay movement in the B-horizon. In the B-horizon, silicate clay has accumulated through the process of illuviation. The one great group of the Alfisols order found in the Preserve is the Haploxeralfs. The Haploxeralfs is a soil with one of the following: an argillic[2] or kandic[3] horizon that is relatively thin, with a clear or gradual upper boundary, or a particle-sized class of loamy throughout the profile. The soil series within the Haploxeralfs great group are the Perkins and the Rincon. Approximately 374 acres of the Preserve are classified as Perkins-Rincon Association. The main vegetation consists of annual grasses as well as areas of scrub and toyon chaparral.

Perkins Series. Perkins soils are silty clay loam over 60 inches deep and well drained with slow subsoil permeability. The Bt-horizon averages 25–35 percent clay, while the A-horizon is generally fine, sandy loam. The soils form in alluvium from sedimentary rocks. The soils are

[1] **ochric epipedon**: "A surface horizon of mineral soil that is too light in color, too high in chroma, too low in organic carbon, or too thin to be a plaggen, mollic, umbric, anthropic or histic epipedon, or that is both hard and massive when dry." Source: Soil Science Society of America, website WWW.soils.org.

[2] **argillic**: "Pertaining to clay or clay minerals in which certain minerals are converted to minerals of the clay group." Source: Bates, R.L. and J.A. Jackson, eds. 1984. *Dictionary of Geological Terms, 3rd edition*. New York: Random House, Inc.

[3] **kandic**: "subsoil diagnostic horizon having a clay increase relitive to overlying horizons and has low activity clays" Source: Soil Science Society of America, website WWW.soils.org.

found on old alluvial terraces and old marine terraces with slopes of 0–30 percent. Water-holding capacity is moderate at 7.5–9 inches.

Rincon Series. Rincon soils are silty clay loam over 60 inches deep and well drained with slow subsoil permeability. Generally, there is a gradual or diffuse boundary between the A- and Bt-horizons. The soils are smectitic with silica clays that have a lattice structure that allows soils to swell in the wet season and shrink in the dry season. The soils form in alluvium from mixed-rock sources. The soils are found on terraces with slopes of 0–30 percent. Water-holding capacity is high at 9–10.5 inches.

Inceptisols. Soil classified as in the Inceptisols order are found within the San Andreas-San Benito 30–70 percent slope Association. The Inceptisols make up approximately 10 percent of the San Andreas-San Benito Association. Inceptisols are mineral soils that have some development with the beginnings of diagnostic horizons. The most common surface horizon of Inceptisols is an ochric epipedon. A weak mollic or umbric epipedon may be present. A mollic epipedon is a thick mineral surface horizon that is dark in color, has a high base saturation, is soft even when dry, and has a high organic content. The umbric epipedon has the same general characteristics as the mollic epipedon, except the base saturation is less than 50 percent.

One suborder Xerepts is found in the Preserve. Xerepts are somewhat freely drained and have a xeric moisture regime. The soil temperature regime is thermic, as described for the overall Mediterranean climate. An ochric epipedon and a cambic horizon are characteristics most Xerepts share. The great group Calcixerepts fall under the suborder Xerepts. Soils in this great group have a calcic, or lime, horizon. The Balcom series soils fall under the Calcixerepts. Balcom soil makes up approximately 5 percent of the area mapped as San Andreas-San Benito 30–70 percent slope Association.

The other great group of the Inceptisols found in the Preserve is Haploxererts or soils with a minimum horizon development. Castaic series is under the Haploxererts. Castaic series makes up approximately 5 percent of the area mapped as San Andreas-San Benito 30–70 percent slope Association.

Balcom Series. The Balcom series consists of well-drained soils that are found on uplands. The soil is silty clay loam weathered from soft, fine-grained sandstone, calcareous soft shale, and marl. Structure ranges from granular to weak subangular blocky or the soil is massive. The soil is moderately alkaline and calcareous throughout the profile. Permeability is moderately slow. The soil is generally 26–40 inches deep, and available water-holding capacity is moderate at 5–7 inches for this depth.

Castaic Series. Castaic soils are 26–40 inches deep. They are well-drained, slowly permeable silty clay loams. The structure is strong fine granular with many very fine roots in the A-horizon to 10 inches. They occur on strong to very steep slopes, and they are formed from weathered shale, sandstone, and mudstone. Available water-holding capacity is moderate at 6.5–8.5 inches.

Entisols. Entisols as an order are weakly developed mineral soils. In general, Entisols are young soils or soils in unstable landscape positions, which prevents the soils from forming diagnostic horizons. Two great groups encompass the Entisols in the Preserve: Xerothents and Torriorthents. In drier regions such as southern California, the lack of water and subsequent relatively sparse vegetation may be the primary factor in lack of soil horizon development in these Entisols. Entisols have very little in common within the soil order except for the key characteristic of the lack of diagnostic horizons. Another characteristic Entisols have in common is generally an ochric surface horizon, or epipedon. An ochric epipedon by definition does not fit into any of the seven other epipedons.

In general, the Entisols within the Preserve are on gently sloping terraces. Typical vegetation is sagebrush scrub, mustard, and annual grassland. Entisols form the Hanford Association, with 90 percent of the soil in the Hanford series and 5 percent each of the Yolo and Hesperia series.

Hanford Series. Hanford soils are coarse-loamy, superactive soils that are very deep and well drained. The soils form from alluvium and are found in floodplains and alluvial fans with slopes of 0–15 percent. The water-holding capacity of this soil is low at 5–7.5 inches.

Yolo Series. Yolo soils are fine-silty, superactive soils that are derived from sedimentary formations on nearly level to moderately sloping alluvial fans. The water-holding capacity is moderate at 8–10.5 inches.

Hesperia Series. Hesperia soils are coarse to loamy, superactive soils that are well drained. The water-holding capacity is moderate at 6–9 inches.

Soil Sample Analysis

As previously described, 93 soil samples were collected over the Preserve. Samples were taken in each of the soil associations described above and within the native and weedy vegetation occurring in each soil association. These samples provide insights into the structural and chemical makeup of the soils within the various soil associations and can alert land managers to the possibility of difficult soils. Table A-C presents the results of the main characteristics of the sampled soils.

The soil analyses show moderate to low fertility in all soils for the major nutrients relative to agricultural suitability, with phosphorous being the most limiting nutrient in many samples. The reported nutrient levels would be expected for the soils in the Preserve under the climatic conditions that are conducive to soil leaching. Similarly, none of the samples demonstrates accumulated salts, with generally low ECe (electrical conductivity) and low sodium adsorption ratios (SAR). Overall, salinity is low and poses no threat to general vegetation.

The minor essential elements of the soil are within acceptable ranges. However, the ratio of calcium to magnesium is low in approximately one-half of the samples, with magnesium being almost equal or somewhat higher than calcium. The optimum ratio for plant uptake of nutrients from the soil is between 2 or 3 calcium to 1 magnesium. In the samples that have a reverse ratio, the overall levels of both calcium and magnesium are higher than is optimum. This combination could impact plant absorption of nutrients, especially potassium uptake. However, based on experience in the region, the levels of calcium and magnesium where the ratio is not optimum do not pose an insurmountable obstacle to native species.

The calcium carbonate (lime) detected in many of the clay and clay loam soil samples may dictate specific native vegetation types where this soil constituent occurs. Purple sage scrub, coyote bush scrub, and black sage scrub communities are found in clay and clay loam soils with lime. Walnut woodland occurs in clay soils with lime and chaparral in clay loam soils that contain lime, while oak

Table A-C: Characteristics of the Sampled Soils

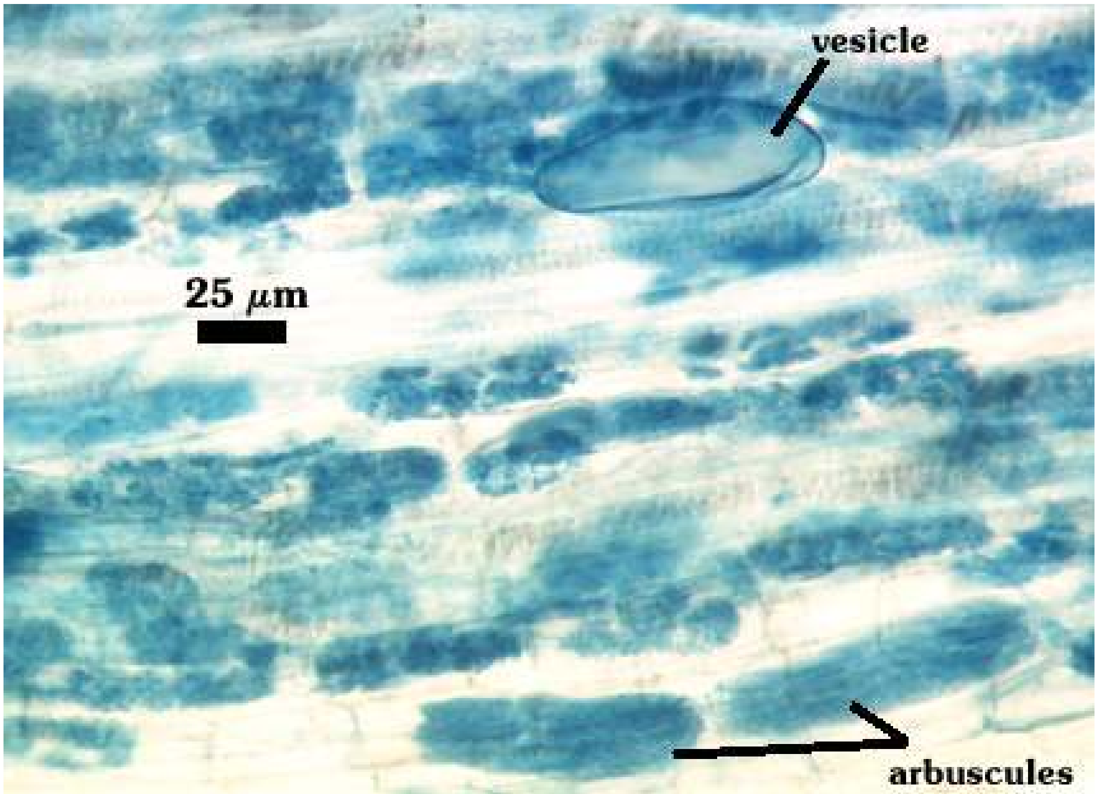
Sample ID	pH	salinity	chloride	nitrate	phosphorus	potassium	iron	manganese	zinc	copper	boron	calcium	magnesium	sodium	sulfur	molybdenum	aluminum	arsenic	barium	cadmium	chromium	cobalt	lead	lithium	mercury	nickel	selenium	silver	strontium	tin	vanadium	IR	texture	Soil Association	lime	SAR	Habitat	Total Infectivity
6	7.71	0.35	18	7	6.12	112	2.5	1.46	1.37	2.72	0.1	270	452	53	10	0.03	n d	0.01	0.67	0.24	0.04	0.04	2.5	0.13	n d	0.8	n d	n d	0.92	n d	0.92	slow/fair	clay loam	Altamont-Diablo 9-30%	yes	0.7	*Brassica nigra/* Non-native grass	37%
8	6.64	0.52	3	2	13.9	407	9.63	12.10	2.36	2.05	0.06	407	237	21	18	0.21	n d	0.08	1.46	0.50	0.03	0.09	2.64	0.19	n d	1.87	n d	n d	0.85	n d	0.65	slow/fair	clay loam	Altamont-Diablo 30-50%	no	0.9	*Brassica nigra/* Non-native grass	56%
9	7.27	0.40	13	3	4.5	74	3.06	3.09	0.90	2.45	0.09	416	126	27	10	0.04	n d	0.08	1.26	0.58	0.01	0.05	1.65	0.17	n d	1.29	n d	n d	0.82	n d	0.73	fair/slow	clay loam	Altamont-Diablo 30-50%	yes	0.9	Non-native grass/*Brassica nigra*	81%
10	7.11	0.36	22	1	9.9	107	3.68	4.77	1.10	1.76	0.08	429	237	20	11	0.01	n d	0.07	1.13	0.54	n d	0.06	1.73	0.19	n d	1.34	n d	n d	0.76	n d	0.40	fair/slow	clay loam	Altamont-Diablo 30-50%	no	0.8	Non-native grass/*Brassica nigra*	43%
12	6.83	0.48	21	1	9.9	180	5.85	4.05	1.61	2.74	0.08	398	447	99	15	0.02	n d	0.11	1.88	0.73	0.01	0.05	1.97	0.21	n d	2.35	n d	n d	1.04	n d	0.81	slow	clay	Altamont-Diablo 30-50%	no	1.2	Non-native grass/*Brassica nigra*	79%
13	7.43	0.26	17	1	3.4	76	2.70	1.85	0.92	1.58	0.10	440	48	20	9	n d	n d	0.02	1.08	0.37	n d	n d	2.02	0.19	n d	0.47	n d	n d	0.72	n d	0.57	fair/slow	clay loam	Perkins-Rincon	yes	1.0	Non-native grass/*Brassica nigra*	81%
14	7.28	0.29	15	9	2.3	87	2.12	0.35	0.66	3.38	0.12	424	229	43	7	n d	n d	0.07	1.51	0.67	n d	n d	1.60	0.19	n d	1.55	n d	n d	0.80	n d	0.90	slow/fair	clay	San Andreas-San Benito	yes	1.0	Non-native grass/*Brassica nigra*	52%
15	7.43	0.32	21	17	3.2	84	1.49	0.29	0.57	4.00	0.12	465	52	46	7	n d	n d	0.08	1.21	0.72	n d	n d	1.85	0.19	n d	0.94	n d	n d	0.71	n d	1.01	slow/fair	clay	San Andreas-San Benito	yes	0.9	Non-native grass/*Brassica nigra*	47%
17	6.81	0.26	20	8	4.1	112	4.10	0.76	0.74	2.96	0.08	465	138	54	8	n d	n d	0.09	1.15	0.89	n d	n d	2.08	0.21	n d	2.41	n d	n d	0.59	n d	0.45	slow/fair	clay	San Andreas-San Benito	no	1.1	*Foeniculum vulgare/* Non-native grass	27%
18	6.11	0.46	21	17	16.7	424	22.09	15.29	3.68	1.90	0.07	449	242	33	19	0.09	n d	0.08	1.54	0.71	0.04	0.08	5.26	0.20	n d	1.85	n d	n d	1.60	n d	0.45	fair/slow	loam	San Andreas-San Benito	no	0.8	Non-native grass/*Brassica nigra*	36%
19	7.42	0.43	30	17	3.7	123	2.70	0.60	0.85	3.98	0.13	414	181	54	13	n d	n d	0.13	1.21	0.45	n d	n d	1.50	0.17	n d	0.83	n d	n d	1.64	n d	0.75	fair/slow	clay loam	San Andreas-San Benito	yes	0.8	Non-native grass/*Brassica nigra*	69%
20	6.16	0.31	11	10	8.6	93	16.63	6.34	1.85	3.01	0.04	397	168	23	11	0.06	n d	0.10	1.10	0.93	0.03	0.08	4.48	0.22	n d	2.73	n d	n d	0.90	n d	0.28	slow/fair	loam	San Andreas-San Benito	no	1.2	Chaparral	42%
21	6.47	0.16	7	4	2.4	31	7.07	1.66	0.85	0.68	0.02	428	523	45	5	n d	n d	0.03	0.47	0.11	n d	0.02	0.67	0.22	n d	0.80	n d	n d	1.23	n d	0.16	slow/fair	loam	San Andreas-San Benito	no	2.0	Black Sage Scrub	55%
22	5.90	0.27	12	12	8.9	234	16.78	15.77	2.17	1.84	0.03	427	401	55	13	n d	n d	0.17	1.60	0.23	0.05	0.17	3.39	0.21	n d	1.95	n d	n d	2.54	n d	0.24	slow/fair	clay loam	San Andreas-San Benito	no	1.9	Non-native grass/*Brassica nigra*	56%
23	5.76	0.34	17	11	7.4	232	27.36	4.30	1.96	3.05	0.06	436	432	75	15	0.05	n d	0.15	1.72	0.60	0.02	0.04	3.00	0.22	n d	3.47	n d	n d	2.03	n d	0.24	fair/slow	clay loam	San Andreas-San Benito	no	1.8	*Raphanus sativus/Brassica nigra*	69%
24	5.47	0.33	7	24	8.9	158	26.85	9.29	1.59	3.35	0.09	458	329	51	14	0.02	n d	0.10	1.75	0.62	0.04	0.06	3.82	0.23	n d	3.81	n d	n d	1.78	n d	0.29	fair/slow	clay loam	San Andreas-San Benito	no	1.5	*Brassica nigra/* Non-native grass	61%
26	6.40	0.49	13	26	4.4	100	8.34	0.75	3.08	2.32	0.05	424	293	48	11	0.02	n d	0.07	1.18	0.35	0.02	n d	1.77	0.20	n d	1.74	n d	n d	1.23	n d	0.24	slow/fair	clay	San Andreas-San Benito	no	1.0	*Raphanus sativus/Brassica nigra*	52%
27	6.00	0.41	34	10	11.1	349	11.67	5.05	2.25	2.72	0.06	460	406	52	13	0.02	n d	0.07	1.80	0.66	0.02	0.04	2.62	0.22	n d	2.77	n d	n d	2.11	n d	0.35	slow/fair	clay	San Andreas-San Benito	no	1.3	Non-native grass/*Raphanus sativus*	46%
28	6.98	0.81	34	6	10.0	318	4.25	1.80	1.38	2.99	0.11	427	126	21	28	0.03	n d	0.04	1.08	0.31	0.01	0.02	2.16	0.19	n d	0.97	n d	n d	0.75	n d	0.35	slow/fair	clay loam	San Andreas-San Benito	no	0.7	Non-native grass/*Brassica nigra*	58%
29	7.10	1.78	15	3	4.8	109	2.47	1.21	0.83	4.96	0.14	444	57	31	431	0.01	n d	0.08	0.50	0.33	n d	0.02	1.26	0.19	0.02	0.63	n d	n d	0.59	n d	0.60	fair/slow	clay loam	Altamont-Diablo 9-30%	yes	0.4	Non-native grass/*Brassica nigra*	63%
31	7.31	0.45	6	10	4.6	201	3.60	0.60	1.21	7.89	0.10	405	165	34	15	n d	n d	0.06	1.07	1.09	n d	n d	1.54	0.19	n d	1.48	n d	n d	0.98	n d	0.78	slow/fair	clay	San Andreas-San Benito	yes	1.2	*Brassica nigra/* Non-native grass	40%
32	6.23	0.25	13	2	5.8	107	4.36	2.72	1.04	2.14	0.08	423	619	32	13	n d	n d	0.05	2.33	0.35	0.03	0.03	1.53	0.22	n d	2.16	n d	n d	0.88	n d	0.34	slow	clay	Altamont-Diablo 9-30%	no	1.3	Sagebrush/Buckwheat Scrub	82%
33	7.22	0.32	22	3	6.9	70	2.62	1.14	1.44	4.55	0.18	385	309	44	17	n d	n d	0.08	1.05	0.47	0.02	0.01	2.73	0.19	n d	1.36	n d	n d	0.78	n d	1.00	fair/slow	clay	Altamont-Diablo 9-30%	yes	1.0	*Brassica nigra/* Non-native grass	37%
34	7.36	0.86	16	18	7.1	147	1.91	0.72	2.65	1.90	0.13	392	198	38	67	0.03	n d	0.05	0.68	0.13	n d	0.01	1.68	0.19	0.01	0.47	n d	n d	0.81	n d	0.54	slow/fair	clay loam	Mocho-Sorrento	yes	0.7	*Brassica nigra/* Non-native grass	79%
36	7.44	0.34	5	8	2.5	43	1.28	0.47	0.50	3.80	0.08	427	65	45	7	n d	n d	0.10	0.79	0.30	n d	n d	1.37	0.18	n d	0.97	n d	n d	0.97	n d	1.32	fair/slow	clay loam	San Andreas-San Benito	yes	1.0	*Brassica nigra/* Non-native grass	75%
38	6.22	0.49	22	4	5.2	185	6.24	4.88	1.99	2.44	0.08	453	765	141	14	n d	n d	0.14	2.32	0.29	0.02	0.04	3.13	0.26	n d	2.48	n d	n d	2.94	n d	0.48	slow	clay	San Andreas-San Benito	no	2.0	*Foeniculum vulgare/* Non-native grass	46%
39	6.77	0.55	7	2	6.8	133	8.67	4.11	2.01	2.10	0.06	392	265	52	11	n d	n d	0.09	0.80	0.19	0.02	0.05	3.72	0.19	n d	1.65	n d	n d	1.08	n d	0.38	fair/slow	clay	Altamont-Diablo 9-30%	no	0.9	Non-native grass/*Brassica nigra*	50%
40	6.96	2.00	17	2	2.9	160	3.37	0.62	0.47	1.33	0.26	387	251	30	3439	0.08	n d	0.07	0.06	0.07	n d	0.02	0.27	0.23	0.02	0.07	n d	n d	1.14	n d	0.16	fair	clay loam	San Andreas-San Benito	yes	0.4	Non-native grass/*Centaurea melitensis*	51%
41	6.61	0.25	31	1	1.8	69	4.69	6.54	0.87	1.64	0.07	382	767	175	7	n d	n d	0.13	2.52	0.12	0.02	0.05	1.00	0.28	n d	1.43	n d	n d	2.19	n d	0.27	slow/fair	clay	Hanford	no	3.3	Non-native grass/*Eucalyptus glauca*	59%
42	7.32	0.29	20	1	0.4	60	1.97	0.89	0.43	0.41	0.06	395	374	23	11	n d	n d	0.02	3.79	0.02	n d	0.01	0.24	0.18	n d	0.21	n d	n d	2.08	n d	0.21	fair/slow	sandy loam	Hanford	no	0.9	*Brassica nigra/Centaurea melitensis*	58%
43	7.38	0.20	13	3	0.9	54	0.91	0.04	0.18	0.56	0.13	325	681	22	3	0.05	n d	0.14	0.75	0.03	n d	0.06	0.23	0.17	n d	0.01	0.08	n d	1.87	0.11	0.49	fair/slow	clay	Altamont-Diablo 9-30%	yes	0.8	Coyote Brush Scrub	81%
44	6.26	0.26	6	14	5.2	63	5.42	0.39	0.47	2.03	0.01	436	556	47	9	n d	n d	0.03	1.49	0.08	n d	0.01	1.03	0.30	n d	1.62	n d	n d	1.58	n d	0.26	slow	clay	Perkins-Rincon	no	1.9	*Eucalyptus glauca/Hirschfeldia incana*	19%
45	7.07	0.61	18	8	12.6	446	3.16	0.16	1.10	1.75	0.22	426	251	58	46	0.04	n d	0.38	0.77	0.29	n d	0.05	0.60	0.19	n d	0.72	n d	n d	1.43	0.11	0.41	slow/fair	clay	Hanford	yes	1.0	*Hirschfeldia incana/Centaurea melitensis*	55%
46	7.51	0.42	13	7	2.7	65	1.90	0.40	2.08	0.85	0.20	398	375	42	74	0.04	n d	0.16	0.81	0.06	n d	0.03	1.13	0.22	n d	0.11	n d	n d	1.67	0.11	0.31	slow/fair	clay loam	Perkins-Rincon	yes	0.8	*Schinus terebenthifolius/Brassica nigra*	42%
47	6.81	0.31	15	3	3.0	35	4.66	0.14	0.35	1.21	0.12	422	387	75	9	n d	n d	0.10	2.46	0.06	n d	0.04	0.33	0.19	n d	0.82	n d	n d	1.81	0.08	0.20	slow/fair	clay loam	Perkins-Rincon	no	1.6	Non-native grass/*Hirschfeldia incana*	78%
48	7.37	0.34	18	11	4.1	133	2.22	0.31	0.32	2.69	0.19	482	73	108	11	0.90	n d	0.04	0.62	0.20	n d	0.04	0.36	0.20	n d	0.31	n d	n d	2.46	0.12	0.29	slow/fair	clay loam	Altamont-Diablo 30-50%	yes	1.3	Non-native grass/*Brassica nigra*	35%
49	7.28	0.47	11	10	16.0	356	3.01	0.27	7.33	3.19	0.18	455	170	12	53	0.02	n d	0.15	1.32	0.54	n d	0.05	2.15	0.18	n d	1.05	0.31	n d	0.96	0.08	1.09	slow	clay	Altamont-Diablo 30-50%	yes	0.4	Walnut Woodland	44%
50	5.44	0.27	11	18	6.9	60	58.16	4.12	2.51	1.04	0.12	452	196	9	8	0.02	0.57	0.16	3.08	0.05	n d	0.03	2.82	0.18	n d	0.55	0.06	n d	2.70	0.12	0.30	slow/fair	sandy loam	San Andreas-San Benito	no	0.8	Sagebrush Scrub	31%
51	5.07	0.32	7	24	15.7	242	30.59	19.75	2.86	3.08	0.10	488	422	38	13	0.03	n d	0.18	1.96	0.81	0.05	0.26	7.63	0.27	n d	4.26	n d	n d	1.87	0.11	0.27	slow/fair	clay loam	San Andreas-San Benito	no	0.7	Oak Woodland	28%
52	7.14	0.75	12	32	2.6	94	7.82	0.95	2.63	2.09	0.19	433	188	44	36	0.01	n d	0.05	0.84	0.10	0.06	n d	3.78	0.25	n d	0.49	n d	n d	1.00	n d	0.32	fair/slow	clay loam	Perkins-Rincon	no	1.0	*Eucalyptus glauca/* Non-native grass	17%
53	7.40	0.74	20	10	1.9	136	1.53	0.07	0.13	0.65	0.17	418	263	14	118	n d	n d	0.12	0.52	0.03	n d	0.03	0.96	0.24	n d	0.02	0.05	n d	1.53	0.12	0.19	slow/fair	clay	Altamont-Diablo 9-30%	yes	0.3	Non-native grass/*Brassica nigra*	24%
54	7.24	0.31	19	10	4.4	61	4.13	0.47	0.78	2.32	0.17	459	141	8	10	n d	n d	0.05	1.14	0.06	n d	0.03	1.63	0.21	n d	0.28	0.10	n d	0.99	0.13	0.36	slow/fair	clay loam	Altamont-Diablo 30-50%	yes	0.7	Purple Sage Scrub	41%
55	7.47	0.30	12	7	2.9	55	1.21	0.25	0.33	3.06	0.14	380	391	55	7	0.03	n d	0.12	0.90	0.09	n d	0.05	0.62	0.18	n d	0.41	n d	n d	2.69	0.10	3.04	slow/fair	clay loam	San Andreas-San Benito	yes	0.8	*Brassica nigra/* Non-native grass	69%
56	7.31	0.37	24	18	6.4	77	2.96	0.72	1.01	4.35	0.16	452	102	21	9	0.07	n d	0.14	1.39	0.50	n d	0.04	2.01	0.18	n d	0.86	0.13	n d	1.37	0.19	0.86	slow/fair	clay loam	Altamont-Diablo 30-50%	yes	0.5	*Brassica nigra/* Non-native grass	39%
57	7.19	1.91	7	14	4.9	236	5.02	0.38	1.87	6.04	0.29	491	57	17	8067	0.61	n d	0.12	0.02	1.15	n d	n d	1.42	0.21	n d	1.20	0.13	n d	0.85	0.07	0.39	slow/fair	clay loam	Altamont-Diablo 30-50%	yes	0.2	Non-native grass/*Brassica nigra*	36%
6004	6.28	0.28	29	5	6.9	197	4.89	4.75	1.82	2.56	0.03	404	846	76	6	0.05	n d	0.06	1.55	0.62	n d	0.06	2.35	0.23	n d	2.67	n d	n d	1.90	0.11	0.51	slow	clay	Altamont-Diablo 30-50%	no	1.8	Non-native grass/*Pichris echioides*	65%
6005	6.92	0.35	21	6	9.4	257	3.09	1.72	1.91	3.85	0.07	382	250	39	14	0.07	n d	0.10	1.12	0.91	n d	0.03	2.98	0.17	n d	1.76	n d	n d	0.82	0.11	0.94	slow	clay	Altamont-Diablo 30-50%	no	1.0	*Brassica nigra/* Non-native grass	35%
6006	6.19	0.46	15	32	15.8	360	13.44	4.86	2.43	3.08	0.07	419	397	38	12	0.09	n d	0.07	1.51	0.81	n d	0.06	3.24	0.20	n d	2.74	n d	n d	1.31	0.10	0.35	slow	clay	Altamont-Diablo 30-50%	no	0.7	Non-native grass/*Hirschfeldia incana*	41%
6008	6.27	0.40	27	14	19.0	381	6.46	14.08	3.68	2.80	0.05	388	414	41	11	0.05	n d	0.06	1.29	0.69	0.02	0.13	3.03	0.18	n d	2.21	n d	n d	1.24	0.10	0.51	slow	clay loam	Altamont-Diablo 30-50%	no	1.0	Non-native grass/*Hirschfeldia incana*	62%
6009	6.27	0.33	14	6	11.1	143	16.01	9.56	3.57	3.78	0.03	391	265	22	11	0.02	n d	0.04	0.47	0.16	0.02	0.09	7.54	0.22	n d	1.42	0.01	n d	0.80	0.09	0.21	slow	clay loam	Hanford	no	0.8	*Brassica nigra/Silybum marianum*	53%
6010	6.37	0.46	26	18	8.2	237	14.29	7.10	2.95	3.42	0.06	378	222	19	11	0.06	n d	0.06	0.95	0.16	0.02	0.07	4.31	0.21	n d	1.23	n d	n d	0.72	0.14	0.13	slow/fair	clay loam	Hanford	no	0.8	*Brassica nigra* /Non-native grass	77%
6011	6.40	0.34	25	13	4.8	183	7.49	3.86	2.04	2.91	0.04	377	402	25	6	0.03	n d	0.05	1.36	0.13	n d	0.06	2.27	0.22	n d	1.14	0.07	n d	1.19	0.08	0.15	slow	clay loam	Altamont-Diablo 30-50%	no	1.0	Non-native grass/*Brassica nigra*	55%
6012	5.92	0.32	23	9	5.4	179	19.93	5.51	3.06	3.33	0.05	443	711	70	9	0.03	n d	0.05	2.47	0.18	0.01	0.08	4.73	0.26	n d	2.52	n d	n d	2.40	0.13	0.12	slow	clay	Hanford	no	1.7	Non-native grass/*Brassica nigra*	50%
6013	6.93	0.45	34	12	4.4	81	3.26	2.86	1.17	3.30	0.08	373	178	31	12	0.02	n d	0.08	0.98	0.11	n d	0.05	2.34	0.21	n d	0.47	0.18	n d	0.79	0.09	0.20	slow	clay loam	Hanford	no	1.0	*Brassica nigra/* Non-native grass	38%
6014	6.89	0.37	15	8	4.9	97	2.99	1.69	1.27	3.11	0.08	370	378	29	5	0.03	n d	0.05	0.83	0.12	n d	0.04	2.50	0.19	n d	0.81	n d	n d	1.10	0.11	0.22	slow	clay loam	Hanford	no	1.0	*Brassica nigra/Silybum marianum*	41%
6015	5.46	0.28	14	16	4.8	70	28.99	7.64	2.15	2.46	0.08	455	852	25	8	n d	n d	0.05	2.28	0.12	0.03	0.17	5.43	0.26	n d	1.64	n d	n d	2.03	0.04	0.15	slow	clay	Altamont-Diablo 30-50%	yes	1.1	Sagebrush Scrub	43%
6016	5.80	0.40	22	25	9.4	88	23.77	11.06	3.63	2.19	0.05	428	183	8	8	n d	n d	0.08	1.16	0.29	0.03	0.09	6.12	0.19	n d	1.41	0.11	n d	1.09	0.11	0.27	slow/fair	clay loam	Hanford	yes	0.7	Black Sage Scrub	50%
6017	7.07	2.00	21	10	5.2	207	2.51	0.87	1.21	3.73	0.16	417	115	45	872	0.13	n d	0.11	0.46	0.38	n d	0.04	1.97	0.18	n d	0.51	n d	n d	0.92	0.09	0.45	slow/fair	clay	Hanford	yes	0.4	*Brassica nigra/* Non-native grass	23%
6018	6.99	0.43	7	8	4.0	107	6.20	2.26	3.25	1.40	0.07	432	158	8	11	0.05	n d	0.03	0.39	0.21	n d	0.04	2.92	0.18	n d	0.66	0.15	n d	0.64	0.08	0.25	fair/slow	clay loam	Altamont-Diablo 30-50%	yes	0.5	Chaparral	33%
6019	7.53	0.49	40	9	3.8	105	3.18	1.24	0.79	3.98	0.07	329	244	78	6	0.10	n d	0.11	1.15	0.47	n d	0.03	1.25	0.15	n d	0.74	n d	n d	1.51	0.08	0.73	slow/fair	clay	Altamont-Diablo 30-50%	yes	2.3	Non-native grass/*Brassica nigra*	41%
6020	7.26	1.64	12	7	7.5	246	4.00	1.50	1.53	5.65	0.08	413	78	51	764	0.05	n d	0.16	0.90	0.79	n d	0.02	2.40	0.19	n d	1.25	n d	n d	0.98	n d	0.68	fair/slow	clay	Altamont-Diablo 30-50%	yes	0.5	*Brassica nigra* /Non-native grass	25%
6021	6.33	0.26	14	2	5.9	142	5.40	6.27	1.36	2.59	0.03	386	602	101	19	0.06	n d	0.10	1.08	0.37	0.02	0.09	1.52	0.24	n d	1.96	n d	n d	1.88	n d	0.45	slow	clay	San Andreas-San Benito	no	1.9	Non-native grass/*Erodiumcicutarium*	64%
6022	7.13	0.52	20	7	10.3	209	3.61	11.82	1.40	3.85	0.18	377	51	38	22	0.08	n d	0.13	0.43	0.35	0.02	0.20	1.50	0.15	n d	1.27	0.01	n d	1.63	0.05	0.53	fair/slow	clay loam	San Andreas-San Benito	yes	0.6	*Erodium cicutarium/* Non-native grass	79%
6023	6.05	0.37	9	7	9.8	221	12.05	18.01	3.42	2.84	0.09	382	490	58	13	0.15	n d	0.16	1.40	0.55	0.04	0.24	3.80	0.19	n d	3.05	n d	n d	2.35	0.06	0.30	fair/slow	clay loam	San Andreas-San Benito	no	1.1	Nassella Grassland	56%
6024	6.22	0.47	30	11	20.0	257	5.85	5.38	2.31	2.73	0.08	378	253	61	21	0.15	n d	0.10	0.84	0.65	n d	0.06	2.99	0.18	n d	2.24	n d	n d	1.22	0.08	0.42	slow/fair	clay	San Andreas-San Benito	no	0.9	Non-native grass/*Brassica nigra*	58%
6025	6.75	0.58	5	15	12.1	137	17.92	15.06	9.65	2.72	0.19	435	105	33	20	n d	n d	0.03	0.78	0.44	0.05	0.17	15.33	0.17	n d	1.54	n d	n d	0.65	0.05	0.42	fair/slow	loam	San Andreas-San Benito	yes	0.5	Black Sage Scrub	66%
6026	7.01	0.46	10	12	15.9	1124	3.08	4.34	3.21	3.85	0.21	401	155	37	26	0.12	n d	0.09	1.33	1.03	n d	0.07	3.67	0.17	n d	2.38	n d	n d	1.19	0.02	0.71	slow/fair	clay	San Andreas-San Benito	yes	0.8	Non-native grass/*Brassica nigra*	61%
6027	7.29	0.46	10	8	10.5	267	6.29	7.91	1.90	4.71	0.14	405	55	66	12	0.09	n d	0.15	0.79	0.54	0.01	0.11	3.52	0.19	n d	1.17	n d	n d	1.54	0.04	0.54	fair/slow	loam	San Andreas-San Benito	yes	0.8	Non-native grass/*Brassica nigra*	60%
6028	5.73	0.33	9	5	13.1	276	18.85	20.39	6.93	3.64	0.05	408	538	66	17	0.14	n d	0.13	1.82	0.72	0.06	0.26	15.42	0.21	n d	3.26	n d	n d	2.18	0.01	0.39	slow/fair	clay	San Andreas-San Benito	no	1.0	Nassella Grassland	62%
6029	6.90	0.80	61	32	6.1	432	2.81	1.71	1.55	3.29	0.17	442	81	41	40	0.06	n d	0.08	1.39	0.42	n d	0.03	2.31	0.19	n d	0.84	n d	n d	2.22	0.03	0.33	slow/fair	clay loam	San Andreas-San Benito	yes	0.7	*Nicotiana glauca/Brassica nigra*	67%
6030	7.16	1.98	12	11	5.6	95	3.10	2.23	0.47	3.02	0.15	416	94	55	5542	0.07	n d	0.03	0.33	0.25	n d	0.05	0.60	0.19	n d	0.57	n d	n d	0.88	0.05	0.44	fair/slow	clay loam	San Andreas-San Benito	yes	0.3	Non-native grass/*Brassica nigra*	47%
6031	7.45	0.44	6	11	3.3	73	1.80	0.42	0.52	5.33	0.25	430	215	96	37	0.06	n d	0.21	1.17	0.31	n d	n d	1.70	0.18	n d	0.72	n d	n d	1.90	0.08	1.83	slow/fair	clay loam	Altamont-Diablo 30-50%	yes	0.8	Non-native grass/*Brassica nigra*	13%
6032	7.42	0.42	7	20	4.1	183	1.86	0.87	1.04	4.26	0.11	460	140	54	13	0.02	n d	0.09	0.83	0.48	n d	0.02	3.13	0.18	n d	1.11	n d	n d	1.54	0.04	0.72	fair/slow	clay	San Andreas-San Benito	yes	0.8	*Brassica nigra/* Non-native grass	42%
6033	7.36	0.72	22	31	5.5	133	2.94	1.15	0.83	3.01	0.10	465	57	52	39	0.06	n d	0.16	1.02	0.26	n d	0.02	2.17	0.19	n d	0.59	n d	n d	2.26	n d	0.33	fair/slow	clay loam	San Andreas-San Benito	yes	0.6	*Brassica nigra/* Non-native grass	42%
6034	7.29	1.64	9	18	4.6	185	3.28	1.04	0.85	3.80	0.12	482	51	43	441	0.14	n d	0.08	0.82	0.34	n d	n d	1.92	0.19	n d	0.55	0.34	n d	2.17	0.06	0.38	fair/slow	clay loam	San Andreas-San Benito	yes	0.3	Non-native grass/*Brassica nigra*	69%
6035	6.20	0.42	4	22	7.2	200	27.47	1.78	2.71	2.93	0.06	428	451	73	16	0.10	n d	0.18	2.39	0.41	0.02	0.02	4.87	0.20	n d	2.94	n d	n d	2.76	0.04	0.29	slow	clay	San Andreas-San Benito	no	1.2	*Phalaris aquatica/* Non-native grass	61%
6036	7.13	1.80	4	13	3.9	137	4.46	0.87	0.54	2.25	0.08	442	39	39	6028	0.67	n d	0.07	n d	0.25	n d	n d	0.34	0.18	n d	0.40	0.19	n d	0.78	0.06	0.17	fair/slow	loam	San Andreas-San Benito	yes	0.3	Non-native grass/*Brassica nigra*	55%
6037	7.21	0.33	7	10	8.1	258	6.11	1.18	1.29	4.96	0.09	442	211	49	26	0.04	n d	0.17	1.30	0.95	n d	0.05	3.61	0.19	n d	2.07	n d	n d	1.72	n d	0.55	slow/fair	clay loam	San Andreas-San Benito	yes	0.6	Purple Sage Scrub	37%
6038	7.12	0.46	20	24	13	411	4.49	1.23	3.57	5.20	0.13	527	92	44	16	0.08	n d	0.04	1.68	1.63	n d	0.03	6.12	0.21	n d	2.20	n d	n d	0.83	0.04	1.40	slow/fair	clay	San Andreas-San Benito	yes	0.7	*Brassica nigra/* Non-native grass	49%
6039	6.94	0.44	12	17	8	214	8.94	1.55	2.38	5.19	0.09	437	209	48	12	0.03	n d	0.18	1.88	1.21	n d	n d	5.26	0.19	n d	2.79	n d	n d	0.72	0.05	1.10	slow/fair	clay	San Andreas-San Benito	yes	0.7	*Phalaris aquatica/* Non-native grass	45%
6040	6.36	0.27	5	15	18	220	12.90	0.88	2.05	5.52	0.06	446	513	64	6	0.09	n d	0.12	2.35	1.53	n d	0.03	4.72	0.23	n d	5.43	n d	n d	1.19	0.03	0.88	slow/fair	clay	San Andreas-San Benito	no	1.0	Non-native grass/*Phalaris aquatica*	57%
6041	7.08	1.75	6	14	3	319	6.48	1.52	2.00	5.23	0.22	535	55	38	3005	0.23	n d	0.10	0.23	0.59	n d	n d	2.96	0.22	n d	0.86	n d	n d	1.46	0.10	0.41	fair/slow	clay loam	Altamont-Diablo 30-50%	yes	0.3	Non-native grass/*Brassica nigra*	32%
6042	5.63	0.67	6	64	26	293	25.14	6.34	2.54	4.42	0.06	430	305	26	24	0.07	n d	0.15	1.56	1.47	0.02	0.04	4.93	0.20	n d	5.39	0.19	n d	1.12	0.12	0.48	slow/fair	clay	Altamont-Diablo 30-50%	no	0.4	Coyote Brush Scrub	47%
6043	7.24	0.82	17	58	156.3	933	33.65	3.21	16.89	8.69	0.47	543	199	5	31	0.01	n d	0.04	0.34	0.36	0.02	0.03	11.72	0.24	n d	0.58	n d	n d	1.90	0.09	0.37	fair/slow	clay loam	Hanford	no	0.3	*Foeniculum vulgare/Ricicus communis*	38%
6044	5.85	1.02	52	84	13.9	236	21.84	4.48	3.28	3.53	0.04	408	506	29	17	0.02	n d	0.03	0.90	0.17	0.01	0.07	5.13	0.22	n d	2.53	n d	n d	1.34	0.08	0.21	slow/fair	clay loam	Hanford	no	0.6	Elderberry Woodland	39%
6045	4.86	0.76	7	64	22.4	186	103.11	41.38	15.42	2.18	0.07	416	130	16	19	n d	2.46	0.08	1.18	0.20	0.15	0.66	25.88	0.16	n d	0.89	n d	n d	1.90	0.04	0.49	fair/slow	sandy loam	Hanford	no	0.6	Sagebrush/Buckwheat Scrub	71%
6046	6.73	0.38	9	12	14.6	339	5.93	0.63	2.17	2.87	0.08	393	288	19	6	n d	n d	0.09	0.77	0.51	n d	0.04	3.75	0.15	n d	1.18	n d	n d	1.08	0.12	0.50	slow/fair	clay loam	Hanford	yes	0.7	*Brassica nigra* /Non-native grass	57%
6047	7.03	1.13	13	18	408.5	931	66.68	2.57	14.36	4.82	0.60	523	190	6	48	n d	n d	0.41	0.18	0.27	0.02	0.05	5.38	0.22	n d	0.98	0.20	n d	2.77	0.12	1.11	fair/slow	loam	Hanford	yes	0.3	*Ricicus communis/Silybum marianum*	41%
6048	5.01	0.74	5	83	23.4	156	43.58	22.98	11.39	1.16	0.07	486	73	9	10	0.05	1.21	0.07	1.19	0.14	0.06	0.07	10.86	0.18	n d	0.39	0.11	n d	1.80	0.08	0.31	fair/good	sandy loam	Altamont-Diablo 30-50%	no	0.5	Sagebrush/Buckwheat Scrub	24%
6049	6.53	0.51	15	3	6.7	328	9.01	0.83	2.51	2.66	0.15	481	151	11	11	n d	n d	0.17	1.31	0.18	n d	0.05	6.43	0.20	n d	0.87	n d	n d	0.87	0.11	0.23	slow/fair	clay loam	San Andreas-San Benito	no	0.5	Non-native grass/*Brassica nigra*	61%
6050	5.35	0.34	22	25	7.8	112	56.27	5.00	2.86	1.34	0.07	432	132	3	9	n d	0.77	0.15	2.05	0.04	0.01	0.08	2.29	0.17	n d	0.72	0.25	n d	2.36	0.08	0.25	slow/fair	loam	San Andreas-San Benito	no	0.8	Chaparral	26%
6051	4.97	0.81	16	51	22.2	160	95.48	14.85	5.91	1.61	0.17	467	287	2	17	n d	1.54	0.08	0.83	0.10	0.04	0.21	8.95	0.19	n d	1.50	n d	n d	1.66	0.12	0.33	fair/slow	loam	San Andreas-San Benito	no	0.4	Oak Woodland	39%
6052	5.26	0.46	11	33	21.0	446	89.12	6.80	5.96	1.75	0.09	438	139	1	8	n d	n d	0.09	1.07	0.31	0.02	0.05	6.34	0.19	n d	1.83	n d	n d	1.94	0.10	0.27	slow/fair	clay loam	San Andreas-San Benito	no	0.6	Oak Woodland	18%
average	6.68	0.58	16.33	15.36	14.12	206.97	13.15	4.70	2.55	3.06	0.11	425.51	276.42	42.45	323.40	0.06	0.07	0.10	1.21	0.44	0.01	0.06	3.51	0.20	0.00	1.48	0.03	0.00	1.44	0.05	0.51	0.00	0.00	0.00	0.00	0.92		
target	6.5-7.9	0.5-3	<150	10-30	8-20	60-180	3-15	0.6-3	1-3	0.2-3	0.2-0.5		25-100	<200	25-100			<2																		<4		

woodlands sampled in clay loam did not contain lime. Additional soil tests in native habitats would likely confirm these observations, which are based on the limited soil tests conducted for this study.

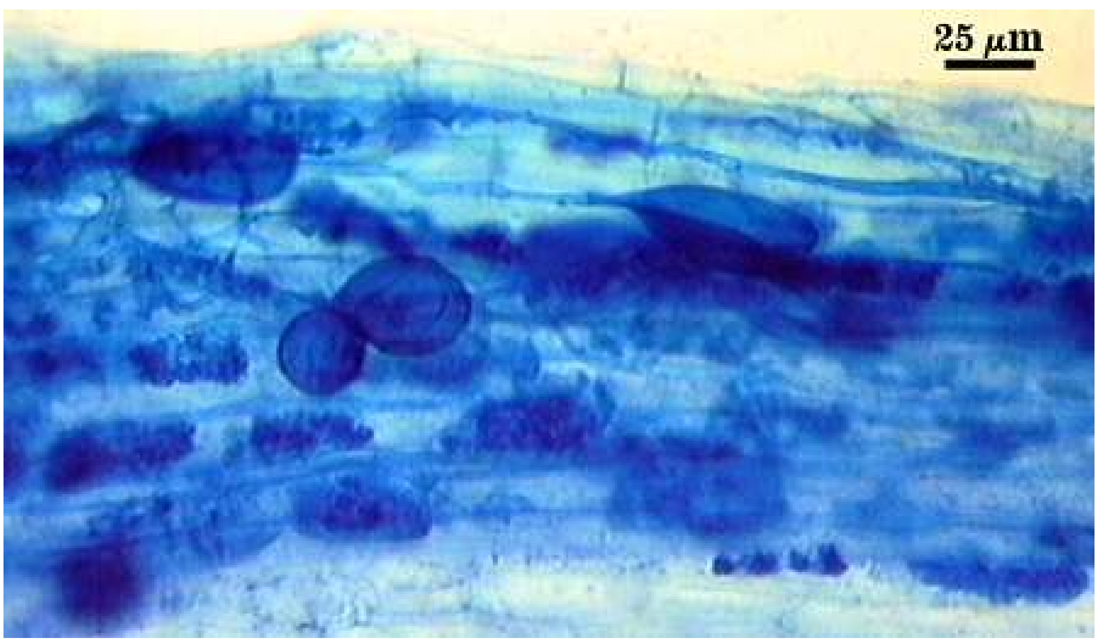
Soil pH ranges from slightly acidic to slightly alkaline over the 93 samples. The more alkaline soils generally are the soils that contain lime. These soil pH levels indicate no inherent problems for vegetation establishment and development.

Results from the mycorrhizal infectivity potential (MIP) tests show that there is little difference in infectivity throughout the Preserve for both soils dominated by exotic vegetation and by native vegetation. Figure A-3 shows an example of a root with mycorrhizal fungal hypha, arbuscule, and vescicle structures. Only samples dominated by eucalyptus demonstrate very low mycorrhizal infectivity. This result demonstrates that mycorrhizal fungi have established in areas of historic disturbance within the Preserve. Since a majority of land plants require an association with mycorrhizal fungi to thrive, the result is not surprising. However, native plants in southern California appear to form stronger relationships with mycorrhizal fungi than do weedy exotic species (Vogelsang et al. 2004). Exotic weedy species are generally inferior hosts for mycorrhizal fungi, and the fungal community can be different and significantly less abundant when associating with exotic host plants than when associating with native host plants. Experimental results have identified a biotic feedback mechanism where exotic species can promote particular microbial communities that, in turn, promote the growth of exotic plants. Coupled with the lack of obligate mycorrhizal association, this biotic feedback may be one reason why weedy exotic species initially are able to colonize and type-convert disturbed native lands, as has occurred within the Preserve. Once such a type-conversion has occurred, it is difficult for native species to recolonize because the original mycorrhizal community has been changed to such an extent that it no longer provides a benefit to native species. Experiments with southern California species show that native plants will grow in either native dominated AM inoculum or in inoculum cultured from exotic dominated sites; however, native plant growth is significantly better in the native inoculum (Vogelsang et al. 2004). Based on the MIP results from the Preserve, it is not possible to assess the species differences in fungal communities between the native habitats and the exotic dominated acreage. However, based on recent research, differences in both fungal species diversity and richness are expected between native habitats and exotic dominated areas. Other interaction, such as competition with exotic species for soil water, are known to limit native performance (Eliason & Allen 1997) and may contribute to the maintenance of stable exotic-dominated communities, even after disturbance has been eliminated.

Arbuscular mycorrhizal fungi aid plants with the uptake of phosphorous and water, while plants provide photosyntate to the fungi, thus the mutualistic association. Therefore, if plant communities are dependant on the mycorrhizal association, there should be a negative correlation between phosphorous levels and the percent soil infectivity (as expressed by percent mychorrizal structures of arbuscules and vesicles). Results from native habitat soils in the Preserve show a negative correlation (-0.50) between the concentrations of available phosphorous and percent of mycorrhizal infection. Samples from Preserve soils dominated by exotic species do not show a correlation (-0.14) between amount of phosphorous and infectivity. Therefore, it can be inferred that the native species may be more dependant on mycorrhizal fungi than the exotic species in areas of low phosphorus.



Arbuscular mycorrhizal structures: vesicle and arbuscules.



Arbuscule mycorrhizae hyphae within plant roots.

Prepared By: LSA

FIGURE A-3

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Mycorrhizae Fungi in Plant Root:
Hypha, Arbuscle, and Visicle

SOURCE: Earthworks, http://invam.caf.wvu.edu

P:\PUE430\g\MycorrhizaeFungiInPlantRoots.cdr (10/27/06)

APPENDIX C, TRAIL CONDITION ASSESSMENT

APPENDIX C

TRAIL CONDITION ASSESSMENT

PUBLIC ACCESS AND TRAILS

Background

Historically, the Puente Hills were used extensively for agriculture, ranching, oil extraction, and other purposes. Farmers, ranchers, and oil corporations carved numerous trails and roads through the landscape to provide access to remote sites from their facilities at lower elevations (Donovan, 2004). Since that time, utility companies, including Southern California Edison (SCE), local water districts, fire departments, and others have also constructed service roads for access to transmission lines and for fire protection. These roads constitute the majority of the Preserve's existing trail system.

While this comprehensive road network provided a ready-made trail system to accommodate public use, it has left the Preserve with a legacy of roads and trails that were not always constructed or maintained with sensitivity to the environment. In addition, a long history of uncontrolled access, coupled with increased recreational use, has facilitated the development of visitor-created unauthorized trails and shortcuts that are potentially damaging to site resources.

Given the purpose of the Preserve, trails and public access are secondary to the primary goal of protecting habitat and resources. However, the Habitat Authority has committed to offering access and recreational opportunities to the public. The challenge for the Habitat Authority is to ensure that public access and recreational use are consistent with habitat protection. As such, the Habitat Authority will focus on improving the current network of roads and trails and look for opportunities to implement management actions to minimize road and trail impacts on site resources. It will evaluate limited new trail routes consistent with the primary purpose of resource protection.

This section provides information on existing trail conditions, potential recreational conflicts, and conflicts with appropriate resource management needs and proposes recommendations for trail connections and trail rehabilitation. These recommendations should be considered prescriptions to direct future implementation of the trail system. Specific routes and design specifications have been prepared using best management practices, standards, and policies and with the benefit of public and agency involvement.

Preparers/Contributors

Trail data/mapping within this report is based upon field studies in Geographic Information Systems (GIS) technology, organized by Dr. Cheryl Swift, Department of Biology at Whittier College (Swift 2002). As part of a course exercise, a student participant, Nick Smalls, walked a majority of trails with a Global Positioning System (GPS) unit to record trail locations and extents. National Park Service staff, Jim Donovan, supplemented trail data in summer/fall 2003 and spring 2004. He collected data for the Schabarum Trail outside the Preserve and for trails originally proposed by the Open Space Advisory Committee (OSAC) in 1998. GPS data from both sources were reconciled and plotted over USGS quad maps 7.5-minute series of *Baldwin Park, Azusa, Whitt*ier*,* and *La Habra* using GIS software.

Based on his familiarity with the site, Jim Donovan was asked to lead the effort to go out in the field and collect information on the existing condition of these trails using an inventory form developed by LSA. He was assisted in the assessment effort by Amy Henderson, Resource Ecologist for the Habitat Authority; several members of the Citizens Technical Advisory Committee, specifically, Bud Welch, Shelley Andros, William McDermott, Michael Hughes; and LSA staff. LSA collated the data and created a comprehensive database of information for each trail segment, including estimated width, clearance, slope, surface, setting and condition, level of use, existing improvements, potential barriers and scenic qualities. The trail assessment was then used with information from the resource inventory to identify potential issues of concern and to develop appropriate recommendations.

Trail Condition Assessment

Terminology. As described above, the trail condition assessment presented in the following sections is a summary of data collected in the field and compiled in the database. The three categories, authorized, informal, and closed/inactive trails, represent the Preserve's current policies regarding public access and recreational use as well as physical characteristics identified in the field. Due to the complexity and variety of the existing trail system, these categories should not be considered definitive. The three categories can be described as follows:

- **Existing Trails:** The Preserve's existing practice is to allow pedestrian and equestrian access to most trails and fire roads and to allow bicycle access to most fire roads and some designated trails. This category includes trails maintained by Preserve rangers and the Los Angeles County Department of Parks and Recreation (L.A. County Parks) and fire roads/utility easements maintained by relevant agencies (i.e., Southern California Edison [SCE], fire department).
- **Informal Trails:** As described above, uncontrolled access and increased recreational use has facilitated the development of visitor-created unauthorized trails and shortcuts that are potentially damaging to site resources. This category includes these unauthorized trails and shortcuts as well as fire roads/utility easements that are no longer maintained, are in poor condition, or do not contribute to a sustainable, comprehensive trail system.
- **Inactive/Closed Trails:** This category includes trails and roads that have become overgrown due to lack of use, have been closed by the rangers due to safety concerns, or have become obsolete due to redundancy or trail realignment. These trails were identified primarily in the field and in discussion with Preserve rangers.

Assessment. For clarity, the Preserve has been divided into eight primary use areas based on points of access and trail use. The trail assessment has been organized according to these subareas, beginning with the Schabarum Trail and working east from Sycamore Canyon/Hellman Park to Powder Canyon.

Schabarum (Skyline) Trail. The Schabarum Trail is a regional trail that extends 17 miles between Workman Mill and Fullerton Roads and is part of a larger system connecting the Rio Hondo and foothills of the San Gabriel Mountains at La Verne (Donovan 2004). The trail consists of numerous segments and is accessed via multiple trailheads both on and off Preserve property. The Schabarum Trail is part of the Los Angeles County trail system and is maintained by L.A. County Parks. However, it forms the spine of the Preserve's trail system and is described here insofar as it connects and impacts Preserve trails. This trail is also designated as the National Park Service historical recreational route of Juan Bautista de Anza.

Schabarum Trail Segments.

1	Trail 1 primarily consists of a fire road/utility easement (12–20 feet [ft] wide), maintained by L.A. County Parks and SCE, a utility company. Segment D is a single-track trail (6 ft wide) that duplicates a parallel road in Turnbull Canyon (Trail 6H). The trail surface consists of compact soil with some areas of pavement and gravel/loose rock. Access to the trail is via a trailhead at Workman Mill Road. The trailhead provides a gate, parking, equestrian staging, and water. As described on the inventory form, Segment A provides an "intensely urban trail experience below Rio Hondo College with multiple undercrossings and bridges." The remainder of the trail follows the ridgeline and provides scenic views of the San Gabriel Valley. The majority of Trail 1 lies outside of the Preserve; fencing along the ridge divides the Preserve from Rose Hills Memorial Park.
16	Trail 16 is primarily a dual-track (8 ft wide) trail maintained by L.A. County Parks as part of the Schabarum Trail. Segment B is a fire road/utility easement (16 ft wide) maintained by SCE. The trail surface consists of compact soil. The trail is heavily used, particularly by cyclists who refer to it as the "Rattlesnake Trail." Significant problems exist in the form of cut-offs (cyclists riding up embankments along trail edges) and deep erosion.
17C	Segment 17C is a single-track (3 ft wide) trail maintained by L.A. County Parks as part of the Schabarum Trail. The trail surface consists of compact soil. Segment 17C climbs up into the upper canyon and crosses Turnbull Canyon Road, a two-lane road. This heavily used trail is in very good condition with some minor erosion. Primary access is from Turnbull Canyon Road, where there is a gate but no parking area.
20A–M	Trail 20 consists of 18 segments including single-track trails (4–8 ft wide), dual-track trails (8–10 ft wide), and fire road/utility easements (12–20 ft wide). Twelve of these segments form a section of the Schabarum Trail that extends from Turnbull Canyon Drive to Trail 36 into Schabarum Park. The trail surface primarily consists of compact soil with areas of gravel/loose rock, bedrock, pavement, and sand. Segments A–D are heavily used, particularly by cyclists, as part of a loop into Worsham Canyon. This portion of the trail travels through brush and grassland and ascends to Workman Hill, which provides a 360-degree panorama of the surrounding landscape. Segment E continues along the ridgeline very near the transmission towers. Shortcuts drop off from this segment into La Cañada Verde. Segments G–K wind through and adjacent to several residential neighborhoods. An undercrossing provides through access beneath Colima Road. Portions of this section are fairly steep and show signs of erosion. Other portions are overgrown with nonnative trees (pines) and other plants. Segment L lies along a natural drainage route and is severely eroded such that tree roots and large boulders are exposed. Segment M provides views to undeveloped canyons

to the north and the San Gabriel Mountains. It is accessible via Punte del Este and Gotera Drives. Although this segment crosses a very steep hillside, it appears to be in good condition.

34C Segment 34C is a piece of an SCE service road that provides a connection between sections of the Schabarum Trail. The trail surface consists of compact, clay-like soils.

36/37/39 These single-track trails (4–8 ft wide) extend the Schabarum Trail into Schabarum Park. The trail surface consists of compact soil. These Schabarum Trail segments lie outside of the Preserve. However, numerous shortcuts/unauthorized trails veer off of these trails into the Preserve. These sections of the Schabarum Trail are served by the trailhead at Schabarum Park. The trailhead provides a gate, parking, equestrian staging, and camping (by permit only). These trails are heavily used but in fairly good condition.

Sycamore Canyon/Hellman Park. This area forms the northwest portion of the Preserve, lying just south and adjacent to Rose Hills Memorial Park. Two trailheads provide primary access to this area: one at Workman Mill Road, the other in Hellman Park. This area contains several old roads that are heavily used, particularly by mountain bikers as part of a loop through Turnbull Canyon. Many of these roads lead off of the Preserve and into Rose Hills Memorial Park.

Existing Trails.

2A Trail 2A is a single-track (approximately 6 ft wide) trail within an old road bed. The trail surface consists of compact soil. The trail edges a creek with regular stream flow, making this a popular birding area. At the time of assessment, the trail had been recently maintained by the rangers; however, some sections remain overgrown.

4 Trail 4 is a single-track (approximately 2 ft wide) trail connecting Trails 2 and 6. The trail surface is compact soil. The trail begins in the canyon and climbs steeply to the ridgeline. The steep slope is difficult for all but experienced runners/hikers; therefore, the trail is lightly used. Despite the steep slope, the trail is in relatively good condition, with only minor erosion damage and a shortcut on the first switchback. The trail provides a great canyon-to-ridgeline hiking experience.

6 Trail 6 is a fire road/utility easement varying in width from 12 to 20 ft. The trail surface consists of compact soil and gravel/loose rock. Access is difficult to Segments A and B; therefore, these segments experience minimal use, probably by local residents and visitors using Hellman Park trails. Most of Segment C and the remaining segments of Trail 6 lie within Rose Hills Memorial Park, outside the Preserve. These segments are heavily used by bikers as part of the Turnbull Canyon circuit. The entire trail provides scenic views of adjoining canyons, downtown Los Angeles, Whittier, the San Gabriel Mountains, and the coastal plain.

7	Trail 7 is a single-track (2 ft wide) trail connecting the Hellman Park Trailhead with Trail 6. The trail surface consists of compact soil, bedrock, and sand. The trail crosses through the canyon and up a steep hill with approximately 15 switchbacks to follow the ridgeline. Heavy use and the steep slope have caused erosion along switchbacks and at the top, along the ridgeline.
8	Trail 8 consists of three trail segments: Segment A, a dual-track trail (12 ft wide); Segment B, a single-track (3 ft wide) trail; and Segment C, a fire road/utility easement (16 ft wide). The trail offers a pleasant, winding, scenic alternative to Trail 7. The trail surface consists of compact soil and sections of bedrock. Trail 8 is heavily used, particularly by cyclists, and affords scenic views into adjoining canyons. There are a number of uncontrolled access points heading off onto unauthorized trails (see below).

Informal Trails.

48	Trail 48 is either a fire road/utility easement or an old road (12–16 ft wide) and unauthorized trail (2 ft wide) connecting Trail 8 (Hellman Park Trailhead) and Trail 6. The trail surface consists of compact soil and areas of gravel/loose rock. Sections of the trail are very steep, and erosion damage is evident. The trail is used, particularly by cyclists who want a steeper, faster route as part of the Turnbull Canyon circuit. Segment 48E is one of the highest points in the hills.
49	Trail 49 is either a fire road/utility easement or an old road (16 ft wide) and unauthorized trail (1–4 ft wide) shortcut connecting Turnbull Canyon Road to Trail 8. The trail surface consists of compact and loose soil. This trail is very steep, eroded, and lacks adequate access and connectivity to authorized trails. Trail 49 is used, particularly by downhill cyclists seeking a more thrilling alternative to Trail 48D.
50	Trail 50 is an unauthorized trail (4 ft wide) created from a former fire break. The trail surface consists of loose soil. This very steep, severely eroded trail experiences heavy use, particularly by cyclists. At the upper elevation, it appears that cyclists have illegally constructed moguls and dips. Segment 50B lies outside the Preserve.

Inactive/Closed Trails.

2B	Trail 2B is a single-track (approximately 3 ft wide) trail within an old road bed. The trail surface is compact soil. The trail runs along the canyon bottom into Dark Canyon and off of the Preserve. The trail is overgrown and partially eroded. Currently, access is not encouraged, as the trail crosses a stream.
3	Trail 3 is an abandoned fire road/utility easement, approximately 12 ft wide. The trail has not been maintained in many years and is overgrown and blocked by downed trees. The trail surface is leaf litter and growth. Trail 3 is not open to the public.

5	Trail 5 is a closed, single-track (1 ft wide) shortcut trail connecting Trails 4, 6, and 7. The trail surface is compact soil. The trail travels through hillside and brush (chaparral) areas. Trail 5 is not open to the public and shows no signs of current use.

Issues.

- Shortcuts
- Signage needed
- Erosion on steep slopes

Hacienda Hills/Puma, Toyon and Coyote canyons. This area encompasses the steep terrain between the residential development of Hacienda Heights to the ridgeline and the Schabarum Trail. Primary use is from local residents; this is their only access point into the Preserve. The Hacienda Hills trailhead was opened in 2005 at the intersection of 7th and Orange Grove Avenues. The trailhead provides a gate, parking, ADA access, a horse stepover, and a restroom. There are no other points of access to this area.

Existing Trails.

12	Trail 12 is a single- to dual-track trail varying in width from 3–10 ft wide. Except for section A, this is a feeder trail to the Schabarum Trail. The trail begins as a path running along the fenceline of existing residential development then climbs up to the ridge. Slope ranges from 5–6 percent to over 20 percent. The trail surface consists of compact soil, loose gravel/rock, and some bedrock. The trail is heavily wooded and edged with large oak trees in some locations. Due to the excessive slope and loose soils, erosion damage in some locations is severe. The trail experiences light to heavy use.
13	Trail 13 begins at the Hacienda Hills Trailhead as a dedicated road bed (approximately 20 ft wide), narrows to a dual-track trail (8 ft wide), and ultimately becomes a single-track trail (2–4 ft wide). This heavily used trail is part of the L.A. County Parks trail system and maintained by L.A. County Parks. Portions of the trail lie outside of the Preserve. The trail is steep in places (14 percent) with several switchbacks and unstable soils. These conditions, coupled with heavy use, have caused heavy erosion damage in some locations. Scenic/unique qualities associated with this trail include views over the San Gabriel Valley and to adjoining canyons.
14	Trail 14 is a dual-track trail (approximately 8 ft wide) connecting Trails 12 and 13. The trail surface is compact soil. Trail 14 provides a beautiful trail experience through the canyon, traversing woodland riparian, and hillside areas. The trail contains 10 switchbacks and is steep and difficult to access, except as part of a larger loop along Trail 13 from the Hacienda Hills Trailhead. Steep slopes show evidence of erosion. This trail is part of the L.A. County Parks trail system and is maintained by L.A. County Parks.

15 Trail 15 is a single-track (4 ft wide) trail accessed via Trail 13 and the Hacienda Hills Trailhead. The trail is closed to cyclists and should not be used by equestrians due to inadequate vertical clearance. The trail surface consists of compact soil. The first one-quarter mile of the trail is steep (16 percent average grade), and the entire trail is thick with poison oak. Toward the ridge, the trail connects to an existing utility access road that provides connections to Trail 1 (Schabarum Trail), Trail 6, and Trail 13. A gate and fencing run along the ridgeline below Trails 1 and 6.

45 Trail 45 is a heavily used single-track trail (approximately 3 ft wide) that forms a loop off of Trail 12. The trail surface is compact soil. The trail is very steep and narrow and pockmarked with gopher holes in some locations. Equestrian use is not advised (per Shelley Andros).

Informal Trails.

66 Trail 66 is an active utility service road (approximately 20 ft wide). At the time of assessment, the surface had been recently regraded and consisted of loose soil. Access is difficult, via a gap in the fence on Orange Grove Avenue. This trail provides access to monitoring wells at the base of the landfill; it should not be used for recreation.

Inactive/Closed Trails.

46 Trail 46 is an unauthorized trail connecting Trail 15 with the Schabarum Trail. This trail was apparently closed when Trail 15 was rerouted to the northwest. It is no longer in use.

Issues.

- Poison oak on Trail 15
- Steep slopes and severe erosion damage

Turnbull Canyon. Turnbull Canyon includes areas of the Preserve south of Sycamore Canyon/Hellman Park and north of Worsham Canyon, east to the Schabarum Trail. This area is bisected by Turnbull Canyon Road, a two-lane road. The varied terrain and elevation provide opportunities for a unique trail experience and for scenic views of the surrounding landscape. As a result, this area is extremely popular, particularly with cyclists. The primary point of access is off of Turnbull Canyon Road and from Schabarum Trail to the east. The gated access point includes signage but no parking area; trail users park along the road shoulder.

Existing Trails.

11 Trail 11 is a fire road/utility easement (16 ft wide) connecting Trail 6 in Sycamore Canyon/Hellman Park to Trail 17 in Turnbull Canyon. The trail surface consists of compact soil with some sections of pavement. The trail is fairly steep (10 percent grade) and heavily used. Minor erosion has been noted on the trail, particularly along trail edges.

17AB Trail 17 is primarily a fire road/utility easement (12–18 ft wide) maintained by the Los Angeles County Fire Department. The trail surface consists of compact soil. Primary access is from Turnbull Canyon Road, where there is a gate but no parking area. This heavily used trail travels along a riparian corridor with sycamores and oaks that provide a shady, pleasant trail experience and eventually crosses the creek at Segment B. Sections of the trail are severely eroded/rutted and shortcuts are present.

19 Trail 19 is a fire road/utility easement (16 ft wide) that spans Turnbull and Worsham Canyons. The trail surface consists of compact soil, lightly covered by weeds and grasses. Access to the trail is difficult due to proximity of residential development (Trail 23X) and distance to adequate parking; it is unlikely this trail gets much use. However, the trail is in excellent condition and provides scenic views into Turnbull and Worsham Canyons.

Informal Trails.

47B Trail 47 is an unauthorized trail (2–3 ft wide) connecting Trail 6 in Hellman Park to Trail 17 in Turnbull Canyon. The trail surface consists of compact soil. Segment A lies outside of the Preserve but poses a problem in that it is used to access Segment B. Segment B travels through good-quality coastal sage scrub habitat but is extremely steep and eroded.

51 Trail 51 is a fire road/utility easement (16 ft wide) and unauthorized trail (2 ft wide) that provides a shortcut between Trails 1 and 16 (Schabarum Trail). The trail surface consists of compact soil and bedrock. Segment A is steep and shows signs of erosion; Segment B is a casually established shortcut. Trail 51B travels alongside the guzzler.

Inactive/Closed Trails.

18 Trail 18 consists of two segments: Segment A, a degraded fire road (2 ft wide) and Segment B, a maintained fire road (20 ft wide). The trail surface consists of compact soil. Segment A is steep, eroded, and overgrown with brush. Segment B is accessible from a dirt turn-out on Turnbull Canyon Road where there is a rhino gate and parking available for 1 or 2 cars. If accessible, Trail 18 could provide an additional connection between Trails 17 and 19.

Issues.

- Erosion
- Prevalence of “cut-offs” (cyclists riding up embankments along trail edges) and shortcuts along switchbacks
- Lack of facilities such as parking
- Crossing of Turnbull Canyon Road without a sign for motorists may be a safety hazard

Worsham Canyon. Worsham Canyon encompasses the area between Turnbull Canyon to the north and Arroyo Pescadero to the south. It is the primary point of entry for Whittier College students to access the Preserve. This area lacks a trailhead and/or a suitable point of access. Users currently access the site illegally from Philadelphia Street through land owned by the City of Whittier.

Existing Trails.

21 Trail 21 is a single-track trail (2–5 ft wide) within the bed of a former ranch road. The trail surface consists of compact soil. Trail 21 is one of the best trails on the Preserve and a key segment in the bicycling circuit. It is a winding, scenic trail through brush and hillside areas. Trail 21 is maintained by the rangers and is generally in good condition with small pockets of erosion evident. At the western end, access is difficult due to proximity of residential development (Trail 23X). Most users access the trail via unauthorized trails across private property (Trails 24B and 52A).

24A Trail 24A is a fire road/utility easement (9 ft wide) maintained by the rangers as part of the Preserve. The trail surface consists of compact soil. This trail segment crosses an isolated parcel just above Whittier College, below Philadelphia Street, and seems to be an active link between the Whittier College campus and Worsham Canyon.

Informal Trails.

24B Trail 24B is a fire road/utility easement (12 ft wide) on land owned by the City of Whittier. The trail surface consists of pavement and sand. This trail segment links the Philadelphia Street neighborhood and Worsham Canyon. Although it is gated and signed “No Trespassing,” this trail segment is heavily used.

52 Trail 52 is an unauthorized trail (1–4 ft wide) connecting Trails 23, 21, and 19. The trail surface consists of bedrock and loose/native soil. Segment A provides a good access point for Worsham Canyon, particularly Trail 21, and is therefore heavily used. However, this trail segment is extremely steep and heavily eroded/rutted. Segment A lies outside of the Preserve on land owned by the City of Whittier. Segment B is a very narrow (1 ft wide) shortcut connecting Trails 21 and 19. It appears to be only lightly used and may be a wildlife trail.

53 Trail 53 is an unauthorized trail (1–2 ft wide) looping off of Trail 20 (Schabarum Trail) and connecting to Trail 23. The trail surface consists of compact soil. Segments of the trail seem to experience light use as a connection between Trails 20 and 23, while other segments are not well established and may only be used by wildlife.

Closed/Inactive Trails.

22	Trail 22 is an abandoned fire road/utility easement (1 ft wide). This old access road is no longer in use and has become overgrown. Terrain includes a very steep drop into the adjacent residential neighborhood.
23	Trail 23 consists of several segments of varying types and widths. Segment A is an old oil company road (12–16 ft wide) consisting of compact soil and gravel/loose rock. Access to this segment is through a gate on Elmquist Avenue. Segment A crosses in back of a residential yard. Segment B is a dual-track trail (6 ft wide) in an old service road bed. The trail surface consists of compact soil, gravel/loose rock, and sand. Most of this trail lies outside of the Preserve. Segment B provides a connection, via Trail 24, from Whittier College into the Preserve. The upper hillsides along this trail segment contain good-quality sage scrub habitat. Segment C is an old, overgrown service road built for oil company access to its wells. Segment C climbs steeply up onto the ridge overlooking the Whittier City Landfill. Segment X is a narrow unauthorized trail through a fuel-modification zone along a fenceline separating residential backyards from the Preserve. This segment provides access to Trail 21, but access is difficult due to proximity of residential development. Terrain is steep, and no obvious alternatives routes can be seen.
25	Trail 25 is an old service road climbing up along the ridgeline overlooking the Whittier City Landfill. The trail surface consists of compact soil. This trail constitutes a high-elevation bypass to existing Worsham Canyon trails. Most of Trail 25 lies outside of the Preserve. The trail encroaches on a residential neighborhood; therefore, access is currently discouraged.
54	Trail 54 is a fire road/utility easement (10 ft wide) (probably an old ranch road) connecting Trails 22 and 20 (Schabarum Trail). Portions of the trail are currently maintained as a fuel-modification zone. The trail surface consists of compact soil. The trail lies right along the edge of residential development and portions are overgrown with vegetation. It is not open to the public.

Issues.

- Lacks a trailhead
- Difficult access
- Discontinuity in property ownership (i.e., City of Whittier DPW property separates areas of the Preserve)
- Shortcuts and erosion, particularly Trail 52A

Arroyo Pescadero. This former oil field site is currently owned by the City of Whittier. The site features a number of old oil company roads and areas of heavily disturbed landscape dominated by nonnative vegetation including eucalyptus, Brazilian pepper, and castor bean. Several restoration projects are currently underway in this area. One of the Preserve's most heavily used trails is accessed via the Arroyo Pescadero Trailhead. The trailhead provides a gate, restroom, parking, water, and equestrian staging for trail users. In addition to the Arroyo Pescadero Trailhead, access points to this area exist at Aurora Crest Drive, Las Palomas Drive, and Casalero Drive.

Existing Trails.

26/27AB These trail segments form the Arroyo Pescadero two-mile loop, a dual-track trail on a former oil company road that varies in width from approximately 10–16 ft. The trail rises up from the trailhead through a landscaped area, drops down into the canyon, comes back up, and then slopes down to the parking area. The slope varies from very mild (1–2 percent) to fairly steep (9–10 percent). The surface consists primarily of compact soil and loose gravel/rock interspersed with remnant pavement from the old oil road. It travels through a range of settings, primarily coastal sage scrub, chaparral, and hillside with some riparian areas. As mentioned above, sections of the trail are heavily disturbed and dominated by nonnative species. They are partially maintained by the L.A. County Fire Department.

27C-G Trail segments form a dual-track trail on a former oil company road, ranging in width from 8–16 ft. The trail surface consists of compact soil and bedrock interspersed with pavement remnants from the old oil road. It is accessible from the Arroyo Pescadero Trailhead, the Las Palomas gate, and the Schabarum Trail (via unauthorized Trail 32). The trail is maintained by the rangers for emergency access but steep sections are experiencing erosion. Trail assessors described it as a “very pleasant medium-range trail through Arroyo San Miguel” with “nice riparian habitat and cross canyons.”

Inactive/Closed Trails.

23Z Trail 23Z is an abandoned dual-track trail on an old oil company road (approximately 8 ft wide). The trail surface consists of compact soil and sand. The trail is currently overgrown and difficult to access. It is not open to the public. The trail forms a loop off of Trail 27.

29 Trail 29 is an abandoned oil company road that probably predates construction of Colima Road. The trail surface consists of compact soil and bedrock. This trail lies very close to the highway and doesn’t appear to be used because it is currently being restored to native habitat.

68 Trail 68 consists of an approximately 2 ft wide trailtread within the bed of a former oil company road. The surface consists of compact soil interspersed with pavement remnants; native species grow in the road throughout its length. The beginning of the trail goes through a riparian zone and then travels primarily through brush habitat. The slope is moderate (5.3 percent). Trail 68 is the four-mile loop extension proposed by the OSAC (1998).

Issues.

- Highly disturbed landscape; many old oil roads and nonnative species
- Heavy brush may create unsafe conditions by preventing safe sightlines (e.g., mountain lions)
- Desire for longer loops (four- and eight-mile loops)
- Would like to limit access due to location of ranger residence in proximity to old roads/proposed trails

Hacienda Road East/Unocal. This area consists of several small parcels linked together by the Schabarum Trail to connect Arroyo Pescadero and Powder Canyon. As a result, many of the trails in this area lie only partially within the Preserve. This area has no trailhead; however, access points currently exist at Aurora Crest Drive, Las Palomas Drive, and Casalero Drive.

Existing Trails.

31 Trail 31 is a road (16 ft wide) used as an alternative route to the Schabarum Trail (Segment 20J). The trail surface consists of compact soil with sections of pavement. Segment A is steep and shows evidence of erosion and damage from off-road vehicle use. Segment B leads to the Preserve property line at the top of the hill. The hilltop area has been used as a “party spot;” garbage is evident. Segment C lies outside of the Preserve.

33 Trail 33 is a road (12 ft wide) consisting of compact soil and gravel/loose rock. Segment A connects the Las Palomas access point to Trail 27 in Arroyo Pescadero. This trail primarily serves local residents from La Habra Heights. Parking restrictions along the roadway preclude broader public access to this trail. Segment B once provided access to oil sites in the canyon; it currently dead ends about one-sixteenth of a mile from the entrance. Both segments of the trail are in good condition.

34 Trail 34 is a utility service road (12 ft wide) connecting the Hacienda Heights neighborhood to Trails 36 and 20 via an access point on Apple Creek Lane. The trail surface is compact soil. Only 30 percent of the trail lies within the Preserve. Sections of the trail are steep and showing signs of erosion. Segment B provides scenic views of the San Gabriel Valley and surrounding mountain ranges.

70 Trail 70 is a fire road/utility easement (16 ft wide) that provides an alternative alignment to the Schabarum Trail. The trail surface consists of compact soil. Sections of the trail are steep, but appear to be in fairly good condition. Off-road vehicle use is evident in the vicinity.

Informal Trails.

32 Trail 32 is a narrow (2 ft wide), unauthorized trail connecting Trail 27 from Arroyo Pescadero to Trail 20 (Schabarum Trail). The trail surface is compact soil. Trail tread exists only as an angled path, beaten through the weeds.

However, horse hoof prints were obvious at the time of trail assessment, indicating the trail is lightly used.

69 Trail 69 consists of an unauthorized trail (Segment A) and a fire road/utility easement (Segments B-E) connecting Trails 27, 31, and, ultimately, the Schabarum Trail. Sections of the trail are extremely steep and degraded. Other segments may be maintained (tractor tracks are evident) as a possible fire break.

Inactive/Closed Trails.

30 Trail 30 is a former access road (12 ft wide) along the ridgeline. The trail surface is compact soil. A portion of the road is outside of the Preserve, and a gate prevents access across the property line. The trail is steep and shows evidence of erosion and overgrowth. Off-road vehicle activity is obvious on the east end of the trail (outside of the Preserve).

55 Trail 55 is a narrow (2 ft wide), single-track trail that spans the Newbre and Serafi properties. Only 50 percent of the trail lies within the Preserve. The trail loops off of the Schabarum Trail. Access is likely from Punte del Este and Gotera Drive in Hacienda Heights.

Issues.

- Lacks a trailhead
- Multitude of shortcuts, dead ends, abandoned roads; needs signage
- Discontinuous property ownership

Powder Canyon. Powder Canyon lies at the eastern extent of the Preserve. Several trails cross into the Preserve from Schabarum Park to the north and intersect with the trails listed below. The Powder Canyon Trailhead provides a gate, horse stepover, parking, equestrian staging, and warm-up ring.

Existing Trails.

20N–S These segments of Trail 20 are part of a fire/utility service road (approximately 16–20 ft wide) that runs along Schabarum Drive to an antenna. The trail surface consists of compact soil and gravel/loose rock. The trail setting is primarily brush with portions along the ridgeline and through hillside and grassland areas. Along the ridgeline, the trail affords views to the south and west across the coastal plain to the ocean. Access from the local neighborhood is restricted by a gate across Schabarum Drive (at segment R:S). Erosion is significant where storm water sheet flows across steep grades. 20R is an improved road, which was treated by antenna leases to prevent erosion.

38 Trail 38 is a fire road/utility easement varying in width from 12–20 ft. The trail surface consists of compact soil with sections of bedrock. Primary access for this trail is from Old Fullerton Road near East Road, although there is no formal

trailhead. The trail experiences heavy use, particularly from local residents (usually on horseback) using it to access Powder Canyon. The trail follows canyon drainage with hybridized walnut trees, providing a nice, shady trail experience. A five-way intersection occurs at segment C:D. Trail 38 eventually leaves the Preserve and continues into Schabarum Park. There is a gate at the property line.

40 Trail 40 is a fire road/utility easement (approximately 20 ft wide). The trail surface consists primarily of compact soil with some bedrock. This shady trail passes through a cluster of oak trees and down into the canyon edged by large toyon trees. A number of shortcuts are present along this trail including Trails 65, 42, 43, 44, and 60. Primary access is off of Old Fullerton Road, although there is no formal trailhead.

41 Trail 41 is the primary trail leaving from the Powder Canyon Trailhead. It is a fire road/utility easement (approximately 20 ft wide). The trail surface consists of compact soil. Like Trail 38B, the trail follows a canyon drainage providing a nice, shady trail experience. This trail is heavily used but in good condition.

Informal Trails

35 Trail 35 is an unauthorized trail (Segments A and B) and utility service road (Segments C and D) connecting Trails 34, 36, and 20. Segments A and B are outside of the Preserve. Segment C is an active service road providing access to an SCE transmission tower. It is lightly used and shows some evidence of erosion. Segment D is steeply sloped and duplicates Segment 20Q along Schabarum Drive. At the highest elevation, the trail provides a scenic view toward the mountains.

42 Trail 42 consists of a utility service road (16 ft wide) and an unauthorized trail. The road accesses an SCE tower. The unauthorized trail then extends from the tower pad over the hill to connect with the Schabarum Trail. The trail surface consists of compact and natural/native soil. Segment 42C is barely visible and was probably established by wildlife. The majority of Trail 42 lies outside the Preserve.

44 Trail 44 is a heavily used, shortcut unauthorized trail connecting Trails 40 and 41. This narrow (2 ft wide) trail climbs steeply from the Powder Canyon Trailhead through grassland and hillside areas. The trail surface consists of compact soil.

56 Trail 56 is a lightly used, shortcut trail connecting Trail 36 in Schabarum Park to Trail 20 along Schabarum Drive. Segment A is a narrow (1 ft wide) unauthorized trail; Segment B is a utility maintenance road (approximately 16 ft wide). The trail surface consists of compact soil. A portion of this trail extends off of the Preserve.

59 Trail 59 is a lightly used, shortcut unauthorized trail connecting Trail 38 in Schabarum Park to Trail 39. The trail is very narrow (2 ft wide) and extremely steep (21.3 percent). The trail surface consists of compact soil. One-half of the trail lies within Schabarum Park, outside of the Preserve. The trail appears to be a "thrill ride" for downhill cyclists coming from Schabarum Park. Due to the steep slope, the trail is eroded and rutted.

62 Trail 62 is a heavily used, narrow (1.5 ft wide) unauthorized trail connecting the Powder Canyon Trailhead to Trail 40. The trail surface consists of compact soil/heavy clay.

65 Trail 65 is a fire road/utility easement (Segment A) and unauthorized trail (Segment B) connecting Trails 40 and 39 (Schabarum Trail). The trail surface consists of compact soil and bedrock. This trail is heavily used as it provides a pleasant connection between Powder Canyon and the Schabarum Trail; the alternative connection is to travel along Old Fullerton Road to the trail edging the water district property. Segment 65A crosses through a shaded canyon and affords views of the San Gabriel Valley, Mount San Antonio, and Mount San Gorgonio. Segment 65B lies outside of the Preserve.

Inactive/Closed Trails

20T Trail 20T is a lightly used shortcut along the fire/utility service road to the antenna. It doesn't seem to connect to trails on the west end of the segment. It appears hikers/cyclists are following the road to the dead end.

43 Trail 43 is an overgrown unauthorized trail connecting Trails 40, 42, and 60. The trail surface consists of compact soil and bedrock. The trail is thick with brush, and it is unclear whether it is being used.

58 Trail 58 is an overgrown, abandoned wildlife trail that continues from the SCE tower pad (Trail 63) and connects to Trail 20 along Schabarum Drive. The trail is very narrow (< 1 ft wide) and difficult to access. The trail surface consists of compact soil.

60 Trail 60 consists of two dead-end segments. Both segments are overgrown possible wildlife trails veering off of Trail 40. These trail segments could not be located in the field.

63/64 Trails 63 and 64 are two SCE service roads that veer off of Trail 38 to access the utility towers. Both trails come to dead ends; they do not connect to any other established trails. The trail surface consists of compact soil. These trails are lightly used.

Issues.

- Shortcuts and dead end routes

- Desire/potential for loop trails and good connections between Powder Canyon, Schabarum Trail, and Schabarum Park
- Signage to clear up confusion regarding trail routes

APPENDIX D, PLANT COMMUNITIES

APPENDIX D

PLANT COMMUNITIES

PLANT COMMUNITIES AND HABITAT TYPES

Under contract with the Habitat Authority, BonTerra biologists classified plant communities with reference to the County of Orange Habitat Classification System (HCS) and Preliminary Descriptions of Terrestrial Natural Communities of California (Holland 1986), and to a lesser extent, Sawyer and Keeler-Wolf (1995), which provide specific criteria for distinguishing among habitat types. In addition, BonTerra reviewed the habitat mapping in the existing literature for the Preserve. The land categorized as annual grass and ruderal in the BonTerra report was mapped for dominant species for this study.

The vegetation within the Preserve is a mosaic of several typical habitat types. BonTerra identified 61 plant communities or variations within the Preserve, including 35 plant communities that are considered sensitive by State and/or local agencies. The dominant plant communities within the Preserve are annual grassland, toyon-sumac chaparral, sagebrush scrub, and coast live oak woodland. Other plant communities within the Preserve include sagebrush-buckwheat scrub, sagebrush-monkey flower scrub, purple sage scrub, black sage scrub, buckwheat scrub, coyote brush scrub, mixed sage scrub, encelia scrub, cactus scrub, coastal isocoma scrub, grassland ecotone, wild rye grassland ruderal, tree tobacco stands, riparian habitats, riparian herb, willow riparian scrub, mulefat scrub, sycamore riparian woodland oak riparian forest, coast live oak riparian forest, walnut woodland Mexican elderberry woodland and xeric cliff faces, as well as a combination of these habitat types.

In addition to the native and naturalized plant communities, orchards, vineyards, urban, rural residential, nonurban commercial/industrial, transportation, ornamental plantings, and developed and/or disturbed areas were identified. The ongoing disturbances associated with previous grading and planting as well as heavy pedestrian, vehicle, and equestrian traffic have contributed to the degraded condition of the habitats that occur adjacent to the roads and trails within the study boundaries.

The distribution of native habitats across soil associations is presented in Table A-D. The distribution of native habitats across aspect is presented in Table A-E. Patterns for specific habitats are discussed in the following section.

Coastal Sage Scrub

The coastal sage scrub vegetation consists primarily of low-growing, drought-tolerant native shrubland community. Coastal sage scrub habitat is scattered over the site in relatively small patches on ridgetops and hillsides and are interspersed with the more common chaparral habitat (LSA 2000).

Table A-D: Habitat Type in Acres Across Soil Associations

Habitat Type	Altamont-Diablo 9-30	Altamont-Diablo 30-50	Hanford	Mocho-Sorrento	Perkins-Rincon	San Andreas-San Benito	Total Acreage[1]
Annual Grassland/Sage Scrub Restoration	20						**20**
Black Sage Scrub	8	47	20		18	25	**119**
Black Sage Scrub/Toyon-Sumac Chaparral			7				**7**
Buckwheat Scrub			3				**3**
Cactus Scrub			9				**9**
Castor Bean Stands			1			1	**2**
Coast Live Oak Woodland	10	36	6		19	140	**212**
Coast Live Oak Woodland/Walnut Woodland		31			9		**40**
Coastal Isocoma Scrub/Grassland Ecotone		1					**1**
Coyote Bush Scrub	15	8	3		6	4	**36**
Encelia Scrub		3			3		**6**
Eucalyptus Woodland/Forest	8	2	19		48	11	**89**
Mexican Elderberry Woodland	2	1	16		3	6	**28**
Mixed Sage Scrub		2			3		**5**
Mixed Sage Scrub/Grassland Ecotone	8	35	21		11	32	**106**
Mule Fat Scrub	2	14	7		5	6	**35**
Mule Fat Scrub/Toyon-Sumac Chaparral						1	**1**
Needlegrass Grassland			7				**7**
Oak Riparian Forest		8			6	13	**26**
Oak Riparian Forest/Sycamore		3				10	**13**

[1] All acreages are rounded to the nearest whole number.

Habitat Type	Altamont-Diablo 9-30	Altamont-Diablo 30-50	Hanford	Mocho-Sorrento	Perkins-Rincon	San Andreas-San Benito	Total Acreage[1]
Riparian Woodland							
Purple Sage Scrub		68	2		4	109	**184**
Purple Sage Scrub/Toyon-Sumac Chaparral		11				3	**14**
Revegetated Sage Scrub			2				**2**
Riparian Habitats (Streambed)			1				**1**
Sagebrush Scrub	33	47	42	7	10	84	**223**
Sagebrush Scrub/Toyon-Sumac Chaparral			6				**6**
Sagebrush-Buckwheat Scrub	28	34	22		2	24	**109**
Sagebrush-Buckwheat Scrub/Toyon-Sumac Chaparral		4					**4**
Sagebrush-Monkey Flower Scrub		4				2	**6**
Sycamore Riparian Woodland		5	7			1	**13**
Sycamore Riparian Woodland/Oak Riparian Forest		13	3				**17**
Toyon-Sumac Chaparral	72	314	85	2	60	342	**874**
Toyon-Sumac Chaparral/Annual Grassland		14	28		8	8	**58**
Toyon-Sumac Chaparral/Black Sage Scrub					8		**8**
Toyon-Sumac Chaparral/Purple Sage Scrub		5					**5**
Toyon-Sumac Chaparral/Sagebrush Scrub	10	6					**16**
Toyon-Sumac Chaparral/Sagebrush-Buckwheat Scrub	7	3	2				**12**
Tree Tobacco Stands		1					**1**

Habitat Type	Altamont-Diablo 9-30	Altamont-Diablo 30-50	Hanford	Mocho-Sorrento	Perkins-Rincon	San Andreas-San Benito	Total Acreage[1]
Walnut Woodland		8			3	6	**17**
Weed Dominated Land	78	365	238	3	99	392	**1176**
Wild Rye Grassland		7					**7**
Willow Riparian Scrub	13	7	6	2	5	2	**35**
Total Acreage	**341**	**1111**	**563**	**15**	**330**	**1220**	**3580**

Table A-E: Habitat Type In Acres Across Aspect

Habitat Type	ASPECT								TOTAL ACREAGE[1]
	North	Northwest	Northeast	South	Southwest	Southeast	East	West	
Annual Grassland/Sage Scrub Restoration	1			6	5	3	1	2	**18**
Black Sage Scrub	4	4	6	18	23	22	25	16	**119**
Black Sage Scrub/Toyon-Sumac Chaparral				1	1	1	3		**7**
Buckwheat Scrub						1		2	**3**
Cactus Scrub				3	4				**7**
Castor Bean Stands	1								**1**
Coast Live Oak Woodland	82	42	41	6	4	9	17	10	**210**
Coast Live Oak Woodland/Walnut Woodland	7	2	15	3	2	2	8	1	**40**
Coyote Brush Scrub		6		10	6	7	2	4	**34**
Encelia Scrub				1	3				**5**
Eucalyptus Woodland/Forest	3	17	2	15	11	20	9	12	**89**
Mexican Elderberry Woodland	8	5	2	2	2	2	3	3	**28**
Mixed Sage Scrub				1	2			1	**4**
Mixed Sage Scrub/Grassland Ecotone	4	9	3	21	17	24	12	15	**106**
Mule Fat Scrub	4	7	2	5	6	5	3	4	**35**
Needlegrass Grassland				2	2	1		2	**7**
Oak Riparin Forest	3	2	3	6	1	7	4		**25**
Oak Riparin Forest/Sycamore Riparian Woodland	1	2		3		4			**11**
Purple Sage Scrub	5	12	7	37	35	40	26	23	**185**
Purple Sage Scrub/Toyon-				4	4	2	2	2	**14**

[1] All acreages are rounded to the nearest whole number.

Habitat Type	ASPECT								TOTAL ACREAGE[1]
	North	**Northwest**	**Northeast**	**South**	**Southwest**	**Southeast**	**East**	**West**	
Sumac Chaparral									
Sagebrush Scrub	37	35	19	28	27	28	18	29	**223**
Sagebrush Scrub/Toyon-Sumac Chaparral					2			3	**5**
Sagebrush-Buckwheat Scrub	5	7	5	30	18	24	10	10	**109**
Sagebrush-Buckwheat Scrub/Toyon-Sumac Chaparral				2	1				**4**
Sagebrush-Monkey Flower Scrub		3							**3**
Sycamore Riparian Woodland	3	2		3	2			1	**12**
Sycamore Riparian Woodland/Oak Riparian Forest	2	5	1	3	2	1		2	**16**
Toyon-Sumac Chaparral	137	139	101	105	92	110	106	85	**874**
Toyon-Sumac Chaparral/Annual Grassland	1	9	1	10	8	8	8	11	**58**
Toyon-Sumac Chaparral/Black Sage Scrub			2				5		**7**
Toyon-Sumac Chaparral/Purple Sage Scrub								3	**3**
Toyon-Sumac Chaparral/Sagebrush Scrub	2	4		1		3	2	1	**14**
Toyon-Sumac Chaparral/Sagebrush-Buckwheat Scrub		1		5		4	2		**12**
Walnut Woodland	3	2	3	1	2	1	2	2	**17**
Weed Dominated Land	97	124	64	203	186	173	93	149	**1089**
Wild Rye Grassland		1					4		**6**
Willow Riparin Scrub	5	5		8	5	6		4	**33**
TOTAL ACREAGE	**418**	**448**	**279**	**545**	**472**	**510**	**363**	**399**	**3433**

Sagebrush-Buckwheat Scrub. In general, this community often consists of a mix of California sagebrush *(Artemisia californica*), and interior California buckwheat *(Eriogonum fasciculatum* var. *foliolosum).* Other less common shrubs include black sage *(Salvia mellifera),* white sage *(Salvia apiana),* deer weed *(Lotus scoparius),* and coastal prickly pear *(Opuntia littoralis).* Some laurel sumac *(Malosma laurina)* is present in this scrub community (BonTerra 2004), typically on south-facing slopes within the Preserve.

The understory of this community is composed of a mixture of natives and nonnatives including ripgut brome *(Bromus diandrus),* black mustard *(Brassica nigra),* fascicled tarweed *(Deinandra fasciculata),* caterpillar phacelia *(Phacelia cicutaria),* summer mustard *(Hirschfeldia incana),* slender wild oat *(Avena barbata),* red brome *(Bromus madritensis* ssp. *rubens),* red-stemmed filaree *(Erodium cicutarium),* tocalote *(Centaurea melitensis),* common sow thistle *(Sonchus oleraceus),* California cudweed *(Gnaphalium californicum),* Italian thistle *(Carduus pycnocephalus),* rattlesnake weed *(Chamaesyce albomarginata),* and vinegar weed *(Trichostema lanceolatum)* (BonTerra 2004). Red brome is on the CalIPC list rated as high;black mustard, tocalote, summer mustard, slender wild oat, ripgut brome and Italian thistle are on the CalIPC list rated[1] as moderate; red-stemmed filaree is on the CalIPC list rated as limited.

Sagebrush-Buckwheat Scrub/Toyon-Sumac Chaparral. This mapping unit consists of sagebrush-buckwheat scrub with toyon and sumac chaparral components interspersed; however, the sage scrub is the dominant vegetation (BonTerra 2004).

Sagebrush-Monkey Flower Scrub. This community is found on mesic slopes and is often found associated with the toyon-sumac chaparral. Although recorded in the field notes as a separate series or subassociation, it was often placed in the sagebrush scrub category due to the difficulty in separating these two communities (BonTerra 2004). However, this habitat type was mapped on the border of Whittier Hills open space and Turnbull Canyon. Characteristic shrubs include California sagebrush, orangebush monkey flower *(Mimulus aurantiacus),* coyote brush *(Baccharis pilularis),* long-stemmed golden yarrow *(Eriophyllum confertiflorum),* and coastal isocoma *(Isocoma menziesii).* Poison oak *(Toxicodendron diversilobum)* is a common species that often forms large stands within this community. Mexican elderberry *(Sambucus mexicana)* and lemonade berry *(Rhus integrifolia)* are occasionally found scattered within this sage scrub. This scrub type is found only on northwesterly slopes in the Preserve within the Altamont-Diablo 30–50 percent slope Association.

Common grasses and forbs present within this community include common bedstraw *(Galium aparine),* man root *(Marah macrocarpa),* western verbena *(Verbena lasiostachys),* Douglas' nightshade *(Solanum douglasii),* California figwort *(Scrophularia californica),* and western pellitory *(Parietaria hespera).* Other common species include the nonnative species ripgut brome, Italian thistle, and red brome. Red brome is on the CalIPC list rated as high; Italian thistle and ripgut brome are on the CalIPC list rated as moderate.

Purple Sage Scrub. This habitat type is dominated by purple sage *(Salvia leucophylla).* Other species found in this community consist of California sagebrush, coyote brush, and poison oak (BonTerra

[1] The CalIPC rating refers to the severity of ecological impacts.

2004). Chaparral elements including Mexican elderberry and lemonadeberry are occasionally present in this scrub. Large areas of this habitat type were mapped in the vicinity of Turnbull Canyon, Whittier Hills open space, and Powder Canyon.

The limited soil tests suggest that purple sage scrub occurs mainly in calcareous clay loam soils. Generally, the distribution of this scrub is in the Altamont-Diablo 30–50 percent slope Association and the San Andreas-San Benito 30–50 percent slope Association. Purple sage scrub is found across most aspects.

Purple Sage Scrub/Toyon-Sumac Chaparral. This mapping unit consists of a mix of purple sage scrub and toyon-sumac chaparral. In contrast to the purple sage scrub, toyon and sumac components of a chaparral community are interspersed; however, the purple sage scrub is the dominant vegetation (BonTerra 2004). Two large polygons of this habitat type were mapped in the Whittier Hills area by BonTerra in 2004. This community is found only in the Altamont-Diablo Association within the Preserve where clay and clay loam soils predominate.

Black Sage Scrub. The black sage scrub is characterized by a dominance of black sage *(Salvia mellifera).* Other species found in this community consist of California sagebrush, coyote brush, and poison oak (BonTerra 2004). Chaparral elements including Mexican elderberry and lemonadeberry are occasionally present in this scrub. BonTerra mapped this habitat in scattered locations throughout the Preserve. Based on limited soil analysis, black sage scrub is found in loam to clay loam soils, with and without lime, across most of the soil associations. This community does not seem to have a preference for aspect and is found on all slopes.

Black Sage Scrub/Toyon-Sumac Chaparral. This mapping unit consists of a mixture of black sage scrub and toyon-sumac chaparral. In contrast to the black sage scrub, toyon and sumac components of a chaparral community are interspersed; however, the black sage scrub is the dominant vegetation (BonTerra 2004). The majority of this habitat type was mapped in the Hall/Childs estate. This community is found only in the Hanford Association on easterly and southeasterly aspects.

Sagebrush Scrub. Sagebrush scrub is found across all aspects, often in association with toyon-sumac chaparral, and in other less xeric localities throughout the Preserve. This community is dominated by California sagebrush. Other species within this habitat type include orangebush monkey flower, coyote brush, chaparral bedstraw *(Galium angustifolium),* coastal isocoma, interior California buckwheat, poison oak, and black sage. Subshrubs in this habitat type include long-stemmed golden yarrow and giant wild rye *(Leymus condensatus).*

The ground cover in this habitat type is dominated by nonnative grasses with some herbs and forbs including ripgut brome, black mustard, blue dicks *(Dichelostemma capitatum),* summer mustard, foxtail fescue *(Vulpia myuros),* soft chess *(Bromus hordeaceus),* California cudweed, red-stemmed filaree, common bedstraw, poison hemlock *(Conium maculatum),* western ragweed *(Ambrosia psilostachya),* and tocalote (BonTerra 2004). However, foothill needlegrass *(Nassella lepida),* a native grass species, was documented as occurring within this habitat type. Black mustard, foxtail fescue, tocalote, poison hemlock, summer mustard and ripgut brome are on the CalIPC list rated as moderate; soft chess and red-stemmed filaree are on the CalIPC list rated as limited.

Limited soil tests show this community is found in sandy loam to clay soils across most of the soil associations within the Preserve. This community may grow well in calcareous soils, as it generally is found growing on such soils.

Sagebrush Scrub/Toyon-Sumac Chaparral. This mapping unit consists of a mix of sagebrush scrub and toyon-sumac chaparral. However, in this case, the sagebrush scrub is the dominant vegetation (BonTerra 2004). This habitat type is mapped within the Whittier Hills open space, mainly on the Altamont-Diablo Association on southwesterly aspects.

Buckwheat Scrub. This type of scrub, which consists of monotypic stands of California buckwheat, is usually found in previously disturbed sites (BonTerra 2004) in the Hanford Association on westerly and southeasterly aspects. Other shrubs in this community include coastal isocoma, coyote brush, and California sagebrush. The nonnative grasses and herbs that occur within this habitat type include black mustard, ripgut brome, summer mustard, and red brome. Red brome is on the CalIPC list rated as high; black mustard, summer mustard and ripgut brome are on the CalIPC list rated as moderate.

Coyote Brush Scrub. This type of scrub, which is dominated by coyote brush, is often found in moist areas adjacent to stream channels and riparian habitat. Other species within this habitat type include poison oak, California sagebrush, orangebush monkey flower, coastal golden bush, giant wild rye, poison oak, and mulefat *(Baccharis salicifolia).* Uncommon chaparral elements present include laurel sumac, lemonadeberry, and Mexican elderberry (BonTerra 2004).

Limited soil tests show that this community is mainly found in clay soils in the Altamont-Diablo Associations and, to a lesser extent, in the Perkins-Rincon, San Andreas-San Benito, and the Hanford Associations. Coyote brush scrub may be found in calcareous clays or in clays without lime. The community is found mainly on northerly and northwesterly aspects.

Mixed Sage Scrub. As defined by the County of Orange HCS, a mixed sage scrub community consists of a dominant mix of four or more scrub species. Common shrubs in this community, which are mapped in the Whittier Hills open space, consist of black sage, California bush sunflower, interior California buckwheat, coastal isocoma, white sage, deerweed, laurel sumac, purple sage, California wishbone bush *(Mirabilis californica),* common sand aster *(Lessingia filaginifolia),* and coyote brush (BonTerra 2004). The understory is dominated by nonnative or ruderal species that include black mustard, ripgut brome, summer mustard, red brome, bicolored cudweed *(Gnaphalium bicolor),* slender wild oat, and tocalote. Red brome is on the CalIPC list rated as high; black mustard, tocalote, summer mustard, slender wild oat and ripgut brome are on the CalIPC list rated as moderate. This scrub is found in the Preserve on southerly and southwesterly slopes in the Altamont-Diablo Association and Perkins-Rincon Association.

Encelia Scrub. This community is generally found on xeric slopes and is composed of stands of California bush sunflower *(Encelia californica)* (BonTerra 2004). Other associated shrub species include interior California buckwheat, black sage, coastal prickly pear, laurel sumac, and California matchweed *(Gutierrezia californica).* Other plant species that occur within this habitat type include red brome, black mustard, slender wild oat, Australian saltbush *(Atriplex semibaccata),* tocalote, ripgut brome, white everlasting *(Gnaphalium microcephalum),* fascicled tarweed, red-stemmed filaree, and common phacelia *(Phacelia distans).* Red brome is on the CalIPC list rated as high; black mustard, Australian saltbush, tocalote, slender wild oat and ripgut brome are on the CalIPC list rated as moderate; red-stemmed filaree is on the CalIPC list rated as limited. Within the Preserve, this community is found on southerly and southwesterly slopes in soils of the Altamont-Diablo Association and Perkins-Rincon Association.

Cactus Scrub. This type of scrub, which is dominated by coastal prickly pear, is found on some of the south-facing slopes within the Preserve (BonTerra 2004). Generally, this community consists of large stands of prickly pear, although there may be some scrub components including California bush sunflower, interior California buckwheat, California brickellbush *(Brickellia californica),* laurel sumac, tree tobacco *(Nicotiana glauca),* and California sagebrush (BonTerra 2004). In addition, there is a nonnative component of this habitat type that includes red brome, summer mustard, ripgut brome, Hartweg's milkvine *(Sarcostemma cyanchoides* ssp. *hartwegii),* and black mustard. Red brome is on the CalIPC list rated as high; black mustard, tree tobacco, summer mustard and ripgut brome are on the CalIPC list rated as moderate. Cactus scrub is found in loamy and sandy loam soils in the Hanford Association within the Preserve.

Poison Oak Scrub (not mapped). In several areas of the Preserve, poison oak forms dense stands, typically in openings of chaparral, coastal sage scrub, or riparian communities. Although these areas are potentially large enough to be mapped as a separate community, they were included with the adjacent plant communities (BonTerra 2004).

Revegetated Sage Scrub. This habitat type consists of areas of planted scrub vegetation where shrubs have matured, and a shrub cover has developed. Shrub species in these areas consist of black sage, purple sage, coyote brush, white sage, coastal prickly pear, California bush sunflower, woolly blue curls *(Trichostema lanatum),* and California sagebrush. In addition, there are some southern California black walnut and coast live oak trees planted in these localities (BonTerra 2004). The majority of the revegetated areas within the Preserve are mapped within Whittier Hills open space.

Coastal Sage Scrub/Grassland Ecotone

The County of Orange HCS indicates that in order for a habitat type to be identified as scrub, it must have at least 20 percent cover by scrub shrubs. Therefore, these habitat types are used in instances where the scrub shrub cover is less than 20 percent and has a high percentage of grassland species.

Coastal Isocoma Scrub/Grassland Ecotone. This community, which is mapped in Turnbull Canyon, consists of stands of coastal goldenbush in a grassland matrix (BonTerra 2004). Other shrub/subshrub species that occur in this habitat type include grassland goldenbush *(Ericameria palmeri* ssp. *pachylepis),* common sandaster, and California sagebrush. The grassland matrix includes nonnative or ruderal grass and forb species such as ripgut brome, black mustard, western ragweed, wild oat *(Avena fatua),* common knotweed *(Polygonum arenastrum),* common sow thistle, red-stemmed filaree, slender wild oat, soft chess, and foxtail fescue (BonTerra 2004). Black mustard, slender wild oat, foxtail fescue, wild oat, and ripgut brome are on the CalIPC list rated as moderate; red-stemmed filaree and soft chess are on the CalIPC list rated as limited. This habitat is found in the soils of the Altamont-Diablo Association.

Mixed Sage Scrub/Grassland Ecotone. Scrub shrub species in this community include California sagebrush, white sage, coyote brush, coastal golden bush, common sandaster, and black sage. The grassland species include ripgut brome, black mustard, summer mustard, tocalote, sweet fennel *(Foeniculum vulgare),* soft chess, foxtail barley *(Hordeum murinum* ssp. *leporinum),* Italian thistle, common sow thistle, bur clover *(Medicago polymorpha),* and western ragweed *(Ambrosia psilostachya).* This habitat type is mapped in scattered occurrences throughout the Preserve over all aspects. It occurs in all soil associations except the Mocho-Sorrento, which is the smallest acreage of any soil association within the Preserve. Sweet fennel is on the CalIPC list rated as high; black mustard, tocalote, summer mustard, ripgut brome, foxtail barley, and Italian thistle are on the CalIPC list rated as moderate; soft chess and bur clover are on the CalIPC list rated as limited.

Chaparral

Chaparral vegetation is typically made up of large, dark-green sclerohyllous shrubs, which are usually two to three meters in height (Ljubenkov 2001). This habitat type is found on steep north- and east-facing slopes in the vicinity of Whittier Hills and most of the steeper slopes in the vicinity of Rosehills (Ljubenkov 2001; LSA 2000). In some areas, the chaparral association exists in patchy association with coastal sage scrub. These areas have been identified separately on the vegetation map as a mixture of these vegetation communities.

Toyon-Sumac Chaparral. Toyon-sumac chaparral typically consists of larger chaparral species, often with coastal sage scrub habitat shrubs (BonTerra 2004). Characteristic species in this community consist of lemonadeberry, laurel sumac, toyon *(Heteromeles arbutifolia),* holly-leaved redberry *(Rhamnus ilicifolia),* and Mexican elderberry. The coastal sage scrub species in this habitat type include orangebush monkey flower, coyote brush, California sagebrush, giant wild rye, purple sage, chaparral bedstraw, and black sage. Poison oak is often observed on the ground and climbing, as a vine, into the shrubs in this habitat type. As mentioned previously, poison oak may form dense thickets on these slopes. Other vines in this habitat type include man root and pipestem *(Clematis lasiantha).* This habitat type is mapped in large areas throughout the Preserve across all soil associations and all aspects within the Preserve.

Toyon-Sumac Chaparral/Sagebrush-Buckwheat Scrub. This habitat consists of toyon-sumac chaparral intermixed with a sagebrush-buckwheat scrub (BonTerra 2004). This habitat type is mapped by BonTerra in Turnbull Canyon and the Whittier Hills open space.

Toyon-Sumac Chaparral/Purple Sage Scrub. This habitat consists of toyon-sumac chaparral with patches of purple sage scrub (BonTerra 2004). This habitat type is mapped in the southern portion of Turnbull Canyon.

Toyon-Sumac Chaparral/Black Sage Scrub. This habitat consists of toyon-sumac chaparral with patches of black sage scrub (BonTerra 2004). This habitat type is mapped by BonTerra in the Whittier Hills open space.

Toyon-Sumac Chaparral/[California] Sagebrush Scrub. This habitat consists of a toyon-sumac chaparral intermixed with a sagebrush scrub (BonTerra 2004). This habitat type is mapped by BonTerra in the Whittier Hills open space.

Toyon-Sumac Chaparral/Annual Grassland Ecotone. This habitat type, which is mapped in Turnbull Canyon and the Whittier Hills open space, generally consists of large open stands of laurel sumac, or in some cases lemonadeberry, with a nonnative grassland understory (BonTerra 2004).

Toyon-Sumac Chaparral/Ornamental Plantings. This habitat type consists of toyon-sumac chaparral mixed with ornamental species, principally eucalyptus *(Eucalyptus globulus)* or acacia (*Acacia* spp.) (BonTerra 2004).

Grassland

Annual Grassland. The preserve area contains large areas of annual grassland typically on flat or mildly sloping areas where maximum sunlight occurs (Ljubenkov 2001). This community is principally characterized by naturalized annual grasses of exotic origin. These grasslands were created by disturbances such as farming, grazing, or grading for firebreaks (Ljubenkov 2001). The most common grass species include ripgut brome, slender wild oat, foxtail barley, red brome, soft chess, wild oat, perennial wild rye, and foxtail fescue. Red brome is on the CalIPC list rated as high; slender wild oat, foxtail barley, wild oat, foxtail fescue, and ripgut brome are on the CalIPC list rated as moderate; soft chess is on the CalIPC list rated as limited.

Common forbs in this community consist of summer mustard, black mustard, bur clover, common fiddleneck *(Amsinckia menziesii),* red-stemmed filaree, common sow thistle, miniature lupine *(Lupinus bicolor),* weak-leaved burweed *(Ambrosia confertiflora),* tocalote, narrow-leaved milkweed *(Asclepias fasciculatus),* white-stemmed filaree *(Erodium moschatum),* fascicled tarweed, arroyo lupine, dove weed *(Croton setigerus),* blue-eyed grass *(Sisyrinchium bellum),* long-beaked filaree *(Erodium botrys),* southern California locoweed *(Astragalus trichopodus),* horehound, blue dicks, coyote melon *(Cucurbita foetidissima),* and big gumplant *(Grindelia robusta).* Subshrubs and shrubs are occasionally found in these grasslands and usually consist of grassland goldenbush, coastal isocoma, common sandaster, and California sagebrush. Black mustard, summer mustard, and tocalote are on the CalIPC list rated as moderate; red-stemmed filaree, horehound, and bur clover are on the CalIPC list rated as limited.

Wild Rye Grassland. This community consists of dense stands of giant wild rye on north-facing slopes, often in openings of chaparral (BonTerra 2004).

Needlegrass. The CDFG, as part of its current mapping and datA-input activities, informally applies a criterion of any native grass species cumulatively equaling or exceeding 10 percent relative cover as constituting a native grassland (e.g., purple needlegrass grassland) (LSA 2000). The County of Orange HCS specifies that a grassland area with a minimum 10 percent cover of purple needlegrass be designated Southern Coastal Needlegrass Grassland. Perennial grasslands are uncommon in this portion of the Puente Hills. Several small patches of purple needlegrass *(Nassella pulchra)* were identified and mapped by BonTerra in 2004. Other grasses and forbs found in this community consist of ripgut brome, black mustard, wild oat, western ragweed, soft chess, blue dicks, red-stemmed filaree, summer mustard, Italian thistle, blue-eyed grass, coastal isocoma, and grassland goldenbush. Black mustard, summer mustard, wild oat, ripgut brome and Italian thistle are on the CalIPC list rated as moderate; red-stemmed filaree and soft chess are on the CalIPC list rated as limited.

Based on limited soil tests, needlegrass communities are found on clay to clay loam soils in the Hanford Association. Within the Preserve, these clay and clay loam soils are not calcareous. No preference for aspect was detected. Remnant native grasslands are found throughout the Preserve in soils from the Altamont-Diablo Association and the San Andreas-San Benito Association.

Ruderal. Ruderal areas consist of highly disturbed sites, often within and adjacent to old roads. In some areas within the Preserve, these disturbed areas were composed of dense stands of milk thistle *(Silybum marianum),* sweet fennel, Italian thistle, wild radish *(Raphanus sativus),* poison hemlock, black mustard, castor bean *(Ricinus communis),* ripgut brome, bur clover, garland chrysanthemum *(Chrysanthemum coronarium),* and dwarf nettle *(Urtica urens)* (BonTerra 2004). Sweet fennel is on the CalIPC list rated as high; black mustard, ripgut brome, Italian thistle, poison hemlock, and garland chrysanthemum are on the CalIPC list rated as moderate; castor bean, milk thistle, wild radish and bur clover are on the CalIPC list rated as limited.

Other roadside or disturbed localities contain a more open cover of Russian thistle *(Salsola tragus),* Crete hedypnois *(Hedypnois cretica),* lesser wort cress *(Coronopus didymus),* tocalote, cheeseweed *(Malva parviflora),* nettle-leaved goosefoot *(Chenopodium murale),* bur clover, field bindweed *(Convolvulus arvensis),* tumbling pigweed *(Amaranthus albus),* telegraph weed *(Heterotheca grandiflora),* schismus *(Schismus barbatus),* Australian saltbush, puncture vine *(Tribulus terrestris),* and pineapple weed *(Chamomilla suaveolens)* (BonTerra 2004). Australian saltbush and tocalote are on the CalIPC list rated as moderate; Russian thistle, bur clover, and schismus are on the CalIPC list rated as limited.

Tree Tobacco Stands. This habitat type consists of dense thickets or stands of tree tobacco (*Nicotiana glauca)* (BonTerra 2004). This habitat type was mapped in two locations: one on the border between the Whittier Hills open space and Turnbull Canyon and the other is within Hellman Park. Tree tobacco is on the CalIPC list rated as moderate. This species is found within nonnative grass- and mustard-dominated areas on clay loam soils in the southerly and southwesterly aspects.

Castor Bean Stands. This habitat type consists of dense stands of castor bean (BonTerra 2004). This habitat type was mapped by BonTerra in two locations within the Preserve: one is within the Davies property and the other is within Worsham Canyon. Castor bean is on the CalIPC list rated as limited. This habitat type prefers loam soil and more southerly to westerly exposures.

Annual Grassland/Sage Scrub Restoration. This habitat type identifies where the planted shrubs are seedlings and substantial shrub cover has not developed (BonTerra 2004). As mentioned previously, most of the coastal sage scrub restoration efforts are mapped within Whittier Hills open space.

Riparian

Although several sites were mapped as riparian habitat during BonTerra's assessment, this habitat type may not be represented accurately on the map, as BonTerra concluded that a more detailed inspection of the drainage channels and associated riparian vegetation within the Preserve would be required at a later date. Based on the analysis for this study, these communities are dependent upon landscape position and hydrology, as might be expected. They are found throughout the various soil associations and aspects based on drainage patterns and slope.

Riparian Herb. Riparian herb vegetation is generally found in ephemeral stream channels and consists almost entirely of herbaceous plant species. Characteristic species include mugwort *(Artemisia douglasiana),* salt grass *(Distichlis spicata),* curly dock *(Rumex crispus),* Bermuda grass *(Cynodon dactylon),* poison hemlock, Italian thistle, bristly ox tongue *(Picris echioides),* yellow sweet clover, black mustard, smilo grass *(Piptatherum miliaceum),* hoary nettle *(Urtica dioica),* prickly lettuce *(Lactuca serriola),* cocklebur *(Xanthium strumarium),* wild radish, perennial ryegrass *(Lolium perenne),* western ragweed, white sweet clover *(Melilotus alba),* common knotweed *(Polygonum arenastrum),* rabbit's foot grass *(Polypogon monspeliensis),* horehound, western verbena, ripgut brome, soft chess, common sow thistle, and California blackberry *(Rubus ursinus).* Shrub species occasionally found in this community include poison oak, coyote brush, castor bean, tree tobacco, and Mexican elderberry (BonTerra 2004). Black mustard, tree tobacco, ripgut brome, Bermuda grass, poison hemlock, and Italian thistle are on the CalIPC list rated as moderate; smilo grass, soft chess, castor bean, wild radish, horehound, and bristly ox tongue are on the CalIPC list rated as limted.

Willow Riparian Scrub. The willow riparian scrub within the major drainages throughout the Preserve, including Powder Canyon Creek, Arroyo San Miguel, Arroyo Pescadero, La Cañada Verde Creek, Worsham Creek, and Turnbull Canyon Creek, includes stands of arroyo willow *(Salix lasiolepis)* and red willow *(Salix laevigata)* shrubs, with some black willow *(Salix gooddingii).* In addition, black cottonwood *(Populus balsamifera* ssp. *trichocarpa)* and coast live oak were occasionally observed within this habitat type. Other common shrubs within this habitat type include mulefat, Mexican elderberry, southern California black walnut, poison oak, toyon, coastal isocoma, coyote brush, golden currant *(Ribes aureum),* California wild rose *(Rosa californica),* and desert wild grape *(Vitus girdiana).* Castor bean and tree tobacco, both nonnative, ruderal species, were often found on the margins of this riparian community (BonTerra 2004). Tree tobacco is on the CalIPC list rated as moderate and castor bean is on the CalIPC list rated as limited.

The understory of this vegetation community is composed of milk thistle, yellow sweet clover, ripgut brome, perennial ryegrass, hoary nettle, Bermuda grass, bristly ox tongue, wild radish, Italian thistle, western rag weed, prickly lettuce, poison hemlock, mugwort, blue periwinkle *(Vinca major),* man root, and western verbena. The vegetation within the drainage channels includes water cress *(Rorippa nasturtium aquaticum),* hoary nettle, and broad-leaved cat-tail *(Typha latifolia)* (BonTerra 2004). Italian thistle, ripgut brome, Bermuda grass, blue periwinkle, and poison hemlock are on the CalIPC list rated as moderate; bristly ox tongue, milk thistle, and wild radish are on the CalIPC list rated as limited.

Mulefat Scrub. Mulefat scrub is typically composed of dense, monotypic stands of mulefat in ephemeral to perennial stream channels. Other shrubs found in this community include coyote brush, Mexican elderberry, laurel sumac, giant wild rye, poison oak, and coastal isocoma. There are occasional arroyo willows or black willow saplings found in this habitat type. Ruderal shrubs in this habitat type include castor bean and tree tobacco (BonTerra 2004). Tree tobacco is on the CalIPC list rated as moderate and castor bean is on the CalIPC list rated as limited.

In addition, this habitat type includes a ruderal component of grasses and forbs that include ripgut brome, giant wild rye, milk thistle, bristly ox tongue, poison hemlock, mugwort, giant wild rye, summer mustard, Italian thistle, man root, black mustard, Douglas' nightshade, horehound, and western verbena (BonTerra 2004). Italian thistle, ripgut brome, poison hemlock, summer mustard, and black mustard are on the CalIPC list rated as moderate; bristly ox tongue, horehound, and milk thistle are on the CalIPC list rated as limited.

Mulefat Scrub/Toyon-Sumac Chaparral. This community consists of narrow stands of mulefat scrub with dense stands of toyon-sumac chaparral along the sides (BonTerra 2004).

Mulefat Scrub/Ornamental Plantings. This community consists of narrow stands of mulefat scrub that are intermixed or have an overstory of ornamental trees and shrubs (BonTerra 2004).

Sycamore Riparian Woodland. This habitat type is typically found on the terraces within the watersheds of the perennial or ephemeral stream channels within the Preserve, often in association with coast live oak. Other trees observed in this woodland are Mexican elderberry and California flowering ash *(Fraxinus velutina)* (BonTerra 2004).

The shrub layer in this habitat type includes mulefat, arroyo willow, sapling red willow, California sagebrush, orangebush monkey flower, fuchsia-flowered gooseberry *(Ribes speciosum),* coyote brush, and toyon. Common vines observed in this habitat include poison oak, desert wild grape, man root, and California blackberry. California brome *(Bromus carinatus)* is a native grass that is found in this habitat type. Nonnative grasses and forbs, including poison hemlock, ripgut brome, smilo grass, Italian thistle, milk thistle, black mustard, soft chess, and curly dock, make up the understory of this habitat type (BonTerra 2004). Italian thistle, poison hemlock, ripgut brome, and black mustard are on the CalIPC list rated as moderate; milk thistle, smilo grass, and soft chess are on the CalIPC list rated as limited. This woodland is found in the Altamont-Diablo 9–30 percent slope Association and the Hanford Association in Turnbull and Sycamore Canyons.

Sycamore Riparian Woodland/Coast Live Oak Riparian Forest. This habitat type consists of areas of sycamore woodland mixed with coast live oak riparian forest within Turnbull Canyon Creek and an unnamed drainage within Hellman Wilderness Park (BonTerra 2004). This mixed riparian woodland is found in the Altamont-Diablo 9–30 percent slope Association and the Hanford Association in Turnbull Canyon.

Coast Live Oak Riparian Forest. Oak riparian forest was mapped along some of the larger drainages, such as Powder Canyon Creek, as well as the Puma, Toyon, and Coyote canyons of the Hacienda Hills (BonTerra 2004). The canopy of this habitat type is composed of coast live oak. In some areas, some southern California black walnut and western sycamore are growing among the oaks (BonTerra 2004). Other trees or large shrubs observed beneath the oak canopy include Mexican elderberry, toyon, fuchsiA-flowered gooseberry, California wild rose *(Rosa californica),* holly-leaved redberry, and laurel sumac (BonTerra 2004). In addition, poison oak is abundant both on the ground and within the canopy of this community.

Willows (i.e., black willow, red willow, and arroyo willow) and mulefat were found adjacent to stream channels within the Preserve. Although uncommon, black cottonwood was found in some of the stream channels.

The oak riparian forests within the drainages of the Preserve include a number of nonnative species such as black locust *(Robinia pseudo-acacia),* English walnut *(Juglans regia),* and common fig *(Ficus carica).* The understory includes dense stands of nonnative annual grasses and forbs, the most common being ripgut brome, milk thistle, Italian thistle, bur clover, prickly lettuce, poison hemlock, wild radish, sandbur chervil (*Anthriscus caucalis).* Italian thistle, common fig, ripgut brome, and poison hemlock are on the CalIPC list rated as moderate; black locust, wild radish, bur clover and milk thistle are on the CalIPC list rated as limited.

Coast Live Oak Riparian Forest/Sycamore Riparian Woodland. This habitat type, which is comprised of a canopy of coast live oak and western sycamore, is typically associated with drainage courses such as Turnbull Canyon (LSA 2000). Therefore, this habitat type appears to be limited to natural drainage areas with substantial water supply. The dominant understory within this habitat is poison oak (LSA 2000).

Woodland

Coast Live Oak Woodland. Coast live oak woodland is similar to the oak riparian forest. However, woodlands are found on the slopes (typically north-facing) and are not associated with riparian vegetation in the Preserve (BonTerra 2004). However, this habitat type may be found in canyon bottoms. The woodland has an open to dense canopy of coast live oak. Other trees and shrubs found in this woodland include southern California walnut, Mexican elderberry, holly-leaved redberry, golden currant, lemonadeberry, toyon, fuchsia-flowered gooseberry, man root, heart-leaved penstemon *(Keckiella cordifolia),* and poison oak. There is a nonnative component that includes ripgut brome, milk thistle, Italian thistle, bur chervil, black mustard, and chickweed *(Stellaria media)* in this habitat type. Italian thistle, black mustard, and ripgut brome are on the CalIPC list rated as moderate and milk thistle is on the CalIPC list rated as limited.

Based on limited soil samples, oak woodlands prefer noncalcareous clay loam to loam soils. This habitat is found on north-facing slopes.

Coast Live Oak Woodland/Walnut Woodland. This habitat type consists of coast live oak woodland intermixed with dense patches of walnut woodland (BonTerra 2004). The majority of this habitat type was mapped in Powder Canyon by BonTerra.

Coast Live Oak Woodland/Ornamental Plantings. This habitat type includes areas of coast live oak woodland mixed with various ornamental trees (BonTerra 2004). This habitat type was mapped on the southern side of Sycamore Canyon.

Walnut Woodland. Walnut woodland dominated by southern California black walnut, is fairly common in Powder Canyon (BonTerra 2004). In addition, this habitat type was mapped between Puma and Toyon canyons of Hacienda Hills. This habitat type is often found mixed with coast live oak, Mexican elderberry, or other chaparral species. These woodlands often contain English walnut/black walnut hybrids, especially in areas with past industrial or rural residential uses (BonTerra 2004).

The subcanopy in this habitat type includes toyon, holly-leaved redberry, Mexican elderberry, poison oak, and fuchsiA-flowered gooseberry.

Based on limited soil tests, walnut woodland prefers calcareous clay soils in the Altamont-Diablo, Perkins-Rincon, and San Andreas-San Benito Associations. This community can be found within the Preserve on northeasterly to westerly slopes.

Mexican Elderberry Woodland. Mexican elderberry, mixed with a toyon-sumac chaparral, forms an open woodland on some of the mesic slopes (BonTerra 2004). Associated shrubs include lemonadeberry, holly-leaved redberry, laurel sumac, toyon, California sagebrush, coyote brush, giant wild rye, and poison oak. Nonnative grasses and forbs, including ripgut brome, summer mustard, sweet fennel, soft chess, and Italian thistle occur in the understory of this habitat type. Sweet fennel is on the CalIPC list rated as high; Italian thistle, ripgut brome and summer mustard are on the CalIPC list rated as moderate; soft chess is on the CalIPC list rated as limited.

Mexican Elderberry Woodland/Ornamental Planting. This habitat type is dominated by Mexican elderberry with various types of ornamental trees (BonTerra 2004).

Limited testing shows that this species is found on clay loam without lime. It is found on northerly to westerly slopes in the Preserve.

Cliff and Rock

Xeric Cliff Faces. Cliff faces are found in Turnbull Canyon, Sycamore Canyon, and other isolated areas within the Preserve. In some instances, these cliffs can contain some scattered occurrences of coastal coastal sage scrub species including California sagebrush, chaparral bedstraw, orangebush monkey flower, poison oak, lance-leaved dudleya *(Dudleya lanceolata),* and white sage. Grasses and forbs may occur on the steep slopes and common species include red brome, cliff malacothrix *(Malacothrix saxatilis),* California figwort, common phacelia, bicolored everlasting, punchbowl clarkia *(Clarkia bottae),* and perennial blue grass *(Poa secunda)* (BonTerra 2004). Red brome is on the CalIPC list rated as high.

Agricultural

Orchards and Vineyards.

Orchards. Decomissioned avocado *(Persea americana)* orchards are found at various locations within the Preserve, particularly in the southeastern portion of Powder Canyon (BonTerra 2004).

Vineyards. A few small decommissioned vineyards are found scattered throughout the area of the Preserve (BonTerra 2004).

These orchards and vineyards are not actively managed or irrigated by the Habitat Authority, but are remnants from previous land owners.

Developed

Urban. This habitat type includes residential developments that occur along the margins of the Preserve (BonTerra 2004).

Rural Residential. This habitat type includes sparse homes without the streets, lawns, and other associated developments that occur in urban residential developments (BonTerra 2004).

Nonurban Commercial/Industrial. Water tanks, oil-processing facilities, and other industrial sites found within the Preserve are mapped as nonurban commercial/industrial (BonTerra 2004).

Transportation. This habitat type includes the paved roads within the Preserve (BonTerra 2004).

Ornamental Plantings. This habitat type was used to identify stands of ornamental trees found along the margin of the Preserve, as well as to identify lawns and playing fields found within the Preserve boundaries (BonTerra 2004).

Common ornamental trees and shrubs include pines (*Pinus* spp.), olive *(Olea europaea),* English walnut, common fig, peach *(Prunus persicaria),* Mexican fan palm *(Washingtonia robusta),* Chinese elm *(Ulmus parviflora),* silk oak *(Grevillea robusta),* Catalina Island cherry *(Prunus lyonii),* oleander *(Nerium oleander),* acacia (*Acacia* spp.), cassia (*Cassia* sp.), jacaranda *(Jacaranda mimosifolia),* Mexican palo verde *(Parkingsonia aculeata),* aeonium (*Aeonium* sp.), lantana *(Lantana camera),* passion flower *(Passiflora edulis),* and Pride of Madeira *(Echium fastuosum).* Common fig and Mexican fan palm are on the CalIPC list rated as moderate; olive, acacia and Pride of Madeira are on the CalIPC list rated as limited.

Eucalyptus Woodland/Forest. This habitat type consists of dense stands of eucalyptus trees found in a variety of locations on the Preserve (BonTerra 2004). These stands appear predominantly in the southwestern portion of Whittier Hills open space and the western portion of Powder Canyon. *Eucalyptus globulus* is on the CalIPC list rated as moderate.

Acacia Woodland/Forest. This habitat type includes dense stands of ornamental acacias found on the Preserve (BonTerra 2004). This habitat type was mapped along Colima Road. Acacia is on the CalIPC list rated as limited.

Black Locust Woodland/Forest. An area of black locust forest was located in Turnbull Canyon (BonTerra 2004). Black locust is on the CalIPC list rated as limited.

Peruvian Pepper Woodland. This habitat type consists of stands of Peruvian pepper trees *(Schinus molle)* (BonTerra 2004). This habitat type was mapped within the southwestern portion of Whittier Hills open space, near Arroyo Pescadero. Peruvian pepper tree is on the CalIPC list rated as limited.

Disturbed

Cleared or Graded. This habitat type identifies the various dirt roads, trails, or graded areas within the Preserve (BonTerra 2004).

APPENDIX E, VASCULAR PLANT SPECIES OBSERVED

APPENDIX E

VASCULAR PLANT SPECIES OBSERVED

The following vascular plant species were observed or documented as having a high potential to occur in the Preserve by various biologists during the course of on-site surveys. Taxonomy and scientific nomenclature conform to Hickman (1993); common names from Abrams (1923, 1944, and 1951) and Abrams and Ferris (1960) were used only when species specific common names were not identified in Roberts (1998). However, where BonTerra identified a plant within the Preserve, the taxonomy follows the references used by BonTerra to ensure consistency between the documents. BonTerra taxonomy for flowering plants generally follows Roberts' checklist of vascular plants of Orange County, California, and the Jepson Manual for scientific and common names of these species. Jepson is primarily followed since the site is not located in Orange County.

* Introduced nonnative species

Scientific Name	Common Name
PTERIDOPHYTA	**FERNS AND FERN-ALLIES**
Polypodiaceae	**Polypody Family**
Polypodium californicum	California polypody
Pteridaceae	**Brake Family**
Pellaea andromedifolia	Coffee fern
Pentagramma triangularis ssp. *triangularis*	Goldenback fern
Selaginellaceae	**Spike-Moss Family**
Selaginella bigelovii	Bigelow's spike-moss
GYMNOSPERMAE	**CONE-BEARING PLANTS**
Cupressaceae	**Cypress Family**
*Cupressus arizonica	Arizona cypress
Pinaceae	**Pine Family**
*Cedrus atlantica	Deodar cedar
*Pinus sp.	Pine
*Pinus canariensis	Canary Island pine
ANGIOSPERMAE: DICOTYLEDONAE	**DICOT FLOWERING PLANTS**
Aceraceae	**Maple Family**
Acer negundo	Box elder
Amaranthaceae	**Amaranth Family**
*Amaranthus albus	Tumbling pigweed
Amaranthus blitoides	Prostrate pigweed
Anacardiaceae	**Sumac Family**
Malosma laurina	Laurel sumac
Rhus integrifolia	Lemonade berry
Rhus ovata	Sugar bush
Rhus trilobata	Skunk brush
*Schinus molle	Peruvian pepper tree
Toxicodendron diversilobum	Poison oak

Scientific Name	Common Name
Apiaceae	**Carrot Family**
**Anthriscus caucalis*	Bur-chervil
**Apium graveolens*	Common celery
**Conium maculatum*	Poison hemlock
**Foeniculum vulgare*	Sweet fennel
Sanicula arguta	Sharp-tooth sanicle
Sanicula bipinnatifida	Purple sanicle
**Torilis nodosa*	Knotted hedge-parsley
Apocynaceae	**Dogbane Family**
**Nerium oleander*	Oleander
**Vinca major*	Blue periwinkle
Araliaceae	**Ginseng Family**
**Hedera canariensis*	Algerian ivy
Asclepiadaceae	**Milkweed Family**
Asclepias californica	California milkweed
Asclepias eriocarpa	Indian milkweed
Asclepias fascicularis	Narrow-leaf milkweed
Sarcostemma cynanchoides	Hartweg’s milkvine
Asteraceae	**Sunflower Family**
Achillea millefolium	California yarrow
Achyrachaena mollis	Blow-wives
Acourtia microcephala	Sacapellote
Ambrosia acanthicarpa	Annual sandbar
Ambrosia confertiflora	Weak-leaved burweed
Ambrosia psilostachya	Western ragweed
Anaphalis margaritacea	Pearly everlasting
Artemisia californica	California sagebrush
Artemisia douglasiana	Mugwort
Artemisia dracunculus	Tarragon
Baccharis emoryi	Emory’s baccharis
Baccharis pilularis	Coyote bush
Baccharis salicifolia	Mule fat
Brickellia californica	California brickellbush
**Carduus pycnocephalus*	Italian thistle
**Centaurea melitensis*	Tocalote
**Chamomilla suaveolens*	Pineapple weed
**Chrysanthemum coronarium*	Garland chrysanthemum
**Cirsium occidentale*	Cobweb thistle
**Cirsium vulgare*	Bull thistle
**Conyza bonariensis*	Flax-leaved horseweed
**Conyza canadensis*	Common horsetail
**Cotula australis*	Australian brass-buttons
* *Cotula coronopifolia*	African brass-buttons
**Cynara cardunculus*	Cardoon
Deinandra fasciculata	Fascicled tarweed
Encelia californica	California bush sunflower
Encelia farinosa	Brittlebush
Encelia californica x *farinosa*	Hybrid encelia
Ericameria palmeri var. *pachylepis*	Grassland goldenbush
Ericameria pinifolia	Pine-bush

Scientific Name	Common Name
Erigeron foliosus var. *foliosus*	Leafy daisy
Eriophyllum confertiflorum var. *confertiflorum*	Long-stemmed golden yarrow
Filago californica	California filago
**Filago gallica*	Narrow-leaved filago
**Gazania linearis*	Gazania
Gnaphalium bicolor	Bicolored cudweed
Gnaphalium californicum	California cudweed
Gnaphalium canescens ssp. *microcephalum*	White everlasting
**Gnaphalium luteo-album*	Weedy cudweed
Gnaphalium palustre	Lowland cudweed
Gnaphalium stramineum	Cotton-batting plant
Grindelia camporum	Big gumplant
Gutierrezia californica	California matchweed
Hazardia squarrosa	Saw-toothed goldenbush
**Hedypnois cretica*	Crete hedypnois
Helianthus annuus	Annual sunflower
Helianthus gracilentus	Slender sunflower
Heterotheca grandiflora	Telegraph weed
**Hypochaeris glabra*	Smooth cat's ear
Isocoma menziesii var. *menziesii*	Menzies' goldenbush
Isocoma menziesii var. *vernonioides*	Coastal isocoma
**Lactuca serriola*	Prickly lettuce
Lagophylla ramosissima	Common hareleaf
Lasthenia californica	Coastal goldfields
Layia platyglossa	Common tidy-tips
Lessingia filaginifolia	Common sand aster
Malacothrix saxatilis var. *tenuifolia*	Cliff malacothrix
**Picris echioides*	Bristly ox tongue
Rafinesquia californica	California chicory
Senecio aphanactis	Common groundsel
Senecio californicus	California butterweed
**Senecio mikanoides*	German ivy
**Senecio vulgaris*	Common groundsel
**Silybum marianum*	Milk thistle
Solidago californica	California goldenrod
**Sonchus asper*	Prickly sow thistle
**Sonchus oleraceus*	Common sow thistle
Stephanomeria diegensis	San Diego wreath-plant
Stephanomeria virgata ssp. *virgata*	Tall wreath plant
Stylocline gnaphalioides	Everlasting nest-straw
**Taraxacum officinale*	Common dandelion
Uropappus lindleyi	Silver puffs
**Xanthium spinosum*	Spiny clotbur
**Xanthium strumarium*	Cocklebur
Bignoniaceae	**Bignonia Family**
**Jacaranda mimosifolia*	Jacaranda
Boraginaceae	**Borage Family**
Amsinckia menziesii var. *intermedia*	Common fiddleneck
Cryptantha intermedia	Common cryptantha
Cryptantha muricata	Prickly cryptantha

Scientific Name	Common Name
**Echium candicans*	Pride of Madeira
Pectocarya linearis	Slender pectocarya
Plagiobothrys canescens	Valley-popcorn flower
Brassicaceae	**Mustard Family**
Barbarea orthoceras	American winter cress
**Brassica nigra*	Black mustard
**Brassica rapa*	Field mustard
**Capsella bursA-pastoris*	Shepherd’s purse
**Hirschfeldia incana*	Summer mustard
Lepidium lasiocarpum	Sand peppergrass
Lepidium nitidum var. *nitidum*	Shining peppergrass
Lepidium strictum	Peppergrass
Lepidium virginicum var. *robinsonii*	Robinsons’ peppergrass
**Lobularia maritima*	Sweet-alyssum
**Raphanus sativus*	Wild radish
**Rorippa nasturtium-aquaticum*	Water cress
**Sisymbrium irio*	London rocket
Sisymbrium officinale	Hedge mustard
**Sisymbrium orientale*	Oriental sisymbrium
Thysanocarpus curvipes	Elegant lacepod
Thysanocarpus laciniatus	Southern fringe-pod
Cactaceae	**Cactus Family**
Opuntia littoralis	Coastal prickly pear
Opuntia x *occidentalis*	Prickly pear hybrid
Capparaceae	**Caper Family**
Isomeris arborea	Bladderpod
Caprifoliaceae	**Honeysuckle Family**
**Lonicera japonica*	Japanese honeysuckle
Lonicera subspicata var. *denudata*	Southern honeysuckle
Sambucus mexicana	Mexican elderberry
Symphoricarpos albus var. *laevigatus*	Common snowberry
Symphoricarpos mollis	Spreading snowberry
Caryophyllaceae	**Pink Family**
**Cerastium glomeratum*	Mouse-ear chickweed
**Silene gallica*	Common catchfly
Silene laciniata ssp. *major*	Mexican pink
**Stellaria media*	Chickweed
Chenopodiaceae	**Goosefoot Family**
**Atriplex semibaccata*	Australian saltbush
**Chenopodium album*	Lamb’s quarters
Chenopodium berlandieri	Pitseed goosefoot
Chenopodium californicum	California goosefoot
**Chenopodium murale*	Nettle-leaved goosefoot
**Salsola tragus*	Russian thistle
Convolvulaceae	**Morning-Glory Family**
Calystegia macrostegia	Morning-glory
**Convolvulus arvensis*	Field bindweed
Crassulaceae	**Stonecrop Family**
**Aeonium arboretum*	Aeonium
Crassula connata	Sand pygmy-stonecrop

Scientific Name	Common Name
Dudleya lanceolata	Lance-leaved dudleya
Dudleya multicaulis	Many-stemmed dudleya
Cucurbitaceae	**Gourd Family**
Cucurbita foetidissima	Coyote melon
Marah macrocarpus	Man root
Cuscutaceae	**Dodder Family**
Cuscuta californica	California witch's hair
Euphorbiaceae	**Spurge Family**
Chamaesyce albomarginata	Rattlesnake weed
**Chamaesyce maculata*	Spotted spurge
Chamaesyce melanadenia	Squaw spurge
Chamaesyce polycarpa	Small-seed sandmat
Croton setigerus	Dove weed
**Euphorbia peplus*	Petty spurge
**Ricinis communis*	Castor bean
Fabaceae	**Legume Family**
**Acacia longifolia*	Golden wattle
**Acacia pendula*	Weeping myall
**Acacia redolens*	Bank catclaw
Amorpha californica	California false indigo
Astragalus didymocarpus	White dwarf locoweed
Astragalus gambelianus	Gambel's locoweed
Astragalus trichopodus	Locoweed
Astragalus trichopodus var. *phoxus*	Antisell's locoweed
Astragalus trichopodus var. *trichopodus*	Southern California locoweed
**Cassia* sp.	Cassia
**Coronilla valentine*	Crown vetch
Lathyrus vestitus var. *vestitus*	Common Pacific pea
Lotus purshianus	Spanish lotus
Lotus salsuginosus var. *salsuginosus*	Alkali lotus
Lotus scoparius var. *scoparius*	Deer weed
Lotus strigosus	Hirsute lotus
Lupinus bicolor	Miniature lupine
Lupinus excubitus	Grape soda lupine
Lupinus hirsutissimus	Stinging lupine
Lupinus longifolius	Pauma bush lupine
Lupinus sparsiflorus	Coulter's lupine
Lupinus succulentus	Arroyo lupine
Lupinus truncatus	Collar lupine
**Medicago polymorpha*	Bur clover
**Melilotus alba*	White sweet clover
**Melilotus indica*	Yellow sweet clover
**Parkinsonia aculeata*	Mexican palo verde
**Robinia pseudoacacia*	Black locust
**Spartium junceum*	Spanish broom
Trifoloium fucatum	Bull clover
Trifolium willdenovii	Tomcat clover
**Vicia benghalensis*	Bengal vetch
**Vicia sativa* ssp. *sativa*	Common vetch
**Vicia villosa*	Winter vetch

Scientific Name	Common Name
**Vicia villosa* ssp. *varia*	Hairy vetch
Fagaceae	**Oak Family**
Quercus agrifolia var. *agrifolia*	Coast live oak
Quercus berberidifolia	California scrub oak
Geraniaceae	**Geranium Family**
**Erodium botrys*	Long-beaked filaree
**Erodium brachycarpum*	Short-fruited filaree
**Erodium cicutarium*	Red-stemmed filaree
**Erodium moschatum*	White-stemmed filaree
Geranium carolinianum	Carolina geranium
Grossulariaceae	**Gooseberry Family**
Ribes aureum var. *gracillimum*	Golden currant
Ribes malvaceum	Chaparral currant
Ribes speciosum	FuchsiA-flowered gooseberry
Hippocastanaceae	**Buckeye Family**
Aesculus californica	California buckeye
Hydrophyllaceae	**Waterleaf Family**
Emmenanthe penduliflora var. *penduliflora*	Whispering bells
Eriodictyon crassifolium	Thick-leaved yerba santa
Eucrypta chrysanthemifolia	Common eucrypta
Nemophila menziesii	Baby blue eyes
Phacelia cicutaria var. *hispida*	Caterpillar phacelia
Phacelia distans	Common phacelia
Phacelia grandiflora	Large-flowered phacelia
Phacelia minor	Wild Canterbury-bell
Phacelia parryi	Parry’s phacelia
Phacelia ramosissima	Branching phacelia
Phacelia tanacetifolia	Tansy phacelia
Phacelia viscida	Phacelia
Pholistoma auritum var. *auritum*	Blue fiesta flower
Pholistoma racemosum	San Diego fiesta flower
Juglandaceae	**Walnut Family**
Juglans californica var. *californica*	Southern California black walnut
**Juglans regia*	English walnut
Juglans californica x *J. regia*	Hybrid walnut
Lamiaceae	**Mint Family**
**Lamium amplexicaule*	Common henbit
**Marrubium vulgare*	Horehound
Salvia apiana	White sage
Salvia columbariae	Chia
Salvia leucophylla	Purple sage
Salvia mellifera	Black sage
Stachys bullata	California hedge-nettle
Stachys rigida ssp. *quercetorum*	Ridge hedge nettle
Trichostema lanceolatum	Vinegar weed
Lauraceae	**Laurel Family**
**Persea americana*	Avocado
Malvaceae	**Mallow Family**
Malacothamnus fasciculatus	Lax-flowered mallow
**Malva nicaeensis*	Bull mallow

Scientific Name	Common Name
**Malva parviflora*	Cheeseweed
**Malva sylvestris*	High mallow
Malvella leprosa	Alkali-mallow
Sidalcea malvaeflora ssp. *malvaeflora*	Common checker bloom
Moraceae	**Fig Family**
**Ficus carica*	Common fig
Myrtaceae	**Myrtle Family**
**Eucalyptus globulus*	Blue gum
**Eucalyptus* sp.	Gum
**Eucaluptus camaldulensis*	River red gum
Nyctaginaceae	**Four O'Clock Family**
Mirabilis californica	California wishbone bush
Oleaceae	**Olive Family**
Fraxinus velutina	California flowering ash
**Olea europaea*	Olive
Onagraceae	**Evening Primrose Family**
Camissonia californica	California suncup
Camissonia intermedia	Intermediate primrose
Camissonia micrantha	Small primrose
Clarkia bottae	Punchbowl clarkia
Clarkia cylindrica ssp. *cylindrica*	Speckled clarkia
Clarkia dudleyana	Dudley's clarkia
Clarkia purpurea	Four-spot clarkia
Epilobium canum ssp. *canum*	California fuchsia
Oxalidaceae	**Oxalis Family**
**Oxalis pes-caprae*	Bermuda buttercup
Papaveraceae	**Poppy Family**
Eschscholzia californica	California poppy
**Papaver* sp.	Poppy
Romneya coulteri	Coulter's matilja poppy
Passifloraceae	**Passion Vine Family**
Passiflora caerulea	Blue crown passion flower
Passiflora edulis	Passion flower
Plantaginaceae	**Plantain Family**
**Plantago major*	Common plantain
Plantago erecta	California plantain
Platanaceae	**Sycamore Family**
Platanus racemosa	Western sycamore
Polemoniaceae	**Phlox Family**
Eriastrum sapphirinum	Sapphire woolly-star
Gilia angelensis	Grassland gilia
Polygonaceae	**Buckwheat Family**
Chorizanthe staticoides	Turkish rugging
Eriogonum elongatum var. *elongatum*	Long-stemmed buckwheat
Eriogonum fasciculatum	Interior California buckwheat
**Polygonum arenastrum*	Common knotweed
Pterostegia drymarioides	Granny's hairnet
**Rumex crispus*	Curly dock
Portulacaceae	**Purslane Family**
Calandrinia ciliata	Red maids

Scientific Name	Common Name
Calyptridium monandrum	Common calyptridium
Claytonia parviflora	Miner's lettuce
Claytonia perfoliata var. *perfoliata*	Miner's lettuce
Primulaceae	**Primrose Family**
**Anagallis arvensis*	Scarlet pimpernel
Proteaceae	**Protea Family**
**Grevillia robusta*	Silk oak
Ranunculaceae	**Buttercup Family**
Clematis lasiantha	Pipestem
Delphinium parryi	Parry's larkspur
Ranunculus californicus	California buttercup
Rhamnaceae	**Buckthorn Family**
Rhamnus ilicifolia	Holly-leaved redberry
Rosaceae	**Rose Family**
Adenostoma fasciculatum	Chamise
Cercocarpus betuloides	Mountain mahogany
**Cotoneaster lacteus*	Cotoneaster
**Cotoneaster pannosa*	Cotoneaster
Heteromeles arbutifolia	Toyon
**Malys sylvestris*	Apple
Potentilla glandulosa ssp. *glandulosa*	Sticky cinquefoil
Prunus illicifolia	Holly-leaved cherry
**Prunus lyonii*	Catalina wild cherry
**Prunus persicaria*	Peach
Rosa californica	California wild rose
Rosa gymnocarpa	Wood rose
**Rubus discolor*	Himalaya blackberry
Rubus ursinus	California blackberry
Rubiaceae	**Madder Family**
Galium angustifolium ssp. *angustifolium*	Chaparral bedstraw
**Galium aparine*	Common bedstraw
Galium nuttallii ssp. *nuttallii*	San Diego bedstraw
Rutaceae	**Orange Family**
**Citrus sinensis*	Orange
Salicaceae	**Willow Family**
Populus balsamifera ssp. *trichopcarpa*	Black cottonwood
Salix goodingii	Black willow
Salix laevigata	Red willow
Salix lasiolepis	Arroyo willow
Saxifragaceae	**Saxifrage Family**
Lithophragma affine ssp. *mixtum*	Woodland star
Scrophulariaceae	**Figwort Family**
Antirrhinum coulterianum	White snapdragon
Antirrhinum kelloggii	Climbing snapdragon
Antirrhinum nuttallianum	Nuttall's snapdragon
Castilleja exserta	Purple owl's clover
Collinsia heterophylla	Purple Chinese houses
Keckiella cordifolia	Heart-leaved penstemon
Mimulus aurantiacus	Orange bush monkey flower
Penstemon centranthifolius	Scarlet bugler

Scientific Name	Common Name
Scrophularia californica	California figwort
**Verbascum virgatum*	Wandmullein
Simaroubaceae	**Simarouba Family**
**Ailanthus altissima*	Tree-of-heaven
Solanaceae	**Nightshade Family**
Datura wrightii	Jimson weed
**Nicotiana glauca*	Tree tobacco
**Solanum americanum*	White nightshade
Solanum douglasii	Douglas' nightshade
Solanum umbelliferum	Blue witch
Solanum xanti	Chaparral nightshade
Sterculiaceae	**Cacao Family**
Tamaricaceae	**Tamarisk Family**
**Tamarix ramosissima*	Mediterranean tamarisk
Ulmaceae	**Elm Family**
**Ulmus parvifolia*	Chinese elm
Urticaceae	**Nettle Family**
Hesperocnide tenella	Western nettle
Parietaria hespera	Western pellitory
Urtica dioica ssp. *holosericea*	Hoary nettle
**Urtica urens*	Dwarf nettle
Valerianaceae	**Valerian Family**
**Centrathus ruber*	Red valerian
Verbenaceae	**Vervain Family**
**Lantana camara*	Lantana
Verbena lasiostachys	Western verbena
Violaceae	**Violet Family**
Viola pedunculata	Johnny jump-ups
Vitaceae	**Grape Family**
Vitis girdiana	Desert wild grape
Zygophyllaceae	**Caltrop Family**
**Tribulus terrestris*	Puncture vine
ANGIOSPERMAE: MONOCOTYLEDONAE	**MONOCOT FLOWERING PLANTS**
Arecaceae	**Palm Family**
**Phoenix canariensis*	Canary Island date palm
**Washingtonia robusta*	Mexican fan palm
Iridaceae	**Iris Family**
Sisyrinchium bellum	Blue-eyed grass
Liliaceae	**Lily Family**
**Agave sisalana*	Sisal
Bloomeria crocea	Common golden stars
Calochortus catalinae	Catalina mariposa lily
Calochortus plummerae	Plummer's mariposa lily
C. plummerae x *weedii* var. *intermedius*	Mariposa lily hybrid
Chlorogalum pomeridianum var. *pomeridianum*	Wavy-leaved soap plant
Dichelostemma capitatum ssp. *capitatum*	Blue dicks
**Yucca aloifolia*	Spanish bayonet
Yucca whipplei	Our Lord's candle
Poaceae	**Grass Family**

Scientific Name	Common Name
Achnatherum coronatum	Giant needlegrass
**Avena barbata*	Slender wild oat
**Avena fatua*	Wild oat
**Brachypodium distachyon*	Purple false brome
**Bromus catharticus*	Rescue grass
Bromus carinatus	California brome
**Bromus diandrus*	Ripgut brome
**Bromus hordeaceus*	Soft chess
**Bromus madritensis* ssp. *rubens*	Red brome
**Bromus tectorum*	Cheatgrass
**Cortaderia selloana*	Pampass grass
**Cynodon dactylon*	Bermuda grass
**Digitaria sanguinalis*	Crab grass
**Echinochloa crus-galli*	Barnyard grass
**Festuca arundinacea*	Reed fescue
**Hordeum murinum* ssp. *glaucaum*	Glaucus barley
**Hordeum murinum* ssp. *leporinum*	Foxtail barley
**Lamarckia aurea*	Golden top
Leptochloa fascicularis	Bearded strangletop
Leptochloa uninervia	Mexican sprangletop
Leymus condensatus	Giant wildrye
Leymus glaucus	Blue wildrye
Leymus triticoides	Beardless wildrye
**Lolium multiflorum*	Italian ryegrass
**Lolium perenne*	Perennial ryegrass
Melica imperfecta	Coast melic
Muhlenbergia microsperma	Littleseed muhly
Nassella lepida	Foothill needlegrass
Nassella pulchra	Purple needlegrass
**Pennisetum setaceum*	African fountain grass
**Pennisetum villosum*	Fountain grass
**Phalaris minor*	Littleseed canary grass
**Piptatherum miliaceum*	Smilo grass
**Poa annua*	Annual blue grass
Poa secunda	Perennial blue grass
**Polypogon interruptus*	Ditch polypogon
**Polypogon monspeliensis*	Rabbitfoot grass
**Schismus barbatus*	Schismus
**Triticum aestivum*	Cereal wheat
Vulpia microstachys var. *microstachys*	Nuttall's fescue
**Vulpia myuros*	Foxtail fescue
Typhaceae	**Cat-Tail Family**
Typha angustifolium	Narrow-leaved cat-tail
Typha latifolia	Broad-leaved cat-tail

APPENDIX F, ANIMAL SPECIES LIST

APPENDIX F

ANIMAL SPECIES LIST

The following animals were observed or documented as having a high potential to occur in the Preserve by various biologists during the course of on-site surveys. The taxonomy and nomenclature are based on the following:

- Damselflies and dragonflies: Manolis, T. (2003. Dragonflies and Damselflies of California. University of California Press, Berkeley.).
- Butterflies: North American Butterfly Association (2001. NABA checklist & English names of North American butterflies, second edition. North American Butterfly Association, Morristown, New Jersey.).
- Fishes: Moyle, P.B. (2002. Inland Fishes of California, second edition. University of California Press, Berkeley.).
- Amphibians and reptiles: Crother, B.I., et al. (2000. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. *Herpetological Circular* 29; and 2003 update.) for species taxonomy and nomenclature; Stebbins, R.C. (2003. A Field Guide to Western Reptiles and Amphibians, third edition, Houghton Mifflin, Boston.) for sequence and higher order taxonomy.
- Birds: American Ornithologists' Union (1998. The A.O.U. Checklist of North American Birds, seventh edition. American Ornithologists' Union, Washington D.C.; and 2000, 2002, 2003, 2004, 2005 and 2006 supplements.).
- Mammals: Grenfell, W.E., Parisi, MD, and McGriff, D. (2003. Complete list of amphibians, reptiles, birds and mammals in California. California Department of Fish and Game. http://www.dfg.ca.gov/whdab/pdfs/species_list.pdf).

* Introduced nonnative species

Scientific Name	Common Name	Observed	Potential
ZYGOPTERA	**DAMSELFLIES**		
Coenagrionidae	**Pond Damsels**		
Argia vivida	Vivid dancer	X	
ANISOPTERA	**TYPICAL DRAGONFLIES**		
Aeshnidae	**Darners**		
Anax junius	Common green darner	X	
Aeshna multicolor	Blue-eyed darner	X	
Aeshna californica	California darner	X	
Libellulidae	**Cruisers, Emeralds, Baskettails, and Skimmers**		
Sympetrum corruptum	Variegated meadowhawk	X	
Sympetrum illotum	Cardinal meadowhawk	X	

Scientific Name	Common Name	Observed	Potential
Libellula saturata	Flame skimmer	X	
Paltothemis lineatipes	Red rock skimmer	X	
Tramea lacerata	Black saddlebags	X	
Tramea onusta	Red saddlebags	X	
Pantala flavescens	Wandering glider	X	
Pantala hymenaea	Spot-winged glider	X	
LEPIDOPTERA	**BUTTERFLIES**		
Papilionidae	**Swallowtails**		
Papilio zelicaon	Anise swallowtail	X	
Papilio cresphontes	Giant swallowtail	X	
Papilorutulus	Western tiger swallowtail	X	
Papilo eurymedon	Pale swallowtail	X	
Pieridae	**Whites and Sulphurs**		
Pontia protodice	Checkered white	X	
** Pieris rapae*	Cabbage white	X	
Anthocharis sara sara	Sara orangetip	X	
Colias eurytheme	Orange sulphur	X	
Colias alexandra	Queen Alexandra's sulphur	X	
Colias eurydice	California dogface	X	
Phoebis sennae	Cloudless sulphur	X	
Lycaenidae	**Gossamer-wing Butterflies**		
Callophrys dumetorum	Bramble hairstreak	X	
Strymon melinus	Gray hairstreak	X	
Brephidium exilie	Western pygmy-blue		X
Leptotes marina	Marine blue	X	
Everes amyntula	Western tailed blue	X	
Celastrina ladon	Spring azure		X
Euphilotes battoides	Square-spotted blue	X	
Glaucopsyche lygdamus	Silvery blue	X	
Icaricia acmon	Acmon blue	X	
Riodinidae	**Metalmarks**		
Calephelis nemesis	Fatal metalmark	X	
Apodemia mormo	Mormon metalmark	X	
Nymphalidae	**Brush-footed Butterflies**		
Agraulis vanillae	Gulf fritillary	X	
Nymphalis antiopa	Mourning cloak	X	
Vanessa virginiensis	American lady	X	
Vanessa cardui	Painted lady	X	
Vanessa carye	West coast lady	X	
Vanessa atlanta	Red admiral	X	
Precis coenia	Common buckeye	X	
Liminitis lorquini	Lorquin's admiral	X	
Adelpha bredowii	California sister	X	
Coenonympha tullia	Common ringlet		X
Danaus plexippus	Monarch	X	
Danaus gilippus	Queen	X	
Hesperiidae	**Skippers**		

Scientific Name	Common Name	Observed	Potential
Erynnis tristis	Mournful duskywing	X	
Erynnis funeralis	Funereal duskywing	X	
Pyrgus albescens/communis	White/common checkered-skipper	X	
Heliopetes ericetorum	Northern white skipper	X	
Hylephila phyleus	Fiery skipper	X	
Ochlodes sylvanoides	Woodland skipper	X	
Poanes melane	Umber skipper	X	
Lerodea eufala	Eufala skipper	X	
AMPHIBIA	**AMPHIBIANS**		
Salamandridae	**Newts**		
Taricha torosa	California newt		X
Plethodontidae	**Lungless Salamanders**		
Aneides lugubris	Arboreal salamander	X	
Batrachoseps nigriventris	Black-bellied slender salamander	X	
Batrachoseps major	Garden slender salamander	X	
Pipidae	**Tongueless Frogs**		
* *Xenopus laevis*	African clawed frog		X
Pelobatidae	**Spadefoot toads**		
Spea hammondii	Western spadefoot	X	
Bufonidae	**True Toads**		
Bufo boreas	Western toad	X	
Hylidae	**Treefrogs and Relatives**		
Pseudacris regilla	Pacific chorus frog	X	
Ranidae	**True Frogs**		
* *Rana catesbeiana*	American bullfrog	X	
REPTILIA	**REPTILES**		
Emydidae	**Box and Water Turtles**		
Actinemys marmorata	Western pond turtle		X
* *Trachemys scripta*	Pond slider		X
Eublepharidae	**Eyelid Geckos**		
Coleonyx variegatus	Western banded gecko		X
Phrynosomatidae	**Phrynosomatid Lizards**		
Sceloporus occidentalis	Western fence lizard	X	
Uta stansburiana	Common side-blotched lizard		X
Phrynosoma coronatum	Coast horned lizard	X	
Scincidae	**Skinks**		
Eumeces skiltonianus	Western skink	X	
Teiidae	**Whiptails and Relatives**		
Aspidoscelis tigris	Western whiptail	X	
Anguidae	**Alligator Lizards and Relatives**		
Elgaria multicarinata	Southern alligator lizard	X	
Anniellidae	**California Legless Lizards**		
Anniella pulchra	California legless lizard		X
Leptotyphlopidae	**Slender Blind Snakes**		
Leptotyphlops humilis	Western blind snake	X	
Boidae	**Boas**		
Charina trivirgata	Rosy boa		X
Colubridae	**Colubrid Snakes**		
Diadophus punctatus	Ringneck snake	X	

Scientific Name	Common Name	Observed	Potential
Masticophis lateralis	California whipsnake	X	
Masticophis flagellum	Coachwhip		X
Coluber constrictor	Racer	X	
Salvadora hexalepis	Western patch-nosed snake		X
Pituophis catenifer	Gopher snake	X	
Arizona elegans	Glossy snake		X
Lampropeltis getulus	Common kingsnake	X	
Rhinocheilus lecontei	Long-nosed snake		X
Thamnophis hammondii	Two-striped garter snake		X
Tantilla planiceps	Western black-headed snake		X
Hypsiglena torquata	Night snake		X
Viperidae	**Vipers**		
Crotalus ruber	Northern red-diamond rattlesnake	X	
Crotalus viridis	Western rattlesnake	X	
AVES	**BIRDS**		
Anatidae	**Ducks, Geese, and Swans**		
Anser albifrons	Greater white-fronted goose		X
Branta canadensis	Canada goose		X
Aix sponsa	Wood duck		X
Anas strepera	Gadwall		X
Anas americana	American wigeon		X
Anas platyrhynchos	Mallard	X	
Anas cyanoptera	Cinnamon teal		X
Anas clypeata	Northern shoveler		X
Anas acuta	Northern pintail		X
Anas crecca	Green-winged teal		X
Aythya valisineria	Canvasback		X
Aythya americana	Redhead		X
Aythya collaris	Ring-necked duck		X
Aythya affinis	Lesser scaup		X
Bucephala albeola	Bufflehead		X
Lophodytes cucullatus	Hooded merganser		X
Oxyura jamaicensis	Ruddy duck		X
Odontophoridae	**New World Quail**		
* *Pavo cristatus*	Common peafowl	X	
Callipepla californica	California quail	X	
Podicipedidae	**Grebes**		
Podilymbus podiceps	Pied-billed grebe		X
Podiceps nigricollis	Eared grebe		X
Pelecanidae	**Pelicans**		
Pelecanus erythrorhynchos	American white pelican		X
Phalacrocoracidae	**Cormorants**		
Phalacrocoax auritus	Double-crested cormorant	X	
Ardeidae	**Herons, Bitterns, and Allies**		
Ardea herodias	Great blue heron	X	
Ardea alba	Great egret	X	
Egretta thula	Snowy egret		X
Butorides striatus	Green heron	X	
Nycticorax nycticorax	Black-crowned night-heron		X

Scientific Name	Common Name	Observed	Potential
Cathartidae	**New World Vultures**		
Cathartes aura	Turkey vulture	X	
Accipitridae	**Hawks, Kites, Eagles, and Allies**		
Pandion haliaetus	Osprey	X	
Elanus leucurus	White-tailed kite	X	
Circus cyaneus	Northern harrier	X	
Accipiter striatus	Sharp-shinned hawk	X	
Accipiter cooperii	Cooper’s hawk	X	
Buteo lineatus	Red-shouldered hawk	X	
Buteo swainsoni	Swainson’s hawk	X	
Buteo jamaicensis	Red-tailed hawk	X	
Buteo regalis	Ferruginous hawk	X	
Buteo lagopus	Rough-legged hawk		X
Aquila chrysaetos	Golden eagle	X	
Falconidae	**Caracaras and Falcons**		
Falco sparverius	American kestrel	X	
Falco columbarius	Merlin	X	
Falco peregrinus	Peregrine falcon	X	
Falco mexicanus	Prairie falcon		X
Rallidae	**Rails, Gallinules, and Coots**		
Rallus limicola	Virginia rail		X
Porzana carolina	Sora		X
Gallinula chloropus	Common moorhen		X
Fulica americana	American coot		X
Charadriidae	**Plovers and Lapwings**		
Charadrius vociferus	Killdeer	X	
Scolopacidae	**Sandpipers, Phalaropes, and Allies**		
Tringa melanoleuca	Greater yellowlegs		X
Actitis macularia	Spotted sandpiper		X
Numenius phaeopus	Whimbrel	X	
Numenius americanus	Long-billed curlew		X
Calidris minutilla	Least sandpiper		X
Gallinago delicata	Wilson’s snipe		X
Laridae	**Skuas, Gulls, Terns, and Skimmers**		
Larus delawarensis	Ring-billed gull	X	
Larus californicus	California gull	X	
Larus argentatus	Herring gull	X	
Larus occidentalus	Western gull	X	
Larus glaucescens	Glaucous-winged gull	X	
Sterna caspia	Caspian tern	X	
Columbidae	**Pigeons and Doves**		
* *Columba livia*	Rock (feral) pigeon	X	
Columba fasciata	Band-tailed pigeon	X	
* *Streptopelia chinensis*	Spotted dove		X
Zeniada macroura	Mourning dove	X	
Columbina passerina	Common ground-dove		X
Cuculidae	**Cuckoos, Roadrunners, and Anis**		

Scientific Name	Common Name	Observed	Potential
Geococcyx californianus	Greater roadrunner	X	
Tytonidae	**Barn Owls**		
Tyto alba	Barn owl	X	
Strigidae	**Typical Owls**		
Otus kennicottii	Western screech-owl	X	
Bubo virginianus	Great horned owl	X	
Athene cunicularia	Burrowing owl	X	
Asio otus	Long-eared owl		X
Asio flammeus	Short-eared owl		X
Caprimulgidae	**Goatsuckers**		
Chordeiles acutipennis	Lesser nighthawk	X	
Phalaenoptilus nuttallii	Common poorwill	X	
Apodidae	**Swifts**		
Chaetura vauxi	Vaux's swift	X	
Aeronautes saxatilis	White-throated swift	X	
Trochilidae	**Hummingbirds**		
Archilochus alexandri	Black-chinned hummingbird	X	
Calypte anna	Anna's hummingbird	X	
Calypte costae	Costa's hummingbird	X	
Stellula calliope	Calliope hummingbird	X	
Selasphorus rufus	Rufous hummingbird	X	
Selasphorus sasin	Allen's hummingbird	X	
Alcedinidae	**Kingfishers**		
Ceryle alcyon	Belted kingfisher		X
Picidae	**Woodpeckers and Allies**		
Melanerpes lewis	Lewis's woodpecker		X
Melanerpes formicivorus	Acorn woodpecker	X	
Sphyrapicus nuchalis	Red-naped sapsucker		X
Sphyrapicus ruber	Red-breasted sapsucker	X	
Picoides nuttallii	Nuttall's woodpecker	X	
Picoides pubescens	Downy woodpecker	X	
Colaptes auratus	Northern flicker	X	
Tyrannidae	**Tyrant Flycatchers**		
Contopus cooperi	Olive-sided flycatcher	X	
Contopus sordidulus	Western wood-pewee	X	
Empidonax traillii	Willow flycatcher	X	
Empidonax hamondii	Hammond's flycatcher	X	
Empidonax wrightii	Gray flycatcher	X	
Empidonax oberholseri	Dusky flycatcher	X	
Empidonax difficilis	Pacific-slope flycatcher	X	
Sayornis nigricans	Black phoebe	X	
Sayornis saya	Say's phoebe	X	
Myiarchus cinerascens	Ash-throated flycatcher	X	
Tyrannus vociferans	Cassin's kingbird	X	
Tyrannus verticalis	Western kingbird	X	
Laniidae	**Shrikes**		
Lanius ludovicianus	Loggerhead shrike	X	
Vireonidae	**Vireos**		
Vireo bellii	Bell's vireo	X	
Vireo plumbeus	Plumbeous vireo		X

Scientific Name	Common Name	Observed	Potential
Vireo cassinii	Cassin's vireo	X	
Vireo huttoni	Hutton's vireo	X	
Vireo gilvus	Warbling vireo	X	
Corvidae	**Crows and Jays**		
Aphelocoma californica	Western scrub-jay	X	
Corvus brachyrhynchos	American crow	X	
Corvus corax	Common raven	X	
Alaudidae	**Larks**		
Eremophila alpestris	Horned lark	X	
Hirundinidae	**Swallows**		
Progne subis	Purple martin		X
Tachycineta bicolor	Tree swallow	X	
Tachycineta thalassina	Violet-green swallow	X	
Stelgidopteryx serripennis	Northern rough-winged swallow	X	
Petrochelidon pyrrhonota	Cliff swallow	X	
Hirundo rustica	Barn swallow	X	
Paridae	**Chickadees and Titmice**		
Poecile gambeli	Mountain chickadee		X
Baeolophus inoratus	Oak titmouse	X	
Aegithalidae	**Long-Tailed Tits and Bushtits**		
Psaltriparus minimus	Bushtit	X	
Sittidae	**Nuthatches**		
Sitta canadensis	Red-breasted nuthatch		X
Sitta carolinensis	White-breasted nuthatch	X	
Troglodytidae	**Wrens**		
Campylorhynchus brunneicapillus	Cactus wren	X	
Salpinctes obsoletus	Rock wren	X	
Catherpes mexicanus	Canyon wren	X	
Thryomanes bewickii	Bewick's wren	X	
Troglodytes aedon	House wren	X	
Troglodytes troglodytes	Winter wren		X
Cistothorus palustris	Marsh wren		X
Regulidae	**Kinglets**		
Regulus satrapa	Golden-crowned kinglet		X
Regulus calendula	Ruby-crowned kinglet	X	
Sylviidae	**Old World Warblers and Gnatcatchers**		
Polioptila caerulea	Blue-gray gnatcatcher	X	
Polioptila californica	Coastal California gnatcatcher	X	
Turdidae	**Thrushes**		
Sialia mexicana	Western bluebird	X	
Sialia currucoides	Mountain bluebird	X	
Catharus ustulatus	Swainson's thrush	X	
Catharus guttatus	Hermit thrush	X	
Turdus migratorius	American robin	X	
Ixoreus naevius	Varied thrush	X	
Timaliidae	**Babblers**		
Chamaea fasciata	Wrentit	X	
Mimidae	**Mockingbirds and Thrashers**		
Mimus polyglottos	Northern mockingbird	X	

Scientific Name	Common Name	Observed	Potential
Oreoscoptes montanus	Sage thrasher	X	
Toxostoma redivivum	California thrasher	X	
Sturnidae	**Starlings**		
** Sturnus vulgaris*	European starling	X	
Motacillidae	**Wagtails and Pipits**		
Anthus rubescens	American pipit	X	
Bombycillidae	**Waxwings**		
Bombycilla cedrorum	Cedar waxwing	X	
Ptilogonatidae	**Silky-flycatchers**		
Phainopepla nitens	Phainopepla	X	
Parulidae	**Wood-warblers**		
Vermivora pereginus	Tennessee warbler	X	
Vermivora celata	Orange-crowned warbler	X	
Vermivora ruficapilla	Nashville warbler	X	
Dendroica petechia	Yellow warbler	X	
Dendroica coronata	Yellow-rumped warbler	X	
Dendroica nigrescens	Black-throated gray warbler	X	
Dendroica townsendi	Townsend's warbler	X	
Dendroica occidentalis	Hermit warbler	X	
Dendroica palmarum	Palm warbler	X	
Setophaga ruticilla	American redstart	X	
Oporornis tolmiei	MacGillivray's warbler	X	
Geothlypis trichas	Common yellowthroat	X	
Wilsonia pusilla	Wilson's warbler	X	
Icteria virens	Yellow-breasted chat	X	
Thraupidae	**Tanagers**		
Piranga ludoviciana	Western tanager	X	
Emberizidae	**Emberizids**		
Pipilo chlorurus	Green-tailed towhee	X	
Pipilo maculatus	Spotted towhee	X	
Pipilo crissalis	California towhee	X	
Aimpohila ruficeps	Rufous-crowned sparrow	X	
Spizella passerna	Chipping sparrow	X	
Spizella pallida	Clay-colored sparrow	X	
Spizella breweri	Brewer's sparrow	X	
Spizella atrogularis	Black-chinned sparrow	X	
Poocetes gramineus	Vesper sparrow	X	
Chondestes grammacus	Lark sparrow	X	
Aimphispiza bilineata	Black-throated sparrow		X
Aimphispiza bellii	Sage sparrow		X
Passerculus sandwichensis	Savannah sparrow	X	
Ammodramus savannarum	Grasshopper sparrow	X	
Passerella iliaca	Fox sparrow	X	
Melospiza melodia	Song sparrow	X	
Melospiza lincolnii	Lincoln's sparrow	X	
Zonotrichia albicollis	White-throated sparrow	X	
Zonotrichia leucophrys	White-crowned sparrow	X	
Zonotrichia atricapilla	Golden-crowned sparrow	X	
Junco hyemalis	Dark-eyed junco	X	
Cardinalidae	**Cardinals, Saltators, and Allies**		

Scientific Name	Common Name	Observed	Potential
Pheucticus melanocephalus	Black-headed grosbeak	X	
Guiraca caerulea	Blue grosbeak	X	
Passerina cyanea	Indigo bunting	X	
Passerina amoena	Lazuli bunting	X	
Icteridae	**Blackbirds**		
Agelaius phoeniceus	Red-winged blackbird	X	
Agelaius tricolor	Tricolored blackbird		X
Sturnella neglecta	Western meadowlark	X	
Xanthocephalus xanthocephalus	Yellow-headed blackbird	X	
Euphagus cyanocephalus	Brewer's blackbird	X	
Quiscalus quiscula	Great-tailed grackle		X
Molothrus ater	Brown-headed cowbird	X	
Icterus cucullatus	Hooded oriole	X	
Icterus bullockii	Bullock's oriole	X	
Icterus parisorum	Scott's oriole	X	
Fringillidae	**Fringilline and Cardueline Finches and Allies**		
Carpodacus purpureus	Purple finch	X	
Carpodacus mexicanus	House finch	X	
Carduelis pinus	Pine siskin	X	
Carduelis psaltria	Lesser goldfinch	X	
Carduelis lawrenci	Lawrence's goldfinch	X	
Carduelis tristis	American goldfinch	X	
Passeridae	**Old World Sparrows**		
* *Passer domesticus*	House sparrow	X	
Lonchura punctulata	Nutmeg mannikin	X	
MAMMALIA	**MAMMALS**		
Didelphidae	**Opossums**		
* *Didelphis virginiana*	Virginia opossum	X	
Soricidae	**Shrews**		
Sorex ornatus	Ornate shrew	X	
Notiosorex crawfordi	Desert shrew		X
Talpidae	**Moles**		
Scapanus latimanus	Broad-footed mole		X
Verspertilionidae	**Evening Bats**		
Myotus yumanensis	Yuma myotis	X	
Myotus evotis	Long-eared myotis		X
Myotis thysanodes	Fringed myotis		X
Myotis volans	Long-legged myotis		X
Myotis californicus	California myotis	X	
Myotis ciliolabrum	Western small-footed myotis		X
Lasionycteris noctivagans	Silvery-haired bat		X
Pipistrellus hesperus	Western pipistrelle	X	
Eptesicus fuscus	Big brown bat	X	
Lasiurus blossevillii	Western red bat	X	
Lasiurus cinereus	Hoary bat	X	
Lasiurus xanthinus	Western yellow bat	X	
Corynorhinus townsendii	Townsend's big-eared bat		X
Antrozous pallidus	Pallid bat	X	

Scientific Name	Common Name	Observed	Potential
Molossidae	**Free-tailed Bats**		
Tadarida brasiliensis	Mexican free-tailed bat	X	
Nyctinomops femorosaccus	Pocketed free-tailed bat	X	
Eumops perotis	Western mastiff bat	X	
Leporidae	**Rabbits and Hares**		
Lepus californicus	Black-tailed jackrabbit		X
Sylvilagus audubonii	Desert cottontail	X	
Sylvilagus bachmani	Brush rabbit		X
Sciuridae	**Squirrels, Chipmunks, and Marmots**		
Spermophilus beecheyi	California ground squirrel	X	
Sciurus griseus	Western gray squirrel	X	
* *Sciurus niger*	Eastern fox squirrel	X	
Geomyidae	**Pocket Gophers**		
Thomomys bottae	Botta's pocket gopher	X	
Heteromyidae	**Pocket Mice and Kangaroo Rats**		
Chaetodipus fallax	San Diego pocket mouse		X
Chaetodipus californicus	California pocket mouse	X	
Dipodomys agilis	Pacific kangaroo rat		X
Dipodomys simulans	San Diego kangaroo rat		X
Muridae	**Mice, Rats, and Voles**		
Reithrodontomys megalotis	Western Harvest Mouse	X	
Peromyscus eremicus	Cactus mouse	X	
Peromyscus californicus	California mouse	X	
Peromyscus maniculatus	Deer mouse	X	
Peromyscus boylii	Brush mouse		X
Onychomys torridus	Southern grasshopper mouse		X
Neotoma lepida	Desert woodrat	X	
Neotoma fuscipes	Dusky-footed woodrat	X	
* *Rattus rattus*	Black rat		X
* *Rattus novegicus*	Norway rat		X
* *Mus musculus*	House mouse		X
Microtus californicus	California vole	X	
Canidae	**Foxes, Wolves, and Allies**		
* *Canis familiaris*	Feral dog		X
Canis latrans	Coyote	X	
* *Vulpes vulpes*	Red fox		X
Urocyon cinereoargenteus	Gray fox	X	
Procyonidae	**Raccoons and Allies**		
Bassariscus astutus	Ringtail		X
Procyon lotor	Raccoon	X	
Mustilidae	**Weasels and Allies**		
Mustela frenata	Long-tailed weasel		X
Taxidea taxus	American badger	X	
Mephitidae	**Skunks**		
Spilogale gracilis	Western spotted skunk		X
Mephitis mephitis	Striped skunk	X	
Felidae	**Cats**		
* *Felis catus*	Feral cat	X	
Puma concolor	Mountain lion	X	

Scientific Name	Common Name	Observed	Potential
Lynx rufus	Bobcat	X	
Cervidae	**Deer, Elk, and Allies**		
Odocoileus hemionus	Mule deer	X	
Bovidae	**Sheep, Goats, and Allies**		
* *Bos taurus*	Cattle	X	

APPENDIX G, EXOTIC PLANT SPECIES DISTRIBUTION

APPENDIX G

EXOTIC PLANT SPECIES DISTRIBUTION

Exotic Plant Species

Specific analyses of the relationship of soils to exotic species required field refinement of existing vegetation maps. Field mapping of the 3,860-acre Preserve was conducted in the western Puente Hills to determine the dominant exotic species of the disturbed areas. A review of the existing vegetation information of the area was conducted before field mapping occurred.

BonTerra's field surveys were conducted on April 15, 16, 22, and 27, and May 4, 5, 13, 20, and 25. Survey methods consisted of field-checking a 1" = 200' set of digital aerial photographs taken in January 2003. Polygons of vegetation type were drawn in the field. Plant communities were based on the coding system of the Orange County Vegetation Classification System (BonTerra Consulting 2004).

A vegetation map created by BonTerra Consulting was reviewed. The exotic vegetation types mapped by BonTerra included acacia woodland forests, annual grasslands, castor bean stands, eucalyptus woodland forests, Peruvian pepper woodlands, ruderal areas, and tree tobacco stands. It is important to keep in mind that the BonTerra Vegetation Map delineated vegetation classification. It is generally accepted that exotic species are prevalent throughout the Puente Hills including in the areas mapped as native vegetation types. This is especially true in the drainage bottoms. Refinement of the BonTerra Vegetation Map was deemed necessary to better describe and understand the weed-infested areas for future restoration and planning needs. Since the BonTerra map had included the specific exotic vegetation categories such as acacia woodland forest, eucalyptus woodland forest, castor bean, tree tobacco, and Peruvian pepper woodland, further mapping of these exotic species was not required. Most of the exotic species are contained within the areas mapped as ruderal or annual grassland.

Further refinement of the areas of annual grassland and ruderal habitats mapped by BonTerra Consulting was conducted by EARTHWORKS and LSA. Mapping occurred over several weeks in the months of October and November of 2004 in conjunction with the soil sampling.

The method of data collection was with the Fujitsu pen tablet computer and Arcpad, the field-mapping software. The BonTerra vegetation layer overlaid a digital aerial photo of the Preserve. The ruderal and annual grassland vegetation types were outlined on the BonTerra vegetation layer indicating the polygons to be refined.

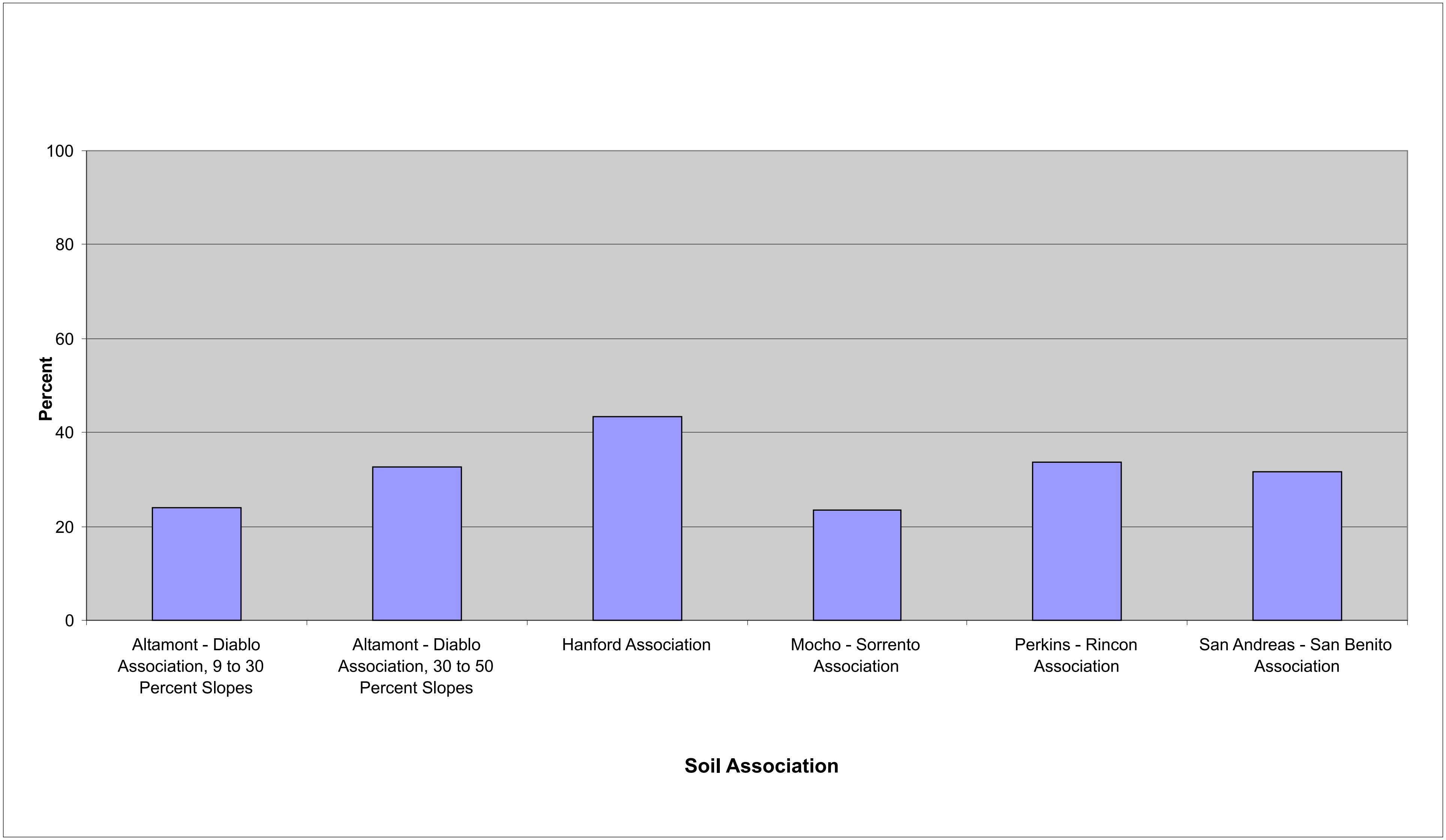
The minimum mapping unit was one acre. All polygons within the disturbed vegetation types over one acre were visited and field data collected for each polygon. Weed polygons were delineated based on the type of exotic species and their cover in a given area. New weed polygons within the disturbed habitat types were created if the suite of exotic species changed or if exotic species cover values changed. Within each weed polygon, a point was assigned with associated data taken with the use of pulldown menus customized in the Arcpad software. If an area was not accessible by vehicle or hiking, the area was surveyed with binoculars.

Variables collected for each weed polygon consisted of weed polygon number, access potential, erosion potential, disturbance factors, the top four dominant exotic species present, and percent cover value. Cover values for exotic species were assigned using the Daubenmire cover class (Bonham 1989). Cover class values are 0–5 percent, 6–25 percent, 26–50 percent, 51–75 percent, 76–95 percent, and 96–100 percent. Native species occurring within the weed polygons were noted. Photographs were also taken of each new weed polygon. If a weed polygon was similar to another datum point for a weed polygon, a point could be assigned "same as," indicating the information is the same as the number indicated.

Exotic Plant Species Distribution

Graph A-2 shows the percent of each soil association that is dominated by weeds. Although the Hanford association has approximately 43 percent dominated by weeds, there is no general relationship between soil association and exotic species, with percentages ranging from 23 to 43 percent of areas dominated by weeds.

Figure 6 in the RMP shows the distribution of dominant exotic species within the Preserve. Table A-F presents the acreage of weed polygons by top dominant species. The most abundant dominant exotic species occurring within the Preserve are annual grasses and mustard *(Brassica nigra).* These two dominant exotics occur throughout the historically disturbed areas of the Preserve with relatively dense cover, with the majority of polygons estimated at 51–75 percent cover for the top dominant species and 26–50 percent for the second dominant species. Table A-G shows the acreage of the second dominant species across all nonnative grass-dominated polygons. Table A-H shows the acreage of the second dominant species across all mustard-dominated polygons. Clearly, nonnative grasses and mustard are the major obstacles to restoration in both distribution and density. There is a more even distribution of species in the third dominant position across nonnative grass-dominated polygons (see Table A-I) and across mustard-dominated polygons (see Table A-J). Milk thistle *(Silybum marianum)* and Italian thistle *(Carduus pycnocephalus)* are exotic species encountered frequently throughout the Preserve as well and generally in association with annual grasses and/or mustard. Figure A-4 shows the distribution of the mustard- and nonnative grass-dominated lands. Tree tobacco (*Nicotiana glauca*) is also found more often in nonnative grass-dominated polygons. Relatively few of the smaller polygons are dominated by other exotic species including fennel *(Foeniculum vulgare),* summer mustard *(Hirschfeldia incana),* Harding grass *(Phalaris aquatica),* wild radish *(Raphanus sativus),* filaree *(Erodium cicuatarium)*, bull thistle *(Cirsium vulgare),* tree tobacco, castor bean *(Ricnus communis),* and areas of *Eucalyptus globulus* and pepper *(Schinus terebenthifolius).* These polygons tend to have less dense cover overall than polygons dominated by nonnative grass or mustard.



Prepared By: LSA

GRAPH A-2

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Percent of Soil Association Dominated by Weedy Plant Species

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Table A-F: Acreage of Weed Polygons by Top Dominant Species

Species	Number of Polygons	Acres
Brassica nigra	190	522.53
Centaurea melitensis	1	1.00
Cirsium vulgare	4	7.17
Erodium cicutarium	5	2.15
Eucalyptus glauca	6	26.40
Foeniculum vulgare	25	28.43
Hirschfeldia incana	4	2.23
Nicotiana glauca	2	1.48
Nonnative Grass	469	683.41
Phalaris aquatica	6	5.52
Raphanus sativus	5	14.67
Ricinus communis	10	8.13
Schinus terebenthifolius	3	1.23
		1304.34

Table A-G: Acreage of Second Dominant in Non-Native grass Dominated Polygons

Species	Number of Polygons	Acres
Brassica nigra	352	568.02
Carduus pycnocephalus	25	22.81
Centaurea melitensis	4	1.98
Erodium cicutarium	9	11.61
Eucalyptus glauca	2	3.37
Foeniculum vulgare	1	1.54
Hirschfeldia incana	35	30.12
Marrubium vulgare	1	0.66
Nicotiana glauca	6	3.97
NONE	6	3.91
Phalaris aquatica	2	2.65
Pichris echioides	3	1.54
Raphanus sativus	3	3.45
Ricinus communis	2	8.10
Salsola tragus	9	7.84
Silybum marianum	9	11.85
		683.41

Table A-H: Acreage of Second Dominant in Mustard Dominated Polygons

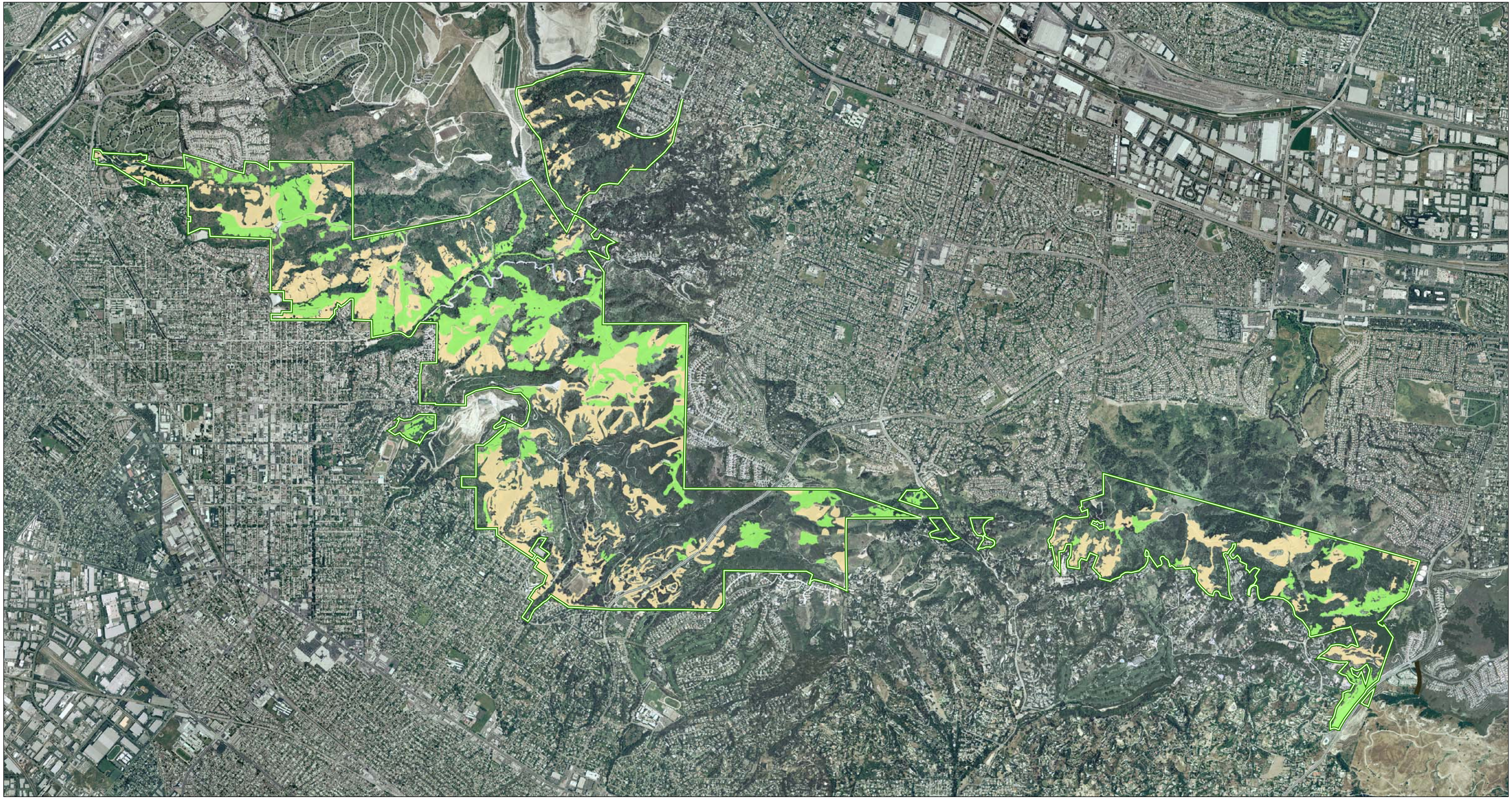
Species	Number of Polygons	Acres
Carduus pycnocephalus	6	9.78
Centaurea melitensis	1	7.00
Foeniculum vulgare	17	16.12
Nicotiana glauca	6	5.28
Nonnative grass	140	465.00
Ricinus communis	2	1.34
Silybum marianum	18	18.01
		522.53

Table A-I: Acreage of Third Dominant in Non-Native grass Dominated Polygons

Species	Number of Polygons	Acres
Brassica nigra	50	46.77
Carduus pycnocephalus	34	46.63
Centaurea melitensis	37	42.80
Cirsium vulgare	7	3.85
Erodium cicutarium	1	0.66
Foeniculum vulgare	17	30.44
Hirschfeldia incana	20	41.52
Marrubium vulgare	4	3.72
Nicotiana glauca	79	162.35
NONE	67	73.08
Ornamental Plant	7	5.09
Raphanus sativus	1	12.00
Ricinus communis	36	52.67
Salsola tragus	15	10.95
Schinus terebenthifolius	2	2.17
Silybum marianum	91	147.92
		682.62

Table A-J: Acreage of Third Dominant in Mustard Dominated Polygons

Species	Number of Polygons	Acres
Carduus pycnocephalus	21	52.11
Centaurea melitensis	6	12.00
Foeniculum vulgare	11	50.91
Hirschfeldia incana	1	0.92
Nicotiana glauca	9	28.75
Non-native grass	26	27.87
NONE	24	27.94
Raphanus sativus	5	7.83
Ricinus communis	8	12.79
Salsola tragus	4	16.98
Silybum marianum	75	284.44
		522.53



Prepared By: LSA

FIGURE A-4

N

0 1,500 3,000
FEET

PRESERVE BOUNDARY

BLACK MUSTARD (*BRASSICA NIGRA*) DOMINATED LAND

NON-NATIVE GRASS DOMINATED LAND

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Mustard and Non-Native
Grass Dominated Land

* Some parcels without data are new properties acquired after vegetation surveys were completed.

SOURCE: Image-EagleAerial (2003)

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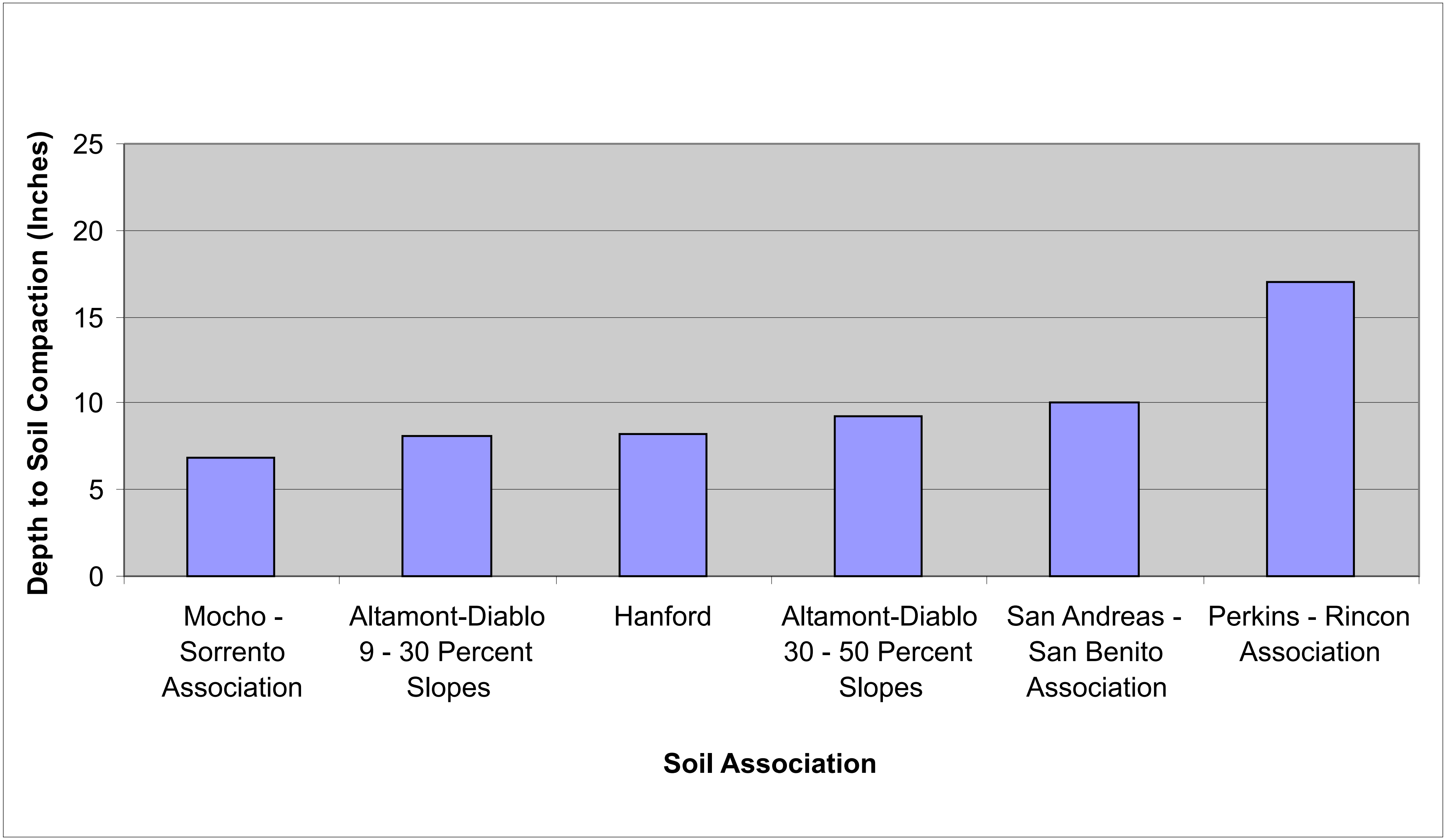
Figure 7 in the RMP presents the acreage of the dominant exotic species from all weed polygons mapped in 2004 across all soil associations. At this level, some patterns can be observed for some of the less widely dispersed species, while the more common exotics, nonnative grass and mustard, range across most of the soil associations. However, an examination of the 71 soil samples from exotic-dominated areas shows some relationship at the finer level of soil texture (see Table A-C). Generally, in the Preserve, black mustard is more likely to be dominant on calcareous clay and clay loam soils with nonnative grasses than the second dominant species. When annual grasses dominate, the soils range from clays to loams with no apparent preference for calcareous soils. However, the second dominant species varies with more specificity for soil type; thus, when annual grasses and mustard are the top two dominant species, more than one-half of the sampled soils are clay loam soils and likely to be calcareous. When the second dominant species are other forbs, the soil is clay and generally not calcareous.

Depth to soil compaction (presented as depth to compaction layer) in the weed polygons shows no pattern across soil associations (see Graph A-3). A Dickey-John soil compaction tester was used to probe the soil, and depth was measured when the tester reached a reading of 300 psi. Nor is there any pattern of compaction based on the occurrence of the top dominant exotic species, with depth to compaction ranging from a few inches to over 20 inches across the weed polygons. An analysis of percent slope also shows no pattern in the depth to compaction in weed polygons. These results indicate that while there is some shallow compaction across the site, there are no specific areas of concern. Based on the field observations, areas where depth to compaction is greatest in weed polygons correlates somewhat with gopher activity. Figure A-5 shows the percent slope of weed dominated land. The distrubution of weed polygons across percent slope seems to be spread out and shows no pattern.



Prepared By: LSA

GRAPH A-3

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Average Depth to Soil
Compaction of Weed Soil Samples Across Soil Association

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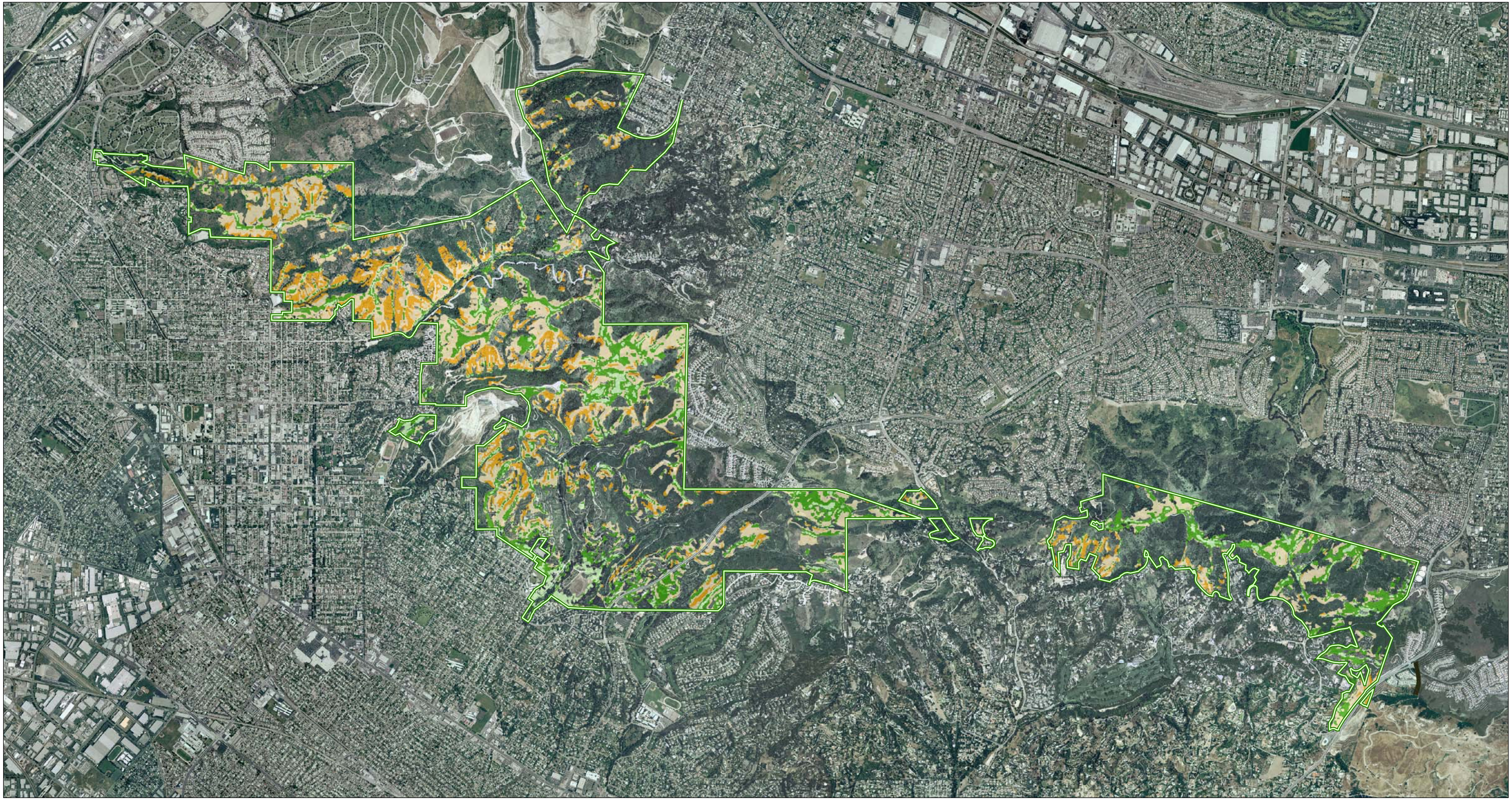

Prepared By: LSA

FIGURE A-5

N

0 1,500 3,000
FEET

Preserve Boundary

Percent Slope

0-20%

20-40%

40-60%

60-85%

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Percent Slope of
Weed Dominated Land

* Some parcels without data are new properties
acquired after vegetation surveys were completed.

SOURCE: Image-EagleAerial (2003)

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APPENDIX H, RAPTOR SPECIES AT THE PRESERVE

APPENDIX H

RAPTOR SPECIES AT THE PRESERVE

The birds of the Puente Hills have not been addressed specifically in the literature except for the summary of breeding land birds of the Puente-Chino Hills prepared by Daniel S. Cooper (2000). Cooper surveyed this area in 1997 and 1998, and his summary of raptors was especially thorough. The following accounts are based upon that work unless otherwise noted.

Turkey Vulture *(Cathartes aura)*

Soaring turkey vultures remain a common site over most habitats in the Puente Hills throughout the year, especially during migration, but nesting probably no longer occurs. Nests were found in the area from 1900 to 1903, but there has been no confirmed nesting since, although suspicious behavior was observed above Sycamore Canyon in 1999. Vultures are especially sensitive to disturbance when nesting (Bloom and Gallagher 1997).

Osprey *(Pandion haliaetus)*

This water-associated species is widespread in southwestern California in winter and during migration periods but has been seen only occasionally in the Puente Hills. One was observed in 2005 (LSA 2005c).

White-Tailed Kite *(Elanus leucurus)*

The charming white-tailed kite is a California Fully Protected Animal and a year-round resident in southwestern California. Cooper found single birds scattered in the Puente Hills, but only one pair, observed courting in the Powder Canyon Natural Area in May 1997. However, California white-tailed kite populations are known to fluctuate significantly (Shuford 1993), so nesting is expected to occur elsewhere in the hills, at least in years with more dense local populations. Local kites prefer oak and sycamore woodlands for nesting; therefore, grasslands for foraging must be nearby (Bloom and Gallagher 1997).

Northern Harrier *(Circus cyaneus)*

The northern harrier is a California Species of Special Concern and a rare breeding species locally (Bloom and Gallagher 1997). Cooper found few birds in the Puente Hills and no evidence of nesting. Harriers are more common and widespread in winter when they forage over a range of open habitats, primarily grasslands. Harriers are expected to occur in the Puente Hills every year from fall through spring, but nesting is unlikely except on rare occasions.

Sharp-Shinned Hawk *(Accipiter striatus)*

This small, primarily bird-eating hawk is widespread in winter but does not nest in the lowlands of southwestern California. Sharp-shinned hawks will forage in all habitats in the Puente Hills, especially wooded ones, and a few birds are expected to occur every year from fall through spring.

Cooper's Hawk *(Accipiter cooperii)*

Cooper's hawk is a California Species of Special Concern and an uncommon resident in southwestern California. It has become well-adapted to suburban habitats, however, and Cooper found it to be a widespread breeder in woodland habitats including Sycamore Canyon, Hacienda Heights, and Rowland Heights.

Red-Shouldered Hawk *(Buteo lineatus)*

This distinctive resident is widespread in riparian woodland and eucalyptus groves in the Puente Hills. Although Cooper confirmed nesting only adjacent to an old estate in Whittier, nesting is certain to occur elsewhere in these habitats as well.

Swainson's Hawk *(Buteo swainsoni)*

Swainson's hawk breeds in interior western North America, but has declined in much of California and is listed as Threatened by the State. Most Swainson's hawks winter in South America, and the species now occurs in southwestern California only as a migrant in spring and fall. The species probably occurs occasionally in this capacity in the Puente Hills, but the only record known is of 12 individuals presumably migrating over Turnbull Canyon on September 29, 1968 (Garrett and Dunn 1981).

Red-Tailed Hawk *(Buteo jamaicensis)*

This familiar species is resident throughout southwestern California and is by far the most frequently encountered raptor in the Puente Hills. Cooper found them nesting throughout the hills in tall trees (especially sycamores) and on transmission-line towers.

Ferruginous Hawk *(Buteo regalis)*

This large hawk, a California Species of Special Concern, is rare in the Puente Hills. Most ferruginous hawks nest to the east and north of California, and wintering birds generally are rare and local in southwestern California. They prefer grasslands and other open areas for foraging.

Rough-Legged Hawk *(Buteo lagopus)*

This species, a more northerly relative of the ferruginous hawk, is very rare in southwestern California. LSA is aware of no records for the Puente Hills, but it may occur in winter on occasion, especially during "flight years."

Golden Eagle *(Aquila chrysaetos)*

The golden eagle is a California Species of Special Concern and a Fully Protected Animal. It still nests in wild country in nearby mountain ranges and probably in the Chino Hills, but not in the Puente Hills. Occasional visitors may occur throughout the year; Cooper reported May and July records from Rowland Heights and Turnbull Canyon, and Larry Schmahl (pers. comm.) reported them from October to early April in the Puente Hills.

American Kestrel *(Falco sparverius)*

This small falcon is still a fairly common and widespread resident in southwestern California. Cooper found them breeding in the Puente Hills in open habitats near structures or large trees with nest cavities.

Merlin *(Falco columbarius)*

Another small falcon, the merlin breeds north of California and is a California Species of Special Concern on its wintering grounds here. Merlins range widely and forage in virtually all habitats. Schmahl (pers. comm.) reported Merlins in low numbers from October through April and LSA (2005c) observed one in October 2005.

Peregrine Falcon *(Falco peregrinus)*

The American peregrine falcon (*F.p. anatum*) has been delisted by the federal government, but remains State listed as Endangered in California. This species still nests in low numbers in southwestern California, including urban areas. It forages primarily in wetland habitats, especially along the coast, but may occur almost anywhere. Schmahl (pers. comm.) reported individuals in the vicinity of the Schabarum Trail on November 26, 1994, and November 2, 1997 and LSA (2005c) observed one along Harbor Blvd. on October 25 and November 4, 2005.

Prairie Falcon *(Falco mexicanus)*

This, the largest of California's regularly occurring falcons, is a California Species of Special Concern at its nesting sites. Prairie falcons may nest in the Santa Ana Mountains, but not in the Puente Hills. They have been observed in the Chino Hills, but LSA is not aware of any records for the Puente Hills, where occasional visitors might forage primarily in open areas.

Barn Owl *(Tyto alba)*

The barn owl is found around the world and is the most conspicuous owl in southwestern California. In the Puente Hills, Cooper recorded it only in the Whittier Hills, but predicted it probably occurs widely. Bloom and Gallagher (1997) reported nearly 100 known breeding pairs in adjacent Orange County, where they nest in cavities in sycamores, coast live oaks, palms, cliffs, buildings, and nest boxes.

Western Screech-Owl *(Otus kennicottii)*

This small woodland owl is resident in southwestern California. Cooper reported four pairs in Sycamore Canyon and at least three pairs in Turnbull Canyon; however, more are probably present in oak and riparian woodland elsewhere in the Preserve.

Great Horned Owl *(Bubo virginianus)*

This large and familiar species is relatively common and widespread in southwestern California. Cooper reported this species from scattered wooded sites in the Puente Hills including eucalyptus groves. Nesting was confirmed south of Hacienda Heights and just north of Turnbull Canyon and likely occurs elsewhere as well. N. John Schmitt (pers. comm.) confirmed nesting in Sycamore Canyon in 1998.

Burrowing Owl *(Athene cunicularia)*

In recent decades, this distinctive species has declined markedly in much of western North America including southwestern California. Recent recorded sightings from the Puente Hills were of the fresh remains of two (killed by a raptor) found in Sycamore Canyon in October 1999 and one in Arroyo San Miguel in October 2006. Apparently, the species had not been seen in the Whittier Hills since the 1960s. Birds are still expected to visit open areas on occasion from fall through spring, but nesting is highly unlikely.

Long-Eared Owl *(Asio otus)*

This inconspicuous owl is poorly known throughout much of its range around the world. This is especially true in most of southwestern California, where nesting pairs are very sensitive to human disturbance. We are unaware of any reports from the Puente Hills, and it is unlikely that nesting will occur under current conditions. It is possible that wandering birds may occur on occasion during migration and winter.

Short-Eared Owl *(Asio flammeus)*

Like the previous species, this one is found at scattered locations around the world. In North America, most birds breed north and east of California. Nesting in southwestern California has been infrequent, especially in recent years. We are unaware of any records of short-eared owls in the Puente Hills, but migrant or wintering birds may appear in grassland areas on occasion.

APPENDIX I, SENSITIVE SPECIES TABLE

Appendix I, Sensitive Species Table

Species	Habitat and Distribution	Activity/Blooming Period	Status Designation[1]	Probability of Occurrence[2]
SPECIES LISTED OR PROPOSED FOR LISTING				
VASCULAR PLANTS				
Braunton's milkvetch *Astragalus brauntonii*	Occurs in recently burned or otherwise disturbed soil areas (e.g., firebreaks) below ca. 1,500 ft. elevation in portions of Ventura, Los Angeles, and Orange Counties. Often found in limestone deposits, marine terraces, and other calcareous soils in association with chaparral, coastal sage scrub, and other brushy places.	February–June	Fed.: FE State: --- CNPS: 1B	**Moderate to High.** Perennial herb. PCR documented a high potential of occurring within Preserve where suitable habitat exists. However, LSA has not observed this species during previous surveys.
Thread-leaved brodiaea *Brodiaea filifolia*	Clay soils, usually associated with annual grassland; vernal pools often surrounded by shrubland habitat.	March-June	Fed.: FT State: CE CNPS: 1B	**Low to Moderate.** Potential of occurring within the Preserve where habitat exists per PCR document. However, LSA has not observed this species during previous surveys.
California Orcutt grass *Orcuttia californica*	Vernal pools in Ventura, Riverside, and San Diego Counties, Baja California; known from fewer than 20 locations; below 2,000-foot elevation.	April–June	Fed: FE State: CE CNPS: 1B	**Low.** Habitat appears unsuitable. LSA has not observed during previous surveys.
BIRDS				
American peregrine falcon *Falco peregrinus anatum*	Widespread, but scarce and local throughout North America. Nests on buildings and bridges in the L.A. Basin.	Year-round	Fed.: --- State: CE CFP	**Observed.** One was seen just west of Harbor Blvd. in October/November 2005.
Southwestern willow flycatcher *Empidonax traillii extimus*	Rare and local breeder in riparian habitat usually with standing water, in the southwestern U.S. and (formerly?) northwestern Mexico. Winters in Central and South America.	May–September	Fed.: FE State: CE	**Low.** Willow flycatchers observed in the Preserve during migration periods (Cooper 2000; LSA 2000) probably represent the subspecies *E.t. Brewster* (little willow flycatcher). The southwestern willow flycatcher nests in the Prado Basin, but nesting habitat in the Preserve appears to be unsuitable.
Coastal California gnatcatcher *Polioptila californica californica*	Coastal sage scrub; occurs only in cismontane southern California and northwestern Baja California in low-lying foothills and valleys.	Year-round	Fed.: FT State: CSC	**Observed.** At least three pairs present in 2005 (LSA 2005a).

[1] For a description of status designations, see Legend on last page.
[2] Based on the following categories: Absent, Low, Moderate, High, Observed.

Species	Habitat and Distribution	Activity/Blooming Period	Status Designation[1]	Probability of Occurrence[2]
Least Bell's vireo *Vireo bellii pusillus*	Formerly occurred in well-developed riparian areas from north-central California to Baja California. Now absent from the northern portion of its range, but populations in southern California are growing rapidly in response to intense management efforts. Winters in western Mexico.	April–September	Fed: FE State: CE	**Observed.** A single male was found in Sycamore Canyon in 2005 (LSA 2005c).
Swainson's hawk *Buteo swainsoni*	Open country; nesting in interior western North America and wintering primarily in South America.	Spring and fall	Fed.: --- State: CT	**Observed.** Twelve migrating birds were seen over Turnbull Canyon on September 29, 1968.
SPECIES NOT LISTED NOR PROPOSED FOR LISTING				
VASCULAR PLANTS				
Coulter's saltbush *Atriplex coulteri*	Occurrence in Chino-Puente Hills region poorly known. Historical record for Chino Creek. Alkaline or clay soils in coastal sage scrub or valley and foothill grassland.	March-October	Fed.: --- State: --- CNPS: 1B	**Low.** No suitable habitat noted within the Preserve.
Catalina mariposa lily *Calochortus catalinae*	Heavy soil, on open grassy slopes and openings in brush, below 2,000 ft. elevation in chaparral, coastal sage scrub, valley, and foothill grassland. San Diego County to San Luis Obispo County; Santa Catalina, Santa Cruz, and Santa Rosa Islands.	February–May	Fed.: --- State: --- CNPS: 4	**Observed.** Observed by LSA in spring 2000 and 2005 within Turnbull Canyon.
Plummer's mariposa lily *Calochortus plummerae*	Dry, rocky places, often in brush, below 5,000 feet elevation. Usually on granitic soils. Found in grassland chaparral, coastal sage scrub, yellow pine forest. Santa Monica Mountains to San Jacinto Mountains. Riverside, San Bernardino, Los Angeles, and Ventura Counties.	May–July	Fed: --- State: --- CNPS: 1B	**Observed.** Observed by LSA in spring 2000 and 2005 within Turnbull Canyon.
Intermediate mariposa lily *Calochortus weedii* var. *Intermedius*	Dry, rocky, open slopes, often in chaparral, coastal sage scrub, valley, and foothill grassland below 2,000 ft. elevation. Los Angeles, Orange, and Riverside Counties.	May–July	Fed.: --- State: --- CNPS: 1B	**Moderate.** LSA documented suitable habitat present within the Preserve. LSA has not observed during previous surveys.
False Payson's jewel flower *Caulanthus heterophyllus* var. *pseudosimulans*	Occurs on xeric, granite slopes in coastal sage scrub or chaparral	March-May	Fed: --- State : CSC CNPS: Local concern	**Low-Moderate.** Not recorded in Puente Hills, but expected to occur in Preserve.
Southern tarplant *Centromadia parryi* ssp. *australis*	Occurs in alkali meadows, grasslands, and riparian herb habitats. Historically occurred in much of Los Angeles basin.	May-November	Fed: --- State: --- CNPS: 1B	**Low to Moderate.** Suitable habitat qustionable within the Preserve. LSA has not observed this species during previous surveys.

Species	Habitat and Distribution	Activity/Blooming Period	Status Designation[1]	Probability of Occurrence[2]
Many-stemmed dudleya *Dudleya multicaulis*	Often on clay soils and around granitic outcrops in chaparral, coastal sage scrub, and grasslands; below 2,500 ft. elevation. Los Angeles, Orange, Riverside, San Bernardino, and San Diego Counties.	May–July	Fed.: --- State: --- CNPS: 1B	**Observed.** Documented in the checklist of Vascular plants of Whittier Hills, LA County. LSA has not observed this species during previous surveys.
Mesa Horkelia *Horkelia cuneata* ssp. *puberula*	Sandy or gravelly substrates with chaparral, cismontane woodland coastal scrub. Typically more inland than other subspecies, from San Diego County to Central California.	February–September	Fed: --- State: --- CNPS: 1B	**Low.** Not observed within the Preserve; not documented as potentially occurring within Preserve vicinity. LSA has not observed this species during previous surveys.
Southern California black walnut *Juglans californica* var. *californica*	Occurs in grasslands, floodplains, and woodland habitats. The Chino-Puente Hills is a major center of distribution for this species.	March-May	Fed: --- State: --- CNPS: 4	**Observed** by Bon Terra.
Coulter's goldfields *Lasthenia glabrata* ssp. *coulteri*	Marshes, playas, vernal pools, grassland; sea level to 3,000 feet elevation. Inland southern California and along coast from San Luis Obispo County to Baja California.	February–June	Fed: --- State: --- CNPS: 1B	**Moderate.** LSA has not observed this species during previous surveys.
Robinson's pepper grass *Lepidium virginicum* var. *robinsonii*	Dry soils in coastal sage scrub and chaparral; typically below 1,500 feet elevation; southwestern California and Baja California.	January–July	Fed: --- State: --- CNPS: 1B	**Observed.** Observed by LSA in spring 2000 within Turnbull Canyon.
Orutt's linanthus *Linanthus orcuttii*	Chaparral, lower montane coniferous forest. Sometimes in disturbed areas, often in gravelly clearings; 1,060–2,000 meters; Orange, Riverside and San Diego Counties into Baja California.	May–June	Fed: --- State: --- CNPS: 1B	**Low.** Not observed within the Preserve, not documented as potentially occurring within the Preserve vicinity. LSA has not observed this species during previous surveys.
Small-flowered microseris *Microseris douglasii* var. *platycarpa*	Found in claysoils. Recorded from Chino Hills in the Diamond Ranch area.	March-May	Fed: --- State: --- CNPS: 4	**Low-Moderate.** Habitat appears suitable. LSA has not observed this species during previous surveys.
Prostrate navarretia *Naverretia prostrata*	Alkaline soils in grassland or in vernal pools. Los Angeles and western San Bernardino Counties to Monterey County.	April–July	Fed: --- State: --- CNPS: 1B	**Low.** Not observed within Preserve boundaries; not documented as potentially occurring within the Preserve vicinity. LSA has not observed this species during previous surveys.

Species	Habitat and Distribution	Activity/Blooming Period	Status Designation[1]	Probability of Occurrence[2]
Golden-rayed pentachaeta *Pentachaeta aurea*	Occurs in grassland and coastal sage scrub. Recorded from the Santa Monica Mountains and Orange County.	March-July	Fed: --- State: --- CNPS: 4	**Moderate.** Although not recorded from the Preserve, it is poorly documented, and habitat on site appears suitable. LSA has not observed this species during previous surveys.
Brand's phacelia *Phacelia stellaris*	Open areas within coastal scrub, typically below 4,500 feet.	March–June	Fed: --- State: --- CNPS: 1B	**Moderate.** LSA documented that suitable habitat is present within the Preserve boundaries. LSA has not observed this species during previous surveys.
Parish's gooseberry *Ribes diveracatum* var. *parishii*	Riparian woodlands. This plant is known from Los Angeles and San Bernardino Counties and is thought to be extinct.	Deciduous shrub; blooms February–April	Fed: --- State: --- CNPS: 1B	**Low.** Not observed within Preserve boundaries; not documented as potentially occurring within the Preserve vicinity. The last known occurrence of this species was in San Bernardino County in 1917. LSA has not observed this species during previous surveys.
Coulter's matilija poppy *Romneya coulteri*	Occurs in alluvial fan sagescrub, sycamore woodland, coastal sage scrub, and chaparral.	March-July	Fed: --- State: --- CNPS: 4	**Observed** by Bon Terra on Whittier College parcel. However, not known if this is a native occurrence.
Southern skullcap *Scutellaria bolanderi* ssp. *austromontana*	Gravelly soils and streambeds in chaparral, woodland and coniferous forests; 1,000–6,000 feet elevation. Known from Riverside and San Diego Counties; extirpated from San Bernardino County; status unknown in Los Angeles County.	June–August	Fed: --- State: --- CNPS: 1B	**Low.** Not observed within Preserve boundaries; not documented as potentially occurring within the Preserve vicinity. Only source of information for this occurrence is site name noted by Jepson in "A flora of California" (1943). Identification of this occurrence is questionable. LSA has not observed this species during previous surveys.
INSECTS				
Monarch *Danaus plexippus*	Varied habitats throughout much of North and South America; milkweeds required for breeding.	Year-round	Fed.: --- State: CSA (wintering) sites)	**Observed.** Probably regular on site (e.g., LSA 2000, 2005c), but presence of winter concentrations unknown.
AMPHIBIANS				
Coast Range newt *Taricha torosa torosa* (southern populations)	Southern populations are found on the coastal slope from Monterey to near the Mexican border. They generally inhabit mesic habitats such as oak woodland and require streams or pools for breeding.	Cooler months	Fed.: --- State: CSC	**Low.** Apparently unknown in the Puente Hills.

Species	Habitat and Distribution	Activity/Blooming Period	Status Designation[1]	Probability of Occurrence[2]
Western spadefoot *Spea hammondii*	Grasslands and occasionally hardwood woodlands; largely terrestrial but for breeding requires rainpools or other ponded water for 3+ weeks; burrows in loose soils during dry season; Central Valley and foothills, coast ranges, inland valleys to Baja California.	October–April	Fed: --- State: CSC	**Observed.** One found in 2005 (LSA 2005c).
REPTILES				
Southwestern pond turtle *Actinemys marmorata pallida*	Permanent or nearly permanent water in a wide variety of habitat types; requires basking sites such as partially submerged logs, rocks, or open mud banks. Central California to northwestern Baja California.	Year-round	Fed: -- State: CSC	**Low-Moderate.** Aquatic habitat within the Preserve may not be adequate.
San Diego banded gecko *Coleonyx variegatus abbotti*	Chaparral, coastal sage, and desert habitats (often with rocks) from southwestern California to northern Baja California Sur.	Year-round, but primarily the warmer months.	Fed.: --- State: CSA	**Low.** Unknown from the Puente Hills and habitat quality is probably marginal.
San Diego horned lizard *Phrynosoma coronatum blainvillii*	Wide variety of habitats including coastal sage scrub, grassland riparian woodland; typically on or near loose sandy soils; coastal and inland areas from Ventura County to Baja California.	April–July	Fed.: -- State: CSC	**High.** Habitat appears suitable but none found by LSA (2005c).
Coastal western whiptail *Aspidoscelis tigris multiscutatus*	Wide variety of habitats including coastal sage scrub, sparse grassland and riparian woodland; coastal and inland valleys and foothills; Ventura County to Baja California.	April –August	Fed.: --- State: CSA	**Observed.** Documented by Haas, et al. (2002) and LSA (2005c).
Silvery legless lizard *Anniella pulchra pulchra*	Inhabits loose soil and humus from central California to northern Baja California.	Year-round	Fed: -- State: CSC	**Low-Moderate.** On site habitat may be unsuitable.
Coastal rosy boa *Lichanura trivirgata rosafusca*	Inhabits rock outcrops and rocky shrublands from southwestern California to northern Baja California.	Warmer months	Fed: -- State: CSC	**Low.** Generally rare and local in the region, apparently unrecorded in the Puente-Chino Hills.
San Bernardino ringneck snake *Diadophis punctatus modestus*	Under surface objects along drainage courses, in mesic chaparral and oak and walnut woodland communities. Moist habitats of southwestern California from about Ventura to Orange Counties.	Year-round	Fed: -- State: CSA	**Observed.** Documented by Haas, et al. (2002) in the Whittier Hills.
Coast patch-nosed snake *Salvadora hexalepis virgultea*	Coastal chaparral, washes, sandy flats, and rocky areas from San Luis Obispo County to northwestern Baja California.	Year-round	Fed: -- State: CSC	**Moderate.** Habitat appears suitable and the species is known to occur in the Chino Hills.
Two-striped garter snake *Thamnophis hammondii*	Highly aquatic; found only in or near permanent sources of water, such as streams with rocky beds supporting willows or other riparian vegetation. Ranges from Monterey County to Baja California Sur.	Diurnal year-round	Fed.: --- State: CSC	**Low.** Habitat generally unsuitable; apparently unrecorded in the Puente Hills.
Northern red diamond rattlesnake *Crotalus ruber ruber*	Coastal sage scrub, open chaparral, and woodland; occasional in grassland and cultivated areas. Prefers rocky areas and dense vegetation. Los Angeles County south to Baja California Sur.	Mid-spring to mid -fall	Fed.: --- State: CSC	**Observed.** Documented by Haas, et al. (2002) and LSA (2005c).

Species	Habitat and Distribution	Activity/Blooming Period	Status Designation[1]	Probability of Occurrence[2]
BIRDS				
White-tailed kite *Elanus leucurus*	Open country in South America and southern North America.	Year-round	Fed: --- State: CSC	**Observed.** Observed by TeraCor Resource Management (2002), (Cooper 2000), and LSA (2005c).
Northern harrier *Circus cyaneus*	Open country in the Temperate Zone worldwide.	Year-round	Fed: --- State: CSC (nesting)	**Observed.** Observed by TeraCor Resource Management (2002, (Cooper 2000), and LSA (2005c).
Cooper's hawk *Accipiter cooperi*	Primarily forests and woodlands throughout North America.	Year-round	Fed.: --- State: CSC (nesting)	**Observed.** Widespread breeder in the Puente Hills (Cooper 2000).
Ferruginous hawk *Buteo regalis*	Open country in western North America; north to Canada in summer and south to Mexico in winter.	Fall and winter	Fed: -- State: CSC	**Low to Moderate.** Although the habitat within the Preserve appears suitable, this species is apparently unrecorded in the Puente Hills.
Golden eagle *Aquila chrysaetos*	Generally open country of the Temperate Zone worldwide. Uncommon resident in southwestern California.	Year-round	Fed: --- State: CSC	**Observed.** No nesting, but foraging birds occasionally visit the region (Cooper 2000).
Merlin *Falco columbarius*	Open country; breeds in the Holarctic Region and winters south to the tropics. Rare fall migrant and winter visitor to southernwestern California.	Fall and winter	Fed: --- State: CSC	**Observed.** Reported by Larry Schmahl (pers. comm.) and LSA (2005c).
Prairie falcon *Falco mexicanus*	Open country in much of North America.	Year-round	Fed: --- State: CSC (nesting)	**Low to Moderate.** Apparently unrecorded in the Puente Hills, but foraging birds may occasionally visit.
Burrowing owl *Athene cunicularia*	Open country in much of North and South America.	Year-round	Fed: --- State: CSC (burrow sites)	**Observed.** Recorded at Sycamore Canyon in 1999 and at Arroyo San Miguel in 2006 but probably only a rare visitor (Cooper 2000, Henderson pers. comm.. 2006).
Long-eared owl *Asio otus*	Scarce and local in forests and woodlands throughout much of the Northern Hemisphere.	Year-round	Fed: --- State: CSC (nesting)	**Low.** Apparently unrecorded in the Puente Hills, but occasional visitors are possible.
Short-eared owl *Asio flammeus*	Open country, usually with tall grass, in scattered regions around the Northern Hemisphere.	Fall through spring	Fed.: --- State: CSC (nesting)	**Low.** Apparently unrecorded in the Puente Hills, but occasional visitors are likely.

Species	Habitat and Distribution	Activity/Blooming Period	Status Designation[1]	Probability of Occurrence[2]
Costa's hummingbird *Calypte costae*	Primarily deserts, arid brushy foothills, and chaparral in the southwestern United States and northwestern Mexico.	Spring through fall.	Fed.: --- State: CSA (nesting)	**Observed.** Widespread; documented by Cooper (2000) and LSA (2000, 2005c).
Allen's hummingbird *Selasphorus sasin*	Chaparral, open oak woodland riparian woodland and residential areas on the breeding grounds from southwestern Oregon to southwestern California; primarily montane woodland on the wintering grounds in central Mexico.	Spring through fall.	Fed.: --- State: CSA (nesting)	**Observed.** Widespread; documented by Cooper (2000) and LSA (2000, 2005c).
Loggerhead shrike *Lanius ludovicianus*	Open country in much of North America, but declining in many areas, including southwestern California.	Year-round	Fed: --- State: CSC	**Observed.** Local; documented by Cooper (2000) and LSA (2000).
California horned lark *Eremophila alpestris actia*	Open grasslands and fields, agricultural areas from northern coastal California to northwestern Baja California.	Year-round	Fed: -- State: CSC	**Observed.** Documented by Cooper (2000) in the Whittier Hills (formerly) and south of Rowland Heights.
Oak titmouse *Baeolophus inornatus*	Primarily oak woodland from southern Oregon to southern Baja California Sur.	Year-round	Fed.: --- State: CSA	**Observed.** Still present in the Powder Canyon area but apparently extirpated elsewhere in the Puente Hills (Cooper 2000).
Coastal cactus wren *Campylorhynchus brunneicapillus*	The coastal population inhabits cactus scrub from southern Ventura County and southwestern San Bernardino County to northwestern Baja California.	Year-round	Fed.: ---- State: CSC	**Observed.** Documented by Cooper (2000), LSA (2000, 2005c), and TeraCor Resource Management (2002).
California thrasher *Toxostoma redivivum*	Primarily chaparral and riparian woodland from northern California to northwestern Baja California.	Year-round	Fed.: --- State: CSA	**Observed.** Widespread; documented by Cooper (2000) and LSA (2000, 2005c).
California yellow warbler *Dendroica petechia brewsteri*	Riparian woodland while nesting in the western U.S. and northwestern Baja California; more widespread in brushy areas and woodlands during migration and winter, when occurring from western Mexico to northern South America.	April−September	Fed.: --- State: CSC (nesting)	**Observed.** Birds observed by Cooper (2000) and LSA (2000, 2005c) but possibly not nesting.
Yellow-breasted chat *Icteria virens*	Nests in riparian situations across much of North America, but extirpated from many areas; winters in Central America.	April−August	Fed: --- State: CSC (nesting)	**Observed.** Local; documented by Cooper (2000) and LSA (2000, 2005c).
Southern California rufous-crowned sparrow *Aimophila ruficeps canescens*	Steep, rocky coastal sage scrub and open chaparral habitats, particularly scrubby areas mixed with grasslands. From Santa Barbara County to northwest Baja California.	Year-round	Fed.: -- State: CSC	**Observed.** Widespread; documented by Cooper (2000) and LSA (2000, 2005c).
Chipping sparrow *Spizella passerina*	Primarily open forests and woodlands, more widespread in winter; breeds throughout much of North America and winters from the southern United States to Central America.	Year-round	Fed.: --- State: CSA nesting	**Low.** Occurs in winter, but apparently does not nest in the Puente-Chino Hills (Cooper 2002, LSA 2005c).

Species	Habitat and Distribution	Activity/Blooming Period	Status Designation[1]	Probability of Occurrence[2]
Black-chinned sparrow *Spizella atrogularis*	Breeds in chaparral, sagebrush, and arid scrub in the southwestern U.S. and northwestern Mexico and winters primarily in Mexico.	March through August	Fed.: --- State: CSA nesting	**Observed.** Documented by Cooper (2002).
Lark Sparrow *Chondestes grammacus*	Open situations with scattered bushes or trees. Breeds throughout much of western North America and winters from the southern United States to southern Mexico.	Year-round	Fed: --- State: CSA	**Observed.** Documented by Cooper (2000), but only in areas east of the Whittier Hills. Non-breeding birds were recorded by LSA (2005c).
Bell's sage sparrow *Amphispiza belli belli*	Occupies chaparral and coastal sage scrub from west central California to northwestern Baja California.	Year-round	Fed.: --- State: CSC	**Low.** Apparently does not reside in the Puente-Chino Hills (Cooper 2000, 2005c).
Tricolored blackbird *Agelaius tricolor*	Open country in western Oregon, California, and northwestern Baja California.	Year-round	Fed.: -- State: CSC (nesting)	**Moderate-High.** Known to nest in Tonner Canyon and may do so occasionally in the Puente Hills (Cooper 2000).
Lawrence's goldfinch *Carduelis lawrencei*	Oak woodland chaparral, riparian woodland and other habitats in arid regions, but usually near water; from northern California to northern Baja California, but periodically wandering throughout much of western North America.	Primarily spring and summer.	Fed.: --- State: CSA (nesting)	**Observed.** Apparently very scarce in the Puente Hills under normal circumstances (Cooper 2000, LSA 2005c).
MAMMALS				
Yuma myotis *Myotis yumanensis*	Varied habitats in western North America.	Warmer months	Fed.: -- State: CSA	**Observed.** Documented by Remmington (2006).
Western small-footed myotis *Myotis ciliolabrum*	Varied habitats throughout much of North America.	Warmer months	Fed.: -- State: CSA	**Moderate.** Habitat probably suitable.
Western red bat *Lasiurus blossevillii*	Forages over a wide range of habitats, but generally roosts in woodlands and forests. Ranges from southwestern Canada through the western United States and Middle America to South America.	Year-round; primarily warmer months	Fed.: --- State: CSA	**Observed.** Documented by Remmington (2006).
Western yellow bat *Lasiurus xanthinus*	Varied habitats, but usually near water; often associated with palm trees. Southwestern United States to southern Mexico.	Year-round; primarily warmer months	Fed.: --- State: CSA	**Observed.** Documented by Remmington (2006).
Hoary bat *Lasiurus cinereus*	Widespread in North America (and Hawaii), with habits similar to the western red bat.	Primarily winter months	Fed.: --- State: CSA	**Observed.** Documented by Remmington (2006).
Pallid bat *Antrozous pallidus*	Varied habitats in western North America.	Warmer months	Fed.: -- State: CSC	**Observed.** Documented by Remmington (2006).
Pocketed free-tailed bat *Nyctinomops femorosaccus*	Varied habitats but usually associated with high cliffs or rocky areas; southwestern North America.	Warmer months	Fed.: --- State: CSC	**Observed.** Documented by Remmington (2006).

Species	Habitat and Distribution	Activity/Blooming Period	Status Designation[1]	Probability of Occurrence[2]
Western mastiff bat *Eumops perotis*	Ranged historically throughout much of the southwestern United States and northwestern Mexico. In California, most records are from rocky areas at low elevations where roosting occurs primarily in crevices.	Warmer months	Fed.: -- State: CSC	**Observed.** Documented by Remmington (2006).
San Diego black-tailed jackrabbit *Lepus californicus bennettii*	Open country of coastal southern California and northern Baja California.	Year-round	Fed.: -- State: CSC	**Moderate.** Two reports identify suitable habitat and a potential for this species to occur within the vicinity of the Preserve. However, this species is now rare and local in the area.
Northwestern San Diego pocket mouse *Perognathus fallax fallax*	Open habitat on the Pacific slope from southwestern San Bernardino County to northwestern Baja California.	Year-round	Fed: -- State: CSC	**Low.** May be restricted to areas from the Chino Hills south and east. However, two reports identify suitable habitat for this species in the vicinity of the Preserve.
Southern grasshopper mouse *Onychomys torridus ramona*	Primarily scrub habitats of southwestern California and northwestern Baja California.	Year-round	Fed.: -- State: CSC	**Low.** Two reports identify suitable habitat and a potential for this species to occur within the vicinity of the Preserve, but the species is now extremely rare in southwestern California.
San Diego desert woodrat *Neotoma lepida intermedia*	Frequents poorly vegetated arid lands and is especially associated with cactus patches. Occurs along the Pacific slope from about San Luis Obispo County to northwest. Baja California.	Year-round	Fed.: -- State: CSC	**Observed.** Documented by LSA (2003c)**.**
Ringtail *Bassariscus astutus*	Woody and rocky areas of the southwestern U.S. and most of Mexico.	Year-round	Fed.: -- State: CFP	**Low.** Not found during mammal movement studies; may no longer be present in the Puente Hills.
American badger *Taxidea taxus*	Occurs throughout much of North America. Primary habitat requirements seem to be sufficient food and friable soils in relatively open uncultivated ground in grasslands, woodlands, and desert.	Year-round	Fed.: -- State: CSA	**Observed.** One found dead on Colima Road in 2006.

Legend: Status Designation

FEDERAL STATUS

FE	Federally listed as Endangered.
FT	Federally listed as Threatened.
PE	Federally proposed as Endangered.
PT	Federally proposed as Threatened.

Note: The U.S. Fish and Wildlife Service (USFWS) has recently revised its classification system for candidate taxa (species, subspecies, and other taxonomic designations), as described below.

C	Certain species formerly designated as "Category 1" (C1) and a few "Category 2" (C2) candidates for federal listing are now known as "Candidate." Refers to taxa for which the U.S. Fish and Wildlife Service (USFWS) has sufficient information available to support a proposal to list as Endangered or Threatened. Issuance of the proposal(s) is anticipated, but precluded at this time.
**	Species formerly designated as "Category 1" (C1) or "Category 2" (C2) candidates for federal listing; not designated presently as "Candidate" species, these C1 and C2 designations have been discontinued by the USFWS. The State now refers to these taxa as "Species of Concern."
C3a	Species considered to be extinct.
C3b	Former federal candidate for listing as Endangered or Threatened, but which is not believed by the Service to represent a distinct taxa meeting the Endangered Species Act's definition of a "species." Species taxonomically invalid.
C3c	Former federal candidate for listing as Endangered or Threatened, but which has been determined by the Service to be too widespread and/or not threatened at this time.

STATE STATUS

CE	State listed as Endangered.
CT	State listed as Threatened.
CR	State listed as Rare.
CFP	California Fully Protected. Species legally protected under special legislation enacted prior to the California Endangered Species Act.
CCE	State candidate for listing as Endangered.
CCT	State candidate for listing as Threatened.
CSC	California Species of Special Concern. These are taxa with pops. declining seriously or otherwise highly vulnerable to human developments.
CSA	Species included on the California Department of Fish and Game's list of "Special Animals" of California. No specific designation assigned.

CALIFORNIA NATIVE PLANT SOCIETY LISTING

1A	List of plants that are presumed extinct in California.
1B	List of plants that are considered by the California Native Plant Society (CNPS) to be Rare, Threatened, or Endangered in California and elsewhere.
2	List of plants that are considered by CNPS to be Rare, Threatened, or Endangered in California, but more common elsewhere.
3	CNPS review list of plants suggested for consideration as Endangered but about which more information is needed.
4	CNPS watch list of plants of limited distribution, whose status should be monitored.

APPENDIX J, ARCHAEOLOGICAL RESOURCES

APPENDIX J

ARCHAEOLOGICAL RESOURCES

METHODS

Records Search. Prior to fieldwork, a records search was conducted at the South Central Coastal Information Center (SCCIC), located at California State University, Fullerton. This included a review of all recorded historic and prehistoric archaeological sites, as well as a review of known cultural resource survey and excavation reports within a one-half-mile radius of the Preserve. In addition, the SCCIC examined the National Register and documents and inventories from the California Office of Historic Preservation, including the lists of California Historical Landmarks, California Points of Historical Interest, listing of National Register Properties, and the Inventory of Historic Structures. The Historical Landmarks of Los Angeles County was also consulted.

In addition, LSA researcher Jay Michalsky visited the Whittier Museum located in Whittier, California, on two separate occasions. With the assistance of museum curator Garland Courts, Mr. Michalsky viewed various newspapers, articles, and books relevant to the history of the Preserve. Mr. Michalsky also conducted research at the Los Angeles County Library. According to Garland Courts, the Whittier Museum contains the most complete collection of local archival material. Therefore, it was determined that further research at additional local institutions would be redundant.

Field Survey. A field survey of the Preserve was conducted from September 21 to September 27, 2004, by LSA archaeologists Terri Fulton and Philip Fulton. The systematic survey consisted of walking transects approximately 15 meters apart in areas where the rugged terrain allowed and where ground visibility was not obscured by dense vegetation. Hilltops, ridges, benches, and other areas typically sensitive for cultural resources were either systematically surveyed with appropriate transect intervals, or intuitively walked over if the area was narrow or nearly impenetrable due to vegetation. Throughout the survey, walls of erosional features, road cuts, and rodent burrow back dirt piles were examined for evidence of buried cultural material.

Less sensitive terrain such as precipitous hillsides and ravines were not systematically examined. Steep slopes and narrow steep ravines have very little potential for the presence of significant archaeological resources. These areas were visually examined from a distance for evidence of historic features such as dams and other structures and for bedrock outcrops that should be investigated for the presence of rock shelters, grinding stations, and/or rock art. Ground visibility varied over the Preserve from zero to 100 percent.

Locational data and maps of cultural resources were recorded using a handheld Garmin GPS unit. Department of Parks and Recreation (DPR) forms, for each resource discovered, were completed and submitted to the SCCIC for the assignment of Primary numbers. A survey report including the DPRs for all recorded resources will also be submitted to the SCCIC.

RESULTS

Records Search. The results of the records search indicate that there are 12 archaeological resources recorded within one-half mile of the Preserve, although no cultural resources had been recorded within the Preserve itself. There are no properties listed on the National Register, California Register, California Historical Landmarks, California Points of Historical Interest, or Historic Properties Directory within one-half mile of the circuit. Twenty-five cultural resource surveys and/or reports have been completed within one-half mile of the Preserve.

Three negative surveys have been conducted within the Preserve. One of these surveys, performed in 1989 by Scientific Resource Surveys, encompasses the entire area of the historic Whittier Oil Field. The oil field was not documented or recorded during that survey, perhaps because it was not recognized at the time as a historic cultural resource.

The additional research conducted at the Whittier Museum yielded information regarding the route of a flume thought to traverse the Preserve. The flume was built in the 1890s to convey water and follows the natural contours of the land from the San Gabriel River near El Monte to Whittier. The route is said to have had a 6-inch-per-mile relief and extended for 12 miles through the flat lands south and west of the Preserve. The flume did cross the flat, wide section of Sycamore Canyon that is located west of the portion of the canyon within the Preserve; however, according the maps and photos obtained at the Whittier Museum (Pearce 1977), it did not enter what is now part of the Preserve at any point.

LSA's research yielded no information regarding the origins of the eucalyptus tree grove located amid the historic oil fields in the southern portion of the Preserve. The trees appear to be historic (over 50 years old). However, it is not known if they are associated with the oil fields or some other person or event of local significance.

Field Survey. Much of the terrain in the Preserve is rugged, consisting of ridgelines and gentle to very steep slopes covered in dense vegetation. Ground visibility in the Preserve generally ranged from zero to 100 percent, with the best visibility occurring on roads, trails, and plowed fire breaks. The soils over the Preserve varied from a medium-brown loam to a brown sandy loam in washes and waterways.

It should be noted that while an attempt was made to survey Sycamore Canyon in search of natural springs, it was nearly impossible, due to dense vegetation including poison oak. The banks of the drainage were examined where the vegetation was marginally penetrable. No remains of the Cal-Baden mineral springs were encountered, and no prehistoric artifacts were observed during this very limited foray.

Two isolated prehistoric cultural resources and seven historic cultural resources determined to be over 50 years old were discovered during the course of the survey. These were assigned temporary numbers and are described below.

> **LSA-PUE430-I-1:** Isolated granitic bifacially ground mano, unshaped, measuring 12.2 x 9.5 x 5.5 cm.

LSA-PUE430-I-2: Isolated metavolcanic scraper measuring 9 x 6.5 x 2 cm.

LSA-PUE430-S-1: Concrete structure measuring 8.5 x 8.5 x 12 feet, located in Sycamore Canyon. The structure is composed of poured concrete, with six-inch-wide plank molding patterns visible on all surfaces. The structure is open and consists of two columns separated by a four-foot-tall (at the highest point) ramped interior. Adjacent to the structure to the north is another concrete wall. This wall is eight feet tall and extends approximately 126 feet, while angling to the northwest. Numerous pieces of boards and planks, some of which were likely used for the molds, can be found in association with the structure, as well as two large redwood beams measuring 2 x 2 feet. These beams were apparently originally set across the vertical columns of the structure, as is evidenced by the 2 x 2 foot areas in the center of each that have been filled in with poorly mixed cement. Bolts that may have secured additional beams protrude from the top of the columns. The origin or use of this structure is unknown, but given the plank molding patterns, it may date to as early as the second decade of the 20th Century. It may be associated with the Sycamore Canyon quarry, which is documented as being in the canyon beginning in 1912 (The Whittier News Annual Edition 1923).

LSA-PUE430-S-2: Water-storage feature/reservoir, located approximately 400 feet northeast of Turnbull Canyon Road on the south side of the fire road. The feature is constructed of rock and mortar and measures approximately 150 feet in diameter and is 9 feet high. The wall thickness is approximately 2 feet throughout, with cobbles and rocks measuring from 4 to 15 inches in diameter and averaging 10 inches in diameter. The structure is cut into the hillside on the southwest and has been truncated and destroyed by construction of the fire road to the northeast. Remnants of the northern perimeter or other associated features may still exist, but vegetation on the north side of the fire road was very dense at the time of the survey, and any possible remains were not visible. The feature is of unknown origin or construction date.

LSA-PUE430-S-3: 1937 Azimuth Mark, U.S. Coast & Geodetic Survey; brass knob mounted in cement. Also says, “For Information write to the Director Washington D.C. $250.00 or imprisonment for disturbing this mark.”

LSA-PUE430-S-4: Ranger’s House: This house is a modified T-shape wood frame clad in stucco. The roof is gable with composition tiles. The rear has had several additions and creates a stepped pattern. Fenestration is by modern vinyl windows and few original wood-frame windows. The main entry is via a newer wood door. There are additional recent doors in the rear. Original construction is thought to have occurred sometime during the 1930s (verbal communication, Habitat Authority 2004).

LSA-PUE430-S-5: Ranger’s Apartment: The apartment is a two-story building with a rectangular mass clad in stucco. The roof is a low-pitch hipped gable with composition tiles. Fenestration on the ground and second floors consists of 6 x 6 foot and 2 x 2 foot wood-frame double-hung windows. There are aluminum sliders in the southwest corner of the west elevation. Entry to the second floor is via a newer wood door on the west elevation atop a concrete stairway. A wood awning is above the door. A recent entryway was placed into the wall on the southeast corner of the east elevation. Entry to the ground floor has been blocked by plywood sheets. Construction is thought to have occurred sometime during the 1930s (verbal communication, Habitat Authority 2004).

LSA-PUE430-S-6: Storage Facility: The building is a rectangular mass made of reinforced concrete and sits on a concrete pad. The roof is low-pitched gable clad in composition tile. There is no fenestration. Entry is via sliding wooden doors on the north and south elevations. There was once an addition on the northwest corner of the north elevation, but was removed; wooden beams appear on the north elevation marking the location of the addition. Construction is thought to have occurred sometime during the 1930s (verbal communication, Habitat Authority 2004).

LSA-PUE430-S-7: Historic Whittier Oil Field: The Whittier Oil Field is located on the southern slope of the Puente Hills immediately east of the City of Whittier. The area included approximately 485 acres of oil-productive geologic formations (Bradley 1943). Oil production began ca. 1885 and continued to be a viable economic force in the area through the 1940s. Cumulative oil production from September 1919 to 1941 was estimated at 1,567,000 barrels (Bradley 1943). Oil production slowed substantially by the 1950s. The wells of the Whittier Oil Field have been dismantled; however, significant ancillary features such as roads, markers, and well pads remain.

CRITERIA FOR EVALUATION

The criteria for listing resources on the California Register are based on those developed by the National Park Service for listing in the National Register of Historic Places. The federal criteria have been modified in order to include a broader range of resources that better reflect the history of California. A property must be significant at the local, State, or national level under one or more of the following four criteria:

1. It is associated with events or patterns of events that have made a significant contribution to the broad patterns of the history and cultural heritage of California and the United States.
2. It is associated with the lives of persons important to the nation or to California's past.
3. It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
4. It has yielded, or may be likely to yield, information important to the prehistory or history of the State and the nation.

Criteria 1 and 2. A property significant for its historic association may be listed if it retains the essential physical features that made up its character or appearance during the period of its association with the important event, historical pattern, or person(s).

Archaeological sites eligible under Criteria 1 and 2 must be in overall good condition, with excellent preservation of features, artifacts, and spatial relationships to the extent that these remains are able to convey important associations with events or persons.

Criterion 3. A property important for illustrating a particular architectural style or construction technique must retain most of the physical features that constitute that style or technique. A property that has lost some historic materials or details may be listed if it retains the majority of the features that illustrate its style. The property may not be listed, however, if it retains some basic features conveying massing but has lost the majority of the features that once characterized its style.

Archaeological sites listed under Criterion 3 must be in overall good condition, with excellent preservation of features, artifacts, and spatial relationships to the extent that these remains are able to illustrate a site type, time period, method of construction, or work of a master.

Criterion 4. For properties to be listed under criterion 4, integrity is based upon the property's potential to yield specific data that address important research questions.

INTEGRITY

Integrity is the authenticity of a property's physical identity, evidenced by the survival of characteristics that existed during the property's period of significance. Properties eligible for listing in the California Register must retain enough of their historic character or appearance to be recognizable as historic properties and to convey the reasons for their significance.

Integrity is judged in relation to location, design, setting, materials, workmanship, feeling, and association. It must also be judged with reference to the particular criteria under which a property is thought to be eligible. Alterations to a property, or changes in use, may themselves have historical, cultural, or architectural significance.

It is possible that such properties may not retain sufficient integrity to meet National Register of Historic Places standards, yet they may still be eligible for listing in the California Register. Properties that have lost their historic character of appearance may still have integrity if they maintain a potential to yield significant scientific or historical information, if the archaeological resources retain integrity, or if the resource retains substantial cultural value even though some major constituents have been removed or disturbed.

Historic Context

Every California Register evaluation must place a property in its historic context to support that property's significance. Historic context means information about the period, the place, and the events that created, influenced, or formed the backdrop to the historic resources. The discussion of historic context should describe the history of the community where the property is located as it relates to the history of the property.

Two other considerations affect evaluations of significance: association and period of significance. Association refers to a direct connection between the property and the area of significance for which it is nominated. For a property to be significant under historic events (Criterion 1), the physical structure must actually have been there to "witness" the event or series of events; and the events must actually have occurred on the nominated property. For a property to be significant for an association with an individual (Criterion 2), the individual should have lived, worked, or been on the premises during the period in which the person accomplished the activities for which the individual is considered significant. Period of significance refers to the span of time during which significant events and activities occurred. Events and associations with historic properties are finite; most properties have a clearly definable period of significance.

Finally, a property is evaluated for its integrity: the authenticity of physical characteristics from which properties obtain their significance. When properties retain historic material and form, they are able to convey their association with events, people, and designs from the past. All buildings change over time. Changes do not necessarily mean that a building is not eligible; but, if it has changed radically, it may no longer retain enough historic fabric, and may not be eligible for the California Register. Historic integrity is the composite of seven qualities: location, design, setting, materials, feeling, workmanship, and association. Important questions to ask when evaluating properties are as follows:

- What was the property called at the time it was associated with the important events or persons, or when it took on its important physical character that gave it importance?
- How many buildings, structures, and other resources make up the property?
- When was the property constructed, and when did it attain its current form?
- What are the property's historic characteristics?
- What changes have been made over time, and when? How have these changes affected its historic integrity?
- What is the current condition of the property, including the exterior, grounds, setting, and interior?
- How was the property used during its period of significance, and how is it used today?
- Who historically occupied or used the property? Did the occupant(s) individually make any important contributions to history? Who is the current owner?
- Was the property associated with important events, activities, or persons?
- Which of the California Register criteria apply to the property? In what areas of history is the property significant?
- How does the property relate to the history of the community where it is located?
- How does the property illustrate any themes or trends important to the history of its community, State, or the nation?
- How large is the property, where is it located, and what are its boundaries?
- Would this property more appropriately be nominated as part of a historic district?

Visibility of Physical Features

Properties eligible under Criteria 1, 2, and 3 not only must retain their essential physical features, but the features must be visible enough to convey their significance. If a mill site contains information as to how site patterning reflects historic functional requirements, but parts of the site have been destroyed, the site is not eligible for its information potential, if a comparison of other mill sites reveals more intact properties with complete information.

Assessing Integrity in Properties

The steps in assessing integrity are as follows:

- Define the essential physical features that must be present for a property to be determined significant.
- Determine whether the essential physical features are visible enough to be significant.
- Determine whether the property needs to be compared with similar properties.
- Based on significance and essential physical features, determine which aspects of integrity are particularly vital to the property being nominated and whether they are present.

Ultimately, the question of integrity is answered by whether or not the property retains the identity for which it is significant.

Defining Physical Features. It is not necessary for a property to retain all of its historic physical features or characteristics. The property must, however, retain the essential physical features that convey its historic identity. The essential physical features are those that define both why a property is significant (Applicable Criteria and Areas of Significance) and when it was significant (Periods of Significance).

Exclusions and Restrictions

In general, the following restrictions apply to California Register listings:

- **Moved Buildings, Structures, or Objects**

  The California Resister encourages the retention of significant resources on site and discourages the nonhistoric grouping of historic buildings into parks or districts. However, it is recognized that moving a historic building, structure, or object is sometimes necessary to prevent its destruction. Therefore, moved buildings, structures, or objects otherwise eligible may be listed in the California Register if they were moved to prevent their demolition at their former location and if the new location is compatible with the original character and use of the resources. Resources should retain their historic features and compatibility in orientation, setting, and general environment.

- **Properties Achieving Significance within the Past 50 Years**

  It is the purpose of the Register to list historically significant resources. In order to understand the historic importance of a property, sufficient time must have passed to obtain a scholarly perspective of the events or individuals associated with the resource. For this reason, a 50-year age requirement has been imposed on Register listings. However, if it can be demonstrated that sufficient time has passed to understand historical importance, a property less than 50 years old may be considered for listing in the California Register.

- **Reconstructed Buildings**

  Reconstructed buildings may not be listed in the California Register under Criteria 1, 2, or 3, unless the reconstruction is at least 50 years old and has achieved historic significance in its own right. This includes buildings wholly constructed of new materials and buildings reassembled from some historic and some new materials. A reconstructed property may be eligible if it embodies traditional building methods and techniques in a resource that plays an important role in a community's historically rooted beliefs, customs, and practices.

Historical Resource Surveys

Historical resources identified as significant in a historical resources survey may be listed in the California Register if the survey process meets all of the following criteria:

1. The survey results are, or will be, included in the State Historical Resources Inventory.
2. The survey process and survey documentation were prepared and conducted in accordance with procedures and requirements established by the Office of Historic Preservation and delineated in Instructions for Recording Historical Resources.

The resource is evaluated and determined by the Office of Historic Preservation to have a significance rating of Category 1 to 5, or any subcategories thereof, on DPR Forms 523 or 422 for archaeological resources. The significant categories have the following corresponding meanings:

1. Listed in the National Register of Historic Places
2. Formally determined eligible for listing in the National Register
3. Appears to be eligible for listing in the National Register
4. Could become eligible for listing in the National Register
5. Locally significant

If the results of the survey are more than five or more years old at the time of nomination, the inventory of properties identified must be updated to include historical resources that have become eligible or ineligible due to changed circumstances as a result of further documentation and those that have been demolished or altered in a manner that substantially diminishes the significance of the resource. For example, a property may have lost integrity due to changes in its physical characteristics, or additional information may warrant a reevaluation.

The 50-year age requirement for California Register listing will not apply for surveys, which generally utilize a 45-year cutoff date when identifying historical resources.

EVALUATION OF HISTORICAL RESOURCES WITHIN THE PRESERVE

The field survey resulted in the identification of nine previously undocumented cultural resources within the Preserve. LSA has evaluated all of the identified cultural resources under California Register criteria, and detailed explanations regarding the conclusions follow.

LSA-PUE430-I-1 and LSA-PUE430-I-2: It is possible for isolated artifacts to contribute to the understanding and appreciation of California's history and prehistory. However, those artifacts must, at minimum, retain integrity of association, location, and/or setting. Neither of these artifacts is unique or temporally diagnostic, and therefore difficult to place in association with a specific time period or culture. Additionally, both isolates were discovered in areas of ground disturbance where their integrity of location and setting has been compromised. LSA's evaluation of these separate isolated artifacts is that they are not eligible for inclusion in the California Register, as they alone are unlikely to yield information important to the prehistory or history of the State and/or the nation.

LSA-PUE430-S-1: This concrete structure of unknown use is not recommended as eligible for inclusion in the California Register. It is possibly associated with the Sycamore Canyon Gravel Company, established in 1912 by Mr. A.H. Gregg. However, the structure itself appears to have been dismantled to some degree and does not retain integrity of design. It was not associated with any other structures or cultural material visible at the time of the survey. While the gravel company was a part of Los Angeles County history, it is not associated with events or patterns of events that have made a significant contribution to the broad patterns of the history and cultural heritage of California and the United States; is not associated with the lives of persons important to the nation or to California's past; does not embody any distinctive characteristics of a type, period, region, or method of construction; does not represent the work of an important creative individual; does not possess high artistic values; and is not likely to yield information important to the prehistory or history of the State and/or the nation.

LSA-PUE430-S-2: This apparent water-storage feature/reservoir is of unknown origin and time period, although the rock and mortar construction and its ruinous condition suggest it was built over 50 years ago and is a historic resource. It could not be associated with a larger system at the time of the survey and does not appear to be eligible under California Register criteria. It has no known association with events significant to the history and cultural heritage of California and the United States. Research did not show it as being associated with the lives of persons important to the nation or to California's past. It does not possess artistic values or distinctive characteristics of a type, specific period, region, or method of construction. It does not represent the work of an important creative individual. It is also unlikely to yield any more information or specific data that would address research questions important to the prehistory or history of the State and/or the nation.

LSA-PUE430-S-3: The azimuth marker is not recommended for eligibility under any California Register criteria. It is not associated with events that have made a significant contribution to the broad patterns of history of California or the United States; is not associated with the lives of persons important to the nation or California's past; does not embody any distinctive characteristics of design; and it is unlikely to yield information important to the history of the State and/or nation.

LSA-PUE430-S-4, S-5, and S-6: Although this complex of buildings, including the ranger's house, an apartment, and a storage building, is thought to be originally built in the 1930s, it has been significantly altered from its original state and lacks integrity of design. The buildings are not associated with events or patterns of events that have made a significant contribution to the broad patterns of history and cultural heritage of California and/or the United States. They are not associated with the lives of persons important to the nation or to California's past and do not embody any distinctive characteristics of a type, period, region, or method of construction. They do not represent the work of an important creative individual or possess high artistic values. In addition, they do not have the potential to yield information important to the prehistory or history of the State and/or nation. Therefore, LSA does not recommend that these buildings are eligible under any California Register criteria.

LSA-PUE430-S-7 (Whittier Oil Field): LSA recommends that the remains of the Whittier Oil Field in the southern Puente Hills are eligible for inclusion in the California Register. Although the wells themselves have been dismantled, the roads and associated markers and well pads indicate quite clearly the original configuration, placement, and design of the oil field. In addition, the lack of the development in the area has preserved the setting. Due to this, the essential physical features of the oil field with regards to location, setting, association, and feeling still exist, and there is minimal loss of integrity.

The southern California oil industry began in the late 1800s in response to growing oil demands of the nation as a whole due to the Industrial Revolution of the 19th Century. It continued to flourish as oil demands increased with the support of World War I and World War II, and was instrumental to the growth of the California economy. The Whittier Oil Field was known among oil men in California as the "best in the State" (The Whittier News Annual Edition 1920) because it was low in sulfur, easily refined, and made good lubricating stock. The fields also contributed to the economic development of United States, since oil-industry workers and their families came from other parts of the country, especially Pennsylvania, where oil was first found in 1859. Oil from the fields was transported to other areas of the nation as well as overseas (The Whittier News Annual Edition 1920). The Whittier Oil Field has, therefore, made a significant contribution to the broad patterns of the history of California and the United States. LSA recommends that LSA-PUE430-S-7 is eligible for inclusion in the California Register under Criterion 1.

There are numerous eucalyptus trees within and surrounding the Whittier Oil Field. These trees are largely mature and likely over 50 years old. In some instances, a case may be made for including the trees as part of the historic oil field or recording them separately as a historic landscape. However, LSA's research found no connection between the trees and the oil field and no indication of their origin. As the trees cannot be definitively associated with any historic event or person, it is not recommended that they be included as part of LSA-PUE430-S-7 or that they be recorded as a separate site or historic landscape.

LSA-PUE430-I-1 and LSA-PUE430-I-2: It is possible for isolated artifacts to contribute to the understanding and appreciation of California's history and prehistory. However, those artifacts must, at minimum, retain integrity of association, location, and/or setting. Neither of these artifacts is unique or temporally diagnostic and they are therefore difficult to place in association with a specific time period or culture. Additionally, both isolates were discovered in areas of ground disturbance where their integrity of location and setting has been compromised. LSA's evaluation of these separate isolated artifacts is that they are not eligible for inclusion in the California Register as they alone are unlikely to yield information important to the prehistory or history of the State and/or the nation.

APPENDIX K, PALEONTOLOGICAL RESOURCES

APPENDIX K

PALEONTOLOGICAL RESOURCES

INTRODUCTION

LSA Associates, Inc. (LSA) performed a paleontological resource assessment to document and evaluate paleontological resources as part of the Resources Management Plan (RMP) that is being developed by LSA to allow for the best management and protection of paleontological resources on the Preserve. This study included conducting a locality search and field survey and summarizing the findings in this report. The purpose of the assessment is to determine whether paleontological resources are present within the Preserve, and if so, to assess their importance and recommend mitigation measures to reduce potential impacts to levels that are less than significant, as required by CEQA. Work was also conducted in accordance with paleontological mitigation guidelines developed by the Society of Vertebrate Paleontology (SVP 1995).

The locality search indicated that no vertebrate fossil localities lie directly within the Preserve boundaries, but that there are localities nearby from the same sedimentary deposits that occur in the Preserve. The field survey was conducted between September 21 and September 28, 2004, by LSA resource specialists Terri Fulton and Phil Fulton. As Principal in Charge, Debbie McLean, M.A., RPA, oversaw all aspects of the paleontological resource assessment as it was completed.

The Preserve is located on over 3,800 acres along the western slopes of the Puente Hills among the communities of Whittier, Hacienda Heights, Rowland Heights, and La Habra Heights, stretching from Harbor Boulevard on the east to the intersection of Interstate 605 and State Route 60 on the west. It is depicted on the USGS *Whittier, La Habra, Baldwin Park,* and *El Monte* 7.5-minute topographic quadrangle maps.

GEOLOGICAL SETTING

Geologically, the Preserve lies in what is defined as the Puente Formation on the extreme southeastern edge of the Los Angeles Basin, in the Puente Hills south of the San Gabriel Mountains. The Puente Formation was formed as part of a long and continuous process. During the Cretaceous Period, the North American plate and other oceanic plates of the Pacific slowly converged to form the plutons and batholiths of the Sierra Nevada and Peninsular Range (Hamilton 1986). Uplift and erosion during the late Cretaceous Period and Paleocene Epoch deposited sediments (Nilsen 1987; Davis et al. 1989). During the late Eocene Epoch, widespread “fanglomerates” were deposited along the eastern flank of the East Pacific Rise (specifically the Sespe Formation; Quinn 1992). Marine transgressions and regressions from the mid-Oligocene to early Miocene Epochs deposited an alternating series of marine (Vaqueros Formation) and non-marine (Sespe Formation) sediments (Nilsen 1987; Blake 1991). During the early Miocene Epoch (18-17 MYA), tectonic forces caused extensive erosion throughout the Los Angeles Basin (Atwater 1970; Luyendyk 1991). Subsidence of the basin in the Middle Miocene Epoch resulted in the deposition of the Topanga Group (Yerkes and Campbell 1979).

During the Middle to Late Miocene period, sedimentation of the Puente Formation into this subsiding basin began through hemipelagic and pelagic sedimentation, mass gravity slides and slumps, and mass sediment or gravity flows (Redin 1991). This represented a change in the overall nature of sedimentation within the Los Angeles Basin for the contemporaneous Monterey, Modelo, and Puente Formations. Crustal extension, which caused earlier basin subsidence, changed to north-south compression in the middle Pliocene Epoch (between 3.4 and 3.9 million years ago; Davis et al. 1989; Harbert 1991; Luyendyk 1991). This compression caused further deformation and significant uplift along the Los Angeles Basin margins.

Marine sediments continued to be deposited in the central Los Angeles Basin until the late Pleistocene Epoch. Sea level fluctuations and rapid deposition of late Pleistocene through Holocene Epochs eventually outpaced the rate of subsidence, producing progressively shallower marine conditions and eventually leading to nonmarine deposition from prograding Los Angeles, San Gabriel, and Santa Ana alluvial fans (Blake 1991). The resulting deposition and uplift produced the current Los Angeles Basin and nearby Santa Monica Mountains.

The Puente Formation. The late Miocene, marine, Puente Formation is divided into four members: the La Vida Member (Tplv), predominantly siltstones; the Soquel Member (Tps), predominantly sandstones; the Yorba Member (Tpy), predominantly siltstones; and the Sycamore Canyon Member (Tpsc), predominantly sandstones.

La Vida Member (Tplv). The La Vida Member is an early-to-late Miocene (lower Mohnian), marine, light brown to pinkish brown and light gray to almost white siliceous and micaceous shale and siltstone. It contains interbeds of yellowish to light gray feldspathic sandstone. Sandstone grains are quartzo-feldspathic, micaceous, and angular to subangular. Siltstones are diatomaceous and micaceous and contain montmorillonite as the main clay mineral. Sandstone is thin to thickly bedded and locally graded or cross-bedded. Siltstone and shale are thin bedded to laminate.

Soquel Member (Tps). The Soquel member of the Puente Formation is derived from a deep marine (bathyal) environment. It contains medium to coarse-grained, gritty sandstone and is interbedded with siltstone. The upper part is a light gray to light yellowish brown, medium to coarse sandstone with pebbles. The siltstone units can be locally siliceous and may contain chert beds. The lower part of the unit is light gray to light yellowish brown, thick-bedded to massive sandstone. The unit also contains zones of large concretions. Fossils are generally uncommon; however, fossils of red and brown algae, terrestrial vascular plants, invertebrates, and fish have been found in abundance in some areas (Sundberg, 1991).

Yorba Member (Tpy). The Yorba Member is a late Miocene (upper Mohnian), marine, pinkish-brown to gray and white shale and siltstone to sandy siltstone with interbeds of thinly bedded sandstone. Locally, there are interbeds of limestone, conglomerate, and thick beds of sandstone. The sandstones contain subangular to subrounded grains that are chiefly quartzo-feldspathic. The siltstone commonly contains mica and can be siliceous or diatomaceous. The major clay mineral is montmorillonite. Gypsum is common in joints. Sandstone interbeds are thin to thickly bedded and locally massive. The siltstone is thinly bedded and platy to thinly laminated; locally bedding in the siltstone is poorly developed.

Sycamore Canyon Member (Tpsc). The Sycamore Canyon Member is a late Miocene marine unit with interbeds of light yellowish brown and light gray sandstone and sandy siltstone with minor conglomerate near Burruel Ridge in Orange County. The conglomerate clasts are mostly well-rounded plutonics with occasional metamorphic and volcanic rocks. Sandstone grains are subangular and quartzo-feldspathic with abundant biotite (up to 40 percent in some areas). Sandstone is thickly bedded to massive. Siltstone is thinly bedded and often platy. An alternating silty sandstone and pebbly conglomerate, the Sycamore Canyon Member has a deep marine origin.

METHODS

Locality Search. A paleontological locality search was conducted through the Los Angeles County Museum of Natural History and records maintained at LSA. It included a review of the area geology and any known paleontological resources recovered from the surrounding area and the geologic formations that would likely be encountered during any ground-disturbing activities within the Preserve. The purpose of the locality search was to establish the status and extent of previously recorded paleontological resources within and adjacent to the Preserve. With this knowledge, LSA could then make an informal assessment of the potential effects to paleontological resources within the Preserve.

Field Survey. The survey consisted of a visual inspection of exposed soil, ground surface, and bedrock outcrop. If any resources were located, the surveyors were prepared to assess them for significance and if necessary, document them. If the find was deemed to be significant, the surveyors were instructed to note its location with a Garmin Global Positioning System (GPS) unit. The use of GPS units allows localities to be quickly and accurately plotted on a standard 7.5′ topographic map. The surveyors were also instructed to fill out a Fossil Locality Sheet that contains important information such as field number of the locality; tentative identification of the find; description of the sediments; formation name; location of the find within the Preserve; GPS information; and elevation.

RESULTS

Locality Search. The results of the locality search indicate that no vertebrate fossil localities have been documented directly within the Preserve boundaries. However, the same sedimentary deposits that occur in the Preserve are also found near by. The closest fossil vertebrate localities are all from around the Puente Hills Landfill immediately north of the northeasternmost parcel of the Preserve. Localities here have produced a suite of fossil marine vertebrates, including great white shark, herring, hake, lanternfish, mackerels, swordfish, flounder, and whale. In the Puente Formation (Sycamore Canyon Member), also near the Puente Hills Landfill, a specimen of fossil whale was found.

The locality search indicated that shallow excavations in the younger Quaternary Alluvium found in the various drainages of the Preserve are unlikely to yield fossil material. Alluvium is a geologically recent deposit of gravel, sand silt, or mud that was deposited by flowing water in a stream or river. It is found along old and active stream and river drainages and is usually loosely consolidated.

However, the locality search also indicated that substantial deep excavations in the bedrock marine deposits of the Miocene Puente Formation could hold significant fossil vertebrate remains.

Field Survey. No paleontological resources were identified during the field survey. Ground visibility was generally limited due to vegetation. Road cuts, erosion cuts, and any other areas of exposed stratigraphy were also examined. The soils over the Preserve varied from a medium brown loam to a brown sandy loam in washes and waterways.

DISCUSSION

In response to CEQA, a system is used to determine the potential for the occurrence of fossils during the initial scoping phase of each project. When an earthmoving project begins, a standard Paleontological Resource Impact Mitigation Program (PRIMP) can be followed that will reduce the impacts upon the fossils to a less than significant level.

During the initial scoping phase, a paleontologist can be retained to complete an assessment report to determine a level of sensitivity for the project. These sensitivity ratings are High, Low, or Undetermined:

Low Potential

Following a literature search, records check, and field survey, areas may be determined by a qualified vertebrate paleontologist as having low potential for containing significant paleontological resources subject to adverse impacts. Low potential cannot be determined simply by looking for rock unit qualifications on a geologic map. For instance, an area mapped as Alluvium may actually be a thin surgical layer of non-fossiliferous sediments that cover fossil-rich Pleistocene sediments. Also, an area mapped as granite may be covered by a Pleistocene soil horizon that contains fossils. The actual sensitivity must be determined by both a records search and a field inspection.

High Potential

Sedimentary rock units with high potential for containing significant nonrenewable paleontological resources are rock units within which vertebrate or significant invertebrate fossils have been determined to be present or likely to be present. These units include, but are not limited to, sedimentary formations that contain significant nonrenewable paleontological resources anywhere within their geographical extent and sedimentary rock units temporally or lithologically suitable for the preservation of fossils. High sensitivity includes not only the potential for yielding abundant vertebrate fossils but also for production of a few significant fossils that may provide new and significant data (taxonomic, phylogenetic, ecologic, and/or stratigraphic).

High sensitivity (High A) is based on geologic formations or mappable rock units that are rocks that contain fossilized body elements and trace fossils such as tracks, nests, and eggs.

High sensitivity (High B) is a sensitivity equivalent to High A but is based on the occurrence of fossils at a specified depth below the surface. High B indicates that fossils are likely to be encountered at depth and may be impacted during excavation by construction activities. A standard condition is attached to the environmental planning document for the project, specifying that during grading stage review, a PRIMP is a condition for any excavation that reaches or exceeds a specified depth.

Undetermined Potential

Areas underlain by sedimentary rocks for which literature and unpublished studies are not available have an undetermined potential for containing significant paleontological resources. These areas must be inspected in a field survey conducted by a qualified vertebrate paleontologist. A specific determination of High potential or Low potential for containing significant nonrenewable paleontological resources can then be made.

APPENDIX L

PUENTE HILLS LANDFILL NATIVE HABITAT PRESERVATION AUTHORITY ACQUISITION CRITERIA

APPENDIX L, PUENTE HILLS LANDFILL NATIVE HABITAT PRESERVATION AUTHORITY ACQUISITION CRITERIA

Puente Hills Landfill
Native Habitat Preservation Authority

MEMORANDUM

Date: October 28, 2004

To: Board Members

From: Andrea Gullo, Executive Director

Subject: Agenda Item No. 10 - Discussion regarding acquisition prioritization criteria.

Recommendation:

That the Board provides direction to staff.

Background:

According the joint powers agreement creating the Authority, its purpose is to:

> …provide for the acquisition, restoration and/or maintenance of additional open space lands in the area depicted in Exhibit A, said land lying within the [La] Puente/Whittier Hills area, in the vicinity of the Puente Hills Landfill, to create or preserve native habitat areas, thereby mitigating impacts to oak tree resources and natural open space…

In terms of acquisition, the Authority has acquired most of the contiguous open space within its jurisdiction. However, remaining contiguous and non-contiguous parcels still remain. At the Chairman's request, staff is submitting a first draft acquisition Parcel Criteria from which to help prioritize remaining parcels by ranking and assisting the Board with investment decisions. Guidelines for Use and Recommendations for Implementation are also provided to assist with the procedure. These draft documents were modeled closely after the Wildlife Corridor Conservation Authority's acquisition criteria system created by its Advisory Committee and adopted by its Board in 1998. Some of the language has been modified and additional criteria added to more closely reflect the purpose of the Authority, but the main ideas and many of the criteria remain the same.

The suggested acquisition criteria could be used, but not limited to the following way: a) staff taking two or more months to identify and rank remaining parcels (many of which are unknown at this time) for acquisition with review by the Advisory Committee, or; b) do not rank the remaining parcels, but establish various thresholds from which to measure parcels as they become known or as opportunities for purchase present themselves. The thresholds would trigger varying levels of consideration of acquisition by the Board. For example, if the Board is contemplating how seriously to consider purchasing Parcel X, it could be ranked and compared to a few known parcels, already ranked by concensus and reviewed by the Advisory Committee which have set various thresholds to measure the new parcel. If Parcel X measured close to the highest ranked parcel, then it would be a parcel for the Board to seriously consider for acquisition, and if it measured close to the lowest ranked parcel, the Board would need to reassess whether or not to invest in this parcel.

If we did not proceed with developing this criteria, we would continue to individually examine parcels in the current fashion, based on existing experience and knowledge, not based on set quantative criteria.

Staff is looking for direction with development and utilization of this criteria system. Having the Advisory Committee review this issue would provide a community perspective to strengthen the support of our future acquisition decisions.

PUENTE HILLS LANDFILL NATIVE HABITAT PRESERVATION AUTHORITY
PROPERTY IDENTIFICATION EVALUATION

RECOMMENDATIONS FOR IMPLEMENTATION

In order to provide the Puente Hills Landfill Native Habitat Preservation Authority (Authority) Board of Directors with advisory information regarding relative value of various segments of land associated with contributing to the overall health of the regional ecosystem or in contributing to the purpose of the Authority, an evaluation of potential properties may be performed in accordance with objective criteria developed for that purpose.

1. Properties to be evaluated will be obtained from a review of general topographic features of the general area, excluding areas already extensively and irreversibly developed in such configuration as to make ecosystem functional integrity impossible, or open space areas which are already preserved.

2. Application of the evaluation criteria shall be performed by all key persons familiar with individual areas throughout the area. These individuals may be staff, agents of the Authority, members of the Advisory Committee or the Board of Directors.

3. It is proposed that rankings be reviewed at a general public meeting to assure that all criteria are applied consistently and uniformly to all properties. The basis for each assigned rating shall be documented in writing.

4. Following determination of initial ratings, a tabulation of scores for technical and management factors will be determined, as well as overall score. A minimum score will be established below which properties may not be considered to be ecosystem functional properties, although purchase may still be considered based on other circumstances.

5. Properties may be further split during the detailed evaluation process if it is determined that such division may help in better defining areas of particular value, or achieve more equitable comparison with other areas.

6. Ratings may be re-evaluated at any time in the event that further information might become available that would cause the rating of one or more properties to change, or at specific intervals (e.g. yearly) as requested by the Board of Directors.

November 18, 2004

Puente Hills Landfill
Native Habitat Preservation Authority
Parcel Criteria

Approved November 2004

FACTOR	Rating	WEIGHT
1. PARCEL CRITICAL FOR THE WILDLIFE CORRIDOR		10
Criterion	Rating	
Area constitutes an important linkage which is actually used or suspected of use by sensitive species with no viable alternative (Loss puts corridor viability in jeopardy)	4	
Area is immediately adjacent and provides direct access to a critical corridor segment	3	
Area is non-contiguous within a restricted portion of the corridor	3	
Area contains a ridgeline or canyon trending in the main direction of corridor circulation	2	
Area provides one of a limited number of parallel routes of movement	1	
No evidence of area use in wildlife circulation	0	
Area has the potential to become ecologically isolated	0	
Maximum Weighted Score		*40*
2. ECOLOGICAL VALUE		10
Criterion	Rating	
Area contains endangered or threatened species or is used by sensitive plant and/or animal species, or supports sensitive vegetation communities	4	
Area is large enough (or contiguous with other large areas) to provide essentially complete ecosystem needs of multiple species, or temporary needs of migrating species	4	
Area contains an active spring or a blue line stream	3	
Habitat is degraded but conditions are suitable for regeneration or restoration	2	
Habitat unsuitable but area could provide a buffer between the corridor and incompatible uses	2	
Habitat unsuitable, but area is contiguous with corridor	1	
Maximum Weighted Score		*40*

3. RESTORATION FACTORS

Criterion		Rating		
Habitat is intact	100% intact	4		2
Habitat is not intact - needs restoring	75% intact	3		
	50% intact	2		
	25% intact	1		
	0% intact	0		
Property dwelling				
Asset		3		1
No dwelling		2		
Liability		0		
Fuel modification is reasonable		1		1
Fuel modification is not reasonable		0		
Potential for Mitigation i.e. riparian, oak/walnut woodland, css		3		1
Maximum Weighted Score			*15*	

4. OPPORTUNITY FOR JOINT RECREATIONAL USE 1

Criterion	Rating	
Area can accommodate significant public access without seriously impeding value to wildlife, or has existing widely used human trail	4	
Area contains a suitable site for a major recreational facility (trail, interpretive center, etc.)	3	
Area could provide access point, parking, or display	2	
Area has cultural or historical attributes (near significant recreational route or facility i.e. Juan Bautista trail)	2	
Recreational use would be incompatible with wildlife use	0	
Maximum Weighted Score		*4*

5. OTHER FACTORS 1

Criterion	Rating
Property is located in Hacienda Heights	5
Property is located near Hacienda Heights and/or is considered valuable by the community.	3

Property is not located in Hacienda Heights	0
Parcel or area does not have a history of repeated illegal activity	1
Parcel or area has a history of repeated illegal activity	0

Maximum Weighted Score *6*

6. ADDITIONAL CONSIDERATIONS 1

Criterion	Rating
time factors particular to specific parcels may not be able to be evaluated based on the criteria set forth in this document. Factors such as the size of a parcel, topography, extremely excessive fuel modification requirements, or extremely valuable land from a mitigation potential perspective may be very significant contributing factors to incorporate into the decision making process. For example, say Property X is 50 acres and Property Y is 50 acres. Both may have 50% intact habitat and be equal in all other categories, but Property Y can yield up to $1,000,000 in mitigation fees for its restoration. This would be a significant difference not captured in the ratings that would need additional consideration. For the time being, a rating of 10 has been assigned to this section.	Up to 10

Maximum Weighted Score *10*

Total *115*

This document was largely based on the Wildlife Corridor Conservation Authority's Corridor Segment Evaluation dated December 22, 1998.

PUENTE HILLS LANDFILL NATIVE HABITAT PRESERVATION AUTHORITY
PARCEL EVALUATION CRITERIA

GUIDELINES FOR USE

1. Parcel scores will be obtained by determining a rating in each category and multiplying the rating times the weight assigned to that category.

2. Ratings will be determined by persons having familiarity with the parcel being rated or by field inspection.

3. A written evaluation form will be prepared for each parcel providing the basis for the rating given.

4. The documented presence of sensitive species on immediately adjacent similar parcels may be used to impute the presence of those same species in neighboring parcels, except where scientific data or physical or biological barriers would seem to rule out their presence.

5. Parcel evaluations can be revised as field studies disclose additional information pertinent to the evaluation criteria.

6. Where more than one criterion may be applicable in a given category, the rating shall be determined using the criterion with the highest numerical value.

7. Parcel ratings will be tabulated individually for Technical (Categories 1 and 2), Management (Categories 3, 4 and 5), and Additional Considerations (Category 6), as well as by a total combined score.

8. Following experience with application of the rating system, threshold scores will be identified from which parcels will be considered to have substantial or less than substantial value for the Authority.

9. Where opportunity or bargain sales become available, the ratings system is not intended to preclude such transactions, but may be used to compare values where budgets are limited.

10. The ratings system is intended to provide guidance to the Authority Board of Directors and is not to be used as an absolute determinant on parcel transactions. All transactions are to be determined by careful consideration of multiple factors by the Board of Directors, with the parcel ratings providing only a part of the overall considerations.

11. The ratings are a part of research and study, and in no way indicate commitment of the Authority for acquisition of any properties.

November 18, 2004

Puente Hills Landfill
Native Habitat Preservation Authority

MEMORANDUM

Date: November 18, 2004

To: Board Members

From: Andrea Gullo, Executive Director

Subject: Agenda Item No. 7 - Discussion regarding acquisition prioritization criteria.

Background:

The attached information is provided for your reference. These materials are on the November 16, 2004 CTAC agenda for review and discussion. CTAC comments on these documents will be discussed at the Board meeting.

Puente Hills Landfill Native Habitat Preservation Authority

EXAMPLE EVALUATION
BASED ON DRAFT CRITERIA

PARCEL DESCRIPTION	CORRIDOR VALUE	ECOLOGICAL VALUE		MANAGEMENT ISSUES									
				RESTORATION				RECREATION POTENTIAL	OTHER				
				Intact Habitat	Dwelling on Property	Fuel Modification	Mitigation Potential		Property Located in Hacienda Heights	History of Illegal Activity		Additional Considerations	
			SUBTOTAL								**SUBTOTAL**		**TOTAL**
WEIGHT	10	10		2	1	1	1	1	1	1		1	
MAX. SCORES	4	4		4	3	1	3	4	5	1		10	
MAX. WEIGHTED SCORES	40	40	**80**	8	3	1	3	4	5	1	**25**	**10**	**115**
Property X	4	4		4	2	1	3	4	3	0			
	40	40	**80**	8	2	1	3	4	3	0	**21**		**101**
Property Y	3	4		4	2	1	3	2	3	1			
	30	40	**70**	4	2	1	3	2	3	1	**16**		**86**
Property Z	3	4		3	2	1	3	0	0	1			
	30	40	**70**	6	2	1	3	0	0	1	**13**		**83**
Property ZZ	3	4		3	3	1	3	2	0	1			
	30	40	**70**	6	3	1	3	2	0	1	**16**		**86**

APPENDIX M, FUEL MODIFICATION PLAN

APPENDIX M

FUEL MODIFICATION PLAN

FUEL MODIFICATION

This fuel modification plan provides the direction for the installation and maintenance of the fuel modification areas maintained by the Habitat Authority, as required by the Los Angeles County Fire Department (LACFD) for fire protection. The fuel modification areas should be maintained regularly to accomplish the following goals: (1) compliance with the most current LACFD Fuel Modification Plan Guidelines (included within this Appendix); and (2) establishment of the maximum vegetation cover allowed by the LACFD guidelines that provides habitat for native animal species and reduces the edge effect to the Preserve.

In order to provide habitat for native animal species, the plants species used in the fuel modification should be species native to the area and compatible with the adjacent native habitat. In Table A-K there is a list of native species approved by LACFD that are appropriate for the Puente Hills area. Depending on the area different plants from this list could be used to vegetate a fuel modification area.

Table A-K: Approved Native Plant Species List

Scientific Name	Common Name
Acer negundo	Box elder
Achillea millefolium	California yarrow
Baccharis pilularis consanguinea	Coyote bush
Cercocarpus betuiloides	Mountain mahogany
Crassula connata	Sand pigmy-stonecrop
Encelia californica	California bush sunflower
Epilobium canum	California fuchsia
Fraxinus dipetala	California flowering-ash
Heteromeles arbutifolia	Toyon
Isomeris arborea	Bladderpod
Juglans californica	Southern California black walnut
Keckiella cordifolia	Heart-leaved penstemon
Lupinus bicolor	Miniature lupine
Lupinus succulentus	Arroyo lupine
Malosma laurina	Laurel sumac
Mimulus aurantiacus	Orange bush monkeyflower
Opuntia littoralis	Coastal prickly pear
Penstemon centranthifolius	Scarlet bugler
Platanus racemosa	Western sycamore
Populus fremontii	Fremont cottonwood
Quercus agrifolia	Coast live oak
Rhamnus ilicifolia	Holly-leaved redberry

Scientific Name	Common Name
Rhus integrifolia	Lemonadeberry
Rhus ovata	Sugar bush
Ribes aureum	Golden currant
Ribes malveceum	Chaparral currant
Ribes speciosum	FuchsiA-flowered gooseberry
Romneya coulteri	Matilija poppy
Rosa californica	California rose
Yucca whipplei	Our Lord's candle

Table A-L is a list of additional native plants that LSA recommends for use within the fuel modification areas. These species are approved by Orange County Fire Authority (OCFA) but are not on LACFD list of approved species. These species would need to be approved by LACFD before they are incorporated into the fuel modification plant and seed palettes. Most of these plants are herbaceous and would help with erosion, diversity, and functionality of the fuel modification areas as habitat. Later in this section there are plant and seed palettes that can be used for coastal sage scrub and chaparral areas that incorporate species from both tables.

Table A-L: Nonapproved Native Plant Species List

Scientific Name	Common Name
Baccharis salicifolia	Mulefat
Dichelostemma capitatum	Blue dicks
Eriophyllum confertiflorum	Golden yarrow
Eschscholzia californica	California poppy
Galium angustifolium	Chaparral bedstraw
Gnaphalium californicum	California cudweed
Isocoma menziesii	Coast goldenbush
Lasthenia californica	Coastal goldfields
Leymus condensatus	Giant wildrye
Lotus scoparius	Deer weed
Melica imperfecta	Coast melic
Mirabilis californica	California wishbone bush
Nassella lepida	Foothill needlegrass
Nassella pulchra	Purple needlegrass
Plantago erecta	California plantain
Poa secunda	Perennial blue grass
Sambucus mexicana	Mexican elderberry
Sisyrinchium bellum	Blue-eyed grass
Solanum xanti	Chaparral nightshade

Site Preparation

All trash and inorganic debris associated with site-preparation activities should be removed prior to installation. All trash should be removed and legally disposed of off site.

Exotic species on the site should be removed, including enough of the root mass to prevent resprouting. These exotic species include but are not limited to the following: pampas grass *(Cortaderia selloana),* Australian saltbush *(Atriplex semibaccata),* Acacia (*Acacia* spp.), Eucalyptus (*Eucalyptus* spp.), Mexican fan palm (*Washingtonia* sp.), red fescue *(Festuca rubra),* fountain grass *(Pennisetum setaceum),* bristly ox tongue *(Picris echioides),* red-stemmed filaree *(Erodium cicutarium),* common sow-thistle *(Sonchus oleraceus),* dwarf baccharis *(Baccharis pilularis pilularis),* tree tobacco *(Nicotiana glauca),* purple rock rose *(Cistus creticus),* oleander *(Nerium oleander),* tamarisk (*Tamarix* sp.), sweet alyssum *(Lobularia maritima),* creeping comprosma *(Coprosma kirkii),* Russian thistle *(Salsola tragus),* and other nonnative grasses. Those individuals whose root mass is too large to remove should be cut horizontally above ground and immediately (within 15 seconds) treated with a 100 percent solution of Roundup Pro in accordance with the "Herbicide Treatment Guidelines," in Appendix N.

Installation Materials

All materials should meet the same requirements indicated in the Habitat Restoration Plan, Appendix N.

Container Plants. Table A-M lists the recommended container plants for a fuel modification area with coastal sage scrub or chaparral adjacent to the Preserve.

Table A-M: Recommended Container Plants List

Scientific Name	Common Name
Baccharis pilularis consanguinea	Coyote bush
Baccharis salicifolia	Mulefat
Encelia californica	California bush sunflower
Epilobium canum	California fuchsia
Heteromeles arbutifolia	Toyon
Isocoma menziesii	Coast goldenbush
Isomeris arborea	Bladderpod
Leymus condensatus	Giant wildrye
Malosma laurina	Laurel sumac
Mimulus aurantiacus	Orange bush monkeyflower
Mirabilis californica	California wishbone bush
Opuntia littoralis	Coastal prickly pear
Rhus integrifolia	Lemonadeberry
Ribes speciosum	FuchsiA-flowered gooseberry
Sambucus mexicana	Mexican elderberry
Solanum xanti	Chaparral nightshade

Seed. The species being installed were selected based on those native species found within the area or suitable for that area. The genetic source of all seed should be within 10 miles of the Preserve and of similar microclimate regime. The genetic source should be approved by the Habitat Authority. If some species are not available in the specified quantity, substitutions may be made at the discretion of the Habitat Authority. The seed should be sown within a few days of delivery.

Table A-N shows the recommended seed mix for a fuel modification area with coastal sage scrub or chaparral adjacent to the site.

Table A-N: Recommended Seed Mix

Scientific Name	Common Name	Pounds per Acre
Dichelostemma capitatum	Blue dicks	0.20
Encelia californica	California bush sunflower	1.25
Eriophyllum confertiflorum	Golden yarrow	0.75
Eschscholzia californica	California poppy	0.50
Galium angustifolium	Chaparral bedstraw	1.00
Gnaphalium californicum	California cudweed	0.50
Isocoma menziesii	Coast goldenbush	0.50
Lasthenia californica	Coastal goldfields	1.50
Lotus scoparius	Deer weed	0.80
Lupinus bicolor	Miniature lupine	1.00
Lupinus succulentus	Arroyo lupine	0.25
Melica imperfecta	Coast melic	1.00
Nassella lepida	Foothill needlegrass	2.00
Nassella pulchra	Purple needlegrass	7.00
Plantago erecta	California plantain	2.00
Poa secunda	Perennial blue grass	2.00
Sisyrinchium bellum	Blue-eyed grass	0.10
Total		**22.35**

Installation Methods

The plants and seed should be installed according to the installation technique described in Appendix N. The plantings should be spaced in natural-looking patterns to replicate the character of the adjacent native habitat with fuel modification characteristics and with consideration of the microclimate requirements for each species. The spacing of the plants will be sparser then in nonfuel modification areas. The LACFD Fuel Modification Plan Guidelines must be referenced to determine the allowed spacing for a particular area. It is also advisable to meet with the LACFD to get their feedback on what they will approve for a particular area. If trees are placed within the fuel modification area, they should be spaced much farther apart then the shrubs.

The container plants should be installed in the fall, by November 30, to allow the container plants to become established during the wet season, so they will survive through the first summer.

Maintenance

The fuel modification area should be thinned and maintained in accordance with the most current LACFD Fuel Modification Plan Guidelines. Normal maintenance will include weeding, thinning, herbivore and erosion control, and supplemental irrigation and planting as necessary.

Maintenance should commence immediately following installation of container plants and the application of the seed. During this time, the plant community should be regularly maintained to ensure its successful establishment.

Weed Control. In order to help establish the developing plant community, all nonnative weeds should be removed to reduce the amount of competition for natural resources including water, nutrients, and sunlight. The amount of weeding required will be determined by the amount of weed seed in the soil, weather conditions, and the diligence in removing the weeds, thereby reducing the weed seed bank. Intense weeding should only be required for the first few years if done properly.

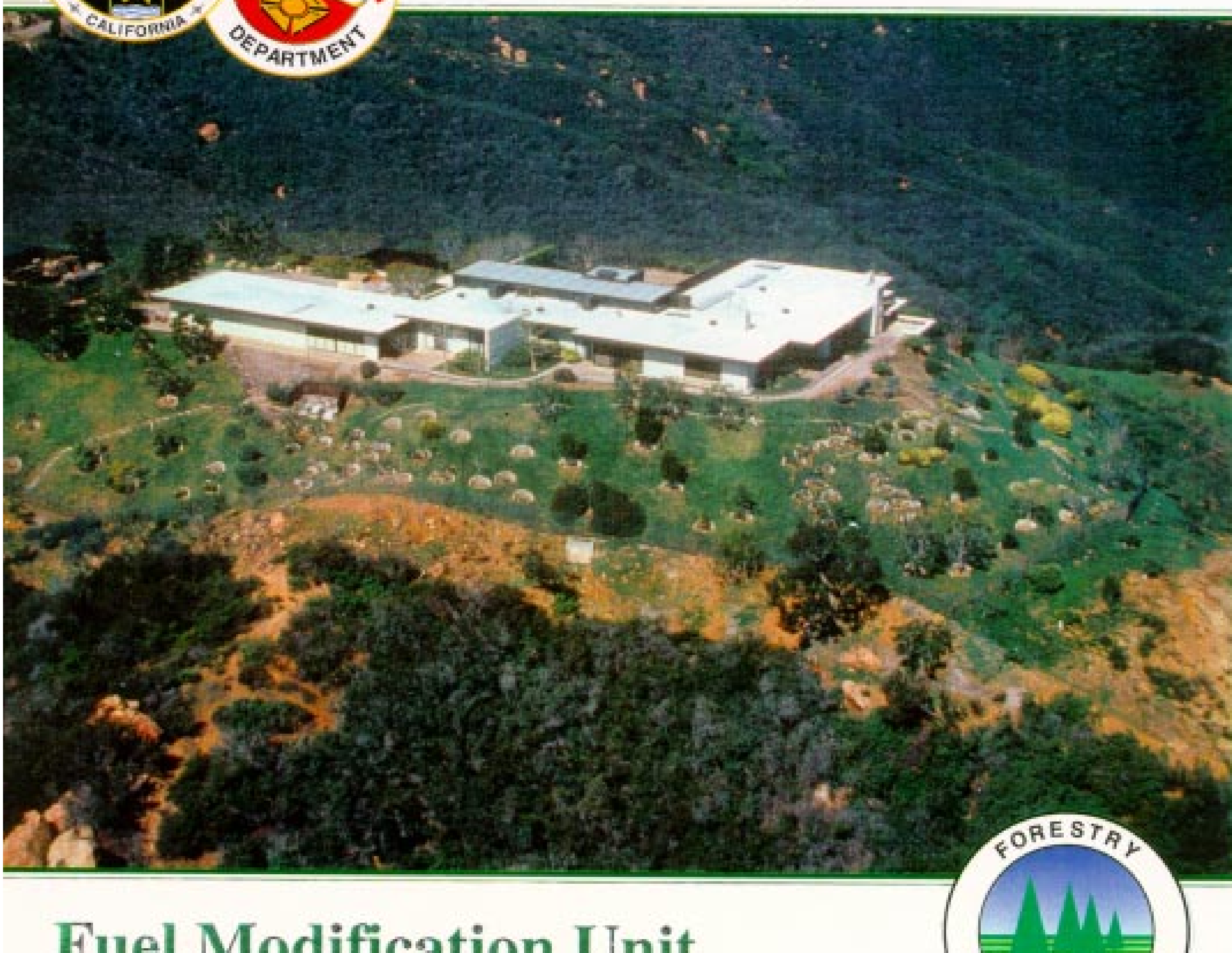
Irrigation. Native vegetation does not require supplemental irrigation under normal conditions. However, if the vegetation is planted in the irrigated zone, then irrigation will be necessary to meet the minimum requirements of the LACFD. Within the two thinning zones, the vegetation should receive temporary irrigation when environmental conditions (e.g., low seasonal rainfall, severely hot winds) are such that the plants exhibit signs of stress, in order to prevent loss of the plantings and dieback that creates fine fuel. The use and method of irrigation will depend on the location of the fuel modification area. All water used for irrigation should be free of impurities, excess chlorine, and salts.

Pruning, Thinning, and Leaf Litter Removal. The fuel modification areas should be thinned according to the LACFD guidelines. Thinning and litter removal will take place within the fuel modification zones where it is required. All litter removal should be in accordance with the LACFD Fuel Modification Plans Guidelines that follow.

LOS ANGELES COUNTY FIRE DEPARTMENT FUEL MODIFICATION PLAN GUIDELINES

Fuel Modification Plan Guidelines

County of Los Angeles
Fire Department



Fuel Modification Unit

Prevention Bureau
Forestry Division

FUEL MODIFICATION PLAN

GUIDELINES

FOR PROJECTS LOCATED IN

FIRE ZONE 4 OR

VERY HIGH FIRE HAZARD

SEVERITY ZONES

ADOPTED

JANUARY 1998

County of Los Angeles Fire Department

Prevention Bureau

Forestry Division

Brush Clearance Section

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Introduction

Following the disastrous Southern California wildfires in 1993, the Board of Supervisors established the Wildfire Safety Panel to analyze and make recommendations on the hazardous conditions that existed for wildfires in the wildland and urban interface/intermix areas of Los Angeles County. The mission identified by the Wildfire Safety Panel at its onset was to enhance life safety concerns in Los Angeles County through the analysis and development of meaningful, cost-effective ways to improve fire safety. One of the recommendations adopted by the Wildfire Safety Panel was for the Fire Department to establish a set of guidelines and landscape criteria for all new construction that would implement ordinances relating to fuel modification planning and help reduce the threat of fires in high hazard areas.

The "Fuel Modification Guidelines" herein are administrative in nature and have been adopted by the County of Los Angeles Fire Department to provide procedural implementation of County Fire Code requirements previously adopted by the Board of Supervisors and already in effect for a Fuel Modification Plan for projects and or structures proposed within the Very High Fire Hazard Severity Zone(s) or Fire Zone 4. The submittal of fuel modification plans that meet the requirements of these guidelines will enable the Fire Department and other agencies to expedite processing and answer applicant's questions. These guidelines require compliance with existing codes and do not modify or change existing Fire Code clearance distances or any other code requirements.

Statute

Per Section 1117.2.1 of the 1996 County Fire Code: "A fuel modification plan, a landscape plan and an irrigation plan shall be submitted with any subdivision of land or prior to any new construction, remodeling, modification or reconstruction of a structure where such remodeling modification or reconstruction of a structure increases the square footage of the existing structure by 50% or more within any 12-month period and where the structure or subdivision is located within areas designated as a Very High Fire Hazard Severity Zone or Fire Zone 4 in the Los Angeles County Building Code (Section 26.150, Los Angeles County Code Title 26 Building Code)."

Fuel modification plans are required for all projects and/or structures receiving tentative map approval or building permits on or after January 7, 1996. Tentative maps approved prior to January 7, 1996 are exempt from these requirements. In addition, any amendment or revisions to such maps which do not require public review would also be exempt.

Description of Fuel Modification Plan

A fuel modification plan identifies specific zones within a property which are subject to fuel modification. A fuel modification zone is a strip of land where combustible native or ornamental vegetation has been modified and/or partially or totally replaced with drought tolerant, fire resistant plants.

Fuel modification plans will vary in complexity and reflect the fire history of the area, the amount and type of vegetation, the arrangement of the fuels, topography, local weather patterns, and construction, design and placement of structures.

Purpose of Fuel Modification

Fuel modification reduces the radiant and convective heat, and provides fire suppression forces a defensible space in which to take action. Fuel modification zones are strategically placed as a buffer to open space, or areas of natural vegetation and generally would occur surrounding the perimeter of a subdivision, commercial development, or isolated development of a single-family dwelling. Modification of combustible vegetation within a development is handled under the "Clearance of Vegetative Growth" section of the Fire Code as it pertains to structures.

Protected Land - Any project located contiguous to protected lands, as defined in Government Code Section 51184, shall be handled on a case-by-case basis as identified within this code section.

Special Constraints - Information regarding physical, environmental, and legal constraints that may compromise the ability to complete the fuel modification requirements of the project should be addressed in the first stages of design and planning, at the time of preliminary review. Alternative solutions to conflicts may include modifications in the zone widths as a result of set backs, structure orientation, building design and materials selection, utilization of streets, parks, golf courses, natural barriers, existing development or increased irrigation zones.

Subdivision Requirements

Current code requirements for subdivisions including access, fire flow, fire sprinklers, water storage and fire resistive construction techniques will be considered and credited, as appropriate, by the Fire Department in establishing the final fuel modification requirements for a project. Alternative fuel modification proposals may be submitted to the Fire Department for review and approval.

Extreme Fire Hazard - If the Fire Department concludes an extreme fire hazard exists on the property, additional mitigation measures may be required. The Fire Department shall review each project on a case-by-case basis to identify the contributing extreme fire hazard conditions including, but not limited to: wind direction and velocity, fuel load, neighboring land uses, terrain, access for firefighting equipment, adequacy of water supply and delivery systems and construction standards. Generally, the Santa Monica Mountains and the south facing slopes of the San Gabriel Mountains are considered to be Extreme Fire Hazard areas.

Submittal Procedures

Fuel modification plans shall be reviewed and approved by the Forestry Division of the Fire Department for reasonable fire safety. Approval of the final fuel modification plan by the Fire Department is required prior to the issuance of a building permit. Property owners located along the perimeter of tracts must submit plans for additional structures for approval by the Fire Department in addition to the building department to ensure compliance with the underlying fuel modification plan (see Exhibit A for a complete checklist of submittal procedures).

Fuel Modification Zones

The size and type of the fuel modification zone(s) will be determined by the Fire Department upon review of the preliminary plans. Fuel modification distances are designed for typical fire weather scenarios and are not intended to be a blanket requirement for all fuel modification plans. Planting of low-volume, fire retardant, drought tolerant plants may also be required for erosion control (see Exhibit B Estimated Fuel Modification Distance Chart to compute the approximate total fuel modification zone distance for your project).

Per Section 1117.2.3 "Extra Hazard" of the County of Los Angeles 1996 Fire Code, "The governing body finds that in many cases of extra-hazardous situations, a firebreak around structures of only 30 feet (9144mm) is not sufficient and that a firebreak of 50 feet (15240mm) or more may be necessary. If the chief or commissioner finds that because of the location of any building or structure, and because of other conditions, a 30-foot (9144 mm) firebreak around such structure as required by Section 1117.2.2 is not sufficient, he may notify all affected owners of property that they must clear all flammable vegetation and other combustible growth or reduce the amount of fuel content for a distance greater that 30 feet (9144 mm), but not to exceed 200 feet (60960mm)." Fire Code distances are measured on the horizontal or straight out from the structure rather than on the slope.

Zone Delineation

The fuel modification plan shall identify one or more of the following zones: A-Setback Zone; B-Irrigated Zone; C-Thinning Zone; D- Interface Thinning Zone based upon preliminary plan review by the Forestry Division of the Fire Department (see Exhibit C). The actual width of zone(s) will depend on the ability to provide desirable clearance distances.

Zone A - Setback Zone

Purpose

- Provides defensible space for fire suppression forces.
- Offers protection from intense flames and sparks or embers carried by strong winds common to a wildfire by reducing the probability of ignition through increased moisture content of existing vegetation and removal of fine fuels.

General Requirements

- Zone in closest proximity to the structure.
- Minimum of 20 feet beyond the edge of combustible structures, attached accessory structures, or appendages and projections.
- For purposes of the fuel modification plan, all combustible accessory structures, appendages, or projections within 20 feet of the combustible structure will be considered as attached.
- Most vegetation in this zone is limited to ground covers, green lawns, and a limited number of selected ornamental plants.

Special Requirements

- Combustible structures, attached accessory structures, appendages or projections must comply with building code requirements for the Very High Fire Hazard Severity Zone or Fire Zone 4.
- Combustible detached accessory structures such as patio covers, decks, carports, trellises, or similar accessory structures within 20 feet of a combustible structure must comply with building code requirements for the Very High Fire Hazard Severity Zone or Fire Zone 4.
- Irrigation by automatic or manual sprinkler systems to maintain healthy vegetation with high moisture content.
- Irrigation away from native Oak trees and outside the dripline.
- Pruning of foliage to reduce fuel load, vertical continuity, removal of plant litter and dead wood.
- Complete removal of undesirable plant species (see Appendix I), minimal allowance for retention of selective native vegetation.
- Plants in this zone shall be highly fire resistant and selected from the approved planting list for the setback zone and given geographical area (see Appendix II).
- Target trees are not allowed within ten feet of combustible structures. Other tree species may be allowed pursuant to the Fire Code regarding clearance of brush and vegetative growth but are not recommended.
- Special consideration will be given for rare and endangered species, geologic hazards, tree ordinances, or other conflicting restrictions.

Maintenance

- Requires continual removal and/or thinning of undesirable combustible vegetation, replacement of dead/dying fire resistant plantings, maintenance of the operational integrity and programming of the irrigation system.
- Regular trimming to prevent ladder fuels.

Zone B Irrigation Zone

Purpose

- Provide defensible space for fire suppression forces.
- Augment irrigation and planting required by the County Department of Public Works and City Public Works Departments relating to remanufactured slopes and landscape ordinances.

General Requirements

- May have isolated detached accessory structures such as patio covers, decks, carports, trellises, and other similar accessory structures provided they meet building code requirements.
- Some native or existing vegetation may remain if spaced according to planting guidelines (see Appendix III) and maintained free of dead wood, and individual plants are thinned to a percentage as specified during the preliminary review to reduce the fuel load.
- A large percentage of existing vegetation may be removed and replaced with appropriate irrigated fire resistant and drought tolerant plant material.

Specific Requirements

- With the exception of specimen native vegetation approved for retention, irrigated surface fuels shall be maintained at a height not to exceed 18 inches.
- Irrigation shall be designed to supplement native vegetation, and establish and maintain planted natives and ornamentals.
- Any plants selected for planting in this zone shall be selected from the approved plant list for the setback, irrigated, or thinning zone for a given geographical area (see appendix II).
- Planting will be in accordance with planting guidelines and spacing standards established in these guidelines to avoid erosion (see Appendix III).
- Special consideration will be given for rare and endangered species, geologic hazards, tree ordinances, or other conflicting restrictions as identified in the environmental documents submitted for project approval, or upon further review.
- Removal of undesirable plant species (see Appendix I) as determined during preliminary review.

Maintenance

- Requires continual removal and/or thinning of undesirable combustible vegetation, replacement of dead/dying fire resistant plantings, maintenance of the operational integrity and programming of the irrigation system.
- Regular trimming to prevent ladder fuels.

- Compliance with the Fire Code is a year round responsibility. Enforcement will occur following inspection by the Fire Department annually or as needed. Annual inspections are generally conducted following natural drying of fine fuels. This occurs between the months of April and June.

Zone C Thinning Zone

Purpose

- Designed to slow the rate of spread, reduce flame lengths, and intensities of the fire prior to reaching the irrigated area.
- Designed to eliminate the spread of fire from one plant to another via ladder fuels and eliminate horizontal continuity by properly spacing remaining vegetation and limiting large masses of unbroken vegetation.
- Reduce the fuel load of a wildland area adjacent to a structure, thereby, reducing the radiant and convective heat of wildland fires.

General Requirements

- Predominantly existing vegetation with removal of the majority of undesirable plant species including trees and tree-form shrubs (see Appendix I).
- Reduce fuel loading by reducing the fuel in each remaining shrub or tree without substantial decrease in the canopy cover or removal of soil holding root systems.
- Some replacement planting with ornamental or less flammable native species to meet minimum slope coverage requirements of city or county public works, landscape or hillside ordinances.
- Natural vegetation is thinned by reduced amounts as the zone moves away from the development.

Specific Requirements

- Removal of all dead and dying vegetation, all fine fuels reduced to 3 inches in height.
- Any plants selected for planting in this zone will be chosen from the approved plant list for the setback, irrigated, or thinning zone for a given geographical area (see Appendix II).
- Special consideration will be given for rare and endangered species, geologic hazards, tree ordinances, or other conflicting restrictions as identified in the environmental documents submitted for project approval review.

Maintenance

- Requires annual removal and/or thinning of undesirable combustible vegetation, replacement of dead/dying fire resistant plantings, maintenance of the operational integrity and programming of the irrigation system.
- Compliance with the Fire Code is a year round responsibility. Enforcement will occur following inspection by the Fire Department annually or as needed. Annual inspections are generally conducted following natural drying of fine fuels. This occurs between the months of April and June.
- Debris and trimmings produced by thinning and pruning shall be removed from the site or chipped and evenly dispersed in the same area to a maximum depth of 5 inches.

Zone D Interface Thinning Zone

Purpose

- Designed to slow the rate of spread, reduce flame lengths, and intensities of the fire prior to reaching the irrigated area.
- Designed to eliminate the spread of fire from one plant to another via ladder fuels and eliminate horizontal continuity by properly spacing remaining vegetation and limiting large masses of unbroken vegetation.
- Reduce the fuel load of a wildland area adjacent to a structure, thereby, reducing the radiant and convective heat of wildland fires.

General Requirements

- Area serving as the initial interface between wildland areas and fuel modification zones.
- Consists of native vegetation individually thinned to reduce foliage mass or fuel loading. This does not necessarily require removing plants, but thinning those that exist.
- Proper thinning and spacing of remaining trees and tree-form native shrubs, reducing fuel load without overly exposing the soil to the threat of erosion.
- Natural vegetation is thinned by reduced amounts as the zone moves away from the development.

Specific Requirements

- Maintain sufficient cover to prevent erosion without requiring planting.
- Special consideration will be given for rare and endangered species, geologic hazards, tree ordinances, or other conflicting restrictions as identified in the environmental documents submitted for project approval.

- Any plants selected for planting in this zone shall be chosen from the approved plant list for the setback, irrigated, or thinning zone for a given geographical area (see Appendix II).
- Special consideration will be given for rare and endangered species, geologic hazards, tree ordinances, or other conflicting restrictions as identified in the environmental documents submitted for project approval review.

Maintenance

- Correct maintenance of this zone requires removal of overgrowth and major pruning every three to five years.
- Debris and trimmings produced by thinning and pruning shall be removed from the site or chipped and evenly dispersed in the same area to a maximum depth of 5 inches.
- Compliance with the Fire Code is a year round responsibility. Enforcement will occur following inspection by the Fire Department annually or as needed. Annual inspections are generally conducted following natural drying of fine fuels. This occurs between the months of April and June.

Off-Site Fuel Modification Option

Off-site fuel modification is generally not recommended due to problems inherent with enforcement of regulations on adjacent property and the potential for confusion regarding responsibility for fuel modification areas outside legal ownership. However, if the applicant should voluntarily request and obtain permission from neighboring property owners for fuel modification, it shall be taken into consideration by the Fire Department as part of the project's fuel modification plan.

The intent of these guidelines is to provide for fuel modification within the proposed project's or structure's property boundaries. If the fuel modification zones, consistent with these guidelines, cannot be fully contained on the subject property, on-site alternative means and methods should be sought to provide an equal level of protection from wildland fire. Alternative means and methods may include, but are not limited to, the following: 1) increasing the width of the setback or irrigated zones to reduce thinning zone dimensions, 2) enhancing fire protection construction techniques, 3) structure orientation, and 4) construction of non-combustible fencing material.

Compliance

Construction Phase - Plan review and approval is required for issuance of a building permit(s). Implementation of the fuel modification plan (other than that which will be assigned to the home buyer) is required prior to the issuance of Certificate of Occupancy or building final.

Long-Term Maintenance/Enforcement - The builder/developer is responsible for providing new property owners with recorded CC&R's or disclosure statements identifying the responsibilities for maintaining the fuel modification zone(s) within their property as defined in the approved Fuel Modification Plan. Approved Fuel Modification Plans will be reviewed annually as part of the brush clearance inspection process, by local fire station personnel, brush clearance office personnel, fire prevention or forestry personnel.

EXHIBIT A
CHECKLIST FOR PRELIMINARY REVIEW TO DETERMINE REQUIRED FUEL MODIFICATION ZONES

A preliminary review of your project will determine the site specific requirements necessary to assure reasonable fire safety. All required documents for a preliminary review shall be submitted to the Fuel Modification Unit of the County of Los Angeles Fire Department at the time of tentative map processing. The Preliminary Fuel Modification Plan review will be required prior to final map approval. Approved revisions to the fuel modification plans will be allowed up to the point of issuance of building permit. For information regarding fuel modification plans, please contact the Fuel Modification Unit of the Forestry Division at (909) 620-8287 or (213) 881-2481.

Tentative Map

1. The applicant shall submit three (3) sets of site plans indicating building envelopes to the Fire Department during the tentative map approval process. Additional copies may be submitted for stamp approval as the applicant deems necessary to meet the requirements of other agencies.
2. Indicate on an additional topographic map: project location, legal description, and tentative map.
3. Indicate existing land uses contiguous in all directions up to two hundred (200) feet outside of the project boundaries (i.e., construction, natural vegetation, roads, parks, etc.)
4. Provide photographs and a photo orientation map, of the area which show the type, size, and density of existing vegetation.
5. Indicate who will be responsible for the long-term maintenance of the fuel modification zones (property owner, adjacent property owner, landscape maintenance district, Homeowner's Association, etc.)
6. Submit copies of environmental documents which may disclose conflict with fuel modification plan requirements (i.e., endangered species habitat mitigation, Oak tree preservation, etc.)
7. After review by the Fire Department of all documents provided by the applicant, the Fire Department will meet with the applicant to discuss the recommended fuel modification requirements for the project and finalize the approval of the preliminary fuel modification plan.

NOTE: Documents prepared specifically to meet requirements of other agencies may be submitted, provided the necessary information is included. Approval of a fuel modification plan by the County of Los Angeles Fire Department does not eliminate the requirement or the responsibility of the applicant to obtain appropriate environmental, grading, building, and zoning clearances or permits from the agencies having jurisdiction.

CHECKLIST FOR FINAL FUEL MODIFICATION PLAN

Building Permit

1. Prior to the issuance of a building permit the applicant will submit three (3) sets of blue line plans to the Fire Department showing the final fuel modification requirements. Additional copies may be submitted for stamp approval as the applicant deems necessary to meet the requirements of other agencies. The plan package shall include the following:

    a. Irrigation Plan - The irrigation plan should indicate the areas to be irrigated and the type of irrigation system to be installed.

    b. Landscape Plan - The landscape plan should identify the location and type of all supplemental plantings and location type, and the size of plants remaining on site following modification. The plan should include a complete list of all plants identified by common and scientific name. The landscape plan should also include any specific maintenance intended for the site such as special pruning, mowing, etc.

    c. Zone Delineation - Zone delineation and fuel modification actions planned and completed may be indicated on the landscape plan or a separate plan.

    d. Identification of Responsibility - A letter identifying parties responsible for installation and/or maintenance such as homeowners, homeowner associations, or land management districts.

2. Prior to the issuance of a building permit, the Fire Department must review and approve the final fuel modification plan package submitted by the applicant. Applicants should expect review within 10 working days of the department's receipt of a complete package.

Certificate of Occupancy/Building Final

1. Final approval of fuel modification zone implementation will be obtained following inspection by the fire department. Applicants shall request inspection of the fuel modification requirements by the Fire Department three business days prior to anticipated issuance of a certificate of occupancy or building final. The Fire Department shall respond to an inspection request within three business days.

2. A copy of the recorded CC&R's pertaining to fuel modification maintenance requirements and responsibilities will be provided to the Forestry Division prior to issuance of Certificate of Occupancy.

NOTE: The review and approval process outlined in these guidelines is designed to assist an applicant through the fuel modification process. If questions or conflicts arise, applicants should request assistance from the Fire Department's Brush Clearance Section Manager. If additional clarification is necessary or special circumstances arise, applicants may seek assistance or policy interpretation from the Chief of the Forestry Division.

EXHIBIT B

ESTIMATED FUEL MODIFICATION DISTANCE CHART (EFMD)

STRUCTURE CONSTRUCTION				SCORE
GOOD/CURRENT FIRE ZONE 4 OR VHFHSZ REQUIREMENTS			1	
MODERATE			5	
POOR			10	
FUELS				
PRIMARILY GRASSLAND			5	
COASTAL SAGE SCRUB/OAK WOODLAND			10	
CHAPARRAL			15	
SLOPE*	**DOWN-SLOPE**	**UP-SLOPE**		
		0 - 20 DEGREES	1	
	0 - 20 DEGREES	20 - 40 DEGREES	2	
	20 - 40 DEGREES	40 - 60 DEGREES	4	
	40 - 60 DEGREES	60 < DEGREES	8	
	60 < DEGREES		16	
ASPECT**				
NORTH			1	
EAST			2	
WEST			4	
SOUTH			8	
FIRE TOPOGRAPHY***				
- DISTANCE FROM SLOPE,CHIMNEYS,SADDLES,CANYONS				
250 - 300			1	
200 - 250			2	
150 - 200			3	
100 - 150			4	
50 - 100			5	
30 - 50			10	
< 30			15	
FIRE HISTORY/ POTENTIAL				
- HISTORICAL FIRE PATTERNS/INTENSITY				
LOW			5	
MODERATE			10	
HIGH			15	
			TOTAL	

ESTIMATED FUEL MODIFICATION DISTANCE****		EFMD
TOTAL	**DISTANCE**	
14-24	50'	
25-34	100'	
35-49	150'	
50-69	200'	
70 +	300'	

* SELECT CATAGORY THAT CORRESSPONDS TO THE LOCATION OF THE REQUIRED MODIFICATION

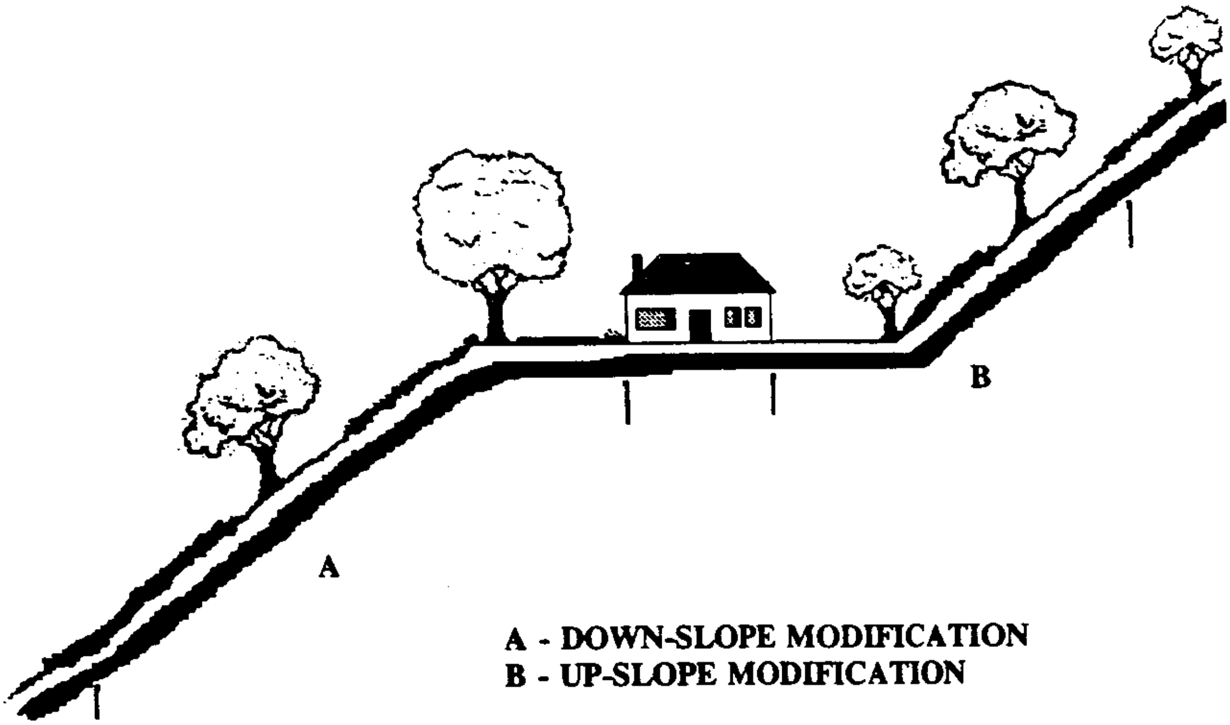
** VALUES ASSIGNED MAY VARY, BASED ON PREVAILING WEATHER PATTERN AND FIRE HISTORY

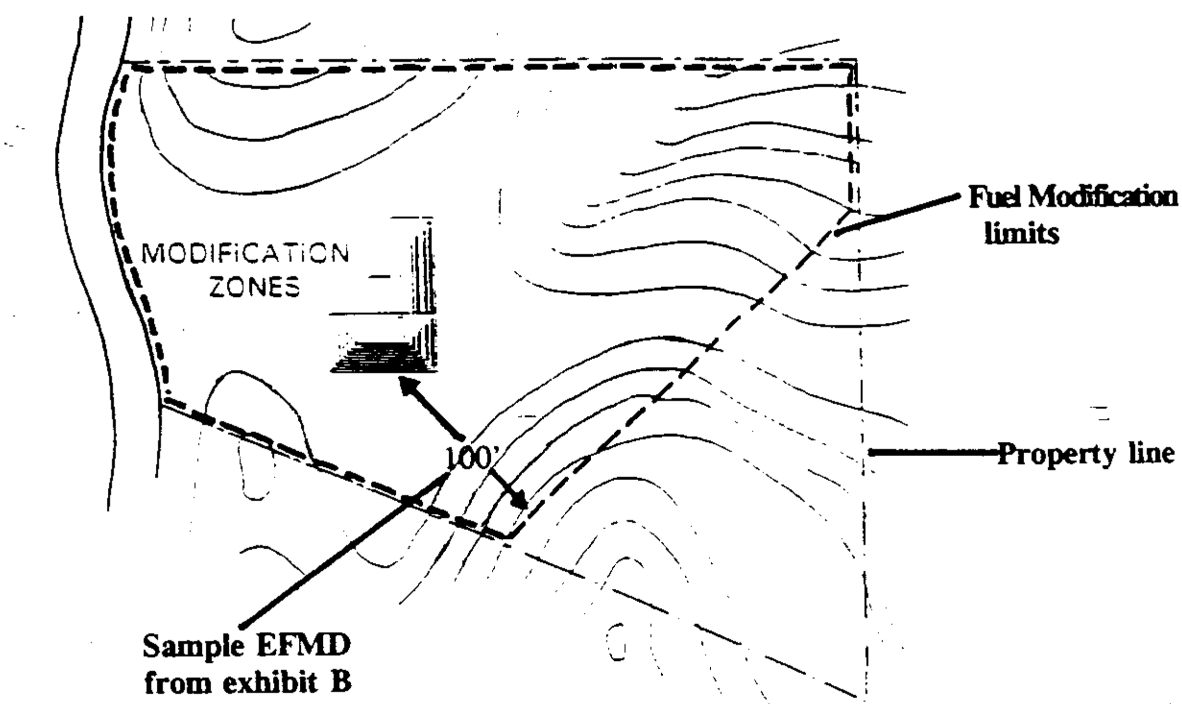
*** SUBDIVISIONS SHOULD ENTER A VALUE OF (5) FOR THIS CATAGORY

**** MEASUREMENT IN FEET TAKEN ALONG SLOPE (HYPOTENUSE)

EXHIBIT C

SAMPLE FUEL MODIFICATION DIAGRAMS





The actual amount of total fuel modification will be determined on a case by case basis utilizing Exhibit B, Estimated Fuel Modification Distance(EFMD). The necessary zone(s) and their width will be determined during the preliminary review process.

APPENDIX I
UNDESIRABLE PLANT LIST

Certain plants are considered to be undesirable in the landscape due to characteristics that make them highly flammable. These characteristics can be either physical or chemical. Physical properties that would contribute to high flamability include large amounts of dead material retained within the plant, rough or peeling bark, and the production of copious amounts of litter. Chemical properties include the presence of volatile substances such as oils, resins, wax, and pitch. Certain native plants are notorious for containing these volatile substances.

Plants with these characteristics should not be planted in fire hazard areas. Should these species already exist within these areas, they should be removed because of the potential threat they pose to any structures. They are referred to as target species since their complete or partial removal is a critical part of hazard reduction. The following is a partial list of plants that should be avoided near structures.

UNDESIRABLE PLANT SPECIES (TARGET SPECIES)

Natives:
Adenostoma fasciculatum - Chamise
Adenostoma sparsifolium - Red shank
Artemisia californica - California Sagebrush
Eriogonum faciculatum - Common Buckwheat
Salvia spp.- Sage

Ornamentals:
Cortaderia spp. - Pampas Grass
Cupressus spp. - Cypress
Eucalyptus spp. - Eucalyptus*
Juniperus spp. - Juniper
Pinus spp. - Pine

* Except as permitted in the planting list

Others - Other plants may be considered to be undesirable because of their ability to naturalize and become a pest. These types of plants should be avoided, especially in sensitive riparian or coastal areas where they could become established and compete with native vegetation.

Plants should fit the location and situation. Avoid using shallow rooted ground covers on steep slopes. Iceplant, while an effective ground cover on flat surfaces would be undesirable on a steep slope because it's shallow rooted nature may cause it to slide off the slope if the root zone becomes saturated during a rain storm. This would expose the bare soil to erosion.

Care should be taken to avoid erosion problems created or exacerbated by total vegetation removal. In areas where target species comprise the total vegetation, partial removal is recommended, with replacement planting using desirable species as the long range goal.

APPENDIX II
DESIRABLE PLANT LIST

Desirable Qualities for Landscape Plants

- Ability to store water in leaves or stems.
- Produces limited dead and fine material.
- Extensive root systems for controlling erosion.
- High levels of salt or other compounds within its tissues that can contribute to fire resistance.
- Ability to withstand drought.
- Prostrate or prone in form.
- Ability to withstand severe pruning.
- Low levels of volatile oils or resins.
- Ability to resprout after a fire.

PLANT LIST LEGEND

Fuel Mod.Zone	Geographical Area	Water Needs	Evergreen/Deciduous
A - Setback	C-Coastal	H-High	E-Evergreen
B - Irrigated	IV-Interior Valley	M-Moderate	D-Deciduous
C - Thinning	D-Deserts	L-Low	E/D-Partly or Summer Deciduous
D - Interface		VL-Very Low	

Comment Code

1	Not for use in coastal areas
2	Should not be used on steep slopes
3	May be damaged by frost.
4	Should be thinned bi-annually to remove dead or unwanted growth
5	Good for erosion control.
6	Grows best in well drained soils.
7	Produces flowers or fruit that attracts birds and or butterflies.
8	Adaptability can vary.
9	Can be used as a lawn substitute.
10	Showy flowers.
11	Produces edible fruit.
12	California native or native cultivar
13	Tends to be short lived.
14	High fire resistance.
15	Dead fronds or leaves need to be removed to maintain fire safety.
16	Tolerant of heavy pruning.
17	Must be cut back after flowering.
18	May require partial shade in desert or valley areas.
19	Perennial
20	Tolerates saline soils.
21	Grows naturally in riparian areas.
22	Good tree for lawns.
23	Produces habitat or food for wildlife.

The following plant list is provided as a suggested guideline (not exclusive) for fuel modification landscapes within Los Angeles County. Plants not listed (grasses, annuals etc.) may be used if approved with the fuel modification plan.

The desirable planting list is based on comments from numerous professionals and public agencies, Sunset Western Garden Book, Bob Perry's Landscape Plants for Western Regions, and the California Department of Water Resources study entitled, WUCOLS (Water Use Classification of Landscape Species). The plant list is arranged by fuel modification zone, geographical area, and plant type and includes a comment code to assist in plant selection and maintenance requirements.

GROUNDCOVERS

BOTANICAL NAME	COMMON NAME	ZONE	WATER NEEDS	HEIGHT	SPREAD	E/D	GEOGRAPHICAL AREA-COMMENTS
Abelia grandiflora 'Prostrata'	Prostrate Glossy Abelia	A,B	M	1 - 2'	3 - 4'	E	C,IV - 3
Achillea tomentosa	Woolly Yarrow	A,B,C	L	6 - 10"	6 - 12"	E	C,IV - 9,19
Aeonium species	NCN	A,B,C	L	Varies	Varies	E	C,IV - 2,3,8,14
Ajuga reptans	Carpet Bugle	A	H	4 - 6"	2 - 4"	E	C,IV - 2,18,19
Aptenia cordifolia	Red Apple Ice Plant	A,B	M,L	- 12"	varies	E	IV,D - 1,2,3,19
Arctostaphylos species	Manzanita	B,C,D	L,VL	Varies	Varies	E	Varies
A. edmundsii	Little Sur Manzanita	B,C,D	L,VL	1 - 2'	4 - 6'	E	C,IV - 4,6,12
A. 'Emerald Carpet'	Emerald Carpet Manzanita	B,C,D	L,VL	1'	4 - 6'	E	C,IV - 4,6,12
Arctotheca calendula	Cape Weed	A,B	M,L	-12"	-18"	E	C,IV,D - 3,7,10,19
Artemisia californica 'cultivars'	Sagebrush - Prostrate Forms	B,C,D	L,VL	varies	varies	E	C,IV,D - 4,6,8,12,23
A. caucasica	Silver Spreader	B,C,D	L,VL	3-6"	2'	E	C,IV,D - 4,6
Asarum caudatum	Wild Ginger	A	M,H	7-10"	2'	D	C,IV - 3,18,19
Atriplex semibaccata	Creeping Saltbrush	B	L,VL	1'	1-5'	E	C,IV,D - 13,20
Baccharis pilularis							
B.p. 'Pigeon Point'	Dwarf Coyote Brush	B,C,D	L,VL	12-24"	-6'	E	C,IV,D - 4,5,12
B.p. 'Twin Peaks'	Dwarf Coyote Brush	B,C,D	L,VL	12-24"	-6'	E	C,IV,D - 4,5,12
Cerastium tomentosum	Snow-In-Summer	A,B	M,L	6-8"	2-3'	E	C,IV,D - 10,19
Chamaemelum nobile	Chamomile	A,B	M	6-8"	-12"	E	C,IV,D - 9,16,19
Cistus salviifolius	Sageleaf Rockrose	B,C	L,VL	1-2'	6'	E	C,IV,D-4,5,6,7,10,16,20
C. 'Sunset'	Rockrose	B,C	L,VL	1-2'	6-8'	E	C,IV,D-4,5,6,7,10,16,20
C. 'Warley rose'	Rockrose	B,C	L,VL	1'	4'	E	C,IV,D-4,5,6,7,10,16,20
Coprosma kirkii	NCN	B	M,L	-2'	6-8'	E	C,IV - 3,4,5,8,18,20
Coreopsis auriculata 'Nana'	NCN	A,B,C	L,VL	5-8"	-2'	E/D	C,IV - 3,8,19
Cotoneaster							
C. adpressus praecox	Cotoneaster	B	M,L	-18"	-6'	D	C,IV,D - 2
C. salicifolius 'Emerald Carpet'	Prostrate Willowleaf Contoneaster	B	M,L	12-15"	-8'	E	C,IV,D - 4
C.s. 'Repens'	Prostrate Willowleaf Contoneaster	B	M,L	-6"	-6'	E	C,IV,D - 4
Dalea greggii	Trailing Indigo Bush	B	L,VL	12-18"	5-10'	E	C,IV - 6
Dichondra micrantha	Dichondra	A,B	H,M	-6"	-2'	E	C,IV - 9
Duchesnea indica	Indian Mock Strawberry	A,B	L	-8"	-4'	E	C,IV,D - 11,16,19
Dymondia margaretae	NCN	A,B	M,L	-3"	12-24"	E	C,IV - 3,8
Epilobium californica	California Fuchsia	B,C,D	L,VL	1-2'	3-5'	E/D	C,IV,D-4,5,7,10,12,13,23
Erigeron glaucus	Seaside Daisy	A,B,C,D	M,L	10-12"	-2'	E	C,IV-3,6,8,10,12,18,19,20
E. karvinskianus	Mexican Daisy	A,B,C,D	M,L	10-20"	-3'	E	C,IV-3,6,8,10,18,19,20
Euonymus fortunei 'Colorata'	Purple-Leaf Winter Creeper	B	M	1-2'	-6'	E	IV - 1,5,8,16
Festuca cinerea(ovina'Glauca')	Blue Fescue	A,B	M,L	-12"	-2'	E	C,IV,D - 4
F. rubra	Red Fescue	A,B	M,L	-16"	-30"	E	C,IV,D - 4,9
Fragaria chiloensis	Wild Strawberrry	A,B,C,D	L,VL	6-12"	-24"	E	C,IV,D - 4,10,11,12,20
Gazania rigens var leucolaena	Trailing Gazania	A,B	L	6-10"	-24"	E	C,IV,D - 10,19
Glechoma hederacea	Ground Ivy	A	M	3-6"	-18"	E/D	C,IV,D - 8,19
Hedera helix & varieties	English Ivy	A,B	M,L	6-18"	-4'	E	IV,D - 1,4,5,16
Helianthemum nummularium	Sunrose	B	L	6-8"	-3'	E	C,IV,D - 6,10
Herniaria glabra	Green Carpet	A	M	2-3"	-16"	E	C,IV,D - 8
Hypericum calycinum	Aaron's Beard	B	M,L	6-12"	-3'	E	C,IV,D - 4,5,7,16
H. coris	NCN	B	M,L	6-12"	-2'	E	C,IV,D - 4,5,7,16
Iberis sempervirens	Evergreen Candytuft	A,B	M	6-12"	-6-12"	E	C,IV,D - 10,19
Iva hayesiana	Poverty Weed	B,C,D	L,VL	2-3'	4-5'	E	C,IV,D - 4,5,12,16,23
Laurentia fluviatilis	Blue Star Creeper	A	M	2-4"	6-12"	E	C,IV - 8,19
Lonicera japonica	Japanese Honeysuckle	B	M	1-2'	6-10'	E	IV - 1,5,7,10,16
Lysimachia nummularia	Moneywort	A	H,M	2-6"	-2'	E	C,IV - 18,19

GROUNDCOVERS cont'd

BOTANICAL NAME	COMMON NAME	ZONE	WATER NEEDS	HEIGHT	SPREAD	E/D	GEOGRAPHICAL AREA-COMMENTS
Mahonia aquifolium'Compacta'	Compact Oregon Grape	A,B	M,L	1-2'	2-3'	E	C,IV - 4,7,12,18,23
M. repens	Creeping Mahonia	A,B	M,L	2-3'	2-3'	E	C,IV - 4,7,12,18,23
Myoporum 'Pacificum'	Pacific Myoporum	B	M,L	2-3'	-30'	E	IV - 1,4,5,16
M. parvifolium	NCN	B	M,L	4-6"	9'	E	IV - 1,4
Nandina domestica							
'Harbour Dwarf'	Dwarf Heavenly Bamboo	A,B	M,L	1 1/2 -2'	2-3'	E	C,IV,D - 15
Oenothera berlandieri	Mexican Evening Primrose	B,C,D	L,VL	10-12"	4'	E	IV,D - 1,4,7,10,17,19
O. stubbei	Baja Evening Primrose	A,B,C,D	L,VL	5"	2'	E	IV,D - 7,19
Ophiopogon japonicus	Mondo Grass	A	M	8-12"	12-24"	E	C,IV - 18
Osteospermum fruticosum	Trailing African Daisy	A,B	M	-18"	-4'	E	IV - 1,10,19
Pelargonium peltatum	Ivy Geranium	A,B	M	-2'	-4'	E	IV - 1,3,7,10,19
P. tomentosum	Peppermint-Scented Geranium	A,B	M	-18"	2-4'	E	IV - 1,3,7,10,19
Phyla nodiflora (Lippia repens)	Lippia	A,B	M,L	2-15"	-3'	E/D	C,IV,D - 9,16,19
Polygonum capitatum	Pink Clover	A,B	M,L	-18"	-2'	E	IV,D - 1,10,19
Potentilla tabernaemontanii	Spring Cinquefoil	A,B	M,L	2-6"	-12"	E	C,IV,D - 9,10,19
Ribes viburnifolium	Catalina Perfume	A,B,C,D	L,VL	-3'	-3'	E	C,IV - 12,18,23
Rosmarinus officinalis							
R.o. 'Huntington Blue'	NCN	B	L	-18"	-4'	E	C,IV,D - 4,5,16
R.o. 'Prostratus'	Prostrate Rosemary	B	L	-24"	-6'	E	C,IV,D - 4,5,16
Salvia sonomensis	Creeping Sage	B,C,D	L	8-12"	3-4'	E	C,IV - 6,12,13,23
Santolina chamaecyparissus	Lavender Cotton	A,B	L	-24"	-3'	E	C,IV,D - 10
S. rosmarinifolius (virens)	Green Lavender Cotton	A,B	L	-24"	-3'	E	C,IV,D - 10
Sedum species	Stonecrops	A,B	L,VL	Varies	Varies	E	C,IV - 2,8,14
Senecio mandraliscae	NCN	A,B	M,L	-18"	-5'	E	C,IV - 3,14,19
S. serpens	Blue Chalkstics	A,B	M,L	-12"	-3'	E	C,IV - 3,14,19
Scaevola 'Mauve Clusters'	NCN	A,B	M,L	4-6"	3-4'	E	C,IV - 6,18,19
Soleirolia soleirolii	Baby's Tears	A	H,M	3-6"	-18"	E	C,IV - 3,18,19
Teucrium chamaedrys							
'Prostratum'	Prostrate Germander	A,B	M,L	4-6"	-3'	E	C,IV,D - 4,16
T. cossonii	NCN	A,B	L	4-6"	-2'	E	C,IV - 6,10
Thymus praecox arcticus	Mother of Thyme	A,B	M,L	2-6"	-18"	E	C,IV,D - 8
T. pseudolanuginosus	Woolly Thyme	A,B	M,L	2-3"	-12"	E	C,IV,D - 8
Trachelospermum							
jasminoides	Star Jasmine	B	M,L	-2'	4-5'	E	C,IV,D - 5,7,10,16
Trifolium fragiferum							
Var. O'connor's	O'Cornor's Legume	B	M,L	6-15"	-6'	E	C,IV,D - 5,9,16,19
Verbena hybrida	Garden Verbena	A,B	L,VL	6-12"	1 1/2-3'	E	C,IV,D - 3,7,10,13
V. peruviana	NCN	A,B,C	L,VL	-8"	-2'	E	C,IV,D - 7, 10
V. pulchella gracilior	Moss Verbena	A,B	L,VL	12-15"	2-3'	E	C,IV,D - 8,10,19
V. tenuisecta	Moss Verbena	A,B	L,VL	12-15"	2-3'	E	C,IV,D - 8,10,19
Wedelia trilobata	Wedelia	B	M,L	-12"	4-6'	E	C,IV,D - 3,16, 20
Zoysia tenuifolia	Korean Grass	A	M,L	-6"	-18"	E	C,IV,D - 9

SHRUBS

PERENNIALS/SUCCULENTS

BOTANICAL NAME	COMMON NAME	ZONE	WATER NEEDS	HEIGHT	SPREAD	E/D	GEOGRAPHICAL AREA-COMMENTS
Acanthus mollis	Bear's Breech	A,D	H,M	-4'	4-6'	E/D	C,IV,D - 3,8,14,16,17,18,19
Achillea filipendulina	Fernleaf Yarrow	B,C	L,VL	4-5'	2'	E	C,IV,D - 10,16,17,19
A. millefolium	Common Yarrow	A,B,C	L,VL	-3'	2'	E	C,IV,D - 10,16,17,19
Aeonium species	NCN	A,B	L	varies	varies	E	C,IV - 3,8,14
Agaranthus species	Lily-Of-The-Nile	A,B	M	varies	varies	E/D	C,IV - 3,4,7,10,14,19
Agave species	Agave	VL,L	L,VL	varies	varies	E	C,IV,D - 3,10,14,17
Aloe species	Aloe	A,B	L,VL	varies	varies	E	C,IV, - 3,7,8,14
Anigozanthos flavidus	Kangaroo Paw	A,B	M,L	3-5'	3'	E	C,IV - 3,6,7,10,19
A. manqlesii	NCN	A,B	M,L	3'	-3'	E	C,IV - 3,6,7,19
Arbutus unedo 'Compacta'	Dwarf Strawberry Tree	B	M,L	6-8'	-8'	E	C,IV,D - 5,7,11,18,23
A.u. 'Elfin King'	NCN	B	M,L	3-5'	-6'	E	C,IV,D - 5,7,11,18,23
A.u. 'Octoberfest'	NCN	B	M,L	6-8'	-8'	E	C,IV,D - 5,7,11,18,23
Arctostaphylos species	Manzanita	B,C,D	L,VL	varies	varies	E	C,IV,D - 4,6,7,10,12
Artemisia 'Powis Castle'	NCN	B,C	L,VL	-3'	6'	E	C,IV - 4,6,12,23
A. stellerana	Beach Worm Wood	B,C	L,VL	-3'	-3'	E	C,IV - 4,6,12,19,23
Aspidistra elatior	Cast-Iron Plant	A,B	M,L	-30"	-3'	E	C,IV - 3,18,19
Baccharis species		B,C,D	L,VL	varies	varies	E	C,IV,D - 4,5,6,12,21,23
Begonia species	Begonia	A,B	H,M	varies	varies	E	C,IV - 3,8,10,14,18
Berberis thunbergii	Japanese Barberry	B	M,L	4-6'	4-6'	D	C,IV,D - 4
B. thunbergii 'cultivars'		A,B	M,L	varies	varies	D	C,IV,D - 4
Bergenia crassifolia	Winter Blooming Bergenia	A,B	M,L	-20"	-20"	E	C,IV - 3,18,19
Buddleia davidii	Butterfly Bush	B	M,L	-10'	-12'	E/D	C,IV,D - 7,10,16,17
Buxus microphylla japonica	Japanese Boxwood	B	M,L	4-6'	4-6'	E	C,IV,D - 16
B.m. koreana	Korean Boxwood	B	M,L	4-6'	4-6'	E	C,IV,D - 16
Caesalpinia gilliesii	Bird of Paradise Bush	B	L,VL	-10'	-10'	E/D	C,IV,D - 7,10
C. mexicana	Mexican Bird of Paradise	B	L,VL	10-12'	-15'	E/D	C,IV,D - 7,10
C. pulcherrima	Red Bird of Paradise	B	L,VL	-10'	-10	E/D	C,IV,D - 7,10
Calliandra californica	Baja Fairy Duster	B,C,D	L,VL	-3'	4-5'	E/D	C,IV,D - 4,6,7,10
C. eriophylla	Fairy Duster	B,C,D	L,VL	-3'	4-5'	E/D	C,IV,D - 4,6,7,10,12
Callistemon citrinus'compacta'	Bottlebrush	B	L,VL	-5'	-5'	E	C,IV,D - 5,7,10,20
Calycanthus occidentalis	Spice Bush	B,C,D	M,L	4-12'	-5'	D	C,IV - 12,18
Carissa macrocarpa							
(grandiflora &'cultivars')	Natal Plum	A,B	M,L	-7'	-7'	E	C,IV - 4,11,16
Cassia artemisioides	Feathery Cassia	B	L,VL	3-6'	-6'	E	C,IV,D - 10,
Ceanothus species	Wild Lilac	B,C,D	L,VL	varies	varies	E/D	C,IV,D - 4,6,7,10,12,23
Cercocarpus betuiloides	Mountain Mahogany	B,C,D	L,VL	5-12'	-10'	E	C,IV,D - 4,6,12,23
Choisya ternata	Mexican orange	B	M	6-8'	-8'	E	C,IV - 10,18
Cistus species	Rockrose	B	L,VL	varies	varies	E	CiIV,D - 4,5,6,10,17,20
Clivia miniata	Clivia	A,B	H,M	2'	2'	E	C,IV - 3,10,14,18,19
Colocasia esculenta (caladium)	Elephant's Ear	A,B	H	-6'	-6'	E/D	C,IV - 3,14,18,19
Comarostaphylis diversifolia	Summer Holly	B,C,D	L,VL	6-10'+	6-8'+	E	C,IV,D - 6,7,12,18.23
Convolvulus cneorum	Bush Morning Glory	B	L	2-4'	2-4'	E	C,IV,D - 6,10
Coprosma pumila	NCN	B	M	-3'	8'	E	IV - 1,4,16,20
C. repens	Mirror Plant	B	M	-10'	-6'	E	IV - 1,4,16,20
Cotoneaster species	Cotoneaster	B	M,L	2-18'	3-15'	E/D	C,IV,D - 4,10,16
Cotyledon species	NCN	A,B	L	1-3'	1-3'	E	C,IV - 3,8,14
Crassula species	NCN	A,B	L	1-9'	1-9'	E	C,IV - 3,8,14
Cyrtomium falcatum	Holly Fern	A,B	H,M	2-3'	3-4'	E	C,IV - 15
Dasylirion longissima	Mexican Grass Tree	B	L,VL	-10'	8'	E	C,IV,D - 15
D. wheeleri	Sotol	B	L,VL	-6'	-6'	E	C,IV,D - 15

SHRUBS cont' PERENNIALS/SUCCULENTS

BOTANICAL NAME	COMMON NAME	ZONE	WATER NEEDS	HEIGHT	SPREAD	E/D	GEOGRAPHICAL AREA-COMMENTS
Dietes bicolor	Fortnight Lily, African Iris	B	M,L	2-3'	2-3'	E	C,IV,D - 4,10,15,19
D. vegeta (iridioides)	Fortnight Lily	B	M,L	-4'	-4'	E	C,IV,D - 4,10,15,19
Echium fatuosum	Pride of Madeira	B	L,VL	-10'	-10'	E	C,IV - 4,6,7,10,19,20
Elaeagnus pungens & cultivars	Silverberry	B	M,L	6-15'	6-15'	E	C,IV,D - 16
Encelia californica	Coast Sunflower	B,C,D	L,VL	3-5'	3-5'	E/D	C,IV - 5,6,10,4,17
E. farinosa	Brittle Bush	B,C,D	L,VL	3-5	3-5	E/D	C,IV,D - 4,5,6,10,12,17
Erigonum giganteum	St. Catherine's Lace	B,C,D	L,VL	- 8'	- 8'	E	C,IV - 4,6,10,12,19,20
Escallonia species	Escallonia	B	M,L	2-15'	2-10'	E	C,IV - 4,10,16
Euonymus japonica & 'cultivars'	Evergreen Euonymus	B	M	2-10'	-6'	E	C,IV,D - 4,16
Fatsia japonica	Japanese Aralia	A,B	M	5-12'	6-10'	E	C,IV - 18
Fouquieria splendens	Ocotillo	A,B,C,D	VL	8-25'	8-15'	E	IV,D - 6,10,12
Fremontodendron species							
& 'cultivars'	Flannel Bush	B,C,D	L,VL	5-20'	-15'	E	C,IV,D - 4,6,10,12
Gardenia jasminoides	Gardenia	A,B	H	3-6'	3-5'	E	C,IV - 10,18
Garrya species	Silktassel	B,C,D	M,L	4-8'	4-8'	E	C,IV,D - 4,5,7,10,12
Hakea suaveolens	Sweet Hakea	B	L	10-20'	-15'	E	C,IV - 4,8
Hebe species & 'cultivars'	Hebe	B	M	3-6'	3-6'	E	C,IV - 4,5,7,10,16
Hemerocallis hybrids	Daylily	A,B	M,L	1-6'	2-6'	E/D	C,IV,D - 7,10,17,19
Hesperaloe parviflora	NCN	B,C	VL	3-4'	4-6'	E	IV,D - 6,7,19
Hibiscus rosa - sinensis	Chinese Hibiscus	B	M	-15'	-12'	E	C,IV - 3,7,10
Iris species	Bearded Iris	A,B	M	-30"	-2'	E	C,IV,D - 10
I.douglasiana	Douglas Iris	A,B,C	M,L	-2'	-2'	E	C,IV - 10,12,18
Isomeris(Cleome) arborea	Bladderpod	B,C,D	L,VL	3-6'	4-6'	E	C,IV,D - 4,6,1O,12,20
Justicia brandegeana	Shrimp Plant	B	M	-3'	-4'	E	C,IV,D - 4,7,10
J. californica	Chuparosa	B,C,D	L,VL	2-5'	-4'	D	IV,D - 4,6,7,10,12
Keckiella cordifolia	Heart-Leaved Penstemon	B,C,D	L,VL	5-6'	8-10'	E/D	C,IV - 4,7,12
Kniphofia uvaria	Red-Hot Poker	A,B	L	2-3'	3-4'	E	C,IV,D - 3,7,10,19
Larrea tridentata	Creosote Bush	B,C,D	VL	4-8'	4-8'	E	IV,D - 6,12,23
Lavandula agnstifolia	English Lavender	B	L	3-4'	3-4'	E	C,IV,D - 4,6,7,10,17
L. dentata	French Lavender	B	L	3'	3'	E	C,IV,D - 4,6,7,10,17
L. intermedia	Lavandin	B	L	1-2'	2-3'	E	C,IV,D - 4,6,7,10,17
L. stoechas	Spanish Lavender	B	L	2-3'	3'	E	C,IV,D - 4,6,7,10,17
Leonotis leonrus	Lion's Tail	B	L	3-6'	4-6'	E	C,IV,D - 3,7,10,17
Leucophyllum candidum	Violet Silverleaf	B	L,VL	4-5'	4-5'	E	IV,D - 4,6,7,10
L. frutescens	Texas Ranger	B	L,VL	6-8'	6-8'	E	IV,D - 4,6,7,10
L. laevigatum	Chihuahuan Sage	B	L,VL	3-4'	4-5'	E	IV,D - 4,6,7,10
Limonium perezii	Sea Lavender	A,B	L	-2'	-2'	E	C,IV - 3,10,15,19,20
Liriope muscari	Big Blue Lily Turf	A,B	M	1-2'	2'	E	C,IV - 18
Lobelia laxflora	Mexican Bush Lobelia	B	L	2-3'	4-6'	E	C,IV,D - 4,7,10
Lupinus species	Lupine	B,C,D	L,VL	varies	varies	E/D	C,IV,D - 4,6,7,10,12,17
Mahonia aquifolium	Oregon Grape	B,C,D	M,L	6-8'	6-8'	E	IV,D - 4,6,11,12,18,23
M. fremontii	Desert Mahonia	B,C,D	L	3-12'	4-8'	E	C,IV,D-4,6,10,11,12,23
M. 'Golden Abundance'	NCN	B,C,D	M,L	5-6'	6'	E	IV,D-4,6,10,11,12,18,23
M. lomarifolia	Venetian Blind Mahonia	B,C	M,L	6-10'	6-10'	E	C,IV,D - 4,6,11,18,23
M. nevinii	Nevin Mahonia	B,C,D	L	3-10'	6-12'	E	C,IV,D-4,6,10,11,12,23
M. pinnata	California Holly Grape	B,C,D	M,L	4-5'	4-6'	E	C,IV-4,6,10,11,12,18,23
Malva sp.	Mallow	B,C	L	varies	varies	E/D	C,IV,D - 6,7,10,13
Mimulus sp. (Diplacus)	Monkey Flower	B,C,D	L	1-4'	1-4'	E	C,IV,D - 4,6,7,10,12
Myrtus communis 'compacta'	Dwarf Myrtle	B	M	5-8'	5-8'	E	C,IV,D - 16
Nandina domestica	Heavenly Bamboo	B	M	6-8'	4-5'	E	C,IV,D - 4,15

SHRUBS cont' PERRENIAL/SUCCULENTS

BOTANICAL NAME	COMMON NAME	ZONE	WATER NEEDS	HEIGHT	SPREAD	E/D	GEOGRAPHICAL AREA-COMMENTS
N.d. 'Compacta'	NCN	B	M	4-5'	3-4'	E	C,IV,D - 4,15
Nephrolepis cordifolia	Southern Sword Fern	A,B	M,L	2-3'	3-6'	E	C,IV - 4,15
Nerium oleander	Oleander	B	M,L	8-20'	10-20'	E	C,IV,D - 10,16
N.o. 'Petite Salmon'	NCN	B	M	3-4'	5-7'	E	C,IV - 3,10,16
Opuntia species	Prickly Pear, Cholla etc.	A,B,C,D	L,VL	varies	varies	E	C,IV,D - 8,12,14,23
Pelargonium species	Geranium	A,B	M,L	varies	varies	E	C,IV - 3,10,19
Penstemon species	Beard Tongue	A,B,C,D	L	varies	varies	E/D	C,IV,D - 7,10,12,17,19
Phlomis fruticosa	Jerusalem Sage	B	M,L	3-4'	3-5'	E	C,IV,D - 6,7,10,17,19
Phormium tenax	New Zealand Flax	B	M	5-9'	6'	E	C,IV,D - 4,19
P.t 'cultivars'	NCN	B	M	varies	varies	E	C,IV,D - 4,19
Photinia fraseri	Common Photinia	B	M,L	10-15'	10-20'	E	C,IV,D - 4,7,10,16
Pittosporum tobira	Tobira	B	M,L	6-15'+	8-15'	E	C,IV,D - 5,16
P.t.'Variegata'	NCN	B	M	5-8'	6-8'	E	C,IV,D - 5,16
P.t.'Wheeler's Dwarf'	Dwarf Pittosporum	A,B	M	1-3'	2-4'	E	C,IV,D - 16
Portulacaria afra	Elephant's Food	B	L	5-12'	6-12'	E	C,IV - 3,14
Punica granatum 'Nana'	Dwarf Pomegranate	A,B	L	3'	4'	D	C,IV,D - 7,11,20
Pyracantha species	Firethorn	B	M	varies	varies	E/D	C,IV,D - 4,16
Rhamnus california	Coffeeberry	B,C,D	M,L	3-15'	4-15'	E/D	C,IV,D - 12,21,23
R. crocea	Redberry	B,C,D	M,L	2-3'	3'	E	IV - 5,12,23
R.c. ilicifolia	Hollyleaf Redberry	B,C,D	M,L	3-15'	3-15'	E	IV - 5,12,23
Rhaphiolepis indica	India Hawthorn	B	M,L	4-8'	4-8'	E	C,IV,D - 4,5,10
R.i 'cultivars'	NCN	B	M,L	varies	varies	E	C,IV,D - 5,10
Rhus integrifolia	Lemonade Berry	B,C,D	L	3-10'+	6-20'	E	C,IV - 4,5,12,23
R.(Malosma) laurina	Laurel Sumac	B,C,D	L	6-15'+	6-15'	E	C,IV - 4,5,12,23
R. ovata	Sugar Bush	B,C,D	L	3-15'	6-15'	E	C,IV,D - 4,5,12,23
Ribes aureum	Golden Currant	B,C,D	L	3-6'	3-6'	D	C,IV,D - 7,10,12,23
R. malvaceum	Chaparral Currant	B,C,D	L	6-8'	6-8'	D	IV - 7,10,12,23
R. sanguineum & 'cultivars'	Red Flowering Currant	B,C,D	M,L	4-12'	4-8'	D	C,IV,D - 7,10,12,23
R. speciosum	Fuchsia-Flowering Gooseberry	B,C,D	L	3-6'	3-6'	D	C,IV,D - 4,7,10,12,23
R. viburnifolium	Catalina Perfume	B,C,D	L	3'	12'	E	C,IV - 7,10,12,23
Romneya coulteri	Matilija Poppy	B,C	L	-8'	4'	D	C,IV,D - 5,6,10,12,17
Rosa species	Rose	A,B	M	varies	varies	E/D	C,IV,D - 10,16,17
Salvia species	Sage	B,C,D	L	varies	varies	E/D	C,IV,D - 4,7,10,12,17,23
Simmondsia chinensis	Jojoba	B,C,D	L,VL	3-8'+	4-8'	E	C,IV,D - 4,6,11,23
Strelitzia reginae	Bird of Paradise	B	M	5'	4'	E	C,IV - 3,4,10,18
Trichostema lanatum	Wooly Blue Curls	B,C,D	L,VL	3-5'	5'	E	C,IV,D - 6,7,10,12,17
Tulbaghia violacea	Society Garlic	A,B	M	18'	2'	E/D	C,IV,D - 3,10,19
Viburnum species	Viburnum	B	M	varies	varies	E/D	C,IV,D - 3,7,10
Westringia fruticosa	Coast Rosemary	B	M,L	5-7'	6-12'	E	C,IV,D - 4,6,18
Xylosma congestum	Shiny Xylosma	B	M,L	15'+	15'+	E	C,IV,D - 5,16,18
X.c. 'Compacta'	Compact Xylosma	B	M,L	8-12'	8-12'	E	C,IV,D - 5,16,18
Yucca species	Yucca	B,C,D	L,VL	varies	varies	E	C,IV,D - 6,10,12,15

TREES

BOTANICAL NAME	COMMON NAME	ZONE	WATER NEEDS	HEIGHT FT	SPREAD FT	E/D	GEOGRAPHICAL AREA-COMMENTS
Acacia farnesiana	Sweet Acacia	B	L	15-20'	15-20'	D	IV,D - 10
A. greggii	Catclaw Acacia	B,C,D	L,VL	15-25'	15-25'	E	IV,D - 10,12,21,23
A. saligna	Willow Acacia	B	L	15-35'	12-25'	E	C,IV,D - 10
A. smallii	NCN	B,C,D	L,VL	15-20'	15-20'	D	C,IV,D - 10,21,23
A. stenophylla	Shoestring Acacia	B	M,L	20-45'	10-20'	E	C,IV,D - 10,22
Acer macrophyllum	Bigleaf Maple	B,C,D	M	30-95'	30-95'	D	C,IV - 12,21,23
A. negundo	Box Elder	B	M,L	-60'	-50'	D	IV,D - 12,23
A. palmatum	Japanese Maple	B	M	-20'+	-20'	D	C,IV - 6
A. saccharinum	Silver Maple	B	M	40-100'	40-100'	D	C,IV,D - 22
Aesculus californica	California Buckeye	B,C,D	M,L	20+	30'	D	C,IV,D - 6,7,10,12,23
Agonis flexuosa	Peppermint Tree	B	M,L	25-35'	25-35'	E	C,IV - 3,22
Albizia julibrissin	Silk Tree	B	M	-40'	40'+	D	C,IV,D - 7,10,22
Alnus cordata	Italian Alder	B	M	40'	25'	D	C,IV,D - 22
A. rhombifolia	White Alder	B	H,M	50-90'	40'	D	IV - 12,21,23
Arbutus 'Marina'	NCN	B	M,L	-40'	-40'	E	C,IV,D - 5,7,10,11,23
A. unedo	Strawberry Tree	B	M,L	12-35'	20-35'	E	C,IV,D - 5,7,10,11,23
Archontophoenix cunninghamiana	King Palm	B	M	50'	10-15'	E	C,IV - 3,10,15
Bauhinia variegata	Purple Orchid Tree	B	M	20-35'	35'	E/D	C,IV - 4,10
Betula pendula	European White Birch	B	M	30-40'	30'	D	C,IV,D - 6,22
Brachychiton acerifolius	Flame Tree	B	L	60'	45-50'	D	C,IV,D - 10,22
B. populneus	Kurrajong Bottle Tree	B	L	30-50'	30'	E	C,IV,D - 10,22
Brahea armata	Blue Hesper Palm	B	L,VL	40'	10'	E	C,IV,D - 6,10,15
B. edulis	Guadalupe Palm	B	L,VL	30'	10'	E	C,IV,D - 6,15
Callistemon citrinus	Lemon Bottlebrush	B	M,L	-25'	-15'	E	C,IV,D - 4,7,10
C. viminalis	Weeping Bottlebrush	B	M,L	20-30'	-15'	E	C,IV - 4,7,10
Calodendrum capense	Cape Chestnut	B	M	30'	25-40'	D	C,IV - 7,10
Carya illinoensis	Pecan	B	M,L	70'	70'	D	C,IV,D - 6,11
Cercidium floridum	Blue Palo Verde	B,C,.D	L,VL	30'	30'	D	IV,D - 6,10,12,21,23
C. micropyllum	Littleleaf Palo Verde	B,C,D	L,VL	25'	25'	D	IV,D - 6,7,10,12,21,23
Cercis occidentalis	Western Redbud	B,C,D	M,L	20'	20'	D	C,IV,D - 7,10,12,23
Chamaerops humilis	Mediterranean Fan Palm	B	M	20'	20'	E	C,IV,D - 15
Chilopsis linearis	Desert Willow	B,C,D	L	-35'	-35'	D	IV,D - 6,7,10,12,23
Chionanthus retusus	Chinese Fringe Tree	B	M	20'	20'	D	C,IV - 10
Chitalpa tashkentensis	Chitalpa	B	M,L	20-30'	20-30'	D	C,IV,D - 7,10
Chorisia speciosa	Floss Silk Tree	B	M	30-60'	30-40'	D	C,IV,D - 10,22
Cinnamomum camphora	Camphor Tree	B	M,L	50'+	60'+	E	C,IV,D - 22
Cocculus laurifolius	Laurel Leaf Snail Seed	B	M	25'	30'+	E	C,IV,D - 4
Cordyline australis	Giant Dracaena	B	M	30'	15'	E	C,IV,D - 15
Cupaniopsis anacardioides	Carrot Wood	B	M	40'	40'	E	C,IV,D - 20
Dracaena drago	Dragon Tree	B	M,L	20'	20'	E	C,IV - 3,10,14,15
Eriobotrya deflexa	Bronze Loquat	B	M,L	20'	20'	E	C,IV,D - 10
Erythrina species	Coral Tree	B	M,L	Varies	Varies	D	C,IV,D - 3,7,8
Eucalyptus citriodora	Lemon-scented Gum	B	M,L	75-100'	-40'	E	IV,D - 1,7,22
E. maculata	Spotted Gum	B	M,L	60-80'	-40'	E	IV,D - 1,7,22
E. nicholii	Willow Peppermint	B	M,L	-40'	-30'	E	IV,D - 1,7,22
E. sideroxylon	Red Ironbark	B	M'L	35-80'	-35'	E	IV,D - 1,7,10
E. torquata	Coral Gum	B	M,L	-25'	-20'	E	IV,D - 1,6,7,10,20
Feijoa sellowiana	Pineapple Guava	B	M,L	18-25'	-25'	E	C,IV,D - 3,7,8,10,11,16
Ficus species	Fig	B	M,L	Varies	Varies	E,D	C,IV,D - 3,8

TREES cont'd

BOTANICAL NAME	COMMON NAME	ZONE	WATER NEEDS	HEIGHT FT	SPREAD FT	E/D	GEOGRAPHICAL AREA-COMMENTS
Fraxinus augustifolia	Raywood Ash	B	M	25+35'	30'	D	C,IV,D - 22
F. dipetala	Foothill Ash	B,C,D	L,VL	18-20'	20-30'	D	C,IV,D - 12,21,22,23
F. latifolia	Oregon Ash	B	M	40-80'	40-60'	D	C,IV,D - 12,22,23
F. velutina	Arizona Ash	B,C	M,L	20-50'	30-50'	D	C,IV,D - 22,23
F.v. coriacea	Montebello Ash	B,C,D	M,L	20-40'	20-40'	D	C,IV,D - 12,22,23
Geijera parviflora	Australian Willow	B	M,L	25-30'	20-30'	E	C,IV,D - 6
Ginkgo biloba	Maidenhair Tree	B	M,L	35-80'	30-60'	D	C,IV,D - 6,22
Gleditsia triacanthos	Honey Locust	B	M,L	35-70'	-30'	D	IV,D - 6,22
Heteromeles arbutifolia	Toyon	B,C,D	L,VL	15-30'	15-30'	E	C,IV,D - 5,7,10,12,23
Hymenosporum flavum	Sweetshade Tree	B	M,L	20-40'	15-20'	E	IV - 10
Jacaranda mimosifolia	Jacaranda	B	M,L	25-40'	-30'	D	C,IV,D - 10,22
Juglans californica	Southern California Black Walnut	B,C,D	L	20-35'	30-45'	D	C,IV, - 5,6,12,23
Koelreuteria bipinnata	Chinese Flame Tree	B	M	20-40'	-45'	D	C,IV,D - 6,22
K. paniculata	Golden Rain Tree	B	M,L	20-35'	-40'	D	IV,D - 20,22
Lagerstroemia indica	Crape Myrtle	B	M,L	-30	-20	D	IV,D - 10,22
Liquidambar formosana	Chinese Sweet Gum	B	M	40-60'	25'	D	C,IV,D - 7
L. styraciflua	American Sweet Gum	B	M	60'	-25'	D	C,IV,D - 7
Liriodendron tulipfera	Tulip Tree	B	M	60-80'	40'	D	C,IV,D - 22
Lithocarpus densiflorus	Tanbark Oak	B,C,D	L	-60'	-40'	E	C,IV - 6,12,23
Magnolia species	Magnolia	B	M	Varies	Varies	E,D	C,IV,D - 6,8,10,22
Maytenus boaria	Mayten Tree	B	M,L	30-50'	30'	E	IV - 6,22
Metasequoia glypstroboides	Dawn Redwood	B	H,M	-80'	-40'	D	C,IV - 22
Metrosideros excelsus	New Zealand Christmas Tree	B	L,VL	-30'	-30'	E	C,IV - 5,6,7,10
Morus alba	White Mulberry	B	M,L	20-60'	30-50'	D	IV,D - 11,16
Olea europea	Olive	B	L,Vl	-35'	20-30'	E	C,IV,D - 11,16,20
Parkinsonia aculeata	Jerusalem Thorn	B	L,VL	15-30'	15-30'	D	C,IV,D - 3,6,7,10,22,
Pistacia chinensis	Chinese Pistache	B	M,L	-60'	-50'	D	C,IV,D - 22
Pittosporum phillyraeoides	Willow Pittosporum	B	L	15-25'	10-15'	E	C,IV,D - 10
P. rhombifolium	Queensland Pittosporum	B	M	15-35'	-25'	E	C,IV,D - 22
P. undulatum	Victorian Box	B	M	-25'	-25'	E	C,IV - 22
Platanus acerifolia	London Plane Tree	B	L	40-80'	30-40'	D	C,IV,D - 22
P. racemosa	California Sycamore	B,C,D	L	50-100'	50-100'	D	C,IV,D - 12,21,22,23
Podocarpus gracilior	Fern Pine	B	M	-60'	-60'	E	C,IV,D - 16,22
P. macrophyllus	Yew Pine	B	M	-50'	-45'	E	C,IV,D - 16,22
Populus fremontii	Fremont Cottonwood	B,C,D	M	40-60'	40-60'	D	C,IV,V - 12,21,22,23
Prosopis glandulosa	Honey Mesquite	B	L,VL	25-30'	25-30'	D	C,IV,D - 5,7,22,23
P. g. var. 'torreyana'	Mesquite	B	L,VL	40-50'	40-50'	D	C,IV,D - 5,7,12,22,23
Prunus species & 'cultivars'	Cherry	B	varies	varies	varies	E,D	C,IV,D - 7,8,10,11,16
P. ilicifolia	Hollyleaf Cherry	B,C,D	L,VL	15-30'	15-30'	E	C,IV,D - 7,11,12,16,23
P. lyonii	Catalina Cherry	B,C,D	L,VL	20-45'	30'+	E	C,IV,D - 7,11,12,16,23
Punica granatum	Pomegranate	B	L	12-18'	-20'	D	C,IV,D - 7,11,20
Quercus agrifolia	Coast Live Oak	B,C,D	L,VL	30-70'	70'+	E	C,IV,D - 6,12,23
Q. chrysolepis	Canyon Live Oak	B,C,D	M,L	30-60'	20-60'	E	C,IV - 6,12,36
Q. douglasii	Blue Oak	B,C,D	M	50'	>50	D	C,IV,D - 6,12,23
Q. engelmannii	Engelmann Oak	B,C,D	l	60'	>60'	E	IV,D - 6,12,23
Q. ilex	Holly Oak	B	M	40-70'	40-70'	E	C,IV,D - 6,23
Q. kelloggii	California Black Oak	B,C,D	M	30-80'	-60'	D	IV - 6,12,23
Q. lobata	Valley Oak	B,C,D	L,VL	70'+	70'+	D	C,IV - 6,12,23
Q. palustris	Pin Oak	B	H,M	50-80'	5-70'	D	C,IV,D - 6,22,23
Q. rubra	Red Oak	B	H,M	-90'	90'	D	C,IV - 6,23

TREES cont'd

BOTANICAL NAME	COMMON NAME	ZONE	WATER NEEDS	HEIGHT FT	SPREAD FT	E/D	GEOGRAPHICAL AREA-COMMENTS
Q. suber	Cork Oak	B	M	70-100'	-100'	E	C,IV,D - 6,23
Q. virginiana	Southern Live Oak	B	M,H	60'	100'	E/D	C,IV,D - 22
Q. wislizenii	Interior Live Oak	B,C,D	M,L	30-75'	75'+	E	IV,D - 6,12,23
Rhus lancea	African Sumac	B	L	20-30'	20-30'	E	C,IV,D - 20,22
Robinia ambigua	Locust	B	M,L	30-50'	-30'	D	IV,D - 1,7,10,22
R. pseudoacacia	Black Locust	B	L	-75'	30-40'	D	IV,D - 1,5,7,10,20,22
Sapium sebiferum	Chinese Tallow Tree	B	M	-35'	-35'	D	IV,D - 22
Schefflera actinophylla	Queensland Unbrella Tree	A,B	H,M	20'+	20'+	E	C - 3,8,18
S. pueckleri	Tupidanthus	A,B	H,M	20'+	20'+	E	C - 3,8,18
Syagrus romanzoffianum	Queen Palm	B	M	50'	-20'	E	C,IV - 15
Tabebuia chrysotricha	Golden Trumpet Tree	B	M	25-30'	-30'	E	C,IV - 6,10,22
T. impetiginosa	Pink Trumpet Tree	B	M	35'	-30'	E	C,IV - 6,10,22
Taxodium mucronatum	Montezuma Cypress	B	H-L	75'	35'	E/D	IV - 22
Tipuana tipu	Tipu Tree	B	M	-50'	-50'	D	C,IV - 10,22
Trachycarpus fortunei	Windmill Palm	B	M	-30'	-6'	E	C,IV,D - 15
Tristania conferta	Brisbane Box	B	L,VL	30-60'	-40'	E	C,IV - 22
Umbellularia californica	California Bay	B,C,D	L,VL	30-75'	30-75'	E	C,IV,D - 5,12,23
Zelkova serrata	Sawleaf Zelkova	B	M	60'	60'	D	IV,D - 22
Ziziphus jujuba	Chinese Jujube	B	M,L	20-30'	20-30'	D	C,IV,D - 11,20,22

APPENDIX III
PLANTING, SPACING, AND MAINTENANCE GUIDELINES

Information:

- Utilize slope distances for all measurements.
- Maintenance includes irrigation and annual removal of weeds, dead materials, and other undesirable flammable vegetation required to keep the fuel modified area in a fire safe condition as required by the approved fuel modification plan.
- During early stages of revegetation, plants are small and may be planted in increased densities to establish erosion control measures; however, as these plants mature and increase in size they must be thinned to meet fuel modification standards.
- The term "fire resistant" may be misleading. All plants will burn if there is enough heat and other conditions are right. Vegetative fire resistance may be enhanced through consistent irrigation.

General Requirements:

- Select plant material which will produce a coverage of permanent planting effectively controlling erosion.
- Consider utilizing deep-rooted plant material needing limited watering.
- Limit use of plants which are known to be especially flammable throughout your property.
- Limit use of plants which develop large volumes of foliage and branches.
- Limit use of plants which develop deciduous or shaggy bark.
- Limit use of plants which develop dry or dead undergrowth.
- **Recommended** minimum spacing is 30 feet between canopies for trees, and 15 feet or three times the diameter of the individual crowns for large shrubs. Limited grouping or alternative spacing may be approved.

Specific Requirements:

- Plants and trees must be individually planted, spaced and maintained in such a manner that they do not form a means of transmitting fire from native growth to the structure.
- Select plant species from the approved plant list for each zone and geographical area. Other species will be reviewed on a case by case basis. Except for dwarf varieties or mature trees small in stature, trees are generally not **recommended** within Zone A for reasons which go beyond fire issues and are therefore not included in the planting guide. Tree canopies may extend into Zone A when planted outside the zone.

- Limit massing of vegetation adjacent to structures; especially under eaves, overhangs, decks, etc.
- Provisions for continuous maintenance must be documented on the fuel modification plan and CCR's, i.e., by homeowner associations, property owners, or other entities.
- Conduct yearly maintenance to reduce fuel volumes, eliminate weeds, remove dead vegetation, etc. prior to annually brush inspections.
- Irrigation shall be designed to supplement native vegetation and establish planted natives and ornamentals.
- Irrigation shall be directed away from native oaks and be placed outside the dripline.

APPENDIX IV

GLOSSARY

CONDUCTION: Direct transfer of heat by objects touching each other.

CONVECTION HEAT: Transfer of heat by atmospheric currents and is most critical under windy conditions and in steep terrain.

CROWN: Upper part of a tree or other woody plant, carrying the main branch system and foliage.

CANOPY: More or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees or other woody growth.

DEFENSIBLE SPACE: An area around the perimeter of structures or developments in the wildland which are key points of defense/attack against encroaching wildfires or escaping structure fires.

DESIRABLE PLANT LIST: List of plants exhibiting characteristics of low fuel volume, fire resistance, and drought tolerance which make them desirable for planting in areas of high fire danger.

DRIPLINE: Ground area at the outside edge of the canopy.

DROUGHT TOLERANCE: Ability of a plant or tree to survive on little water.

FINE FUELS: Fuels such as grass, leaves, and draped pine needles, which, when dry, ignite readily and are consumed rapidly. Also called flash fuels.

FIRE BREAK: Removal of growth usually in strips around housing developments to prevent a fire from spreading to the structures from open land or vice versa.

FIRE RESISTANT: Any plant will burn with enough heat and proper conditions. Resistance is often used as a comparative term relating to the ability of a plant to resist ignition.

FIRE RETARDANCE: Relative comparison of plant species related to differences in fuel volume, inherent flammability characteristics, and ease of fire spread.

FIRE ZONE 4: Any geographic area designated pursuant to Section 6402 and Chapter 26.150 of Title 26, County Building Code to contain the type and condition of vegetation, topography, weather, and structure density to increase the possibility of conflagration fires.

FUELBREAK: A wide strip or block of land on which the native or pre-existing vegetation has been permanently modified so that fires burning into it can be more readily extinguished.

FUEL LOAD: The weight of fuels in a given area, usually expressed in tons per acre.

FUEL MODIFICATION ZONE: A strip of land where combustible native or ornamental vegetation has been modified and partially or totally replaced with drought tolerant, fire retardant plants.

FUEL MOISTURE CONTENT: The amount of water in a fuel, expressed as a percentage of the oven dry weight of that fuel.

FUEL VOLUME: The amount of fuel in a plant in a given area of measurement. Generally an open-spaced plant will be low in volume.

HORIZONTAL CONTINUITY: The extent or horizontal distribution of fuels at various levels or planes.

LADDER FUELS: Fuels which provide vertical continuity between strata. Fire is able to carry from surface fuels by convection into the crowns with relative ease.

LITTER: The uppermost layer of loose debris composed of freshly fallen or slightly decomposed organic materials such as dead sticks, branches, twigs, leaves or needles.

LONG-TERM: In perpetuity of the fuel modification plan requirement.

PROBABILITY OF IGNITION: A rating of the probability that a firebrand (glowing or flaming) will cause a fire, providing it lands on receptive fuels. It is calculated from air temperature, fuel shading, and fuel moisture.

RADIANT HEAT: Transfer of heat by electromagnetic waves and can, therefore, travel against the wind. For example, it can preheat the opposite side of a burning slope in a steep canyon or a neighboring home to the ignition point.

SUBDIVISION: A parcel of land that is subdivided to create multiple individual lots for residential purposes in accordance with The State of California Subdivision Map Act.

TARGET SPECIES: Undesirable species which are generally removed as part of the fuel modification plan (see undesirable species).

UNDESIRABLE SPECIES: Those species of plants with inherent characteristics which make them highly flammable. These characteristics can be either physical or chemical. Physical properties include large amounts of dead material retained within the plant, rough or peeling bark, and the production of large amounts of litter. Chemical properties include the presence of volatile substances such as oils, resins, wax, and pitch. These plants are sometimes referred to as target species.

URBAN INTERFACE: That line, area, or zone where structures and other human development meets or intermingles.

VERTICAL CONTINUITY: The proximity of fuels to each other that governs the fire's capability to sustain itself. Vertical continuity applies to the relationship of aerial fuels to surface fuels or fuels low to the ground.

VERY HIGH FIRE HAZARD SEVERITY ZONE: Any geographic area designated pursuant to Government Code Section 51178 to contain the type and condition of vegetation, topography, weather, and structure density to increase the possibility of conflagration fires.

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APPENDIX V

SUBMITTAL AND ROUTING PROCEDURES

SUBDIVISION AND ACCESS UNIT:

1. Applicants submitting proposed tract or parcel maps for projects located in the Very High Fire Hazard Severity Zone (VHFHSZ) or Fire Zone 4, will be referred to the Fuel Modification Unit for approval of their Preliminary Fuel Modification Plan. Notification will be given to the applicant by use of Form #266, "Conditions of Approval for Subdivisions - Incorporated," or by use of Form #267, "Conditions of Approval for Subdivisions - Unincorporated" during Subdivision Committee meetings. A representative from the Fuel Modification Unit will attend the subdivision meetings.

    a. Fuel Modification Plan Guidelines are available from the Fire Prevention Office, Forestry Division Office, Regional Planning One-Stop, Fuel Modification Unit, Area Prevention Office, Building and Safety, and Contract Cities.

    b. Fuel Modification Plans may be submitted by mail or in person to the Fuel Modification Unit.

2. The Subdivision and Access Unit will notify the Fuel Modification Unit in writing, using Form #266 or Form #267 regarding the impending tract/parcel map.

3. The Fuel Modification Unit will return a copy of the Preliminary Fuel Modification Plan Approval Letter to the applicant and the Subdivision and Access Unit before final map clearance is approved.

FIRE PREVENTION ENGINEERING:

1. Applicants submitting proposed building plans for projects located in the Very High Fire Hazard Severity Zone (VHFHSZ) or Fire Zone 4, will be referred to the Fuel Modification Unit for approval of their Preliminary and/or Final Fuel Modification Plan. Notification will be given to the applicant in the form of the "Very High Fire Hazard Severity Zone/Fire Zone 4" plan check sheet, during the initial review.

    a. Fuel Modification Plan Guidelines are available from the Fire Prevention Office, Forestry Division Office, Regional Planning One-Stop, Fuel Modification Unit, Area Prevention Office, Building and Safety, and Contract Cities.

b. Fuel Modification Plans may be submitted by mail or in person to the Fuel Modification Unit.

2. The following verbatim note will be required to be blueprinted on the final building plans, prior to obtaining approval. "This property is located within an area designated by the Fire Department as Very High Fire Hazard Severity Zone (VHFHSZ) or Fire Zone 4. A Final Fuel Modification Plan shall be submitted and approved, prior to building permit approval. Implementation of the approved Final Fuel Modification Plan and final inspection will be required prior to approval of occupancy." Submit three sets of plans to the Fuel Modification Unit.

3. Fire Prevention, Engineering will notify the Fuel Modification Unit in writing, using the Very High Fire Hazard Severity Zone (VHFHSZ) or Fire Zone 4 Building Requirement Checklist regarding the impending building permit request.

4. The Fuel Modification Unit will return a copy of the Final Fuel Modification Plan Approval Letter to the applicant and the Fire Prevention, Engineering Unit, before building permit clearance is approved.

5. The Fuel Modification Unit will return a copy of the Final Inspection and Receipt of CCR's approval letter to the applicant and the Fire Prevention Unit before final occupancy is approved.

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PREVENTION: *"HOMEOWNERS CHECKLIST"*

OUTSIDE

1 Design/Construction

- __ Consider installing residential sprinklers
- __ Build your home away from ridge tops, canyons and areas between high points on a ridge
- __ Build your home at least 30-100 feet from your property line
- __ Use fire resistant materials
- __ Enclose the underside of eaves, balconies and above ground decks with fire resistant materials
- __ Try to limit the size and number of windows in your home that face large areas of vegetation
- __ Install only dual-paned or triple-paned windows
- __ Make sure that electric service lines, fuse boxes and circuit breaker panels are installed and maintained as prescribed by code
- __ Contact qualified individuals to perform electrical maintenance and repairs

2 Access

- __ Identify at least two exit routes from your neighborhood
- __ Construct roads that allow two-way traffic
- __ Design road width, grade and curves to allow access for large emergency vehicles
- __ Construct driveways to allow large emergency equipment to reach your house
- __ Design bridges to carry heavy emergency vehicles, including bulldozers carried on large trucks
- __ Post clear road signs to show traffic restrictions such as dead-end roads, and weight and height limitations
- __ Make sure dead-end roads, and long driveways have turn-around areas wide enough for emergency vehicles
- __ Construct turnouts along one-way roads
- __ Clear flammable vegetation at least 10 feet from roads and five feet from driveways
- __ Cut back overhanging tree branches above roads
- __ Construct fire barriers such as greenbelts
- __ Make sure that your street is named or numbered, and a sign is visibly posted at each street intersection
- __ Make sure that your street name and house number are not duplicated elsewhere in the county
- __ Post your house address at the beginning of your driveway, or on your house if it is easily visible from the road

3 Roof

- __ Remove branches within 10 feet of your chimney and dead branches overhanging your roof
- __ Remove dead leaves and needles from your roof and gutters
- __ Install a fire resistant roof. Contact your local fire department for current roofing requirements
- __ Cover your chimney outlet and stovepipe with a nonflammable screen of $^1/_2$ inch or smaller mesh

4 Landscape

- __ Create a "defensible space" by removing all flammable vegetation at least 100 feet from all structures
- __ Never prune near power lines. Call your local utility company first
- __ Landscape with fire resistant plants
- __ On slopes or in high fire hazard areas remove flammable vegetation out to 100 feet or more
- __ Space native trees and shrubs at least 10 feet apart
- __ For trees taller than 18 feet, remove lower branches within six feet of the ground
- __ Maintain all plants by regularly watering, and by removing dead branches, leaves and needles
- __ Before planting trees close to any power line contact your local utility company to confirm the maximum tree height allowable for that location

5 Yard

- __ Stack woodpiles at least 30 feet from all structures and remove vegetation within 10 feet of woodpiles
- __ Locate LPG tanks (butane and propane) at least 30 feet from any structure and maintain 10 feet of clearance
- __ Remove all stacks of construction materials, pine needles, leaves and other debris from your yard
- __ Contact your local fire department to see if open burning is allowed in your area; if so, obtain a burning permit
- __ Where burn barrels are allowed, clear flammable materials at least 10 feet around the barrel; cover the open top with a non-flammable screen with mesh no larger than $^1/_4$ inch

6 Emergency Water Supply

- __ Maintain an emergency water supply that meets fire department standards through one of the following:
  - a community water/hydrant system
  - a cooperative emergency storage tank with neighbors
  - a minimum storage supply of 2,500 gallons on your property
- __ Clearly mark all emergency water sources
- __ Create easy firefighter access to your closest emergency water source
- __ If your water comes from a well, consider an emergency generator to operate the pump during a power failure

Flex your Power

January 2005

California Department of Forestry and Fire Protection

Homeowners Checklist

How To Make Your Home Fire Safe

CALIFORNIA DEPARTMENT OF FORESTRY and FIRE PROTECTION
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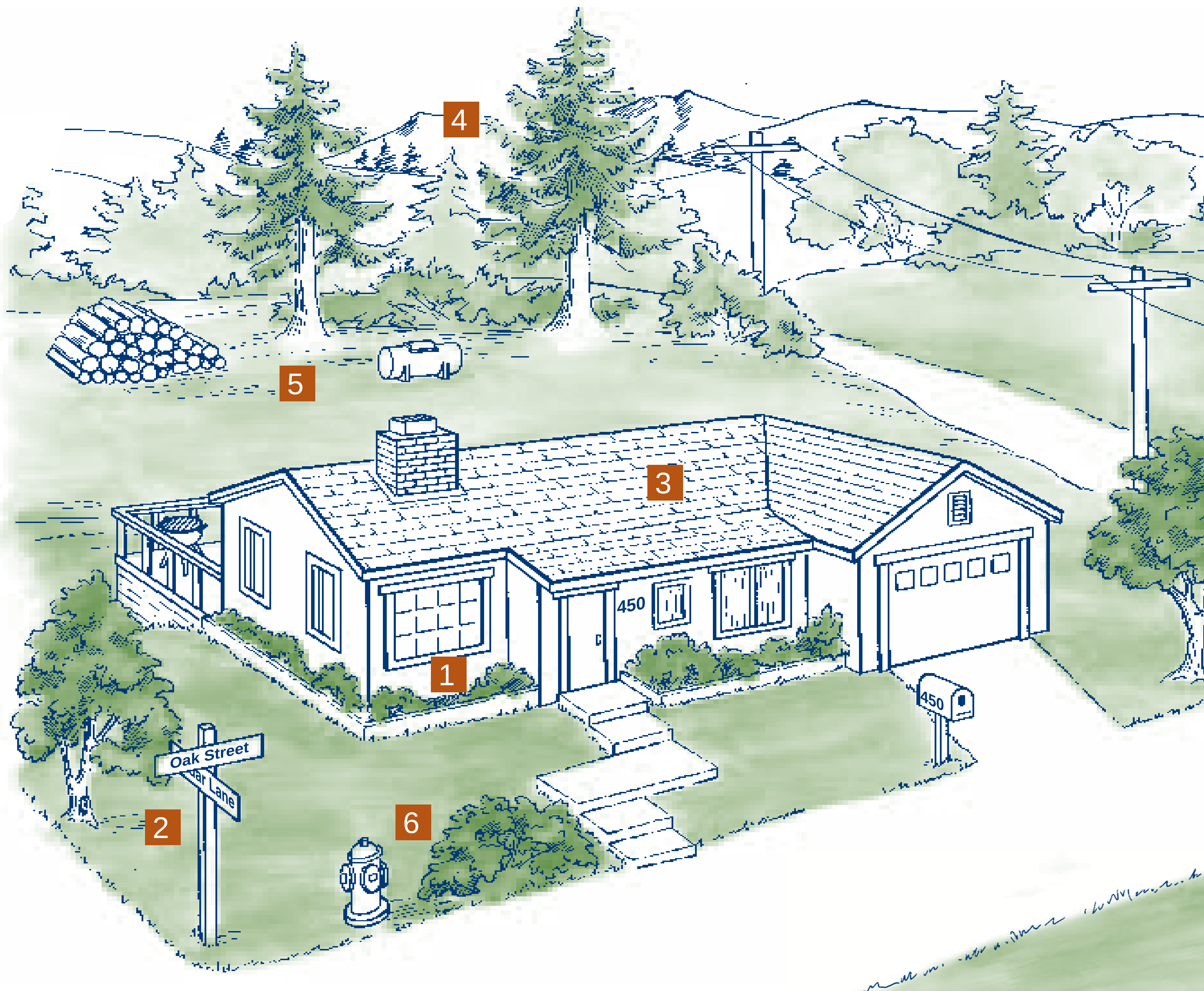

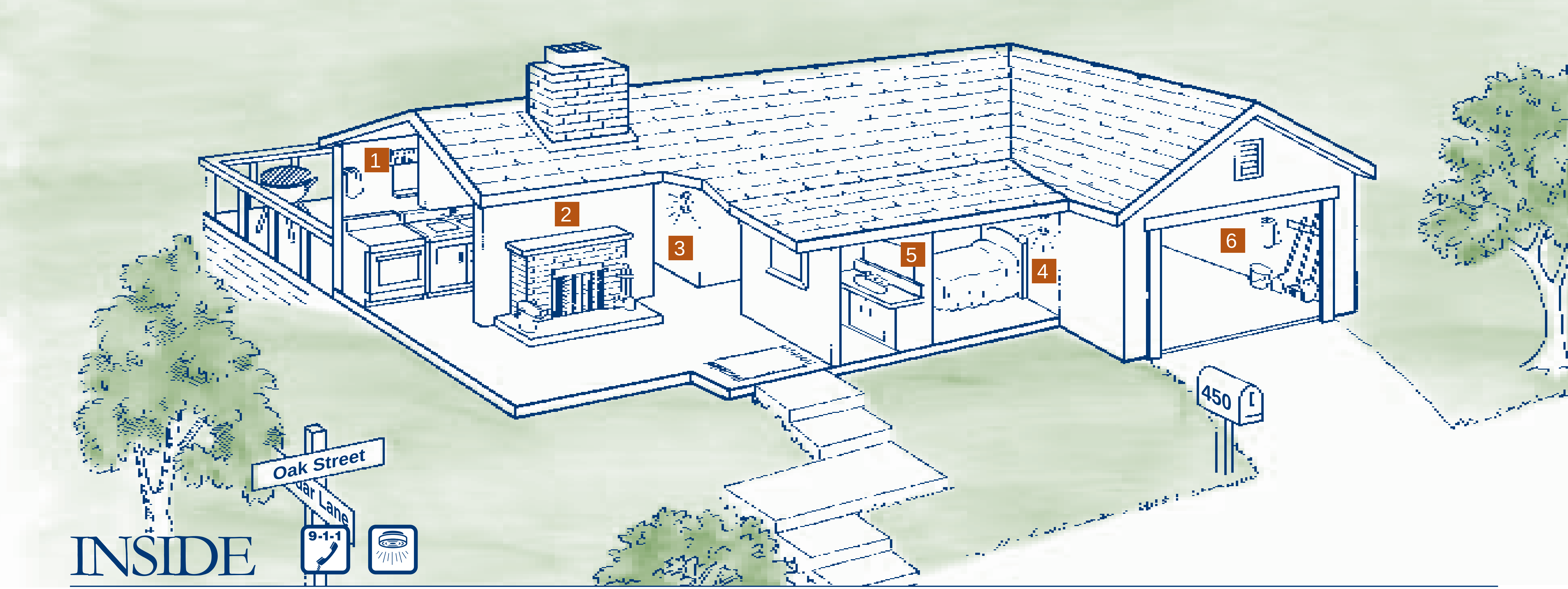

INSIDE

1 Kitchen

— Keep a working fire extinguisher in the kitchen
— Maintain electric and gas stoves in good operating condition
— Keep baking soda on hand to extinguish stove-top grease fires
— Turn the handles of pots and pans containing hot liquids away from the front of the stove
— Install curtains and towel holders away from burners on the stove
— Store matches and lighters out of the reach of children
— Make sure that electrical outlets are designed to handle appliance loads

2 Living Room

— Install a screen in front of fireplace or wood stove
— Store the ashes from your fireplace (and barbecue) in a metal container and dispose of only when cold
— Clean fireplace chimneys and flues at least once a year

3 Hallway

— Install smoke detectors between living and sleeping areas
— Test smoke detectors monthly and replace batteries twice a year, when clocks are changed in the spring and fall
— Install child safety plugs (caps) on all electrical outlets
— Replace electrical cords that do not work properly, have loose connections, or are frayed

4 Bedroom

— If you sleep with the door closed, install a smoke detector in the bedroom
— Turn off electric blankets and other electrical appliances when not in use
— Do not smoke in bed
— If you have security bars on your windows or doors, be sure they have an approved quick-release mechanism so you and your family can get out in the event of a fire

5 Bathroom

— Disconnect appliances such as curling irons and hair dryers when done; store in a safe location until cool
— Keep items such as towels away from wall and floor heaters

6 Garage

— Mount a working fire extinguisher in the garage
— Have tools such as a shovel, hoe, rake and bucket available for use in a wildfire emergency
— Install a solid door with self-closing hinges between living areas and the garage
— Dispose of oily rags in UL (Underwriters Laboratories) approved metal containers
— Store all combustibles away from ignition sources such as water heaters
— Disconnect electrical tools and appliances when not in use
— Allow hot tools such as glue guns and soldering irons to cool before storing
— Properly store flammable liquids in approved containers and away from ignition sources such as pilot lights

Disaster Preparedness

— Maintain at least a three-day supply of drinking water, and food that does not require refrigeration and generally does not need cooking
— Maintain a portable radio, flashlight, emergency cooking equipment, portable lanterns and batteries
— Maintain first aid supplies to treat the injured until help arrives
— Keep a list of valuables to take with you in an emergency; if possible, store these valuables together
— Make sure that all family members are ready to protect themselves with STOP, DROP AND ROLL
— For safety, securely attach all water heaters and furniture such as cabinets and bookshelves to walls
— Have a contingency plan to enable family members to contact each other. Establish a family/friend phone tree
— Designate an emergency meeting place outside your home
— Practice emergency Exit Drills In The House (EDITH) regularly
— Outdoor cooking appliances such as barbecues should never be taken indoors for use as heaters

APPENDIX N, HABITAT RESTORATION PLAN

APPENDIX N

HABITAT RESTORATION FRAMEWORK PLAN

PREVIOUS AND CURRENT RESTORATION EFFORTS

There have been a number of restoration efforts and studies performed on the Preserve. The most comprehensive restoration study performed to date has been "Recommendations for Restoration in the Western Puente Hills, Final Draft," (Recommendations) prepared by Dr. Cheryl Swift in 2004. The Recommendations provides a list of potential restoration projects and analyzes the Puente Hills for areas of common characteristics. The Recommendations also discusses specific techniques and seed and plant lists recommended for use in the area.

In addition, there are a number of restoration efforts being implemented or planned in the area totaling approximately 120 acres, including Harbor Boulevard Wildlife Underpass, the former Kou property, the former Diaz property, the former Javaid property, Powder Canyon, Shapell mitigation, Arroyo Pescadero, the former Chevron property, the former Ford property, Orange Avenue–Castor Bean and Fuel Modification Area, Hellman Park Trailhead, Turnbull Canyon, the former Canlas property, the former Unocal property (mitigation for Pacific Communities, Catellus, and K. Hovnanian), Centex at Sycamore Canyon, Hacienda Hills Trailhead, and LA County Public Works mitigation at Powder Canyon (see Figure A-6). Some of these projects are mitigation for development projects in the surrounding area. A summary of each project is provided below.

- Harbor Boulevard Wildlife Underpass: native revegetation at Harbor Boulevard crossing.
- Former Kou property: 3.8 acres to walnut and oak woodland.
- Former Diaz property: 16 acres to walnut woodland and oak woodland.
- Former Javaid property: 5 acres to walnut woodland and oak woodland.
- Powder Canyon: 2 acres to native grassland, oak woodland, and walnut woodland.
- Arroyo Pescadero: 2.5 acres to coastal sage scrub.
- Former Chevron property: 9 acres of eucalyptus grove removal restored to coastal sage scrub, oak woodland, and elderberry woodland.
- Former Ford property: 0.5 acres to coastal sage scrub.

Prepared By: LSA

FIGURE A-6

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Preserve Boundary

Existing Restoration Sites

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Existing Restoration Sites

SOURCE: Image-EagleAerial (2003)

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- Orange Avenue–Castor Bean and Fuel Modification Area: 1 acre to fuel modification compatible coastal sage scrub.
- Hellman Park Trailhead: 2 acres to cactus scrub and coastal sage scrub.
- Turnbull Canyon: 4 acres to coastal sage scrub and grassland.
- Former Canlas property: 8 acres to coastal sage scrub.
- Former Unocal property:
  - Shapell Mitigation: 20 acres to coastal sage scrub.
  - Catellus Residential Group Mitigation: 0.7 acre to coastal sage scrub and riparian scrub.
  - Pacific Communities Mitigation: 2 acres to coastal sage scrub and riparian scrub.
  - K. Hovnanian Companies of California Mitigation: 12.9 acres to coastal sage scrub and riparian scrub.
  - Forest Lawn: 17.2 acres to coastal sage scrub and riparian, with nonnative arundo removal.
- Hacienda Hills Trailhead: 1.4 acres to sycamore woodland, oak woodland, meadow, and coastal sage scrub.
- Centex Stone Canyon Preserve project at Sycamore Canyon: 3.5 acres to sycamore riparian woodland habitat.
- Los Angeles County Public Works mitigation at Powder Canyon: 3.6 acres to willow/mulefat scrub with a riparian understory.

These restoration efforts account for a small fraction of the restoration opportunities available on the Preserve. There are approximately 1,366 acres of areas that were mapped by BonTerra that contain exotic vegetation and are available for restoration. Habitat restoration recommendations and priorities follow.

HABITAT RESTORATION GUIDELINES AND PRIORITIES

The purpose of this Habitat Restoration Plan (Plan) is to provide guidance on restoring degraded and disturbed habitats throughout the Habitat Authority property. While the Plan provides a great deal of technical information on existing conditions in the Preserve and on restoration methods, it is programmatic in nature and accomplishes the following:

- Identifies the range of conditions that exist in the potential restoration areas, specifically soil characteristics and weed composition;
- Provides restoration criteria and a priority evaluation on restoring the degraded and disturbed habitats;
- Provides information on the most effective restoration methods currently known and their associated costs;
- Provides basic data and recommendations prescribing restoration methods for each type of potential restoration area;
- Provides guidelines for preparing more detailed, site-specific plans that will maximize the success and minimize the cost of individual restoration efforts; and
- Provides guidance for approving future mitigation projects in the Preserve.

Specific plans for individual restoration sites should be developed on a case-by-case basis, with consideration of the information and guidelines provided in this Plan as well as new information that is developed through adaptive management.

This Plan is organized by the analyses of existing conditions (e.g., soil and weeds), restoration criteria and priority, restoration application, restoration techniques, performance standards and monitoring, and planting and seeding palettes.

This Plan considers all of the baseline resource and cultural resource data to make sure that the tenets of Ecosystem Management are incorporated. The Plan utilizes restoration criteria on which to base the restoration priorities as well as a master list of techniques and the situations for which they are appropriate. The restoration areas are evaluated for site conditions, and recommendations of the specific restoration techniques are prescribed for each type of restoration area.

Approach

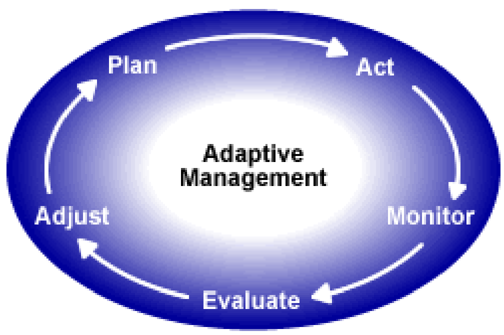
This Plan was prepared with three primary concepts in mind: Ecosystem Management, Adaptive Management, and Ecological Successional Model.

Ecosystem Management. Ecosystem Management integrates scientific knowledge of ecological relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term.

The following are Ecosystem Management goals:

- Maintain viable populations of all native species in situ;
- Represent, within protected areas, all native ecosystem types across their natural range of variation;
- Maintain evolutionary and ecological processes (e.g., disturbance regimes, hydrological processes, nutrient cycles);
- Manage over a period of time long enough to maintain the evolutionary potential of species and ecosystems; and
- Accommodate human use and occupancy within these constraints.

Adaptive Management. Adaptive Management incorporates regular monitoring to evaluate the implemented Plan. Adaptive Management allows for continual adjustments to improve upon the current Plan. It is expected that this Plan will be used as a guide and that as more restoration is implemented in the Preserve, improvements will be made from each restoration success and failure.



Ecological Successional Model. The Ecological Successional Model mimics the successional process that occurs in nature following a disturbance. In nature, fast-growing plant species quickly recolonize the disturbed areas. These fast-growing species are well suited for competing against the heavily invasive alien species such as mustard, annual grasses, and thistle. In addition, these early seral species help prepare the soil by colonizing mycorrhizae and fixing nitrogen for the slower-developing perennials. By the time the vegetation reaches the climax plant community, most of the early successional species have dropped out of the plant community. However, these early successional species are lying dormant in the soil as seed, ready to germinate following the next disturbance. Plant communities are continuously in a state of change, constantly progressing towards a climax state, and are always being disturbed by natural and human forces. By basing the restoration primarily on seeded species, the specific site conditions will determine the actual climax plant community. These conditions and their effects on the ultimate community cannot always be known with certainty. In contrast, a climax restoration model attempts to mimic the climax plant community. This type of restoration leaves out the early successional species, primarily relying on container plants to provide the instant climax plant community. This model also assumes that the restoration "designer" knows what the climax community should be including its species composition.

Soil

An understanding of soil and vegetation associations is key to determining appropriate habitat restoration. To start, LSA determined whether any of the soil associations were more likely to support exotic weeds. Table A-O shows the distribution of weedy areas across soil associations in relation to native vegetation. Table A-P shows that generally, exotic weeds are likely to be found in all soil associations from clay soils on gentle slopes to sandy loam soils on steep slopes.

Table A-O: Soil Associations Acreage in Relation to Native Vegetation and Weed Distribution

Soil Association	Soil Association Total Acres	Acres of Native Vegetation (%)	Acres of Weeds (%)
San Andreas-San Benito 30–70 percent slope	1,266	862 (68%)	404 (32%)
Hanford	618	360 (58%)	258 (42%)
Mocho-Sorrento	16	12 (75%)	4 (25%)
Perkins-Ricon	374	224 (60%)	150 (40%)
Altamont-Diablo 9–30 percent slope	341	238 (70%)	103 (30%)
Altamont-Diablo 30–50 percent slope	1,175	804 (68%)	371 (32%)

Table A-P: General Relationships of Exotic Species

Weed Community	Soil Characteristics		Aspect
	Texture	Calcareous (Lime Detected)	
Brassica nigra/Centaurea melitensis	Sandy Loam	No Lime	East to South to West
*Brassica nigra/*Nonnative grass	Clay Loam to Loam	Preference	All
Brassica nigra/Silybum marianum	Clay Loam	No Lime	East to South to West
*Erodium cicutarium/*Nonnative grass	Clay Loam	Preference	All
Eucalyptus glauca	Clay to Clay Loam	No Lime	All
Foeniculum vulgare	Clay to Clay Loam	No Lime	All
Hirschfeldia incana/Centaurea melitensis	Clay	Preference	West to Southeast
Nicotiana glauca/Brassica nigra	Clay Loam	Preference	South to Southwest
Nonnative grass/*Brassica nigra*	Clay Loam, Clay to Loam	Preference	All

Weed Community	Soil Characteristics		Aspect
	Texture	Calcareous (Lime Detected)	
Nonnative grass/*Centaurea melitensis*	Clay Loam	Preference	Southeast to Southwest
Nonnative grass/*Erodium cicutarium*	Clay	No Lime	All
Nonnative grass/*Eucalyptus glauca*	Clay	No Lime	All
Nonnative grass/*Hirschfeldia incana*	Clay Loam to Clay	No Lime	All
Nonnative grass/*Phalaris aquatica*	Clay	No Lime	North to Southeast
Nonnative grass/*Pichris echioides*	Clay	No Lime	Northwest to East
Nonnative grass/*Raphanus sativus*	Clay	No Lime	All
Phalaris aquatica/Nonnative grass	Clay	No Preference	Northwest to Northeast
Raphanus sativus/Brassica nigra	Clay to Clay Loam	No Lime	All
Ricicus communis/Silybum marianum	Loam	Preference	Southeast to West
Schinus terebenthifolius/Brassica nigra	Clay Loam	Preference	South to Southeast

The analyses from the Exotic Plant Species section (Appendix G) show the general relationships between soil, aspect, and weed species. These conclusions are based on limited soil tests.

Table A-Q shows the general relationship of some of the dominant native communities based on the limited soil testing conducted for this study. These general relationships can be used as a basis for developing the most appropriate native habitat for restoration in the Preserve. However, it should be stressed that the results are based on sample test locations over the entire Preserve. A more comprehensive sampling regime at specific locations for several key soil characteristics, such as lime, texture, and soil shrink-swell characteristics would provide more insight to guide appropriate habitat restoration.

Table A-Q: Specific Relationships of Native Communities Based upon Limited Soil Tests

Plant Community	Soil Characteristics		Aspect
	Texture	Calcareous (Lime Detected)	
Black Sage Scrub	Loam to Clay Loam	No Preference	East to West
Chaparral	Loam to Clay Loam	No Preference	North to Northwest
Coyote Brush Scrub	Clay	No Preference	Northwest to Southeast
Elderberry Woodland	Clay Loam	No Lime	North to West
Nassella Grassland	Clay to Clay Loam	No Lime	No Preference
Oak Woodland	Clay Loam to Loam	No Lime	North
Purple Sage Scrub	Clay Loam	Preference	Southeast to Southwest
Sagebrush Scrub	Sandy Loam to Clay	Low Preference	No Preference
Sagebrush/Buckwheat Scrub	Sandy Loam to Clay	No Lime	Southeast to Southwest
Walnut Woodland	Clay	Preference	Northeast to West

Based upon the results of LSA's analysis, which indicates that particular habitats prefer certain soil types, further soil investigation should be required during the development of a specific plan for each identified weed polygon. At a minimum, the soil should be mapped within each polygon to determine the overall type of soil: clay, clay loam, or loams. If the study is conducted during summer or early fall, then soil cracks should be noted to establish the shrink-swell capacity of the soils. Additionally, pooled soil samples from similar soil textures across the site should be collected, and tests for lime and available phosphorous should be performed. After these soil analyses establish texture and limited chemistry, then geomorphic position, slope, and aspect will contribute to determining an appropriate habitat for restoration based upon descriptions and analyses in the preceding sections.

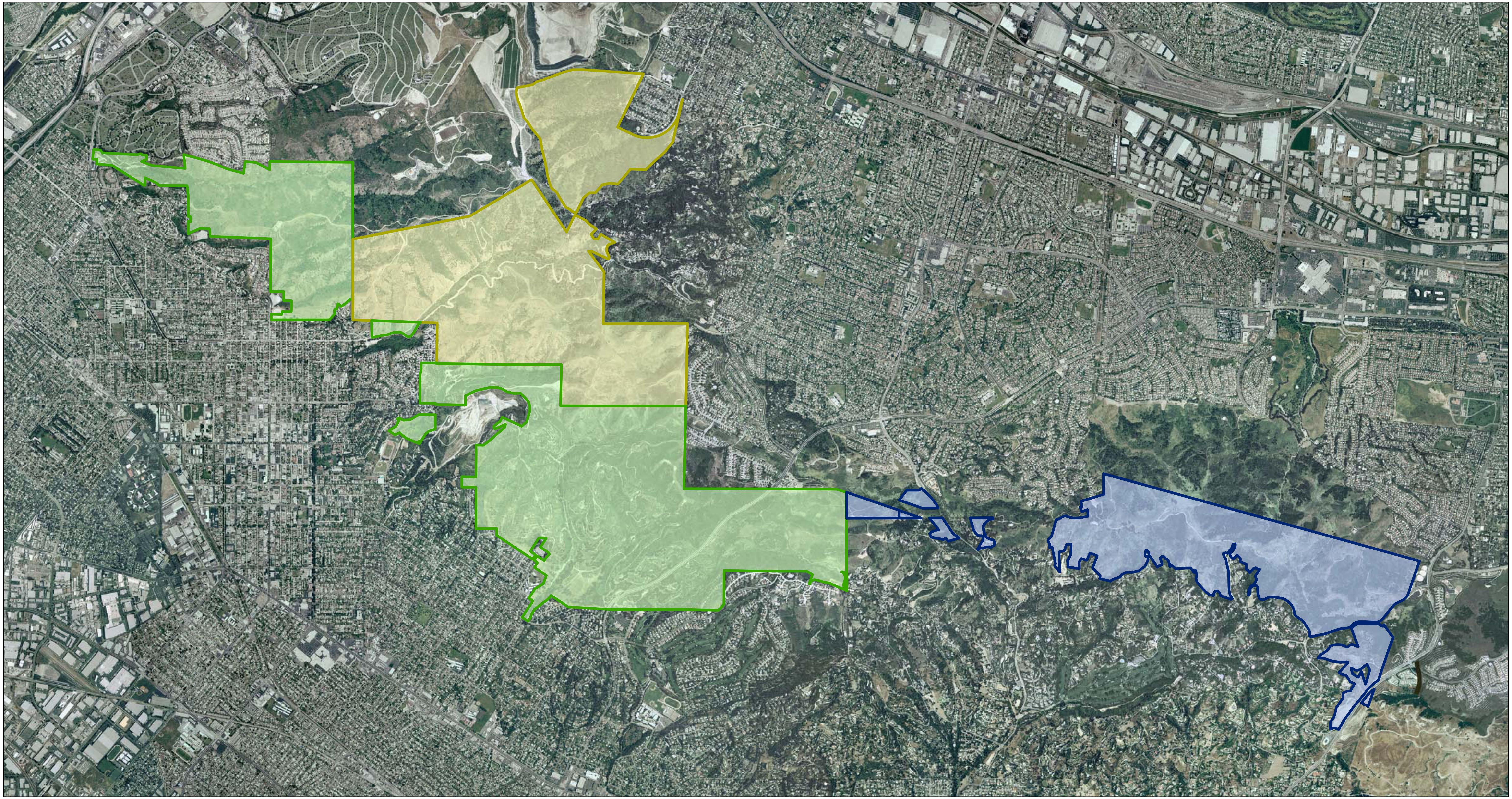
Restoration Criteria and Priority Ranking

Restoration criteria and priority ranking were developed with input from the Habitat Authority when all the data were collected and analyzed and results were discussed. The criteria and priorities will be analyzed for and applied to the previously identified weed polygons. It is important to note that weeds are scattered throughout the Preserve and not only limited to the areas mapped by BonTerra; however, the largest and highest concentration of weeds are found in these areas and will be the most useful for restoration planning purposes.

Habitat restoration/priorities were originally derived based on a concept of individual "management areas" (Whittier, Hacienda Heights, and La Habra Heights) throughout the Preserve (Figure A-7). However current management efforts are based on a Preserve-wide assessment. Therefore, the originazation of the priorities by management unit provided herein is primarily for general information and does not prescribe actual management priorities.

Another factor affecting restoration priorities is the annual restoration budget. It will be important to maximize the restoration effort and cost-effectiveness to provide the most ecologically meaningful restoration.

Priority Calculating Method. Restoration priorities were developed using a number of factors including average slope category; polygon size; proximity to trails/roads; proximity to existing restoration efforts; whether it is positioned on a ridge top above natives; the presence of targeted highly invasive species and whether the targeted invasive species are the top two dominant species; and wildlife connectivity. Each category was given a priority value based upon criteria developed with input from the Habitat Authority. Although each priority value is somewhat subjective, weighting is based on the relative degree of difficulty for restoration and habitat value in an effort to maximize the amount of habitat restored within the Habitat Authority's budget. It is important to note that this analysis does not include fire or rare-plant data because they were not available at the time of this analysis. The rankings from each of the categories were added together, resulting in a priority ranking for the overall Preserve. The management areas were further divided into restoration planning units by watershed. Each of restoration planning units is referenced with the names called out on the USGS map. All unnamed restoration units are designated with a letter referencing the management area within the same watershed and a number. For example, H3 refers to the third canyon in the



Prepared By: LSA

FIGURE A-7

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Hacienda Heights Management Area

La Habra Heights Management Area

Whittier Management Area

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Habitat Restoration Plan
Management Areas

SOURCE: Aerial-EagleAerial (2003)

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Hacienda Heights restoration unit. The restoration units were then ranked throughout the Preserve. Because the Preserve manages the land according to city/community ownership, the ranking of restoration units over the whole Preserve are further ranked by management area (Whittier, Hacienda Heights, and La Habra Heights). The restoration priority factors are described below.

Slope. In general, it is easier and less expensive to restore land with gentle slopes than land with steep slopes. The steeper areas are more difficult to access with equipment and personnel; tend to be more erosive; and, in extreme cases, can present a hazardous working condition. The percent slope was calculated for the weed polygons within the Preserve. The slope was broken into four categories: 0–20 percent, 20–40 percent, 40–60 percent, and 60–85 percent). Each weed polygon was designated the slope category with the most area for that polygon. Since some of the potential restoration areas are on very steep terrain, such as in Turnbull Canyon, these areas were given a low priority and ranked 2. The more gentle areas were ranked 40. The slope categories and priority values are shown in Table A-R below.

Table A-R: Percent Slope Categories and Priority Values

Percent Slope (%)	Priority Value
0–20	40
20–40	36
40–60	20
60–85	2

Size. The size of the weed polygons is generally related to a cost efficiency factor. The larger the area, the more cost-effective it will be to restore it. The largest weed polygons were designated a priority value of 10, and the smallest weed polygons were designated a priority value of 1. The weed polygon size categories and priority values are shown in Table A-S below.

Table A-S: Weed Polygon Size Categories and Priority Values

Weed Polygon Size	Priority Value
25–50 acres	10
10–25 acres	8
5–10 acres	6
1–5 acres	2
< 1 acre	1

Proximity to Roads and Trails. Site access by equipment and personnel is important when evaluating a restoration site. Site access was determined by proximity to existing roads or trails. The roads and trails were buffered at 10 feet, 50 feet, 100 feet, 500 feet, 1,000 feet, and 5,000 feet. The weed polygons were classified by the closest proximity category to the road or trail. Table A-T shows the priority-valued designated for each proximity classification.

Table A-T: Proximity to Roads and Trails

Proximity to Roads and Trails (feet)	Priority Value
< 10	10
10–50	9
50–100	8
101–500	5
501–1,000	3
1,000–5,000	2
> 5,000	1

Proximity to Existing Restoration. There are a number of restoration efforts that are planned or are currently underway in the Preserve. In order to help protect the integrity of these young restoration sites from composition from surrounding weeds, higher priority was given to those weed polygons in close proximity to existing or planned restoration sites. Also, the areas near existing restoration sites usually have well-traveled access and are nearby existing staging areas. Table A-U shows the priority values for proximity of existing restoration.

Table A-U: Proximity to Existing Restoration Efforts

Proximity to Existing Restoration (feet)	Priority Value
< 500	10
501–1,000	8
1,001–2,000	6
> 2,000	3

Exotics' Position on Ridge Tops. In areas where exotics are positioned at the highest elevations, natural conversion to native plant communities is the most difficult. These areas do not have a continuous source of native seeds as they would if positioned downhill of native plant communities. In addition, these exotics will continue to spread seed downhill into native plant communities. The weed polygons that are positioned on ridge tops are designated a priority value of 10, and the other weed polygons are designated a priority value of 4. Table A-V shows the priority value for the ridge top position.

Table A-V: Exotics Positioned on Ridge Tops

Exotics Positioned on Ridge Tops	Priority Value
Yes	10
No	4

Highly Invasive Species. There are some exotic species that are more invasive than others. The most highly invasive exotic weeds are identified and rated by California Invasive Plant Council (CalIPC). In addition, the Preserve has provided input on weeds that seem to be spreading in the Preserve. The most invasive of weeds should be a top priority to slow and stop their spread. If one or more of these species was present, the highest priority value was designated for that weed polygon. In addition, the amount of area these highly invasive weeds occupy is an important factor in their rate of spread and eradication. To account for this, weed polygons where the dominant and second most dominant weeds were invasive with a rating greater than 5 had a multiplier applied as follows. For weed polygons where the dominant weed was a species greater than 5, a 1.5 multiplier was applied. For weed polygons where the second dominant weed was a species greater than 5, a 1.2 multiplier was applied. The three numbers, including highly invasive weed species, most dominant invasive weed with a value greater than 5 (with multiplier), and second dominant highly invasive weed with a value greater than 5 (with multiplier), were added to the total. Table A-W shows a list of the most highly invasive weeds and their designated priority value.

Table A-W: Highly Invasive Species and Priority Value

Highly Invasive Exotic Species Present			
Scientific Name	**Common Name**	**CAL-IPC**	**Value**
Schinus molle	Peruvian pepper	Limited	3
Nonnative Grasses	NNG	Moderate	3
Brassica nigra	black mustard	Moderate	4
Bromus diandrus	ripgut brome	Moderate	4
Robinia pseudoacacia	black locust	Limited	5
Nicotiana glauca	tree tobacco	Moderate	6
Carduus pycnocephalus	Italian thistle	Moderate	10
Cirsium arvense	Canada thistle	Moderate	10
Cirsium vulgare	bull thistle	Moderate	10
Cortaderia selloan	pampas grass	High	10
Foeniculum vulgare	Fennel	High	10
Myoporum laetum	Myoporum	Moderate	10
Pennisetum setaceum	fountain grass	Moderate	10
Phalaris aquatica	harding grass	Moderate	10
Ricinus communis	castor bean	Limited	10
Schinus terebinthifolius	Brazilian pepper	Limited	10
Silybum marianum	milk thistle	Limited	10
Conium maculatum	poison hemlock	Moderate	10
Eucalyptus sp.	Eucalyptus	Limited to Moderate	10
Acacia sp.	Acacia	Limited	8
Washingtonia robusta	Mexican fan palm	Moderate	6

Highly Invasive Exotic Species Present		CAL-IPC	Value
Scientific Name	Common Name		
Dominance 1	> 5 Invasive Value	Multiply by 1.5	
Dominance 2	> 5 Invasive Value	Multiply by 1.2	

Wildlife Connectivity. The Preserve provides connectivity for wildlife from canyons leading from Chino Hills at the eastern Puente Hills west to the San Gabriel River and beyond. Each watershed was given a rating depending upon whether it had a high, medium, or low importance for wildlife connectivity. Table A-X shows the priority values associated with the different levels of importance.

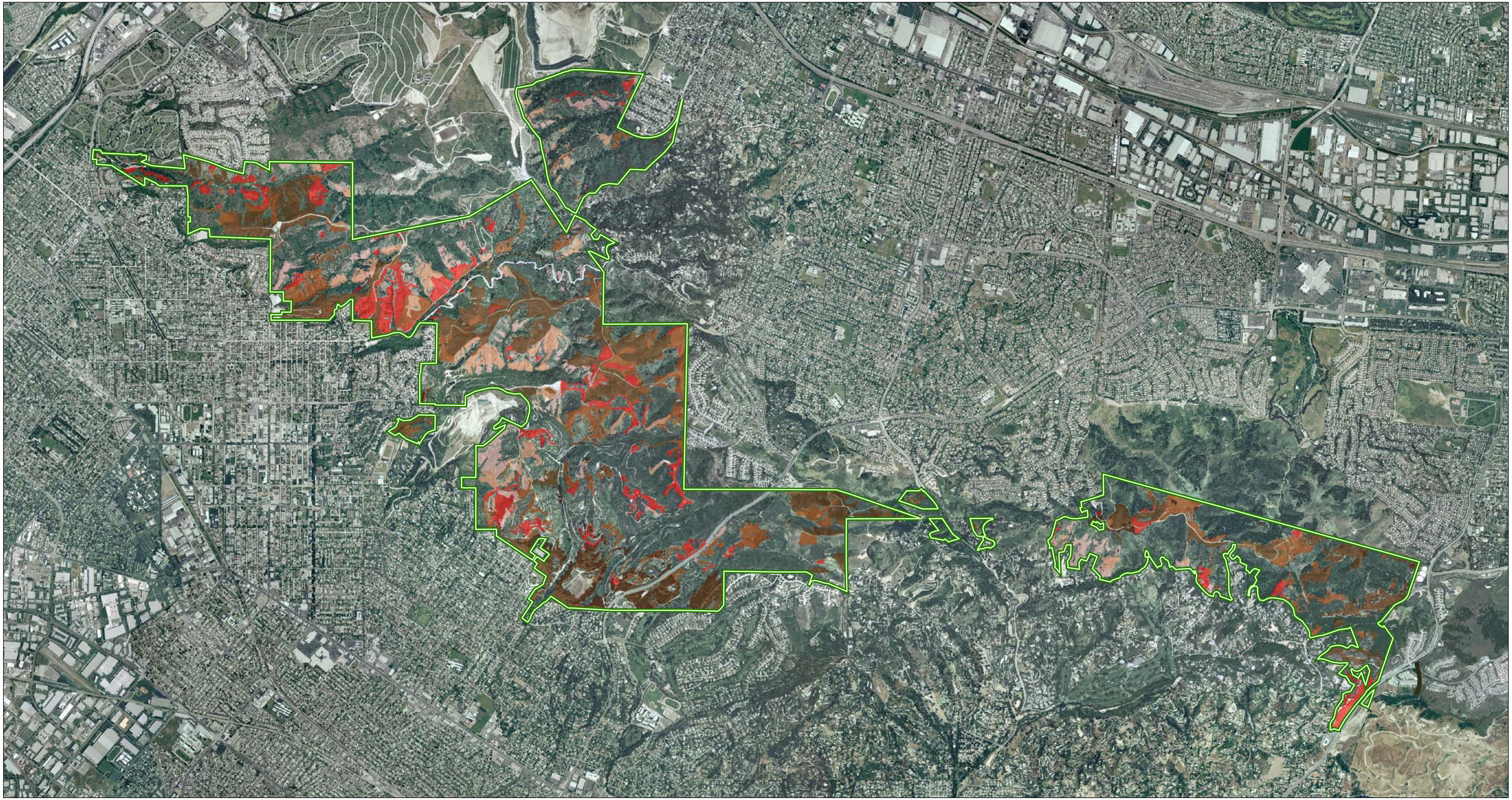
Table A-X: Wildlife Connectivity and Priority Values

Importance of Connectivity	Priority Value
High Importance	10
Medium Importance	5
Low Importance	2

When all categories were designated, the priority values for each category were added together, resulting in a cumulative total to help create a basis for the restoration priorities. The resulting priority scores were then divided into five priority categories ranging from high to low. Table A-Y shows the priority categories and associated priority score totals. Figure A-8 shows the results of the weighted analysis for the overall priorities for restoration across the entire Preserve.

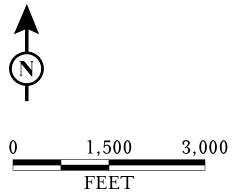
Table A-Y: Restoration Priority Ranking Categories and Priority Score Ranges

Restoration Priority Ranking	Priority Score Ranges
High Priority	70–94
Medium-High Priority	60–69
Medium Priority	50–59
Medium-Low Priority	40–49
Low Priority	0–39



Prepared By: L S A

FIGURE A-8



Preserve Boundary

Restoration Priorities

- Low Restoration Priority
- Medium-Low Restoration Priority
- Medium Restoration Priority
- Medium-High Restoration Priority
- High Restoration Priority

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Overall Restoration Priorities

SOURCE: Aerial-EagleAerial (2003)

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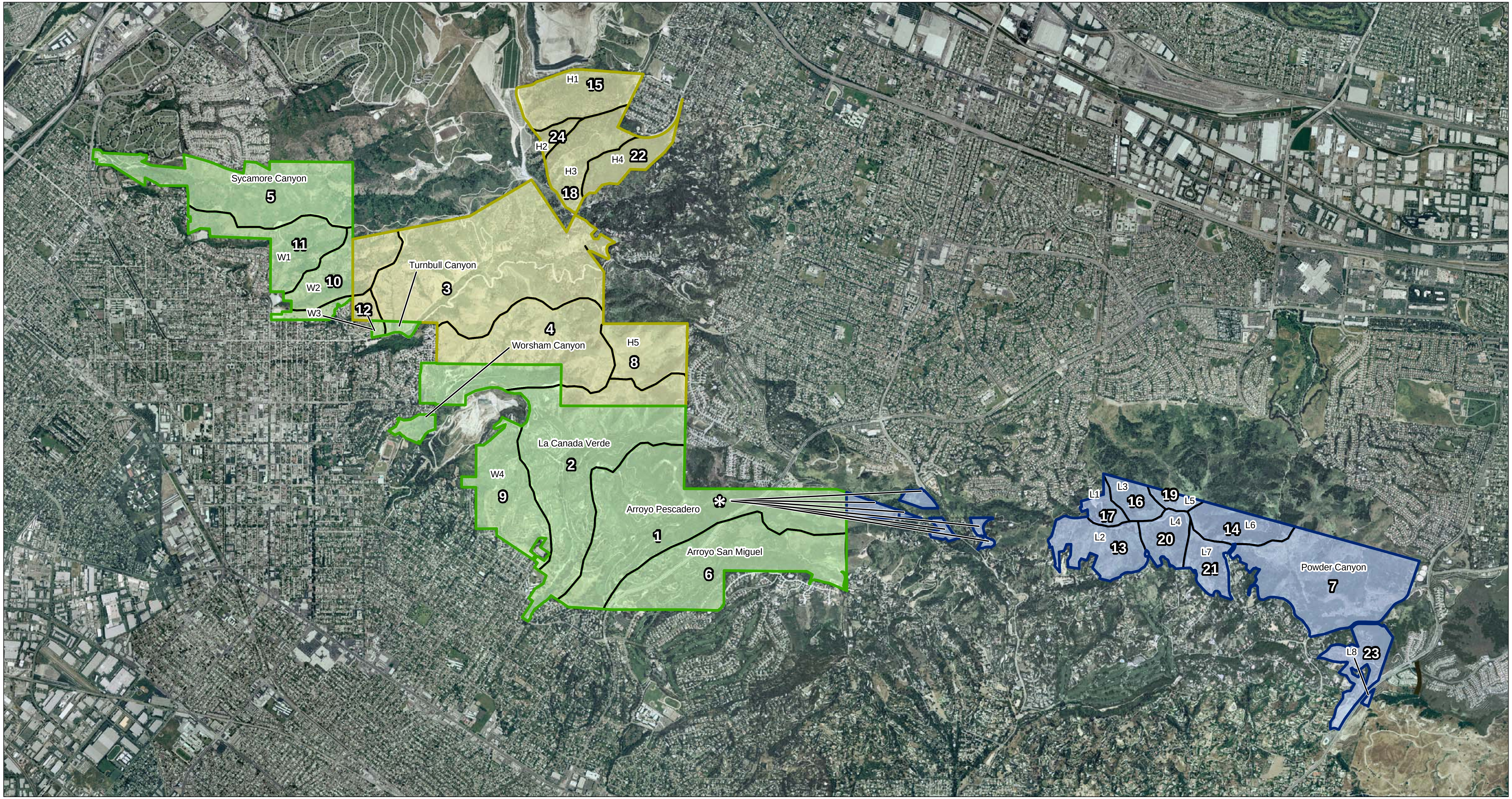
The weed polygons with priority ratings were then divided by restoration units. The restoration unit boundaries are based on watersheds. The restoration units were then ranked by calculating the percent of area occupied by weeds and multiplied by the categories in Table A-Z. The ranking calculation resulted in an ecological-based ranking, as shown in Figure A-9. However, some of the higher-ranked restoration units were not very feasible due to specific site conditions that were not reflected in the priority ranking system. The rankings of the restoration units were manually adjusted to account for this and could not be factored in by a calculation, as shown on Figure A-10. Specific electronic geographic information that contains all of these data will be provided separately to the Habitat Authority.

Table A-Z: Restoration Unit Priority Ranking Multipliers by Percent of Weed Area

Percent of Restoration Unit Occupied by Weeds	Priority Ranking Multiplier
0–20	1
20–40	1.1
40–60	1.3
60–80	1.4
80–100	1.5

MANAGEMENT AREAS AND RESTORATION UNITS

As previously described, the Preserve has been divided into management areas based on ownership and adjacent communities. These management areas are discussed in the following section and restoration priorities have been calculated within each management area. Each of the management areas was analyzed and prioritized for restoration units by roughly-grouped watersheds to determine priority status for restoration. Named canyons and numbered watersheds are described in the following sections for each management area in order of the highest-priority restoration unit to the lowest priority. For each restoration unit, LSA developed a table identifying each weed polygon, the acreage, restoration priority rating, and proposed habitat to restore for polygons with a high to medium restoration priority. Where the weed polygon is one of the 93 soil sample areas, then LSA is confident of the determination of the habitat to be restored. Determination of the appropriate habitat included not only soils but also an analysis of remnant native species in the polygon, dominant weeds and cover, slope, aspect, and adjacent native habitats (specific electronic geographic information that contains all of these data will be provided separately to the Habitat Authority). If a weed polygon does not contain a specific associated soil sample, then the proposed habitat is followed by an asterisk (*) indicating that it was determined based on general soil associations, rather than specific soil characteristics. For those specific invasive weed polygons extrapolated from BonTerra vegetation map, no habitat types were recommended. These polygons can be identified by the polygons in the 800 series. Additionally, analyses of remnant native species in the polygon, percent cover of dominant weeds, slope, aspect, and adjacent native habitats were used to suggest the appropriate habitat for restoration. It is LSA's recommendation that prior to restoration, soils be sampled in these polygons to confirm the appropriate habitat, as described previously. Because some weed polygons crossed watershed and management unit boundaries, some weed polygon numbers repeat within and across restoration units.



Prepared By: LSA

RESTORATION UNITS-LABELED WITH ECOLOGICAL PRIORITY RANKING (E.G., 14) AND NAME (E.G. W4)

HACIENDA HEIGHTS MANAGEMENT AREA

LA HABRA HEIGHTS MANAGEMENT AREA

WHITTIER MANAGEMENT AREA

✿ These parcels do not drain into the Arroyo Pescadero. However, for the purposes of the Habitat Restoration Plan, restoration data for these parcels is grouped with the Arroyo Pescadero Restoration Unit.

N

0 1,500 3,000
FEET

FIGURE A-9

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Ecological Restoration
Unit Priorities

SOURCE: Aerial-EagleAerial (2003)

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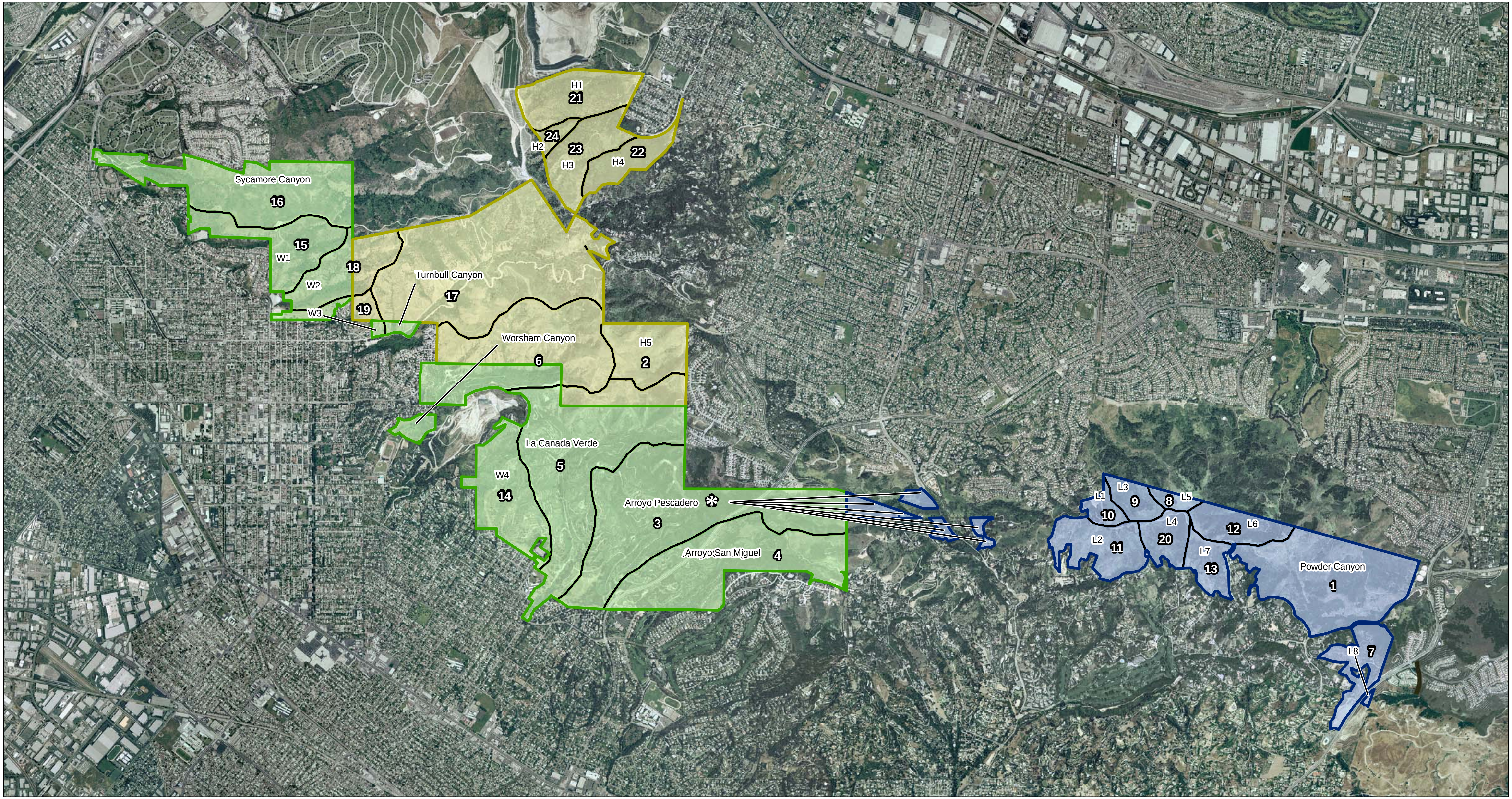

Prepared By: LSA

N

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FEET

Restoration Units-Labeled with Practical Priority Ranking (e.g., 14) and Name (e.g., W4)

Hacienda Heights Management Area

La Habra Heights Management Area

Whittier Management Area

✽ These parcels do not drain into the Arroyo Pescadero. However, for the purposes of the Habitat Restoration Plan, restoration data for these parcels is grouped with the Arroyo Pescadero Restoration Unit.

FIGURE A-10

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

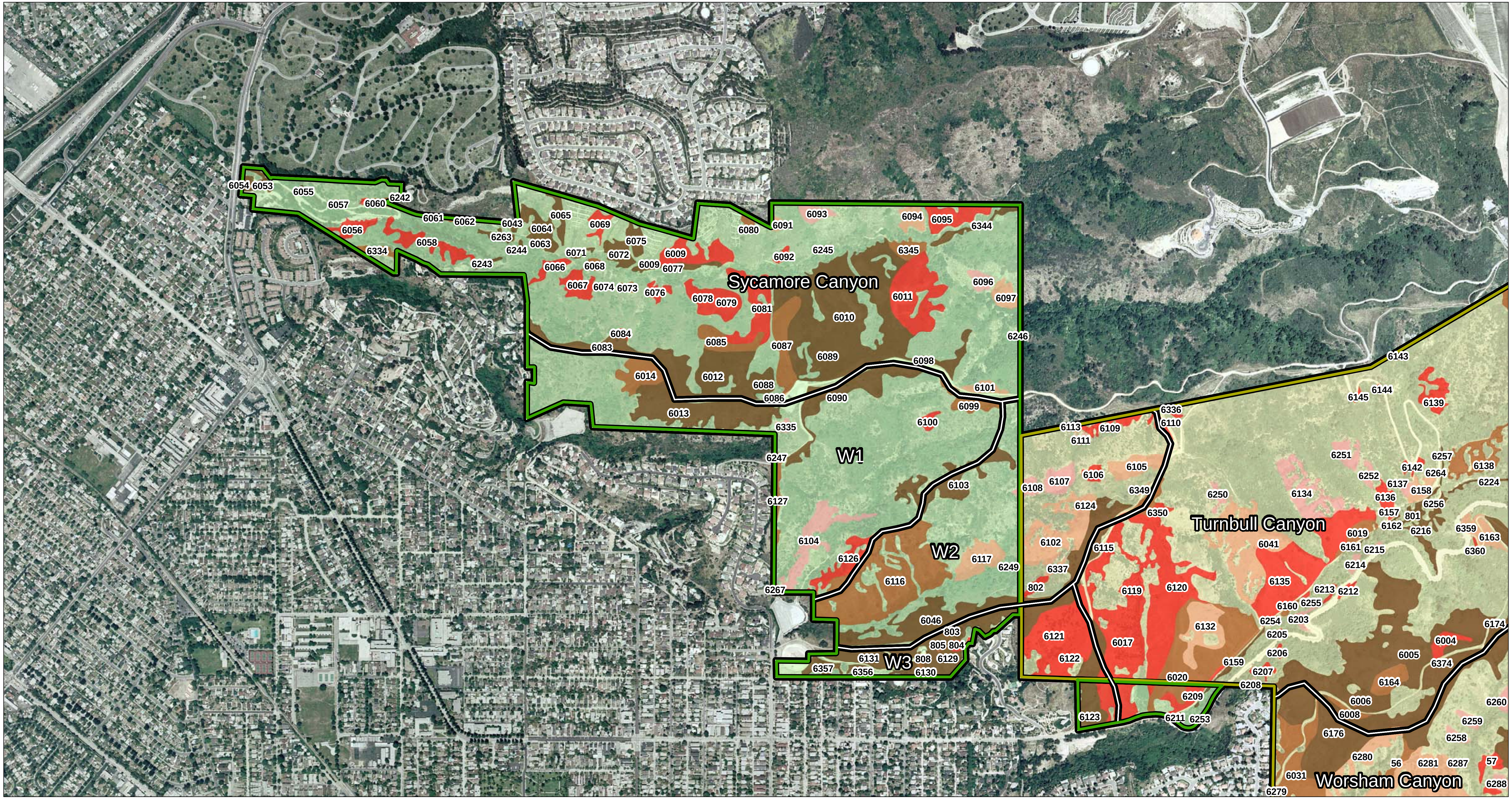
Ecologically-based
Practical Restoration Priorities

SOURCE: Aerial-EagleAerial (2003)

I:\PUE430\GIS\Maps\Draft RMP\Appendices\FigA-10_Overall_RestUnit_Priorities.mxd (03/05/2007)

Whittier Management Area and Restoration Units
The Whittier Management Area contains all soil associations identified within the Preserve. Slopes are predominantly low to moderately steep with some very steep slopes. Dominant exotic species are annual grasses and black mustard, as well as mapped areas dominated by one of the following target invasive exotic species: eucalyptus, fennel, Peruvian pepper, and castor bean. Castor bean is generally found throughout the lower slopes in all drainages. The Whittier Management Area is divided into eight watersheds: Sycamore Canyon, W1, W2, W3, W4, La Cañada Verde, Arroyo Pescadero, and Arroyo San Miguel. Figures A-11, A-12, and A-13 identify the restoration priority of each weed polygon within the eight restoration units.

Arroyo Pescadero. This restoration unit provides connectivity to the La Habra Management Area. There are already a few restoration projects within this watershed, although its native habitats are relatively intact. The soils range from clay, silty clay loam to sandy loams, with mainly Altamont-Diablo 9–30 percent slope Association, Hanford Association, Perkins-Rincon Association, and some areas of San Andreas-San Benito Association. Table A-AA presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the Arroyo Pescadero restoration unit within the Whittier Management Area.



Prepared By: LSA

FIGURE A-11

Restoration Units - Labeled with Name

Hacienda Heights Management Area

Whittier Management Area

Restoration Priorities - Labeled with ID

Low Restoration Priority

Low-Medium Restoration Priority

Medium Restoration Priority

Medium-High Restoration Priority

High Restoration Priority

N

0 500 1,000

FEET

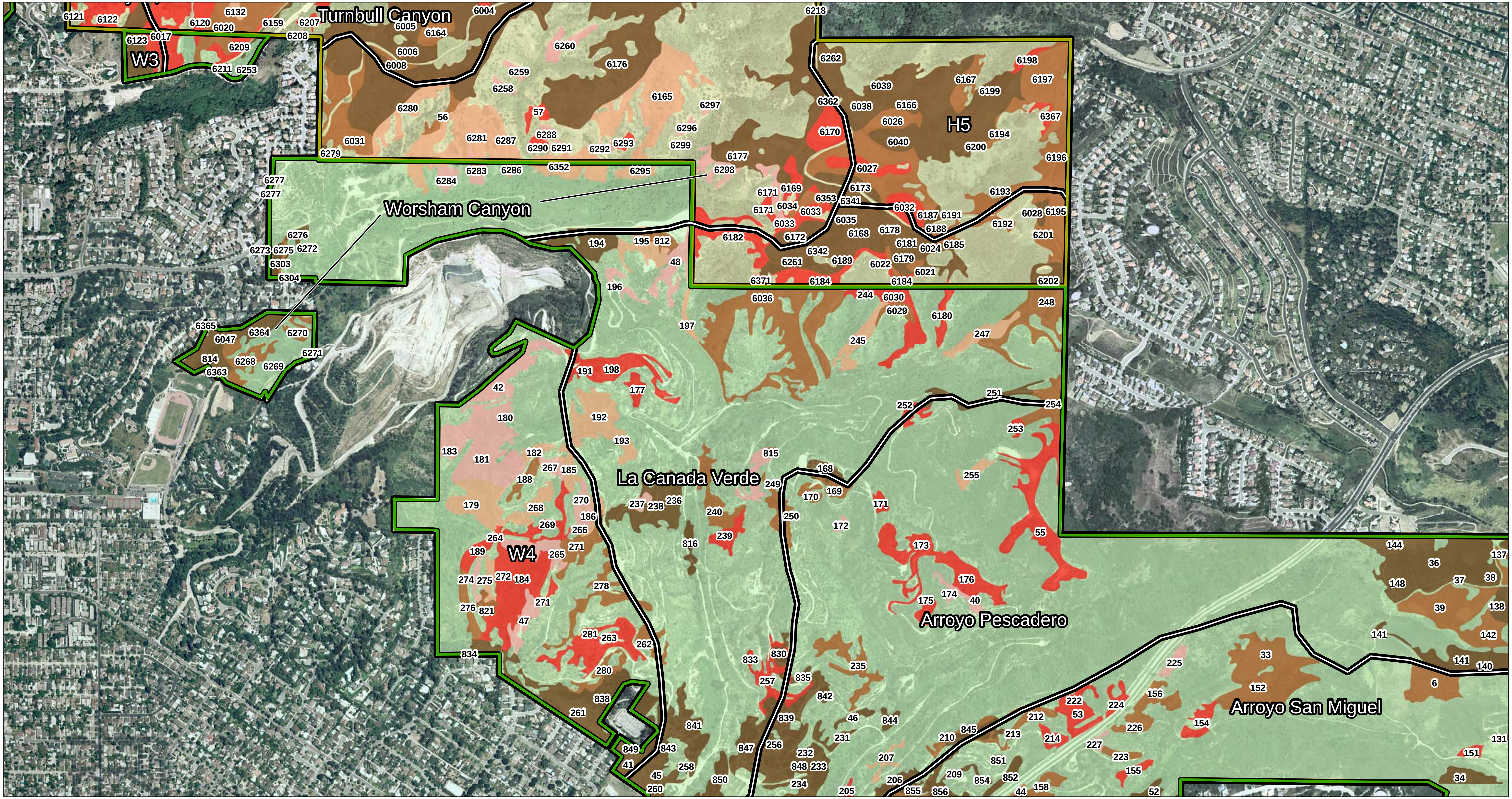
Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Whittier Management Area:
Weed Polygon Restoration Priorities

SOURCE: Aerial-EagleAerial (2003)

I:\PUE430\GIS\Maps\Draft RMP\Appendices\FigA-11_sycamore_W123.mxd (03/05/2007)



Prepared By: LSA

FIGURE A-12

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0 500 1,000

FEET

Restoration Units - Labeled with Name

Whittier Management Area

Hacienda Heights Management Area

Restoration Priorities - Labeled with ID

Low Restoration Priority

Low-Medium Restoration Priority

Medium Restoration Priority

Medium-High Restoration Priority

High Restoration Priority

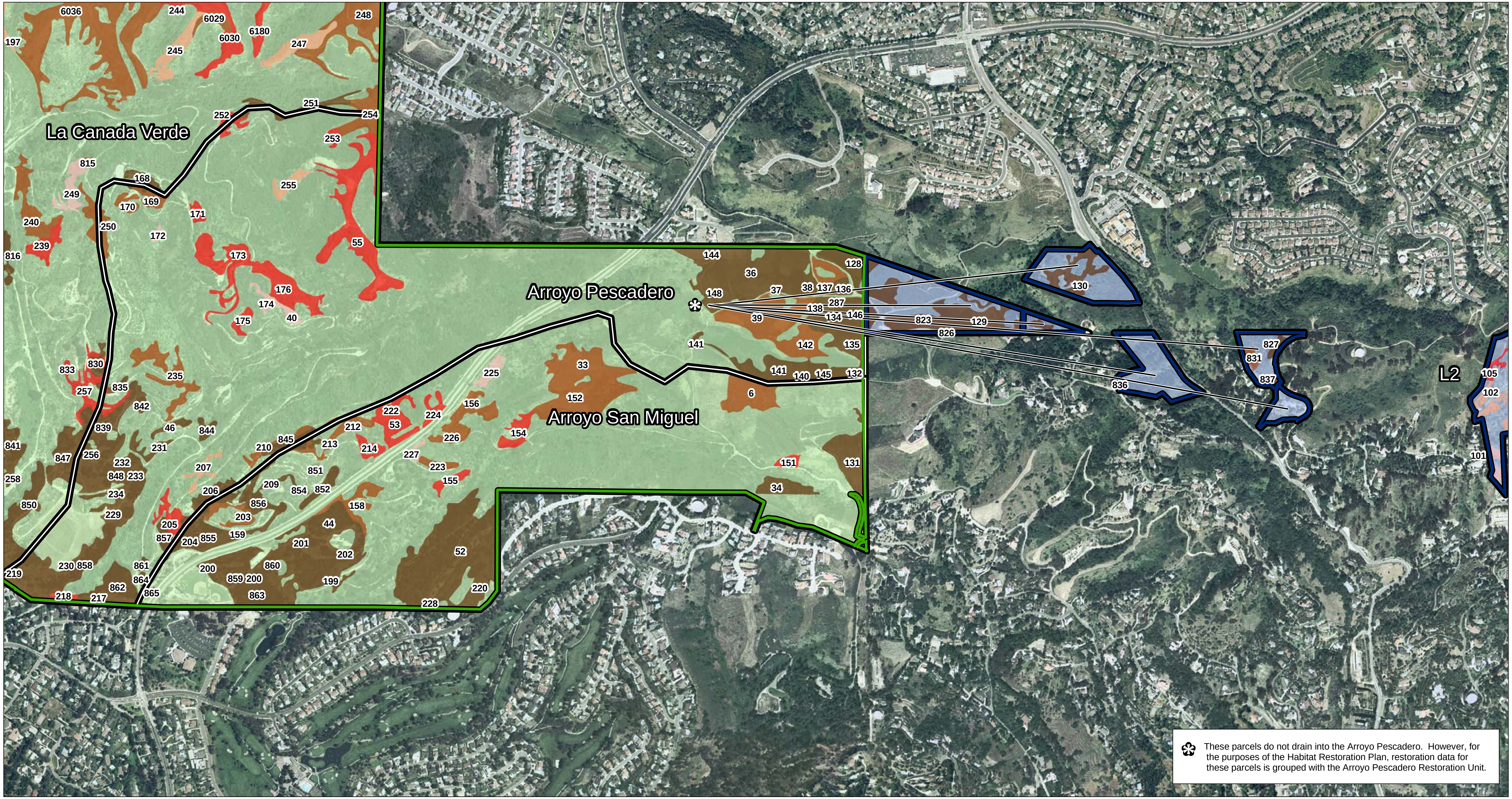
Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Whittier Management Area:
Weed Polygon Restoration Priorities

SOURCE: Aerial-EagleAerial (2003)

I:\PUE430\GIS\Maps\Draft RMP\Appendices\FigA-12_Lacanada_Arroyos.mxd (03/05/2007)



Prepared By: LSA

N

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FEET

SOURCE: Aerial-EagleAerial (2003)
I:\PUE430\GIS\Maps\Draft RMP\Appendices\FigA-13_arroyos.mxd (03/05/2007)

Restoration Units-Labeled with Name
Whittier Management Area
La Habra Heights Management Area

Restoration Priorities - Labeled with ID
Low Restoration Priority
Low-Medium Restoration Priority
Medium Restoration Priority
Medium-High Restoration Priority
High Restoration Priority

FIGURE A-13

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Whittier Management Area:
Weed Polygon Restoration Priorities

Table A-AA: Arroyo Pescadero Restoration Unit Weed Polygon Priorities within the Whittier Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
36	10.551	88	Non-Native Grasses, *Brassica nigra, Foeniculum vulgare*	high priority	Sagebrush Scrub*
37	0.402	104	Non-Native Grasses, *Foeniculum vulgare, Silybum marianum, Centaurea melitensis*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
38	1.349	97	Non-Native Grasses, *Foeniculum vulgare, Brassica nigra, Silybum marianum*	high priority	Sagebrush Scrub*
39	6.661	62	Non-Native Grasses, *Brassica nigra, Silybum marianum*	medium-high priority	Sagebrush Scrub*
40	0.521	32	Non-Native Grasses, *Centaurea melitensis*, *Brassica nigra*	low priority	
46	0.643	76	Non-Native Grasses, *Schinus terebinthisfolius, Brassica nigra,*	high priority	Coyote Brush Scrub
55	9.621	52	*Brassica nigra*, Non-Native Grasses, *Centaurea melitensis*	medium priority	Purple Sage/Sagebrush Scrub*
128	2.653	85	Non-Native Grasses, *Foeniculum vulgare, Brassica nigra, Ricinis communis*	high priority	Sagebrush Scrub*
132	0.765	70	Non-Native Grasses, *Brassica nigra, Foeniculum vulgare*	high priority	Black Sage Scrub*
134	1.535	94	Non-Native Grasses, *Foeniculum vulgare, Brassica nigra*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
135	2.090	70	Non-Native Grasses, *Brassica nigra, Foeniculum vulgare, Ricinis communis*	high priority	Black Sage Scrub
136	0.838	96	Non-Native Grasses, *Foeniculum vulgare, Brassica nigra*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
137	1.456	64	*Brassica nigra*, Non-Native Grasses	medium-high priority	Sagebrush Scrub*
138	1.203	97	Non-Native Grasses, *Foeniculum vulgare, Brassica nigra,*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
140	0.789	81	Non-Native Grasses, *Brassica nigra, Foeniculum vulgare*	high priority	Black Sage Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
141	0.506	84	Non-Native Grasses, *Foeniculum vulgare, Brassica nigra*	high priority	Sagebrush Scrub*
142	2.682	67	*Brassica nigra*, Non-Native Grasses, *Foeniculum vulgare*	medium-high priority	Sagebrush Scrub*
144	2.321	70	Non-Native Grasses, *Brassica nigra*	high priority	Sagebrush/Black Sage Scrub*
145	1.150	85	Non-Native Grasses, *Foeniculum vulgare, Brassica nigra,*	high priority	Black Sage Scrub*
146	2.043	79	Non-Native Grasses, *Foeniculum vulgare, Brassica nigra, Silybum marianum*	high priority	Sagebrush Scrub*
148	1.584	85	Non-Native Grasses, *Foeniculum vulgare, Brassica nigra,*	high priority	Sagebrush Scrub*
168	0.094	75	Non-Native Grasses, *Brassica nigra, Ricinis communis*	high priority	Toyon Chaparral*
168	0.085	75	Non-Native Grasses, *Brassica nigra, Ricinis communis*	high priority	Toyon Chaparral*
168	0.050	75	Non-Native Grasses, *Brassica nigra, Ricinis communis*	high priority	Toyon Chaparral*
169	0.959	62	Non-Native Grasses, *Brassica nigra, Ricinis communis, Nicotiana glauca*	medium-high priority	Purple Sage Scrub*
170	0.816	62	Non-Native Grasses, *Brassica nigra, Silybum marianum, Ricinis communis*	medium-high priority	Sagebrush Scrub*
171	0.590	50	Non-Native Grasses, *Brassica nigra, Silybum marianum, Ricinis communis*	medium priority	Purple Sage Scrub*
172	0.298	38	Non-Native Grasses, *Nicotiana glauca*	low priority	
173	4.233	57	Non-Native Grasses, *Brassica nigra, Ricinis communis, Nicotiana glauca*	medium priority	Purple Sage Scrub*
174	0.777	38	Non-Native Grasses, *Brassica nigra Ricinis communis, Nicotiana glauca*	low priority	
175	0.783	56	Non-Native Grasses, *Brassica nigra, Ricinis communis*	medium priority	Purple Sage Scrub*
176	3.796	53	Non-Native Grasses, *Brassica nigra, Nicotiana glauca*	medium priority	Sagebrush Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
204	0.176	69	Non-Native Grasses	medium-high priority	Sagebrush Scrub*
205	1.469	52	Non-Native Grasses, *Brassica nigra, Schinus terebinthisfolius*	medium priority	Sagebrush Scrub*
206	0.950	76	Non-Native Grasses, *Brassica nigra*	high priority	Elderberry Woodland*
207	0.841	39	Non-Native Grasses, *Brassica nigra*	low priority	
209	0.001	70	Non-Native Grasses, *Brassica nigra, Ricinis communis, Nicotiana glauca*	high priority	Coyote Brush Scrub*
210	0.934	61	Non-Native Grasses, *Brassica nigra*	medium-high priority	Sagebrush Scrub/Elderberry Woodland*
212	0.191	68	Non-Native Grasses, *Brassica nigra, Silybum marianum*	medium-high priority	Sagebrush/Buckwheat Scrub*
213	0.035	60	Non-Native Grasses, *Brassica nigra, Silybum marianum, Centaurea melitensis*	medium-high priority	Sagebrush/Buckwheat Scrub*
217	0.708	72	Non-Native Grasses, *Brassica nigra, Salsola tragus*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
218	0.449	52	Non-Native Grasses, *Brassica nigra, Salsola tragus*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
219	2.303	75	Non-Native Grasses, *Brassica nigra, Salsola tragus, Raphanus sativus*	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
222	0.047	54	*Brassica nigra*, Non-Native Grasses, *Silybum marianum, Centaurea melitensis*	medium priority	Sagebrush Scrub*
229	1.611	78	Non-Native Grasses, *Salsola tragus, Brassica nigra, Silybum marianum*	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
230	0.770	72	Non-Native Grasses, *Brassica nigra, Salsola tragus, Raphanus sativus*	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
231	1.020	74	Non-Native Grasses, *Brassica nigra, Foeniculum vulgare, Ricinis communis*	high priority	Coyote Brush Scrub*
232	0.311	75	Non-Native Grasses, *Brassica nigra, Silybum marianum, Schinus terebinthisfolius*	high priority	Mixed Sage Scrub/Toyon Chaparral*
233	0.251	69	Non-Native Grasses, *Brassica nigra*, Salsola tragus, Atriplex semibaccata	medium-high priority	Mixed Sage Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
234	0.773	83	Non-Native Grasses, *Brassica nigra, Ricinis communis, Foeniculum vulgare*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
235	3.632	60	Non-Native Grasses, *Brassica nigra, Nicotiana glauca, Ricinis communis*	medium-high priority	Black Sage Scrub/Toyon Chaparral*
250	1.088	63	Non-Native Grasses, *Brassica nigra, Centaurea melitensis, Silybum marianum*	medium-high priority	Sagebrush/Buckwheat Scrub*
251	0.465	70	Non-Native Grasses, *Brassica nigra, Ricinis communis*	high priority	Purple Sage Scrub*
251	0.190	70	Non-Native Grasses, *Brassica nigra, Ricinis communis*	high priority	Purple Sage Scrub*
252	0.611	58	Non-Native Grasses, *Brassica nigra, Ricinis communis, Silybum marianum*	medium priority	Purple Sage Scrub*
253	0.531	50	Non-Native Grasses, *Brassica nigra, Silybum marianum*	medium priority	Purple Sage Scrub*
254	1.454	66	Non-Native Grasses, *Brassica nigra*	medium-high priority	Purple Sage Scrub/Toyon Chaparral*
255	1.092	46	Non-Native Grasses, *Brassica nigra*	medium-low priority	
256	3.648	76	Non-Native Grasses, *Brassica nigra, Centaurea melitensis, Nicotiana glauca*	high priority	Mixed Sage Scrub*
257	0.021	56	Non-Native Grasses, *Brassica nigra, Centaurea melitensis, Nicotiana glauca*	medium priority	Black Sage/Encelia Scrub*
257	0.108	56	Non-Native Grasses, *Brassica nigra, Centaurea melitensis, Nicotiana glauca*	medium priority	Black Sage/Encelia Scrub*
257	0.528	56	Non-Native Grasses, *Brassica nigra, Centaurea melitensis, Nicotiana glauca*	medium priority	Black Sage/Encelia Scrub*
287	0.210	96	Non-Native Grasses, *Foeniculum vulgare, Brassica nigra*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
835	0.381	77	*Eucalyptus globulus*	high priority	
839	1.836	95	*Eucalyptus globulus*	high priority	
842	0.263	74	*Eucalyptus globulus*	high priority	
844	0.667	88	*Eucalyptus globulus*	high priority	

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
845	1.209	93	*Eucalyptus globulus*	high priority	
847	0.134	97	*Eucalyptus globulus*	high priority	
847	0.001	97	*Eucalyptus globulus*	high priority	
848	4.520	91	*Eucalyptus globulus*	high priority	
850	0.959	103	*Eucalyptus globulus*	high priority	
855	0.530	97	*Eucalyptus globulus*	high priority	
855	0.216	97	*Eucalyptus globulus*	high priority	
857	0.777	84	*Eucalyptus globulus*	high priority	
858	3.672	96	*Eucalyptus globulus*	high priority	
861	0.295	69	*Schinus molle*	medium-high priority	
862	3.101	85	*Eucalyptus globulus*	high priority	
864	0.171	96	*Eucalyptus globulus*	high priority	
Total	**111.969**	**5825.2**			

* Indicates best prediction without specific soil samples

Arroyo San Miguel. This restoration unit has the most ongoing restoration projects. Access is fairly good with relatively moderate slopes. As with Arroyo Pescadero, there are large areas of intact native habitat. The soils range from clay to silty loam, with mainly Altamont-Diablo 9–30 percent slope Association and Perkins-Rincon Association, with areas of San Andreas-San Benito Association and Mocho-Sorrento Association. In addition to the ubiquitous annual grass- and mustard-dominated areas in association with milk thistle and Italian thistle, there are concentrations of fennel, castor bean, and eucalyptus. Table A-BB presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the Arroyo San Miguel restoration unit within the Whittier Management Area.

Table A-BB: Arroyo San Miguel Restoration Unit Weed Polygon Priorities within the Whittier Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6	4.016	64.000	*Brassica nigra*, Non-Native Grasses	medium-high priority	Sagebrush/Coyote Brush Scrub*
33	7.394	65.000	*Brassica nigra*, Non-Native Grasses, *Foeniculum vulgare*	medium-high priority	Sagebrush Scrub*
34	1.978	91.000	*Ricinis communis*, *Foeniculum vulgare*, *Brassica nigra*, Non-Native Grasses	high priority	Sagebrush Scrub*
44	7.980	93.000	*Eucalyptus globules*, *Hirschfeldia incana*, Non-Native Grasses	high priority	Mixed Sage Scrub*
52	16.748	84.000	*Eucalyptus globules*, Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	high priority	Sagebrush/Buckwheat Scrub*
53	1.773	54.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*	medium priority	Sagebrush Scrub*
131	4.693	70.000	Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*	high priority	Coyote Brush Scrub*
132	0.238	70.000	Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*	high priority	Black Sage Scrub*
140	0.018	81.000	Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*	high priority	Black Sage Scrub*
145	0.035	85.000	*Foeniculum vulgare*, *Brassica nigra*, Non-Native Grasses	high priority	Black Sage Scrub*
151	0.609	57.000	*Brassica nigra*, Non-Native Grasses	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
152	4.604	64.000	*Brassica nigra*, Non-Native Grasses, *Ricinis communis*, *Foeniculum vulgare*	medium-high priority	Sagebrush Scrub*
154	1.544	56.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium priority	Sagebrush Scrub/Toyon Chaparral*
155	0.739	55.000	*Brassica nigra*, Non-Native Grasses, *Nicotiana glauca*	medium priority	Sagebrush Scrub*
156	2.369	62.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Silybum marianum*	medium-high priority	Sagebrush/Black Sage Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
158	2.056	60.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Nicotiana glauca*	medium-high priority	Sagebrush/Buckwheat Scrub*
159	1.380	85.200	Non-Native Grasses, *Nicotiana glauca*, *Silybum marianum*, *Brassica nigra*	high priority	Sagebrush Scrub*
199	2.963	74.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	high priority	Mixed Sage Scrub*
200	0.504	79.000	Non-Native Grasses, *Salsola tragus*, *Brassica nigra*, *Eucalyptus globulus*	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
201	1.399	80.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*, *Salsola tragus*	high priority	Mixed Sage Scrub*
202	0.778	71.000	Non-Native Grasses, *Centaurea melitensis*, *Brassica nigra*, *Salsola tragus*	high priority	Mixed Sage Scrub*
203	1.344	64.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Nicotiana glauca*	medium-high priority	Sagebrush Scrub*
204	1.215	69.000	Non-Native Grasses	medium-high priority	Sagebrush Scrub*
206	0.259	76.000	Non-Native Grasses, *Brassica nigra*	high priority	Elderberry Woodland*
209	1.165	70.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*, *Nicotiana glauca*	high priority	Coyote Brush Scrub*
212	0.502	68.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium-high priority	Sagebrush/Buckwheat Scrub*
212	0.004	68.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium-high priority	Sagebrush/Buckwheat Scrub*
213	1.007	60.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Centaurea melitensis*	medium-high priority	Sagebrush/Buckwheat Scrub*
214	0.930	50.000	*Brassica nigra*, Non-Native Grasses, *Nicotiana glauca*	medium priority	Mixed Sage Scrub*
217	0.022	72.000	Non-Native Grasses, *Brassica nigra*, *Salsola tragus*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
220	2.320	73.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*	high priority	Purple Sage Scrub*
222	1.297	54.000	*Brassica nigra*, Non-Native Grasses,	medium priority	Sagebrush Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
			Silybum marianum, *Centaurea melitensis*		
223	0.779	59.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Nicotiana glauca*	medium priority	Sagebrush Scrub*
224	0.937	50.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*	medium priority	Sagebrush Scrub*
225	0.988	32.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Nicotiana glauca*	low priority	
226	0.909	59.000	Non-Native Grasses, *Brassica nigra*	medium priority	Sagebrush Scrub*
227	0.368	35.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	low priority	
228	1.399	90.000	Non-Native Grasses, *Ricinis communis*, *Brassica nigra*, *Silybum marianum*	high priority	Purple Sage Scrub*
845	0.034	93.000	*Eucalyptus globulus*	high priority	
845	0.559	93.000	*Eucalyptus globulus*	high priority	
845	0.026	93.000	*Eucalyptus globulus*	high priority	
851	0.191	74.000	*Eucalyptus globulus*	high priority	
852	1.106	75.000	*Eucalyptus globulus*	high priority	
854	0.268	74.000	*Eucalyptus globulus*	high priority	
855	2.093	97.000	*Eucalyptus globulus*	high priority	
856	1.249	83.000	*Eucalyptus globulus*	high priority	
859	1.966	97.000	*Eucalyptus globulus*	high priority	
860	0.935	77.000	*Acacia* sp.	high priority	
862	0.079	85.000	*Eucalyptus globulus*	high priority	
862	0.009	85.000	*Eucalyptus globulus*	high priority	
863	3.509	92.000	*Eucalyptus globulus*	high priority	
865	0.054	90.000	*Eucalyptus globulus*	high priority	
Total	**93.315**	**3830.200**			

* Indicates best prediction without specific soil samples

La Cañada Verde. Within this restoration unit, the soils range from clay to loams with mainly Altamont-Diablo 30–50 percent slope Association and Perkins-Rincon Association, as well as San Andreas-San Benito Association with areas of Altamont-Diablo 9–30 percent slope Association. Areas of the lower slopes are dominated by annual grass, accompanied by mustard, castor bean, and tree tobacco, as well as milk thistle and Italian thistle. Table A-CC presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the Arroyo San Miguel restoration unit within the Whittier Management Area.

Table A-CC: La Cañada Verde Restoration Unit Weed Polygon Priorities within the Whittier Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
Total	**107.375**	**4365.800**			
41	0.937	92.000	Non-Native Grasses, *Eucalyptus globulus*	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
45	1.464	73.000	*Hirschfeldia incana, Centaurea melitensis,* Non-Native Grasses	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
48	3.171	33.000	Non-Native Grasses, *Brassica nigra, Hirschfeldia incana*	low priority	
168	0.989	75.000	Non-Native Grasses, *Brassica nigra, Ricinis communis*	high priority	Toyon Chaparral*
169	0.032	62.000	Non-Native Grasses, Brassica nigra, Ricinis communis, Nicotiana glauca	medium-high priority	Purple Sage Scrub*
169	0.004	62.000	Non-Native Grasses, *Brassica nigra, Ricinis communis, Nicotiana glauca*	medium-high priority	Purple Sage Scrub*
177	1.037	54.000	*Ricinis communis,* Non-Native Grasses	medium priority	Toyon Chaparral*
185	0.001	45.000	Non-Native Grasses, *Brassica nigra, Ricinis communis, Nicotiana glauca*	medium-low priority	
186	0.228	45.000	Non-Native Grasses, *Brassica nigra, Schinus terebinthisfolius*	medium-low priority	
191	1.141	51.000	*Brassica nigra, Ricinis communis, Nicotiana glauca,* Non-Native Grasses	medium priority	Mixed Sagebrush/Toyon Chaparral*
192	4.921	45.000	*Brassica nigra,* Non-Native Grasses, *Ricinis communis, Nicotiana glauca*	medium-low priority	

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
193	1.400	39.000	Non-Native Grasses, *Brassica nigra, Silybum marianum, Schinus terebinthisfolius*	low priority	
194	3.608	76.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum, Ricinis communis*	high priority	Mixed Sage Scrub*
195	2.388	46.000	Non-Native Grasses, *Brassica nigra, Ricinis communis, Nicotiana glauca*	medium-low priority	
196	0.954	29.000	Non-Native Grasses, *Brassica nigra*	low priority	
197	0.841	45.000	Non-Native Grasses, *Brassica nigra, Silybum marianum, Nicotiana glauca*	medium-low priority	
198	3.842	57.000	Non-Native Grasses, *Brassica nigra, Ricinis communis, Nicotiana glauca*	medium priority	Purple Sage Scrub*
215	1.277	77.000	Non-Native Grasses, *Brassica nigra,* Ornamental Plants	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
219	2.088	75.000	Non-Native Grasses, *Brassica nigra, Salsola tragus, Raphanus sativus*	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
236	1.049	69.000	Non-Native Grasses, *Silybum marianum, Brassica nigra, Ricinis communis*	medium-high priority	Toyon Chaparral*
237	0.597	38.000	Non-Native Grasses, *Brassica nigra, Silybum marianum*	low priority	
238	4.860	69.000	Non-Native Grasses, *Silybum marianum, Brassica nigra, Ricinis communis*	medium-high priority	Toyon Chaparral/Black Sage Scrub*
239	1.620	52.800	Non-Native Grasses, *Silybum marianum, Brassica nigra*	medium priority	Mixed Sage Scrub/Toyon Chaparral*
240	3.232	66.000	Non-Native Grasses, *Silybum marianum, Brassica nigra, Schinus terebinthisfolius*	medium-high priority	Mixed Sagebrush/Toyon Chaparral*
244	0.717	53.000	Non-Native Grasses, *Brassica nigra, Silybum marianum, Nicotiana glauca*	medium priority	Black Sage Scrub*
245	2.333	48.000	Non-Native Grasses, *Brassica nigra, Nicotiana glauca*	medium-low priority	
247	2.302	48.000	Non-Native Grasses, *Brassica nigra*	medium-low priority	
248	6.432	62.000	*Brassica nigra*, Non-Native Grasses	medium-	Purple Sage Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
				high priority	
249	1.830	36.000	Non-Native Grasses, *Brassica nigra, Centaurea melitensis, Silybum marianum*	low priority	
250	1.367	63.000	Non-Native Grasses, *Brassica nigra, Centaurea melitensis, Silybum marianum*	medium-high priority	Sagebrush/Buckwheat Scrub*
250	0.008	63.000	Non-Native Grasses, *Brassica nigra, Centaurea melitensis, Silybum marianum*	medium-high priority	Sagebrush/Buckwheat Scrub*
251	1.668	70.000	Non-Native Grasses, *Brassica nigra, Ricinis communis*	high priority	Purple Sage Scrub*
252	0.390	58.000	Non-Native Grasses, *Brassica nigra, Ricinis communis, Silybum marianum*	medium priority	Purple Sage Scrub*
254	1.508	66.000	Non-Native Grasses, *Brassica nigra*	medium-high priority	Purple Sage Scrub/Toyon Chaparral*
256	0.827	76.000	Non-Native Grasses, *Brassica nigra, Centaurea melitensis, Nicotiana glauca*	high priority	Mixed Sage Scrub*
256	0.035	76.000	Non-Native Grasses, *Brassica nigra, Centaurea melitensis, Nicotiana glauca*	high priority	Mixed Sage Scrub*
256	0.406	76.000	Non-Native Grasses, *Brassica nigra, Centaurea melitensis, Nicotiana glauca*	high priority	Mixed Sage Scrub*
257	2.072	56.000	Non-Native Grasses, *Brassica nigra, Centaurea melitensis, Nicotiana glauca*	medium priority	Black Sage/Encelia Scrub*
258	1.686	70.000	Non-Native Grasses, *Brassica nigra, Salsola tragus, Centaurea melitensis*	high priority	Black Sage Scrub*
259	0.504	78.000	Non-Native Grasses, Brassica nigra, Ornamental Plant	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
260	2.053	90.000	Non-Native Grasses, *Brassica nigra, Ricinis communis, Salsola tragus*	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
262	0.260	66.000	*Brassica nigra*, Non-Native Grasses, *Centaurea melitensis, Ricinis communis*	medium-high priority	Black Sage Scrub*
262	0.251	66.000	*Brassica nigra*, Non-Native Grasses, *Centaurea melitensis, Ricinis communis*	medium-high priority	Black Sage Scrub*
271	0.210	63.000	Non-Native Grasses, *Brassica nigra, Ricinis*	medium-	Black Sage Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
			communis, Nicotiana glauca	high priority	
271	0.017	63.000	Non-Native Grasses, *Brassica nigra, Ricinis communis, Nicotiana glauca*	medium-high priority	Black Sage Scrub*
278	0.149	63.000	Non-Native Grasses, Brassica nigra, Centaurea melitensis, Ricinis communis	medium-high priority	Black Sage Scrub*
278	0.379	63.000	Non-Native Grasses, Brassica nigra, Centaurea melitensis, Ricinis communis	medium-high priority	Black Sage Scrub*
812	1.128	69.000	*Nicotiana glauca*	medium-high priority	
815	0.235	68.000	*Eucalyptus globulus*	medium-high priority	
815	0.001	68.000	*Eucalyptus globulus*	medium-high priority	
816	0.981	83.000	*Eucalyptus globulus*	high priority	
830	0.816	80.000	*Eucalyptus globulus*	high priority	
833	0.523	56.000	*Eucalyptus globulus*	medium priority	
839	0.698	95.000	*Eucalyptus globulus*	high priority	
840	0.068	80.000	*Eucalyptus globulus*	high priority	
841	2.737	77.000	*Eucalyptus globulus*	high priority	
843	0.114	95.000	*Eucalyptus globulus*	high priority	
843	0.922	95.000	*Eucalyptus globulus*	high priority	
847	2.217	97.000	*Eucalyptus globulus*	high priority	
850	4.157	103.000	*Eucalyptus globulus*	high priority	
6029	0.993	62.000	*Nicotiana glauca, Brassica nigra*, Non-Native Grasses	medium-high priority	Purple Sage Scrub
6030	3.095	54.000	Non-Native Grasses, *Brassica nigra, Hirschfeldia incana, Centaurea melitensis*	medium priority	Purple Sage Scrub
6036	18.273	60.000	Non-Native Grasses, *Brassica nigra, Hirschfeldia incana, Nicotiana glauca*	medium-high priority	Purple Sage Scrub/Toyon Chaparral

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6180	1.202	52.000	Non-Native Grasses, *Brassica nigra, Hirschfeldia incana, Centaurea melitensis*	medium priority	Purple Sage Scrub
6182	0.006	54.000	Non-Native Grasses, *Brassica nigra, Silybum marianum, Centaurea melitensis*	medium priority	Sagebrush/Buckwheat Scrub*
6184	0.002	58.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium priority	Black Sage/Purple Sage Scrub*
6184	0.067	58.000	*Brassica nigra,* Non-Native Grasses, *Silybum marianum*	medium priority	Black Sage/Purple Sage Scrub*
Total	**107.375**	**4365.800**			

* Indicates best prediction without specific soil samples

Worsham Canyon. This central restoration unit is relatively weedy with mustard and annual grasses as the dominant weeds associated with castor bean and tree tobacco. Soils fall within the Hanford and Altamont-Diablo 30–50 percent slope Association ranging from clay to sandy loam. Table A-DD presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the Worsham Canyon restoration unit within the Whittier Management Area.

Table A-DD: Worsham Canyon Restoration Unit Weed Polygon Priorities within the Whittier Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
48	0.008	33.000	Non-Native Grasse, *Brassica nigra*, *Hirschfeldia incana*	low priority	
194	0.447	76.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	high priority	Mixed Sage Scrub*
194	0.032	76.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	high priority	Mixed Sage Scrub*
194	0.065	76.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	high priority	Mixed Sage Scrub*
194	0.056	76.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	high priority	Mixed Sage Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
195	0.249	46.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*, *Nicotiana glauca*	medium-low priority	
812	0.047	69.000	*Nicotiana glauca*	medium-high priority	
814	1.023	89.000	*Ricinis communis*	high priority	
6047	3.596	93.000	*Ricinis communis*, *Silybum marianum*, *Foeniculum vulgare*, *Marubium vulgare*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6182	0.029	54.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Centaurea melitensis*	medium priority	Sagebrush/Buckwheat Scrub*
6268	2.785	66.000	*Brassica nigra*, *Foeniculum vulgare*, Non-Native Grasses, *Centaurea melitensis*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6269	0.090	65.000	*Brassica nigra*, *Foeniculum vulgare*, Non-Native Grasses, *Centaurea melitensis*	medium-high priority	Sagebrush Scrub*
6270	0.957	65.000	*Brassica nigra*, *Foeniculum vulgare*, Non-Native Grasses, *Centaurea melitensis*	medium-high priority	Elderberry Woodland*
6271	0.050	65.000	*Brassica nigra*, *Foeniculum vulgare*, Non-Native Grasses, *Centaurea melitensis*	medium-high priority	Sagebrush Scrub*
6272	0.050	77.000	*Brassica nigra*, *Foeniculum vulgare*, Non-Native Grasses, *Centaurea melitensis*	high priority	Toyon Chaparral/Sagebrush-Buckwheat Scrub
6273	0.154	69.000	*Hirschfeldia incana*, Non-Native Grasses, *Centaurea melitensis*, *Silybum marianum*	medium-high priority	Toyon Chaparral/Sagebrush-Buckwheat Scrub
6274	0.083	81.000	*Brassica nigra*, *Foeniculum vulgare*, Non-Native Grasses, *Centaurea melitensis*	high priority	Toyon Chaparral/Sagebrush-Buckwheat Scrub
6275	0.310	62.000	*Centaurea melitensis*, *Hirschfeldia incana*, Non-Native Grasses, *Silybum marianum*	medium-high priority	Toyon Chaparral/Sagebrush-Buckwheat Scrub

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6276	0.438	69.000	*Hirschfeldia incana*, *Centaurea melitensis*, Carduus pycnocephalus, *Foeniculum vulgare*	medium-high priority	Toyon Chaparral/Sagebrush-Buckwheat Scrub
6277	0.070	60.000	*Hirschfeldia incana*, Non-Native Grasses, *Centaurea melitensis*, *Silybum marianum*	medium-high priority	Toyon Chaparral*
6281	1.445	42.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium-low priority	
6281	0.018	42.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium-low priority	
6281	0.014	42.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium-low priority	
6281	0.008	42.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium-low priority	
6283	0.884	36.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6284	1.095	35.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6286	0.455	41.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	
6295	1.409	40.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Silybum marianum*	medium-low priority	
6303	0.877	72.000	*Eucalyptus globulus*, Non-Native Grasses, *Hirschfeldia incana*, *Silybum marianum*	high priority	Toyon Chaparral/Sagebrush-Buckwheat Scrub
6304	0.114	96.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Hirschfeldia incana*	high priority	Sagebrush Scrub*
6352	2.799	40.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Silybum marianum*	medium-low priority	
6363	0.302	85.000	*Brassica nigra*, *Foeniculum vulgare*, Non-Native Grasses, *Centaurea melitensis*	high priority	Elderberry Woodland*
6364	0.701	85.000	*Brassica nigra*, *Foeniculum vulgare*, Non-Native Grasses, *Centaurea melitensis*	high priority	Mule Fat/Mixed Sage Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6365	0.060	90.000	*Ricinis communis*, *Silybum marianum*, *Foeniculum vulgare*, *Marubium vulgare*	high priority	Elderberry Woodland*
Total	**20.801**	**2215.000**			

* Indicates best prediction without specific soil samples

W4. This restoration unit is on the western edge of the Preserve. The soils fall mainly within the Hanford Association and the Rincon-Perkins Association and are mainly loamy soils. There are sage and sage-chaparral habitat in this restoration unit. Along with the usual annual grasses and mustard, castor bean is a subdominant weed. Access is available. Table A-EE presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the W4 restoration unit within the Whittier Management Area.

Table A-EE: W4 Restoration Unit Weed Polygon Priorities within the Whittier Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
41	1.973	92.000	Non-Native Grasses, *Eucalyptus globulus*	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
42	6.998	32.000	*Brassica nigra*, *Centaurea melitensis*, Non-Native Grasses	low priority	
45	0.010	73.000	*Hirschfeldia incana*, *Centaurea melitensis*, Non-Native Grasses	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
47	1.944	37.000	*Schinus terebinthisfolius*, *Brassica nigra*, Non-Native Grasses	low priority	
179	4.406	44.000	Non-Native Grasses, *Brassica nigra*	medium-low priority	
180	0.890	25.000	Non-Native Grasses, *Brassica nigra*	low priority	
181	7.351	30.000	Non-Native Grasses, *Brassica nigra*	low priority	
182	0.839	45.000	*Brassica nigra*, Non-Native Grasses	medium-low priority	
183	1.356	37.000	Non-Native Grasses, Brasica nigra	low priority	

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
184	5.074	54.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*	medium priority	Toyon Chaparral*
185	1.402	45.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*, *Nicotiana glauca*	medium-low priority	
186	0.942	45.000	Non-Native Grasses, *Brassica nigra*, *Schinus terebinthisfolius*	medium-low priority	
188	0.998	63.000	Non-Native Grasses, *Brassica nigra*, *Schinus terebinthisfolius*, *Washingtonia robusta*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
189	1.515	57.000	Non-Native Grasses, *Brassica nigra* *Nicotiana glauca*, *Silybum marianum*	medium priority	Sagebrush Scrub*
191	0.020	51.000	*Brassica nigra*, *Ricinis communis*, *Nicotiana glauca*, Non-Native Grasses	medium priority	Mixed Sagebrush/Toyon Chaparral*
198	0.240	57.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*, *Nicotiana glauca*	medium priority	Purple Sage Scrub*
260	0.023	90.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*, *Salsola tragus*	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
261	6.688	83.000	Non-Native Grasses, *Ricinis communis*	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
262	0.907	66.000	*Brassica nigra*, Non-Native Grasses *Centaurea melitensis*, *Ricinis communis*	medium-high priority	Black Sage Scrub*
263	1.228	52.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Ricinis communis*	medium priority	Mixed Sage Scrub/Toyon Chaparral*
264	1.322	26.000	Non-Native Grasses, *Raphanus sativus*, *Brassica nigra*	low priority	
265	1.321	34.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Schinus terebinthisfolius*	low priority	
266	0.657	27.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Nicotiana glauca*	low priority	
267	0.788	29.000	*Foeniculum vulgare*, Non-Native Grasses, *Nicotiana glauca*, *Brassica nigra*	low priority	
268	2.600	46.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Ricinis communis*	medium-low priority	

Weed Polygon Number	**Acreage**	**Priority Score**	**Exotic Vegetation Currently on Site**	**Priority Level**	**Restoration Habitat Type**
269	2.167	52.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*	medium priority	Mixed Sage Scrub*
270	0.785	32.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
271	2.516	63.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*, *Nicotiana glauca*	medium-high priority	Black Sage Scrub*
272	3.207	50.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*	medium priority	Mixed Sage Scrub*
274	0.680	30.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*, *Nicotiana glauca*	low priority	
275	0.900	42.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*	medium-low priority	
276	1.483	61.000	*Brassica nigra*, Non-Native Grasses, *Ricinis communis*, *Nicotiana glauca*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
278	3.457	63.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Ricinis communis*	medium-high priority	Black Sage Scrub*
280	1.682	67.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*, *Centaurea melitensis*	medium-high priority	Mixed Sage Scrub*
281	4.335	58.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Ricinis communis*	medium priority	Mixed Sage Scrub*
821	0.808	63.000	*Eucalyptus globulus*	medium-high priority	
834	0.128	83.000	*Eucalyptus globulus*	high priority	
838	3.020	85.000	*Eucalyptus globulus*	high priority	
843	2.473	95.000	*Eucalyptus globulus*	high priority	
849	0.104	81.000	*Eucalyptus globulus*	high priority	
Total	**80.404**	**2215.000**			

* Indicates best prediction without specific soil samples

W1. This restoration unit has fewer weed polygons than most of the restoration units in the Whittier Management Area. Slopes are steep, and the watershed is not readily accessible. Table A-FF presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the W1 restoration unit within the Whittier Management Area.

Table A-FF: W1 Restoration Unit Weed Polygon Priorities within the Whittier Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6010	0.002	76.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Silybum marianum*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6012	0.001	72.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	high priority	Sagebrush Scrub/Toyon Chaparral*
6012	0.177	72.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	high priority	Sagebrush Scrub/Toyon Chaparral*
6013	9.899	74.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	high priority	Sagebrush/Buckwheat Scrub*
6014	2.940	62.800	*Brassica nigra*, *Silybum marianum*, Non-Native Grasses, *Nicotiana glauca*	medium-high priority	Cactus Scrub*
6083	0.014	77.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	high priority	Mixed Sage Scrub*
6083	0.015	77.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	high priority	Mixed Sage Scrub*
6083	0.020	77.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	high priority	Mixed Sage Scrub*
6083	0.186	77.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	high priority	Mixed Sage Scrub*
6083	0.000	77.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	high priority	Mixed Sage Scrub*
6083	0.040	77.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	high priority	Mixed Sage Scrub*
6090	5.638	74.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	high priority	Black Sage Scrub
6099	1.846	65.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	medium-high priority	Sagebrush Buckwheat Scrub/Toyon Chaparral

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6100	0.542	51.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	medium priority	Sagebrush Buckwheat Scrub*
6103	0.003	84.000	*Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*, *Centaurea melitensis*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6103	2.189	84.000	*Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*, *Centaurea melitensis*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6104	4.572	38.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Marubium vulgare*	low priority	
6116	0.000	60.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Schinus terebinthisfolius*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6116	0.084	60.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Schinus terebinthisfolius*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6116	0.739	60.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Schinus terebinthisfolius*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6116	0.121	60.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Schinus terebinthisfolius*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6126	2.767	54.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium priority	Mixed Sage Scrub*
6127	1.163	62.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6247	0.089	67.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	medium-high priority	Sagebrush Scrub*
6267	0.086	54.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Marubium vulgare*	medium priority	Mixed Sage Scrub*
6335	0.367	33.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	low priority	
Total	**33.500**	**1724.800**			

* Indicates best prediction without specific soil samples

Sycamore Canyon. This restoration unit provides connectivity to the San Gabriel River, and it ranks high in other categories in the prioritization, such as adjacent roadways and invasive exotic species. Fennel and castor bean as well as Italian thistle and milk thistle frequently are among the top four dominant species. However, the feasibility of access to most of the canyon for active restoration is low. Although there are several weed polygons that rank in the medium-high range for restoration, LSA recommends using alternative methods of weed control, such as several seasons of managed goat grazing followed by aerial seeding, as funds allow (see Restoration Methods). Table A-GG presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the Sycamore Canyon restoration unit within the Whittier Management Area.

Table A-GG: Sycamore Canyon Restoration Unit Weed Polygon Priorities within the Whittier Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6009	3.314	53.000	*Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*, *Foeniculum vulgare*	medium priority	Coyote Brush Scrub
6010	25.576	76.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Silybum marianum*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6011	7.378	51.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Sagebrush Scrub
6012	8.720	72.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	high priority	Sagebrush Scrub/Toyon Chaparral*
6013	0.185	74.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	high priority	Sagebrush/Buckwheat Scrub*
6013	0.040	74.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	high priority	Sagebrush/Buckwheat Scrub*
6014	0.043	62.800	*Brassica nigra*, *Silybum marianum*, Non-Native Grasses, *Nicotiana glauca*	medium-high priority	Cactus Scrub*
6043	0.104	97.000	*Foeniculum vulgare*, *Ricinis communis*, *Nicotiana glauca*, *Carduus pycnocephalus*	high priority	Coyote Brush Scrub*
6056	1.394	52.000	Non-Native Grasses, *Carduu pycnocephalus*, *Brassica nigra*, *Silybum marianum*	medium priority	Elderberry Woodland*
6057	0.092	58.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Ricinis communis*	medium priority	Coyote Brush/Mule Fat Scrub*
6058	2.465	53.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Silybum marianum*	medium priority	Elderberry Woodland*
6059	0.091	58.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Ricinis communis*	medium priority	Cactus Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6060	0.323	64.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Ricinis communis*	medium-high priority	Cactus Scrub*
6061	0.337	64.000	*Brassica nigra*, Non-Native Grasses, *Ricinis communis*, *Nicotiana glauca*	medium-high priority	Coyote Brush Scrub*
6062	0.076	76.000	*Brassica nigra*, Non-Native Grasses, *Ricinis communis*, *Nicotiana glauca*	high priority	Coyote Brush Scrub*
6063	0.261	97.000	*Foeniculum vulgare*, *Ricinis communis*, *Nicotiana glauca*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6064	2.210	70.000	*Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*, *Foeniculum vulgare*	high priority	Black Sage Scrub/Native Grassland Ecotone*
6065	0.928	74.000	*Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*, *Foeniculum vulgare*	high priority	Black Sage Scrub/Native Grassland Ecotone*
6066	0.934	57.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium priority	Sagebrush Scrub*
6067	1.784	54.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium priority	Sagebrush Scrub*
6068	0.442	68.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium-high priority	Elderberry Woodland*
6069	0.927	56.000	*Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*, *Foeniculum vulgare*	medium priority	Sagebrush Scrub*
6070	0.080	70.000	*Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*, *Foeniculum vulgare*	high priority	Sagebrush Scrub*
6071	0.143	97.000	*Foeniculum vulgare*, *Ricinis communis*, *Nicotiana glauca*, *Carduus pycnocephalus*	high priority	Mule Fat Scrub*
6072	1.549	71.000	*Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*, *Foeniculum vulgare*	high priority	Sagebrush Scrub*
6073	0.245	65.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium-high priority	Sagebrush Scrub*
6074	0.049	65.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium-high priority	Sagebrush Scrub*
6075	1.038	75.000	*Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*, *Foeniculum vulgare*	high priority	Sagebrush Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6076	0.675	53.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium priority	Sagebrush Scrub/Elderberry Woodland*
6077	1.208	86.000	*Foeniculum vulgare*, *Ricinis communis*, *Nicotiana glauca*, *Carduus pycnocephalus*	high priority	Coyote Brush/Mule Fat Scrub*
6078	0.484	58.000	*Nicotiana glauca*, Non-Native Grasses, *Brassica nigra*	medium priority	Sagebrush Scrub*
6079	3.012	54.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium priority	Sagebrush Scrub*
6080	0.476	65.000	*Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*, *Foeniculum vulgare*	medium-high priority	Sagebrush Scrub*
6081	4.079	58.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium priority	Sagebrush Scrub/Toyon Chaparral*
6083	2.954	77.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	high priority	Mixed Sage Scrub*
6083	0.527	77.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	high priority	Mixed Sage Scrub*
6084	0.269	56.000	*Brassica nigra*, *Silybum marianum*, Non-Native Grasses, *Nicotiana glauca*	medium priority	Sagebrush Scrub*
6085	2.352	60.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium-high priority	Sagebrush Scrub*
6086	0.069	42.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	medium-low priority	
6087	3.880	61.000	Non-Native Grasses, *Carduus pycnocephalus*, *Silybum marianum*, *Brassica nigra*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6088	1.224	78.000	Non-Native Grasses, *Nicotiana glauca*, *Brassica nigra*, *Ricinis communis*	high priority	Sagebrush Scrub/Native Grassland Ecotone*e
6089	3.083	69.200	*Brassica nigra*, *Nicotiana glauca*, Non-Native Grasses, *Silybum marianum*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6090	0.202	74.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	high priority	Black Sage Scrub
6090	0.431	74.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	high priority	Black Sage Scrub

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6091	0.398	47.000	*Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*, *Foeniculum vulgare*	medium-low priority	
6092	0.364	51.000	*Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*, *Foeniculum vulgare*	medium priority	Sagebrush Scrub*
6093	1.222	36.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Silybum marianum*	low priority	
6094	1.465	39.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*	low priority	
6095	3.001	57.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Black Sage Scrub/Cactus Scrub*
6096	0.963	38.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*	low priority	
6097	1.632	40.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*	medium-low priority	
6098	1.557	77.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Hirschfeldia incana*	high priority	Sagebrush Scrub*
6099	0.220	65.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	medium-high priority	Sagebrush Buckwheat Scrub/Toyon Chaparral
6099	0.054	65.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	medium-high priority	Sagebrush Buckwheat Scrub/Toyon Chaparral
6101	0.943	45.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	medium-low priority	
6242	0.024	68.000	*Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*, *Foeniculum vulgare*	medium-high priority	Cactus Scrub*
6243	0.287	70.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Silybum marianum*	high priority	Toyon Chaparral*
6244	0.092	96.000	*Foeniculum vulgare*, *Ricinis communis*, *Nicotiana glauca*, *Carduus pycnocephalus*	high priority	Sycamore Riparian Woodland*
6245	0.175	82.000	Non-Native Grasses, *Carduus pycnocephalus*, *Silybum marianum*, *Brassica nigra*	high priority	Elderberry Woodland*
6246	0.134	35.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduu pycnocephalus*	low priority	

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6263	0.508	97.000	*Foeniculum vulgare*, *Ricinis communis*, *Nicotiana glauca*, *Carduus pycnocephalus*	high priority	Coyote Brush Scrub/Willow Riparian Scrub
6334	0.824	65.000	Non-Native Grasses, *Brassica nigra*, *Marubium vulgare*, *Silybum marianum*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6344	1.308	83.000	Non-Native Grasses, *Carduus pycnocephalus*, *Hirschfeldia incana*, *Silybum marianum*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6345	1.338	65.000	Non-Native Grasses, *Brassica nigra*, *Marubium vulgare*, *Silybum marianum*	medium-high priority	Sagebrush Scrub*
Total	**102.171**	**4249.000**			

* Indicates best prediction without specific soil samples

Turnbull Canyon. This restoration unit has large areas of mustard and annual grassland across soils mainly in the Altamont-Diablo 30–50 percent slope Association. Access is difficult due to the steepness of the slopes. Table A-HH presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the Turnbull Canyon restoration unit within the Whittier Management Area.

Table A-HH: Turnbull Canyon Restoration Unit Weed Polygon Priorities within the Whittier Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6017	1.820	58.000	*Brassica nigra*, Non-Native Grasses, *Nicotiana glauca*, *Ricinis communis*	medium priority	Purple Sage Scrub
6020	1.517	60.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6020	0.065	60.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6120	0.192	57.000	*Brassica nigra*, Non-Native Grasses, *Nicotiana glauca*, *Ricinis communis*	medium priority	Mixed Sage Scrub*
6159	0.072	83.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	high priority	Mixed Sage Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6209	1.373	54.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6210	0.045	74.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	high priority	Sycamore Riparian Woodland*
6211	0.091	77.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Sycamore Riparian Woodland*
6253	0.053	58.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	medium priority	Toyon Chaparral*
Total	**5.228**	**581.000**			

* Indicates best prediction without specific soil samples

W2. This restoration unit is quite steep with poor access for restoration activities. The soils in this watershed are mainly Hanford Association and the Altamont-Diablo 30–50 percent slope Association. Dominant weeds are annual grasses and mustard with milk thistle and Italian thistle and areas of tree tobacco and castor bean. Table A-II presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the W2 restoration unit within the Whittier Management Area.

Table A-II: W2 Restoration Unit Weed Polygon Priorities within the Whittier Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6046	8.150	78.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Sagebrush Scrub/Elderberry Woodland
6046	0.010	78.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Sagebrush Scrub/Elderberry Woodland
6046	0.204	78.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Sagebrush Scrub/Elderberry Woodland
6099	0.015	65.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	medium-high priority	Sagebrush Buckwheat Scrub/Toyon Chaparral
6102	0.013	48.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6102	0.090	48.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	
6103	3.438	84.000	*Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*, *Centaurea melitensis*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6103	0.003	84.000	*Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*, *Centaurea melitensis*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6108	0.208	31.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6108	0.007	31.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6116	17.030	60.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Schinus terebinthisfolius*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6117	3.207	39.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Schinus terebinthisfolius*	low priority	
6126	0.041	54.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium priority	Mixed Sage Scrub*
6126	0.089	54.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium priority	Mixed Sage Scrub*
6131	0.006	72.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub*
6131	0.014	72.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub*
6249	0.071	38.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Schinus terebinthisfolius*	low priority	
Total	**71.577**	**2860.800**			

* Indicates best prediction without specific soil samples

W3. This restoration unit is small and lies on the western edge of the Preserve. The soils are all Hanford Association. The dominant weeds are mustard and annual grasses with very little habitat intact. Table A-JJ presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the W3 restoration unit within the Whittier Management Area.

Table A-JJ: W3 Restoration Unit Weed Polygon Priorities within the Whittier Management Area

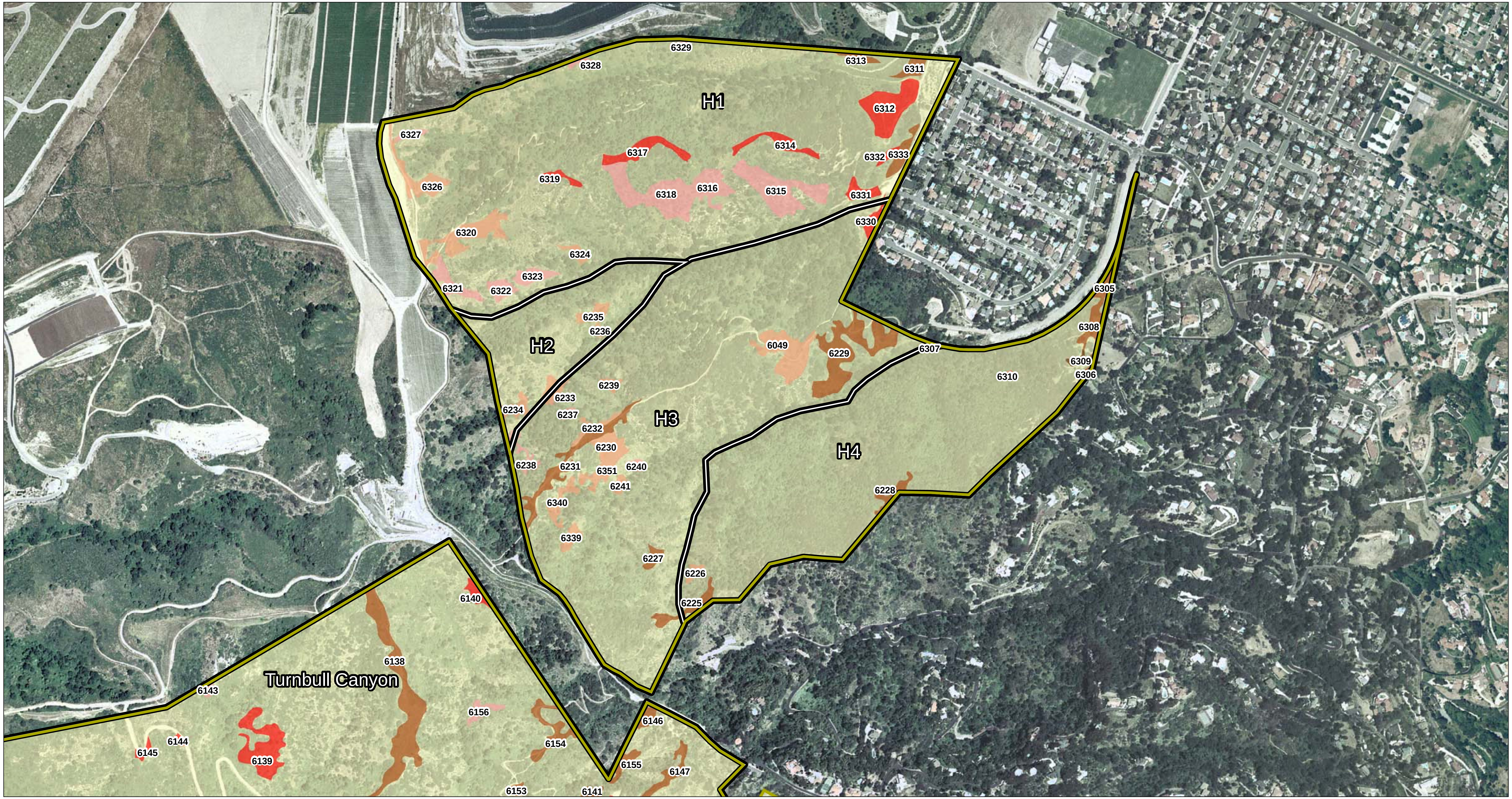
Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
803	0.041	65.000	*Eucalyptus globulus*	medium-high priority	
804	0.387	55.000	*Nicotiana glauca*	medium priority	
805	0.107	66.000	*Eucalyptus globulus*	medium-high priority	
806	0.022	82.000	*Eucalyptus globulus*	high priority	
807	0.045	83.000	*Eucalyptus globulus*	high priority	
808	0.131	66.000	*Eucalyptus globulus*	medium-high priority	
809	0.104	86.000	*Eucalyptus globulus*	high priority	
6017	1.609	58.000	*Brassica nigra*, Non-Native Grasses, *Nicotiana glauca*, *Ricinis communis*	medium priority	Purple Sage Scrub
6046	2.780	78.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Sagebrush Scrub/Elderberry Woodland
6123	2.886	76.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6129	4.088	70.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6130	0.985	71.000	Non-Native Grasses, *Salsola tragus*, *Nicotiana glauca*, *Eucalyptus globulus*	high priority	Mixed Sage Scrub*
6131	2.796	72.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub*
6356	0.496	71.000	Non-Native Grasses, *Salsola tragus*, *Nicotiana glauca*, *Eucalyptus globulus*	high priority	Mixed Sage Scrub*
6357	1.151	71.000	Non-Native Grasses, *Salsola tragus*, *Nicotiana glauca*, *Eucalyptus globulus*	high priority	Mixed Sage Scrub*
Total	**17.628**	**1070.000**			

* Indicates best prediction without specific soil samples

Hacienda Heights Management Area and Restoration Units

Hacienda Heights Management Area contains the San Andreas-San Benito 30–70 percent slope Association and the Altamont-Diablo 30–50 percent slope Association. Slopes range from low to very steep. Dominant exotic species are mainly annual grasses, with black mustard also common in the top four dominant species. Many areas are dominated by one of the following target invasive exotic species: milk thistle, Italian thistle, fennel, Harding grass, and castor bean. The Hacienda Heights Management Area contains 10 watersheds: upper Turnbull Canyon, W2, W3, W4, La Cañada Verde, Arroyo Pescadero, and Arroyo San Miguel. Figures A-14 and A-15 show weed polygon priorities within restoration units in the Hacienda Heights Management Area.

H5. This central restoration unit is interesting because there are many remnant native grassland and forbland habitats. It is relatively weedy with mustard and annual grasses as the dominant weeds associated with castor bean, tree tobacco, and milk thistle. Soils fall within the San Andreas-San Benito 30–75 percent slope Association and Altamont-Diablo 30–50 percent slope Association, ranging from clay to loam. Table A-KK presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the H5 restoration unit within the Hacienda Heights Management Area.



Prepared By: LSA

N

0 350 700
FEET

Restoration Units - Labeled with Name

Hacienda Heights Management Area

Restoration Priorities-Labeled with ID

Low Restoration Priority

Medium-Low Restoration Priority

Medium Restoration Priority

Medium-High Restoration Priority

High Restoration Priority

FIGURE A-14

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Hacienda Heights Management Area:
Weed Polygon Restoration Priorities

SOURCE: Aerial-EagleAerial (2003)

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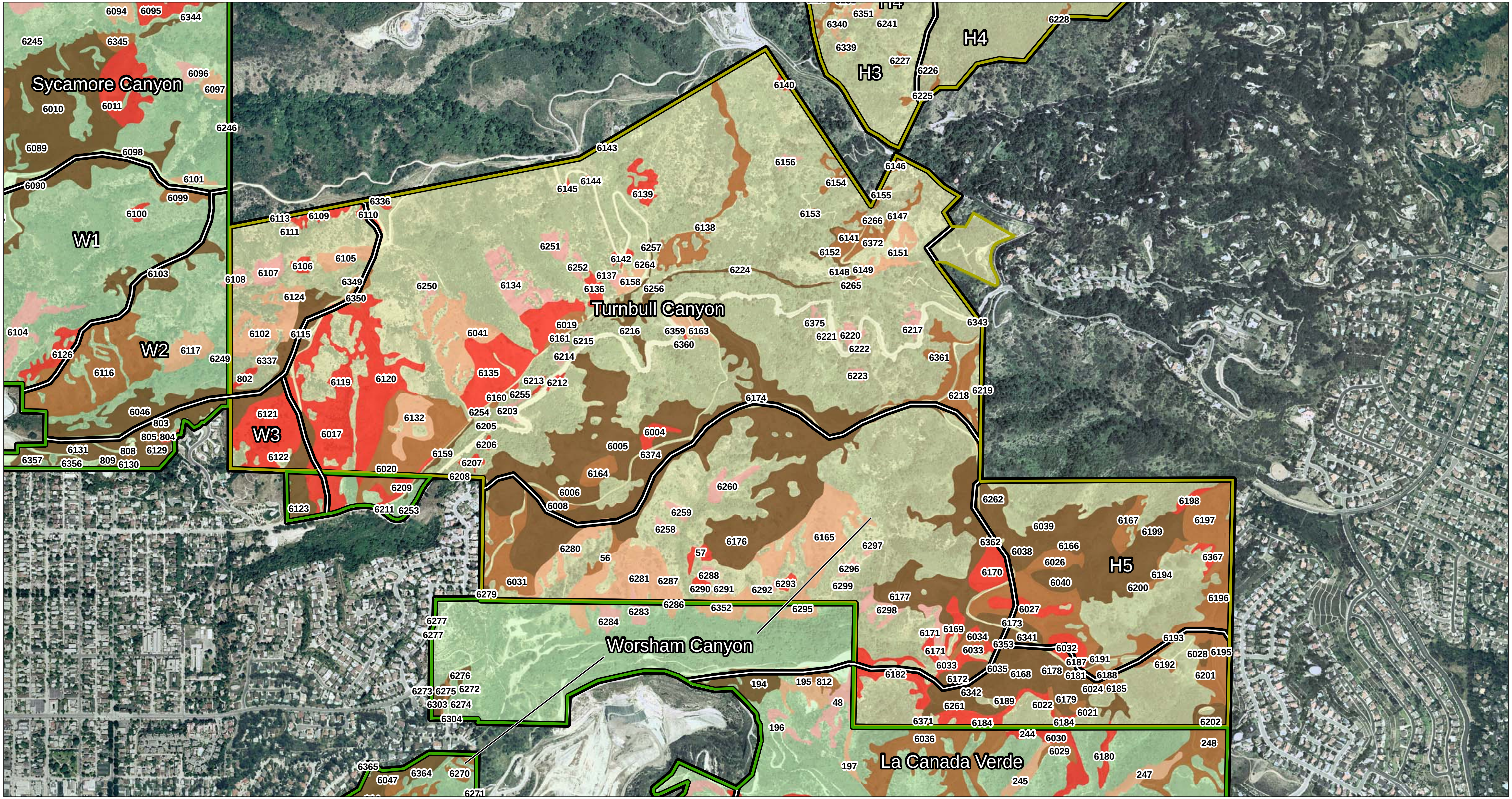


Prepared By: LSA

FIGURE A-15

N

0 500 1,000
FEET

Restoration Units - Labeled with Name
Hacienda Heights Management Area
Whittier Management Area

Restoration Priorities-Labeled with ID
Low Restoration Priority
Low-Medium Restoration Priority
Medium Restoration Priority
Medium-High Restoration Priority
High Restoration Priority

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Hacienda Heights
Management Area:
Weed Polygon Restoration Priorities

SOURCE: Aerial-EagleAerial (2003)

I:\PUE430\GIS\Maps\Draft RMP\Appendices\FigA-15_Turnbull_Worsham_H5.mxd (03/05/2007)

Table A-KK: H5 Restoration Unit Weed Polygon Priorities within the Hacienda Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6026	9.457	64.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	medium-high priority	Purple Sage Scrub*
6027	1.488	57.000	Non-Native Grasses, *Brassica nigra*, *Hirschfeldia incana*, *Centaurea melitensis*	medium priority	Toyon Chaparral/Purple Sage Scrub
6032	1.464	58.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Hirschfeldia incana*	medium priority	Coyote Brush/Native Grassland Ecotone*
6038	19.804	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Coyote Brush/Purple Sage Scrub
6039	1.066	75.000	*Phalaris aquatica*, Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*	high priority	Native Grassland
6040	2.508	75.000	Non-Native Grasses, *Phalaris aquatica*, *Hirschfeldia incana*, *Marubium vulgare*	high priority	Purple Sage Scrub
6166	1.328	91.000	*Phalaris aquatica*, Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*	high priority	Native Grassland*
6167	2.068	63.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Hirschfeldia incana*	medium-high priority	Toyon Chaparral*
6168	0.023	73.000	Non-Native Grasses, *Erodium cicutarium*, *Silybum marianum*, *Hirschfeldia incana*	high priority	Mixed Sage Scrub*
6170	0.056	58.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium priority	Purple Sage Scrub*
6173	0.936	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6177	0.251	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Purple Sage Scrub/Toyon Chaparral
6177	0.012	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Purple Sage Scrub/Toyon Chaparral
6181	0.017	69.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6185	0.117	67.000	Non-Native Grasses, *Hirschfeldia incana*, *Centaurea melitensis*, *Silybum marianum*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6187	0.297	57.000	Non-Native Grasses, *Brassica nigra*, *Hirschfeldia incana*, *Centaurea melitensis*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6188	0.771	64.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium-high priority	Sagebrush Scrub/Native Grassland Ecotone*e
6191	0.441	75.000	*Brassica nigra*, *Foeniculum vulgare*, Non-Native Grasses, *Silybum marianum*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6192	0.059	64.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium-high priority	Purple Sage Scrub/Native Grassland Ecotone
6193	2.874	64.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6194	1.161	64.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	medium-high priority	Purple Sage Scrub*
6195	0.528	64.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*	medium-high priority	Mixed Sage Scrub*
6196	3.545	64.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Silybum marianum*	medium-high priority	Purple Sage Scrub/Toyon Chaparral
6197	6.686	68.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium-high priority	Purple Sage Scrub/Toyon Chaparral
6198	0.736	56.000	*Erodium cicutarium*, Non-Native Grasses, *Centaurea melitensis*, *Hirschfeldia incana*	medium priority	Black Sage Scrub
6199	1.748	76.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Silybum marianum*	high priority	Native Grassland*
6200	1.035	75.000	*Phalaris aquatica*, Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*	high priority	Native Grassland*
6262	2.713	76.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Purple Sage Scrub*
6341	0.428	76.000	Non-Native Grasses, *Hirschfeldia incana*, *Silybum marianum*, *Marubium vulgare*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6353	0.351	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6353	0.233	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6367	0.773	58.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	medium priority	Purple Sage Scrub*
Total	**64.974**	**2171.000**			

* Indicates best prediction without specific soil samples

La Cañada Verde. This restoration unit comprises the upper canyon. The soils here range from clay to loams with mainly Altamont-Diablo 30–50 percent slope Association and San Andreas-San Benito Association. Areas of the slopes are dominated by annual grass, accompanied by mustard, castor bean, and tree tobacco as well as milk thistle and Italian thistle. Some weed polygons are dominated by Harding grass. Table A-LL presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the La Cañada Verde restoration unit within the Hacienda Heights Management Area.

Table A-LL: La Cañada Verde Restoration Unit Weed Polygon Priorities within the Hacienda Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
48	0.024	33.000	Non-Native Grasse, *Brassica nigra*, *Hirschfeldia incana*	low priority	
248	0.038	62.000	*Brassica nigra*, Non-Native Grasses	medium-high priority	Purple Sage Scrub*
248	0.001	62.000	*Brassica nigra*, Non-Native Grasses	medium-high priority	Purple Sage Scrub*
6021	0.341	64.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	medium-high priority	Native Forb/Grassland
6022	0.377	64.000	*Erodium cicutarium*, Non-Native Grasses, *Centaurea melitensis*, *Hirschfeldia incana*	medium-high priority	Black Sage Scrub
6023	0.138	83.000	Non-Native Grasses, *Phalaris aquatica*, *Marubium vulgare*, *Hirschfeldia incana*	high priority	Native Grassland
6024	5.323	80.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Hirschfeldia incana*	high priority	Native Grassland

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6026	0.005	64.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	medium-high priority	Purple Sage Scrub*
6028	0.583	75.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Carduus pycnocephalus*	high priority	Native Grassland
6032	0.522	58.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Hirschfeldia incana*	medium priority	Coyote Brush/Native Grassland Ecotone*e
6035	0.629	86.000	*Phalaris aquatica*, Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*	high priority	Native Grassland
6036	0.152	60.000	Non-Native Grasses, *Brassica nigra*, *Hirschfeldia incana*, *Nicotiana glauca*	medium-high priority	Purple Sage Scrub/Toyon Chaparral
6036	0.003	60.000	Non-Native Grasses, *Brassica nigra*, *Hirschfeldia incana*, *Nicotiana glauca*	medium-high priority	Purple Sage Scrub/Toyon Chaparral
6036	0.003	60.000	Non-Native Grasses, *Brassica nigra*, *Hirschfeldia incana*, *Nicotiana glauca*	medium-high priority	Purple Sage Scrub/Toyon Chaparral
6036	0.004	60.000	Non-Native Grasses, *Brassica nigra*, *Hirschfeldia incana*, *Nicotiana glauca*	medium-high priority	Purple Sage Scrub/Toyon Chaparral
6036	0.004	60.000	Non-Native Grasses, *Brassica nigra*, *Hirschfeldia incana*, *Nicotiana glauca*	medium-high priority	Purple Sage Scrub/Toyon Chaparral
6168	5.027	73.000	Non-Native Grasses, *Erodium cicutarium*, *Silybum marianum*, *Hirschfeldia incana*	high priority	Mixed Sage Scrub*
6172	0.013	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6172	0.422	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6178	0.656	69.000	Non-Native Grasses, *Marubium vulgare*, *Erodium cicutarium*, *Brassica nigra*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6179	0.499	86.000	*Phalaris aquatica*, Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*	high priority	Native Grassland*
6180	0.046	52.000	Non-Native Grasses, *Brassica nigra*, *Hirschfeldia incana*, *Centaurea melitensis*	medium priority	Purple Sage Scrub
6181	0.628	69.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6182	2.609	54.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Centaurea melitensis*	medium priority	Sagebrush/Buckwheat Scrub*
6184	3.099	58.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium priority	Black Sage/Purple Sage Scrub*
6185	0.423	67.000	Non-Native Grasses, *Hirschfeldia incana*, *Centaurea melitensis*, *Silybum marianum*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6186	0.176	52.000	Non-Native Grasses, *Hirschfeldia incana*, *Centaurea melitensis*, *Silybum marianum*	medium priority	Black Sage Scrub/Native Grassland Ecotone*
6187	0.177	57.000	Non-Native Grasses, *Brassica nigra*, *Hirschfeldia incana*, *Centaurea melitensis*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6188	0.299	64.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium-high priority	Sagebrush Scrub/Native Grassland Ecotone*e
6189	2.363	70.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	high priority	Black Sage Scrub*
6192	0.953	64.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, Carduus pycnocephalu	medium-high priority	Purple Sage Scrub/Native Grassland Ecotone
6193	0.804	64.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6195	1.892	64.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*	medium-high priority	Mixed Sage Scrub*
6201	2.526	64.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium-high priority	Mixed Sage Scrub*
6202	1.751	76.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Silybum marianum*	high priority	Sagebrush Scrub*
6261	0.968	90.000	*Phalaris aquatica*, Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*	high priority	Native Grassland*
6341	0.106	76.000	Non-Native Grasses, *Hirschfeldia incana*, *Silybum marianum*, *Marubium vulgare*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6342	0.342	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Marubium vulgare*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6342	0.730	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Marubium vulgare*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6353	0.067	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6353	0.100	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6371	0.257	47.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium-low priority	
Total	**35.568**	**2872.000**			

* Indicates best prediction without specific soil samples

Worsham Canyon. This central restoration unit is relatively weedy with mustard and annual grasses as the dominant weeds associated with castor bean, tree tobacco, and milk thistle. Soils fall within the San Andreas-San Benito 30–75 percent slope Association and Altamont-Diablo 30–50 percent slope Association, ranging from clay to loam. Table A-MM presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the Worsham Canyon restoration unit within the Hacienda Heights Management Area.

Table A-MM: Worsham Canyon Restoration Unit Weed Polygon Priorities within the Hacienda Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
56	0.913	59.000	*Brassica nigra*, Non-Native Grasses, *Nicotiana glauca*	medium priority	Purple Sage Scrub*
57	0.866	53.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Centaurea melitensis*	medium priority	Purple Sage Scrub*
6005	3.093	75.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6026	1.993	64.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	medium-high priority	Purple Sage Scrub*
6027	0.786	57.000	Non-Native Grasses, *Brassica nigra*, *Hirschfeldia incana*, *Centaurea melitensis*	medium priority	Toyon Chaparral/Purple Sage Scrub

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6031	6.458	67.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6033	0.055	57.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Marubium vulgare*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6034	1.047	60.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Hirschfeldia incana*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6038	0.006	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Coyote Brush/Purple Sage Scrub
6165	11.331	42.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	
6168	0.005	73.000	Non-Native Grasses, *Erodium cicutarium*, *Silybum marianum*, *Hirschfeldia incana*	high priority	Mixed Sage Scrub*
6169	1.422	52.000	Non-Native Grasses, *Brassica nigra*, *Marubium vulgare*, *Silybum marianum*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6170	3.251	58.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium priority	Purple Sage Scrub*
6171	0.011	32.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	low priority	
6172	1.980	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6173	0.786	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6174	0.149	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Purple Sage Scrub/Coyote Brush Scrub/Toyon
6174	0.008	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Purple Sage Scrub/Coyote Brush Scrub/Toyon
6176	30.689	75.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6176	7.646	75.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6177	15.235	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Purple Sage Scrub/Toyon Chaparral

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6182	0.862	54.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Centaurea melitensis*	medium priority	Sagebrush/Buckwheat Scrub*
6182	1.340	54.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Centaurea melitensis*	medium priority	Sagebrush/Buckwheat Scrub*
6218	0.405	67.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6258	0.477	31.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6259	0.632	31.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6260	1.891	36.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	low priority	
6262	0.131	76.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Purple Sage Scrub*
6279	0.340	81.000	*Eucalyptus globulus*, Non-Native Grasses, *Schinus terebinthisfolius*, *Centaurea melitensis*	high priority	Mixed Sage Scrub*
6280	3.231	42.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium-low priority	
6281	9.449	42.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium-low priority	
6283	0.168	36.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6283	0.029	36.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6286	0.531	41.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	
6287	0.719	41.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	
6288	0.572	35.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6290	0.307	57.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Sagebrush Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6291	0.146	35.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6292	0.277	35.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6293	0.456	53.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium priority	Purple Sage Scrub*
6295	0.527	40.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Silybum marianum*	medium-low priority	
6295	0.051	40.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Silybum marianum*	medium-low priority	
6296	0.472	35.000	Non-Native Grasses, *Brassica nigra*, *Hirschfeldia incana*, *Centaurea melitensis*	low priority	
6297	0.229	35.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6298	1.711	36.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6299	0.276	35.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6341	0.172	76.000	Non-Native Grasses, *Hirschfeldia incana*, *Silybum marianum*, *Marubium vulgare*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6342	0.003	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Marubium vulgare*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6342	0.182	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Marubium vulgare*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6352	1.625	40.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Silybum marianum*	medium-low priority	
6353	0.928	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6361	0.002	67.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium-high priority	Sagebrush Scrub*
6362	0.161	75.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Purple Sage Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
Total	**119.092**	**2977.000**			

* Indicates best prediction without specific soil samples

Turnbull Canyon. This restoration unit is similar to that previously described within the Whittier Management Area. This restoration unit has large areas of mustard and annual grassland across soils mainly in the Altamont-Diablo 30–50 percent slope Association. Access is difficult due to the steepness of the slopes. There are some potential restoration areas in the southern edge of the canyon. Table A-NN presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the Turnbull Canyon restoration unit within the Hacienda Heights Management Area.

Table A-NN: Turnbull Canyon Restoration Unit Weed Polygon Priorities within the Hacienda Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
801	0.676	72.000	*Robinia pseudoacacia*	high priority	
6004	1.158	58.000	Non-Native Grasses, *Picris echioides*, *Hirschfeldia incana*, *Phalaris aquatica*	medium priority	Native Forb/Grassland
6005	24.787	75.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6006	0.196	63.000	Non-Native Grasses, *Hirschfeldia incana*, *Silybum marianum*, *Foeniculum vulgare*	medium-high priority	Native Grassland
6008	0.601	63.000	Non-Native Grasses, *Hirschfeldia incana*, *Silybum marianum*, *Cirsium vulgare*,	medium-high priority	Native Forb/Grassland
6017	6.170	58.000	*Brassica nigra*, Non-Native Grasses, *Nicotiana glauca*, *Ricinis communis*	medium priority	Purple Sage Scrub
6019	1.343	59.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6020	9.603	60.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6031	0.001	67.000	Non-Native Grasses, *Brassica nigra*, *Silybum*	medium-high	Mixed Sage Scrub/Native

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
			marianum, *Marubium vulgare*	priority	Grassland Ecotone*
6041	8.662	48.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium-low priority	
6105	0.091	43.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	
6110	0.277	49.200	*Brassica nigra*, *Nicotiana glauca*, Non-Native Grasses	medium-low priority	Sagebrush Buckwheat Scrub/Toyon Chaparral
6115	1.102	70.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Erodium cicutarium*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6119	0.018	54.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium priority	Mixed Sage Scrub/Toyon Chaparral*
6119	9.551	54.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium priority	Mixed Sage Scrub/Toyon Chaparral*
6120	8.351	57.000	*Brassica nigra*, Non-Native Grasses, *Nicotiana glauca*, *Ricinis communis*	medium priority	Mixed Sage Scrub*
6122	0.579	54.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Ricinis communis*	medium priority	Mixed Sage Scrub*
6122	0.014	54.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Ricinis communis*	medium priority	Mixed Sage Scrub*
6123	0.847	76.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6132	3.992	43.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	
6134	4.073	32.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	low priority	
6135	12.301	50.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6136	0.878	56.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6137	0.423	38.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	low priority	
6138	6.995	66.000	*Brassica nigra*, Non-Native Grasses, *Silybum*	medium-high	Mixed Sage Scrub/Toyon

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
			marianum, *Carduus pycnocephalus*	priority	Chaparral*
6139	2.007	53.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium priority	Black Sage Scrub*
6140	0.356	56.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Sagebrush/Buckwheat Scrub*
6141	1.924	64.000	Non-Native Grasses, *Hirschfeldia incana*, *Silybum marianum*, *Brassica nigra*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6142	0.472	58.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Carduus pycnocephalus*	medium priority	Black Sage Scrub*
6143	0.140	31.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6144	0.096	58.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Carduus pycnocephalus*	medium priority	Black Sage Scrub*
6145	0.176	58.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Carduus pycnocephalus*	medium priority	Black Sage Scrub*
6146	0.351	65.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium-high priority	Sagebrush Scrub*
6147	1.167	59.000	Non-Native Grasses, *Hirschfeldia incana*, *Centaurea melitensis*, *Silybum marianum*	medium priority	Sagebrush Buckwheat Scrub/Toyon Chaparral
6148	0.094	69.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium-high priority	Toyon Chaparral*
6149	0.246	39.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	low priority	
6151	2.592	48.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Centaurea melitensis*	medium-low priority	
6152	0.642	75.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Centaurea melitensis*	high priority	Toyon Chaparral*
6153	0.143	61.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Centaurea melitensis*	medium-high priority	Toyon Chaparral*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6154	0.903	63.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6155	0.432	63.000	Non-Native Grasses, *Hirschfeldia incana*, *Silybum marianum*, *Brassica nigra*	medium-high priority	Sagebrush Scrub*
6156	0.373	34.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6157	0.362	58.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6158	1.154	41.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*	medium-low priority	
6159	0.539	83.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	high priority	Mixed Sage Scrub*
6160	0.231	61.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	medium-high priority	Sycamore Riparian Woodland*
6161	0.105	78.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	high priority	Sycamore Riparian Woodland/Oak Woodland
6162	0.071	77.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	high priority	Sycamore Riparian Woodland/Oak Woodland
6163	0.942	39.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	low priority	
6164	1.896	60.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium-high priority	Purple Sage Scrub*
6174	11.125	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Purple Sage Scrub/Coyote Brush Scrub/Toyon
6176	0.081	75.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6176	0.516	75.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6176	0.383	75.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6176	0.001	75.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub/Toyon Chaparral*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6176	0.006	75.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6176	7.144	75.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6203	0.484	38.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Centaurea melitensis*	low priority	
6205	0.119	50.000	*Brassica nigra*, *Carduus pycnocephalus*, Non-Native Grasses, *Foeniculum vulgare*	medium priority	Toyon Chaparral*
6206	0.290	50.000	*Brassica nigra*, *Carduus pycnocephalus*, Non-Native Grasses, *Foeniculum vulgare*	medium priority	Sagebrush Scrub*
6207	0.446	56.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Sagebrush Scrub/Toyon Chaparral*
6208	0.143	38.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	low priority	
6209	0.192	54.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6209	0.011	54.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6212	0.398	53.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Purple Sage Scrub*
6213	0.275	53.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Toyon Chaparral*
6214	0.390	38.000	*Brassica nigra*, Non-Native Grasses, *Ricinis communis*, *Silybum marianum*	low priority	
6215	0.158	35.000	*Brassica nigra*, Non-Native Grasses, *Carduus pycnocephalus*, *Centaurea melitensis*	low priority	
6216	2.072	83.000	*Brassica nigra*, *Carduus pycnocephalus*, Non-Native Grasses, *Foeniculum vulgare*	high priority	Purple Sage Scrub/Toyon Chaparral*
6217	0.787	38.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Ricinis communis*	low priority	
6218	3.666	67.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6218	0.001	67.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6219	0.149	35.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	low priority	
6220	0.587	38.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Ricinis communis*	low priority	
6221	0.098	38.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Ricinis communis*	low priority	
6222	0.215	36.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	low priority	
6223	0.448	35.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	low priority	
6224	1.296	74.000	*Brassica nigra*, *Carduus pycnocephalus*, Non-Native Grasses, *Foeniculum vulgare*	high priority	Sycamore Riparian Woodland/Oak Woodland
6250	0.641	34.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	low priority	
6251	1.370	32.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	low priority	
6252	0.509	31.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	low priority	
6254	0.047	72.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	high priority	Willow Riparian Scrub*
6255	0.086	58.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	medium priority	Sycamore Riparian Woodland*
6256	0.154	78.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	high priority	Mule Fat Scrub*
6257	0.147	70.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	high priority	Mule Fat Scrub*
6264	0.057	39.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Ricinis communis*	low priority	
6265	0.168	56.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium priority	Mule Fat Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6266	0.050	56.000	Non-Native Grasses, *Hirschfeldia incana*, *Centaurea melitensis*, *Silybum marianum*	medium priority	Toyon Chaparral*
6280	0.154	42.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium-low priority	
6336	0.242	58.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium priority	Sagebrush/Buckwheat Scrub*
6343	0.044	54.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Marubium vulgare*	medium priority	Toyon Chaparral*
6350	0.853	68.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Erodium cicutarium*	medium-high priority	Purple Sage Scrub*
6359	0.937	39.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	low priority	
6360	0.086	57.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium priority	Purple Sage Scrub*
6361	3.375	67.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	medium-high priority	Sagebrush Scrub*
6372	1.174	64.000	Non-Native Grasses, *Hirschfeldia incana*, *Silybum marianum*, *Brassica nigra*	medium-high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6374	0.082	63.000	Non-Native Grasses, *Picris echioides*, *Hirschfeldia incana*, *Phalaris aquatica*	medium-high priority	Native Forb/Grassland
6375	0.324	38.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	low priority	
Total	**162.099**	**5579.200**			

* Indicates best prediction without specific soil samples

W2. As previously described in the Whittier Management section, this restoration unit is quite steep, with poor access for restoration activities. The soils in this watershed are mainly Hanford Association and the Altamont-Diablo 30–50 percent slope Association. Dominant weeds are annual grasses and mustard with milk thistle and Italian thistle and areas of tree tobacco and castor bean. Table A-OO presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the W2 restoration unit within the Hacienda Heights Management Area.

Table A-OO: W2 Restoration Unit Weed Polygon Priorities within the Hacienda Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
802	0.560	58.000	*Eucalyptus globulus*	medium priority	
6017	0.319	58.000	*Brassica nigra*, Non-Native Grasses, *Nicotiana glauca*, *Ricinis communis*	medium priority	Purple Sage Scrub
6046	1.316	78.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Sagebrush Scrub/Elderberry Woodland
6046	1.830	78.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Sagebrush Scrub/Elderberry Woodland
6102	5.031	48.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	
6105	2.603	43.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	
6106	0.658	49.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	Sagebrush Buckwheat Scrub*
6107	1.838	32.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6108	0.755	31.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6109	1.346	49.200	*Brassica nigra*, *Nicotiana glauca*, Non-Native Grasses	medium-low priority	Sagebrush Buckwheat Scrub/Toyon Chaparral
6110	0.219	49.200	*Brassica nigra*, *Nicotiana glauca*, Non-Native Grasses	medium-low priority	Sagebrush Buckwheat Scrub/Toyon Chaparral
6111	0.274	38.200	*Brassica nigra*, *Nicotiana glauca*, Non-Native Grasses	low priority	
6112	0.034	44.200	*Brassica nigra*, *Nicotiana glauca*, Non-Native Grasses	medium-low priority	
6113	0.038	44.200	*Brassica nigra*, *Nicotiana glauca*, Non-Native Grasses	medium-low priority	
6115	3.061	70.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Erodium cicutarium*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6115	0.610	70.000	Non-Native Grasses, *Brassica nigra*,	high priority	Mixed Sage Scrub/Native

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
			Centaurea melitensis, *Erodium cicutarium*		Grassland Ecotone*
6119	0.101	54.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Salsola tragus*	medium priority	Mixed Sage Scrub/Toyon Chaparral*
6120	0.000	57.000	*Brassica nigra*, Non-Native Grasses, *Nicotiana glauca*, *Ricinis communis*	medium priority	Mixed Sage Scrub*
6121	6.014	55.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Schinus terebinthisfolius*	medium priority	Mixed Sage Scrub/Toyon Chaparral*
6122	3.677	54.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Ricinis communis*	medium priority	Mixed Sage Scrub*
6123	1.451	76.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	high priority	Mixed Sage Scrub/Toyon Chaparral*
6124	1.520	46.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	
6337	0.237	39.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6349	0.113	39.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Erodium cicutarium*	low priority	
6350	0.461	68.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Erodium cicutarium*	medium-high priority	Purple Sage Scrub*
Total	**34.066**	**1328.000**			

* Indicates best prediction without specific soil samples

W3. As previously described in the Whittier Management section, this restoration unit is small and lies on the western edge of the Preserve. The soils are all Hanford Association. The dominant weeds are mustard and annual grasses with very little intact habitat. Table A-PP presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the W3 restoration unit within the Hacienda Heights Management Area.

Table A-PP: W3 Restoration Unit Weed Polygon Priorities within the Hacienda Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6017	0.319	58.000	*Brassica nigra*, Non-Native Grasses, *Nicotiana glauca*, *Ricinis communis*	medium priority	Purple Sage Scrub
6046	1.830	78.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Carduus pycnocephalus*	high priority	Sagebrush Scrub/Elderberry Woodland
6115	0.610	70.000	Non-Native Grasses, *Brassica nigra*, *Centaurea melitensis*, *Erodium cicutarium*	high priority	Mixed Sage Scrub/Native Grassland Ecotone*
6121	6.014	55.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Schinus terebinthisfolius*	medium priority	Mixed Sage Scrub/Toyon Chaparral*
6122	3.677	54.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*, *Ricinis communis*	medium priority	Mixed Sage Scrub*
6123	1.451	76.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*, *Nicotiana glauca*	high priority	Mixed Sage Scrub/Toyon Chaparral*
Total	**13.901**	**391.000**			

* Indicates best prediction without specific soil samples

H1. This restoration unit is relatively intact chaparral on the northeastern edge of the Preserve. It falls within the San Andreas-San Benito 30–75 percent slope Association and the Altamont-Diablo 30–50 percent slope Association. Access is difficult. Table A-QQ presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the H1 restoration unit within the Hacienda Heights Management Area.

Table A-QQ: H1 Restoration Unit Weed Polygon Priorities within the Hacienda Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6311	0.457	62.000	Non-Native Grasses, *Hirschfeldia incana*, *Centaurea melitensis*, *Erodium cicutarium*	medium-high priority	Oak Riparian Forest*
6312	2.016	56.000	Non-Native Grasses, *Hirschfeldia incana*,	medium priority	Coyote Brush Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
			Centaurea melitensis, *Erodium cicutarium*		
6313	0.363	66.000	*Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*, *Centaurea melitensis*	medium-high priority	Sagebrush Scrub*
6314	0.727	50.000	Non-Native Grasses, *Hirschfeldia incana*, *Carduus pycnocephalus*, *Centaurea melitensis*	medium priority	Sagebrush Scrub*
6315	2.474	32.000	Non-Native Grasses, *Hirschfeldia incana*, *Carduus pycnocephalus*, *Centaurea melitensis*	low priority	
6316	1.354	33.000	Non-Native Grasses, *Hirschfeldia incana*, *Carduus pycnocephalus*, *Centaurea melitensis*	low priority	
6317	1.007	51.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	medium priority	Sagebrush/Buckwheat Scrub*
6318	2.376	33.000	Non-Native Grasses, *Hirschfeldia incana*, *Carduus pycnocephalus*, *Centaurea melitensis*	low priority	
6319	0.314	50.000	Non-Native Grasses, *Hirschfeldia incana*, *Carduus pycnocephalus*, *Centaurea melitensis*	medium priority	Sagebrush/Buckwheat Scrub*
6320	1.723	39.000	Non-Native Grasses, *Hirschfeldia incana*, *Carduus pycnocephalus*, *Centaurea melitensis*	low priority	
6321	0.798	38.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	low priority	
6322	0.466	23.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6323	0.535	23.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
6324	0.252	45.000	Non-Native Grasses, *Hirschfeldia incana*, *Carduus pycnocephalus*, *Centaurea melitensis*	medium-low priority	
6326	1.032	39.000	Non-Native Grasses, *Hirschfeldia incana*, *Carduus pycnocephalus*, *Centaurea melitensis*	low priority	
6327	0.201	31.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	low priority	
6328	0.202	33.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Silybum marianum*	low priority	
6329	0.136	33.000	Non-Native Grasses, *Brassica nigra*, *Carduus*	low priority	

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
			pycnocephalus, *Silybum marianum*		
6330	0.013	53.000	*Erodium cicutarium*, Non-Native Grasses, *Medicago polymorpha*, *Malva parvifloria*	medium priority	Coast Live Oak Woodland*
6331	0.457	55.000	Non-Native Grasses, *Hirschfeldia incana*, *Centaurea melitensis*, *Erodium cicutarium*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6332	0.187	53.000	*Erodium cicutarium*, Non-Native Grasses, *Medicago polymorpha*, *Malva parvifloria*	medium priority	Mixed Sage Scrub/Native Grassland Ecotone*
6333	0.546	63.000	*Erodium cicutarium*, Non-Native Grasses, *Medicago polymorpha*, *Malva parvifloria*	medium-high priority	Sagebrush Scrub*
Total	**17.636**	**961.000**			

* Indicates best prediction without specific soil samples

H4. This restoration unit is relatively intact chaparral on the northeastern edge of the Preserve. It falls within the San Andreas-San Benito 30–75 percent slope Association. Access is difficult. Table A-RR presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the H4 restoration unit within the Hacienda Heights Management Area.

Table A-RR: H4 Restoration Unit Weed Polygon Priorities within the Hacienda Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6225	0.407	67.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Centaurea melitensis*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6226	0.157	44.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Centaurea melitensis*	medium-low priority	
6228	0.476	63.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Centaurea melitensis*	medium-high priority	Sagebrush Scrub*
6305	0.383	60.000	Non-Native Grasses, *Brassica nigra*, *Carduus pycnocephalus*, *Ricinis communis*	medium-high priority	Toyon Chaparral*
6306	0.101	61.000	Non-Native Grasses, *Carduus pycnocephalus*,	medium-high	Coast Live Oak Woodland*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
			Brassica nigra, *Centaurea melitensis*	priority	
6307	0.016	72.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Centaurea melitensis*	high priority	Coast Live Oak Woodland*
6308	0.653	62.000	Non-Native Grasses, *Erodium cicutarium*, *Hirschfeldia incana*, *Silybum marianum*	medium-high priority	Toyon Chaparral*
6309	0.215	74.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Centaurea melitensis*	high priority	Coast Live Oak Woodland*
6310	0.055	57.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Centaurea melitensis*	medium priority	Coast Live Oak Woodland*
Total	**2.463**	**560.000**			

* Indicates best prediction without specific soil samples

H3. This restoration unit is relatively intact chaparral on the northeastern edge of the Preserve. It falls within the San Andreas-San Benito 30–75 percent slope Association. Access is difficult. Table A-SS presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the H3 restoration unit within the Hacienda Heights Management Area.

Table A-SS: H3 Restoration Unit Weed Polygon Priorities within the Hacienda Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6049	1.917	45.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	medium-low priority	
6225	0.258	67.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Centaurea melitensis*	medium-high priority	Sagebrush Scrub/Toyon Chaparral*
6227	0.291	60.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Centaurea melitensis*	medium-high priority	Sagebrush Scrub*
6229	2.997	63.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Centaurea melitensis*	medium-high priority	Mixed Sage Scrub/Toyon Chaparral*
6230	0.634	46.000	*Erodium cicutarium*, Non-Native Grasses,	medium-low	

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
			Medicago polymorpha, *Malva parvifloria*	priority	
6231	1.592	66.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Centaurea melitensis*	medium-high priority	Toyon Chaparral*
6232	0.302	47.000	Non-Native Grasses, *Hirschfeldia incana*, *Centaurea melitensis*, *Erodium cicutarium*	medium-low priority	
6233	0.254	39.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	low priority	
6237	0.136	21.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	low priority	
6238	0.325	24.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	low priority	
6238	0.001	24.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	low priority	
6239	0.229	39.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	low priority	
6240	0.163	24.000	Non-Native Grasses, *Brassica nigra*	low priority	
6241	0.196	42.000	Non-Native Grasses, *Brassica nigra*	medium-low priority	
6307	0.035	72.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Centaurea melitensis*	high priority	Coast Live Oak Woodland*
6330	0.401	53.000	*Erodium cicutarium*, Non-Native Grasses, *Medicago polymorpha*, *Malva parvifloria*	medium priority	Coast Live Oak Woodland*
6339	0.364	42.000	Non-Native Grasses, *Brassica nigra*	medium-low priority	
6340	0.564	45.000	Non-Native Grasses, *Brassica nigra*	medium-low priority	
6351	0.722	42.000	Non-Native Grasses, *Carduus pycnocephalus*, *Brassica nigra*, *Centaurea melitensis*	medium-low priority	
Total	**11.381**	**861.000**			

* Indicates best prediction without specific soil samples

H2. This restoration unit is relatively intact chaparral on the northeastern edge of the Preserve. It falls within the San Andreas-San Benito 30–75 percent slope Association. Access is difficult. Table A-TT presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the H2 restoration unit within the Hacienda Heights Management Area.

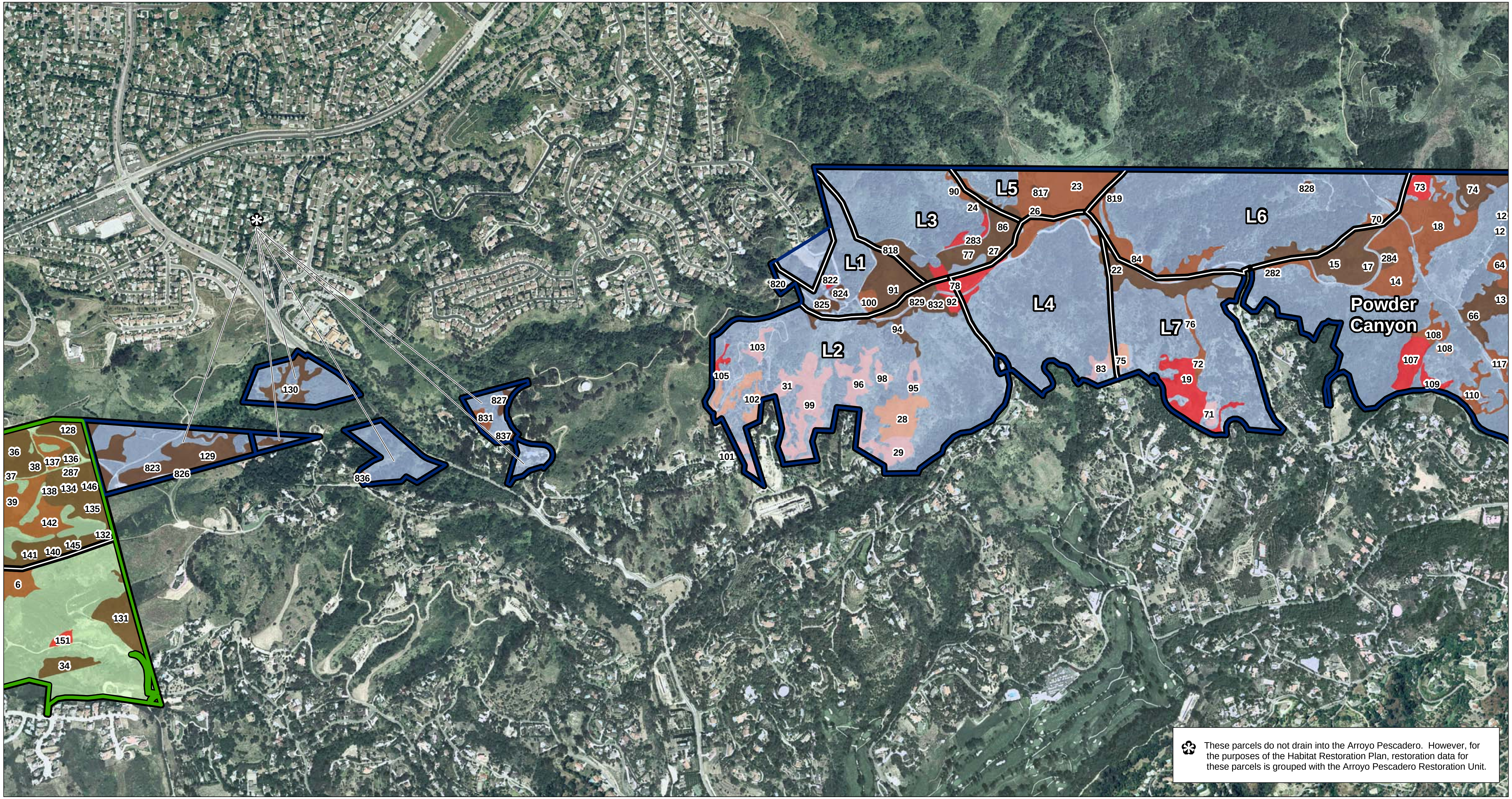
Table A-TT: H2 Restoration Unit Weed Polygon Priorities within the Hacienda Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
6233	0.012	39.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	low priority	
6233	0.232	39.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	low priority	
6234	0.482	41.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	
6235	0.413	39.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	low priority	
6236	0.090	39.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	low priority	
6238	0.135	24.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Marubium vulgare*	low priority	
Total	**1.364**	**221.000**			

* Indicates best prediction without specific soil samples

La Habra Heights Management Area and Restoration Units

La Habra Heights Management Area mainly contains the San Andreas-San Benito 30–75 percent slope Association, Perkins-Rincon Association, and the Altamont-Diablo 30–50 percent slope and 9–30 percent slope Associations. Slopes range from low to steep slopes. Dominant exotic species mainly include annual grasses and black mustard; several areas are dominated with fennel. The La Habra Heights Management Area contains 10 watersheds: upper Arroyo Pescadero, Powder Canyon, and watersheds L1–L8. Figures A-16 and A-17 show weed polygon priorities with ranked restoration units within the La Habra Heights Management Area.



Prepared By: LSA

FIGURE A-16

0 500 1,000
FEET

SOURCE: Aerial-EagleAerial (2003)

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Restoration Units-Labeled with Name

La Habra Heights Management Area

Whittier Management Area

Restoration Priorities-Labeled with ID

Low Restoration Priority

Low-Medium Restoration Priority

Medium Restoration Priority

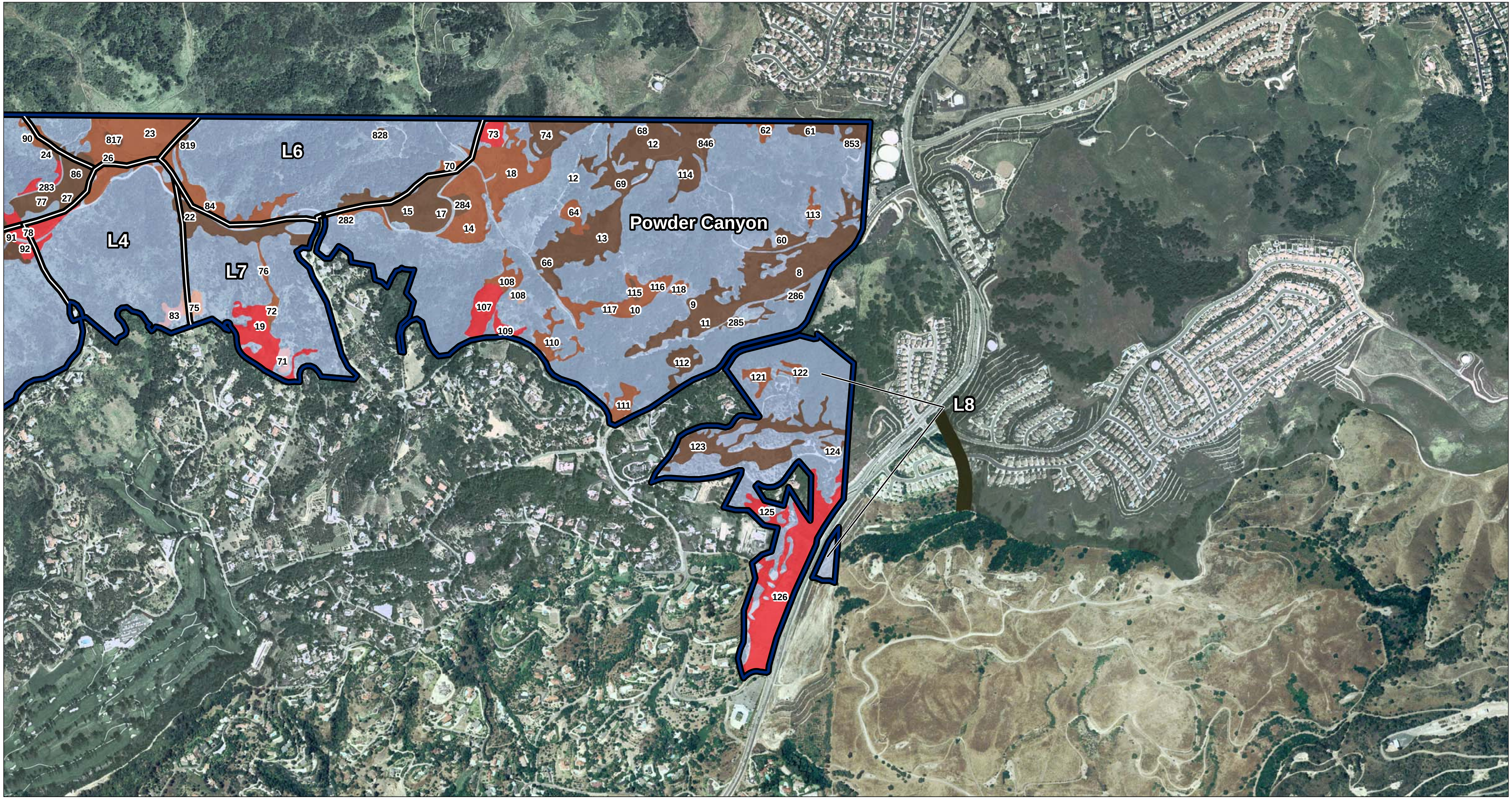
Medium-High Restoration Priority

High Restoration Priority

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

La Habra Heights
Management Area:
Weed Polygon Restoration Priorities



Prepared By: LSA

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Restoration Units

La Habra Heights Management Area

Restoration Priorities-Labeled with ID

Low Restoration Priority

Medium-Low Restoration Priority

Medium Restoration Priority

Medium-High Restoration Priority

High Restoration Priority

FIGURE A-17

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

La Habra Heights
Management Area:
Weed Polygon Restoration Priorities

SOURCE: Aerial-EagleAerial (2003)

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Powder Canyon. This restoration unit provides for wildlife connectivity ultimately to Tonner Canyon and the Chino Hills. The habitats are relatively intact, with weed polygons mostly associated with the roadways and trails through the watershed. Soils range from clay to loam in the San Andreas-San Benito Association and the Altamont-Diablo 30–50 percent slope Association. Table A-UU presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the Powder Canyon restoration unit within the La Habra Heights Management Area.

Table A-UU: Powder Canyon Restoration Unit Weed Polygon Priorities within the La Habra Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
8	16.762	76.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	high priority	Purple Sage Scrub
9	0.308	69.000	Non-Native Grasses, *Brassica nigra*	medium-high priority	Sagebrush Scrub
10	0.420	61.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*, *Centaurea melitensis*	medium-high priority	Sagebrush Scrub
11	0.899	69.000	*Brassica nigra*, Non-Native Grasses	medium-high priority	Purple Sage Scrub*
12	0.005	74.000	*Brassica nigra*, Non-Native Grasses, *Foeniculum vulgare*, *Silybum marianum*	high priority	Native Grassland
13	5.754	70.000	Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*, *Cirsium vulgare*	high priority	Purple Sage Scrub
14	5.935	61.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium-high priority	Purple Sage Scrub
15	5.051	73.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	high priority	Purple Sage Scrub
17	1.176	78.000	*Foeniculum vulgare*, Non-Native Grasses, *Brassica nigra*, *Conium maculatum*	high priority	Native Grassland*
18	8.012	67.000	Non-Native Grasses, *Brassica nigra*, *Raphanus sativus*, *Lactuca seriola*	medium-high priority	Black Sage Scrub
60	1.516	74.800	*Brassica nigra*, *Silybum marianum*, Non-Native Grasses	high priority	Purple Sage Scrub*
61	2.676	72.000	Non-Native Grasses, *Brassica nigra*,	high priority	Black Sage Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
			Foeniculum vulgare, *Cirsium vulgare*		
62	0.837	68.000	Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*	medium-high priority	Black Sage Scrub*
64	1.388	60.000	Non-Native Grasses, *Brassica nigra*, *Cirsium vulgare*	medium-high priority	Mixed Sage Scrub*
66	2.867	75.000	*Cirsium vulgare*, *Brassica nigra*, Non-Native Grasses	high priority	Purple Sage Scrub*
68	0.516	74.000	*Foeniculum vulgare*, Non-Native Grasses	high priority	Coast Live Oak Woodland*
69	3.240	72.000	Non-Native Grasses, *Brassica nigra*	high priority	Native Grassland/Mixed Sage Scrub Ecotone*
70	0.168	68.000	Non-Native Grasses, *Brassica nigra*	medium-high priority	Purple Sage Scrub*
73	1.388	51.000	*Brassica nigra*, Non-Native Grasses	medium priority	Purple Sage Scrub*
74	3.829	69.000	*Brassica nigra*, Non-Native Grasses, *Foeniculum vulgare*, *Cirsium vulgare*	medium-high priority	Sagebrush Scrub*
107	2.956	54.000	Non-Native Grasses, *rassica nigra*, *Silybum marianum*	medium priority	Sagebrush Scrub*
108	1.567	63.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium-high priority	Sagebrush Scrub*
109	0.919	53.000	*Brassica nigra*, Non-Native Grasses, *Hirschfeldia incana*	medium priority	Sagebrush Scrub*
110	1.978	60.000	Non-Native Grasses, *Brassica nigra*	medium-high priority	Sagebrush Scrub*
111	1.972	66.000	*Brassica nigra*, Non-Native Grasses	medium-high priority	Coast Live Oak Woodland-Walnut Woodland*
112	2.096	76.000	Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*	high priority	Walnut Woodland*
113	0.751	66.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium-high priority	Coast Live Oak Woodland*
114	0.672	80.000	*Foeniculum vulgare*, Non-Native Grasses	high priority	Native Grassland/Purple Sage Scrub Ecotone*
115	0.329	77.800	*Brassica nigra*, *Silybum marianum*,	high priority	Sagebrush Scrub*

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
			Centaurea melitensis, Non-Native Grasses		
116	1.012	62.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum Centaurea melitensis*	medium-high priority	Sagebrush Scrub*
117	3.147	62.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium-high priority	Sagebrush Scrub*
118	0.491	63.000	Non-Native Grasses, *Brassica nigra*	medium-high priority	Sagebrush Scrub*
282	1.082	63.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium-high priority	Purple Sage Scrub*
284	0.829	77.000	*Foeniculum vulgare*, Non-Native Grasses, *Brassica nigra*, *Conium maculatum*	high priority	Native Grassland*
285	0.888	81.800	*Brassica nigra*, *Silybum marianum*, Non-Native Grasses	high priority	Purple Sage Scrub*
286	0.537	73.800	*Brassica nigra*, *Silybum marianum*, Non-Native Grasses	high priority	Purple Sage Scrub*
846	0.540	80.000	*Eucalyptus globulus*	high priority	
853	0.337	74.000	*Eucalyptus globulus*	high priority	
Total	**94.654**	**2743.200**			

* Indicates best prediction without specific soil samples

Arroyo Pescadero. This restoration unit provides connectivity to the Whittier Management Area and the previously discussed restoration projects within this watershed. This area of the watershed has a high concentration of weeds mainly mustard- and fennel-dominated polygons. The soils range from clay loams, with mainly the San Andreas-San Benito Association and some areas of Altamont-Diablo 9–30 percent slope Association. Table A-VV presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the Arroyo Pescadero restoration unit within the La Habra Heights Management Area.

Table A-VV: Arroyo Pescadero Restoration Unit Weed Polygon Priorities within the La Habra Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
128	0.433	85.000	*Foeniculum vulgare*, *Brassica nigra*, Non-Native Grasses, *Ricinis communis*	high priority	Sagebrush Scrub*
128	1.442	85.000	*Foeniculum vulgare*, *Brassica nigra*, Non-Native Grasses, *Ricinis communis*	high priority	Sagebrush Scrub*
129	6.179	80.000	*Brassica nigra*, *Foeniculum vulgare*, *Raphanus sativus*, *Silybum marianum*	high priority	Sagebrush Scrub*
129	0.452	80.000	*Brassica nigra*, *Foeniculum vulgare*, *Raphanus sativus*, *Silybum marianum*	high priority	Sagebrush Scrub*
130	3.254	72.000	Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*, *Cirsium vulgare*	high priority	Sagebrush Scrub*
146	0.673	79.000	*Foeniculum vulgare*, *Brassica nigra*, Non-Native Grasses, *Silybum marianum*	high priority	Sagebrush Scrub*
823	1.202	79.000	*Ricinis communis*	high priority	
826	0.103	88.000	*Eucalyptus globulus*	high priority	
827	0.600	83.000	*Eucalyptus globulus*	high priority	
831	0.723	68.000	*Eucalyptus globulus*	medium-high priority	
836	0.226	66.000	*Eucalyptus globulus*	medium-high priority	
837	0.323	71.000	*Eucalyptus globulus*	high priority	
Total	**15.610**	**936.000**			

* Indicates best prediction without specific soil samples

L8. This restoration unit also provides connectivity ultimately to Tonner Canyon and Chino Hills. Soils range from clay to loam in the San Andreas-San Benito Association and the Altamont-Diablo 30–50 percent slope Association, with some areas of Altamont-Diablo 9–30 percent slope Association. The dominant weeds are mustard and annual grasses, which cover large areas of this restoration unit. Table

A-WW presents the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the L8 restoration unit within the La Habra Heights Management Area.

Table A-WW: L8 Restoration Unit Weed Polygon Priorities within the La Habra Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
121	1.173	67.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*, *Silybum marianum*	medium-high priority	Walnut Woodland*
122	0.598	64.000	Non-Native Grasses, *Brassica nigra*, *Ricinis communis*, *Silybum marianum*	medium-high priority	Walnut Woodland*
123	9.365	75.000	Non-Native Grasses, *Brassica nigra*	high priority	Purple Sage Scrub*
124	0.517	71.000	Non-Native Grasses, *Brassica nigra*	high priority	Purple Sage Scrub*
125	1.560	52.000	*Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium priority	Mixed Sage Scrub*
126	15.451	58.000	*Brassica nigra*, Non-Native Grasses, *Salsola tragus*, *Nicotiana glauca*	medium priority	Purple Sage Scrub*
Total	**28.664**	**387.000**			

* Indicates best prediction without specific soil samples

L1–L7. These restoration units share the same soil types, with mainly San Andreas-San Benito 30–75 percent slope Association. The units provide connection between Powder Canyon and Pescadero Canyon. Many of these restoration units have relatively intact habitat with either mustard or annual grasses as the most common dominant weed. There are fennel-dominant areas in L3 and L7. Tree tobacco dominates a large polygon in L5. Tables A-XX – A-DDD present the priority ranking, acreage, exotic vegetation currently on site, and proposed habitat for the L1–L7 restoration units within the La Habra Heights Management Area.

Table A-XX: L1 Restoration Unit Weed Polygon Priorities within the La Habra Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
91	2.483	75.000	Non-Native Grasses, *Hirschfeldia incana*, *Foeniculum vulgare*, *Raphanus sativus*	high priority	Sagebrush Scrub*
94	0.020	69.000	*Brassica nigra*, Non-Native Grasses	medium-high priority	Sagebrush Scrub*
100	0.795	62.000	*Raphanus sativus*, Non-Native Grasses, *Foeniculum vulgare*	medium-high priority	Sagebrush Scrub*
818	2.993	90.000	*Eucalyptus globulus*	high priority	
820	0.124	71.000	*Eucalyptus globulus*	high priority	
822	0.307	50.000	*Eucalyptus globulus*	medium priority	
824	0.452	71.000	*Eucalyptus globulus*	high priority	
825	0.866	78.000	*Eucalyptus globulus*	high priority	
829	0.020	89.000	*Eucalyptus globulus*	high priority	
829	0.019	89.000	*Eucalyptus globulus*	high priority	
Total	**8.079**	**744.000**			

* Indicates best prediction without specific soil samples

Table A-YY: L2 Restoration Unit Weed Polygon Priorities within the La Habra Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
28	3.994	48.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	medium-low priority	
29	2.035	29.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
31	1.029	30.000	*Brassica nigra*, Non-Native Grasses, *Nicotiana glauca*	low priority	

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
78	0.601	57.000	*Brassica nigra*, Non-Native Grasses	medium priority	Purple Sage Scrub*
91	0.341	75.000	Non-Native Grasses, *Hirschfeldia incana*, *Foeniculum vulgare*, *Raphanus sativus*	high priority	Sagebrush Scrub*
91	0.110	75.000	Non-Native Grasses, *Hirschfeldia incana*, *Foeniculum vulgare*, *Raphanus sativus*	high priority	Sagebrush Scrub*
91	0.603	75.000	Non-Native Grasses, *Hirschfeldia incana*, *Foeniculum vulgare*, *Raphanus sativus*	high priority	Sagebrush Scrub*
92	0.640	50.000	*Brassica nigra*, Non-Native Grasses	medium priority	Purple Sage Scrub*
94	1.377	69.000	*Brassica nigra*, Non-Native Grasses	medium-high priority	Sagebrush Scrub*
95	0.797	35.000	Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*	low priority	
96	3.768	36.000	Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*	low priority	
98	0.646	31.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
99	6.267	34.000	Non-Native Grasses, *Brassica nigra*, *Nicotiana glauca*	low priority	
100	0.076	62.000	*Raphanus sativus*, Non-Native Grasses, *Foeniculum vulgare*	medium-high priority	Sagebrush Scrub*
101	1.273	28.000	Non-Native Grasses, *Brassica nigra*	low priority	
102	3.027	48.000	Non-Native Grasses, *Brassica nigra*	medium-low priority	
103	1.024	32.000	Non-Native Grasses, *Hirschfeldia incana*	low priority	
104	0.803	46.000	Non-Native Grasses, *Hirschfeldia incana*	medium-low priority	
105	0.623	50.000	Non-Native Grasses, *Brassica nigra*	medium priority	Sagebrush/Black Sage Scrub*
818	0.103	90.000	*Eucalyptus globulus*	high priority	
825	0.299	78.000	*Eucalyptus globulus*	high priority	
829	0.537	89.000	*Eucalyptus globulus*	high priority	
832	1.110	78.000	*Eucalyptus globulus*	high priority	

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
Total	**31.083**	**1245.000**			

* Indicates best prediction without specific soil samples

Table A-ZZ: L3 Restoration Unit Weed Polygon Priorities within the La Habra Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
24	0.368	74.000	*Brassica nigra*, Non-Native Grasses, *Raphanus sativus*	high priority	Purple Sage Scrub
27	1.596	69.000	Non-Native Grasses, *Raphanus sativus*, *Brassica nigra*, *Silybum marianum*	medium-high priority	Native Grassland
77	1.299	78.000	*Foeniculum vulgare*, *Brassica nigra*, Non-Native Grasses	high priority	Sagebrush Scrub*
78	0.565	57.000	*Brassica nigra*, Non-Native Grasses	medium priority	Purple Sage Scrub*
78	0.017	57.000	*Brassica nigra*, Non-Native Grasses	medium priority	Purple Sage Scrub*
86	2.732	78.000	*Foeniculum vulgare*, Non-Native Grasses, *Brassica nigra*	high priority	Sagebrush Scrub*
90	0.639	59.000	Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*, *Silybum marianum*	medium priority	Sagebrush Scrub*
91	0.410	75.000	Non-Native Grasses, *Hirschfeldia incana*, *Foeniculum vulgare*, *Raphanus sativus*	high priority	Sagebrush Scrub*
283	0.808	56.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium priority	Sagebrush Scrub*
818	1.900	90.000	*Eucalyptus globulus*	high priority	
829	0.000	89.000	*Eucalyptus globulus*	high priority	
Total	**10.334**	**782.000**			

* Indicates best prediction without specific soil samples

Table A-AAA: L4 Restoration Unit Weed Polygon Priorities within the La Habra Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
22	0.447	73.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	high priority	Purple Sage Scrub
26	2.166	61.000	*Raphanus sativus*, *Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium-high priority	Native Grassland/Purple Sage Scrub Ecotone*
27	0.006	69.000	Non-Native Grasses, *Raphanus sativus*, *Brassica nigra*, *Silybum marianum*	medium-high priority	Native Grassland
27	0.119	69.000	Non-Native Grasses, *Raphanus sativus*, *Brassica nigra*, *Silybum marianum*	medium-high priority	Native Grassland
27	0.121	69.000	Non-Native Grasses, *Raphanus sativus*, *Brassica nigra*, *Silybum marianum*	medium-high priority	Native Grassland
75	0.566	48.000	Non-Native Grasses, *Brassica nigra*	medium-low priority	
78	1.427	57.000	*Brassica nigra*, Non-Native Grasses	medium priority	Purple Sage Scrub*
83	0.800	27.000	*Brassica nigra*, Non-Native Grasses	low priority	
84	0.401	63.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium-high priority	Sagebrush Scrub*
86	0.097	78.000	*Foeniculum vulgare*, Non-Native Grasses, *Brassica nigra*	high priority	Sagebrush Scrub*
92	0.327	50.000	*Brassica nigra*, Non-Native Grasses	medium priority	Purple Sage Scrub*
Total	**6.477**	**664.000**			

* Indicates best prediction without specific soil samples

Table A-BBB: L5 Restoration Unit Weed Polygon Priorities within the La Habra Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
23	6.268	61.000	*Raphanus sativus*, *Brassica nigra*	medium-high priority	Purple Sage Scrub
24	0.236	74.000	*Brassica nigra*, Non-Native Grasses, *Raphanus sativus*, *Foeniculum vulgare*	high priority	Purple Sage Scrub
26	4.109	61.000	*Raphanus sativus*, *Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium-high priority	Native Grassland/Purple Sage Scrub Ecotone*
86	0.186	78.000	*Foeniculum vulgare*, Non-Native Grasses, *Brassica nigra*	high priority	Sagebrush Scrub*
86	0.482	78.000	*Foeniculum vulgare*, Non-Native Grasses, *Brassica nigra*	high priority	Sagebrush Scrub*
90	0.311	59.000	Non-Native Grasses, *Brassica nigra*, *Foeniculum vulgare*, *Silybum marianum*	medium priority	Sagebrush Scrub*
817	0.471	77.000	*Eucalyptus globulus*	high priority	
Total	**12.063**	**488.000**			

* Indicates best prediction without specific soil samples

Table A-CCC: L6 Restoration Unit Weed Polygon Priorities within the La Habra Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
15	1.536	73.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	high priority	Purple Sage Scrub
15	0.001	73.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	high priority	Purple Sage Scrub
18	0.152	67.000	Non-Native Grasses, *Brassica nigra*, *Raphanus sativus*, *Lactuca seriola*	medium-high priority	Black Sage Scrub
22	0.014	73.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	high priority	Purple Sage Scrub

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
22	0.137	73.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	high priority	Purple Sage Scrub
23	0.100	61.000	*Raphanus sativus*, *Brassica nigra*	medium-high priority	Purple Sage Scrub
26	0.869	61.000	*Raphanus sativus*, *Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium-high priority	Native Grassland/Purple Sage Scrub Ecotone*
70	0.721	68.000	Non-Native Grasses, *Brassica nigra*	medium-high priority	Purple Sage Scrub*
73	0.000	51.000	*Brassica nigra*, Non-Native Grasses	medium priority	Purple Sage Scrub*
84	2.035	63.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium-high priority	Sagebrush Scrub*
84	1.796	63.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium-high priority	Sagebrush Scrub*
282	0.024	63.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium-high priority	Purple Sage Scrub*
282	0.072	63.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium-high priority	Purple Sage Scrub*
819	0.228	77.000	*Eucalyptus globulus*	high priority	
828	0.234	71.000	*Eucalyptus globulus*	high priority	
Total	**7.919**	**1000.000**			

* Indicates best prediction without specific soil samples

Table A-DDD: L7 Restoration Unit Weed Polygon Priorities within the La Habra Heights Management Area

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
19	5.641	50.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium priority	Purple Sage Scrub
22	5.077	73.000	Non-Native Grasses, *Brassica nigra*, *Silybum*	high priority	Purple Sage Scrub

Weed Polygon Number	Acreage	Priority Score	Exotic Vegetation Currently on Site	Priority Level	Restoration Habitat Type
			marianum		
26	0.000	61.000	*Raphanus sativus*, *Brassica nigra*, Non-Native Grasses, *Silybum marianum*	medium-high priority	Native Grassland/Purple Sage Scrub Ecotone*
71	0.627	32.000	Non-Native Grasses, *Brassica nigra*, *Cirsium vulgare*	low priority	
72	0.624	63.000	Non-Native Grasses, *Brassica nigra*, *Cirsium vulgare*	medium-high priority	Purple Sage Scrub*
75	0.064	48.000	Non-Native Grasses, *Brassica nigra*	medium-low priority	
75	0.813	48.000	Non-Native Grasses, *Brassica nigra*	medium-low priority	
76	0.447	59.000	Non-Native Grasses, *Brassica nigra*, *Cirsium vulgare*	medium priority	Sagebrush Scrub*
84	0.226	63.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium-high priority	Sagebrush Scrub*
84	0.380	63.000	Non-Native Grasses, *Brassica nigra*, *Silybum marianum*	medium-high priority	Sagebrush Scrub*
Total	**13.899**	**560.000**			

* Indicates best prediction without specific soil samples

RESTORATION TECHNIQUES

The restoration techniques described below are general restoration techniques and are not necessarily appropriate for all areas. There are some techniques for restoration described in this section that are not the most appropriate for any given area within the Preserve. However, these techniques are included as an adaptive management option for use when more information becomes available for each site. Habitat restoration is generally undertaken in four steps: site preparation, seeding/planting, maintenance/adaptive management, and performance monitoring. Although this section provides a good basis for restoration planning, an experienced restoration ecologist should oversee and monitor each step of the restoration. This section has been written with the expectation that the restoration ecologist monitoring the restoration will use their judgment to modify the plan as appropriate. Each step of habitat restoration is discussed below.

SITE PREPARATION

The purpose of site preparation is to prepare the site for installation. There are several constraints that can hinder a plant community's development, including weed competition, nutrient deficiencies, soil compaction/lack of water infiltration, and lack of beneficial soil organisms. As discussed above, habitat restoration must address the soil and weeds to be successful. Specific agricultural suitability tests should be performed at each restoration site. Potential site preparations methods are discussed below.

Weed Control.

Mechanical.

Flail Mowing. Flail mowing is effective for clearing weedy vegetation from the site. Flail mowing should be completed prior to weed seed set. This method is useful in areas where patches of native vegetation may be present within a site dominated by nonnative annual species. Fire-prevention measures must be taken to avoid accidental fires due to sparks and machinery operation. These measures may be extensive during the dry season.

If seed is not present on the mowed vegetation, the cut vegetation can be left on site as an organic source. The cut vegetation can be raked off the site if the soil is to be exposed for seeding. Rather than remove the material from the site, the mowed material can be raked into berms up to three feet high to reduce water-flow velocities on the slope or at the toe of the slope, or compost piles can be created over the site with seeding implemented between piles. Areas that receive compost piles or berms can then be restored by adjacent established native areas as the weed material composts slowly over time. This method saves costs by not using labor to remove the material off site and not having hauling and dump fees.

The mowing treatment is limited to areas that are accessible by mechanical equipment. Slopes greater than 3:1 limit the feasibility and effectiveness of this treatment. Figure A-18 shows the portions of the Preserve that may be good candidates for composting.

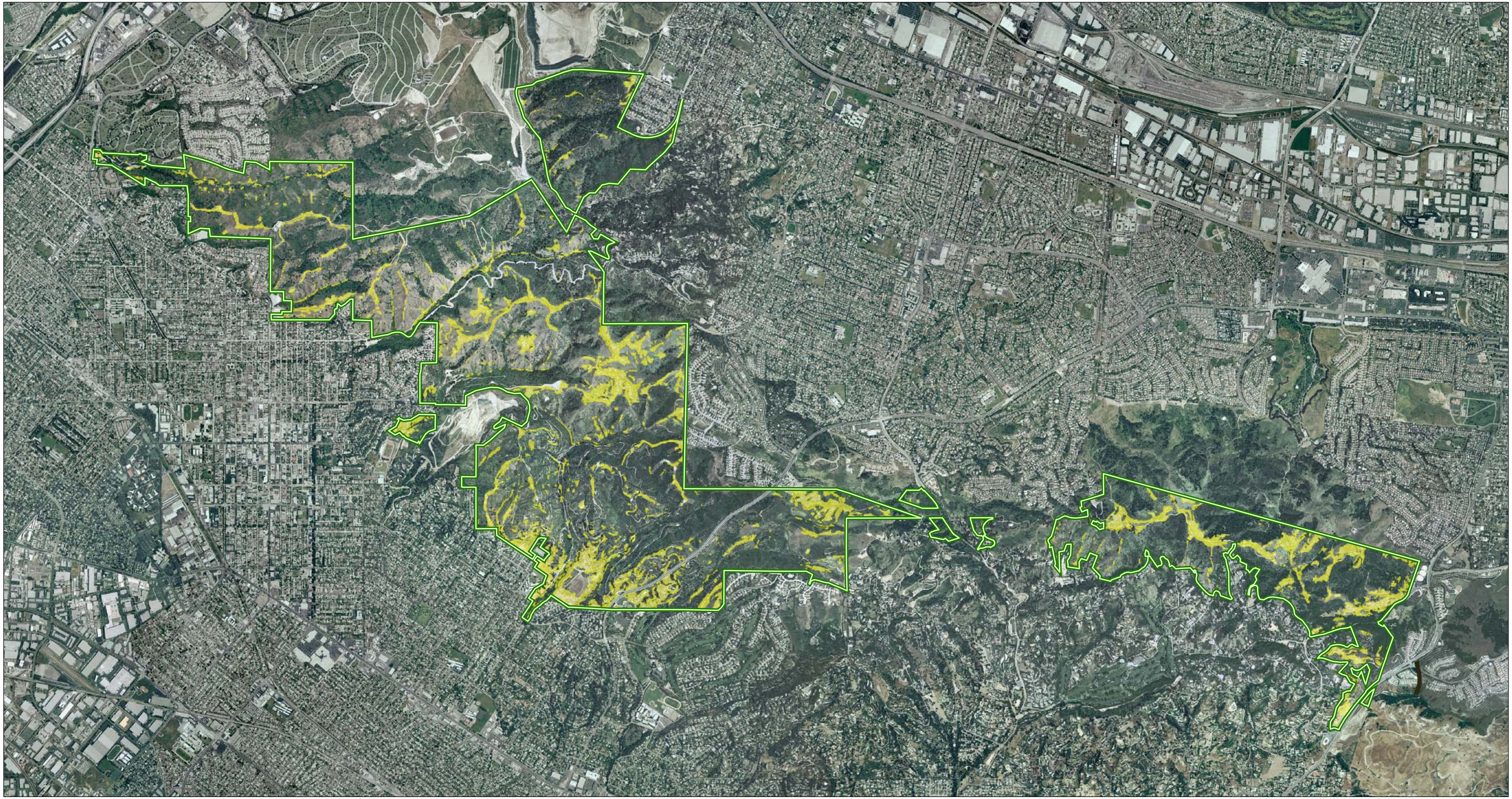
Discing. Although not effective as a sole weed control method, discing can be used to turn under the thatch and germinate weed seed in the soil. The goal of this operation is to reduce the nonnative annual grass seed bank that currently exists in the soil by encouraging the seed to germinate (through discing followed by precipitation), then destroying the resulting germinants with subsequent discing. Discing is limited to large areas that are dominated by nonnative annual species, without rocks in the substrate, and accessible by mechanical equipment. Slopes greater than 3:1 limit the feasibility and effectiveness of this treatment. To minimize erosion, all discing should be conducted parallel to the slope contour. Discing should be conducted following the first rains in the fall and continue through the spring or summer to keep weeds from producing seed. Discing should be scheduled following nonnative annual grass and forb seed germination, and when soil is dry enough to run the equipment. Other methods of weed control such as mowing and/or chemical application should be used in conjunction with discing.

Managed Goat Grazing. The steepness of many restoration units make accessibility by restoration crews very difficult. Managed grazing using goats is an option in some of these areas. Grazing over several seasons would be required to reduce weed seed banks and thatch prior to any potential seeding. Ideally, grazing would occur in early spring through early summer to control weeds prior to seeding. There are presently several companies that provide goats for grazing fire breaks in open space in southern California.

Solarization. Soil solarization can be used following vegetation clearing and soil preparation to kill weeds and weed seeds in the top two to six inches of soil. This method works best on cool season weeds and grasses, but not on deep-rooted summer weeds with rhizomes. Soil solarization also kills other soil flora and fauna in many cases. Soil is solarized by applying sheets of clear one to two mil polyethylene plastic to the prepared soil during the hottest part of the year for a minimum of four months. This method should be used on sites that do not have obstructive objects (e.g., rocks, branches), which can poke holes in the plastic.

Chemical Application. In circumstances where mechanical control is not effective, chemical application can be used to control weeds. Methods of chemical application include cut and paint, foliar application, and wicking. Only herbicides registered for wildlands may be used, and they must be carefully applied in order to avoid inadvertent damage to native plants. Some species, such as willows, are very susceptible to drift of small amounts of fine mist. Chemical applications using backpack sprayers may be the only option to control invasive weeds in areas with difficult access.

For general grasses and broadleaf herbicide applications, EPA-approved, glyphosate-based, systemic herbicides should be used, such as Round-up Pro or Rodeo for use near water courses. There are a few herbicides registered for use in noncrop wildlife areas that are selective for certain types of plants (e.g., selective for particular composite species or grasses). However, there is no herbicide that is selective for weeds only; in other words,



Prepared By: LSA

FIGURE A-18

Puente Hills Landfill
Native Habitat Preservation Authority

Resource Management Plan

Potential Composting Areas

SOURCE: Image-EagleAerial (2003)
I:\PUE430\GIS\Maps\Draft RMP\Appendices\FigA-18_Potl_Composting.mxd (11/28/2006)

all herbicides must be applied with the least harmful effect to nontarget native species. Other herbicides recommended for limited use include clopyralid (i.e., Transline) for use on yellow star-thistle and Italian thistle, fluazifop-p (i.e., Fusilade) for use on annual and perennial grass weeds, and triclopyr (i.e., Garlon 3A) for use on sweet fennel. Although fluazifop-p and triclopyr can be used for particular weed species above mean high water mark, they cannot be applied near surface water; therefore, to avoid any environmental hazards to the wetland resources, only glyphosate-based herbicides will be used within or near wetlands, as previously stated. Clopyralid should not be used on sites where movement through the soil could contaminate ground water (such as on loamy sand or sand). Methods of herbicide application are discussed below. The Habitat Authority currently only allows Round-up and Rodeo to be used in the Preserve.

Cut and Paint Chemical Application. The cut and paint chemical method is typically used on large woody, exotic species. This method involves cutting the stems to within six inches of the ground, then applying chemicals to the cut stump within two minutes of cutting. The recommended chemical application rate varies with species. This method often requires a second application, either by foliar or cut and paint, of resprouts within six months of treatment.

Foliar Chemical Application. This treatment involves broadcast spraying with a herbicide during the late winter, spring, and summer. Native seedlings present in this treatment area should be avoided during spraying. Clearing previous years' dried vegetation may be necessary to treat newly germinating weed seedlings. Following the first spray treatment, the dead vegetation, dominated by nonnative grasses and mustard, can be cut and raked into berms along the contours or at the toe of the treated slope.

An indicator dye should be used with the herbicide to keep track of the plants sprayed. A low-volume spray nozzle should be used to apply the chemical when applying manually.

Wicking. Wicking involves the use of a rag or sponge on the end of a controlled dispenser, typically in the form of a long wand or thin cylindrical stick. Wicking is good for treating smaller species in areas where native species are abundant.

Soil Preparation.

Grading. Depending on the condition of the site, some grading may be necessary during site preparation. In particular, dirt roads may need to be regraded or created to allow for access onto the site. If grading is necessary, cultural resource issues may need to be addressed prior to construction activities.

Cross Ripping. Cross ripping or rototilling can be used to decompact soils and create an uneven surface for increasing water infiltration and safe sites for native seed and organic matter. Mycorrhizal fungi inoculum can be incorporated into the soil with cross ripping.

Cross ripping is limited to sites no steeper than 2:1 due to equipment access and maneuverability.

Soils Testing/Amendments. Based on the limited soil testing in the Preserve, in most cases, the soil will have sufficient nutrients and organic matter for native plants. However, if there is an indication of poor, stunted, or deformed plant growth of weeds prior to restoration, additional soil testing may be necessary to determine if there is a nutrient deficiency or a toxic element in the soil. Another cause for these conditions is a thin soil layer covering an underlaying clay lens, rock, or hard pan layer. If soil nutrient deficiency or toxicity is suspected, soil analysis should be conducted to determine the fertility and agricultural suitability of the surface and subsurface soils. If soil analysis reveals a nutrient or organic deficiency or toxicity, remedial measures (e.g., incorporation of soil amendments, leaching) may be necessary. Otherwise, native species tolerant to these conditions may be planted.

If there is a possibility that herbicide was applied to the site, agricultural records should be checked to determine if (and when) an organic herbicide was applied to the site. If organic herbicides are present in the soil, remedial measures, including incorporation of carbon slurry may be required prior to plant installation.

Fencing and Signage. Depending on the site and adjacent land uses, fencing and signage may be necessary to keep grazing animals and pedestrians out of the restoration areas during plant establishment. This need for and type of fencing should be determined during the planning phase. Informational signage size, type, and quantity should also be considered if pedestrians and vandalism are anticipated.

Erosion Control. Potential erosion protective measures should be considered as part of the restoration effort, especially on sites that are on slopes. The potential for erosion will vary depending on the steepness and size of the slope, drainage patterns, and soil type. The type of erosion control should be determined during the planning phase, and may need to be amended following implementation of the restoration plan. Some sort of erosion control may be required, since in most cases the weedy vegetation will be cleared from the site and the soil will be exposed for at least a few months. Erosion control measures may include soil swales, drainage ways, straw wattles, rice straw wattles, sandbags, netting, mulching, or other bioengineering techniques.

METHODS FOR PLANTING NATIVE SPECIES

Container Plant Materials and Installation. The successional restoration will rely most heavily upon seed. The use of container plantings in high densities is a method used to obtain an instant vegetation structure, or vegetation "islands." The use of container plants is appropriate in limited quatities in extremely weedy areas, where seeding may not be feasible, and in order to ensure the presence of species that do not germinate reliably in the field from seed. The "island" concept is a restoration strategy that utilizes dense groupings of container plants with the expectation that the islands of native plants will expand into the surrounding weedy areas. Container plants require water within the first one to two months after planting depending on rainfall. Where feasible, plant material could be salvaged for replanting efforts from areas proposed for heavy ground disturbance within the Preserve. This would be especially beneficial in infrastructure developments within the Preserve where grading for trails or roads is necessary.

Seeding. This method can be used on nearly all restoration sites that have at least one year of site-preparation weeding. Weed control is important in the initial stages to ensure establishment once seeds have germinated. Seeding is an important component of the Early Successional Model described previously. There are a number of factors to consider when developing a seed list for particular habitats, including soils, existing native species, and distance to existing native habitats. Several seed lists were developed for use in the Preserve when the site conditions are identified to the extent that a specific habitat type can be prescribed. Alternatively, a general seed mix was developed that can be used in the Preserve when there is no clear indication of which of several specific habitats may be best for the site.

The seed mixes developed for both specific and general applications have been carefully selected to provide a balance of early successional species including annuals and perennials, as well as later successional shrub species. These seed mixes are for guidance and will need to be adjusted through results of site-specific application in accordance with the adaptive management. The seed list also includes propagation through the use of cactus pads.

Site-adapted seed materials must be used for each site; therefore, seed collection should be coordinated at least one to two years in advance. It does not seem feasible to collect all of the species from the Puente Hills Preserve, especially since most of the habitats are mature and there are no available seeds of early successional species necessary for an ecological restoration. Therefore, while recognizing the importance of maintaining genetic integrity, seed collection for some species may range beyond the Puente Hills. For those species that function as erosion control (e.g., small fescue and woolly plantain) or do not exist in large enough quantities within the specified area, it will be necessary to either use seed that is commercially grown or extend the collection area on a species-by-species basis. The Habitat Authority should contract with a seed collection contractor specializing in native seed to ensure that seed material will be collected from the Preserve and other sites as close as possible to the Preserve.

Following are the recommended seed lists (Tables A-EEE — A-RRR) to serve as a guide when developing the specific restoration plans.

Table A-EEE: Black Sage Scrub Seed Mix

Scientific Name	Common Name	Minimum Purity/Germination[1]	Pounds of Seed per Acre[2]
Salvia mellifera	black sage	70/50	2.0
Brickellia californica	California brickelbush	10/20	0.25
Deinandra fasciculata	fascicled tarweed	20/80	0.5
Eriogonum fasciculatum	California buckwheat	50/20	3.0
Gnaphalium californicum	California everlasting	5/40	0.5
Lotus scoparius	Deerweed	95/80	6.0
Lupinus bicolor[3]	miniature lupine	98/85	3.0
Lupinus succulentus	succulent lupine	98/85	1.5
Lupinus truncatus[3]	collar lupine	98/85	1.5
Malosma laurina	laurel sumac	98/70	0.5
Melica imperfecta	melic grass	80/60	2.0
Mirabilis californica	California wishbone	90/50	0.5
Nassella lepida[4]	foothill needlegrass	90/60	1.5
Phacelia distans[3]	common phacelia	98/80	0.4
Rhus integrifolia	lemonade berry	90/70	0.1
Salvia apiana	white sage	70/30	1.5
Vulpia microstachys[3]	small fescue	90/80	6.0
Species Additions for North-, Northwest-, and Northeast-Facing Slopes			
Artemisia californica	California sagebrush	15/60	2.0
Eriophyllum confertiflorum[3]	golden yarrow	30/70	2.5
Heteromeles arbutifolia	Toyon	95/50	0.5
Leymus condensatus	giant wild rye	80/80	0.5
Mimulus aurantiacus	sticky monkey flower	2/60	1.5
Rhus integrifolia	lemonade berry	90/70	0.5
Scrophularia californica	California figwort	90/60	0.2
Species Additions for South-, Southeast-, Southwest-, and West-Facing Slopes			
Phacelia ramosissima[3]	branching phacelia	95/80	0.2
Solanum douglasii[3]	Douglas' nightshade	90/20	0.1

Foot notes:

[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
[4] Seed of *Nassella* spp. shall be de-awned.

Table A-FFF: Coyote Bush Scrub Seed Mix

Scientific Name	Common Name	Minimum Purity/Germination[1]	Pounds of Seed per Acre[2]
Baccharis pilularis	coyote bush	2/40	1.0
Asclepias fascicularis	narrow-leaf milkweed	90/60	0.2
Artemisia californica	California sagebrush	15/60	0.3
Dichelostemma capitatum	blue dicks	90/80	0.2
Grindelia camporum camporum	big gum plant	90/70	0.2
Isocoma menziesii menziesii	Menzies' goldenbush	40/30	0.5
Lepidium nitidum[3]	shining peppergrass	90/50	1.0
Lessingia filaginifolia filaginifolia	California aster	15/30	0.2
Leymus condensatus	giant wild rye	80/80	1.0
Lotus scoparius[3]	Deerweed	95/80	6.0
Lupinus bicolor[3]	miniature lupine	98/85	2.0
Lupinus truncatus[3]	collar lupine	98/85	1.5
Melica imperfecta	melic grass	80/60	2.0
Nassella pulchra [4]	purple needlegrass	90/80	1.5
Phacelia distans[3]	common phacelia	98/80	0.4
Rhus integrifolia	lemonade berry	90/70	0.2
Ribes speciosum	fuchsiA-flowered gooseberry	N/A	0.1
Salvia leucophylla	purple sage	80/40	0.5
Sambucus mexicana	Mexican elderberry	90/60	0.5
Sisyrinchium bellum	blue-eye grass	95/75	0.5
Vulpia microstachys[3]	small fescue	90/80	6.0
Species Additions for North-, Northwest-, and Northeast-Facing Slopes			
Eriophyllum confertiflorum[3]	golden yarrow	30/70	2.5
Species Additions for South-, Southeast-, Southwest-, and West-Facing Slopes			
Phacelia ramosissima[3]	branching phacelia	90/80	0.2
Solanum douglasii[3]	Douglas' nightshade	90/20	0.1

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
[4] Seed of *Nassella* spp. shall be de-awned.
N/A = Information about seed purity and germination not available

Table A-GGG: Forb Seed Mix

Scientific Name	Common Name	Minimum Purity/Germination[1]	Pounds of Seed per Acre[2]
Clay Loam Substrates			
Asclepias fascicularis	narrow-leaf milkweed	90/60	0.2
Bloomeria crocea	golden stars	90/80	0.2
Dichelostemma capitatum	blue dicks	90/80	0.2
Deinandra fasciculata	fascicled tarweed	20/80	0.5
Grindelia camporum camporum	big gum plant	90/70	0.3
Hazardia squarrosa grindelioides	saw-toothed goldenbush	15/20	0.3
Heterotheca grandiflora	telegraph weed	90/50	0.2
Isocoma menziesii vernonioides	coastal goldenbush	40/30	0.5
Layia platyglossa	tidy-tips	70/70	0.2
Lepidium nitidum[3]	shining peppergrass	90/50	1.0
Lessingia filaginifolia filaginifolia	California aster	15/30	0.2
Lotus salsuginosus[3]	alkali lotus	98/75	1.5
Lupinus bicolor[3]	miniature lupine	98/85	2.0
Nassella pulchra[4]	purple needlegrass	90/80	2.0
Plantago erecta	California plantain	98/75	2.0
Stephanomeria virgata	tall wreath-plant	N/A	0.2
Vulpia microstachys[3]	small fescue	90/80	6.0
Species for Clay Substrates with Lime and/or High Water-Holding Capacity			
Amaranthus blitoides	prostrate pigweed	N/A	0.1
Isocoma menziesii menziesii	Menzies' goldenbush	40/30	1.0
Lasthenia californica	Goldfields	70/50	1.0
Lepidium strictum	upright peppergrass	N/A	0.5
Lotus salsuginosus	alkali lotus	98/75	1.0
Malvella leprosa	alkali malva	5/50	1.0
Nassella pulchra	purple needlegrass	90/80	0.5
Sisyrinchium bellum	blue-eye grass	95/75	0.5

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
[4] Seed of *Nassella* sp. shall be de-awned.
N/A = Information about seed purity and germination not available

Table A-HHH: Native Grassland Seed Mix

Scientific Name	Common Name	Minimum Purity/Germination[1]	Pounds of Seed per Acre[2]
Ambrosia psilostachya	western ragweed	20/30	0.2
Amsinckia menziesii intermedia	rancher's fireweed	40/60	0.5
Asclepias fascicularis	narrow-leaf milkweed	90/60	0.1
Bloomeria crocea	golden stars	90/80	0.2
Dichelostemma capitatum	blue dicks	90/80	0.2
Deinandra fasciculata	fascicled tarweed	20/80	0.5
Ericameria palmeri pachylepis	Grassland goldenbush	05/50	0.5
Isocoma menziesii vernonioides	coastal goldenbush	40/30	0.5
Lasthenia californica	Goldfields	70/50	1.0
Layia platyglossa	tidy-tips	70/70	0.2
Lepidium nitidum [3]	shining peppergrass	90/50	0.5
Lessingia filaginifolia filaginifolia	California aster	15/30	0.2
Lotus purshianus[3]	Spanish clover	98/70	1.5
Lotus salsuginosus[3]	alkali lotus	98/75	1.0
Lupinus bicolor[3]	miniature lupine	98/85	3.0
Lupinus succulentus[3]	arroyo lupine	98/85	1.5
Lupinus truncatus[3]	collar lupine	98/85	1.5
Melica imperfecta	melic grass	80/60	2.0
Nassella pulchra[4]	purple needlegrass	90/80	5
Plantago erecta	California plantain	98/75	2
Stephanomeria virgata	tall wreath-plant	N/A	0.2
Vulpia microstachys[3]	small fescue	90/80	6.0
Species Additions for North-, Northwest-, and Northeast-Facing Exposures			
Bromus carinatus californica	California brome	95/80	1.5
Hazardia squarrosa grindelioides	saw-toothed goldenbush	15/20	0.5
Sisyrinchium bellum	blue-eye grass	95/75	0.5
Species Additions for South-, Southeast-, East-, Southwest-, and West-Facing Exposures			
Ambrosia confertiflora	weak-leaved burweed	N/A	0.5
Eremocarpus setigerus	dove weed	90/40	0.5
Poa secunda secunda	one-sided bluegrass	90/70	0.3
Trichostema lanceolatum	vinegar weed	80/60	0.2

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
[4] Seed of *Nassella* spp. shall be de-awned.
N/A = Information about seed purity and germination not available

Table A-III: Purple Sage Scrub Seed Mix

Scientific Name	Common Name	Minimum Purity/Germination[1]	Pounds of Seed per Acre[2]
Salvia leucophylla	purple sage	80/40	2.5
Artemisia californica	California sagebrush	15/60	0.5
Baccharis pilularis	coyote bush	2/40	0.1
Dichelostemma capitatum	blue dicks	90/80	0.25
Deinandra fasciculata	fascicled tarweed	20/80	0.5
Isocoma menziesii menziesii	Menzies' goldenbush	40/30	0.5
Leymus condensatus	giant wild rye	80/80	0.5
Lepidium nitidum[3]	shining peppergrass	90/50	1.0
Lotus salsuginosus[3]	alkali lotus	98/75	1.0
Lotus scoparius[3]	Deerweed	90/80	6.0
Lupinus bicolor[3]	miniature lupine	98/85	3.0
Lupinus truncatus[3]	collar lupine	98/85	1.5
Melica imperfecta	melic grass	80/60	2.0
Nassella pulchra[4]	purple needlegrass	90/80	1.5
Phacelia distans[3]	common phacelia	98/80	0.4
Rhus integrifolia	lemonade berry	90/70	0.1
Ribes speciosum	fuchsiA-flowered gooseberry	N/A	0.2
Sambucus mexicana	Mexican elderberry	90/60	0.4
Sisyrinchium bellum	blue-eye grass	95/75	0.5
Vulpia microstachys[3]	small fescue	90/80	6.0
Species Additions for North-, Northwest-, and Northeast-Facing Slopes			
Eriophyllum confertiflorum[3]	golden yarrow	30/70	2.5
Species Additions for South-, Southeast-, Southwest-, and West-Facing Slopes			
Phacelia ramosissima[3]	branching phacelia	95/80	0.2
Solanum douglasii[3]	Douglas' nightshade	90/20	0.1

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
[4] Seed of *Nassella* spp. shall be de-awned.
N/A = Information about seed purity and germination not available

Table A-JJJ: Cactus Scrub

Scientific Name	Common Name	Minimum Purity/Germination[1]	Pounds of Seed per Acre[2]
Opuntia littoralis	coast prickly pear cactus	N/A	pads 15' o.c.
Brickellia californica	California brickelbush	10/20	0.25
Chamaesyce albomarginata	rattlesnake weed	N/A	0.1
Cryptantha intermedia	intermediate popcorn flower	10/50	0.3
Deinandra fasciculata	fascicled tarweed	20/80	0.5
Eriogonum fasciculatum	California buckwheat	50/20	3.0
Lepidium lasiocarpum[3]	sand peppergrass	N/A	1.0
Lotus scoparius	Deerweed	95/80	1.0
Lupinus bicolor[3]	miniature lupine	98/85	2.0
Lupinus hirsutissimus	stinging lupine	90/80	1.0
Lupinus truncatus[3]	collar lupine	98/85	1.5
Malosma laurina	laurel sumac	98/70	0.1
Melica imperfecta	melic grass	80/60	0.5
Mirabilis californica	California wishbone	90/50	0.5
Nassella lepida[4]	foothill needlegrass	90/60	1.5
Phacelia distans[3]	common phacelia	98/80	0.4
Phacelia ramosissima[3]	branching phacelia	95/80	0.2
Salvia mellifera	black sage	70/50	0.25
Solanum douglasii[3]	Douglas' nightshade	90/20	0.1
Vulpia microstachys[3]	small fescue	90/80	6.0

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
[4] Seed of *Nassella* spp. shall be de-awned.
N/A = Information about seed purity and germination not available
o.c. = On center

Table A-KKK: Encelia Scrub

Scientific Name	Common Name	Minimum Purity/Germination[1]	Pounds of Seed per Acre[2]
Encelia californica	California bush sunflower	40/60	3.0
Brickellia californica	California brickelbush	10/20	0.4
Cryptantha intermedia	intermediate popcorn flower	10/50	0.3
Deinandra fasciculata	fascicled tarweed	20/80	1.5
Eriogonum fasciculatum	California buckwheat	50/20	6.0
Gutierrezia californica	California matchweed	10/10	0.2
Isocoma menziesii vernonioides	coastal goldenbush	40/30	0.5
Lepidium lasiocarpum[3]	sand peppergrass	N/A	1.0
Lotus scoparius	Deerweed	95/80	6.0
Lupinus bicolor[3]	miniature lupine	98/85	3.0
Lupinus hirsutissimus	stinging lupine	90/80	1.5
Lupinus truncatus[3]	collar lupine	98/85	1.5
Malosma laurina	laurel sumac	98/70	0.5
Melica imperfecta	melic grass	80/60	2.0
Nassella lepida[4]	foothill needlegrass	90/60	1.5
Phacelia distans[3]	common phacelia	98/80	0.4
Phacelia ramosissima[3]	branching phacelia	95/80	0.2
Salvia mellifera	black sage	70/50	0.5
Solanum douglasii[3]	Douglas' nightshade	90/20	0.1
Vulpia microstachys[3]	small fescue	90/80	6.0

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
[4] Seed of *Nassella* spp. shall be de-awned.
N/A = Information about seed purity and germination not available

Table A-LLL: Toyon-Sumac Chaparral Seed Mix

Scientific Name	Common Name	Minimum Purity/Germination[1]	Pounds of Seed per Acre[2]
Heteromeles arbutifolia	Toyon	95/50	2.0
Malosma laurina	laurel sumac	98/70	2.0
Artemisia californica	California sagebrush	15/60	0.25
Baccharis pilularis	coyote bush	2/40	0.1
Eriophyllum confertiflorum[3]	golden yarrow	30/70	2.5
Galium angustifloium	chaparral bedstraw	80/30	0.2
Gnaphalium bicolor	two-tone everlasting	5/40	0.5
Hazardia squarrosa Grindelioides	saw-toothed goldenbush	15/20	0.5
Helianthus gracilentus	Slender sunflower	50/60	0.2
Lepidium lasiocarpum[3]	sand peppergrass	N/A	1.0
Lotus scoparius	Deerweed	95/80	6.0
Lupinus bicolor[3]	miniature lupine	98/85	3.0
Lupinus hirsutissimus	stinging lupine	90/80	0.5
Lupinus truncatus[3]	collar lupine	98/85	1.5
Melica imperfecta	melic grass	80/60	2.0
Mirabilis californica	California wishbone	90/50	0.5
Nassella lepida[4]	foothill needlegrass	90/60	1.5
Phacelia circutaria	caterpillar phacelia	95/80	0.4
Phacelia distans	common phacelia	98/80	0.4
Rhamnus ilicifolia	holly-leaved redberry	90/70	0.5
Rhus integrifolia	lemonade berry	90/70	0.5
Salvia mellifera	black sage	70/50	0.5
Scrophularia californica	California figwort	90/60	0.2
Toxicodendron diversilobum	poison oak	N/A	0.2
Vulpia microstachys[3]	small fescue	90/80	6.0

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
[4] Seed of *Nassella* spp. shall be de-awned.
N/A = Information about seed purity and germination not available

Table A-MMM: Sagebrush Scrub Seed Mix

Scientific Name	Common Name	Minimum Purity/Germination[1]	Pounds of Seed per Acre[2]
Artemisia californica	California sagebrush	15/60	2.5
Brickellia californica	California brickellbush	10/20	0.5
Deinandra fasciculata	fascicled tarweed	20/80	1.5
Encelia californica	California encelia	40/60	0.5
Eriogonum elongatum	long-stem buckwheat	50/10	0.2
Eriogonum fasciculatum	California buckwheat	50/20	3.0
Eriophyllum confertiflorum	golden yarrow	30/70	1.5
Gnaphalium californicum	California everlasting	5/40	0.5
Isocoma menziesii vernonioides	coastal goldenbush	40/30	0.5
Lepidium nitidum[3]	shining peppergrass	90/50	1.0
Lotus scoparius	Deerweed	95/80	6.0
Lupinus bicolor[3]	miniature lupine	98/85	3.0
Lupinus truncatus[3]	collar lupine	98/85	1.5
Melica imperfecta	melic grass	80/60	1.0
Mirabilis californica	California wishbone	90/50	0.5
Nassella lepida[4]	foothill needlegrass	90/60	2.0
Phacelia distans	common phacelia	98/80	0.4
Rhus integrifolia	lemonade berry	90/70	0.5
Salvia apiana	white sage	70/30	1.0
Salvia mellifera	black sage	70/50	0.5
Vulpia microstachys[3]	small fescue	90/80	6.0
Species Additions for North-, Northwest-, and Northeast-Facing Slopes			
Eriophyllum confertiflorum[3]	golden yarrow	30/70	2.5
Heteromeles arbutifolia	Toyon	95/50	0.5
Leymus condensatus	giant wild rye	80/80	1.0
Malosma laurina	laurel sumac	98/70	0.5
Mimulus aurantiacus	sticky monkey flower	2/60	1.5
Rhamnus ilicifolia	holly-leaved redberry	90/70	0.2
Sambucus mexicana	Mexican elderberry	90/60	0.5
Scrophularia californica	California figwort	90/60	0.3
Toxicodendron diversilobum	poison oak	N/A	0.2
Species Additions for South-, Southeast-, Southwest-, and West-Facing Slopes			
Opuntia littoralis	coast prickly pear cactus	Pads	Pads 25' o.c.
Phacelia ramosissima[3]	branching phacelia	95/80	0.2
Solanum douglasii[3]	Douglas' nightshade	90/20	0.1

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
[4] Seed of *Nassella* spp. shall be de-awned.
N/A = Information about seed purity and germination not available
o.c. = On center

Table A-NNN: General Scrub Seed Mix

Scientific Name	Common Name	Minimum Purity/Germination[1]	Pounds of Seed per Acre[2]
Artemisia californica	California sagebrush	15/60	2.5
Brickellia californica	California brickellbush	10/20	0.5
Deinandra fasciculata	fascicled tarweed	20/80	1.5
Encelia californica	California encelia	40/60	1.5
Eriogonum elongatum	long-stem buckwheat	50/10	0.2
Eriogonum fasciculatum	California buckwheat	50/20	3.0
Eriophyllum confertiflorum	golden yarrow	30/70	1.5
Gnaphalium californicum	California everlasting	5/40	0.5
Isocoma menziesii vernonioides	coastal goldenbush	40/30	1.5
Lepidium nitidum[3]	shining peppergrass	90/50	1.0
Lotus scoparius	Deerweed	95/80	6.0
Lupinus bicolor[3]	miniature lupine	98/85	3.0
Lupinus truncatus[3]	collar lupine	98/85	1.5
Melica imperfecta	melic grass	80/60	1.0
Mirabilis californica	California wishbone	90/50	0.5
Nassella lepida[4]	foothill needlegrass	90/60	2.5
Phacelia distans	common phacelia	98/80	0.5
Rhus integrifolia	lemonade berry	90/70	0.5
Salvia apiana	white sage	70/30	1.5
Salvia mellifera	black sage	70/50	1.5
Vulpia microstachys[3]	small fescue	90/80	6.0
Species Additions for North-, Northwest-, and Northeast-Facing Slopes			
Eriophyllum confertiflorum[3]	golden yarrow	30/70	2.5
Heteromeles arbutifolia	Toyon	95/50	0.5
Leymus condensatus	giant wild rye	80/80	1.0
Malosma laurina	laurel sumac	98/70	0.5
Mimulus aurantiacus	sticky monkey flower	2/60	1.5
Rhamnus ilicifolia	holly-leaved redberry	90/70	0.2
Sambucus mexicana	Mexican elderberry	90/60	0.5
Scrophularia californica	California figwort	90/60	0.3
Species Additions for South-, Southeast-, Southwest-, and West-Facing Slopes			
Phacelia ramosissima[3]	branching phacelia	95/80	0.2
Solanum douglasii[3]	Douglas' nightshade	90/20	0.1

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
[4] Seed of *Nassella* spp. shall be de-awned.
N/A = Information about seed purity and germination not available

Table A-OOO: Oak Woodland

Scientific Name	Common Name	Stock Type or Purity/Germination[1]	Plant Spacing or Pounds of Seed per Acre[2]
Canopy and Shrub Layer			
Quercus agrifolia	coast live oak	Acorns/1 gal	10' o.c.
Amorpha californica	California false indigo	95/50	0.25
Heteromeles arbutifolia	Toyon	95/50	0.1
Isocoma menziesii Vernonioides	coastal goldenbush	40/30	0.5
Keckiella cordifolia	heart-leaved penstemon	40/20	0.2
Malosma laurina	laurel sumac	98/70	0.1
Sambucus mexicana	Mexican elderberry	90/60	0.25
Rhamnus ilicifolia	holly-leaved redberry	N/A	0.2
Rhus integrifolia	lemonade berry	90/70	0.2
Ribes speciosum	fuchsiA-flowered current	N/A	0.2
Toxicodendron diversilobum	poison oak	N/A	0.2
Herbaceous Understory			
Ambrosia confertiflora	weak-leaved burweed	N/A	0.5
Ambrosia psilostachya	western ragweed	20/30	0.25
Bromus carinatus californica	California brome	95/80	2.0
Claytonia perfoliata	miner's lettuce	30/40	0.25
Elymus glaucus	blue wild rye	90/80	0.5
Lotus salsuginosus[3]	alkali lotus	98/75	0.5
Lupinus bicolor[3]	miniature lupine	98/85	1.0
Lupinus truncatus[3]	collar lupine	98/85	1.5
Vulpia microstachys[3]	small fescue	90/80	3.0

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
N/A = Information about seed purity and germination not available
gal = Gallon
o.c. = On center

Table A-PPP: Walnut Woodland

Scientific Name	Common Name	Stock Type or Purity/Germination[1]	Plant Spacing or Pounds of Seed per Acre[2]
Canopy and Shrub Layer			
Juglans californica	Southern California black walnut	1 gal	10' o.c.
Heteromeles arbutifolia	Toyon	95/50	0.5
Isocoma menziesii vernonioides	coastal goldenbush	40/30	0.5
Malosma laurina	laurel sumac	98/70	0.5
Rhamnus ilicifolia	holly-leaved redberry	90/70	0.2
Rhus integrifolia	lemonade berry	90/70	0.5
Sambucus mexicana	Mexican elderberry	90/60	0.5
Herbaceous Understory			
Ambrosia confertiflora	weak-leaved burweed	N/A	0.5
Bromus carinatus californica	California brome	95/80	3.5
Deinandra fasciculata	fascicled tarweed	20/80	0.5
Lessingia filaginifolia Filaginifolia	California aster	15/30	0.5
Lotus salsuginosus[3]	alkali lotus	98/75	1.5
Lupinus bicolor[3]	miniature lupine	98/85	2.0
Lupinus truncatus[3]	collar lupine	98/85	1.5
Phacelia distans	common phacelia	98/80	0.5
Vulpia microstachys[3]	small fescue	90/80	6.0

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
N/A = Information about seed purity and germination not available
gal = Gallon
o.c. = On center

Table A-QQQ: Willow Riparian Scrub

Scientific Name	Common Name	Stock Type or Purity/Germination[1]	Plant Spacing or Pounds of Seed per Acre[2]
Canopy and Shrub Layer			
Salix lasiolepis	arroyo willow	Cuttings	10' o.c.
Salix laevigata	red willow	Cuttings	15' o.c.
Baccharis salicifolia	mule fat	Cuttings	20' o.c.
Sambucus mexicana	Mexican elderberry	90/60	0.5
Populus trichocarpa	Black cottonwood	Cuttings	25' o.c.
Ribes aureum	golden currant	N/A	0.5
Herbaceous Understory			
Artemisia douglasiana	Mugwort	15/50	1.5
Ambrosia psilostachya	western ragweed	20/30	0.5
Elymus glaucus	blue wild rye	90/80	0.5
Oenothera elata	Hooker's evening-primrose	98/80	0.25
Juncus mexicana	Mexican rush	90/80	0.25
Cyperus eragrostis	tall umbrella sedge	90/80	0.5
Urtica dioica	hoary nettle	60/60	0.1

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending on results of tests for germination.
N/A = Information about seed purity and germination not available
o.c. = On center

Table A-RRR: Sycamore/Oak Riparian Woodland

Scientific Name	Common Name	Stock Type or Purity/Germination[1]	Plant Spacing or Pounds of Seed per Acre[2]
Canopy and Shrub Layer			
Platanus racemosa	western sycamore	1 gal	25' o.c.
Amorpha californica	California false indigo	95/50	0.25
Fraxinus velutina	flowering ash	N/A	0.25
Quercus agrifolia	coast live oak	1 gal	25' o.c.
Salix lasiolepis	arroyo willow	Cuttings	20' o.c.
Sambucus mexicanus	Mexican elderberry	90/60	0.5
Populus trichocarpa	black cottonwood	Cuttings	25' o.c.
Ribes aureum	golden currant	N/A	0.5
Rubus ursinus	California blackberry	N/A	0.2
Vitus girdiana	wild grape	98/70	0.2
Herbaceous Understory			
Artemisia douglasiana	Mugwort	15/50	1.0
Ambrosia psilostachya	western ragweed	20/30	0.5
Bromus carinatus californica	California brome	95/80	1.5
Elymus glaucus	blue wild rye	90/80	0.5
Lupinus truncatus[3]	collar lupine	98/85	1.5
Juncus mexicana	Mexican rush	90/80	0.25
Oenothera elata	Hooker's evening-primrose	98/80	0.25

Footnotes:
[1] Minimum germination may be adjusted after germination tests on special local collection.
[2] Bulk seed rate may be adjusted depending upon results of tests for germination.
[3] Erosion control and nurse crop species.
N/A = Information about seed purity and germination not available
gal = Gallon
o.c. = On center

There are several methods for dispersing seed materials: hand seeding, drill seeding, imprint seeding, hydroseeding, hydroseeding with a bonded fiber matrix, and importing native topsoil. The methods for applying seed are briefly described below.

Broadcast Seeding. Broadcast seeding is the all-purpose seeding method, where seed is broadcast, usually by hand and often with an inert dispersal medium, and raked in. It can be used in all situations; however, other seeding methods maybe more applicable in certain situations. Broadcast seeding does create the greatest potential for loss of seed due to wind, runoff, and herbivores.

Drill Seeding. Drill seeding should be used on uncompacted sandy or silty soils where the gradient is 3:1 or less. A drill seeder is an agricultural seeding implement that creates an opening in the ground, deposits the seed in linear rows, and buries it as it is pulled behind a tractor. Arbuscular mycorrhizae can be directly incorporated into the soil with this method.

Imprint Seeding. This method should be used on uncompacted sandy or silty soils where the gradient is 3:1 or less. It may be used on slopes of 2:1 if there is special equipment available. An imprint seeder presses seed into the soil using a heavy drum with attached angular teeth. Imprint seeding creates a terrain with small indentations that trap water and provides a varied microclimate for the seed. Arbuscular mycorrhizae can be directly incorporated into the soil with this method.

Aerial Seeding. Aerial seeding using a helicopter is also a method that may be used in the steeper areas of the Preserve, in combination with goat grazing, as a site preparation method. Aerial seeding would require either heavy rates or seed coating to insure that enough seed is delivered to the site.

Hydroseeding. Hydroseeding should be used on bare slopes that have a gradient greater than 3:1 and where the potential for erosion is evident. Access to a nearby water source by equipment is necessary. Hydroseeding applies seed in slurry (water, mulch, and binder) that adheres to the soil. The mulch and binder help stabilize the soil and help protect the seed from loss due to herbivores and environmental factors. Arbuscular mycorrhizae can be included in the hydroseed slurry and applied at the same time as the seed.

Hydroseeding with Bonded Fiber Matrix (BFM). This type of hydroseeding should also be used on bare slopes where the potential for erosion is evident; however, the gradient can be 2:1. Access to a nearby water source by equipment is necessary.

Import Native Topsoil. Topsoil from a nearby native site that is relatively free of weeds and slated for disturbance may be imported to a site for restoration.

Mycorrhizal Inoculum Materials (inoculum produced from site-specific sources or commercial inoculum). This fungal inoculum should be used in sites that have low-phosphorous and historically dense weeds. The application can be done with most seeding operations as well as in the containerized plants. While most commercial arbuscular mycorrhizal material contains only one species *(Glomus intradices),* this species generally is beneficial in establishing native plants, especially where mustard dominates. There has been limited work on establishing site-specific inoculum for restoration sites, and it is still not known how effectively the inoculum reflects all species from the native site. The infectivity tests in the native areas show that there is a source on site that will move into the restoration areas naturally. Therefore, given the limited funding for restoration, it is not recommended to establish site-specific inoculum from the site.

Transplanting. Small native plants—and some large plants, depending upon the species—can be salvaged from a nearby native site that is slated for disturbance and transplanted to the restoration site.

MAINTENANCE

Maintenance consists of caring for the revegetated site until the plants are established and can be sustained without human intervention. In some cases, particularly with "passive enhancement" of existing natural areas, little maintenance may be required. However, in order to assure establishment of native vegetation in extremely disturbed sites, some level of maintenance will be required. The level of maintenance will depend on the degree of disturbance of the site, the size of the site, the location of the site (with respect to access), the amount of site preparation conducted prior to planting (preplanting weed control), and proximity to a native seed source.

Exotic Weed Control. The recommended seed mixes contain native species that are fast-growing and may compete with exotic species. These are mainly the early successional native species that gradually give way to perennial native species. However, active weed control will likely still be required. Weed control is used to reduce the competition of nonnative species so that the native species can become established. The type and level of weed control will depend on the form of restoration (container plantings, seed installation, or a combination of both), the type of weeds present on the site, the size of the site, and the physical conditions of the site. For example, some weeds (less-invasive exotic species or native species that dominate on disturbed sites) are not as aggressive as others, occur in small numbers, and do not actively compete with other species. Sow thistle (*Sonchus* spp.) is an example of an exotic species that can typically be left on site if it is not abundant. Invasive, exotic species that have a competitive edge need to be controlled on a regular basis until they are no longer present on site. Native species will then establish so that they may outcompete these invasive species and prevent population explosions. Examples of invasive, exotic species include artichoke thistle, tree tobacco, black mustard, tocalote, pampas grass, poison hemlock, Italian thistle, milk thistle, wild oats, ripgut brome, and summer mustard *(Hirschfeldia incana).*

Timing of weed control is critical for effectiveness. Most of the exotic species will begin to germinate with late fall rains and begin to flower in early to mid-spring. Therefore, the majority of the weed-control effort will be required during winter through early summer. Some species will continue to grow into the summer. No exotic species should be allowed to go to flower or seed, and it is recommended that weedy species not be allowed to exceed five inches in height at any time. Should any weedy species go to seed, all seed heads should be removed and legally disposed of off site within 24 hours of removal. It is easiest and most cost-effective to actively control weeds to this standard during the first two years of planting. This gives the native species an advantage by reducing the competition for resources. The reduction of the seed source during the first year will cause a reduction in weed-control requirements over the life of the project. If optimal weed-growth conditions prevail at anytime during the maintenance period, the level of effort for weed control will need to be increased. Methods of weed control include manual, mechanical, or chemical.

Manual. Manual weed control should only be conducted within two feet of any native plant, so as not to disturb the native species' vegetative or underground root system. Manual weed control is a good method to use on smaller sites, when weeds are small, or on small species of weeds.

Mechanical. Mechanical weed control such as mowing and weed whipping should only be used in areas where native species can be avoided during the weeding process, such as areas dominated by weedy species that are taller than newly germinating native seedlings. Mechanical control can be used to reduce the size of the weedy species (this will allow light to reach the native seedlings), also to prolong or prevent flowering and seed set of nonnative species. Mechanical methods are typically used on softer forb species rather than woody species or on woody exotic species just prior to chemical application.

Chemical. Chemical use for weed control should be limited in restoration sites. Preemergent chemicals should not be used at any time. However, chemical control is necessary to control some exotic species (e.g., artichoke thistle, tree tobacco, castor bean). Chemicals used should be limited to those that are permitted in California and are not toxic to wildlife or fish species. Chemicals should always be used in accordance with the manufacturer's label and with acceptable or compatible dyes. Methods of chemical application include wicking, foliar application, and cut and paint.

Wicking. Wicking involves the use of a rag or sponge on the end of a controlled dispenser, typically in the form of a long wand or thin cylindrical stick. Wicking is good for treating smaller species in areas where native species are abundant.

Foliar Chemical Application. Foliar chemical application is useful in areas where native species are not present within a minimum of three feet from the weed patch or population. Foliar application should always be applied with a low-volume sprayer and on a calm day to avoid drift of the chemical. This treatment is good for patches of broadleaved weedy species or larger broadleaf species such as artichoke thistle (before they flower).

Cut and Paint Chemical Application. The cut and paint chemical method is typically used on large, woody exotic species. This method involves cutting the stems to within six inches of the ground, then applying chemical to the cut stump within two minutes of cutting. The recommended chemical application rate varies with species. This method often requires a second application to resprouts within six months of treatment, either by foliar or cut and paint.

Supplemental Irrigation. Supplemental irrigation may not be required if plant installation is conducted at the optimal time of year (October 15–December 1) and precipitation is frequent following installation. Supplemental irrigation may be required to establish the plants and seeds installed if the installation occurs late in the season or if precipitation is not adequate (at least one-half inch every 10–14 days) to sustain the plants. Supplemental irrigation is typically not necessary for more than two years following installation. If supplemental irrigation is required, it is best to correspond with the natural rainfall period, when seasonal temperatures tend to be relatively cool. Also, all supplemental irrigation should provide enough water to wet the entire root system of the native species.

Some methods of supplemental irrigation are hand watering with a hose from a tank or water truck; water truck spray; or a temporary irrigation system. Containerized water (i.e., DRiWATER) is not recommended because it does not promote the growth of deep plant roots.

> **Hand Watering.** Hand watering is conducted using a hose hooked up to a water-holding container (e.g., tank, synthetic bag, or water truck). The water should be administered at a rate that does not disturb the soil around the container plants. The water basin should be intact at the time of supplemental watering to concentrate the water around the rootball. If this method of watering is used, care should be taken during the watering process to avoid damage to the plants when dragging the hose around the site.

> **Water Truck.** A water truck can be used, where there is suitable access to the site, to provide a light spray for supplemental watering to seeded areas as well as a source for a hose attachment for deep watering container plants, as discussed above.

> **Temporary Irrigation System.** A temporary irrigation system can be used on sites where a water source is available (e.g., near residential, well, tank). A temporary water source such as a tank with a pump can be used to provide water to the temporary irrigation system if water is not already available to the site. This method of irrigation can be costly to install, but requires less labor to operate.

> **Containerized Water.** DriWater is containerized water in a gelatinous form that releases water for up to 90 days. It is installed adjacent to the rootball of container plants and replaced as needed. This method can be appropriate for harsh environments at remote locations, with plant species that do not require as much water: e.g., some of the hardier upland species, such as black sage and California buckwheat.

Herbivore Control. Herbivore control should be conducted when herbivory negatively affects 20 percent or more of the restoration site. Herbivore damage by deer and rabbits is often common to specific species rather than the entire site, whereas gophers and squirrels may not be as selective. Preventive or remedial measures may include installing aboveground and belowground protective caging around the affected plants (typically container plants) or live trapping.

Insect pests are rarely a problem on restoration sites. If insect pests are abundant and affect 20 percent or more of the restoration site, a licensed pest-control advisor should be consulted for a treatment that is least damaging to the surrounding environment.

Watering Basin Repair. In order to provide the most water to the establishing rootball of the container plants, the watering basins should be maintained intact until the container plants are established.

Erosion Control Repair. Erosion control should be maintained in working order throughout the establishment period.

Mulching. Mulch can be used to help retain moisture, prevent erosion, and control weeds in revegetated sites. If mulch is used, it should be replaced at least every six months at the depth and of the same quality as originally specified, until the plants are established. Mulch may need to be replaced more frequently if it is washed out.

Supplemental Amendments. Supplemental amendments may be applied to a site during the establishment period if the plants appear stressed due to an imbalance of nutrients. Prior to application, soil samples should be taken to confirm the quantity and type of amendments needed to enhance the soil for optimal growth of native species. Soil samples must be taken by an experienced person to ensure proper representation of the problem areas. Soil samples must be analyzed by a reputable soil laboratory.

Trash Removal. Trash should be removed from the site on an as-needed basis.

Human Encroachment. Human encroachment is common on restoration sites whether they are in close proximity to residences or in semiremote locations. Human encroachment can be in the form of dumping; trespassing by pedestrians, bicycles, vehicles, horses, and cattle; fence cutting, etc. Fences should be immediately repaired if damaged. Signs should be posted that explain the sensitivity of the area, requesting no trespassing, and providing a phone number to contact for inquiry about the project. In areas near residences, where vandalism by children is a potential problem, education through brochures or local meetings may help alleviate the problem.

METHODS OF MONITORING

The proposed site-specific Plan and its installation should be carefully reviewed and monitored during all steps of the process to ensure it is progressing as planned or to determine the need for adaptive management. To that end, site visits by the restoration ecologist are recommended prior to and upon initiation as well as upon completion of each phase of the Plan to ensure that each phase is carried out appropriately. Field memos should be written by the restoration ecologist to document the progress of the Plan as well as to track restoration/enhancement plans, their installation and progress, and determine how resources are being allocated throughout the Preserve.

Monitoring of the restoration/enhancement area and buffer zone around the area should continue until the site has met the predetermined performance standards.

Vegetation Monitoring. Monitoring for restoration sites includes both qualitative monitoring and quantitative performance monitoring.

Most qualitative monitoring is conducted by an experienced restoration ecologist who is familiar with the site and the restoration methods used, as well as the range of maintenance measures that are appropriate for the area. Qualitative monitoring is documented by field notes, as well as photographs when appropriate. When container plants are used in restoration, qualitative monitoring may include a mortality assessment to ensure that a sufficient number of plants survived or that a sufficient number of replacements are provided.

Most quantitative monitoring of restoration sites requires estimates of the following: percentage of cover of native plant species in the shrub canopy and herbaceous understory, percentage of cover of exotic species, number of different species that are present, and the average height of the shrub canopy. The methods used for quantitative monitoring depend on the project goals and the level of reporting required for the restoration site.

If comparisons are to be made for specific restoration sites and a reference area, comparable monitoring methods must be used for both the restoration and the reference site. Most restoration sites will be small relative to the size of the Preserve. Therefore, ecological landscape methods suitable for long-term monitoring of large areas may not be suitable for the size of most restoration sites within the Preserve. Reliable estimates of percentage of cover, species composition, and habitat structure for moderate-sized sites (5–100 acres) are routinely obtained from transect methods (line-intercept, point-intercept, or point-quadrat) by using an adequate number of sampling units and a random-sampling scheme. Permanent photo stations are used to augment quantitative monitoring.

Alternatively, qualitative vegetation performance monitoring is used when the success criteria for restoration sites is not specifically quantitative (i.e., no specific percentage of vegetation cover required or no comparison to vegetation cover for a specific reference site). Permanent photo stations are routinely used for qualitative monitoring to document the performance or development of the site over time. Photo station monitoring can be quantitative when the photograph includes a board or rod that has been painted with specific intervals to measure the development of the vegetation over time (as recorded by the photograph).

Methodology. The selection of variables measured for the performance monitoring will be based on the goals of the restoration program, development characteristics of each plant community, and the performance standards outlined above. Variables will include native species cover, exotic species cover, percent bare ground and litter, as well as species frequency and seedling frequency in monitoring transects and quadrats. Where applicable, shrub height will also be measured to provide an additional parameter to assess habitat suitability. The number of sampling units in each habitat will be determined by areas to ensure statistical confidence based on the variation over the site. Sampling methods are discussed in detail below.

Coastal Sage Scrub and Ecotone Vegetation Sampling. Vegetation sampling in coastal sage scrub should utilize the line-intercept method to measure vegetation cover. This method is best suited to measure scrub vegetation and can provide the most efficient and reliable method for estimating cover and species composition over the mitigation site.

Locations of the transects should be randomly selected within each restoration area. At each randomly selected site, a 25-meter line-intercept transect can be performed in shrub and ecotone communities. A 25-meter tape can be stretched taut, perpendicular to the main line at the randomly selected locations. Length of vegetative cover for each plant that comes into contact with the transect tape and vertical plane under the tape can be measured and entered into a handheld computer. Data to be recorded can include the species, length of vegetative cover in meters, plant number (if a continuous segment of tape consists of more than one of the same species), and the developmental stage of the plant (seedling, juvenile, or adult). Annual grasses can be grouped together in one measurement and species of annual grasses can be noted.

Seedlings can be identified for shrubs and subshrubs and can be determined by being small in size, having a nonwoody base, and usually the result of germination during the same year as the transect reading. Juveniles and adults can be identified by being definitely woody at the base of the stem. Bare ground can be recorded as areas with no vegetative cover, and litter can be recorded in areas of no vegetative cover but with dead vegetative matter covering the ground. Data on the height of the shrubs can also be recorded for all woody shrubs along the transect.

Cover data can be reported as actual linear measurements and absolute percent cover as well as relative cover. Frequency data can be reported as the percent of transects a species is reported to occur in. Height data can be reported as the average height of the shrub species.

Additionally, the restoration area can be walked and a list prepared of all species observed. This species list can be reported in the annual report in addition to the transect data.

Perennial Grassland Vegetation Sampling. Vegetation sampling in perennial grassland habitats can utilize the point-intercept method to estimate vegetation cover and species diversity. This method is best suited to measure grassland habitats, and it can provide the most efficient and reliable method for estimating cover and species composition over the mitigation site.

Locations of the transects should be randomly selected within each restoration area. At each randomly selected site, a 25-meter point-intercept transect can be performed with points at every five meters. A 25-meter tape can be stretched taut, perpendicular to the main line at the randomly selected locations. At each five-meter mark, a one-half-meter quadrat can be placed. Native and nonnative plant cover can be estimated and entered into a handheld computer. Data to be recorded can include the species present within quadrats and native and nonnative vegetative cover in relative percent.

Additionally, the restoration area can be walked and a list prepared of all species observed. This species list can be reported in the annual report in addition to the transect data.

Oak Woodland and Walnut Woodland Vegetation Sampling. Vegetation sampling in oak woodlands can utilize belt transects to measure vegetation cover. This method is best suited to measure woodland vegetation, and it can provide the most efficient and reliable method for estimating cover and species composition over the sites.

Locations of the belt transects should be randomly selected within each restoration area. At each randomly selected site, a 25 x 2 meter belt transect can be performed. A 25-meter tape can be stretched taut, perpendicular to the main line at the randomly selected locations. Data to be recorded can include the species within the belt transect, an estimate of understory cover, and the height and cover of tree species. Annual grasses can be grouped together in one measurement, and species of annual grasses can be noted.

Cover data can be reported for understory species as an estimate of relative cover. Cover for tree species can be reported as absolute cover based on the volume of sampled trees. Each tree canopy within the belt can be measured from two perpendicular diameter measurements. Frequency data can be reported as the percent of transects a species is reported to occur in. Height data can be reported as the average height of the tree species.

Additionally, the restoration area can be walked and a list prepared of all species observed. This species list can be reported in the annual report in addition to the transect data. The percent survivorship of tree species can be determined from direct counts over the site.

Arbuscular Mycorrhizal (AM) Fungi Sampling. To determine if AM is persistent throughout the restoration site, roots of seedling species known to have a symbiotic relationship with AM can be sampled and analyzed for AM fungi. Locations for root samples can be randomly selected on each discrete slope. Soil can be collected at each random site in three locations in close proximity to plant species known to be mycorrhizal symbionts. Samples should be collected at a depth of approximately 2–3 inches.

Roots should be washed and stained with 0.05 percent of Trypan Blue Stain. Roots can then be mounted on slides and analyzed using a compound microscope. Data can be recorded of the presence or absence of AM fungi in the roots.

Alternatively, soil from each site may be collected and used to determine a mycorrhizal infectivity index of the soil. In this case, soil would be used from the site to grow test plants. These test plants would then be harvested and root infectivity would be determined as above. Baseline data are presently under investigation and would be used to measure the success of the restoration sites.

These performance standards should be consistent with the ecological goals above. However, specific standards can be used to assess the performance of mitigation projects. While certain restoration and enhancement projects may require many years to implement, it is recommended that mitigation projects strive to meet performance standards within five years following installation.

Soil Monitoring. Soil monitoring of restoration sites usually focuses on an analysis of organic matter as a measure of the potential for nutrient cycling (as a function of the habitat). Another measure of soil development is the presence of mycorrhizal fungi in the soil and in the roots of plant species. Both of these soil-development indicators are determined through mycorrhizae infectivity potential (MIP) assay and soil and root assays.

Wildlife Monitoring. Wildlife monitoring for target species usually focuses on sensitive species such as the California gnatcatcher. Current approved protocols for target species surveys are used to determine presence and/or monitor breeding activity. However, point count stations for birds are another method used to document the suitability of restoration sites for wildlife. Birds are used as an indicator of habitat suitability for several reasons: (1) Birds are observable throughout the year; (2) Birds are a reliable indicator of the health of a functioning habitat; and (3) Bird species observed over time are an indicator of the complexity, function, and age of the habitat. Supplemental qualitative monitoring for wildlife includes documenting observations and/or signs noted during monitoring events.

This information could be used to monitor invasive or nonnative animal species to determine if control of these populations should be considered a priority within certain areas of the Preserve. The occurrences of brown-headed cowbirds, feral cats, opossums, striped skunks, and feral dogs should be documented and the Habitat Authority should track these occurrences.

Performance Standards/Goals for Restoration/Enhancement Sites

Performance can be assessed based on the restoration area developing a trend of vegetative cover, diversity, and species dominance that is similar to the plant communities naturally occurring in adjacent areas of the Preserve and specific performance standards can be determined on a case-by-case basis, commensurate with the scale of the project, the impetus for the project, and location within the Preserve. The goal of this type of restoration effort is to replicate the existing distribution patterns and relative proportions of key species in existing high-quality habitat within the Preserve. Ecologically based goals, such as low cover of the most problematic invasive species, can be used as performance standards instead of species or habitat specific goals. Performance should be assessed as the restoration areas develop trends in cover, species diversity, and soil development, so the habitat quality of the site is restored. Specifically, the restoration should be considered successful when the following criteria are met for each habitat type:

Coastal Sage Scrub.

- The site does not require significant maintenance measures during the last two years of the establishment period as documented by the restoration ecologist.
- The majority of plant species set seed, and seedlings of at least five dominant coastal sage scrub species demonstrate recruitment in the site.
- AM fungi root colonization of 90 percent of seedlings randomly sampled over the site.
- The habitat resists invasion by exotic plant species as demonstrated by less than 25 percent cover of annual grass species and less-aggressive exotic forbs. (Note: The 25 percent cover standard for these species is based on the percent of exotic species in the adjacent reference sites within the Preserve. There shall be no aggressive, invasive exotic species such as *Brassica nigra* and *Nicotiana glauca*.)
- The relative cover of native plant species is at least 80 percent.

- The site demonstrates 80 percent of the native species richness found in the reference habitat in the Preserve.

Perennial Grasslands and Grassland/Forbs.

- The site does not require significant maintenance measures during the last two years of the establishment period as documented by the restoration ecologist.
- The native grasses set seed.
- AM fungi root colonization of 90 percent of seedlings randomly sampled over the site.
- The habitat resists invasion by exotic plant species as demonstrated by less than 25 percent cover of annual grass species and less-aggressive exotic forbs. There shall be no aggressive, invasive exotic species such as bull thistle. The relative cover of native plant species is at least 60 percent.
- The site demonstrates 80 percent of the native species richness found in the reference habitat in the Preserve.

Grassland Scrub Ecotone.

- The site does not require significant maintenance measures during the last two years of the establishment period as documented by the restoration ecologist's annual monitoring report.
- The majority of plant species set seed, and seedlings of at least three coastal sage scrub species demonstrate recruitment in the site in the fifth year of monitoring, based on information from quantitative monitoring.
- AM fungi root colonization of 90 percent of seedlings randomly sampled over the site.
- The habitat resists invasion by exotic plant species as demonstrated by less than 25 percent cover of annual grass species and less-aggressive exotic forbs. There shall be no aggressive, invasive exotic species such as *Brassica nigra* and *Nicotiana glauca*.
- The relative cover of native plant species is at least 70 percent with approximately 10–30 percent cover from shrub species.

Oak Woodland and Walnut Woodland.

- The site does not require significant maintenance measures during the last two years of the establishment period as documented by the restoration ecologist's annual monitoring report.
- At least 60 percent of container plants have survived in the site in the fifth year of monitoring, based on information from quantitative monitoring.
- AM fungi root colonization of 90 percent of understory seedlings randomly sampled over the site.
- The habitat resists invasion by exotic plant species as demonstrated by less than 25 percent cover of annual grass species and less-aggressive exotic forbs. There shall be no aggressive, invasive exotic species such as *Carduus pynocephalus* and *Brassica nigra*.

- The relative cover of native plant species is at least 75 percent with at least 5 percent cover from oak saplings and/or walnut saplings.

APPENDIX O, TRAIL DESIGN GUIDELINES

APPENDIX O

TRAIL DESIGN GUIDELINES

The Habitat Authority's primary goal is to preserve and protect native habitat. Consistent with this purpose, the Habitat Authority will evaluate the potential for new trail routes, but focus on improving the current network of trails and implementing management actions to minimize road and trail impacts. This section describes, in general, best management practices (BMPs), design standards, maintenance, and management strategies that the Habitat Authority should endeavor to implement for roads and trails within the Preserve.

Due to the wide variety of trail and resource conditions encountered within the Preserve, these guidelines should be adjusted based on specific on-site conditions. Before deciding when and where to reconstruct or upgrade a portion of a road or trail, the Habitat Authority should carefully consider the pros and cons of different strategies and techniques available to remedy a particular problem and identify those that will have the minimum environmental impact.

TRAIL DESIGN

The road and trail system already exists; therefore, planning for new routes is not a priority. However, new trail routes may be needed as additional land is acquired and/or new sections of trail may need to be constructed to reroute an existing road or trail in order to minimize environmental impacts. The following are general guidelines for trail design and selection of trail alignments:

Location

- New trails should be integrated as much as possible into the existing trail system.
- Trail location should utilize the maximum number of staging areas in order to disperse user loads and provide for the greatest variety of trail length options (Paris 2005).
- Trail alignment should follow the natural contours of the landscape and take advantage of natural topographic features as turning points. Sharp angular turns over 50 degrees and long straight stretches should be avoided, as practicable (Point Reyes 2003).
- Routes should be sited so that minimal maintenance will be required.
- Hillside alignments should angle across the natural slope and take advantage of natural drainage to minimize the need for major drainage modifications (Point Reyes 2003).

Use

- The Habitat Authority should determine what uses are appropriate on a given trail. Some uses may be prohibited on a trail due to safety or environmental concerns.

- Where a trail is restricted to a particular type of user(s), the trail, when practicable, should be posted with use signs and appropriate barriers to discourage unauthorized use (MHA 2001).
- The durability and erodibility of the native soils should be considered with the design of any trail designated for mountain bike use. Many old road beds serving as trails are appropriate for mountain bike use because they tend to be wider, have greater sight distance, have more passing room between users, and have less slope (USDOT 2005).

Dimensions

- Trail dimensions should be based on the type and volume of uses anticipated, on the stability of native materials, and on the type of terrain along the route. Generally, a trail tread width should not be less than 18 inches for foot trails and 24 inches for horse trails (Point Reyes 2003).
- Clearing trails of overhanging branches shall be determined on a case-by-case basis to protect natural features (MHA 2001).
- Outsloping is the most important part of the tread. Water will not flow across the tread without proper outslope. The finished tread should have a 3%-5% outslope from the back of the tread to the outer edge (IMBA 2005).

Grade

- Where grades are steep, long, gradual switchbacks should be used rather than short, steep switchbacks (MHA 2001).
- In flatter areas, trails should be located so that there is some grade to provide for proper drainage (NPS 1996).
- A grade should undulate gently to provide natural drainage and to eliminate monotonous level stretches and long, steep grades that are tiring to trail users (NPS 1996).

Environmental Considerations

- Biological resource assessments should be conducted before specific trail routes are implemented. Assessments should be conducted by a qualified biologist and will include surveys for sensitive habitats and special-status species in the appropriate seasons. These assessments will include recommendations to align the trail to avoid impacts to sensitive habitats, special-status species, and heritage and significant trees (MHA 2001).
- Removal of native vegetation should be avoided as much as possible. The appropriate resource agencies should be contacted regarding any trail alignments that may impact sensitive habitats, special status species, or their habitat. Ensure plant replacement is native to the area (MHA 2001).
- In special status species habitat areas, trail use levels shall be limited as appropriate to ensure protection of resources. Techniques for limiting use may include, but are not limited to: physical access controls, seasonal or intermittent closures, restricted use permits, and exclusion of domestic pets (Colorado State Parks 1998).
- Existing vegetation patterns should be evaluated in terms of their fuel characteristics, such as ease of ignition, relative flammability, fuel load, responsiveness to suppression actions, and

ramifications if the vegetation should burn. Where alternate trail alignment siting is available, the alignment with the least flammable vegetation should be given priority.

ADA Access

Where feasible, the design of Habitat Authority trails should recognize the intent of the American with Disabilities Act (ADA) and should emphasize accessibility for everyone. To determine feasibility and the degree to which trails will be designed for accessibility, the overall terrain conditions of the area surrounding the trail route should be evaluated. As feasible, newly designed and constructed pedestrian trails or altered portions of existing pedestrian trails connecting to designated trailheads or accessible trails shall comply with the provisions of the ADA Accessibility Guidelines (MHA 2001).

Summary of Design Standards for Accessible Recreation Trails

	Easy	**Moderate**	**Difficult**
	(urban/rural)	*(roaded/natural)*	*(semi-primitive)*
Clear width (minimum)	48 inches	36 inches	28 inches
Sustained running slope (maximum)	5%	8.3%	12.55%
Maximum grade allowed for a maximum distance of 50 feet	10%	14%	20%
Cross slope (maximum)	3%	5%	8.3%
Passive space interval (maximum)	200 feet	300 feet	400 feet
Rest area interval (maximum)	400 feet	900 feet	1200 feet
Small level changes (maximum)	1 inch	2 inches	3 inches

There are no guidelines for accessible recreation trails in primitive recreation settings (Resources Agency 1998).

ADA Accessibility Design Guidelines

- All accessible recreation trails should be designed to provide the gentlest slope possible within the constraints of the natural environment. The maximum sustained running slope allowed for accessible recreation trails in each setting is outlined above (Resources Agency 1998).
- If an accessible recreation trail has less than 60 inches of clear width, passing space must be provided at reasonable intervals not to exceed the distances outlined above. Each passing space must be at least 60 inches by 60 inches. A T-intersection of two trails is also an acceptable passing space (Resources Agency 1998).
- Passing spaces can provide valuable rest areas for all people. In urban/rural and roaded natural settings, benches and other types of fixed seating should be provided adjacent to passing spaces as a matter of convenience and accommodation and should be accessible. On accessible recreation trails, rest areas at passing spaces should be provided at reasonable intervals, as shown below (Resources Agency 1998).

Level of Accessibility	ROS	Interval of Rest Areas
Easy	Urban/rural	Minimum every other passing space
Moderate	Roaded natural	Minimum every third passing space
Difficult	Semi-private	Minimum every third passing space
Most Difficult	Primitive	Not Applicable

- Resting intervals should be 60 inches minimum in length, should have a width at least as wide as the widest portion of the trail segment leading to the resting interval, and have a slope not exceeding 5% in any direction (Architectural 1999).
- Accessibility trails whose edges drop off sharply (greater than 12.5%) or have hazardous edge conditions should have a 6 inch minimum high curb at the trail's edge, a safety railing with diagonal or bull rails, or both. All safety railings should be 32 inches high and be placed at the trail's edge. Railing must be required on both sides of the trail on all ramps where hazardous conditions warrant (USDOT 2004).
- Distinctive tactile surface textures should be provided in areas of potential danger to persons with visual impairments. In addition, distinctive tactile surface textures should be provided to call attention to any interpretive displays, panels, or information signs (USDOT 2004).
- The trail surface should be firm and stable. Openings in trail surfaces should be of a size that does not permit passage of a 1/2-inch diameter sphere. Elongated openings should be placed so that the long dimension is perpendicular or diagonal to the dominant direction of travel (Architectural 1999).
- No obstacles (i.e., interpretive signs, plaques, benches, lighting) should overhang the edge of the trail by more than 4 inches, if the lower edge of the obstacle is more than 27 inches above the trail's surface (USDOT 2004).
- Accessibility guidelines are not yet available regarding the use of cross-drains and water bars in outdoor recreation settings. Designers and managers of recreation settings are encouraged to use their best judgment in ensuring that the use of cross-drains or water bars does not create an undue barrier to accessibility on recreation trails (Resources Agency 1998).
- If the surface of an accessible recreation trail changes in level more than the allowed maximums, such change must be accomplished by means of a graded surface. An accessible recreation trail may not include stairs or steps (Resources Agency 1998).
- All accessible recreation trails must have clear head room of at least 80 inches. If vertical clearance of an area adjoining an accessible recreation trail is reduced to less than 80 inches, a barrier must be provided to warn people with limited vision (Resources Agency 1998).

TRAIL AMENITIES

Signage

- Sign standards should be adopted by the Habitat Authority and implemented uniformly throughout the Preserve.
- Each trailhead, where practicable, should have an informational kiosk. Informational kiosks should include a copy of the most recent Habitat Authority map of the roads and trails. These

kiosks should provide a summary of the rules and regulations regarding use of the roads and trails, and describe benefits of using the designated system of roads and trails and the detriments of non-system trail use and construction (Marin Municipal 2005).

- Where practicable, identity signs should be located at staging areas and trail intersections. Identity signs should portray information to include: trail name and distance to staging areas, intersections with other trails, or other points of interest along the trail route (MHA 2001).
- Use signs should inform visitors of which types of trail use are appropriate, permitted, or prohibited on the trail; identify accessibility conditions and other ADA related information; educate trail users about respecting private property along the trail route and/or any special land use considerations; and prohibit smoking and use of matches or lighters. Use signs should be placed at each trail staging area where practicable (MHA 2001).
- Safety signs should display warnings of mountain lion or other wildlife danger, identify any use restrictions during the fire season, and explain the hierarchy of yielding among trail users. Safety signs should be located on an as-needed basis (MHA 2001).
- Interpretive and protective signs should be located where appropriate. Interpretive and protective signs should indicate natural resource or historical points of interest or sensitive areas. Signs should be designed to identify specimen habitat types and to educate the visitor by describing resource characteristics and values (MHA 2001).

Structures/Facilities

- Trail crossings of freshwater stream zones and drainages should be designed to minimize disturbance, through the use of bridges or culverts, whichever is least environmentally damaging. Bridges and culverts should be designed so that they visually and functionally blend with the environment and do not interfere with the movement of native fish (MHA 2001).
- Bollards, boulders, logs, stiles and/or other structures shall be used to prevent motorized vehicles from entering trail routes at any crossing of a public road right-of-way or at any trail staging area. Barriers shall be designed to comply with the latest ADA Accessibility Guidelines for Outdoor Developed Areas at trail designated as ADA accessible (MHA 2001). Removable bollards, secured with padlocks, can be installed to provide trail access for emergency and maintenance vehicles (City of Fayetteville 2003).
- Steps may be required on steep terrain with highly erodible soil. Steps should be thoughtfully placed to ensure that hikers will use them. They should be in the most appropriate place to walk and have evenly spaced rise and run. Construction materials for steps include stone slabs, railroad ties, or rough-sawn, rot-resistant timbers (Rathke and Baughman 2005, USDOT 2004).
- When designing equestrian trailhead facilities, provide for parking of tandem axle vehicles, turning radius, off loading of horses, and space for ingress and egress of additional vehicles. An area should be provided for saddling the animals. Several single or double hitching posts are generally better than one long hitching post. Water may be provided for horses at the trail head in troughs or in a container suitable for horses (USDOT 2004) or in equestrian drinking fountains.
- When developing trailhead facilities, it is important to design the trail head access points to meet both management and user needs. For trails designed for multiple use, a step-through stile is appropriate. Through use of barriers, stiles, vegetation, and natural terrain, access can be provided for the intended users and eliminated for off-road vehicles. A simple and effective stile that

accommodates both hikers and horses is a walk-through stile. This stile uses the combination of posts, log step-over barriers, gates, and log and rock barriers. The posts are placed 5 feet apart to provide an opening for both hikers and horses. The log step-over barriers are placed in front of the opening. Three logs 18-inch in diameter are placed parallel to the opening with 30-inch landings in between them. They are then bedded 4 inches into the ground and anchored with either pipe or rebar. Two additional logs are then placed perpendicular to these logs across their ends. They also are bedded 4 inches into the ground and pinned. All five logs should have a finished height of 14 inches above the trail grade (USDOT 2004). This type of stile may be considered, or the type of stile currently in place at the Las Palomas access point and Hacienda Hills Trailhead. It is generally the same concept as that previously described but it is a two, not three, log stepover with other slight variations.

Drainage Structures

Ideally, pathways built along hillsides will have an outsloped tread that allows water to flow off the pathway before it can do any damage.

- In the construction of a trail, the trail surface should be outsloped toward the downhill side.
- Grade dips can also be used to divert water from the trail. Grade dips are short trail sections cut at a grade opposite that of the prevailing trail surface. Grade dips are typically established at natural drainage ways or ditches with intermittent flows. Grade dips are permanent and usually maintenance-free. They often take advantage of natural features, descending into and then climbing out of slight folds in the terrain. Grade dips are ideal for trails frequented by bicycle riders or wheelchairs because they provide for barrier-free drainage (Resources Agency 1998).
- For existing trails, drain dips can be dug into the tread. Drain dips can most effectively be installed in trails with a prevailing grade of no more than 12 percent. The dip must be large enough to divert water from the trail and to withstand the impact of traveler's feet, hooves, and wheels. Outslope the dip to direct water toward the spill point and protect the spillway with rocks (Resources Agency 1998).
- Waterbars can also be used for existing trails. Waterbars are obstructions on the trail surface designed to divert water off the trail. They are usually constructed with logs or stones placed at an angle from the trail's edge (Rathke and Baughman 2005). On gentle trails, a bar set at a 20- to 30-degree angle may be enough. On steeper routes where the speed of the water may wash out barriers embedded at shallow angles, bars may need to be set at angles of 45 degrees or more (Resources Agency 1998). A water bar is made up of three parts: A log or rock bar that rises no more than a couple of inches above the tread; 5 feet or more of tread called an apron that is shaped to direct water off the trail; and an outlet ditch.
  - In determining where to place a water bar, a site should be selected that will discourage travelers from going around the ends of the bar. A tree or boulder can be a good barrier. If no natural barriers present themselves, a few large rocks should be embedded near one or both ends of the water bar to direct traffic toward the center of the trail.
  - Once the bar has been installed, the trail tread should be sculpted for 5 feet or more leading down to the bar in such a way that water will gradually turn off of the pathway, exiting the trail a foot or more before hitting the bar itself. The effectiveness of this funnel-shaped apron

may be tested by rolling an orange toward the water bar; the track of the orange will indicate the route that the water will take.

- Complete the water bar by digging an outlet ditch from the low point of the apron far enough away to assure that water will be carried away from the trail. Steep sideslopes may not require ditches at all, while a water bar ditch on a moderate hillside may extend several yards or more. Each ditch should be cut wider than the blade of a shovel to facilitate easy maintenance in years to come. On steeper slopes, stones placed below the end of the ditch will dissipate the force of exiting water and help protect the downslope from erosion.
- Soil removed during construction or maintenance of a water bar can be shoveled against the down-trail side of the bar to reinforce it and to lessen the height of the step over the structure. Some trail builders also advocate packing soil against the upper side of a water bar barrier to restore the curving outslope of the tread, especially when erosion has begun to undercut the bar.

- Check dams slow the flow of water in gullies to prevent further erosion and allow silt to build up behind the structures. Check steps serve the same purpose in rutted-out trails. They are effective tools for badly eroded tread and for restoring closed trails and damaged slopes, but are not suitable on routes used by horses or wheeled vehicles (Resources Agency 1998).
  - Construct check dams and steps from peeled logs or sizeable rocks, extending the ends of each dam or step well into the sides of the ditch so that water cannot sneak around them.
  - Filling behind the rock or logs with small stones or mineral soil will allow the structures to be used as steps.
  - On closed trails or in gullies that are not traveled, the space behind the rock or logs can be left empty to provide room for silt to accumulate, or it can be filled with fertile soil and planted with native vegetation.

TRAIL CLOSURE

Decommissioning

The goal of decommissioning is to restore natural topography and habitat as much as possible so that maintenance work is no longer needed and to prevent future environmental impacts (Marin Municipal 2005). Shortcuts and volunteer trails may be eliminated when discovered. If left uncorrected, these volunteer trails will encourage additional use and lead to damaged vegetation, soil erosion, and drainage problems (USDOT 2004). A key component of any trail closure plan is to create a fun and sustainable alternative. You must provide a new trail that is more appealing than the old route. Otherwise, some visitors will continue to use the original trail (IMBA 2005).

- In areas where the old trail is being relocated or abandoned, time should be taken to obliterate the old trail and restore it to as natural a condition as possible. This will avoid confusion as to which trail to use, eliminate sources of erosion, restore it to a more natural appearance, and help eliminate short cutting. Depending on the terrain, one may use rock, brush, fallen timber, and transplanted vegetation. It may, in some extreme cases, require the construction of temporary fencing to prevent use (USDOT 2004).

- Compacted soil in the old trail tread should be broken up or scarified to allow the seeds and roots of new plants to penetrate.
- Surface drainage on abandoned routes needs to be addressed so that it is self-maintaining, adequately serves the area it drains, and does not deliver sediment to a creek or reservoir (Marin Municipal 2005). Abandoned tread should be stabilized to prevent further erosion. This will promote natural revegetation in some instances. Trails break natural drainage patterns and collect and concentrate surface water flows. Restoring the natural contour of the slope reestablishes the local drainage patterns and reduces the likelihood of erosion. Recontouring usually eliminates any temptation to use the old trail and facilitates revegetation efforts (USDOT 2004).
- Check dams are easy-to-build structures, typically made of logs, rocks, or straw bales fixed across the trail to trap soil. Check dams should be tall to trap the soil and well secured so that they won't wash away. A wide range of manufactured erosion control materials are designed to absorb and retain water while providing an ideal microclimate for the growth of vegetation. These include straw wattles, erosion control blankets, and commercial mulches that combine fiber, seed, fertilizer, and bonding agents (IMBA 2005).
- Starting plants on the old trail is the best way to restore the landscape. Disturbed soil often provides an opportunity for invasive plant species to take hold. Only native species should be planted in these areas. Proper transplanting techniques, fertilizer, and a portable drip irrigation system should be used to reduce transplant shock (IMBA 2005).
- The best way to keep people off the closed trail is to make it look like it was never there. The goal is to eliminate the visual corridor, including the airspace above the old trail tread. Logs and branches may be dragged across the tread and deadfall planted in the ground vertically to block the corridor at eye level. Leaves and other organic matter should be raked over the tread as the final step to complete the disguise and aid new plants. As a last resort, the beginning and end of the trail may be blocked with a fence and signs. However, the fence will look out of place, and could draw more attention to the closure, which may cause controversy. Answer expected questions by posting signage explaining the closure on, or near the fence. When the trail has been closed for a while the fence can be removed (USDOT 2004).

Seasonal Closure

Minimizing heavy traffic loads, especially during the rainy season, is one of the simplest ways to maintain an unpaved road or trail.

- Close roads and trails susceptible to erosion whenever possible provided that they do not allow access to critical public water supply facilities or utilities (Marin Municipal 2005).
- Entry points onto a closed trail should be signed appropriately. Some consideration may be given to including on the sign reference the estimated reopening date. Care should be exercised to remove all closure signs when conditions have changed (USDOT 2004).

TRAIL MAINTENANCE

Trail work should be planned and implemented with the objective of providing for visitor safety, resource protection, and public access. Operating within budgetary and staffing constraints, the Preserve Supervisor's trail maintenance program should include:

1. Regular monitoring of each trail
2. Annual trail work aimed toward preventing serious damage, and
3. Emergency repair work and/or signing to eliminate or to identify a possible safety hazard (East Bay 1995).

<u>General Trail Maintenance Guidelines</u>

- Practice environmentally sound maintenance and use techniques appropriate for the type of trail. For example, avoid the use of chemicals to retard vegetation growth.
- Assess the type of volume of use by counting the type and volume of vehicles at the trailhead.
- Repair heavily used trails in the spring and maintain them throughout the season on an as-needed basis.

<u>Spring and Early Summer Tasks</u>

- Clear windfalls and dangerous trees from the trail bed for safety and to prevent detouring.
- Remove loose rocks and debris from the tread surface.
- Repair trail wash-outs.
- Remove new plant growth on the trail annually. Clear in the spring and early summer when the new growth is soft. Vegetation on the sides of the trail should be pruned to allow passage, but should be preserved, as much as possible, to protect the aesthetic quality of the trail. Typically, vegetation is cleared to a height of seven feet to accommodate hikers and to a height of ten feet to accommodate equestrian use. Good pruning practices must be followed, including cutting branches almost flush with the limb and cutting stumps at ground level or below. Large limbs should be pruned almost flush with the trunk. Dead and dying limbs and snags which may fall on the trail should be removed. Ground cover plants and low shrubs should not be removed except on the actual trail tread.
- Level the trail tread as necessary and restore the tread grade to the original slopes. Use local material to fill ruts, holes, low spots, or muddy areas.
- Repair erosion-damaged facilities promptly to prevent further damage. Check for erosion effects after spring runoff. Check and repair water bars, drainage ditches, culverts, and drainage dips. Construct additional drainage structures if needed. Corrective work for drainage or erosion problems shall be performed within a reasonable period of time. Where necessary, barriers to prevent further erosion shall be erected until problems are corrected.
- Check and repair all structures after spring runoff and after severe summer storms.
- Check, repair, or replace signs and trail markers prior to the major use season.

<u>Weekly or Monthly Tasks (As Warranted)</u>

- Maintain trailhead facilities such as toilets and waste containers.

- Maintain switchbacks to reduce the need of costly reconstruction. Switchback maintenance involves the reshaping of tread to the intended drainage, cleaning of the inboard ditch on the upper leg, maintenance of the landing between upper and lower legs and the rehabilitation of any short cuts developing between legs.

Monitoring

An inventory of all trail maintenance, including drainage, vegetation clearing, signing, surfacing, need for graffiti removal and repair of structures, gates, fences and barriers may be pursued in early spring, prior to the heavy summer use period. Based on maintenance reports done yearly at the end of summer for winterizing trails, trails should be subject to seasonal closures or repair as warranted (MHA 2001).

PHLNHPA Trails Inventory (Sample)

Trail Number: ____ **Trail Segment:** ____

Nearest Existing Trail: ____

Trail Classification:

- Single-Track Trail (1 to 8 ft) ☐
- Dual-Track Trail (> 8 ft) ☐
- Fire Road/Utility Easement ☐
- Volunteer Trail ☐
- Other: ____

Trail Width: ____

Slope: ____

ADA Access? (check if yes) ☐

- Easy (< 5% sustained slope) ☐
- Moderate (< 8.3% sustained slope) ☐
- Difficult (< 12.5% sustained slope) ☐

Trail Setting (check all that apply):

- Brush ☐
- Ridgeline ☐
- Grassland ☐
- Riparian ☐
- Woodland ☐
- Hillside ☐
- Wetland ☐
- Other: ____

Trail Condition (check all that apply):

- Maintained ☐
- Eroded/Rutted ☐
- Lacking Needed Facilities ☐
- Short Cuts Present ☐
- Comments: ____

Scenic or Unique Qualities (check if yes)? ☐

Describe: ____

Trail Surface (check all that apply):

- Compact Soil ☐
- Gravel/Loose Rock ☐
- Pavement ☐
- Bedrock ☐
- Sand ☐
- Other: ____

Potential Barriers/Obstacles (check all that apply):

- Steep Grade (> 10%) ☐
- Difficult Access ☐
- Eroded ☐
- Overgrown/Needs Maintenance ☐
- Uncontrolled Access ☐
- Fencing ☐
- Impaired Vertical Clearance (< 10 ft) ☐
- Steps ☐
- Other: ____

Existing Improvements:

- Gate ☐
- Equestrian Staging ☐
- Horse stepover ☐
- Water ☐
- Trailhead (Parking) ☐
- Other: ____

Is there a trailhead opportunity (check if yes)? ☐

Describe: ____

Current Level of Use:

- Heavily Used ☐
- Lightly Used ☐
- Not Used ☐
- Not Open to Public ☐

Number of People Encountered While Surveying: ____

Surveyed By: ____ **Date/Time Surveyed:** ____

Comments: ____

Trail Rating: ____

***Please include photos of each trail segment**

APPENDIX P, SIGNIFICANT REFERENCES AND STUDIES USED TO PREPARE THE RESOURCE MANAGEMENT PLAN

APPENDIX P

SIGNIFICANT REFERENCES AND STUDIES USED TO PREPARE THE RESOURCE MANAGEMENT PLAN

This appendix lists references with information relevant to the Preserve and indicates how it was incorporated into the RMP. The complete reference list is in the Reference section of the RMP.

Bissell, Ronald. 1986. Cultural Resources Assessment of a 500+ Acre Parcel in Rowland Heights, Los Angeles County, California, reference number L=1615.

> Information from this document was incorporated into the cultural resources sections of the RMP.

Bon Terra Consulting. 2004. *Plant Communities and Special Status Plant Species on the Puente Hills Landfill Native Habitat Preservation Authority*.

> The vegetation mapping information was used to evaluate the habitat in the Preserve. The vegetation descriptions and list were used to prepare the plant species list, existing habitat conditions section, and sensitive species section of the RMP.

California Department of Fish and Game. 2003. A Guide and Annotated Outline for Writing Land Management Plans (South Coast Region). Lands and Facilities Branch, Sacramento, California.

> This guide was consulted to help develop the format and scope of the RMP.

California State Parks. 2003. *Chino Hills State Park Trail Management Plan,* Draft.

> Information from this document was used to assist in the development of the Trail Plan.

Conservation Biology Institute (CBI). 2005. Maintaining Ecological Connectivity Across the “Missing Middle” of the Puente-Chino Hills Wildlife Corridor. Encinitas, California.

> This report was used to formulate management guidelines for the maintenance, enhancement, and preservation of the wildlife corridor through the Preserve.

Cooper, D. S. 2000. *Breeding Landbirds of a Highly Threatened Open Space: the Puente-Chino Hills, California.*

> The species list in this report helped create the animal species and wildlife sections of the RMP.

County of Los Angeles Fire Department. 1998. *Fuel Modification Plan Guidelines for Projects Located in Fire Zone 4 or Very High Fire Hazard Severity Zones.*

> The guidelines and acceptable species list were used to formulate the fuel modification plan and plant palettes in the RMP.

Haas, Chris D. 2000. *Distribution, Relative Abundance, and Roadway Underpass Responses of Carnivores throughout the Puente-Chino Hills.*

> The species observed and the distribution of species were incorporated into the wildlife sections of the RMP.

Haas, C. D., et al. 2002. *Monitoring Reptiles and Amphibians at Longterm Biodiversity Monitoring Stations: The Puente-Chino Hills*.

> The species observed were added to the species list of the RMP. The format of the survey was used to perform the additional surveys throughout the Puente Hills to fill in the gaps of this study within the project limits.

Haas, C. and Greta Turschak. 2002. *Responses of Large and Medium-bodied Mammals to Recreation Activities: the Colima Road Underpass.*

> The use of the underpass was incorporated into the wildlife sections of the RMP.

Hillside Preservation Task Force and the Open Space Advisory Committee. 1998. *Management Policies and Guidelines for the Whittier Hills Wilderness Preserve.*

> Information from this document was incorporated into the habitat restoration guidelines and Trail Plan.

Hillside Preservation Task Force and the Open Space Advisory Committee. 1998. *Specific Management Plan, "Integrated Multiple Resource Management" for the Whittier Hills Wilderness Preserve.*

> Information from this document was incorporated into the habitat restoration guidelines and Trail Plan.

Ljubenkov, J. A. S. and T. Ross. 2001. An Annotated Checklist of the Vascular Plants of the Whittier Hills.

> The list of observed species was incorporated into the plant species list of the RMP.

LSA Associates, Inc. 2000. Draft Biological Resources of the Rose Hills Foundation, Turnbull Canyon Property.

The species observed and habitat assessment of the area were incorporated into the species list, sensitive species table, and the habitat assessment section of the RMP.

LSA Associates, Inc. 2005a. Results of Protocol Coastal California Gnatcatcher Surveys, Puente Hills Landfill Native Habitat Preservation Authority, Cities of Hacienda Heights, Whittier, and La Habra Heights, County of Los Angeles, California. Irvine, California.

The results of this survey were incorporated into the applicable existing conditions and management sections of the RMP.

LSA Associates, Inc. 2005b. 2005 Rodent Survey of the Puente Hills Landfill Native Habitat Preservation Authority Lands. Irvine, California.

The results of this survey were incorporated into the applicable existing conditions and management sections of the RMP.

LSA Associates, Inc. 2005c. Dragonfly, Butterfly, and Vertebrate Species Matrix for the Puente Hills Landfill Native Habitat Preservation Authority Lands, Results of Multispecies Surveys and Pitfall Trapping. Irvine, California.

The results of this survey were incorporated into the applicable existing conditions and management sections of the RMP.

LSA Associates, Inc. 2006. Botanical Survey Report 2005, Puente Hills Landfill Native Habitat Preservation Authority Lands. Irvine, California.

The results of this survey were incorporated into the applicable existing conditions and management sections of the RMP.

Lyren, L.M. 2001. *Movement Patterns of Coyotes and Bobcats Relative to Roads and Underpasses in the Chino Hills Area of Southern California.*

The distribution and movement of the species included in this report were incorporated into the wildlife sections of the RMP.

McKenna, Jeanette. 1997. Biennial Report for Archaeological Monitoring Services for the Puente Hills Landfill Expansion Areas, Whittier, Los Angeles County, California, reference number LS 3781.

Information from this document was incorporated into the cultural resources sections of the RMP.

Noss, Reed, Paul Beier, and William Shaw. *Evaluation of the Coal Canyon Biological Corridor.*

The use of underpass and movement of wildlife were incorporated into the wildlife sections of the RMP.

PCR Services Corporation, Frank Hovore and Associates, and Forma Systems. 2000. Biological Resources Assessment of the Proposed Puente Hills Significant Ecological Area.

Some of this information was used in the wildlife and habitat restoration guidelines sections of the RMP.

Puente Hills Landfill Native Habitat Preservation Authority. 2004. Access Strategies for People in the Puente Hills: A comprehensive trail inventory and action plan, presented as a component to the Authority's Resources Management Plan.

The information from this document was incorporated into the Trails Plan.

Remington, S. 2006. Bat Surveys of the Puente Hills, Los Angeles County, California. Costa Mesa, California.

The results of this survey were incorporated into the applicable existing conditions and management sections of the RMP.

Scientific Resource Surveys, Inc. 1989. Cultural Resource Survey Report On the Whittier Property. Reference number L-17476.

Information from this document was incorporated into the cultural resources sections of the RMP.

1920. Whittier News Annual Edition.

Information from this document was incorporated into the cultural resources sections of the RMP.

1923. Whittier News Annual Edition.

Information from this document was incorporated into the cultural resources sections of the RMP.

Scott, T. A., and D. S. Cooper. 1999. Summary of Avian Resources of the Puente-Chino Hills Corridor.

The list of species was incorporated into the animal species list for the RMP.

Swift, Cheryl. 2004. Recommendations for Restoration in the Western Puente Hills.

General concepts of the plan were considered in the habitat restoration guidelines section of the RMP.

Teracor Resource Management. 2002. Presence/Absence Report for the Coastal California Gnatcatcher *(Polioptila californica californica)* and General Avifaunal Survey for the Former Unocal Property in the Puente Hills.

The species observed during the surveys were incorporated into the animal species list for the RMP.

University of Southern California, Center for Sustainable Cities. 2006. Park Visitor User Survey. Presented to the Puente Hills Landfill Native Habitat Preservation Authority, Whittier, California.

Survey results were incorporated into the Preserve use conditions section of the RMP and were considered in the development of the Trail Plan and trail management guidelines.

Yerkes, R. F. and R. H. Campbell. 1979. Stratigraphic Nomenclature of the Central Santa Monica Mountains, Los Angeles County, California.

Information from this document was incorporated into the paleontological section of the RMP.