FINAL

VEGETATION MAPPING (2015-2016 SEASON)
FOR
NAVAL WEAPONS STATION SEAL BEACH
DETACHMENT FALLBROOK
FALLBROOK, CALIFORNIA

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May 2017

Recommended Citation:

AECOM. 2017. Vegetation Mapping (2015-2016 Season) for Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, California. Prepared under contract with Naval Facilities Engineering Command Southwest, San Diego, CA.

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List of Acronyms

GIS	geographic information system
MCV	A Manual of California Vegetation
MMU	minimum mapping unit
Navy	U.S. Department of the Navy
NWSSB-DF	Naval Weapons Station Seal Beach Detachment Fallbrook

1. Introduction

This report presents the methods and results of a vegetation mapping effort conducted at Naval Weapons Station Seal Beach Detachment Fallbrook (NWSSB-DF) in 2015–2016. This report also includes a discussion of these results in the context of prior mapping at the installation. Vegetation maps provide insight into many aspects of natural resource management by providing a temporal and geospatial representation of habitat characteristics, such as species distribution, patch size, diversity, seral development, etc., and vegetation communities are commonly used surrogates when defining faunal habitats. Vegetation mapping is conducted periodically at this installation to inform environmental compliance in support of the Navy's mission. NWSSB-DF is an 8,852-acre installation in northern San Diego County, California (Figure 1).

2. Methods

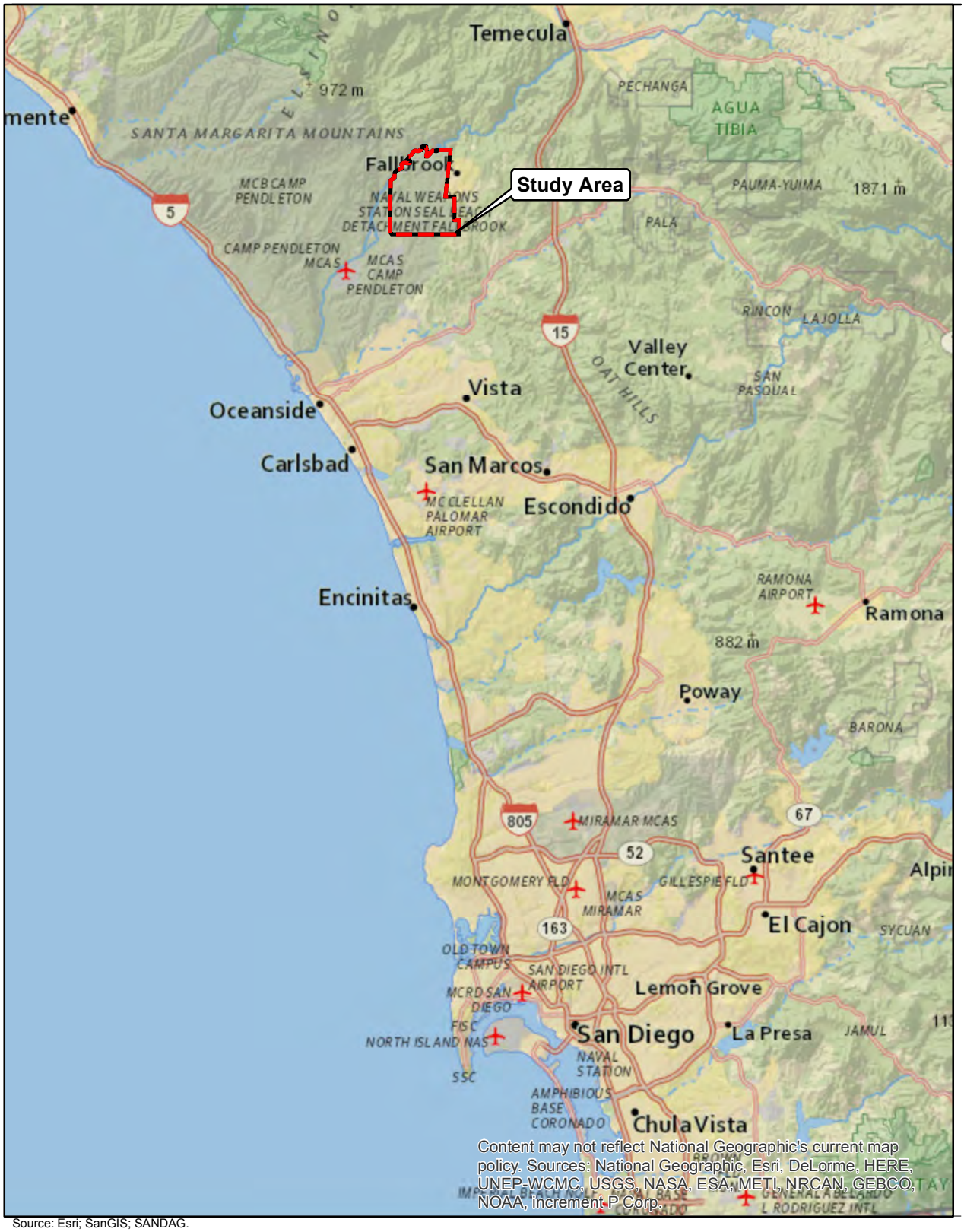
This mapping effort was conducted following the guidelines described in *Vegetation Mapping Protocol for Naval Weapons Station Seal Beach Detachment Fallbrook* ("Protocol"; USDON 2016).

Four-band (color with color IR) aerial images were collected by GeoTerra, Inc. during June 20 and 21, 2015. All flight plans and airspace access were authorized through Marine Corps Base Camp Pendleton Range Control (Longrifle). All image acquisition, processing, and ortho-rectification were conducted by GeoTerra, Inc. Final orthophotos were delivered with a resolution of 0.25 foot. This set of images served as the visual layer for photo-interpretation.

Beginning with the NWSSB-DF base layer, consisting of developed or otherwise maintained areas (e.g., paved surfaces, established dirt roads), vegetation features (e.g., polygons representing vegetation stands) were "cut" from the base layer and attributed through a combination of photo-interpretation and field reconnaissance. Vegetation polygons were drawn using a combination of photo-interpretation and field reconnaissance, with a minimum mapping unit (MMU) of 0.25 hectare and vegetation attributes assigned using the vegetation key provided in the Protocol. Vegetation types were minimally assigned to the Alliance level and to the Association level wherever discernable. Field verification was conducted to establish photo-signature training for each alliance and association. Approximately 37% (accounting for 67% of the total mapped area) of all polygons and vegetation assignments were field verified.

Following the completion of polygon creation and vegetation name attribution, quality control steps, including topological analysis, were completed to eliminate any gaps or overlaps. Additional attribution required by the Protocol includes an assessment of the ecological structure for each vegetation feature. This attribution includes an estimation of the relative (foliar) cover for each vegetation stratum (tree, shrub, herb), and the heterogeneity of each feature. This attribution was generated using the following geoprocessing steps conducted in ArcGIS:

- Training features were created to provide a representative photo-signature for each stratum
- A Maximum Likelihood Classification was conducted based on the training features using the ArcGIS Classification Toolset
- Pixel value totals for each vegetation polygon were summarized using the ArcGIS Tabulate Area Toolset



Source: Esri; SanGIS; SANDAG.

8 4 0 8 Miles

Scale: 1:506,880; 1 inch = 8 miles

Figure 1
Regional Map

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First, an image classification was conducted on the same ortho-photo used for photo-interpretation. This image was classified using a minimum number of training polygons for each of the three cover strata and an additional training feature for bare ground. Training features were drawn independent of the vegetation mapping polygons and were selected based on the photo-signature of areas of relatively homogenous cover that would represent the stratum for the mapping effort as a whole. Five training features were used for the tree and herb strata. Two separate sets of five training features were used for the shrub stratum. It was found through trial analysis that these two subsets were necessary to distinguish between "hard" chaparral shrub types from "soft" coastal scrub shrub types.

Using these training features the aerial imagery was classified using the Maximum Likelihood Classification from the ArcGIS Classification Toolset. The result of this step is a raster set with each individual raster assigned a value representing a land cover of tree, shrub, herb, or bare ground. Values from the resulting classified image were then joined to vegetation features using the Tabulate Area geoprocessing tool in ArcGIS. This step produced a summary of the number of cells (pixels) per stratum for each vegetation feature (polygon). Relative percent cover values for each stratum within each vegetation polygon were then calculated by simple arithmetic and assigned to one of the five cover class categories defined in the Protocol (Table 1). The resultant classified image is included with the project data deliverables.

Table 1. 2016 Acreages of Vegetation and Other Cover Types on NWSSB-DF

Cover Class	**1**	**2**	**3**	**4**	**5**
Percent Relative Cover	<1%,	1–5%	5–35%	35–60%	>60%

A value for heterogeneity was calculated for each vegetation polygon using these cover class assignments. Heterogeneity is a measure of the inclusion of other cover strata (below the MMU) within each mapped feature (e.g. the relative cover of tree, herb, and bare ground cover within a shrub dominated polygon). An assignment of heterogeneity was made using an arithmetic formula: cover class assignments for the non-dominant were summed, then assigned per the following ranges, (LOW) values < 3, (Moderate) values >3 and <7, (HIGH) values 7 or greater.

For this effort, Ed Kentner, PhD., served as lead photo-interpreter and conducted all photographic signature training, field verification, and assignment of vegetation attributes. All subsequent geoprocessing, quality control, and map finalization steps were conducted by Jonathan Dunn.

No thematic accuracy assessment was performed for this mapping effort, as it was beyond the scope of this project. Nonetheless, the high level of field verification offers insight into the accuracy of the product. Moreover, the methodology for this mapping effort followed the guidelines of "Method 2" as described in *Thematic Accuracy Assessment Procedures: National Park Service Vegetation Inventory,* Version 2.0 (Lea and Curtis 2010), which also produces fairly high accuracy for the reference sites because it involves an expert in the vegetation of the area. Vegetation classification assignments and polygon boundaries were field verified for approximately 67% of the total mapped area, accounting for approximately 37% of all vegetation polygons.As the mapping was conducted by the same team that created the vegetation classification and included extensive field verification a high degree of accuracy is expected.

3. Results

The results of the vegetation mapping effort are presented at a scale of 1:36,000 (1" = 3,000') in Figure 2. The large number of vegetation categories makes symbolization of the map difficult to discern at full scale. Users needing greater detail are directed to the GIS feature data. A tabular summary of the areas for each vegetation type is presented in Table 2. Vegetation types were grouped according to NWSSB-DF traditional ecological groups. As a consequence, the *Quercus agrifolia/Salix lasiolepis* Association has been placed in the Riparian Woodlands group because that association tends to follow linear drainages and is managed along with riparian habitat on the Detachment, though it could alternatively be placed in the Oak Woodlands group. Approximately 1% of all vegetation polygons could not be discerned to the Association level and were attributed as "Alliance Only." A summary of areas grouped by NatureServe Ecological Systems is presented in Table 3.

Table 2. 2016 Acreages of Vegetation and Other Cover Types on NWSSB-DF

NWSSBDF Ecological Group	Alliance	Association	Acres
Oak Woodlands	*Quercus agrifolia*	*Quercus agrifolia*/*Toxicodendron diversilobum*/Grass	142.6
	Quercus engelmannii	*Quercus engelmannii-Quercus agrifolia*/*Toxicodendron diversilobum*/Grass	68.6
		Oak Woodlands Total	**211.2**
Other Woodlands	*Eucalyptus* (*globulus*, *camaldulensis*) Semi-Natural Stand Type	Semi-Natural Stand Type	7.8
		Other Woodlands Total	**7.8**
Chaparral	*Adenostoma fasciculatum*	*Adenostoma fasciculatum*	25.9
		Adenostoma fasciculatum–Ceanothus crassifolius	90.5
		Alliance Only	24.3
	Quercus berberidifolia	*Quercus* (*berberidifolia*, ×*acutidens*)	147.6
		Chaparral Total	**288.3**
Scrub	*Acmispon glaber*	*Acmispon glaber*	742.4
	Artemisia californica	*Artemisia californica*	561.5
	Artemisia californica-Eriogonum fasciculatum	*Artemisia californica-Eriogonum fasciculatum-Malosma laurina*	635.5
		Artemisia californica-Eriogonum fasciculatum-Opuntia littoralis/Dudleya (edulis) Inland	443.7
		Alliance Only	3.5
	Artemisia californica-Salvia mellifera	*Artemisia californica-Salvia mellifera*	129.2
	Malosma laurina	*Malosma laurina-Acmispon glaber*	3452.6
		Alliance Only	9.8
	Salvia apiana	*Salvia apiana-Artemisia californica*	63.9
		Scrub Total	**6042.0**
Herbaceous	*Avena* (*barbata, fatua*) Semi-Natural Stands	Semi-Natural Stand Type	6.3
	Brassica nigra and Other Mustards Semi-Natural Stands	Semi-Natural Stand Type	9.9
	Deinandra fasciculata	*Deinandra fasciculata*	2.3
	Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands	Semi-Natural Stand Type	1273.8
	Stipa cernua	*Stipa cernua*	118.6
		Herbaceous Total	**1411.0**

NWSSBDF Ecological Group	Alliance	Association	Acres
Riparian Woodland	*Quercus agrifolia*	*Quercus agrifolia*/*Salix lasiolepis* [a]	110.9
	Platanus racemosa	*Platanus racemosa-Populus fremontii/Salix lasiolepis*	43.4
		Platanus racemosa-Quercus agrifolia	180.1
	Salix laevigata	*Salix laevigata*	15.5
		Riparian Woodland Total	**349.9**
Riparian Scrub	*Baccharis pilularis*	*Baccharis pilularis*	1.0
	Baccharis salicifolia	*Baccharis salicifolia*	16.2
	Pluchea sericea	*Pluchea sericea*	0.6
	Salix lasiolepis	*Salix lasiolepis*	43.0
	Tamarix spp. Semi-Natural Stands	Semi-Natural Stand Type	2.0
		Riparian Scrub Total	**62.8**
Herbaceous Wetland	Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands	Semi-Natural Stand Type	5.7
	Schoenoplectus californicus	Schoenoplectus californicus	15.5
	Typha (*angustifolia, domingensis, latifolia*)	Alliance Only	0.2
		Herbaceous Wetland Total	**21.3**
Unvegetated	Open Water	Open Water	2.2
		Unvegetated Total	**2.2**
Other Cover Types	Developed	Developed	330.4
	Graded/Scraped/Maintained	Graded/Scraped/Maintained	166.7
		Other Cover Types Total	**497.2**
		Grand Total [b]	**8893.8**

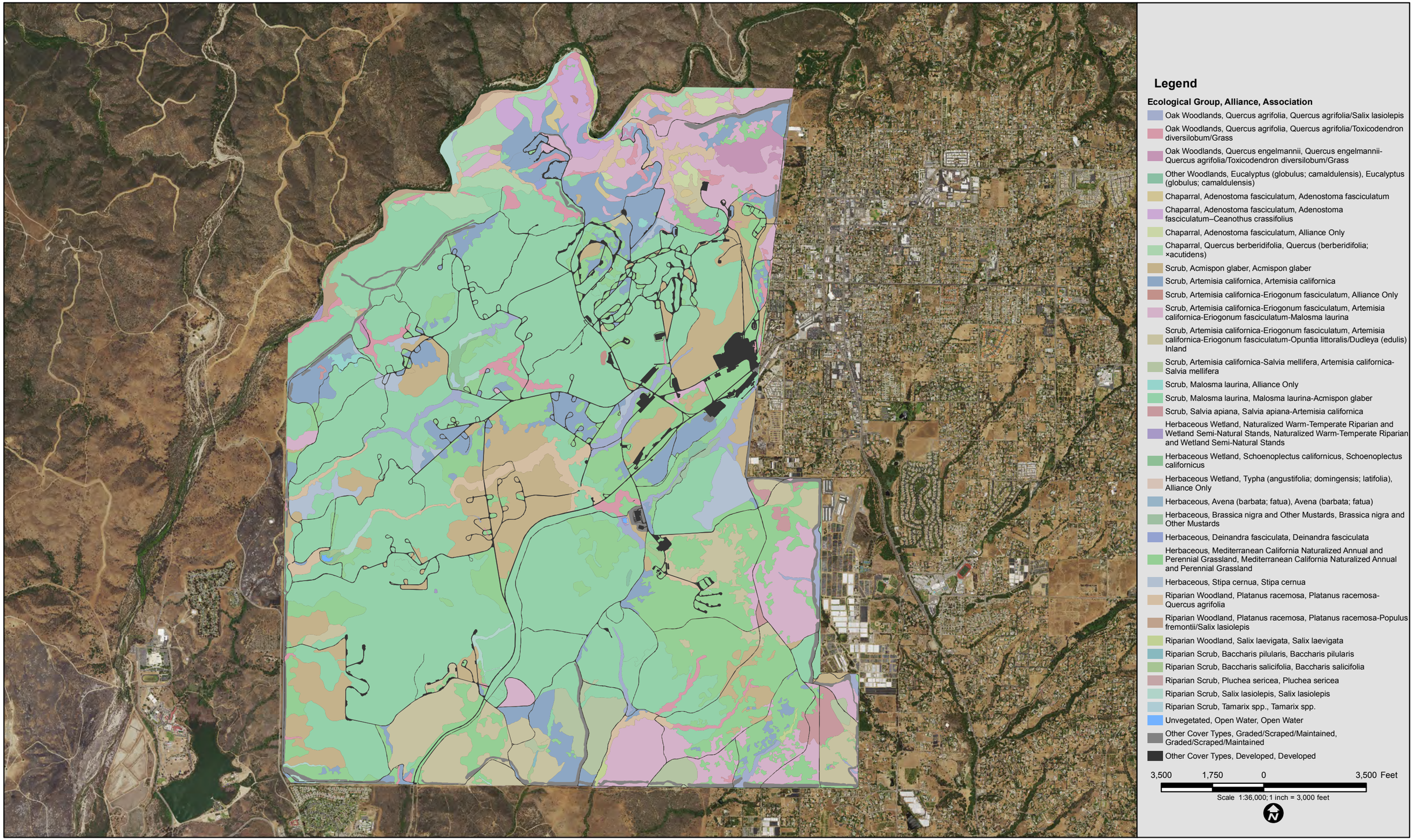
[a] *Quercus agrifolia*/*Salix lasiolepis* could also be placed in the Oak Woodlands ecological group.

[b] NWSSB-DF is 8,852 acres per Real Estate documentation; the addition of approximately 42 acres in this table can be attributed to imprecision in the GIS boundary layer for the installation along the Santa Margarita River.

Table 3. Vegetation Acres Arranged by NatureServe Ecological System

Terrestrial Ecological System	Acres
CALIFORNIA CENTRAL VALLEY AND SOUTHERN COASTAL GRASSLAND (CES206.942)	**1411.0**
***Deinandra fasciculata* Alliance**	**2.3**
Deinandra fasciculata Association	2.3
***Stipa cernua* Alliance**	**118.6**
Stipa cernua Association	118.6
***Avena* (*barbata*; *fatua*) Semi-Natural Stands**	**6.3**
***Brassica nigra* and Other Mustards Semi-Natural Stands**	**9.9**
Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands	**1273.8**
CALIFORNIA MESIC CHAPARRAL (CES206.926)	**147.6**
***Quercus berberidifolia* Alliance**	**147.6**
Quercus (*berberidifolia*; ×*acutidens*) Association	147.6
MEDITERRANEAN CALIFORNIA FOOTHILL AND LOWER MONTANE RIPARIAN WOODLAND AND SHRUBLAND (CES206.944)	**110.9**
***Quercus agrifolia* Alliance**	**110.9**
Quercus agrifolia/*Salix lasiolepis* Association	110.9
NORTH AMERICAN ARIDWEST EMERGENT MARSH (CES300.729)	**21.3**
***Schoenoplectus californicus* Alliance**	**15.5**
Schoenoplectus californicus Association	15.5

Terrestrial Ecological System	Acres
***Typha* (*angustifolia*; *domingensis*; *latifolia*) Alliance**	**0.2**
Alliance Only	0.2
Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands	**5.7**
NORTH AMERICAN WARM DESERT RIPARIAN WOODLAND AND SHRUBLAND (CES302.753)	**300.8**
***Baccharis salicifolia* Alliance**	**16.2**
Baccharis salicifolia Association	16.2
***Platanus racemosa* Alliance**	**223.5**
Platanus racemosa-Populus fremontii/*Salix lasiolepis* Association	43.4
Platanus racemosa-Quercus agrifolia Association	180.1
***Pluchea sericea* Alliance**	**0.6**
Pluchea sericea Association	0.6
***Salix laevigata* Alliance**	**15.5**
Salix laevigata Association	15.5
***Salix lasiolepis* Alliance**	**43.0**
Salix lasiolepis Association	43.0
***Tamarix* spp.**	**2.0**
Tamarix spp. Semi-Natural Stands	2.0
SOUTHERN CALIFORNIA COASTAL SCRUB (CES206.933)	**6043.0**
***Acmispon glaber* Alliance**	**742.4**
Acmispon glaber Association	742.4
***Artemisia californica* Alliance**	**561.5**
Artemisia californica Association	561.5
***Artemisia californica-Eriogonum fasciculatum* Alliance**	**1082.7**
Alliance Only	3.5
Artemisia californica-Eriogonum fasciculatum-Malosma laurina Association	635.5
Artemisia californica-Eriogonum fasciculatum-Opuntia littoralis/*Dudleya* (*edulis*) Inland Association	443.7
***Artemisia californica-Salvia mellifera* Alliance**	**129.2**
Artemisia californica-Salvia mellifera Association	129.2
***Baccharis pilularis* Alliance**	**1.0**
Baccharis pilularis Association	1.0
***Malosma laurina* Alliance**	**3462.4**
Alliance Only	9.8
Malosma laurina-Acmispon glaber Association	3452.6
***Salvia apiana* Alliance**	**63.9**
Salvia apiana-Artemisia californica Association	63.9
SOUTHERN CALIFORNIA DRY-MESIC CHAPARRAL (CES206.930)	**140.7**
***Adenostoma fasciculatum* Alliance**	**140.7**
Adenostoma fasciculatum Association	25.9
Adenostoma fasciculatum–Ceanothus crassifolius Association	90.5
Alliance Only	24.3
SOUTHERN CALIFORNIA OAK WOODLAND AND SAVANNA (CES206.938)	**211.2**
***Quercus agrifolia* Alliance**	**142.6**
Quercus agrifolia/*Toxicodendron diversilobum*/Grass Association	142.6
***Quercus engelmannii* Alliance**	**68.6**
Quercus engelmannii-Quercus agrifolia/*Toxicodendron diversilobum*/Grass Association	68.6
Non-NatureServe Ecological Systems	**507.1**
***Eucalyptus* (*globulus*; *camaldulensis*) Semi-Natural Stands**	**7.8**
Developed	**330.4**
Graded/Scraped/Maintained	**166.7**
Open Water	**2.2**
Grand Total	**8893.8**



Source of Aerial Imagery: USDA NAIP, 2014

Figure 2
Detachment Fallbrook - Vegetation Communities

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4. Discussion

4.1 Overview

In October 2013 and May 2014, the De Luz and Tomahawk fires burned a total of 5,153 acres, roughly 58%, of the 8,852-acre installation. These fires effected changes, at least temporal, in the species composition and structure of the vegetation on NWSSB-DF. Species have varied responses to fire. Some may re-sprout quickly, while others may need to regenerate from seed. As it is the intended result of the methodology of the Protocol to map the vegetation existing during the mapping period (rather than potential vegetation), these fire-induced changes have a significant manifestation on the resulting vegetation mapping product.

Approximately 47% of the mapped vegetation was assigned to the *Malosma laurina* and *Acmispon glaber* Alliances. These two alliances are frequently common following fire in southern California scrub and chaparral habitats and may temporarily replace other shrub alliances as the post-fire regrowth progresses to denser and more species rich assemblages. Post-fire succession in California shrublands is a well-researched topic (Keeley and Fotheringham 2001). Scrub species such as *Artemisia californica* may regenerate following a fire by seedling reproduction or re-sprouting (Keeley 1991; Westman 1981). Both of these conditions were noted during mapping field reconnaissance.

Other general effects of the fires were noted during this mapping effort. The rapid re-sprouting *Stipa cernua* and the removal of thatch likely increased the detection of this alliance. Large numbers of seedlings of coastal sage scrub species, such as *Artemisia californica*, were noted during field reconnaissance, although frequently of insufficient cover to drive a keying decision away from a *Malosma laurina* or *Acmispon glaber* Alliance.

4.2 Image Classification for Quantification of Vegetation Strata

Application of the image classification techniques to quantify vegetation strata for this effort inadvertently elucidated limitations and considerations of the method. The aerial imagery was collected in two panels, a northern half and a southern half, and thus the image classification was performed twice, once on each half of the raster. The classification shows distinct bias between the two halves. In the northern half of the study area the classification had a distinct bias toward classifying pixels as “herbaceous” relative to the southern half and in the southern half of the study area the classification had a distinct bias toward classifying pixels as “shrub” relative to the northern half. The presence of this bias within the same mapping effort significantly undermines the notion of the image classification being reproducible or useful for tracking temporal trends in vegetation on a landscape.

4.3 Comparison with Prior Results

This current mapping effort is the first to utilize the 2016 vegetation classification defined in the Protocol. One of the stated purposes of the Protocol is to provide clear vegetation classification and mapping rules such that the results of successive mapping efforts are adequately comparable to detect true vegetation change and potential trends through time; however, the comparison of the current results with earlier results is problematic since past mapping efforts used different vegetation classifications and mapping methodologies. These differences cloud conclusions regarding what is detectable change versus differences in methodologies.

Exclusive of simple errors, six principal causes for differences in results can be identified when comparing mapping efforts conducted at different points in time and of the same spatial extent:

1. Brief environmental events (e.g., fire);
2. Differences in vegetation type assignment (due to differences in membership rules and/or the lack of a published decision key);
3. The accumulation of subtle differences in line placement;

4. Prolonged disturbance and/or long-term changes in environmental conditions;
5. Differences in mapping resolution (MMU);
6. Vagaries of cross-walking inequivalent classification systems.

In a comparison of the current results with the most recent prior vegetation mapping at NWSSB-DF conducted in 2007 (Tierra Data Inc. 2011), factors 1–3, by ranked order, appear to be the most significant causes of differences in the results between these two efforts. Three comparisons of the 2007 data and 2016 are offered here, first, by broad ecological groups, second by a cross-walk of vegetation types, and third by geospatial analysis.

4.3.1 Comparison by Ecological Groups

When compared by broad ecological groups (Table 4), differences would seem explainable largely by the effects of fire. Woody vegetation types (including oak woodlands, chaparral, and riparian) show a modest decrease in acreages while early scrub types (including early seral types such as *Malosma laurina* and *Acmispon glaber* Alliances) show considerable increases. The significant decrease in herbaceous vegetation types might also be explained by fire effects with early post-fire recruitment of *Acmispon glaber* in areas previously dominated by non-native forbs and grasses.

Table 4. Comparison of 2016 and 2007 Vegetation Mapping Results by Ecological Group

Ecological Group [a]	2007 (acres)	2016 (acres)	Percent Difference (2016-2007)/2016
Oak Woodlands	367.6	322.2	-14%
Chaparral	312.3	288.3	-8%
Scrub	5424.0	6042.0	+10%
Herbaceous	1817.0	1411.0	-29%
Riparian	363.3	301.8	-20%
Herbaceous Wetlands	18.8	23.5	+20%
Eucalyptus Woodlands	26.3	7.8	-235%
Developed / Graded	557.4	497.2	-12%
Total	**8886.6**	**8893.8**	0.08%

[a] Data are summarized by ecological groups. Group memberships for 2016 data are derived from Table 2 above. Group memberships for 2007 data are presented in Appendix A.

4.3.2 Comparison by Cross-walk of Vegetation Types

While the two mapping efforts used similar classifications, they are not equivalent. A cross-walk was prepared to relate the vegetation assignments used for the two efforts. When compared by a cross-walk of vegetation types (Table 5), differences due to fire effects again appear relevant for several classification groups, most especially in the temporal conversion of habitats to *Malosma laurina* and *Acmispon glaber* Alliances. However, differences in vegetation type assignment also become obvious. For example, it is not likely that sycamore woodlands have increased by approximately 217 acres, and that willow riparian areas have decreased by approximately 211 acres during the 9 years between the maps. As these two vegetation types both occupy riparian habitats, it seems reasonable that the differences in these results is likely due to differing vegetation attribution of the same areas. The Protocol contains a top-down decision tree that prioritizes and quantifies vegetation alliance and association assignment, while the 2007 effort relied on alliance membership rules found in *Manual of California Vegetation* (CMV) (Sawyer et al. 2009). Considerable overlap in species covers can be found within the alliance definitions in the CMV and no qualitative keys are provided for association level distinction.

Table 5. Cross-walk Comparison of 2016 and 2007 Vegetation Mapping Results

2016 Vegetation Attribution	2016 Acres	2016 Acres	Difference	2007 Acres	2007 Vegetation Attribution	2007 Acres
Quercus agrifolia Alliance	253.5	***322.2***	***-45.4***	***367.6***	Coast Live Oak	367.6
Quercus engelmannii Alliance	68.6					
Adenostoma fasciculatum Alliance	140.7	***288.3***	***-26.6***	***314.9***	Chamise Chaparral	296.7
Quercus berberidifolia Alliance	147.6				Scrub Oak Chaparral	15.6
					Toyon	2.6
Artemisia californica Alliance	561.5	***561.5***	***-2715.7***	***3277.2***	California Sagebrush	3250.0
					Recovering (ARTCAL)	18.0
					Recovering (ARTCAL sp.)	9.2
Artemisia californica-Eriogonum fasciculatum Alliance	1082.7	***1211.9***	***507.3***	***704.6***	California Sagebrush-California Buckwheat	416.1
Artemisia californica-Salvia mellifera Alliance	129.2				California Buckwheat	43.6
					Monkeyflower	58.6
					Coyote Brush	8.7
					Goldenbush	103.5
					Black Sage	61.5
					Recovering (ARTCAL-ERIFAS)	12.6
Salvia apiana Alliance	63.9	***63.9***	***-144.5***	***208.4***	White Sage	207.5
					California Buckwheat-White Sage	0.9
Malosma laurina Alliance	3462.4	***4204.8***	***2973.6***	***1231.2***	Laurel Sumac	1086.7
					Deerweed	97.2
Acmispon glaber Alliance	742.4				Recovering (MALLAU)	47.3
Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands	1273.8	***1290.0***	***-440.9***	***1730.9***	Annual and Perennial Grasslands	1725.0
Avena (*barbata*, *fatua*) Semi-Natural Stands	6.3				Mariposa Rush	5.9
Brassica nigra and Other Mustards Semi-Natural Stands	9.9					
Stipa cernua Alliance	118.6	***120.9***	***34.7***	***86.2***	Purple Needlegrass	82.4
Deinandra fasciculata Alliance	2.3				Disturbed/vernal pools	3.8
Platanus racemosa Alliance	223.5	***223.5***	***217.5***	***6.0***	California Sycamore	6.0
Salix laevigata Alliance	15.5	***61.1***	***-210.7***	***271.8***	Black Willow	71.5
Salix lasiolepis Alliance	43.0				Arroyo Willow	106.3
Pluchea sericea Alliance	0.6				Willow riparian (undifferentiated)	85.5
Tamarix spp. Semi-Natural Stands	2.0				Laurel Sumac riparian	8.6
Baccharis salicifolia Alliance	16.2	***17.2***	***-53.1***	***70.3***	Mulefat	70.3
Baccharis pilularis Alliance	1.0				Coyote Brush riparian	
Eucalyptus (*globulus*, *camaldulensis*) Semi-Natural Stands	7.8	***7.8***	***-18.5***	***26.3***	Eucalyptus woodland	26.3
Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands	5.7	***21.3***	***3.2***	***18.1***	Freshwater marsh	3.0
Schoenoplectus californicus Alliance	15.5				Herbaceous stream bed	5.2
Typha (*angustifolia*, *domingensis*, *latifolia*) Alliance	0.2				Unvegetated stream channel	9.9
Graded/Scraped/Maintained	166.7	***497.2***	***-60.2***	***557.4***	Firebreak	154.1
					Landscaped	4.7
Developed	330.4				Developed	398.6
Open Water	2.2	***2.2***	***-13.6***	***15.8***	Pond	15.8
Grand Total	8893.8				Grand Total	8886.6

4.3.3 Comparison by a Geospatial Analysis

In the prior comparison examples, the results of the 2016 and 2007 mapping efforts show differences that seem attributable to fire effects and differing approaches to vegetation classification assignment. For the geospatial analysis comparison, the geographic information system (GIS) vegetation data layers for the 2016 and 2007 mapping projects were intersected to create a single table of areas with the unique vegetation assignments from each of the two efforts (Table 6).

The results of the geospatial analysis appear to validate the assumptions made in the earlier comparisons. Large area values for *Malosma laurina* and *Acmispon glaber* Alliances are currently mapped in areas affected by fire and previously occupied by woodlands, chaparral, sagebrush, and grasslands. This can be seen in Table 6, for example, with the 1439.5 acres of *Malosma laurina* mapped in 2015 that was mapped as California Sagebrush in 2007.

Large area values for *Platanus racemosa* Alliance were previously mapped as coast live oak and willow vegetation types, indicating differences in decision making for classification attribution. Analogous examples may be found throughout this table.

Table 6. Comparison of 2016 and 2007 Vegetation Mapping Results by Geospatial Intersection[1]

2015 Vegetation Alliances (Shaded) as Mapped in 2007	Acres
Quercus agrifolia	**252.5**
Annual and Perennial Grasslands	15.7
Arroyo Willow	32.3
Black Sage	0.2
Black Willow	12.8
California Buckwheat	0.0
California Sagebrush	20.2
California Sagebrush-California Buckwheat	2.2
California Sycamore	1.6
Chamise chaparral	5.8
Coast Live Oak	120.8
Coyote Brush	2.3
Deerweed	1.3
Eucalyptus woodland	5.8
firebreaks	1.1
Freshwater marsh	0.1
Goldenbush	3.4
Herbaceous stream bed	0.2
Laurel Sumac	7.5
Laurel Sumac riparian	0.6
Monkeyflower	0.0
Mulefat	5.8
Pond	0.7
Purple Needlegrass	0.5
Recovering (ARTCALsp)	0.1
Recovering (MALLAU)	0.0
Roads/developed	2.8
Scrub Oak Chaparral	0.0

2007 Vegetation Alliances (Shaded) as Mapped in 2015	Acres
Coast Live Oak	**367.4**
Acmispon glaber	3.5
Adenostoma fasciculatum	8.4
Artemisia californica	17.3
Artemisia californica-Eriogonum fasciculatum	17.1
Artemisia californica-Salvia mellifera	0.0
Deinandra fasciculata	0.2
Developed	1.4
Graded/Scraped/Maintained	0.4
Malosma laurina	35.1
Mediterranean California Naturalized Annual and Perennial Grassland	3.0
Open Water	0.0
Platanus racemosa	97.6
Pluchea sericea	0.6
Quercus agrifolia	120.8
Quercus berberidifolia	5.9
Quercus engelmannii	50.5
Salix laevigata	0.8
Salix lasiolepis	3.2
Stipa cernua	1.7

2015 Vegetation Alliances (Shaded) as Mapped in 2007	Acres
Unvegetated stream channel	0.0
White Sage	0.5
Willow riparian (undifferentiated)	8.1
Quercus engelmannii	**68.6**
Annual and Perennial Grasslands	1.5
California Sagebrush	14.9
Coast Live Oak	50.5
Deerweed	0.1
firebreaks	0.0
Laurel Sumac	0.8
Purple Needlegrass	0.4
Roads/developed	0.4
Eucalyptus (globulus; camaldulensis)	**7.8**
Annual and Perennial Grasslands	0.5
Arroyo Willow	1.1
California Sagebrush	1.0
Eucalyptus woodland	4.7
Mulefat	0.0
Roads/developed	0.5
Adenostoma fasciculatum	**140.4**
Annual and Perennial Grasslands	4.0
California Buckwheat	0.7
California Sagebrush	6.3
California Sagebrush-California Buckwheat	1.7
Chamise chaparral	107.5
Coast Live Oak	8.4
Deerweed	0.4
Laurel Sumac	0.7
Roads/developed	0.1

2007 Vegetation Alliances (Shaded) as Mapped in 2015	Acres
Eucalyptus woodland	**26.2**
Acmispon glaber	8.6
Artemisia californica	0.7
Artemisia californica-Eriogonum fasciculatum	0.7
Brassica nigra and Other Mustards	0.0
Developed	0.2
Eucalyptus (globulus; camaldulensis)	4.7
Graded/Scraped/Maintained	0.3
Malosma laurina	0.6
Mediterranean California Naturalized Annual and Perennial Grassland	4.3
Platanus racemosa	0.3
Quercus agrifolia	5.8
Chamise chaparral	**296.6**
Acmispon glaber	0.6
Adenostoma fasciculatum	107.5
Artemisia californica	18.4
Artemisia californica-Eriogonum fasciculatum	25.8
Baccharis salicifolia	0.0
Developed	0.0
Graded/Scraped/Maintained	0.0
Malosma laurina	17.9
Mediterranean California Naturalized Annual and Perennial Grassland	0.5

2015 Vegetation Alliances (Shaded) as Mapped in 2007	Acres
Scrub Oak Chaparral	10.4
White Sage	0.2
Willow riparian (undifferentiated)	0.1
Quercus berberidifolia	**143.0**
Annual and Perennial Grasslands	2.1
California Sagebrush	2.0
California Sagebrush-California Buckwheat	5.8
Chamise chaparral	115.5
Coast Live Oak	5.9
firebreaks	0.0
Laurel Sumac	8.8
Scrub Oak Chaparral	2.7
White Sage	0.0
Willow riparian (undifferentiated)	0.2
Acmispon glaber	**742.3**
Annual and Perennial Grasslands	146.9
Arroyo Willow	2.2
Black Willow	0.8
California Buckwheat	2.8
California Buckwheat-White Sage	0.1
California Sagebrush	484.2
California Sagebrush-California Buckwheat	41.2
California Sycamore	0.1
Chamise chaparral	0.6
Coast Live Oak	3.5
Coyote Brush	0.5
Coyote Brush riparian	0.2
Deerweed	0.5
Eucalyptus woodland	8.6
firebreaks	0.9
Goldenbush	18.6
Herbaceous stream bed	0.7
Laurel Sumac	1.2
Laurel Sumac riparian	1.7
Monkeyflower	5.6
Mulefat	5.4
Purple Needlegrass	3.1
Recovering (ARTCALsp)	0.0
Roads/developed	12.9
Artemisia californica	**560.8**
Annual and Perennial Grasslands	92.7
Arroyo Willow	1.0
Black Willow	0.0
California Buckwheat	2.5

2007 Vegetation Alliances (Shaded) as Mapped in 2015	Acres
Platanus racemosa	3.9
Quercus agrifolia	5.8
Quercus berberidifolia	115.5
Salix lasiolepis	0.2
Salvia apiana	0.6
Scrub Oak Chaparral	**15.6**
Adenostoma fasciculatum	10.4
Artemisia californica	0.0
Artemisia californica-Eriogonum fasciculatum	0.2
Malosma laurina	2.2
Platanus racemosa	0.0
Quercus agrifolia	0.0
Quercus berberidifolia	2.7
Salix laevigata	0.1
Toyon	**2.6**
Artemisia californica-Eriogonum fasciculatum	2.6
California Sagebrush	**3249.4**
Acmispon glaber	484.2
Adenostoma fasciculatum	6.3
Artemisia californica	277.1
Artemisia californica-Eriogonum fasciculatum	589.6
Artemisia californica-Salvia mellifera	104.7
Baccharis pilularis	0.0
Baccharis salicifolia	0.1
Deinandra fasciculata	2.1
Developed	23.8
Eucalyptus (globulus; camaldulensis)	1.0
Graded/Scraped/Maintained	4.0
Malosma laurina	1439.5
Mediterranean California Naturalized Annual and Perennial Grassland	207.2
Platanus racemosa	10.9
Pluchea sericea	0.1
Quercus agrifolia	20.2
Quercus berberidifolia	2.0
Quercus engelmannii	14.9
Salix laevigata	0.7
Salix lasiolepis	2.2
Salvia apiana	37.4
Schoenoplectus californicus	0.8
Stipa cernua	20.6
California Sagebrush-California Buckwheat	**415.9**
Acmispon glaber	41.2
Adenostoma fasciculatum	1.7
Artemisia californica	39.9
Artemisia californica-Eriogonum fasciculatum	146.2
Artemisia californica-Salvia mellifera	0.6

2015 Vegetation Alliances (Shaded) as Mapped in 2007	Acres
California Sagebrush	277.1
California Sagebrush-California Buckwheat	39.9
Chamise chaparral	18.4
Coast Live Oak	17.3
Coyote Brush	0.2
Deerweed	2.0
Eucalyptus woodland	0.7
firebreaks	1.5
Goldenbush	10.5
Laurel Sumac	26.7
Laurel Sumac riparian	0.5
Mulefat	1.1
Recovering (ARTCAL)	5.2
Recovering (ARTCAL-ERIFAS)	10.9
Recovering (MALLAU)	18.8
Roads/developed	9.8
Scrub Oak Chaparral	0.0
White Sage	23.8
Willow riparian (undifferentiated)	0.0
Artemisia californica-Eriogonum fasciculatum	**1078.0**
Annual and Perennial Grasslands	120.5
Arroyo Willow	5.5
Black Sage	36.3
Black Willow	1.0
California Buckwheat	5.9
California Sagebrush	589.6
California Sagebrush-California Buckwheat	146.2
Chamise chaparral	25.8
Coast Live Oak	17.1
Coyote Brush	2.2
Deerweed	45.9
Eucalyptus woodland	0.7
firebreaks	5.0
Goldenbush	3.2
Herbaceous stream bed	0.2
Laurel Sumac	20.1
Laurel Sumac riparian	1.4
Monkeyflower	12.1
Mulefat	6.9
Pond	0.0
Purple Needlegrass	4.0
Roads/developed	10.8
Scrub Oak Chaparral	0.2
Toyon	2.6
White Sage	14.6

2007 Vegetation Alliances (Shaded) as Mapped in 2015	Acres
Developed	3.3
Graded/Scraped/Maintained	0.9
Malosma laurina	140.2
Mediterranean California Naturalized Annual and Perennial Grassland	25.3
Platanus racemosa	0.5
Quercus agrifolia	2.2
Quercus berberidifolia	5.8
Salix lasiolepis	0.1
Salvia apiana	3.5
Stipa cernua	4.5
California Buckwheat	**43.6**
Acmispon glaber	2.8
Adenostoma fasciculatum	0.7
Artemisia californica	2.5
Artemisia californica-Eriogonum fasciculatum	5.9
Developed	0.1
Malosma laurina	26.8
Mediterranean California Naturalized Annual and Perennial Grassland	4.7
Quercus agrifolia	0.0
Salix laevigata	0.0
California Buckwheat-White Sage	**0.9**
Acmispon glaber	0.1
Malosma laurina	0.8
Black Sage	**61.5**
Artemisia californica-Eriogonum fasciculatum	36.3
Artemisia californica-Salvia mellifera	16.4
Developed	0.2
Malosma laurina	8.3
Mediterranean California Naturalized Annual and Perennial Grassland	0.1
Platanus racemosa	0.0
Quercus agrifolia	0.2
Coyote Brush	**8.7**
Acmispon glaber	0.5
Artemisia californica	0.2
Artemisia californica-Eriogonum fasciculatum	2.2
Developed	0.2
Malosma laurina	2.9
Mediterranean California Naturalized Annual and Perennial Grassland	0.3
Platanus racemosa	0.0
Quercus agrifolia	2.3
Salix laevigata	0.1
Deerweed	**96.5**
Acmispon glaber	0.5
Adenostoma fasciculatum	0.4
Artemisia californica	2.0

2015 Vegetation Alliances (Shaded) as Mapped in 2007	Acres
Willow riparian (undifferentiated)	0.1
Artemisia californica-Salvia mellifera	**129.0**
Annual and Perennial Grasslands	1.1
Black Sage	16.4
Black Willow	0.3
California Sagebrush	104.7
California Sagebrush-California Buckwheat	0.6
Coast Live Oak	0.0
Firebreaks	1.7
Laurel Sumac	2.9
Laurel Sumac riparian	0.0
Mulefat	0.4
Pond	0.0
Roads/developed	0.9
Baccharis pilularis	**1.0**
California Sagebrush	0.0
Laurel Sumac	0.0
Mulefat	0.9
Malosma laurina	**3462.0**
Annual and Perennial Grasslands	313.3
Arroyo Willow	30.4
Black Sage	8.3
Black Willow	6.5
California Buckwheat	26.8
California Buckwheat-White Sage	0.8
California Sagebrush	1439.5
California Sagebrush-California Buckwheat	140.2
California Sycamore	0.7
Chamise chaparral	17.9
Coast Live Oak	35.1
Coyote Brush	2.9
Coyote Brush riparian	0.0
Deerweed	44.9
disturbed/vernal pools	3.7
Eucalyptus woodland	0.6
Firebreaks	6.8
Goldenbush	26.4
Herbaceous stream bed	3.6
Landscaped	0.2
Laurel Sumac	997.0
Laurel Sumac riparian	4.2
Mariposa rush	5.4
Monkeyflower	36.5
Mulefat	27.5
Pond	1.2

2007 Vegetation Alliances (Shaded) as Mapped in 2015	Acres
Artemisia californica-Eriogonum fasciculatum	45.9
Baccharis salicifolia	0.0
Developed	0.1
Graded/Scraped/Maintained	0.1
Malosma laurina	44.9
Mediterranean California Naturalized Annual and Perennial Grassland	0.7
Platanus racemosa	0.6
Pluchea sericea	0.0
Quercus agrifolia	1.3
Quercus engelmannii	0.1
Goldenbush	**103.5**
Acmispon glaber	18.6
Artemisia californica	10.5
Artemisia californica-Eriogonum fasciculatum	3.2
Baccharis salicifolia	0.1
Brassica nigra and Other Mustards	0.0
Developed	2.2
Graded/Scraped/Maintained	0.2
Malosma laurina	26.4
Mediterranean California Naturalized Annual and Perennial Grassland	38.4
Quercus agrifolia	3.4
Salix lasiolepis	0.1
Salvia apiana	0.3
Laurel Sumac	**1086.6**
Acmispon glaber	1.2
Adenostoma fasciculatum	0.7
Artemisia californica	26.7
Artemisia californica-Eriogonum fasciculatum	20.1
Artemisia californica-Salvia mellifera	2.9
Baccharis pilularis	0.0
Baccharis salicifolia	0.1
Developed	4.0
Graded/Scraped/Maintained	1.8
Malosma laurina	997.0
Mediterranean California Naturalized Annual and Perennial Grassland	1.8
Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands	0.0
Platanus racemosa	7.0
Quercus agrifolia	7.5
Quercus berberidifolia	8.8
Quercus engelmannii	0.8
Salvia apiana	6.2
Stipa cernua	0.0
Monkeyflower	**58.6**
Acmispon glaber	5.6
Artemisia californica-Eriogonum fasciculatum	12.1

2015 Vegetation Alliances (Shaded) as Mapped in 2007	Acres
Purple Needlegrass	23.9
Recovering (ARTCAL)	12.7
Recovering (ARTCAL-ERIFAS)	0.0
Recovering (ARTCALsp)	6.3
Recovering (MALLAU)	27.2
Roads/developed	45.9
Scrub Oak Chaparral	2.2
White Sage	157.9
Willow riparian (undifferentiated)	5.3
Salvia apiana	**63.9**
Annual and Perennial Grasslands	3.1
California Sagebrush	37.4
California Sagebrush-California Buckwheat	3.5
Chamise chaparral	0.6
firebreaks	0.0
Goldenbush	0.3
Laurel Sumac	6.2
Monkeyflower	4.2
Recovering (ARTCAL-ERIFAS)	1.0
Recovering (MALLAU)	0.4
Roads/developed	0.4
White Sage	6.9
Avena (barbata; fatua)	**6.3**
Annual and Perennial Grasslands	6.1
firebreaks	0.0
Recovering (MALLAU)	0.2
Brassica nigra and Other Mustards	**9.9**
Annual and Perennial Grasslands	7.6
Arroyo Willow	1.2
Black Willow	1.0
Eucalyptus woodland	0.0
Goldenbush	0.0
Mulefat	0.1
White Sage	0.0
Deinandra fasciculata	**2.3**
California Sagebrush	2.1
Coast Live Oak	0.2
firebreaks	0.0
Roads/developed	0.0
Mediterranean California Naturalized Annual and Perennial Grassland	**1271.7**
Annual and Perennial Grasslands	877.3
Arroyo Willow	1.5
Black Sage	0.1
Black Willow	0.6
California Buckwheat	4.7
California Sagebrush	207.2

2007 Vegetation Alliances (Shaded) as Mapped in 2015	Acres
Developed	0.2
Malosma laurina	36.5
Quercus agrifolia	0.0
Salvia apiana	4.2
White Sage	**207.5**
Adenostoma fasciculatum	0.2
Artemisia californica	23.8
Artemisia californica-Eriogonum fasciculatum	14.6
Brassica nigra and Other Mustards	0.0
Developed	1.9
Graded/Scraped/Maintained	0.1
Malosma laurina	157.9
Mediterranean California Naturalized Annual and Perennial Grassland	0.8
Quercus agrifolia	0.5
Quercus berberidifolia	0.0
Salvia apiana	6.9
Stipa cernua	0.7
Recovering (ARTCAL)	**18.0**
Artemisia californica	5.2
Developed	0.1
Malosma laurina	12.7
Recovering (ARTCAL-ERIFAS)	**12.6**
Artemisia californica	10.9
Developed	0.1
Graded/Scraped/Maintained	0.6
Malosma laurina	0.0
Salvia apiana	1.0
Recovering (ARTCALsp)	**9.2**
Acmispon glaber	0.0
Developed	0.0
Malosma laurina	6.3
Quercus agrifolia	0.1
Stipa cernua	2.8
Recovering (MALLAU)	**47.3**
Artemisia californica	18.8
Avena (barbata; fatua)	0.2
Developed	0.4
Graded/Scraped/Maintained	0.3
Malosma laurina	27.2
Quercus agrifolia	0.0
Salvia apiana	0.4
Stipa cernua	0.0
Annual and Perennial Grasslands	**1723.9**
Acmispon glaber	146.9
Adenostoma fasciculatum	4.0
Artemisia californica	92.7

2015 Vegetation Alliances (Shaded) as Mapped in 2007	Acres
California Sagebrush-California Buckwheat	25.3
California Sycamore	0.0
Chamise chaparral	0.5
Coast Live Oak	3.0
Coyote Brush	0.3
Coyote Brush riparian	0.1
Deerweed	0.7
Eucalyptus woodland	4.3
firebreaks	3.0
Goldenbush	38.4
Herbaceous stream bed	0.4
landscaped	0.0
Laurel Sumac	1.8
Laurel Sumac riparian	0.0
Mariposa rush	0.4
Mulefat	5.4
Pond	0.8
Purple Needlegrass	49.2
Roads/developed	45.8
White Sage	0.8
Willow riparian (undifferentiated)	0.0
Stipa cernua	**118.6**
Annual and Perennial Grasslands	85.6
Arroyo Willow	0.3
Black Willow	0.6
California Sagebrush	20.6
California Sagebrush-California Buckwheat	4.5
Coast Live Oak	1.7
Laurel Sumac	0.0
Purple Needlegrass	1.1
Recovering (ARTCALsp)	2.8
Recovering (MALLAU)	0.0
Roads/developed	0.6
White Sage	0.7
Platanus racemosa	**216.5**
Annual and Perennial Grasslands	3.8
Arroyo Willow	25.9
Black Sage	0.0
Black Willow	27.1
California Sagebrush	10.9
California Sagebrush-California Buckwheat	0.5
California Sycamore	3.4
Chamise chaparral	3.9
Coast Live Oak	97.6
Coyote Brush	0.0
Deerweed	0.6

2007 Vegetation Alliances (Shaded) as Mapped in 2015	Acres
Artemisia californica-Eriogonum fasciculatum	120.5
Artemisia californica-Salvia mellifera	1.1
Avena (barbata; fatua)	6.1
Baccharis salicifolia	0.8
Brassica nigra and Other Mustards	7.6
Developed	24.8
Eucalyptus (globulus; camaldulensis)	0.5
Graded/Scraped/Maintained	15.3
Malosma laurina	313.3
Mediterranean California Naturalized Annual and Perennial Grassland	877.3
Platanus racemosa	3.8
Quercus agrifolia	15.7
Quercus berberidifolia	2.1
Quercus engelmannii	1.5
Salix laevigata	0.6
Salix lasiolepis	0.6
Salvia apiana	3.1
Schoenoplectus californicus	0.0
Stipa cernua	85.6
Purple Needlegrass	**82.4**
Acmispon glaber	3.1
Artemisia californica-Eriogonum fasciculatum	4.0
Developed	0.2
Malosma laurina	23.9
Mediterranean California Naturalized Annual and Perennial Grassland	49.2
Platanus racemosa	0.0
Quercus agrifolia	0.5
Quercus engelmannii	0.4
Stipa cernua	1.1
California Sycamore	**6.0**
Acmispon glaber	0.1
Developed	0.1
Graded/Scraped/Maintained	0.1
Malosma laurina	0.7
Mediterranean California Naturalized Annual and Perennial Grassland	0.0
Platanus racemosa	3.4
Quercus agrifolia	1.6
Black Willow	**71.4**
Acmispon glaber	0.8
Artemisia californica	0.0
Artemisia californica-Eriogonum fasciculatum	1.0
Artemisia californica-Salvia mellifera	0.3
Baccharis salicifolia	2.2
Brassica nigra and Other Mustards	1.0
Developed	0.5
Graded/Scraped/Maintained	0.1

2015 Vegetation Alliances (Shaded) as Mapped in 2007	Acres
Eucalyptus woodland	0.3
Laurel Sumac	7.0
Mulefat	1.6
Pond	0.7
Purple Needlegrass	0.0
Roads/developed	1.5
Scrub Oak Chaparral	0.0
Unvegetated stream channel	1.6
Willow riparian (undifferentiated)	29.9
Baccharis salicifolia	**16.2**
Annual and Perennial Grasslands	0.8
Arroyo Willow	1.3
Black Willow	2.2
California Sagebrush	0.1
Chamise chaparral	0.0
Deerweed	0.0
firebreaks	0.0
Freshwater marsh	0.4
Goldenbush	0.1
Laurel Sumac	0.1
Mulefat	5.1
Roads/developed	0.3
Willow riparian (undifferentiated)	5.6
Salix laevigata	**13.9**
Annual and Perennial Grasslands	0.6
Arroyo Willow	0.9
Black Willow	2.6
California Buckwheat	0.0
California Sagebrush	0.7
Coast Live Oak	0.8
Coyote Brush	0.1
firebreaks	0.1
Mulefat	1.1
Roads/developed	0.0
Scrub Oak Chaparral	0.1
Unvegetated stream channel	0.1
Willow riparian (undifferentiated)	6.7
Salix lasiolepis	**40.6**
Annual and Perennial Grasslands	0.6
Arroyo Willow	1.7
Black Willow	10.4
California Sagebrush	2.2
California Sagebrush-California Buckwheat	0.1
Chamise chaparral	0.2
Coast Live Oak	3.2

2007 Vegetation Alliances (Shaded) as Mapped in 2015	Acres
Malosma laurina	6.5
Mediterranean California Naturalized Annual and Perennial Grassland	0.6
Platanus racemosa	27.1
Quercus agrifolia	12.8
Salix laevigata	2.6
Salix lasiolepis	10.4
Schoenoplectus californicus	4.9
Stipa cernua	0.6
Arroyo Willow	**106.3**
Acmispon glaber	2.2
Artemisia californica	1.0
Artemisia californica-Eriogonum fasciculatum	5.5
Baccharis salicifolia	1.3
Brassica nigra and Other Mustards	1.2
Developed	0.4
Eucalyptus (globulus; camaldulensis)	1.1
Graded/Scraped/Maintained	0.2
Malosma laurina	30.4
Mediterranean California Naturalized Annual and Perennial Grassland	1.5
Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands	0.1
Platanus racemosa	25.9
Quercus agrifolia	32.3
Salix laevigata	0.9
Salix lasiolepis	1.7
Schoenoplectus californicus	0.1
Stipa cernua	0.3
Typha (angustifolia; domingensis; latifolia)	0.0
Coyote Brush riparian	**0.5**
Acmispon glaber	0.2
Developed	0.0
Malosma laurina	0.0
Mediterranean California Naturalized Annual and Perennial Grassland	0.1
Salix lasiolepis	0.2
Laurel Sumac riparian	**8.6**
Acmispon glaber	1.7
Artemisia californica	0.5
Artemisia californica-Eriogonum fasciculatum	1.4
Artemisia californica-Salvia mellifera	0.0
Developed	0.0
Malosma laurina	4.2
Mediterranean California Naturalized Annual and Perennial Grassland	0.0
Quercus agrifolia	0.6
Mulefat	**69.6**
Acmispon glaber	5.4
Artemisia californica	1.1

2015 Vegetation Alliances (Shaded) as Mapped in 2007	Acres
Coyote Brush riparian	0.2
firebreaks	0.1
Freshwater marsh	0.3
Goldenbush	0.1
Mulefat	7.1
Pond	0.3
Roads/developed	0.4
Unvegetated stream channel	0.6
Willow riparian (undifferentiated)	13.2
Pluchea sericea	**0.6**
California Sagebrush	0.1
Coast Live Oak	0.6
Deerweed	0.0
Tamarix spp.	**2.0**
Pond	2.0
Schoenoplectus californicus	**15.5**
Annual and Perennial Grasslands	0.0
Arroyo Willow	0.1
Black Willow	4.9
California Sagebrush	0.8
Freshwater marsh	2.1
Pond	7.6
Roads/developed	0.1
Typha (angustifolia; domingensis; latifolia)	**0.2**
Arroyo Willow	0.0
Pond	0.1
Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands	**2.9**
Arroyo Willow	0.1
Laurel Sumac	0.0
Pond	0.6
Unvegetated stream channel	1.8
Willow riparian (undifferentiated)	0.4
Open Water	**2.2**
Coast Live Oak	0.0
Freshwater marsh	0.1
Pond	1.7
Unvegetated stream channel	0.2
Willow riparian (undifferentiated)	0.1
Developed	**327.9**
Annual and Perennial Grasslands	24.8
Arroyo Willow	0.4
Black Sage	0.2
Black Willow	0.5
California Buckwheat	0.1
California Sagebrush	23.8

2007 Vegetation Alliances (Shaded) as Mapped in 2015	Acres
Artemisia californica-Eriogonum fasciculatum	6.9
Artemisia californica-Salvia mellifera	0.4
Baccharis pilularis	0.9
Baccharis salicifolia	5.1
Brassica nigra and Other Mustards	0.1
Developed	0.3
Eucalyptus (globulus; camaldulensis)	0.0
Graded/Scraped/Maintained	0.6
Malosma laurina	27.5
Mediterranean California Naturalized Annual and Perennial Grassland	5.4
Platanus racemosa	1.6
Quercus agrifolia	5.8
Salix laevigata	1.1
Salix lasiolepis	7.1
Willow riparian (undifferentiated)	**69.9**
Adenostoma fasciculatum	0.1
Artemisia californica	0.0
Artemisia californica-Eriogonum fasciculatum	0.1
Baccharis salicifolia	5.6
Graded/Scraped/Maintained	0.0
Malosma laurina	5.3
Mediterranean California Naturalized Annual and Perennial Grassland	0.0
Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands	0.4
Open Water	0.1
Platanus racemosa	29.9
Quercus agrifolia	8.1
Quercus berberidifolia	0.2
Salix laevigata	6.7
Salix lasiolepis	13.2
Unvegetated stream channel	**4.3**
Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands	1.8
Open Water	0.2
Platanus racemosa	1.6
Quercus agrifolia	0.0
Salix laevigata	0.1
Salix lasiolepis	0.6
Freshwater marsh	**3.0**
Baccharis salicifolia	0.4
Open Water	0.1
Quercus agrifolia	0.1
Salix lasiolepis	0.3
Schoenoplectus californicus	2.1
Herbaceous stream bed	**5.2**
Acmispon glaber	0.7
Artemisia californica-Eriogonum fasciculatum	0.2

2015 Vegetation Alliances (Shaded) as Mapped in 2007	Acres
California Sagebrush-California Buckwheat	3.3
California Sycamore	0.1
Chamise chaparral	0.0
Coast Live Oak	1.4
Coyote Brush	0.2
Coyote Brush riparian	0.0
Deerweed	0.1
disturbed/vernal pools	0.0
Eucalyptus woodland	0.2
firebreaks	2.1
Goldenbush	2.2
Herbaceous stream bed	0.0
landscaped	4.0
Laurel Sumac	4.0
Laurel Sumac riparian	0.0
Mariposa rush	0.1
Monkeyflower	0.2
Mulefat	0.3
Purple Needlegrass	0.2
Recovering (ARTCAL)	0.1
Recovering (ARTCAL-ERIFAS)	0.1
Recovering (ARTCALsp)	0.0
Recovering (MALLAU)	0.4
Roads/developed	257.1
White Sage	1.9
Graded/Scraped/Maintained	**164.1**
Annual and Perennial Grasslands	15.3
Arroyo Willow	0.2
Black Willow	0.1
California Sagebrush	4.0
California Sagebrush-California Buckwheat	0.9
California Sycamore	0.1
Chamise chaparral	0.0
Coast Live Oak	0.4
Deerweed	0.1
Eucalyptus woodland	0.3
firebreaks	130.3
Goldenbush	0.2
landscaped	0.6
Laurel Sumac	1.8
Mulefat	0.6
Recovering (ARTCAL-ERIFAS)	0.6
Recovering (MALLAU)	0.3
Roads/developed	8.2
White Sage	0.1

2007 Vegetation Alliances (Shaded) as Mapped in 2015	Acres
Developed	0.0
Malosma laurina	3.6
Mediterranean California Naturalized Annual and Perennial Grassland	0.4
Quercus agrifolia	0.2
Mariposa rush	**5.9**
Developed	0.1
Malosma laurina	5.4
Mediterranean California Naturalized Annual and Perennial Grassland	0.4
Pond	**15.8**
Artemisia californica-Eriogonum fasciculatum	0.0
Artemisia californica-Salvia mellifera	0.0
Malosma laurina	1.2
Mediterranean California Naturalized Annual and Perennial Grassland	0.8
Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands	0.6
Open Water	1.7
Platanus racemosa	0.7
Quercus agrifolia	0.7
Salix lasiolepis	0.3
Schoenoplectus californicus	7.6
Tamarix spp.	2.0
Typha (angustifolia; domingensis; latifolia)	0.1
disturbed/vernal pools	**3.8**
Developed	0.0
Malosma laurina	3.7
Roads/developed	**398.6**
Acmispon glaber	12.9
Adenostoma fasciculatum	0.1
Artemisia californica	9.8
Artemisia californica-Eriogonum fasciculatum	10.8
Artemisia californica-Salvia mellifera	0.9
Baccharis salicifolia	0.3
Deinandra fasciculata	0.0
Developed	257.1
Eucalyptus (globulus; camaldulensis)	0.5
Graded/Scraped/Maintained	8.2
Malosma laurina	45.9
Mediterranean California Naturalized Annual and Perennial Grassland	45.8
Platanus racemosa	1.5
Quercus agrifolia	2.8
Quercus engelmannii	0.4
Salix laevigata	0.0
Salix lasiolepis	0.4
Salvia apiana	0.4
Schoenoplectus californicus	0.1
Stipa cernua	0.6

2015 Vegetation Alliances (Shaded) as Mapped in 2007	Acres
Willow riparian (undifferentiated)	0.0
Grand Total	**8860.7**

2007 Vegetation Alliances (Shaded) as Mapped in 2015	Acres
landscaped	**4.7**
Developed	4.0
Graded/Scraped/Maintained	0.6
Malosma laurina	0.2
Mediterranean California Naturalized Annual and Perennial Grassland	0.0
firebreaks	**152.7**
Acmispon glaber	0.9
Artemisia californica	1.5
Artemisia californica-Eriogonum fasciculatum	5.0
Artemisia californica-Salvia mellifera	1.7
Avena (barbata; fatua)	0.0
Baccharis salicifolia	0.0
Deinandra fasciculata	0.0
Developed	2.1
Graded/Scraped/Maintained	130.3
Malosma laurina	6.8
Mediterranean California Naturalized Annual and Perennial Grassland	3.0
Quercus agrifolia	1.1
Quercus berberidifolia	0.0
Quercus engelmannii	0.0
Salix laevigata	0.1
Salix lasiolepis	0.1
Salvia apiana	0.0
Grand Total	**8860.7**

[1]The totals presented in Table 6 are the result of a geospatial intersection of the 2007 and 2016 map products, therefore mutually exclusive areas were not included. Consequently, the totals in this table differ from those of Tables 4 and 5. Respectively, the 2007 and 2016 map products had 25.93 and 33.04 acres of non-overlap, which accounts for these differential totals.

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Appendix A

2007 Vegetation Alliances
Summarized by Ecological Groups

APPENDIX A
2007 Vegetation Alliances Summarized by Ecological Groups

Ecological Group	2007 ALLIANCE	Total
Oak Woodlands	Coast Live Oak	367.6
	Oak Woodlands Total	**367.6**
Chaparral	Chamise chaparral	296.7
	Scrub Oak Chaparral	15.6
	Chaparral Total	**312.3**
Scrub	Black Sage	61.5
	California Buckwheat	43.6
	California Buckwheat-White Sage	0.9
	California Sagebrush	3250.0
	California Sagebrush-California Buckwheat	416.1
	Coyote Brush	8.7
	Deerweed	97.2
	Goldenbush	103.5
	Laurel Sumac	1086.7
	Monkeyflower	58.6
	Recovering (ARTCAL)	18.0
	Recovering (ARTCAL-ERIFAS)	12.6
	Recovering (ARTCALsp)	9.2
	Recovering (MALLAU)	47.3
	Toyon	2.6
	White Sage	207.5
	Scrub Total	**5424.0**
Herbaceous	Annual and Perennial Grasslands	1725.0
	disturbed/vernal pools	3.8
	Mariposa rush	5.9
	Purple Needlegrass	82.4
	Herbaceous Total	**1817.0**
Riparian	Arroyo Willow	106.3
	Black Willow	71.5
	California Sycamore	6.0
	Coyote Brush riparian	0.5
	Herbaceous stream bed	5.2
	Laurel Sumac riparian	8.6
	Mulefat	69.9
	Unvegetated stream channel	9.9
	Willow riparian (undifferentiated)	85.5
Riparian Total	**Riparian Total**	**363.3**
Herbaceous Wetlands	Freshwater marsh	3.0
	Pond	15.8
	Herbaceous Wetlands Total	**18.8**
Eucalyptus Woodlands	Eucalyptus woodland	26.3
	Eucalyptus Woodlands Total	**26.3**
Developed / Graded	firebreaks	154.1
	landscaped	4.7
	Roads/developed	398.6
	Developed / Graded Total	**557.4**