

## Memorandum

**To:** Clint Elsholz, Department of Parks and Recreation  
**From:** Petra Unger, AECOM  
**CC:**  
**Date:** February 27, 2012  
**Subject:** Vegetation Classification and Mapping Report

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### INTRODUCTION

This report describes the methods and results of vegetation classification and mapping conducted at the Carnegie SVRA and adjacent Tesla-Alameda properties. The purpose of the vegetation classification and mapping was to support preparation of the General Plan and associated Environmental Impact Report by the Department of Parks and Recreation (DPR).

### METHODS

#### Vegetation Classification

Vegetation nomenclature generally follows the Manual of California Vegetation (Sawyer, Keeler-Wolf, and Evens 2009) classification system, but modifications are applied to account for site-specific variability as necessary. The Manual of California Vegetation (MCV) has been developed as a standardized statewide classification system to facilitate coordination and data sharing amongst agencies and nongovernmental conservation organizations, as required under Senate Bill 85 and California Fish and Game Code Section 1940. The MCV has been developed in compliance with the National Vegetation Classification System and Ecological Society of America standards. Using this standardized classification system will make the data more compatible across administrative boundaries and facilitate conservation and management coordination at the local, regional, and state levels, in accordance with the *Memorandum of Understanding for Cooperative Vegetation and Habitat Mapping and Classification* (California Biodiversity Council 2000). In addition, using standardized state nomenclature compatible with the National Vegetation Classification System allows agencies to track the rarity and imperilment of vegetation types. Consistent with the MCV, the vegetation classification unit applied here is 'vegetation type' rather than 'vegetation community' or 'plant community.' Unvegetated and developed areas are described in terms of land cover types (e.g., developed, disturbed).

Vegetation types were mapped to the alliance level, which is based on diagnostic species from the primary layer (e.g., the tree layer in the case of a woodland alliance), and is a finer scale in the National Vegetation Classification hierarchy than the group level, which is based on formation type (e.g., forest, woodland, scrub) and foliage (e.g., broadleaf, deciduous), but coarser than the association level, which is based on diagnostic species in multiple layers and not just the primary layer. The association level may be most appropriate for small, local sites and the alliance level is usually recommended for regional

or state level mapping. The alliance level is appropriate for meeting the management objectives of DPR for these properties and for preparing the General Plan and associated Environmental Impact Report.

## **Vegetation Mapping**

### ***Prefield Mapping and Investigation***

Vegetation types in the study area were initially identified using information obtained from previous vegetation mapping efforts in the Carnegie SVRA (HDR 2004, Jones and Stokes 2000, DPR 1980) and the *Existing Vegetation* (Eveg) maps (USFS 2007) for the study area. Eveg maps were created by the United State Forest Service (USFS) using automated, systematic procedures, remote sensing classification, photo editing and field based observations to efficiently and cost-effectively map large areas with minimal bias. The classification is a provisional system that meets the floristically based level of the National Vegetation Classification Standard hierarchy. Eveg vegetation cover maps are produced at relatively low spatial detail (1:24,000 map scale) to provide a broad overview of existing vegetation in California.

The vegetation types were then refined through aerial photograph interpretation using aerial imagery provided to AECOM by DPR (2010) and National Agricultural Imagery Program (NAIP 2009) aerial imagery to identify areas where vegetation cover may have changed since the previous mapping efforts were completed, or where vegetation boundaries may not have been drawn accurately due to the methodology, classification system, or mapping scale used.

AECOM botanists mapped vegetation type polygons in a GIS overlay from aerial photograph interpretation during September and October 2011. Vegetation types were mapped at a fine-scale (1:6,000 map scale) in accordance with the *Memorandum of Understanding for Cooperative Vegetation and Habitat Mapping and Classification* mapping standards (California Biodiversity Council 2002). The minimum mapping unit is 1 acre for all common vegetation types. All discernible sensitive habitats, including wetland and riparian vegetation types and linear aquatic features (e.g., streams, rivers, ditches) were mapped regardless of size. For woodland vegetation types, trees on the edge of the polygon were included when they were within approximately two average tree canopy widths of the polygon (approximately 30 meters).

### ***Field Surveys***

AECOM then conducted a field verification survey of the study area on December 7 and 8, 2011, to verify, refine, and correct the vegetation types mapped in the office. The vegetation cover and linear aquatic feature GIS data layers created during the prefield mapping exercises were printed on 1 inch = 500 feet scale maps and also loaded onto a Trimble Global Positioning System (GPS) device with the 2010 DPR aerial imagery and compared for consistency with conditions observed on the ground. Areas that deviated from vegetation types mapped from aerial photography were corrected and refined in the field on the hard copy maps and digitally using the GPS device. The boundaries of wetlands and drainages were further refined using data from the wetland delineation conducted in the study area in 2010 (DPR 2010). Representative photographs were taken of each vegetation type.

## **RESULTS**

Table 1 lists the 16 vegetation and land cover types identified during the field investigation and provides a crosswalk between the vegetation types assigned by AECOM and previous mapping efforts. Table 2 provides the acreage of each vegetation and land cover type. A description of each vegetation type identified on the Carnegie and Tesla-Alameda properties follows the tables and their distribution is shown on the maps in Appendix A. Representative photographs are provided in Appendix B.

**Table 1. Vegetation and Landover Crosswalk**

Source of Vegetation Map	AECOM 2012	HDR 2004	Jones and Stokes 2000	DPR 1980
Vegetation Classification Source(s)	Sawyer, Keeler-Wolf, and Evens 2009, USFS 2007, DPR 2010	Holland 1986, Sawyer and Keeler-Wolf 1995, DFG 2003	EDAW 1997	unknown
Vegetation Types	Mulefat thickets	Riparian Scrub	Central Coast Cottonwood-Sycamore Riparian Woodland	Riparian
	Fremont cottonwood forest			
	Valley oak woodland	Riparian Woodland		
	Fremont cottonwood forest	Fremont Cottonwood Riparian Forest		
	Pond	Pond	not included	not included
	Seep	Seep	not included	not included
	Blue oak woodland	Blue Oak Woodland	Blue Oak Woodland	Blue Oak Woodland
	Ghost pine woodland			
	California juniper woodland	California Juniper Woodland	California Juniper Woodland	
	California sagebrush-black sage scrub	Diablan Sage Scrub	Coastal Sage Scrub	Central Coastal Scrub
	Bush mallow scrub			
	Choke cherry thickets	Choke Cherry Scrub		
	Desert olive patches	Desert Olive Scrub		
	Blue oak woodland	Blue Oak Savanna	Savanna	Blue Oak Woodland
	Valley oak woodland	Valley Oak-Coast Live Oak Savanna		
	Annual brome grassland	Mesquite-Tree-of-Heaven-Pepper Tree	not included	
		Tree-of-Heaven-Pepper Tree	not included	
		California Annual Grassland	California Annual Grassland	Grassland
		Barrens	Barren	
	Disturbed	Disturbed		
	Developed	Developed-Ruderal		

Source: AECOM 2012.

Table 2. Acreage of Vegetation and Land Cover Types			
Landcover Type	Acres		
	Carnegie SVRA	Tesla-Alameda properties	Total
Fremont cottonwood forest	65.92	25.13	<b>91.06</b>
Blue oak woodland	287.91	1,003.48	<b>1,291.40</b>
Valley oak woodland	0	32.87	<b>32.87</b>
California juniper woodland	0	1	<b>1</b>
Ghost pine woodland	0	99.91	<b>99.91</b>
California sagebrush/Black sage scrub	231.39	357.10	<b>588.50</b>
Bush mallow scrub	127.98	0	<b>127.98</b>
Mulefat thickets	2.55	1.90	<b>4.45</b>
Desert olive patches	3.29	20.95	<b>24.24</b>
Choke cherry thickets	0	2.32	<b>2.32</b>
Annual brome grassland	926.69	1,413.93	<b>2,340.62</b>
Seep	0	0.29	<b>0.29</b>
Pond	1.66	2.57	<b>4.24</b>
Drainage	0 <sup>1</sup>	5.77 <sup>1</sup>	<b>5.77<sup>1</sup></b>
Disturbed	0	5.45	<b>5.45</b>
Developed	79.78	6.97	<b>86.75</b>
<b>Total</b>	<b>1,727.20</b>	<b>2,979.65</b>	<b>4,706.84</b>
Note: 1. An acreage was not calculated for drainages that are included within another vegetation type. The acreage presented in this table includes only the non-vegetated portion of Mitchell Ravine. Source: AECOM 2012, DPR 2010			

### Fremont cottonwood forest

Fremont cottonwood forest on the site has an open tree canopy dominated by Fremont cottonwood (*Populus fremontii*). California sycamore (*Platanus racemosa*) is a common co-dominant and black willow (*Salix gooddingii*) is an occasional associate. To qualify as a Fremont cottonwood forest, relative cover of Fremont cottonwood in the tree canopy must be at least 30% (absolute cover at least 5%). Thickets of mule fat (*Baccharis salicifolius*) are scattered throughout the understory of this vegetation type. Other shrub associates include arroyo willow (*Salix lasiolepis*) and coyotebrush (*Baccharis pilularis*). Fremont cottonwood forest occurs on floodplains along low-gradient rivers, perennial and intermittent streams, alluvial fans, and in valleys with a reliable, seasonal groundwater supply. Fremont cottonwood forest is found along Corral Hollow Creek and covers approximately 91 acres of the study area.

### Blue oak woodland

Blue oak woodland on the site is dominated by blue oak (*Quercus douglasii*) intermingled with occasional stands of foothill pine (*Pinus sabiniana*), California juniper (*Juniperus californica*) and California buckeye (*Aesculus californica*). In this vegetation type, blue oak makes up greater than 50% relative cover in the tree canopy and associate tree species make up less than 30% relative tree canopy

cover. The shrub layer is either lacking or consists of scattered California sagebrush (*Artemisia californica*). Herbaceous species are the same as those seen in the annual brome grassland described below. The tree canopy is intermittent to continuous or savanna-like (trees spaced 1 to 2 typical canopy widths [i.e., approximately 30 meters] apart). Blue oak woodland occurs on shallow, rocky, low-fertility soils in valley bottoms, foothills, ridges, and rock outcrops. Blue oak woodland is found extensively throughout the study area, covering approximately 1,291 acres.

### **Valley oak woodland**

Valley oak woodland on the site is dominated by a mix of Valley oak (*Quercus lobata*), coast live oak (*Q. agrifolia*), California sycamore, red willow (*Salix laevigata*), and arroyo willow. Relative cover of valley oak in the tree canopy is at least 30% in this alliance. Scattered poison oak (*Toxicodendron diversilobum*) and California sagebrush can be found in the shrub layer. The herbaceous layer consists of the same species found in annual brome grassland, as well as creeping wildrye (*Leymus triticoides*) and Douglas' mugwort (*Artemisia douglasiana*), on the upper slopes and saltgrass (*Distichlis spicata*) and swamp prickleglass (*Crypsis schoenoides*) in the Arroyo Seco Creek channel. Valley oak woodland occurs on seasonally saturated alluvial or residual soils of valley bottoms. Valley oak woodland is found along Arroyo Seco Creek and two tributaries and covers approximately 33 acres of the study area.

### **California juniper woodland**

California juniper woodland is dominated by California juniper and, in the study area, consists of one small stand on the Tesla-Alameda properties. The canopy of this stand is dense and there is no understory, although this vegetation type typically has an open to intermittent tree canopy with a shrub layer and a sparse herbaceous layer. To meet the membership rules of the California juniper alliance, absolute cover of California juniper must be at least 1% and there can be no other tree species present with greater cover. This vegetation type covers approximately 1 acre of the study area.

### **Ghost pine woodland**

Ghost pine woodland is dominated by ghost pine (*Pinus sabiniana*), with blue oak, coast live oak, and California buckeye as co-dominants. The shrub and herbaceous layers are similar to those found in the blue oak woodland. This vegetation type is found on streamside terraces, valleys, slopes, and ridges with shallow, infertile soils. Ghost pine woodland is present on the Tesla-Alameda properties along the lower slopes of Corral Hollow Creek in the southern part of the property and around the old mining area. Ghost pine woodland was mapped in areas where absolute cover of ghost pine is greater than 10%. Approximately 100 acres of ghost pine woodland is present in the study area.

### **California sagebrush/Black sage scrub**

In the California sagebrush/black sage scrub type, there is 30 to 60% relative cover of both California sagebrush and black sage (*Salvia mellifera*) in the shrub canopy. California yerba santa (*Eriodictyon californicum*) and coyotebrush are occasional associates, and the herbaceous layer is very sparse. It is found on moderate to steep slopes extensively throughout the site, covering approximately 588 acres of the study area.

### **Bush mallow scrub**

Bush mallow scrub on the site is dominated by bush mallow (*Malacothamnus fasciculatus*), with occasional California yerba santa resprouting from burned stumps. Areas mapped as bush mallow scrub contain at least 50% relative cover of bush mallow in the shrub layer. The herbaceous layer is similar to that of annual brome grassland. This vegetation type is generally found in loam or clay soils on

slopes that have experienced a recent (i.e., within the last 10 years) fire event. Bush mallow scrub is present in the southeastern portion of the Carnegie SVRA in areas that burned in 2009, and covers approximately 128 acres.

### **Mulefat thickets**

Mulefat thickets on the site are dominated by mule fat, with scattered Fremont's cottonwood and California sycamore occasionally present at low cover. Relative cover of mulefat in the shrub canopy is greater than 50% and the herbaceous layer is sparse or absent. Where Fremont's cottonwood trees were greater than 5% absolute cover, these areas were classified as Fremont cottonwood forest. This vegetation type occurs in mixed alluvial soils in canyon bottoms, irrigation ditches, floodplains, lake margins, and stream channels. Mulefat thickets are present in small patches along Corral Hollow Creek and cover approximately 4 acres of the study area.

### **Desert olive patches**

Desert olive (*Forestiera pubescens*) makes up greater than 50% of the relative shrub canopy cover of this vegetation type, with occasional coyotebrush, toyon (*Heteromeles arbutifolia*), and poison oak also present. The shrub layer is dense and there is very little herbaceous understory. Desert olive patches are found on floodplains, stream banks, springs, river terraces, and washes and in the study area, are present in ravines along creeks and extending upslope. They cover approximately 24 acres of the study area.

### **Choke cherry thickets**

In this vegetation type, choke cherry (*Prunus virginiana*) may be dominant or co-dominant with other shrubs. In the study area, choke cherry is dominant with a few shrubs of poison oak and blue elderberry (*Sambucus nigra* ssp. *cerulea*) also present. The shrub layer is very dense with very little herbaceous understory. This vegetation type occurs in rock outcrops, draws, and stream terraces and is present in only one location in the study area, on the western end of the Tesla-Alameda properties on a north-facing slope, covering approximately 2 acres of the study area.

### **Annual brome grassland**

Like all of California's annual grasslands, species composition and abundance vary considerably in annual grasslands in the study area depending on site factors such as soil chemistry and texture, topography, and disturbance regime. In addition, species composition and abundance vary temporally from season to season and year to year (Sawyer, Keeler-Wolf, and Evans 2009:30). Although California's annual grasslands are generally characterized by a high percentage of nonnative annual grasses and forbs, native wildflowers are generally an important component of the community that is often overlooked. Annual grasslands are generally composed of a diverse assemblage of native and nonnative annual grasses and native and nonnative forbs, also predominantly annuals, but generally also containing many perennial forbs, especially members of the lily family. Because field surveys for this mapping and classification exercise were conducted in October when most of the species that comprise this vegetation type are dead, classification of the grassland as brome-dominated is based on the identification of dead standing biomass and from previous classification efforts.

Annual brome grassland is dominated by a mix of nonnative annual grasses and forbs, including soft chess (*Bromus hordeaceus*), ripgut brome (*B. diandrus*), mouse barley (*Hordeum murinum*), slender wild oats (*Avena barbata*), annual fescue (*Vulpia myuros*), Maltese star thistle (*Centaurea melitensis*), burclover (*Medicago polymorpha*), and black mustard (*Brassica nigra*). On the Carnegie SVRA, the soil is highly disturbed by ORV traffic and the annual brome grassland is dominated mainly by these

nonnative annual grasses and forbs. On the Tesla-Alameda properties the soil is much less disturbed and significant numbers of native forbs are also present, especially in the spring. Native wildflowers that have been documented in grasslands in the study area include California goldfields (*Lasthenia californica*), California poppy (*Eschscholzia californica*), valley tassels (*Castilleja attenuata*), brodiaea (*Brodiaea* spp. and *Triteleia* spp.), and lupines (*Lupinus* spp.). This vegetation type is present extensively across the study area, covering approximately 2,341 acres.

### Seep

There are three seeps in the study area. There is a seep located between two ponds on the Tesla-Alameda property (Map 2), where seepage from the ponds supports wetland plant species. Dominant species include annual rabbitsfoot grass (*Polypogon monspeliensis*), western marsh cudweed (*Gnaphalium palustre*), spiny cocklebur (*Xanthium spinosum*), turkey mullein (*Eremocarpus setigerus*), gumweed (*Grindelia* sp.), and Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*). There is another seep dominated by similar species located down slope of those same ponds (Map 2) at the top of an ephemeral drainage. There is a third seep characterized by saltgrass and swamp pricklegum located below a cattle water trough on the bank of Corral Hollow Creek on the Tesla-Alameda property (Map 1). These areas cannot be clearly categorized using the MCV (Sawyer, Keeler-Wolf, and Evens 2009) classification system based on the dominant species observed. Seeps cover approximately 0.29 acres of the study area.

### Pond

Most ponds on the property are characterized by open water, with sparse upland vegetation along the perimeter; these ponds are seasonally dry. Some of the perennial ponds support emergent wetland vegetation, such as cattails (*Typha* spp.), and floating aquatic plants. A few support willows (*Salix* spp.) or riparian vegetation similar to that found in Fremont cottonwood forest and mulefat thickets. There are 24 ponds covering approximately 4 acres of the study area.

### Drainage

Drainages are distributed throughout the study area. These include ephemeral drainages, as well as Arroyo Seco Creek, Corral Hollow Creek, and Mitchell Ravine. Ephemeral drainages are narrow and the vegetation within the channel is the same as the surrounding upland vegetation. Arroyo Seco Creek is a deeply downcut narrow channel, which is covered by valley oak woodland described above. Corral Hollow Creek is a wide and braided channel dominated by Fremont cottonwood forest and mulefat thickets as described above. Mitchell Ravine is a deep single channel, which is mostly non-vegetated except a few California sycamore, mulefat, coyotebrush, and California sagebrush which are scattered sparsely throughout the channel. Acreage was not calculated for drainages that are included within another vegetation type as these drainages were mapped as lines and not areas. The non-vegetated portion of Mitchell Ravine covers approximately 6 acres.

### Disturbed

Disturbed areas include bare land in the historic mining area on the Tesla-Alameda property (Map 1), which cover approximately 5 acres of the study area.

### Developed

Developed areas consist of roads, buildings, parking and staging areas, picnic areas, and race tracks on both the Carnegie SVRA and Tesla-Alameda properties. Developed areas cover approximately 87 acres of the study area.



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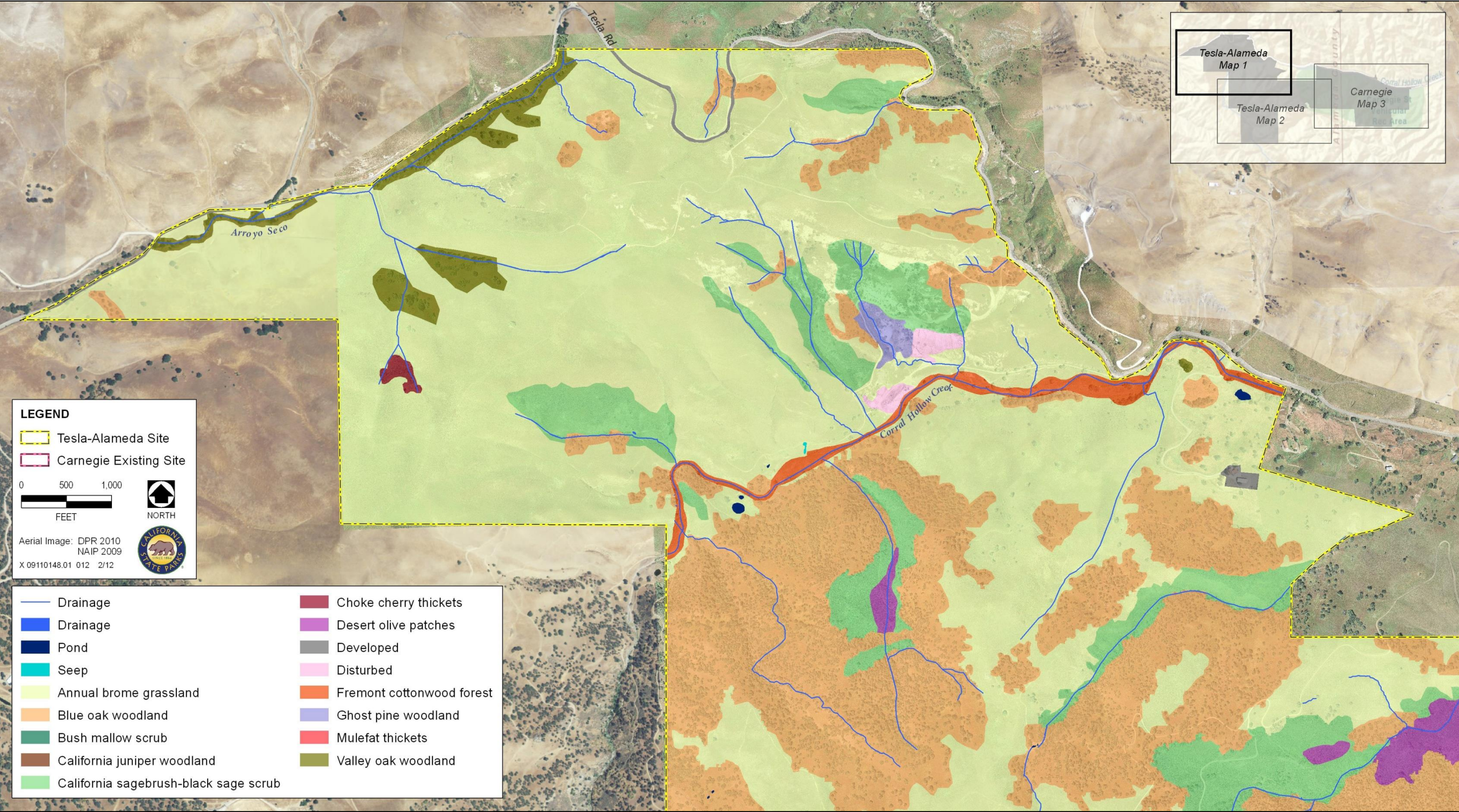
# **APPENDIX A**

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## Vegetation Maps





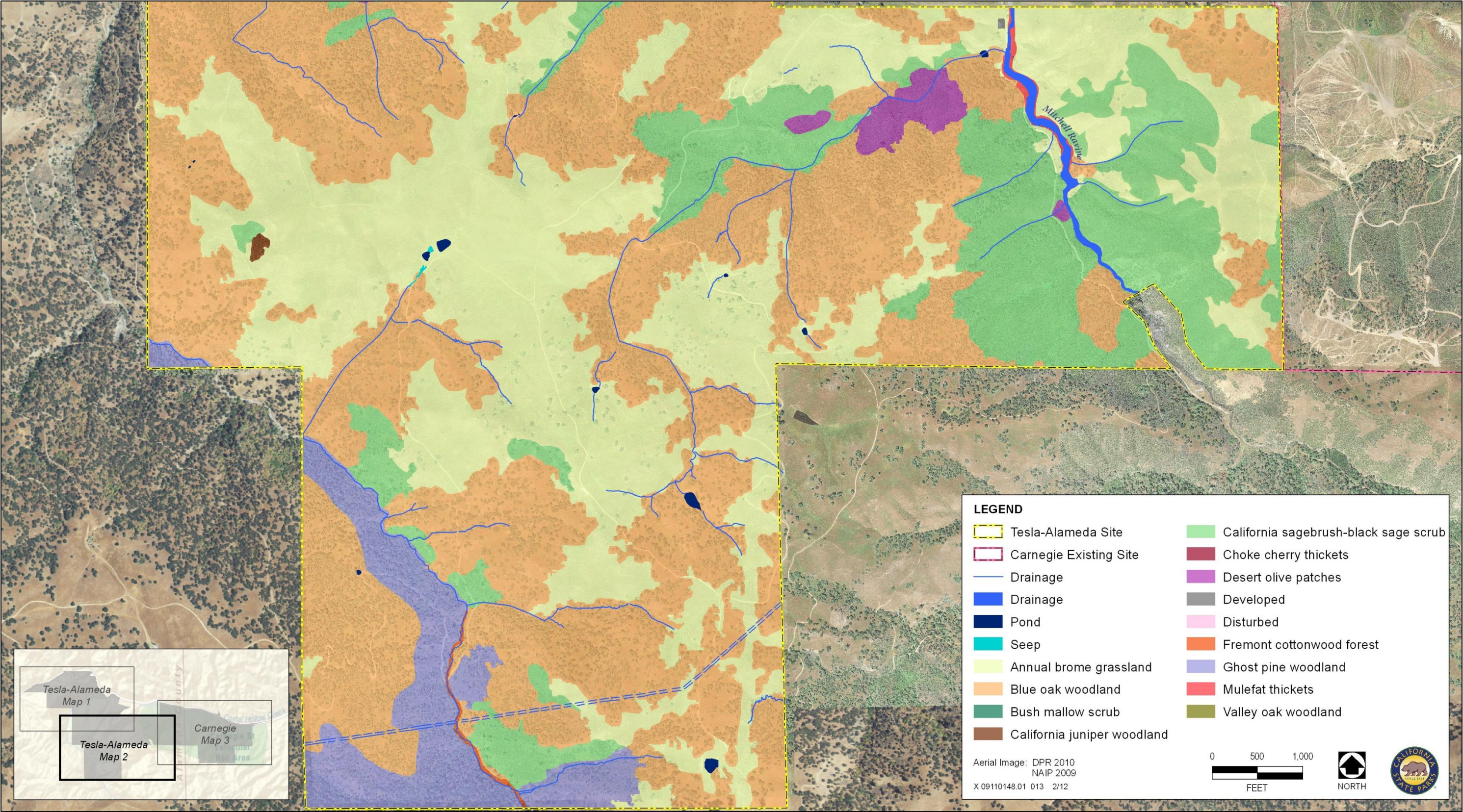


Source: DPR 2010, TRA 2011, AECOM 2012







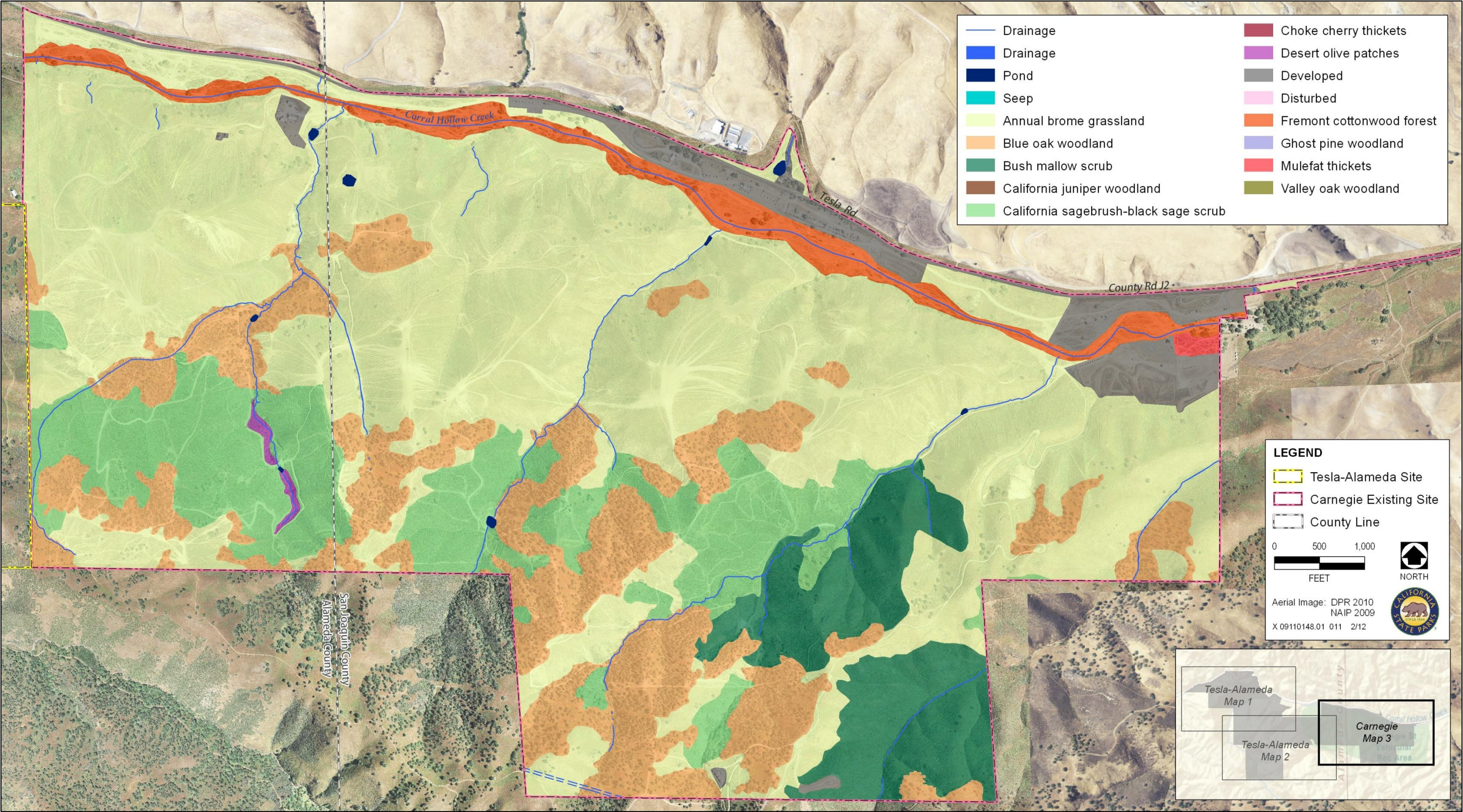


Source: DPR 2010, TRA 2011, AECOM 2012









Source: DPR 2010, TRA 2011, AECOM 2012





## **APPENDIX B**

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### Representative Photographs

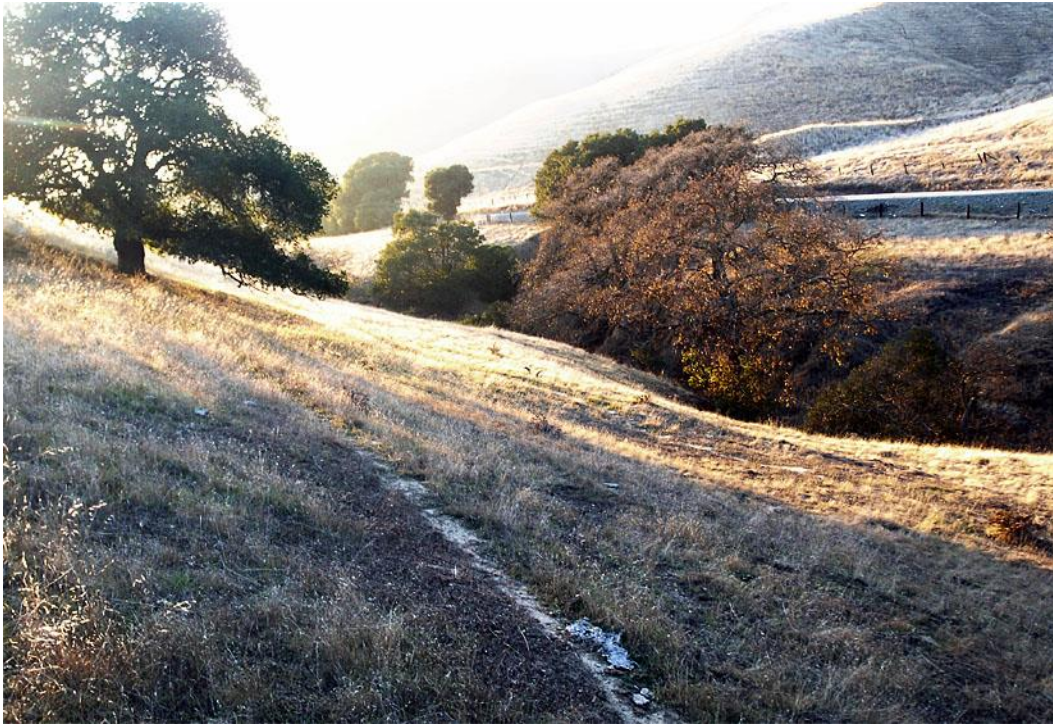


Fremont cottonwood forest. March 2011.



Blue oak woodland.





Valley oak woodland along Arroyo Seco Creek. December 2011.



California juniper woodland. December 2011.





Ghost pine woodland. December 2011.



California sagebrush/Black sage scrub. December 2011.





Bush mallow scrub. March 2011.



Mulefat thickets. March 2011.





Desert olive patches. December 2011.



Annual brome grassland and ORV trails on the Carnegie SVRA. March 2011.





Annual brome grassland on the Tesla-Alameda property. December 2011.



Seep between two ponds on the Tesla-Alameda property. December 2011.





Pond surrounded by upland vegetation. March 2011.



Perennial pond with emergent wetland vegetation. May 2011.





Mitchell Ravine. December 2011.



Corral Hollow Creek. March 2011.





Disturbed area above California sagebrush/black sage scrub. March 2011.



Developed area on Carnegie SVRA. March 2011.