United States Department of Agriculture
NRCS Natural Resources Conservation Service

Ecological Site Description

UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE

ECOLOGICAL SITE DESCRIPTION

ECOLOGICAL SITE CHARACTERISTICS

Site Type: Rangeland

Site Name: Fine Loamy

Quercus douglasii - Pinus sabiniana / *Ceanothus cuneatus - Toxicodendron diversilobum* / *Bromus - Avena*
(blue oak - California foothill pine / buckbrush - Pacific poison oak / brome - oat)

Site ID: R015XI003CA

Major Land Resource Area: 015 - Central California Coast Range

Physiographic Features

This ecological site extends across more than 400,000 acres from Santa Barbara County to Monterey and San Benito Counties. It is an upland site occurring on hills and mountains uplands along the central coast at elevations from 600 to 2500 feet. Slopes range from 9 to 75 percent.

Land Form: (1) Hill

	Minimum	Maximum
Elevation (feet):	600	2500
Slope (percent):	9	75
Water Table Depth (inches):		
Flooding:		
Frequency:	None	None
Duration:	None	None
Ponding:		
Depth (inches):		
Frequency:		
Duration:	None	None
Runoff Class:		
Aspect:	North	

South

Climatic Features

The climate on this site is characterized by mild cool winters. The average January temperature is about 46 degrees F, the average July temperature is about 76 degrees F, and the mean annual temperature is about 60 degrees F. The average annual precipitation ranges from 10 to 24 inches, with most falling as rain from November to March.

Precipitation and temperature are 1971-2000 means from the PRISM Group, Oregon Climate Service, Oregon State University, Corvallis, Oregon (Daly 2006). Frost free period obtained from map unit descriptions (Soil Data Mart). Mean monthly precipitation is reported in the maximum precipitation row.

	Minimum	Maximum
Frost-free period (days):	175	300
Freeze-free period (days):	0	0
Mean annual precipitation (inches):	12.0	20.0

Monthly precipitation (inches) and temperature (°F):

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precip. Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Precip. Max.	3.3	2.8	2.8	1.3	0.3	0.3	0.3	0.3	0.8	0.8	2.3	2.3
Temp. Min.	35.0	36.4	38.9	40.0	45.4	51.9	57.8	57.5	53.5	46.1	37.5	33.0
Temp. Max.	60.6	62.4	65.3	71.5	79.2	87.9	94.5	94.4	89.0	79.7	66.3	61.1

Climate Stations:

Influencing Water Features

Intermittent streams drain these sites.

Wetland Description:	System	Subsystem	Class

Representative Soil Features

This ecological site is characterized by well drained loamy soils derived from sandstone and shale (Nacimiento, Balcom, Dibble, Ayar, and Kilmer) or metamorphic and sedimentary rock (Los Osos). The depth to bedrock is 20 to 54 inches. Available water holding capacity is 3.4 to 8 inches. Permeability is moderately slow. This ecological site can be found at elevations from 1200 to 4800 feet. Fertility of these soils is generally low due to low nutrient content of the parent material or low organic matter build up. Nutrient concentration is often higher under oak trees.

CA665 134,135,136,137 Dibble
CA665 175, 176 Nacimiento silty clay loam
CA665 177, 178 Nacimiento-Ayar complex
CA665 179, 180, 181 Nacimiento-Los Osos complex

CA667 101, 102, 103 Balcom-Nacimiento complex
CA667 134 Kilmer-Nacimiento-Aido complex
CA667 251, 252 Nacimiento clay loam

Las Padres National Forest 12 Kilmer-Nacimiento family association

CA053 NaD, NaE, NaF, NaG, Nacimiento silty clay loam
CA053 NbF, NbG Nacimiento-Los Osos Complex

CA069 CbF2, CcG2 Cibo
CA069 LoEes, LoFes Los Osos
CA069 NaD, NaE, NaF2, NaG2, Nacimiento clay loam
CA069 NcG3 Nacimiento loam

CA673 NaF2 Nacimiento silty clay loam
CA673 NbG Nacimiento-Landslide complex

Predominant Parent Materials:
Kind: Residuum
Origin: Sandstone and shale

Surface Texture: (1) Loam

Subsurface Texture Group:

	Minimum	Maximum
Surface Fragments <=3" (% Cover):		
Surface Fragments > 3" (% Cover):		
Subsurface Fragments <=3" (% Volume):		
Subsurface Fragments > 3" (% Volume):		

Drainage Class: Well drained

Permeability Class: Very slow To Moderately rapid

	Minimum	Maximum
Depth (inches):	24	60
Electrical Conductivity (mmhos/cm):		
Sodium Absorption Ratio:		
Calcium Carbonate Equivalent (percent):	0	
Soil Reaction (1:1 Water):		
Soil Reaction (0.01M CaCl2):		
Available Water Capacity (inches):	3.4	7.6

Plant Communities

Ecological Dynamics of the Site

Ecological Dynamics

Before European settlement, the natural plant community for this ecological site ranged from a blue oak (Quercus douglasii) savanna with little or no shrub layer to a woodland with wedgeleaf ceanothus (Ceanothus cuneatus) dominating the shrub layer. The understory of this site was dominated by native annual and perennial grasses and forbs. On this site, the savanna or woodland is frequently intermixed in a mosaic with open grasslands. The reference state for this ecological site is similar to its pre-European state; however, density of shrubs and foothill pine (Pinus sabiniana) may be different due to fire suppression and annual grasses and forbs now dominate the understory.

The reference state for this ecological site ranges from a blue oak savanna at lower elevations to a blue oak-foothill pine woodland with a shrub layer that is dominated by ceanothus and an understory dominated by

annual grasses and forbs. Annual grassland patches (non-woody) are interspersed in a mosaic with the savanna and woodland patches. Other woody species that can be found throughout this ecological site include; poison oak (Toxicodendron diversiloba), and scrub oak (Quercus berberidifolia). Understory species and grassland patches are frequently dominated by soft chess brome (Bromus hordeaceus), ripgut brome (Bromus diandrus), annual fescue (Vulpia myuros), filaree (Erodium spp), and fiddleneck (Amsinkia spp).

Competition between the species that germinate or resprout following fire or other disturbances, mediated by weather and soil moisture conditions, greatly influence the vegetation states present in the oak-woodlands. On some soils, geological substrates, and aspects; tree, shrub and grass patches are all possible vegetations states. Shallow soils, coarse and rocky soils and southern aspects sometimes limit vegetation to shrub dominated states. Frequent fire tends to result in vegetation states dominated by an annual grass or oak-annual grass community. Protection from fire and grazing results in a gradual increase in shrubs and foothill pine contributing to increased fuel loads. As the shrub canopy reaches into the tree canopy the potential for crown fires increases. Crown fires can top-kill oak trees. Blue Oak may not resprout in some locations resulting in a shrubland or annual grassland. Grazing and browsing may slow recovery of woody plants following fire (Johnson and Fitzhugh 1990).

Blue oak trees are long-lived species that evolved under low severity understory fires that naturally occur at intervals of about 25 years (McClaran 1986). Many mature blue oaks range from 100 to 200 years old but some blue oaks have been aged at more than 400 years (McClaran 1986). Blue oak is adapted to fire by sprouting from the root crown but blue oak resprouting declines with age (Burns and Honkala 1990). Blue oak is a vigorous sprouter in some locations and not in others. Fire top-kills blue oak seedlings and saplings. Foothill pine (Pinus sabiniana) is increasing in blue oak-foothill pine communities due to fire suppression and lack of blue oak regeneration (Borchart et al. 1991).

The shrub layer is dominated by ceanothus, a prolific seed producer. These long-lived seeds accumulate in the soil and litter until they are stimulated to germinate by the heat of a fire. Frequent burning can remove these species form the site. Poison oak and scrub oak are top-killed by fire but resprout from the root crown following a fire.

The historic herbaceous understory layer of the plant community is not known, having been replaced by annual grasses and forbs of European origin during the colonization of California (Burcham 1957, Bartolome 1987, Baker 1989). The soils in this ecological site support oak savanna of few to many trees and annual grassland. The tree and shrub layers remain intact and fire is a normal component of these plant communities that were managed by the Native American population to provide food and fiber (Blackburn and Anderson 1993). Prior to European settlement in the mid-1800s fire frequency was approximately every 25 years (McClaran 1986). Fires were more frequent (5 to 15 years) following settlement before and after the gold rush (Pavlik 1991, Mensing 1992, Stephens 1997). The intentional use of fire by ranchers and others to reduce brush from 1850 to the 1950s contributed to this frequent fire interval. While prescribed burning continues today, foothill subdivision, urbanization and air quality concerns have reduced the use of fire as a management tool. Today fire frequency is more likely to be on the order of 25 to 50 years. Prescribed burning, mechanical and chemical brush control have been used to remove the shrub and tree layers but is infrequently used at the beginning of the 21st century (Murphy and Crampton 1964, Murphy and Berry 1973).

Species composition and productivity of the annual dominated grassland and understory grasses and forbs vary greatly within and between years and is greatly influenced by the timing and amount of precipitation and the amount of residual dry matter (George et al. 2001a). Grass dominated years occur when rainfall is well-distributed or greater than normal. Filaree years occur in low rainfall years or when residual dry matter (Bartolome et al. 2002) is low. Drought, heavy grazing and fire result in filaree dominated understory. Following a fire filaree may dominate the site for up to three years (Parsons and Stohlgren 1989, McDougald et al 1991).

Oak Woodland Plant Community

This ecological site is dominated by oak woodland and open grassland patches. In some cases it occurs as

annual grassland with no tree or shrub overstory. The oak woodlands of California are a multi-layered mosaic of trees, shrubs and grass patches. In some locations these mosaics have been correlated with geological substrate (Cole 1980) and soil characteristics (Harrison et al. 1971). However, other researches have found each of these vegetation types on most soil depths, slopes, aspects and all geological substrates suggesting that disturbance (fire) and/or biological factors (competition, grazing and browsing) are important determinants of the patchy distribution of these vegetation types (Wells 1962, Callaway and Davis 1991) at a scale smaller than an ecological site or even a soil mapping unit. Given this mosaic of multi-layered vegetation types there is wide amplitude in expected species composition and amounts on the same soil series or association within an ecological site. Therefore these sites were delineated more on the basis of soil characteristics and long-term understory production than on species composition.

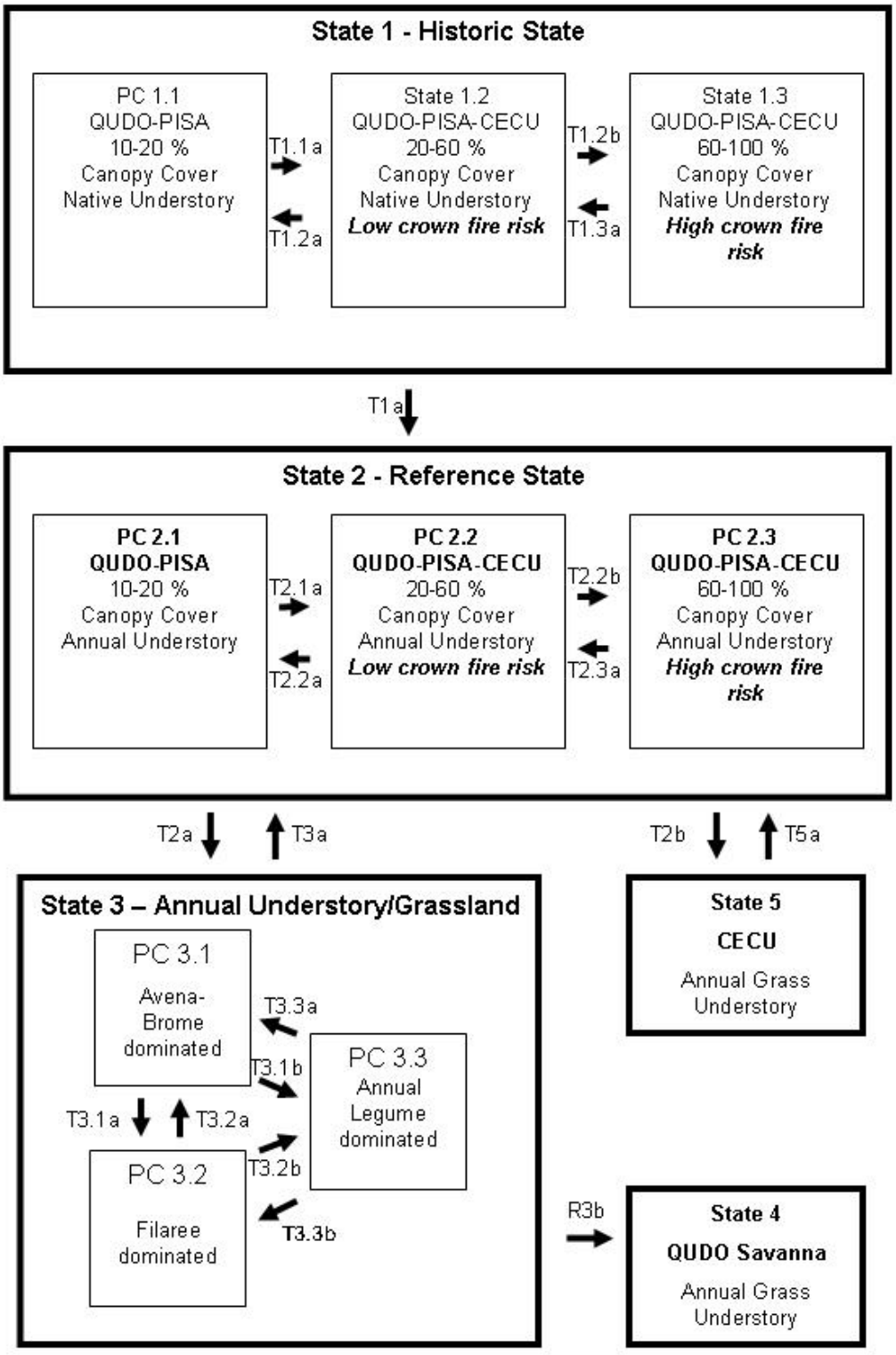
The understory and open grassland patches are dominated by annual grasses and forbs of European origin. As germination, seedling establishment and plant growth progress during the growing season, species composition changes depending primarily on the timing and amount of precipitation and temperature (George et al. 2001a). Consequently, understory and open grassland species composition varies seasonally and annually. Unlike many perennial dominated grasslands, kinds and amounts (weight or cover) of herbaceous species are not stable and annually predictable. Therefore, exact percentages by weight or ground cover are not reported as is done in perennial dominated ecosystems. Instead several species are listed, several of which can be expected to dominate the composition in some years and be present in most years.

The tree layer is dominated by blue oak (Quercus douglasii), with foothill pine (Pinus sabiniana) sometimes present. The shrub layer, when present, may include wedgeleaf ceanothus (Ceanothus cuneatus), scrub oak (Q. berberidifolia), and poison oak (Toxicodendron diversiloba). The understory is dominated by annual grasses and forbs of European origin. Patches on shallow soils are often dominated by filaree or other low growing forbs. Native perennial grasses may be present.

Total Annual Production and Growth Curve

Forage production and species composition is largely controlled by four factors: precipitation, temperature, soil characteristics and plant residue (George et al. 2001a). Precipitation and temperature control the timing and characteristics of four distinct phases of forage growth: break of season (germination and onset of growth), winter growth, rapid spring growth, and peak forage production. March and April are usually the months when 50 to 75 percent of the annual production occurs. The cold months of December and January often produce only 0 to 5 percent of the annual production. During cold weather seasonal and annual variation in production during each of these seasons contributes to the variable total annual production in the annual dominated understory and open grass patches. This ecological site commonly supports an open annual grassland intermixed with a blue oak dominated woodland of less than 60 percent canopy cover. In this woodland type understory production decreases as canopy cover increases above 25 percent.

Production curves are provided as examples of monthly forage production for normal (2300 lb/a), favorable (3500 lb/a), and unfavorable (1000 lb/a) years. Annual plant growth begins with germination following the first fall rains (George et al. 2001a). Germination commonly begins within 1 week of receiving 0.5 to 1.0 inch of rainfall. This normally occurs late in October or early November. Temperatures commonly turn cold in mid-November. The longer the period between germination and the onset of cold temperatures the greater is fall herbage production. Early rains followed by an extended dry period can result in loss of most of the initial wave of germination. This is known as a “false break” and will be followed by a second germination wave when adequate rainfall resumes. The onset of rapid spring growth coincides with warming spring temperatures commonly in mid-February. The rapid spring growth period continues until soil moisture is depleted following the end of the rainy season. The longer the period from mid-February to soil moisture depletion, the greater is spring production.



Fine Loamy State and Transition Model

State 1: Historic State

State 1: This is the assumed historic state consisting of long lived tree and shrub species similar to those in State 2. State 1 assumes that native annual and perennial grasses and forbs were common in the understory of the tree and shrub layer of these former oak-woodland ecosystems but there is no record of the species composition. As in State 2 a continuum of plant communities (PC 1.1, 1.2, and 1.3) resulted from increasing canopy cover following fire. In State 1, fire was more frequent and was not suppressed as is commonly the case in State 2. Under a more frequent fire regime, this community may never have reached the higher canopy covers that occur in State 2. Additionally, foothill pine was probably less prevalent in State 1.

T1.1a (PC 1.1 to PC 1.2): Under natural fire frequencies shrub and tree canopy cover increases toward State 1.2 following fire. Similar to T2.1a.

T1.2a (PC 1.2 to PC 1.1): Natural fire frequencies estimated to be 25 years maintains an oak savanna with few shrubs and an herbaceous understory. More frequent burning can result in a savanna free of shrubs and understory trees. Application of mechanical and/or chemical brush control practices can result in a similar transition. Similar to T 2.2a.

T1.2b (PC 1.2 to PC 1.3): Prolonged periods without fire result in increased shrub and tree canopy cover to the point where the savanna is classified as woodland. Increasing ladder fuels increase the chances of a high intensity crown fire. Under a 25 year fire interval this state may not have been reached in the pre-European plant community. Similar to T2.2b

T1.3a (PC 1.3 to PC 1.1 or 1.2): Burning woodlands with dense shrub and tree layers results in removal of most shrub and understory tree canopy. In extreme cases this transition could return from PC 1.3 to PC 1.1. Similar to T2.3a.

T1a (State 1 to State 2): Invasion by exotic annual species, yearlong continuous grazing, drought, fire suppression and cultivation reduced or destroyed the native perennial grass and forb component of the assumed climax plant community (Burcham 1957, Bartolome 1987, Baker 1989). Apparently this is an irreversible transition in a time frame relevant to management. Restoration of native perennial herbaceous vegetation is a recurring management objective that has been largely unsuccessful. Researchers, managers and citizens groups have been unsuccessful at reversing the loss of native perennial grasses. Competition from invasive annuals and long dry summers apparently are insurmountable. Annual grasses and forbs are more competitive for soil moisture than native perennials reducing oak seedling survival (Gordon et al. 1989, Corbin and D'Antonio 2004).

State 2: Reference State - Plant Communities 2.1, 2.2, and 2.3

State 2: This reference state is characterized by a continuum of plant communities that can be sparse in canopy cover to dense canopy cover depending on the frequency of fire. Fire suppression has resulted in longer intervals between fires resulting in fewer ground fires and more intense crown fires. Natural fires in State 1 would have been ignited by lightening, whereas anthropogenic fires were ignited most commonly by Native Americans. Fire in State 2 is often man-caused, but can be started by lightening as well, however the timing and frequency of the fire has probably changed from State 1 to State 2.

Plant community 2.1 (PC 2.1) is a savanna community (Allen Class: Blue Oak/Grass) with 10 to 20 percent canopy cover of blue oak with an annual grass dominated understory and few or no shrubs. Blue oaks are fire resistant and evolved under low-severity grassland fires. Foothill pine is sensitive to moderate or intense fires but its overall cover is increasing throughout the site more than likely due to fire suppression. Ceanothus has seeds that require fire to germinate; therefore these species may dominate immediately following a fire.

Plant community 2.2 (PC 2.2) ranges from 20 – 60 percent canopy cover resulting from an increase in ceanothus and other shrubs, foothill pine and increased oak canopy (Allen Class: Foothill Pine/Wedgeleaf Ceanothus/Grass).

Plant community 2.2 (PC 2.2) is a woodland community (Allen Class: Blue Oak-Foothill Pine/Wedgeleaf Ceanothus/Grass) resulting from continued increases in canopy cover (60 – 100 %) due to infrequent fire. Fire hazard is usually high in this plant community because of the high fuel loads that can lead to high crown fire risk. The understory of these plant communities is generally dominated by annual grasses and forbs of Eurasian origin. Understory productivity decreases as canopy cover increases above 50%. The understory species composition and dynamics in this state is similar to that for State 3 with ripgut brome and foxtail barley often prevalent under the oak canopy and soft brome and filaree more common in the open patches.

T2.1a (PC 2.1 to PC 2.2): Under natural fire frequencies shrub and tree canopy cover increases toward PC 2.2 following fire.

T2.2a (PC 2.2 to PC 2.1): Natural fire frequencies estimated to be 25 years maintains an oak savanna with a few shrubs and an herbaceous understory. More frequent burning can result in a savanna free of shrubs and understory trees. Application of mechanical and/or chemical brush control practices can result in a similar transition.

T2.2b (PC 2.2 to PC 2.3): Prolonged periods without fire result in increased shrub and tree canopy cover to the point where the savanna is classified as woodland. Increasing ladder fuels increase the chances of a high intensity crown fire.

T2.3a (PC 2.3 to PC 2.1 or 2.2): Burning woodlands with dense shrub layers results in removal of most shrub and understory tree canopy. In extreme cases this transition could return from PC 2.3 to PC 2.1. Implementation of mechanical or chemical brush control practices can result in a similar transition.

T2a (State 2 to State 3 - Type conversion from woodland to grassland): Use of mechanical and chemical tree and shrub control and prescribed burning remove all trees and shrubs resulting in a conversion from woodland to annual grassland. In some cases this transition may be irreversible without artificial regeneration of native woody species, especially if frequent fires and grazing suppress seedlings of woody species. Seeding and fertilization often accompanied tree and shrub control. At low canopy covers fire or natural mortality could remove woody species and conditions for resprouting or acorn germination and seedling establishment may be unfavorable.

Fine Loamy Ecological Site

State 2: Reference State - Plant Communities 2.1, 2.2, and 2.3 Plant Species Composition:

Grass/Grasslike

Group	Group Name	Common Name	Scientific Name	Annual Production in Pounds Per Acre Low	High
2 - Native cool season perennial grass				0	0
			Melica imperfecta var. flexuosa (Syn)	0	0
8 - Non-native annual cool season grass				0	0
		wild oat	*Avena fatua*	0	0
		ripgut grass	*Bromus diandrus*	0	0
		soft brome	*Bromus hordeaceus*	0	0
		cheatgrass	*Bromus tectorum*	0	0
		barley	*Hordeum*	0	0
		fescue	*Vulpia*	0	0

Forb

Group	Group Name	Common Name	Scientific Name	Annual Production in Pounds Per Acre Low	High
11 - Native perennial forb				0	0
		common yarrow	*Achillea millefolium*	0	0
14 - Non-native annual forb				0	0
		fiddleneck	*Amsinckia*	0	0
		Maltese star-thistle	*Centaurea melitensis*	0	0
		lambsquarters	*Chenopodium album*	0	0
		redstem stork's bill	*Erodium cicutarium*	0	0
		dotseed plantain	*Plantago erecta*	0	0
		clover	*Trifolium*	0	0

Shrub/Vine

Group	Group Name	Common Name	Scientific Name	Annual Production in Pounds Per Acre Low	High
17 - Native shrub				0	0
		buckbrush	*Ceanothus cuneatus*	0	0
		scrub oak	*Quercus berberidifolia*	0	0
		Pacific poison oak	*Toxicodendron diversilobum*	0	0

Tree

Group	Group Name	Common Name	Scientific Name	Annual Production in Pounds Per Acre Low	High
23 - Native coniferous tree				0	0
		California foothill pine	*Pinus sabiniana*	0	0
24 - Native non-deciduous tree				0	0
		blue oak	*Quercus douglasii*	0	0

Annual Production by Plant Type:

Plant Type	Annual Production (lbs/AC) Low	Representative Value	High
Forb	200	460	700
Grass/Grasslike	800	1840	2800
Total:	1000	2300	3500

Structure and Cover:

Ground Cover (%)

Vegetative Cover						Non-Vegetative Cover					
Grass/ Grasslike	Forb	Shrub/ Vine	Tree	Non-Vascular Plants	Biological Crust	Litter	Surface Fragments > 1/4 & <= 3"	Surface Fragments > 3"	Bedrock	Water	Bare Ground
80 to 100	0 to 20					0 to 100					0 to 20

Structure of Canopy Cover (%)

	Grasses/Grasslike	Forbs	Shrubs/Vines	Trees
<=0.5 feet		0 to 20		
> 0.5 - < 1 feet	80 to 100			
< 1 - >= 2 feet				
> 2 - < 4.5 feet				
< 4.5 - >= 13 feet			0 to 30	
> 13 - < 40 feet				0 to 70

Plant Growth Curve:
Growth Curve Number: CA1501
Growth Curve Name: Annual rangeland (Normal Production Year)
Growth Curve Description: Growth curve for a normal (average) production year resulting from the production year starting in November and extending into early May. Growth curve is for oak-woodlands and associated annual grasslands.

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

0	10	25	40	5	0	0	0	0	0	10	10

Plant Growth Curve:
Growth Curve Number: CA1502
Growth Curve Name: Annual rangeland (Favorable Production Year)
Growth Curve Description: Growth curve for a favorable production year resulting from the production year starting in October and extending through May. Growth curve is for oak-woodlands and associated annual grasslands.

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	10	20	30	25	0	0	0	0	5	5	5

Plant Growth Curve:
Growth Curve Number: CA1503
Growth Curve Name: Annual rangeland (Unfavorable Production Year)
Growth Curve Description: Growth curve for an unfavorable production year resulting from the production year starting in October and exgtending through May. Growth curve is for oak-woodlands and associated annual grasslands.

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	15	70	5	0	0	0	0	0	0	5	5

State 3: Annual Grassland State

State 3: Annual grassland with species composition fluctuating in response to weather, grazing, fire and fertility. Plant community 3.1 (PC 3.1) is dominated by wild oats (Avena spp), soft chess brome (Bromus hordeaceus) and ripgut brome (B. diandrus). Plant community 3.2 (PC 3.2) is dominated by filaree (Erodium spp) or other decumbent species. Plant community 3.3 (PC 3.3) is an annual grassland containing seeded annual legumes such as subterranean clover (Trifolium subterraneum) and rose clover (T. hirtum). Soil quality, especially fertility, declines following tree removal.

T3a (State 3 to State 2): Recovery from grassland conversions may take decades or may be irreversible depending on the intensity and type of brush control practices. Repeated fires and grazing help to maintain the grassland. Blue oaks and other woody plants may colonize adjacent open grasslands but seedlings are seldom found more than 30 m from existing tree canopy.

T3.1a (PC 3.1 to PC 3.2): Filaree increases in response to low litter levels. Litter levels reduced by poor growing conditions, fire or heavy grazing. Long periods of inadequate rainfall within the growing season reduce grasses.

T3.2a (PC 3.2 to PC 3.1): Annual grasses increase in filaree patches. Light to moderate grazing increases litter. Mulching effect of litter favors annual grass seedlings. Annual grasses shade filaree and other forb seedlings. Nitrogen fertilization favors increase in grasses.

T3.1b and 3.2 b (PC 3.1 or PC 3.2 to 3.3): Annual legume seeding. Sulfur and/or phosphorus fertilization are required to maintain productive annual legume stands. Close grazing helps to maintain legume composition.

T3.3a (PC 3.3 to PC 3.1): Grasses increase with improved soil fertility and light grazing

T3.3b (PC 3.3 to PC 3.2): With loss of fertility and close grazing annual legumes are replaced by filaree.

R3b (State 3 to State 4): Planting, weed control and protection of blue oak seedlings from animal damage can successfully restore blue oaks (McCreary 2001).

State 3: Annual Grassland State Plant Species Composition:

Grass/Grasslike

Group	Group Name	Common Name	Scientific Name	Annual Production in Pounds Per Acre Low	High
2 - Native cool season perennial grass				0	0
			Melica imperfecta var. flexuosa (Syn)	0	0
8 - Non-native cool season annual grass				0	0
		wild oat	*Avena fatua*	0	0
		ripgut grass	*Bromus diandrus*	0	0
		soft brome	*Bromus hordeaceus*	0	0
		cheatgrass	*Bromus tectorum*	0	0
		barley	*Hordeum*	0	0
		fescue	*Vulpia*	0	0

Forb

Group	Group Name	Common Name	Scientific Name	Annual Production in Pounds Per Acre Low	High
11 - Native perennial forb				0	0
		common yarrow	*Achillea millefolium*	0	0
14 - Non-native annual forb				0	0
		fiddleneck	*Amsinckia*	0	0
		Maltese star-thistle	*Centaurea melitensis*	0	0
		lambsquarters	*Chenopodium album*	0	0
		redstem stork's bill	*Erodium cicutarium*	0	0
		dotseed plantain	*Plantago erecta*	0	0
		clover	*Trifolium*	0	0

Annual Production by Plant Type:

Plant Type	Annual Production (lbs/AC) Low	Representative Value	High
Forb	200	460	700
Grass/Grasslike	800	1840	2800
Total:	1000	2300	3500

Structure and Cover:

Ground Cover (%)

Vegetative Cover						Non-Vegetative Cover					
Grass/ Grasslike	Forb	Shrub/ Vine	Tree	Non-Vascular Plants	Biological Crust	Litter	Surface Fragments > 1/4 & <= 3"	Surface Fragments > 3"	Bedrock	Water	Bare Ground
80 to 100	0 to 20					0 to 100					0 to 20

Structure of Canopy Cover (%)

	Grasses/Grasslike	Forbs	Shrubs/Vines	Trees
<=0.5 feet		0 to 20		
> 0.5 - < 1 feet	80 to 100			

Plant Growth Curve:
Growth Curve Number: CA1501
Growth Curve Name: Annual rangeland (Normal Production Year)
Growth Curve Description: Growth curve for a normal (average) production year resulting from the production year starting in November and extending into early May. Growth curve is for oak-woodlands and associated annual grasslands.

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	10	25	40	5	0	0	0	0	0	10	10

Plant Growth Curve:
Growth Curve Number: CA1502
Growth Curve Name: Annual rangeland (Favorable Production Year)
Growth Curve Description: Growth curve for a favorable production year resulting from the production year starting in October and extending through May. Growth curve is for oak-woodlands and associated annual grasslands.

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	10	20	30	25	0	0	0	0	5	5	5

Plant Growth Curve:
Growth Curve Number: CA1503
Growth Curve Name: Annual rangeland (Unfavorable Production Year)
Growth Curve Description: Growth curve for an unfavorable production year resulting from the production year starting in October and exgtending through May. Growth curve is for oak-woodlands and associated annual grasslands.

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	15	70	5	0	0	0	0	0	0	5	5

State 4: Restored Blue Oak Savanna

State 4: Blue oak savanna. Artificially regenerated oak woodland with an annual grass understory. Allen Class: Blue Oak/Grass or Blue Oak-Understory Blue Oak/Grass.

State 5: Ceanothus State

State 5: Ceanothus chaparral.

T5a-State 5 to 2: On deeper soils with better moisture holding capacity blue oak regenerate from acorns that germinate under canopy of shrubs (Callaway and D'Antonio 1991, Muick 1997). This is a slow successional process.

Ecological Site Interpretations

Animal Community:
Wildlife

Of the 632 terrestrial vertebrates (amphibians, reptiles, birds, and mammals) native to California, over 300 species use oak woodlands for food, cover and reproduction, including at lest 120 species of mammals, 147 species of birds and approximately 60 species of amphibians and reptiles (Tietje et al. 2005). Common species on this site include California quail (Callipepla californicus), Beechey ground squirrels (Spermophilus beecheyi), Botta pocket gopher (Thomomys bottae mewa), Blacktailed jackrabbit (Lepus californicus), and mule deer (Odocoileus hemionus). The rich rodent and lagomorph population is an important food source for common predators including: bobcat (Lynx rufus californicus), coyote (Canis latrans) and the Pacific rattlesnake (Crotalus viridis oreganus). The value of this site for food or cover changes seasonally with the vegetation. In habitat planning each plant community and each species needs must be considered individually and collectively.

Columbian black tailed deer, California mule deer, and lagomorphs, browse blue oak and rodents graze and browse in this community. Acorns are eaten by at least a dozen species of songbirds, several upland game birds, rodents, black-tailed deer, feral and domestic pig, and all other classes of livestock (Adams et al. 1992, Duncan and Clawson 1980, Sampson and Jespersen 1963). Acorns are a critical food source for deer (Burns and Honkala 1990). The California Wildlife Habitat Database (Mayer and Laudenslayer 1988), maintained by California Department of Fish and Game, can provide extensive information on wildlife species that may occur in the habitat type on this site.

Grazing and Browsing

The annual dominated understory of this plant community is used by domestic livestock and wildlife throughout the year. Currently and historically use has been primarily by cow-calf operations but stocker cattle are also grass fed on these plant communities. While sheep use may have been greater in the past it is currently limited. The main problem for livestock production on this site is lack of natural water sources during most of the year.

The plant communities on this site are suitable for grazing by all classes of livestock at any season. However, forage quality declines below the nutritional needs of many kinds and classes of livestock during the 6 to 8 month dry season. Matching the nutrient demands of livestock with the nutrients supplied by range forage is a balancing act for a considerable portion of each year (George et al. 2001b). The quality of range forage varies with plant species, season, location, and range improvement practices. Range forage is optimal for livestock growth and production for only a short period of the year. Early in the growing season, forage may be of high nutrient content, but high water content in the forage may result in rapid passage through the rumen and incomplete nutrient extraction. The browse value of common oak woodland species can be found in Sampson and Jespersen (1963).

Plant Preference by Animal Kind:

Hydrology Functions:
The watersheds associated with these sites are drained by intermittent streams that only flow during the wet season. In dry years these intermittent streams may not flow at all. Runoff on these soils is rapid and soil erosion hazard is high.

Recreational Uses:
Hunting, horseback riding, and hiking are common recreational pursuits.

Wood Products:
Firewood cutting of blue oak, once prevalent, has decreased as voluntary and county regulatory actions to protect blue oaks that are weak resprouters on this site.

Other Products:
Native Americans have historically used and managed the blue oak woodlands for food and fiber.

Other Information:

Revegetation/Restoration Of Disturbed Areas

Oak Restoration:

Natural regeneration of blue oaks may be limited because they are weak resprouters on some dry sites and because of a number of factors that limit seed germination, seedling establishment and survival to the tree stage. Competition for soil moisture from the understory annual plants, acorn and seedling damage by rodents, livestock grazing and changed fire regimes are important factors that can reduce blue oak regeneration. McCreary (2001) provides an extensive review of oak regeneration problems and practices on California's oak woodlands.

Native Grass Restoration:

While, the soils on this ecological site support remnant native perennial grasses, competition from non-native annuals has prevented successful re-introduction of native grasses.

Annual Legumes And Annual Grasses:

Rainfall at this site is probably marginal for successful annual legume seedings. The high cost of seeding and fertilization has reduced the use of this practice.

Poisonous/Non-native Plants

Poisonous Plants:

Poisonous plants that may occur on this ecological site include locoweed (Astragalus spp), fiddleneck (Amsinkia spp), Mexican whorled milkweed (Asclepias fascicularia), groundsel (Senecio vulgaris), larkspur (Delphinium spp), and tarweed (Hemizonia spp). Yellow starthistle (Centaurea solstitialis) may be present and is poisonous to horses. Oleander (Nerium oleander), an ornamental frequently used in foothill landscapes, is very toxic to humans and animals and should be kept away from pasture fence lines. Livestock poisoning is often a result of hungry animals being concentrated on toxic plants.

Invasive Species:

The understory and open grassland vegetation on this site is dominated by non-native annuals that invaded during the colonization of California. The species composition of the pre-colonization community is unknown. Medusahead (Taeniatherum asperum), cheatgrass (Bromus tectorum), yellow starthistle and Maltese starthistle also called tocolote (Centaurea melitensis) are invaders of concern.

Supporting Information

Associated Sites:

Site Name	Site ID	Site Narrative

Similar Sites:

Site Name	Site ID	Site Narrative
FINE LOAMY	R015XF011CA	
Fine Loamy 9-13" p.z.	R015XE020CA	
FINE LOAMY	R015XD024CA	
Loamy Upland 9-13" P.Z.	R015XF031CA	
LOAMY UPLAND	R015XD126CA	

State Correlation:
This site has been correlated with the following states:
CA

Inventory Data References:
KOmissionp3 37.5049308 121.9059356
Bobcat05 38.5250866 122.0766964
RLadel.2 35.6695000 120.8103800
Rladel.4 35.6746100 120.8176300
RLadel1.1 35.6690400 120.8103900
KShog.2 35.8696667 120.4821667
KShog.4 35.8641667 120.4813333
MGhog1 35.8643619 120.4809712
RLhog.1 35.8695500 120.4827100
RLhog.6 35.8625700 120.4816700

Type Locality:

Relationship to Other Established Classifications:
This blue oak dominated site may include the following Allen-Diaz Classes: 1) Blue Oak/Grass, 2) Blue Oak-Foothill Pine/Wedgeleaf Ceanothus/Grass, 3) Blue Oak-Understory Blue Oak/Grass (Allen Diaz et al. 1989). This site includes Blue Oak Woodland (BOW) and Blue Oak-Foothill Pine (BOP) of the California Wildlife Habitat Relationships System. The Society for Range Management Cover Type for this site is Blue Oak Woodland.

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Site Description Approval:

Author	Date	Approval	Date
Melvin George, Royce Larsen, Karl Striby	5/14/2005		

Reference Sheet

Author(s)/participant(s):

Contact for lead author:

Date: **MLRA:** 015X **Ecological Site:** Fine Loamy R015XI003CA This *must* be verified based on soils and climate (see Ecological Site Description). Current plant community cannot be used to identify the ecological site.

Composition (indicators 10 and 12) based on: Annual Production, Foliar Cover, Biomass

Indicators. For each indicator, describe the potential for the site. Where possible, (1) use numbers, (2) include expected range of values for above- and below-average years for **each** community and natural disturbance regimes within the reference state, when appropriate and (3) cite data. Continue descriptions on separate sheet.

1. **Number and extent of rills:**
2. **Presence of water flow patterns:**
3. **Number and height of erosional pedestals or terracettes:**
4. **Bare ground from Ecological Site Description or other studies (rock, litter, standing dead, lichen, moss, plant canopy are not bare ground):**
5. **Number of gullies and erosion associated with gullies:**
6. **Extent of wind scoured, blowouts and/or depositional areas:**
7. **Amount of litter movement (describe size and distance expected to travel):**
8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**
9. **Soil surface structure and SOM content (include type and strength of structure, and A-horizon color and thickness):**
10. **Effect on plant community composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**
12. **Functional/Structural Groups (list in order of descending dominance by above-ground weight using symbols: >>, >, = to indicate much greater than, greater than, and equal to) with dominants and sub-dominants and "others" on separate lines:**
    Dominant:
    Sub-dominant:
    Other:
    Additional:
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
14. **Average percent litter cover (%) and depth (inches):**
15. **Expected annual production (this is TOTAL above-ground production, not just forage production:**
16. **Potential invasive (including noxious) species (native and non-native). List Species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species**

on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicator, we are describing what in NOT expected in the reference state for the ecological site:

17. Perennial plant reproductive capability: