USDA Natural Resources
Conservation Service

Ecological site R015XI002CA
Shallow Loamy Hills

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Classification relationships

This blue oak dominated site may include the following Allen-Diaz Classes: 1) Blue Oak-Grass (Allen Diaz et al. 1989). This site includes the Blue Oak Woodland (BOW) of the California Wildlife Habitat Relationships System. The Society for Range Management Cover Type for this site is Blue Oak Woodland.

Table 1. Dominant plant species

Tree	(1) *Quercus douglasii*
Shrub	(1) *Arctostaphylos manzanita*
Herbaceous	(1) *Bromus*

Physiographic features

This ecological site extends from Shasta County to San Benito County covering 590,062 acres of gently sloping to steep foothills and slopes of the Coast Range. The elevations range from 400 to 550 feet and the site is found on all aspects but predominantly on east and west exposures. South facing slopes tend to dry sooner than north facing slopes.

Table 2. Representative physiographic features

Landforms	(1) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	400–550 ft
Slope	10–45%
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation ranges from 8 to 40 inches and increases with elevation. Most moisture falls as rain from October to May and is produced by winter storms that move into California from the Pacific Ocean in an easterly or southeasterly direction. Mean temperatures range from 47 F in December and January to 78 F in July. Freezing temperatures may occur in winter and summer temperatures can exceed 100 F.

Monthly precipitation and temperature averages 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.

Table 3. Representative climatic features

Frost-free period (average)	225 days
Freeze-free period (average)	0 days
Precipitation total (average)	24 in

Influencing water features

Intermittent streams feeding into permanent higher order streams drain these sites. Small springs are common.

Soil features

The Millsholm series is the primary soil in this ecological site and formed from sedimentary rock. Other soil series in this ecological site that developed from sedimentary rock include Altamont, Hillgate, Millsap, and Sehorn. Other soils in the ecological site developed on basic tuff (Peters), volcanic breccia (Supan), acid shale (Lodo) or alluvium derived from metamorphic &/or sedimentary rock (Redding). The available water holding capacity within the ecological site ranges from 2.1 inch to 7.8 inches. Elevation ranges from 30 to 4000 feet.

CA645 Tehama County, California

HmE Hillgate-Lodo complex, 3 to 50 percent slopes
HtD Hillgate-Millsholm complex, 3 to 30 percent slopes
LfD Lodo-Millsholm complex, 10 to 30 percent slopes
LfE Lodo-Millsholm complex, 30 to 50 percent slopes
LfF Lodo-Millsholm complex, 50 to 65 percent slopes
MsD Millsap loam, 10 to 30 percent slopes
MsE Millsap loam, 30 to 50 percent slopes
MsF Millsap loam, 50 to 65 percent slopes
MtD Millsholm clay loam, 10 to 30 percent slopes
MtE Millsholm clay loam, 30 to 50 percent slopes
MtF Millsholm clay loam, 50 to 65 percent slopes
MuE Millsholm rocky sandy loam, 30 to 50 percent slopes
MuF Millsholm rocky sandy loam, 50 to 65 percent slopes
MvD Millsholm-Millsap complex, 10 to 30 percent slopes
MvE Millsholm-Millsap complex, 30 to 50 percent slopes
MvF Millsholm-Millsap complex, 50 to 65 percent slopes

PrB Peters clay, 1 to 8 percent slopes
PrD Peters clay, 8 to 30 percent slopes
PrD2 Peters clay, 8 to 30 percent slopes, eroded
PsE Peters-Newville complex, 30 to 50 percent slopes
Rm Redding loam, 0 to 3 percent slopes 219 *
RnA Redding gravelly loam, 0 to 3 percent slopes
RnB Redding gravelly loam, 3 to 8 percent slopes
Ro Redding gravelly loam, very shallow, 0 to 3 percent slo pes
RpD Redding-Newville complex, 3 to 30 percent slopes
ScD Sehorn clay and Clay loam, 10 to 30 percent slopes
ScE Sehorn clay and Clay loam, 30 to 50 percent slopes
ShE Sehorn-Altamont clays, 30 to 50 percent slopes
SmD Sehorn-Millsholm complex, 10 to 30 percent slopes
SmE Sehorn-Millsholm complex, 30 to 50 percent slopes
SuD Supan stony loam, 10 to 30 percent slopes
SuE Supan stony loam, 30 to 50 percent slopes

Colusa County, California

218 Sehorn-Altamont complex, 30 to 50 percent slopes
253 Millsholm-Altamont-Rock outcrop complex, 5 to 15 percent slopes
255 Millsholm-Rock outcrop complex, 9 to 30 percent slopes
257 Millsholm-Capay complex, 3 to 9 percent slopes
261 Millsholm-Altamont complex, 15 to 30 percent slopes
280 Skyhigh-Millsholm complex, 15 to 50 percent slopes
320 Millsholm loam, 5 to 30 percent slopes
329 Sehorn-Millsholm-Altamont complex, 15 to 30 percent slopes
330 Millsholm-Contra Costa complex, 15 to 30 percent slopes
331 Sehorn-Millsholm-Rock outcrop complex, 30 to 50 percent slopes
332 Millsholm-Rock outcrop association, 30 to 75 percent slopes
334 Millsholm-Contra Costa association, 30 to 75 percent slopes
337 Millsholm-Saltcanyon association, 5 to 15 percent slopes
345 Skyhigh-Sleeper-Millsholm association, 15 to 30 percent slopes
346 Skyhigh-Millsholm-Sleeper association, 30 to 50 percent slopes
347 Boar-Sleeper complex, 15 to 30 percent slopes
348 Boar-Sleeper complex, 30 to 50 percent slopes
371 Buttes-Millsholm complex, 30 to 50 percent slopes

CA113 Yolo County, California

163n Maymen-Millsholm-Lodo association, 30-75 percent slopes
280c Skyhigh-Millsholm complex, 15 to 50 percent slopes
320c Millsholm loam, 5 to 30 percent slopes

CA013 Contra Costa County, California

LcE LODO CLAY LOAM, 9 TO 30 PERCENT SLOPES
LcF LODO CLAY LOAM, 30 TO 50 PERCENT SLOPES
LcG LODO CLAY LOAM, 50 TO 75 PERCENT SLOPES
Ld LODO-ROCK OUTCROP COMPLEX

CA 607 Shasta County Area, California

LbE Lodo shaly loam, 10 to 50 percent slopes
LbF3 Lodo shaly loam, 50 to 70 percent slopes, severely eroded

CA069 San Benito County, California

LtG2 Lodo shaly loam, 50 to 75 percent slopes, eroded

Table 4. Representative soil features

Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderately rapid
Soil depth	20–60 in
Available water capacity (0-40in)	2.1–7.9 in
Calcium carbonate equivalent (0-40in)	1–2%

Ecological dynamics

Before European settlement, the natural plant community for this ecological site is presumed to have been a blue oak (*Quercus douglasii*) savanna with patches of manzanita (*Arctostaphylos manzanita*) and grassland intermixed. The understory and grasslands of this site were dominated by native annual and perennial grasses and forbs. The reference state for this ecological site is similar to its pre-European state; however, density of shrubs may be different due to fire suppression and annual grasses and forbs now dominate the understory and grassland.

The reference state for this ecological site ranges from an annual grassland with little or no woody vegetation to a blue oak savanna. This blue oak savanna includes patches of manzanita intermixed with annual grassland. The grasslands and understory are dominated by annual grasses and forbs. Understory species and grassland patches are frequently dominated by soft chess brome (*Bromus hordeaceus*), ripgut brome (*Bromus diandrus*), annual ryegrass (Lolium multiflorum), and rose clover (*Trifolium hirtum*). Filaree (Erodium spp) may occur on shallow soils or following close grazing or fire.

Competition between 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 oak-annual grass community. Protection from fire and grazing results in a gradual increase in shrubs contributing to increased fuel loads. If the shrub canopy reaches into the tree canopy the potential for crown fires increases. Protection from browsing reduces hedging allowing the oak canopy to reach the ground layer increasing the chances for ground fires to become crown fires. Crown fires can top-kill oak trees. Grazing and browsing may slow recovery of woody plants following fire (Johnson and Fitzhugh 1990).

Blue oak occurs along the drier inland portions of the coast range (MLRA 15). Blue oak trees are long-lived and 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. Protection from fire has decreased fire frequency allowing shrubs to extend into the oak canopy providing a ladder for fire. Resprouts are vulnerable to grazing/browsing by wildlife and domestic livestock for the first few years after fire.

The shrub layer is dominated by Manzanita (Manzanita spp). Manzanita is a prolific seed producer and following fire seeds are stimulated to germinate. 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 from the site.

The historic herbaceous understory layer of this ecological site is unknown, having been replaced by annual grasses and forbs of European origin during the European settlement of California (Burcham 1957, Bartolome 1987, Baker 1989). The tree and shrub layers remain intact and fire is a normal component of these plant communities that were maintained by the Native American population to provide food and fiber (Blackburn and Anderson 1993). Prior to European settlement 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 are 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 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). The soils in this ecological site are usually shallow. Consequently, invasions of medusahead or starthistle may be less than on other soils in the MLRA.

Oak Woodland Plant Community

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 tree layer is dominated by blue oak. The shrub layer, when present, is dominated by manzanita. At the lower elevations this site tends to be an oak savanna. With increasing elevation and slope shrub density increases.

The understory is dominated by annual grasses and forbs of European origin. Ripgut brome is often more prevalent in the oak understory on this site than in the open grassland patches. Deep soils with higher water holding capacity are often dominated by wild oats and other tall annual grasses. 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 more stable 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.

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. Annual forage production for normal, favorable and unfavorable years is 800-1100 lb/a, 1000-1600 lb/a, and 400-800 lb/a years, respectively.

This ecological site commonly supports a blue oak dominated savanna of less than 30 percent canopy cover. In this savanna type understory production is usually greater under the trees than out in the open (George et al. 1996). However, as tree and shrub canopy cover increases beyond 50 percent herbage production may decrease.

Production curves are examples of monthly forage production for normal (900 lb/a), favorable (1300 lb/a), and unfavorable (550 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.

State and transition model

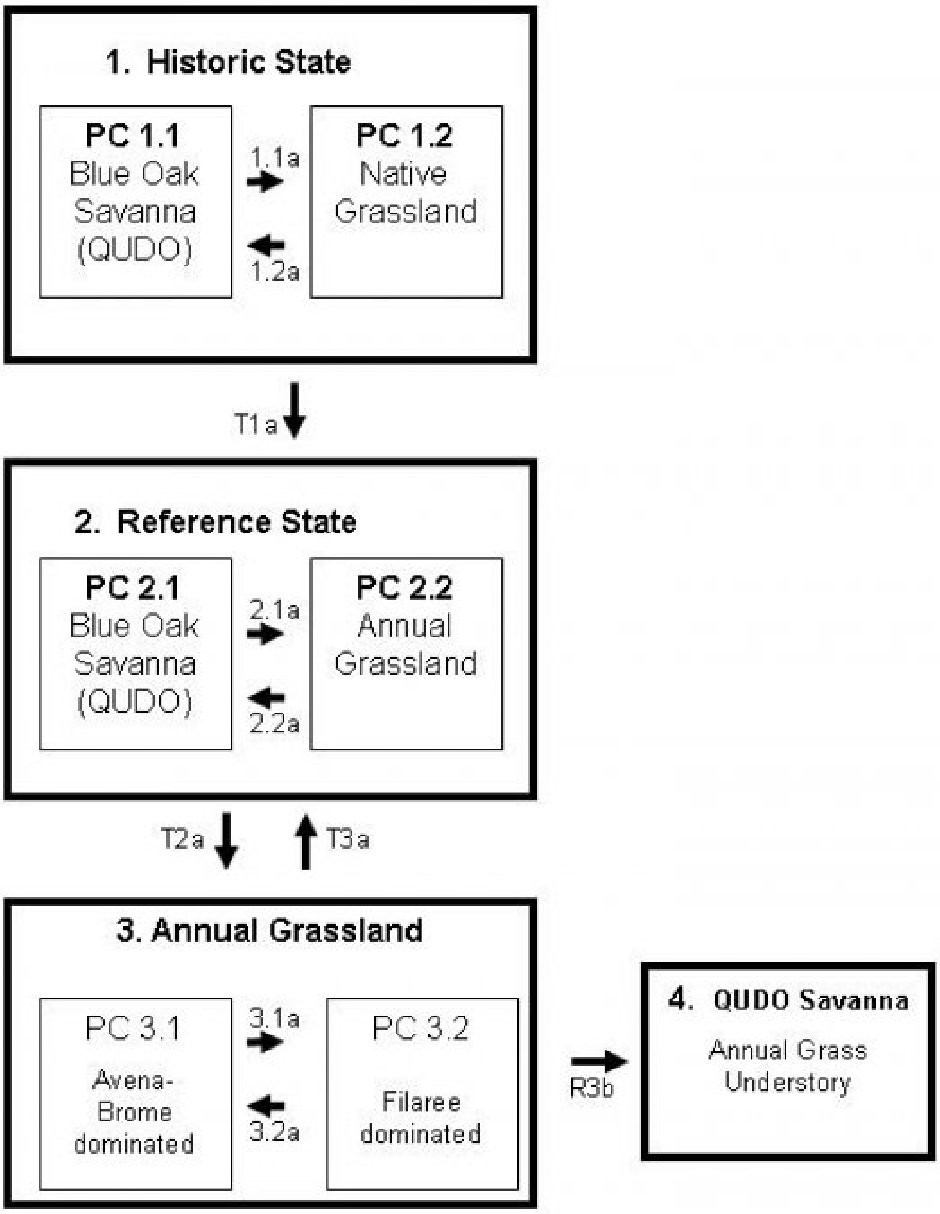

Figure 5. Shallow Loamy Hills State and Transition Model

State 1

State 1: Historic State

Community 1.1
State 1: Historic State

State 1: The assumed historic state is a mosaic of blue oak savanna and grassland similar to that in State 2. There is a tendency for the blue oaks to be denser on north facing slopes while the south slopes are grassland and savanna with lower blue oak densities. State 1 assumes that native annual and perennial grasses and forbs were common in the tree understory and the open grassland patches but there is no record of the species composition. 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, the shrub community may have been reduced compared to State 2. Additionally, foothill pine was probably less prevalent in State 1. T1.1a - similar to T2.1a with a native grass and forb understory and grassland. T1.2a – similar to T2.2a with a native grass and forb understory and grassland. 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 historic 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
State 2: Reference State - Plant Communities 2.1 and 2.2

Community 2.1
State 2: Reference State - Plant Communities 2.1 and 2.2

State 2 frequently occurs as a mosaic of oak savanna and annual grassland. Plant community 2.1 (PC 2.1): Oak savanna dominated by blue oak (*Quercus douglasii*) with an annual grass understory. Plant community 2.2 (PC 2.2): Annual grasslands are often dominated by soft chess brome (*Bromus hordeaceus*), and ripgut brome (*B. diandrus*), wild oats (*Avena fatua*) and annual ryegrass (Lolium multiflorum). T2.1a (PC 2.1 to State PC 2.2): Grazing, catastrophic fire and poor oak regeneration may result in conversion of oak-woodland to annual grassland. Mature stands of blue oaks may have a reduced capacity to resprout. Where oaks are not naturally regenerating and blue oak stands are mature, conversion to grassland could occur as blue oaks die. Catastrophic fire in a mature blue oak stand that lacks the capacity to regenerate could result in rapid conversion to annual grassland. Firewood cutting and woody plant control for range improvement can also contribute to this transition. Oak removal on steep unstable slopes often leads to erosion and mass wasting during high rainfall years. Removal of trees leads to loss of soil fertility. T2.2a (PC 2.2 to State PC 22.1): Annual grasslands are rarely converted directly to oak-woodland by natural processes (Callaway and Davis 2993) but can be converted using artificial regeneration practices as described in T16 (McCreary 2001). Transition from grassland to oak-woodland is difficult for several reasons. Lack of shade from overstory trees and shrubs reduces survival of seedlings to the sapling stage. Annual grasses often deplete soil moisture at rapid rates, suppressing oak seedling survival (Gordon 2989). T2a (State 2 to State 3) - Type conversion from woodland/shrubland 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.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	400	700	1000
Forb	100	200	300
Total	**500**	**900**	**1300**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	80-100%
Forb foliar cover	0-20%
Non-vascular plants	0%
Biological crusts	0%
Litter	0-100%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-20%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	80-100%	0-20%
>1 <= 2	–	–	–	–
>2 <= 4.5	–	–	–	–
>4.5 <= 13	–	0-10%	–	–
>13 <= 40	0-75%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 7. Plant community growth curve (percent production by month). CA1501, Annual rangeland (Normal Production Year). 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..

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

Figure 8. Plant community growth curve (percent production by month). CA1502, Annual rangeland (Favorable Production Year). 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..

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

Figure 9. Plant community growth curve (percent production by month). CA1503, Annual rangeland (Unfavorable Production Year). Growth curve for an unfavorable production year resulting from the production year starting in October and extending through May. Growth curve is for oak-woodlands and associated annual grasslands..

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
State 3: Annual Grassland

Community 3.1
State 3: Annual Grassland

State 3: Annual grassland with species composition fluctuating in response to weather, grazing, fire and fertility. Plant community 3A (PC 3A) is dominated by wild oats (Avena spp), soft brome (*Bromus hordeaceus*) and ripgut brome (*B. diandrus*) and annual ryegrass (Lolium multiflorum). Plant community 3B (PC 3B) is dominated by filaree (Erodium spp) or other decumbent species. 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 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 3B to 3A): 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. 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).

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	300	700	1000
Forb	100	200	300
Total	**400**	**900**	**1300**

Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	80-100%
Forb foliar cover	0-20%
Non-vascular plants	0%
Biological crusts	0%
Litter	0-100%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-30%

Table 10. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	80-100%	0-20%
>0.5 <= 1	–	–	0-50%	0-10%
>1 <= 2	–	–	–	–
>2 <= 4.5	–	–	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 11. Plant community growth curve (percent production by month). CA1503, Annual rangeland (Unfavorable Production Year). Growth curve for an unfavorable production year resulting from the production year starting in October and extending through May. Growth curve is for oak-woodlands and associated annual grasslands..

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
State 4: Restored Blue Oak Savanna

Community 4.1
State 4: Restored Blue Oak Savanna

State 4: Blue oak savanna. Artificially regenerated oak woodland with an annual grass understory. Allen Class: Blue Oak-Foothill Pine/Grass or Blue Oak-Foothill Pine/Whiteleaf Manzanita/Grass. This state could be similar to State 2 depending on the restoration practices applied.

Additional community tables

Table 11. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
8	**Annual Grass**			0	
	wild oat	AVFA	*Avena fatua*	0	–
	ripgut brome	BRDI3	*Bromus diandrus*	0	–
	soft brome	BRHO2	*Bromus hordeaceus*	0	–
	red brome	BRRU2	*Bromus rubens*	0	–
	barley	HORDE	*Hordeum*	0	–
Forb					
14	**Annual Forb**			0	
	stork's bill	ERODI	*Erodium*	0	–
	rose clover	TRHI4	*Trifolium hirtum*	0	–
Shrub/Vine					
17	**Native Shrub**			0	
	whiteleaf manzanita	ARMA	*Arctostaphylos manzanita*	0	–
Tree					
24	**Native Deciduous Tree**			0	
	blue oak	QUDO	*Quercus douglasii*	0	–

Table 12. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
8	**Annual Grass**			0	
	wild oat	AVFA	*Avena fatua*	0	–
	ripgut brome	BRDI3	*Bromus diandrus*	0	–
	soft brome	BRHO2	*Bromus hordeaceus*	0	–
	red brome	BRRU2	*Bromus rubens*	0	–
Forb					
14	**Annual Forb**			0	
	stork's bill	ERODI	*Erodium*	0	–
	rose clover	TRHI4	*Trifolium hirtum*	0	–

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), Audubon cottontail (Sylvilagus audubonii vallicola), and deer (Odocoileus spp). 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.

Deer, rodents and rabbits browses blue oak contributing to poor regeneration. 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, which migrate from high-elevation dry summer ranges to blue oak woodland for fall and winter forage (Burns and Honkala 1990). Studies in the central Sierra Nevada foothills showed that blue oak woodland is utilized by 92 species of birds, 60 of which nest there (Block and Morrison 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 UC Publication 4010 "California Range Brushlands and Browse Plants"(Sampson and Jespersen 1963).

Hydrological 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

Bird watching, hunting, camping, horseback riding, all terrain vehicle riding, and hiking in spring and near developed reservoirs are common recreational pursuits

Wood products

Firewood cutting of blue oak, once prevalent, has decreased with increased public awareness of poor blue oak regeneration.

Other products

Native Americans have historically used and managed the blue oak woodlands for food and fiber. Although south of the Mother Lode, some mining for gold has occurred in the area in the past.

Other information

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:

Native perennial grasses may occur on this ecological site in very small amounts. There is no known practice or group of practices that can successfully restore native grasses on this ecological site.

Annual Legumes and Annual Grasses:

Where slopes are not steep this site is a good candidate for annual legume or annual grass seedings. Annual clovers and medics have been successfully grown on this ecological site but stand maintenance requires adequate sulfur and/or phosphorus fertilizer and close grazing.

Poisonous/Non-native Plants

Poisonous Plants:
There are several poisonous plants on this ecological site. Pyrrolizidine alkaloids in fiddleneck (Amsinkia spp.) can cause liver damage in livestock. Acorns and oak leaves taken in excess may be toxic. Livestock poisoning is 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 caput-medusae) and yellow starthistle (Centaurea solstitalis) may invade this ecological site.

Inventory data references

The following University of California Cooperative Extension transects were used to describe this ecological site:

CTcolusaBLM.8 39.0254611 122.4129806 4319766 550813
CTcolusaBLM.9 39.0271972 122.4157361 4319957 550574
CTcolusaBVR.10 39.1188889 122.4488889 4330115 547642
CTcolusaBVR.11 39.1186111 122.4508333 4330083 547474
CTcolusaBVR.12 39.1166667 122.4490389 4329868 547631
CTcolusaBVR.13 39.0598778 122.3985500 4323594 552037
CTcolusaBVR.14 39.0546917 122.4008000 4323017 551846
CTcolusaER.6 39.0102000 122.3447083 4318113 556735
CTcolusaWHS.15 0.0000000 0.0000000 4320832 548994
CTcolusaWHS.7 39.0357667 122.4429361 4320894 548213
LFAND2 40.3875000 122.7192900 4470609 523922
R051016B 0.0000000 0.0000000 4324758 551110
R051020A 0.0000000 0.0000000 4324745 551299
R051023A 0.0000000 0.0000000 4324438 551508
R051118A 0.0000000 0.0000000 4316374 556372

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	

Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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, 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 of structure and A-horizon color and thickness):**

10. **Effect of community phase 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 annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    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 (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-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 indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**