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 Upland (Los Osos)

Quercus agrifolia - *Quercus douglasii* / *Baccharis pilularis* / *Bromus* - *Erodium*
(California live oak - blue oak / dwarf chaparral broom / brome - stork's bill)

Site ID: R015XI012CA

Major Land Resource Area: 015 - Central California Coast Range

Physiographic Features

This ecological site extends across more than 250,000 acres along the Coast Range from Sonoma County to Santa Barbara County. It is an upland site occurring on hills at elevations from 100 to 3,500 feet. Slope is 5 to 75 percent.

Land Form: (1) Hill

	Minimum	Maximum
Elevation (feet):	100	3500
Slope (percent):	5	75
Water Table Depth (inches):		
Flooding:		
Frequency:	None	None
Duration:	None	None
Ponding:		
Depth (inches):		
Frequency:	None	None
Duration:	None	None
Runoff Class:	High	Very high
Aspect:	No Influence on this site	

Climatic Features

The average annual precipitation for this ecological site ranges from 14 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 annual temperature is 56 degrees to 63 degrees F. The mean January temperature is about 51 degrees F. and the mean July temperature about 65 degrees F. The frost-free season is 200 to 320 days.

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.

	Minimum	Maximum
Frost-free period (days):	200	320
Freeze-free period (days):	0	0
Mean annual precipitation (inches):	14.0	40.0

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.	5.75	4.75	3.75	2.0	0.25	0.25	0.25	0.25	0.25	1.75	4.25	5.25
Temp. Min.	39.2	41.9	43.6	45.2	48.8	52.4	54.7	54.9	53.7	49.7	43.8	39.1
Temp. Max.	55.4	59.8	63.0	67.9	72.5	77.9	81.4	81.7	79.8	74.1	63.2	55.8

Climate Stations:

Influencing Water Features

Intermittent streams feeding into permanent higher order streams drain these sites.

Wetland Description:	System	Subsystem	Class

Representative Soil Features

The soils of this ecological site are moderately deep and well drained. They formed in material weathered from sandstone and shale.

Alameda Area (CA609), California

CA609 120aw Los Osos silty clay loam, 9 to 30 percent slopes
CA609 122aw Los Osos-Millsholm complex, 9 to 30 percent slopes
CA609 123aw Los Osos-Millsholm complex, 30 to 50 percent slopes
CA609 LhEcc Los Osos clay loam, 15 to 30 percent slopes
CA609 LhFcc Los Osos clay loam, 30 to 50 percent slopes
CA609 LhGcc Los Osos clay loam, 50 to 75 percent slopes
CA609 LsC Los Osos loam, seeped variant, 3 to 15 percent slopes
CA609 LtD Los Osos silty clay loam, 7 to 30 percent slopes
CA609 LtE2 Los Osos silty clay loam, 30 to 45 percent slopes, eroded

CA609 LtF2 Los Osos silty clay loam, 45 to 75 percent slopes, eroded
CA609 LuD Los Osos and Millsholm soils, 7 to 30 percent slopes
CA609 LuE2 Los Osos and Millsholm soils, 30 to 45 percent slopes, eroded

Alameda County (CA610), California, Western Part

CA610 120 Los Osos silty clay loam, 9 to 30 percent slopes
CA610 121 Los Osos silty clay loam, 30 to 50 percent slopes
CA610 122 Los Osos-Millsholm complex, 9 to 30 percent slopes
CA610 123 Los Osos-Millsholm complex, 30 to 50 percent slopes
CA610 124 Los Osos-Millsholm complex, 50 to 75 percent slopes

Contra Costa County (CA013), California

CA013 Lhe Los Osos Clay Loam, 15 To 30 Percent Slopes
CA013 Lhf Los Osos Clay Loam, 30 To 50 Percent Slopes
CA013 Lhg Los Osos Clay Loam, 50 To 75 Percent Slopes
CA013 Lk Los Osos-Los Gatos Complex 4,145 0.8
CA013 Lm Los Robles Clay Loam
CA013 Ltdaa Los Osos Silty Clay Loam, 7 To 30 Percent Slopes
CA013 Lte2aa Los Osos Silty Clay Loam, 30 To 45 Percent Slopes, Eroded
CA013 Ludaa Los Osos And Millsholm Soils, 7 To 30 Percent Slopes
CA013 Lue2aa Los Osos And Millsholm Soils, 30 To 45 Percent Slopes, Eroded

Marin County (CA041), California

CA041 140 Los Osos-Bonnydoon Complex, 5 To 15 Percent Slopes
CA041 141 Los Osos-Bonnydoon Complex, 15 To 30 Percent Slopes
CA041 142 Los Osos-Bonnydoon Complex, 30 To 50 Percent Slopes
CA041 143 Los Osos-Urban Land-Bonnydoon Complex, 15 To 30 Percent Slopes
CA041 144 Los Osos-Urban Land-Bonnydoon Complex, 30 To 50 Percent Slopes

Monterey County (CA053), California

CA053 LmD Los Osos clay loam, 9 to 15 percent slopes
CA053 LmE Los Osos clay loam, 15 to 30 percent slopes
CA053 LmF Los Osos clay loam, 30 to 50 percent slopes
CA053 LmG Los Osos clay loam, 50 to 75 percent slopes
CA053 Ln Los Osos-Millsholm complex

Napa County (CA055), California

CA055 DaF2y Dibble clay loam, 30 to 50 percent slopes, eroded
CA055 DaG2y Dibble clay loam, 50 to 75 percent slopes, eroded
CA055 DbEso Dibble-Los Osos loams, 9 to 30 percent slopes
CA055 DbF2so Dibble-Los Osos loams, 30 to 50 percent slopes, eroded
CA055 DlEso Dibble-Los Osos clay loams, 9 to 30 percent slopes
CA055 DlF2so Dibble-Los Osos clay loams, 30 to 50 percent slopes, eroded

San Benito County (CA069), California

CA069 LoEes Los Osos clay loam, 15 to 30 percent slopes
CA069 LoFes Los Osos clay loam, 30 to 50 percent slopes
San Luis Obispo County (CA664), California, Coastal Part

CA664 158 Los Osos loam, 5 to 9 percent slopes
CA664 159 Los Osos loam, 9 to 15 percent slopes
CA664 160 Los Osos loam, 15 to 30 percent slopes
CA664 161 Los Osos loam, 30 to 50 percent slopes
CA664 162 Los Osos-Diablo complex, 5 to 9 percent slopes
CA664 163 Los Osos-Diablo complex, 9 to 15 percent slopes
CA664 164 Los Osos-Diablo complex, 15 to 30 percent slopes
CA664 165 Los Osos-Diablo complex, 30 to 50 percent slopes
CA664 166 Los Osos-Lodo complex, 15 to 30 percent slopes
CA664 167 Los Osos-Lodo complex, 30 to 75 percent slopes
CA664 168 Los Osos variant clay loam, 15 to 50 percent slopes

San Luis Obispo County (CA665), California, Paso Robles Area

CA665 163 Los Osos-Lodo complex, 50 to 75 percent slopes
CA665 164 Los Osos-Rock outcrop complex, 30 to 50 percent slopes

Northern Santa Barbara Area (CA672), California

CA672 LoE Los Osos clay loam, 15 to 30 percent slopes
CA672 LoG Los Osos clay loam, 30 to 75 percent slopes
CA672 LsE Los Osos-San Benito clay loams, 15 to 30 percent slopes
CA672 LsF Los Osos-San Benito clay loams, 30 to 45 percent slopes
CA672 LsG3 Los Osos-San Benito clay loams, 30 to 75 percent slopes, severely eroded

Eastern Santa Clara Area (CA646), California

CA646 LoE Los Osos clay loam, 15 to 30 percent slopes
CA646 LoF Los Osos clay loam, 30 to 50 percent slopes
CA646 LoG Los Osos clay loam, 50 to 75 percent slopes
CA646 LsCaa Los Osos loam, seeped variant, 3 to 15 percent slopes

Solano County (CA095), California

CA095 DbC Dibble-Los Osos loams, 2 to 9 percent slopes
CA095 DbE Dibble-Los Osos loams, 9 to 30 percent slopes
CA095 DbF2 Dibble-Los Osos loams, 30 to 50 percent slopes, eroded
CA095 DlC Dibble-Los Osos clay loams, 2 to 9 percent slopes
CA095 DlE Dibble-Los Osos clay loams, 9 to 30 percent slopes
CA095 DlF2 Dibble-Los Osos clay loams, 30 to 50 percent slopes, eroded

Sonoma County (CA097), California

CA097 Lod Los Osos Clay Loam, 2 To 15 Percent Slopes
CA097 Loe Los Osos Clay Loam, 15 To 30 Percent Slopes
CA097 Lof Los Osos Clay Loam, 30 To 50 Percent Slopes
CA097 Lof2 Los Osos Clay Loam, 30 To 50 Percent Slopes, Eroded
CA097 Lsd Los Osos Clay Loam, Thin Solum, 5 To 15 Percent Slopes
CA097 Lse Los Osos Clay Loam, Thin Solum, 15 To 30 Percent Slopes
CA097 Lse2 Los Osos Clay Loam, Thin Solum, 15 To 30 Percent Slopes, Eroded
CA097 Lsf2 Los Osos Clay Loam, Thin Solum, 30 To 50 Percent Slopes

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 To Well drained

Permeability Class: Slow To Moderate

	Minimum	Maximum
Depth (inches):	25	29
Electrical Conductivity (mmhos/cm):		
Sodium Absorption Ratio:		
Calcium Carbonate Equivalent (percent):		
Soil Reaction (1:1 Water):		
Soil Reaction (0.01M CaCl2):		
Available Water Capacity (inches):	4.1	4.1

Plant Communities

Ecological Dynamics of the Site

Before European settlement, the natural plant community for this ecological site is assumed to have been a mosaic of grassland, shrub and coast live oak (Quercus agrifolia) patches. The grassland and understory of this site was 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.

The reference state for this ecological site is a mosaic of coast live oak, Baccharis scrub and annual grassland. Blue oak is often mixed with coast live oak in the reference state. Native perennial grasses, such as purple needlegrass (Nasella pulcra) and blue wild rye (Elymus glaucus) may be present in small amounts. Coyote brush may be found in the shrub layer. The understory and grassland patches are frequently dominated by bromes (Bromus spp), wild oats (Avena spp), filaree (Erodium spp), and annual legumes (Trifolium spp and Medicago spp).

Fire frequency largely defines the extent of Baccharis scrub, grassland, and oak woodland in the coast range. Without fire or grazing Baccharis scrub species tend to be slowly replaced by oak. Burning and grazing tend to slow the transition from grassland to coyote brush scrub and to oak woodland (Callaway 1990, Ford and Hayes 2007). 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 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. While interior coast live oak will resprout vigorously, blue oak may not resprout in some locations resulting in a post fire coast live oak dominated site. Grazing and browsing may slow the recovery of woody plants following fire (Johnson and Fitzhugh 1990).

Coast live oak trees are long-lived species that evolved under low severity understory fires that are estimated to have naturally occurred at intervals of 10 to 30 years (Greenlee and Langenheim 1990). Beginning in the mid-1900s fire return intervals are estimated to have increased to as much as 50 to 75 years. Coast live oak is

adapted to fire by having a thick bark and by sprouting from the root crown following fire. 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. The shrub layer on this ecological site is dominated by coyote brush. Frequent burning can remove this species from the site and control reinvasion.

The historic herbaceous 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 patches 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 10 to 30 years (Greenlee and Langenheim 1990). Following European settlement before and after the gold rush fire was frequent (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 50 to 75 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 coast live oak, and open grassland patches. In some cases this ecological site occurs as an annual grassland with no tree or shrub overstory. Coast live oaks generally occur on mesic sites such as north slopes, alluvial terraces, canyon bottoms, or upper streambanks (Brophy 1973, Lewis 1991, and Davidson et al. 2001). Coast live oak's preference for mesic sites is most pronounced in the southern part of its range (Martin 1982). The oak woodlands of California are a multi-layered mosaic of tree, shrub 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.

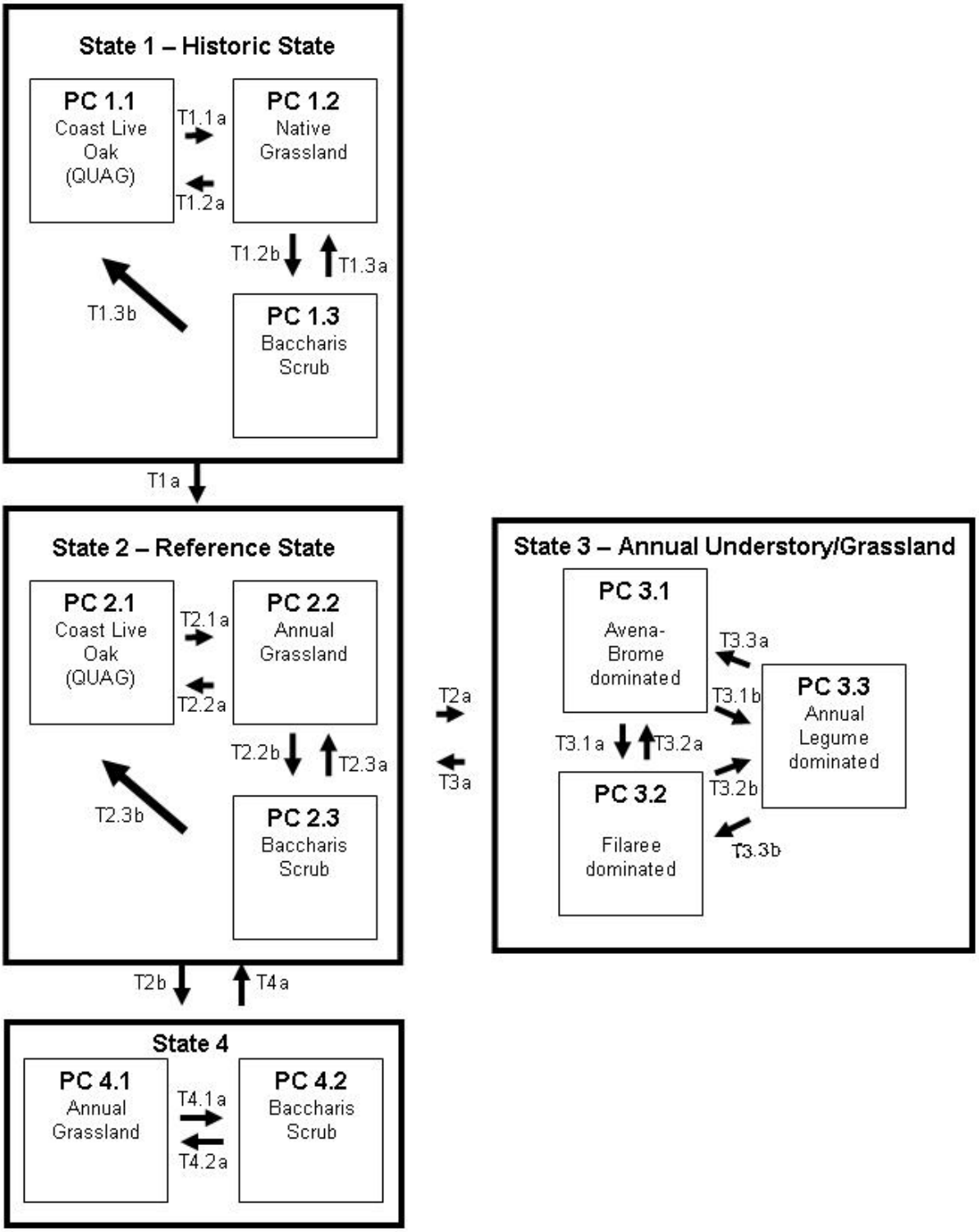
The tree layer is dominated by coast live oak (Quercus agrifolia) with coyote brush (Baccharis pilularis) in the

shrub layer. 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 coast live oak dominated savanna.

Production curves are provided as examples of monthly forage production for normal (3000 lb/a), favorable (3500 lb/a), and unfavorable (2000 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 1 – Historic State
PC 1.1
Coast Live Oak (QUAG)
T1.1a
T1.2a
PC 1.2
Native Grassland
T1.2b
T1.3a
T1.3b
PC 1.3
Baccharis Scrub
T1a
State 2 – Reference State
PC 2.1
Coast Live Oak (QUAG)
T2.1a
T2.2a
PC 2.2
Annual Grassland
T2.2b
T2.3a
T2.3b
PC 2.3
Baccharis Scrub
T2b
T4a
T2a
T3a
State 3 – Annual Understory/Grassland
PC 3.1
Avena-Brome dominated
T3.3a
T3.1b
PC 3.3
Annual Legume dominated
T3.1a
T3.2a
T3.2b
PC 3.2
Filaree dominated
T3.3b
State 4
PC 4.1
Annual Grassland
T4.1a
T4.2a
PC 4.2
Baccharis Scrub

State 1: Historic State

State 1: The assumed historic state is a mosaic of coast live oak savanna, annual grassland and Baccharis scrub similar to that in State 2. Blue oak may also be present in the tree layer. State 1 assumes that native annual and perennial grasses and forbs were common in the tree and shrub 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 Coyote brush community canopy cover may have been reduced compared to State 2.

Transitions :

Protection from fire and grazing tends to support transition from grassland to shrubland or savanna. Grazing tends to slow these transitions. Fire tends to eliminate or mask vegetation patterns associated with topography.

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.

T1.2b – similar to T2.2b with a native grass and forb understory and grassland.

T1.3a – similar to T2.3a with a native grass and forb understory and grassland.

T1.3b – similar to T2.3b 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: Reference State

State 2: The reference state is a mosaic of coast live oak savanna, annual grassland and coyote brush dominated Baccharis scrub. Blue oak may also be present in the tree layer. 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): Oak woodlands are dominated by coast live oak (Quercus agrifolia) with an annual grass understory. Blue oak may also be present.

Plant community 2.2 (PC 2.2): Annual grasslands are often dominated by soft chess brome (Bromus hordeaceus), and ripgut brome (B. diandrus), red brome (B. rubens) and annual fescue (Vulpia myuros).

Plant community 2.3 (PC 2.3): Baccharis scrub communities are dominated by coyote brush (Baccharis pilularis).

T2.1a (PC 2.1 to State PC 2.2): Grazing, catastrophic fire and poor oak regeneration may result in conversion of oak patches to annual grassland. Because coast live oak is more resistant to fire than most other oaks this transition is rare. 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. Sudden oak death could lead to this transition. As of 2007 Monterey County was the southern most location of sudden oak.

T2.2a (PC 2.2 to State PC 2.1): 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 T19 (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).

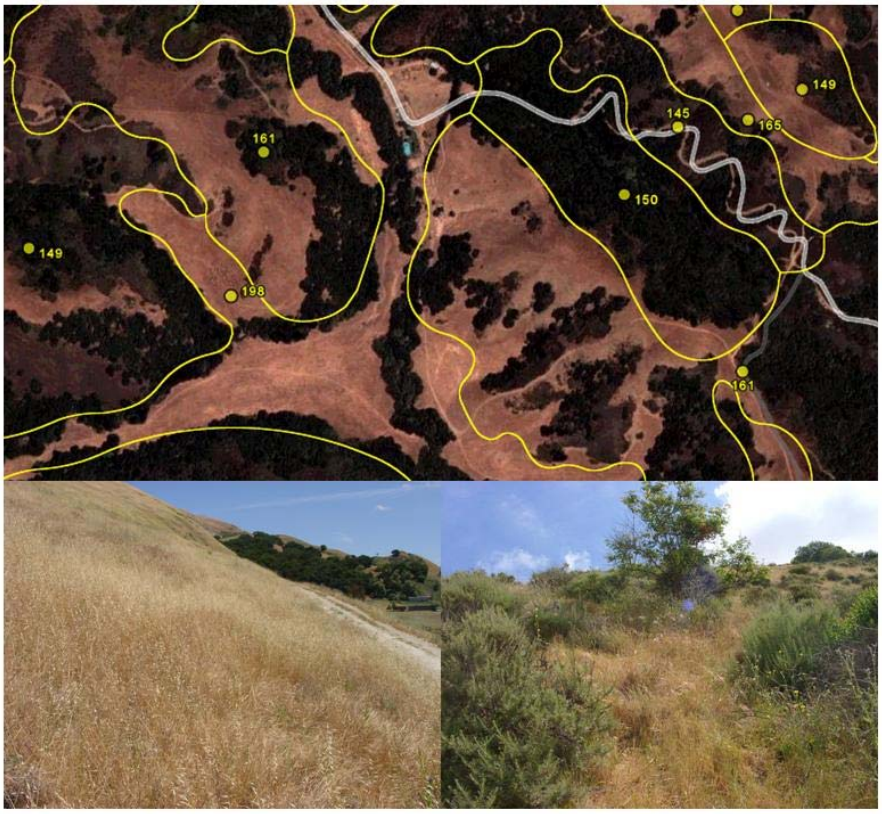
T2.2b (PC 2.2 to State PC 2.3): Protection from fire and grazing facilitates replacement of grassland by Baccharis scrub. This transition is more likely on exposed, south facing slopes than on sheltered topography of north facing slopes.

T2.3a (PC 2.3 to State PC 2.2): Transition of Baccharis scrub back to annual grassland occurs with protection from fire and/or grazing.

T2.3b (PC 2.3 to State PC 2.1): On some soils oak-woodlands may eventually replace Baccharis scrub with protection from burning and grazing (Callaway and Davis 1993). This transition may take several decades. Shrubs may act as nurse plants for oak seedlings.

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.

T2b (State 2 to State 4): Similar to T2a but firewood cutting or selective chemical treatments remove trees and leave the shrub layer as plants or in the seedbed.



State 2: Reference 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
		blue wildrye	*Elymus glaucus*	0	0
		purple needlegrass	*Nassella pulchra*	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
		red brome	*Bromus rubens*	0	0
		barley	*Hordeum*	0	0
			Lolium multiflorum (Syn)	0	0
		fescue	*Vulpia*	0	0

Forb

Group	Group Name	Common Name	Scientific Name	Annual Production in Pounds Per Acre Low	High
12 - Native forb				0	0
		tarweed	*Hemizonia*	0	0
14 - Non-native annual forbs				0	0
		Italian thistle	*Carduus pycnocephalus*	0	0
		stork's bill	*Erodium*	0	0
		geranium	*Geranium*	0	0
		cat's ear	*Hypochaeris*	0	0

	lettuce	*Lactuca*	0	0
	prickly lettuce	*Lactuca serriola*	0	0
	burclover	*Medicago polymorpha*	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
		dwarf chaparral broom	*Baccharis pilularis*	0	0

Tree

Group	Group Name	Common Name	Scientific Name	Annual Production in Pounds Per Acre Low	High
24 - Native deciduous tree				0	0
		blue oak	*Quercus douglasii*	0	0
25 - Native non-deciduous tree				0	0
		California live oak	*Quercus agrifolia*	0	0

Annual Production by Plant Type:

Plant Type	Annual Production (lbs/AC) Low	Representative Value	High
Forb	400	600	700
Grass/Grasslike	1600	2400	2800
Total:	2000	3000	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 20	0 to 60			80 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			0 to 20	
< 4.5 - >= 13 feet				
> 13 - < 40 feet				0 to 60

Plant Growth Curve:

Growth Curve Number: CA0501

Growth Curve Name: Annual Grassland in MLRA 5

Growth Curve Description: Annual Grassland growth curve in MLRA 5.

Percent Production by Month

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

15	20	35	15	0	0	0	0	0	0	5	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 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). Plant community 3B (PC 3B) is dominated by filaree (Erodium spp) or other decumbent species. Plant community 3 C is dominated by bur clover (Medicago polymorpha) or other annual legumes.

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. 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 3.2 to 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 3.2b (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.

State 3: Annual Grassland Plant Species Composition:

Grass/Grasslike	Annual Production in Pounds Per Acre

Group	Group Name	Common Name	Scientific Name	Low	High
2 - Native cool season perennial grass				0	0
		purple needlegrass	*Nassella pulchra*	0	0
8 - Annual Grass				0	0
		wild oat	*Avena fatua*	0	0
		ripgut grass	*Bromus diandrus*	0	0
		soft brome	*Bromus hordeaceus*	0	0
		red brome	*Bromus rubens*	0	0
		barley	*Hordeum*	0	0
			Lolium multiflorum (Syn)	0	0

Forb

Group	Group Name	Common Name	Scientific Name	Annual Production in Pounds Per Acre Low	High
12 - Native annual forb				0	0
		tarweed	*Hemizonia*	0	0
			Lotus purshianus (Syn)	0	0
14 - Annual Forb				0	0
		Italian thistle	*Carduus pycnocephalus*	0	0
		yellow star-thistle	*Centaurea solstitialis*	0	0
		thistle	*Cirsium*	0	0
		stork's bill	*Erodium*	0	0
		sweet fennel	*Foeniculum vulgare*	0	0
		lupine	*Lupinus*	0	0
		burclover	*Medicago polymorpha*	0	0
		rose clover	*Trifolium hirtum*	0	0

Annual Production by Plant Type:

Plant Type	Annual Production (lbs/AC) Low	Representative Value	High
Forb		540	
Grass/Grasslike		2160	
Total:	0	2700	0

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 30

Structure of Canopy Cover (%)

	Grasses/Grasslike	Forbs	Shrubs/Vines	Trees
<=0.5 feet	80 to 100	0 to 20		
> 0.5 - < 1 feet	0 to 50	0 to 10		

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: Baccharis scrub/annual grass mosaic

State 4: Baccharis scrub and annual grassland mosaic.

T4a (State 4 to 2): On deeper soils with better moisture holding capacity coast live oaks regenerate from acorns that germinate under canopy of shrubs (Callaway and D'Antonio 1991, Muick 1997). This is a slow successional process.

T4.1a (PC 4.1 to State PC 4.2): Protection from fire and grazing facilitates replacement of grassland by Baccharis scrub. This transition is more likely on exposed, south facing slopes than on sheltered topography of north facing slopes.

T4.2a (PC 4.2 to State PC 4.1): Frequent fire facilitates the transition from Baccharis scrub back to annual grassland. Heavy grazing may also support this transition. Goats have been used to reduce shrubs in coastal sage scrub.

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), 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).

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:

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 potentially 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), Italian thistle (Carduus pycnocephalus) and yellow starthistle (Centaurea solstitalis) may invade this ecological site.

Supporting Information

Associated Sites:

Site Name	Site ID	Site Narrative

Similar Sites:

Site Name	Site ID	Site Narrative

State Correlation:

This site has been correlated with the following states:
CA

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

JMHMarMtBurdell1 38.1361866 122.6056908
R051122A_05 37.9823424 122.2153332
SBmissionpeak2 37.5090880 121.9000711
sbPLEASANTON4 37.6710094 121.9638710
SBsimas_new 37.9773001 122.2218914
SLescuela1 35.3381479 120.7428037
SLpeterson2 35.3160692 120.6483418
SlSteinie1 38.3217523 122.8124839
TWescuela1 35.3394646 120.7396420
TWescuela2 35.3490702 120.7365868
TWpeterson2 35.3163449 120.6482058
SLescuela2 35.3488908 120.7366520

Type Locality:

Relationship to Other Established Classifications:
This blue oak dominated site may include the following Allen-Diaz Classes: 1) Coast live oak, 2) Coast live oak-grass, 3) Blue oak-Coast Live oak-grass, and 4)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.

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Site Description Approval:

Author	Date	Approval	Date
Melvin George, Sheila Barry, Stephaine Larson, Theresa Becchetti, John Harper, Royce Larsen, Craig Schriefer, and Karl Striby	5/14/2004		

Reference Sheet

Author(s)/participant(s):

Contact for lead author:

Date: **MLRA:** 015X **Ecological Site:** Fine Loamy Upland (Los Osos) R015XI012CA 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

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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:**