Ecological Site Description

UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE

ECOLOGICAL SITE DESCRIPTION

ECOLOGICAL SITE CHARACTERISTICS

Site Type: Rangeland

Site Name: Gravelly Fine Loam (Santa Lucia)

/ / *Bromus - Avena*
(/ / brome - oat)

Site ID: R015XI022CA

Major Land Resource Area: 015 - Central California Coast Range

Physiographic Features

This ecological site extends across more than 274,000 acres from Santa Barbara County to Monterey and San Benito Counties. It is an upland site occurring on hill and mountain uplands along the central coast at elevations from 100 to 3000 feet. Slopes range from 9 to 75 percent.

Land Form: (1) Hill

	Minimum	Maximum
Elevation (feet):	100	3000
Slope (percent):	2	75
Water Table Depth (inches):		
Flooding:		
Frequency:	None	None
Duration:	None	None
Ponding:		
Depth (inches):		
Frequency:		
Duration:	None	None
Runoff Class:	Very low	High
Aspect:	South	

No Influence on this site

Climatic Features

The climate on this ecological site is subhumid mesothermal with cool to warm rainless but foggy summers near the coast and cool moist winters. The mean annual precipitation is 12 to 35 inches. The average January temperature is 47 degrees to 51 degrees F.; the average July temperature is 63 degrees to 68 degrees F.; the mean annual temperature is about 58 degrees to 60 degrees F. The annual freeze-free season is 175 to about 300 days.

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	35.0

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 drain these sites.

Wetland
Description: System Subsystem Class

Representative Soil Features

The soils on this ecological site consist of moderately deep, well drained soils that formed in material weathered from white shale containing some ash, and some siliceous and diatomaceous material. Santa Lucia soils are on uplands and have slopes of 2 to 75 percent.

Monterey County, California

SfD Santa Lucia shaly clay loam, 2 to 15 percent slopes
SfE Santa Lucia shaly clay loam, 15 to 30 percent slopes
SfF Santa Lucia shaly clay loam, 30 to 50 percent slopes
Sg Santa Lucia-Reliz association

San Luis Obispo County, California, Carrizo Plain Area

520 Santa Lucia channery clay loam, 50 to 75 percent slopes

521 Santa Lucia channery clay loam, 15 to 30 percent slopes
522 Santa Lucia channery clay loam, 30 to 50 percent slopes

San Luis Obispo County, California, Paso Robles Area

198 Santa Lucia-Lopez complex, 15 to 50 percent slopes
199 Santa Lucia-Gazos complex, 50 to 75 percent slopes

Northern Santa Barbara Area, California

SmD Santa Lucia shaly clay loam, 9 to 15 percent slopes
SmE Santa Lucia shaly clay loam, 15 to 30 percent slopes
SmF Santa Lucia shaly clay loam, 30 to 45 percent slopes
SmF2 Santa Lucia shaly clay loam, 15-45 percent slopes eroded
SmG Santa Lucia shaly clay loam, 45 to 75 percent slopes

Eastern Santa Clara Area, California

ScF2 Santa Lucia shaly loam, 30 to 50 percent slopes, eroded
ScG Santa Lucia shaly loam, 50 to 75 percent slopes

Santa Cruz County, California

167 Santa Lucia shaly clay loam, 5 to 30 percent slopes
168 Santa Lucia shaly clay loam, 30 to 50 percent slopes
169 Santa Lucia shaly clay loam, 50 to 75 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: Moderate To Moderate

	Minimum	Maximum
Depth (inches):	24	36
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):	0.0	0.0

Plant Communities

Ecological Dynamics of the Site

This grassland site is dominated by annual grasses and forbs of European origin. Annual grasses include wild oats (Avena spp), soft chess (Bromus hordeaceus), ripgut brome (Bromus diandrus), and foxtail fescue (Vulpia myuros). Common forbs include true clovers (Trifolium spp), and bur clover (Medicago polymorpha). Shallow soils are often dominated by filaree or other low growing forbs. Deep soils with higher water holding capacity are often dominated by wild oats and other tall annual grasses. Blue oaks (Quercus douglasii) and coast live oaks (Quercus agrifolia) may occur along drainage channels providing less than 5 percent canopy cover on the site.

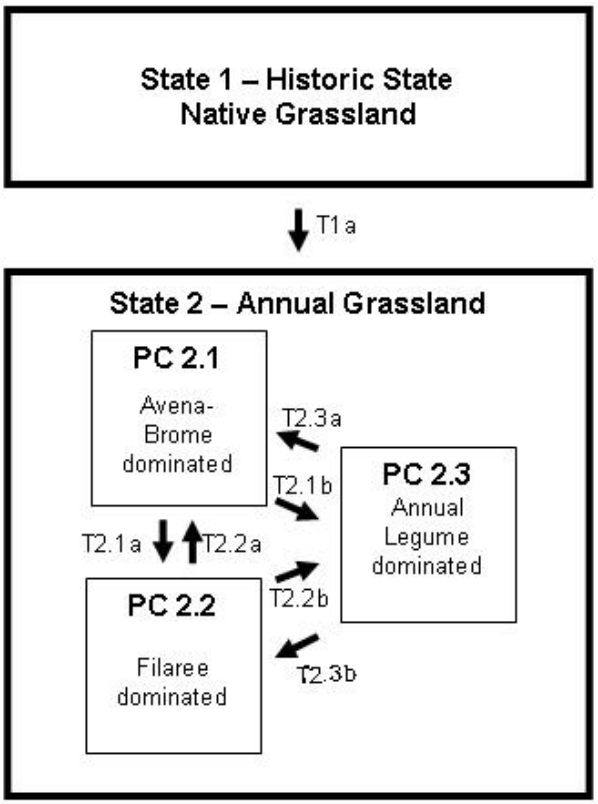
As germination, seedling establishment and plant growth progress during the growing season, species composition changes depending primarily on the timing and amount of precipitation and temperature (George et al. 2001a). Consequently, grassland species composition varies seasonally and annually. Unlike 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 for this ecological site 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.

Species composition and productivity of the annual grasslands 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 may result in a filaree dominated grassland. Following a fire filaree may dominate the site for up to three years (Parsons and Stohlgren 1989, McDougald et al 1991).

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.

Production curves are examples of monthly forage production for normal (1700 lb/a), favorable (2100 lb/a), and unfavorable (1500 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.



Annual Grassland State and Transition Model

State 1: Historic State

State 1: The assumed historic state is a grassland composed of native annual and perennial grasses and forbs. In State 1, fire was more frequent and was not suppressed as is commonly the case in State 2. While remnant native grasses and forbs can be found on this site the historic species composition and productivity are unknown.

Transitions

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: Annual Grassland State

State 2: Annual grassland with species composition fluctuating in response to weather, grazing, fire and fertility. Plant community 2.1 (PC 2.1) is dominated by wild oats (Avena spp), soft brome (Bromus hordeaceus) and ripgut brome (B. diandrus). Plant community 2.2 (PC 2.2) is dominated by filaree (Erodium spp) or other decumbent species. Plant community 2.3 (PC 2.3) is dominated by bur clover (Medicago polymorpha) or other annual legumes.

T2.1a (PC 2.1 to 2.2): 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.

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

T2.1b and 2.2b (PC 2.1 or PC 2.2 to 2.3): Annual legume seeding. Sulfur and/or phosphorus fertilization are required to maintain productive annual legume stands. Close grazing helps to maintain legume composition.

T2.3a (PC 2.3 to PC 2.1): Grasses increase with improved soil fertility and light grazing

T2.3b (PC 2.3 to PC 2.2): With loss of fertility and close grazing annual legumes are replaced by filaree.

Annual Grassland

State 2: 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
		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
		Bromus madritensis ssp. rubens (Syn)	0	0
	barley	*Hordeum*	0	0
	Italian ryegrass	*Lolium perenne ssp. multiflorum*	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
		tarweed	*Hemizonia*	0	0
14 - Non-native annual forb				0	0
		pimpernel	*Anagallis arvensis*	0	0
		mustard	*Brassica*	0	0
		California poppy	*Eschscholzia californica*	0	0
		cudweed	*Gnaphalium*	0	0
		burclover	*Medicago polymorpha*	0	0
		dock	*Rumex*	0	0
		clover	*Trifolium*	0	0
		vetch	*Vicia*	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:

	Annual Production (lbs/AC)		
Plant Type	Low	Representative Value	High
Forb	420	350	300
Grass/Grasslike	1680	1360	1200
Total:	2100	1710	1500

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 5	0 to 5			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			0 to 5	
< 4.5 - >= 13 feet				0 to 5

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

Ecological Site Interpretations

Animal Community:
Wildlife

Many wildlife species use the annual grasslands for foraging (Mayer and Laudenslayer 1988), but some require special habitat features such as cliffs, caves, ponds, or habitats with woody plants for breeding, resting, and escape cover. Characteristic reptiles that breed in annual grassland habitats include the western fence lizard (Sceloporus occidentalis), common garter snake (Thamnophis sirtalis), and western rattlesnake (Crotalus viridis)(Basey and Sinclear 1980). Mammals typically found in this habitat include the black-tailed jackrabbit

(Lepis californicus), California ground squirrel(Spermophilus beecheyi), Botta's pocket gopher (Thomomys bottae), western harvest mouse (Reithrodontomys megalotis), California vole (Microtus californicus), badger (Taxidea taxus), and coyote (Canis latrans)(White et al.1980). The endangered San Joaquin kit fox(Vulpes macrotis mutica)is also found in and adjacent to this habitat (U.S. Fish and Wildlife Service 1983). Common birds known to breed in annual grasslands include the burrowing owl (Althene cunicularia), short eared owl (Asio flammeus), horned lark(Eremophila alpestris), and western meadowlark(Sturnella neglecta) (Verner et al. 1980). This habitat also provides important foraging habitat for the turkey vulture (Cathartes aura), and the American kestrel (Falco sparverius).

Grazing and Browsing

The annual grasslands are 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.

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:

Other Products:

Other Information:
Revegetation/Restoration Of Disturbed Areas

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	R015XE020CA	
FINE LOAMY	R015XD024CA	
Coarse Sandy Loam (Concepcion)	R015XF031CA	
LOAMY UPLAND	R015XD126CA	

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

Inventory Data References:
JDpecho10 35.2532200 120.8936300
JDpecho11 35.2485000 120.8928300
RLpecho2 35.2341700 120.8769500
RLpecho9 35.2549600 120.8963200
SBsantalucia3 36.4820974 121.7903340
TWpecho2 35.2370474 120.8864772

Type Locality:

Relationship to Other Established Classifications:
Annual Grassland habitat has been described as Valley Grassland (Munz and Keck 1959, Heady 1977), Valley and Foothill Grassland(Cheatham and Haller 1975), California Prairie (Küchler 1977), Annual Grasslands Ecosystem (Garrison et al. 1977), Brome grass, Fescue, Needlegrass, and Wild Oats series (Paysen et al. 1980), and Annual Grass-Forb series (Parker and Matyas 1981).

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Site Description Approval:

Author	Date	Approval	Date
Melvin George,	5/14/2005		

Reference Sheet

Author(s)/participant(s):

Contact for lead author:

Date: **MLRA:** 015X **Ecological Site:** Gravelly Fine Loam (Santa Lucia) R015XI022CA
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.

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1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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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:**