Ecological Site Description

UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE

ECOLOGICAL SITE DESCRIPTION

ECOLOGICAL SITE CHARACTERISTICS

Site Type: Rangeland

Site Name: Loamy Hills (Bearwallow)

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

Site ID: R015XI014CA

Major Land Resource Area: 015 - Central California Coast Range

Physiographic Features

This site can be found on about 24,000 acres in Mendocino and Sonoma Counties on ridgetops and rolling side slopes of hills and mountains and have slopes of 5 to 75 percent.

		Minimum	Maximum
Land Form:	(1) Hill		
Elevation (feet):		200	3300
Slope (percent):		5	75
Water Table Depth (inches):			
Flooding:			
Frequency:			
Duration:		None	None
Ponding:			
Depth (inches):			
Frequency:			
Duration:		None	None
Runoff Class:		Medium	Very high
Aspect:		No Influence on this site	

Climatic Features

The climate on this site is characterized by mild cool winters. Mean annual precipitation is 35 to 65 inches. Mean January temperature is about 44 degrees F.; mean July temperature is about 72 degrees F.; mean annual temperature is 53 degrees to 59 degrees F. Frost-free period ranges from 150 to 250 days. Average monthly precipitation is presented in the maximum monthly precipitation row in the table below.

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).

	Minimum	Maximum
Frost-free period (days):	150	250
Freeze-free period (days):	0	0
Mean annual precipitation (inches):	35.0	65.0

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.	8.2	5.98	4.75	2.5	0.75	0.25	0.25	0.25	0.5	2.25	5.0	7.0
Temp. Min.	36.0	37.6	38.9	40.8	44.2	48.5	52.6	51.9	49.9	45.0	39.2	35.5
Temp. Max.	51.2	53.5	56.7	61.1	66.3	72.6	79.2	79.3	76.2	68.2	56.4	50.9

Climate Stations:

Influencing Water Features

Intermittent and permanent streams drain these sites.

Wetland
Description: System Subsystem Class

Representative Soil Features

The soils(Bearwallow-Hellman-Witherell) on this site formed on material weathered from sandstone or shale at elevations of 200 to 3,000 feet. Soil depth is 20 to 40 inches.

Mendocino County (CA687), Eastern Part And Southwestern Part Of Trinity County, California

CA687 104 Bearwallow-Hellman Loams, 15 To 30 Percent Slopes
CA687 105 Bearwallow-Hellman-Witherell Complex, 30 To 50 Percent Slopes

Mendocino County (CA694), Western Part, California

CA694 103 Bearwallow-Wolfey Complex, 5 To 15 Percent Slopes
CA694 104 Bearwallow-Wolfey Complex, 15 To 30 Percent Slopes

Sonoma County (CA097), California

Map

CA097 104em Bearwallow-Hellman Loams, 15 To 30 Percent Slopes 38 *
CA097 105em Bearwallow-Hellman-Witherell Complex, 30 To 50 Percent Slopes 348 *
386 0.0

Predominant Parent Materials:
Kind: Residuum
Origin: Sandstone

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: Moderately well drained To Well drained

Permeability Class: Moderate To Slow

	Minimum	Maximum
Depth (inches):	20	40
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):	1.5	5.1

Plant Communities

Ecological Dynamics of the Site

Ecological Dynamics

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 filaree (Erodium spp), and true clovers (Trifolium spp). 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) 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.

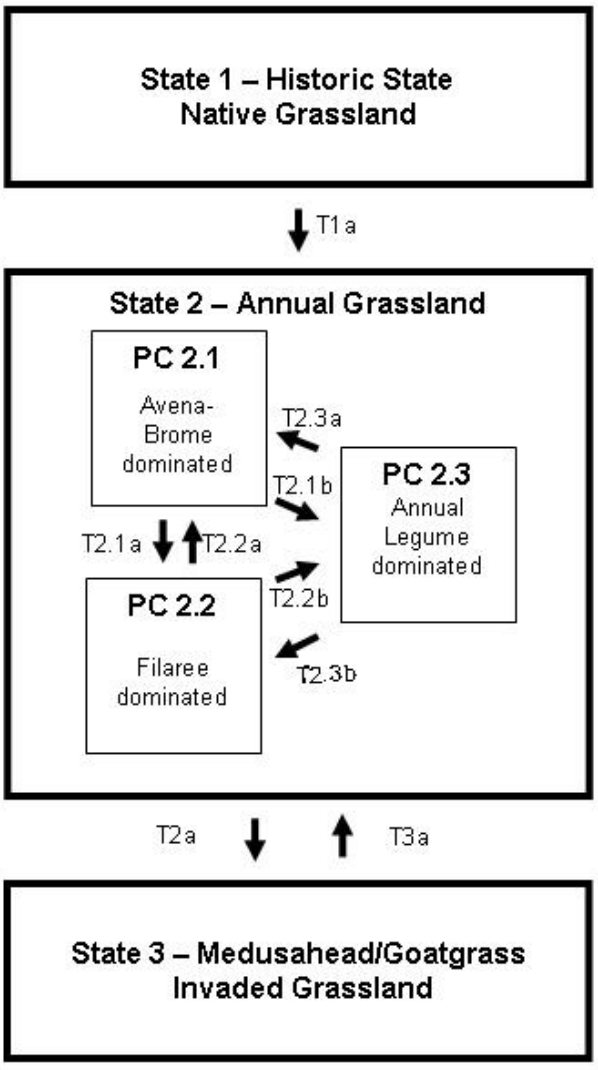
Species composition and productivity of the annual grasslands vary greatly within and between years and is greatly influenced by the timing and amount of precipitation and the amount of residual dry matter (George et al. 2001a). Grass dominated years occur when rainfall is well-distributed or greater 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). Medusahead (Taeniatherum caput-medusa), goatgrass (Aegilops triuncialis) and yellow starthistle (Centaurea solstitialis) invasions are common on this site because of it's higher clay content and higher precipitation than more southern sites in this MLRA. Some experts have suggested that medusahead and other invasive species may gradually adapt to new sites (Rice et al 2006).

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 (2500 lb/a), favorable (3500 lb/a), and unfavorable (1800 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
Native Grassland
T1a
State 2 – Annual Grassland
PC 2.1
Avena-
Brome
dominated
T2.3a
T2.1b
PC 2.3
Annual
Legume
dominated
T2.1a
T2.2a
T2.2b
PC 2.2
Filaree
dominated
T2.3b
T2a
T3a
State 3 – Medusahead/Goatgrass
Invaded Grassland

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.

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 - Annual Grassland

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. Blue oak and valley oak may occur as isolated trees or along drainage channels providing less than 5 percent canopy cover.

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.

T2a (State 2 to State 3): Medusahead and/or goatgrass invade the grassland. Light to moderate grazing allows build up of litter, excluding most other grassland species.

State 2: Reference State - Annual Grassland Plant Species Composition:

Grass/Grasslike

Group	Group Name	Common Name	Scientific Name	Annual Production in Pounds Per Acre Low	High
8 - Non-native cool season annual grass				0	0
		barbed goatgrass	*Aegilops triuncialis*	0	0
		oat	*Avena*	0	0
		ripgut grass	*Bromus diandrus*	0	0
		soft brome	*Bromus hordeaceus*	0	0
		big quakinggrass	*Briza maxima*	0	0
		little quakinggrass	*Briza minor*	0	0
		barley	*Hordeum*	0	0
		Italian ryegrass	*Lolium perenne ssp. multiflorum*	0	0
		medusahead	*Taeniatherum caput-medusae*	0	0
		rat-tail fescue	*Vulpia myuros*	0	0

Forb

Group	Group Name	Common Name	Scientific Name	Annual Production in Pounds Per Acre Low	High
14 - Non-native annual forb				0	0
		stork's bill	*Erodium*	0	0
		clover	*Trifolium*	0	0

Annual Production by Plant Type:

Plant Type	Annual Production (lbs/AC) Low	Representative Value	High
Forb	360	500	700

Grass/Grasslike	1440	1500	2800
Total:	1800	2000	3500

Structure and Cover:

Ground Cover (%)

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

Structure of Canopy Cover (%)

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

Plant Growth Curve:
Growth Curve Number: CA1504
Growth Curve Name: North Coast annual rangeland (normal production year)
Growth Curve Description: Growth curve for a normal(average)production year resulting form the production year starting in October and extending through May. Growth curve is for oak-woodland and associated annual grasslands.

Percent Production by Month

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

Plant Growth Curve:
Growth Curve Number: CA1505
Growth Curve Name: North Coast 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 into June. Growth curve is 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	25	20	5	0	0	0	10	5	5

Plant Growth Curve:
Growth Curve Number: CA1506
Growth Curve Name: North Coast annual rangeland (unfavorable production year)
Growth Curve Description: Growth curve for an unfavorable production year resulting from the production year starting late and ending early. 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	30	45	0	0	0	0	0	0	5	5

State 3: Medusahead/Goatgrass invaded grassland

Medusahead dominated grassland resulting from medusahead invasion.

T3a (State 3 to State 2): Burning when medusahead is still green and other annuals are dry can reduce medusahead by more than 90 percent (McKell et al. 1962). May require repeated burning to reduce goatgrass. Filaree and other forbs may dominate for up to three years following burning. Grasses will gradually increase. Heavy grazing in winter and spring reduces medusahead density and allows other grassland species to increase (George et al. 1989)).

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). 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 and by perennial streams. In dry years these intermittent streams may not flow at all. Runoff on these soils is rapid and soil erosion hazard is high.

The soils of this ecological site are present at the UC Hopland Research and Extension Center in Mendocino County. Research at this station illustrates the loss of soil following conversion of the oak-woodland to a grassland. Removal of the deep rooted trees and shrubs reduces the amount of water extracted from the lower soil profile (Dahlgren et al. 2001). Watershed studies have found that it take about 6 to 10 inches of precipitation to initiate stream flow.

Recreational Uses:
Hunting, horseback riding, bird watching, off-road driving 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 have often prevented successful natural and artificial re-introduction of native grasses.

Annual Legumes and Non-native Perennial Grasses:

Subterranean clover seedings have been highly successful on these soils but require phosphorus and sulfur to maintain high productivity. The high cost of seeding and fertilization has reduced the use of this practice. Introductions of non-native perennial grasses such as harding grass (Phalaris tuberosa) and summer dormant orchard grass (Dactylis glomerata) can be successful on this site but this practice is infrequently used (George et al. 1983).

Poisonous/Non-native Plants

Poisonous Plants:

Poisonous plants that may occur on this ecological site include lupine (Lupinus spp), and fiddleneck (Amsinkia spp), common groundsel (Senecio vulgaris), and hemlock (Cicuta spp). Yellow starthistle (Centaurea solstitialis) is poisonous to horses. Livestock poisoning is usually 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. Several species have invaded and spread in these annual dominated communities including: medusahead (Taeneantherum caput-medusa), goatgrass (Aegilops triuncialis), starthistle (Centaurea solstitialis), Italian thistle (Carduus pycnocephalus), and tansy ragwort (Senecio jacobaea).

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:
SLUpperStrip_05 38.9974707 123.0693150
JMHMenVassCorner 38.9919311 123.0667414
MlmendoUpperStrip1 38.9974552 123.0692402
JMHMenWatershedII1 38.9924369 123.0905327
MlmendoWatershedI1 38.9944351 123.0767673
MlmendoWatershedII2 38.9903441 123.0907032
JHMenVasserCorner05 38.9909988 123.0678354

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, John Harper, Stephanie Larson, Michael Lennox	6/4/2004		

Reference Sheet

Author(s)/participant(s):

Contact for lead author:

Date: **MLRA:** 015X **Ecological Site:** Loamy Hills (Bearwallow) R015XI014CA 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:**