

Ecological site R018XI105CA

Mesic Steep Convex Slopes

bordering thermic

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General information

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

MLRA notes

Major Land Resource Area (MLRA): 018X—Sierra Nevada Foothills

Major Land Resource Area (MLRA) 18, Sierra Nevada Foothills is located entirely in California and runs north to south adjacent to and down-slope and to the east of the Sierra Nevada Mountains (MLRA 22A). MLRA 18 includes rolling to steep dissected hills and low mountains, with several very steep river valleys. Climate is distinctively Mediterranean (xeric soil moisture regime) with hot, dry summers, and relatively cool, wet winters. Most of the precipitation comes as rain; average annual precipitation ranges from 15 to 55 inches in most of the area (precipitation generally increases with elevation and from south to north). Soil temperature regime is thermic; mean annual air temperature generally ranges between 52 and 64 degrees F. Geology is rather complex in this region; there were several volcanic flow and ashfall events, as well as tectonic uplift, during the past 25 million years that contributed to the current landscape.

LRU notes

This LRU (designated XI) is located on moderate to steep hills in the Sierra Nevada Foothills east of Sacramento, Stockton, and Modesto, CA. Various geologies occur in this region: metavolcanics, granodiorite, slate, marble, argillite, schist and quartzite, as well as ultramafic bands to a limited and localized extent. It includes mesa formations from volcanic flows, where vernal pool habitats occur. Soil temperature regime is thermic and soil moisture regime is xeric. Elevation ranges between 300 and 3400 feet above sea level. Precipitation ranges from 14 to 42 inches annually. Most precipitation falls between the months of November and March in the form of rain. Dominant vegetation includes annual grasslands, blue oak (*Quercus douglasii*), interior live oak (*Quercus wislizeni*), chamise (*Adenostoma fasciculatum*), buckbrush (*Ceanothus cuneatus*), and foothill pine (*Pinus sabiniana*).

Classification relationships

CLASSIFICATION RELATIONSHIPS This site is located within M261F, the Sierra Nevada Foothills Section, (McNab et al., 2007) of the National Hierarchical Framework of Ecological Units (Cleland et al., 1997), M261Fb, the Lower Foothills Metamorphic Belt Subsection. Level III and Level IV ecoregions systems (Omernik, 1987, and EPA, 2011) are: Level III, Central California Foothills and Coastal Mountains and Level IV, Ecoregion 6b, Northern Sierran Foothills, Ecoregion 6c, Comanche Terraces.

Ecological site concept

This site is found on moderately deep to deep soils on moderately steep to very steep hills and mountains (15 to 70% slope). This site commonly occurs on convex positions that tend to shed water from the surface and is highly aspect dependent. This site occurs on the margin of mesic soil temperature regimes, often in the same areas where F022AI201CA occurs; therefore, it can be found in both MLRA 18 and 22A map units. Mean annual precipitation typically ranges from 34 to 40 inches. Relatively rocky soils on steep, south to west facing aspects on water shedding landscape positions support shrubland communities that are well adapted to relatively low available water capacities. Common soil components in this ecological site include Hurtleton and Arpatutu components which are both moderately deep, loamy-skeletal, ultic haploxeralfs. Hurtleton components are derived from variably metamorphosed coarse-grained intrusive igneous rocks, while Arpatutu is derived from phyllite, schist, and other metasedimentary rocks. Sierra, a deep to very deep soil also supports this ecological site. It is a fine loamy, mixed active thermic Ultic Haploxeralf occurring on ridge tops and side slopes on igneous parent materials (Sierran plutons). The vegetation in this ecological site consists of dense chamise (*Adenostoma fasciculatum*) chaparral, and at the higher elevations of the sites' range, chamise is replaced by manzanita (*Arctostaphylos* spp.). Shrubs make up approximately 85% of the annual production. Some subshrubs and few forbs occur underneath the shrub canopy and the most diverse assemblage of herbaceous plants can be found in openings between shrubs, but comprise no more than 35% of the annual production.

Associated sites

F022AI201CA	Dry Mesic Foothills 33-45 PZ This site commonly occurs nearby.
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Similar sites

R018XI106CA	Steep Thermic Hillslopes and Canyon Walls Site relationships being developed.
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Table 1. Dominant plant species

Tree	(1) <i>Quercus wislizeni</i>
Shrub	(1) <i>Adenostoma fasciculatum</i> (2) <i>Arctostaphylos</i>
Herbaceous	Not specified

Physiographic features

This ecological site occurs in foothill landscapes on high hills, ridge tops, and on the backslopes of canyons. This site commonly occurs on convex positions that tend to shed water from the surface where it is most commonly found on south and west aspects.

Table 2. Representative physiographic features

Hillslope profile	(1) Summit (2) Shoulder (3) Backslope
Slope shape across	(1) Convex
Landforms	(1) Foothills > Hill (2) Foothills > Ridge
Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	270 – 810 m

Slope	20 – 70 %
Aspect	W, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	60 – 1,110 m
Slope	0 – 90 %

Climatic features

This ecological site is characterized by hot, dry summers and cool, wet winters, a typical Mediterranean climate. Mean annual precipitation ranges from 33 to 46 inches and usually falls from October to May. Mean annual temperature ranges from 59 to 61 degrees F with 153 to 221 frost free days.

Table 4 Representative climatic features

Frost-free period (characteristic range)	150-220 days
Freeze-free period (characteristic range)	240-370 days
Precipitation total (characteristic range)	840-1,170 mm
Frost-free period (actual range)	150-240 days
Freeze-free period (actual range)	230-370 days
Precipitation total (actual range)	790-1,400 mm
Frost-free period (average)	190 days
Freeze-free period (average)	320 days
Precipitation total (average)	990 mm

- (1) GROVELAND 2 [USC00043669], Groveland, CA
- (2) SONORA [USC00048353], Jamestown, CA
- (3) NEW MELONES DAM HQ [USC00046174], Angels Camp, CA
- (4) SUTTER HILL CDF [USC00048713], Jackson, CA
- (5) ELECTRA P H [USC00042728], Jackson, CA
- (6) AUBURN [USC00040383], Auburn, CA
- (7) DOBBINS 1 S [USC00042456], Dobbins, CA
- (8) PARADISE [USC00046685], Chico, CA

Influencing water features

Due to the topographic position, this site does not have water features or wetlands.

Wetland description

N/A

Soil features

The soils in this ecological site are formed from the colluvium and residuum of granodioritic and metasedimentary rock. The typical depth range is from moderately to very deep, the particle size control sections are fine-loamy to loamy-skeletal, and surface textures range from fine sandy loams, loams, and gravelly loams. The bedrock is a restrictive layer found between 13 and 60 inches of depth. Gravels (3 inch diameter) cover between 0 to 10% of the soil surface, while larger fragments (= 3 inch diameter) range between 0 and 22% cover. Within the soil profile gravels range between 2 and 28% and larger fragments occupy 0 to 35% by volume. The soils in this ecological site are well drained and the permeability class ranges is moderately rapid. Available Water Capacity (AWC) is between 1.1 and 5.2 inches and the soil pH in the top 10 inches is between 5.4 and 6.5 and in the sub-horizons between 5.5 and 6.3.

Common soils in this ecological site include Hurleton and Arpatutu components which are both moderately deep, loamy-skeletal, ultic haploxeralfs, and Sierra, a deep to very deep fine loamy, mixed active thermic Ultic Haploxeralf. Hurleton and Sierra are derived from intrusive igneous parent materials, while Arpatutu is derived from metasedimentary rocks.

Table 5. Representative soil features

Parent material	(1) Residuum – metasedimentary rock (2) Colluvium – granite and gneiss (3) Colluvium – metasedimentary rock (4) Residuum – granite and gneiss
Surface texture	(1) Gravelly loam (2) Loam (3) Fine sandy loam
Family particle size	(1) Fine-loamy (2) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderately rapid

Depth to restrictive layer	30 – 150 cm
Soil depth	30 – 150 cm
Surface fragment cover ≤3"	0 – 10 %
Surface fragment cover >3"	0 – 20 %
Available water capacity (0-101.6cm)	2.79 – 13.21 cm
Soil reaction (1:1 water) (0-25.4cm)	5.4 – 6.5
Subsurface fragment volume ≤3" (0-152.4cm)	0 – 20 %
Subsurface fragment volume >3" (0-152.4cm)	0 – 40 %

Table 6. Representative soil features (actual values)

Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately rapid to rapid
Depth to restrictive layer	20 – 200 cm
Soil depth	20 – 200 cm
Surface fragment cover ≤3"	0 – 40 %
Surface fragment cover >3"	0 – 80 %
Available water capacity (0-101.6cm)	1.27 – 19.05 cm

Soil reaction (1:1 water) (0-25.4cm)	0 – 7.3
Subsurface fragment volume <=3" (0-152.4cm)	0 – 70 %
Subsurface fragment volume >3" (0-152.4cm)	0 – 80 %

Ecological dynamics

State and transition model

Figure 7. State and Transition Model

Figure 8. Community Pathways

Figure 9. State 1: Shrub Chaparral

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 1.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Inventory data references

Inventory data to be collected using future projects based on priorities.

References

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Approval

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Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	10/05/2026
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. Presence of water flow patterns:

3. Number and height of erosional pedestals or terracettes:

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):

5. Number of gullies and erosion associated with gullies:

6. Extent of wind scoured, blowouts and/or depositional areas:

7. Amount of litter movement (describe size and distance expected to travel):

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):

12. Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):

Dominant:

Sub-dominant:

Other:

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):

14. Average percent litter cover (%) and depth (in):

15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):

16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

17. Perennial plant reproductive capability:
