

Ecological site R018XI111CA

Low Gradient, Concave Depressions

Last updated: 4/24/2024
Accessed: 09/26/2026

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 of the west side 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 in drainageways, depressions or otherwise concave positions on nearly level to strongly sloping hills where water tends to accumulate. Soils are moderately deep to deep and formed from alluvium or residuum from granitic, metavolcanic, and metasedimentary origin. Soils generally tend to have redox depletions or some evidence of aquic conditions for part of the year during normal years. Mean annual precipitation typically ranges from 27 to 34 inches. Elevation ranges from 1000 to 2000 feet. Ephemeral channels may be associated with this site, containing water during the winter, spring, and early summer months. However, obligate wetland species are generally absent because the soils generally dry out during years of normal precipitation during the dry season (May through October). Most of the soils correlated to this site are at the family level (Aquic or Aeric subgroups). Shenandoah is one series commonly correlated to this site. Shenandoah soils are fine, smectitic, thermic Aquic Palexeralfs occurring on granitic parent material. Vegetation consists of annual grasses, especially bulbous bluegrass (*Poa bulbosa*), rushes (*Juncus* spp.), sedges (*Carex* spp.), and forbs, such as western buttercup (*Ranunculus occidentalis*) and clover (*Trifolium* spp.). Sparse blue oak (*Quercus douglasii*) cover is sometimes found, but usually is limited to the drier upland surfaces.

Associated sites

F018XI200CA	Low Elevation Foothills This site commonly occurs nearby.
F018XI205CA	Thermic Granitic Foothills This site commonly occurs nearby.
F018XI208CA	Deep Low Rolling Hills and Terraces This site commonly occurs nearby.

Table 1. Dominant plant species

Tree	(1) <i>Quercus douglasii</i>
Shrub	Not specified
Herbaceous	(1) <i>Juncus</i> (2) <i>Poa bulbosa</i>

Physiographic features

This site is found in foothill landscapes on drainageways, depressions or otherwise concave positions on nearly level to strongly sloping hills where water tends to accumulate.

Table 2. Representative physiographic features

Slope shape across	(1) Concave
Landforms	(1) Foothills > Depression (2) Foothills > Drainageway
Runoff class	Medium
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Flooding frequency	None to rare
Ponding duration	Very brief (4 to 48 hours)
Ponding frequency	None to occasional
Elevation	310 – 610 m

Slope	0 – 10 %
Water table depth	60 – 90 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Medium
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Flooding frequency	None to rare
Ponding duration	Very brief (4 to 48 hours)
Ponding frequency	None to occasional
Elevation	60 – 820 m
Slope	0 – 20 %
Water table depth	40 – 100 cm

Climatic features

This ecological site is characterized by hot, dry summers and cool, wet winters, a typical Mediterranean climate. Mean annual precipitation ranges from 27 to 34 inches and usually falls from October to May. Mean annual temperature ranges from 58 to 62 degrees F with 170 to 299 frost free days.

Table 4 Representative climatic features

Frost-free period (characteristic range)	170-300 days
Freeze-free period (characteristic range)	280-370 days
Precipitation total (characteristic range)	690-860 mm
Frost-free period (actual range)	160-350 days
Freeze-free period (actual range)	240-370 days

Precipitation total (actual range)	610-860 mm
Frost-free period (average)	240 days
Freeze-free period (average)	320 days
Precipitation total (average)	760 mm

- (1) SONORA [USC00048353], Jamestown, CA
- (2) NEW MELONES DAM HQ [USC00046174], Angels Camp, CA
- (3) CAMP PARDEE [USC00041428], Valley Springs, CA
- (4) SUTTER HILL CDF [USC00048713], Jackson, CA

Influencing water features

Ephemeral channels may be associated with this site, with water during the winter, spring, and early summer months. However, obligate wetland species are generally absent because the soils generally dry out during years of normal precipitation during the dry season (May through October).

Wetland description

N/A

Soil features

The soils in this ecological site are formed from alluvium or residuum from granitic, metavolcanic, and metasedimentary origin. The typical depth range is from moderately to very deep, the particle size control sections are fine to fine-loamy, and surface textures tend to be either sandy loams or loams. The bedrock is a restrictive layer typically found between 28 and 43 inches of depth. Gravels (3 inch diameter) range between 0 and 3% cover, while larger fragments (= 3 inch diameter) rarely occur. Within the soil profile gravels range between 0 to 23% and larger fragments occupy 0 to 4% by volume. The soils in this ecological site range from poorly to moderately well drained and the permeability class is moderately slow. Available Water Capacity (AWC) is between 4 and 6.3 inches and the soil pH in the top 10 inches is between 5.4 and 6.3 and in the sub-horizons between 5.6 and 6.3.

Most of the soils correlated to this site are at the family level, with Aquic Haploxeralfs being the most common. Shenandoah has also been correlated to this site. Shenandoah soils are fine, smectitic, thermic Aquic Palexeralfs occurring on granitic parent material.

Table 5. Representative soil features

Parent material	(1) Alluvium – metavolcanics (2) Residuum – granite (3) Alluvium – metasedimentary rock (4) Alluvium – granite (5) Residuum – metavolcanics (6) Residuum – metasedimentary rock
Surface texture	(1) Loam (2) Sandy loam

Drainage class	Poorly drained to moderately well drained
Permeability class	Moderately slow
Depth to restrictive layer	70 – 110 cm
Soil depth	70 – 110 cm
Surface fragment cover ≤3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	10.16 – 20 cm
Soil reaction (1:1 water) (0-25.4cm)	5.4 – 6.3
Subsurface fragment volume ≤3" (0-152.4cm)	0 – 20 %
Subsurface fragment volume >3" (0-152.4cm)	Not specified

Table 6. Representative soil features (actual values)

Drainage class	Poorly drained to moderately well drained
Permeability class	Moderately slow to moderate
Depth to restrictive layer	50 – 150 cm
Soil depth	50 – 150 cm
Surface fragment cover ≤3"	0 – 10 %
Surface fragment cover >3"	0 – 10 %

Available water capacity (0-101.6cm)	6.1 – 20.32 cm
Soil reaction (1:1 water) (0-25.4cm)	5.1 – 7.8
Subsurface fragment volume <=3" (0-152.4cm)	0 – 40 %
Subsurface fragment volume >3" (0-152.4cm)	0 – 40 %

Ecological dynamics

State and transition model

Figure 7. State and Transition Model

Figure 8. Community Pathways and Transitions

Figure 9. STM Photos

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Inventory data references

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

References

Natural Resources Conservation Service. . **National Ecological Site Handbook.**

Other references

Deil, U. 2005. A review on habitats, plant traits and vegetation of ephemeral wetlands – a global perspective. *Phytocoenologia* 35: 533-705.

Emery, N.C., Stanton, M.L. and K.J. Rice. 2009. Factors driving distribution limits in an annual plant community. *New Phytologist* 181: 734-747.

Lee, B.D., Graham, R.C., Laurent, T.E., Amrhein, C. and R.M. Creasy. 2001. Spatial distributions of soil chemical conditions in a

serpentinic wetland and surrounding landscape. Soil Science Society of America Journal 65: 1183-1195.

Marty, J. 2005. Effects of cattle grazing on diversity in ephemeral wetlands. Conservation Biology 19: 1626-1632.

McIlroy, S.K. and B.H. Allen-Diaz. 2012. Plant community distribution along water table and grazing gradients in montane meadows of the Sierra Nevada Range (California, USA). Wetlands Ecology and Management 20: 287-296.

Philpot, C.W. 1977. Vegetative features as determinants of fire frequency and intensity. In: Mooney, H.A. and C.E. Conrad, technical coordinators. Proceedings of the symposium on the environmental consequences of fire and fuel management in Mediterranean ecosystems; 1977 August 1-5; Palo Alto, CA. Gen. Tech. Rep. WO-3. Washington, DC: U.S. Department of Agriculture, Forest Service: 12-16.

Contributors

K. Moseley
John Proctor
Nathan Roe
Dave Evans

Approval

Kendra Moseley, 4/24/2024

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	09/26/2026
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:
