

Ecological site R018XE103CA

Loamy Low Hills

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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

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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 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

LRU 18XE is located on moderate to steep mountains and hills in the Tehachapi Foothills east of Bakersfield. This LRU covers the lower slopes around the southern end of the Greenhorn Mountains, the western sides of Breckenridge Mountain and the Tehachapi Mountains. The elevation ranges from 500 to 6500 feet above sea level and the geology of the region is predominately granitoid (both unaltered and metamorphosed). Similar to LRU 18XC to the north, vegetation series include blue oak, needlegrass and annual grasslands, as well as chamise, ceanothus, mixed oaks, and foothill pine, although this LRU tends to be more arid than with an annual precipitation range of only 8 to 31 inches per year. The lower precipitation and higher evaporative losses mean that these soils may not be able to completely leach excess salts, leading to a build-up of calcium and/or sodium in the subsoil. The soil temperature regime in this LRU is thermic and the soil moisture regimes are both xeric and aridic.

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 6ae, Tehachapi Foothills.

Ecological site concept

This site is characterized by shallow or coarse-textured moderately deep soils occurring on hills. This site occurs on granitic parent materials and metamorphic rocks of similar chemical composition. Slopes typically range from 20 to 55%. Precipitation typically ranges from 9 to 15 inches per year, and elevation ranges from 2250 to 4000 feet.

Low available water capacity of shallow soils, and high evapotranspiration demand, are the main limits to woody plant production. Steeper parts of the landscape may be subject to erosion which may further restrict plant growth and lead to areas of barren ground. Common soils correlated to this ecological site are Tunis (Loamy, mixed, superactive, thermic, shallow Typic Haploxerolls), Kernville (Mixed, thermic, shallow Typic Xeropsamments) and Stineway (Loamy-skeletal, mixed, superactive, thermic Lithic Mollic Haploxeralfs).

This ecological site consists of annual forbs and grasses. The annuals that dominate are wild oats (*Avena fatua*), soft chess (*Bromus hordeaceus*), riggut brome (*Bromus diandrus*), red brome (*Bromus madritensis* ssp. *rubens*) annual barley (*Hordeum* spp.) and fescues (*Festuca* spp.). Production ranges between 500 and 1200 lbs per acre.

Similar sites

R018XE102CA	Steep Clayey Shallow Site relationships being developed.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Bromus hordeaceus</i> (2) <i>Avena fatua</i>

Physiographic features

This ecological site occurs on hill and mountain slopes in the foothills. Slope gradient is between 20 and 55% and elevation ranges from 2300 to 4000 feet above sea level.

Table 2. Representative physiographic features

Geomorphic position, mountains	(1) Mountainflank
Hillslope profile	(1) Backslope
Landforms	(1) Foothills > Hillslope (2) Mountains > Mountain slope
Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	2,300–4,000 ft
Slope	20–55%
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	1,000–6,000 ft
Slope	2–75%

Climatic features

This ecological site is characterized by hot, dry summers and cool, wet winters, a typical Mediterranean climate. Mean annual precipitation ranges from 12 to 17 inches and usually falls from October to May. Mean annual

temperature ranges from 52 to 55 degrees F with 114 to 141 frost free days.

Table 4. Representative climatic features

Frost-free period (characteristic range)	114-141 days
Freeze-free period (characteristic range)	176-192 days
Precipitation total (characteristic range)	12-17 in
Frost-free period (actual range)	107-148 days
Freeze-free period (actual range)	171-197 days
Precipitation total (actual range)	12-20 in
Frost-free period (average)	128 days
Freeze-free period (average)	184 days
Precipitation total (average)	15 in

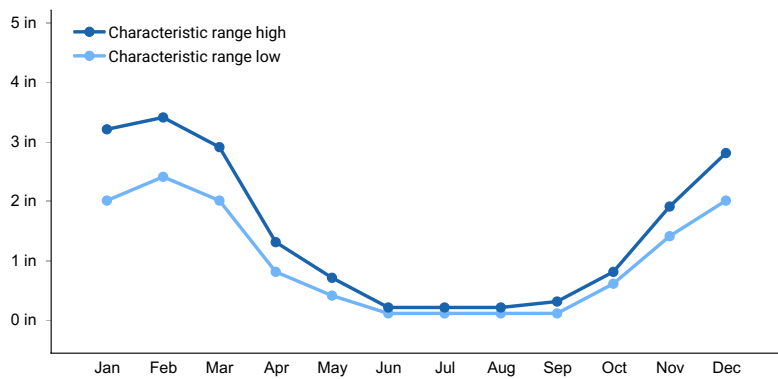


Figure 1. Monthly precipitation range

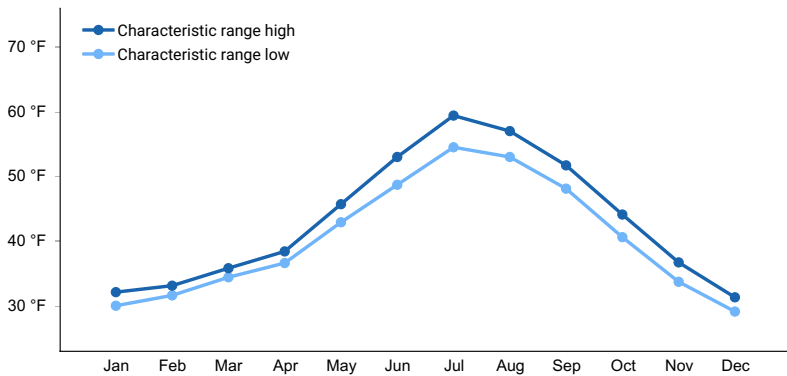


Figure 2. Monthly minimum temperature range

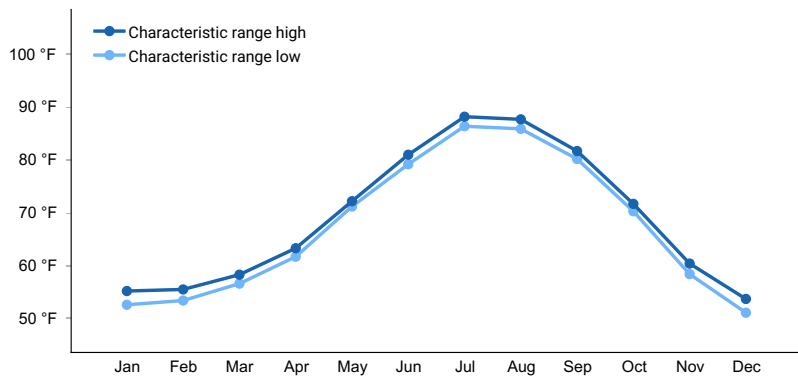


Figure 3. Monthly maximum temperature range

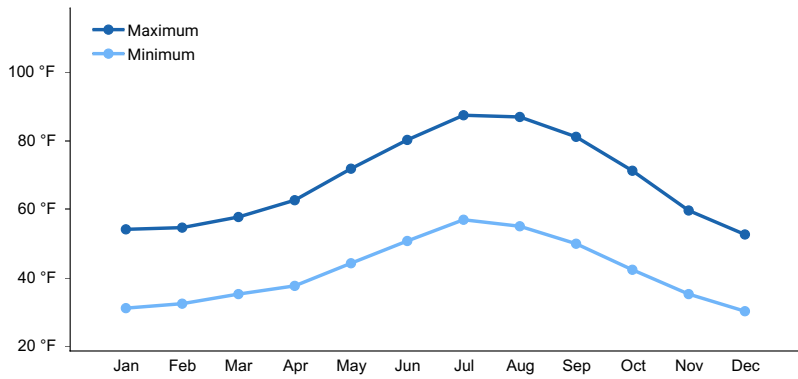


Figure 4. Monthly average minimum and maximum temperature

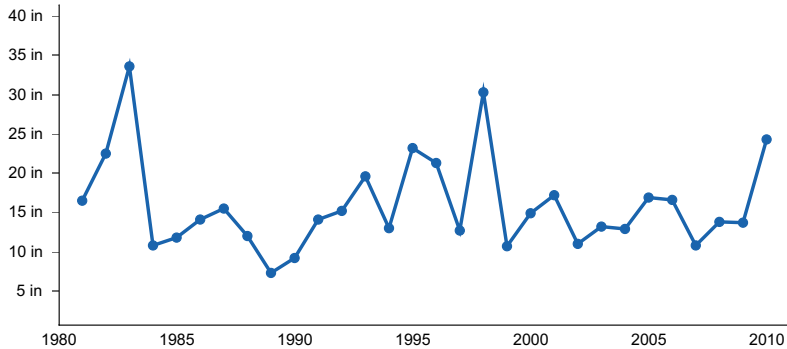


Figure 5. Annual precipitation pattern

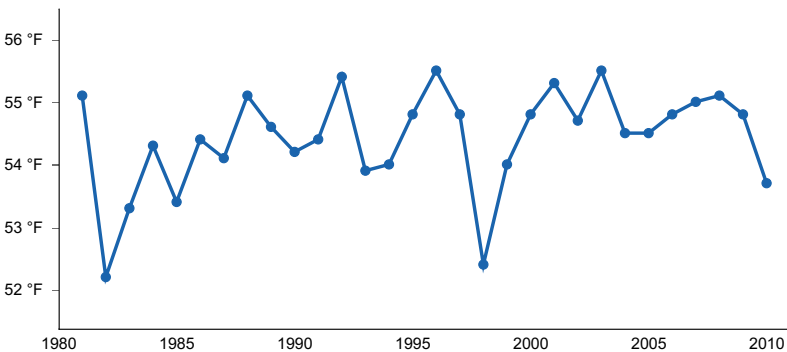


Figure 6. Annual average temperature pattern

Climate stations used

- (1) TEHACHAPI [USC00048826], Tehachapi, CA
- (2) TEHACHAPI 4 SE [USC00048829], Tehachapi, CA
- (3) GLENNVILLE [USC00043463], Glennville, CA

Influencing water features

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

Wetland description

N/A

Soil features

The soils in this ecological site are formed in residuum from granitic, metamorphic and sedimentary rocks. The soil depth ranges from very shallow to moderately deep (between 11 and 24 inches) to restrictive bedrock. The particle size control section is typically loamy. Surface texture is sandy loam, loam or gravelly loamy coarse sand. Gravels

on the soil surface range from 5 to 40% cover and larger fragments range from 0 to 20% cover. Gravels (≤ 3 inch diameter) range from 5 to 25% by volume throughout the profile and larger fragments (> 3 inch diameter) range from 0 to 10% by volume throughout the profile. Soils in this ecological site are well to somewhat excessively drained. Permeability ranges from moderate to rapid. Available Water Storage (AWS) in the profile ranges from 1 to 4.6 inches. Surface pH ranges from 6.7 to 7.5 and subsurface pH ranges from 6.7 to 7.7. Common soils correlated to this ecological site are Tunis (Loamy, mixed, superactive, thermic, shallow Typic Haploxerolls), Kernville (Mixed, thermic, shallow Typic Xeropsamments) and Stineway (Loamy-skeletal, mixed, superactive, thermic Lithic Mollic Haploxeralfs).

Table 5. Representative soil features

Parent material	(1) Residuum–granitoid (2) Residuum–metamorphic and sedimentary rock
Surface texture	(1) Sandy loam (2) Loam (3) Gravelly loamy coarse sand
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to rapid
Depth to restrictive layer	11–24 in
Soil depth	11–24 in
Surface fragment cover ≤ 3 "	5–40%
Surface fragment cover > 3 "	0–20%
Available water capacity (0–40in)	1–4.6 in
Soil reaction (1:1 water) (0–10in)	6.7–7.5
Subsurface fragment volume ≤ 3 " (0–60in)	5–25%
Subsurface fragment volume > 3 " (0–60in)	0–10%

Table 6. Representative soil features (actual values)

Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to rapid
Depth to restrictive layer	5–40 in
Soil depth	5–40 in
Surface fragment cover ≤ 3 "	0–80%
Surface fragment cover > 3 "	0–35%
Available water capacity (0–40in)	0.6–9.1 in
Soil reaction (1:1 water) (0–10in)	5.6–9
Subsurface fragment volume ≤ 3 " (0–60in)	0–55%
Subsurface fragment volume > 3 " (0–60in)	0–50%

Ecological dynamics

State and transition model

Loamy Low Hills
10 - 17" PZ

STM: R018XE103CA

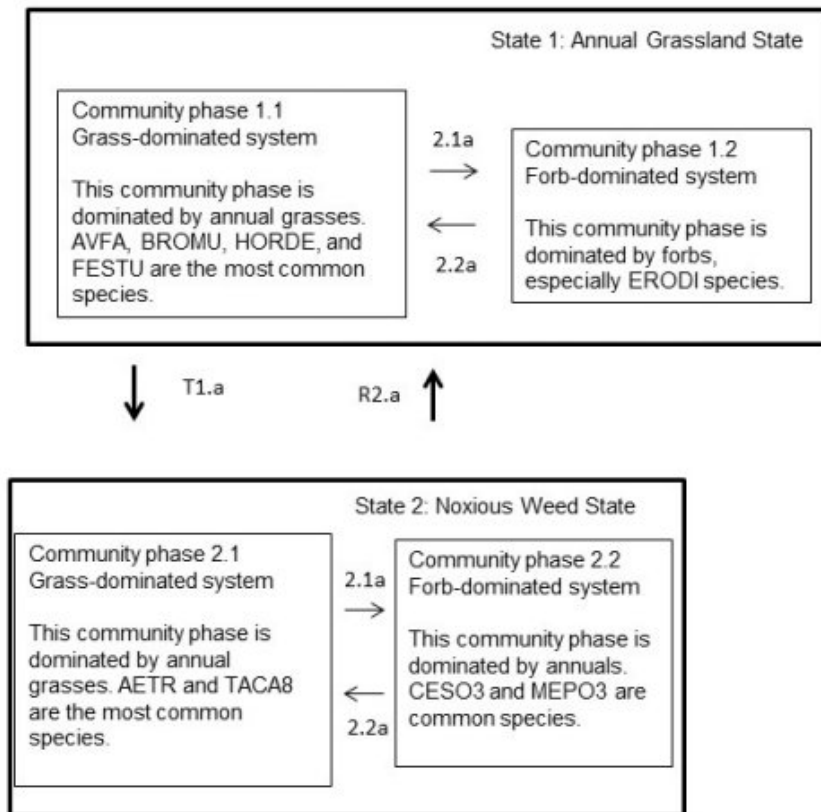


Figure 7. State and Transition Model.

Community pathways and Transitions

- T1.a This transition occurs after invasive plants posing extreme economic/environmental issues become established.
- 1.1a This community pathway occurs as forbs become more dominant, often following low winter precipitation and reduced litter layers.
- 1.2a This community pathway occurs as grasses become more dominant, often in response to higher litter levels.
- R2.a This restoration pathway occurs with integrated weed management. May require mowing, herbicides, and/or biological control.
- 2.1a This community pathway occurs as invasive forb species become dominant.
- 2.2a This community pathway occurs as invasive grass species become dominant.

Figure 8. Community Pathways and Transitions.

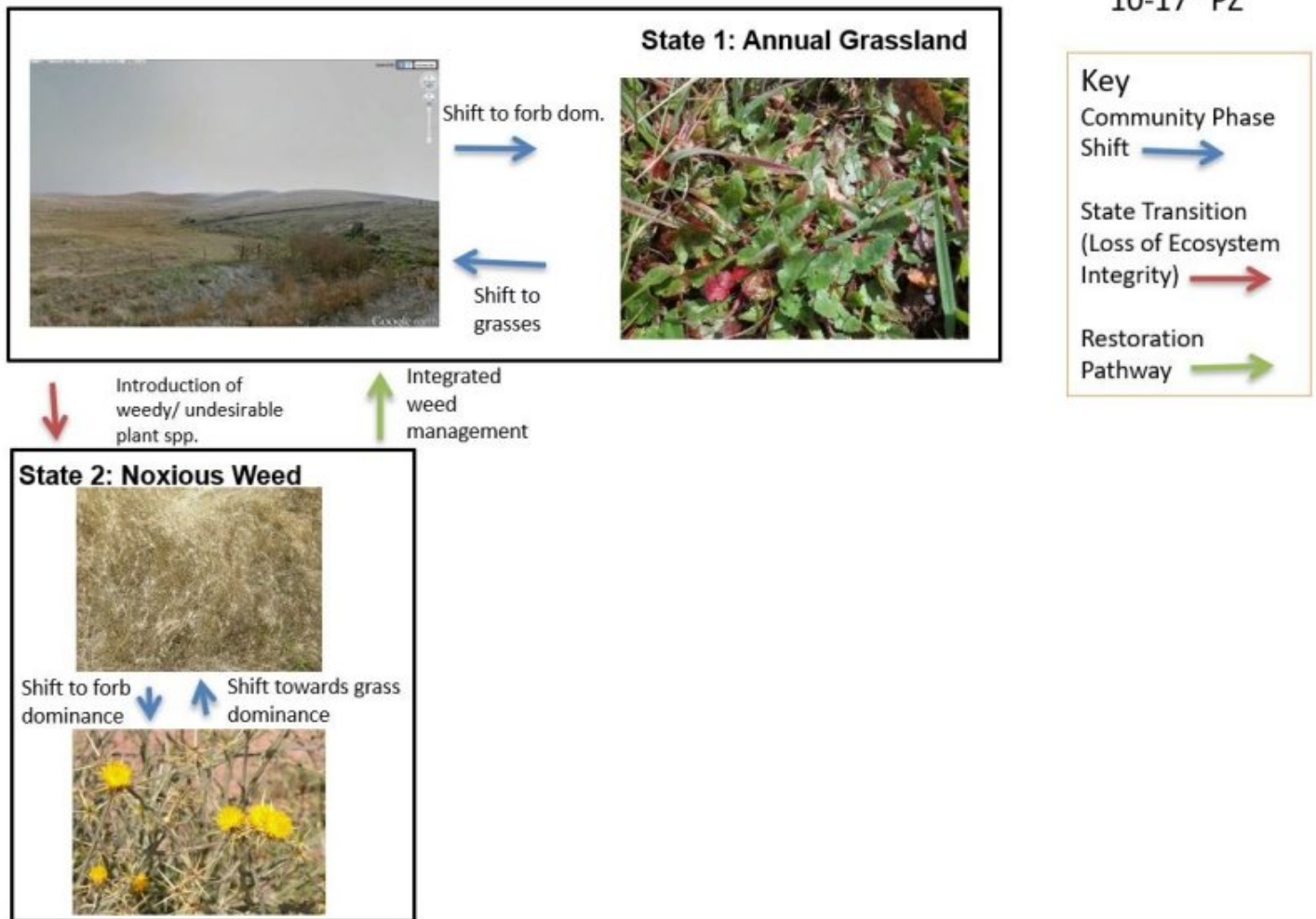


Figure 9. STM Photos

**State 1
Annual Grassland State**

**Community 1.1
Grass-dominated system**

This community phase is dominated by annual grasses. AVFA, BROMU, HORDE, and VULPI are the most common species.

Dominant plant species

- wild oat (*Avena fatua*), grass
- brome (*Bromus*), grass
- barley (*Hordeum*), grass
- fescue (*Vulpia*), grass

**Community 1.2
Forb-dominated system**

This community phase is dominated by forbs, especially ERODI species.

Dominant plant species

- stork's bill (*Erodium*), other herbaceous

Pathway P1.1a

Community 1.1 to 1.2

This community pathway occurs as forbs become more dominant, often following low winter precipitation and reduced litter layers

Pathway P1.2a

Community 1.2 to 1.1

This community pathway occurs as grasses become more dominant, often in response to higher litter levels.

State 2

Noxious Weed State

Community 2.1

Grass-dominated system

This community phase is dominated by annual grasses. AETR and TACA8 are the most common species.

Dominant plant species

- barbed goatgrass (*Aegilops triuncialis*), grass
- medusahead (*Taeniatherum caput-medusae*), grass

Community 2.2

Forb-dominated system

This community phase is dominated by annuals. CESO3 and MEPO3 are common species.

Dominant plant species

- yellow star-thistle (*Centaurea solstitialis*), other herbaceous

Pathway P2.1a

Community 2.1 to 2.2

This community pathway occurs as invasive forb species become dominant.

Pathway P2.2a

Community 2.2 to 2.1

This community pathway occurs as invasive grass species become dominant.

Transition T1.a

State 1 to 2

This transition occurs after invasive plants posing extreme economic/environmental issues become established.

Restoration pathway R2.a

State 2 to 1

This restoration pathway occurs with integrated weed management. May require mowing, herbicides, and/or biological control.

Additional community tables

Other references

Bartolome, J. W. 1987. California annual grassland and oak savannah. *Rangelands* 9:122-125.

Harrison, S. 1999. Native and alien species at the local and regional scales in a grazed California grassland. *Oecologia* 121: 99-106.

Harrison, S., Inouye, B. and H. Safford. 2003. Ecological heterogeneity in the effects of grazing and fire on grassland diversity. *Conservation Biology* 17: 837-845.

Hobbs, R.J., Yates, S. and H.A. Mooney. 2007. Long-term data reveal complex dynamics in relation to climate and disturbance. *Ecological Monographs* 77: 545-568.

Jackson, L. 1985. Ecological origins of California's Mediterranean grasses. *Journal of Biogeography* 12:349-361.

Keeley, J. E., Lubin, D. and Fotheringham, C. J. 2003. Fire and grazing impacts on plant diversity and alien plant invasions in the southern Sierra Nevada. *Ecological Applications* 13:1355-1374.

McDonald, P.M. 1990. *Quercus douglasii* Hook & Arn. Blue oak. In: Burns, Russell M; Honkala, Barbara H, tech. cords. *Silvics of North America*. Vol. 2: Hardwoods. Agricultural Handbook 654. Washington DC: USDA, Forest Service: 631-639.

Perakis, S.S. and C.H. Kellogg. 2007. Imprint of oaks on nitrogen availability and delta N-15 in California grassland-savanna: a case of enhanced N inputs? *Plant Ecology* 191: 209-220.

Seabloom, E., Borer, E., Boucher, V., Burton, R., Cottingham, K., Goldwasser, L., Gram, W., Kendall, B. and F. Micheli. 2003. Competition, seed limitation, disturbance, and reestablishment of California native annual forbs. *Ecological Applications* 13: 575-592.

Stewart, O. C., H. T. Lewis (ed.) and M. K. Anderson (ed.) 2002. *Forgotten fires: Native Americans and the transient wilderness*. University of Oklahoma Press: Norman, OK.

Contributors

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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	05/15/2024
Approved by	Kendra Moseley
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:**
