USDA Natural Resources
Conservation Service

Ecological site R018XC103CA
Lithic Thermic Foothills

Last updated: 4/24/2024
Accessed: 05/21/2025

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

LRU 18XC is located on moderate to steep mountains and hills in the Sierra Nevada Foothills east of Fresno, CA. The major differences between the southern and northern foothills are the dryer climate (12 to 37 inches of annual precipitation), greater summer/winter temperature variation, and steeper topography of the southern foothills. The geology of this region is predominately granitoid. The elevation ranges between 300 and 4100 feet above sea level. Warmer temperatures and lower precipitation (than at higher latititudes) allow for blue oak grasslands to exist at higher elevations. The soil temperature regime is primarily thermic, however some mesic soils are found at higher elevations of 18XC. At these upper elevations, the break in soil temperature regime

(between thermic and mesic) is highly aspect dependent. Southern and western aspects at the steep, high elevations promote chamise-yucca plant assemblages. Buckeye is common in the concave positions. Riparian trees that are generally absent from the northern LRU's include California Sycamore (Plantanus racemosa) and lemon scented gum (Eucalyptus citriodora).

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), M261Fc, the Lower Granitic Foothills and M261Fd, Southern Granitic Foothills Subsections.

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 6c, Southern Sierran Foothills.

Ecological site concept

This site is characterized by lithic to moderately deep soils occurring on backslopes, shoulders, and summits of low hills on metamorphic geologies. Some rock outcrop can occur, but usually less than 25%. Slopes typically range from 5 to 60%. Precipitation typically ranges from 17 to 24 inches per year, and elevation ranges from 900 feet to 2800 feet.

Shallow soil depth and low available water capacity, coupled with lower foothill elevations where higher evapotranspiration demands exist (relative to the entire elevation profile of 18XC), are the main limits to woody production. Representative soil components include Millerton, Fallbrook and Vista. Millerton soils are shallow over schist, with weakly developed argillic horizons. Fallbrook soils are deep to grus with more pronounced argillic horizons. Both soils are well drained and are classified as ultic haploxeralfs. Vista soils are moderately deep to grus and are also well drained. Vista soils are less developed than both Millerton and Fallbrook and are classified as coarse-loamy, mixed, superactive, thermic Typic Haploxerepts.

This ecological site consists of annual forbs and grasses. Fillaree (Erodium spp.), ripgut brome (Bromus diandrus), soft chess (Bromus hordeaceus), and foxtail fescue (Festuca megalura) are some of the main species. Shrubs in this site are uncommon or make up a very low percentage of the site.

Associated sites

F018XC203CA	**Cool Thermic Slopes** This site commonly occurs nearby.

R018XC104CA	**Thermic Free Face Foothills** This site commonly occurs nearby.

Similar sites

R018XC102CA	**Steep Thermic Clayey Shallow** Site relationships being developed.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Erodium* (2) *Bromus diandrus*

Physiographic features

This site occurs on elevations typically ranging from 900 to 2800 feet on slopes typically ranging from 5 to 60%.

Table 2. Representative physiographic features

Hillslope profile	(1) Summit (2) Shoulder (3) Backslope
Landforms	(1) Foothills > Hill (2) Foothills > Hillslope
Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	274–853 m
Slope	5–60%
Aspect	W, NW, N, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	91–1,219 m

Slope	3–70%

Climatic features

This ecological site is characterized by hot, dry summers and cool, wet winters, a typical Mediterranean climate. Mean annual precipitation ranges from 17 to 24 inches and usually falls from October to May. Mean annual temperature ranges from 59 to 63 degrees F with 193 to 205 frost free days.

Table 4. Representative climatic features

Frost-free period (characteristic range)	193-205 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	432-610 mm
Frost-free period (actual range)	190-208 days
Freeze-free period (actual range)	365 days
Precipitation total (actual range)	381-660 mm
Frost-free period (average)	199 days
Freeze-free period (average)	365 days
Precipitation total (average)	533 mm

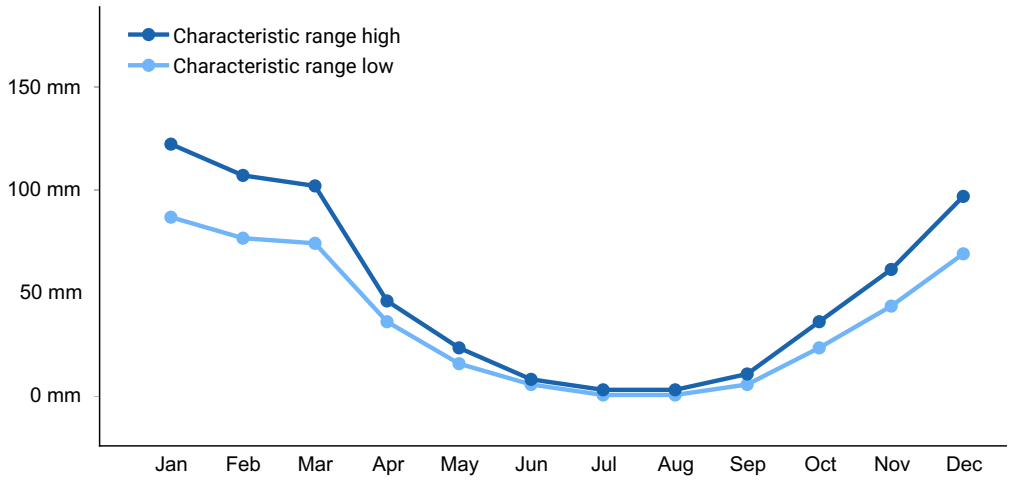


Figure 1. Monthly precipitation range

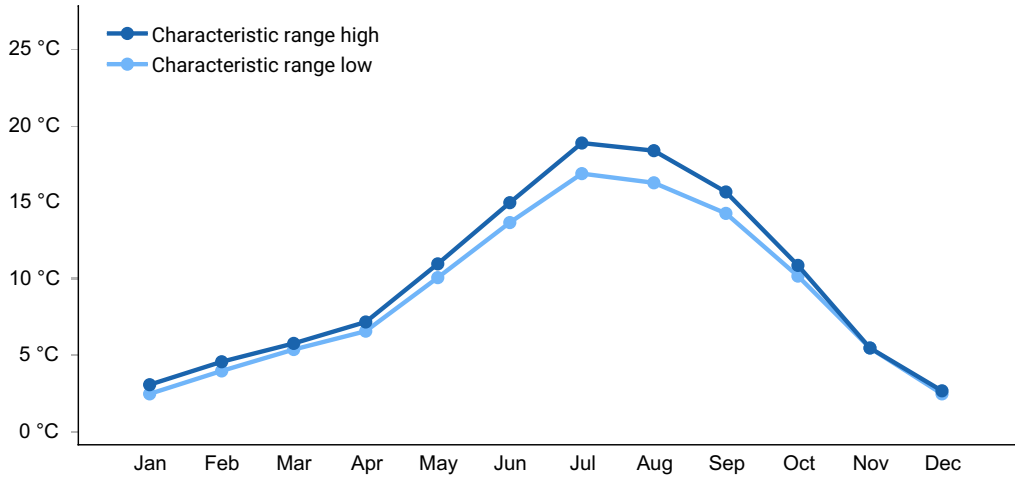


Figure 2. Monthly minimum temperature range

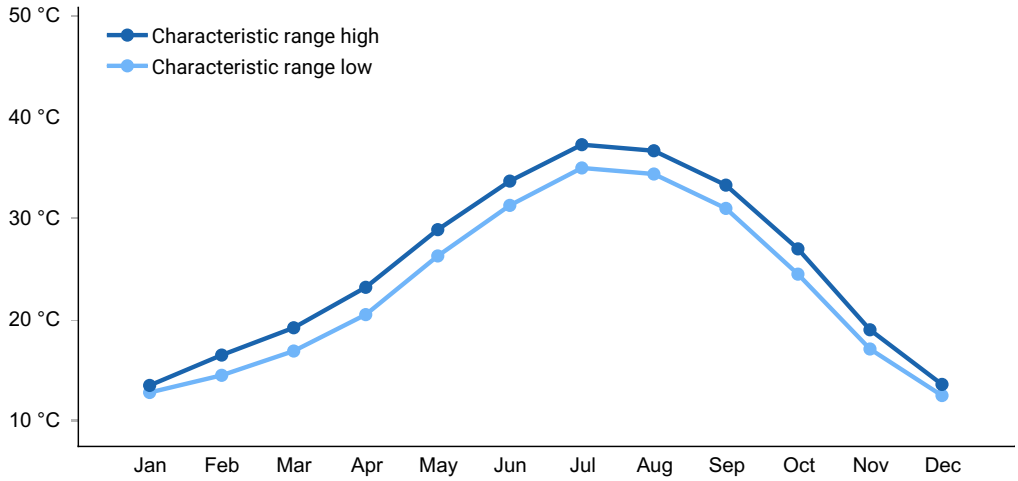


Figure 3. Monthly maximum temperature range

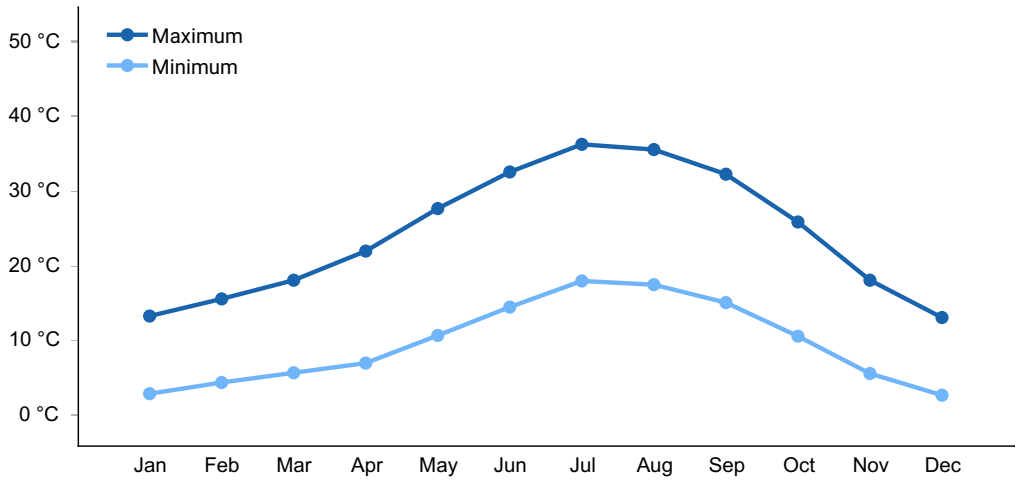


Figure 4. Monthly average minimum and maximum temperature

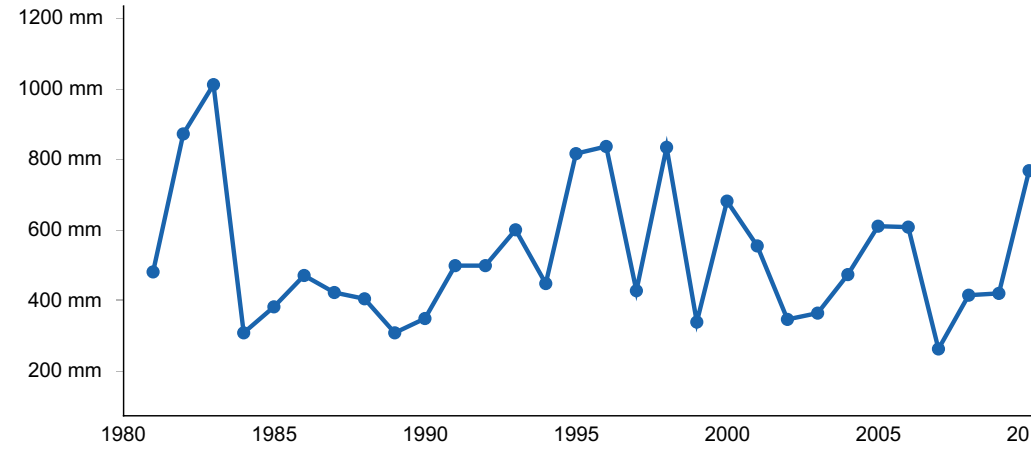


Figure 5. Annual precipitation pattern

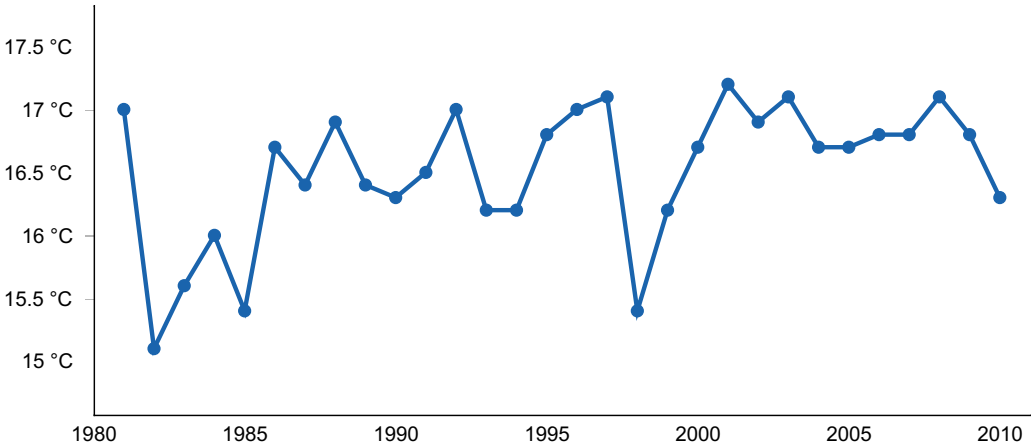


Figure 6. Annual average temperature pattern

Climate stations used

- (1) FRIANT GOVERNMENT CAMP [USC00043261], Friant, CA
- (2) AUBERRY 2 NW [USC00040379], Auberry, 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 from residuum of basic granitoid rock. These soils are typically lithic, although moderately deep soils are also found associated with this site. The particle size control section is loamy (coarse to fine). Surface texture is fine sandy loam, coarse sandy loam and sandy loam. The bedrock is a restrictive layer of

metavolcanic or granitoid rock found between 14 and 20 inches of depth. Gravels (< 3 inch diameter) cover 6 to 15% of the soil surface, larger fragments (= 3 inch diameter) on the soil surface were not recorded for this site. Subsurface gravels range from 2 to 15% of the soil volume while larger fragments are again not recorded for this site. These soils are well drained and the permeability class is rapid. The Available Water Capacity (AWC) is 1.5 to 2.8 inches and the pH of the soil ranges from 6.5 to 6.7.

Representative soil components include Millerton, Fallbrook (moderately deep phase) and Vista. Millerton soils are shallow over schist, with weakly developed argillic horizons. Fallbrook soils overlie grus with more pronounced argillic horizons. Both soils are well drained and are classified as ultic haploxeralfs. Vista soils are also moderately deep to grus and are also well drained. Vista soils are less developed than either Millerton or Fallbrook and are classified as coarse-loamy, mixed, superactive, thermic Typic Haploxerepts.

Table 5. Representative soil features

Parent material	(1) Residuum–metavolcanics (2) Residuum–diorite (3) Residuum–granite
Surface texture	(1) Fine sandy loam (2) Coarse sandy loam (3) Sandy loam
Family particle size	(1) Coarse-loamy (2) Fine-loamy
Drainage class	Well drained
Permeability class	Rapid
Depth to restrictive layer	36–51 cm
Soil depth	36–51 cm
Surface fragment cover <=3"	6–15%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	3.81–8.64 cm
Soil reaction (1:1 water) (0-25.4cm)	6–7
Subsurface fragment volume <=3" (0-152.4cm)	2–14%
Subsurface fragment volume >3" (0-152.4cm)	0%

Table 6. Representative soil features (actual values)

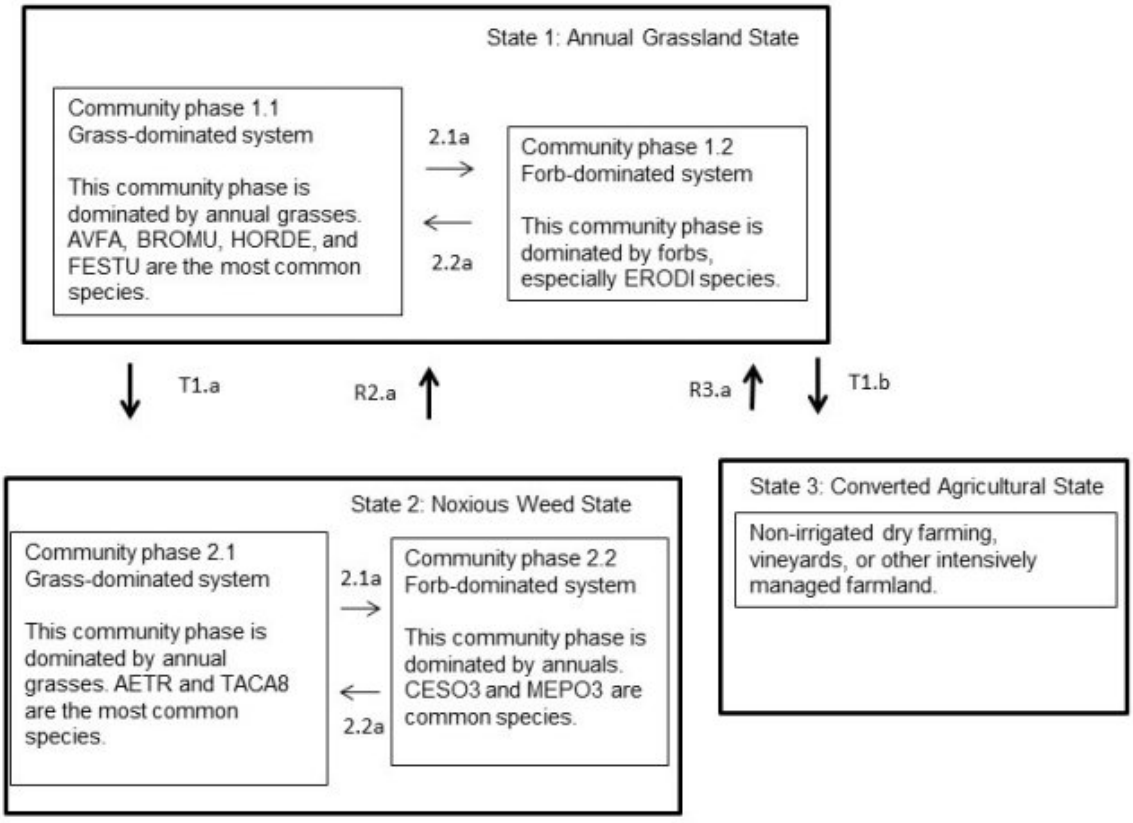
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately rapid to rapid
Depth to restrictive layer	10–61 cm
Soil depth	10–61 cm
Surface fragment cover <=3"	0–30%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	3.05–9.14 cm
Soil reaction (1:1 water) (0-25.4cm)	4.5–7.3
Subsurface fragment volume <=3" (0-152.4cm)	0–35%
Subsurface fragment volume >3" (0-152.4cm)	0–3%

Ecological dynamics

State and transition model

STM: R018XC103CA

Lithic Thermic Foothills
14 - 17" PZ



Community pathways and Transitions

T1.a This transition occurs after invasive plants posing extreme economic/environmental issues become established.

T1.b This transition occurs after planting of commercial agriculture products. This transition can range from highly intensive operations that plow and disrupt the solum to no-till operations (dry farming or otherwise). The hydrology may also be significantly altered in this transition.

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.

T3.a. This transition occurs after abandoning agricultural operations or mismanagement of farming that allows for noxious weeds to establish. The natural succession tends to produce plant communities of lesser economic importance or value.

R3.a This restoration pathway occurs with land use change to pasture land. This transition likely requires seeding of grasses and possibly weed management.

State 1
Annual Grassland State

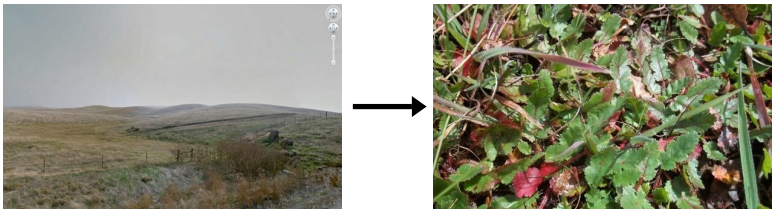
Community 1.1
Grass-dominated system

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

Community 1.2
Forb-dominated system

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

Pathway 1.1a
Community 1.1 to 1.2



Grass-dominated system **Forb-dominated system**

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

Pathway 1.2a
Community 1.2 to 1.1

Forb-dominated system **Grass-dominated system**

This community pathway occurs as grasses become more dominant, often in response to

higher litter levels.

State 2
Noxious Weed State

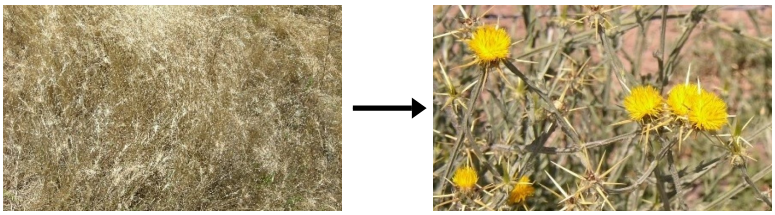
Community 2.1
Grass-dominated system

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

Community 2.2
Forb-dominated system

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

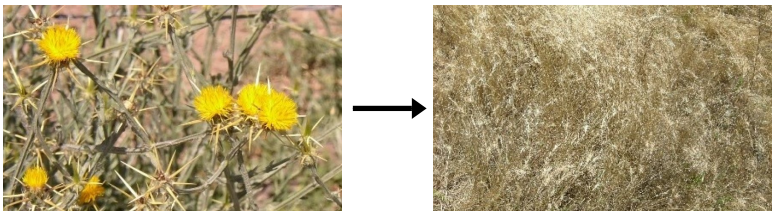
Pathway 2.1a
Community 2.1 to 2.2



Grass-dominated system | Forb-dominated system

This community pathway occurs as invasive forb species become dominant.

Pathway 2.2a
Community 2.2 to 2.1



Forb-dominated system | Grass-dominated system

This community pathway occurs as invasive grass species become dominant.

State 3
Converted Agricultural State

Community 3.1
Converted Agriculture system

Non-irrigated dry farming, vineyards, or other intensively managed farmland.

Transition T1.a
State 1 to 2

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

Transition T1.b
State 1 to 3

This transition occurs after planting of commercial agriculture products. This transition can range from highly intensive operations that plow and disrupt the solum to no-till operations (dry farming or otherwise). The hydrology may also be significantly altered in this transition.

Restoration pathway R2.a
State 2 to 1

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

Restoration pathway R3.a
State 3 to 1

This restoration pathway occurs with land use change to pasture land. This transition likely requires seeding of grasses and possibly weed management.

Restoration pathway T3.a
State 3 to 2

This transition occurs after abandoning agricultural operations or mismanagement of farming that allows for noxious weeds to establish. The natural succession tends to produce plant communities of lesser economic importance or value.

Additional community tables

Inventory data references

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

References

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Other references

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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	05/21/2025
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:**