USDA Natural Resources
Conservation Service

Ecological site R018XC110CA
Cool Thermic Shallowly Dissected Slopes

Last updated: 4/24/2024
Accessed: 05/13/2024

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 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 XC 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 very deep soils in narrow drainages on steep to very steep igneous intrusive and/or

metamorphic hills and mountains. These parent materials range in composition from acidic to basic. Slopes typically near 100%. This site occurs on linear to concave slope shapes on highly dissected slopes. Precipitation typically ranges from 26 to 29 inches per year, and elevation ranges from 1850 to 2825 feet.

The main controlling factor on this ecological site is the greater available water capacity occurring on water-gathering surfaces and deeper soils within a dissected landscape (complex slopes), leading to greater plant production and high diversity of woody species (but fewer trees than in F018XC203CA, which occurs on simple concave slopes in the same elevation range). The higher AWC helps to account for the darker surface horizons due to the greater buildup of organic material. A representative soil component is Yuccacreek. Yuccacreek is a very deep, well-drained soil with thick organic matter accumulation in the soil surface. This soil is a coarse-loamy, mixed, superactive, thermic Ultic Argixeroll.

The vegetation community consists of chaparral shrubs, including dense buckeye (Aesculus californica), scrub oak (Quercus berberidifolia), California redbud (Cercis orbiculata), and alderleaf mountain mahogany (Cercocarpus montanus).

Associated sites

R018XC107CA	**Thermic Granitic Foothills south-facing** This site commonly occurs nearby.

Similar sites

R018XC107CA	**Thermic Granitic Foothills south-facing** Site relationships being developed.
R018XC109CA	**Steep Marble Canyon Walls** Site relationships being developed.

Table 1. Dominant plant species

Tree	(1) *Aesculus californica* (2) *Cercis orbiculata*
Shrub	(1) *Quercus berberidifolia* (2) *Cercocarpus montanus*
Herbaceous	Not specified

Physiographic features

This site occurs between the elevations of 1850 and 2825 feet and on slopes that range from 65 to over 100%. The soils associated with this site are generally found on north aspects, and occur on backslopes of hillslopes and mountain slopes.

Figure 1.

Table 2. Representative physiographic features

Hillslope profile	(1) Backslope
Landforms	(1) Foothills > Hillslope (2) Foothills > Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	1,850–2,825 ft
Slope	65–100%
Aspect	NW, N, NE, E, SE

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	None
Ponding frequency	None
Elevation	1,400–4,230 ft
Slope	50–100%

Climatic features

This ecological site is characterized by hot, dry summers and cool, wet winters, a typical Mediterranean climate. Mean annual precipitation ranges from 26 to 29 inches and usually falls from October to May. Mean annual air temperature ranges from 59 to 63 degrees F with 245 to 250 frost free days.

Table 4. Representative climatic features

Frost-free period (characteristic range)	245-250 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	26-29 in
Frost-free period (actual range)	225-270 days
Freeze-free period (actual range)	365 days
Precipitation total (actual range)	25-34 in
Frost-free period (average)	245 days
Freeze-free period (average)	365 days
Precipitation total (average)	26 in

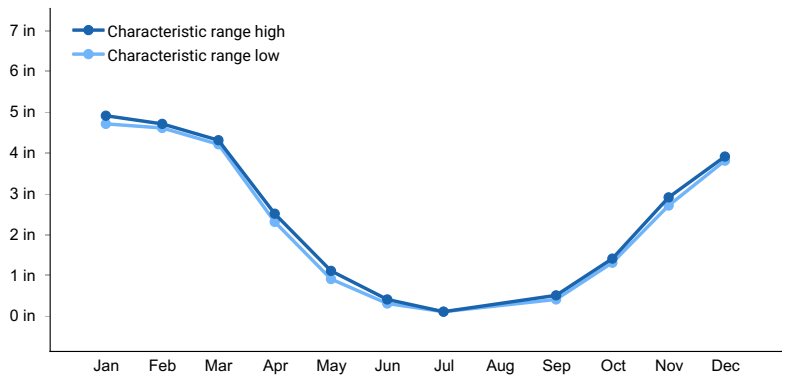


Figure 2. Monthly precipitation range

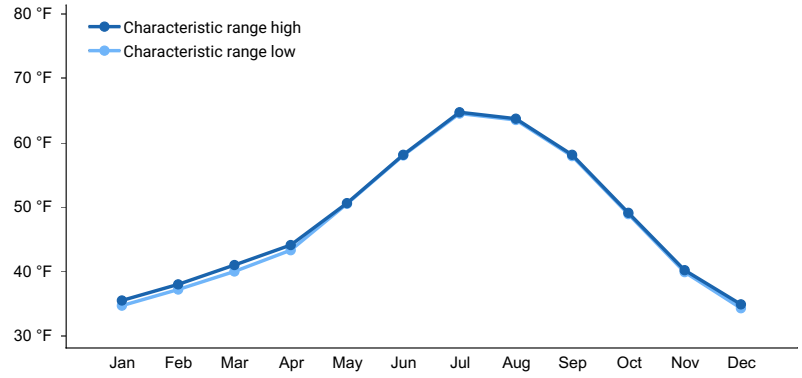


Figure 3. Monthly minimum temperature range

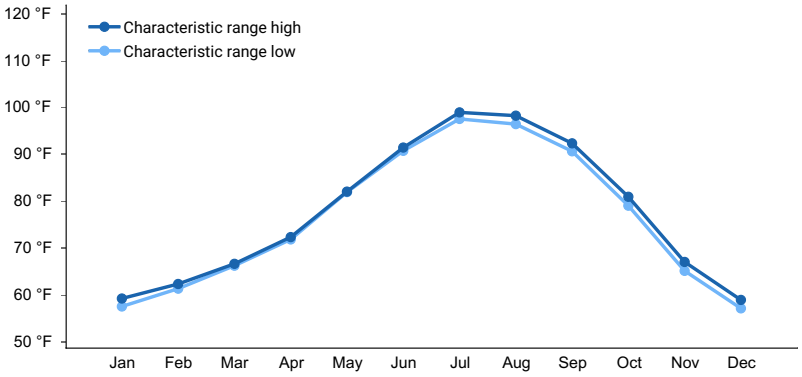


Figure 4. Monthly maximum temperature range

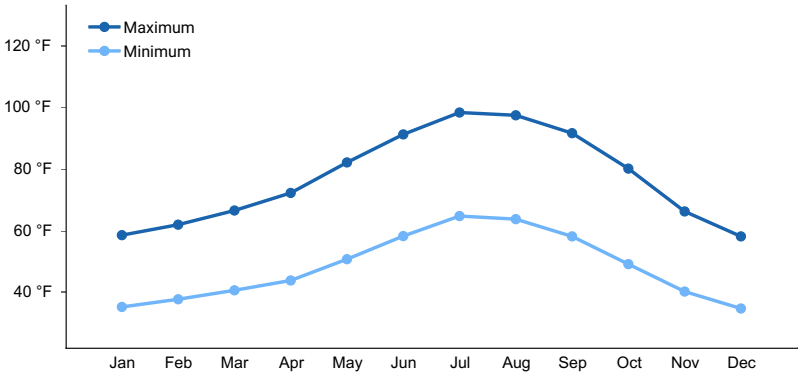


Figure 5. Monthly average minimum and maximum temperature

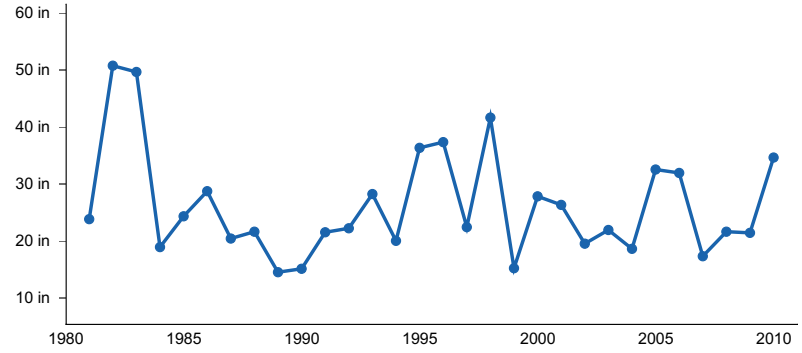


Figure 6. Annual precipitation pattern

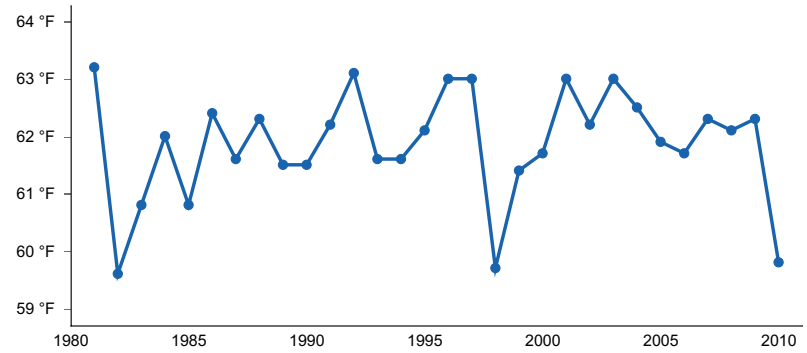


Figure 7. Annual average temperature pattern

Climate stations used

- (1) THREE RVRS EDISON PH 1 [USC00048917], Three Rivers, CA
- (2) ASH MTN [USC00040343], Three Rivers, 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 the colluvium and residuum of granitic and metamorphic rocks. The typical depth range is very deep. These soils are typically greater than 60 inches deep to restrictive bedrock. The particle size control sections are coarse-loamy, and surface textures include sandy loam and silt loam. Surface gravels (< 3 inch diameter) are typically absent, and larger fragments (= 3 inch diameter) range between 0 to 5% cover. Within the soil profile gravels range from 0 to 15%, and larger fragments from 0 to 15% by volume. The soils in this ecological site are well drained and the permeability class is moderately rapid. Available Water Capacity (AWC) is between 5 and 6.5 inches. The soil pH in the top 10 inches is between 6.3 and 6.6, and in the subsurface 10 to 40 inches is between 5.9 and 6.5.

Common soils correlated to this ecological site are Yuccacreek (coarse-loamy, mixed, superactive, thermic Ultic Argixerolls).
Common soil components in this ecological site include Yuccacreek, steep and Yuccacreek, steep taxadjunct. The Yuccacreek soils are very deep over weathered granitic or metamorphic rock.

Figure 8.

Table 5. Representative soil features

Parent material	(1) Colluvium–metamorphic rock (2) Residuum–metamorphic rock
Surface texture	(1) Sandy loam (2) Silt loam
Family particle size	(1) Coarse-loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Depth to restrictive layer	150–200 in
Soil depth	150 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	5.3–6.4 in
Soil reaction (1:1 water) (0-10in)	6.3–6.6
Subsurface fragment volume <=3" (0-60in)	0–15%
Subsurface fragment volume >3" (0-60in)	0–15%

Table 6. Representative soil features (actual values)

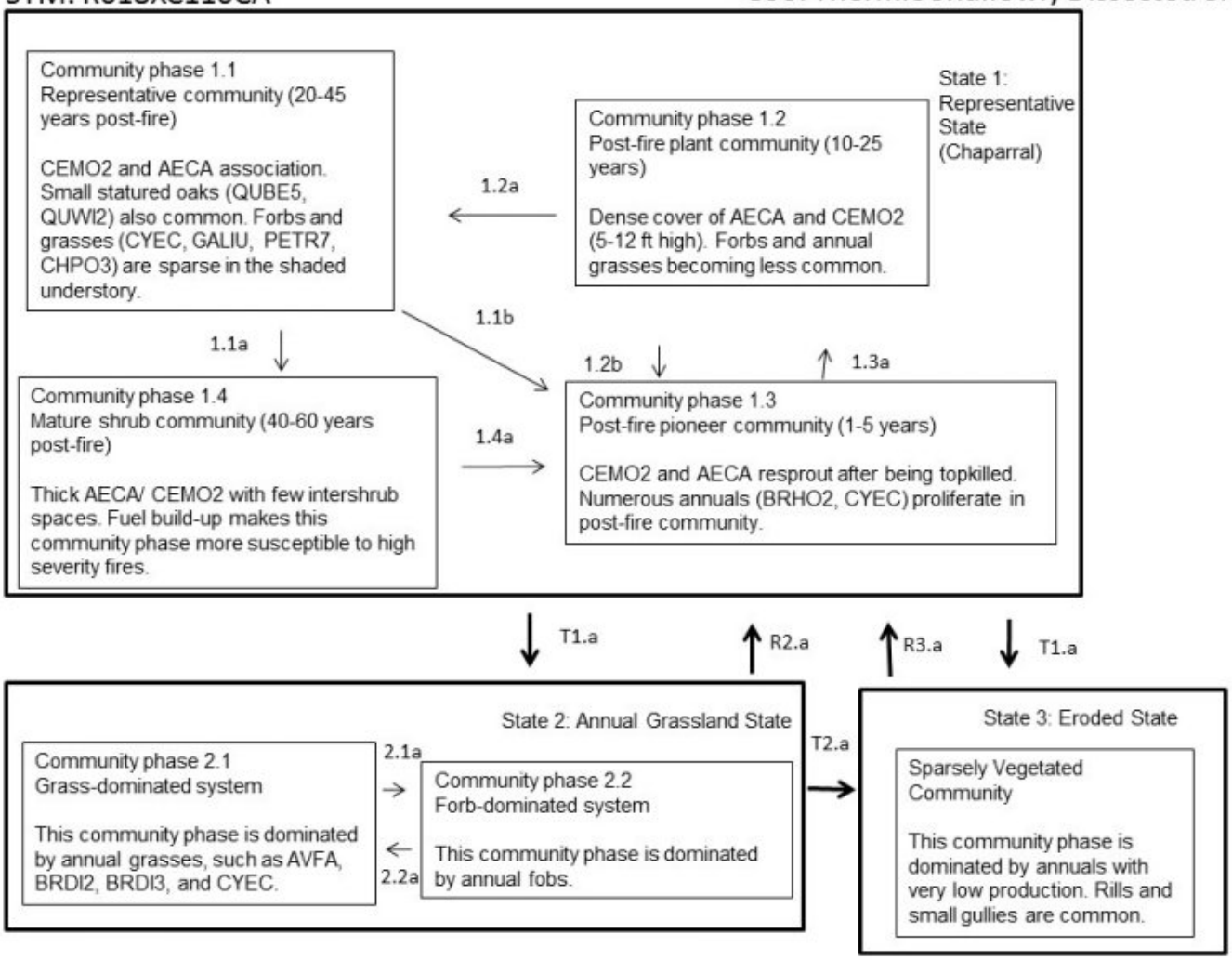
Drainage class	Well drained
Permeability class	Moderately rapid
Depth to restrictive layer	150–200 in
Soil depth	150 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–15%
Available water capacity (0-40in)	3.6–7.7 in
Soil reaction (1:1 water) (0-10in)	5.6–7.3
Subsurface fragment volume <=3" (0-60in)	0–30%
Subsurface fragment volume >3" (0-60in)	0–35%

Ecological dynamics

State and transition model

STM: R018XC110CA

Cool Thermic Shallowly Dissected Slopes



Community pathways and Transitions

T1.a This transition occurs after multiple stand replacing fires reduce the fitness of chaparral shrubs and annual grasses can outcompete woody vegetation. This is not a common transition, but historical records show that indigenous peoples facilitated this dynamic.

T1.b This transition occurs after heavy winter rains occur shortly after stand replacing fires, before reestablishment of plants.

1.1a This community pathway occurs over time without major disturbances.

1.1b This community pathway occurs following a moderately severe fire. A prescription of mechanical clearing and burning of slash may also produce the same results.

1.2a This community pathway occurs over time without vegetation management or major disturbances.

1.2b This community pathway occurs following a moderate severity fire.

1.3a This community pathway occurs over time and normal progression.

1.4a This community pathway occurs following a high severity fire.

T2.a This transition occurs after heavy winter rains occur shortly after intense grass fires, before reestablishment of plants stabilizes the soils.

R2.a This restoration pathway occurs with reseeding of native shrub species.

2.1a This community pathway occurs as invasive forbs become more dominant, often following low winter precipitation and reduced litter layers.

2.2a This community pathway occurs as invasive grass species become dominant, often in response to increases in litter following high winter precipitation years.

R3.a This restoration pathway occurs with reseeding of native shrub species. This restoration may not be possible if too much soil has been lost.

State 1
Representative State (Chaparral)

Dominant plant species

- California buckeye (*Aesculus californica*), tree
- alderleaf mountain mahogany (*Cercocarpus montanus*), tree

Community 1.1
Representative community (20-45 years post-fire)

CEMO2 and AECA association. Small statured oaks (QUBE5, QUWI2) also common. Forbs and grasses (CYEC, GALIU, PETR7, CHPO3) are sparse in the shaded understory.

Dominant plant species

- California buckeye (*Aesculus californica*), tree
- alderleaf mountain mahogany (*Cercocarpus montanus*), tree
- scrub oak (*Quercus berberidifolia*), shrub
- interior live oak (*Quercus wislizeni*), shrub
- bristly dogstail grass (*Cynosurus echinatus*), grass
- bedstraw (*Galium*), other herbaceous
- goldback fern (*Pentagramma triangularis*), other herbaceous
- wavyleaf soap plant (*Chlorogalum pomeridianum*), other herbaceous

Community 1.2
Post-fire plant community (10-25 years)

Dense cover of AECA and CEMO2 (5-12 ft high). Forbs and annual grasses becoming less common.

Dominant plant species

- California buckeye (*Aesculus californica*), tree
- alderleaf mountain mahogany (*Cercocarpus montanus*), tree

Community 1.3
Post-fire pioneer community (1-5 years)

CEMO2 and AECA resprout after being topkilled. Numerous annuals (BRHO2, CYEC) proliferate in post-fire community.

Dominant plant species

- alderleaf mountain mahogany (*Cercocarpus montanus*), tree
- California buckeye (*Aesculus californica*), tree
- bristly dogstail grass (*Cynosurus echinatus*), grass
- soft brome (*Bromus hordeaceus*), grass

Community 1.4
Mature shrub community (40-60 years post-fire)

Thick AECA/ CEMO2 with few intershrub spaces. Fuel build-up makes this community phase more susceptible to high severity fires.

Dominant plant species

- California buckeye (*Aesculus californica*), tree
- alderleaf mountain mahogany (*Cercocarpus montanus*), tree
- interior live oak (*Quercus wislizeni*), shrub
- scrub oak (*Quercus berberidifolia*), shrub

Pathway P1.1b
Community 1.1 to 1.3

This community pathway occurs following a moderately severe fire. A prescription of mechanical clearing and burning of slash may also produce the same results.

Pathway P1.1a
Community 1.1 to 1.4

This community pathway occurs over time without major disturbances.

Pathway P1.2a
Community 1.2 to 1.1

This community pathway occurs over time without vegetation management or major disturbances.

Pathway P1.2b
Community 1.2 to 1.3

This community pathway occurs following a moderate severity fire.

Pathway P1.3a
Community 1.3 to 1.2

This community pathway occurs over time and normal progression.

Pathway P1.4a
Community 1.4 to 1.3

This community pathway occurs following a high severity fire.

State 2
Annual Grassland State

Community 2.1
Grass-dominated system

This community phase is dominated by annual grasses, such as AVFA, BRDI2, BRDI3, and CYEC.

Dominant plant species

- wild oat (*Avena fatua*), grass
- ripgut brome (*Bromus diandrus*), grass
- purple false brome (*Brachypodium distachyon*), grass
- bristly dogstail grass (*Cynosurus echinatus*), grass

Community 2.2
Forb-dominated system

This community phase is dominated by annual fobs.

Pathway P2.1a
Community 2.1 to 2.2

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

Pathway P2.2a
Community 2.2 to 2.1

This community pathway occurs as invasive grass species become dominant, often in response to increases in litter following high winter precipitation years.

State 3
Eroded State

Community 3.1
Sparsely Vegetated Community

This community phase is dominated by annuals with very low production. Rills and small gullies are common.

Transition T1.a
State 1 to 2

This transition occurs after multiple stand replacing fires reduce the fitness of chaparral shrubs and annual grasses can outcompete woody vegetation. This is not a common transition, but historical records show that indigenous peoples facilitated this dynamic.

Transition T1.b
State 1 to 3

This transition occurs after heavy winter rains occur shortly after stand replacing fires, before reestablishment of plants.

Restoration pathway R2.a
State 2 to 1

This restoration pathway occurs with reseeding of native shrub species.

Transition T2.a
State 2 to 3

This transition occurs after heavy winter rains occur shortly after intense grass fires, before reestablishment of plants stabilizes the soils.

Restoration pathway R3.a
State 3 to 1

This restoration pathway occurs with reseeding of native shrub species. This restoration may not be possible if too much soil has been lost.

Additional community tables

Inventory data references

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

References

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Contributors

Nathan Roe

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	05/13/2024
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:**