Ecological site R018XC107CA
Thermic Granitic Foothills south-facing

Last updated: 4/24/2024
Accessed: 05/19/2024

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

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 12 to 55 inches in most of the area (precipitation generally increases with elevation and from south to north). 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 shallow to moderately deep soils occurring on summits, shoulders, and backslopes of hills. This site occurs on metasedimentary (schist) and igneous intrusive (granitic to basic igneous) parent

materials. Slopes typically range from 20 to 60%. This site occurs on south-facing slopes, where temperatures are warmer and soil conditions are drier due to a greater amount of solar radiation. Annual precipitation typically ranges from 16 to 28 inches per year. Elevation typically ranges from 1250 to 2750 feet.

The low 'effective' precipitation, due to south aspects where higher evapotranspiration demands exist, is the main limit to production. Representative moderately deep, well to somewhat excessively drained soil components include Coarsegold and Fryespoint. Coarsegold soils form on schist and are classified as fine-loamy, mixed, superactive, thermic Mollic Haploxeralfs. Fryespoint soils formed in colluvium and residuum weathered from granitic rocks and are loamy-skeletal, mixed, superactive, thermic Ultic Haploxerolls.

Vegetation communities are dominated by chamise (Adenostoma fasciculatum) stands with very little herbaceous cover. Lower densities of California yerba santa (Eriodictyon californicum) and manzanita (Arctostaphylos spp.) sometimes occur. Occasional blue oak (Quercus douglasii) and live oak (Quercus wislizeni) will occur in microsite positions that retain water for longer periods. Total annual production typically ranges from 1200 to 2600 lbs per acre.

Associated sites

F018XC201CA	**Thermic Granitic Foothills** This site commonly occurs nearby.

Similar sites

R018XC110CA	**Cool Thermic Shallowly Dissected Slopes** Site relationships being developed.
R018XC109CA	**Steep Marble Canyon Walls** Site relationships being developed.

Table 1. Dominant plant species

Tree	(1) *Quercus douglasii* (2) *Quercus wislizeni*
Shrub	(1) *Adenostoma fasciculatum* (2) *Eriodictyon californicum*
Herbaceous	(1) *Bromus* (2) *Erodium*

Physiographic features

This site occurs on elevations typically ranging from 1250 to 2750 feet on slopes typically ranging from 20 to 60%.

Table 2. Representative physiographic features

Hillslope profile	(1) Summit (2) Shoulder (3) Backslope
Landforms	(1) Foothills > Hill
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	381–838 m
Slope	20–60%
Aspect	W, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	152–1,372 m
Slope	3–90%

Climatic features

This ecological site is characterized by hot, dry summers and cool, wet winters, a typical Mediterranean climate. Mean annual precipitation ranges from 16 to 28 inches and usually falls from October to May. Mean annual temperature ranges from 59 to 63 degrees F with 193 to 209 frost free days.

Table 4. Representative climatic features

Frost-free period (characteristic range)	193-209 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	483-660 mm
Frost-free period (actual range)	192-215 days
Freeze-free period (actual range)	365 days
Precipitation total (actual range)	406-711 mm
Frost-free period (average)	201 days
Freeze-free period (average)	365 days
Precipitation total (average)	559 mm

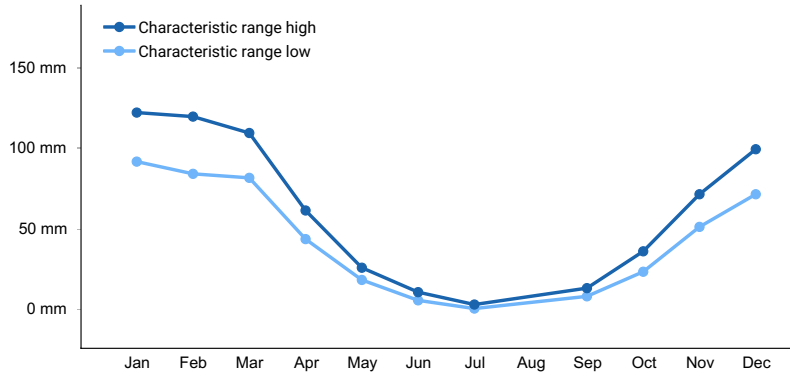


Figure 1. Monthly precipitation range

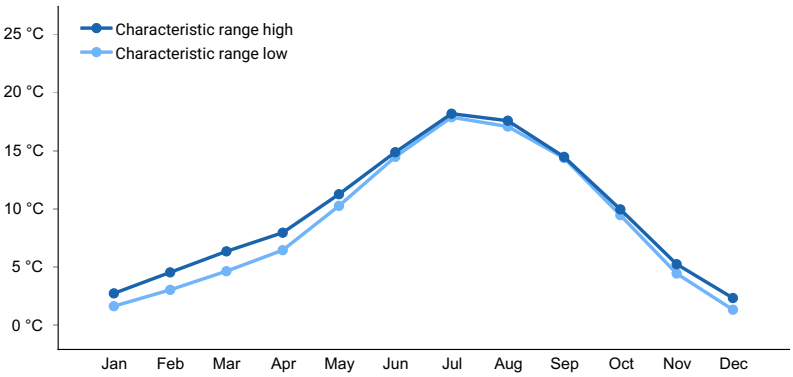


Figure 2. Monthly minimum temperature range

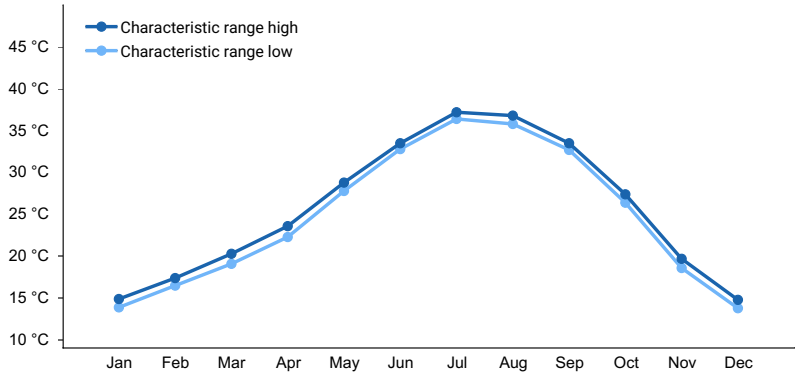


Figure 3. Monthly maximum temperature range

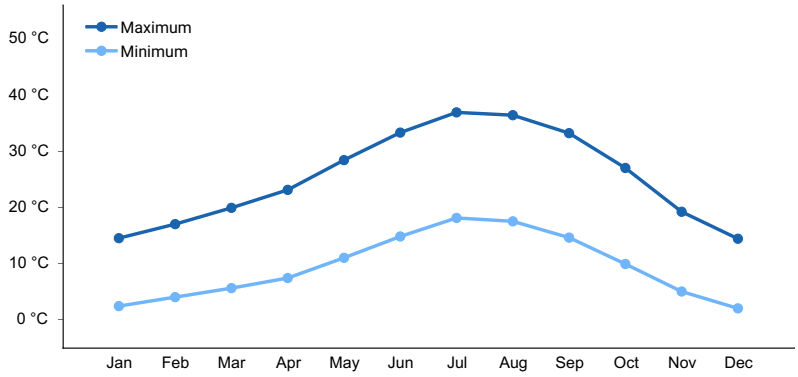


Figure 4. Monthly average minimum and maximum temperature

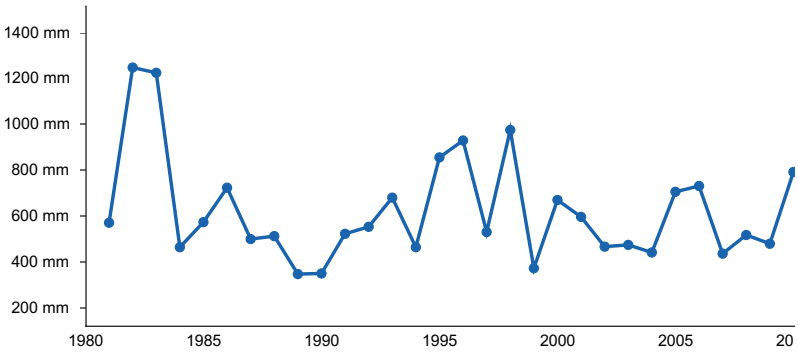


Figure 5. Annual precipitation pattern

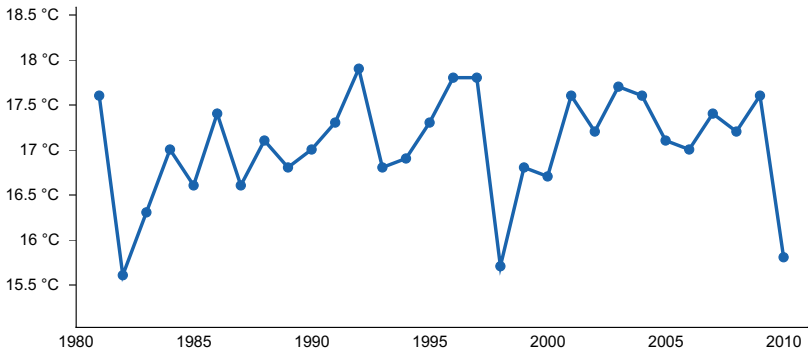


Figure 6. Annual average temperature pattern

Climate stations used

- (1) LEMON COVE [USC00044890], Woodlake, CA
- (2) THREE RVRS EDISON PH 1 [USC00048917], Three Rivers, CA
- (3) 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 residuum derived of mica schist or metasedimentary rocks. The typical depth is moderately deep, and the particle size control section is typically fine-loamy. Surface texture is fine sandy loam, loam and gravelly loam. The bedrock is a restrictive layer found between 22 and 37 inches of depth. Gravels (< 3 inch diameter) cover up to 20% of the soil surface, while larger fragments (= 3 inch diameter) may cover up to 10% percent of the surface. Subsurface gravels make up between 5 to 25% of the soil volume while larger fragments are only 0 to 2% profile volume. The soils in this ecological site are well drained and the permeability class is moderate. The Available Water Capacity (AWC) is 1.9 to 5.5 inches and the pH throughout the entirety of the profile ranges from 5.6 to 6.7.

Representative moderately deep, well to somewhat excessively drained soil components include Coarsegold and Fryespoint. Coarsegold soils form on schist and are classified as fine-loamy, mixed, superactive, thermic Mollic Haploxeralfs. Fryespoint soils formed in colluvium and residuum weathered from granitic rocks and are loamy-skeletal, mixed, superactive, thermic Ultic Haploxerolls.

Table 5. Representative soil features

Parent material	(1) Residuum–mica schist (2) Residuum–metasedimentary rock
Surface texture	(1) Fine sandy loam (2) Loam (3) Gravelly loam
Family particle size	(1) Fine-loamy
Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	56–94 cm
Soil depth	56–94 cm
Surface fragment cover <=3"	2–20%
Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	4.83–13.97 cm
Soil reaction (1:1 water) (0-25.4cm)	5.6–6.7
Subsurface fragment volume <=3" (0-152.4cm)	6–26%
Subsurface fragment volume >3" (0-152.4cm)	0–2%

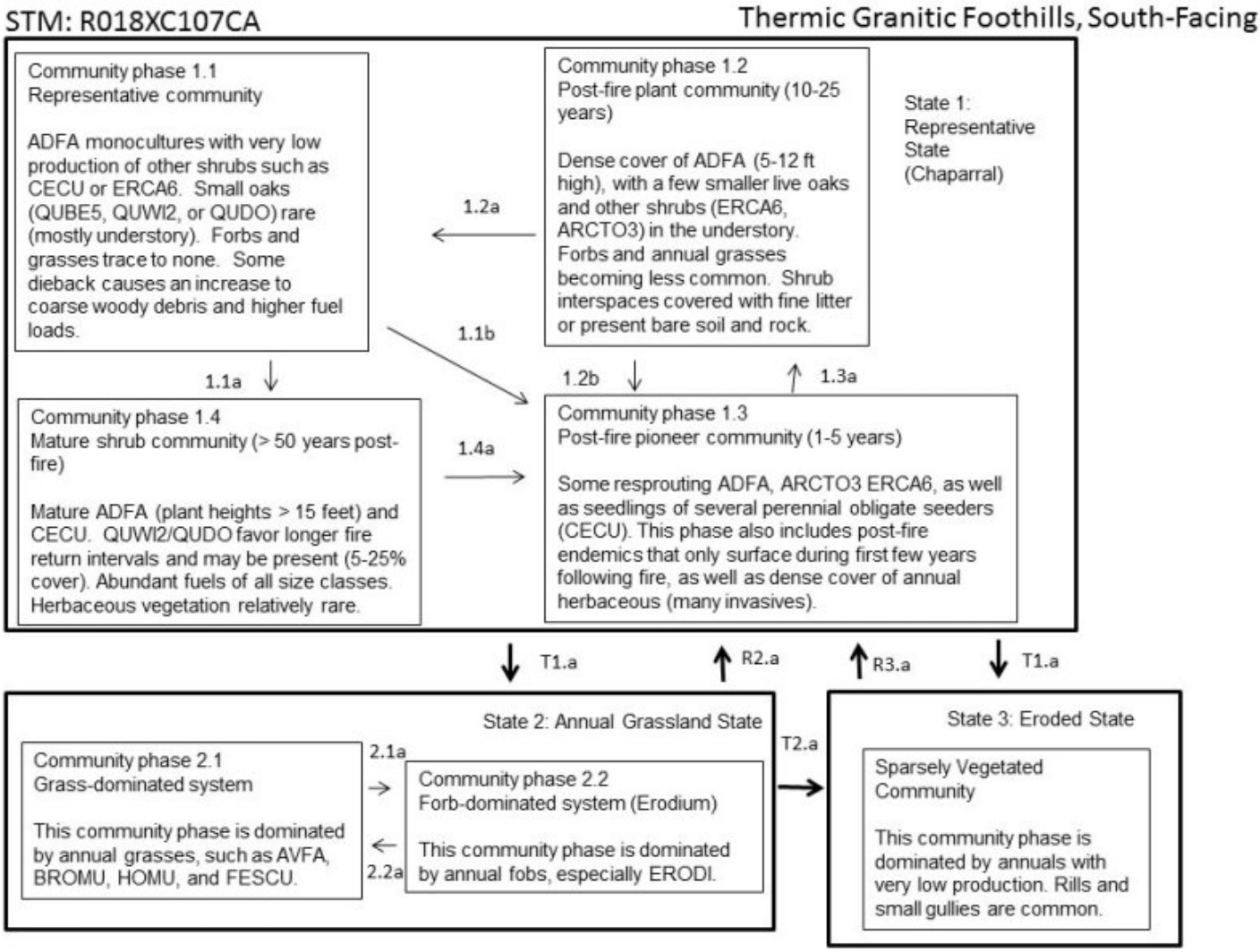
Table 6. Representative soil features (actual values)

Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to rapid
Depth to restrictive layer	25–107 cm
Soil depth	25–107 cm

Surface fragment cover <=3"	0–30%
Surface fragment cover >3"	0–70%
Available water capacity (0-101.6cm)	2.54–19.3 cm
Soil reaction (1:1 water) (0-25.4cm)	5.1–7.3
Subsurface fragment volume <=3" (0-152.4cm)	0–64%
Subsurface fragment volume >3" (0-152.4cm)	0–31%

Ecological dynamics

State and transition model



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 high severity 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 to high severity fire. A prescription of mechanical clearing and burning of slash may have some success in mimicking natural dynamics.

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

Community 1.1
Representative plant community

ADFA monocultures with very low production of other shrubs such as CECU or ERCA6. Small oaks (QUBE5, QUWI2, or QUDO) rare (mostly understory). Forbs and grasses trace to none. Some dieback causes an increase to coarse woody debris and higher fuel loads.

Dominant plant species

- blue oak (*Quercus douglasii*), tree
- scrub oak (*Quercus berberidifolia*), tree
- interior live oak (*Quercus wislizeni*), tree
- manzanita (*Arctostaphylos*), shrub
- buckbrush (*Ceanothus cuneatus*), shrub
- California yerba santa (*Eriodictyon californicum*), shrub

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

Dense cover of ADFA (5-12 ft high), with a few smaller live oaks and other shrubs (ERCA6, ARCTO3) in the understory. Forbs and annual grasses becoming less common. Shrub interspaces covered with fine litter or present bare soil and rock.

Dominant plant species

- blue oak (*Quercus douglasii*), tree

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

Some resprouting ADFA, ARCTO3 ERCA6, as well as seedlings of several perennial obligate seeders (CECU). This phase also includes post-fire endemics that only surface during first few years following fire, as well as dense cover of annual herbaceous (many invasives).

Community 1.4
Mature shrub community (> 50 years post-fire)

Mature ADFA (plant heights > 15 feet) and CECU. QUWI2/QUDO favor longer fire return intervals and may be present (5-25% cover). Abundant fuels of all size classes. Herbaceous vegetation relatively rare.

Dominant plant species

- interior live oak (*Quercus wislizeni*), tree
- blue oak (*Quercus douglasii*), tree
- chamise (*Adenostoma fasciculatum*), shrub
- buckbrush (*Ceanothus cuneatus*), shrub

Pathway P1.1b
Community 1.1 to 1.3

This community pathway occurs following a high severity 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 to high severity fire. A prescription of mechanical clearing and burning of slash may have some success in mimicking natural dynamics.

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

Community 2.1
Grass-dominated system

This community phase is dominated by annual grasses, such as AVFA, BROMU, HOMU, and FESCU.

Dominant plant species

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

Community 2.2
Forb-dominated system (Erodium)

This community phase is dominated by annual fobs, especially ERODI.

Dominant plant species

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

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

Community 3.1
Sparsely Vegetated Community

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

State 4

State 5

State 6

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.a
State 1 to 3

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.

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

Natural Resources Conservation Service. . National Ecological Site Handbook.

Other references

Other References
Abrams, M.D. 1990. Adaptations and responses to drought in Quercus species of North America. Tree Physiology 7(1-4): 227-238.

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

Bolsinger, C. L. 1988. The hardwoods of Califonia’s timberlands, woodlands, and savannas. Portland, OR: Pacific Northwest Forest and Range Experiment Station, Forest Service, USDA.

Callaway, R.M. 1992. Morphological and physiological responses of three California oak species to shade. International Journal of Plant Science. 153(3): 434-441.

Hickman, G.W., Perry, E.J. and R.M. Davis. 2011. Wood Decay Fungi in Landscape Trees. University of California. Integrated Pest Management Program. Agriculture and Natural Resources. Pest Notes 74109.

Howard, J.L. 1992. Pinus sabiniana. In: Fire Effects Information System. (Online) USDA, Forest Service Rocky Mountain Research Station, Fire Sciences Lab (Producer). Accessed: http://www.fs.fed.us/database/feis/[April 20, 2017]

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.

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.

USDA, Forest Service, Missoula Fire Sciences Laboratory. 2012. Information from LANDFIRE on fire regimes of California oak woodlands. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer). Available: https://www.fs.fed.us/database/feis/fire_regimes/CA_oak_woodlands/all.html[2018, March 21].

Contributors

Michael Higgins
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	05/19/2024
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:**
