Ecological site R018XI107CA
Shallow, Undulating Volcanic Hills

Last updated: 4/24/2024
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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

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 characterized by shallow soils derived from volcanic parent materials. It occurs on undulating to hilly volcanic tabular ridges and sideslopes. Slope gradient typically ranges from 3 to 30 %, but may be as high as 60%. Mean annual precipitation typically ranges from 29 to 35 inches, and elevations range from 300 to 1800 feet.

Shallow soils with very low available water capacities restrict the establishment of trees and other woody vegetation. Common soil components include Amador, Pentz. and Inks. Amador soils are loamy, mixed, superactive, thermic, shallow Typic Dystroxerepts. Pentz soils are loamy, mixed, superactive, thermic, shallow Ultic Haploxerolls. Both of these soils are derived from tuffaceous sediments, Amador being derived from acidic tuff and Pentz from basic tuff. Inks soils are loamy-skeletal, mixed, superactive, thermic, shallow Ultic Argixerolls formed from consolidated or cemented sediments from volcanic rocks.

This vegetation community consists of annual grasses and forbs with very few trees or shrubs. Dominant plants include soft brome (Bromus hordeaceus), wild oat (Avena fatua), and Italian ryegrass (Lolium perenne spp. multiflorum) as well as potential infestations areas of the invasive medusahead (Taeniatherum caput-medusae) grass. Annual production data is lacking for this site, but seems to be heavily skewed towards greatest production of herbaceous annual plants (especially annual grasses).

Associated sites

F018XI207CA	**Deep Volcanic Plateaus and Hills** This site commonly occurs nearby.

Similar sites

R018XI125CA	**Very Steep Skeletal Hillslopes** Site relationships being developed.
R018XI163CA	**Thermic Low Rolling Hills** Site relationships being developed.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Bromus hordeaceus* (2) *Avena fatua*

Physiographic features

This ecological site occurs in foothills on undulating hills and ridges with SW aspects where the slope gradient typically ranges from 3 to 30%, but may be as high as 60%.

Table 2. Representative physiographic features

Geomorphic position, hills	(1) Nose Slope (2) Side Slope
Landforms	(1) Foothills > Hill (2) Foothills > Ridge
Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	300–1,800 ft
Slope	3–30%
Aspect	SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Medium
Flooding frequency	None

Ponding frequency	None
Elevation	100–2,500 ft
Slope	2–60%

Climatic features

This ecological site is characterized by hot, dry summers and cool, wet winters, a typical Mediterranean climate. Mean annual precipitation ranges from 29 to 35 inches and usually falls from October to May. Mean annual temperature ranges from 58 to 62 degrees F with 181 to 292 frost free days.

Table 4. Representative climatic features

Frost-free period (characteristic range)	181-292 days
Freeze-free period (characteristic range)	308-365 days
Precipitation total (characteristic range)	29-35 in
Frost-free period (actual range)	158-347 days
Freeze-free period (actual range)	243-365 days
Precipitation total (actual range)	25-37 in
Frost-free period (average)	240 days
Freeze-free period (average)	329 days
Precipitation total (average)	32 in

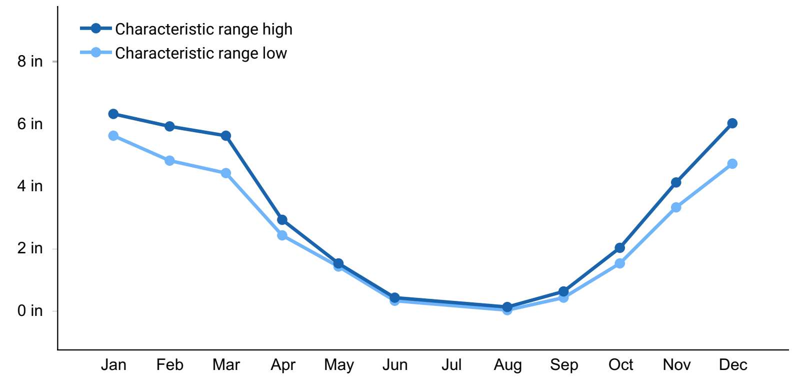


Figure 1. Monthly precipitation range

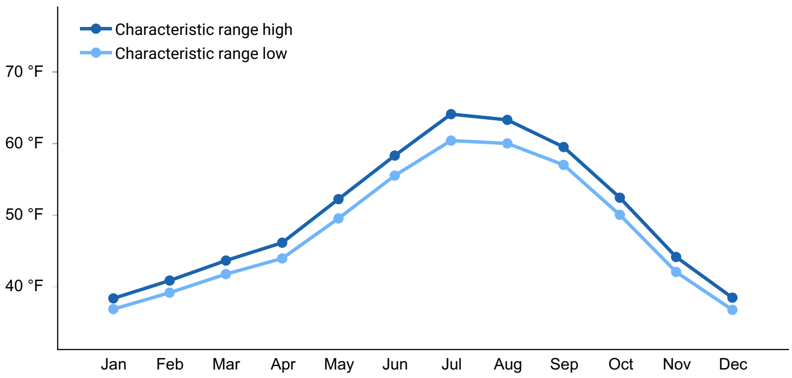


Figure 2. Monthly minimum temperature range

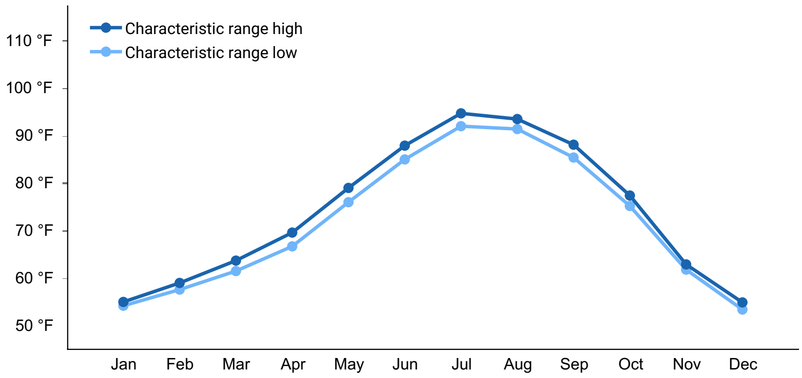


Figure 3. Monthly maximum temperature range

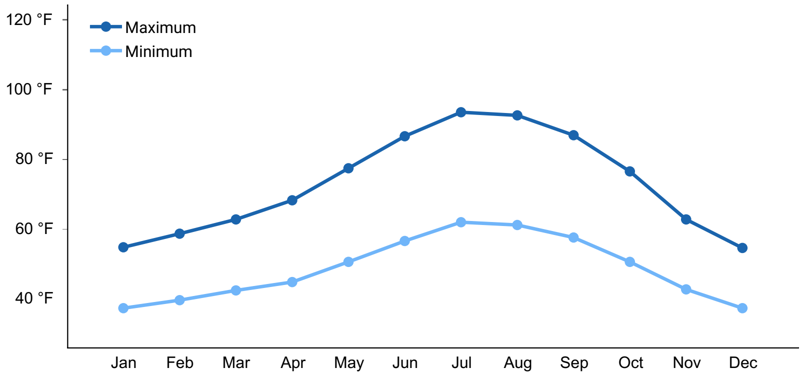


Figure 4. Monthly average minimum and maximum temperature

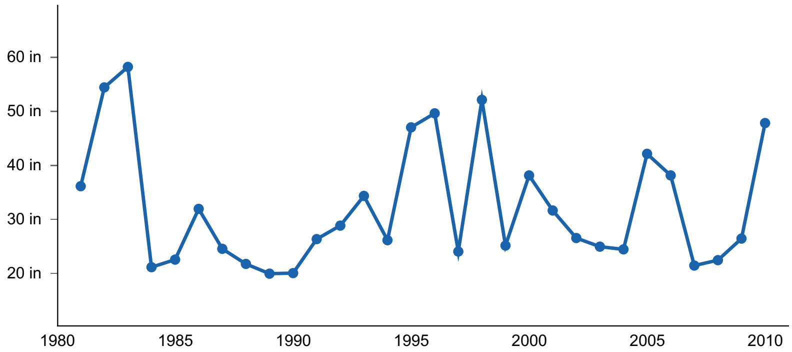


Figure 5. Annual precipitation pattern

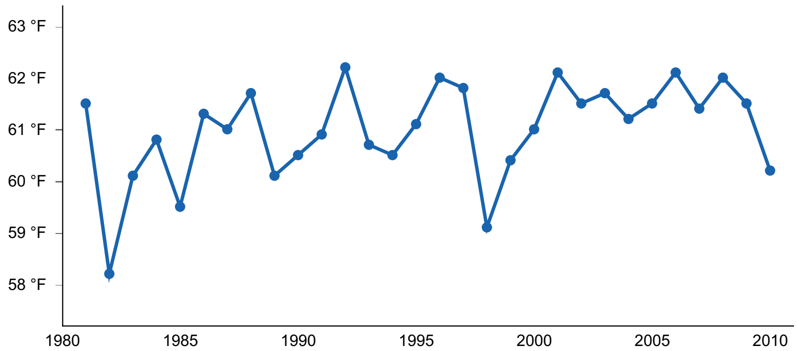


Figure 6. Annual average temperature pattern

Climate stations used

- (1) 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
- (5) AUBURN [USC00040383], Auburn, CA

Influencing water features

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

Wetland description

N/A

Soil features

The soils in this ecological site are formed from the colluvium and residuum of consolidated tuff and breccias. These soils tend to be shallow, the particle size control sections are loamy to loamy-skeletal, and surface textures include sandy loams, loams, and cobbly loams. Bedrock is restrictive and is typically found between 8 and 24 inches below the surface. Gravels (< 3 inch diameter) and larger fragments (= 3 inch diameter) range between 0 to 5% cover. Within the soil profile gravels range between 5 to 22% and larger fragments occupy 0 to 27% by volume. The soils in this ecological site are well drained and the permeability class is moderately rapid. Available Water Capacity (AWC) is ranges from 1 to 3.4 inches. The soil pH within the top 10 inches of the profile is between 5.3 and 6.5 and in the subsurface it is between 5 and 6.5.

Common soil components in this ecological site include Pentz, and Amador and Inks. Pentz is classified as a loamy, mixed, superactive, thermic, shallow Ultic Haploxeroll, Amador is a loamy, mixed, superactive, thermic, shallow Typic Haploxerepts, and Inks is a loamy-skeletal, mixed, superactive, thermic, shallow Ultic Argixeroll.

Table 5. Representative soil features

Parent material	(1) Residuum–tuff (2) Alluvium (3) Residuum–volcanic breccia (4) Colluvium–tuff
Surface texture	(1) Cobbly loam (2) Sandy loam
Drainage class	Well drained
Permeability class	Moderately rapid
Depth to restrictive layer	8–24 in
Soil depth	8–24 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	1–3.4 in
Soil reaction (1:1 water) (0-10in)	5.3–6.5
Subsurface fragment volume <=3" (0-60in)	5–22%
Subsurface fragment volume >3" (0-60in)	0–27%

Table 6. Representative soil features (actual values)

Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to rapid
Depth to restrictive layer	4–40 in

Soil depth	4–40 in
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–35%
Available water capacity (0-40in)	0.3–5.8 in
Soil reaction (1:1 water) (0-10in)	3.9–7.3
Subsurface fragment volume <=3" (0-60in)	0–60%
Subsurface fragment volume >3" (0-60in)	0–45%

Ecological dynamics

State and transition model

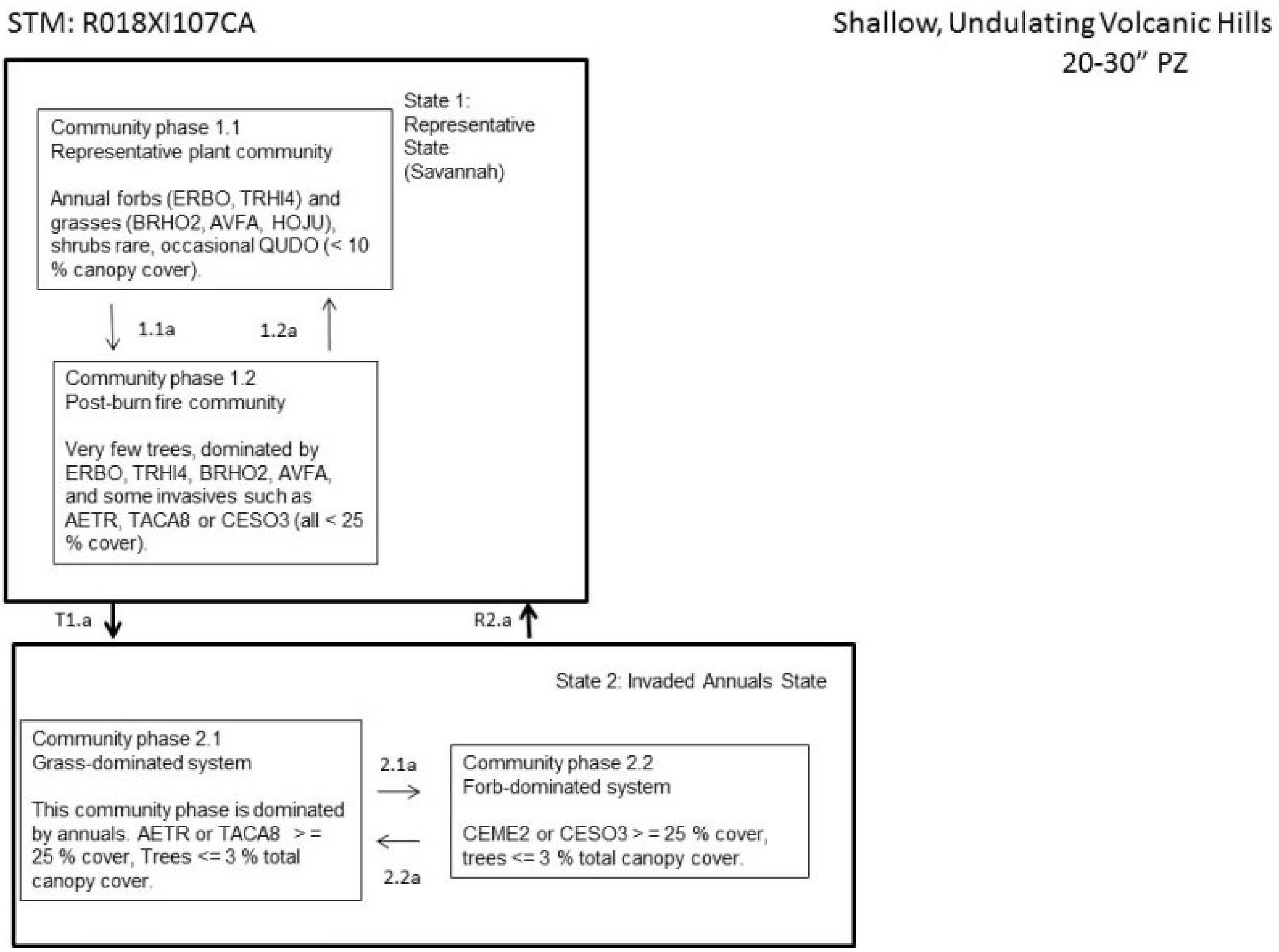


Figure 7. State and Transition Model

Community pathways and Transitions

T1.a This transition occurs when undesirable invasive plants become established.

1.1a This community pathway occurs following low to moderate severe fire, some trees die. Sometimes seeds of invasive, economically damaging plants come become established in the cleared spaces. Mechanical clearing can also result in this community phase pathway.

1.2a Scattered regeneration events, especially on the cool microsites (i.e. north facing exposures, sheltered by stumps of dead trees, etc.). Grazing dynamics often help maintain this state relatively open and keep the vegetation community in this phase.

R2.a This restoration pathway occurs with integrated weed management and may require mowing, herbicides, and/or biological control.

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.

Figure 8. Community Dynamics

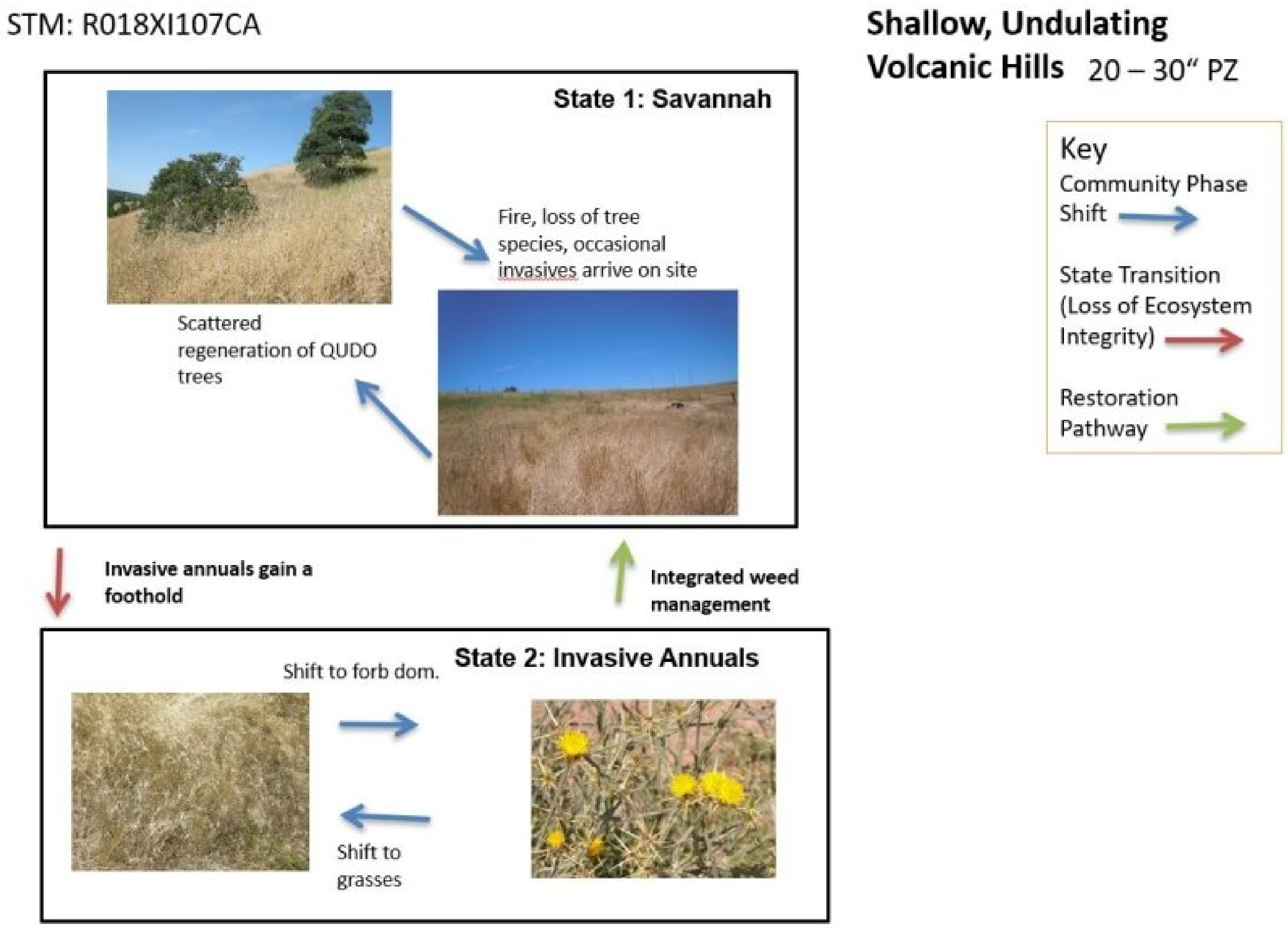


Figure 9. STM Photos

State 1
Representative State (Savannah

Community 1.1
Representative plant community

Annual forbs (ERBO, TRHI4) and grasses (BRHO2, AVFA, HOJU), shrubs rare, occasional QUDO (< 10 % canopy cover).

Community 1.2
Post-burn fire community

Very few trees, dominated by ERBO, TRHI4, BRHO2, AVFA, and some invasives such as AETR, TACA8 or CESO3 (all < 25 % cover).

Pathway 1.1a
Community 1.1 to 1.2

Representative plant community

Post-burn fire community

This community pathway occurs following low to moderate severe fire, some trees die. Sometimes seeds of invasive, economically damaging plants come become established in the cleared spaces. Mechanical clearing can also result in this community phase pathway.

Pathway 1.2a
Community 1.2 to 1.1

Post-burn fire community

Representative plant community

Scattered regeneration events, especially on the cool microsites (i.e. north facing exposures, sheltered by stumps of dead trees, etc.). Grazing dynamics often help maintain this state relatively open and keep the vegetation community in this phase.

State 2
Invaded Annuals State

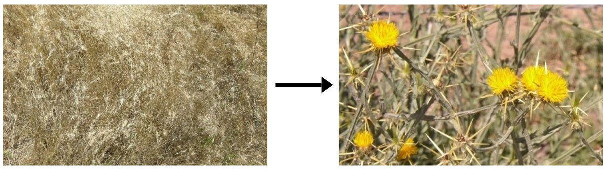
Community 2.1
Grass-dominated system

This community phase is dominated by annuals. AETR or TACA8 = 25 % cover, Trees

Community 2.2
Forb-dominated system

CEME2 or CESO3 = 25 % cover, trees

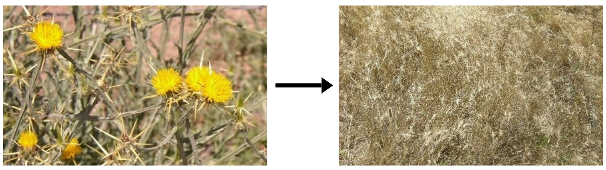
Pathway 2.1a
Community 2.1 to 2.2



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

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

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, often in response to increases in litter following high winter precipitation years.

Transition T1.a
State 1 to 2

This transition occurs when undesirable invasive plants become established.

Restoration pathway R2.a
State 2 to 1

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

Additional community tables

Inventory data references

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

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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	04/26/2024
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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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:**