USDA Natural Resources Conservation Service

Ecological site R018XE101CA
Very Deep Alkaline Alluvium

Last updated: 4/24/2024
Accessed: 05/12/2025

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

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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 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 very deep, alkaline soils occurring in alluvium on dissected terraces and alluvial fan remnants. Soil pH is generally at least slightly alkaline, with pH >7 throughout most of the profile. Free carbonates may be present. Slope gradient typically ranges from 1 to 40%. Precipitation ranges from 8 to 12 inches per year,

and elevation ranges from 1290 to 3300 feet.

The overriding abiotic factor controlling vegetation expression is alkaline (high pH) soils which can make some nutrients less available for plant uptake; limiting range productivity. Common soils correlated to this ecological site are Steuber (Coarse-loamy, mixed, superactive, nonacid, thermic Mollic Xerofluvents), Havala (Fine-loamy, mixed, superactive, thermic Pachic Argixerolls), and Tehachapi (Fine-loamy, mixed, active, thermic Typic Argixerolls)

This vegetation community consists of annual grasses and forbs. Dominant plants include soft brome (Bromus hordeaceus), wild oat (Avena fatua), redstem stork's bill (Erodium cicutarium), bur clover, (Medicago hispida), and ripgut brome (Bromus diandrus). Occasional perennial plants such as purple needlegrass (Nassella pulchra) may also occur at this site. Production ranges from 800 to 3000 lbs per acre.

Associated sites

F018XE201CA	**Granitic Hills and Mountains** This site commonly occurs nearby.

Similar sites

R018XI164CA	**Clayey Dissected Swales** 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 in mountain valleys, fan piedmonts, flood plains, and alluvial fans with slope gradients that range from 1 to 20 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain valley (2) Foothills > Flood plain (3) Foothills > Fan piedmont (4) Foothills > Alluvial fan
Runoff class	Very low to very high
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	None to occasional
Ponding duration	Not specified
Ponding frequency	None
Elevation	1,290–3,300 ft
Slope	1–40%
Ponding depth	0 in
Water table depth	0–80 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Very low to very high

Flooding duration	Very long (more than 30 days)
Flooding frequency	None to frequent
Ponding duration	Long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	7–4,500 ft
Slope	0–50%
Ponding depth	0–40 in
Water table depth	0–80 in

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 56 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

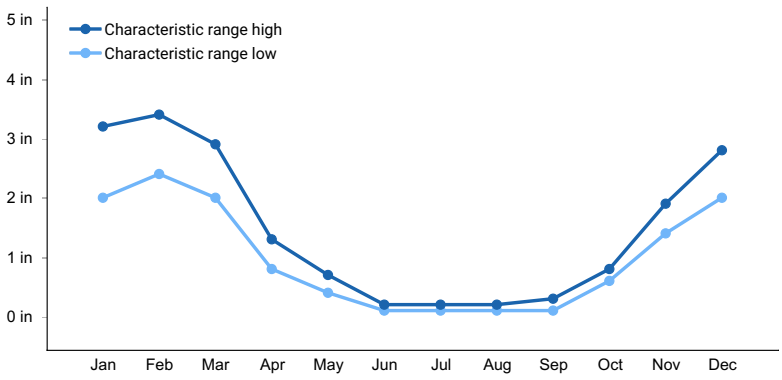

Figure 1. Monthly precipitation range

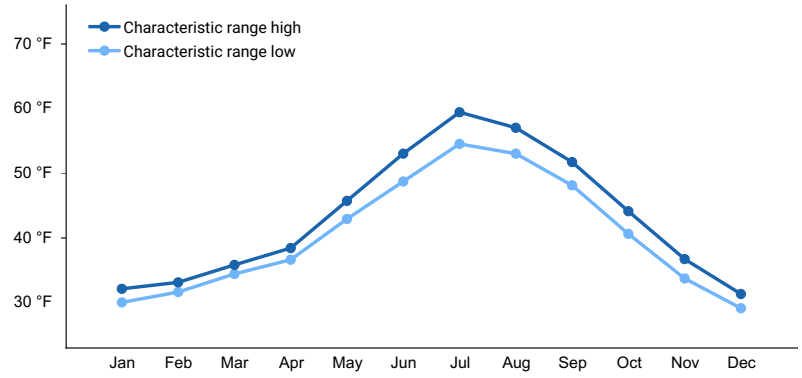

Figure 2. Monthly minimum temperature range

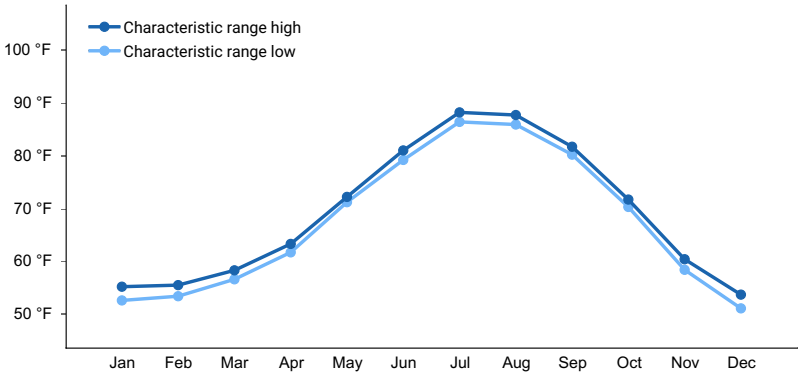

Figure 3. Monthly maximum temperature range

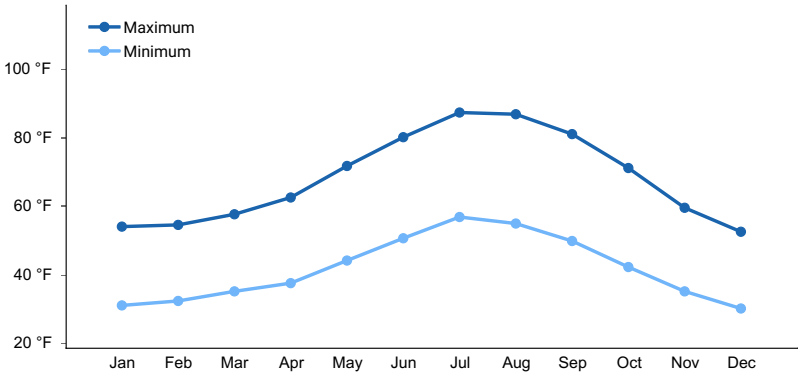

Figure 4. Monthly average minimum and maximum temperature

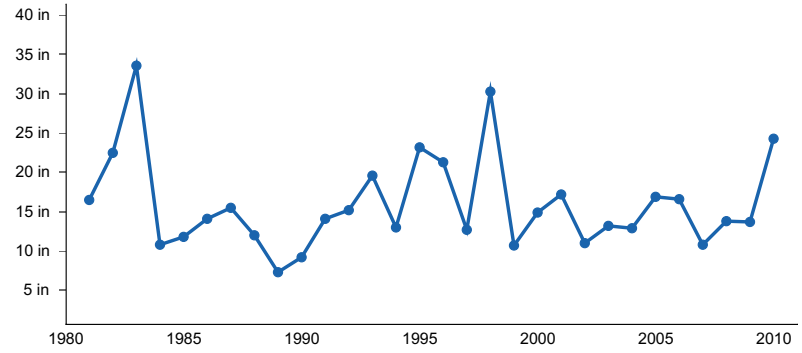

Figure 5. Annual precipitation pattern

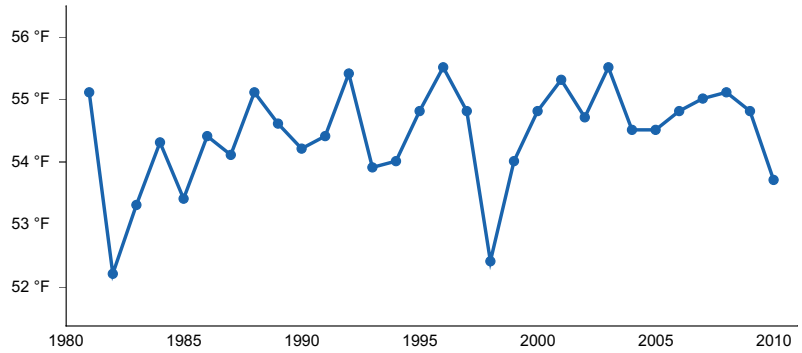

Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

This site can experience flooding and/or ponding conditions during periods of high water level in adjacent drainageways. The most extensive flooding and ponding occurs in the late fall to early spring months (from November to April). Complex arrangements of terraces, alluvial fans, and dynamics of water table depth versus distance from stream result in wide variation in the frequency and duration of flooding and ponding within a landscape and across all soil components correlated to this ecological site.

Wetland description

N/A

Soil features

The soils in this ecological site are formed in mixed alluvium (primarily of granitic origin). The soils are very deep and lack a restrictive feature within the upper 80 inches. The particle size control section is fine-loamy or coarse loamy. The surface texture is sandy loam, sandy clay loam or gravelly sandy loam. Gravels on the soil surface range from 5 to 35% cover and larger fragments range from 0 to 10% cover. Gravels (≤3 inch diameter) range from 0 to 15% by volume throughout the profile and larger fragments (> 3 inch diameter) range from 0 to 20% by volume throughout the profile. Most soils in this ecological site are well drained, but drainage class ranges from very poorly drained to somewhat excessively drained due to variability within alluvial landforms, proximity to drainageway, and in some instances altered hydrology. Available Water Storage (AWS) in the profile ranges from 3 to 6 inches. The soils in this site are neutral to slightly alkaline throughout; sometimes with secondary accumulations of carbonate. Surface pH and subsurface pH ranges from 7 to 8. Common soils correlated to this ecological site are Steuber (Coarse-loamy, mixed, superactive, nonacid, thermic Mollic Xerofluvents), Havala (Fine-loamy, mixed, superactive, thermic Pachic Argixerolls), and Tehachapi (Fine-loamy, mixed, active, thermic Typic Argixerolls)

Table 5. Representative soil features

Parent material	(1) Alluvium–granite (2) Alluvium–granitoid (3) Alluvium–igneous, metamorphic and sedimentary rock
Surface texture	(1) Sandy loam (2) Gravelly sandy loam (3) Sandy clay loam
Drainage class	Well drained
Permeability class	Moderate to rapid

Surface fragment cover <=3"	5–35%
Surface fragment cover >3"	0–10%
Available water capacity (0-40in)	3.2–5.7 in
Soil reaction (1:1 water) (0-10in)	6.9–8
Subsurface fragment volume <=3" (0-60in)	5–15%
Subsurface fragment volume >3" (0-60in)	0–20%

Table 6. Representative soil features (actual values)

Drainage class	Very poorly drained to somewhat excessively drained
Permeability class	Moderately slow to rapid
Surface fragment cover <=3"	0–50%
Surface fragment cover >3"	0–65%
Available water capacity (0-40in)	0.5–6.8 in
Soil reaction (1:1 water) (0-10in)	6–9
Subsurface fragment volume <=3" (0-60in)	0–50%
Subsurface fragment volume >3" (0-60in)	0–60%

Ecological dynamics

State and transition model

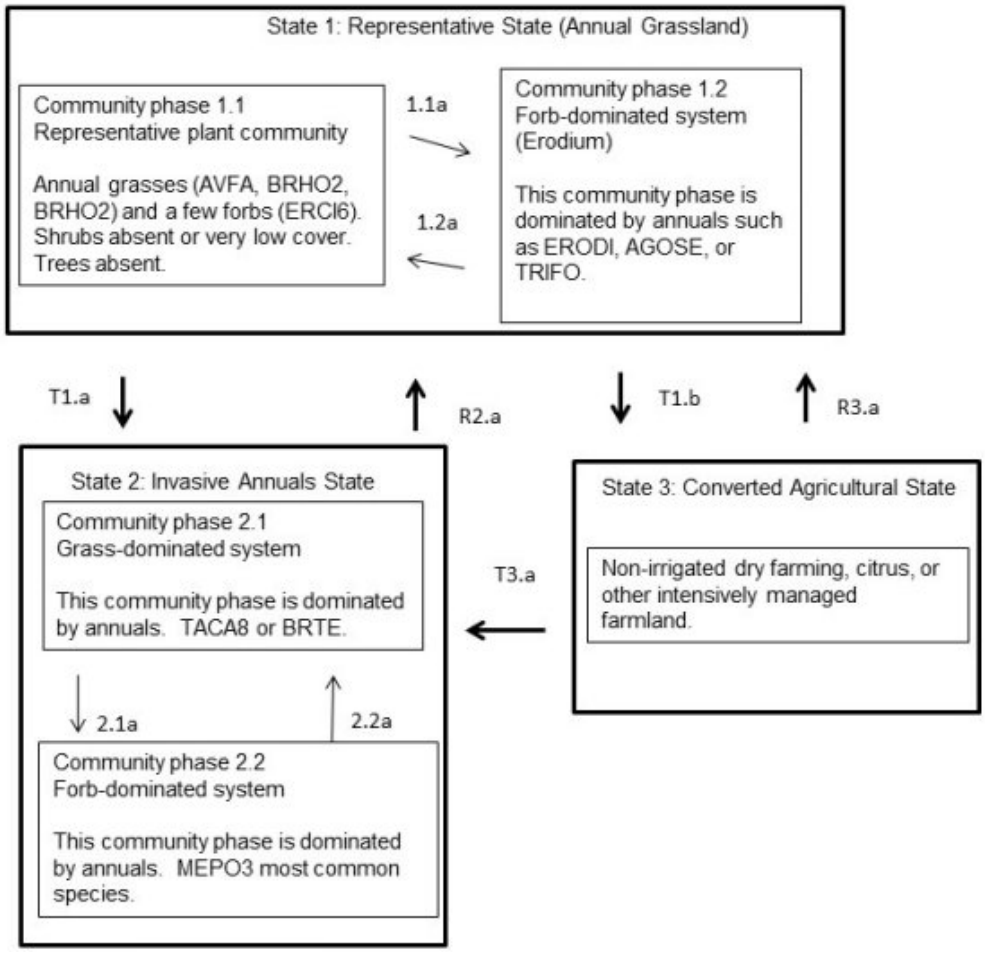

Figure 7. State and Transition Model.

Community pathways and Transitions

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

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 transition 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, 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 high winter precipitation and greater cover of litter.

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.

Figure 8. Community Pathways and Transitions.

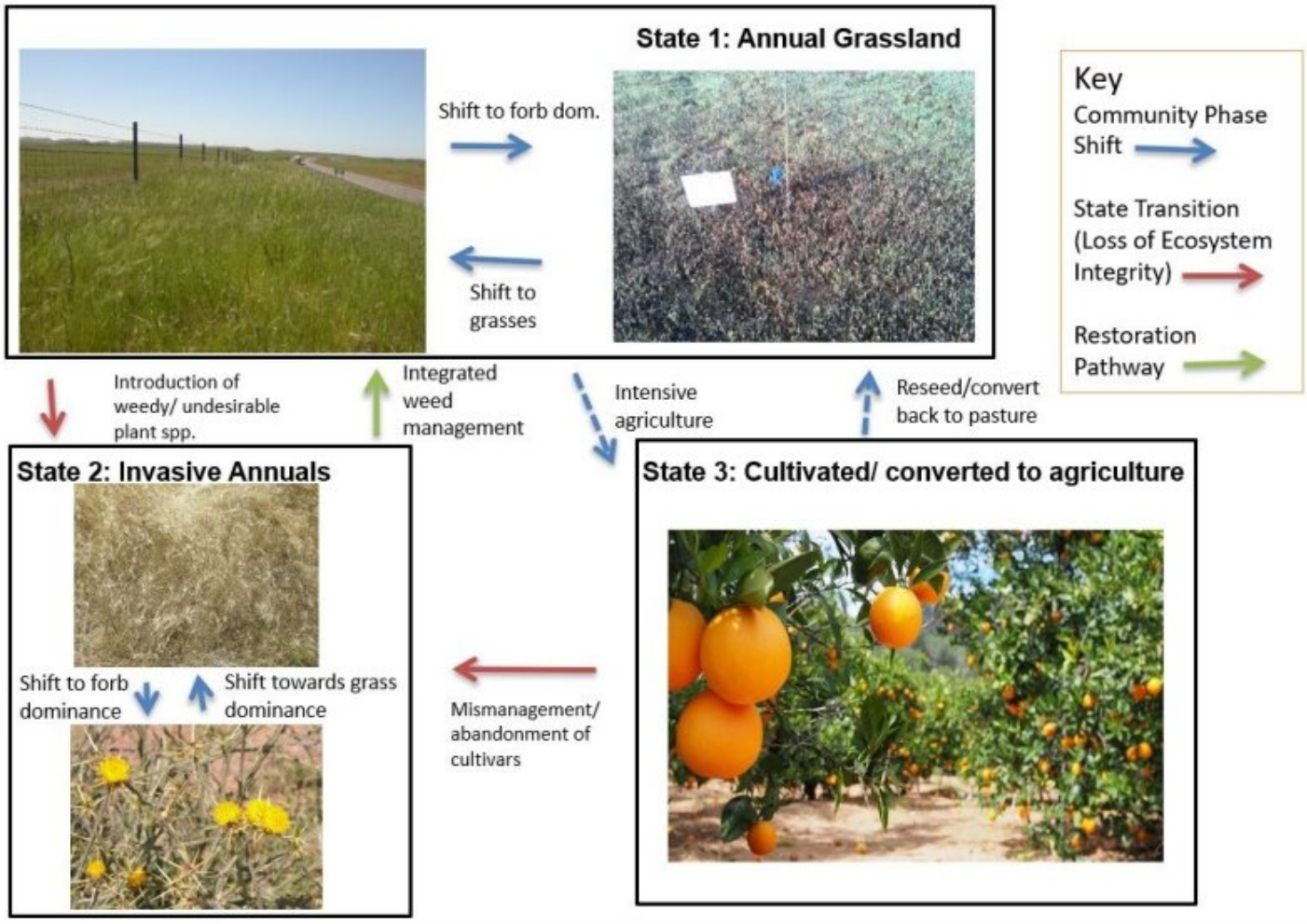

Figure 9. STM Photos

State 1
Representative State (Annual Grassland)

Community 1.1
Representative plant community

Annual grasses (AVFA, BRHO2) and a few forbs (ERCI6). Shrubs absent or very low cover. Trees absent.

Dominant plant species

- wild oat (*Avena fatua*), grass
- soft brome (*Bromus hordeaceus*), grass
- redstem stork's bill (*Erodium cicutarium*), other herbaceous

Community 1.2
Forb-dominated system (Erodium)

This community phase is dominated by annuals such as ERODI, AGOSE, or TRIFO.

Dominant plant species

- stork's bill (*Erodium*), other herbaceous
- agoseris (*Agoseris*), other herbaceous
- clover (*Trifolium*), 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
Invasive Annuals State

Community 2.1
Grass-dominated system

This community phase is dominated by annuals. TACA8 or BRTE.

Dominant plant species

- medusahead (*Taeniatherum caput-medusae*), grass
- cheatgrass (*Bromus tectorum*), grass

Community 2.2
Forb-dominated system

This community phase is dominated by annuals. CESO3 most 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, 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 high winter precipitation and greater cover of litter.

State 3
Converted Agricultural State

Community 3.1
Farmland

Non-irrigated dry farming, citrus, 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 transition occurs with integrated weed management. May require mowing, herbicides, and/or biological control.

Transition T2.b
State 2 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 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.

Additional community tables

Inventory data references

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

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	05/12/2025
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:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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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:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:

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17. **Perennial plant reproductive capability:**
