Ecological site NX117X01Y029
Terrace

Last updated: 9/22/2023
Accessed: 05/05/2024

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): 117X–Boston Mountains

This MLRA is about 6,850 square miles (17,775 square kilometers) and is in Arkansas (82 percent) and Oklahoma (18 percent). The Ozark National Forest makes up a significant portion of the MLRA.

This area is predominantly in the Boston Mountains Section of the Ozark Plateaus Province of the Interior Highlands. This MLRA marks the southern extent of the Ozarks, a deeply eroded plateau. Ridges of the MLRA are narrow and rolling, and valley sides are steep. Elevation ranges from 570 feet (170 meters) to 1,860 feet (560 meters). Some lower and higher areas are on valley floors and crests of ridges, respectively.

Level to slightly tilted shale, sandstone, and siltstone strata of geologic formations from the Pennsylvanian Subperiod underlie most of the MLRA. These formations include the Atoka Formation, the Bloyd Shale, and the Cane Hill and Prairie Grove Members of the Hale Formation. The Pitkin Limestone, Fayetteville Shale, and Batesville Sandstone Formations from the Mississippian Subperiod underlie parts of the northern edge of the MLRA. Alluvial deposits are in river valleys and consist of an unconsolidated mixture of clay, silt, sand, and gravel.

The MLRA has a thermic soil temperature regime and a udic soil moisture regime. The dominant soil orders are Ultisols and Inceptisols. The soils are loamy and have mixed or siliceous mineralogy. They are shallow to very deep and are well drained. Hapludults and Dystrudepts formed in residuum on hills, plateaus, and mountains. Paleudults, on terraces and hills, formed in old alluvium over residuum or colluvium over residuum.

Ecological site concept

The Terrace Ecological Site is on stream terraces above the main flood plain. The soils associated with this site are very deep and well drained. They formed in alluvium from sandstone, siltstone, and shale. Slope ranges from 0 to 18 percent, and elevation ranges from 490 to 2,170 feet. The particle-size control section has more than 18 percent clay. This site is subject to very rare flooding events for very brief periods.

Associated sites

NX117X01Y030	**Flood Plain** This site is on flood plains alongside rivers or streams. The site is subject to occasional or frequent flooding for brief periods between January and July. This site may also occur due to slope run off on toe slopes and foot slopes.

Similar sites

NX117X01Y035	**Seasonally Wet Loamy Upland** This site is on hillslopes of hills and has deep or very deep soils. There is a perched water table 24 to 36 inches below the soil surface in late winter and spring.

Table 1. Dominant plant species

Tree	(1) *Quercus* (2) *Platanus*
Shrub	(1) *Alnus* (2) *Hamamelis*
Herbaceous	(1) *Panicum virgatum* (2) *Schizachyrium scoparium*

Legacy ID

F117XY029AR

Physiographic features

This ecological site is on stream terraces above the main flood plain. Slope ranges from 0 to 18 percent, and elevation ranges from 490 to 2,170 feet (150 to 660 meters). The runoff class is low or medium. The site is subject to very rare flooding events.

Table 2. Representative physiographic features

Landforms	(1) Hills > Stream terrace (2) Bench (3) Hillside
Runoff class	Low to medium
Flooding frequency	None to very rare
Ponding frequency	None
Elevation	149–661 m
Slope	0–18%

Climatic features

Hot summers, cool winters, and mild spring and fall temperatures are typical for the ecological site. The mean annual precipitation is 51 inches. The average frost-free period is 165 days, and the average freeze-free period is 191 days. The highest precipitation occurs in May (6.2 inches), and the lowest occurs in January (3.0 inches). The warmest month of the year is August (91°F average high), and the coolest is January (25°F average low). Thunderstorms and heat waves are common and occur frequently during the summer months.

Occasionally, catastrophic storm events, such as tornados, ice storms, floods, and hailstorms, will occur. According to the Oklahoma Water Resource Board, drought occurs every 5 to 10 years (Oklahoma Water Resource Board, 2022). The EPA predicts droughts will become more severe throughout Arkansas due to longer periods without rain and an increase in very hot days (EPA, 2016).

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/. The Fayetteville, Mountainburg, and Mountain View climate stations provided general climate data. Site-specific climate data is available through the National Weather Service.

Table 3. Representative climatic features

Frost-free period (characteristic range)	159-169 days
Freeze-free period (characteristic range)	188-195 days
Precipitation total (characteristic range)	1,245-1,321 mm
Frost-free period (actual range)	158-174 days
Freeze-free period (actual range)	185-196 days

Precipitation total (actual range)	1,245-1,321 mm
Frost-free period (average)	165 days
Freeze-free period (average)	191 days
Precipitation total (average)	1,295 mm

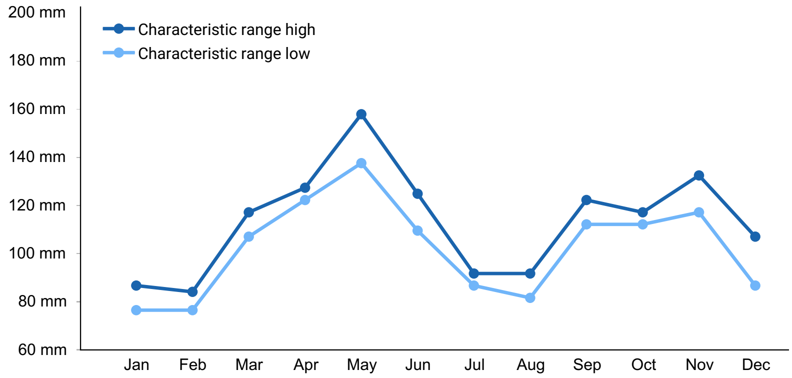


Figure 1. Monthly precipitation range

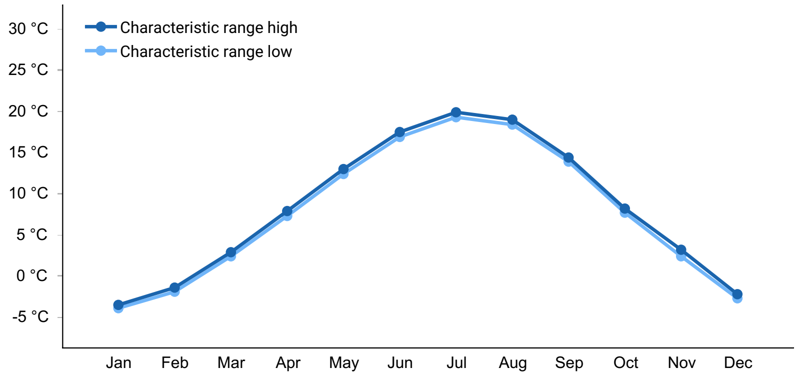


Figure 2. Monthly minimum temperature range

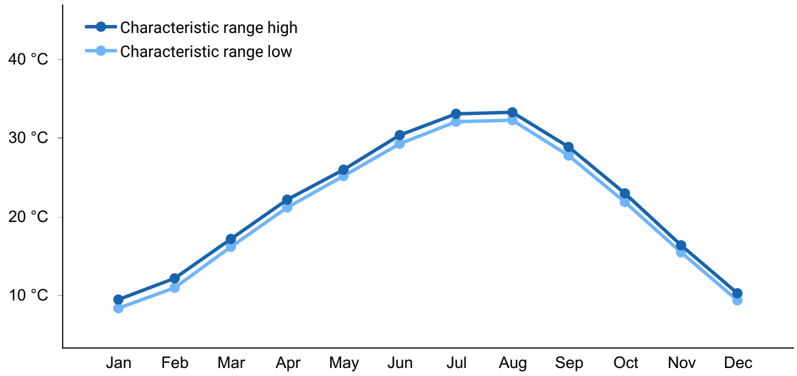


Figure 3. Monthly maximum temperature range

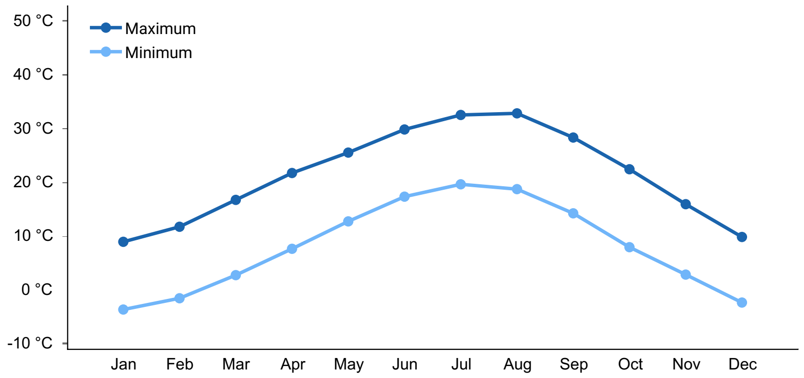


Figure 4. Monthly average minimum and maximum temperature

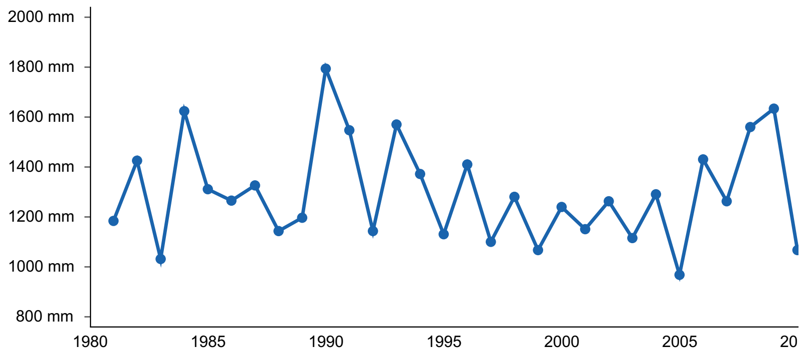


Figure 5. Annual precipitation pattern

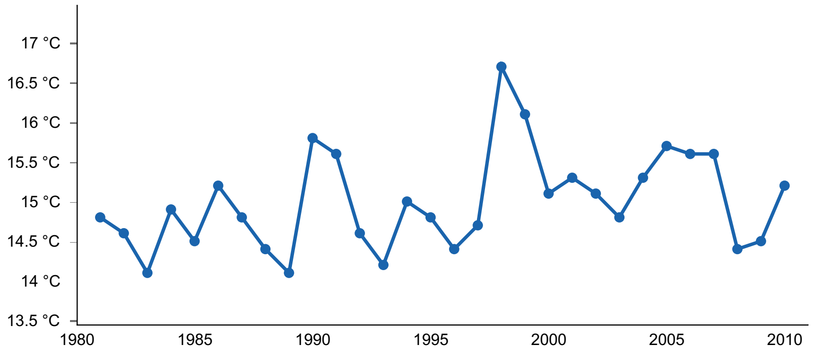


Figure 6. Annual average temperature pattern

Climate stations used

- (1) MTN VIEW [USC00035046], Mountain View, AR
- (2) FAYETTEVILLE DRAKE FLD [USW00093993], Fayetteville, AR
- (3) MOUNTAINBURG 2 NE [USC00035018], Mountainburg, AR

Influencing water features

Flooding occurs very rarely (1 time in 500 years) for brief periods (4 to 48 hours).

Wetland description

Wetlands do not significantly influence this ecological site.

Soil features

The soils associated with this ecological site formed in alluvium from sandstone, siltstone, and shale. The soils are very deep, are well drained, and have a moderate permeability class. The surface texture is commonly fine sandy loam or gravelly sandy loam, and the particle-size control section has greater than 18 percent clay.

The soil series associated with this site are the Spadra and Allegheny Series.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone (2) Alluvium–shale and siltstone
Surface texture	(1) Fine sandy loam (2) Gravelly sandy loam
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	152–203 cm
Surface fragment cover <=3"	0–12%
Surface fragment cover >3"	5–12%
Available water capacity (Depth not specified)	8.64–20.07 cm
Soil reaction (1:1 water) (Depth not specified)	4.5–6
Subsurface fragment volume <=3" (Depth not specified)	5–14%
Subsurface fragment volume >3" (Depth not specified)	0–7%

Ecological dynamics

The Reference State for this ecological site is a bottomland hardwood forest. Common tree species include oak, sycamore, hickory, and hackberry (Bedinger, 1979). This ecological site is part of the South-Central Interior Large Floodplain System and the Arkansas Valley Prairie and Woodland System (NatureServe, 2009). These ecosystems are known as hardwood flats in the HGM (hydrogeomorphic) classification system (Klimas et.al., 2009).

Fire somewhat influences this ecological site during dry years. High precipitation throughout the year impacts fire behavior due to proximity to riparian areas (NatureServe, 2009). Historically, the average fire-return interval was likely between 3 and 25 years for the surrounding landscape (Guyette and Spetich, 2003; Hallgren et al., 2012). Some of these wildfires occurred naturally through lightning strikes, but human activities probably caused most of these fires(DeSantis et al., 2010).

Climate-related events, such as floods, hailstorms, tornados, thunderstorms, and extreme precipitation, occur on these sites. Hailstorms can reduce canopy size, increase litter deposition, and increase tree bark removal. When paired with other disturbances, such as fire, the effects on tree species were much greater than in areas not affected by the hailstorm (Gower et al., 2015). Tornados can change plant community compositions in savanna ecosystems, favoring hardwoods and eliminating softwoods (Liu et al., 1997). Lightning storms greatly affect ecosystems. Lightning storms generally occur during summer months but can occur during any season. If a fire starts with a lightning strike, the effects on the ecosystem vary depending on the season (Hiers et al., 2000).

Grazing and farming are feasible for this ecological site. Changes to the ecological dynamics are proportional to the intensity of livestock grazing and can accelerate through overgrazing (Angerer et al., 2016). For example, desirable grasses and forbs repeatedly grazed by livestock become weak and can die, and less desirable species may replace preferable species (Smith, 1940).

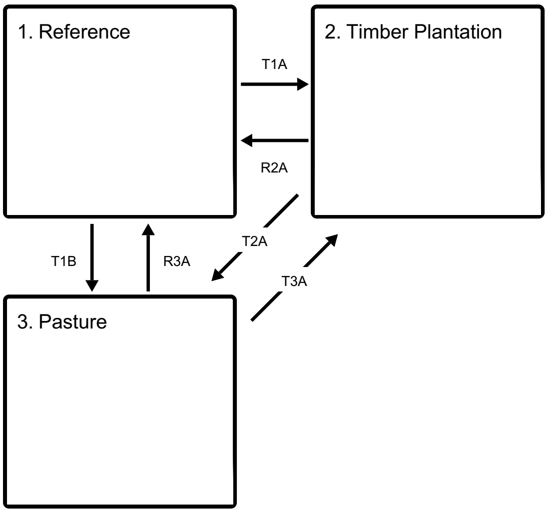
Timber harvesting alters the form and function of oak-pine ecosystems. Depending on the timber harvest method used (shelterwood, group selection, single-tree selection, seed tree, variable retention, or clearcutting), ecosystem dynamics can change very little or completely alter in form and function (Clark and Covey, 2012). Most of the currently forested sites have younger stands. Timber harvest practices alter the species composition and quality of these stands and reduce the ecological value of the site. (Guldin and Fitzpatrick, 1991).

Floods occur very rarely on this ecological site. Flooding affects ecosystems differently depending on flooding duration, the time of year, and ponding duration. Flooding during the dormant season does not negatively affect species diversity or growth (Bedinger, 1979). Flooding events transport and distribute nutrients and seeds throughout the landscape.

The state-and-transition model for the Terrace Ecological Site consists of three identified states: Reference, Timber Plantation, and Pasture. Because of sparse data availability, the model only explored basic principles and included only a small number of species. Further data collection from this ecological site would provide a greater understanding of ecological form and function and of resource consumption and distribution.

State and transition model

Ecosystem states



T1A - Planting of merchantable trees Targeted suppression of vegetation Prescribed fire Fertilization

T1B - Tree removal Mechanical and chemical suppression of woody vegetation Tillage Introduction of annual or perennial forage species

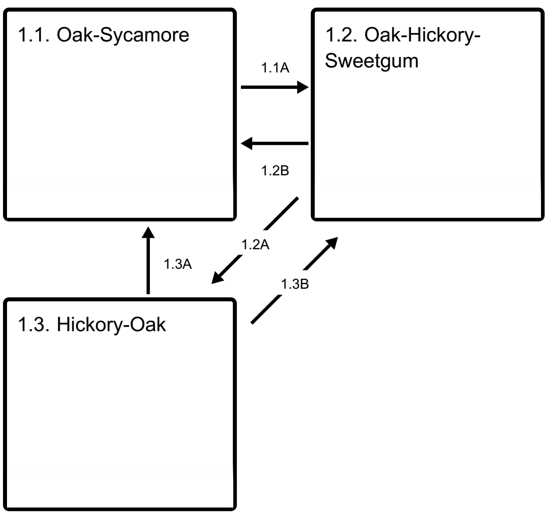
R2A - Natural regeneration and disturbance regimes

T2A - Tree removal Mechanical and chemical suppression of woody vegetation Tillage Introduction of annual or perennial forage species

R3A - Natural regeneration and disturbance regimes

T3A - Planting of merchantable trees Targeted suppression of vegetation Prescribed fire Fertilization

State 1 submodel, plant communities



1.1A - Lower precipitation and less soil moisture

1.2B - Higher precipitation and more soil moisture

1.2A - Lower precipitation and less soil moisture

1.3A - Higher precipitation and more soil moisture

1.3B - Higher precipitation and more soil moisture

State 2 submodel, plant communities

2.1. Loblolly Pine

State 3 submodel, plant communities

3.1. Bermudagrass

State 1
Reference

The Reference State represents the natural range of variability for the ecological site without major human influences. The main drivers for community pathways within the Reference State are climate effects (decadal scale), insect and disease presence or establishment, flooding events, wildlife grazing or browsing, and wildfire frequency and intensity. High soil moisture and very rare flooding events are the main feedback mechanisms within this state. Because these factors limit the types of species that can grow and survive, water-tolerant trees dominate the ecological site.

Characteristics and indicators. The Reference State consists of a bottomland hardwood forest. Common tree species for this state are oak, sycamore, hickory, and hackberry (Bedinger, 1979).

Dominant plant species

- oak (*Quercus*), tree
- hybrid hickory (*Carya*), tree
- hackberry (*Celtis*), tree
- sycamore (*Platanus*), tree
- pine (*Pinus*), tree
- sweetgum (*Liquidambar*), tree

Community 1.1
Oak-Sycamore

Community 1.2
Oak-Hickory-Sweetgum

Community 1.3
Hickory-Oak

Pathway 1.1A
Community 1.1 to 1.2

This pathway consists of lower precipitation and less soil moisture.

Pathway 1.2B
Community 1.2 to 1.1

This pathway consists of higher precipitation and more soil moisture.

Pathway 1.2A
Community 1.2 to 1.3

This pathway consists of lower precipitation and less soil moisture.

Pathway 1.3A
Community 1.3 to 1.1

This pathway consists of higher precipitation and more soil moisture.

Pathway 1.3B
Community 1.3 to 1.2

This pathway consists of higher precipitation and more soil moisture.

State 2
Timber Plantation

The Timber Plantation State consists of merchantable trees planted to maximize production and wood volume. Common species include loblolly pine and oak. Important ecological drivers in this state include timber type (softwood or hardwood) and harvest method. The main drivers for community pathways in this state are prescribed fire, pest management, vegetation management, and canopy density. Timber harvesting is the main feedback mechanism for this state. Management focuses on increasing the growth of cultivated species.

Dominant plant species

- loblolly pine (*Pinus taeda*), tree
- oak (*Quercus*), tree

Community 2.1
Loblolly Pine

State 3
Pasture

Species that improve forage quality dominate the Pasture State. The quality and quantity of forbs and grass species within this state depend on the level of management inputs (seeding, weed management, and land uses). Both warm-season and cool-season forages are suitable for this ecological site. The main drivers for community pathways in this state are the mechanical disturbance of the soil and seed planting, climate effects (decadal scale), seed dispersal, and wildlife or livestock grazing or browsing. The main feedback mechanism in this state is the use of mechanical equipment or chemicals to maintain a productive pasture. Wildlife or livestock grazing or browsing reduces the amount of available forage. Fertilizer inputs and brush management are essential for maintaining high productivity.

Dominant plant species

- Bermudagrass (*Cynodon dactylon*), grass
- red clover (*Trifolium pratense*), grass

Community 3.1
Bermudagrass

Transition T1A
State 1 to 2

The main triggers for this transition are the planting of merchantable trees, targeted suppression of vegetation, prescribed fire, and fertilization. The main slow variables for this transition are increased production and management of merchantable trees, alongside tree thinning when appropriate. The main thresholds for this transition are the removal of existing vegetation and the planting of timber species.

Transition T1B
State 1 to 3

The main triggers for this transition are tree removal, mechanical and chemical suppression of woody vegetation, tillage, and the introduction of annual or perennial forage species. The main slow variables for this transition are increased production and management of forage species. The main thresholds for this transition are changes in soil properties, such as structure, organic matter, and nutrient cycling, and changes in type and frequency of disturbance.

Restoration pathway R2A
State 2 to 1

Restoration efforts for this pathway begin with mechanical and chemical treatment of undesirable woody vegetation and seeding native species. A grazing management plan and a reintroduction of historical disturbance regimes must accompany these initial treatments. Returning to a historical fire interval through prescribed burning helps to suppress woody vegetation and manage invasive species.

Transition T2A
State 2 to 3

The main triggers for this transition are tree removal, mechanical and chemical suppression of woody vegetation, tillage, and the introduction of annual or perennial forage species. The main slow variables for this transition are increased production and management of forage species. The main thresholds for this transition are changes in soil properties, such as structure, organic matter, and nutrient cycling, and changes in type and frequency of disturbance.

Restoration pathway R3A
State 3 to 1

Restoration efforts for this pathway include the removal of introduced species, cessation of suppression activities affecting desirable species, planting of native species, and regeneration. Introduced species may need removing several times before native species can flourish.

Transition T3A
State 3 to 2

The main triggers for this transition are the planting of merchantable trees, targeted suppression of vegetation, prescribed fire, and fertilization. The main slow variables for this transition are increased production and management of merchantable trees, alongside tree thinning when appropriate. The main threshold for this transition is the suppression of introduced forage species due to management strategies and shading from the canopy.

Additional community tables

Animal community

Common wildlife species in this MLRA include whitetail deer, coyote, red fox, gray fox, bobcat, beaver, raccoon, opossum, skunk, muskrat, mink, cottontail, fox squirrel, gray squirrel, bobwhite quail, and mourning dove.

Hydrological functions

The following are estimated withdrawals of freshwater by use in this MLRA:

Public supply—surface water, 24.4%; ground water, 5.1%
Livestock—surface water, 8.1%; ground water, 0.6%
Irrigation—surface water, 0.0%; ground water, 0.0%
Other—surface water, 61.8%; ground water, 0.0%

Total withdrawals average 95 million gallons per day (360 million liters per day). About 6 percent is from groundwater sources, and 94 percent is from surface-water sources. The moderately high precipitation is adequate for crops and pasture. Large reservoirs on a few major streams supply water for municipal purposes, aid in flood control, and provide recreation opportunities. The surface-water quality is generally good, and the water is suitable for most uses. Shallow wells are the principal sources of water for domestic use. Deep wells are necessary for obtaining moderate to large quantities of ground water. Water from the Ozark aquifer system in the northern half of this MLRA is suitable for drinking.

Recreational uses

In this MLRA, mountain biking, camping, fishing, hiking, horseback riding, hunting, mineral prospecting, nature viewing, off-highway vehicle riding, and water activities are available where permitted on public land, and where allowed on private land. The Ozark National Forest makes up a significant portion of this MLRA.

Wood products

Public and private timberland cover large areas throughout this MLRA. Loblolly pine is the most popular species to harvest and provides timber for lumber, pulpwood, posts, and poles. Hardwood species provide timber for lumber, flooring, and pulpwood.

Other products

Poultry production is a major industry throughout the MLRA. Small grains, soybeans, and hay are major crops.

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NatureServe
Oklahoma Water Resource Board
National Centers For Environmental Information
University of Arkansas
Oklahoma State University
Arkansas Department of Forestry
Oklahoma Department of Forestry

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Approval

Bryan Christensen, 9/22/2023

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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	05/05/2024
Approved by	Bryan Christensen
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:**

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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:**
