Ecological site F134XY303LA
West Central Natric Loess Terrace - PROVISIONAL

Accessed: 05/15/2024

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): 134X–Southern Mississippi Valley Loess

MLRA 134, Southern Mississippi Valley Loess, is in Mississippi (39 percent), Tennessee (23 percent), Louisiana (15 percent), Arkansas (11 percent), Kentucky (9 percent), Missouri (2 percent), and Illinois (1 percent). It makes up about 26,520 square miles (68,715 square kilometers). The northern part of the area includes Paducah and Murray, Kentucky; Paragould, Jonesboro, and Forrest City, Arkansas; and Memphis, Dyersburg, Bartlett, and Germantown, Tennessee. The southern part includes Yazoo City, Clinton, and Jackson, Mississippi, and Baton Rouge, Opelousas, Lafayette, and New Iberia, Louisiana. This portion is the central western part of the MLRA in Louisiana and Arkansas. It is in the Macon Ridge Section of the EPA Ecoregions in sub-section 73j. The dissected plains in this MLRA have a loess mantle that is thick at the valley wall and thins rapidly as distance from the valley wall increases. This portion of the MLRA is distinct from other portions of the MLRA because of the influences of the Mississippi River and it series of entrenchments and adjacent old channels of the Arkansas River, such channels as Bayou Bartholomew, Bayou Bonnne Idee, Boeuf River, and segments of the Ouachita River. The Macon Ridge has been inhabited prior to European Settlement, Poverty Point is located on the east central portion of the Macon Ridge and has earthworks dating back to 1700-1100 BC.

Classification relationships

Major Land Resource Area (MLRA) and Land Resource Unit (LRU) (USDA-Natural Resources Conservation Service, 2006)
EPA Level IV Ecoregion
The Natural Communities of Louisiana - (Louisiana Natural Heritage Program - Louisiana Department of Wildlife and Fisheries)

Ecological site concept

Nearly level Somewhat Poorly to Poorly Drained, natric (Saline), thin local loess alluvium mixed with clayey alluvium over braided stream material. The site is found on level to depressional broad flats on terraces of the Macon Ridge. It is a complex of wet & dry Saline communities. Limitations of this site include a potential for a high or perched water table, with potential for high exchangeable Al (Aluminum). This soil chemistry limitation are significant because, Aluminum (Al) toxicity limits production on strongly acidic soils, pH values at or below 5. Toxic forms of Al solubilized into the soil solution, inhibiting root growth and function (Kochian etal). Salinity splits this site from other sites. Range of variability for drainage class could separate this into 2 sites with additional data. Delta Post oak, Willow oak, Winged Elm and Cherrybark oak occur on the site and Loblolly pine on the better drained areas. A Hardwood Forest plant community exists with exclusion of fire, however, if fire is introduced the plant community shifts to a Savanna plant community dominated by Delta Post Oak and Three Awn. These types of communities would have persisted under natural conditions and with the management of Native Americans.

Associated sites

F134XY304LA	**West Central Somewhat Poorly Drained Flats - PROVISIONAL** Similar to this site with additional limitations of Natric soil properties.

Similar sites

F134XY304LA	**West Central Somewhat Poorly Drained Flats - PROVISIONAL** Similar to this site with additional limitations of Natric soil properties.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

Macon Ridge in extreme northeastern Louisiana and southeastern Arkansas is a 135-mile long prominent ridge that lies between the Boeuf and Tensas Basins. It reaches a maximum width of about 25 miles in northeastern Louisiana about 30 miles north of Sicily Island. The ridge is consistently higher on its eastern side where elevations are 20 to 30 feet higher than in the adjacent Tensas Basin (floodplain). On the western side, elevations of the ridge are approximately the same as those in the Boeuf Basin, and it is sometimes difficult to distinguish the two at the surface. Macon Ridge consists almost entirely of Early Wisconsin age glacial outwash and is a continuation of the valley train in the Western Lowlands" (Saucier, 1994).

Macon Ridge is a terrace that features level to gently undulating topography with steep scarps of uplands, floodplains, depressions, and drainageways. The entire area is located within the Mississippi Alluvial Valley section of the Coastal Plain Province of the Atlantic Plain. The entire Macon Ridge is underlain by Pleistocene-aged loamy and clayey braided stream alluvium from the "old" Arkansas River. The area mantled by loess on the eastern edge of the terrace rises 10 to 30 feet above the floodplains. The loess thins toward the west, and elevation decreases. The loess in the western part of Macon Ridge contains small mixtures of the older underlying braided-stream terrace alluvium, and in even lower elevations, the loess contains mixtures of recent clayey alluvium or is buried completely beneath recent alluvium (T. E. Allen, USDA-NRCS Richland Parish Soil Survey Report, 1993).

This PES occurs on silty broad flats and depressional areas on the Macon Ridge in Arkansas and Louisiana. Slopes are level (0 to 1%). The site occurs on terraces, flats, and depressions of the loess-mantled Macon Ridge braided-stream terrace. These soils are fine-silty to a depth of 80 inches or more, with a high content of sodium in the subsoil. These sites include floodplains, depressions and drainageways of Caney Bayou, Indian Bayou, Big Colewa Creek, Big Creek and Old Big Creek, Little Creek, Bee Bayou, Bulls Bayou, Muddy Bayou, Turkey Creek, Ash Slough, Daves Bayou, and Deer Creek.

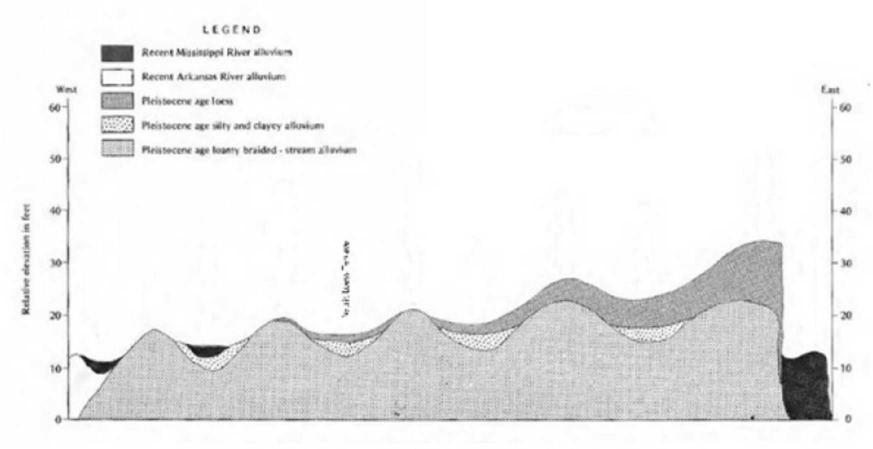


Figure 1. 134XY303PES Landscape Diagram

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Flat (3) Depression
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	18–29 m
Slope	0–1%
Ponding depth	0 cm
Water table depth	30–91 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of North East Louisiana and South East Arkansas is warm and humid with a monthly precipitation that is well distributed throughout the year. The monthly precipitation mean is between 2.9 and 5.3 inches, with the lowest rainfall occurring from June through November. The following climatic data are averages from the three weather stations listed below. Temperature and precipitation may vary considerably from that listed for each month. Site specific weather data should be used for land management decisions. For site specific weather conditions, obtain data from a weather station close to the site.

Table 3. Representative climatic features

Frost-free period (average)	227 days
Freeze-free period (average)	263 days
Precipitation total (average)	1,499 mm

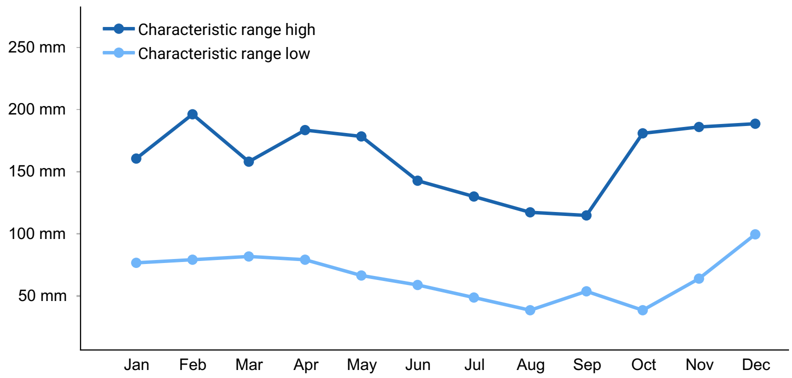


Figure 2. Monthly precipitation range

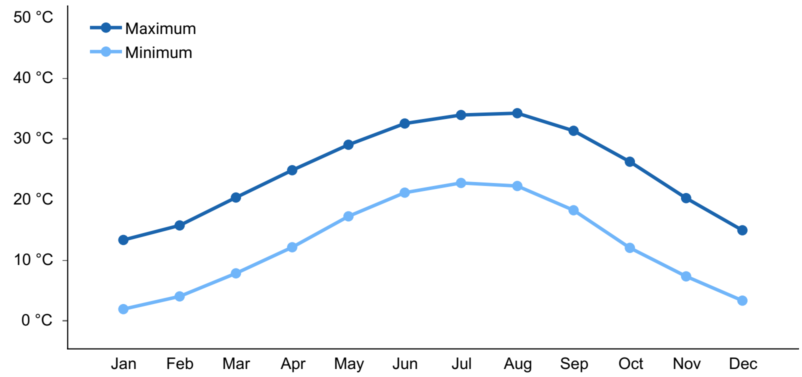


Figure 3. Monthly average minimum and maximum temperature

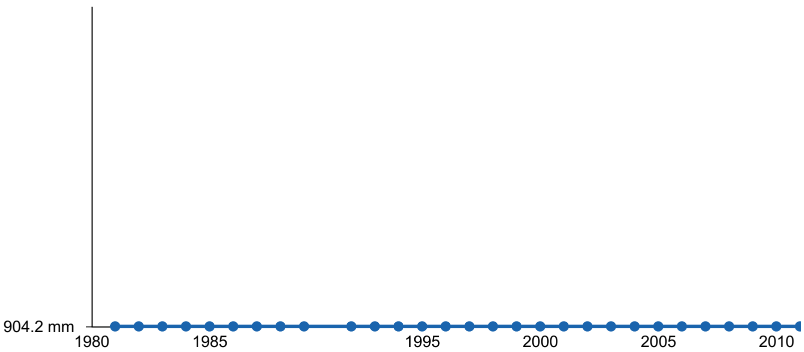


Figure 4. Annual precipitation pattern

Climate stations used

- (1) EUDORA [USC00032355], Eudora, AR
- (2) RAYVILLE [USC00167691], Rayville, LA
- (3) WINNSBORO 5 SSE [USC00169806], Winnsboro, LA

Influencing water features

Hydrology on this site is very important and when water is limited by drought or removal by other means vegetative composition will be affected by soil chemistry. The Sodium (Na) and Aluminum (Al) that is present in the soils of this site will dictate growth, production and species composition in a more drastic manner when moisture is limited. This will be readily seen in cropland when prolonged dryness occurs and will present as areas within a field that are stressed or plants will die.

These sites are generally found in depressions where water from adjacent areas accumulates. This is also a contributor to the development of the sites because this runoff from adjacent areas can carry additional Al & Na. These accumulate when the water that carries them evaporates and leaves them behind to concentrate in the soil.

Soil features

Foley, Deerford

Soils of this site are poorly drained, Albic Glossic Natraqualfs (Foley), and somewhat poorly drained, Albic Glossic Natraqualfs (Deerford) that have a high content of sodium in the subsoil. These soils formed in silty material, water-reworked loess sediments of late Pleistocene Age. Slopes range from 0 to 2 percent. These very deep, slowly and very slowly permeable soils are found in broad flats and narrow depressional areas in the terrace uplands. Foley soil map units are considered hydric and the perched water table is within 1 to 3 feet of the surface during winter and spring months in normal years. Deerford soil map units are considered non-hydric and the perched water table is within 1 to 1.5 feet of the surface during winter and spring months in normal years. These soils are subject to none to rare flooding for brief duration.

Natraqualfs (sodium soils) are commonly found throughout the loessal regions of the U.S. The sodium in these soils originated from in-situ weathering of Na-rich feldspars of the parent loess. The natric soil horizons act as a root restriction layer. Natric horizons typically have compound soil structure consisting of prismatic parting to subangular blocky structure. The natric horizons are dense with firm consistency and brittleness. The horizons also have very low hydraulic conductivity and tend to perch water during wet periods. The natric horizons are often considerably drier than overlying horizons. It is important not only to recognize salinity stress and toxicity, but also to determine where the sodium problem is located in the soil profile. Accelerated erosion and land leveling can truncate the surface soil and expose the underlying natric horizons with disastrous consequences. (Pettry, 1998).

Bare soil areas in agricultural fields essentially devoid of vegetation, or containing stunted and dead plants, have been referred to as slick-spots, salt-spots, and deer licks. Areas range in size from less than an acre to entire fields. Crops have different sensitivities to elevated salt contents. Generally, cotton and bermudagrass are more tolerant than corn and soybeans. Seasonal changes in soil moisture affect the ability of crops to tolerate high salt levels. Greater soil moisture at spring planting may maintain low enough levels for plant establishment and growth; however drier conditions in mid-summer may concentrate salt levels to a point at which they become toxic to the plant. Plants stressed from high sodium levels often exhibit various symptoms of nutritional disorders due to competitive uptake of ions. The exposed surface soil commonly has a light-colored, bleached appearance and is vulnerable to accelerated surface erosion. Salt-impacted areas are not as evident in forests, but the impact can be seen in areas containing stunted trees.

Natric soils commonly have poor physical conditions due to dispersive properties associated with sodium that negatively impact reclamation. The poor physical conditions reduce permeability to air and water movement. These adverse properties give rise to the observable physical characteristics of the soil being sticky when wet and hard when dry. Early reclamation of sodic soils used ponded water to leach salts below the root zone in arid regions, but these practices often required long periods of time and could not flush the salts due to low soil permeability. Sodium must be displaced on the soil exchange complex and leached from the soil to remediate the Na-toxicity and improve physical conditions. Gypsum is commonly used for reclamation of sodic soils. The amount of gypsum need to displace sodium depends on soil texture, cation exchange capacity, and sodium content. Large quantities of organic matter incorporated into the soil at gypsum application can increase replacement efficiency. The organic matter improves soil structure and drainage, increases cation exchange capacity and water holding capacity (Pettry, 1998).

Table 4. Representative soil features

Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to poorly drained
Permeability class	Slow to very slow
Soil depth	152–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	0.3–0.61 cm
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	1–20
Soil reaction (1:1 water) (0-101.6cm)	4.5–9
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The pre settlement plant community of this site would have been dominated by bottomland hardwood species. Within this site there will be a gradient of wetness from Rare to No flooding and brief duration. The wetness variations will dictate the species that are present and the composition of them within an area. Areas that sustained fire at regular intervals would have had a more Savanna appearance of Delta Post Oak and a three awn herbaceous understory.

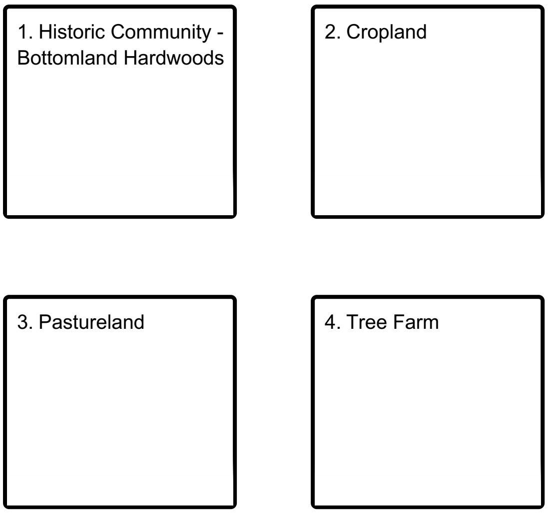
Due to wetness, rooting depths of some species will be limited and due to this there is a potential for some trees to be uprooted by climatic events, such as strong winds or floods. With these events, openings in the canopy can occur which will set back succession and allow herbaceous and woody shrub species to colonize, these low stature communities are generally short lived and the upper canopy will close as tall growing trees mature. There is generally an age gradient within a forest stand from the herbaceous openings to mature bottomland hardwoods.

This site has been altered by human activity and is utilized for multiple production systems such as Aquaculture, Cropland, Pasture and Tree Farms, for all of these alternative states wetness and soil chemistry are limitations for this site for productivity and management activities. Within the alternative uses of the site the transitions will be very similar and require the input of resources such as installation of infrastructure needs and establishment of the desired species.

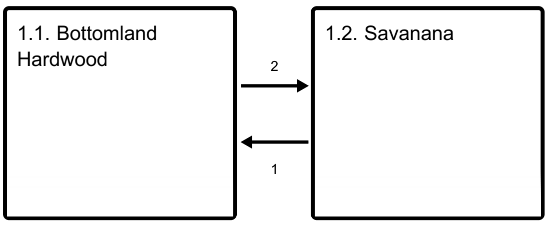
This PES occurs on silty broad flats and depressional areas on the Macon Ridge in Arkansas and Louisiana. Slopes are level (0 to 1%). The site occurs on terraces, flats, and depressions of the loess-mantled Macon Ridge braided-stream terrace. These soils are fine-silty to a depth of 80 inches or more, with a high content of sodium in the subsoil.

State and transition model

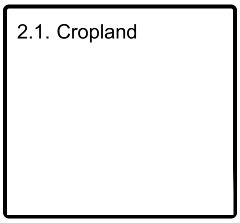
Ecosystem states



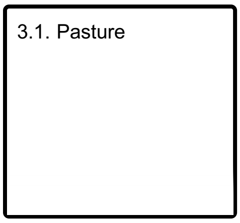
State 1 submodel, plant communities



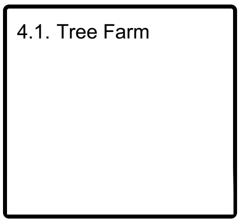
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities



State 1
Historic Community - Bottomland Hardwoods

Historically bottomland hardwoods, complex of wet & dry Saline communities. Delta Post Oak, Willow Oak, Winged Elm, Cherrybark oak, Loblolly Pine (more Lob on Deerford). If unburned Forest, if Burned Delta Post Oak, three awn Savanna.

Community 1.1
Bottomland Hardwood

Nuttall oak, Willow oak, Green ash, Overcup oak, Bitter pecan and Bald cypress, Drummond red maple, Swamp privet, Persimmon, Tupelo gum. Community species would have a range of wetness tolerance from Willow oak which is commonly found up to less abundant Water oak in the driest areas of the site.

Community 1.2
Savanana

Delta Post Oak, three awn Savanna.

Pathway 2
Community 1.1 to 1.2

Introduction of fire on this site will transition to a more savanna type system.

Pathway 1
Community 1.2 to 1.1

Reduction of fire on this site will transition to a more closed canopy wooded system.

State 2
Cropland

Cropland

Community 2.1
Cropland

Row Crop Production Due to Sodium (Na) and Aluminum (Al) in the soil profile, this site should not be land graded. This practice could potentially remove topsoil and expose or bring closer to the rooting zone these potential soil chemistry problems.

State 3
Pastureland

Managed Pasture - PHG 8I

Community 3.1
Pasture

Pasture or Grassland This phase is characterized by a monoculture of or mixture of Forage species planted or allowed to establish from naturalized species managed for forage production or as herbaceous ground cover. This Site fits into Pasture & Hayland Group 8I. Upland and terrace soils with silty surface layers and subsoils. Poorly drained and somewhat poorly drained, droughty, alkaline soils that have a concentration of sodium in the subsoil. Natural fertility is low or medium. 0-3% slopes. Most slopes are 0-1%. Management Interpretations: Fertilizer is needed on improved pastures. Usually the calcium level in these soils is adequate for legumes. These soils have poor physical condition and very slow movement of moisture into the soil. They remain wet on the surface after rain. Surface drainage may be needed in lows. Adapted Grasses and Legumes: Common bermudagrass is probably the better adapted warm seasonal perennial. The adapted cool season legumes are white clover, winter peas, and vetch. Without fertilization, these soils usually support a fair cover of Pinehill bluestem, paspalums, threeawns, and carpetgrass. Periodic brush control is needed to prevent it from reverting to woodland. All soils need nitrogen fertilization for production when grasses are grown alone. It is not practical to apply high rates of fertilizer due to the wetness limitation potential of the site which normally occurs from December through June. To prevent extreme acidity in the subsoil when high rates of acidifying nitrogen is used, the surface soil should not be allowed to become more acid than 5.0 pH and lime should be applied at more frequent intervals.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2018	3363	4932
Total	**2018**	**3363**	**4932**

State 4
Tree Farm

Tree Farm

Community 4.1
Tree Farm

Hardwood or Pine Plantation: This phase is characterized by few or a monoculture of Hardwood or Pine species planted or allowed to regenerate from seed trees managed for wood production. This Site fits into multiple Woodland Suitability Groups (1o7, 2w8, & 3w9) depending on the soil Mapunit. The first part of the symbol indicates potential productivity of the soils for important trees, very high (1), high (2) to moderately high (3). The second part, a letter, indicates the major kind of soil limitation, no serious management problems (o), limitation of excessive water in or on the soil (w). The third part of the symbol, a numeral, indicates the kind of trees for which the soils are best suited and the severity of the hazard or limitation. The numerals 7, 8, and 9 indicate slight, moderate, and severe limitations, respectively, and suitability for both needle leaf and broadleaf trees. These groups would generally describe this site as very highly to moderately highly productive with few or Slight to severe limitations for wetness for the production of broadleaf and some pine species. WS 1 o 7 Well drained loam soils suitable for either pines or southern hardwoods with very high potential productivity; no serious management problems. Potential is high for management of turkey and quail, and moderately high for squirrels and deer. WS 2 w 8 Slightly to moderately wet, acid, loamy and clayey soils with high potential productivity; moderate equipment limitations due primarily to excess water; well suited for either pines or southern hardwoods. Site index for loblolly and slash pine 90, oaks and sweetgum 90. Potential is high for management of turkey and moderately high for deer, ducks, quail and squirrels. WS 3 w 9 Wet, clayey soils with moderately high potential productivity; severe equipment limitations and moderate seedling mortality due primarily to excess water; suited for pine and southern hardwood. Site index for loblolly and slash pine 80, oaks and sweetgum 80. Potential is high for management of deer, squirrels and turkey, and moderately high for ducks.

Additional community tables

Table 6. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm Season Grasses**			2018–4932	
	bahiagrass	PANO2	*Paspalum notatum*	2578–4932	–
	Bermudagrass	CYDA	*Cynodon dactylon*	2018–3363	–

Animal community

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Hydrological functions

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Recreational uses

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Wood products

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Other products

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Other information

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Inventory data references

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Other references

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Contributors

D Charles Stemmans
Dwayne Rice
Wayne Roberts
Rachel Stout Evans

Acknowledgments

The Macon Ridge Technical Team did an outstanding job of utilizing existing data and knowledge to develop site concepts. They also provided the needed sections of the descriptions, review and comments of them.

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	
Approved by	
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):**

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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:**
