USDA Natural Resources
Conservation Service

Ecological site F134XY206AL
Western Fragipan Terrace - PROVISIONAL

Accessed: 05/13/2025

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.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 134X–Southern Mississippi Valley Loess

The Southern Mississippi Valley Loess (MLRA 134) extends some 500 miles from the southern tip of Illinois to southern Louisiana. This MLRA occurs 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. Landscapes consist of highly dissected uplands, level to undulating plains, and broad terraces that are covered with a mantle of loess. Underlying the loess are Tertiary deposits of unconsolidated sand, silt, clay, gravel, and lignite. The soils, mainly Alfisols, formed in the loess mantle. Stream systems of the MLRA typically originate as low-gradient drainageways in the upper reaches that broaden rapidly downstream to wide, level floodplains with highly meandering channels. Alluvial soils, mostly Entisols and Inceptisols, are predominantly silty where loess thickness of the uplands are deepest but grade to loamy textures in watersheds covered by thin loess. Crowley’s Ridge, Macon Ridge, and Lafayette Loess Plains are discontinuous, erosional remnants that run north to south in southeastern Missouri - eastern Arkansas, northeastern Louisiana, and south-central Louisiana, respectively. Elevations range from around 100 feet on terraces in southern Louisiana to over 600 feet on uplands in western Kentucky. The steep, dissected uplands are mainly in hardwood forests while less sloping areas are used for crop, pasture, and forage production (USDA-NRCS, 2006).

The core concepts of this site strictly pertain to the loess-capped terraces of the Western Lowlands Pleistocene Valley Trains (EPA Level IV Ecoregion: 73g; Woods et al., 2004), although the soils of the site have been mapped on uplands and terraces within Crowley’s Ridge physiographic province and to the east on the Northern Holocene

Meander Belts (EPA Ecoregion: 73c; Woods et al., 2004).

Classification relationships

All or portions of the geographic range of this site falls within a number of ecological/land classifications including:
-NRCS Major Land Resource Area (MLRA) 134 – Southern Mississippi Valley Loess
-NRCS Major Land Resource Area (MLRA) 131A – Southern Mississippi River Alluvium
-Environmental Protection Agency's Level IV Ecoregion: Western Lowlands Pleistocene Valley Trains: 73g (Woods et al., 2004)
-234A – Southern Mississippi Alluvial Plain section of the USDA Forest Service Ecological Subregion (McNab et al., 2005)
-LANDFIRE Biophysical Setting 4515130 and NatureServe Ecological System CES203.193 Lower Mississippi River Flatwoods, respectively (LANDFIRE, 2008; NatureServe, 2009)
-Upland Forests of Pleistocene Outwash Terraces and Alluvial Fans (Klimas et al., 2012)

Ecological site concept

The Western Fragipan Terrace is characterized by deep, moderately well drained soils that formed in a mantle of loess. The deep, loessal soils associated with this site were deposited mainly on the higher and older Pleistocene Valley Train terraces of the Western Lowlands. Slopes range from 0 to 8 percent and extend upwards to 12 percent, locally. Topographic features or landforms of this site include low mounds; narrow, linear ridges, and terrace scarps. These prominent positions on the flat terrace landscape never flood but are influenced by seasonal wetness. Soils of this site often perch water during wet seasons and/or high rainfall events due to moderately slow to slow permeability in a dense subsoil layer, typically a fragipan. Historically, the high grounds of this site were likely favored by indigenous people inhabiting the Western Lowlands, and their subsistence and cultural activities would have influenced the surrounding plant communities. Resultantly, a complex mosaic of conditions including forests, open woodlands, and fire-maintained prairies likely existed. Today, this high site is favored for construction and building purposes that include private residences, commercial lots, and cemeteries. Most areas are in agriculture production but few, if any, locations support natural vegetation. Plant species that historically occurred on this site likely consisted of upland hardwoods that included southern red oak, post oak, water oak, and shagbark hickory as dominants with associates of white oak, black gum, and possibly shortleaf pine. Open, fire-influenced areas supported an herbaceous community that consisted of species characteristic of the Grand Prairie ecoregion. Dominant herbaceous species likely consisted of big bluestem, little bluestem, and Indian grass.

Associated sites

F134XY201AL	**Western Loess Terrace - PROVISIONAL** This site occurs in close proximity to the Western Fragipan Terrace but probably does not join or is adjacent to the site.
F134XY202AL	**Western Wet Loess Terrace - PROVISIONAL** The Western Fragipan Terrace occurs as rises or low terrace ridges on the Western Wet Loess Terrace.
F134XY209AL	**Western Moderately Wet Terrace - PROVISIONAL** The Western Fragipan Terrace occurs as rises or low terrace ridges on the Western Moderately Wet Terrace.

Similar sites

F134XY013AL	**Northern Loess Fragipan Terrace - PROVISIONAL** This site is the eastern counterpart to the Western Fragipan Terrace site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The Western Fragipan Terrace ecological site is broadly distributed in the Western Lowlands ecoregion. However, the bulk of the site's occurrence is on the older, loess-capped Pleistocene terraces and alluvial fans (the latter occurring along the interface of Crowley's Ridge and the Western Lowlands).

The Western Lowlands border Crowley's Ridge to the west and extends over a north-south distance of approximately 225 miles from Cape Girardeau, Missouri to the vicinity of Helena, Arkansas (Saucier, 1994). An irregular and sometimes ill-defined boundary of two MLRAs, 134 and 131A, converge within the Lowlands. Soils that formed in loess (considered soils of MLRA 134) mainly occur along the eastern edge of the Lowlands and along the western interface with Crowley's Ridge. However, loessal soils of the terraces often occur in intricate, complex patterns with soils that formed in alluvium and eolian loamy and sandy deposits (i.e., soils of MLRA 131A).

Much of these complexities were borne from past events, generally attributed to various glacial outwash episodes that occurred as a result from cyclical continental glaciation. Tremendous amounts of meltwater streamed through the area forming a highly dendritic network of braided stream channels. A culmination of these events helped to create one of the region's most characteristic landscapes, a series of ancient fluvial terraces sometimes referred to as "valley train" terraces. Each terrace was established at different time intervals with the oldest feature occurring along the western margin of Crowley's Ridge. Proceeding westward, the age of each successive terrace becomes progressively younger, and each terrace is distinguished by a drop of several feet in elevation. The oldest terrace is at least 30 feet higher than the modern floodplain of active streams on the Western Lowlands (Klimas et al., 2012).

Most modern stream systems enter the Lowlands from the Ozark Plateau or arise within the basin (Klimas et al., 2009), including a few minor systems originating on Crowley's Ridge. Some of the ancestral braided streams that had once formed from glacial outwash now supports modern tributaries and local drainageways, which have since formed narrow valleys and floodplains (Saucier, 1994). Another feature of the historic stream braids are a series of swales or what is locally referred to as "slashes". Such features tend to hold water for very long periods throughout the year and are essentially remnant channel braids or scours (T. Foti, personal communication). Superimposed on this backdrop of complex physiographic features are low ridges, mounds, and relict dunes that are of eolian origin – consisting of loess (e.g., loessal ridges) and sand or sandy loam (e.g., dunes).

The core concepts of this site are primarily associated with the Early Wisconsin Terraces of the Western Lowlands and are defined by deep loessal soils that now comprise topographically diverse landforms of low, linear ridges; low mounds; and terrace scarps.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Rise (3) Alluvial fan
Elevation	52–107 m
Slope	0–12%
Ponding depth	0 cm
Water table depth	46–66 cm
Aspect	Aspect is not a significant factor

Climatic features

This site falls under the Humid Subtropical Climate Classification (Koppen System). The mean annual precipitation for this site from 1980 through 2010 was approximately 50 inches with a range from 35 to roughly 69 inches. Maximum precipitation occurs in spring (April and May) and late fall (November and December) and typically decreases throughout the summer. Rainfall often occurs as high-intensity, convective thunderstorms during warmer periods but moderate-intensity frontal systems can produce large amounts of rainfall during winter. Snowfall generally occurs in most years but duration is often brief (USDA-NRCS, 2006). The average annual maximum and minimum air temperature is 71 (range 47 to 91) and 50 (range 29 to 71) degrees F, respectively. The average frost free and freeze free periods are 206 and 235 days, respectively.

Table 3. Representative climatic features

Frost-free period (average)	206 days
Freeze-free period (average)	235 days
Precipitation total (average)	1,270 mm

Climate stations used

- (1) PARAGOULD 1S [USC00035563], Paragould, AR
- (2) WYNNE [USC00038052], Wynne, AR
- (3) MALDEN MUNI AP [USC00235207], Malden, MO
- (4) ALICIA 2NNE [USC00030064], Alicia, AR
- (5) CLARENDON [USC00031442], Clarendon, AR
- (6) HELENA [USC00033242], Helena, AR
- (7) SAINT CHARLES [USC00036376], Clarendon, AR
- (8) BRINKLEY [USC00030936], Brinkley, AR

Influencing water features

This site is not influence by a hydrologic regime.

Soil features

Please note that the soils listed in this section of the description may not be all inclusive. There may be additional soils that fit the site's concepts. Additionally, the soils that provisionally form the concepts of this site may occur elsewhere, either within or outside of the MLRA and may or "may not" have the same geomorphic characteristics or support similar vegetation. Some soil map units and soil series included in this "provisional" ecological site were used as a "best fit" for a particular soil – landform catena during a specific era of soil mapping, regardless of the origin of parent material or the location of MLRA boundaries. Therefore, the listed soils may not be typical for MLRA 134 or a specific location, and the associated soil map units may warrant further investigation in a joint ecological site inventory – soil survey project. When utilizing this provisional description, the user is encouraged to verify that the area of interest meets the appropriate ecological site concepts by reviewing the soils, landform, vegetation, and physical location. If the site concepts do not match the attributes of the area of interest, please review the Similar or Associated Sites listed in the Supporting Information section of this description to determine if another site may be a better fit for your area of interest.

This site consists of deep, moderately well drained soils that formed in a mantle of loess. The soils are shallow or moderately deep to a fragipan that perches water during wet seasons in late winter and early in spring. Permeability is moderate above the fragipan and moderately slow to slow in the fragipan. Depth to the fragipan varies but in general, most depths range from 14 to 36 inches. Eroded phases may have shallower depths. Slopes on this site range from 0 to 12 percent. Rate of runoff is low on slopes less than 1 percent, medium on slopes up to 5 percent, and high on slopes up to 12 percent.

The principal soils of this site are the Loring (Fine-silty, mixed, active, thermic Oxyaquic Fragiudalfs) and Grenada (Fine-silty, mixed, active, thermic Oxyaquic Fraglossudalfs) series. Both soils formed in loess or water reworked loess with thickness greater than 48 inches. Loring has a single clay maximum in the Bt horizon above the fragipan, and Grenada has a glossic horizon, which may provide greater avenues for root penetration.

A secondary soil of this site is Providence (Fine-silty, mixed, active, thermic Oxyaquic Fragiudalfs), which is represented by only two soil map units toward the northern extent of the site. Providence soils formed in a mantle of silty materials, about 2 feet thick, and the underlying sandy and loamy sediments. Depth to the discontinuity with more than 15 percent fine sand and coarser material ranges from 24 to 48 inches of the surface.

Table 4. Representative soil features

Surface texture	(1) Silt loam

Family particle size	(1) Loamy
Drainage class	Moderately well drained
Permeability class	Very slow to moderate
Soil depth	53–127 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	13.46–19.81 cm
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.3–5.6
Subsurface fragment volume <=3" (Depth not specified)	2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site occurs on higher elevations and landforms of the Western Lowlands including the alluvial fans that formed along the interface of Crowley's Ridge and the Lowlands. Occurrences of this site on the terrace proper generally consist of "rises" on terrace treads. More intuitively, these landforms include low, linear ridges; gently sloping mounds; and terrace scarps.

The moderately well drained soils of this site have a seasonally perched water table due to the presence of a fragipan. Soil moisture may become a limiting factor later in the growing season due to evapotranspiration. The higher physiographic features of this site coupled with soil properties create conditions for supporting a drier plant community. Although no publication adequately captures the historic natural vegetation occurring on this particular soil – site environment, Klimas et al. (2012) provide a list of potential natural vegetation of an environment that would include this site. The authors type this system as "Upland forests of Pleistocene outwash terraces and alluvial fans (U2)." With no extant examples to draw from, their assessment is followed.

The list of species from Klimas et al. (2012) consists of taxa typically associated with upland environments. Dominant species listed for this site include southern red oak, post oak, water oak, and shagbark hickory with associates of black gum, white oak, and shortleaf pine. The authors emphasized the variability in composition per stand by pointing out differences in soils, drainage, and the presence/absence of fire.

This particular site is associated with and most similar to the Western Loess Terrace ecological site. A potential difference between the two sites hinges mainly on the presence of a root restriction layer (i.e., a fragipan) in this site, which may limit available water capacity during the growing season. A reduction in soil moisture through the growing season could lead to the presence of a drier plant association on this site vs. that of the deep loess site with no restriction layer.

The pre-settlement plant community of this ecological site was removed decades ago, and there are no extant examples of that community remaining. Today, this high, well-drained site is favored for construction and building purposes that include private residences, commercial lots, and cemeteries. Areas that do not support structures are in agriculture production but few, if any, locations support natural vegetation. Outside of construction or building sites, cropland is the major land use, and possibly the only land use, of this site. Therefore, only two "realistic" states are indicated for this site, the perceived or projected reference conditions and agriculture production. One additional state is being provided to illustrate a conservation alternative. That state involves a discontinuation of production and the alternative to establish native vegetation, whether the establishment is predominantly of woodland conditions or an herbaceous community comprised of native grasses and forbs. Theoretically, a return to

the reference state may not be possible because that former community no longer exists, and there is an absence of examples from which to duplicate the composition and structural complexities of the historic system. Until additional information is discovered, actions leading back to reference conditions are not addressed in this description report.

Following this narrative, a “provisional” state and transition model is provided that includes the “perceived” reference state and several alternative (or altered) vegetation states that have been observed and/or projected for the Western Fragipan Terrace ecological site. This model is based on limited reconnaissance, literature, expert knowledge, and interpretations. Plant communities will differ due to natural variability in soils and physiography. Depending on objectives, the reference plant community may not necessarily be the management goal.

The environmental and biological characteristics of this site are complex and dynamic. As such, the following diagram suggests pathways that the vegetation on this site might take, given that the modal concepts of climate and soils are met within an area of interest. Specific locations with unique soils and disturbance histories may have alternate pathways that are not represented in the model. This information is intended to show the possibilities within a given set of circumstances and represents the initial steps toward developing a defensible description and model. The model and associated information are subject to change as knowledge increases and new information is garnered. This is an iterative process. Most importantly, local and/or state professional guidance should always be sought before pursuing a treatment scenario.

State and transition model

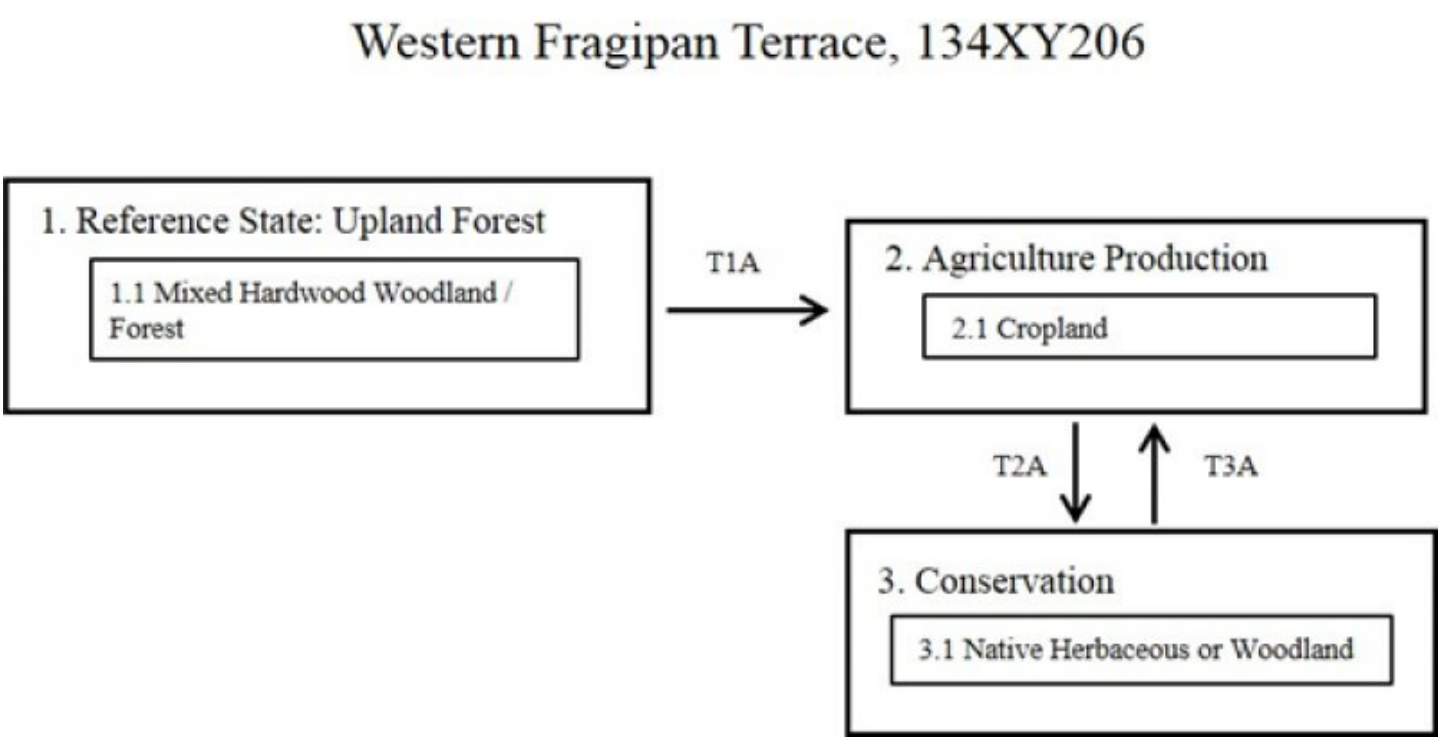

Figure 6. STM - Western Fragipan Terrace

Pathway	Practice
T1A	mechanical removal of vegetation; establish cultivation practices (State 2)
T2A	discontinuing cultivation/production and establishing native grasses/forbs or trees; may include “guided” natural succession (State 3)
T3A	discontinuing conservation practices and return to production

Figure 7. Legend - Western Fragipan Terrace

State 1
Upland Forest

The reference state of this ecological site was removed long ago and no extant examples of that former system remain. The name and description of the reference state listed above is largely drawn from the description of the

potential natural vegetation presented in Klimas et al. (2012). They type or class this site as “Upland forests of Pleistocene outwash terraces and alluvial fans (U2).” The historic vegetation occurring on this site is believed to have been largely comprised of upland hardwoods. This projection of the natural community is well grounded given the soils and their occurrence on higher and steeper landforms of the surrounding terrace landscape. Klimas et al. emphasized that great variability in composition per location may have occurred due to site specifics such as varying soils, drainage, and the effects of fire. From a structural perspective, this site may have supported a mosaic of conditions that included closed forests, open woodlands, and small, fire-influenced prairies that either occurred along the fringes or within the site proper. A single community phase is provided to represent the range of conditions that may have occurred on this site. Additional reference community phases may be included in subsequent iterations of this ecological site description, if warranted.

Community 1.1
Mixed Hardwood Woodland / Forest

The pre-settlement natural community of this site likely consisted of a mosaic of community types and/or structural complexities that included forest, open woodland, and meadows or small prairies. Forest or woodland components likely consisted of an upland hardwood community that included southern red oak, post oak, water oak, shagbark hickory, and associates of black gum, white oak, and possibly shortleaf pine in the drier, more fire prone localities. Where periodic fires carried well into this site, structural conditions were likely open. Areas that sustained more influence from fire likely supported prairie to savanna-like conditions. The herbaceous community would have certainly been comprised of many species that also occurred in the fabled Grand Prairie ecoregion. Dominants of that community likely consisted of big bluestem, little bluestem, Indian grass, along with many additional graminoids and a rich association of forbs.

State 2
Agriculture Production

Agriculture production on this site has no limitations. This is the prevailing land use on this site outside of residential and commercial establishments.

Community 2.1
Cropland

Crops grown on this site include cotton, soybean, winter small grain, and corn.

State 3
Conservation

This alternative state is included to represent the range or breadth of conservation actions that may be implemented and established should agriculture production be discontinued within a given location. Several actions may be chosen including the standard of establishing: native warm season grasses; suitable forbs for pollinators; select native trees to manage for open woodland or forest conditions. Various options are available for establishing conservation measures on this site, but ideally, the best case scenario is to reconstruct the perceived reference conditions of this site. This action requires a concerted effort to reestablish herbaceous species most common to the Grand Prairie system with the possible addition of widely spaced hardwoods (e.g., upland oaks from the reference state). If at all possible, the herbaceous species established should be derived from the “wild types” (genetic stock) from the Grand Prairie ecoregion. This action would help preserve the unique genetic material of that venerated system and would help to reintroduce the native prairie system back into a portion of its former range, the Western Lowlands. One caveat exists to the above discourse and this alternative state. This state only applies to those areas where the former landforms (rises) still exist. Areas that have been leveled and the critical features of this site removed are in an altered condition that has no parallel. Soils under those conditions need assessment and re-evaluation to ascertain what plants are best suited under those permanently altered conditions.

Community 3.1
Native Herbaceous or Woodland

This community phase represents the establishment of select native plants to meet conservation objectives on this

site. As alluded to above, the best case scenario is the establishment of species from the Grand Prairie region of Arkansas. Herbaceous species that may be suitable for establishing on this site include big bluestem, Indian grass, little bluestem, prairie blazing star, pinkscale blazing star, wild indigo, compass plant, meadow evening primrose, wild quinine, wooly ragwort, hoarypea, and Baldwin's ironweed (Heineke, 1987; NatureServe, 2015). A much greater and more diverse listing of species of the Grand Prairie may be obtained from the Arkansas Natural Heritage Commission. Of current concern, finding the source of the Grand Prairie genetic material may be difficult at this time but efforts may be in place whereby a future source is a distinct possibility (T. Foti, personal communication). Tree species for planting include white oak, southern red oak, cherrybark oak, and Shumard's oak. Many additional hardwoods will seed naturally, including desirable and undesirable species. Persistent management and maintenance of the conservation state is essential for perpetuation.

Transition T1A
State 1 to 3

Actions include mechanical removal of vegetation and stumps; herbicide treatment of residual plants; preparation for cultivation; crop establishment (State 3).

Transition T2A
State 2 to 3

This pathway represents the decision to discontinue production and establish native grasses/forbs or trees on this site. This action also includes management activities to "guide" natural succession. Actions may include prescribed fire for maintaining and enhancing herbaceous establishment and herbicide treatments for controlling exotic species invasions and to ensure select tree establishment.

Transition T3A
State 3 to 2

This pathway represents the discontinuation of conservation practices and a return to production.

Additional community tables

Other references

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Contributors

Barry Hart

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Tom Foti (Ecologist, Arkansas Natural Heritage Commission) and Henry Langston (Arkansas Highway Department) provided invaluable discussion, knowledge, and experience with regards to the soils and vegetation associated with this site.

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:**

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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:**

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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):**

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:**