Ecological site F110XY026IL
Lacustrine Swamp Forest

Last updated: 4/22/2020
Accessed: 05/11/2025

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): 110X–Northern Illinois and Indiana Heavy Till Plain

The Northern Illinois and Indiana Heavy Till Plain (MLRA 110) encompasses the Northeastern Morainal, Grand Prairie, and Southern Lake Michigan Coastal landscapes (Schwegman et al. 1973, WDNR 2015). It spans three states – Illinois (79 percent), Indiana (10 percent), and Wisconsin (11 percent) – comprising about 7,535 square miles (Figure 1). The elevation is about 650 feet above sea level (ASL) and increases gradually from Lake Michigan south. Local relief varies from 10 to 25 feet. Silurian age fractured dolomite and limestone bedrock underlie the region. Glacial drift covers the surface area of the MLRA, and till, outwash, lacustrine deposits, loess or other silty material, and organic deposits are common (USDA-NRCS 2006).

The vegetation in the MLRA has undergone drastic changes over time. At the end of the last glacial episode – the Wisconsinan glaciation – the evolution of vegetation began with the development of tundra habitats, followed by a phase of spruce and fir forests, and eventually spruce-pine forests. Not until approximately 9,000 years ago did the climate undergo a warming trend which prompted the development of deciduous forests dominated by oak and hickory. As the climate continued to warm and dry, prairies began to develop approximately 8,300 years ago. Another shift in climate that resulted in an increase in moisture prompted the emergence of savanna-like habitats from 8,000 to 5,000 years before present (Taft et al. 2009). Forests maintained footholds on steep valley sides, morainal ridges, and wet floodplains. Fire, droughts, and grazing by native mammals helped to maintain the prairies and savannas until the arrival of European settlers, and the forests were maintained by droughts, wind, lightning, and occasional fire (Taft et al. 2009; NatureServe 2018).

Classification relationships

USFS Subregions: Southwestern Great Lakes Morainal (222K) and Central Till Plains and Grand Prairies (251D) Sections; Kenosha-Lake Michigan Plain and Moraines (222Kg), Valparaiso Moraine (Kj), and Eastern Grand Prairie (251Dd) Subsections (Cleland et al. 2007)

U.S. EPA Level IV Ecoregion: Kettle Moraines (53b), Illinois/Indiana Prairies (54a), and Valparaiso-Wheaton Morainal Complex (54f) (USEPA 2013)

National Vegetation Classification – Ecological Systems: North-Central Interior and Appalachian Rich Swamp (CES202.605) (NatureServe 2018)

National Vegetation Classification – Plant Associations: Acer (rubrum, saccharinum) – Fraxinus spp. Ulmus americana Swamp Forest (CEGL005038) (Nature Serve 2018)

Wisconsin Natural Communities: Southern Hardwood Swamp (WDNR 2015)

Ecological site concept

Lacustrine Swamp Forests are located within the green areas on the map. They occur on lake plains. The soils are Mollisols that are ponded and very poorly to poorly drained, formed in lacustrine deposits.

The historic pre-European settlement vegetation on this ecological site was dominated by hydrophytic woody and herbaceous species. Red maple (Acer rubrum L.) and green ash (Fraxinus pennsylvanica Marshall) are the dominant trees, with silky dogwood (Cornus amomum mill.) and common winterberry (Ilex verticillata (L.) A. Gray) the dominant shrubs and hop sedge (Carex lupulina Muhl. ex Willd.) and jewelweed (Impatiens capensis Meerb.) the dominant herbaceous species on the site. A variety of other hardwood trees can occur including American elm (Ulmus americana L.), silver maple (Acer saccharinum L.), bitternut hickory (Carya cordiformis (Wangenh.) K. Koch), hackberry (Celtis occidentalis L.), and black ash (Fraxinus nigra Marshall) (WDNR 2015). Species indicative of an undisturbed plant community associated with this ecological site includes ravenfoot sedge (Carex crus-corvi Shttlw. Ex Kunze), blue ash (Fraxinus quadrangulata Michx.), and Kentucky coffeetree (Gymnocladus dioica (L.) K. Koch) (Bernthal 2003). Ponding is the primary disturbance factor that maintains this ecological site, while windthrow, drought, and fire are secondary factors (WDNR 2015).

Associated sites

F110XY012IL	**Moist Glacial Drift Upland Forest** Loess or other silty or loamy material, loamy outwash, glacial till, or lacustrine deposits with a water table within 18-72 inches including Aptakisic, Blount, Del Rey, Nappanee, Ozaukee, Sabina, Starks, St. Clair, Tuscola, and Whitaker soils

Similar sites

F110XY028IL	**Silty-Loamy Floodplain Forest** Silty-Loamy Floodplain Forests have a similar vegetation type, but the site is a RIVERINE wetland

Table 1. Dominant plant species

Tree	(1) *Acer rubrum* (2) *Fraxinus pennsylvanica*
Shrub	(1) *Cornus amomum* (2) *Ilex verticillata*
Herbaceous	(1) *Carex lupulina* (2) *Impatiens capensis*

Physiographic features

Lacustrine Swamp Forests occur on lake plains. They are situated on elevations ranging from approximately 341 to 1200 feet ASL. The site experiences frequent ponding that can last more than 30 days.

Figure 1.

Table 2. Representative physiographic features

Slope shape across	(1) Linear
Slope shape up-down	(1) Linear
Landforms	(1) Lake plain
Runoff class	Very high
Ponding duration	Long (7 to 30 days) to very long (more than 30 days)
Ponding frequency	Frequent
Elevation	341–1,200 ft
Slope	0–2%
Ponding depth	0–24 in
Water table depth	0 in
Aspect	Aspect is not a significant factor

Climatic features

The Northern Illinois and Indiana Heavy Till Plain falls into the hot-summer humid continental climate (Dfa) and warm-summer humid continental climate (Dfb) Köppen-Geiger climate classifications (Peel et al. 2007). The two main factors that drive the climate of the MLRA are latitude and weather systems. Latitude, and the subsequent reflection of solar input, determines air temperatures and seasonal variations. Solar energy varies across the seasons, with summer receiving three to four times as much energy as opposed to winter. Weather systems (air masses and cyclonic storms) are responsible for daily fluctuations of weather conditions. High-pressure systems are responsible for settled weather patterns where sun and clear skies dominate. In fall, winter, and spring, the polar jet stream is responsible for the creation and movement of low-pressure systems. The clouds, winds, and precipitation associated with a low-pressure system regularly follow high-pressure systems every few days (Angel n.d.).

The soil temperature regime of MLRA 110 is classified as mesic, where the mean annual soil temperature is between 46 and 59°F (USDA-NRCS 2006). Temperature and precipitation occur along a north-south gradient, where temperature and precipitation increase the further south one travels. The average freeze-free period of this ecological site is about 164 days, while the frost-free period is about 139 days (Table 2). The majority of the precipitation occurs as rainfall in the form of convective thunderstorms during the growing season. Average annual precipitation is 34 inches, which includes rainfall plus the water equivalent from snowfall (Table 3). The average annual low and high temperatures are 37.6 and 56.0°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	131-145 days
Freeze-free period (characteristic range)	146-179 days
Precipitation total (characteristic range)	34 in
Frost-free period (actual range)	130-152 days
Freeze-free period (actual range)	143-192 days
Precipitation total (actual range)	34 in
Frost-free period (average)	139 days
Freeze-free period (average)	164 days
Precipitation total (average)	34 in

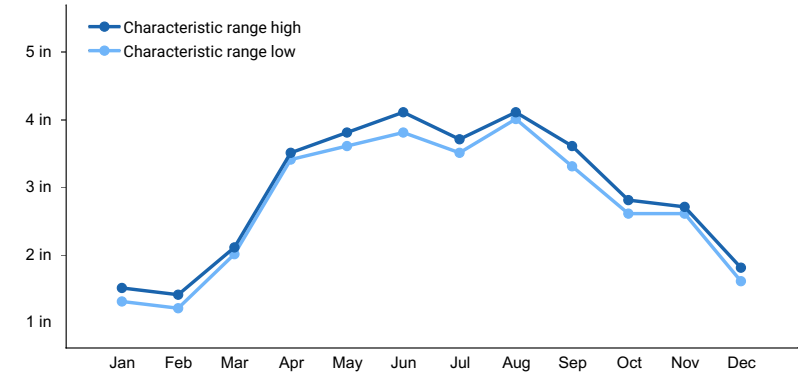


Figure 2. Monthly precipitation range

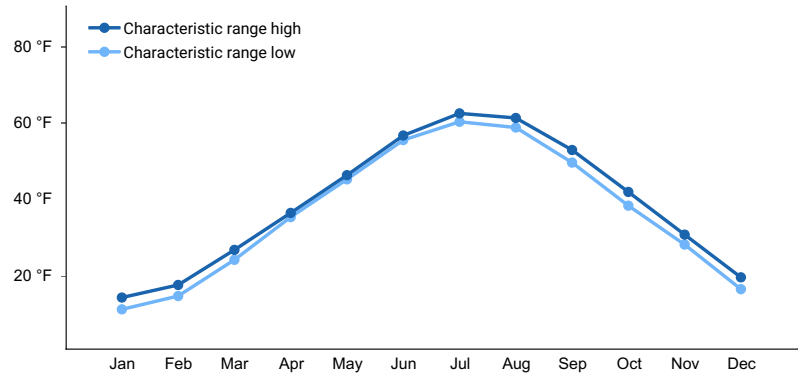


Figure 3. Monthly minimum temperature range

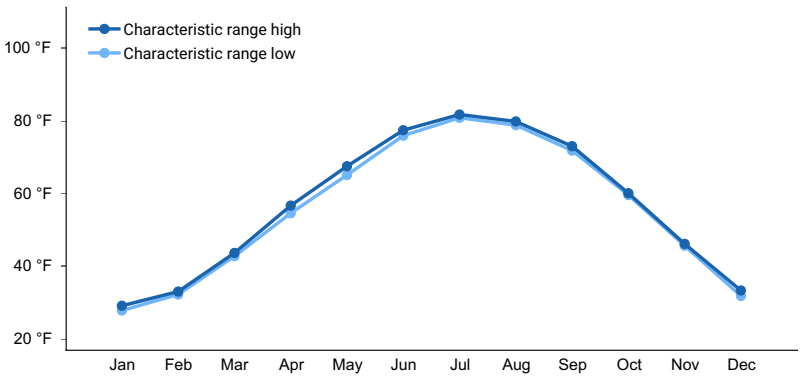


Figure 4. Monthly maximum temperature range

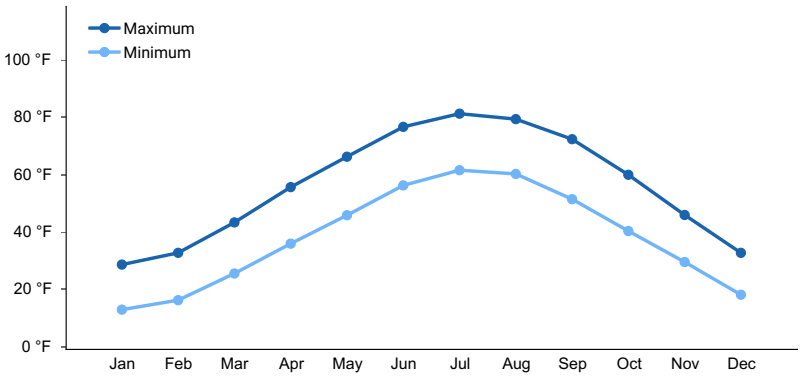


Figure 5. Monthly average minimum and maximum temperature

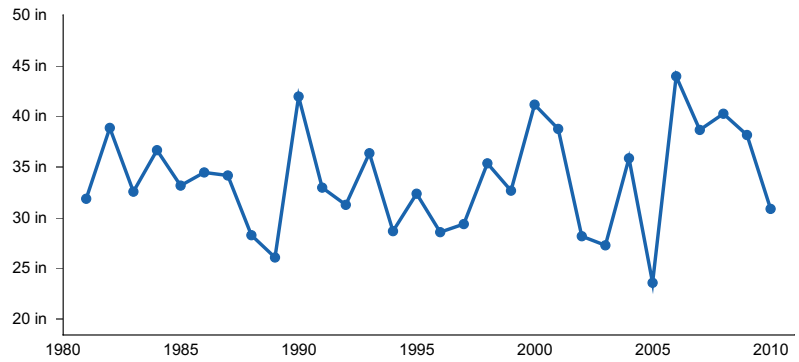


Figure 6. Annual precipitation pattern

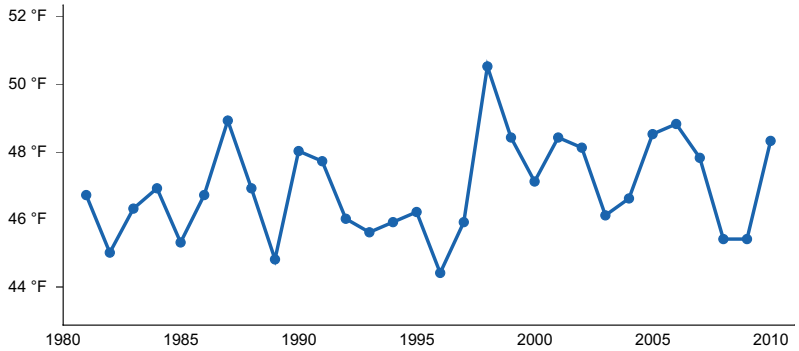


Figure 7. Annual average temperature pattern

Climate stations used

- (1) BURLINGTON [USC00471205], Burlington, WI
- (2) UNION GROVE [USC00478723], Union Grove, WI
- (3) RACINE BATTEN AP [USW00094818], Racine, WI

Influencing water features

Lacustrine Swamp Forests are classified as an ORGANIC SOIL FLATS: Frequently ponded, forested wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008) and as a Palustrine, Forested, Broad-leaved Deciduous, Seasonally Flooded-Saturated wetland under the National Wetlands Inventory (FGDC 2013). Snowmelt and precipitation from spring rains are the main sources of water for this ecological site (Smith et al. 1995; WDNR 2015). Infiltration is very slow (Hydrologic Group D) for undrained soils, and surface runoff is very high.

Wetland description

Primary wetland hydrology indicators for an intact Lacustrine Swamp Forest may include: (A1) Surface water, (A2) High water table, (A3) Saturation, and (B9) Water-stained leaves. Secondary wetland hydrology indicators may include: (C2) Dry-season water table and (D5) FAC neutral test (USACE 2010).

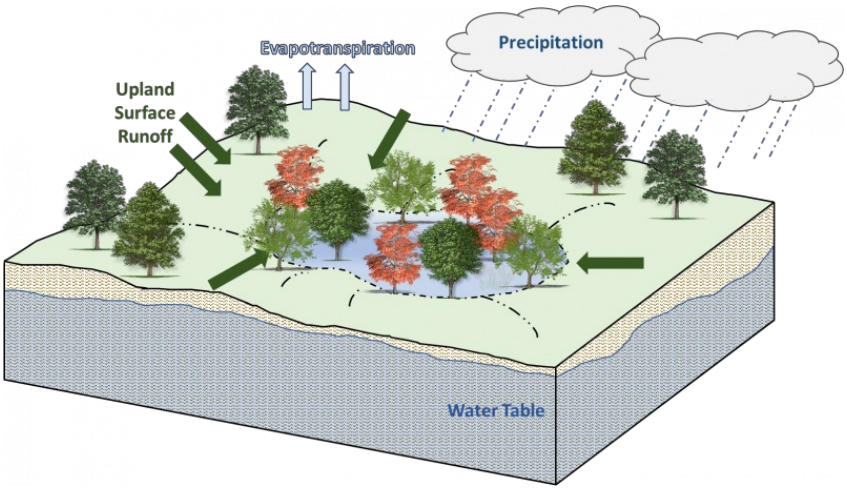


Figure 8. Hydrologic cycling in Lacustrine Swamp Forest ecological site.

Soil features

Soils of Lacustrine Swamp Forests are in the Mollisols order, further classified as Typic Argiaquolls and Vertic Endoaquolls with very slow infiltration and very high runoff potential. The soil series associated with this site includes Montgomery and Navan. The parent material is lacustrine deposits, and the soils are very poorly to poorly drained with seasonal high-water tables. Soil pH classes are slightly acid to moderately alkaline. No rooting restrictions are noted for the soils of this ecological site.

Some soil map units in this ecological site, if not drained, may meet the definition of hydric soils and are listed as meeting criteria 2 of the hydric soils list (77 FR 12234).

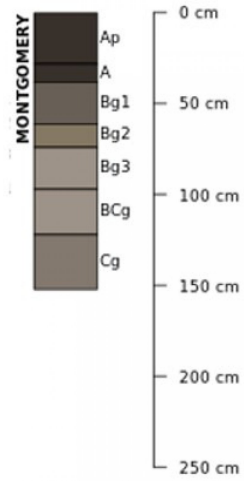


Figure 9. Profile sketches of soil series associated with Lacustrine Swamp Forest.

Table 4. Representative soil features

Parent material	(1) Lacustrine deposits
Family particle size	(1) Fine (2) Fine-loamy
Drainage class	Very poorly drained to poorly drained
Depth to restrictive layer	80 in
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (Depth not specified)	6–7 in
Calcium carbonate equivalent (Depth not specified)	0–35%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–7%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

The information in this Ecological Site Description, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land management decisions.

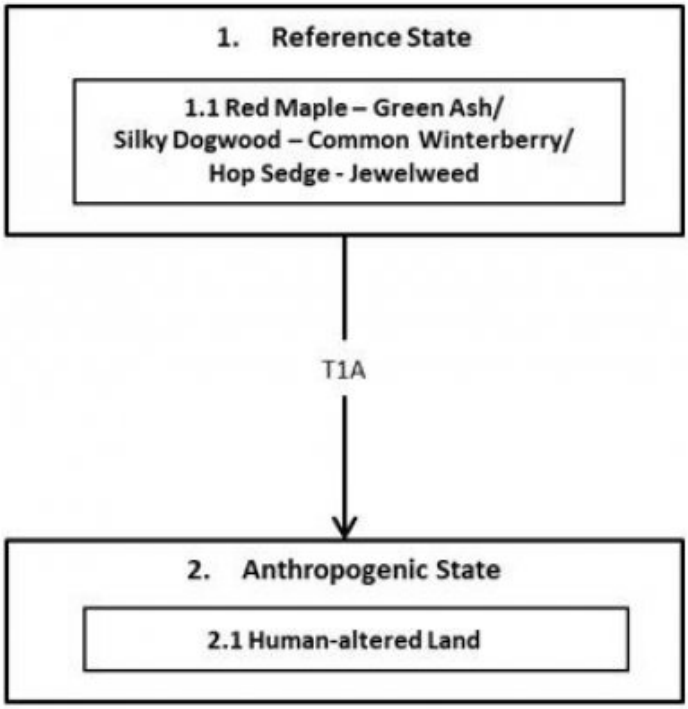
The MLRA lies within the tallgrass prairie ecosystem of the Midwest, but a variety of environmental and edaphic factors resulted in landscape that historically supported prairies, savannas, forests, and various wetlands. Lacustrine Swamp Forests form an aspect of this vegetative continuum. This ecological site occurs on lake plains on very poorly to poorly drained soils. Species characteristic of this ecological site consist of hydrophytic woody and herbaceous vegetation.

Ponding is the primary disturbance factor that maintains Lacustrine Swamp Forests, with the depth and duration of inundation regulating the density and diversity of the herbaceous layer (WDNR 2015; NatureServe 2018). Windthrow, drought, and matrix-driven fire regimes are secondary disturbances. Damage to trees from wind and ice storms can vary from minor, patchy effects of individual trees to stand effects that temporarily affect community structure and species richness and diversity (Irland 2000; Peterson 2000). Drought can also slow the growth of plants and result in dieback of certain species. When coupled with fire, periods of drought and catastrophic storm damage can greatly delay the establishment and maturation of woody vegetation (Pyne et al. 1996).

Today, Lacustrine Swamp Forests may be considered extirpated from the MLRA as large-scale clearing was undertaken to make way for agricultural and other human-modified landscapes. Watershed hydrologic disruptions and the spread of non-native pests and diseases have so greatly impaired community function that successful restoration techniques are currently unknown (WDNR 2015). The state-and-transition model that follows provides a detailed description of each state, community phase, pathway, and transition. This model is based on available experimental research, field observations, literature reviews, professional consensus, and interpretations.

State and transition model

F110XY026IL LACUSTRINE SWAMP FOREST



Code	Process
T1A	Vegetation removal and human alterations/transportation of soils

State 1
Reference State

The reference plant community is categorized as a swamp forest community, dominated by hydrophytic woody and herbaceous vegetation. The one community phase within the reference state is dependent on ponding. The depth and duration of inundation alters species composition, cover, and extent. Windthrow, drought, and matrix-driven fires have more localized impacts in the reference phase, but do contribute to overall species composition, diversity, cover, and productivity.

Community 1.1
Red Maple - Green Ash/Silky Dogwood - Common Winterberry/Hop Sedge - Jewelweed

Sites in this reference community phase are dominated by a variety of hardwoods including red maple, green ash, and American elm, while silver maple, bitternut hickory, hackberry, black ash, bur oak (*Quercus macrocarpa* Michx.), swamp white oak (*Quercus bicolor* L.), and American basswood (*Tilia americana* L.) are common canopy associates. Depending on disturbance histories, the shrub strata cover can be quite variable with such representative species as silky dogwood, common winterberry, redosier dogwood (Cornus stolonifera), common ninebark (*Physocarpus opulifolius* (L.) Maxim., orth. cons.), and nannyberry (Virburnum lentago L.). Characteristic herbaceous species include hop sedge, jewelweed, bluejoint (*Calamagrostis canadensis* L.), fowl mannagrass (*Glyceria striata*(Lam.) Hitchc.), Canadian woodnettle (*Laportea canadensis* (L.) Weddell), and smallspike false nettle (*Boehmeria cylindrica* (L.) Sw.) (WDNR 2015).

Dominant plant species

- red maple (*Acer rubrum*), tree
- green ash (*Fraxinus pennsylvanica*), tree

- silky dogwood (*Cornus amomum*), shrub
- common winterberry (*Ilex verticillata*), shrub
- hop sedge (*Carex lupulina*), other herbaceous
- jewelweed (*Impatiens capensis*), other herbaceous

State 2
Anthropogenic State

The anthropogenic state occurs when the reference state is cleared and developed for human use and inhabitation, such as for commercial and housing developments, landfills, parks, golf courses, cemeteries, earthen spoils, etc. The native vegetation has been removed and soils have either been altered in place (e.g. cemeteries) or transported from one location to another (e.g. housing developments). Most of the soils in this state have 50 to 100 cm of overburden on top of the natural soil. This natural material can be determined by observing a buried surface horizon or the unaltered subsoil, till, or lacustrine parent materials. This state is generally considered permanent.

Community 2.1
Human-altered land

Sites in this community phase have had the native plant community removed and soils heavily re-worked in support of human development projects.

Transition T1A
State 1 to 2

Vegetation removal and human alterations/transportation of soils transitions the site to the anthropogenic state (2).

Additional community tables

Inventory data references

No field plots were available for this site. A review of the scientific literature and professional experience were used to approximate the plant communities for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in this ecological site description.

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Approval

Chris Tecklenburg, 4/22/2020

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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	05/11/2025
Approved by	Chris Tecklenburg
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:**
