

Ecological site F111XA019IN Moderately Deep Restricted

Last updated: 4/17/2020
Accessed: 05/18/2024

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): 111X–Indiana and Ohio Till Plain

A PROVISIONAL ECOLOGICAL SITE is a conceptual grouping of soil map unit components within a Major Land Resource Area (MLRA) based on the similarities in response to management. Although there may be wide variability in the productivity of the soils grouped into a Provisional Site, the soil vegetation interactions as expressed in the State and Transition Model are similar and the management actions required to achieve objectives, whether maintaining the existing ecological state or managing for an alternative state, are similar. Provisional Sites are likely to be refined into more precise group during the process of meeting the APPROVED ECOLOGICAL SITE DESCRIPTION criteria.

This PROVISIONAL ECOLOGICAL SITE has been developed to meet the standards established in the National Ecological Site Handbook. The information associated with this ecological site does not meet the Approved Ecological Site Description Standard, but it has been through a Quality Control and Quality Assurance processes to assure consistency and completeness. Further investigations, reviews and correlations are necessary before it becomes an Approved Ecological Site Description.

111A – Indiana and Ohio Till Plain, Central Part. This area is in the Till Plains Section of the Central Lowland Province of the Interior Plains. It is dominated by broad, nearly level ground moraines that are broken in some areas by kames, outwash plains, and stream valleys along the leading edge of the moraines. Narrow, shallow valleys commonly are along the few large streams in the area. Elevation ranges from 680 to 1,250 feet (205 to 380 meters), increasing gradually from west to east. Relief is mainly a few meters, but in some areas hills rise as much as 100 feet (30 meters) above the adjoining plains.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Wabash (0512), 46 percent; Great Miami (0508), 30 percent; Scioto (0506), 22 percent; and the Middle Ohio (0509), 2 percent. The major rivers in the area include the East and West Forks of the White River and the Whitewater River in Indiana and the Great Miami, Stillwater, Big Darby, Scioto, and Big Walnut Rivers in Ohio.

Surface deposits in this area include glacial deposits of till, lacustrine sediments, and outwash from Wisconsin and older glacial periods. A moderately thick mantle of loess covers much of the area. Most of this MLRA is underlain by Silurian and Devonian limestone and dolostone. Also, some areas of Late Ordovician shale and limestone are in the western part of the MLRA (USDA, 2006).

Classification relationships

Major Land Resource Area (USDA-Natural Resources Conservation Service, 2006)

USFS Ecological Regions (USDA, 2007):

Sections – Southern Unglaciaded Allegheny Plateau (221E), Central Till Plains, Beech Maple (222H), Interior Low Plateau-Transition Hills (223B), Interior Low Plateau-Bluegrass (223F)

Subsections - Lower Scioto River Plateau (221Eg), Bluffton Till Plains (222Ha), Miami-Scioto Plain-Tipton Till Plain

(222Hb), Little Miami Old Drift Plain (222Hc), Mad River Interlobate Plains (222Hd), Darby Plains (222He), Brown County Hills (223Ba), Northern Bluegrass (223Fd), Muscatatuck Flats and Valleys (223Fe), Scottsburg Lowlands (223Ff)

NatureServe Systems anticipated (NatureServe, 2011): Agriculture - Cultivated Crops and Irrigated Agriculture, Agriculture - Pasture/Hay, Allegheny-Cumberland Dry Oak Forest and Woodland, Appalachian (Hemlock)-Northern Hardwood Forest, Central Appalachian Pine-Oak Rocky Woodland, Central Interior Acidic Cliff and Talus, Central Interior Highlands Calcareous Glade and Barrens, Central Tallgrass Prairie, Clearcut - Grassland/Herbaceous, Introduced Upland Vegetation – Treed, Managed Tree Plantation, Mississippi River Riparian Forest, North-Central Interior and Appalachian Acidic Peatland, North-Central Interior Beech-Maple Forest, North-Central Interior Dry-Mesic Oak Forest and Woodland, North-Central Interior Floodplain, North-Central Interior Freshwater Marsh, North-Central Interior Oak Savanna, North-Central Interior Wet Flatwoods, North-Central Interior Wet Meadow-Shrub Swamp, North-Central Oak Barrens, Northeastern Interior Dry-Mesic Oak Forest, Ruderal Forest, Ruderal Upland - Old Field, South-Central Interior / Upper Coastal Plain Wet Flatwoods, South-Central Interior Large Floodplain, South-Central Interior Mesophytic Forest, South-Central Interior Small Stream and Riparian, Southern Appalachian Oak Forest, Southern Interior Low Plateau Dry-Mesic Oak Forest, Southern Ridge and Valley / Cumberland Dry Calcareous Forest, Successional Shrub/Scrub

LANDFIRE Biophysical Settings anticipated (USGS, 2010): Allegheny-Cumberland Dry Oak Forest and Woodland, Appalachian (Hemlock-) Northern Hardwood Forest, Central Interior and Appalachian Floodplain Systems, Central Interior and Appalachian Riparian Systems, Central Interior and Appalachian Shrub-Herbaceous Wetland Systems, Central Interior and Appalachian Swamp Systems, Central Interior Highlands Calcareous Glade and Barrens, Central Interior Highlands Dry Acidic Glade and Barrens, Central Tallgrass Prairie, Great Lakes Coastal Marsh Systems, North-Central Interior Beech-Maple Forest, North-Central Interior Dry-Mesic Oak Forest and Woodland, North-Central Interior Dry Oak Forest and Woodland, North-Central Interior Oak Savanna, North-Central Interior Wet Flatwoods, South-Central Interior Mesophytic Forest, South-Central Interior/Upper Coastal Plain Flatwoods, Southern Appalachian Oak Forest, Southern Interior Low Plateau Dry-Mesic Oak Forest

Ecological site concept

This site is an upland site generally formed on residuum weathered from limestone and shale. The depth to the restrictive layer is between 20 and 40 inches. Drainage is moderately well to well drained with slopes generally from 8-50%. This woodland site was, historically, a mixed hardwood site with oaks being the dominant canopy species. The combination of moderately deep soils and slope restricted the impact of fire to portions of the site. This allows the site have a high amount of fire sensitive, shade tolerant species such as sugar maple being co-dominant with the oak species. Overall, the largest driver of species dynamics is that of gap-phase regeneration that contributes to the maintenance of the site as a mixed hardwoods. Currently, the areas with less slope have been converted for agricultural use, mostly hay and pasture, but some are used for small grains as well.

Associated sites

F111XA018IN	Shallow Restricted Site is generally higher on the landscape; soil depth to restrictive layer is less than 20 inches.
F111XA020IN	Deep Restricted Site is generally lower on the landscape; soil depth to restrictive layer is 40 inches or greater.

Similar sites

F111XA014IN	Outwash Upland Soil parent material is outwash; soils are somewhat poorly to moderately well drained.
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Table 1. Dominant plant species

Tree	(1) <i>Quercus</i> (2) <i>Acer saccharum</i>
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecosite is found in karst in MLRA 111A: Indiana and Ohio Till Plain, Central Part. Soils are moderately deep (20-40 inches) from lithic contact.

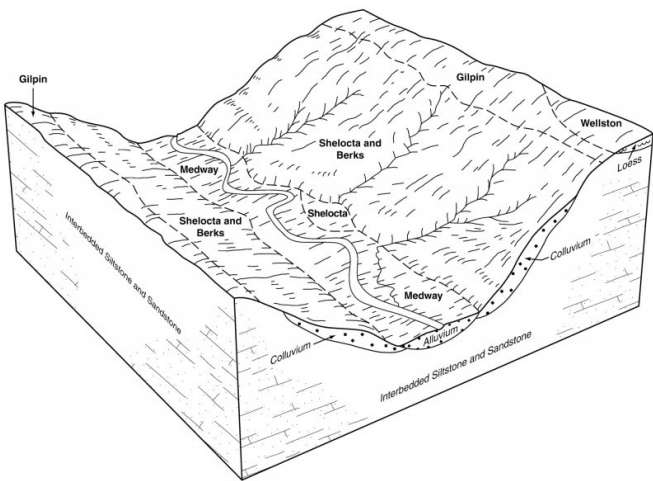


Figure 1. Block diagram showing soil series on the landscape.

Table 2. Representative physiographic features

Landforms	(1) Knob (2) Valley side (3) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	90–457 m
Slope	6–75%
Ponding depth	0 cm
Water table depth	69 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The average annual precipitation in this area is 36 to 43 inches (915 to 1,090 millimeters). Most of the rainfall occurs as convective thunderstorms during the growing season. About half or more of the precipitation occurs during the freeze-free period. Snowfall is common in winter. The average annual temperature is 49 to 53 degrees F (9 to 12 degrees C). The freeze-free period averages about 195 days and ranges from 175 to 215 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	145-166 days
Freeze-free period (characteristic range)	174-199 days
Precipitation total (characteristic range)	991-1,067 mm
Frost-free period (actual range)	142-174 days
Freeze-free period (actual range)	171-201 days
Precipitation total (actual range)	991-1,118 mm
Frost-free period (average)	154 days
Freeze-free period (average)	185 days
Precipitation total (average)	1,041 mm

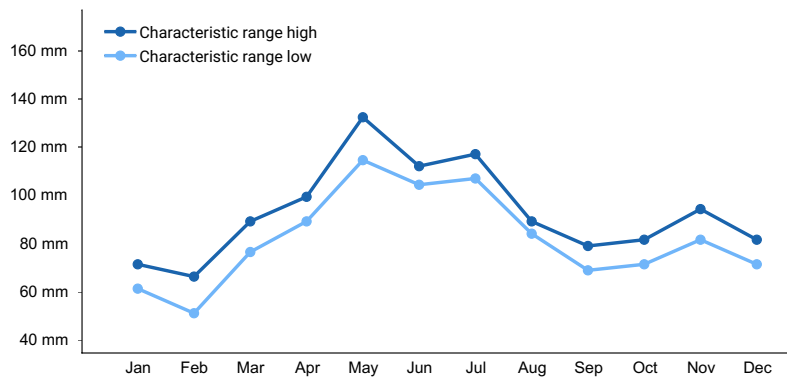


Figure 2. Monthly precipitation range

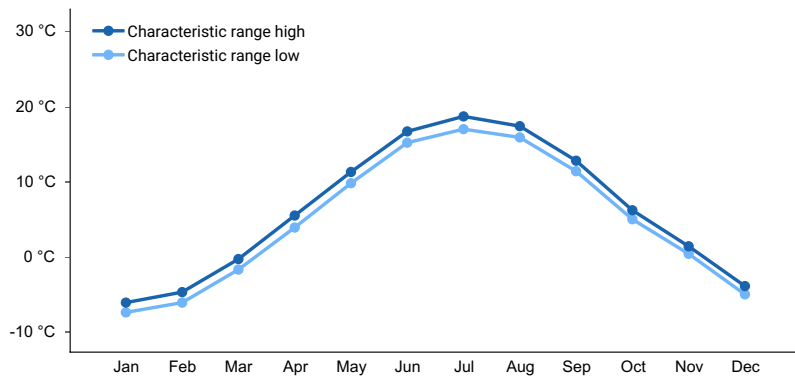


Figure 3. Monthly minimum temperature range

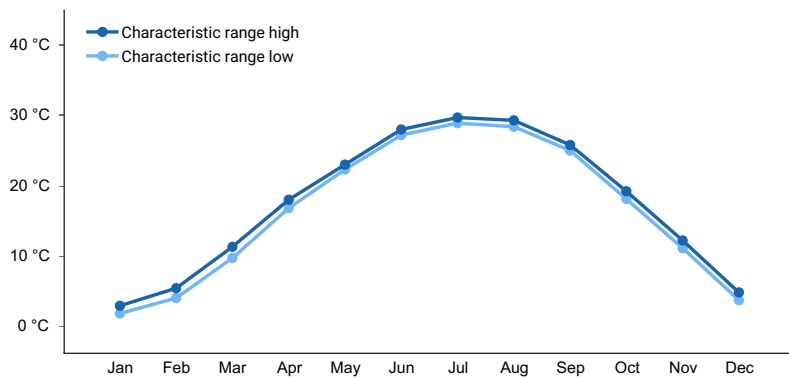


Figure 4. Monthly maximum temperature range

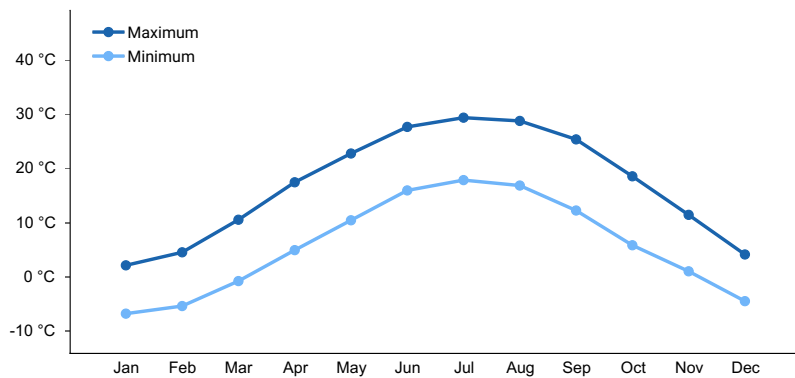


Figure 5. Monthly average minimum and maximum temperature

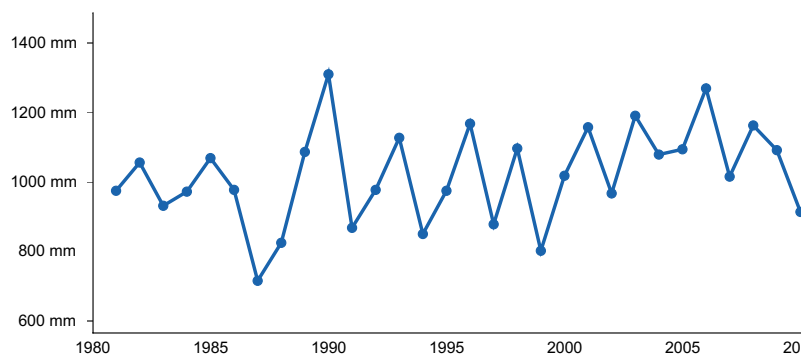


Figure 6. Annual precipitation pattern

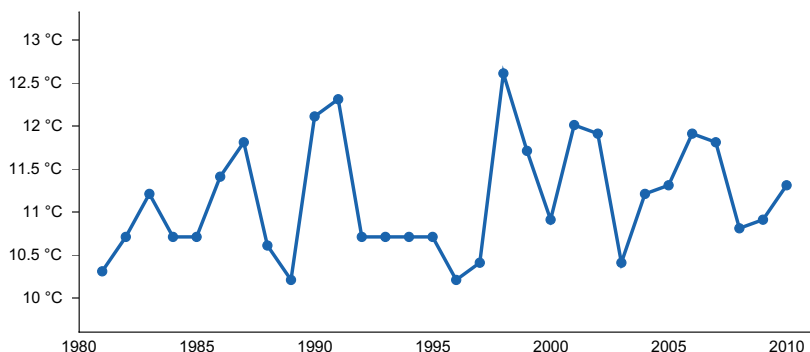


Figure 7. Annual average temperature pattern

Climate stations used

- (1) KOKOMO 3 WSW [USC00124662], Russiaville, IN
- (2) INDIANAPOLIS EAGLE CREEK AP [USW00053842], Indianapolis, IN
- (3) COLUMBUS [USC00121747], Columbus, IN
- (4) RICHMOND WTR WKS [USC00127370], Richmond, IN
- (5) SPRINGFIELD NEW WWKS [USC00337935], Springfield, OH
- (6) COLUMBUS OHIO STATE UNIV AP [USW00004804], Dublin, OH
- (7) CHILLICOTHE MOUND CITY [USC00331528], Chillicothe, OH

Influencing water features

This ecological site is not influenced by wetland or riparian water features.

Soil features

The soil series associated with this site are: Muskingum, Lily, Latham, Jessietown, Gilwood, Gilpin, Edenton, Eden, Dekalb, Caneyville, Brownstown, Bratton, Berks. They are moderately deep, moderately well drained to well drained, and very slow to rapid permeable soils, with very strongly acidic to neutral soil reaction, that formed in Residuum.

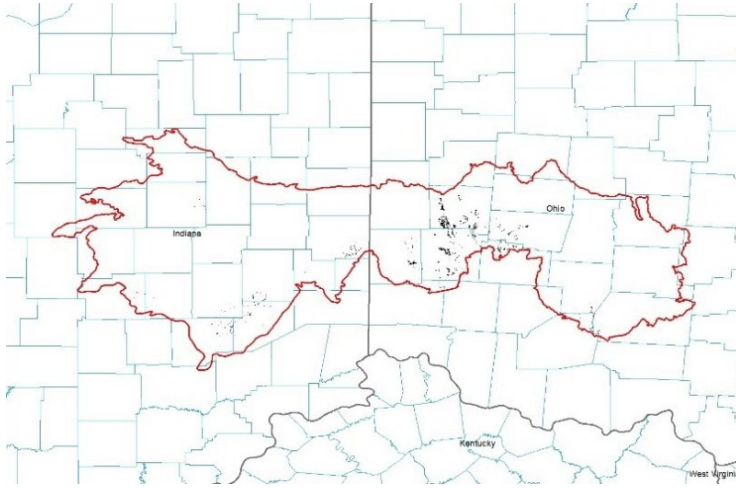


Figure 8. Mapunit locations within the MLRA.

Table 4. Representative soil features

Parent material	(1) Residuum—calcareous shale
Surface texture	(1) Channery silty clay loam (2) Flaggy silt loam (3) Silty clay
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to rapid
Soil depth	51–102 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	5.08–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	0–2%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.5–6.8
Subsurface fragment volume <=3" (Depth not specified)	0–35%
Subsurface fragment volume >3" (Depth not specified)	0–62%

Ecological dynamics

The historic plant community of this ecological site is a mixed forest. The dominant species in the canopy are a variety of oak species and sugar maple principally, with beech, hickories, basswood, and tulip-tree being present as well. This site is naturally dominated by stable, uneven-aged forests with the canopy dynamics being driven by gap-phase regeneration. The portions of this site that have been converted to agriculture are mostly used for hay and pasture, though some areas are used for small grains.

State and transition model

Moderately Deep Restricted, F111AY019IN

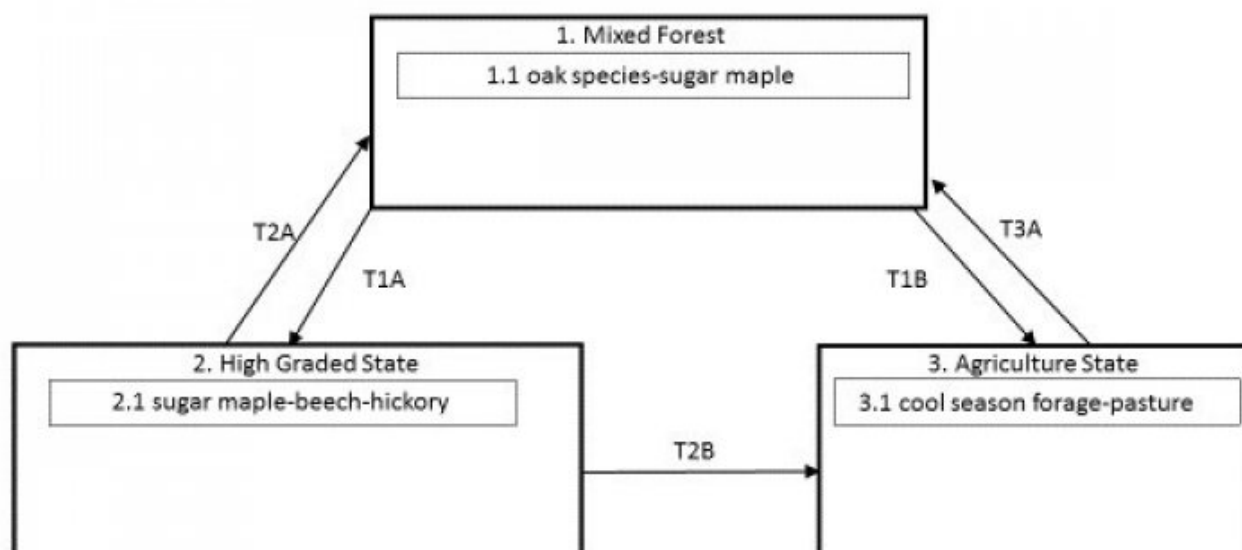


Figure 9. STM

Moderately Deep Restricted, F111AY019IN Diagram Legend

T1A	Selective tree harvest; no TSi
T1B	Remove woody species, plant forage/pasture, management
T2A	Plant desired species, low intensity fire
T2B	Remove woody species, plant forage/pasture, management
T3A	Plant desired species, low intensity fire

Figure 10. Legend

State 1 Mixed Forest

This is the diagnostic plant community for this site. Oak species and sugar maple are the dominant canopy tree species. This site is naturally dominated by stable, uneven-aged forests with the canopy dynamics being driven by gap-phase regeneration. This lends towards the canopy containing a diverse number of species.

Dominant plant species

- oak (*Quercus*), tree
- sugar maple (*Acer saccharum*), tree

Community 1.1

oaks/sugar maple

This phase is characterized by tree dominance, particularly oaks and sugar maple. Additional canopy species include beech, hickories, basswood, and tulip-tree.

Dominant plant species

- oak (*Quercus*), tree
- sugar maple (*Acer saccharum*), tree

State 2

High Graded State

This phase is characterized by the removal of the more marketable tree species, primarily oaks and black walnut, and occasionally tulip-tree. The resulting tree species, tulip-tree, hickory species, and ash become the dominant species in the canopy.

Dominant plant species

- tuliptree (*Liriodendron tulipifera*), tree
- hybrid hickory (*Carya*), tree

Community 2.1

sugar maple/beech/hickory

This phase is characterized by the removal of the oaks and black walnut. The sugar maple/beech/hickory trees dominate the canopy.

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- hybrid hickory (*Carya*), tree

State 3

Agriculture State

This state is characterized by the conversion of the site to agricultural use. Most common practice is a corn and soybean rotation of various types. A small portion of the historic acres are used for forage and pasture.

Community 3.1

corn/soybeans

This phase is characterized by row crop agriculture of small grains, primarily corn and soybeans.

Community 3.2

cool season forage/pasture

This phase is characterized by forage or grazing agriculture. Different mixes of, generally, cool season grasses and forbs, largely clovers, are grown.

Pathway P3.1A

Community 3.1 to 3.2

Planting of cool season pasture/forage species and management to maintain them.

Pathway P3.2A

Community 3.2 to 3.1

Establishment and maintenance of row crops

Transition T1A

State 1 to 2

Removal of highly marketable tree species, primarily oaks and black walnut will move the site towards State 2.

Transition T1B

State 1 to 3

Removal off trees and other wood species. Install drainage system (if warranted), prepare the site for planting the agricultural crop, and regular agricultural practices.

Restoration pathway R2A

State 2 to 1

Timber stand improvement practices and planting (if warranted) of desired species.

Transition T2B

State 2 to 3

Removal off trees and other wood species. Install drainage system (if warranted), prepare the site for planting the agricultural crop, and regular agricultural practices.

Restoration pathway R3A

State 3 to 1

Removal of drainage system (if warranted), site preparation, and tree planting.

Additional community tables

Inventory data references

Site concept developed through expert opinion and review of the literature.

Other references

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Contributors

Tyler Staggs

Approval

Chris Tecklenburg, 4/17/2020

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)	TYLER STAGGS
Contact for lead author	
Date	05/18/2024
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:**
-
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:**
-
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**
-
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:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
-
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:
