

## Ecological site F111XD022IN Shallow Restricted

Last updated: 5/28/2020  
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### 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.

111D – Indiana and Ohio Till Plain, Western Part. This MLRA occurs in two separate areas. One area is in the west-central part of Indiana (73 percent), and the other is in southwestern Ohio (27 percent). The MLRA makes up 5,355 square miles (13,880 square kilometers). It includes the towns of Crawfordville, Delphi, Frankfort, Lafayette, and Liberty, Indiana, and Hamilton, Lebanon, Middletown, and Wilmington, Ohio. Interstates 65 and 74 cross the part of this area in Indiana, and Interstates 71 and 75 cross the part in Ohio. Shades and Turkey Run State Parks are in the part in Indiana, and Caesar Creek and Hueston Woods State Parks are in the part in Ohio. A small portion of the Wright-Patterson Air Force Base, in Ohio, is in the northern part of the area.

This area is in the Till Plains Section of the Central Lowland Province of the Interior Plains. It is dominated by loess hills and flats that are broken in places by moraines, kames, outwash plains, and stream terraces. Narrow, shallow valleys commonly are along the few large streams in the area. Elevation ranges from 530 to 1,050 feet (160 to 320 meters), increasing gradually from southwest to northeast. 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), 68 percent; Great Miami (0508), 15 percent; Middle Ohio (0509), 14 percent; Scioto (0506), 2 percent; and Upper Illinois (0712), 1 percent. Wildcat Creek in Indiana and the Little Miami River in Ohio have been designated as National Wild and Scenic Rivers. Sugar Creek and Walnut Creek occur in the part of the area in northern Indiana, and the Whitewater River is in the part in southeastern Indiana. The Sevenmile, Fourmile, and Great Miami Rivers cross the part of the area in Ohio.

Most of the eastern part of this MLRA is underlain by Late Ordovician shale and limestone. The western part is underlain by shale, siltstone, sandstone, limestone, and dolostone ranging in age from Middle Pennsylvanian to Silurian. Surficial materials include glacial deposits of till, outwash, and lacustrine sediments from Wisconsin and

older glacial periods. A thin or moderately thick mantle of loess overlies much of the area.

## Classification relationships

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

USFS Ecological Regions (USDA, 2007):

Sections –Central Till Plains, Beech Maple (222H), Interior Low Plateau-Shawnee Hills (223D), Interior Low Plateau-Bluegrass (223F), Central Till Plains-Oak Hickory (223G), Central Till Plains and Grand Prairies (251D)

Subsections -Bluffton Till Plains (222Ha), Miami-Scioto Plain-Tipton Till Plain (222Hb), Little Miami Old Drift Plain (222Hc), Mad River Interlobate Plains (222Hd), Crawford Uplands (223De), Crawford Escarpment (223Df), Northern Bluegrass (223Fd), Lower Wabash Alluvial Plain (223Gc), Southwest Indiana Glaciated Lowlands (223Ge), Eastern Grand Prairie (253Dd).

NatureServe Systems anticipated (NatureServe, 2011): Agriculture - Cultivated Crops and Irrigated Agriculture, Agriculture - Pasture/Hay, Allegheny-Cumberland Dry Oak Forest and 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 Dry Oak Forest and Woodland, North-Central Interior Floodplain, North-Central Interior Freshwater Marsh, North-Central Interior Maple-Basswood Forest, North-Central Interior Oak Savanna, North-Central Interior Wet Flatwoods, North-Central Interior Wet Meadow-Shrub Swamp, North-Central Oak Barrens, Northern Atlantic Coastal Plain Hardwood 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, Successional Shrub/Scrub

LANDFIRE Biophysical Settings anticipated (USGS, 2010): Allegheny-Cumberland Dry Oak Forest and Woodland, Bluegrass Savanna and Woodland, 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, Mississippi River Alluvial Plain Dry-Mesic Loess Slope Forest, 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 Maple-Basswood Forest, North-Central Interior Oak Savanna, North-Central Interior Wet Flatwoods, Paleozoic Plateau Bluff and Talus, Pennyroyal Karst Plain Prairie and Barrens, 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 formed on clayey residuum overlaying limestone and shale. The depth to the restrictive layer is less than 20 inches. Drainage is well drained or drier with slopes up generally from 25-80%. Landscape position, shallow soil depth, and slope provide a level of protection for the site from fire. This combination of factors allow the eastern red cedar to become a co-dominant on the site with oak species. The dark soil surface color and depth of the color, along with the drainage of the site indicate that the understory was comprised largely of herbaceous, mostly graminoid, species. A large portion of the site in agricultural use is used for pasture or hay. The majority of the site is in natural vegetation, with an appreciable amount being in second growth woodlands or brush.

## Associated sites

F111XD023IN	<b>Moderately Deep Restricted</b> Located on similar and adjacent landscape positions; restrictive layer depth is 20 to 40 inches.
F111XD024IN	<b>Deep Restricted</b> Located on similar and adjacent landscape positions; restrictive layer depth is greater than 40 inches.

**Table 1. Dominant plant species**

Tree	(1) <i>Quercus</i> (2) <i>Juniperus virginiana</i>
Shrub	Not specified
Herbaceous	Not specified

## Physiographic features

This ecosite is found in steep, rocky landscapes in MLRA 111A: Indiana and Ohio Till Plain, Central Part, 111D: Indiana and Ohio Till Plain, Western Part.

list of unique landform positions: Backslope, Shoulder, Summit

Soils in this site have one or more characteristics that are severely limiting to the planting and growth of trees and shrubs. Soil depth is less than 20 inches; available water capacity is less than 3 inches; depth to a water table during the growing season is less than 0.5 feet; pH is less than 4.0 or greater than 8.5, sodium adsorption rate is greater than 25; CaCO<sub>3</sub> percentages equal or exceed 40%; flooding duration is very long. This group also includes urban land and water.

**Table 2. Representative physiographic features**

Landforms	(1) Ridge (2) Hill (3) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	91–381 m
Slope	6–80%
Ponding depth	0 cm
Water table depth	152 cm
Aspect	SE, W

## 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 54 degrees F (10 to 12 degrees C). The freeze-free period averages about 200 days and ranges from 180 to 215 days.

**Table 3. Representative climatic features**

Frost-free period (characteristic range)	133-148 days
Freeze-free period (characteristic range)	175-185 days
Precipitation total (characteristic range)	991-1,118 mm
Frost-free period (actual range)	132-158 days
Freeze-free period (actual range)	171-189 days
Precipitation total (actual range)	991-1,168 mm
Frost-free period (average)	141 days
Freeze-free period (average)	179 days

Precipitation total (average)

1,067 mm

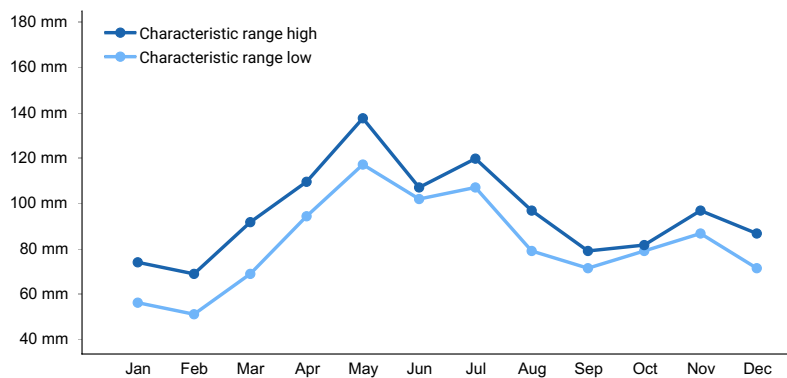


Figure 1. Monthly precipitation range

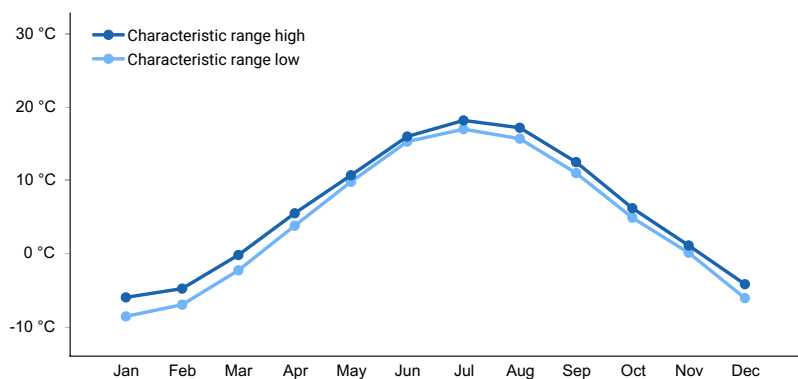


Figure 2. Monthly minimum temperature range

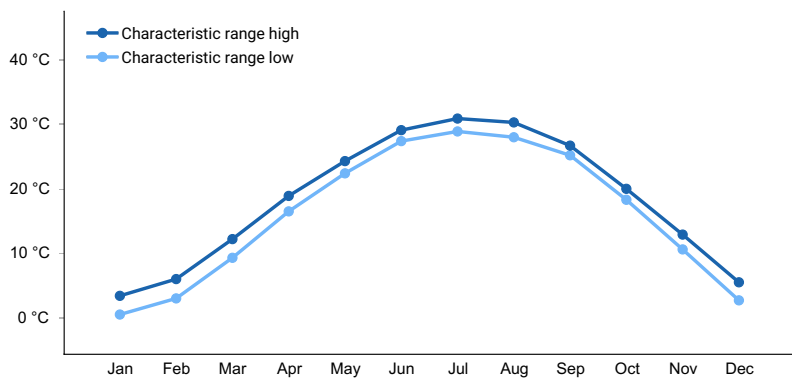


Figure 3. Monthly maximum temperature range

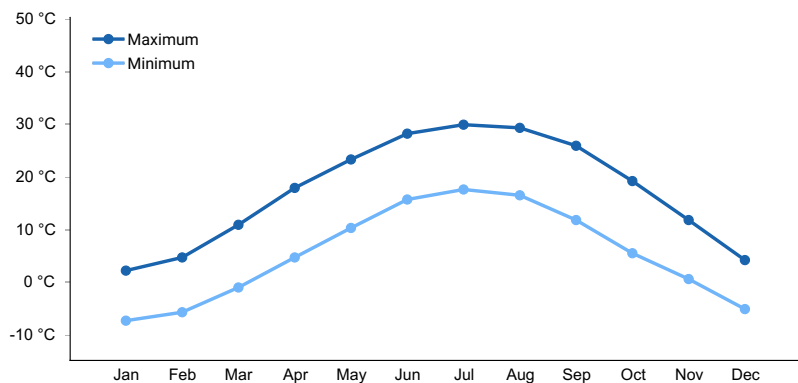


Figure 4. Monthly average minimum and maximum temperature

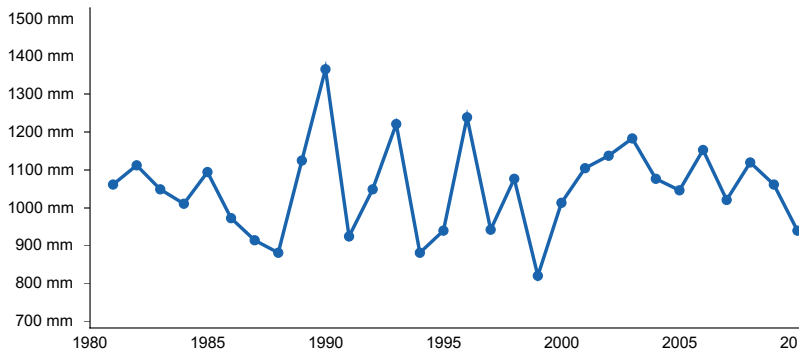


Figure 5. Annual precipitation pattern

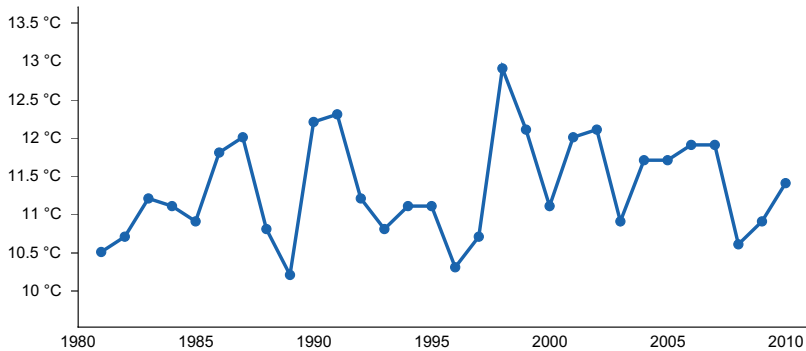


Figure 6. Annual average temperature pattern

### Climate stations used

- (1) FRANKLIN [USC00332928], Franklin, OH
- (2) ROCKVILLE [USC00127522], Rockville, IN
- (3) FAIRFIELD [USC00332651], Hamilton, OH
- (4) ATTICA 2E [USC00120331], Attica, IN
- (5) BOSWELL 4WNW [USC00120858], Fowler, IN
- (6) WABASH [USC00129138], Wabash, IN
- (7) TERRE HAUTE INDIANA ST [USC00128723], Terre Haute, IN
- (8) HAMILTON BUTLER CO RGNL AP [USW00053855], Fairfield, 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: Weikert, Opequon, Gasconade, Fairmount, Corydon. They are shallow, well drained to somewhat excessively drained, and very slow to moderately rapid permeable soils, with extremely acidic to moderately alkaline soil reaction, that formed in Residuum from Limestone, Limestone and shale, Sandstone and shale.

Table 4. Representative soil features

Parent material	(1) Residuum–limestone and shale
Surface texture	(1) Channery clay (2) Flaggy silty clay loam (3) Very channery silt loam
Family particle size	(1) Clayey
Drainage class	Well drained to somewhat excessively drained

Permeability class	Very slow to moderate
Soil depth	30–48 cm
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	3–25%
Available water capacity (0-101.6cm)	3.3–7.62 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.3–7.2
Subsurface fragment volume <=3" (Depth not specified)	1–33%
Subsurface fragment volume >3" (Depth not specified)	1–27%

## Ecological dynamics

The historic plant community of the Shallow Restricted ecological site is that of a barrens that is somewhat protected from fire. The site is mostly wooded with various oak species and eastern red cedar being characteristic of the site. The understory is dominated by herbaceous species, particularly little bluestem and sideoats grama. Low intensity surface fires maintain the herbaceous understory and less frequent, more severe fires keep the site from being dominated by eastern red cedar. Much of this site is currently still in a wooded or old field state. Areas used for agriculture are mostly used for growing forage or pasture.

## State and transition model

### Shallow Restricted, F111DY022IN

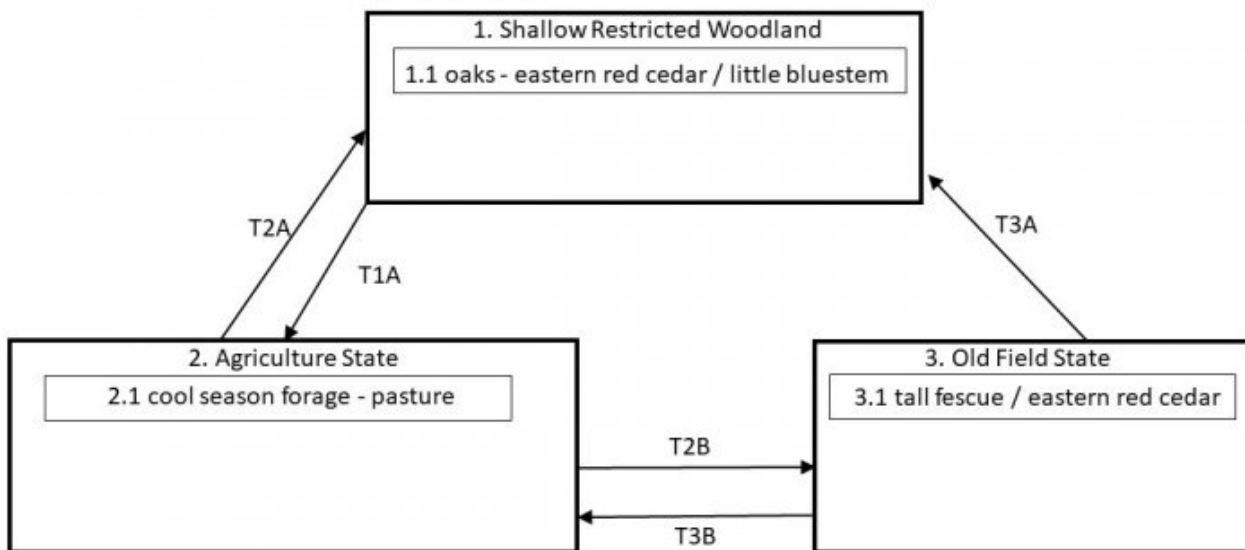


Figure 7. Shallow Restricted

## Shallow Restricted, F111DY022IN

### Diagram Legend

T1A	Remove woody species, plant forage/pasture, management
T2A	Plant desired species, low intensity fire
T2B	No management
T3A	Plant desired species, low intensity fire
T3B	Remove woody species, plant forage/pasture, management

Figure 8. Legend

#### State 1

##### Shallow Restricted woodland

This is the reference or diagnostic plant community for this site. The site is mostly wooded with various oak species and eastern red cedar being characteristic of the site. The understory is dominated by herbaceous species, particularly little bluestem and sideoats grama.

##### Community 1.1

###### oaks/eastern red cedar/little bluestem

Low intensity surface fires maintain the herbaceous understory and less frequent, more severe fires keep the site from being dominated by eastern red cedar.

#### State 2

##### Agriculture

The portion of this site used for agriculture is largely used for pasture or cool season forage production.

##### Community 2.1

###### 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.

#### State 3

##### Old Field State

This state is characterized by interrupted drainage and removal of historical vegetation. Both contribute to site being comprised of largely weedy species that will progress to tree dominance.

##### Community 3.1

###### tall fescue/eastern red cedar

Tall fescue and eastern red cedar colonize the site after agricultural abandonment.

### **Transition T 1-2**

#### **State 1 to 2**

Remove the woody species, plant desired forage species, and pasture/forage management will move the site to and maintain state #2.

### **Restoration pathway 2-1**

#### **State 2 to 1**

Plant appropriate species, low intensity fires.

### **Transition 2-3**

#### **State 2 to 3**

Abandonment or no management on agricultural field.

### **Transition T 3-1**

#### **State 3 to 1**

Removal of existing vegetation, planting of desired species, and low intensity fire will move this state towards the reference community.

### **Restoration pathway 3-2**

#### **State 3 to 2**

Clear woody vegetation, plant crop species, and management that allows the area to be in agriculture.

## **Additional community tables**

### **Inventory data references**

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

### **Other references**

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the Pacific Basin. U. S. Department of Agriculture, Natural Resources Conservation Service. U. S. Department of Agriculture Handbook 296.

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## Contributors

Tyler Staggs

## Approval

Chris Tecklenburg, 5/28/2020

## 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	05/07/2024
Approved by	Chris Tecklenburg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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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):**

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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:**

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