USDA Natural Resources Conservation Service

Ecological site F114XA802IN
Eolian Forest

Last updated: 9/26/2024
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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): 114X–Southern Illinois and Indiana Thin Loess and Till Plain

MLRA 114 makes up about 4,550 square miles (11,795 square kilometers. The three parts of this MRLA are mostly in the Till Plains Section of the Central Lowland Province of the Interior Plains. The western third of the western part is in the Highland Rim Section of the Interior Low Plateaus Province of the Interior Plains. The eastern half of the eastern part is in the Kanawha Section of the Appalachian Plateaus Province of the Appalachian Highlands. Both large and small tributaries of the Ohio River dissect the nearly level to very steep glaciated uplands in this area. The major streams and rivers have well defined valleys with broad flood plains and numerous stream terraces. The flood plains along the smaller streams are narrow. Broad summits are nearly level to gently sloping. Elevation ranges from 320 feet (100 meters) on the southernmost flood plain along the Ohio River to 1,250 feet (380 meters) on the highest ridges. Local relief is mainly 10 to 50 feet (3 to 15 meters), but it can be 50 to 100 feet (15 to 30 meters) along drainageways and streams. Also, the Ohio River bluffs are as much as 300 feet (90 meters) above the river valley floor.

Classification relationships

USFS: 222 Eastern Broadleaf Forest (Continental) Province

Homoya's Natural Regions of Indiana: Bluegrass Region

The following NatureServe Explorer Ecological System has a high level of probability to match the ecological site found on these soils. Field verification is needed prior to using this information for conservation planning and/or restoration initiatives: North-Central Interior Dry Oak Forest and Woodland-Unique Identifier: CES202.047

Ecological site concept

Eolian Forest reference sites are a dry mixed oak woodland. Common trees include black oak, white oak, scarlet oak, sassafras, and multiple hickory species. These sandy sites have a variable water table depth depending on their landscape location. Shrub and understory plants will vary depending on fire regime and disturbance history. Few sites exist in MLRA 114A as most have been converted to agriculture or urban uses.

Associated sites

F114XA404IN	**Outwash Upland Forest** These soils are generally well drained and are found on outwash upland forest sites.

Similar sites

F114XA404IN	**Outwash Upland Forest** Dry outwash upland forest sites will have many of the same oak and hickory species.

Table 1. Dominant plant species

Tree	(1) *Quercus velutina* (2) *Quercus alba*
Shrub	(1) *Vaccinium*
Herbaceous	(1) *Prenanthes altissima* (2) *Danthonia spicata*

Physiographic features

These sites are on backslopes, shoulders, and summits of dunes and loess hills.

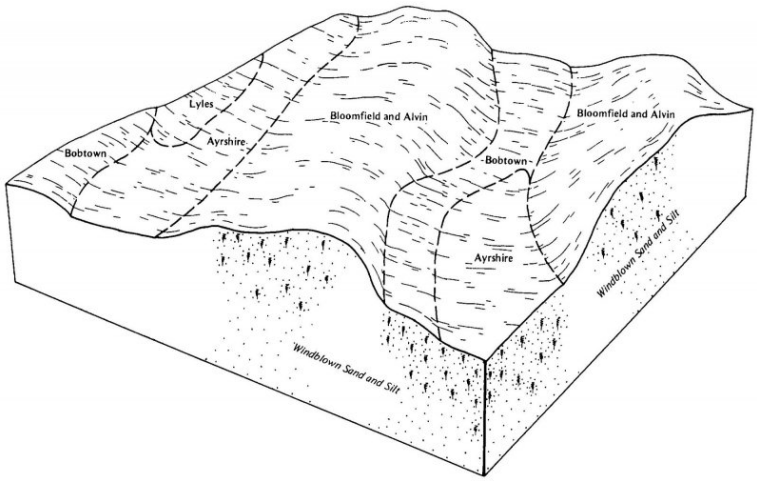


Figure 1. Physiographic image - Block diagram showing Bloomfield and Bobtown soils on the landscape.

Table 2. Representative physiographic features

Landforms	(1) Hills > Loess hill (2) Dune field > Dune
Runoff class	Negligible to medium
Flooding frequency	None
Ponding frequency	None to rare
Elevation	340–1,360 ft
Slope	0–15%
Water table depth	20–48 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0–45%
Water table depth	Not specified

Climatic features

About 60 percent of the precipitation falls during the freeze-free period. Most of the rainfall occurs as high-intensity, convective thunderstorms during summer. Snowfall is common in winter. The freeze-free period averages about 180 days.

Table 4. Representative climatic features

Frost-free period (characteristic range)	154-160 days
Freeze-free period (characteristic range)	177-185 days
Precipitation total (characteristic range)	45-47 in
Frost-free period (actual range)	153-160 days
Freeze-free period (actual range)	176-190 days
Precipitation total (actual range)	43-47 in
Frost-free period (average)	157 days
Freeze-free period (average)	181 days
Precipitation total (average)	46 in

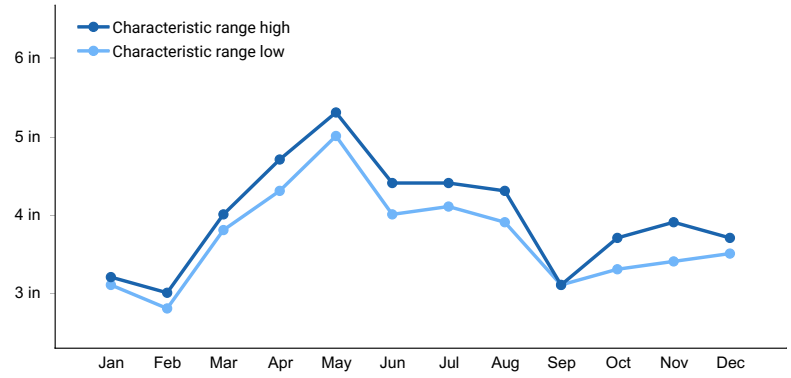


Figure 2. Monthly precipitation range

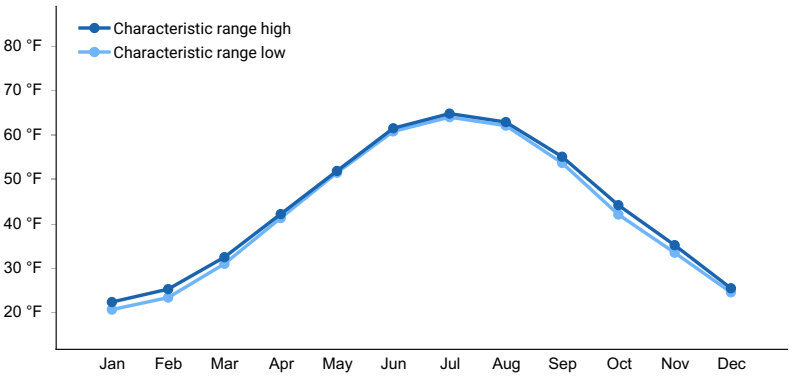


Figure 3. Monthly minimum temperature range

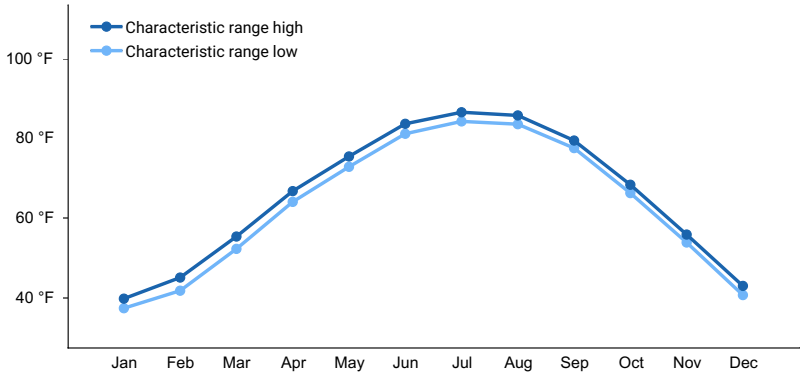


Figure 4. Monthly maximum temperature range

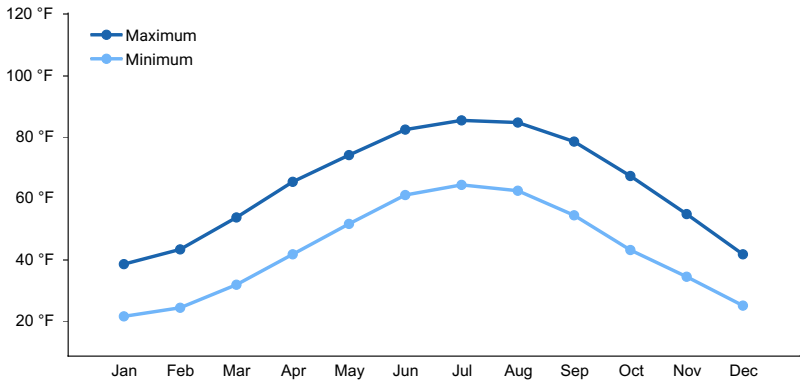


Figure 5. Monthly average minimum and maximum temperature

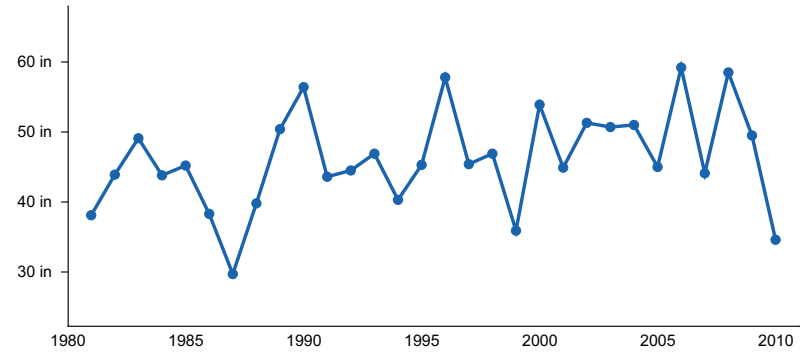


Figure 6. Annual precipitation pattern

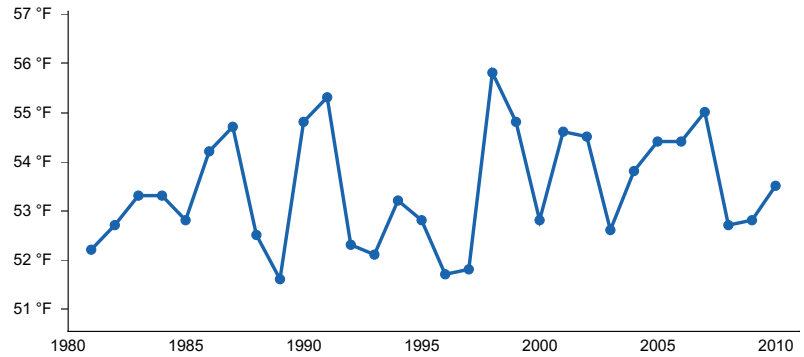


Figure 7. Annual average temperature pattern

Climate stations used

- (1) NORTH VERNON 2 ESE [USC00126435], North Vernon, IN
- (2) SEYMOUR 2 N [USC00127935], Seymour, IN
- (3) SCOTTSBURG [USC00127875], Scottsburg, IN

- (4) HILLSBORO [USC00333758], Hillsboro, OH

Influencing water features

These sites are not influenced by riparian or wetland features. Sites may have a seasonal high water table.

Soil features

Soils in this initial PES grouping are very deep, moderately well drained to somewhat excessively drained and formed in eolian deposits or sands. Series include Ayrshire, Bloomfield, Bobtown, and Priceton.

Table 5. Representative soil features

Parent material	(1) Eolian sands (2) Eolian deposits
Surface texture	(1) Fine sand (2) Fine sandy loam (3) Loamy fine sand (4) Sandy loam
Drainage class	Moderately well drained to somewhat excessively drained
Permeability class	Moderate to rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	4–6 in
Soil reaction (1:1 water) (Depth not specified)	5–6.5
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	3.8–6.5 in
Soil reaction (1:1 water) (Depth not specified)	Not specified
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

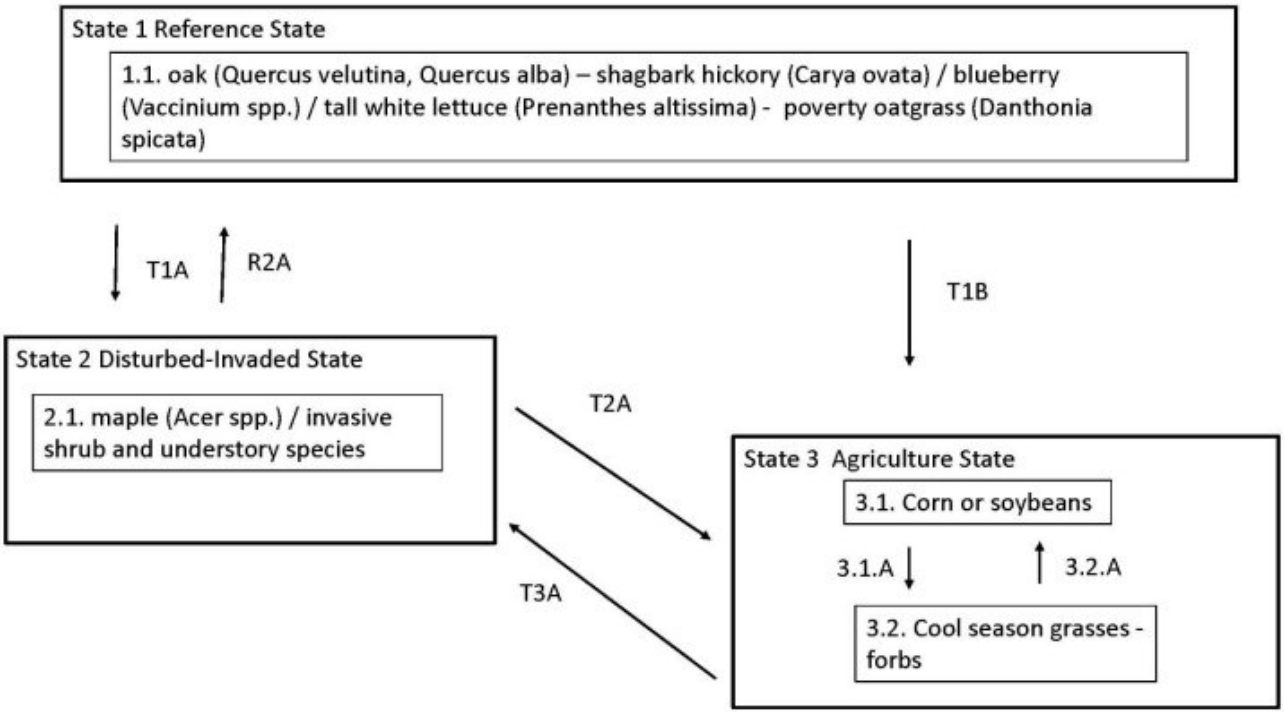
These sites exhibit a dry oak forest alliance with a tree canopy that is moderately closed, often shrubby, and generally shades 60-80% of the forest floor. Black oak (*Quercus velutina*) is a common dominant along with white

oak (*Q. alba*), shagbark hickory (*Carya ovata*), pignut hickory (*Carya glabra*) and scarlet oak (*Q. coccinea*). Other trees on site include sassafras (*Sassafras albidum*), hophornbeam (*Ostrya virginiana*), and red maple (*Acer rubrum*). Understory species are variable depending on seasonal depth to water table, available water capacity, canopy cover, site disturbances, fire regime, and available seed sources.

Grazing or frequent fires have the potential to temporarily modify the ecology by decreasing tree reproduction, decreasing canopy cover, and increasing shade-intolerant grass and herbaceous understory species. Fire dynamics on these sites are complex and need to be carefully evaluated prior to initiating a prescribed fire regime.

The majority of these sites in MLRA 114A have incurred repeated historic disturbances and most are now utilized as farmland or have been developed.

State and transition model



State 1
Reference State

Tree species on these dry oak sites may include black oak, white oak, scarlet oak, pignut hickory, shagbark hickory, blackgum, sassafras, dogwoods sassafras, and hophornbeam. Post oak and blackjack oak may be present on the drier sites. The shrub and understory layers are variable on these sites based on fire regime, anthropogenic disturbances, water table depth, and landscape position. With a natural fire regime, the understory was relatively dense since the wide tree spacing allowed for sunlight to support a variety of understory species.

Dominant plant species

- black oak (*Quercus velutina*), tree

- white oak (*Quercus alba*), tree
- shagbark hickory (*Carya ovata*), tree
- pignut hickory (*Carya glabra*), tree
- blueberry (*Vaccinium*), shrub
- poverty oatgrass (*Danthonia spicata*), grass
- tall rattlesnakeroot (*Prenanthes altissima*), other herbaceous

Community 1.1
Dry Oak Woodland

Historically, numerous oak and hickory species may be found on these sites. Common dominants were black oak, shagbark hickory, pignut hickory, red oaks, and white oak. Shrub and understory species composition and density was dependent upon the natural fire frequency which was a principal driver for these sites.

Dominant plant species

- black oak (*Quercus velutina*), tree
- white oak (*Quercus alba*), tree
- pignut hickory (*Carya glabra*), tree
- shagbark hickory (*Carya ovata*), tree
- blueberry (*Vaccinium*), shrub
- rose (*Rosa*), shrub
- blackberry (*Rubus*), shrub
- poverty oatgrass (*Danthonia spicata*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- tall rattlesnakeroot (*Prenanthes altissima*), other herbaceous

State 2
Disturbed-Invaded State

Numerous disturbances can impact these sites including lack of natural fire regime, agricultural conversion, and woodland harvest. Large scale disturbance are often the precursor to an invasion of non-native plants. Species will depend upon available seed sources. Dense non-native shrub layers will negatively impact native plant and tree regeneration.

Dominant plant species

- maple (*Acer*), tree
- cottonwood (*Populus*), tree
- locust (*Gleditsia*), tree
- locust (*Robinia*), tree
- autumn olive (*Elaeagnus umbellata*), shrub
- honeysuckle (*Lonicera*), shrub
- garlic mustard (*Alliaria petiolata*), other herbaceous

Community 2.1
Disturbed- Invaded Community

Numerous disturbance have impacted many of the remaining wooded sites. Lack of natural fires, clearing/selective harvest, adjacent ditching/tiling and unmanaged grazing alter the ecological community. Shade tolerant species such as sugar maple and the invasive Asian honeysuckles are often established after disturbances. An increase in the fire return interval leads to a higher tree density and the resulting increase in shade impacts tree regeneration and understory composition.

Dominant plant species

- maple (*Acer*), tree
- cottonwood (*Populus*), tree
- locust (*Gleditsia*), tree

- locust (*Robinia*), tree
- honeysuckle (*Lonicera*), shrub
- autumn olive (*Elaeagnus umbellata*), shrub
- poverty oatgrass (*Danthonia spicata*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- garlic mustard (*Alliaria petiolata*), other herbaceous

State 3
Agriculture State

Many of these sites are now used for crop production, hay production, or forage. Species planted and management activities will depend on the owner goals and objectives.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- brome (*Bromus*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- red clover (*Trifolium pratense*), other herbaceous
- white clover (*Trifolium repens*), other herbaceous
- corn (*Zea mays*), other herbaceous
- soybean (*Glycine max*), other herbaceous

Community 3.1
Cropland

Crops grown will depend on landowner goals. Many crops can be grown on these sites.

Dominant plant species

- corn (*Zea mays*), other herbaceous
- soybean (*Glycine max*), other herbaceous

Community 3.2
Pastureland

Numerous cool and warm season grasses can be produced on these sites. Fescue is a common crop mixed with clover.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- red clover (*Trifolium pratense*), other herbaceous
- white clover (*Trifolium repens*), other herbaceous

Pathway 3.1.A
Community 3.1 to 3.2

Transitioning a crop field to a pasture would require multiple management inputs including seeding desired species and weed control.

Pathway 3.2.A
Community 3.2 to 3.1

Transitioning a pasture to crop production will require multiple management inputs including site preparation, seeding, and weed control.

Transition T1A

State 1 to 2

Large scale disturbance such as clearing, selective harvest, unmanaged grazing, etc will alter the species composition and allow for invasive species to increase in dominance.

Transition T1B
State 1 to 3

Transitioning an oak woodland to a agricultural state would require multiple management inputs including clearing, brush removal, site preparation, seeding, and weed control.

Restoration pathway R2A
State 2 to 1

Transitioning this State to a reference community would require long-term management inputs including planting of desired species, timber stand management activities, and brush/weed control.

Transition T2A
State 2 to 3

Transitioning an oak woodland to a agricultural state would require multiple management inputs including clearing, brush removal, site preparation, seeding, and weed control.

Transition T3A
State 3 to 2

When agriculture sites are abandoned, they move through a series of successional plant communities. Species will depend on previous uses; on-going disturbances; available seed sources; and natural disturbances such as fire. Eventually, tree species will gain dominance but often is a mix of fast growing species such as maples, poplars, locusts, and cedars.

Additional community tables

Inventory data references

No field monitoring was conducted as part of this PES development. Future ESD development may result in plant community edits, soil mapunits being added or removed from this grouping, and/or additions or modifications to the narratives, tables, vegetation descriptions and state and transition model.

Other references

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Approval

Greg Schmidt, 9/26/2024

Acknowledgments

PES documents developed for adjacent MLRAs in Indiana and Ohio served as a source of information as these MLRAs often split counties and/or shared similar soil series with MLRA 114A. USDA-NRCS county soil surveys for the counties within MLRA 114A where a valuable reference including tree species observed on site by NRCS staff. NRCS Indiana resource soil scientists contributed field observation, field notes, and extensive soil mapping expertise.

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)	A. Arends, ESI Specialist

Contact for lead author	
Date	05/10/2025
Approved by	Greg Schmidt
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:

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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:**
