USDA Natural Resources
Conservation Service

Ecological site F093BY003MI
Floodplains

Last updated: 9/27/2023
Accessed: 11/21/2024

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): 093B–Superior Stony and Rocky Loamy Plains and Hills

MLRA Notes:
The Wisconsin portion of this MLRA is a mixture of high-relief moraines and flat till plains with interspersed glacial meltwater deposits. It is bordered on the north by glaciolacustrine deposits of Glacial Lake Duluth and on the south by extensive pitted and unpitted outwash plains. The approximate land area is just under 600,000 acres (935 sq miles).

The Penokee-Gogebic Iron Range runs through the middle of the Wisconsin portion of this MLRA and into Michigan. The range is a hilly, bedrock-controlled moraine. The bedrock outcropping is composed of igneous and metamorphic materials and was created by inland folding and faulting of the ancient Superior continent when it collided with the Marshfield continent about 1.8 billion years ago (Dott & Attig, 2004). Volcanic and intrusive bedrock occurs in some places. This bedrock is overlain by a thin layer of glacial till deposited by the Chippewa Lobe.

To the north of the range is a former spillway for Glacial Lake Ontonagon. The flowing meltwater cut deep channels into the morainal systems. Glaciofluvial landforms here include old beaches and dunes. South of the range, along the southern edge of this MLRA, are rolling collapsed end moraines, pushed to their extent by the Chippewa and Ontonagon Lobes. The landscape is dotted with abundant kettle lakes and swamps, especially in the eastern portion. Ice-walled lake plains and eskers are also found along these collapsed moraines.

The climate is influenced by Lake Superior in areas near the lake, resulting in cooler summers, warmer winters, and greater precipitation – especially snowfall – compared to more inland locations. Historically, mixtures of eastern hemlock (Tsuga canadensis), sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), eastern white pine (Pinus strobus), and red pine (Pinus resinosa) covered the area. In wetter pockets (such as the swamps that dot the moraines to the south) white cedar (Thuja occidentalis), black spruce (Picea mariana), and tamarack (Larix laricina) were common (Finley, R., 1976).

Classification relationships

Relationship to Established Frameworks and Classification Systems:
Habitat Types of N. Wisconsin (Kotar, 2002): Two sites key out to *Acer saccharum* – Tsuga canadensis/ Athyrium felix-femina – Onoclea sensibilis (ATAtOn), one site keys to *Acer saccharum* – Tsuga canadensis/ Maianthemum canadense (ATM), and one site keys to *Acer saccharum*/ Hydrophyllum virginianum (AH).

Biophysical Setting (Landfire, 2014): This ES is mapped as Boreal Acidic Peatland System, Laurentian-Acadian Northern Hardwoods Forest – Hemlock, and Eastern Boreal Floodplain; though, it is best represented by the latter.

WDNR Natural Communities (WDNR (2015): This ES is most similar to the Floodplain Forest.

Hierarchical Framework Relationships:

Major Land Resource Area (MLRA): Superior Stoney and Rocky Loamy Plains and Hills, Eastern Part (93B)

USFS Subregions: Winegar Moraines (212Jc)
Small sections occur in the Gogebic-Penokee Iron Range (212Jb) subregion
Wisconsin DNR Ecological Landscapes: North Central Forest

Ecological site concept

The Floodplains ecological site is uncommon in MLRA 93B, located in floodplains, primarily (but not exclusively) along Tyler Forks, Devils Creek, and the Montreal and Potato rivers. These sites are characterized by very deep, poorly to moderately well drained soils that formed in loamy alluvium. Sites are subject to occasional ponding and flooding. Water is received primarily from stream inflow, precipitation, runoff from adjacent uplands, and groundwater inflow. Sites may remain saturated for long durations and meet hydric soil requirements. Soils range from strongly acid to slightly acid.

Floodplains sites are defined by their landform (i.e. situated on a floodplain). The vegetation must be tolerant of flooding from stream inflow.

Associated sites

F093BY005MI	**Moist Lowlands** Many ecological sites are found adjacent to Floodplain sites. Any upland sites adjacent to a river can be associated with this ecological site.

Similar sites

F093BY002MI	**Mucky Swamps** Mucky swamps consist of deep, highly decomposed herbaceous organic material. These soils remain saturated throughout the year and some sites are subject to occasional ponding and flooding. They are neutral to moderately acidic. These are wetland sites that may sometimes occur on floodplain landforms, but they are distinguished from Floodplains by their drainage class (very poorly drained).

Table 1. Dominant plant species

Tree	(1) *Acer saccharum* (2) *Tilia americana*
Shrub	Not specified
Herbaceous	(1) *Matteuccia struthiopteris*

Physiographic features

These sites are found in toeslope and footslope positions on flood plains. Slopes range from 0 to 4 percent. Some sites are subject to occasional ponding in the spring and fall, lasting up to 30 days. Most sites are subject to rare to occasional flooding. Flooding occurs in the spring and sometimes the fall, though many sites are flooded throughout the year. Flooding duration is often brief (2-7 days) but may be long (7-30 days) in the spring. These sites have an apparent seasonally high water table within 42 inches. Surface runoff is negligible to low.

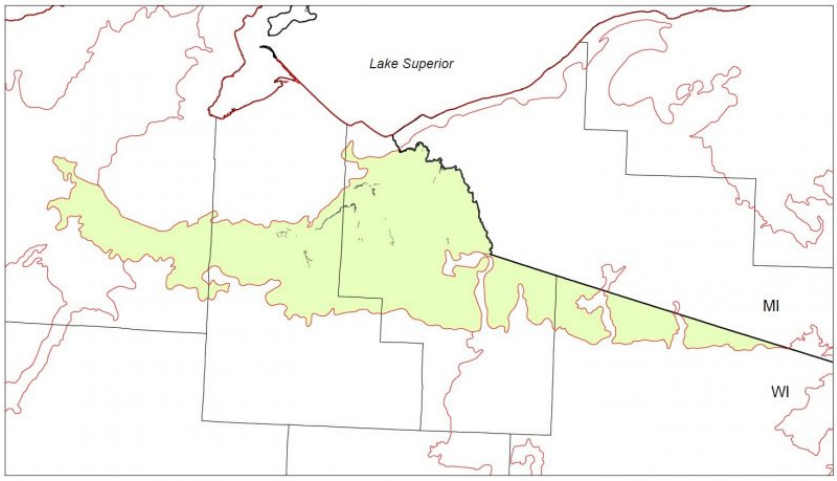


Figure 1. Distribution of Floodplains in the Superior Stoney and Rocky Loamy Plains and Hills, Eastern Part (93B).

Table 2. Representative physiographic features

Landforms	(1) Flood plain
Runoff class	Negligible to high
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Rare to occasional
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	200–250 m
Slope	0–4%
Ponding depth	0–38 cm
Water table depth	0–107 cm
Aspect	Aspect is not a significant factor

Climatic features

The continental climate of the Superior Stoney and Rocky Loamy Plains and Hills, Eastern Part MLRA is characterized by long, cold winters and short, warm summers where precipitation exceeds evapotranspiration. Neither average annual precipitation nor average annual minimum and maximum temperatures vary greatly within this MLRA, though the climate of the northern tip is somewhat affected by Lake Superior and receives higher annual precipitation in the form of lake effect snow.

Table 3. Representative climatic features

Frost-free period (characteristic range)	89-119 days
Freeze-free period (characteristic range)	123-149 days
Precipitation total (characteristic range)	737-864 mm
Frost-free period (actual range)	84-121 days
Freeze-free period (actual range)	120-157 days
Precipitation total (actual range)	711-914 mm
Frost-free period (average)	104 days
Freeze-free period (average)	137 days
Precipitation total (average)	813 mm

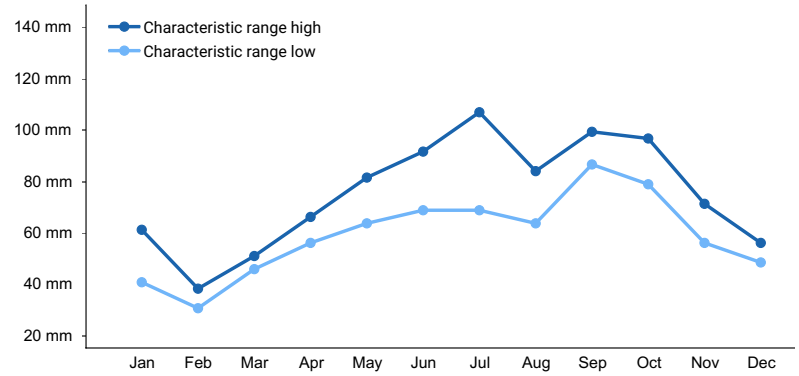


Figure 2. Monthly precipitation range

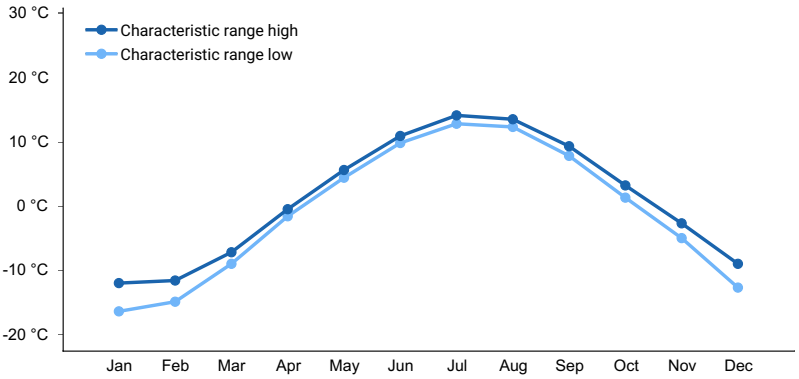


Figure 3. Monthly minimum temperature range

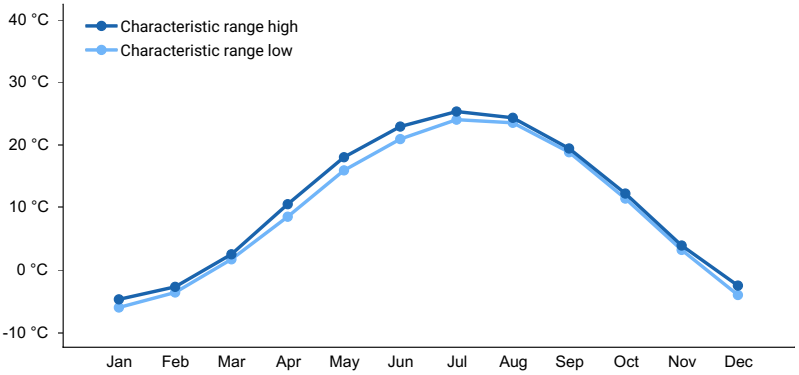


Figure 4. Monthly maximum temperature range

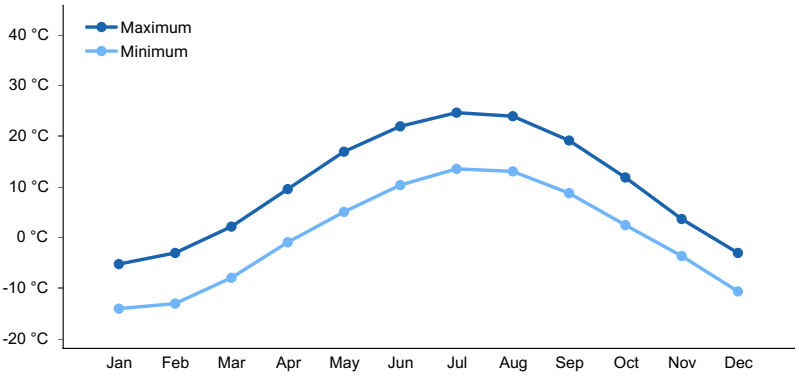


Figure 5. Monthly average minimum and maximum temperature

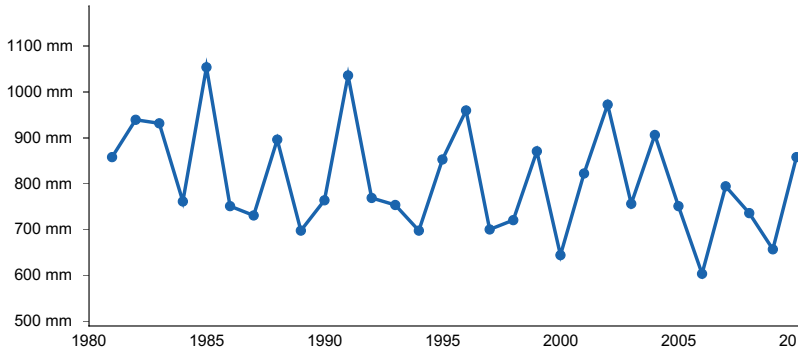


Figure 6. Annual precipitation pattern

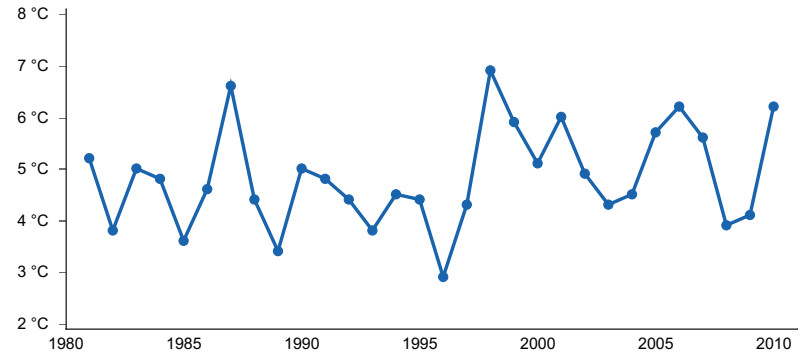


Figure 7. Annual average temperature pattern

Climate stations used

- (1) MELLEN 4 NE [USC00475286], Mellen, WI
- (2) HURLEY [USC00473800], Ironwood, WI
- (3) HANCOCK HOUGHTON CO AP [USW00014858], Calumet, MI
- (4) MARQUETTE [USW00014838], Marquette, MI

Influencing water features

Water is received through precipitation, runoff from adjacent uplands, stream inflow, and groundwater inflow. Water levels are greatly influenced by precipitation rates and runoff from upland sites. Water is lost from the site primarily through stream outflow, subsurface outflow, evapotranspiration, and groundwater recharge. Some sites are wetlands.
Frequent flooding from stream inflow is a significant factor in the ecological development of Floodplain sites. The vegetation must be tolerant of frequent flooding that may persist for a month.

Under the Cowardin System of Wetland Classification, or National Wetlands Inventory (NWI), the wetlands can be classified as:
1) Palustrine, forested, broad-leaved deciduous, saturated, or
2) Palustrine, scrub-shrub, broad-leaved deciduous, saturated, or
3) Palustrine emergent, persistent, saturated

Under the Hydrogeomorphic Classification System (HGM), the wetlands can be classified as:
1) Depressional, forested/organic, or
2) Depressional, scrub-shrub/organic

Permeability of the soils is moderately slow to rapid. The hydrologic group of these sites is A, A/D, or B/D.

Hydrogeomorphic Wetland Classification: Depressional, forested/organic; Depressional, scrub-shrub/organic

Cowardin Wetland Classification: PFO1B, PSS1B, PEM1B

Soil features

These sites are represented by the Arnhiem, Dechamps, Moquah, and Pelkie soil series, classified as Typic Fluaquents, Aquic Udifluvents, Typic Udifluvents, and Oxyaquic Udipsamments, respectively.

These soils form in sandy and loamy alluvium, often stratified. Arnheim is poorly drained, Dechamps is somewhat poorly drained, and Moquah and Pelkie (which have slightly coarser textures than their counterparts) are moderately well drained. Arnheim soils meet hydric soil requirements.

Surface textures are primarily coarse-loamy, though some soils have up to 5inches of mucky silt loam at the surface. Subsurface textures range from sand to silt loam. Surface fragments are absent in these soils. Subsurface fragments are rare, but up to 7 percent gravel and 1 percent cobble may be found in some soils. Soil pH ranges from strongly acid to neutral with values of 5.2 to 6.7. Carbonates are generally absent, but some sites may have a calcium carbonate equivalency up to 3 percent starting at the surface.

Parent Material--Kind: Loamy alluvium
Parent Material--Origin: Alluvium
Surface Texture: Loam, fine sandy loam, very fine loamy sand, mucky silt loam
Surface Texture Modifiers: None
Subsurface Texture: Sand, fine sand, loamy fine sand, loamy very fine sand, fine sandy loam, very fine sandy loam, silt loam

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Loam (2) Fine sandy loam (3) Very fine sandy loam
Drainage class	Poorly drained to moderately well drained
Permeability class	Moderate to rapid
Depth to restrictive layer	198–203 cm
Soil depth	198–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	12.52–26.24 cm
Calcium carbonate equivalent (Depth not specified)	0–3%
Soil reaction (1:1 water) (Depth not specified)	5.2–6.7
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

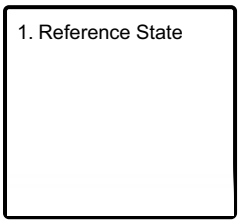
Ecological dynamics

Because this Ecological Site is subject to seasonal, yearly and long-term variation in hydrological conditions, it is not possible to speak of any directional, community-driven plant succession, as is typical of more environmentally-stable upland plant communities. Instead, individual hydrologic events create conditions temporarily favorable to a given species, or groups of species, and unfavorable to other species or groups. Species differ greatly in their ability to tolerate frequency of flooding and duration of ponding. Silver maple (*Acer saccharinum*) is best adapted species to colonize freshly deposited sediment. It is a prolific seed producer and germinates immediately upon maturing, without the need of undergoing a cold period. Once established, seedlings, as well as mature trees, tolerate

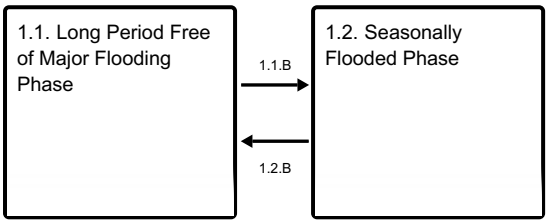
repeated flooding and prolonged ponding. Black ash (*Fraxinus nigra*) is well adapted to growing in saturated conditions, allowing it to grow commonly in seasonally flooded habitats. Other species that may become established in periods without major flooding, or ponding are red maple (*Acer rubrum*) yellow birch (Betula allegheniensis), and even basswood (*Tilia americana*). It appears that very long period without ponding leads this site type to develop into ATM or ATD (Acer-Tsuga/Maianthemum or /Dryopteris) Forest Habitat Type (Kotar and Burger, 1996), although presence of basswood and sugar maple also heavily depends on existence of local seed sources. These sources are rare throughout southern Wisconsin, presumably due to prevalence of wildfires in pre-European settlement time. Seed sources of fire-sensitive species have been preserved almost exclusively on landscape positions protected from advancing fires by water bodies and wetlands (Finley, 1976).

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1.B - Major flooding; sedimentation

1.2.B - Decrease in ponding

State 1
Reference State

Because of the dynamic nature of hydrological events affecting this Ecological Site, many different plant communities can be found at any given time. Two distinct community phases to represent the Reference state: 1) a long period free of extended ponding community phase and 2) frequently flooded and ponded community phase.

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- American basswood (*Tilia americana*), tree
- ostrich fern (*Matteuccia struthiopteris*), other herbaceous
- early meadow-rue (*Thalictrum dioicum*), other herbaceous

Community 1.1
Long Period Free of Major Flooding Phase

Periods of several decades, or longer, without prolonged flooding allow for the development of forest communities closely resembling the upland mesic or wet-mesic communities. Such forests are characterized by strong presence, or dominance of any of the following species: Green ash (*Fraxinus pennsylvanica*), basswood, yellow birch (*Betula alleghaniensis*) and, in some cases, even sugar maple (*A. saccharum*), a species known for its intolerance of prolonged root zone saturation. Characteristic understory plants include ostrich fern (*Matteuccia struthiopteris*), meadow rue (*Thalictrum dioicum*), Jack-in-the-pulpit (*Impatiens capensis*), orange jewelweed (*Impatiens capensis*), sensitive fern (Onoclea sensibillis) and wood fern (*Dryopteris carthusiana*).

Resilience management. Small scale canopy disturbances, e.g., snow/ice breakage and individual tree mortality, increase light on forest floor and stimulate regeneration of canopy species. Through this process the relative

importance of different species varies, but the basic mesic community is perpetuated.

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- American basswood (*Tilia americana*), tree
- ostrich fern (*Matteuccia struthiopteris*), other herbaceous
- early meadow-rue (*Thalictrum dioicum*), other herbaceous

Community 1.2
Seasonally Flooded Phase

Silver maple is a well-adapted species to frequently flooded conditions. On such sites it typically occurs in pure stands, or with only sporadic association of other species that become established on micro-sites with less frequent, or shorter duration ponding. Such associates are black ash, red maple, swamp white oak, elms (Ulmus spp.) and occasionally yellow birch. Understory vegetation is sparse, consisting mostly of goldenrod (Solidago, spp.) sedges (Carex spp.), and false-nettle (*Laportea canadensis*).

Resilience management. This community has seasonal flooding with fresh sediment deposition.

Dominant plant species

- silver maple (*Acer saccharinum*), tree
- black ash (*Fraxinus nigra*), tree
- sedge (*Carex*), grass
- goldenrod (*Solidago*), other herbaceous

Pathway 1.1.B
Community 1.1 to 1.2

Major flooding event deposits new sediment that causes mortality of some of the canopy trees and provides germination and seedling establishment conditions for some species, most frequently silver maple.

Pathway 1.2.B
Community 1.2 to 1.1

Decrease in ponding frequency and duration allows for the establishment of sugar maple and basswood.

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 ecological site description.

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Approval

Suzanne Mayne-Kinney, 9/27/2023

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	09/27/2023
Approved by	Suzanne Mayne-Kinney
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):**

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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:**
