

## Ecological site F094AB019MI Sandy Drift

Last updated: 10/03/2019  
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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.

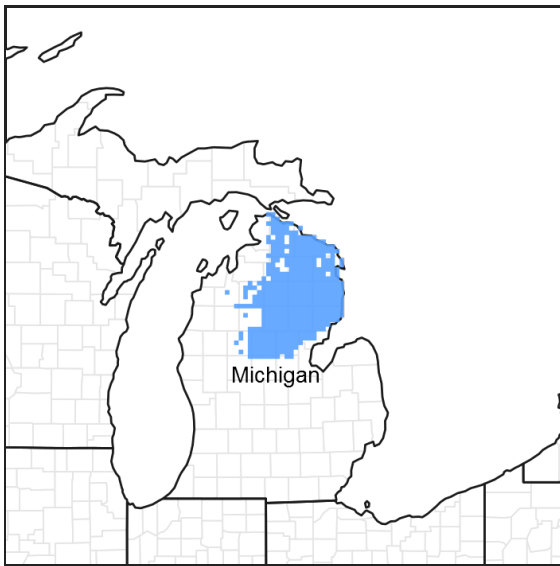


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

### MLRA notes

Major Land Resource Area (MLRA): 094A–Northern Michigan Sandy Highlands

"This area is dominated by outwash plains and moraines. The terrain can be steep on the moraines and flat in the areas of outwash. Elevation ranges from 177 to 520 m (580 to 1705 ft). Local topographic relief averages 14 m and ranges up to 188 m (45 to 615 ft). This area is covered entirely by drift. Bedrock consisting of Devonian limestone and dolomite with interbedded shale, chert, and anhydrite stringers is at various depths below the surface because of the curvature of the Michigan basin. However, bedrock exposures completely absent, as the depth of glacial drift ranges from 60 to 300 m (200-1000 ft). The Au Sable, Manistee, Au Gres, and Pine Rivers are the major streams draining this MLRA, in both the Lake Michigan and Lake Huron watersheds. The Muskegon River has its headwaters in this area.

About 70 percent of this area is forested, and about 15 percent is cropland or hayland. About one-third of the area is in small, privately owned holdings, and another one-third consists of national and State forests. The forests are used mainly for timber production and recreation. Dairy and beef operations are very important enterprises in the area. Forage and feed grains for dairy cattle and other livestock are the principal crops. Wheat, oats, corn, potatoes, and hay also are grown in the area. The Huron and Manistee National Forests, Hartwick Pines State Park, Camp Grayling (Department of Defense), Pigeon River Country State Forest are among the most notable conservation lands in the area. Reaches of the Au Sable and Pine Rivers are National Wild and Scenic Rivers.

## Summary of existing land use:

Upland Forest (58%)

Hardwood (41%)

Conifer (15%)

Swamps and Marshes (14%)

Developed (11%)

Agricultural (10%)

Grassland (5%)

"

## Classification relationships

According to the USFS (Bailey) system of ecoregions, the site is located mostly within 212Hg (Kirtland's Warbler High Sand Plains) and 212Hh (Gladwin Silty Lake Plain) subsections. According to the EPA (Omernik) system of ecoregions, the site is located in 50ae (Mio Plateau), 50ah (Tawas Lake Plain) and eastern 50ad (Vanderbilt Moraines) level IV ecoregions. This site roughly corresponds to PVCd, in the Kotar system. This site corresponds to the Outwash Plains ecological land type phases 10-12, in the USFS Ecological Land Type system.

## Ecological site concept

The central concept of Sandy Drift is uplands with a seasonal high watertable greater than 100 cm in depth (excessively drained to moderately well drained) and lacking significant B horizon development in the soil profile. Site occurs on sandy drift (outwash, ice contact, or lake plains) where soil textures are sand or loamy sand (upper 50 cm >70% sand). Site is outside the heavy snowfall belt, mostly east of Houghton Lake where fire was frequent. Vegetation trending towards xerophytic woodlands and barrens with a high fire frequency.

Table 1. Dominant plant species

Tree	(1) <i>Pinus banksiana</i>
Shrub	Not specified
Herbaceous	(1) <i>Carex pensylvanica</i> (2) <i>Festuca scabrella</i>

## Physiographic features

Site occurs mostly on sandy outwash plains, with minor amounts of coarse textured ice contact, glacial till, and lake plain deposits with similar properties. Landforms are mostly gently sloping, but there are no upper limits to slope defined.

Table 2. Representative physiographic features

Landforms	(1) Outwash plain (2) Kame (3) Lake plain
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## Climatic features

Mean annual temperatures are 5.7 to 7.6 °C (42 to 46 °F). The warmest six months average 14.3 to 16.1 °C (58 to 61 °F). Mean July temperatures range from 19.1 to 20.8 °C (66 to 69 °F). Mean January temperatures range from -8.2 to -6.0 °C (17 to 21 °F). The maximum monthly average daily highs are 25.9 to 27.7 °C (79 to 82 °F). The minimum monthly average daily lows are -13.2 to -10.7 °C (8 to 13 °F). Temperatures generally decrease with elevation and latitude. Mean annual precipitation ranges from 700 to 870 mm (28 to 34 in). Precipitation decreases from west to east. Average 0 °C (32 °F) frost-free season ranges from 73 to 144 days. Average -2 °C (28 °F) freeze-free season is 106 to 172 days. Mean annual snowfall ranges from 1.1 to 2.9 m (40 to 120 in). Snowfall decreases from northwest to southeast. Mean annual extreme minimum temperatures range from -33.3 to -23.1 °C (-28 to -10 °F), or hardiness zones 4a to 6a.

**Table 3. Representative climatic features**

Frost-free period (average)	117 days
Freeze-free period (average)	147 days
Precipitation total (average)	32 in

### **Climate stations used**

- (1) EAST TAWAS [USC00202423], Tawas City, MI
- (2) GRAYLING [USC00203391], Grayling, MI
- (3) MIO HYDRO PLT [USC00205531], Mio, MI
- (4) VANDERBILT 11ENE [USC00208417], Vanderbilt, MI
- (5) HOUGHTON LK ROSCOMMON AP [USW00094814], Houghton Lake, MI
- (6) HALE LOUD DAM [USC00203529], Glennie, MI
- (7) WEST BRANCH 3SE [USC00208800], West Branch, MI

### **Influencing water features**

Lower slope positions and finer substrates may have a seasonal high water table 100-200 cm in depth. Well drained upper slope positions are 200 cm or more from the water table.

### **Soil features**

Soils are well drained to excessively well drained sands. They are commonly classified Lamellic Udipsamments, Typic Udipsamments, and Arenic Glossudalfs, and commonly mapped as Graycalm, Grayling, and Typic Udipsamments series or components. The top 50 cm has a typical pH of 5 and is 90% sand and 0.8% organic matter. At depth, pH ranges up to 5.8, and texture averages 90% sand and 5% clay. Depth to impeded hydraulic conductivity or root restrictive layers averages >200 cm. Depth to carbonates averages >200 cm.

### **Ecological dynamics**

Sandy Drift tends to share the same ecological dynamics as Natureserve/Landfire system, Laurentian-Acadian Jack Pine Barrens and Forest. Stand replacing fires occurred every 10-80 years, with light surface fires every 2-20 years. Overstory was dominated by fire dependent, early successional jack pine (*Pinus banksiana*) and Hill's oak (*Quercus ellipsoidalis*). Jack pine reproduction is dependent on reoccurring crown fire to open its serotinous cones. The nearly endemic Kirtland's warbler (*Setophaga kirtlandii*) is dependent upon the early stages of dense jack pine regeneration. This key stage is 5-20 years from establishment while the trees are 1.5-5.5 m tall and at about 70% cover. Understory was grass dominated with prairie grasses and forbs. Penn sedge (*Carex pensylvanica*) may form continuous cover under a moderately open canopy. Occasionally, bracken fern (*Pteridium aquilinum*) may dominate. Regular fire is necessary to maintain a wider diversity of prairie forbs and grasses such as big bluestem (*Andropogon gerardi*), little bluestem (*Schizachyrium scoparium*), and Indiangrass (*Sorghastrum nutans*). The prairie forbs feature species disjunct from western North America such as prairie dandelion (*Agoseris glauca*) and rough fescue (*Festuca altaica*). Kotar community, PVCd (*Pinus strobus*/Vaccinium spp.-Cladina spp.), understory indicator species include: *Arctostaphylos uva-ursi*, *Cladonia rangiferina*, *Comptonia peregrina*, *Pinus banksiana*, *Pteridium aquilinum*, and *Vaccinium angustifolium* (Kinnikinnick, reindeer lichen, Sweetfern, Jack Pine, Bracken Fern, and Northern Lowbush Blueberry).

### **State and transition model**

# F094AB019MI Sandy Drift

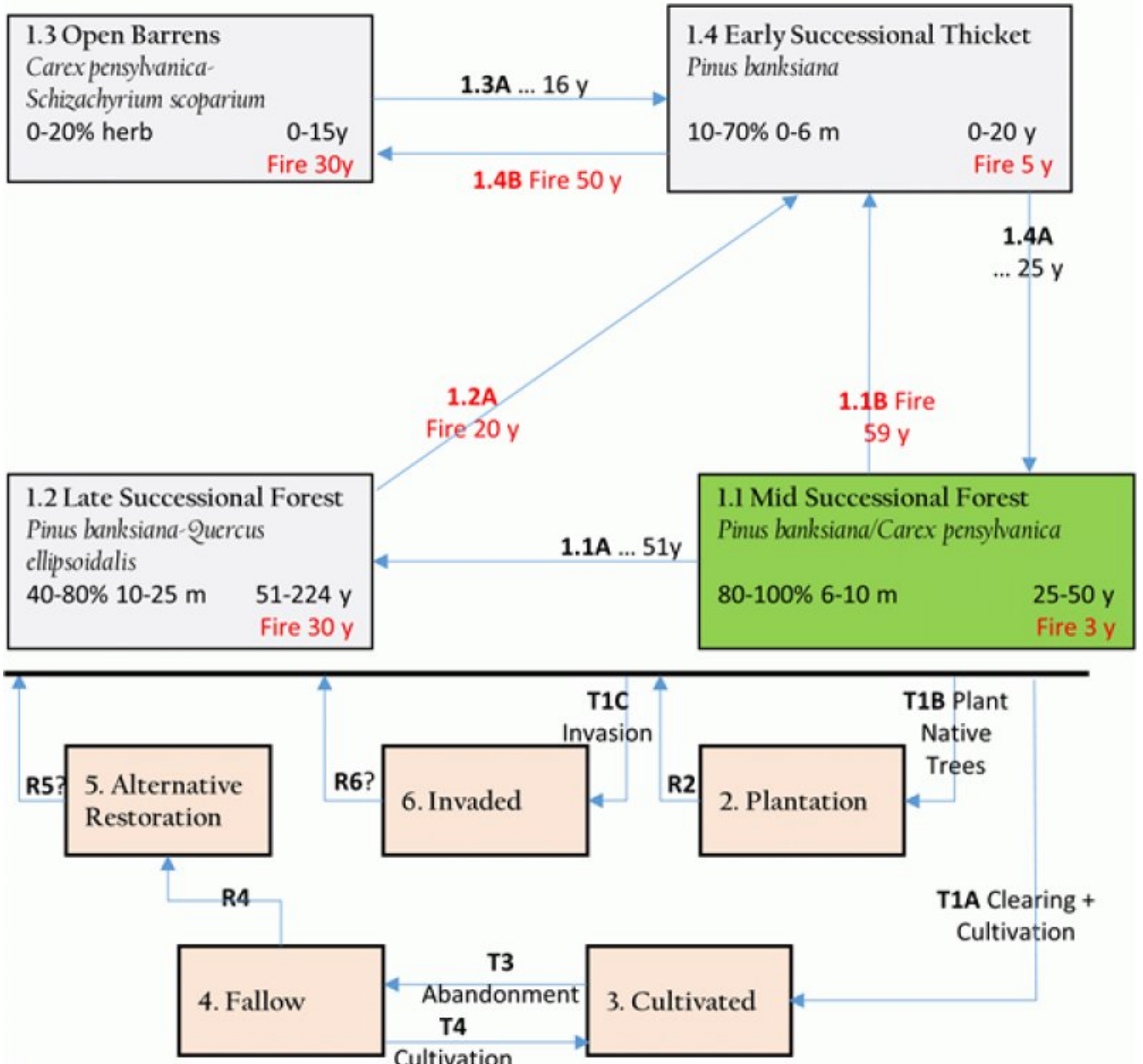


Figure 6. stm

# Legend

1.1A	No disturbance for 51 years
1.1B	Replacement fire every 59 years
1.2A	Replacement fire every 20 years
1.3A	No disturbance for 16 years
1.4A	No disturbance for 25 years
1.4B	Replacement fire every 50 years
R2	Restoration
R4	Restoration
R5	Restoration?
R6	Restoration?
T1A	Clearing + cultivation of crops
T1B	Clearing + plant native trees in rows
T1C	Invasive species introduction
T3	Abandonment + invasive species
T4	Cultivation

Figure 7. legend

## State 1

### Reference State

#### Community 1.1

**Mid-Successional Forest: *Pinus banksiana* - (*Pinus resinosa*) - *Quercus ellipsoidalis* / *Carex pensylvanica* Forest**

This phase has a canopy closure of 80-100% and height of 6-10 m. This phase is 25-50 years old.

#### Community 1.2

**Late-Successional Forest: *Pinus banksiana* - (*Pinus resinosa*) - *Quercus ellipsoidalis* / *Carex pensylvanica* Forest**

This phase has a canopy closure of 40-80% and height of 10-25 m. The trees are 51-224 years old and are beginning to thin as trees fall apart due to breakage and shading.

### **Community 1.3**

#### **Open Barrens: *Pinus banksiana* - (*Quercus ellipsoidalis*) / *Schizachyrium scoparium* - Prairie Forbs Woodland**

Herb dominated woodland. Woody canopy cover typically 0-20%. Tree heights are 5-25 m, mostly survivors of previous vegetation phases. Tree regeneration generally kept at 0 to 15 years old by reoccurring crown fire. Fire needed to maintain openness or else trees become too large and shade out herb layer.

### **Community 1.4**

#### **Early Successional Thicket: *Pinus banksiana* - (*Pinus resinosa*) - *Quercus ellipsoidalis* / *Carex pensylvanica* Forest**

Dense thicket of jack pine (*Pinus banksiana*) at 10-70% crown cover, and 0-6 m tall. Unless fire causes mortality of regenerated jack pine and reverting back to an herb dominated phase, this phase lasts about 0-20 years before succeeding to closed canopy phase. This phase is key nesting habitat for the rare Kirtland's warbler (*Setophaga kirtlandi*) [otherwise such intermediate stage would have been grouped within the same phase as a late successional stage].

### **Pathway 1.1A**

#### **Community 1.1 to 1.2**

Succession.

### **Pathway 1.1B**

#### **Community 1.1 to 1.4**

Crown fire -or- clear cut followed by intense tree planting.

#### **Conservation practices**

Prescribed Burning
Tree/Shrub Site Preparation
Tree/Shrub Establishment
Forest Stand Improvement

### **Pathway 1.2A**

#### **Community 1.2 to 1.4**

Crown fire -or- clear cut followed by intense tree planting.

#### **Conservation practices**

Prescribed Burning
Tree/Shrub Site Preparation
Tree/Shrub Establishment
Forest Stand Improvement

### **Pathway 1.3A**

#### **Community 1.3 to 1.4**

Succession about 16 years without fire, depending on initial regeneration of jack pine.

### **Conservation practices**

Tree/Shrub Site Preparation
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Tree/Shrub Establishment
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### **Pathway 1.4A**

#### **Community 1.4 to 1.1**

Succession.

### **Pathway 1.4B**

#### **Community 1.4 to 1.3**

Fire, killing refrigerating jack pine.

### **Conservation practices**

Prescribed Burning
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## **State 2**

### **Cultural State**

#### **Community 2.1**

##### **Sustainable Crop, Pasture, or Plantation**

#### **Community 2.2**

##### **Unsustainable Crop, Pasture, or Plantation**

#### **Community 2.3**

##### **Conservation Feature**

Can be a grassed waterway, conservation reserve, a small patch pollinator garden, or other land taken out of its primary cultural production to mitigate or reduce impacts of adjacent land use, and is not by itself a permanent restoration of a complete native biological community and associated ecosystem services.

### **Pathway 2.1A**

#### **Community 2.1 to 2.2**

Revert to unsustainable cultural practices.

### **Pathway 2.1B**

#### **Community 2.1 to 2.3**

Establish conservation feature.

### **Conservation practices**

Conservation Cover
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Grassed Waterway
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### **Pathway 2.2A**

#### **Community 2.2 to 2.1**

Implement sustainable cultural practices.

### **Conservation practices**

Conservation Crop Rotation
Cover Crop
Nutrient Management
Integrated Pest Management (IPM)

### **Pathway 2.2B**

#### **Community 2.2 to 2.3**

Establish conservation feature.

### **Conservation practices**

Conservation Cover
Grassed Waterway

### **Pathway 2.3A**

#### **Community 2.3 to 2.1**

Implement sustainable cultural practices.

### **Conservation practices**

Conservation Cover
Conservation Crop Rotation
Nutrient Management
Integrated Pest Management (IPM)

### **Pathway 2.3B**

#### **Community 2.3 to 2.2**

Revert to unsustainable cultural practices.

## **State 3**

### **Seminatural State**

#### **Community 3.1**

##### **Ruderal Meadow & Shrubland**

#### **Community 3.2**

##### **Exotic Ruderal Forest**

### **Pathway 3.1A**

#### **Community 3.1 to 3.2**

Succession.

### **Pathway 3.2A**

#### **Community 3.2 to 3.1**

Blowdown/clearcut.



## **Transition T1A**

### **State 1 to 2**

Clear vegetation; cultivate domesticated species

## **Transition T1B**

### **State 1 to 3**

Clear vegetation, invasive species introduced

## **Restoration pathway R2**

### **State 2 to 1**

Remove domesticated species; restore native species.

### **Conservation practices**

Brush Management
Tree/Shrub Site Preparation
Tree/Shrub Establishment
Restoration and Management of Rare and Declining Habitats
Upland Wildlife Habitat Management
Herbaceous Weed Control

## **Transition T2A**

### **State 2 to 3**

Abandoned, succession.

## **Restoration pathway R3**

### **State 3 to 1**

Control invasive species; restore native species

### **Conservation practices**

Brush Management
Tree/Shrub Site Preparation
Tree/Shrub Establishment
Restoration and Management of Rare and Declining Habitats
Upland Wildlife Habitat Management
Herbaceous Weed Control

## **Restoration pathway T3A**

### **State 3 to 2**

Clear vegetation; cultivate domesticated species

## **Additional community tables**

### **Other references**

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. A provisional ecological site is a first

approximation based on a cursory literature review, personal experience, and limited field reconnaissance. As more adequate literature review, expert opinion, and intensive plot data are collected, the site concept is subject to shifting, broadening, narrowing, subdivision, or re-aggregation in definition. Likewise, the community dynamics will be more elaborate in content, and may also change in structure, upon reaching approved status.

Future work, as described in a project plan, to validate the information in this provisional ecological site description is needed. This will include field activities to collect low and medium intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document. Annual reviews of the project plan are to be conducted by the Ecological Site Technical Team.

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## **Contributors**

Gregory J. Schmidt

## **Approval**

Nels Barrett, 10/03/2019

## **Acknowledgments**

The following individuals made substantive comments regarding the development of the Provisional Ecological Sites: Randy Swaty, The Nature Conservancy; Trevor Hobbs, USFS; Richard A. Corner, USFS; Andy Henriksen, NRCS; Dan Zay, NRCS.

## **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	
Approved by	
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):**
- 

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:**
-