

Ecological site F111XE403OH

Outwash Upland

Last updated: 5/28/2020
Accessed: 05/03/2024

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

111E – Indiana and Ohio Till Plain, Eastern Part. Most of this area is in the Till Plains Section of the Central Lowlands Province of the Interior Plains. The northeast tip of the area is in the Southern New York Section of the Appalachian Highlands. The entire area has been glaciated. It is dominated by ground moraines that are broken in places by kames, lake plains, outwash plains, terraces, and stream valleys. Narrow, shallow valleys commonly are along the few large streams in the area. Elevation ranges from 580 to 1,400 feet (175 to 425 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 plain.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Scioto (0506), 33 percent; Muskingum (0504), 31 percent; and Western Lake Erie (0410), 28 percent; Upper Ohio (0503), 5 percent; and Southern Lake Erie (0411), 3 percent. The headwaters of many rivers in central Ohio, including the Vermillion, Black Fork, Sandusky, Little Scioto, and Olentangy Rivers, are in this MLRA.

This MLRA is underlain by late Devonian shale and sandstone. Surficial materials include glacial deposits of till, glaciolacustrine sediments, and outwash from Wisconsin and older glacial periods.

Classification relationships

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

USFS Ecological Regions (USDA, 2007):

Sections – Central Till Plains, Beech Maple (222H), Western Glaciated Allegheny Plateau (221F)

Subsections – Allegheny Plateau (221Fa), Bluffton Till Plains (222Ha), Miami-Scioto Plain – Tipton Till Plain (222Hb)

NatureServe Systems anticipated (NatureServe, 2011): Agriculture - Cultivated Crops and Irrigated Agriculture, Agriculture – Pasture/Hay, North-Central Interior Beech-Maple Forest, North-Central Interior Dry-Mesic Oak Forest and Woodland

LANDFIRE Biophysical Settings anticipated (USGS, 2010): North-Central Interior Beech-Maple Forest, North-Central Interior Dry-Mesic Oak Forest and Woodland

Ecological site concept

This woodland site was, historically, a mixed hardwood site with sugar maple and red oak being the dominant canopy species. Canopy associates include American beech, basswood, black cherry, and white oak. Fires were low frequency, high intensity events on the site at maturity and occurred very rarely, and even then only after large

windthrow events or extreme drought. Low intensity, surface fires were more common in the mid seral stages when more fire tolerant species, oaks specifically, were more dominant in the canopy. Small gap disturbances are the most common overall disturbance mechanism and often result from windthrow or disease. Selective tree harvest moves the site to a new state where the canopy becomes dominated by less desirable timber species like beech, basswood, hickory and elm species. Currently, large areas of the site have been converted for agricultural use, mostly row crops and small grains, but some are being used for hay and pasture as well.

Associated sites

R111XE401OH	Wet Outwash Mollisol Soils are very poorly or poorly drained; soil surface is darker in color
R111XE402OH	Dry Outwash Mollisol Soils are somewhat poorly drained or dried; soil surface is darker in color
F111XE404OH	Dry Outwash Upland Soils are moderately well drained or drier

Similar sites

F111XE102OH	Lacustrine Forest Located on lacustrine parent materials; soils are somewhat poorly drained or drier.
F111XE503OH	Till Ridge Located on glacial till parent materials; site located on a convex landscape position; soils are moderately well to well drained.

Table 1. Dominant plant species

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

Physiographic features

This ecological site is found in MLRA 111E: Indiana and Ohio Till Plain, Eastern Part. Unique landforms that contain this site include outwash plains and terraces along with glacial drainage channels. Slopes range from 0 to 6 percent and are often footslopes and summits.

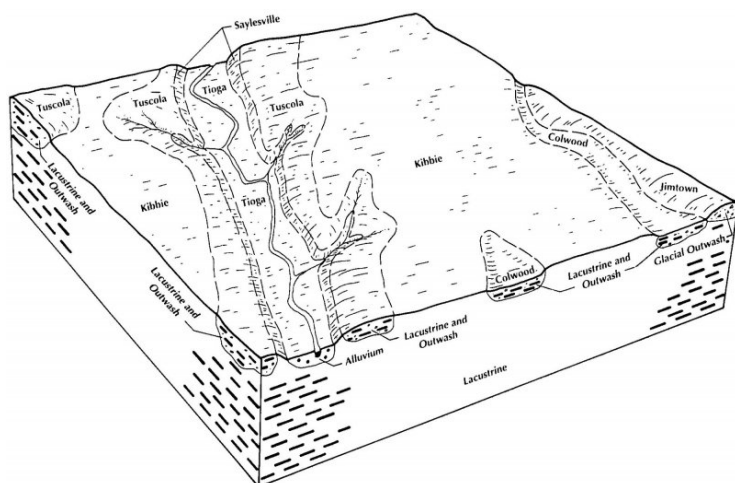


Figure 1. block diagram showing soils on the landscape

Table 2. Representative physiographic features

Landforms	(1) Outwash plain (2) Outwash terrace
Flooding frequency	None
Ponding duration	Long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	207–344 m
Slope	0–6%
Ponding depth	0–38 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation in this area is 35 to 41 (890 to 1,040 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 48 to 52 degrees F (9 to 11 degrees C). The freeze-free period averages about 185 days and ranges from 165 to 205 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	131-148 days
Freeze-free period (characteristic range)	169-181 days
Precipitation total (characteristic range)	991-1,016 mm
Frost-free period (actual range)	128-149 days
Freeze-free period (actual range)	166-183 days
Precipitation total (actual range)	965-1,041 mm
Frost-free period (average)	140 days
Freeze-free period (average)	176 days
Precipitation total (average)	991 mm

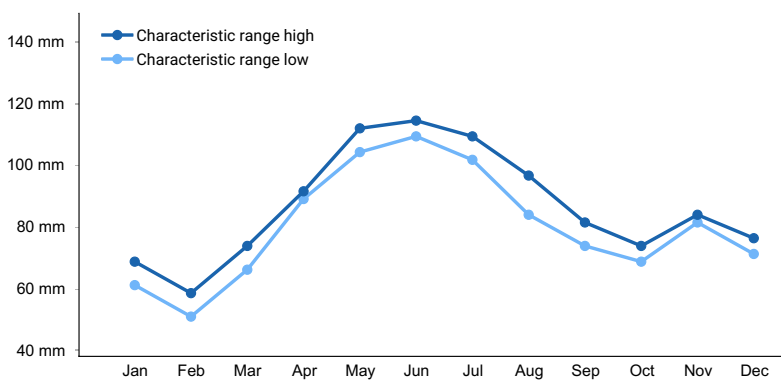


Figure 2. Monthly precipitation range

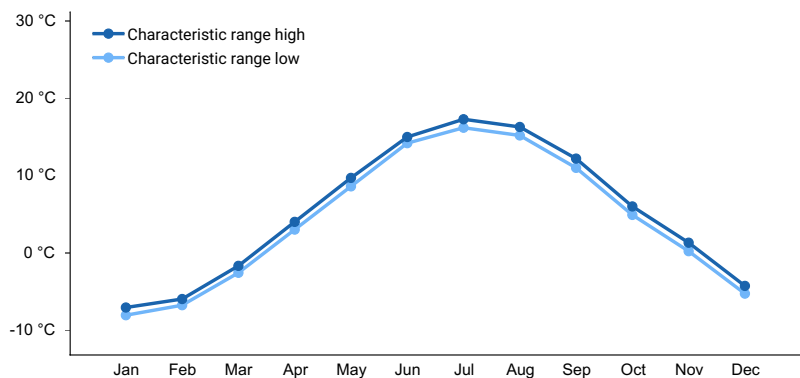


Figure 3. Monthly minimum temperature range

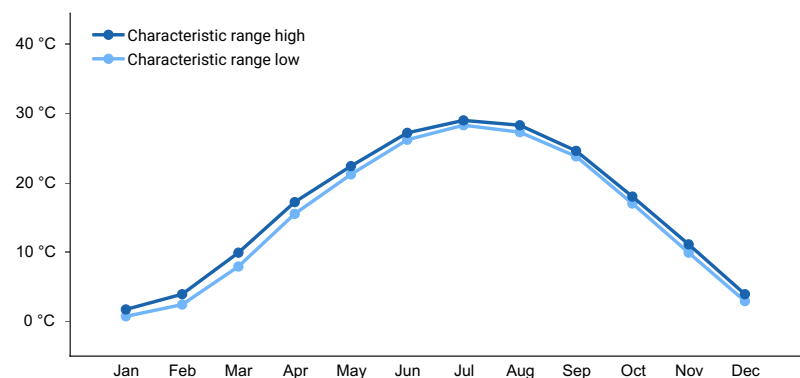


Figure 4. Monthly maximum temperature range

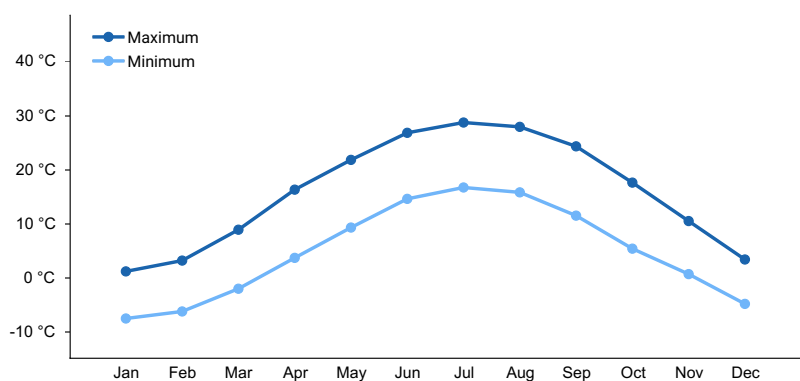


Figure 5. Monthly average minimum and maximum temperature

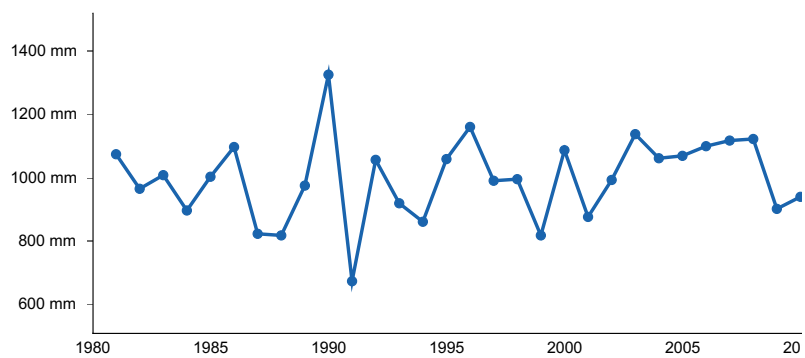


Figure 6. Annual precipitation pattern

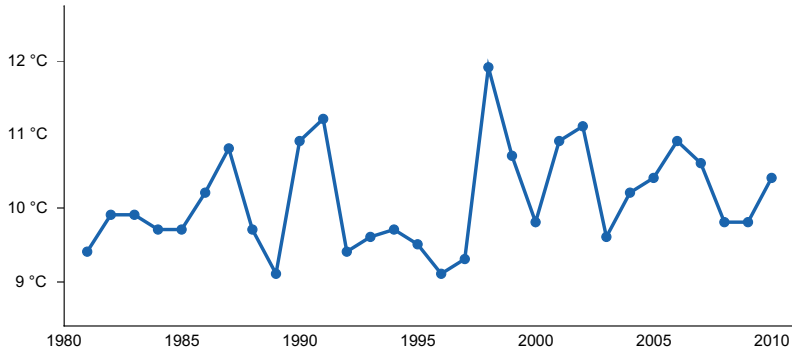


Figure 7. Annual average temperature pattern

Climate stations used

- (1) ASHLAND 2 SW [USC00330256], Ashland, OH
- (2) CENTERBURG 2 SE [USC00331404], Centerburg, OH
- (3) NORWALK WWTP [USC00336118], Norwalk, OH
- (4) BUCYRUS [USC00331072], Bucyrus, OH
- (5) WESTERVILLE [USC00338951], Westerville, OH

Influencing water features

This ecological site is not influenced by wetland or riparian water features as it is an upland site. The site does not flood, but ponding can occur frequently and last up to 30 days. The majority of the water comes from precipitation, but the site does receive water from adjacent sites that are up slope. The site is a recharge depression, as the majority of the water on the site enters into the groundwater.

Soil features

The soil series associated with this site are: Sleeth, Olmsted, Jimtown, Digby, Bogart. They are very deep, very poorly drained to moderately well drained, and moderate to moderately rapid permeable soils, with strongly acidic to neutral soil reaction that formed in outwash.

Parent Materials Kind: outwash

Surface Texture: loam, silt loam, silty clay loam

Subsurface Texture group: loamy



Figure 8. Mapunit locations in the MRLA

Table 4. Representative soil features

Parent material	(1) Outwash
-----------------	-------------

Surface texture	(1) Silt loam (2) Silty clay loam (3) Loam
Drainage class	Very poorly drained to moderately well drained
Permeability class	Moderate to moderately rapid
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	15.24–19.81 cm
Calcium carbonate equivalent (Depth not specified)	0%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	5.5–7
Subsurface fragment volume <=3" (Depth not specified)	2–14%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The historic plant community of the Outwash Upland ecological site is mixed hardwood forest with sugar maple and red oak being the dominant canopy species. At late seral stages, small gap disturbances are the most common overall disturbance mechanism and often result from windthrow or disease. This allows for ascension of shade tolerant species to reach the canopy. Mid seral stages are more prone to low intensity ground fires, which allow the oak species to reach the canopy. This mixture of disturbance types and frequency permits the mix of species that occupies the majority of the canopy.

State and transition model

Outwash Upland, F111EY403OH

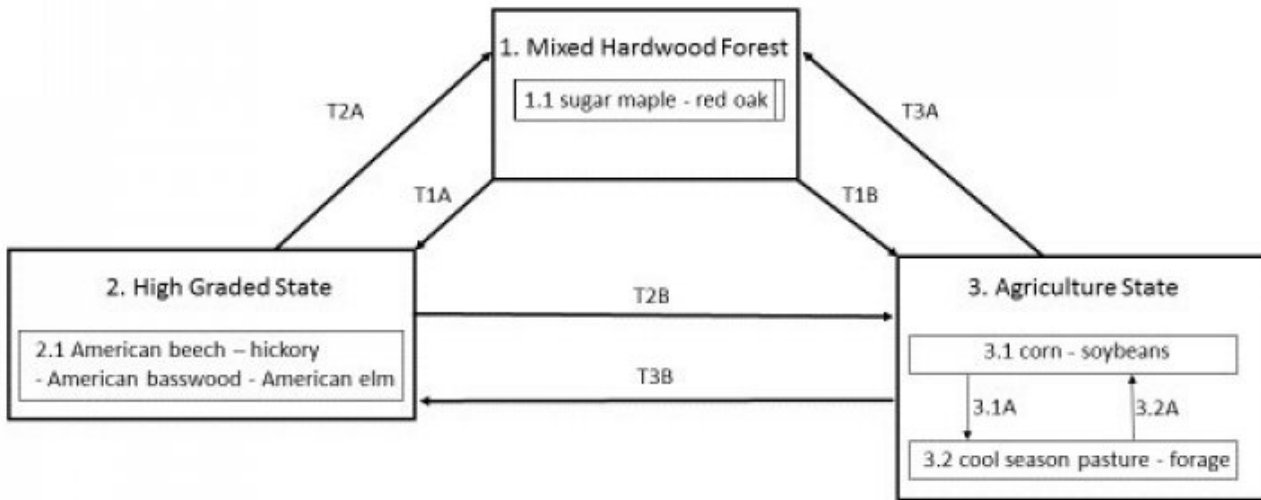


Figure 9. STM

Outwash Upland, F111EY403OH

Diagram Legend

T1A	Removal of marketable tree species; no management to replace
T1B	Remove woody species, drainage (if needed), site preparation, planting
T2A	Plant desired species, low intensity fire
T2B	Remove woody species, drainage (if needed), site preparation, planting
T3A	Plant desired species, low intensity fire
T3B	Removal of drainage system (if warranted) tree planting or no management; removal of marketable tree species
3.1A	Pasture/forage planting and management
3.2A	Conventional/no-till planting and management of row crops

Figure 10. Legend

State 1 Mixed Hardwood Forest

This is the diagnostic plant community for this site. White oak and red 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

- white oak (*Quercus alba*), tree
- northern red oak (*Quercus rubra*), tree

Community 1.1

sugar maple - red oak

This phase is characterized by tree dominance, particularly sugar maple and red oak. Additional canopy species include American beech, basswood, black cherry, elm and white oak.

Dominant plant species

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

State 2

High Graded State

This phase is characterized by the removal of the more marketable tree species, primarily oaks and sugar maple. The resulting tree species, maple, beech, basswood, hickory and elm become the dominant species in the canopy.

Dominant plant species

- maple (*Acer*), tree
- American beech (*Fagus grandifolia*), tree

Community 2.1

American beech - hickory - American basswood -American elm

This phase is characterized by the removal of the oaks species. The beech/hickory/basswood/elm trees dominate the canopy.

Dominant plant species

- American beech (*Fagus grandifolia*), tree
- hybrid hickory (*Carya*), tree

State 3

Agricultural State

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

Community 3.1

row crops (corn - soybeans)

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

Community 3.2

cool season pasture - forage

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

Planting, either by conventional or no-till methods, of row crop. Management that keeps the site in row crop production

Transition T1A

State 1 to 2

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

Transition T1B

State 1 to 3

Removal of trees and other woody species. Install drainage system (if warranted), prepare the site for planting the agricultural crop, and regular agricultural practices move the site towards State 3.

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 of trees and other woody 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, tree planting, followed by timber practices that select for and perpetuate the desired species.

Transition T3B

State 3 to 2

Removal of drainage system (if warranted), site preparation, tree planting, followed by selective tree harvest

Additional community tables

Inventory data references

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

Other references

Anderson, D. M. 1982. Plant communities of Ohio: A preliminary classification and description. Columbus, OH: Ohio Dept. of Natural Resources, Division of Natural Areas and Preserves.

Braun, E. Lucy. 2001. Deciduous forests of eastern North America. Caldwell, N.J.: Blackburn Press.

Homoya, M. A., Abrell, D. B., Aldrich, J. R., & Post, T. W. (1985). The Natural Regions of Indiana. Indiana Academy of Science, 94, 245-269.

Gordon, R. B. 1969. The natural vegetation of Ohio in pioneer days. Columbus: Ohio State University.

Lafferty, M. B. 1979. Ohio's natural heritage. Columbus: Ohio Academy of Science.

Kartesz, J. T. (2011). Density Gradient Map Samples Produced From BONAP's Floristic Synthesis. Retrieved 12

12, 2011, from Biota of North America Program: <http://bonap.org/diversity/diversity/diversity.html>

NatureServe. (2011). An online encyclopedia of life [web application]. NatureServe, Arlington, VA, USA [Online: www.natureserve.org/explorer].

Jackson, Marion T. 1997. The Natural heritage of Indiana. Bloomington: Indiana University Press, published in association with the Indiana Department of Natural Resources and the Indiana Academy of Science.

Johnson, Paul S., Stephen R. Shifley, and Robert Rogers. 2002. The ecology and silviculture of oaks. Wallingford, Oxon: CABI

Upland Oak Ecology Symposium, and Martin A. Spetich. 2004. Upland Oak Ecology Symposium: history, current conditions, and sustainability: Fayetteville, Arkansas, October 7-10, 2002. [Asheville, NC]: [Southern Research Station].

USDA. (2007). Ecological Subregions: Sections and Subsections for the Conterminous United States. Washington, DC: USDA - Forest Service.

USDA. (2006). Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U. S. Department of Agriculture, Natural Resources Conservation Service. U. S. Department of Agriculture Handbook 296.

USGS. (2010). LANDFIRE Biophysical Settings. Retrieved from <http://www.landfire.gov>

Whitaker, John O., Charles J. Amlaner, Marion T. Jackson, George R. Parker, and Peter Evans Scott. 2012. Habitats and ecological communities of Indiana presettlement to present. Bloomington: Indiana University Press.

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	05/03/2024
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:**
