

Ecological site F088XY014MN Clayey Upland Wet-Mesic Hardwood Forest

Last updated: 8/12/2024
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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): 088X–Northern Minnesota Glacial Lake Basins

MLRA 88 consists of the lake beds of glacial Lakes Agassiz, Upham, and Aitkin. These vast glacial lake beds were formed by meltwaters associated with the last glaciation of the Wisconsin age. The large, flat, wet landscapes are filled with lacustrine lake sediments, wave-washed glacial till, and vast expanses of organic soils. This area is entirely in Minnesota and makes up about 11,590 square miles (30,019 square kilometers).

The western boundary of MLRA 88 with MLRA 56B is gradual. MLRA 56B is a portion of the Red River Valley that was formed by glacial Lake Agassiz and is dominantly prairie. The southern boundary of MLRA 88 with MLRA 57 consists of distinct moraines that formed from the glacial drift sediments of Late Wisconsin age. The eastern and southeastern boundaries are with portions of MLRAs 90A and 93A. These MLRAs are in a distinct glaciated region of sediments of the Rainy and Superior Lobes, and much of MLRA 93A is bedrock controlled (USDA-Ag Handbook 296, 2022).

Classification relationships

Relationship to Other Established Classifications:

MN DNR Native Plant Community (MN DNR, 2003); the reference community of this Provisional Ecological Site is most similar to:

MHn47 Northern Rich Mesic Hardwood Forest

MHc37 Central Mesic Hardwood Forest (Western) **Located in the Hardwood Hills subsection from Becker County north to Polk County in the northern tip of MIM – Naytahwaush & Mahkonce

Ecological site concept

Clayey Upland Wet-Mesic Hardwood Forest sites typically occur on summit, shoulders and backslope hillslope positions on moraines and till plains, and occasionally on gentle to steeper sloping areas of glacial lake plains. These sites typically exist on soils with fine textured clayey and silty textures of clay, silty clay, silty clay loam, silt loam, very fine sandy loam or loamy very fine sand within a depth of 50 centimeters.

Associated sites

F088XY008MN	Wet Mixed Forest These sites occur on footslope and toeslope hillslope positions, drainageways surrounded by uplands or on the edge of uplands grading to very poorly drained peatland soils. These sites typically exist on loamy and occasionally sandy moraines and till plains. Parent material is calcareous fine to loamy textured glacial till, stratified material and occasionally sandy.
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Similar sites

F088XY015MN	Loamy Upland Wet-Mesic Mixed Forest These sites occur on summit, shoulders and backslope hillslope positions on moraines and till plains. These sites typically exist on soils with loamy textures of loam, sandy loam, sandy clay loam or fine sandy loam within a depth of 50 centimeters. The underlying parent material is generally medium textured till, sandy loam till or stratified materials with generally less than 35 percent rock fragments within a depth of 100 centimeters.
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Table 1. Dominant plant species

Tree	(1) <i>Acer saccharum</i> (2) <i>Tilia americana</i>
Shrub	(1) <i>Prunus virginiana</i> (2) <i>Corylus cornuta</i>
Herbaceous	(1) <i>Athyrium</i> (2) <i>Aralia nudicaulis</i>

Physiographic features

Clayey Upland Wet-Mesic Hardwood Forest sites typically occur on summit, shoulders and backslope hillslope positions on flats, moraines, and till plains, and occasionally on gentle to steeper sloping areas of glacial lake plains.

Table 2. Representative physiographic features

Slope shape across	(1) Linear
Slope shape up-down	(1) Convex
Landforms	(1) Flat (2) Till plain (3) Moraine (4) Hillslope (5) Glacial lake
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	311–521 m
Slope	1–4%
Ponding depth	0 cm
Water table depth	30–61 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation is 25 to 28 inches (635 to 711 millimeters). Most of the rainfall comes from convective thunderstorms during the growing season. Snowfall generally occurs from October through April. The average annual temperature is 43 to 46 degrees F (6 to 8 degrees C). The mean frost free period ranges from 86 to 110 days, with the mean freeze-free period ranging from 119 to 136 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	86-110 days
Freeze-free period (characteristic range)	119-136 days
Precipitation total (characteristic range)	635-711 mm
Frost-free period (actual range)	79-112 days

Freeze-free period (actual range)	114-141 days
Precipitation total (actual range)	610-711 mm
Frost-free period (average)	98 days
Freeze-free period (average)	129 days
Precipitation total (average)	660 mm

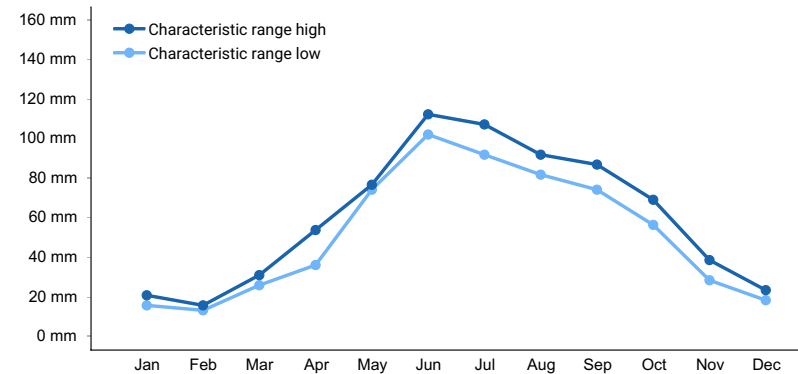


Figure 1. Monthly precipitation range

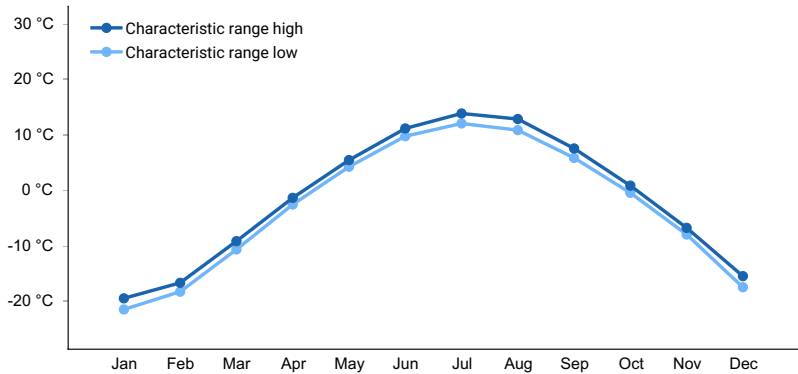


Figure 2. Monthly minimum temperature range

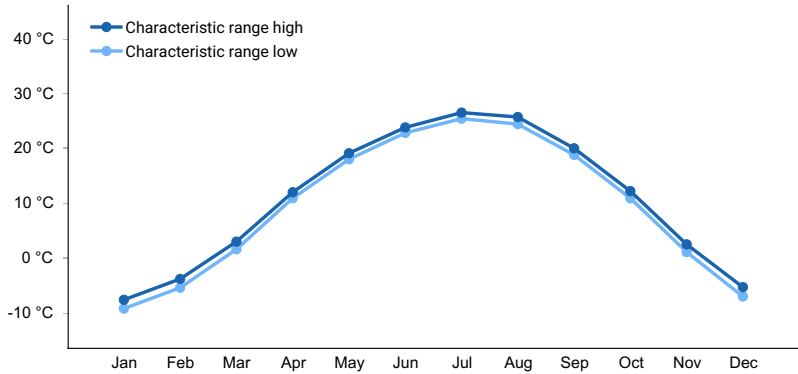


Figure 3. Monthly maximum temperature range

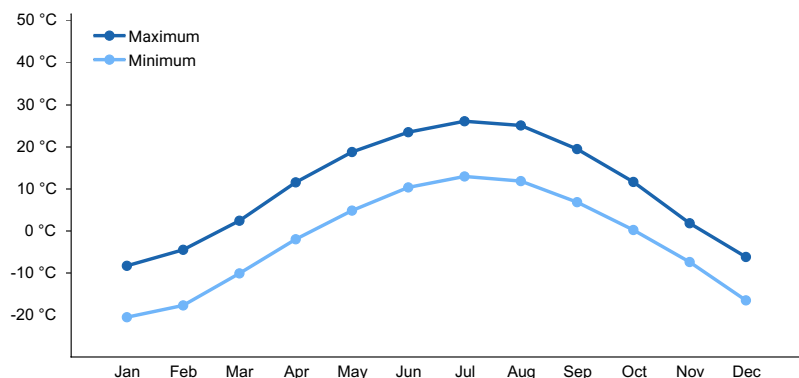


Figure 4. Monthly average minimum and maximum temperature

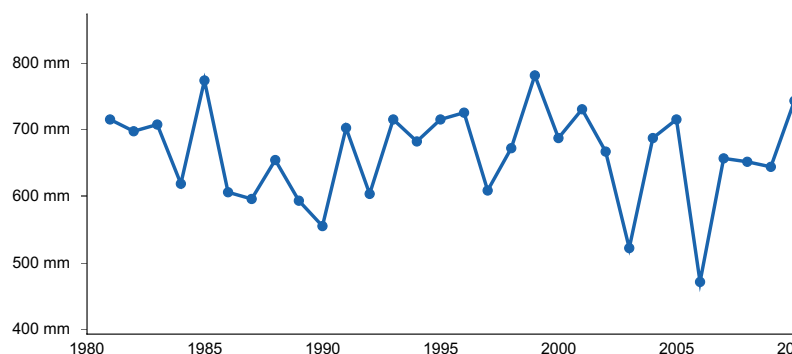


Figure 5. Annual precipitation pattern

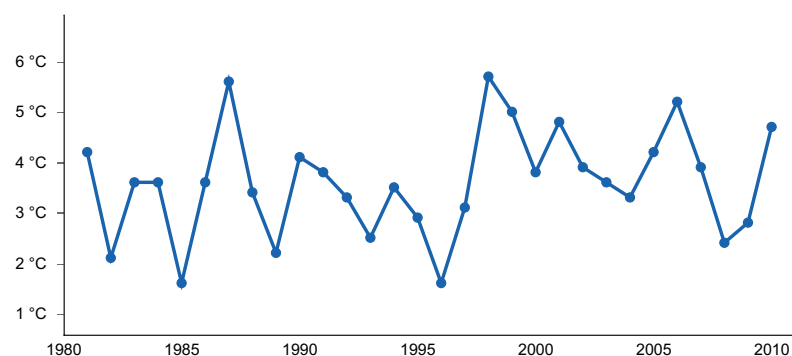


Figure 6. Annual average temperature pattern

Climate stations used

- (1) INTL FALLS INTL AP [USW00014918], International Falls, MN
- (2) LITTLEFORK 10 SW [USC00214809], Big Falls, MN
- (3) BIG FALLS [USC00210746], Big Falls, MN
- (4) WASKISH 4NE [USC00218700], Big Falls, MN
- (5) RED LAKE INDIAN AGCY [USC00216795], Ponemah, MN
- (6) BAUDETTE INTL AP [USW00094961], Baudette, MN
- (7) CAMP NORRIS DNR [USC00211250], Beltrami Isl State for, MN
- (8) WARROAD [USC00218679], Warroad, MN
- (9) EVELETH WWTP [USC00212645], Eveleth, MN
- (10) FLOODWOOD 3 NE [USC00212842], Floodwood, MN
- (11) GRAND RPDS FOREST LAB [USC00213303], Grand Rapids, MN
- (12) POKEGAMA DAM [USC00216612], Cohasset, MN
- (13) LEECH LAKE [USC00214652], Bena, MN

Influencing water features

This site is not prone to ponding or flooding. Fine soils may perch water, leading to a water table within 30 inches of

the surfaces.

Soil features

These sites typically exist on soils with fine textured clayey and silty textures of clay, silty clay, silty clay loam, silt loam, loam, fine sandy loam, loamy fine sand, very fine sandy loam or loamy very fine sand within a depth of 50 centimeters. The underlying parent material is generally fine or medium textured glacial till; or fine textured clayey or silty glacial lacustrine sediments with generally less than 5 percent rock fragments within a depth of 100 centimeters.

Soils in the Clayey Upland Wet-Mesic Hardwood Forest fall within the Alfisol and Mollisol orders. Soil series within this ecological site include Ashlake, Taylor, Alango, Suomi, Kooch, Grasston, Longsiding, Haystore, Morcom, Dalbo, Lahti, Mahkonce, and Thistledew.

Table 4. Representative soil features

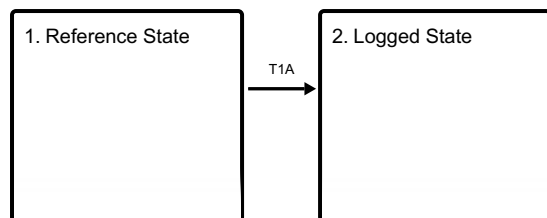
Parent material	(1) Till (2) Glaciolacustrine deposits
Surface texture	(1) Loam (2) Silty clay (3) Silt loam (4) Fine sandy loam (5) Loamy fine sand (6) Very fine sandy loam (7) Clay (8) Silty clay loam (9) Loamy very fine sand
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Very slow to moderately slow
Depth to restrictive layer	203 cm
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	10.67–20.32 cm
Soil reaction (1:1 water) (0-25.4cm)	5.1–7.3
Subsurface fragment volume <=3" (0-203.2cm)	0–8%
Subsurface fragment volume >3" (0-203.2cm)	0–1%

Ecological dynamics

Plant communities typically include sugar maple, basswood, and often yellow birch, also can include paper birch, ironwood, northern red oak, black ash, balsam fir, and white spruce. Understory typically includes sugar maple, basswood and ironwood saplings as well as beaked hazelnut, fly honeysuckle, mountain maple, and chokecherry; with the forb layer including lady fern, wild sarsaparilla, Clayton's sweet cicely and hairy solomon's seal to mention a few.

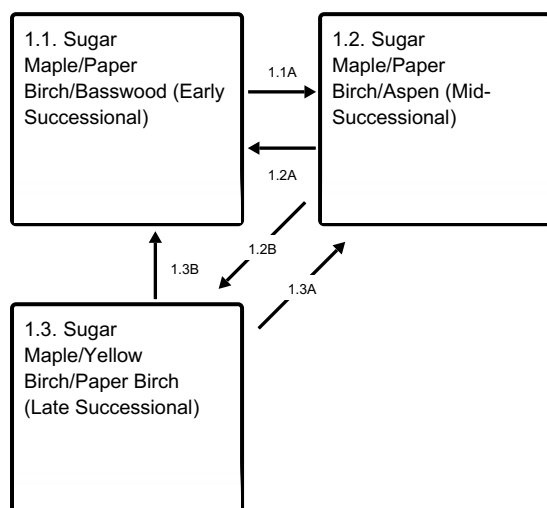
State and transition model

Ecosystem states



T1A - Mechanical removal of tree species for timber harvest.

State 1 submodel, plant communities



1.1A - Lack of fire/blow downs (35-95 years)

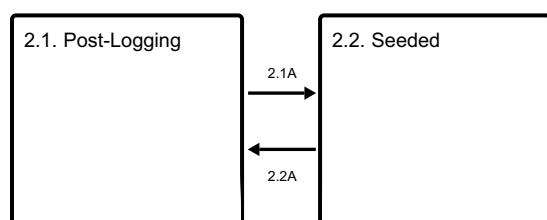
1.2A - Increased low intensity fire frequency and blow downs (<35 years)

1.2B - Lack of fire/blow downs (95-195 years)

1.3B - Stand replacing fire

1.3A - Increased low intensity fire frequency and blow downs (<95 years)

State 2 submodel, plant communities



2.1A - Planting of desired species and herbicide use.

2.2A - Harvest of tree species upon desired growth stage.

State 1 Reference State

The reference state consists of three forest communities in varying successional phases.

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- paper birch (*Betula papyrifera*), tree
- American basswood (*Tilia americana*), tree
- quaking aspen (*Populus tremuloides*), tree
- yellow birch (*Betula alleghaniensis*), tree

- northern red oak (*Quercus rubra*), tree
- black ash (*Fraxinus nigra*), tree
- balsam fir (*Abies balsamea*), tree
- white spruce (*Picea glauca*), tree
- beaked hazelnut (*Corylus cornuta*), shrub
- mountain maple (*Acer spicatum*), shrub
- American fly honeysuckle (*Lonicera canadensis*), shrub
- chokecherry (*Prunus virginiana*), shrub
- wild sarsaparilla (*Aralia nudicaulis*), other herbaceous
- common ladyfern (*Athyrium filix-femina*), other herbaceous
- Clayton's sweetroot (*Osmorhiza claytonii*), other herbaceous
- hairy Solomon's seal (*Polygonatum pubescens*), other herbaceous

Community 1.1

Sugar Maple/Paper Birch/Basswood (Early Successional)

Young forests recovering from fire or wind, notable sugar maple dominance with earlier successional species (0-35 years).

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- paper birch (*Betula papyrifera* var. *papyrifera*), tree
- American basswood (*Tilia americana*), tree

Community 1.2

Sugar Maple/Paper Birch/Aspen (Mid-Successional)

A transitional period marked with a decline in paper birch, aspen, and basswood. Along with development of yellow birch, white pine, and white spruce seedlings become developed (35-75 years).

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- paper birch (*Betula papyrifera*), tree
- quaking aspen (*Populus tremuloides*), tree

Community 1.3

Sugar Maple/Yellow Birch/Paper Birch (Late Successional)

Mature forest with prominent mixed canopy (75+ years).

Dominant plant species

- sugar maple (*Acer saccharum* var. *saccharum*), tree
- yellow birch (*Betula alleghaniensis* var. *alleghaniensis*), tree
- paper birch (*Betula papyrifera* var. *papyrifera*), tree

Pathway 1.1A

Community 1.1 to 1.2

Lack of fire/blow downs (35-95 years)

Pathway 1.2A

Community 1.2 to 1.1

Increased low intensity fire frequency and blow downs (<35 years)

Pathway 1.2B

Community 1.2 to 1.3

Lack of fire/blow downs (95-195 years)

Pathway 1.3B

Community 1.3 to 1.1

Stand replacing fire

Pathway 1.3A

Community 1.3 to 1.2

Increased low intensity fire frequency and blow downs (<95 years)

State 2

Logged State

Removal of tree species for timber harvest leaves an open canopy with very disturbed understory vegetation. Shrubs dominate immediately post logging and often prevent tree's from re-establishing quickly.

Dominant plant species

- beaked hazelnut (*Corylus cornuta*), shrub
- American fly honeysuckle (*Lonicera canadensis*), shrub
- mountain maple (*Acer spicatum*), shrub
- chokecherry (*Prunus virginiana*), shrub

Community 2.1

Post-Logging

Removal of tree species for timber harvest leaves an open canopy with very disturbed understory vegetation. Shrubs dominate immediately post logging and often prevent tree's from re-establishing quickly.

Dominant plant species

- beaked hazelnut (*Corylus cornuta var. cornuta*), shrub
- American fly honeysuckle (*Lonicera canadensis*), shrub
- mountain maple (*Acer spicatum*), shrub
- chokecherry (*Prunus virginiana*), shrub

Community 2.2

Seeded

Reseeded to a forested site with desired timber species.

Dominant plant species

- red pine (*Pinus resinosa*), tree
- eastern white pine (*Pinus strobus*), tree

Pathway 2.1A

Community 2.1 to 2.2

Planting of desired species for future timber harvest and herbicide use to prevent shrubs from dominating.

Pathway 2.2A

Community 2.2 to 2.1

Harvest of tree species upon desired growth stage.

Transition T1A

State 1 to 2

Mechanical removal of tree species for timber harvest.

Additional community tables

Inventory data references

Information presented was derived from Minnesota Department of Natural Resources Field Guide to the Native Plant Communities of Minnesota, USDA-NRCS soil survey information, and USDA Plants Database.

Other references

Cleland, D.T.; Freeouf, J.A.; Keys, J.E., Jr.; Nowacki, G.J.; Carpenter, C; McNab, W.H. 2007. Ecological Subregions: Sections and Subsections of the Conterminous United States.[1:3,500,000], Sloan, A.M., cartog. Gen. Tech. Report WO-76. Washington, DC: U.S. Department of Agriculture, Forest Service.

Eggers, Steve D. and Donald M. Reed. 1997. Wetland Plants and Plant Communities of Minnesota and Wisconsin. U.S. Army Corps of Engineers, St. Paul District.

Minnesota Department of Natural Resources (2003). Field Guide to the Native Plant Communities of Minnesota: The Laurentian Mixed Forest Province. Ecological Land Classification Program, Minnesota County Biological Survey, and Natural Heritage and Nongame Research Program. MNDNR St. Paul, MN.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Series Descriptions. Available online. Accessed March 2018.

United States Department of Agriculture, Natural Resources Conservation Service. 2022. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

USDA, NRCS. 2018. The PLANTS Database (<http://plants.usda.gov>, 27 March 2018). National Plant Data Team, Greensboro, NC 27401-4901 USA.

U.S. Environmental Protection Agency. 2013. Level III and IV ecoregions of the continental United States: Corvallis, Oregon, U.S. EPA, National Health and Environmental Effects Research Laboratory, map scale 1:3,000,000, <https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states>.

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Approval

Suzanne Mayne-Kinney, 8/12/2024

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	05/13/2025
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):

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:
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17. **Perennial plant reproductive capability:**
-