

Ecological site F093AY001MN

Flooded Peatland

Last updated: 9/06/2024

Accessed: 09/03/2026

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): 093A–Superior and Rainy Stony and Rocky Till Plains and Moraines

The Superior Stony and Rocky Loamy Plains and Hills, Western Part is located and completely contained in northeastern Minnesota. This area has both the highest and lowest elevations in the state, as well as some of the state's most rugged topography (Ojakangas and Matsch, 1982). The MLRA was glaciated by numerous advances of the Superior, Rainy, and Des Moines glacial lobes during the Wisconsin glaciation as well as pre-Wisconsin glacial periods. The geomorphic surfaces in this MLRA are geologically very young (i.e., 10,000 to 20,000 years) and dominated by drumlin fields, moraines, small lake plains, outwash plains, and bedrock-controlled uplands (USDA-NRCS, 2022). There are thousands of lakes scattered throughout the region that were created by these glacial events. Most of these lakes are bedrock-controlled in comparison to adjacent glaciated regions where glacial drift deposits are much thicker and the lakes occur in depressions atop the glacial drift (Ojakangas and Matsch, 1982). In contrast to adjacent MLRAs, the depth to the predominantly crystalline or sandstone bedrock in MLRA 93A is relatively shallow because the most recent glacial events were more erosional than depositional (Ojakangas and Matsch, 1982).

Classification relationships

Major Land Resource Area (MLRA): Superior Stony and Rocky Loamy Plains and Hills, Western Part (93A) USFS Subregions: Northern Superior Uplands Section (212L); North Shore Highlands Subsection (212Lb) Relationship to Other Established Classifications: Minnesota Department of Natural Resources (MN DNR), FPN63-Northern Cedar Swamp, Forested Rich Peatland System, Northern Floristic Region MN DNR WFn53-Northern Wet Cedar Forest, Wet Forest System, Northern Floristic Region

Ecological site concept

This site is a conifer-dominated swamp on very poorly drained peat soils. Soils are saturated, very deep, very poorly drained and flooding occurs occasional to very frequent. Typical site settings include margin of streams and river channels plus lake basins and margins of large peatlands. The canopy is often dominated by northern white cedar, black spruce, and balsam fir. The understory includes ericaceous shrubs, multiple species of sedge, and sphagnum. The plant community structure and composition will vary depending on microtopography and the depth and frequency of flooding.

Associated sites

F093AY004MN	Peatland Peatland. This site characterized by a shrub-graminoid plant community. The site is potentially ponded. Does not typically occurs at the margin of stream and river channels.
F093AY003MN	Acid Peatland Acid Peatland. Ponding can occur and pH ranges from 3.5-5.5 at 20 inches in depth. Noticeable lack of diverse shrub and graminoid layer due to the acidic pH. Does not typically occurs at the margin of stream and river channels

Similar sites

F093AY004MN	Peatland Peatland. This site characterized by a shrub-graminoid plant community. The site is potentially ponded. Does not typically occurs at the margin of stream and river channels.
F093AY003MN	Acid Peatland Acid Peatland. Ponding can occur and pH ranges from 3.5-5.5 at 20 inches in depth. Noticeable lack of diverse shrub and graminoid layer due to the acidic pH. Does not typically occurs at the margin of stream and river channels

Table 1. Dominant plant species

Tree	(1) <i>Thuja occidentalis</i> (2) <i>Picea mariana</i>
Shrub	(1) <i>Ledum groenlandicum</i> (2) <i>Alnus incana ssp. rugosa</i>
Herbaceous	(1) <i>Carex</i> (2) <i>Sphagnum</i>

Physiographic features

Typical site settings include margin of streams and river channels plus lake basins and margins of large peatlands.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Flat (3) Drainageway
Runoff class	Very low
Flooding duration	Brief (2 to 7 days) to very long (more than 30 days)
Flooding frequency	Occasional to very frequent
Ponding duration	Very brief (4 to 48 hours) to very long (more than 30 days)
Ponding frequency	None to frequent
Elevation	200 – 600 m

Slope	0 %
Water table depth	0 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation is 26-32 inches (66 to 81 centimeters). Measurable climatic variation (due to the lake effect) near some of Lake Superior may alter temperature and precipitation (Hillman & Nielsen, 2023). About 65 percent of the precipitation falls as rain during the growing season (May through September) and about 21 percent falls as snow. The freeze-free period averages about 130 days and ranges from 123 to 143 days (USDA-NRCS, 2022).

Table 3 Representative climatic features

Frost-free period (characteristic range)	90-110 days
Freeze-free period (characteristic range)	120-140 days
Precipitation total (characteristic range)	660-810 mm
Frost-free period (actual range)	40-110 days
Freeze-free period (actual range)	100-150 days
Precipitation total (actual range)	660-810 mm
Frost-free period (average)	90 days
Freeze-free period (average)	130 days
Precipitation total (average)	740 mm

- (1) ELY 25E [USC00212555], Ely, MN
- (2) GRAND PORTAGE [USC00213296], Grand Portage, MN
- (3) KETTLE FALLS [USC00214306], Voyageurs Natl Park, MN
- (4) DULUTH [USW00014913], Duluth, MN
- (5) WOLF RIDGE ELC [USC00219134], Finland, MN
- (6) KABETOGAMA [USC00214191], Orr, MN
- (7) BRIMSON 2S [USC00210989], Brimson, MN

Influencing water features

This site receives water through precipitation, runoff from uplands, and subsurface flow including direct flooding from riparian features. Flooding occurs rarely to frequently and variations in flooding regimes will directly affect the plant community composition.

Wetland description

Under the Cowardin System of Wetland Classification, or National Wetlands Inventory (NWI), the wetlands can be classified as:

- 1) Palustrine, forested, needle-leaved evergreen, saturated, or
- 2) Palustrine, scrub-shrub, broad-leaved deciduous, saturated, or
- 3) Palustrine, scrub-shrub, broad-leaved evergreen, saturated, or
- 4) Palustrine, emergent, persistent, saturated

Under the Hydrogeomorphic Classification System (HGM), these sites could be classified as: Depressional, forested/organic or Depressional, scrub-shrub/organic.

Soil features

Soils representative of this site include Bowstring and Tacoosh. Parent materials are organic material mixed with alluvium, organic material over loamy drift, and organic material over glaciolacustrine deposits. Soils are muck, peat, or mucky peat, very deep, and very poorly drained.

Table 4. Representative soil features

Parent material	(1) Organic material (2) Herbaceous organic material (3) Alluvium
Surface texture	(1) Mucky peat (2) Muck (3) Peat
Drainage class	Very poorly drained
Permeability class	Moderately rapid to very rapid
Depth to restrictive layer	200 cm
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-152.4cm)	27.94 – 53.34 cm
Calcium carbonate equivalent (0-203.2cm)	0 – 10 %

Soil reaction (1:1 water) (0-203.2cm)	5.6 – 7.3
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

This site is a wooded swamp on saturated, organic substrate of muck or mucky peat. This site is influenced by periodic flooding. Flooding intensity and frequency will result in variability in the plant community composition.

Historically, catastrophic disturbances were quite rare within this community. Stand replacing catastrophic storms occurred every 575 to 600 years. Catastrophic fires rarely occur, with an estimated occurrence every 920 years approximately (Minnesota Department of Natural Resources, 2005). Due to the saturated soils and shallow tree rooting systems, windthrow did cause smaller canopy-opening disturbances to occur at a shorter time interval. Hence, downed trees, displaced stumps, and sphagnum hummocks are characteristic for this site.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Inventory data references

No field plots were established for this project. A review of the scientific literature was used to approximate the plant communities for this ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional. Future field verification will refine the plant communities described in this project.

References

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Approval

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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)	
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Contact for lead author	
Date	09/06/2024
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:

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:
