Ecological site F090BY001WI
Poor Fen

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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): 090B–Central Wisconsin Thin Loess Dissected Till Plain

The Wisconsin and Minnesota Thin Loess MLRA, Northern and Southern Parts (90A and 90B) correspond closely to the North Central Forest and the Forest Transition Ecological Landscapes, respectively. Some of the following brief overview is borrowed from the Wisconsin Department of Natural Resources ecological landscape publications (2015). The Wisconsin and Minnesota Thin Loess MLRA, Northern and Southern Parts (90A and 90B) is an extensive glacial landscape that comprised of over 11.1 million acres (17,370 sq mi) throughout central and northern Wisconsin – about 27% of the total land area in the state. This glacial landscape is comprised of a heterogenous mix of loess-capped ground moraines, end moraines with eskers and ice-walled lake plains, and pitted, unpitted, and collapsed outwash plains sometimes interspersed with drumlins from the Illinoian and Pre-Illinoian glaciations. The entire area has been glaciated and nearly all of it is underlain by dense glacial till that impedes drainage. An extensive morainal system – the Perkinstown end moraine – spans most of the width of northern Wisconsin and divides the Northern and Southern Parts of this large landscape. This moraine, which has been sliced by outwash in many places, marks the southernmost extent of the Wisconsin glaciation (Wisconsin's most recent glacial advance). North of the Perkinstown morainal system is a loess plain, with a loess mantle 6-24 inches thick. The northernmost edge of this landscape is an undulating till and outwash plain with materials deposited by the Chippewa Lobe. Drumlins are common in the northern and northeastern portions. The drumlins are oriented towards the southwest and formed during a glacial episode prior to the most recent glacial advance. Some are covered with glacial till. Pitted, unpitted, and collapsed outwash plains fill the spaces between drumlins. Detached from the major land mass to the northeast is the hummocky Hayward collapsed end moraines, where swamps, ice-walled lake plains, and eskers are common. Most of the MLRA to the south of the Perkinstown morainal system is an extensive ground moraine with some proglacial stream features including pitted outwash plains, terraces, and fans. A layer of loess 6-47 inches thick covers much of the area. Like the Northern Part, all areas of the Southern Part of this MLRA were glaciated, although the southcentral portion is a relatively older till plain with materials from the Illinoian and pre-Illinoian glaciations, not the most recent Wisconsin glaciation. The landforms in the southcentral portion are highly variable. Much of the area topography is controlled by underlying bedrock. Sandstone outcrops and pediments can be found here. Some of the most southern portions of the MLRA are mixed glacial deposits and residuum. The land surface of the southeastern portion was formed by many small glacial advances and retreats. Morainal ridges protrude through an erosional, pitted outwash-mantled surface. These parallel ridges run in a northeast to southwest orientation and are dissected by many steams. The continental climate of this MLRA is typical of northcentral Wisconsin, with cold winters and warm summers. The southern boundary of this MLRA straddles Wisconsin's Tension Zone, a zone of transition between Wisconsin's northern and southern ecological landscapes. Historically, the mesic forests were dominated by eastern hemlock (Tsuga canadensis), sugar maple (Acer saccharum), and yellow birch (Betula alleghaniensis).

Classification relationships

Relationship to Established Framework and Classification Systems: Wetland Forest Habitat Type Classification System for Northern Wisconsin (Kotar and Burger, 2017): All four visited sites in this ES keyed out to one habitat type: Picea mariana - Larix laricina [PmLLe] Biophysical Settings (Landfire, 2014): Much of this site is mapped as Boreal Acidic Peatland Forest, Boreal Acidic Peatland Herbaceous, Boreal Acidic Peatland Shrubland, Central Interior and Appalachian Swamp Shrubland, and Laurentian-Acadian Alkaline Conifer-Hardwood Swamp Forest WDNR Natural Communities (WDNR, 2015): This ES is most similar to the Black Spruce Swamp, Northern Wet Forest, and Northern Tamarack Swamp communities Hierarchical Framework Relationships: Major Land Resource Area (MLRA): Wisconsin and Minnesota Thin Loess and Till (Northern and Southern Parts - 90A and 90B) USFS Subregions: St. Croix Moraine (212Qa), Hayward Stagnation Moraines (212Xf), Glidden Loamy Drift Plain (212Xa), Central-Northwest Wisconsin Loess Plains (212Xd), Perkinstown End Moraine (212Xe), Brule and Paint Rivers Drumlinized Ground Moraine (212Xc), Green Bay Lobe Stagnation Moraine (212Ta) Small sections occur in Green Bay Lobe Stagnation Moraine (212Ta), Central Wisconsin Moraines and Outwash (222Kb), Bayfield Sand Plains (212Ka), Athelstane Sandy Outwash and Moraines (212Tc) Wisconsin DNR Ecological Landscapes: North Central Forest, Forest Transition, Northwest Lowlands

Ecological site concept

The Poor fen ecological site is scattered throughout MLRA 90A and 90B in drainageways and depressions on moraines, outwash, lake, and till plains. These sites are characterized by very deep, very poorly drained soils formed in thick organic deposits underlain by glacial till, glacial outwash, or alluvium. Sites are subject to frequent ponding in the spring and fall. Soils remain saturated during the growing season and meet hydric soils requirements. Water is primarily received form precipitation and runoff from adjacent uplands with little groundwater discharge and stream inflow. Soils range from extremely acid to strongly acid. Poor fen sites have low pH that differentiates it from Organic ecological sites. The low pH is caused by limited interaction with groundwater that may be enriched with carbonates. In addition, the groundwater discharging into Poor fen sites is likely passing through surrounding parent materials that are acidic (i.e. outwash sand). Sites that are acid bogs have very little interaction with groundwater and receive most of their water from precipitation and runoff from adjacent uplands, both of which tend to be quite acidic. The low pH limits vegetative growth.

Associated sites

F090BY005WI	**Wet Sandy Lowland** Wet Sandy Lowland consist of deep sandy deposits derived from a mixture of outwash, alluvium, and lacustrine sources. They form in seasonally ponded depressions and are saturated long enough for hydric conditions to occur. Some sites are wetlands. These sites occur slightly higher on the drainage sequence than Poor fen sites.
F090BY009WI	**Moist Sandy Upland** Moist Sandy Lowland primarily consist of deep, sandy deposits from outwash, alluvium, lacustrine, and till. They sandy deposits may have a loamy mantle or be underlain by loamy deposits. The finer materials can cause episaturation and allow the site to remain moist for some of the growing season. They are drier and occur higher on the drainage sequence than Poor fen sites.
F090BY013WI	**Sandy Upland** Sandy Upland consist of deep sandy and loamy deposits of outwash, alluvium, till, and residuum. Soils are primarily sand and loamy sand and have a seasonally high water table within 80 inches, though they don't remain saturated for extended periods. They are much drier and occur higher on the drainage sequence than Poor fen sites.
F090BY019WI	**Dry Sandy Upland** Dry Sandy Upland consist of primarily sandy deposits of various origin. Loamy deposits are also present in many soils. They may have a seasonally high water table within two meters of the surface, though they do not remain saturated for sustained periods. They are much drier and occur higher on the drainage sequence than Poor fen sites.

Similar sites

F090BY002WI	**Mucky Swamp** Like Poor fen sites, Mucky Swamp sites consist of herbaceous organic materials, sometimes with mineral soil contact. They are also very poorly drained, permanently saturated wetlands. Organic Nonacid sites are more alkaline than Poor fen sites because they receive more stream and groundwater. Additionally, adjacent sites may have more calcareous parent materials than those adjacent to Poor fen sites. These differences are reflected in the vegetative communities, with Organic Nonacid having improved growing conditions over Poor fen.

F090BY003WI	**Sandy Floodplain** Sandy Floodplain sites are found exclusively on floodplains in sandy and sometimes silty alluvium. These sites are somewhat poorly to poorly drained and are subject to flooding. Some sites may be saturated for long enough for hydric conditions to occur. Unlike Poor fen sites, they receive most of their water from streamflow. They are much less acidic and slightly drier than Poor fen sites. Growing conditions are improved.
F090BY005WI	**Wet Sandy Lowland** Wet Sandy Lowland consist of deep sandy deposits derived from a mixture of outwash, alluvium, and lacustrine sources. They form in seasonally ponded depressions and are saturated long enough for hydric conditions to occur. These sights occupy slightly higher landscape positions than Poor fen sites. The vegetative communities they support are slightly drier and more nutrient-demanding than those supported by Poor fen sites.

Table 1. Dominant plant species

Tree	(1) *Picea mariana* (2) *Larix laricina*
Shrub	(1) *Ledum groenlandicum*
Herbaceous	(1) *Sphagnum*

Physiographic features

This site occurs in drainageways and depressions on moraines, outwash, lake, and till plains. Landform shape is concave or linear, and sites are in the toeslope position. Slopes range from 0 to 2 percent.

These sites are subject to rare to frequent ponding throughout much the year. The ponding duration is brief to long with depths up to 6 inches above the surface. These sites do not flood. These soils have an apparent seasonally high water table (endosaturation) at the surface but the water table may drop during dry conditions. Runoff is negligible.

Table 2. Representative physiographic features

Hillslope profile	(1) Toeslope
Slope shape across	(1) Concave
Slope shape up-down	(1) Linear
Landforms	(1) Drainageway (2) Depression (3) Outwash plain (4) Till plain (5) Lake plain

Runoff class	Very low
Flooding frequency	None
Ponding duration	Very brief (4 to 48 hours) to long (7 to 30 days)
Ponding frequency	Rare to frequent
Elevation	170 – 350 m
Slope	0 %
Ponding depth	0 – 20 cm
Water table depth	0 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of the expansive Wisconsin and Minnesota Thin Loess and Till Plain is highly variable. The eco-climatic zone (the “Tension Zone”) that runs southeast-northwest across the state splits the MLRA. In general, the MLRA has cold winters and warm summers with an adequate amount of precipitation. Near Lake Superior, precipitation and temperature tend to increase. The far western section of the MLRA, known as the western prairie ecological landscape by the Wisconsin DNR, has warmer temperatures compared to the rest of the MLRA because it falls below the eco-climatic zone. The soil moisture regime of MLRA is udic (humid climate). The soil temperature regime is frigid and cryic.

The average annual precipitation for this site is 32 inches. The average annual snow fall is 58 inches. The average annual maximum and minimum temperatures are 52oF and 30oF, respectively.

Table 3 Representative climatic features

Frost-free period (characteristic range)	90-120 days
Freeze-free period (characteristic range)	120-140 days
Precipitation total (characteristic range)	760-840 mm
Frost-free period (actual range)	70-120 days
Freeze-free period (actual range)	110-150 days
Precipitation total (actual range)	740-860 mm

Frost-free period (average)	100 days
Freeze-free period (average)	130 days
Precipitation total (average)	790 mm

- (1) STAMBAUGH 2SSE [USC00207812], Iron River, MI
- (2) FLORENCE [USC00472826], Florence, WI
- (3) GOODMAN SANITARY DIST [USC00473174], Goodman, WI
- (4) LAONA 6 SW [USC00474582], Laona, WI
- (5) LAKEWOOD 3 NE [USC00474523], Lakewood, WI
- (6) ROSHOLT 9 NNE [USC00477349], Wittenberg, WI
- (7) WAUPACA [USC00478951], Waupaca, WI
- (8) JUMP RIVER 3E [USC00474080], Sheldon, WI
- (9) HOLCOMBE [USC00473698], Holcombe, WI
- (10) BIG FALLS HYDRO [USC00470773], Glen Flora, WI
- (11) WINTER [USC00479304], Ojibwa, WI
- (12) BUTTERNUT 3N [USC00471249], Butternut, WI
- (13) LUCK [USC00474894], Luck, WI
- (14) AMERY [USC00470175], Amery, WI
- (15) ISLE 12N [USC00214103], Isle, MN
- (16) SANDSTONE 6 W [USW00054932], Hinckley, MN
- (17) MILACA [USC00215392], Milaca, MN
- (18) CLOQUET [USC00211630], Cloquet, MN
- (19) AITKIN 2E [USC00210059], Aitkin, MN

Influencing water features

Water is received through precipitation, runoff from adjacent uplands, and groundwater. Water levels are greatly influenced by precipitation rates and runoff from upland sites. Water leaves the site primarily through evapotranspiration, groundwater recharge, and less often, stream outflow. These sites are wetlands.

The hydrology of Poor fen sites significantly impacts their ecological development. Groundwater movement into these sites brings in water that is exposed to surrounding acidic parent materials, such as sand deposits. This interaction keeps the soils acidic, but less acidic than if it had no groundwater discharge on the site, as it is in the case of acid bogs.

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), the wetlands can be classified as:
1) Depressional, acidic, forested/organic, or
2) Depressional, acidic, scrub-shrub/organic

Permeability of the soil is very slow to moderately slow.
Hydrologic Group: A/D, B/D, C/D
Hydrogeomorphic Wetland Classification: Depressional acidic forested/organic; Depressional acidic scrub-shrub/organic
Cowardin Wetland Classification: PFO4B, PSS4B, PSS3B, PEM1B

Soil features

The soils of this site are represented by the Beseman, Cathro, Daisybay, Dawson, Greenwood, and Loxley soil series. Besemen, Cathro, and Dawson are classified as Terric Haplosaprists; Daisybay is a Terric Haplohemist, Greenwood is a Typic Haplohemist, and Loxley is a

Typic Haplosaprist.

These soils are formed in deep, highly decomposed organic material primarily of herbaceous origin. The organic material may be underlain by loamy till, sandy outwash, glacial drift, or loamy alluvium. The thickness of organic deposits ranges from 31 to 60 inches. These sites are very poorly drained and remain saturated throughout the year. They meet hydric soil requirements.

The surface horizon of these soils is muck, peat, or mucky peat. The subsurface horizons are highly decomposed muck—sapric materials. Underlying the muck is mineral soil with loam, sandy loam, silt loam, clay, and sand textures. Soil pH is extremely acid to strongly acidic with a range of 4.0 to 5.4. Surface horizons are absent of fragments, and subsurface fragments less than three inches may exist in the mineral soil material, up to 19 percent volume. Sites are often absent of carbonates, but may have up to 2 percent within 35 inches.

Table 4. Representative soil features

Parent material	(1) Organic material (2) Till (3) Outwash (4) Alluvium
Surface texture	(1) Mucky, peaty
Drainage class	Very poorly drained
Permeability class	Very slow to moderately slow
Soil depth	200 – 250 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	38.1 – 77.98 cm
Calcium carbonate equivalent (Depth not specified)	Not specified
Soil reaction (1:1 water) (Depth not specified)	0 – 5.4
Subsurface fragment volume <=3" (Depth not specified)	0 – 20 %

Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

Vegetative communities on this ecological site develop over very long and slow processes. These sites are part of the acid peatlands of northern Wisconsin. Communities range from open bogs to black spruce swamps. These sites developed in wet depressions that allowed organic matter to build over time. These communities are distinct from other wetland communities by the dominance and total carpeting of Sphagnum moss and its effects on the hydrology, pH, and nutrient availability of the site. As Sphagnum moss dominates these sites, it develops thick layers that raise the surface and effectively isolates vegetation from groundwater interaction. Precipitation and runoff become the primary sources of water, which causes sites to become very acidic and poor in nutrients. These sites remain saturated throughout the year based on the moss' ability to retain water. Vegetation on these sites is limited by species that can tolerate saturation, high acidity, and low nutrient availability. Changes to the hydrology can cause severe changes. Drainage near the site that lowers the water table can allow for invasion of woody shrubs.

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 (%)

Table 6. Community 1.2 plant community composition

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

Table 7. Community 1.3 plant community composition

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

Inventory data references

Plot and other supporting inventory data for site identification and community phases is located on a NRCS North Central Region shared and one drive folder. University Wisconsin-Stevens Point described soils, took photographs, and inventoried vegetation data at community phases within the reference state. The data sources include WI ESD Plot Data Collection Form - Tier 2, Releve Method, NASIS pedon description, NRCS SOI 036, photographs, and Kotar Habitat Types. Wetland Forest Habitat Type Classification System for Northern Wisconsin (Kotar and Burger, 2017): All four visited sites in this ES keyed out to one habitat type: Picea mariana - Larix laricina [PmLLe] Biophysical Settings (Landfire, 2014): Much of this site is mapped as Boreal Acidic Peatland Forest, Boreal Acidic Peatland Herbaceous, Boreal Acidic Peatland Shrubland, Central Interior and Appalachian Swamp Shrubland, and Laurentian-Acadian Alkaline Conifer-Hardwood Swamp Forest WDNR Natural Communities (WDNR, 2015): This ES is most similar to the Black Spruce Swamp, Northern Wet Forest, and Northern Tamarack Swamp communities

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Approval

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NRCS contracted UWSP to write ecological sites in MLRA 90B, completed in 2021.

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	08/30/2026
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:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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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:**