

## Ecological site F090BY005WI Wet Sandy Lowland

Last updated: 11/16/2023  
Accessed: 05/18/2024

---

### 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): 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 heterogeneous 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 to 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 to 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 streams.

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

Major Land Resource Area (MLRA): Wisconsin and Minnesota This Loess and Till (Northern and Southern Parts - 90A and 90B)

USFS Subregions: Rib Mountain Rolling Ridges (212Qd), Green Bay Lobe Stagnation Moraine (212Ta), Brule and Paint Rivers Drumlinized Ground Moraine (212Xc), St. Croix Moraine (212Qa), Glidden Loamy Drift Plain (212Xa)  
Small sections occur in Central-Northwest Wisconsin Loess Plains (212Xd) and Rosemont Baldwin Plains and Moraines (222Md)

Wisconsin DNR Ecological Landscapes: Forest Transition, North Central Forest

## Ecological site concept

The Wet Sandy Lowland ecological site occurs primarily in the southeast portion of MLRA 90A and 90B in depressions and drainageways on outwash plains, floodplains, and stream terraces. These sites are characterized by very deep, very poorly or poorly drained soils that formed in sandy outwash, lacustrine, or alluvium deposits. Sites are subject to frequent ponding or flooding during the spring and fall. Soils remain saturated for long periods during the growing season and meet hydric soil requirements. Precipitation, runoff from adjacent uplands, groundwater discharge, and stream inflow are the primary sources of water. Soils range from extremely acid to neutral.

Wet Sandy Lowland are differentiated from other ecological sites by its deep sandy deposits and very poorly or poorly drained soils. Other very poorly or poorly drained sites have loamy or clayey deposits. These sites have lower pH and available water capacity than their loamy and clayey counterparts, which can limit vegetative growth. The poor drainage of this site distinguishes it from other sandy sites.

## Associated sites

F090BY001WI	<p><b>Poor Fen</b> Poor Fen sites consist of deep herbaceous organic materials. Some sites have mineral soil contact. They are very poorly drained and remain saturated throughout the year. They are strongly to extremely acidic. These sites are permanently saturated wetlands. They are wetter and occur lower on the drainage sequence than Wet Sandy Lowland.</p>
F090BY009WI	<p><b>Moist Sandy Upland</b> Moist Sandy Lowland sites 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 somewhat drier and occur higher on the drainage sequence than Wet Sandy Lowland.</p>
F090BY013WI	<p><b>Sandy Upland</b> Sandy Upland sites 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 two meters, though they don't remain saturated for extended periods. They are drier and occur higher on the drainage sequence than Wet Sandy Lowland.</p>
F090BY019WI	<p><b>Dry Sandy Upland</b> Dry Sandy Upland sites 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 Wet Sandy Lowland.</p>

## Similar sites

F090BY003WI	<p><b>Sandy Floodplain</b></p> <p>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. These sites are found on different landforms, but they share their particle size class and drainage capability. Sandy Floodplains can support similar vegetative communities as Wet Sandy Lowlands.</p>
F090BY006WI	<p><b>Wet Loamy Lowland</b></p> <p>Wet Loamy Lowland sites consist primarily of deep loamy deposits derived from a mixture of outwash, alluvium, loess, and lacustrine sources. Some sites may have bedrock contact within two meters of the surface. These sites are seasonally ponded depressions that remain saturated for sustained periods, allowing hydric conditions to occur. They are found in similar landforms as Wet Sandy Lowlands and have similar drainage capabilities but with finer textures. These sites can support vegetative communities with higher nutrient demand.</p>
F090BY009WI	<p><b>Moist Sandy Upland</b></p> <p>Moist Sandy Lowland sites 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, though they are not subject to ponding. The vegetative communities they support may be similar to those found on Wet Sandy Lowlands.</p>

**Table 1. Dominant plant species**

Tree	(1) <i>Acer rubrum</i> (2) <i>Abies balsamea</i>
Shrub	(1) <i>Cornus canadensis</i> (2) <i>Alnus</i>
Herbaceous	(1) <i>Osmunda cinnamomea</i>

## Physiographic features

These sites occur in depressions and drainageways on outwash plains, floodplains, and stream terraces. Sites have an apparent seasonally high water table (endosaturation) at 0 inches. The water table can drop below 80 inches during dry conditions. Surface runoff is negligible to very low.

**Table 2. Representative physiographic features**

Hillslope profile	(1) Toeslope
Slope shape across	(1) Linear
Slope shape up-down	(1) Concave
Landforms	(1) Depression (2) Drainageway (3) Outwash plain (4) Flood plain (5) Stream terrace
Runoff class	Negligible to very low
Flooding duration	Very brief (4 to 48 hours) to long (7 to 30 days)
Flooding frequency	None to frequent
Ponding duration	Long (7 to 30 days) to very long (more than 30 days)
Ponding frequency	None to frequent
Elevation	170–275 m
Slope	0–2%
Ponding depth	0–30 cm

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

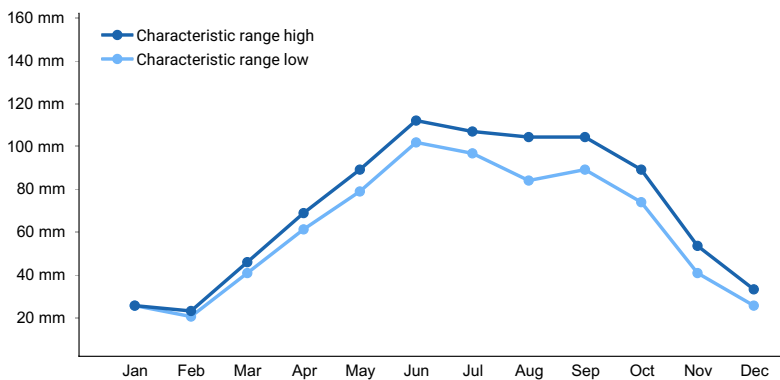
## Climatic features

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.

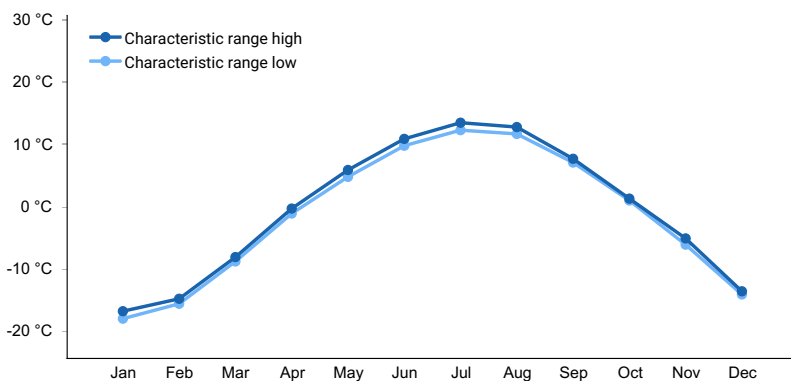
The soil moisture regime of this MLRA is udic (humid climate). The soil temperature regime is frigid and cryic.

**Table 3. Representative climatic features**

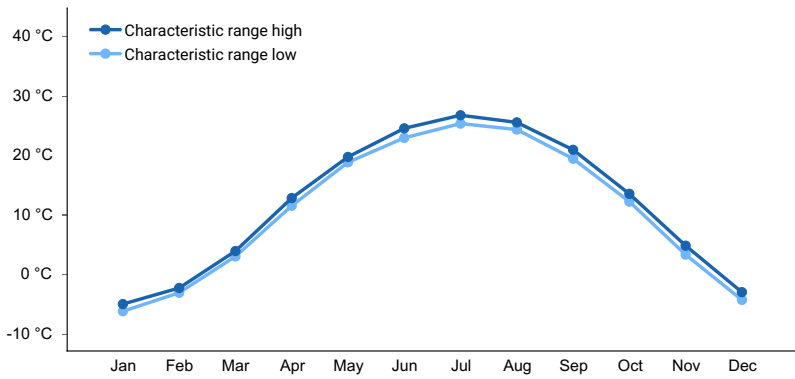
Frost-free period (characteristic range)	83-96 days
Freeze-free period (characteristic range)	111-129 days
Precipitation total (characteristic range)	762-838 mm
Frost-free period (actual range)	61-104 days
Freeze-free period (actual range)	100-134 days
Precipitation total (actual range)	737-864 mm
Frost-free period (average)	88 days
Freeze-free period (average)	119 days
Precipitation total (average)	787 mm



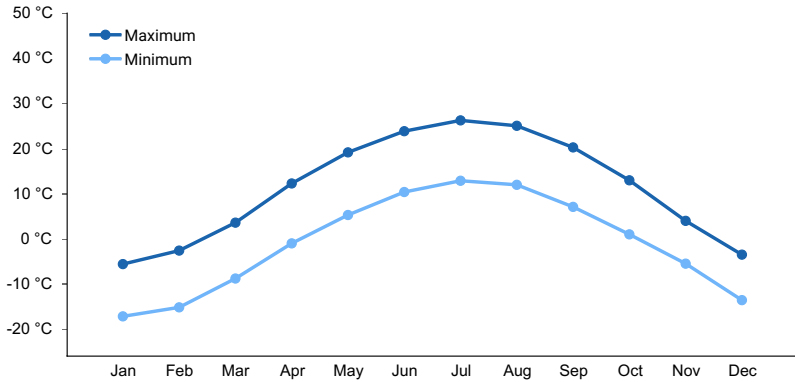
**Figure 1. Monthly precipitation range**



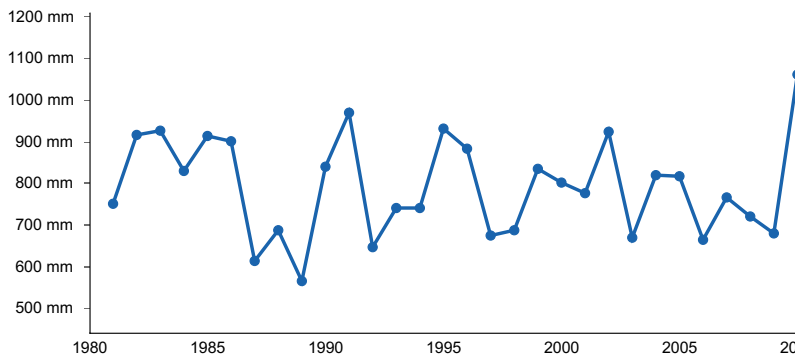
**Figure 2. Monthly minimum temperature range**



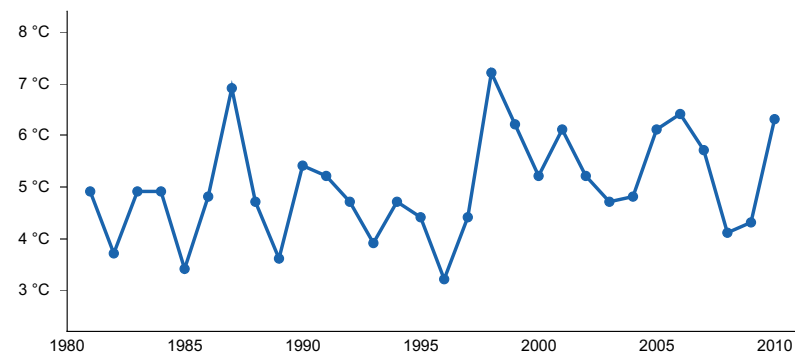
**Figure 3. Monthly maximum temperature range**



**Figure 4. Monthly average minimum and maximum temperature**



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

### Climate stations used

- (1) ROSHOLT 9 NNE [USC00477349], Wittenberg, WI
- (2) LADYSMITH 3W [USC00474391], Ladysmith, WI
- (3) STAMBAUGH 2SSE [USC00207812], Iron River, MI

- (4) WINTER [USC00479304], Ojibwa, WI
- (5) PARK FALLS DNR HQ [USC00476398], Park Falls, WI
- (6) MORA [USC00215615], Mora, MN
- (7) AITKIN 2E [USC00210059], Aitkin, MN

## Influencing water features

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

## Wetland description

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

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

Under the Hydrogeomorphic Classification System (HGM), the wetlands can be classified as:

- 1) Depressional, forested/organic, or
- 2) Depressional, scrub-shrub/organic

Permeability of the soils is slow to rapid.

Hydrologic Group: A/D

Hydrogeomorphic Wetland Classification: Depressional, forested/organic; Depressional, scrub-shrub/organic

Cowardin Wetland Classification: PFO1B, PFO4B, PSS1B, PSS4B, PEM1B

## Soil features

These sites are represented by the Ausable, Kinross, and Newson soil series. Ausable is classified as a Histic Humaquept, Kinross is a Typic Endoaquod, and is a Humaqueptic Psammaquent.

These soils formed in sandy outwash, lacustrine, or alluvium. Soils are very deep and are very poorly or poorly drained. These sites meet hydric soil requirements.

Surface textures of these sites is muck, moderately decomposed plant material, loamy fine sand, and mucky loamy sand. Subsurface textures include mucky sandy loam, loamy sand, and sand. Soil pH ranges from extremely acid to neutral with values of 4.0 to 7.1. Surface fragments are absent. Subsurface fragments less than 3 inches can be present up to 7 percent volume, but fragments greater than 3 inches are absent. Carbonates are absent within 80 inches.

**Table 4. Representative soil features**

Parent material	(1) Lacustrine deposits (2) Alluvium (3) Glaciolacustrine deposits
Surface texture	(1) Mucky sand (2) Mucky loamy sand
Drainage class	Very poorly drained to poorly drained
Permeability class	Slow to rapid
Soil depth	203–254 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

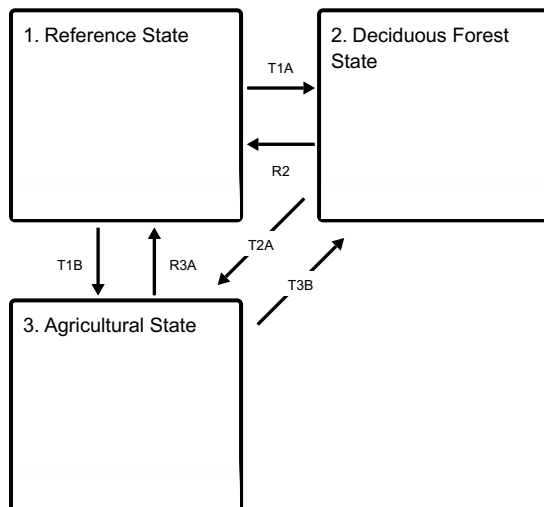
Available water capacity (0-154.9cm)	4.7–7.47 cm
Soil reaction (1:1 water) (0-100.1cm)	4–7.1
Subsurface fragment volume <=3" (Depth not specified)	0–7%
Subsurface fragment volume >3" (Depth not specified)	0%

## Ecological dynamics

In pre-European settlement time wildfire was the main controlling factor of forest community dynamics. Following a severe, stand-replacing fire, any of the species present on the landscape could become established, depending on seed source availability and specific conditions of post-fire seedbed. The newly established young stands of any species were easily eliminated by recurring fires, but differences in fire-resisting properties among the species began to play a role in any species' survival success. Many pine and oak species were dominant in the region because of their fire-resistant properties and successful regeneration post-fire. With clear cutting and continued fire suppression, many of the species that are fire-tolerant and intolerant of shade, are replaced by other species. Species such as white pine and red oak are still common on the landscape based on their tolerance to some shade; these species may establish under a canopy, and in time, may become a component of the canopy. Red maple is sensitive to fire, but in its absence, it has the ability to dominate sites based on its shade tolerance and prolific seed production.

## State and transition model

### Ecosystem states



**T1A** - Stand replacing disturbance that includes fire.

**T1B** - Removal of forest cover and tilling for agricultural crop production.

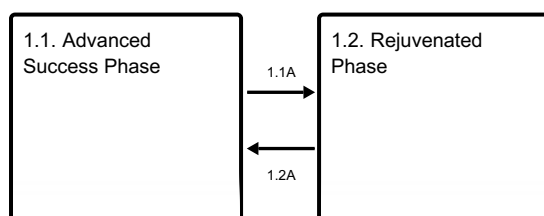
**R2** - Deciduous forest community is slowly invaded by conifers.

**T2A** - Removal of forest cover and tilling for agricultural crop production.

**R3A** - Cessation of agricultural practices leads to natural reforestation, or site is replanted.

**T3B** - Cessation of agricultural practices leads to natural reforestation, or site is replanted.

### State 1 submodel, plant communities



1.1A - Light to moderate intensity fires, blow-downs, ice storms.

1.2A - Disturbance-free period for 30+ years.

## State 1

### Reference State

Reference state is a forest community dominated by red maple (*Acer rubrum*) with groups of balsam fir (*Abies balsamea*). Depending on history of disturbance, two community phases can be distinguished largely by differences in dominance of tree species and community age structure.

### Community 1.1

#### Advanced Success Phase

In the absence of major disturbance—particularly fire—these sites are dominated by a canopy of red maple and balsam fir. Sites may have a super-canopy of large white pine that might be able to maintain itself in few numbers through regeneration in gaps. White pine (*Pinus strobus*) has a moderate shade tolerance and grow to be much larger than red maple and balsam fir at maturity and typically live longer. The shrub layer is not well developed and dominated by red maple sapling and tag alder (*Alnus incana*). The ground layer is covered by cinnamon fern (*Osmunda cinnamomea*), bunchberry (*Cornus canadensis*), Canada mayflower (*Maianthemum canadense*), and blueberry (*Vaccinium*, spp.) are common.

#### Dominant plant species

- red maple (*Acer rubrum*), tree
- balsam fir (*Abies balsamea*), tree
- alder (*Alnus*), shrub
- cinnamon fern (*Osmunda cinnamomea*), other herbaceous
- bunchberry dogwood (*Cornus canadensis*), other herbaceous

### Community 1.2

#### Rejuvenated Phase

The canopy of the rejuvenated community is still dominated by original species, but the understory now also includes a well-established younger cohort and perhaps a few additional seedlings and saplings of less shade tolerant species. Black spruce (*Picea mariana*) may occur sporadically on sites, but is unable to compete with red maple and balsam fir with the lack of fire or other disturbance.

#### Dominant plant species

- red maple (*Acer rubrum*), tree
- balsam fir (*Abies balsamea*), tree
- black spruce (*Picea mariana*), tree
- alder (*Alnus*), shrub
- common winterberry (*Ilex verticillata*), shrub
- cinnamon fern (*Osmunda cinnamomea*), other herbaceous
- bunchberry dogwood (*Cornus canadensis*), other herbaceous

### Pathway 1.1A

#### Community 1.1 to 1.2

Light intensity fires, crown breakage from ice and snow and small scale blow-downs create canopy openings, releasing advanced regeneration and stimulating new seedling establishment. Some additional less shade tolerant species such as red oak may be able to enter the community.

### Pathway 1.2A

#### Community 1.2 to 1.1

A long period without major canopy disturbance allows gradual replacement of oldest canopy trees by younger



cohorts. Small scale disturbances may still occur periodically, but once second or third canopies are established there is minimal new regeneration taking place and the forest gradually returns to mature state.

## **State 2**

### **Deciduous Forest State**

Pure, or mixed, aspen – paper birch community replaces the reference state community. If seed source is present, red maple and young cohorts of balsam fir readily becomes member of this community.

#### **Dominant plant species**

- quaking aspen (*Populus tremuloides*), tree
- birch (*Betula*), tree
- red maple (*Acer rubrum*), tree
- alder (*Alnus*), shrub
- balsam fir (*Abies balsamea*), shrub
- cinnamon fern (*Osmunda cinnamomea*), other herbaceous
- bunchberry dogwood (*Cornus canadensis*), other herbaceous

## **State 3**

### **Agricultural State**

Hay or cultivated crops.

#### **Transition T1A**

##### **State 1 to 2**

Stand replacing disturbance that must include fire to create conditions for aspen and paper birch to colonize the site.

#### **Transition T1B**

##### **State 1 to 3**

Removal of forest cover and tilling for agricultural crop production.

#### **Restoration pathway R2**

##### **State 2 to 1**

Deciduous forest community is slowly invaded by conifers.

#### **Transition T2A**

##### **State 2 to 3**

Removal of forest cover and tilling for agricultural crop production.

#### **Restoration pathway R3A**

##### **State 3 to 1**

Cessation of agricultural practices leads to natural reforestation, or site is replanted.

#### **Transition T3B**

##### **State 3 to 2**

Cessation of agricultural practices leads to natural reforestation, or site is replanted.

### **Additional community tables**

## 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.

Habitat Types of N. Wisconsin (Kotar, 2002), Wetland Forest Habitat Type Classification System for Northern Wisconsin (Kotar and Burger, 2017): The sites of this ES keyed out to four habitat types: *Acer rubrum-Abies balsamea/Vaccinium-Coptis* (ArAbVC); *Acer rubrum-Fraxinus nigra/Rubus hispidus* (ArFnRh); *Pinus-Acer rubrum-Gaylussacia* (PArGy); *Picea mariana-Larix/Nemopanthus* (PmLNe)

Biophysical Settings (Landfire, 2014): This ES is mapped as Laurentian-Acadian Northern Hardwoods Forest-Hemlock; the central concepts are similar

WDNR Natural Communities (WDNR, 2015):

## Other references

Cleland, D.T.; Avers, P.E.; McNab, W.H.; Jensen, M.E.; Bailey, R.G., King, T.; Russell, W.E. 1997. National Hierarchical Framework of Ecological Units. Published in, Boyce, M. S.; Haney, A., ed. 1997. Ecosystem Management Applications for Sustainable Forest and Wildlife Resources. Yale University Press, New Haven, CT. pp. 181-200.

County Soil Surveys from St. Croix, Polk, Barron, Rusk, Chippewa, Clark, Marathon, Taylor, Price, Sawyer, Burnett, Washburn, Douglas, Bayfield, Ashland, Lincoln, Oneida, Langlade, Shawano, Menominee, Forest, Florence, Marinette, and Pierce Counties.

Curtis, J.T. 1959. Vegetation of Wisconsin: an ordination of plant communities. University of Wisconsin Press, Madison. 657 pp.

Davis, R.B. 2016. Bogs and Fens, A Guide to the Peatland Plants of Northeastern United States and Adjacent Canada. University Press of New England, Hanover and London. 296 pp.

Finley, R. 1976. Original vegetation of Wisconsin. Map compiled from U.S. General Land Office notes. U.S. Forest Service, North Central Forest Experiment Station, St. Paul, Minnesota.

Hvizdak, David. Personal knowledge and field experience.

Jahnke, J. and Gienccke, A. 2002. MLRA 92 Clay Till Field Investigations. Summary of field day investigations by Region 10 Soil Data Quality Specialists.

Kotar, J. 1986. Soil – Habitat Type relationships in Michigan and Wisconsin. J. For. and Water Cons. 41(5): 348-350.

Kotar, J., J.A. Kovach and G. Brand. 1999. Analysis of the 1996 Wisconsin Forest Statistics by Habitat Type. U.S.D.A. For. Serv. N.C. Res. Stn. Gen. Tech. Rept. NC-207.

Kotar, J., J. A. Kovach, and T. L. Burger. 2002. A Guide to Forest Communities and Habitat Types of Northern Wisconsin. Second edition. University of Wisconsin-Madison, Department of Forest Ecology and Management, Madison.

Kotar, J., and T. L. Burger. 2017. Wetland Forest Habitat Type Classification System for Northern Wisconsin: A Guide for Land Managers and landowners. Wisconsin Department of Natural Resources, PUB-FR-627 2017, Madison.

Martin, L. 1965. The physical geography of Wisconsin. Third edition. The University of Wisconsin Press, Madison.

McNab, W.H. and P.W. Avers. 1994. Ecological Subregions of the United States: Section Descriptions. USDA For. Serv. Pun. WO-WSA-5, Washington, D.C.

NatureServe. 2018. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. U.S.A. Data current as of 28 August 2018.

Radeloff, V.C., D.J. Mladenoff, H.S. He and M.S. Boyce. 1999. Forest landscape change in Northwestern Wisconsin Pine Barrens from pre-European settlement to the present. *Can. J. For. Res.* 29: 1649-1659.

Schulte, L.A., and D.J. Mladenoff. 2001. The original U.S. public land survey records: their use and limitations in reconstructing pre-European settlement vegetation. *Journal of Forestry* 99:5–10.

Schulte, L.A., and D.J. Mladenoff. 2005. Severe wind and fire regimes in northern forests: historical variability at the regional scale. *Ecology* 86(2):431–445.

Soil Survey Staff. Input based on personal experience. Tim Miland, Scott Eversoll, Ryan Bevernitz, and Jason Nemecek.

Stearns, F. W. 1949. Ninety years change in a northern hardwood forest in Wisconsin. *Ecology*, 30: 350-58.

United States Department of Agriculture, Forest Service. 1989. Proceedings – Land Classification Based on Vegetation: Applications for Management. Gen. Tech. Report INT-527.

United States Department of Agriculture, Forest Service. 1990. *Silvics of North America, Vol. 1, Hardwoods*. Agricultural Handbook 654, Washington, D.C.

United States Department of Agriculture, Forest Service. 1990. *Silvics of North America, Vol. 2, Conifers*. Agricultural Handbook 654, Washington, D.C.

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

United States Department of Agriculture, Natural Resources Conservation Service. 2008. Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service. Technical Note No. 190-8-76. Washington D.C.

Wilde, S.A. 1933. The relation of soil and forest vegetation of the Lake States Region. *Ecology* 14: 94-105.

Wilde, S.A. 1976. *Woodlands of Wisconsin*. University of Wisconsin Cooperative Extension, Pub. G2780, 150 pp.

Wisconsin Department of Natural Resources. 2015. The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management. Wisconsin Department of Natural Resources, PUB-SS-1131 2015, Madison.

## **Contributors**

Bryant Scharenbroch, Assistant Professor at University of Wisconsin Stevens Point

Jacob Prater, Associate Professor at University of Wisconsin Stevens Point

John Kotar, Ecological Specialist, independent contractor

## **Approval**

Suzanne Mayne-Kinney, 11/16/2023

## **Acknowledgments**

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	05/18/2024
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:**
- 

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