

Ecological site F090BY003WI Sandy Floodplain

Last updated: 11/16/2023
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): 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 (15-60 cm) 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 (15-120 cm) 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), Lincoln Formation Till Plain - Hemlock Hardwoods (212Qc)

Wisconsin DNR Ecological Landscapes: Forest Transition

Ecological site concept

The Sandy Floodplain ecological site is an uncommon site in MLRA 90A and 90B, located on floodplains primarily along the Wisconsin and Big Rib, Big Eau Pleine rivers which occupy valleys filled with sandy outwash deposits. These sites are characterized by very deep, poorly to somewhat poorly drained soils that formed primarily in sandy alluvium. Sites are subject to frequent flooding in spring and fall, some sites are subject to ponding. Soils remain saturated for long duration during growing season and some sites meet hydric soil requirements. Stream inflow, precipitation, runoff from adjacent uplands, and groundwater discharge are the primary sources of water. Soils range from strongly acid to neutral.

The characteristic traits of Sandy Floodplain site are their sandy textures and their location on a floodplain. Vegetation must be tolerant of frequent floods. Sandy Floodplains lack carbonates and have a lower pH and available water capacity than their loamy counterparts.

Similar sites

F090BY004WI	Loamy Floodplain Loamy Floodplain are found exclusively on floodplains in loamy alluvium, sometimes underlain by sandy alluvium. Soils are very poorly to moderately well drained and are subject to flooding. Some sites may be saturated for long enough for hydric conditions to occur. They are found in similar landscape positions as Sandy Floodplain but have finer textures.
F090BY002WI	Mucky Swamp Mucky swamp sites consist of deep, highly decomposed herbaceous organic materials. Some sites have mineral soil contact. They are very poorly drained and are neutral to slightly acid. These sites are permanently saturated wetlands. Some of the vegetative communities supported by Organic Nonacid sites may also be found on Sandy Floodplain.
F090BY005WI	Wet Sandy Lowland Wet Sandy Lowland sites 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. They support similar vegetative communities as Sandy Floodplain.

Table 1. Dominant plant species

Tree	(1) <i>Acer rubrum</i> (2) <i>Fraxinus americana</i>
Shrub	Not specified
Herbaceous	(1) <i>Parthenocissus quinquefolia</i> (2) <i>Thalictrum</i>

Physiographic features

This site occurs in floodplains. These sites are subject to rare to frequent flooding. Runoff is negligible to high.

Table 2. Representative physiographic features

Slope shape across	(1) Linear
Slope shape up-down	(1) Linear
Landforms	(1) Flood plain
Runoff class	Negligible to high
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Rare to frequent
Ponding duration	Long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	555–905 ft
Slope	0–2%
Ponding depth	0–6 in
Water table depth	0–20 in
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 snowfall is 52 inches. The annual average maximum and minimum temperatures are 54°F and 34°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	78-97 days
Freeze-free period (characteristic range)	117-134 days
Precipitation total (characteristic range)	30-33 in
Frost-free period (actual range)	60-110 days
Freeze-free period (actual range)	102-137 days
Precipitation total (actual range)	27-33 in
Frost-free period (average)	89 days
Freeze-free period (average)	124 days
Precipitation total (average)	31 in

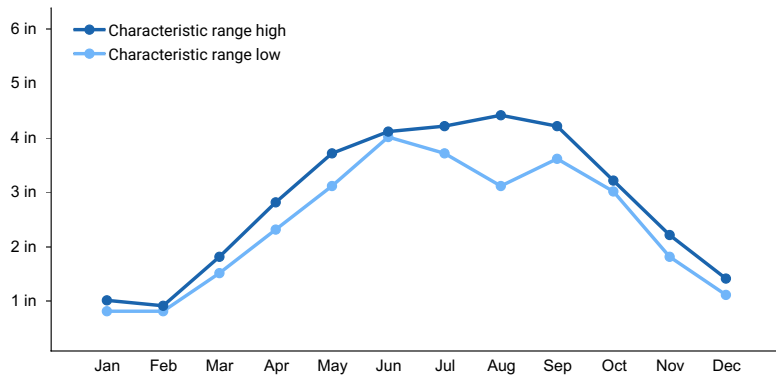


Figure 1. Monthly precipitation range

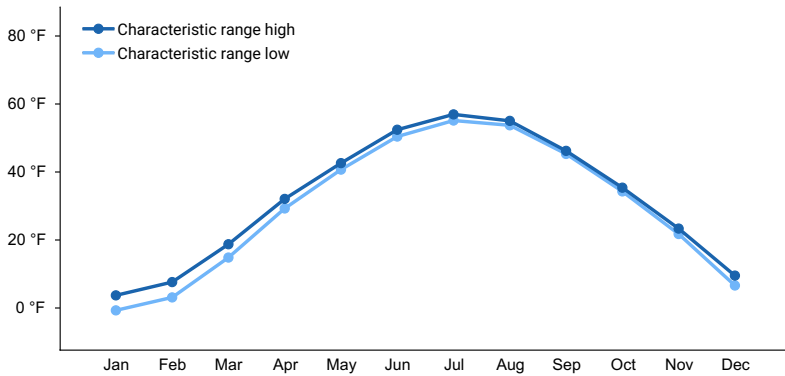


Figure 2. Monthly minimum temperature range

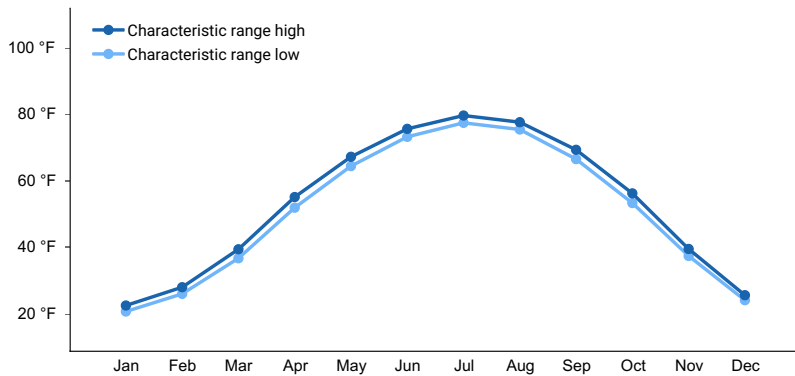


Figure 3. Monthly maximum temperature range

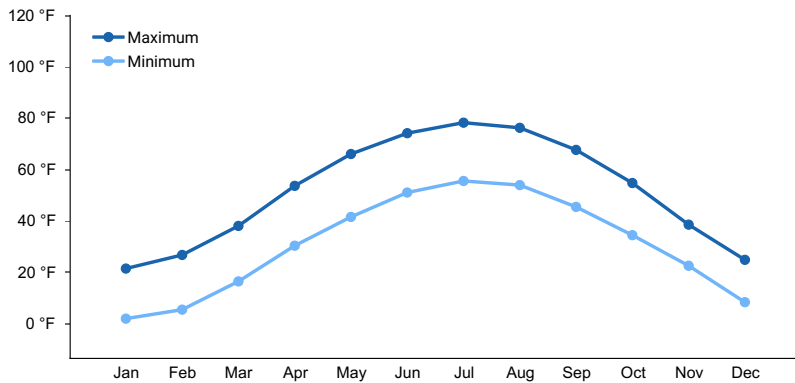


Figure 4. Monthly average minimum and maximum temperature

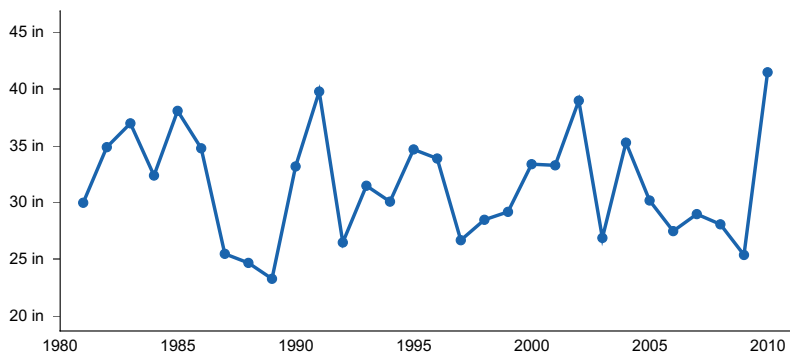


Figure 5. Annual precipitation pattern

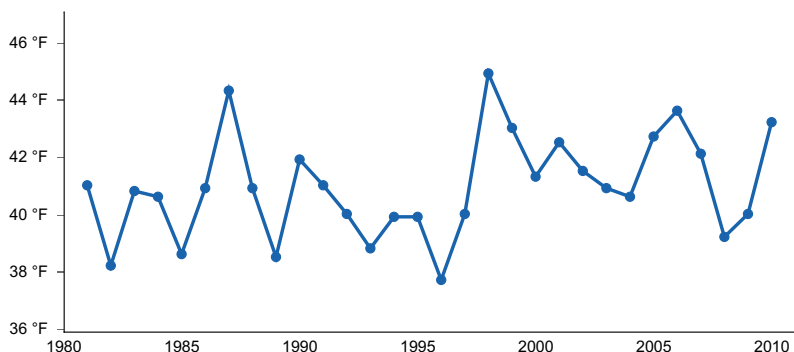


Figure 6. Annual average temperature pattern

Climate stations used

- (1) LAONA 6 SW [USC00474582], Laona, WI
- (2) ROSHOLT 9 NNE [USC00477349], Wittenberg, WI
- (3) STAMBAUGH 2SSE [USC00207812], Iron River, MI
- (4) WINTER [USC00479304], Ojibwa, WI
- (5) LUCK [USC00474894], Luck, WI
- (6) JUMP RIVER 3E [USC00474080], Sheldon, WI
- (7) ISLE 12N [USC00214103], Isle, MN

Influencing water features

Water is received through stream inflow, precipitation, runoff from adjacent uplands, and groundwater discharge. Water levels are greatly influenced stream inflow, precipitation rates and runoff from upland sites. Water leaves from the site primarily through stream outflow, subsurface outflow, evapotranspiration, and groundwater recharge. Some of these sites are wetlands.

Frequent flooding from stream inflow is a significant factor in the ecological development of Sandy Floodplain sites. The vegetation must be tolerant of frequent flooding that may persist for a month.

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, scrub-shrub, broad-leaved deciduous, saturated, or
- 3) 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 soil is moderately slow or rapid.

Hydrologic Group: A/D, B/D

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

Cowardin Wetland Classification: PFO1B, PSS1B, PEM1B

Soil features

These sites are represented by the Sturgeon, Totagatic, and Winterfield soil series. Sturgeon is classified as an Aquic Udifluent, Totagatic is a Typic Fluvaquent, and Winterfield is an Aquic Udipsamment.

These soils formed in sandy and silty alluvium. These soils are very deep and are poorly to somewhat poorly drained. Sites represented by the Totagatic series remain saturated for long periods of time and meet hydric soil requirements.

The surface of these soils is muck, sandy loam, or silt loam. Subsurface horizons include loamy sand, sand, and silt loam textures. Soil pH ranges from strongly acid to neutral with values of 5.5 to 7.0. Carbonates are absent in soils to 80 inches (200 cm).

Table 4. Representative soil features

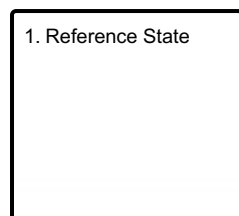
Parent material	(1) Alluvium
Surface texture	(1) Mucky sandy loam (2) Mucky silt loam
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Moderately slow to rapid
Soil depth	80–100 in
Surface fragment cover ≤3"	0–2%
Surface fragment cover >3"	0%
Available water capacity (0-60in)	4.36–7.2 in
Soil reaction (1:1 water) (0-40in)	5.5–7
Subsurface fragment volume ≤3" (Depth not specified)	5–14%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

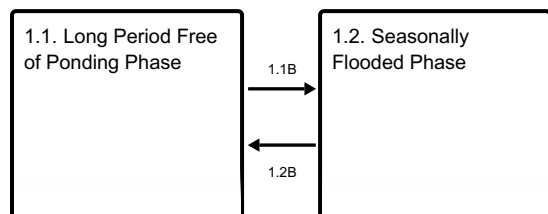
Because this Ecological Site is subject to seasonal, yearly and long-term variation in hydrological conditions, it is not possible to speak of any directional, community-driven plant succession, as is typical of more environmentally-stable upland plant communities. Instead, individual hydrologic events create conditions temporarily favorable to a given species, or groups of species, and unfavorable to other species or groups. Species differ greatly in their ability to tolerate frequency of flooding and duration of ponding. Silver maple (*Acer saccharinum*) is best adapted species to colonize freshly deposited sediment. It is a prolific seed producer and germinates immediately upon maturing, without the need of undergoing a cold period. Once established, seedlings, as well as mature trees, tolerate repeated flooding and prolonged ponding. Black ash (*Fraxinus nigra*) is well adapted to growing in saturated conditions, allowing it to grow commonly in seasonally flooded habitats. Other species that may become established in periods without major flooding, or ponding are red maple (*Acer rubrum*) and white ash (*Fraxinus americana*).

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1B - Major flooding event depositing new sediment.

1.2B - Long period without major flooding.

State 1 Reference State

Because of the dynamic nature of hydrological events affecting this Ecological Site, many different plant communities can be found at any given time. We chose two distinct community phases to represent the Reference state: 1, a long period free of extended ponding community phase and 2, frequently flooded and ponded community phase.

Community 1.1 Long Period Free of Ponding Phase

Periods of several decades, or longer, without prolonged ponding allow for the development of forest communities closely resembling the upland mesic or wet-mesic communities. Such forests are characterized by strong presence, or dominance of any of the following species: red maple, white ash, and boxelder (*Acer negundo*). Characteristic understory plants Virginia creeper (*Parthenocissus quinquefolia*), meadow rue (*Thalictrum dioicum*), orange jewelweed (*Impatiens capensis*), sensitive fern (*Onoclea sensibilis*) and wood fern (*Dryopteris carthusiana*). Possible small scale canopy disturbances, e.g., snow/ice breakage and individual tree mortality, increase light on forest floor and stimulate regeneration of canopy species. Through this process the relative importance of different species varies, but the basic mesic community is perpetuated.

Dominant plant species

- red maple (*Acer rubrum*), tree
- white ash (*Fraxinus americana*), tree
- Virginia creeper (*Parthenocissus quinquefolia*), other herbaceous
- meadow-rue (*Thalictrum*), other herbaceous

Community 1.2 Seasonally Flooded Phase

Silver maple is a well-adapted species to frequently flooded conditions. On such sites it typically occurs in pure stands, or with only sporadic association of other species that become established on micro-sites with less frequent, or shorter duration ponding. Such associates are black ash, red maple, swamp white oak, elms (*Ulmus* spp.) and occasionally yellow birch. Understory vegetation is sparse, consisting mostly of goldenrod (*Solidago*, spp.), grasses (*Poaceae*), and false-nettle (*Laportea canadensis*). Possible seasonal flooding with fresh sediment deposition.

Dominant plant species

- silver maple (*Acer saccharinum*), tree
- white ash (*Fraxinus americana*), tree
- Grass, native (*Grass, native*), grass
- goldenrod (*Oligoneuron*), other herbaceous
- false nettle (*Boehmeria*), other herbaceous

Pathway 1.1B

Community 1.1 to 1.2

Major flooding event deposits new sediment that causes mortality of some of the canopy trees and provides germination and seedling establishment conditions for some species, most frequently silver maple.

Pathway 1.2B

Community 1.2 to 1.1

Long period without major flooding.

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, Relevé Method, NASIS pedon description, NRCS SOI 036, photographs, and Kotar Habitat Types.

Habitat Types of N. Wisconsin (Kotar, 2002): The sites of this ES keyed out to two habitat types:

Acer/Hydrophyllum-Impatiens (AHI); Acer-Tsuga/Athyrium-Onoclea (ATAtOn)

Biophysical Settings (Landfire, 2014): This ES is largely mapped as Laurentian-Acadian Northern Hardwoods Forest and Laurentian-Acadian Floodplain Forest

WDNR Natural Communities (WDNR, 2015): Floodplain Forest

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-

- 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

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	05/03/2024
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:**
