USDA Natural Resources
Conservation Service

Ecological site F095XA003WI
Wet Sandy Lowland

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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): 095X–Eastern Wisconsin, Northern Illinois, and Upper Michigan Drift Plain

This MLRA is characterized by nearly level to rolling till plains, outwash plains, drumlin fields, and glacial lake plains. It is used to produce cash crops, feed grain, and livestock. It includes the shorelines of Lake Winnebago and Lake Michigan. This area is in Wisconsin (85 percent), Illinois (10 percent), and Michigan (5 percent). It makes up about 17,255 square miles (44,690 square kilometers). This area is in the Central Lowland province of the Interior Plains. Most of the area is in the Eastern Lake section. A narrow strip along the southwestern edge of the area is in the Wisconsin Driftless section. The southwestern quarter is in the Till Plains section. The nearly level to rolling till plains, glacial lake plains, and outwash plains are mixed with drumlin fields, ground moraines, end moraines, flood plains, lake terraces, beaches, dunes, swamps, and marshes. Most of the southern part of this area has belts of morainic hills and ridges and nearly level outwash terraces. Drumlins are prominent features in the central part of the area. Glaciokarst topography occurs in the east-central parts of the area influenced by underlying Niagara Dolomite. Lakes and streams are numerous, and streams generally form a dendritic drainage pattern. Elevation ranges from 530 to 1,580 feet (160 to 480 meters). Local relief is mainly 25 feet (8 meters), but the moraines, drumlins, and bedrock escarpments rise 80 to 330 feet (25 to 100 meters) above the adjacent valleys.

The annual precipitation ranges from 28 to 37 inches (700 to 950 millimeters) with a mean of 33 inches (840 millimeters). The annual temperature ranges from 41 to 48 degrees F (5.1 to 9.2 degrees C) with a mean of 46 degrees F (7.7 degrees C). The freeze-free period ranges from 115 to 185 days with a mean of 155 days. It decreases in length from south to north and from the shore of Lake Michigan inland. Lake Michigan helps to moderate the climate of the area.

This MLRA is mostly covered with glacial drift of Wisconsin age. Some of the higher areas are moraines that appear as arc-shaped ridges representing the retreat of the ice from south to north. Most of the bedrock in the area consists of Silurian, Ordovician, and Cambrian sandstone, limestone, and dolomite. Some igneous and metamorphic rocks underlie the northwestern edge of the area. Devonian limestone and shale occur at the far eastern edge in the Milwaukee area.

The dominant soil orders in this MLRA are Alfisols, Entisols, Histosols, Mollisols, and Spodosols. The soils in the area dominantly have a mesic or frigid temperature regime, an aquic or udic moisture regime, and mixed mineralogy. They are very deep, excessively drained to very poorly drained, and sandy to clayey. Areas of Spodosols and soils with a frigid soil temperature regime occur in the northern part of the MLRA.
The northern part of this MLRA supports natural stands of mixed northern hardwoods and pine. Sugar maple, oak, white ash, elm, yellow birch, white pine, red pine, and American beech are the principal species. Low-lying areas support both mixed hardwoods and conifers. Elm, soft maple, black ash, and northern white cedar are the major species. Brush and sedge meadows also occur in the low-lying areas.

The southern part of this MLRA supports hardwoods and prairie vegetation. Uplands support natural stands of oak, sugar maple, and hickory, and natural prairie vegetation is characterized by little bluestem and big bluestem. Many of the prairies have scattered oak and hickory trees. Low-lying areas support sedge and grass meadows and mixed

stands of hardwoods and conifers. Elm, ash, eastern cottonwood, soft maple, and white cedar are the major species in the low-lying areas. (USDA-NRCS, 2022)

USDA-NRCS. 2022. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture, Agriculture Handbook 296.

LRU notes

The Northeastern Wisconsin Drift Plain LRU (Land Resource Unit - 95XA) corresponds closely to the Northern and Central Lake Michigan Coastal Ecological Landscapes. Some of the following brief overview is borrowed from the Wisconsin Department of Natural Resources Ecological Landscape publication (2015).

The Northeastern Wisconsin Drift Plain LRU is located along Wisconsin's northeastern and central coast of Lake Michigan and the Door Peninsula. This glacial landscape is comprised of approximately 3.6 million acres (5,715 square miles). It is dominated by till plains and glacial lake deposits. The Green Bay and Lake Michigan Lobes are responsible for the formation of the landscape. The Green Bay Lobe covered most of the LRU, excluding the eastern edge where the Lake Michigan Lobe advanced. The glaciers were separated by the Niagara Escarpment, a 650-mile-long dolomite ridge that begins in Wisconsin near the Illinois border, extends into Michigan's Upper Peninsula and down through Canada's Bruce Peninsula into Rochester, New York. Within LRU 95XA, the escarpment runs from Lake Winnebago northeast through the Door Peninsula. Much of the topography of this LRU is bedrock-controlled. Bedrock is generally deeper than 150cm except in the Door Peninsula, where bedrock is much shallower. Wetlands are common throughout this MLRA where drainage is impeded by fine-textured materials and shallow bedrock.

The northern portion of this LRU is dominated by an undulating till plain, gently sloping to the east, formed entirely by the Green Bay Lobe. This glacial lobe centered over the present-day city of Green Bay and flowed out in a fan shape, moving both south-southwest and south-southeast over the Door Peninsula. The lobe deposited loamy and coarse-loamy till mixed with dolomite fragments plucked from the bedrock. In some areas, the till has been reworked by Glacial Lake Oshkosh or overlain by its lacustrine deposits. Numerous drumlins formed, orientated to the south-southwest in the direction of glacial flow. Some eskers are present. Much of this area has dolomite and limestone within 50 ft of the surface. Proglacial streams formed small areas of pitted and unpitted outwash plains, terraces, and fans.

The Door Peninsula was formed primarily by the early advances of the Green Bay Lobe. The till found here is comprised of relatively old, calcareous loamy materials mixed with dolomite and limestone fragments plucked by the glacial lobe from the shallow bedrock. The till is thinly draped over the Niagara Escarpment that lies 1 to 3 meters below the surface. A drumlin field is oriented south-southeast, the direction of the ice flow over the peninsula. The eastern shore of the peninsula is composed of lake sediments that were reworked and deposited by Lake Michigan Lobe. The northern tip of the peninsula has glaciolacustrine beach terrace and ridge deposits and eolian sand dunes, which are remnants of the intra- and postglacial lakes Nipissing and Algonquin.

The central portion of this LRU is dominated by lacustrine deposits from Glacial Lake Oshkosh. In its largest stage, Glacial Lake Oshkosh covered 1.4 million acres. The lake formed from meltwater as the Green Bay Lobe receded between ice sheet advances. The glacial lobe stalled between present day Lake Winnebago and the city of Green Bay, blocking the drainage of meltwater north to the Lake Michigan Basin. Glacial Lake Oshkosh continued to rise until it found other drainage pathways, eventually draining into the Wisconsin River Valley. Glacial Lake Oshkosh reworked the till deposits of the Green Bay Lobe. Silty and clayey lacustrine deposits formed in the deepest area of the lakes, whereas sandy beach ridges, terraces, and dunes formed along the ancient shore.

The area east of Glacial Lake Oshkosh and south along the shore of Lake Michigan are dominated by a thin till sheet over the Niagara Escarpment that was deposited by the Green Bay and Lake Michigan Lobes. The Green Bay Lobe deposited calcareous clay and silty till reworked from lake sediments. The Lake Michigan Lobe deposited silt loam, loam, and compacted sandy clay loam till. Remnants of the intra- and postglacial lakes Nipissing and Algonquin are also found along Lake Michigan shore. Proglacial streams formed small areas of pitted and unpitted outwash plains, terraces, and fans.

Historically, the vegetation in this LRU was dominated by northern and central hardwood forests and wetlands. The northern hardwoods were comprised of eastern hemlock (Tsuga canadensis) and American beech (*Fagus*

grandifolia). The central hardwoods were dominated by sugar maple (*Acer saccharum*), American basswood (Tilia Americana), and American beech (*Fagus grandifolia*). Forested wetlands were a major part of the landscape, covering more than 25% in some areas.

Classification relationships

Relationship to Established Framework and Classification Systems:

Biophysical Settings (Landfire, 2014): This ES is largely mapped as Laurentian-Acadian Herbaceous Wetlands, Laurentian-Acadian Alkaline Conifer-Hardwood Swamp Forest, Laurentian Oak Barrens, and Laurentian-Acadian Northern Hardwoods Forest

Habitat Types of N. & S. Wisconsin (Kotar, 2002, 1996): The sites of this ES keyed out to Acer-Tsuga/Athyrium-Onoclea [ATAtOn] and *Acer saccharum*-Fagus/Arismaea (*Acer saccharum*-Fagus/Arismaea-Osmorhiza) [AFAs/AFAs-O].

WDNR Natural Communities (WDNR, 2015): This ES is most similar to the Northern and Southern Mesic forests described by the WDNR.

Hierarchical Framework Relationships:

Major Land Resource Area (MLRA): 095X–Eastern Wisconsin, Northern Illinois, and Upper Michigan Drift Plain

USFS Subregions: West Green Bay Till Plain (212Tb), Outagamie Loamy Till and Silty Lake Plain (212Za), Lake Winnebago Clay Plain (222Kc)

DNR Ecological Landscapes: Northern Lake Michigan Coastal, Central Lake Michigan Coastal, Southeast Glacial Plains

Ecological site concept

The Wet Sandy Lowlands ecological site primarily occurs in the north and west area of LRU 95XA. These sites are represented by a variety of Aquents and Aquolls. Parent materials are primarily outwash and glaciofluvial type deposits and may sometimes include a thin mucky surface layer, but otherwise have sandy surface textures. Wet Sandy Lowlands are often subjected to periodic flooding and ponding. The soils representing this ES are hydric and many are wetlands. Typical vegetation on these sites include *Acer rubrum*, *Fagus grandifolia*, Ilex verticilata, Cornus racemose, Amphicarpa bracteate, and Dryopteris carthusiana.

Associated sites

F095XA001WI	**Mucky Swamp** Mucky Swamps consist of deep, herbaceous organic materials. They are very poorly drained and remain saturated throughout the year. The occur in landscape depressions and are found in lower landscape positions along the same drainage sequence as Wet Sandy Lowlands. These sites are wetlands.
F095XA005WI	**Moist Sandy Lowland** These sites consist of deep sandy outwash or lacustrine deposits, sometimes underlain by finer-textured materials. They are somewhat poorly drained. They occur slightly higher on the drainage sequence than Wet Sandy Lowlands.
F095XA009WI	**Sandy Uplands** These sites consist of very deep, sandy deposits, primarily of outwash or lacustrine origin. Some sites are overlain or underlain by finer-textured materials. They are moderately well to somewhat excessively drained. They occur much higher on the drainage sequence than Wet Sandy Lowlands.

Similar sites

F095XA004WI	**Wet Loamy or Clayey Lowland** These sites consist of shallow to very deep, loamy to clayey deposits of various origin. They are sometimes underlain by sandy outwash. They are very poorly to poorly drained. They occupy the same position on the landscape as Wet Sandy Lowlands but have finer particle size classes. They are more common to till plains and lake plains.
F095XA001WI	**Mucky Swamp** Wet organic lowlands consist of deep, herbaceous organic materials. They are very poorly drained and remain saturated throughout the year. The occur in landscape depressions and occupy the lowest position on their drainage sequences. Like some Wet Sandy Lowlands sites, these sites are wetlands.

Table 1. Dominant plant species

Tree	(1) *Acer saccharum* (2) *Acer rubrum*
Shrub	(1) *Ilex verticillata* (2) *Cornus racemosa*
Herbaceous	(1) *Amphicarpaea bracteata* (2) *Dryopteris carthusiana*

Physiographic features

This site occurs in depressions and drainageways generally on sandy outwash plains but sometimes on lake plains, till plains, and moraines. Sites are found in the toeslope position and landform shape is concave or linear. Slopes range from 0 to 2 percent.

Most sites are subject to inundation by water, either through flooding or ponding. Inundation is most common in April and May. These soils have an apparent seasonally high water table (endosaturation) that is generally found within 8 inches (20 cm) of the surface. Runoff is negligible to low.

Table 2. Representative physiographic features

Hillslope profile	(1) Toeslope
Slope shape across	(1) Concave
Slope shape up-down	(1) Linear
Landforms	(1) Outwash plain > Depression (2) Lake plain > Drainageway (3) Moraine (4) Lake plain
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	None to rare
Ponding duration	Brief (2 to 7 days) to very long (more than 30 days)
Ponding frequency	None to frequent
Elevation	656–1,050 ft
Slope	0–18%
Ponding depth	0–24 in
Water table depth	0–7 in
Aspect	Aspect is not a significant factor

Climatic features

The continental climate of the Northeastern Wisconsin Drift Plain is typical of central Wisconsin – cold winters and

warm summers. The climate is moderated by the thermal mass of Lake Michigan, especially in coastal areas. Fall and early winter temperatures are slightly warmer and spring and early summer temperatures are slightly cooler along the Lake Michigan coastline. Lake effect snow occurs along the coastline.

The average annual precipitation for this site is 33 inches. The average annual maximum and minimum temperatures are 54oF and 34oF, respectively. This site receives more annual snow than the MLRA average, 46 inches compared to 44 inches.

Table 3. Representative climatic features

Frost-free period (characteristic range)	126-127 days
Freeze-free period (characteristic range)	155-159 days
Precipitation total (characteristic range)	30-31 in
Frost-free period (actual range)	125-128 days
Freeze-free period (actual range)	154-160 days
Precipitation total (actual range)	30-33 in
Frost-free period (average)	127 days
Freeze-free period (average)	157 days
Precipitation total (average)	31 in

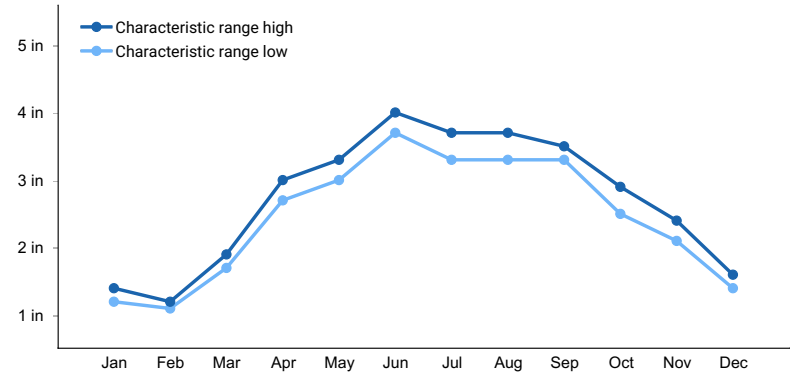


Figure 1. Monthly precipitation range

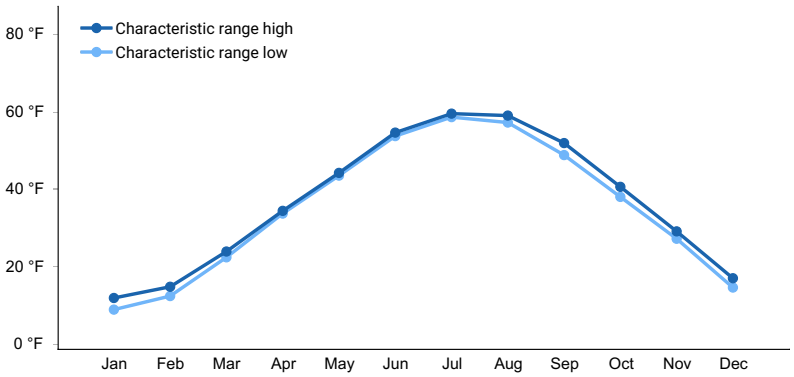


Figure 2. Monthly minimum temperature range

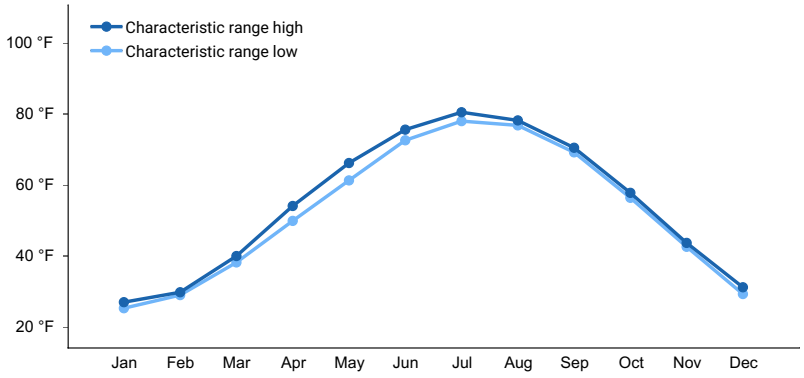


Figure 3. Monthly maximum temperature range

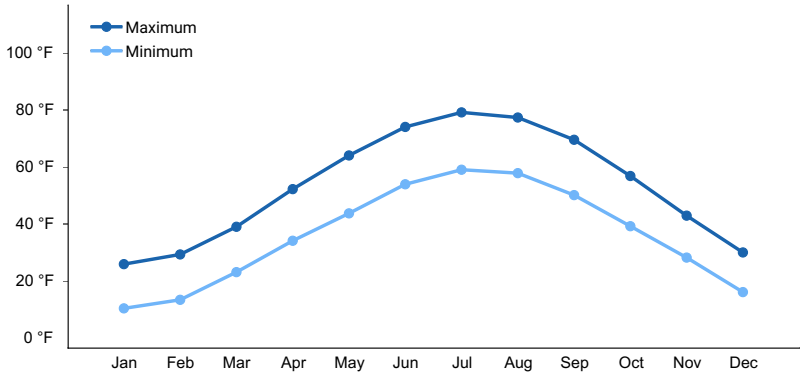


Figure 4. Monthly average minimum and maximum temperature

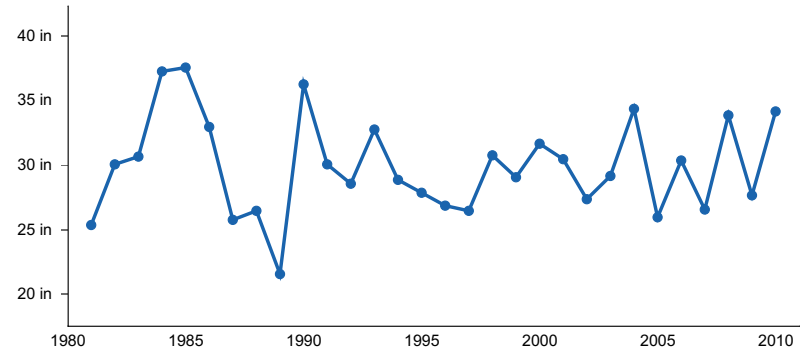


Figure 5. Annual precipitation pattern

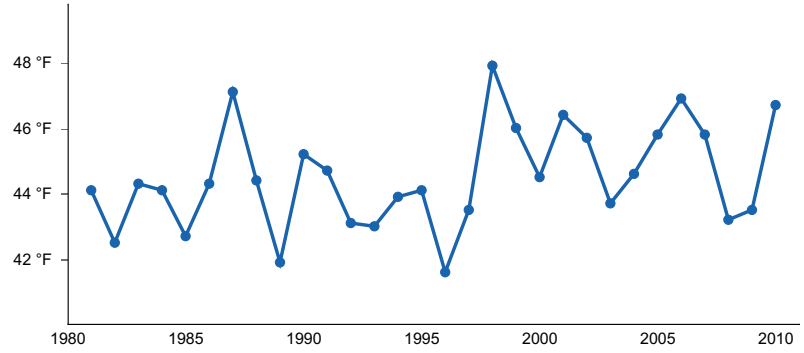


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BRILLION [USC00471064], Brillion, WI
- (2) DENMARK WWTP [USC00472055], Denmark, WI
- (3) SHEBOYGAN CO MEM AP [USW00004841], Sheboygan Falls, WI

- (4) CITY OF SHEBOYGAN WWTP [USC00471605], Sheboygan, WI
- (5) EPHRAIM 1NE-WWTP [USC00472626], Sister Bay, WI
- (6) GREEN BAY [USW00014898], Green Bay, WI
- (7) KEWAUNEE [USC00474195], Kewaunee, WI

Influencing water features

Water is received primarily through precipitation, runoff from adjacent uplands, and groundwater discharge. Water levels are greatly influenced by rates of precipitation and runoff from upland sites. Water leaves the site primarily through evapotranspiration and groundwater recharge. Some sites may be 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 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, or
3) Depressional, herbaceous/organic

Permeability of the soil is impermeable to moderately rapid. The hydrologic group of this site is B/D.

Soil features

The soils of this sites are represented by the Belleville, Brevort, Deford, Granby, Pinconning, Roscommon, and Wheatley series. Deford is a Typic Psammaquent, Roscommon and Wheatley are Mollic Psammaquents, Brevort is a Mollic Endoaquent, Pinconning is a Mollic Epiaquent, Belleville is a Typic Haplaquoll, and Granby is a Typic Endoaquoll. 68% of the acreage of this site is Psammaquents. 16% is Endoaquents. 10% is Endoaquolls. When combined, Epiaquents, Haplaquents, Haplaquepts, and Haplaquolls make up the remaining 6%.

These soils form in very deep, sandy materials primarily deposited by flowing glacial meltwaters (outwash or glaciofluvial deposits). Some soils in the northwestern portion of this MLRA are underlain by sandy to clayey lacustrine deposits or by loamy till. Soils are poorly to very poorly drained and meet hydric soil requirements.

The surfaces of these soils are sandy and sometimes mucky. Subsurface textures are often sandy as well, though finer subsurface textures may be found in some sites in the northwestern portion. Soils are strongly acid to moderately alkaline. Surface fragments are generally absent in these soils. Subsurface fragments smaller than 3 inches in diameter generally occupy up 5 percent volume. Larger fragments may occupy up to 6 percent volume. Fragments may be stratified (in the case of outwash and lacustrine deposits) or unstratified (in the case of till). Some of these fragments may be pieces of limestone and dolomite plucked from the bedrock by glacial ice and mixed in with the mineral glacial deposits. Secondary carbonates are sometimes present. $CaCO_3$ equivalency may be up to 25 percent.

Figure 7. Roscommon Soil Series sampled on 06/07/2020 in Marinette County, Wisconsin.

Table 4. Representative soil features

Parent material	(1) Outwash (2) Glaciofluvial deposits (3) Lacustrine deposits (4) Alluvium (5) Organic material
Surface texture	(1) Mucky sand (2) Mucky loamy sand (3) Sand (4) Sandy loam (5) Loamy sand
Drainage class	Very poorly drained to poorly drained
Permeability class	Moderately rapid
Soil depth	79 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-59.1in)	1.13–3.7 in
Soil reaction (1:1 water) (0-39.4in)	5.8–8.2
Subsurface fragment volume <=3" (0-39.4in)	0–5%
Subsurface fragment volume >3" (0-39.4in)	0–6%

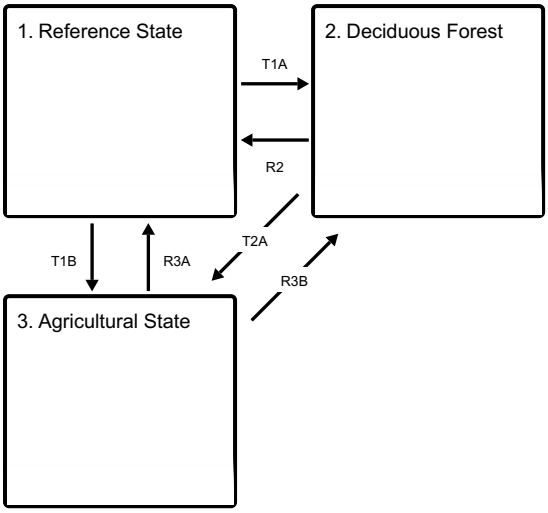
Ecological dynamics

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 of 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.

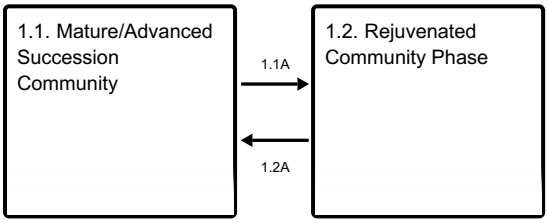
R2 - Deciduous forest community is slowly taken over by shade tolerant maples and other species.

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

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

R3B - Cessation of agricultural practices leads to natural reforestation, or site is replanted.

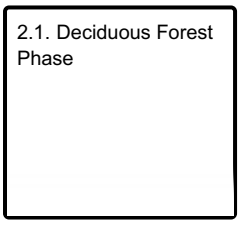
State 1 submodel, plant communities



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

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

State 2 submodel, plant communities



State 1
Reference State

Reference state is a forest community dominated by sugar maple (*Acer saccharum*) and red maple (*Acer rubrum*) with a mixture of American Beech (*Fagus grandifolia*), White Ash (*Fraxinus americana*), and Basswood (*Tilia americana*). Less commonly Red oak (*Quercus rubra*) may be present. Wetter sites within this ES may also include black ash and/or white cedar. 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
Mature/Advanced Succession Community

In the absence of major disturbance—particularly fire—these sites are dominated by a canopy of Sugar maple and/or Red maple and American Beech. The shrub layer is not well developed and may be variously represented by a variety of species including Winterberry, Elms, Gray dogwood, Balsam fir, and Tag alder in addition to regenerating canopy species. The ground layer is covered by various ferns (Woodferns and Oakfern), Hogpeanut, and Virginia creeper among many others sparsely represented.

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- red maple (*Acer rubrum*), tree
- woodfern (*Dryopteris*), other herbaceous
- oakfern (*Gymnocarpium*), other herbaceous
- American hogpeanut (*Amphicarpaea bracteata*), other herbaceous

Community 1.2
Rejuvenated Community Phase

Figure 8. Image courtesy of UWSP taken on 06/07/2020 in Marinette County, Wisconsin.

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.

Dominant plant species

- red maple (*Acer rubrum*), tree
- sugar maple (*Acer saccharum*), tree

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

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.

Community 2.1
Deciduous Forest Phase

Figure 9. Image courtesy of UWSP taken on 06/05/2020 in Oconto County, Wisconsin.

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

- bigtooth aspen (*Populus grandidentata*), tree
- paper birch (*Betula papyrifera*), tree
- red maple (*Acer rubrum*), tree
- balsam fir (*Abies balsamea*), tree

State 3
Agricultural State

Hay or cultivated crop production.

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.

Restoration pathway R3B
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.

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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)	
Contact for lead author	
Date	04/18/2024
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:

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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:**
