USDA Natural Resources
Conservation Service

Ecological site F095XB004WI
Wet Loamy or Clayey Lowland

Last updated: 11/16/2023
Accessed: 04/18/2024

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): 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)

LRU notes

The Southern Wisconsin and Northern Illinois Drift Plain LRU (Land Resource Unit) (95XB) corresponds closely to the Central Sand Hills and Southeast Glacial Plains Ecological Landscapes. Some of the following brief overview is borrowed from the Wisconsin Department of Natural Resources Ecological Landscape publication (2015).

The Southern Wisconsin and Northern Illinois Drift Plain MLRA is found in southeast Wisconsin and extends into northern Illinois. The Wisconsin portion of this LRU is approximately 6.3 million acres (9,900 square miles). This LRU was entirely glaciated – mostly formed by the Green Bay and Lake Michigan Lobes of the Wisconsin Glaciation except the southern part, which was covered by an earlier glaciation. The landscape is dominated by till plains with drumlins, but also has large areas of outwash, pitted outwash, and glaciolacustrine deposits. The LRUcontains the Kettle Interlobate Moraine—the end moraine system formed where the Green Bay and Lake Michigan lobes met. The thickness of glacial deposits is typically less than 15 meters deep throughout the LRU, but the eastern portion can reach up to 60 meters thick. Nearly all the LRU is covered in a loess cap ranging from 1.2 meters (in the west) to 15 centimeters (in the east).

The northwest portion of LRU 95XB is part of the Central Sand Hills Ecological Landscape. The area from Portage County south through Marquette is dominated by till plains covered in outwash. The Green Bay Lobe deposited the till and created a morainal system along the west margin. The Johnstown moraine is the terminal moraine, but smaller, lateral moraines are also prominent on the landscape. As the glacier receded, meltwaters covered the intermorainal till plain with sand and gravel outwash sediments, sometimes covering blocks of ice. As the temperatures rose, the ice melted and collapsed the surface, creating an extensive area of pitted outwash. Till in this area is sandy and lacks dolomite found in other tills of this LRU. It may be hard to distinguish from the sandy outwash of the area. The rest of the northwest portion is dominated by till plains and glacial lake sediments. Glacial Lake Wisconsin covered a portion of this LRU, but the Lewiston Basin is the most significant glacial lake in this region. The Lewiston Basin formed when glacial meltwaters were impounded behind the Johnstown Moraine. Most of the lake drained after a catastrophic breach of an ice dam that supported it. The rest of this region is a till plain covered in a thin layer of loess. This till is a sandy loam with dolomite from the Niagara Escarpment. The till plain is covered with drumlins and bedrock-cored knolls and hills where the overlying till has been eroded. Wetlands are common in the low-lying outwash and the fine-textured lake sediments.

The central portion of this LRU is dominated by a rolling till plain covered in drumlins. Terminal and recessional moraines show the extent of the Green Bay Lobe. The topography of the moraines is hummocky because the supraglacial till was deposited unevenly along the ice margin and the surface collapsed after buried ice melted. Glacial lakes formed on the ice margin from ice dams, bedrock ridges, and moraines. Glacial Lakes Scuppernong and Yahara were two significant lakes that deposited clay and silty clay in deep basins. Meltwater streams deposited outwash sediments over some areas of the till plain, creating pockets of outwash and pitted outwash. The till deposited here is gravelly, clayey, and silty sand with dolomite pebbles.

The Kettle Interlobate Moraine is a unique and significant feature along the eastern border this LRU. The Kettle Moraine is a complex range of ridges and hills that formed by the end moraine systems where the Green Bay and Lake Michigan lobes met. The area ranges from 1 to 30 miles wide and landforms up to 300 feet in elevation. The area experienced massive volumes of meltwater from the two glacial lobes, which deposited primarily sand and gravel, but morainal till is also present. There are two distinct portions for the Kettle Moraine. The south potion formed as the lobes receded and deposited a series of level outwash fans between the lobes. Buried ice melted and parts of the fan collapsed to form kettles—round depressions on the surface that often fill with water to become lakes when the water table is near the surface. In the northern section, debris collected in the ice where the two lobes flowed together. As the glaciers receded, meltwaters deposited outwash materials on top of ice. As the ice melted, the surface collapsed and created a mixture of collapsed outwash and till materials. The till was in and beneath the buried ice.

West of the Kettle Moraine lies a landscape dominated by till plains with drumlins and areas of outwash formed by the Lake Michigan Lobe. Braided proglacial streams deposited outwash and pitted outwash plains. A small extent of lake plains is present. Wetlands are abundant because of impeded drainage from the underlying till and lake sediments.

The southern portion of this LRU is comprised of older glacial sediment deposited before the Wisconsin Glaciation. In the east lie broad, flat to rolling till plains. In the west, an eroded and dissected, hilly bedrock-controlled landscape is present; this area is similar in appearance to the Driftless region. Some low areas have outwash deposited by proglacial streams from Green Bay Lobe meltwater. In some areas in the west, dissolution of bedrock has created karst topography. There is a small extent of lake plain sediments.

Historically, the vegetation in this LRU was dominated in the northwest by oak forest and opening with interspersed marsh and sedge wetlands. The southern portion was dominated by oak and mesic forests with abundant wetlands. Black oak (Quercus velutina), white oak (Quercus alba), and bur oak (Quercus macrocarpa) were significant tree species in all of the LRU. There were also many areas of prairie, maple-basswood upland forest, and small areas of tamarack (Larix laricina), northern white-cedar (Thuja occidentalis), and black spruce (Picea mariana) in the lowlands. Conifers were not significant in this LRU. Wetlands covered up to 17% of land area.

Classification relationships

Relationship to Established Framework and Classification Systems:

Habitat Types of N. & S. Wisconsin (Kotar, 2002, 1996): The sites of this ES keyed out to *Acer saccharum*-Tilia-Fraxinus/Viburnum [ATiFrVb].

Biophysical Settings (Landfire, 2014): This ES is largely mapped as North-Central Interior Maple-Basswood Forest, Central Interior and Appalachian Swamp Forest, Eastern Cool Temperate Developed Ruderal Grassland, and Eastern Cool Temperate Row Crop

WDNR Natural Communities (WDNR, 2015): This ES is most similar to the Southern Mesic Forest and Southern Hardwood Swamp as described by the WDNR.

Hierarchical Framework Relationships:

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

USFS Subregions: Central Wisconsin Moraines and Outwash (222Kb), South Central Wisconsin Prairie and Savannah (222Kd), Southern Green Bay Lobe (222Ke), Geneva-Darien Moraines and Till Plains (222Kf), Rock River Old Drift Country (222Kh), Kickapoo-Wisconsin River Ravines (222Ld)

DNR Ecological Landscapes: Southeast Glacial Plains, Central Sand Hills

Ecological site concept

The Wet Loamy or Clayey Lowlands ecological site occurs throughout LRU 95XB. Most of the soils comprising this ES are Mollisols and consist of very deep, loamy or clayey materials deposited by flowing water, glacial ice, or ancient glacial lakes. Some sites are underlain by fine lacustrine deposits, loamy till, or sandy outwash. Lacustrine deposits are sometimes stratified with coarser-textured materials. Some sites have a loess mantle. Some soils have contact with dolomitic bedrock within 100 cm. Thick, organic-enriched surfaces are common to these soils. These soils are generally very poorly to poorly drained and meet hydric soil requirements (Some Sebewa soils are somewhat poorly drained and do not meet hydric soil requirements). This is the third-most extensive site in MLRA 95B, occupying roughly half a million acres (9% of the total area). This extensive site occurs on toeslopes and footslopes in swales, floodplains, depressions, and drainageways on till plains, lake plains, outwash plains, moraines, and stream terraces.

These sites receive water primarily through precipitation, runoff from adjacent uplands, and groundwater discharge. The water levels are strongly influenced by precipitation and runoff from surrounding uplands. These sites are slightly acid to moderately alkaline. Typical vegetation includes Quercus spp., Acer spp., Viburnum spp., and Parthenocissus quinquefolia.

Associated sites

F095XB001WI	**Mucky Swamp** Mucky Swamp consists 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 points on their drainage sequences.
F095XB005WI	**Moist Loamy or Clayey Lowland** These sites consist of very deep, loamy or clayey materials deposited by flowing water, glacial ice, or ancient glacial lakes. Some sites are overlain or underlain by sandy outwash. They are somewhat poorly drained. They may be found adjacent to Wet Loamy or Clayey Lowlands but occupy slightly higher, drier positions on the landscape.
F095XB007WI	**Loamy Upland with Carbonates** These sites consist of very deep, loamy materials deposited by flowing water, glacial ice, or ancient glacial lakes. Many are underlain by clayey lacustrine materials or sandy outwash. They have secondary carbonates, generally occupying at least 10% by volume, within the upper 100cm. They are moderately well to somewhat excessively drained. They may be adjacent to Wet Loamy or Clayey Lowlands but on higher position on the landscape with improved drainage.
F095XB008WI	**Clayey Upland with Carbonates** These sites consist of very deep, clayey till or lacustrine deposits, sometimes mantled with sandy outwash. Secondary carbonates usually occupy at least 10% volume in the upper 40 inches (100 cm). They are moderately well to well drained. They may be adjacent to Wet Loamy or Clayey Lowlands but on higher position on the landscape with improved drainage.
F095XB010WI	**Loamy and Clayey Upland** These sites consist of very deep, sandy to clayey deposits of till, outwash, alluvium, colluvium, and lacustrine materials. They are moderately well to somewhat excessively drained. They may be adjacent to Wet Loamy or Clayey Lowlands but on higher position on the landscape with improved drainage.

Similar sites

F095XB003WI	**Wet and Moist Sandy Lowland** These sites occur on depressions in sandy outwash plains and stream terraces, primarily in the northwestern portion of the MLRA. They form in very deep, sandy outwash or lacustrine materials, sometimes underlain or overlain by finer-textured materials. They generally lack secondary carbonates and are very poorly to somewhat poorly drained. They are found on similar positions along the drainage sequence as Wet Loamy or Clayey Lowlands and have similar drainage capabilities but have coarser particle size classes.
F095XB002WI	**Wet Floodplain** These sites occur on floodplains and depressions and form in very deep, loamy or silty materials, primarily alluvial in origin. Most sites are subject to flooding events of varying frequency, duration, and intensity. They are very poorly to moderately well drained. The often share particle size classes with Wet Loamy or Clayey Lowlands and sometimes support vegetative communities that are tolerant to inundation by water.

Table 1. Dominant plant species

Tree	(1) *Acer rubrum* (2) *Acer saccharum*
Shrub	(1) *Ilex verticillata*
Herbaceous	(1) *Parthenocissus quinquefolia*

Physiographic features

This extensive site occurs in swales, floodplains, depressions, and drainageways on till plains, lake plains, outwash plains, moraines, and stream terraces. It's often found in lower landscape positions between drumlins. Landform shape is concave or linear, and sites are in the footslope or toeslope position. Slope ranges from 0 to 6 percent.

These sites may be subject to some flooding and ponding. Inundation by water can last from four hours to over a month. The soil has an apparent seasonally high water table (endosaturation) within 12 inches (30 cm) of the surface. Runoff potential ranges from negligible to very high and is highest in soils with steeper slopes and silt loam surfaces.

Table 2. Representative physiographic features

Hillslope profile	(1) Toeslope (2) Footslope
Slope shape across	(1) Concave
Slope shape up-down	(1) Linear
Landforms	(1) Depression (2) Drainageway (3) Flood plain (4) Swale (5) Till plain (6) Lake plain (7) Outwash plain
Runoff class	Negligible to very high
Flooding duration	Very brief (4 to 48 hours) to long (7 to 30 days)
Flooding frequency	None to frequent
Ponding duration	Brief (2 to 7 days) to very long (more than 30 days)
Ponding frequency	None to frequent
Elevation	705–1,050 ft
Slope	0–6%
Ponding depth	0–24 in
Water table depth	0–12 in
Aspect	Aspect is not a significant factor

Climatic features

The continental climate of MLRA 95B is typical of southern Wisconsin – cold winters and warm summers. The MLRA spans over 2 degrees of latitude, or about 150 miles. The lowest latitudes have warmer summers, warmer winters, and high precipitation rates. The growing season decreases from south to north and from the shores of the thermal mass of Lake Michigan inland.

This site occurs on landscape depressions and may have a microclimate with shorter freeze-free and frost-free periods than what is represented by the weather station data.
The average annual precipitation for this site is 35 inches. The average annual snowfall is 41 inches. The average annual maximum and minimum temperatures are 56oF and 36oF, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	123-136 days
Freeze-free period (characteristic range)	149-168 days
Precipitation total (characteristic range)	35-37 in
Frost-free period (actual range)	116-139 days
Freeze-free period (actual range)	142-172 days
Precipitation total (actual range)	34-37 in
Frost-free period (average)	129 days
Freeze-free period (average)	156 days
Precipitation total (average)	36 in

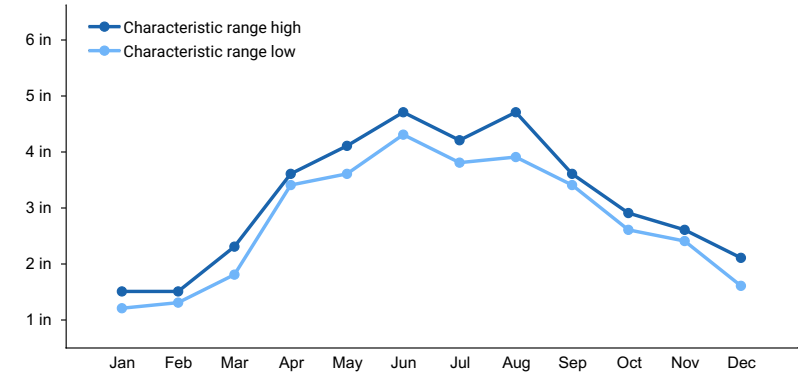


Figure 1. Monthly precipitation range

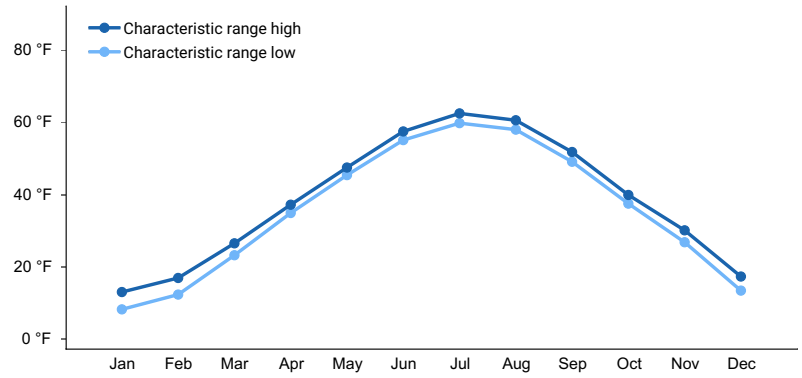


Figure 2. Monthly minimum temperature range

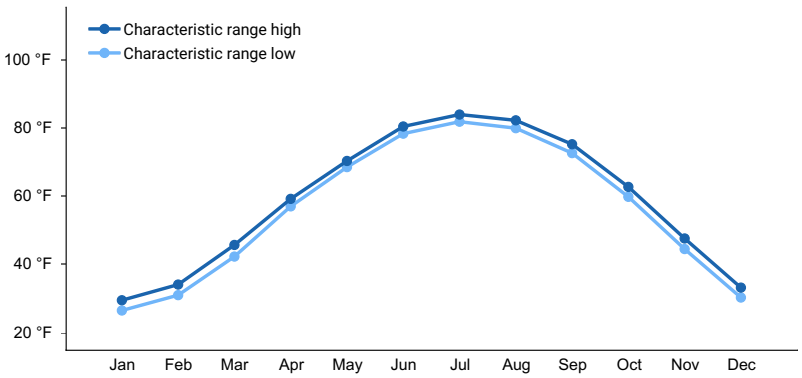


Figure 3. Monthly maximum temperature range

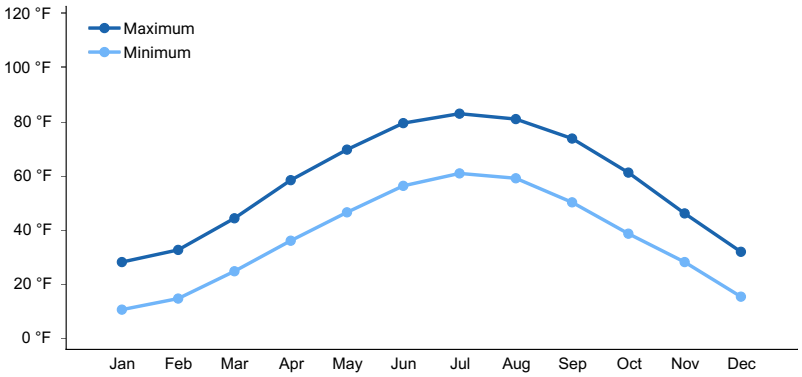


Figure 4. Monthly average minimum and maximum temperature

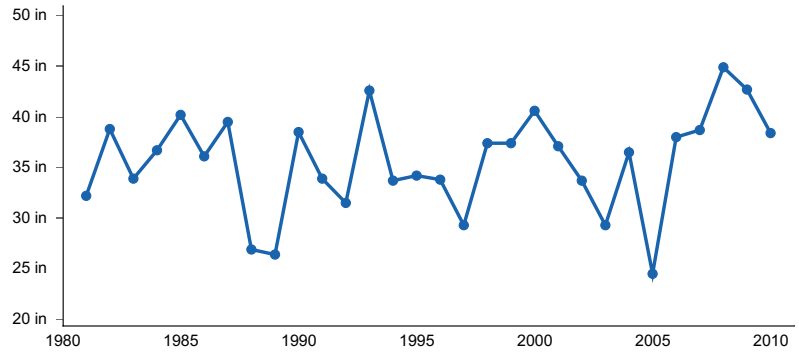


Figure 5. Annual precipitation pattern

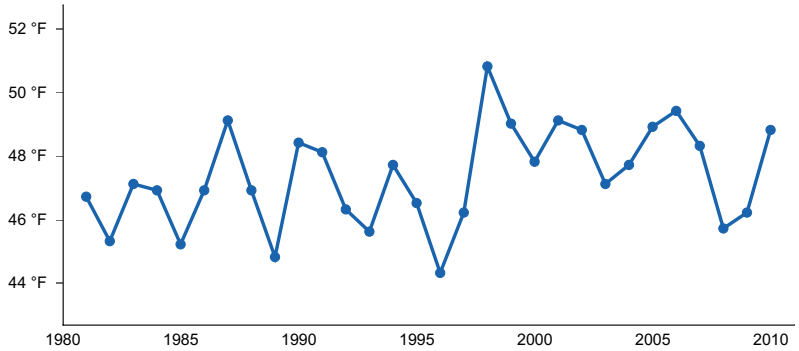


Figure 6. Annual average temperature pattern

Climate stations used

- (1) MARENGO [USC00115326], Marengo, IL
- (2) BRODHEAD [USC00471078], Brodhead, WI
- (3) ROCKFORD GTR ROCKFORD AP [USW00094822], Rockford, IL
- (4) HUSTISFORD WWTP [USC00473820], Hustisford, WI
- (5) WAUKESHA [USC00478937], Waukesha, WI
- (6) ARLINGTON UNIV FARM [USC00470308], De Forest, WI
- (7) MONTELLO [USC00475581], Montello, WI
- (8) ELGIN [USC00112736], Elgin, IL

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. On wetland sites, the dominant vegetation is emergent sedges, grasses, and rushes. Some sites have swamp hardwoods. Rarely do sites have conifer cover.

Wetland description

Under the Cowardin System of Wetland Classification, or National Wetlands Inventory (NWI), the wetlands can be classified as:
1) Palustrine emergent, persistent, saturated
2) Palustrine, forested, broad-leaved deciduous, saturated, or
3) Palustrine, forested, needle-leaved evergreen, saturated, or

Under the Hydrogeomorphic Classification System (HGM), the wetlands can be classified as:
1) Depressional, herbaceous/organic, or
2) Depressional, forested/organic

Permeability of the soil is impermeable to moderately slow. The hydrologic group of this site is A/D, B/D, or C/D.

Cowardin Wetland Classification: PEM1B, PFO1B, PFO3B,

Soil features

The soils of this site are represented by the Ashkum, Barry, Brookston, Colwood, Drummer, Gilford, Keowns, Kingsville, Marshan, Milford, Montgomery, Mussey, Navan, Ossian, Pella, Poygan, Roscommon, Sable, Sebewa, Wacousta, Washtenaw, and Wauseon soil series. Most of these are Mollisols (Endoaquolls, Argiaquolls, Epiaquolls, and Haplaquolls). Some are also classified as Fluvaquents, Psammaquents, Endoaquepts, and Humaquepts. These soils typically form in very deep, loamy or clayey materials deposited by flowing water, glacial ice, or ancient glacial lakes. Some sites are underlain by fine lacustrine deposits, loamy till, or sandy outwash. Lacustrine deposits are sometimes stratified with coarser-textured materials. Some sites have a loess mantle. Some soils have contact with dolomitic bedrock within 40 inches (100 cm). Thick, organic-enriched surfaces are common to these soils.

These soils are generally moderately acid to moderately alkaline. Some sites formed in sandy glaciolacustrine materials may be strongly acid. The presence of secondary carbonates varies significantly; they may be absent or occupy up to 40% volume, especially in those soils formed in loamy till. Presence of fragments also varies. Fragments may occupy up to 28 percent volume in the substratum. Some may be pieces of limestone and dolomite plucked from the bedrock by glacial ice and mixed in with the mineral glacial deposits. Others may be rounded, mixed rocks deposited by flowing water. These soils are generally very poorly to poorly drained and meet hydric soil requirements. Some Sebewa soils are somewhat poorly drained and do not meet hydric soil requirements.

Figure 7. Brookston Soil Series sampled on 08/14/20 in Fond Du Lac County, Wisconsin.

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Colluvium (3) Till (4) Lacustrine deposits (5) Outwash (6) Loess (7) Herbaceous organic material (8) Residuum
Surface texture	(1) Loamy sand (2) Sandy loam (3) Loam (4) Silt loam (5) Silty clay loam
Drainage class	Very poorly drained to poorly drained
Permeability class	Moderately rapid
Soil depth	28–80 in

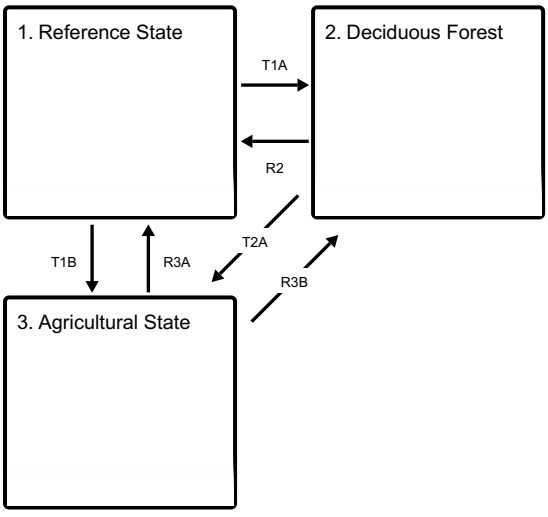
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-59.1in)	1.55–7.53 in
Calcium carbonate equivalent (0-39.4in)	0–40%
Soil reaction (1:1 water) (0-39.4in)	5.3–8.2
Subsurface fragment volume <=3" (0-39.4in)	0–28%
Subsurface fragment volume >3" (0-39.4in)	0–12%

Ecological dynamics

Historically, 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 these species adapted to fire 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 to 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.

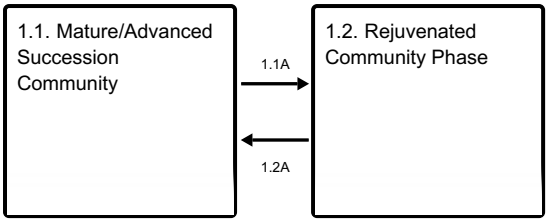
R2 - Deciduous forest community is slowly taken over by shade tolerant maples and other species.

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.

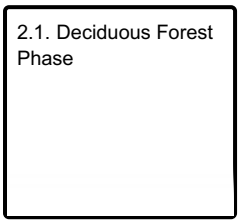
State 1 submodel, plant communities



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 Red and Swamp white oak (*Quercus rubra* and *Quercus bicolor*), Sugar and red maple (*Acer saccharum* and *Acer rubrum*) with Black ash (*Fraxinus nigra*). 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 Oaks, Maples, and Ashes. The shrub layer is not well developed. The ground layer is highly variable but often contains Virginia creeper and lots of regenerating seedlings.

Dominant plant species

- red maple (*Acer rubrum*), tree
- sugar maple (*Acer saccharum*), tree
- black ash (*Fraxinus nigra*), tree
- oak (*Quercus*), tree
- common winterberry (*Ilex verticillata*), shrub
- Virginia creeper (*Parthenocissus quinquefolia*), other herbaceous

Community 1.2
Rejuvenated Community Phase

Figure 8. Image courtesy of UWSP taken on 08/14/20 in Fond Du Lac County, Wisconsin.

The canopy of the rejuvenated community may still be dominated by original species, but it is far more likely that various oaks may have a much stronger representation. If seed source for the dominant species (Sugar Maple and Black Ash) is missing then the site will remain as an advanced succession Oak forest as an alternative stable state. 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
- oak (*Quercus*), tree
- sugar maple (*Acer saccharum*), tree
- black ash (*Fraxinus nigra*), tree
- common winterberry (*Ilex verticillata*), shrub
- Virginia creeper (*Parthenocissus quinquefolia*), 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 advance regeneration and stimulating new seedling establishment. Some additional less shade tolerant species 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. Understory plants may be only weekly expressed when aspen and paper birch are closely growing and dominant. If seed source is present and canopy openings allow, red maple will readily become member of this community. Depending on age within this phase the canopy varies from pure (young) to mixed (older) aspen – paper birch. Disturbance history and seed source will dictate whether aspen or birch dominate this phase.

Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- paper birch (*Betula papyrifera*), tree

- red maple (*Acer rubrum*), tree

Community 2.1
Deciduous Forest Phase

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
- paper birch (*Betula papyrifera*), tree
- red maple (*Acer rubrum*), tree

State 3
Agricultural State

The Agricultural State consists of a post disturbance establishment of hay, crops, or pasture and a continuation of those practices for many years.

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. Clear cutting can also accomplish this change.

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 shade tolerant species.

Transition T2A
State 2 to 3

Removal of forest cover and tilling for agricultural crop production.

Restoration pathway R3A
State 3 to 1

Abandonment of agricultural practices and allowing natural vegetation to colonize the site or apply artificial afforestation. The time required for forest community to reach the reference state conditions may exceed 100 years. Unless understory plants are seeded naturally or artificially it may take some time before the understory is restored.

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 of 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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Acknowledgments

NRCS contracted UWSP to write ecological sites in MLRA 95X. 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	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:

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:**