USDA Natural Resources Conservation Service

Ecological site R105XY018WI
Dry Mollic or Umbric Upland

Last updated: 2/23/2024
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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): 105X–Upper Mississippi River Bedrock Controlled Uplands and Valleys

The Northern Mississippi Valley Loess Hills area corresponds closely to the Western Coulees and Ridges and Southwest Savanna Ecological Landscapes. Some of the following brief overview is borrowed from the Wisconsin Department of Natural Resources Ecological Landscape publication (2015).

Fifty-two percent of the Upper Mississippi River Bedrock Controlled Uplands and Valleys MLRA is in Wisconsin; Iowa, Minnesota, and Illinois contain the rest. This region is the only area in Wisconsin that has not been covered by glaciers within the past 2.4 million years. The Wisconsin portion of this MLRA is approximately 7.4 million acres (11,600 square miles). The landscape is characterized by dissected topography with deeply-incised, steep-walled valleys between bedrock controlled ridges.

Though it's called the "Driftless Region", some glacial drift is found in the major river valleys of this region in the form of outwash, deposited by proglacial streams of glacial meltwater. Wisconsin's most recent glaciations also impacted the sediment of the area through the deposition of loess. After the glacier receded and before vegetation established, the bare surfaces of the glaciated areas were highly susceptible to wind erosion. As a result, a veneer of loess (wind-blown silt) was deposited over the entire region. The thickest deposits—nearly five meters—are on ridges near the Mississippi River and gradually thin moving eastward. The loess caps in Dane and Green counties are generally 0.5-1.5 meters deep. Much of the loess has eroded downslope and collected in floodplains.

Bedrock is shallow throughout this MLRA and is a major influence on topography and hydrology. Most of the MLRA has bedrock within two meters, except in the deep river valleys that are filled with outwash and alluvium materials. Sandstone is the dominant bedrock type in MLRA 105, but the southernmost portion is dominated by dolomite. Military Ridge is an escarpment that straddles the boundary between sandstone and dolomite bedrock. The sandstone north of the ridge is weaker than the erosion-resistant dolomite south of the ridge. The sandstone is deeply cut and dissected into steep slopes and valleys. The dolomite-controlled ridges tend to be less dissected and broader with more gentle, south sloping topography. Geomorphic and fluvial processes formed these landscapes by way of sheet wash, soil creep, and flowage. These processes eroded the hillslopes, cut into bedrock, and transported the debris to streams, forming floodplains and terraces.

Underfit streams are common in MLRA 105, especially in the southern portion. These streams currently occupy large river valleys—especially those of the Black, Chippewa, Mississippi, and Wisconsin Rivers—that were carved by proglacial meltwater streams carrying much larger quantities of water than what's present today. As the climate dried, waterflow decreased and the valleys filled with alluvial sediment. Narrow meanders were formed by the shrinking streams and are often dissimilar to the meanders of the larger valleys they occupy. Fluvial landforms – including terraces, oxbow lakes, sandbars, eroding bluffs, and large floodplain complexes – are found within these large valleys and are subject to varying flooding frequencies, intensities, and durations.

Karst topography formed in this region from dissolution of carbonate bedrock by surface and groundwater. Dolomite and limestone are more easily affected by dissolution, but karst topography also formed in sandstone. Erosion by

water (stream meanders, rain/runoff, and groundwater), wind, and frost weaken joints and bedding planes that can cause collapse. In addition, sandstone materials collapse into cavities in underlying dolomite or limestone.

Historically, MLRA 105 was dominated by oak forests and oak openings making up more than 50% of the area. Prairies were significant and covered 32% of the area south of Military Ridge. Maple-basswood forests covered 19% of the area north of Military Ridge. Dominant tree species were white oak (*Quercus alba*), bur oak (*Quercus macrocarpa*), black oak (*Quercus velutina*), and sugar maple (Acer saccharum).

Classification relationships

Relationship to Established Framework and Classification Systems:

Habitat Types of S. Wisconsin (Kotar, 1996): The sites in this ES likely key out to Pinus strobus/Vaccinium-Cornus racemose [PVCr] and *Acer rubrum*/Desmodium-Vaccinium [ArDe-V] if forested.

Biophysical Settings (Landfire, 2014): This ES is largely mapped as North-Central Interior Sand and Gravel Tallgrass Prairie, Paleozoic Plateau Bluff and Talus Woodland, Managed Tree Plantation-Northern and Central Hardwood and Conifer Plantation Group, Eastern Cool Temperate Row Crop, Eastern Cool Temperate Close Grown Crop, and Eastern Cool Temperate Developed Ruderal Grassland

WDNR Natural Communities (WDNR, 2015): This ES is best matches Dry Prairies as described by the Wisconsin DNR

Hierarchical Framework Relationships:

Major Land Resource Area (MLRA): Upper Mississippi River Bedrock Controlled Uplands and Valleys (105)

USFS Subregions: Menominee Eroded Pre-Wisconsin Till (222La), Melrose Oak Forest and Savannah (222Lb), Mississippi-Wisconsin River Ravines (222Lc)

Wisconsin DNR Ecological Landscapes: Western Coulee and Ridges

Ecological site concept

The Dry Mollic or Umbric Upland site occupies approximately 129,000 acres across MLRA 105, or about 1.9% of total land area. It is found in upland positions on sandstone valleys and hills and sandy outwash terraces throughout the MLRA, especially the wide outwash plains along the Chippewa, Mississippi, and Wisconsin rivers.

This site is characterized by somewhat excessively to excessively drained, sandy soils with deep, dark surfaces (mollic or umbric epipedons) resulting from long-term additions of organic materials, especially from fine, fibrous roots of grassy vegetation.
Historically, these sites were prairies, though modern fire suppression has resulted in the encroachment by woody species. Today, many sites are forested.

Associated sites

F105XY002WI	**Wet Sandy Floodplain** These sites form in deep, sandy alluvium and outwash deposits in floodplains, especially those along the Chippewa, Black, and Wisconsin rivers. They support vegetation tolerant of seasonal flooding. They are sometimes saturated enough for hydric conditions to occur. They are found in floodplains adjacent to Dry Mollic or Umbric Upland.
F105XY006WI	**Moist Sandy Lowland** These sites form in sandy outwash deposits along major waterways. They are somewhat poorly drained. They are sometimes found adjacent to adjacent to Dry Mollic or Umbric Upland in lower landscape positions.

F105XY019WI	**Dry Upland** These sites form in sandy materials deposited by wind, water, gravity, or weathered from sandstone bedrock. They are well drained to excessively drained. They are often found adjacent to adjacent to Dry Mollic or Umbric Upland.

Similar sites

F105XY017WI	**Shallow Dry Upland** These sites form in sandy materials deposited by wind, water, gravity, or weathered from sandstone bedrock. They have bedrock contact within one meter of the soil surface. They are somewhat excessively to excessively drained. They are similar to Dry Mollic or Umbric Upland but have shallower surfaces (ochric rather than mollic or umbric epipedons).
F105XY019WI	**Dry Upland** These sites form in sandy materials deposited by wind, water, gravity, or weathered from sandstone bedrock. They are well drained to excessively drained. They are similar to Dry Mollic or Umbric Upland but have shallower surfaces (ochric rather than mollic or umbric epipedons).
R105XY011WI	**Mollic Loamy-Silty Upland** These sites form in loamy to silty materials, often silty loess and residuum. They have deep, dark surfaces. They are moderately well to somewhat excessively drained. They are similar to Dry Mollic or Umbric Upland but have slightly finer soil textures and are sometimes slightly wetter.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Bouteloua curtipendula*

Physiographic features

These sites are found on ridges, hills, terraces, outwash plains, sand sheets, and valley trains in the summit, shoulder, or backslope position. Slope shape is convex to linear. Slopes range from 0 to 15 percent.

These sites are not subject to inundation by water. Evidence of a seasonally high water table is generally found below 44 inches (112 cm) from the soil surface, or not at all. Runoff potential is negligible to low.

Table 2. Representative physiographic features

Hillslope profile	(1) Summit (2) Shoulder (3) Backslope
Slope shape across	(1) Convex
Slope shape up-down	(1) Linear
Landforms	(1) Ridge (2) Hill (3) Terrace (4) Outwash plain (5) Sand sheet (6) Valley train
Runoff class	Negligible to low
Flooding frequency	None
Ponding frequency	None
Elevation	705–1,001 ft
Slope	0–15%
Water table depth	44–80 in

Aspect	Aspect is not a significant factor

Climatic features

The climate of the Upper Mississippi River Bedrock Controlled Uplands and Valleys MLRA is typical of southern Wisconsin, with warmer winters, warmer summers, and higher precipitation rates than MLRA in northern Wisconsin. The MRA stretches over about 2.9 degrees of latitude, or nearly 200 miles, from its northern tip in Barron county to its southern Wisconsin extent on the border of Illinois. This results in considerable variation in climate throughout the MLRA. The growing season ranges from 117 to 181 growing degree days, with longer growing seasons in the southern portion.

The average annual precipitation for this ecological site is 34 inches. The average annual snowfall is 39 inches. The annual average maximum and minimum temperatures are 57°F and 35°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	118-134 days
Freeze-free period (characteristic range)	142-157 days
Precipitation total (characteristic range)	33-35 in
Frost-free period (actual range)	110-136 days
Freeze-free period (actual range)	128-162 days
Precipitation total (actual range)	32-35 in
Frost-free period (average)	124 days
Freeze-free period (average)	148 days
Precipitation total (average)	34 in

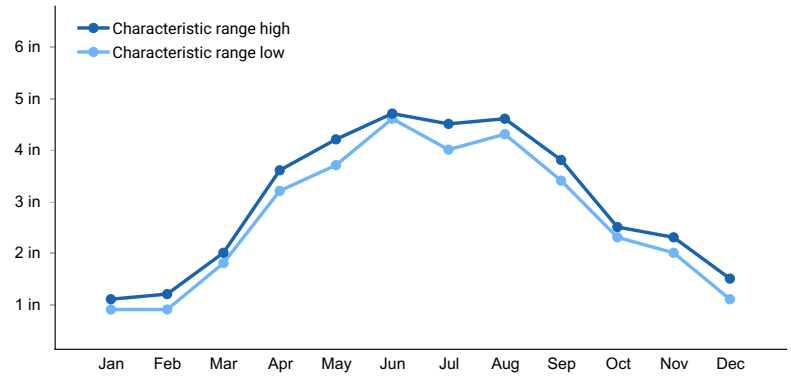


Figure 1. Monthly precipitation range

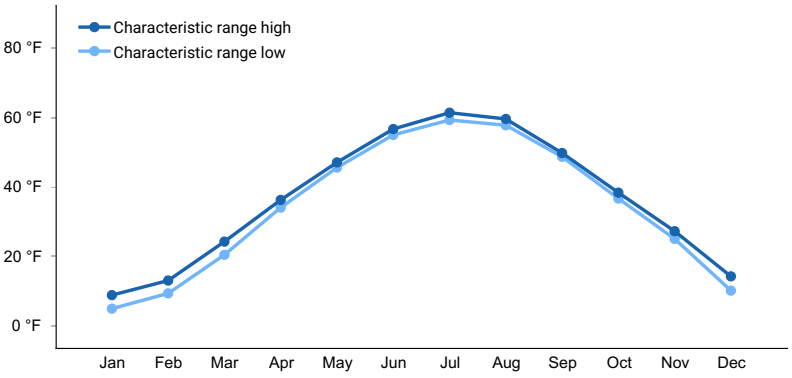


Figure 2. Monthly minimum temperature range

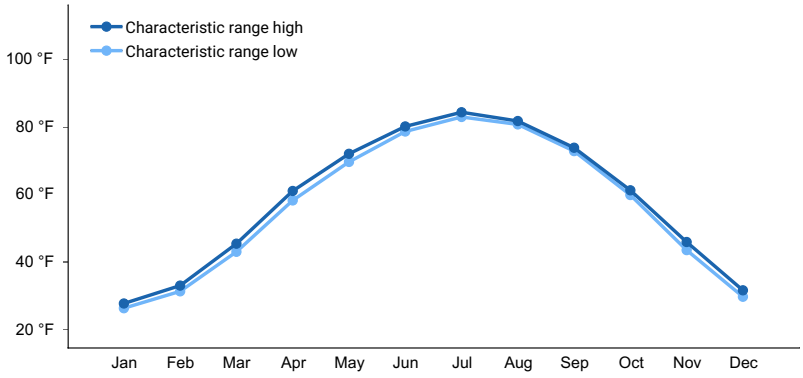


Figure 3. Monthly maximum temperature range

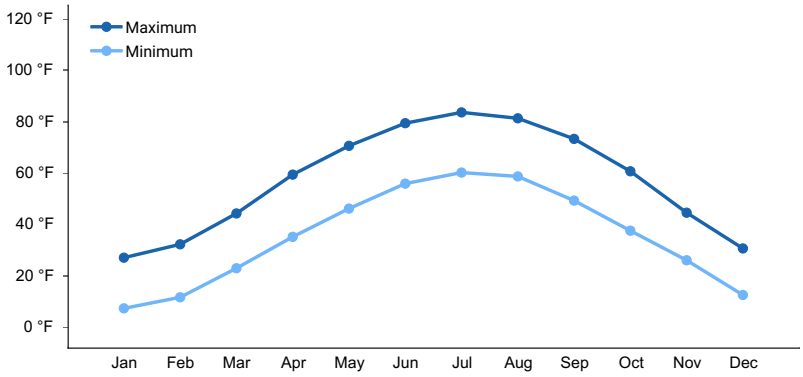


Figure 4. Monthly average minimum and maximum temperature

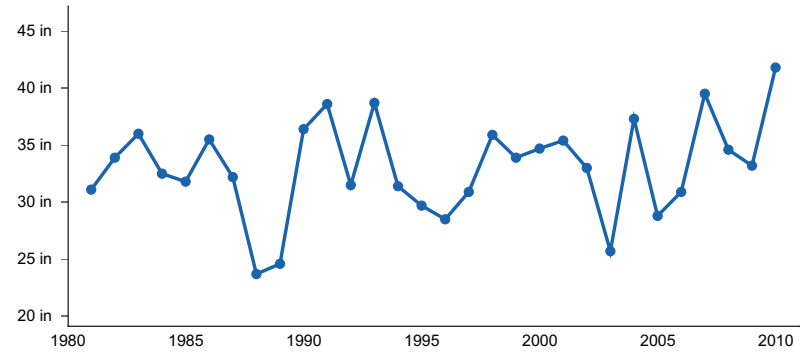


Figure 5. Annual precipitation pattern

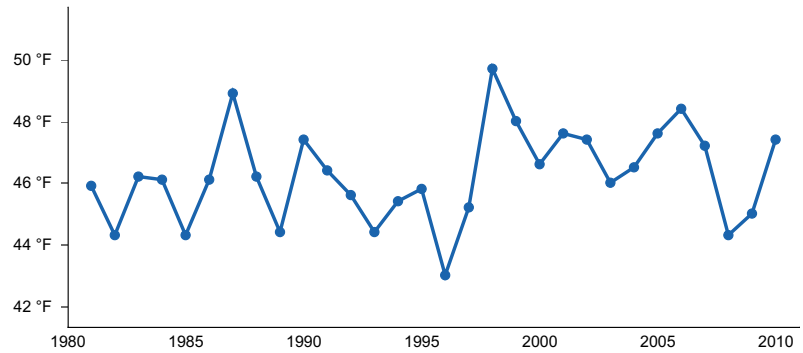


Figure 6. Annual average temperature pattern

Climate stations used

- (1) MONDOVI [USC00475563], Mondovi, WI
- (2) PRAIRIE DU CHIEN [USC00476827], Prairie du Chien, WI
- (3) MAZOMANIE [USC00475189], Mazomanie, WI

- (4) MENOMONIE [USC00475335], Menomonie, WI
- (5) BOSCOBEL AP [USW00094994], Boscobel, WI
- (6) SPARTA [USC00477997], Sparta, WI
- (7) DURAND [USC00472279], Durand, WI
- (8) LONE ROCK TRI CO AP [USW00014921], Spring Green, WI
- (9) PRAIRIE DU SAC 2 N [USC00476838], Prairie du Sac, WI
- (10) DODGE [USC00472165], Arcadia, WI

Influencing water features

Water is received through precipitation and runoff from adjacent uplands. Water is lost from the site primarily through runoff, evapotranspiration, and groundwater recharge.

Permeability of the soils is moderately slow to rapid. The hydrologic soil group is A.

Wetland description

Not Applicable.

Soil features

This soil is represented by the Burkhardt, Dickinson, Finchford, Garne, Impact, Komro, and Sparta soil series, as well as a variant of the Sparta soil series. Entic Hapludolls account for 58% of the acreage of this site. The remaining acreage is equally split between Typic Hapludolls and Humic Psammentic Dystrudepts. As small amount of Oxyaquic Hapludolls belonging to this site can be found in northeast Iowa county in the outwash plains along the Wisconsin River.

These soils form in sandy to loamy outwash and alluvium deposits – sometimes reworked by wind – and in sandy residuum weathered from sandstone bedrock. Soils have thick surface horizons, dark from enrichment of organic matter (mollic or umbric epipedons). Bedrock contact within two meters in rare but is sometimes found in wind-blown deposits along the Chippewa River. Subsurface fragments smaller than 3 inches in diameter (gravel) may occupy up to 25% soil volume. Fragments may be mixed rocks deposited by flowing water or pieces of weathered sandstone bedrock. Soils are moderately well to excessively drained and do not meet hydric soil requirements.

Soils are strongly acid to neutral and they generally lack accumulations of secondary carbonates.

Figure 7. Finchford soil series sampled on 07/22/2020 in LaCrosse County, WI.

Table 4. Representative soil features

Parent material	(1) Eolian sands (2) Outwash (3) Residuum (4) Alluvium
Drainage class	Moderately well drained to excessively drained
Permeability class	Moderately slow to rapid
Soil depth	34–80 in
Surface fragment cover <=3"	0–3%
Surface fragment cover >3"	0–3%
Available water capacity (0-59.1in)	1.47–2.37 in
Soil reaction (1:1 water) (0-39.4in)	5.5–6.9
Subsurface fragment volume <=3" (0-39.4in)	0–25%
Subsurface fragment volume >3" (0-39.4in)	0–3%

Ecological dynamics

In pre-European settlement time wildfire was the main controlling factor of range and forest community dynamics. Some areas had been persistent in grasslands, but had the capacity to support both grassland and forest depending on the frequency and intensity of fire and the presence of large grazers. Shorter fire return intervals led to grasslands, intermediate fire return intervals to scrub, and long fire return intervals to forest. Any scrub or forest community was dependent on the presence of adjacent seed source. Many of the previous grasslands have been converted to agriculture or have reverted to forest following fire suppression.

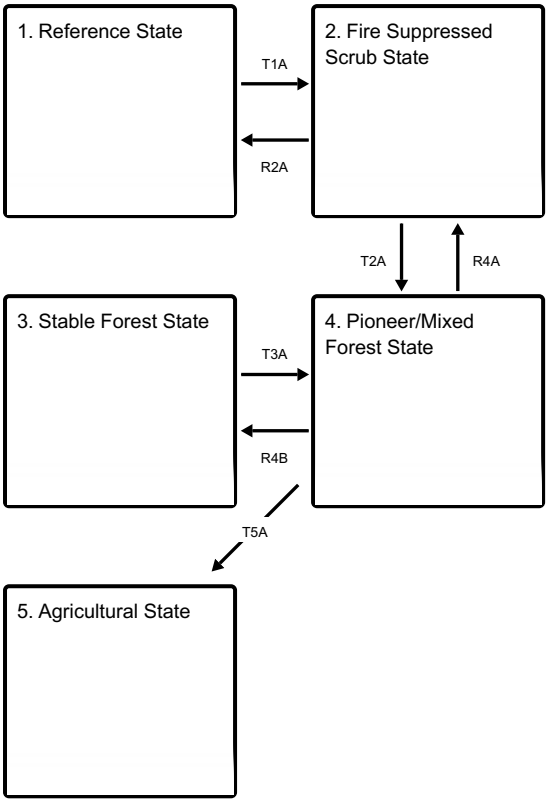
Forest communities can be described thusly, in pre-European settlement time wild fire was the main controlling factor of forest community dynamics. Following a severe, stand-replacing fire, any of the species present on the landscape could become established, depending on seed source availability and 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. White pine is best adapted for long-term success on this Ecological Site. Although vulnerable to damage or elimination by fire in early life it eventually develops thick fire-resistant bark which helps to extend its longevity, in some cases for up to four centuries or more. These survival properties assure the species' relatively continuous seed source in the region as a whole. White pine is also moderately shade-tolerant in early life which means that it can become established in some pioneer communities, such as aspen – white birch stands, or in poorly stocked oak and red maple dominated communities. Red pine had in the past been a common associate of white pine stands. It shares some of the fire-resisting properties of white pine, but it lacks shade-tolerance and does not become established in the understory. For this reason, it has not maintained its presence in current stands and its seed source has been greatly reduced throughout its natural range following the unset of fire suppression. Several species of oak are common members of forest communities on this ecological site. Northern pin oak (*Q. ellipsoidalis*) and, to a lesser degree, black oak (*Q. velutina*), are intolerant of shade and do not reproduce from seed under existing canopies. However, following fire or clear cutting they respond by sprouting from stumps. In the absence of disturbance, they are replaced—through succession—by more shade-tolerant white pine, red maple (*Acer rubrum*), or white oak (*Quercus alba*).

Red maple has not been identified by Finley (1976) as an important component of pre-settlement pine or oak forests, but it is a prominent member in current stands. Absence of fire since the original logging era is probably the main reason. Red maple is extremely sensitive to fire damage, but is a prolific and early seed producer. Stems of 2-4 inches in diameter can produce large amounts of seed (USDA For. Serv. 1990). It is sufficiently shade-tolerant to become established in the understories of most communities on sandy soils. On this Ecological Site it behaves similarly to white pine, but because of its much smaller size at maturity, it does not compete with white pine in the upper canopy.
Some portions of this ES may support grassland or oak savanna and restoration/establishment efforts have had

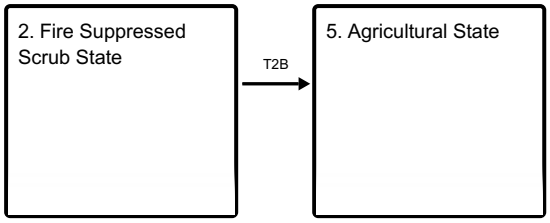
some success.

State and transition model

Ecosystem states



States 2 and 5 (additional transitions)



T1A - Suppression of fire

R2A - Return of fire and/or large grazers to the landscape.

T2A - Continued fire suppression for over 20 years

T2B - Removal of forest/shrub cover and tilling for agricultural crop production.

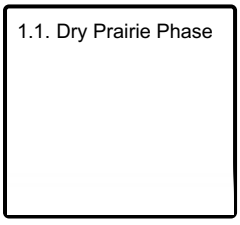
T3A - Cutting, fire, or blowdown removing existing tree canopy.

R4A - Low intensity moderate return interval fire removing fire intolerant species and regeneration

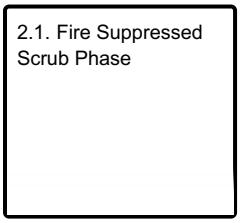
R4B - Deciduous forest community is slowly invaded by conifers.

T5A - Removal of forest/shrub cover and tilling for agricultural crop production.

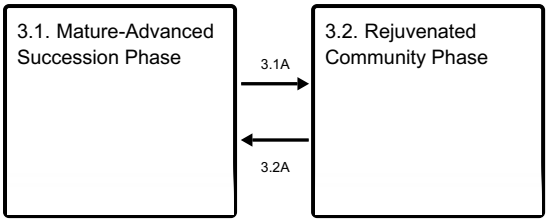
State 1 submodel, plant communities



State 2 submodel, plant communities



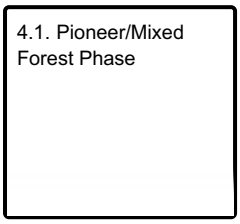
State 3 submodel, plant communities



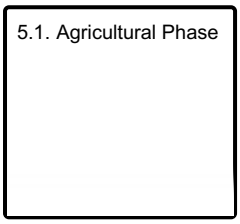
3.1A - Light to moderate intensity fires, blow-downs, ice storms.

3.2A - Disturbance-free period for 30+ years.

State 4 submodel, plant communities



State 5 submodel, plant communities



State 1
Reference State

The Reference State is a grassland state dominated by little bluestem, but also includes side-oats grama, and other short grasses. Leadplant and flowering spurge are common. The reference state for this ES is very rare today and was maintained by frequent fire removing the encroachment of tree and shrub species.

Community 1.1
Dry Prairie Phase

The Dry Prairie Phase is a grassland state dominated by short grasses including little bluestem, side-oats grama, and other short grasses. Leadplant and flowering spurge are common. This phase is very rare today.

Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- leadplant (*Amorpha canescens*), other herbaceous
- flowering spurge (*Euphorbia corollata*), other herbaceous

State 2
Fire Suppressed Scrub State

A mostly open grassland with sporadic shrubs and trees. As soon as fire is suppressed tree and shrub species invade this ES and various tree and shrub species may take hold resulting in a grassland with sparse and sporadic tree and shrub cover.

Community 2.1
Fire Suppressed Scrub Phase

Fire Suppressed Scrub is a tree and shrub invaded grassland. The grassland species are similar to the reference state with the addition of various species of tree or shrub beginning to create a sparse canopy.

Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- oak (*Quercus*), tree
- red maple (*Acer rubrum*), tree
- pine (*Pinus*), tree
- little bluestem (*Schizachyrium scoparium*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- Forb, annual (*Forb, annual*), other herbaceous

State 3
Stable Forest State

In absence of stand-leveling disturbances the Stable Forest State Community oscillates between two easily definable community phases, a mature, or late successional, community phase and a rejuvenated community phase. The major difference between these two states being the level and degree of small scale disturbance leading to canopy openings and the resulting abundance and age of canopy tree species as well as the shrub layer. Typically this state is characterized by a mixed forest of White pine, Black, Pin, and White Oak, and Red maple. A mixed presence of Red pine, and Jack pine could occur as well.

Community 3.1
Mature-Advanced Succession Phase

A mature forest community contains a super-canopy, or a scattering, of large white pine trees. In pre-European settlement time such trees would have been anywhere from 80 to more than 300 years old (Sterns, 1950). Common associates have been red pine (P. resinosa), and white oak (*Q. alba*). However, only white pine and white oak are moderately shade-tolerant and able to reproduce in small canopy openings and remain as permanent members of mature community in absence of moderate to severe disturbance. Red maple (*Acer rubrum*) had not been an important species in pre-settlement forests, but is today the most successful reproducing tree species in forest communities on this Ecological Site. While this ES was likely typified by fire disturbance these species are likely to dominate in the absence of fire as well.

Dominant plant species

- eastern white pine (*Pinus strobus*), tree
- white oak (*Quercus alba*), tree
- black oak (*Quercus velutina*), tree
- pin oak (*Quercus palustris*), tree
- red maple (*Acer rubrum*), tree
- gray dogwood (*Cornus racemosa*), shrub
- black cherry (*Prunus serotina*), shrub

- Virginia creeper (*Parthenocissus quinquefolia*), other herbaceous

Community 3.2
Rejuvenated Community Phase

The canopy of the rejuvenated community is still dominated by original species, but the understory now also includes a well established younger cohort and perhaps a few additional seedlings and saplings of less shade tolerant species.

Dominant plant species

- eastern white pine (*Pinus strobus*), tree
- white oak (*Quercus alba*), tree
- black oak (*Quercus velutina*), tree
- pin oak (*Quercus palustris*), tree
- red maple (*Acer rubrum*), tree
- gray dogwood (*Cornus racemosa*), shrub
- black cherry (*Prunus serotina*), shrub
- Virginia creeper (*Parthenocissus quinquefolia*), other herbaceous

Pathway 3.1A
Community 3.1 to 3.2

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 such as red oak may be able to enter the community.

Pathway 3.2A
Community 3.2 to 3.1

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 4
Pioneer/Mixed Forest State

Pioneer/Mixed Forest state may consist of considerable diversity of pioneer and mid-successional community phases. Here we are describing four, most commonly found under current conditions.

Community 4.1
Pioneer/Mixed Forest Phase

On this Ecological Site these three oak species occur in mixtures dominated by any of them. In some stands there also occur red oak, bur oak (*Q. macrocarpa*) or shagbark hickory (Carya ovvata). Community composition and structure is a function of composition of the preceding, cut-over, or burned-over community and time since the disturbance. Time since disturbance is an important factor because of significant differences in sprouting abilities and success of regeneration from seed, among the participating species. Pin and black oak typically exist in current stands as multi-stem clusters resulting from stump sprouting, while white oak often reproduces from seed and gradually gains canopy dominance because of its greater shade tolerance than that of other oak species. Jack Pine and/or Red Pine may be present as well.

Dominant plant species

- jack pine (*Pinus banksiana*), tree
- red pine (*Pinus resinosa*), tree
- quaking aspen (*Populus tremuloides*), tree
- white oak (*Quercus alba*), tree

- black oak (*Quercus velutina*), tree
- pin oak (*Quercus palustris*), tree
- eastern white pine (*Pinus strobus*), shrub
- red maple (*Acer rubrum*), shrub

State 5
Agricultural State

Indefinite period of applying agricultural practices varying from crops to pasture or hay.

Community 5.1
Agricultural Phase

Indefinite period of applying agricultural practices. Crops likely include alfalfa, corn, soybeans, and hay or pasture. It is possible that some areas have been abandoned, but persist in a domesticated grassland condition having been previously pasture or hay ground.

Transition T1A
State 1 to 2

Suppression of fire leading to the encroachment of wood species. Continued suppression for 10+ years required for the establishment of woody species.

Restoration pathway R2A
State 2 to 1

Reintroduction of fire causing the mortality of encroaching trees and shrubs. This fire must then return at relatively short intervals to continue to suppress the growth of woody vegetation.

Transition T2A
State 2 to 4

Continued fire suppression for several decades will lead to a dominant woody cover on the site.

Transition T2B
State 2 to 5

Removal of forest cover and tilling for agricultural crop production

Transition T3A
State 3 to 4

Major stand-replacing disturbance. In pre-European settlement time, the event was most often a severe blow down, sometimes followed by fires. Such blow downs have been estimated to occur in this part of Wisconsin every 300 to 400 years (Schulte and Mladenoff, 2005). In post settlement virtually every acre has been logged either by clear cutting or successive cuts targeting species marketable at that time. Post logging slash fires also have been a significant factor in most areas. These disturbances created the environment suitable for natural regeneration of many shade-intolerant species and for commercial planting.

Restoration pathway R4A
State 4 to 2

Reintroduction of low intensity fire that kills fire intolerant species and most regeneration.

Restoration pathway R4B
State 4 to 3

A period of some 70-100 years without major stand disturbance, especially fire, leads to decreased presence, through natural mortality, of early successional species and the dominance of shade tolerant sugar maple with less tolerant associates of red oak and white ash.

Transition T5A
State 4 to 5

Removal of forest/shrub cover and tilling for agricultural crop production.

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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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	04/25/2024
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):

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
