Ecological site F105XY012WI
Shallow Loamy-Silty Upland

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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): Acer saccharum-Tilia/Cornus racemose(Arismaea) [ATiCr(As)], Acer saccharum-Tilia/Desmodium [ATiDe], Acer saccharum-Tilia/Arismaea(Desmodium) [ATiAs(De)], Acer saccharum-Acer rubrum/Viburnum [AArVb], and Pinus strobus/Vaccinium-Hammamelis [PVHa]. Biophysical Settings (Landfire, 2014): This ES is largely mapped as North-Central Interior Maple-Basswood Forest, North-Central Interior Dry-Mesic Oak Forest and Woodland, North-Central Interior Dry Oak Forest and Woodland, and Paleozoic Plateau Bluff and Talus Woodland WDNR Natural Communities (WDNR, 2015): This ES is most similar to Southern Mesic Forest 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), Kickapoo-Wisconsin River Ravines (222Ld), Mineral Point Prairie-Savannah (222Le) Wisconsin DNR Ecological Landscapes: Western Coulee and Ridges, Southwest Savannah

Ecological site concept

The Shallow Loamy-Silty Upland ecological site occupies approximately 1,443,000 acres in MLRA 105, or about 21% of total land area. It is the second-most extensive ecological site in MLRA 105 behind Loamy Silty Uplands. It is found in upland positions across diverse landforms throughout MLRA 105. These sites are characterized by moderately well to well drained loamy soils. Bedrock contact is found within 3 feet (1 meter) of the soil surface. The bedrock acts as a root restricting layer and can limit root growth and perch water. These sites may be vulnerable to tree trips.

Associated sites

F105XY008WI	**Moist Loamy-Clayey Lowland** These sites form in loamy and clayey materials. They are somewhat poorly drained. They can sometimes be found adjacent to Shallow Loamy-Silty Upland in lower landscape positions.
F105XY003WI	**Wet Loamy-Clayey Floodplain** These sites form in deep, loamy alluvium deposits along floodplains, especially those along smaller tributaries to the Chippewa, Black, and Wisconsin rivers. They support vegetation tolerant of seasonal flooding. They are sometimes saturated enough for hydric conditions to occur. They can e found in floodplains adjacent to Shallow Loamy-Silty Upland.

Similar sites

F105XY013WI	**Loamy-Silty Upland** These sites form in loamy to silty materials, often silty loess and residuum. They are moderately well to well drained. They are very similar to Shallow Loamy-Silty Upland but lack bedrock contact within one meter of the soil surface.
R105XY010WI	**Shallow Mollic Loamy-Silty Upland** These sites form in loamy to silty materials, often silty loess and residuum. They have deep, dark surfaces and bedrock contact within one meter of the soil surface. They are well drained to somewhat excessively drained. They are very similar to Shallow Loamy-Silty Upland but have deeper surface horizons of organic-enriched soil (mollic rather than ochric epipedons).
F105XY015WI	**Shallow Clayey 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 found in similar landscape positions as Shallow Loamy-Silty Upland but have coarser soil textures with a lower nutrient status.

Table 1. Dominant plant species

Tree	(1) *Acer saccharum* (2) *Fraxinus americana*
Shrub	Not specified

Herbaceous	(1) *Parthenocissus quinquefolia* (2) *Circaea ×intermedia*

Physiographic features

These sites are found on hills, ridges, and valley sides in the summit, shoulder, or backslope position. Slope shape is convex or linear. Slopes range from 1 to 60 percent. Elevation of the landform ranges from 705 to 1001 feet (215 to 305 meters) above sea level.

These sites are not subject to inundation by water. The seasonally high water table is generally found below 24 inches (61 cm) from the soil surface. Runoff potential is low to very high.

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) Hill (2) Ridge (3) Valley side
Runoff class	Low to very high
Flooding frequency	None
Ponding frequency	None
Elevation	220 – 310 m
Slope	0 – 60 %
Water table depth	60 – 90 cm
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 MLRA 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 35 inches. The average annual snowfall is 42 inches. The annual average maximum and minimum temperatures are 56°F and 35°F, respectively.

Table 3 Representative climatic features

Frost-free period (characteristic range)	120-120 days
Freeze-free period (characteristic range)	140-150 days
Precipitation total (characteristic range)	860-940 mm
Frost-free period (actual range)	110-120 days
Freeze-free period (actual range)	130-150 days
Precipitation total (actual range)	810-970 mm
Frost-free period (average)	120 days
Freeze-free period (average)	140 days
Precipitation total (average)	890 mm

- (1) HILLSBORO [USC00473654], Elroy, WI
- (2) RIDGELAND 1 NNE [USC00477174], Dallas, WI
- (3) MONDOVI [USC00475563], Mondovi, WI
- (4) MENOMONIE [USC00475335], Menomonie, WI
- (5) DODGEVILLE [USC00472173], Dodgeville, WI
- (6) ARGYLE [USC00470287], Argyle, WI
- (7) REEDSBURG [USC00477052], Reedsburg, 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 impermeable to moderately slow. The hydrologic soil groups for these sites are B, C, and D.

Wetland description

Hydrogeomorphic Wetland Classification: None
Cowardin Wetland Classification: None

Soil features

This site is represented by the Baraboo, Derinda, Dobie, Eleva, Elevasil, Elkmound, Gale, Hayriver, Hiles, Hixton, Humbird, La Farge, Mifflin, Newglarus, Norden, Northfield, Urne soil series, and by a variant of the Mifflin series. Hapludalfs make up 82% of the acreage of this site. Eutrudepts make up 11% of the acreage. The remaining acreage is made up of Dystrudepts, Glossudalfs, and a very small amount of Haplorthods.

These soils formed in silty, loamy, or clayey deposits of loess, colluvium, till, or pedisediment, and in sandy to loamy residuum weathered from sandstone and shale. They have bedrock contact within 39 inches (100 cm) from the soil surface. Subsurface fragments smaller than 3 inches in diameter (gravel) may occupy up to 14% volume. Larger fragments may occupy up to 30% volume. These fragments may be mixed, unstratified rocks (in the case of till), or fragments of weathered sandstone, limestone, or dolostone bedrock. The soils are moderately well to well drained. They do not meet hydric soil requirements.

Soils are extremely acid to neutral. Some soils may have accumulations of secondary carbonates.

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Residuum (3) Loess (4) Pedisediment (5) Drift
Surface texture	(1) Silt loam (2) Loam (3) Silty clay loam (4) Sandy loam
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow
Soil depth	30 – 100 cm
Surface fragment cover <=3"	0 – 10 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-150.1cm)	2.01 – 7.92 cm
Calcium carbonate equivalent (0-100.1cm)	0 – 10 %

Soil reaction (1:1 water) (0-100.1cm)	0 – 6.7
Subsurface fragment volume <=3" (0-100.1cm)	0 – 10 %
Subsurface fragment volume >3" (0-100.1cm)	0 – 30 %

Ecological dynamics

Historically, this site was dominated by mesic hardwoods in a landscape adapted to fire disturbance that allowed for a strong presence of oaks. 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 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. Mesic hardwoods are sensitive to fire, but in its absence, the have the ability to dominate sites based on their shade tolerance and prolific seed production.

Today, these forests most commonly include stands of red oak, white oak, and other mesic hardwoods may be present as well. Some sites have a the likely reference community of sugar maple and basswood with a mixture of ashes. These sites have the conditions to support shade tolerant mesic hardwoods, but historically had significant wind throw and fire disturbance that allowed for a strong presence of oak species. As long as fire is continually suppressed, maples and other mesic hardwoods will continue to dominate the canopy.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 9. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

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.

Other references

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

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

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

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

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

Kotar, J., J. A. Kovach, and T. L. Burger. 1996. A Guide to Forest Communities and Habitat Types of Southern Wisconsin. University of Wisconsin-Madison, Department of Forest Ecology and Management, Madison.

Kotar, J., and T. L. Burger. 2017. Wetland Forest Habitat Type Classification System for Northern Wisconsin: A Guide for Land Managers and landowners. Wisconsin Department of Natural Resources, PUB-FR-627 2017, Madison.
Schulte, L.A., and D.J. Mladenoff. 2001. The original U.S. public land sur¬vey records: their use and limitations in reconstructing pre-European settlement vegetation. Journal of Forestry 99:5–10.

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

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

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

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

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Approval

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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	06/22/2026
Approved by	
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:**
