Ecological site F090BY018WI
Dry Sandy Bedrock Upland

Last updated: 11/16/2023
Accessed: 08/17/2026

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 090B–Central Wisconsin Thin Loess Dissected Till Plain

The Wisconsin and Minnesota Thin Loess MLRA, Northern and Southern Parts (90A and 90B) correspond closely to the North Central Forest and the Forest Transition Ecological Landscapes, respectively. Some of the following brief overview is borrowed from the Wisconsin Department of Natural Resources ecological landscape publications (2015). The Wisconsin and Minnesota Thin Loess MLRA, Northern and Southern Parts (90A and 90B) is an extensive glacial landscape that comprised of over 11.1 million acres (17,370 sq mi) throughout central and northern Wisconsin – about 27% of the total land area in the state. This glacial landscape is comprised of a heterogenous mix of loess-capped ground moraines, end moraines with eskers and ice-walled lake plains, and pitted, unpitted, and collapsed outwash plains sometimes interspersed with drumlins from the Illinoian and Pre-Illinoian glaciations. The entire area has been glaciated and nearly all of it is underlain by dense glacial till that impedes drainage. An extensive morainal system – the Perkinstown end moraine – spans most of the width of northern Wisconsin and divides the Northern and Southern Parts of this large landscape. This moraine, which has been sliced by outwash in many places, marks the southernmost extent of the Wisconsin glaciation (Wisconsin's most recent glacial advance). North of the Perkinstown morainal system is a loess plain, with a loess mantle 6-24 inches thick. The northernmost edge of this landscape is an undulating till and outwash plain with materials deposited by the Chippewa Lobe. Drumlins are common in the northern and northeastern portions. The drumlins are oriented towards the southwest and formed during a glacial episode prior to the most recent glacial advance. Some are covered with glacial till. Pitted, unpitted, and collapsed outwash plains fill the spaces between drumlins. Detached from the major land mass to the northeast is the hummocky Hayward collapsed end moraines, where swamps, ice-walled lake plains, and eskers are common. Most of the MLRA to the south of the Perkinstown morainal system is an extensive ground moraine with some proglacial stream features including pitted outwash plains, terraces, and fans. A layer of loess 6-47 inches thick covers much of the area. Like the Northern Part, all areas of the Southern Part of this MLRA were glaciated, although the southcentral portion is a relatively older till plain with materials from the Illinoian and pre-Illinoian glaciations, not the most recent Wisconsin glaciation. The landforms in the southcentral portion are highly variable. Much of the area topography is controlled by underlying bedrock. Sandstone outcrops and pediments can be found here. Some of the most southern portions of the MLRA are mixed glacial deposits and residuum. The land surface of the southeastern portion was formed by many small glacial advances and retreats. Morainal ridges protrude through an erosional, pitted outwash-mantled surface. These parallel ridges run in a northeast to southwest orientation and are dissected by many steams. The continental climate of this MLRA is typical of northcentral Wisconsin, with cold winters and warm summers. The southern boundary of this MLRA straddles Wisconsin's Tension Zone, a zone of transition between Wisconsin's northern and southern ecological landscapes. Historically, the mesic forests were dominated by eastern hemlock (Tsuga canadensis), sugar maple (Acer saccharum), and yellow birch (Betula alleghaniensis).

Classification relationships

Major Land Resource Area (MLRA): Wisconsin and Minnesota Thin Loess and Till (Northern and Southern Parts – 90A and 90B) USFS Subregions: Rosemont Baldwin Plains and Moraines (222Md) Wisconsin DNR Ecological Landscapes: Western Prairie

Ecological site concept

The Dry Sandy Bedrock Upland ecological site is an uncommon site in MLRAs 90A and 90B but may be found in southwest portion, located on hills, till plains, and stream terraces. It's found primarily in St. Croix and Pierce counties where bedrock is relatively shallow. These sites are characterized by moderately deep, somewhat excessively to excessively drained soils that formed in sandy alluvium, sandy till, and sandy residuum. Precipitation and runoff from adjacent uplands are the primary water sources. Soils range from extremely acid to moderately acid. Dry Sandy Bedrock Upland is distinguished from other ecological sites based on somewhat excessive to excessive drainage and a moderately deep profile. Other somewhat excessively and excessively drained sands have soils that are greater than 80 inches in depth. The underlying bedrock perches the water table and can cause limitations to growth, acting as a root restricting layer. These sites are more vulnerable to tree tips. Other somewhat excessively and excessively drained sites have loamy

deposits. Sands have lower pH and available water capacity than loamy sites, which can limit vegetative growth. The somewhat excessively and excessively drained soils differentiates this site from other sandy sites.

Associated sites

F090BY013WI	**Sandy Upland** Sandy Upland consist of deep sandy and loamy deposits of outwash, alluvium, till, and residuum. Soils are primarily sand and loamy sand and have a seasonally high water table within two meters, though they don't remain saturated for extended periods. They are somewhat wetter and occur lower on the drainage sequence than Dry Sandy Bedrock Upland.
F090BY019WI	**Dry Sandy Upland** Dry Sandy Upland sites consist of primarily sandy deposits of various origin. Loamy deposits are also present in many soils. They may have a seasonally high water table within two meters of the surface, though they do not remain saturated for sustained periods. They may be found adjacent to Dry Sandy Bedrock Upland.

Similar sites

F090BY020WI	**Dry Loamy Bedrock Upland** Dry Loamy Bedrock Upland consist of silty loess, sometimes underlain by loamy till. Basalt or quartzite bedrock typically occurs within one meter of the surface. These soils show no evidence of a seasonally high water table. They occur in similar landscape positions and share both drainage class and bedrock contact with Dry Sandy Bedrock Upland but have finer particle sizes.
F090BY019WI	**Dry Sandy Upland** Dry Sandy Upland consist of primarily sandy deposits of various origin. Loamy deposits are also present in many soils. They may have a seasonally high water table within two meters of the surface, though they do not remain saturated for sustained periods. They occur in similar landscape positions and share both drainage class and particle size with Dry Sandy Bedrock Upland but lack bedrock contact within two meters of the surface.

Table 1. Dominant plant species

Tree	(1) *Pinus strobus* (2) *Quercus rubra*
Shrub	(1) *Rubus*
Herbaceous	(1) *Circaea ×intermedia* (2) *Parthenocissus quinquefolia*

Physiographic features

These sites formed on hills, till plains, and stream terraces. Slopes range from 0 to 50 percent. Sites are on summit, shoulder, and backslope positions.

These sites are not subject to ponding or flooding. They show no evidence of a seasonally high water table within 80 inches. Surface runoff is very low to 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) Till plain (2) Stream terrace (3) Hill
Runoff class	Very low to high
Flooding frequency	None
Ponding frequency	None
Elevation	230 – 280 m
Slope	0 – 50 %
Aspect	Aspect is not a significant factor

Climatic features

The climate of the expansive Wisconsin and Minnesota Thin Loess and Till Plain is highly variable. The eco-climatic zone (the “Tension Zone”) that runs southeast-northwest across the state splits the MLRA. In general, the MLRA has cold winters and warm summers with an adequate amount of precipitation. Near Lake Superior, precipitation and temperature tend to increase. The far western section of the MLRA, known as the western prairie ecological landscape by the Wisconsin DNR, has warmer temperatures compared to the rest of the MLRA because it falls below the eco-climatic zone. The soil moisture regime of MLRA is udic (humid climate). The soil temperature regime is frigid and cryic.

The average annual precipitation for this ecological site is 32 inches. The average annual snowfall is 45 inches. The annual average maximum and minimum temperatures are 53°F and 34°F, respectively.

Table 3 Representative climatic features

Frost-free period (characteristic range)	90-110 days
Freeze-free period (characteristic range)	120-140 days

Precipitation total (characteristic range)	740-840 mm
Frost-free period (actual range)	40-120 days
Freeze-free period (actual range)	90-150 days
Precipitation total (actual range)	710-890 mm
Frost-free period (average)	90 days
Freeze-free period (average)	130 days
Precipitation total (average)	790 mm

- (1) HOLCOMBE [USC00473698], Holcombe, WI
- (2) ROSHOLT 9 NNE [USC00477349], Wittenberg, WI
- (3) STAMBAUGH 2SSE [USC00207812], Iron River, MI
- (4) BIG FALLS HYDRO [USC00470773], Glen Flora, WI
- (5) COUDERAY 7 W [USC00471847], Stone Lake, WI
- (6) ISLE 12N [USC00214103], Isle, MN
- (7) MILACA [USC00215392], Milaca, MN
- (8) LAKEWOOD 3 NE [USC00474523], Lakewood, WI
- (9) MINONG 5 WSW [USC00475525], Minong, WI
- (10) AMERY [USC00470175], Amery, WI
- (11) BRUNO 7ENE [USC00211074], Bruno, MN

Influencing water features

Water is received through precipitation, runoff from adjacent uplands, and groundwater discharge. Water levels are greatly influenced by precipitation rates and runoff from upland sites. Water leaves the site primarily through runoff, evapotranspiration, and groundwater recharge. Subsurface flow may occur where water perches on bedrock.

Wetland description

Permeability of these sites is slow to rapid.
Hydrologic Group: A, B
Hydrogeomorphic Wetland Classification: None
Cowardin Wetland Classification: None

Soil features

These sites are represented by the Boone and Ishpeming soil series, classified as Typic Quartzipsamments and Entic Haplorthods, respectively.

These soils formed in sandy residuum and sandy alluvium. Soils are moderately deep with bedrock occurring between 23 and 35 inches. Soils are somewhat excessively or excessively drained. They do not meet hydric soil requirements.

Surface textures are primarily loamy fine sand moderately decomposed plant material. Subsurface textures include sandy loam, loamy sand, and sand. Some horizons have fine sands. Soil pH ranges from very strongly acid to strongly acid with values of 4.6 to 5.5. . Carbonates are absent within 80 inches.

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Eolian deposits (3) Lacustrine deposits (4) Till (5) Outwash (6) Drift (7) Sandstone (8) Igneous and metamorphic rock
Surface texture	(1) Loamy sand (2) Sandy loam (3) Loam (4) Silt loam
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderately rapid
Depth to restrictive layer	60 – 90 cm
Soil depth	200 – 250 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-154.9cm)	2.82 – 12.65 cm
Calcium carbonate equivalent (0-100.1cm)	Not specified
Soil reaction (1:1 water) (0-100.1cm)	4.6 – 5.5

Subsurface fragment volume <=3" (Depth not specified)	10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

A unique feature of dry, nutrient poor sites such as this ES is that they do not support the highly shade tolerant species Sugar maple, American beech, Basswood, American hophornbeam, and hemlock.

Though similar to Dry Sandy Uplands this site is likely to have lower net primary production and a more open canopy due to bedrock restricting roots and a reduction in available water and nutrients due to the shallower soil profile. Additionally it may be less likely to contain successful Red maple in the Reference State. This ES is also less likely to be in the Advanced Succession Phase of the Reference State, as compared to Dry Sandy Uplands, due to being prone to blow downs.

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 (%)

Table 10. Community 3.1 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 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. Habitat Types of S. Wisconsin (Kotar, 1996): The sites of this ES keyed out to one habitat types: Pinus/Vaccinium-Cornus (PVCr) 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 Eastern Cool Temperate Pasture and Hayland WDNR Natural Communities (WDNR, 2015):

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Approval

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Acknowledgments

NRCS contracted UWSP to write ecological sites in MLRA 90B, completed in 2021.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	08/17/2026
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):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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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:**
