Ecological site F092XY012WI
Moist Clayey Lowlands

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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): 092X–Superior Lake Plain

The Wisconsin portion of the Superior Lake Plain (MLRA 92) corresponds very closely to the Superior Coastal Plain Ecological Landscape published by Wisconsin Department of Natural Resources (WDNR 2015). The following brief overview of this MLRA is borrowed from that publication. The Superior Coastal Plain is bordered on the north by Lake Superior and on the south by the Northwest Sands, Northwest Lowlands, and North Central Forest Ecological Landscapes. The total land area is approximately 1.2 million acres, which mostly consists of privately-owned forestland. The climate is strongly influenced by Lake Superior, resulting in cooler summers, warmer winters, and greater precipitation compared to more inland locations. The most extensive landform in this ecological landscape is a nearly level plain of lacustrine clays that slopes gently northward toward Lake Superior. The coastal plain is cut by deeply incised stream drainages and interrupted by the comparatively rugged Bayfield Peninsula. During the Late Wisconsin glacial period, this area was covered with the advancing and retreating lobes of Superior and Chippewa. The landscape was rippled with moraines, but they were subdued by deposition of lacustrine materials. As the glaciers receded, glacial lakes riddled the landscape—most notably, Glacial Lake Duluth. The glacier receded eastward, exposing the western Lake Superior Basin. The ice covered the eastern basin, blocking the outlet of the lake, and continued to recede and contribute meltwaters that filled the glacial lake. The deep, red clays were deposited during this period of glacial lakes. The meltwaters from the glacier also contained sands which were deposited along the edge of the glacial lakes as beach deposits. Deep, narrow valleys have since been carved by rivers and streams flowing north into Lake Superior. Historically, the Superior Coastal Plain was almost entirely forested. Various mixtures of eastern white pine (Pinus strobus), white spruce (Picea glauca), balsam fir (Abies balsamea), white birch (Betula papyrifera), balsam poplar (Populus balsamifera), quaking aspen (Populus tremuloides), and northern white-cedar (Thuja occidentalis) occurred on the fine-textured glacio-lacustrine deposits bordering much of the Lake Superior coast. Sandy soils, sometimes interlayered with clays, occur in some places. Such areas supported forests dominated by eastern white pine and red pine (Pinus resinosa). Eastern white pine was strongly dominant in some areas, according to mid-19th century notes left by surveyors of the federal General Land Office (Finley, R. 1976). Dry-mesic to wet-mesic northern hardwoods or hemlock-hardwood forests were prevalent on the glacial tills of the Bayfield Peninsula. Large peatlands occurred along the Lake Superior shoreline, associated with drowned river mouths.

Classification relationships

Habitat Types of N. Wisconsin (Kotar, 2002): One site in this ES keys out to Acer rubrum – Abies balsamea / Vaccinium spp. – Cornus canadensis [ArAbVCo], and one site keys out to Acer saccharum – Tsuga canadensis / Maianthemum canadense [ATM]. Biophysical Setting; Landfire (NatureServe, 2018): This is ES is mapped as Larentian – Acadian Northern Hardwoods Forest and Laurentian – Acadian Sub-boreal Mesic Balsam Fir-Spruce Forest. The ES is not well represented by any of these, but most similar to Sub-Boreal Mesic Balsam Fir - Spruce Forest. WDNR Natural Communities (WDNR, 2015): This ES is not well represented by any of the described natural communities, but bears some resemblance to Northern Wet-Mesic Forest and Boreal Forest. USFS Subregions: Superior-Ashland Clay Plain Subsection (212Ya); May contain small areas of Ewen Dissected Lake Plain Subsection (212Jo), Winegar Moraines Subsection (212Jc), Gogebic-Penokee Iron Range Subsection (212Jb), and NorthShore Highlands Subsection (212Lb)* Major Land Resource Area (MLRA): Superior Lake Plain (92)

Ecological site concept

Moist Clayey Lowlands has a fairly wide extent throughout the MLRA, but most common in the Bayfield peninsula and the Apostle Islands. The sites are located on till plains and lake plains, with very fine and fine textures, sometimes with a sandy or loamy mantle over the clayey deposits. The fine materials cause a perched seasonally high water table that has a depth of 0 to 30 cm, but the water table can reach a depth of greater than 152 cm during dry periods. The primary source of water is precipitation, but runoff and groundwater also contribute. The soils range from strongly acid to strongly alkaline. Carbonates may be present beginning at 30 cm. The wide pH range is caused by soil differences—mores specifically, the soils with a sandy mantle are more acidic because of the coarse texture and

lack of carbonates. This ES is wetter than Clayey Uplands, but not as wet as Wet Loamy or Clayey Lowlands. This ES differs from Moist Sandy Lowlands and Moist Loamy Lowlands based on its finer texture, clayey deposits, and its higher seasonally high water table. Typical vegetation includes balsam fir, red maple, sugar maple, paper birch, red oak, green ash, and quaking aspen. Ground flora includes ferns, beaked hazelnut, goldthread, American starflower, and Canada mayflower.

Associated sites

F092XY007WI	**Wet Loamy or Clayey Lowlands** These sites are poorly to very poorly drained soils that formed in mainly clayey deposits. Some sites may have a sandy or loamy mantle overlying a clayey deposit. Soils remain saturated throughout the year and frequently experience ponding and flooding in the spring and fall. Water table rarely drops below 30cm in drought conditions. Most sites have apparent carbonates, and pH ranges from strongly acid to moderately alkaline. HGM criteria: recharge, Depressional. These sites are often adjacent to Moist Clayey Lowlands but located on a lower landscape position in the drainage sequence.
F092XY015WI	**Clayey Uplands** These sites are deep, moderately well to well drained soils that formed in clayey till or glaciolacustrine deposits. Some sites have a sandy or loamy mantle. Sites have a seasonally high water table, but does not remain saturated for extended periods. Sites range from strongly acid to moderately alkaline, with carbonates present in many sites. These sites are often adjacent to Moist Clayey Lowlands but located on a higher landscape position in the drainage sequence.

Similar sites

F092XY010WI	**Moist Sandy Lowlands** Moist Sandy Lowlands have a sandy mantle overlying finer glaciofluvial materials. The finer materials can cause episaturation in spring and fall, allowing the site to remain moist for some of the growing season, but does not remain saturated, nor does it have hydric conditions. These sites are found in a similar landscape to Moist Clayey Lowlands but are coarser textured and in a different drainage sequence.
F092XY011WI	**Moist Loamy Lowlands** These sites are somewhat poorly drained soils formed in various parent materials, but primarily are primarily loamy. The loamy texture causes the soil to remain moist for much of the growing season but does not remain saturated long enough to form hydric conditions. These sites are found in a similar landscape to Moist Clayey Lowlands but are coarser textured and in a different drainage sequence.

Table 1. Dominant plant species

Tree	(1) *Acer rubrum* (2) *Abies balsamea*
Shrub	(1) *Corylus cornuta* (2) *Alnus incana ssp. rugosa*
Herbaceous	(1) *Pteridium aquilinum* (2) *Eurybia macrophylla*

Physiographic features

This site occurs on plains, drainageways, terraces, and footslopes located on till plains and lake plains. Landform shape is predominantly linear, but can be concave on footslopes. Elevation of the landforms range from 185 to 330 meters above sea level. Slopes are

predominantly 0 to 6 percent, but will range up to 15 percent on footslopes. This site occurs on all slope aspects.

Table 2. Representative physiographic features

Landforms	(1) Lake plain > Terrace (2) Till plain > Drainageway
Runoff class	High to very high
Elevation	190 – 330 m
Slope	0 – 20 %
Water table depth	150 cm
Aspect	Aspect is not a significant factor

Climatic features

The Moist Clayey Lowlands PESD is located throughout the MLRA, but most concentrated in the Bayfield Peninsula. The annual average precipitation ranges from 29-33 inches, with a range of 56-167 inches of annual average snowfall (PRISM, 1981-2010). The annual average minimum temperature ranges from 28-34oF, and the maximum temperature ranges from 46-52oF (PRISM, 1981-2010). The freeze free period ranges from 156-194 days, with an average of 171 days (Table 1). The frost-free period ranges from 130-166 days, with an average of 144 days (Table 1).

Table 3 Representative climatic features

Frost-free period (characteristic range)	80-110 days
Freeze-free period (characteristic range)	120-140 days
Precipitation total (characteristic range)	790-810 mm
Frost-free period (actual range)	70-110 days
Freeze-free period (actual range)	110-140 days
Precipitation total (actual range)	790-840 mm
Frost-free period (average)	100 days
Freeze-free period (average)	130 days

Precipitation total (average)	810 mm

- (1) ASHLAND 3S [USC00470347], Ashland, WI
- (2) ASHLAND EXP FARM [USC00470349], Ashland, WI
- (3) BAYFIELD 6 N [USC00470603], Bayfield, WI
- (4) MADELINE ISLAND [USC00474953], La Pointe, WI
- (5) FOXBORO [USC00472889], Foxboro, WI
- (6) PATTISON RANGER STAION [USC00476413], Foxboro, WI

Influencing water features

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

Permeability of the soil ranges from impermeable to very slow. Runoff potential is high to very high. The hydrologic group of this site is primarily D, but where there is a sandy mantle over the clayey deposits the hydrologic group is C.

Enough water will percolate into some soil areas that will result in a perched seasonally high water table (episaturation) at a depth of 0 to 30 cm that may occur in any month, but will range to greater than 152 cm under dry conditions. Water that percolates into the soil is generally lost through plant uptake and evapotranspiration. Because of the permeability of the soil, there is very little to no ground water recharge.

Soil features

The soils of this site are represented by the Allendale, Badriver, Borea, Cuttre, Herbster, and Sedgwick soil series. These soils are predominantly classified as Glossaqualfs (Badriver, Borea, Cuttre, and Herbster), but includes sites that are Epiaquods (Allendale and Sedgwick).
This ecological site is characterized by very deep, somewhat poorly drained soils formed in clayey till or glaciolacustrine deposits (Badriver, Borea, Cuttre, and Herbster). Some areas include soil formed in a sandy glaciofluvial mantle over the clayey deposits (Allendale), while in other areas the soil formed in a loamy glaciofluvial mantle over the clayey deposits (Sedwick).
The average gravel content within the soil can be as much as 7 percent, while the average content of cobbles and stones can be as much as 1 percent. Soil reaction (pH) in the upper 100 cm ranges from strongly acid to strongly alkaline. Carbonates can be as shallow as 30 cm below the surface.

Table 4. Representative soil features

Parent material	(1) Till (2) Glaciolacustrine deposits
Surface texture	(1) Clay (2) Clay loam (3) Silt loam (4) Sandy loam (5) Loamy fine sand (6) Loamy sand
Drainage class	Somewhat poorly drained
Permeability class	Very slow

Available water capacity (0-152.4cm)	8.81 – 13.13 cm
Calcium carbonate equivalent (0-101.6cm)	10 – 20 %
Soil reaction (1:1 water) (0-101.6cm)	5.3 – 8.5
Subsurface fragment volume <=3" (0-101.6cm)	0 – 10 %
Subsurface fragment volume >3" (0-101.6cm)	Not specified

Ecological dynamics

Because of relatively poorly drained soils historic fire disturbance has likely been less frequent and less severe than on the better drained sites. This is evident by the presence (historic and current) of shade-tolerant and fire sensitive species such as red maple, balsam fir and white spruce. Aspen stands are common in current communities, but they are largely the result of fires associated with past logging. Red maple and balsam fir are the most obvious succeeding species, but white pine and white spruce may also become more important in the future as seed source availability increases. Although the shade-tolerant sugar maple occurs sporadically in some stands its competitive ability is reduced by excessive soil moisture and relatively low nutrient availability. For these reasons it is likely to remain only as a sporadic associate rather than the dominant component of mature forest communities as is typically the case on all mesic sites throughout northern Wisconsin.

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 3.1 plant community composition

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

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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	04/28/2026
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:**

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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):**

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:**