Ecological site F092XY015WI
Clayey Uplands

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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): Six sites key out to Acer rubrum – Abies balsamea / Sanicula spp. [ArAbSn], three sites key out to Acer saccharum / Athyrium felix-femina – Rubus pubescens [AAtRp], one site keys out to Acer saccharum / Sanicula spp. – Mitchella repens [ASnMi], one site keys out to Acer saccharum / Clintonia borealis [ACl], and one site keys out to Acer saccharum – Tsuga canadensis / Maianthemum canadense [ATM]. Biophysical Setting (Landfire, 2014): This is ES is mapped as, Laurentian – Acadian Northern Hardwoods Forest – Hemlock, Laurentian – Acadian Sub-boreal Mesic Balsam Fir-Spruce Forest, Laurentian – Acadian – Northern Pine – (Oak) Forest, North Central Interior Dry-Mesic Oak Forest & Woodland, and North Central Interior Maple – Basswood Forest. The ES is best represented by Northern hardwoods Forest and North Central Interior Maple – Basswood Forest. WDNR Natural Communities (WDNR, 2015): This ES is most similar to Northern Mesic and Norther Wet-mesic Forests. 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)* •Located in Upper Peninsula of Michigan (212J) and Minnesota (212Lb) Major Land Resource Area (MLRA): Superior Lake Plain (92)

Ecological site concept

Clayey Uplands is the most common ES in MLRA 92. It spans nearly every part of the MLRA. The sites were formed in clayey till or glaciolacustrine deposits, though some sites have a thin (15 cm) sandy or loamy mantle over the clayey till or glaciolacustrine deposits. Soils are moderately well to well drained, but may have a seasonally high water table with a depth of 0 to 122 cm. The depth to water

table can exceed 152 cm during drier periods. Water is received primarily through precipitation. These sites do not remain moist throughout the year. Many sites have carbonates present beginning as shallow as 13 cm, but absent in others. The soils range from strongly acid to moderately alkaline. This range depends on parent materials, whether there is a sandy mantle (acidic, lack of carbonates) or just clayey till or glaciolacustrine deposits. The nutrient availability regime, on a relative scale, is poor to medium. Within the Wisconsin Forest Habitat Type Classification System, this ES most frequently represent the ArAbSn and sometime AAtRp Habitat Types. Historically, shade tolerant balsam fir and white spruce were best represented tree species on this Ecological Site, but scattered white and red pines were also common. Following early logging, trembling aspen became the dominant forest type, but succession to balsam fir and, to a lesser degree, white spruce and red maple is evident everywhere where seed sources are present. While there is no good record of the degree of red maple representation in the pre-European settlement forests, the species is well represented and successfully reproducing today. Common ground flora species are round-leaved dogwood, wood anemone, sedges, ferns, beaked hazelnut, horsetails, wild strawberry, and raspberries. This ES differs from Sandy Upland and Loamy Upland based on soil texture, parent material, and depth to seasonally high water table. Clayey Uplands has the finest textures and clayey deposits on every site. This site does not remain saturated for extended lengths of time, differing it from Wet Clayey Lowlands and Moist Clayey Lowlands.

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 Clayey Uplands but located on a lower landscape position in the drainage sequence.
F092XY012WI	**Moist Clayey Lowlands** These sites are somewhat poorly drained soils with fine textures that formed in clayey deposits. Some sites have a sandy or loamy mantle. The fine materials cause episaturation in spring and fall and remain saturated for extended period, but the water table can reach depths of 152cm during dry periods. Soils range from strongly acid to strongly alkaline. Carbonates present in some soils beginning at 30cm. Depressional. These sites are often adjacent to Clayey Uplands but located on a lower landscape position in the drainage sequence.

Similar sites

F092XY013WI	**Sandy Uplands** These sites are formed primarily in sandy outwash or beach deposits, and some are underlain by finer glaciofluvial material. Sites are moderately well to well drained, but sites with underlying finer materials may have extended saturation in spring and fall. Sites range from strongly acid to neutral and may contain carbonates. These sites are found in a similar landscape as Clayey Uplands but are coarser textured and in a different drainage sequence.
F092XY014WI	**Loamy Uplands** These sites are deep, moderately well to well drained loamy soils. They formed in loamy and silty till, glaciolacustrine, or glaciofluvial deposits. Some sites have a sandy mantle. Many sites have a seasonally high water table but does not remain saturated for the growing season. Soils range from strongly acid to strongly alkaline, and some sites have carbonates present. These sites are found in a similar landscape as Clayey Uplands 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 knolls, ridges, hillslopes, interfluves, terraces, and ravines located on till plains and lake plains. Landform shape ranges from linear to convex. Elevation of the landforms range from 185 to 330 meters above sea level. Slopes range from 2 to 60 percent. Slope stability within ravines may be compromised by stream cutting leading to slumping or mass movement slope failure. This site occurs on all slope aspects.

Table 2. Representative physiographic features

Landforms	(1) Lake plain (2) Till plain
Runoff class	High to very high
Elevation	190 – 330 m
Slope	0 – 60 %
Water table depth	200 cm
Aspect	Aspect is not a significant factor

Climatic features

Clayey Upland PESD is extremely widely distributed all throughout the MLRA. 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 29-36oF, and the maximum temperature ranges from 46-52oF (PRISM, 1981-2010). The length of the freeze-free period ranges from 156 to 194 days, with an average of 171 days (Table 2). The frost-free period ranges from 130-166 days, with an average of 144 days (Table 2). With such a wide spread, this PESD has the widest ranges for climatic features throughout the MLRA.

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)	760-840 mm
Frost-free period (average)	100 days
Freeze-free period (average)	130 days
Precipitation total (average)	790 mm

- (1) ASHLAND KENNEDY MEM AP [USW00094929], Ashland, WI
- (2) ASHLAND EXP FARM [USC00470349], Ashland, WI
- (3) ASHLAND 3S [USC00470347], Ashland, WI
- (4) BAYFIELD 6 N [USC00470603], Bayfield, WI
- (5) MADELINE ISLAND [USC00474953], La Pointe, WI
- (6) FOXBORO [USC00472889], Foxboro, WI
- (7) SUPERIOR [USC00478349], Superior, WI

Influencing water features

Water is received primarily through precipitation. Water is lost from the site primarily through runoff.

Permeability of the soil ranges from impermeable to very slow. Runoff potential is high to very high, but may be negligible to medium on low slope areas where there is a sandy or loamy mantle over the clay. The hydrologic group of this site is predominantly D, but where there is a sandy or loamy mantle over the clayey deposits the hydrologic group is A or 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 122 cm that may occur during any month, but will range to greater than 152 cm under dry conditions. Other soil areas will not exhibit any significant saturation at any depth for any significant period. 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 Amnicon, Anton, Cornucopia, Kellogg, Manistee, Miskoaki, Odanah, Portwing, Sanborg, and Superior soil series. These soils are predominantly classified as Glossudalfs (Amnicon, Anton, Cornucopia, Miskoaki, Odanah, Portwing, and Sanborg), but include sites that are Haplorthods (Kellogg, Manistee, and Superior).

This ecological site is characterized by very deep, moderately well to well drained soils formed in clayey till or glaciolacustrine deposits (Amnicon, Anton, Cornucopia, Miskoaki, Odanah, Portwing, and Sanborg). Some areas include soil formed in a sandy glaciofluvial mantle over the clayey deposits (Kellogg and Manistee), while in other areas the soil formed in a loamy glaciofluvial mantle over the clayey deposits (Superior).

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 very strongly acid to strongly alkaline. Carbonates can be as shallow as 13 cm below the surface.

Table 4. Representative soil features

Parent material	(1) Glaciolacustrine deposits (2) Glaciofluvial deposits

Surface texture	(1) Clay loam (2) Silty clay loam (3) Silt loam (4) Sandy loam (5) Sand
Drainage class	Moderately well drained to well drained
Permeability class	Very slow
Soil depth	200 cm
Available water capacity (0-152.4cm)	8.79 – 13.08 cm
Calcium carbonate equivalent (12.7-96.5cm)	0 – 20 %
Soil reaction (1:1 water) (0-101.6cm)	4.6 – 8.7
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	06/03/2026
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):**

    _____

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:**
