USDA Natural Resources Conservation Service

Ecological site F092XY007WI
Wet Loamy or Clayey Lowlands

Last updated: 4/09/2020
Accessed: 11/21/2024

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): All forested sites in this ES key out to Fraxinus nigra – Abies balsamea / Impatiens capensis [FnAbI].

Biophysical Setting (Landfire, 2014): This is ES is mapped as Eastern Boreal Floodplain, Boreal Acidic Peatland System, Laurentian – Acadian Alkaline Conifer – Hardwood Swamp, Larentian – Acadian Northern Hardwoods

Forest – Hemlock, and Laurentian – Acadian Sub-boreal Mesic Balsam Fir-Spruce Forest. The ES is not well represented by any of these, but most similar to Eastern Boreal Floodplain.

WDNR Natural Communities (WDNR, 2015): This ES is most similar to Mesic Floodplain Terrace.

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

Wet Loamy or Clayey Lowlands has a fairly large extent in MLRA 92; much larger than the sandy counterpart of this ES. This ES occurs in swamps, depressions, and drainageways in soils that formed mainly in clayey deposits or sandy over clayey deposits in till plains and lake plains. Only around 1.5% of these sites occur in loamy soils. These soils are poorly to very poorly drained, are frequently flooded, and experience ponding in spring and fall. The sites have a seasonally high water table but remain saturated throughout the year as the water table only drops to 30 cm in drier conditions. These sites often have apparent carbonates that can begin as shallow as 10 cm. The sites that have a sandy or loamy mantle over clayey deposits may contain carbonates, but they begin at a lower depth. This variation in soil texture causes the sites to range from strongly acid to moderately alkaline.

Typical vegetation on these sites includes black ash and balsam fir with aspen, paper birch, and red maple as common associates. Typical understory includes dwarf raspberry, horsetail, sedges, and ferns. Shrub layers for this ES are not consistent but when present (often from a lack of canopy) consist of tag alder, serviceberry, or beaked hazelnut. It is common among this ES to have black ash seedlings and seedlings of the other dominant canopy trees in the understory.

Due to long duration ponding on some sites in the ES some sites may have minimal canopies and trend towards tag alder or open areas with sedges and grasses dominating. This is an effect of hydroperiod that may be influenced changing precipitation patterns or localized changes in the amount of runoff from adjacent lands.

This ES is distinct from its sandy counterpart based on soil texture, parent materials, depth to water table, amount and depth of carbonates, and the sandy or loamy mantles of clayey deposits on some sites. This ES is finer textured, has mostly clayey deposits, and has the highest water table throughout the year.

Associated sites

F092XY011WI	**Moist Loamy 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. These sites are often adjacent to Wet Loamy or Clayey Lowlands, located above them 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 Wet Loamy or Clayey Lowlands, located above them in the drainage sequence.
F092XY002WI	**Mucky Swamps** These sites consist of saprist soils that have formed in deep organic materials in depressions. The soils are highly decomposed herbaceous and woody materials and range from 40 to greater than 200cm in depth. Sites are underlain by sandy or loamy glacial deposits. The sites are poorly to very poorly drained and remain saturate throughout the year. These are slightly acidic to slightly alkaline wetland soils. These sites may be found adjacent to Wet Loamy or Clayey Lowlands in a lower landscape position in the drainage sequence.

Similar sites

F092XY006WI	**Wet Sandy Lowlands** Wet Sandy Depressions are poorly or very poorly drained sandy soils that have formed in outwash and lake plains. The sites are seasonally ponded depressions that remain saturated for sustained periods, allowing for hydric conditions to occur. Primarily associated with Kinross soil series. HGM criteria: recharge; Depressional. These sites are found in a similar landscape to Wet Loamy or Clayey Lowlands, but are coarser textured and in a different drainage sequence.

Table 1. Dominant plant species

Tree	(1) *Fraxinus nigra* (2) *Abies balsamea*
Shrub	Not specified
Herbaceous	(1) *Impatiens capensis*

Physiographic features

This site occurs in swamps, closed depressions, open depressions, and drainageways located on till plains and lake plains, and in some cases outwash plains. Landform shape is concave to linear. Elevation of the landforms range from 185 to 330 meters above sea level. Slopes are 0 to 2 percent.

Table 2. Representative physiographic features

Landforms	(1) Till plain > Drainageway (2) Lake plain > Closed depression (3) Lake plain > Open depression (4) Lake plain > Swamp
Runoff class	Negligible to very high
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	185–330 m
Slope	0–2%
Ponding depth	0–30 cm
Water table depth	0–30 cm
Aspect	Aspect is not a significant factor

Climatic features

The Wet Loamy or Clayey Lowlands PESD is very widely distributed and common throughout the MLRA. Therefore, the climatic features have quite a range. The annual average precipitation ranges from 29-33 inches, with a range of 56-167 inches of annual snowfall (PRISM, 1981-2010). The annual average minimum temperature ranges from 29-35oF, and the maximum temperatures range from 47-52oF (PRISM, 1981-2010). The length of the freeze-free period ranges from 156 to 197 days, with an average of 173 days (Table 2). The length of the frost-free period ranges from 130 to 169 days, with an average of 147 days (Table 2). Similar to the other poorly to very poorly drained PESDs, this PESD is found within depressions, so it has a more specific microclimate difficult to capture with weather station data. The microclimate will tend to remain cooler and wetter than adjacent PESDs.

Table 3. Representative climatic features

Frost-free period (characteristic range)	82-112 days
Freeze-free period (characteristic range)	120-136 days
Precipitation total (characteristic range)	787-838 mm
Frost-free period (actual range)	70-114 days

Freeze-free period (actual range)	109-138 days
Precipitation total (actual range)	762-889 mm
Frost-free period (average)	95 days
Freeze-free period (average)	127 days
Precipitation total (average)	813 mm

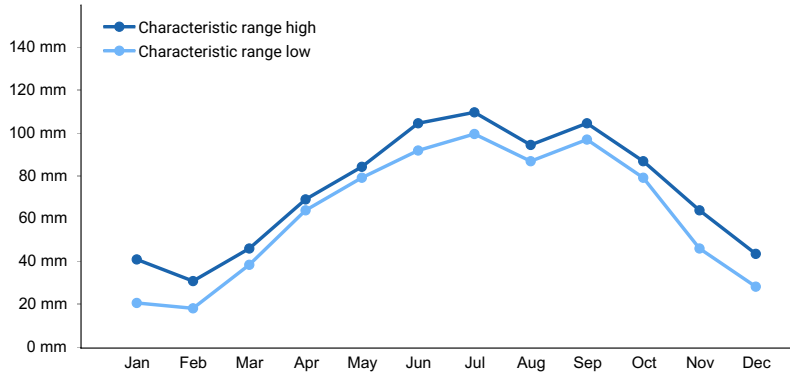


Figure 1. Monthly precipitation range

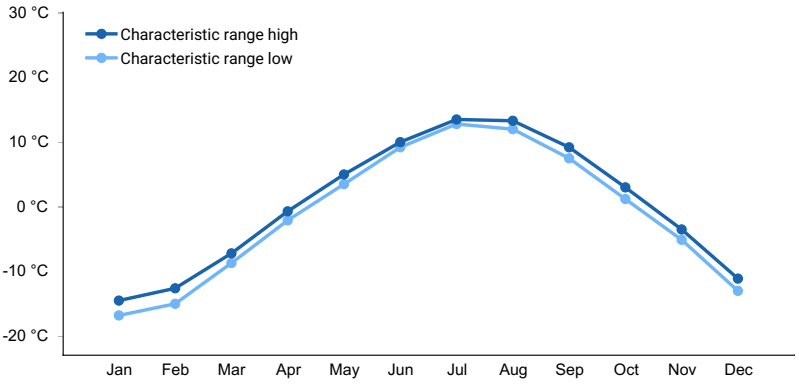


Figure 2. Monthly minimum temperature range

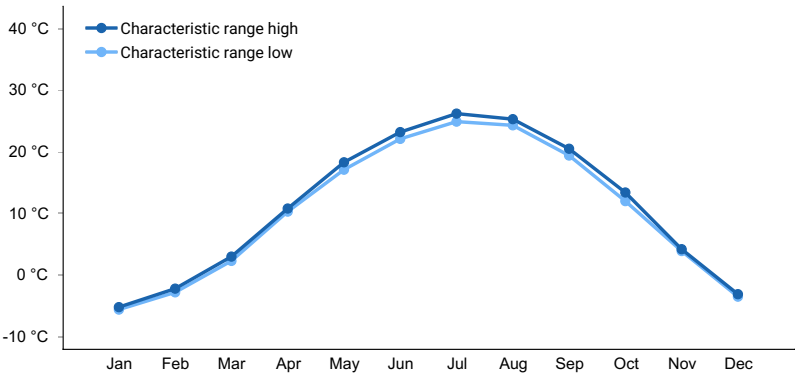


Figure 3. Monthly maximum temperature range

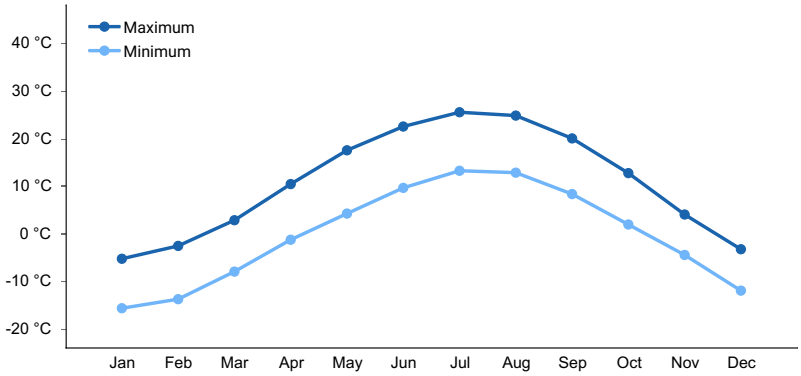


Figure 4. Monthly average minimum and maximum temperature

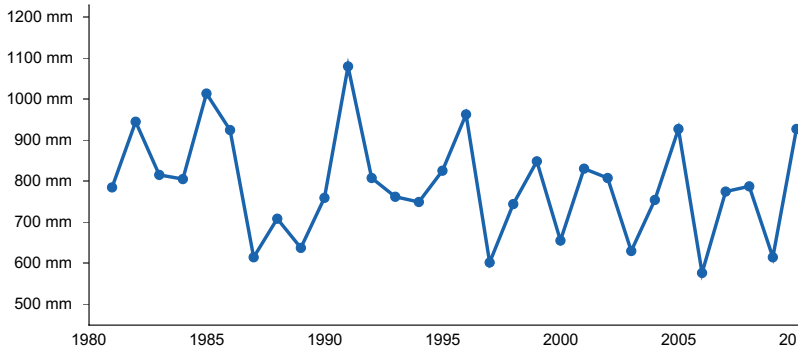


Figure 5. Annual precipitation pattern

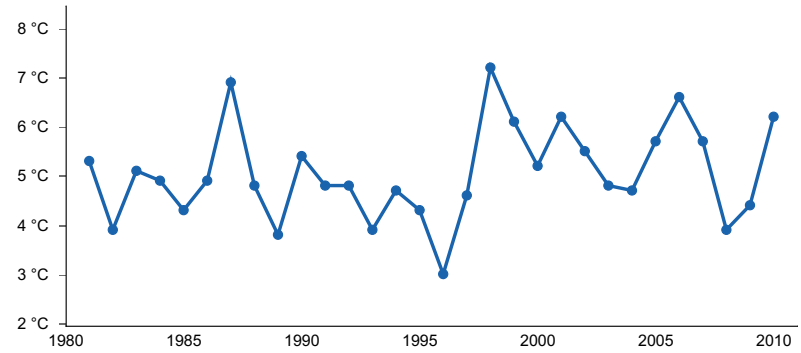


Figure 6. Annual average temperature pattern

Climate stations used

- (1) ASHLAND 3S [USC00470347], Ashland, WI
- (2) ASHLAND EXP FARM [USC00470349], Ashland, WI
- (3) ASHLAND KENNEDY MEM AP [USW00094929], 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
- (8) HURLEY [USC00473800], Ironwood, WI

Influencing water features

Water is received through precipitation, runoff from adjacent uplands, and stream inflow. Water is discharged from the site primarily through evapotranspiration and stream outflow. These sites are wetlands.

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

These sites are subject to occasional to frequent ponding throughout the year for brief to long periods with water depths up to 30 cm above the surface. Enough water will percolate into the soil resulting in a perched seasonally high water table (episaturation) that is generally at a depth of 0 to 30 cm throughout the year, but may be absent under dry conditions. Water that percolates in the soil is generally lost through plant uptake and evapotranspiration. Because of the permeability of the soil, there is very little ground water recharge.

Wetland description

Under the Cowardin System of Wetland Classification, or National Wetlands Inventory (NWI), the wetlands can be classified as (PFO1B, PFO4B, PSS1B):
1) Palustrine, forested, broad-leaved deciduous, saturated,
2) Palustrine, forested, needle-leaved evergreen, saturated, or
3) Palustrine, scrub-shrub, broad-leaved deciduous, saturated.
Under the Hydrogeomorphic Classification System (HGM), the wetlands can be classified as
1) Depressional, forested/clayey, or
2) Depressional, scrub-shrub/clayey.

Soil features

The soils of this site are represented by the Bergland, Lerch, Pickford, Munuscong, Wakeley, Bruce, Shagm, and Tonkey soil series. These soils are predominantly classified as Epiaqualfs (Bergland), Epiaquepts (Lerch, Pickford, and Munuscong), Epiaquents (Wakeley), Endoaqupets (Bruce and Tonkey) and Endoaquolls (Shag).

This ecological site is characterized by very deep, poorly and very poorly drained soils formed in clayey till or glaciolacustrine deposits (Bergland, Lerch, and Pickford). Some areas include soil formed in a sandy glaciofluvial mantle over the clayey deposits (Wakeley), while in other areas the soil formed in a loamy glaciofluvial mantle over the clayey deposits (Munuscong). The few loamy soils formed in stratified loamy and sandy glaciofluvial or glaciolacustrine deposits (Bruce and Tonkey) or in silty glaciolacustrine deposits (Shag). These soils formed under saturated conditions throughout most of the year and meet the criteria for hydric soils.

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 moderately alkaline. Carbonates can be as shallow as 10 cm below the surface.

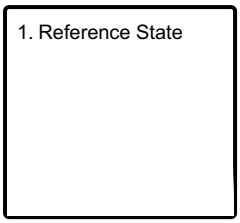
Table 4. Representative soil features

Parent material	(1) Glaciolacustrine deposits (2) Till
Surface texture	(1) Mucky clay (2) Silty clay loam (3) Silt loam (4) Sandy loam (5) Loamy sand
Drainage class	Poorly drained to very poorly drained
Soil depth	203 cm
Available water capacity (0-152.4cm)	12.57–20.83 cm
Calcium carbonate equivalent (10.2-101.6cm)	8–20%
Soil reaction (1:1 water) (0-101.6cm)	4.3–8.1
Subsurface fragment volume <=3" (0-101.6cm)	0–7%
Subsurface fragment volume >3" (0-101.6cm)	0–1%

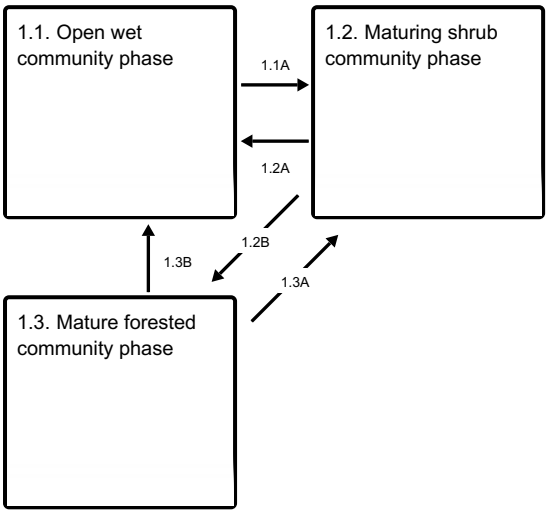
Ecological dynamics

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1A - Ponding frequency and duration decreases

1.2A - Ponding frequency and duration increases

1.2B - Very infrequent flooding

1.3B - Ponding frequency and duration increases dramatically

1.3A - Ponding frequency and duration increases moderately

State 1
Reference State

Reference State is a continuum of hydroperiod influenced vegetation where flooding frequency and duration drive vegetation communities. There are three distinct phases, each being stable within a window of hydroperiod variation. Sites on or near floodplains are most likely to be in phases 1.1 and 1.2 while sites farther from streams are more likely to be in phase 1.3. The higher the frequency and more prolonged the wetness the more likely the site will be a northern wet meadow 1.1 (dominantly sedges with sporadic willows and steeplebush). As wetness frequency and duration decreases the site will become a northern shrub thicket 1.2 and speckled alder (and tag alder) will appear and begin to dominate the vegetation. If a site has very low frequency flooding/ponding that is of short duration a Black ash/Balsam fir forest will likely form 1.3. This forested state can be described by the Kotar Wetland Forest Habitat Type Black ash-Balsam fir/Spotted Touch-me-not [FnAbI]. In some cases this forest will also include White cedar an associate, but deer browsing has limited the regeneration of this species in this MLRA.

Community 1.1
Open wet community phase

With frequent flooding and long durations of inundation this ES will exhibit as a northern wet meadow. The vegetation will be dominated by sedges and grasses with sporadic willows and steeplebush present. Willows can be quite extensive in these sites at times. As long as the hydroperiod is consistent this is a stable state. This phase may also include some isolated large shrubs or trees that persist from a previous phase with a different hydroperiod.

Community 1.2
Maturing shrub community phase

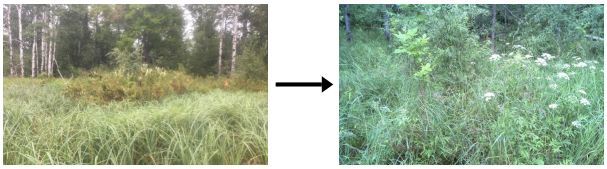
With moderate frequency of flooding with out very long durations of inundation a shrub thicket will form on these sites. The composition of the shrubs on these sites is often dominated by Tag and/or Speckled alder but willow may occur as well. As long as the hydroperiod is consistent this is a stable state. Some tree species may be present in

this phase as a site matures toward a forested phase. These trees may include trembling aspen and young Fraxinus spp. and Ulmus spp.

Community 1.3
Mature forested community phase

In the absence of frequent long duration flooding a wet forest community composed of Black ash and Balsam fir will dominate these sites. Common associates may include Sugar maple or Red maple, and American elm. White cedar is not common on these sites. Reproduction of Black ash is often very successful in these stands. A shrub layer may be present in this community phase as well. The shrub layer is often composed of Tag alder and Winterberry. Understory plant communities may be composed of many different species including sedges, grasses, and ferns. Dwarf raspberry and Touch-me-not are commonly present and skunk cabbage may be present if there is moving water (small streams). As long as flooding frequency and duration remain low this is a stable state.

Pathway 1.1A
Community 1.1 to 1.2



Open wet community phase

Maturing shrub community phase

This transition represents a decrease in hydroperiod where flooding frequency and duration decrease enough for Tag alder and Speckled alder to establish in what was previously open sedges with Steeplebush, and a few isolated Willows.

Pathway 1.2A
Community 1.2 to 1.1

Maturing shrub community phase

Open wet community phase

This transition represents an increase in the hydroperiod where flooding frequency and duration increase enough for Sedges to out compete Tag alder and Speckled alder. This could be done as a restoration effort if hydroperiod is controllable or the stream channel is made narrower causing increased frequency of flooding.

Pathway 1.2B
Community 1.2 to 1.3

Maturing shrub community phase

Mature forested community phase

This transition represents a decrease in hydroperiod where flooding frequency and duration decrease enough for Black ash and Balsam fir to establish and out compete Tag alder and Speckled alder. This ecosystem is stable with very infrequent and/or short duration flooding. Understory species will shift to Impatiens spp., sedges, and sometimes skunk cabbage. Sites where there is little deer browse may include White cedar as an associate.

Pathway 1.3B
Community 1.3 to 1.1

Mature forested community phase

Open wet community phase

This transition represents a dramatic increase in the hydroperiod where flooding frequency and duration increase enough for Sedges to out compete Black ash and Balsam fir. This could be done as a restoration effort if hydroperiod is controllable or the stream channel is made narrower causing increased frequency of flooding.

Pathway 1.3A
Community 1.3 to 1.2

Mature forested community phase

Maturing shrub community phase

This transition represents an increase in the hydroperiod where flooding frequency and duration increase enough for Tag alder and Speckled alder to outcompete Black ash and Balsam fir.

Additional community tables

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Approval

Chris Tecklenburg, 4/09/2020

Acknowledgments

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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	11/21/2024
Approved by	Chris Tecklenburg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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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):**

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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:**
