

Ecological site F088XY015MN

Loamy Upland Wet-Mesic Mixed Forest

Last updated: 8/12/2024

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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): 088X–Northern Minnesota Glacial Lake Basins

MLRA 88 consists of the lake beds of glacial Lakes Agassiz, Upham, and Aitkin. These vast glacial lake beds were formed by meltwaters associated with the last glaciation of the Wisconsin age. The large, flat, wet landscapes are filled with lacustrine lake sediments, wave-washed glacial till, and vast expanses of organic soils. This area is entirely in Minnesota and makes up about 11,590 square miles (30,019 square kilometers).

The western boundary of MLRA 88 with MLRA 56B is gradual. MLRA 56B is a portion of the Red River Valley that was formed by glacial Lake Agassiz and is dominantly prairie. The southern boundary of MLRA 88 with MLRA 57 consists of distinct moraines that formed from the glacial drift sediments of Late Wisconsin age. The eastern and southeastern boundaries are with portions of MLRAs 90A and 93A. These MLRAs are in a distinct glaciated region of sediments of the Rainy and Superior Lobes, and much of MLRA 93A is bedrock controlled (USDA-Ag Handbook 296, 2022).

Classification relationships

Relationship to Other Established Classifications:  
MN DNR Native Plant Community (MN DNR, 2003); the reference community of this Provisional Ecological Site is most similar to:  
MHn35 Northern Mesic Hardwood Forest

Ecological site concept

Loamy Upland Wet-Mesic Mixed Forest sites typically occur on flats, rises, and lake plains. These sites typically exist on soils with loamy textures of loam, sandy loam, sandy clay loam or fine sandy loam within a depth of 50 centimeters.

Associated sites

F088XY008MN	<div><div>Wet Mixed Forest</div><div>These sites occur on footslope and toeslope hillslope positions, drainageways surrounded by uplands or on the edge of uplands grading to very poorly drained peatland soils. These sites typically exist on loamy and occasionally sandy moraines and till plains. Parent material is calcareous fine to loamy textured glacial till, stratified material and occasionally sandy. Soils are somewhat poorly to poorly drained soils with grey soil color or grey-mottles shallow within the soil profile indicative of high local water tables.</div></div>
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Similar sites

F088XY014MN	<b>Clayey Upland Wet-Mesic Hardwood Forest</b> These sites occur on summit, shoulders and backslope hillslope positions on moraines and till plains, and occasionally on gentle to steeper sloping areas of glacial lake plains. These sites typically exist on soils with fine textured clayey and silty textures of clay, silty clay, silty clay loam, silt loam, very fine sandy loam or loamy very fine sand within a depth of 50 centimeters. The underlying parent material is generally fine or medium textured glacial till; or fine textured clayey or silty glacial lacustrine sediments with generally less than 5 percent rock fragments within a depth of 100 centimeters. .
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**Table 1. Dominant plant species**

Tree	(1) <i>Acer saccharum</i> (2) <i>Tilia americana</i>
Shrub	(1) <i>Cornus</i> (2) <i>Corylus cornuta</i>
Herbaceous	(1) <i>Aralia nudicaulis</i> (2) <i>Eurybia macrophylla</i>

## Physiographic features

Loamy Upland Wet-Mesic Mixed Forest sites are level to gently sloping sites occur on flats, rises, and lake plains. These sites are not prone to flooding or ponding, though the water table is typically present within 40 inches of the surface.

**Table 2. Representative physiographic features**

Slope shape across	(1) Linear
Slope shape up-down	(1) Convex
Landforms	(1) Flat (2) Rise (3) Lake plain
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	244–521 m
Slope	0–3%
Ponding depth	0 cm
Water table depth	46–99 cm
Aspect	Aspect is not a significant factor

## Climatic features

The average annual precipitation is 25 to 28 inches (635 to 711 millimeters). Most of the rainfall comes from convective thunderstorms during the growing season. Snowfall generally occurs from October through April. The average annual temperature is 43 to 46 degrees F (6 to 8 degrees C). The mean frost free period ranges from 82 to 110 days, with the mean freeze-free period ranging from 116 to 136 days.

**Table 3. Representative climatic features**

Frost-free period (characteristic range)	82-110 days
Freeze-free period (characteristic range)	116-136 days
Precipitation total (characteristic range)	635-711 mm

Frost-free period (actual range)	75-112 days
Freeze-free period (actual range)	114-141 days
Precipitation total (actual range)	610-711 mm
Frost-free period (average)	97 days
Freeze-free period (average)	127 days
Precipitation total (average)	660 mm

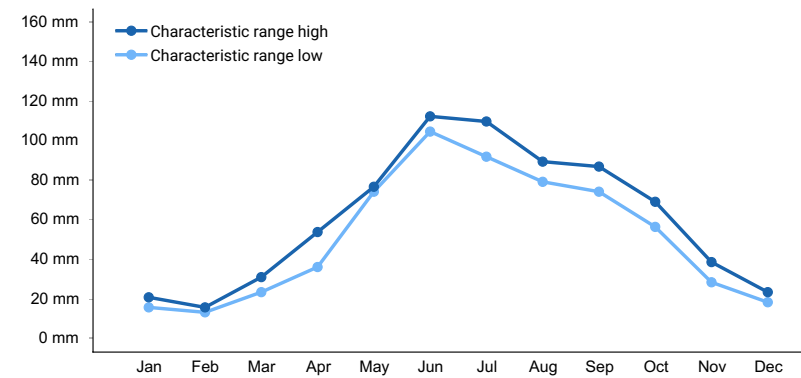


Figure 1. Monthly precipitation range

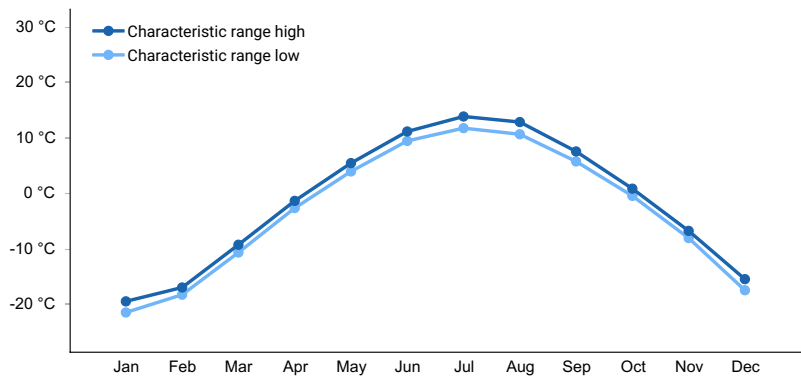


Figure 2. Monthly minimum temperature range

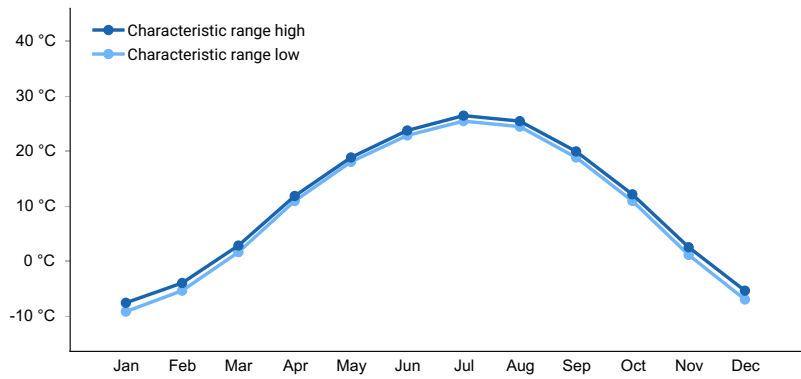
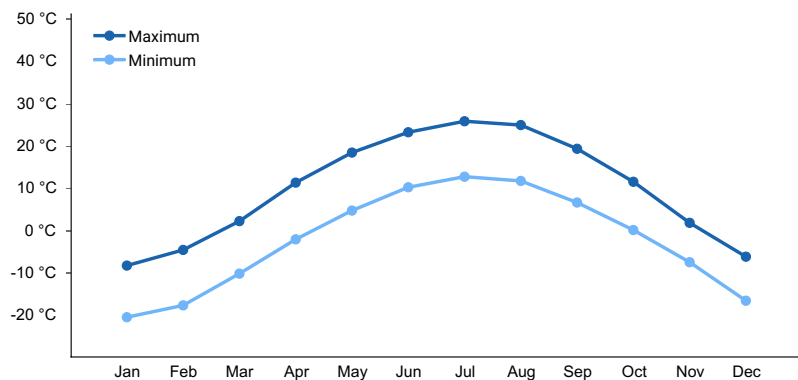
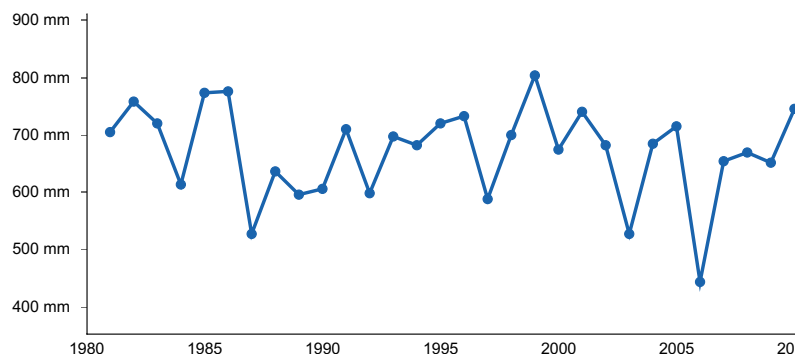


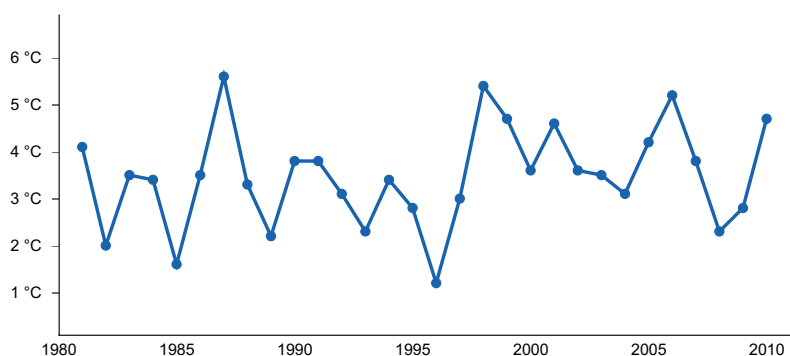
Figure 3. Monthly maximum temperature range



**Figure 4. Monthly average minimum and maximum temperature**



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) EVELETH WWTP [USC00212645], Eveleth, MN
- (2) HIBBING CHISHOLM HIBBING AP [USW00094931], Hibbing, MN
- (3) FLOODWOOD 3 NE [USC00212842], Floodwood, MN
- (4) SANDY LAKE DAM LIBBY [USC00217460], McGregor, MN
- (5) GRAND RPDS FOREST LAB [USC00213303], Grand Rapids, MN
- (6) POKEGAMA DAM [USC00216612], Cohasset, MN
- (7) INTL FALLS INTL AP [USW00014918], International Falls, MN
- (8) LITTLEFORK 10 SW [USC00214809], Big Falls, MN
- (9) WASKISH 4NE [USC00218700], Big Falls, MN
- (10) RED LAKE INDIAN AGCY [USC00216795], Ponemah, MN
- (11) BAUDETTE INTL AP [USW00094961], Baudette, MN
- (12) CAMP NORRIS DNR [USC00211250], Beltrami Isl State for, MN
- (13) WARROAD [USC00218679], Warroad, MN

## Influencing water features

This site does not receive excess water from adjacent uplands, nor does water runoff this site. This site typically has

a water table within 40 inches of the soil surface.

## Soil features

These sites typically exist on soils with loamy textures of loam, loamy sand, loamy fine sand, very fine sandy loam, silt loam, sandy loam, sandy clay loam, loam very fine sand, sandy clay loam, or fine sandy loam within a depth of 50 centimeters. The underlying parent material is generally medium textured till, sandy loam till or stratified materials with generally less than 35 percent rock fragments within a depth of 100 centimeters.

Soils in the Loamy Upland Wet-Mesic Mixed Forest fall within the Alfisol, Entisol, Inceptisol, and Mollisol orders.

Prominent soil series within this ecological site include Little Swan, Garnes, Baudette, Ricelake, Vasso, and Eckvoll.

**Table 4. Representative soil features**

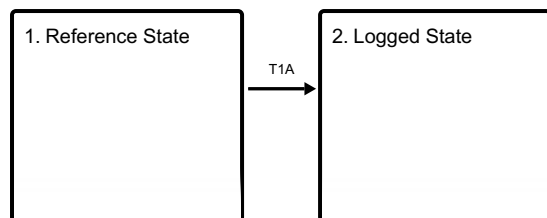
Parent material	(1) Glaciolacustrine deposits (2) Till (3) Outwash
Surface texture	(1) Loamy sand (2) Silt loam (3) Fine sandy loam (4) Loamy fine sand (5) Very fine sandy loam (6) Sandy loam (7) Loam (8) Loamy very fine sand (9) Sandy clay loam (10) Loamy sand
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Moderately slow to moderately rapid
Depth to restrictive layer	0 cm
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	8.38–18.8 cm
Soil reaction (1:1 water) (0-25.4cm)	5.6–7.3
Subsurface fragment volume <=3" (0-203.2cm)	0–6%
Subsurface fragment volume >3" (0-203.2cm)	0–2%

## Ecological dynamics

Plant communities typically dominated by sugar maple, basswood, balsam fir, white spruce, and northern red oak, or mixtures of paper birch, sugar maple, basswood, and quaking aspen. Understory typically includes sugar maple saplings as well as beaked hazelnut, chokecherry, pagoda dogwood, fly honeysuckle, and balsam fir; with the forb layer including wild sarsaparilla, large leaf aster, mountain rice grass, and rose twisted stalk to mention a few.

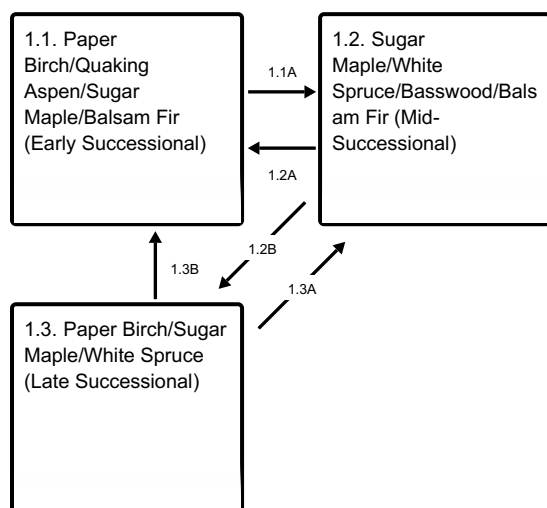
## State and transition model

## Ecosystem states



**T1A** - Mechanical removal of tree species for timber harvest.

## State 1 submodel, plant communities



**1.1A** - Lack of fire/blow downs (35-95 years)

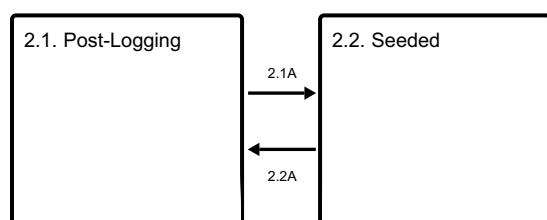
**1.2A** - Increased low intensity fire frequency and blow downs (<35 years)

**1.2B** - Lack of fire/blow downs (95-195 years)

**1.3B** - Stand replacing fire

**1.3A** - Increased low intensity fire frequency and blow downs (<95 years)

## State 2 submodel, plant communities



**2.1A** - Planting of desired species and herbicide use.

**2.2A** - Harvest of tree species upon desired growth stage.

## State 1 Reference State

The reference state of the ecological site consists of three forested plant communities in varying successional levels.

## Dominant plant species

- sugar maple (*Acer saccharum*), tree
- white spruce (*Picea glauca*), tree
- balsam fir (*Abies balsamea*), tree
- paper birch (*Betula papyrifera*), tree

- northern red oak (*Quercus rubra*), tree

## **Community 1.1**

### **Paper Birch/Quaking Aspen/Sugar Maple/Balsam Fir (Early Successional)**

Young forests recovering from fire or wind, notable quaking aspen dominance (0-55 years).

#### **Dominant plant species**

- paper birch (*Betula papyrifera*), tree
- quaking aspen (*Populus tremuloides*), tree
- sugar maple (*Acer saccharum* var. *saccharum*), tree
- balsam fir (*Abies balsamea*), tree

## **Community 1.2**

### **Sugar Maple/White Spruce/Basswood/Balsam Fir (Mid-Successional)**

A transitional period marked with a decline in quaking aspen stand replacement. Along with development of understory coniferous species (55-95 years).

#### **Dominant plant species**

- sugar maple (*Acer saccharum*), tree
- white spruce (*Picea glauca*), tree
- American basswood (*Tilia americana*), tree
- balsam fir (*Abies balsamea*), tree

## **Community 1.3**

### **Paper Birch/Sugar Maple/White Spruce (Late Successional)**

Mature forest with prominent mixed canopy (95+ years).

#### **Dominant plant species**

- paper birch (*Betula papyrifera*), tree
- sugar maple (*Acer saccharum*), tree
- white spruce (*Picea glauca*), tree

## **Pathway 1.1A**

### **Community 1.1 to 1.2**

Lack of fire/blow downs (35-95 years)

## **Pathway 1.2A**

### **Community 1.2 to 1.1**

Increased low intensity fire frequency and blow downs (<35 years)

## **Pathway 1.2B**

### **Community 1.2 to 1.3**

Lack of fire/blow downs (95+ years)

## **Pathway 1.3B**

### **Community 1.3 to 1.1**

Stand replacing fire

## **Pathway 1.3A**

### **Community 1.3 to 1.2**

Increased low intensity fire frequency and blow downs (<95 years)

## **State 2**

### **Logged State**

Removal of tree species for timber harvest leaves an open canopy with very disturbed understory vegetation. Shrubs dominate immediately post logging and often prevent trees from re-establishing quickly.

#### **Dominant plant species**

- speckled alder (*Alnus incana ssp. rugosa*), shrub
- serviceberry (*Amelanchier*), shrub
- bunchberry dogwood (*Cornus canadensis*), shrub

## **Community 2.1**

### **Post-Logging**

Removal of tree species for timber harvest leaves an open canopy with very disturbed understory vegetation. Shrubs dominate immediately post logging and often prevent tree's from re-establishing quickly.

#### **Dominant plant species**

- speckled alder (*Alnus incana ssp. rugosa*), shrub
- serviceberry (*Amelanchier*), shrub
- bunchberry dogwood (*Cornus canadensis*), shrub

## **Community 2.2**

### **Seeded**

Reseeded to a forested site with desired timber species.

#### **Dominant plant species**

- red pine (*Pinus resinosa*), tree
- eastern white pine (*Pinus strobus*), tree

## **Pathway 2.1A**

### **Community 2.1 to 2.2**

Planting of desired species for future timber harvest and herbicide use to prevent shrubs from dominating.

## **Pathway 2.2A**

### **Community 2.2 to 2.1**

Harvest of tree species upon desired growth stage.

## **Transition T1A**

### **State 1 to 2**

Mechanical removal of tree species for timber harvest.

## **Additional community tables**

## **Inventory data references**

Information presented was derived from Minnesota Department of Natural Resources Field Guide to the Native



Plant Communities of Minnesota, USDA-NRCS soil survey information, and USDA Plants Database.

## Other references

Cleland, D.T.; Freeouf, J.A.; Keys, J.E., Jr.; Nowacki, G.J.; Carpenter, C; McNab, W.H. 2007. Ecological Subregions: Sections and Subsections of the Conterminous United States.[1:3,500,000], Sloan, A.M., cartog. Gen. Tech. Report WO-76. Washington, DC: U.S. Department of Agriculture, Forest Service.

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U.S. Environmental Protection Agency. 2013. Level III and IV ecoregions of the continental United States: Corvallis, Oregon, U.S. EPA, National Health and Environmental Effects Research Laboratory, map scale 1:3,000,000, <https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states>.

## Contributors

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## Approval

Suzanne Mayne-Kinney, 8/12/2024

## 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	08/12/2024
Approved by	Suzanne Mayne-Kinney
Approval date	

## 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):**
- 

14. **Average percent litter cover (%) and depth ( in):**
- 

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:**
-