

Ecological site F088XY013MN

Dry Sandy Upland Coniferous Forest

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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).

Ecological site concept

This site is a dry jack pine-red pine woodland and located on outwash plains and moraines. Soils are course textured, well drained to excessively drained, and have a low available water capacity. Historically, fire was a common disturbance that influenced plant community composition.

Associated sites

F088XY012MN	Very Dry Sandy Upland Coniferous Forest The Very Dry Sandy Upland Coniferous Forest ecological site is located on uplands with soils that are course textured and moderately well drained to somewhat excessively drained. Available water capacity ranges from 2-5 inches. The depth to water table is deeper in the very Dry Sandy Upland Coniferous Forest.
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Similar sites

F088XY012MN	Very Dry Sandy Upland Coniferous Forest The Very Dry Sandy Upland Coniferous Forest ecological site is located on uplands with soils that are course textured and moderately well drained to somewhat excessively drained. Available water capacity ranges from 2-5 inches. The depth to water table is deeper in the very Dry Sandy Upland Coniferous Forest.
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Table 1. Dominant plant species

Tree	(1) <i>Pinus banksiana</i> (2) <i>Pinus resinosa</i>
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Shrub	(1) <i>Vaccinium angustifolium</i> (2) <i>Amelanchier</i>
Herbaceous	(1) <i>Maianthemum canadense</i> (2) <i>Pteridium aquilinum</i>

Physiographic features

This upland site is commonly located on flats, dunes, and outwash plains. No flooding or ponding occurs. The available water capacity ranges from 1.7 - 4.3 inches (4 - 11 centimeters).

Table 2. Representative physiographic features

Slope shape across	(1) Linear
Slope shape up-down	(1) Convex
Landforms	(1) Flat (2) Dune (3) Outwash plain
Runoff class	Very low to low
Flooding frequency	None
Ponding frequency	None
Elevation	180 – 620 m
Slope	0 – 10 %
Ponding depth	0 cm
Water table depth	70 – 110 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 86 to 110 days, with the mean freeze-free period ranging from 117 to 135 days.

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)	640-710 mm
Frost-free period (actual range)	80-110 days
Freeze-free period (actual range)	110-140 days
Precipitation total (actual range)	610-710 mm
Frost-free period (average)	100 days
Freeze-free period (average)	130 days
Precipitation total (average)	660 mm

- (1) INTL FALLS INTL AP [USW00014918], International Falls, MN
- (2) LITTLEFORK 10 SW [USC00214809], Big Falls, MN
- (3) BIG FALLS [USC00210746], Big Falls, MN
- (4) WASKISH 4NE [USC00218700], Big Falls, MN
- (5) RED LAKE INDIAN AGCY [USC00216795], Ponemah, MN
- (6) CAMP NORRIS DNR [USC00211250], Beltrami Isl State for, MN
- (7) BAUDETTE INTL AP [USW00094961], Baudette, MN
- (8) WARROAD [USC00218679], Warroad, MN
- (9) EVELETH WWTP [USC00212645], Eveleth, MN
- (10) HIBBING CHISHOLM HIBBING AP [USW00094931], Hibbing, MN
- (11) FLOODWOOD 3 NE [USC00212842], Floodwood, MN
- (12) SANDY LAKE DAM LIBBY [USC00217460], McGregor, MN
- (13) GRAND RPDS FOREST LAB [USC00213303], Grand Rapids, MN
- (14) POKEGAMA DAM [USC00216612], Cohasset, MN
- (15) LEECH LAKE [USC00214652], Bena, MN

Influencing water features

This site is not influenced by riparian and wetland features. This site is characterized by dry soil conditions.

Soil features

Soils in this site are coarse textured, moderately well-drained, and very deep. These soils formed in glaciolacustrine or glaciofluvial deposits and eolian sand parent material. Soils in this site have relatively low available water capacity.

Soil series in the Dry Sandy Upland Coniferous Forest ecological site fall within the Alfisol, Entisol, and Mollisol orders. These soils can be further classified as Aquic Hapludalfs, Aquic Udipsamments, Lamellic Udipsamments, Oxyaquic Udipsamments, Typic Udipsamments, Aeris Calciaquolls, Entic Hapludolls, and Oxyaquic Hapludolls.

Dominant soil series in this site include Hiwood, Guida, Karlstad, Wurtsmith, Westoo, and Lavell.

Table 4. Representative soil features

Parent material	(1) Glaciolacustrine deposits (2) Eolian sands (3) Glaciofluvial deposits
Surface texture	(1) Loamy fine sand (2) Loamy sand (3) Fine sand
Drainage class	Moderately well drained
Permeability class	Rapid
Depth to restrictive layer	200 cm
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	4.32 – 10.92 cm
Soil reaction (1:1 water) (0-25.4cm)	4.5 – 6.5
Subsurface fragment volume <=3" (0-203.2cm)	Not specified
Subsurface fragment volume >3" (0-203.2cm)	Not specified

Ecological dynamics

This site is a dry jack pine-birch woodland. Fire was a historical disturbance that influenced plant species composition. Young woodlands post-fire are dominated by jack pine and paper birch. Mature woodlands are pine dominated with an understory variability dependent upon the fire regime. (MN DNR, 2005)

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 (%)
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Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 2.2 plant community composition

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

This is a provisional ecological site, and as such no field plots were inventoried for this project. A review of the scientific literature and expert opinion was used to develop the plant communities and ecological dynamics contained within the state and transition model. Future field verification is needed to refine the plant communities and ecological dynamics described in this ecological site description.

Other references

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Approval

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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	08/31/2026
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:

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:
