

Ecological site F057XY023MN

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): 057X–Northern Minnesota Gray Drift

The Northern Minnesota Gray Drift (57) is located within the Northern Lakes Forest and Forage Region. This area is entirely in north-central Minnesota and makes up about 9,785 square miles (Figure 1). The entire area is covered by Wisconsin-age glacial drift. The glacial deposits are from four major ice lobes-Des Moines, Rainy, Superior, and Wadena. The landscape developed through a series of glaciations and the subsequent retreating and wasting of the ice sheets, which resulted in a complex pattern of moraines, outwash plains, drumlins, lake plains and drainages. Lakes, ponds and marshes are common. The thickness of the glacial till ranges from 90 to 185 meters. Some areas of these deposits are overlain by outwash or lacustrine sediments. Some depressional areas have an accumulation of organic matter. The organic deposits are more than 2.5meters thick in some areas. Elevation ranges from 300 to 500 meters across the area. (USDA-NRCS 2006) The dominant soil orders in this MLRA are Alfisols, Entisols, and Histisols, with some Mollisols in the westernmost part of the area. The soils in the area have a frigid soil temperature regime; aquic or udic soil moisture regime, and mixed mineralogy. Their natural drainage class is related to landscape position. In general, the Alfisols formed in till on moraines, Entisols formed in outwash on moraines and outwash plains, and Histosols formed in organic material over outwash or till on moraines or outwash plains. (USDA-NRCS 2006)

Classification relationships

Major Land Resource Area (MLRA): Northern Minnesota Gray Drift (57) (USDA Handbook 296, 2006) USFS Subregions: Northern Minnesota Drift & Lake Plain Section (212N); Chippewa Plains Subsection (212Na), Pine Moraines & Outwash Plains Subsections (212Nc), St. Louis Moraines Subsection (212Nb); Minnesota & NE Iowa Morainal Section (222M); Hardwood Hills Subsection (222Ma); Northern Superior Uplands Section (212L); Nashwauk Uplands Subsection (212Lc); Northern Minnesota & Ontario Peatlands Section (212M); Littlefork-Vermillion Uplands Subsection (212Ma) (Cleland et al. 2007). US EPA Level IV Ecoregion: Itasca and St. Louis Moraines (50q); Chippewa Plains (50r); Nashwauk/Marcell Moraines and Uplands (50s); Alexandria Moraines and Detroit Lakes Outwash Plain (51j); McGrath Till Plain and Drumlins (51k); Wadena/Todd Drumlins and Osakis Till Plain (51l)(U.S. Environmental Protection Agency, 2013)

Ecological site concept

Dry Sandy Upland Coniferous Forest are widespread throughout the entire MLRA 57, and typically occur on summit, shoulders and backslope hillslope positions on outwash plains and dune fields. These sites typically exist on soils with coarser textures of sand, coarse sand, loamy sand, loamy coarse sand, fine sand, or loamy fine sand within a depth of 50 centimeters.

Associated sites

F057XY017MN	Steep Loamy Upland Forest These sites occur on shoulders and backslope hillslope positions with slopes greater than 15 percent on outwash plains and moraines. These sites typically exist on soils with sandy textures of sand, coarse sand, loamy sand, loamy coarse sand, fine sand, or loamy fine sand within a depth of 50 centimeters. The underlying material is generally coarse textured and generally has 0 to 35 percent rock fragments, but areas of sand capped glacial till can be included.
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F057XY015MN	Wet Mixed Forest 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.
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Similar sites

F057XY022MN	Sandy Upland Moist Mixed Forest These sites occur on summit, shoulders and backslope hillslope positions on outwash plains, moraines and till plains. These sites typically exist on soils with medium textures of sandy loam, fine sandy loam or loam within a depth of 50 centimeters but can also include very fine sandy loam or loamy very fine sand in some cases. The underlying material is coarse textured and generally has 5 to 35 percent rock fragments.
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Table 1. Dominant plant species

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

Physiographic features

Dry Sandy Upland Coniferous Forest are widespread throughout the entire MLRA 57, and typically occur on summit, shoulders and backslope hillslope positions on outwash plains and dune fields.

Table 2. Representative physiographic features

Hillslope profile	(1) Summit (2) Shoulder (3) Backslope
Landforms	(1) Dune field (2) Outwash plain (3) Hillslope
Runoff class	Very low to medium
Flooding frequency	None

Ponding frequency	None
Elevation	180 – 620 m
Slope	0 – 20 %
Water table depth	130 cm
Aspect	Aspect is not a significant factor

Climatic features

In general, MLRA 57 has cold winters and warm summers. About 65 percent of the annual precipitation falls as rain during the 5-month growing season (May through September), and an additional 18 percent falls as snow. The freeze-free period averages 150 days and ranges from 120 to 175 days.

Table 3 Representative climatic features

Frost-free period (characteristic range)	100-110 days
Freeze-free period (characteristic range)	120-140 days
Precipitation total (characteristic range)	690-710 mm
Frost-free period (actual range)	90-110 days
Freeze-free period (actual range)	120-140 days
Precipitation total (actual range)	690-710 mm
Frost-free period (average)	100 days
Freeze-free period (average)	130 days
Precipitation total (average)	690 mm

- (1) WALKER AH GWAH CHING [USC00218618], Walker, MN
- (2) DEEP PORTAGE [USC00212050], Backus, MN
- (3) ITASCA UNIV OF MINN [USC00214106], Park Rapids, MN
- (4) BEMIDJI [USC00210643], Bemidji, MN
- (5) CASS LAKE [USC00211374], Cass Lake, MN

Influencing water features

None

Wetland description

Not Applicable

Soil features

The central concept soil series are Abbeylake, Clearriver, Eagleview and Zimmerman but other series are included. These sites typically exist on soils with coarser textures of sand, coarse sand, loamy sand, loamy coarse sand, fine sand, or loamy fine sand within a depth of 50 centimeters. The underlying material is generally coarse textured and generally has 0 to 35 percent rock fragments, but areas of sand capped glacial till can be included. Soils are moderately well to excessively drained with rust and gray redoximorphic features and or depth to seasonal water table between 50 to greater than 150 centimeters. In some areas the soil surface color is somewhat dark to very dark in the upper 25cm because of incorporated organic matter, which indicates that these site were formerly occupied by deciduous woodlands and prairies.

Table 4. Representative soil features

Parent material	(1) Outwash (2) Till
Surface texture	(1) Sand (2) Loamy coarse sand (3) Loamy fine sand
Drainage class	Moderately well drained to excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	200 cm
Surface fragment cover <=3"	0 – 10 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-381cm)	9.4 – 13.72 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 20 %

Soil reaction (1:1 water) (0-101.6cm)	3.5 – 7.8
Subsurface fragment volume <=3" (0-101.6cm)	0 – 30 %
Subsurface fragment volume >3" (0-101.6cm)	Not specified

Ecological dynamics

Dry Sandy Upland Coniferous Forest are widespread throughout the entire MLRA 57, and typically occur on summit, shoulders and backslope hillslope positions on outwash plains and dune fields. These sites typically exist on soils with coarser textures of sand, coarse sand, loamy sand, loamy coarse sand, fine sand, or loamy fine sand within a depth of 50 centimeters. The underlying material is generally coarse textured and generally has 0 to 35 percent rock fragments, but areas of sand capped glacial till can be included. Soils are moderately well to excessively drained with rust and gray redoximorphic features and or depth to seasonal water table between 50 to greater than 150 centimeters. In some areas the soil surface color is somewhat dark to very dark in the upper 25cm because of incorporated organic matter, which indicates that these site were formerly occupied by deciduous woodlands and prairies.

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

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. 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: FDn12 (a or b) Northern Dry-Sand Pine woodland FDc12 Central Poor Dry Pine Woodland FDn33 Northern Dry-Mesic Mixed Woodland (dunes, sand cap glacial tills and glossics) FDc23 Central Dry Pine Woodland (darkened surface due to prairie influence) FDc34 Central Dry-Mesic Pine-Hardwood Forest (sand cap or glossic)

Other references

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USDA, NRCS. 2018. The PLANTS Database (<http://plants.usda.gov>, 27 March 2018). National Plant Data Team, Greensboro, NC 27401-4901 USA.

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, 10/03/2023

Acknowledgments

MLRA 57 technical team completed in 2022.

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	09/16/2026
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:
