

Ecological site F143XY502ME

Loamy Till Toeslope

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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): 143X–Northeastern Mountains

MLRA 143, known as the Northeastern Mountains, covers approximately 23 million acres of mountains, hills, and valleys in northern Maine, New Hampshire, Vermont, New York, and Massachusetts. The area is sparsely populated, with less than five percent of the land area developed for agriculture, residential, and urban development. About 90 percent of the area is forested, most of which is actively managed for timber. Elevations are mostly between 1,000 to 4,000 feet, with a few isolated peaks more than 5,000 feet above sea level. The present day mountains are but remnants of a much larger ancient range that has been eroding for approximately 500 million years. Bedrock consists of mostly very old metamorphic rock (gneiss, schist, slate, marble, quartzite, etc.) with younger intrusions of igneous rock (e.g. granite and granodiorite) from the Triassic and Cretaceous periods. MLRA 143 differs somewhat geologically from its neighboring MLRAs (142, 144A, 144B, 145, and 146), which have greater amounts of nutrient-rich sedimentary rock. Compared to MLRA 143, they are all lower in elevation, with longer growing seasons large areas that were once submerged by the ocean following glaciation.

The characteristic landforms and soils of northern New England were derived from the massive continental ice sheet that engulfed the region during North America's most recent glaciation. Mighty glaciers, embedded with sediment and rock fragments, scoured bedrock and compacted mineral beds in a steady march south and east toward the Atlantic Ocean. The softer sedimentary rocks were pulverized into fine silts and clays under the immense weight of ice a mile thick, while the more resistant igneous and metamorphic rocks were sculpted into steep mountains and hills or plucked and dragged along the base of the glacier. With a warming climate, the ice retreated northward, depositing a thin layer of unsorted glacial till sediment atop the newly-exposed bedrock and compacted mineral beds. Deeper mounds of unsorted till formed small hills, kames, moraines and drumlins. Enormous chunks of ice detached as the glacier retreated, melting slowly in place and forming many kettle lakes and basins where water and fine sediments collect. Raging torrents of glacial meltwater dissected much of the barren landscape, entraining coarse and fine sediments, carving river valleys, and leaving well-sorted deposits of mostly sand and gravel along the watercourse. By 10,000 years ago the ice sheet had fully receded from MLRA 143. Silty floodplains developed along perennial rivers, many of which occupy the same channels that once gushed with sediment-rich glacial meltwater. Over time, wet basins accumulated fine sediment, some dried out, and still others became acidified by organic matter inputs from colonizing vegetation.

In terms of climate, MLRA 143 is distinguished from neighboring MLRAs by a shorter growing season and the occurrence of cryic soil temperature regimes at high elevations. The majority of MLRA 143 averages 32 to 44 inches of precipitation annually with a five to six month growing season and frigid winter temperatures. However, the higher elevations may receive up to double the annual precipitation of the lower elevations, and have a three to four month growing season with extremely cold winters. As the northernmost MLRA in the region with the coldest temperatures and shortest growing season, the Northeastern Mountains have less overall tree diversity, fewer pine and oak trees, and more abundant spruce and fir trees than neighboring MLRAs.

Classification relationships

This site occurs in Ecological Site Group 5 (Loamy Forests) of MLRA 143 (The Northeastern Mountains), in the Northeastern Forage and Forest Region (Land Resource Region R).

The Northeastern Forage and Forest LRR includes all of Maine, New Hampshire, Vermont, Rhode Island, and Connecticut, as well as large portions of Massachusetts, New York, New Jersey, Pennsylvania, and Ohio. Its southern boundary marks the extent of the Wisconsin ice sheet, which engulfed the entire LRR as recently as 10,000 to 15,000 years ago. Erosional and depositional processes associated with glaciation created many of the topographic patterns that distinguish MLRAs within the Northeastern region. Harder granitic and metamorphic bedrock to the north were more resistant to glacial erosion, resulting in the relatively nutrient poor mountains of MLRA 143; whereas nutrient-rich sedimentary bedrock of MLRAs 139, 140, and 146 resulted in relatively flat, fertile landscapes ideal for cultivation. Other areas were depressed below sea-level by the sheer mass of the glacier, resulting in pockets of marine sediments which distinguish MLRAs 142, 144A, 144B, and 145.

Precipitation is sufficient to support productive forestland throughout the Northeastern region. Still, a latitudinal temperature gradient from mesic to frigid soil temperatures results in a general transition from central hardwoods and pine in the southern MLRAs to northern hardwoods and spruce-fir forests farther north (no true boreal forests exist in the region). Elevations are generally low throughout the Northeastern region, with the exception of MLRA 143 which has many high mountain ecosystems with cryic temperature regimes and alpine vegetation above the tree line.

Ecological site concept

This site occurs on gentle foot and toe slopes (0-15%) at the base of watersheds where water and nutrients accumulate near slope breaks. Soils are underlain by a densely compacted till layer within 43 inches of the soil surface, which perches water and nutrients in the plant rooting zone. Occasionally groundwater seeps out at the surface, leaving rivulets as useful site indicators. The resulting plant community is highly-productive and most commonly dominated by northern hardwoods, though red spruce and balsam fir are often abundant, particularly in flatter areas. Abundant yellow birch is a good indicator of this site.

Associated sites

F143XY503ME	Loamy Flat The Loamy Flat site occurs downslope in the watershed from the Loamy Till Toeslope on flatter landscape positions where water is more stagnant.
F143XY301ME	Loamy Till Swamp (Northern White Cedar) The Loamy Till Swamp site occurs lower in the watershed than the Loamy Till Toeslope site. The two sites occur together along a soil drainage gradient from somewhat poorly- to poorly- and very poorly-drained.
F143XY504ME	Enriched Loamy Cove The Enriched Loamy Cove site is richer than the Loamy Till Toeslope, and occurs in areas where the most amount of nutrients accumulate, such as small drainageways.
F143XY501ME	Loamy Slope The Loamy Slopes site often occurs upslope of the Loamy Till Toeslope, which receives extra water and nutrients from above, enriching the toeslope soils somewhat.

Similar sites

F143XY503ME	Loamy Flat The Loamy Flat site and Loamy Till Toeslopes site share many of the same soils, but Loamy Flats occur on flatter areas grading into wetlands and produce spruce-fir forests, whereas the Loamy Till Toeslope occurs at the base of slopes and produces semi-rich mixedwood forests.
F143XY504ME	Enriched Loamy Cove The Enriched Loamy Cove site occurs along drainageways, produces hardwood forests (typically with white ash, yellow birch, sugar maple, and/or beech), has a thick dark soil surface horizon, and has rich site indicators. By contrast, the Loamy Till Toeslope occurs at the base of slopes and produces semirich hardwood or mixedwood stands.

F143XY501ME	Loamy Slope The Loamy Slopes site is predominantly well and moderately well-drained soils (sometimes with somewhat poorly-drained inclusions) that produce mostly northern hardwoods, whereas the Loamy Till Toeslopes site consists of somewhat poorly- to poorly drained soils and can produce more mixedwood stands.
F143XY702ME	Shallow And Moderately Deep Till The Shallow and Mod-deep Till site produces mixedwood communities similar to Loamy Till Toeslope, but typically occurs on hill shoulder positions and other well- to excessively-drained areas rather than somewhat poorly and poorly-drained toeslopes positions. Shallow and Mod-deep Till refers to bedrock within 40 inches of the soil surface, whereas Loamy Till Toeslope lacks bedrock and has a dense soil horizon within 43 inches of the soil surface.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site is found at the base of large watersheds, typically on toeslopes of hills as they transition to till plains. A seasonally high water table can be found between 6 and 22 inches below the soil surface from November to May. This site has sufficient water and nutrients in the soil to be highly productive. It occurs from sea level to 2500 feet in elevation.

Table 2. Representative physiographic features

Landforms	(1) Drumlin (2) Hill (3) Till plain
Flooding frequency	None
Ponding frequency	None
Elevation	0–2,500 ft
Slope	0–15%
Water table depth	6–22 in
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is typical of MLRA 143, with very cold snowy winters, warm rainy summers, and a relatively short growing season. Precipitation is fairly constant from month to month and averages about 45 inches annually. Growing degree days ranges from 104-132 days from June to September.

Table 3. Representative climatic features

Frost-free period (average)	104 days
Freeze-free period (average)	132 days
Precipitation total (average)	45 in

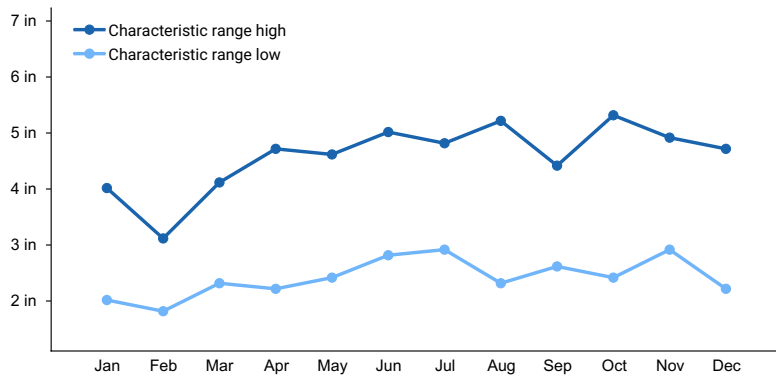


Figure 1. Monthly precipitation range

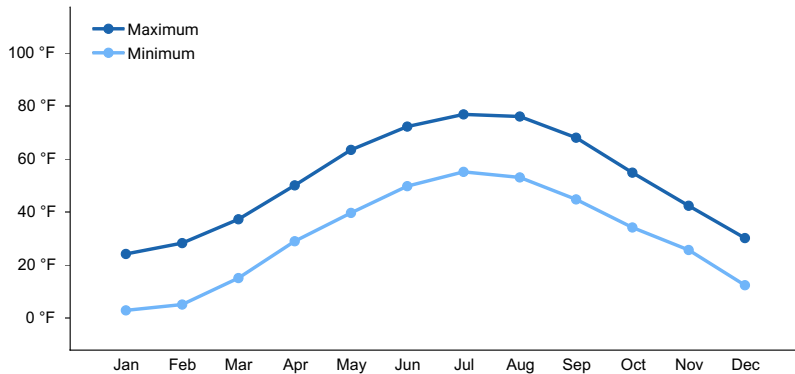


Figure 2. Monthly average minimum and maximum temperature

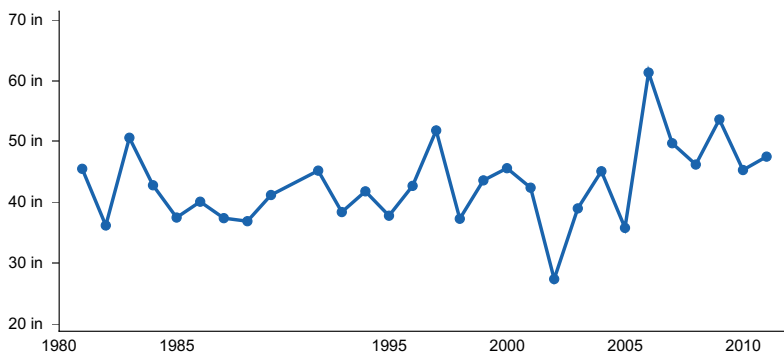


Figure 3. Annual precipitation pattern

Climate stations used

- (1) JACKMAN [USC00174086], Jackman, ME
- (2) RANGELEY 2 NW [USC00177039], Rangeley, ME
- (3) BARNARD [USC00170398], Brownville, ME
- (4) GRAND LAKE STREAM [USC00173261], Northern Washington Co, ME

Influencing water features

This site is not typically influenced by streams or wetlands.

Soil features

The soils of this site are typically an association of poorly- and somewhat poorly-drained lodgment till. They are characterized by a densely-compacted layer within 10 to 43 inches of the soil surface. Textures range from silt loam to fine sandy loam on the surface, with few rock fragments throughout the profile.

The soil surface is typically pit-and-mound formed by tree roots excavating small depressions in the soil when trees

tip over, depositing a mound of soil next to the pit. Often the pits are poorly-drained with gleyed grey colors near the soil surface, while the mounds are somewhat poorly-drained with redoximorphic features above the dense layer. Soil pH is typically 4.5 to 6.0, and 3.2 to 6.5 at the extremes.

Table 4. Representative soil features

Parent material	(1) Lodgment till–granite (2) Till–phyllite
Surface texture	(1) Silt loam (2) Fine sandy loam (3) Loam
Family particle size	(1) Loamy
Drainage class	Poorly drained to somewhat poorly drained
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–2%
Available water capacity (0-40in)	2.6–11 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	3.2–6.5
Subsurface fragment volume <=3" (Depth not specified)	4–10%
Subsurface fragment volume >3" (Depth not specified)	0–6%

Ecological dynamics

This site is dominated by northern hardwoods and can be co-dominant with conifers, particularly red spruce. Yellow birch is a good site indicator, and red and sugar maples are often dominant.

Treethrow and logging are the most common disturbances on this site. The site is resilient following these disturbances and succeeds through an herbaceous and shrubby phase prior to tree establishment and eventual return to the reference community. The young forest stands include several species not typically dominant in the reference community, including grey and white birch, aspen, balsam fir, etc. After about 80-100 years these species die out and the reference community species retain dominance.

This site may be cultivated for crop or pasture. When cropland or pastureland management ceases, the site either returns to northern hardwoods or may transition to a white pine forest. Once white pine is established, it tends to form a single age stand with low diversity and little understory.

State and transition model

F143XY502ME – Loamy Till Toeslope

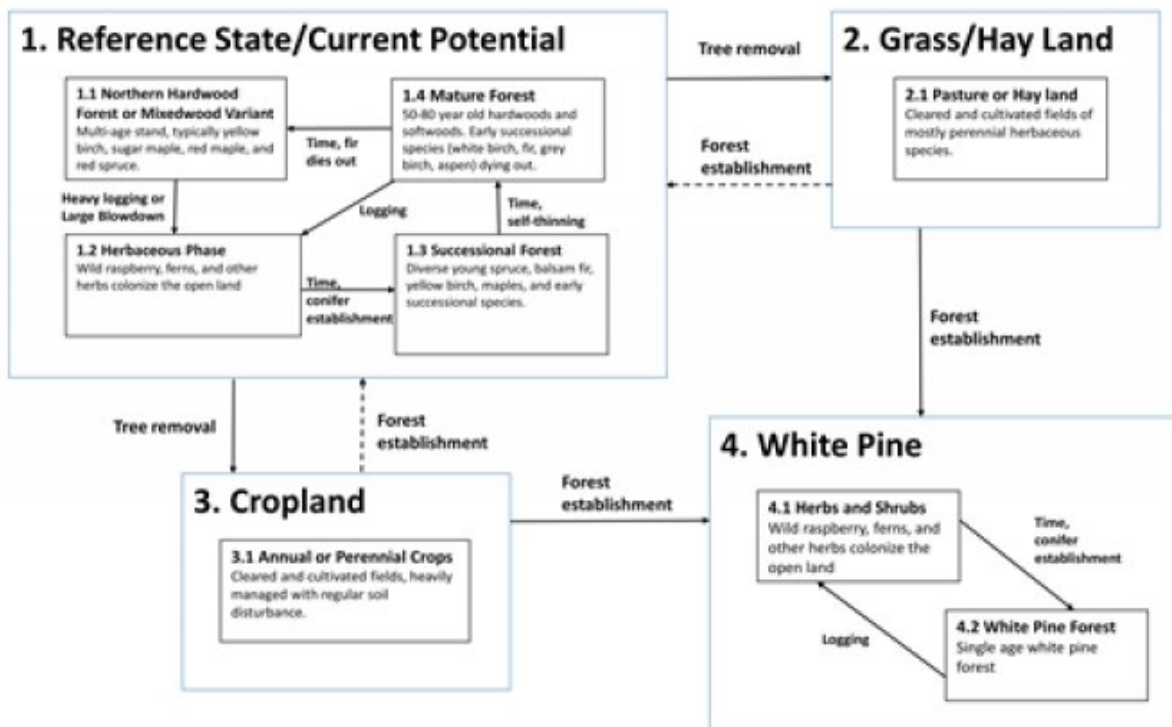


Figure 5. STM

Inventory data references

Future work is needed, as described in a future project plan, to validate the information presented in this provisional ecological site description. Future work includes field sampling, data collection and analysis by qualified vegetation ecologists and soil scientists. As warranted, annual reviews of the project plan can be conducted by the Ecological Site Technical Team. A final field review, peer review, quality control, and quality assurance reviews of the ESD are necessary to approve a final document.

Other references

Barton, A. M., A. S. White, and C. V. Cogbill. 2012. *The Changing Nature of the Maine Woods*. University Press of New England, Lebanon, NH.

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Sperduto, D. and B. Kimball. 2011. *The Nature of New Hampshire: Natural Communities of the Granite State*. The Nature Conservancy and The New Hampshire Heritage Bureau. University Press of New England, Lebanon, NH.

Thompson, E. H. and E. R. Sorenson. 2000. *Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont*. The Nature Conservancy and the Vermont Department of Fish and Wildlife. University Press of New England, Hanover, NH.

USDA Natural Resources Conservation Service. 2006. *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin*. U.S. Department of Agriculture Handbook 296.

Contributors

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Approval

Greg Schmidt, 10/07/2024

Acknowledgments

Nels Barrett

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	05/11/2025
Approved by	Greg Schmidt
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:**
