USDA Natural Resources
Conservation Service

Ecological site RX141X502
Loamy Till Toeslope

Last updated: 10/03/2024
Accessed: 05/11/2025

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): 141X–Tug Hill Plateau

MLRA 141 is entirely in New York and makes up about 1,173 square kilometers (3,037 square kilometers). It consists of a relatively small but unique upland that lies just off the eastern end of Lake Ontario and west of the Black River Valley and Adirondack Mountain region. It is essentially a north- and east-facing glaciated cuesta scarp and is underlain by thick Wisconsin till and small areas of outwash. Most of the plateau is woodland, so forestry and recreation are the primary uses, but small isolated dairy operations and hobby farms are located around the perimeter.

The area is bordered on the east by the Black River Valley, on the north by the St. Lawrence Lowland, on the west by the Ontario Lowland, and on the south by the Upper Mohawk Valley. The northern and eastern boundaries of MLRA 141 are distinct where they contact the physiographically dissimilar southwestern part of MLRA 142 (St. Lawrence-Champlain Plain). The western and southern boundaries are also distinct where they contact the physiographically dissimilar MLRA 101 (Ontario-Erie Plain and Finger Lakes Region).

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 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

RX141X305	**Wet Loamy Flat** Wet Loamy Flat ecological sites may be adjacent to or grade into Loamy Till Toeslope ecological sites on the landscape.
RX141X501	**Loamy Slopes** Loamy Slopes ecological sites may be adjacent to or grade into Loamy Till Toeslope ecological sites on the landscape.
RX141X503	**Loamy Flat** Loamy Flat ecological sites may be adjacent to or grade into Loamy Till Toeslope ecological sites on the landscape.

Similar sites

RX141X501	**Loamy Slopes** Loamy Slopes ecological sites may have similar vegetative composition, soil properties, and may be situated on similar topography.

Table 1. Dominant plant species

Tree	(1) *Betula alleghaniensis* (2) *Picea rubens*
Shrub	(1) *Viburnum lantanoides* (2) *Viburnum acerifolium*
Herbaceous	(1) *Dryopteris intermedia* (2) *Aralia nudicaulis*

Legacy ID

F141XY502NY

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Till plain > Depression (2) Till plain > Drumlinoid ridge (3) Till plain > Low hill (4) Drumlin (5) Hill (6) Lake plain (7) Bench (8) Ridge
Runoff class	Very high
Elevation	279–2,034 ft
Water table depth	3–17 in
Aspect	Aspect is not a significant factor

Climatic features

Throughout the year precipitation is evenly distributed around most of this area with slightly less rainfall occurring around the lower margins of the plateau. Rainfall occurs as high-intensity, convective thunderstorms during the summer. Lake-effect snowfall is heavy from late autumn to early spring with the summit of the plateau having the lowest temperatures and the shortest freeze-free periods.

Climate stations Watertown and Old Forge are adjacent to the MLRA and were used to tabulate additional representative climate data.

Table 3. Representative climatic features

Frost-free period (characteristic range)	92-124 days
Freeze-free period (characteristic range)	129-159 days
Precipitation total (characteristic range)	47-53 in
Frost-free period (actual range)	86-131 days
Freeze-free period (actual range)	119-164 days
Precipitation total (actual range)	44-57 in
Frost-free period (average)	108 days
Freeze-free period (average)	143 days

Precipitation total (average)	50 in

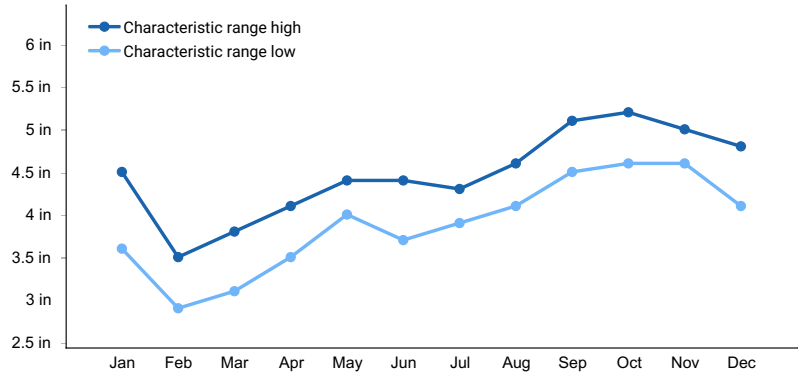


Figure 1. Monthly precipitation range

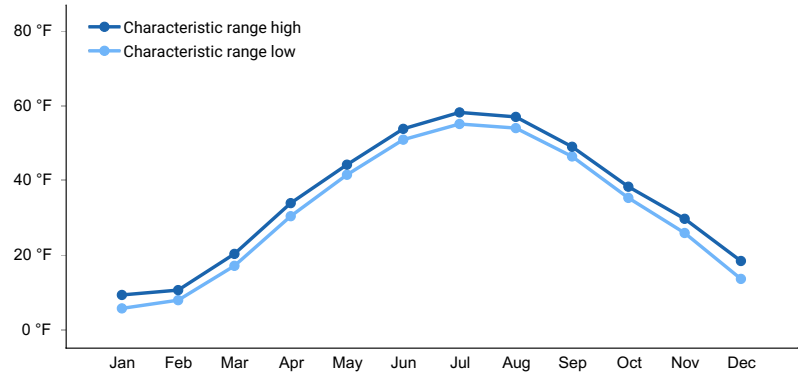


Figure 2. Monthly minimum temperature range

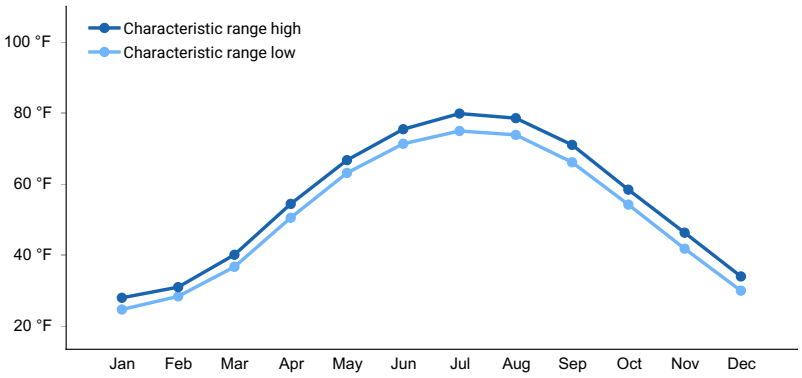


Figure 3. Monthly maximum temperature range

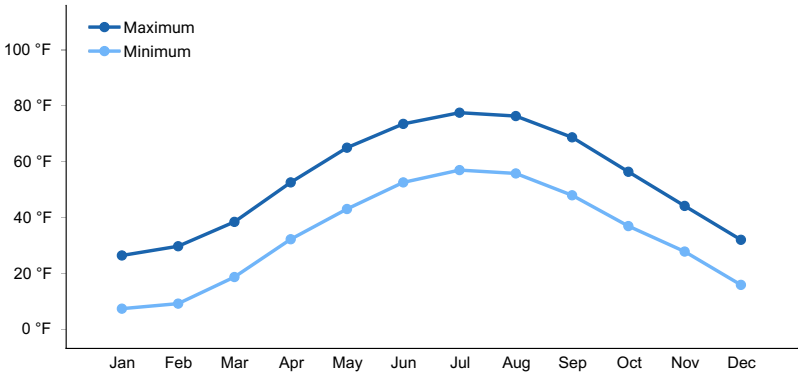


Figure 4. Monthly average minimum and maximum temperature

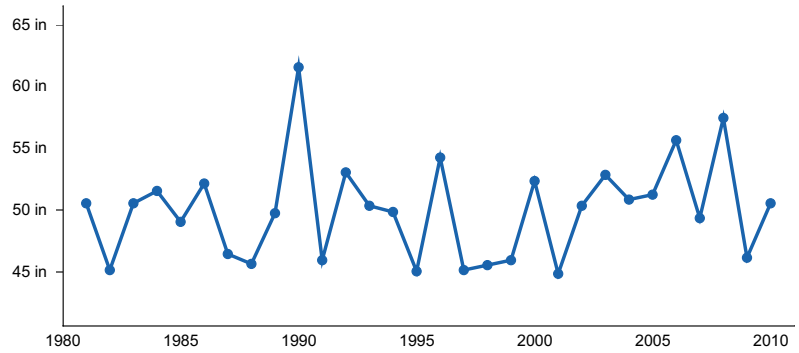


Figure 5. Annual precipitation pattern

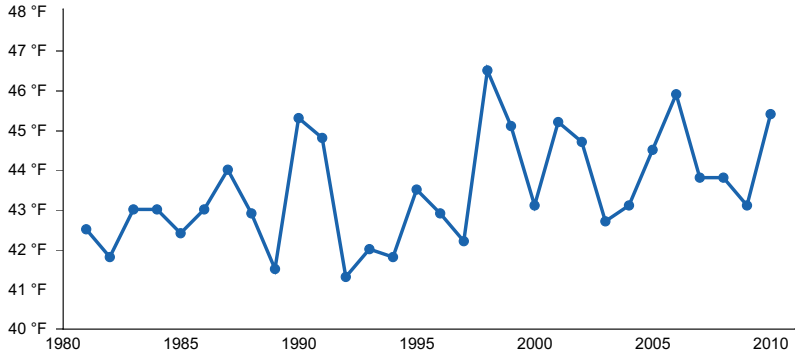


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BOONVILLE 4 SSW [USC00300785], Boonville, NY
- (2) CAMDEN [USC00301110], Camden, NY
- (3) WATERTOWN [USC00309000], Watertown, NY
- (4) OLD FORGE [USC00306184], Eagle Bay, NY

Influencing water features

Soil features

Table 4. Representative soil features

Parent material	(1) Till (2) Eolian deposits (3) Glaciolacustrine deposits (4) Till–sedimentary rock (5) Till–sandstone (6) Till–shale and siltstone (7) Till–sandstone and siltstone
Surface texture	(1) Loam (2) Silt (3) Very fine sand (4) Loam (5) Loam (6) Loam (7) Loam
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Very slow
Soil depth	10–30 in
Surface fragment cover <=3"	0%

Surface fragment cover >3"	0–9%
Available water capacity (1-6in)	Not specified
Soil reaction (1:1 water) (3.5-8.4in)	Not specified
Subsurface fragment volume <=3" (0-35in)	Not specified
Subsurface fragment volume >3" (1-7in)	Not specified

Ecological dynamics

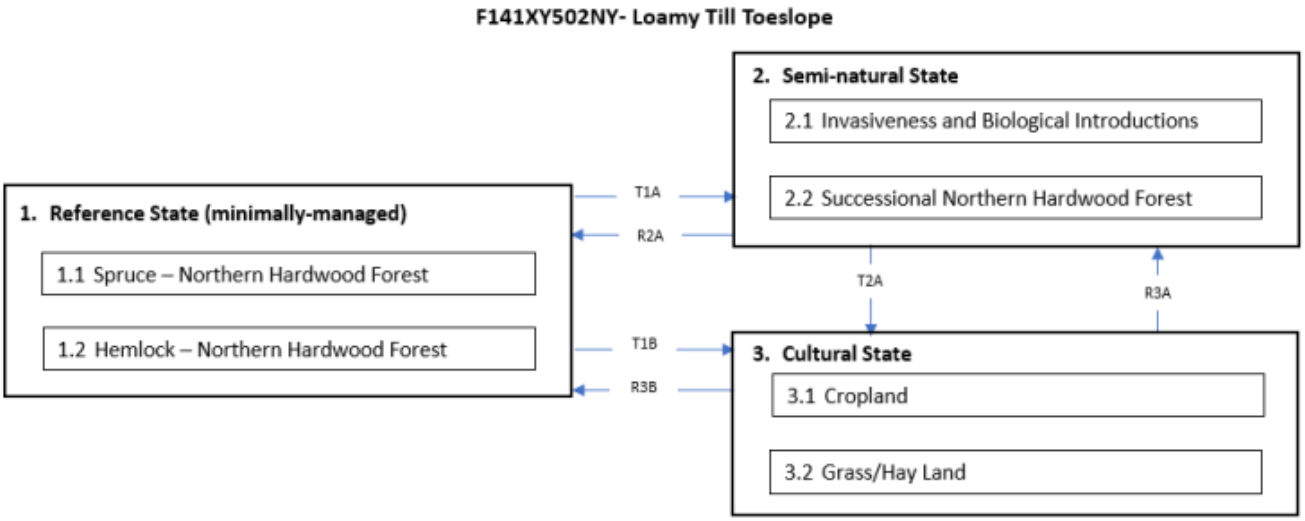
[Caveat: The vegetation information contained in this section and is only provisional, based on concepts, and future projects support validation through field work. *] The vegetation groupings described in this section are based on the terrestrial ecological system classification and vegetation associations developed by NatureServe (Comer 2003) and localized associations provided by the New York Natural Heritage Program (Edinger et al. 2014).

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



Transition	*Drivers/practices*
T1A	climate change, old growth hardwood loss, canopy opened, introduction of invasive species, pests, and pathogens
R2A	management of invasive species, pests, and pathogens, restoration of key native plant species, restoration of terrestrial habitat, white pine thinning
T1B, T2A	landscape alteration, logging, mechanical soil disturbance, landscape clearing, seeding, planting
R3A, R3B	seeding, planting, restoration of compacted soil, establishment of key native plant species

State 1
Reference State (minimally-managed)

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 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.

Characteristics and indicators. 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.

Resilience management. 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.

Dominant resource concerns

- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Wildfire hazard from biomass accumulation
- Terrestrial habitat for wildlife and invertebrates
- Aquatic habitat for fish and other organisms

Community 1.1
Spruce - Northern Hardwood Forest

A mixed forest that occurs on lower mountain slopes and upper margins of flats on glacial till. Codominant trees are red spruce (*Picea rubens*), sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*), and red maple (*Acer rubrum*), with scattered balsam fir (*Abies balsamea*). Striped maple (*Acer pensylvanicum*) and mountain maple (*A. spicatum*) are common subcanopy trees. Characteristic shrubs are hobblebush (*Viburnum lantanoides*), American fly honeysuckle (*Lonicera canadensis*), and Canada yew (*Taxus canadensis*). Characteristic groundlayer plants are common wood-sorrel (*Oxalis montana*), common wood fern (*Dryopteris intermedia*), shining fir clubmoss (*Huperzia lucidula*), wild sarsaparilla (*Aralia nudicaulis*), blue bead-lily (*Clintonia borealis*), goldthread (*Coptis trifolia*), bunchberry (*Cornus canadensis*), Canada mayflower (*Maianthemum canadense*), Indian cucumber-root (*Medeola virginiana*), and twisted stalk (Streptopus roseus). (Edinger et al. 2014)

Resilience management. New York Natural Heritage Program State Rank: S3/S4 S3- Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State. S4- Apparently secure in New York State.

Dominant resource concerns

- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Wildfire hazard from biomass accumulation
- Terrestrial habitat for wildlife and invertebrates

Community 1.2

Hemlock Northern Hardwood Forest

A mixed forest that typically occurs on middle to lower slopes of ravines, on cool, mid-elevation slopes, and on moist, well-drained sites at the margins of swamps. In any one stand, eastern hemlock (*Tsuga canadensis*) is codominant with any one to three of the following: sugar maple (*Acer saccharum*), red maple (*A. rubrum*), yellow birch (*Betula alleghaniensis*), black birch (*B. lenta*), red oak (*Quercus rubra*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), chestnut oak (*Quercus montana*), white oak (*Q. alba*), white pine (*Pinus strobus*), Other trees may include hop hornbeam (*Ostrya virginiana*), black cherry (*Prunus serotina*), and basswood (*Tilia americana*). The relative cover of eastern hemlock is quite variable, ranging from nearly pure stands in some steep ravines to as little as 20% of the canopy cover. Striped maple (*Acer pensylvanicum*) is often prominent as a mid-story tree. The shrub layer may be sparse and typically includes saplings of canopy trees. Characteristic shrubs are witch hazel (*Hamamelis virginiana*), hobblebush (*Viburnum lantanoides*), maple-leaf viburnum (*Viburnum acerifolium*), lowbush blueberry (*Vaccinium pallidum*), and raspberries (Rubus spp.). In some ravines, especially in the southern part of the state, rosebay (*Rhododendron maximum*) forms a dense subcanopy or tall shrub layer. Canopy cover can be quite dense, resulting in low light intensities on the forest floor and hence a relatively sparse groundlayer. Characteristic groundlayer herbs include woodferns (*Dryopteris marginalis*, *D. intermedia D. campyloptera*), Christmas fern (*Polystichum acrostichoides*), Canada mayflower (*Maianthemum canadense*), white wood aster (*Eurybia divaricata*), sarsaparilla (*Aralia nudicaulis*), partridge berry (*Mitchella repens*), common wood-sorrel (*Oxalis montana*), jack-in-the-pulpit (*Arisaema triphyllum*), star flower (*Trientalis borealis*), lady fern (*Athyrium filix-femina* var. asplenioides), and Pennsylvania sedge (*Carex pensylvanica*). Other plants include Indian cucumber-root (*Medeola virginiana*), sessile-leaved bellwort (*Uvularia sessilifolia*), shining fir clubmoss (*Huperzia lucidula*), foamflower (*Tiarella cordifolia*), round-leaf violet (*Viola rotundifolia*), twisted stalk (Streptopus roseus), purple trillium (*Trillium erectum*), and white cushion moss (*Leucobryum glaucum*). In forests that have American beech as a codominant tree, beech-drops (*Epifagus virginiana*) is a common herb. Indian-pipe (*Monotropa uniflora*) and American pinesap (M. hypopithys) are occasionally found in low light examples. Hay-scented fern (*Dennstaedtia punctilobula*) and New York fern (*Thelypteris noveboracensis*) may be common in canopy gaps. (Edinger et al. 2014)

Resilience management. New York Natural Heritage Program State Rank: S4- Apparently secure in New York State.

Dominant resource concerns

- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Wildfire hazard from biomass accumulation
- Terrestrial habitat for wildlife and invertebrates

State 2
Semi-natural State

Shifts in ecological site composition, functionality, and dynamics driven by natural disturbances, processes, and pressures (may have some anthropogenic drivers). More research is needed to determine the extent of the Semi-natural state associated with this ecological site.

Dominant resource concerns

- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates

Community 2.1
Invasiveness and Biological Introductions

Introduction of invasive species, pathogens, and/or pests resulting in shifts in ecological site composition, functionality, and dynamics. More research is needed to determine the extent of these effects on the semi-natural state associated with this ecological site.

Dominant resource concerns

- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates

Community 2.2
Successional Northern Hardwood Forest

A hardwood or mixed forest that occurs on sites that have been cleared or otherwise disturbed. Characteristic trees and shrubs include any of the following: quaking aspenn (*Populus tremuloides*), big-tooth aspenn (*P. grandidentata*), balsam poplarn (*P. balsamifera*), paper birchn (*Betula papyrifera*), gray birchn (*B. populifolia*), pin cherryn (*Prunus pensylvanica*), black cherry (*P. serotina*), red maple (*Acer rubrum*), white pine (*Pinus strobus*), with lesser amounts of white ash (*Fraxinus americana*), green ash (*F. pennsylvanica*), and American elm (*Ulmus americana*). This is a broadly defined community and several seral and regional variants are known. (Edinger et al. 2014)

Dominant resource concerns

- Compaction
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates

State 3
Cultural State

Shifts in ecological site composition, functionality, and dynamics that are primary driven by anthropogenic disturbances and pressures (may have some associated natural drivers). More research is needed to determine the extent of the cultural state associated with this ecological site.

Dominant resource concerns

- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates

Community 3.1
Cropland

Site altered to support crop cultivation and production

Community 3.2
Grass/Hay Land

Site altered for grazing grass or hay production.

Dominant resource concerns

- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates

Transition T1A
State 1 to 2

climate change, old growth hardwood loss, canopy opened, introduction of invasive species, pests, and pathogens

Conservation practices

Hardwood Crop Tree Release
Monitoring and Evaluation

Transition T1B
State 1 to 3

landscape alteration, logging, mechanical soil disturbance, landscape clearing, seeding, planting

Conservation practices

Cover Crop
Land Clearing
Precision Land Forming
Irrigation Land Leveling
Land Smoothing
Prescribed Grazing
Grazing Land Mechanical Treatment
Forest Land Management
Monitoring and Evaluation

Restoration pathway R2A
State 2 to 1

management of invasive species, pests, and pathogens, restoration of key native plant species, restoration of terrestrial habitat, white pine thinning

Conservation practices

Critical Area Planting
Restoration and Management of Rare and Declining Habitats
Upland Wildlife Habitat Management
Early Successional Habitat Development/Management
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Invasive Plant Species Control
Pathogen Management
Multi-species Native Perennials for Biomass/Wildlife Habitat
Biological suppression and other non-chemical techniques to manage brush, weeds and invasive species
Biological suppression and other non-chemical techniques to manage herbaceous weeds invasive species
Monitoring and Evaluation

Transition T2A
State 2 to 3

landscape alteration, logging, mechanical soil disturbance, landscape clearing, seeding, planting

Conservation practices

Cover Crop
Land Clearing
Precision Land Forming
Irrigation Land Leveling
Land Smoothing
Grazing Land Mechanical Treatment
Spoil Spreading
Planned Grazing System
Prescribed Grazing
Prescribed Forestry
Grazing management to improve wildlife habitat
Harvest hay in a manner that allows wildlife to flush and escape
Resource-Conserving Crop Rotation
Conversion of cropped land to grass-based agriculture
Monitoring and Evaluation

Restoration pathway R3B
State 3 to 1

seeding, planting, restoration of compacted soil, establishment of key native plant species

Conservation practices

Critical Area Planting
Restoration and Management of Rare and Declining Habitats
Upland Wildlife Habitat Management
Early Successional Habitat Development/Management
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Restoration and Management of Rare or Declining Habitats
Multi-species Native Perennials for Biomass/Wildlife Habitat
Monitoring and Evaluation

Restoration pathway R3A
State 3 to 2

seeding, planting, restoration of compacted soil, establishment of key native plant species

Conservation practices

Critical Area Planting
Restoration and Management of Rare and Declining Habitats
Upland Wildlife Habitat Management
Early Successional Habitat Development/Management
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management

Multi-species Native Perennials for Biomass/Wildlife Habitat
Habitat Development for Beneficial Insects for Pest Management
Monitoring and Evaluation

Additional community tables

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

Comer, P., D. Faber-Langendoen, R. Evans, S. Grawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schultz, K. Snow, and J. Teague. 2003. Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems. NatureServe, Arlington, Virginia

Edinger, G. J., D. J. Evans, S. Gebauer, T. G. Howard, D. M. Hunt, and A. M. Olivero (editors). 2014. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

Gawler, S. and A. Cutko. 2010. Natural Landscapes of Maine: A Guide to Natural Communities and Ecosystems. Maine Natural Areas Program, Maine Department of Conservation, Augusta, Maine.

NatureServe. 2021. NatureServe Explorer: An online encyclopedia of life [web application]. NatureServe, Arlington, Virginia. https://explorer.natureserve.org/. (accessed 10 July. 2021).

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. Agricultural Handbook 296

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Series Descriptions. Available online. (accessed 11 Aug. 2021).

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Climate Research Station Data. Available online. (accessed 23 June. 2021).

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database for [MLRA 141, Maine]. Available online. (accessed 14 Oct. 2021).

USNVC [United States National Vegetation Classification]. 2017. United States National Vegetation Classification Database V2.01. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. Available The U.S. National Vegetation Classification (usnvc.org) (accessed 2 July. 2021).

Contributors

Christopher Mann

Approval

Greg Schmidt, 10/03/2024

Acknowledgments

Nels Barrett and Nick Butler provided considerable review of this ecological site concept.

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:**