USDA Natural Resources Conservation Service

Ecological site RX141X304
Wet Clay Flat

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 in gently sloping areas near the bottom of watersheds where water saturates glaciolacustrine deposits for much of the growing season. Soils are poorly- and very poorly-drained with clayey textures and parent materials. The water table is seasonally high (within 12 inches of the surface) and typically dries out in late summer and fall. This site is typically drier than the Clay site (401) and may be ponded in depressions. Mixed hardwoods and softwoods dominate the reference community, including black and red spruce, red maple, brown ash, and balsam fir.

Similar sites

RX141X401	**Clay** This site is typically drier than the Clay site (401) and may be ponded in depressions. Similar vegetative composition may be present among both sites.

Table 1. Dominant plant species

Tree	(1) *Acer rubrum* (2) *Picea mariana*
Shrub	(1) *Alnus incana ssp. rugosa* (2) *Cephalanthus occidentalis*
Herbaceous	(1) *Osmunda cinnamomea* (2) *Moehringia lateriflora*

Legacy ID

F141XY304NY

Physiographic features

This site occurs on poorly drained uplands or in depressions associated with gently sloping areas near the bottom of watersheds where water saturates glaciolacustrine deposits for much of the growing season. Overall topographic relief is very flat in this system though small tip-up mounds and depressions can occur from windthrow and often create small pockets with vegetation more typical of upland or swamp forest

Table 2. Representative physiographic features

Landforms	(1) Depression
Flooding frequency	None
Ponding frequency	None to frequent
Elevation	49–1,699 ft
Water table depth	0–6 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

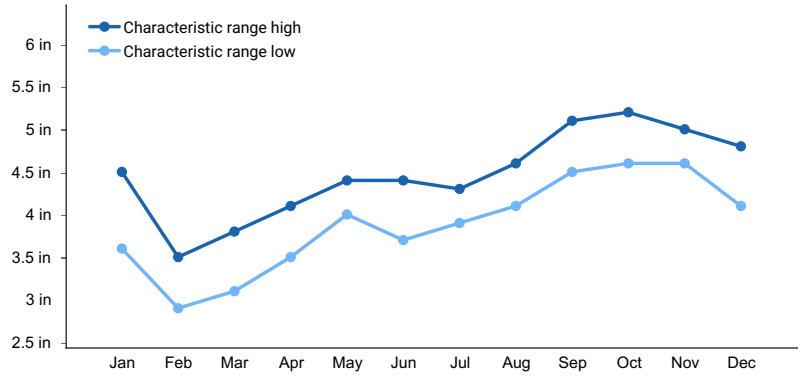


Figure 1. Monthly precipitation range

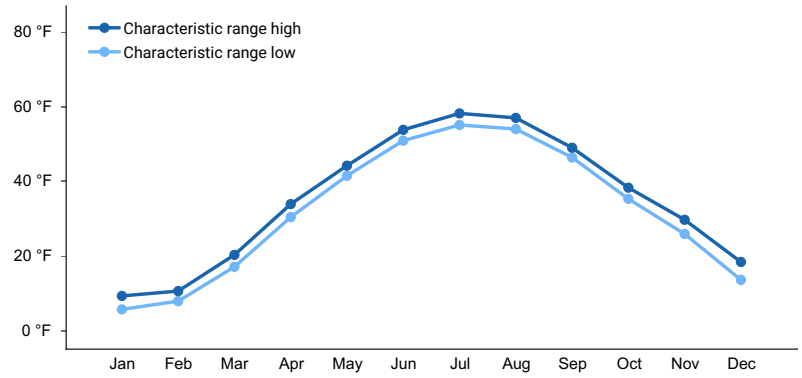


Figure 2. Monthly minimum temperature range

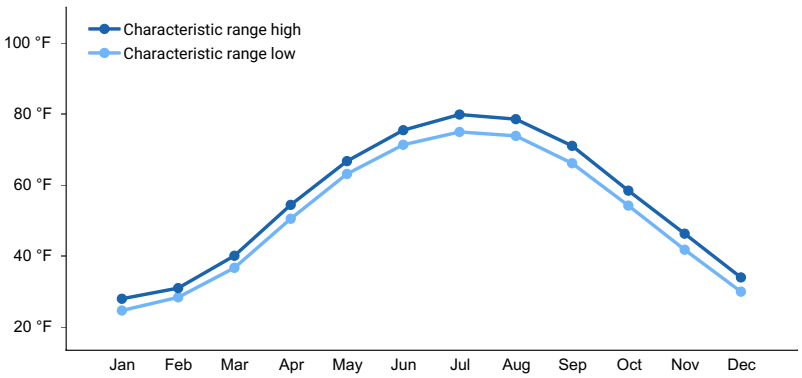


Figure 3. Monthly maximum temperature range

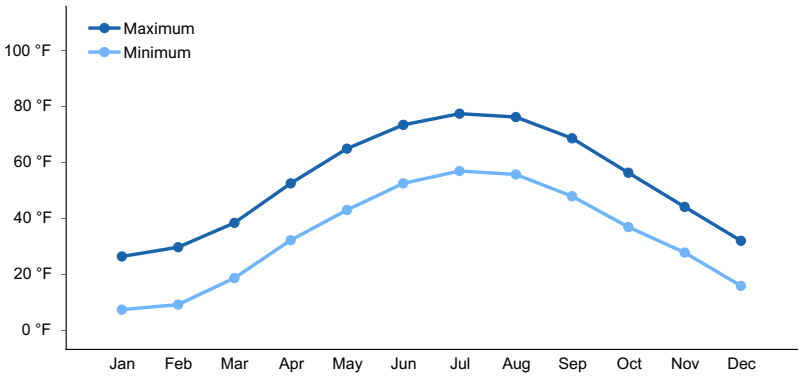


Figure 4. Monthly average minimum and maximum temperature

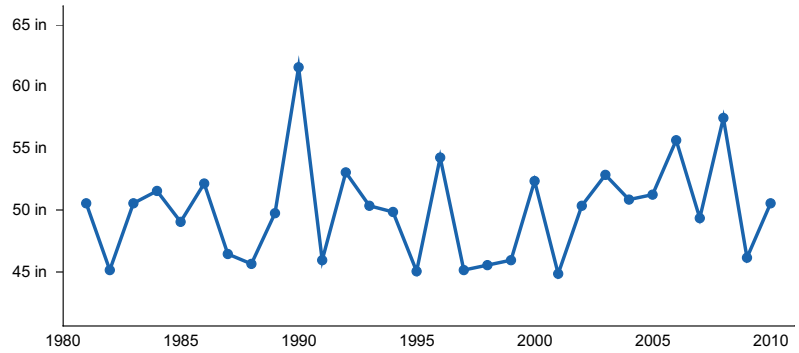


Figure 5. Annual precipitation pattern

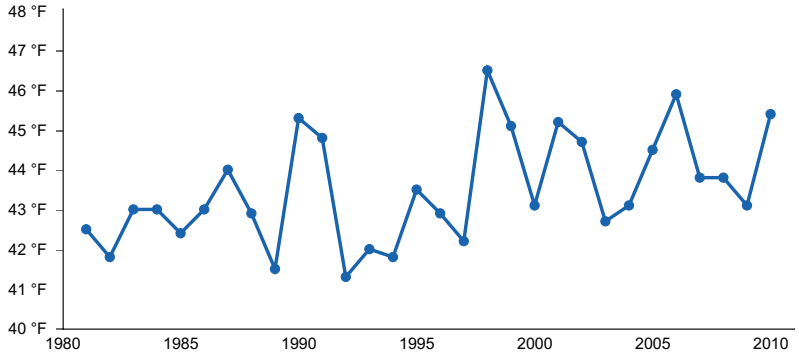


Figure 6. Annual average temperature pattern

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

Soils often have an impermeable or nearly impermeable clay layer that impedes waterflow. This favors flooding or ponding in the spring or after heavy rains. It also restricts subsurface water movement into the system and slows the growth of roots through it. Both of these factors lead to water deficits for the vegetation in the late summer and fall. These fluctuating moisture levels can lead to complexes of forest upland and wetland species occurring within this system.

Soil features

Table 4. Representative soil features

Parent material	(1) Glaciolacustrine deposits (2) Till–acid shale
Surface texture	(1) Clay (2) Clay
Drainage class	Very poorly drained to poorly drained
Permeability class	Very slow
Soil depth	28–72 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (4-6in)	Not specified
Soil reaction (1:1 water) (3.6-8.4in)	Not specified
Subsurface fragment volume <=3" (2-18in)	Not specified
Subsurface fragment volume >3" (3in)	Not specified

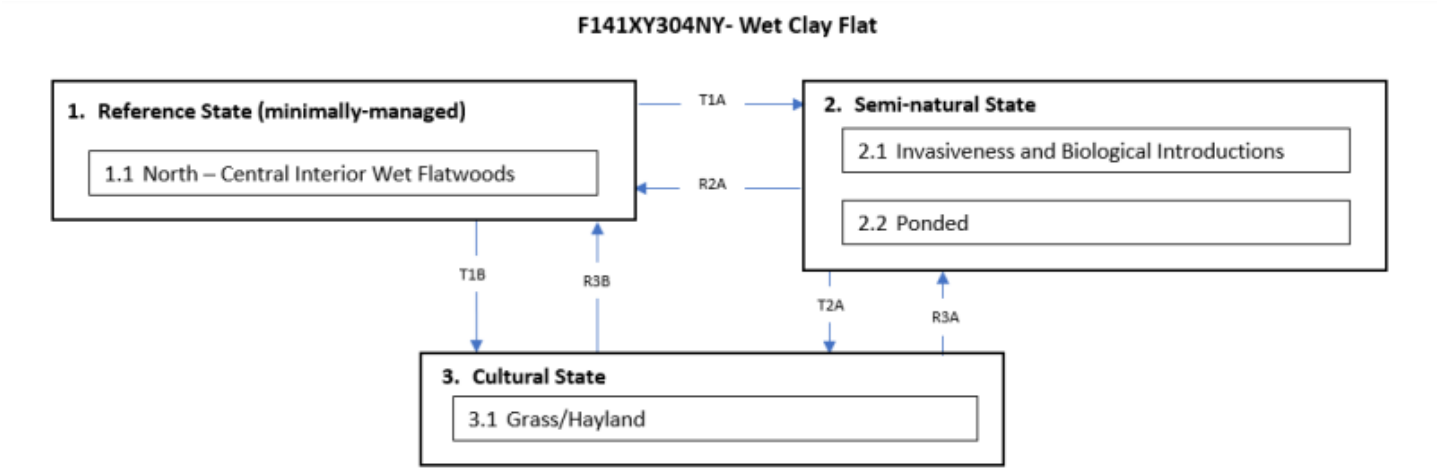
Ecological dynamics

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 mixed hardwood and softwood species including red and black spruce, balsam fir, larch, red maple and brown ash. It is often logged, which sets the stand through a series of phases, beginning with herbaceous colonizers, then dense spruce and balsam fir saplings, and eventually to mature spruce-fir forest. Within 100 years, any balsam fir dies out and longer-lived species dominate the mature forest. Similar community dynamics occur within stands on this site as blowdowns or spruce budworm open up small patches of mature overstory trees for establishment by herbs and conifer saplings.

In some areas this site has been converted to perennial grass hayland.

State and transition model



Transition	*Drivers/practices*
T1A	climate change, hydrological alteration, significant increase in flooding events and annual precipitation, introduction of invasive species, pests, and pathogens
R2A	remediation of hydrologic alteration, management of invasive species, pests, and pathogens, restoration of key native plant species, restoration of terrestrial and aquatic habitat
T1B, T2A	hydrologic alteration (barrier, obstruction, dam, diversion), landscape alteration, mechanical soil disturbance, landscape alteration, planting, seeding
R3A, R3B	remediation of hydrologic alteration, seeding, planting, significant flooding events and increase in annual precipitation, compacted soil, establishment of key native plant species

State 1

Reference State (minimally-managed)

This site occurs in gently sloping areas near the bottom of watersheds where water saturates glaciolacustrine deposits for much of the growing season. Soils are poorly- and very poorly-drained with clayey textures and parent materials. The water table is seasonally high (within 12 inches of the surface) and typically dries out in late summer and fall. This site is typically drier than the Clay site (401) and may be ponded in depressions. Mixed hardwoods and softwoods dominate the reference community, including black and red spruce, red maple, brown ash, and balsam fir.

Resilience management. This site is dominated by mixed hardwood and softwood species including red and black spruce, balsam fir, larch, red maple and brown ash. It is often logged, which sets the stand through a series of phases, beginning with herbaceous colonizers, then dense spruce and balsam fir saplings, and eventually to mature spruce-fir forest. Within 100 years, any balsam fir dies out and longer-lived species dominate the mature forest. Similar community dynamics occur within stands on this site as blowdowns or spruce budworm open up small patches of mature overstory trees for establishment by herbs and conifer saplings.

Dominant resource concerns

- Ponding and flooding
- 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
North Central Interior Wet Flatwoods

This system usually occurs on poorly drained uplands or in depressions associated with glacial features such as tillplains, lakeplains, or outwash plains. Soils often have an impermeable or nearly impermeable clay layer that impedes waterflow. This favors flooding or ponding in the spring or after heavy rains. It also restricts subsurface water movement into the system and slows the growth of roots through it. Both of these factors lead to water deficits for the vegetation in the late summer and fall. These fluctuating moisture levels can lead to complexes of forest upland and wetland species occurring within this system. Overall topographic relief is very flat in this system though small tip-up mounds and depressions can occur from windthrow and often create small pockets with vegetation more typical of upland or swamp forest, respectively. *Quercus palustris* and/or *Quercus bicolor* typically dominate the wetter portions and are often associated with *Acer rubrum*. *Quercus alba*, *Quercus rubra*, *Fagus grandifolia*, and *Acer saccharum* are common in the better-drained areas. *Carya ovata* is a characteristic tree in the Champlain Valley. *Liquidambar styraciflua*, *Nyssa sylvatica*, *Fraxinus americana*, and *Fraxinus pennsylvanica* are also common associates, though their occurrence varies somewhat by region. Understory herbaceous and shrub species present in examples of this system can vary. Stands with more dense tree cover have less shrub and herbaceous cover, while those with moderate tree canopy cover tend to have a dense understory. Some common species include Carex spp., *Osmunda cinnamomea*, *Cephalanthus occidentalis*, Alnus spp., and Ilex spp. In the clayplain forests of Vermont, characteristic herbs include *Waldsteinia fragarioides* and *Moehringia lateriflora* (= Arenaria lateriflora). The large seasonal change in local available moisture is key to the development and maintenance of this system. Plants must be able to tolerate the excessive available moisture (surface flooding or saturation) and drought conditions that occur in most growing seasons. Fire can occur after the system dries, typically late in the growing season. Fires rarely start in this system but under favorable conditions can spread from nearby fire-prone systems (typically prairies, oak savannas, or oak woodlands). With the often shallowly-rooted trees, strong winds can create canopy openings. Small-scale windthrow is a characteristic disturbance in flatwoods that influences composition and structure by creating canopy gaps that are suitable for the colonization and growth of light-dependent tree seedlings and saplings, shrubs, and herbs. Windthrow also tips and uproots trees, creating pit-and-mound topography that provides suitable microhabitats for a diversity of plants. NatureServe Element Code: CES202.700 (NatureServe, 2022)

Resilience management. Changes to the hydrologic regime and conversion to agricultural or urban uses are the most common threats to this system. Road building and urban development can cut off or increase waterflow; drainage systems for nearby agriculture can remove water from the system. Fraxinus spp. and Ulmus spp. can

invade and become common if the flooding/drying regime is not maintained and fires do not move through the ground layer. Invasive shrubs are a problem in some areas. Very few examples remain as almost all have been converted to agriculture. Those sites that do remain typically occur as isolated woodlots in agricultural or urban landscapes, degraded by landscape-scale fragmentation and hydrologic alteration. Additional disturbances that have reduced viability of remnant flatwoods over the past century include the introduction of non-native pests and pathogens (e.g., elm blight and emerald ash borer), invasive plants, and excessive deer herbivory, which have significantly altered community structure, species composition, and successional trajectory. NatureServe Element Code: CES202.700 (NatureServe, 2022)

Dominant resource concerns

- Ponding and flooding
- 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

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

- Ponding and flooding
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates
- Aquatic habitat for fish and other organisms

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
Ponded

Increased annual/decadal precipitation or increase in significant flooding events

Dominant resource concerns

- Ponding and flooding
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure

- 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

- Compaction
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates
- Aquatic habitat for fish and other organisms

Transition T1A
State 1 to 2

climate change, hydrological alteration, significant increase in flooding events and annual precipitation, introduction of invasive species, pests, and pathogens

Conservation practices

Monitoring and Evaluation

Transition T1B
State 1 to 3

hydrologic alteration (barrier, obstruction, dam, diversion), landscape alteration, mechanical soil disturbance, landscape alteration, planting, seeding

Conservation practices

Cover Crop
Land Clearing
Precision Land Forming
Irrigation Land Leveling
Land Smoothing
Infiltration Ditches
Residue Management -Direct Seed
Improve the plant diversity and structure of non-cropped areas for wildlife food and habitat
Grazing management to improve wildlife habitat
Harvest hay in a manner that allows wildlife to flush and escape

Restoration pathway R2A
State 2 to 1

remediation of hydrologic alteration, management of invasive species, pests, and pathogens, restoration of key native plant species, restoration of terrestrial and aquatic habitat

Conservation practices

Restoration and Management of Rare and Declining Habitats
Early Successional Habitat Development/Management
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Pathogen Management
Invasive Plant Species Control
Invasive Species Pest Management
Multi-species Native Perennials for Biomass/Wildlife Habitat
Establish pollinator habitat
High level Integrated Pest Management to reduce pesticide environmental risk
Monitoring and Evaluation

Transition T2A
State 2 to 3

hydrologic alteration (barrier, obstruction, dam, diversion), landscape alteration, mechanical soil disturbance, landscape alteration, planting, seeding

Conservation practices

Plant an annual grass-type cover crop that will scavenge residual nitrogen
Monitoring and Evaluation
Conversion of cropped land to grass-based agriculture

Restoration pathway R3B
State 3 to 1

remediation of hydrologic alteration, seeding, planting, significant flooding events and increase in annual precipitation, compacted soil, establishment of key native plant species

Conservation practices

Critical Area Planting
Restoration and Management of Rare and Declining Habitats
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
Establish pollinator habitat
Habitat Development for Beneficial Insects for Pest Management
Monitoring and Evaluation

Restoration pathway R3A
State 3 to 2

remediation of hydrologic alteration, seeding, planting, significant flooding events and increase in annual precipitation, compacted soil, establishment of key native plant species

Conservation practices

Restoration and Management of Rare and Declining Habitats
Early Successional Habitat Development/Management
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and 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:**