USDA Natural Resources
Conservation Service

Ecological site RX141X302
Mucky Swamp

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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): 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 relatively flat areas (0-2% slopes) near the bottom of watersheds where water saturates deep organic muck deposits for most of the growing season. These organic soils are very poorly-drained and often underlain by mineral deposits at depths greater than 16 inches. The water table is within a few inches of the surface. This site often has pit and mound topography, with ponding typical in the pits, and slightly drier soil conditions on the mounds where most trees are rooted.

Northern white cedar is abundant, with balsam fir, black spruce, larch, black ash, and grey birch as common associates. Diverse herbs, shrubs, and bryophytes dominate the understory. Treethrow and altered hydrology are common disturbances on this site. Small openings created by treethrow, which is very common on these unstable soils, are typically colonized by species already present in the community and may persist as canopy openings dominated by herbaceous species for a long time.

Associated sites

RX141X110	**Floodplain Riparian Complex** Floodplain Riparian Complex may be adjacently located or surround Mucky Swamp ecological sites.
RX141X210	**Marsh Wetland Complex** Marsh Wetland Complex may be adjacently located or surround Mucky Swamp ecological sites.

Similar sites

RX141X210	**Marsh Wetland Complex** Mucky Swamp ecological sites may have similar vegetative composition and can transition to a Marsh Wetland Complex under select environmental conditions and/or constraints.
RX141X301	**Semi-rich Loamy Swamp** Mucky Swamp ecological sites may have similar vegetative composition and can transition to a Semi-rich Loamy Swamps under select environmental conditions and/or constraints.

Table 1. Dominant plant species

Tree	(1) *Thuja occidentalis* (2) *Picea mariana*
Shrub	(1) *Cornus sericea* (2) *Alnus incana ssp. rugosa*
Herbaceous	(1) *Carex trisperma* (2) *Osmunda cinnamomea*

Legacy ID

F141XY302NY

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Swamp or marsh (2) Depression
Runoff class	Negligible
Ponding frequency	Frequent
Elevation	581–2,001 ft
Slope	2%
Water table depth	0 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

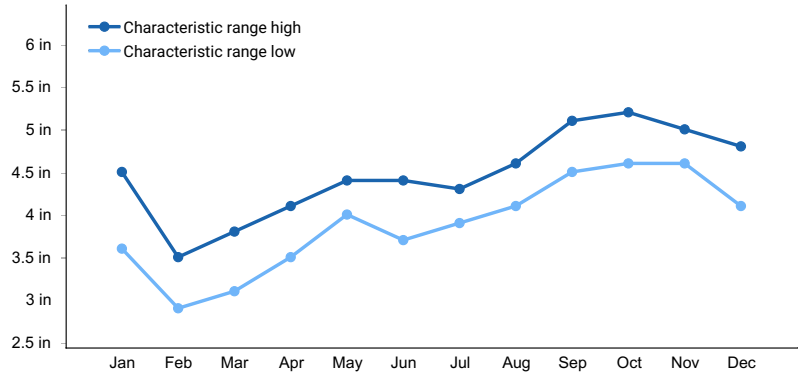


Figure 1. Monthly precipitation range

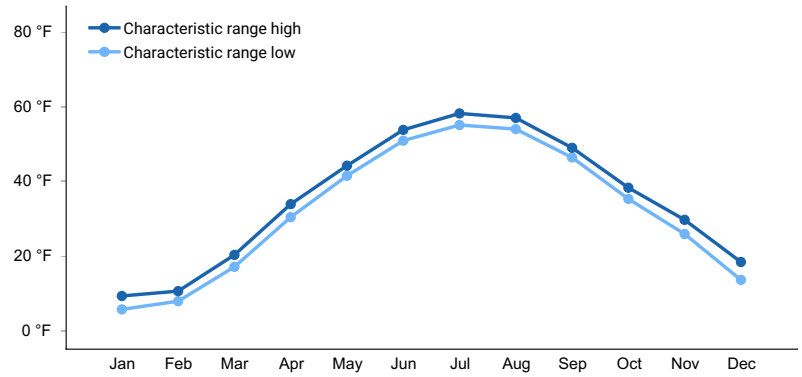


Figure 2. Monthly minimum temperature range

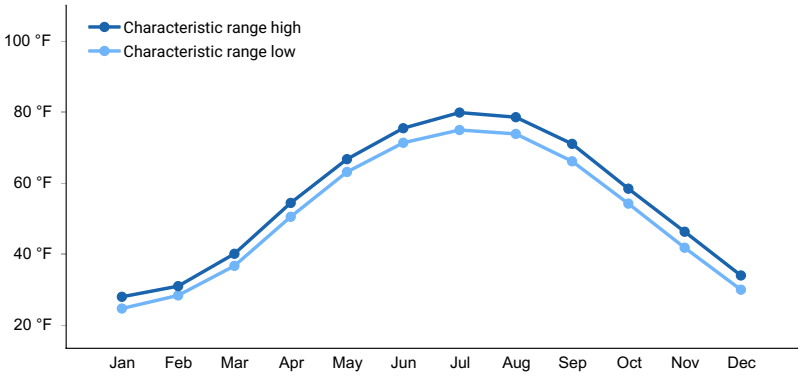


Figure 3. Monthly maximum temperature range

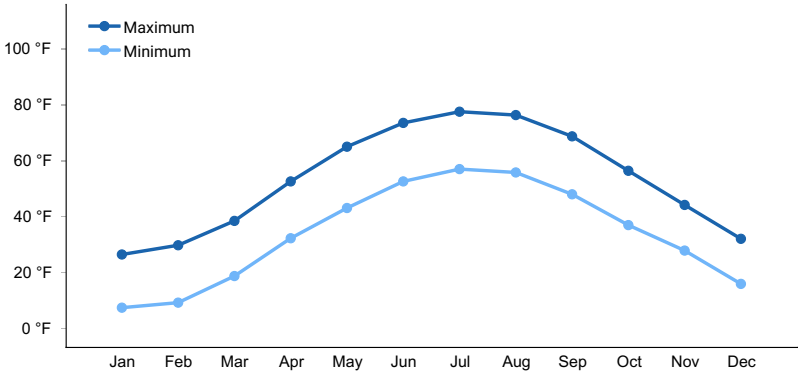


Figure 4. Monthly average minimum and maximum temperature

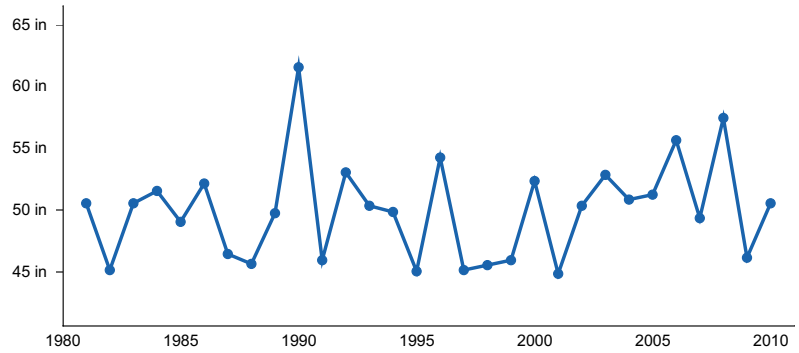


Figure 5. Annual precipitation pattern

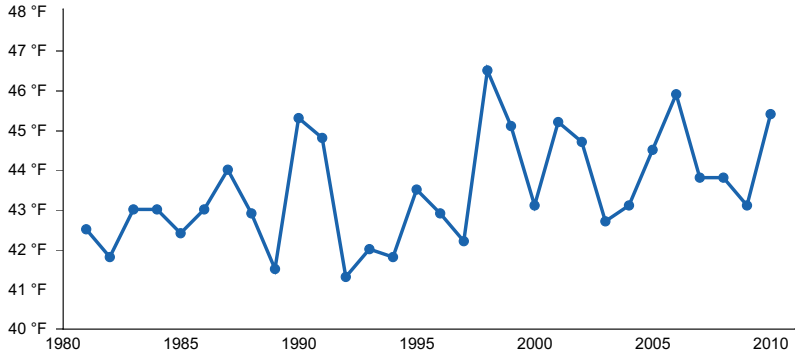


Figure 6. Annual average temperature pattern

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

Wetland description

Water levels in these swamps typically fluctuate seasonally; they may be flooded in spring and relatively dry by late summer.

Soil features

Table 4. Representative soil features

Parent material	(1) Organic material
Surface texture	(1) Loam
Drainage class	Very poorly drained
Permeability class	Slow
Soil depth	72 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (9-10in)	Not specified

Soil reaction (1:1 water) (5.1-7.3in)	Not specified
Subsurface fragment volume <=3" (0in)	Not specified
Subsurface fragment volume >3" (0in)	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 white cedar, often with black spruce, balsam fir, red maple, yellow birch, white pine, and/or brown ash present in small amounts. Most trees are rooted in the poorly-drained soil mounds rather than the very poorly-drained soil depressions. The understory is diverse with sphagnum moss, creeping snowberry, and three-seed sedge common.

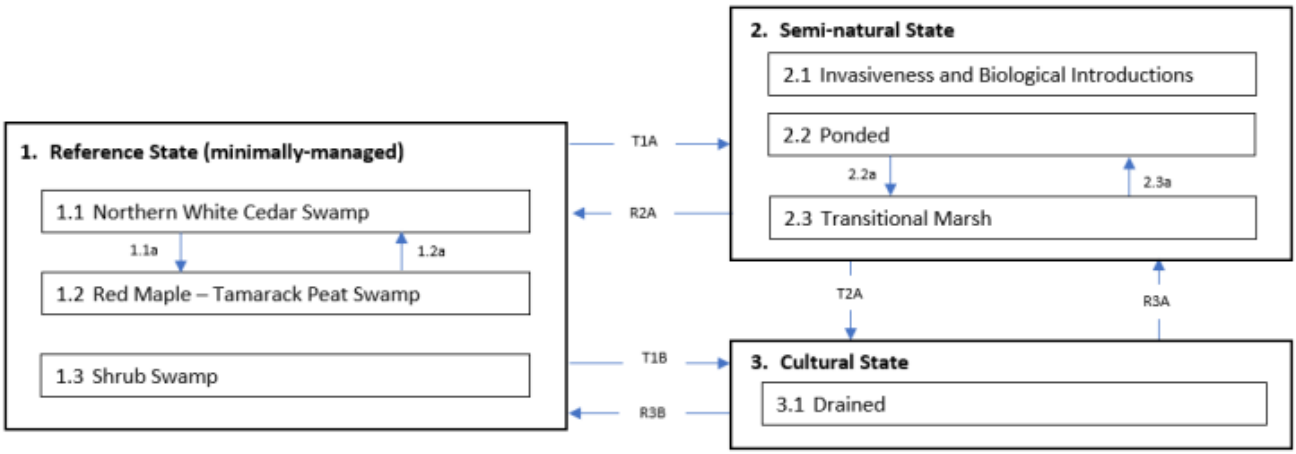
Treethrow and altered hydrology are common disturbances on this site. Small openings created by treethrow, which is very common on these unstable soils, are typically colonized by species already present in the community and may persist as canopy openings dominated by herbaceous species for a long time.

Persistent ponding caused by beavers, man-made structures (such as roads, dams, etc.), or increased runoff in the watershed above can cause water levels to rise and kill cedar trees, resulting in an open ponded or marsh condition. If hydrology is restored to reference conditions, the site is likely to transition through a marsh and/or early seral forest phase before eventually returning to cedar dominance.

Logging is limited on this site and requires winter harvest methods when the ground is frozen. Cedar removal may result in an early seral phase dominated by balsam fir, grey birch, red maple, and other colonizers before eventually reverting to cedar dominance. This may take a very long time to occur.

State and transition model

F141XY302NY- Mucky Swamp



Transition	*Drivers/practices*
1.1a, 1.2a	The presence or absence (removal or loss) of *Thuja occidentalis* as the dominant tree will result in shifts between sites
T1A	climate change, hydrological alteration, increased nutrients or chemicals (pesticide, herbicide, fertilizer) transported to surface water, 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
2.2a, 2.3a	Remediation of hydrological alteration, decreased annual/decadal precipitation or flooding events; hydrological alteration (beaver or debris), increased annual/decadal precipitation or flooding events
T1B, T2A	hydrologic alteration (barrier, obstruction, dam, diversion), landscape alteration, mechanical soil disturbance, landscape alteration
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 relatively flat areas (0-2% slopes) near the bottom of watersheds where water saturates deep organic muck deposits for most of the growing season. These organic soils are very poorly-drained and often underlain by mineral deposits at depths greater than 16 inches. The water table is within a few inches of the surface. This site often has pit and mound topography, with ponding typical in the pits, and slightly drier soil conditions on the mounds where most trees are rooted. This site is dominated by northern white cedar, often with black spruce, balsam fir, red maple, yellow birch, white pine, and/or brown ash present in small amounts. Most trees are rooted in the poorly-drained soil mounds rather than the very poorly-drained soil depressions. The understory is diverse with sphagnum moss, creeping snowberry, and three-seed sedge common.

Resilience management. Treethrow and altered hydrology are common disturbances on this site. Small openings created by treethrow, which is very common on these unstable soils, are typically colonized by species already present in the community and may persist as canopy openings dominated by herbaceous species for a long time. Persistent ponding caused by beavers, man-made structures (such as roads, dams, etc.), or increased runoff in the watershed above can cause water levels to rise and kill cedar trees, resulting in an open ponded or marsh condition. If hydrology is restored to reference conditions, the site is likely to transition through a marsh and/or early seral forest phase before eventually returning to cedar dominance. Logging is limited on this site and requires winter harvest methods when the ground is frozen. Cedar removal may result in an early seral phase dominated by balsam fir, grey birch, red maple, and other colonizers before eventually reverting to cedar dominance. This may take a very long time to occur.

Dominant resource concerns

- Ponding and flooding

- Seasonal high water table
- Surface water depletion
- Ground water depletion
- Elevated water temperature
- 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 1.1
Northern White Cedar Swamp

This site is a conifer or mixed swamp that occurs on organic soils in cool, poorly drained depressions in central and northern New York, and along lakes and streams in the northern half of the state. These swamps are often spring fed or enriched by seepage of cold, minerotrophic groundwater, resulting in a stable water table and continually saturated soils. Soils are often rich in calcium. At some sites these soils have developed above a marl substrate. The dominant tree is northern white cedar (*Thuja occidentalis*), which makes up more than 30% of the canopy cover. Thuja may form nearly pure stands, or it may be mixed with other conifers and hardwoods, including red maple (*Acer rubrum*), eastern hemlock (*Tsuga canadensis*), balsam fir (*Abies balsamea*), tamarack (*Larix laricina*), yellow birch (*Betula alleghaniensis*), white pine (*Pinus strobus*), spruces (*Picea mariana*, *P. rubens*, *P. glauca*), and black ash (*Fraxinus nigra*) which is a good indicator for this community when present. The shrub layer is usually sparse; characteristic species are northern white cedar (*Thuja occidentalis*), dwarf raspberry (*Rubus pubescens*), red osier dogwood (*Cornus sericea*), swamp fly honeysuckle (*Lonicera oblongifolia*), speckled alder (*Alnus incana* ssp. rugosa), and highbush blueberry (*Vaccinium corymbosum*). The groundlayer is typically diverse, with many bryophytes and boreal herbs. There are typically many hummocks formed by decaying downed trees or tip-up mounds. Characteristic herbs on the hummocks include sedges (*Carex leptalea*, *C. eburnea*), oak fern (*Gymnocarpium dryopteris*), goldthread (*Coptis trifolia*), starflower (*Trientalis borealis*), bunchberry (*Cornus canadensis*), miterwort (*Mitella nuda*), Canada mayflower (*Maianthemum canadense*), blue bead lily (*Clintonia borealis*), snowberry (*Gaultheria hispidula*), partridge berry (*Mitchella repens*), and dwarf scouring rush (*Equisetum scirpoides*) which is a good indicator for this community when present. Characteristic herbs of hollows between the hummocks are the sedge *Carex intumescens*, sensitive fern (*Onoclea sensibilis*), marsh fern (*Thelypteris palustris*), cinnamon fern (*Osmunda cinnamomea*), royal fern (*O. regalis*), crested wood fern (*Dryopteris cristata*), showy lady's-slipper (*Cypripedium reginae*), yellow lady's-slipper (*Cypripedium parviflorum* var. pubescens), and golden ragwort (*Packera aurea*). Characteristic bryophytes are several peat mosses (Sphagnum spp.), feather mosses such as stair-step moss (*Hylocomium splendens*) and knight’s plume moss (*Ptilium crista-castrensis*), and leafy liverworts such as *Bazzania trilobata* and *Trichocolea tomentella*. (Edinger et al. 2014)

Resilience management. New York Natural Heritage Program State Rank: S2/S3 S2- Typically 6 to 20 occurrences, few remaining individuals (for species), acres, or miles of stream, or factors demonstrably making it very vulnerable in New York State. S3- Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State. Flooding by beaver is common and the community may oscillate between a tall shrubland and forest over long cycles of beaver flooding and abandonment

Dominant resource concerns

- Ponding and flooding
- Surface water depletion
- Ground water depletion
- Nutrients transported to surface water
- Pesticides transported to surface water
- Pathogens and chemicals from manure, biosolids, or compost applications transported to surface water
- Petroleum, heavy metals, and other pollutants transported to surface water
- Sediment transported to surface water
- Elevated water temperature
- 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 1.2
Red Maple - Tamarack Peat Swamp

A mixed swamp that occurs on organic soils (peat or muck) in poorly drained depressions. These swamps are often spring fed or enriched by seepage of minerotrophic groundwater resulting in a stable water table and continually saturated soil. Soils are often rich in calcium. The dominant trees are red maple (*Acer rubrum*) and tamarack (*Larix laricina*). These species usually form an open canopy (50 to 70% cover) with numerous small openings dominated by shrubs or sedges. Other less frequently occurring trees include black spruce (*Picea mariana*), white pine (*Pinus strobus*), black ash (*Fraxinus nigra*), American hornbeam (*Carpinus caroliniana*), and northern white cedar (*Thuja occidentalis*). Characteristic shrubs are alders (*Alnus incana* ssp. rugosa, *A. serrulata*), winterberry (*Ilex verticillata*), various shrubby dogwoods, especially red osier dogwood (*Cornus sericea*), willows (Salix spp.), highbush blueberry (*Vaccinium corymbosum*), dwarf raspberry (*Rubus pubescens*), along with many rich shrub fen species such as swamp birch (*Betula pumila*), alder-leaf buckthorn (*Rhamnus alnifolia*), poison sumac (*Toxicodendron vernix*), swamp fly honeysuckle (*Lonicera oblongifolia*), and shrubby cinquefoil (*Dasiphora fruticosa* ssp. floribunda). Other less frequently occurring shrubs include black chokeberry (*Aronia melanocarpa*) and mountain holly (Nemopanthus mucronatus). The herb layer is often very diverse and usually includes calcium-rich indicator species. Characteristic herbs include sedges (*Carex trisperma*, *C. interior*, *C. stricta*, *C. lacustris*, *C. leptalea*), royal fern (*Osmunda regalis*), cinnamon fern (*O. cinnamomea*), marsh fern (*Thelypteris palustris*), crested wood fern (*Dryopteris cristata*), skunk cabbage (*Symplocarpus foetidus*), purple avens (*Geum rivale*), marsh marigold (*Caltha palustris*), and water horehound (*Lycopus uniflorus*). Other less frequently occurring herbs include cattail (*Typha latifolia*), goldthread (*Coptis trifolia*), flat-topped white aster (*Doellingeria umbellata* var. umbellata), fowl manna grass (*Glyceria striata*), water horsetail (*Equisetum fluviatile*), buckbean (*Menyanthes trifoliata*), starflower (*Trientalis borealis*), goldenrods (*Solidago patula*, *S. uliginosa*), golden ragwort (*Packera aurea*), and marsh cinquefoil (*Comarum palustre*). (Edinger et al. 2014)

Resilience management. Data on characteristic fauna are needed. These swamps are closely related to and often grade into rich shrub fens and rich graminoid fens. New York Natural Heritage Program State Rank: S2/S3 S2: Typically 6 to 20 occurrences, few remaining individuals (for species), acres, or miles of stream, or factors demonstrably making it very vulnerable in New York State. S3: Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State.

Pathway 1.1a
Community 1.1 to 1.2

The absence (removal or loss) of *Thuja occidentalis* as the dominant tree will result in shifts between reference sites.

Pathway 1.2a
Community 1.2 to 1.1

The presence (addition or increase of *Thuja occidentalis* as the dominant tree will result in shifts between reference sites.

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
- Elevated water temperature
- 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

- Organic matter depletion
- Ponding and flooding
- Elevated water temperature
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates

Community 2.2
Ponded

A Shrub Swamp can be an example of a ponded site and is mostly a inland wetland dominated by tall shrubs that occurs along the shore of a lake or river, in a wet depression or valley not associated with lakes, or as a transition zone between a marsh, fen, or bog and a swamp or upland community. The substrate is usually mineral soil or muck. A few examples may have a shallow layer of sphagnous peat. This is a very broadly defined type that includes several distinct communities and many intermediates. Shrub swamps are very common and quite variable. They may be co-dominated by a mixture of species, or have a single dominant shrub species. Characteristic shrubs that are common in these and other types of shrub swamps include meadow-sweet (*Spiraea alba* var. alba and *S. alba* var. latifolia), hardhack (*Spiraea tomentosa*), gray dogwood (*Cornus racemosa*), swamp azalea (*Rhododendron viscosum*), highbush blueberry (*Vaccinium corymbosum*), male-berry (*Lyonia ligustrina*), smooth alder (*Alnus serrulata*), spicebush (*Lindera benzoin*), willows (*Salix bebbiana*, *S. discolor*, *S. lucida*, *S. petiolaris*), wild raisin (*Viburnum nudum* var. cassinoides), and arrowwood (*Viburnum dentatum* var. lucidum). Scattered young trees may be present, such as red maple (*Acer rubrum*), American elm (*Ulmus americana*), and green ash (*Fraxinus pennsylvanica*).(Edinger et al. 2014)

Resilience management. New York Natural Heritage Program State Rank: S5- Demonstrably secure in New York State.

Dominant resource concerns

- Surface water depletion
- Ground water depletion
- Nutrients transported to surface water
- Pesticides transported to surface water
- Pathogens and chemicals from manure, biosolids, or compost applications transported to surface water
- Petroleum, heavy metals, and other pollutants transported to surface water
- Sediment transported to surface water
- Elevated water temperature
- 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 2.3
Transitional Marsh

Shallow emergent marshes typically occur in lake basins and along streams often intergrading with deep emergent marshes, shrub swamps, and sedge meadows, and they may occur together in a complex mosaic in a large wetland. This site occurs on mineral soil or deep muck soils, that are typically permanently saturated and seasonally flooded. Water depths may range from 15 cm to 1 m (6 in to 3.3 ft) during flood stages, but the water level usually drops by mid to late summer and the substrate is exposed during an average year. Shallow emergent marshes are common and variable, and may be dominated by a mixture of herbaceous vegetation or a single species. Shrubs may be scattered throughout marshes, though areas with greater than 50% shrub cover are classified as shrub swamps. The hydroperiod of these sites may determine species composition, with species dependent on differing hydrologic states (permanently saturated, seasonally flooded, or temporarily saturated). (Edinger et al. 2014) Sedge meadows are a wet meadow community that has organic soils (muck or fibrous peat). Soils are permanently saturated and seasonally flooded; there is usually little peat accumulation in the substrate and usually underlain by deep muck. Sparse shrubs may be present and the dominant herbaceous vegetation must be members of the sedge family (Cyperaceae), typically of the genus Carex. Sedge meadows typically occur along streams and near the inlets and outlets of lakes and ponds; they also occur in lake basins as a zone near the upland edge of a shallow emergent marsh. A sedge meadow does not typically form a floating mat, instead it is covered with water during flooding. When water levels are low, there is little or no open water. (Edinger et al. 2014)

Resilience management. New York Natural Heritage Program State Rank (Shallow emergent marsh): S5-Demonstrably secure in New York State. New York Natural Heritage Program State Rank (Sedge meadow): S4-Apparently secure in New York State. Species composition may be strongly influenced by annual and seasonal water levels. These sites may be found on found in agricultural or cleared land that may present issues related to agricultural runoff (pesticide, petroleum, waste, etc.) (Edinger et al. 2014)

Pathway 2.2a
Community 2.2 to 2.3

Remediation of hydrological alteration, decreased annual/decadal precipitation or flooding events.

Pathway 2.3a
Community 2.3 to 2.2

hydrological alteration (beaver or debris), increased annual/decadal precipitation or flooding events

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

- Surface water depletion
- Ground water depletion
- 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 3.1
Drained

Hydrological alteration of site resulting in depleted or drained surface or ground water

Dominant resource concerns

- Surface water depletion
- Ground water depletion
- Naturally available moisture use
- 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, increased nutrients or chemicals (pesticide, herbicide, fertilizer) transported to surface water, 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

Conservation practices

Dam
Land Clearing
Precision Land Forming
Irrigation Land Leveling
Land Smoothing
Drainage Water Management

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

Riparian Herbaceous Cover
Riparian Forest Buffer
Aquatic Organism Passage
Obstruction Removal
Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Upland Wildlife Habitat Management
Shallow Water Development and Management

Early Successional Habitat Development/Management
Wetland Restoration
Wetland Enhancement
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Pathogen Management
Invasive Plant Species Control
Pathogen Management
Invasive Species Pest Management
Precision Pest Control Application
Shallow water habitat
Non-forested riparian zone enhancement for fish and wildlife
Riparian forest buffer, terrestrial and aquatic wildlife habitat
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
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
Herbaceous Weed Control
Aquatic Organism Passage Barrier Removal

Transition T2A
State 2 to 3

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

Conservation practices

Land Clearing
Precision Land Forming
Irrigation Land Leveling
Land Smoothing
Drainage Water Management
Floodproofing

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

Obstruction Removal
Vegetated Treatment Area
Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Upland Wildlife Habitat Management
Shallow Water Development and Management
Early Successional Habitat Development/Management
Wildlife Watering Facility
Constructed Wetland
Wetland Restoration
Wetland Creation
Wetland Enhancement
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Shallow water habitat
Non-forested riparian zone enhancement for fish and wildlife
Riparian forest buffer, terrestrial and aquatic wildlife habitat
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

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

Conservation practices

Obstruction Removal
Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Upland Wildlife Habitat Management
Shallow Water Development and Management
Early Successional Habitat Development/Management
Constructed Wetland
Wetland Restoration
Wetland Creation
Wetland Enhancement
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Restoration of Compacted Soils
Shallow water habitat
Non-forested riparian zone enhancement for fish and wildlife

Riparian forest buffer, terrestrial and aquatic wildlife habitat
Restoration and Management of Rare or Declining Habitats
Multi-species Native Perennials for Biomass/Wildlife Habitat
Establish pollinator habitat
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.

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Contributors

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Approval

Greg Schmidt, 10/03/2024

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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	05/10/2025
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):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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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:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**
