USDA Natural Resources Conservation Service

Ecological site RX141X220
Semi-acidic Peat Wetland Complex

Last updated: 10/03/2024
Accessed: 05/13/2025

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 flat, low-lying areas characterized by very poorly-drained, semi-acidic peat soils and bog vegetation. Soil pH is typically between 4.5 and 6.0 throughout, allowing for more overall species diversity than true acid bogs, but also lacking many true acid bog indicator species. It is dominated by sphagnum moss and heath shrubs, and supports other common bog species such as cotton grass in lower quantities. This site may also support low cover of black spruce and larch trees in some areas. Representative soils include: Bucksport and Wonsqueak.

This ecological site is resistant to major disturbances except for small scale hydrologic alterations that may create small patches of drained or ponded peatland. This ecological resistance can be attributed to the ability of these bogs to respond to large fluctuations in water, as well as general resistance to fire, insects, disease, construction, land management, etc.. Further study is needed to identify alternative states for this site.

Associated sites

RX141X302	**Mucky Swamp** Mucky Swamp ecological site may be adjacent or transition into a Semi-acidic Peat Wetland Complex site, depending on fluctuations of pH levels and peat deposits.
RX141X303	**Acidic Swamp** Acidic Swamp ecological site may be adjacent or transition into a Semi-acidic Peat Wetland Complex site, depending on fluctuations of pH levels and peat deposits.

RX141X110	**Floodplain Riparian Complex** Floodplain Riparian Complex ecological site may be adjacent or transition into a Semi-acidic Peat Wetland Complex site.
RX141X230	**Acidic Peat Wetland Complex** Acidic Peat Wetland Complex ecological site may be adjacent or transition into a Semi-acidic Peat Wetland Complex site, depending on fluctuations of pH levels.
RX141X210	**Marsh Wetland Complex** Marsh Wetland Complex ecological site may be adjacent or transition into a Semi-acidic Peat Wetland Complex site.

Similar sites

RX141X230	**Acidic Peat Wetland Complex** Acidic Peat Wetland Complex ecological site may share similar physiographic, soil, and vegetative properties as a Semi-acidic Peat Wetland Complex. As pH levels fluctuate these systems may transition into one another.

Table 1. Dominant plant species

Tree	(1) *Acer rubrum* (2) *Picea mariana*
Shrub	(1) *Chamaedaphne calyculata* (2) *Dasiphora fruticosa ssp. floribunda*
Herbaceous	(1) *Calla palustris* (2) *Carex lasiocarpa*

Legacy ID

F141XY220NY

Physiographic features

These peatlands occur in kettle depressions on pitted outwash and moraines and in flat areas and shallow depressions on glacial outwash and glacial lakeplain.

Table 2. Representative physiographic features

Landforms	(1) Valley > Bog (2) Valley > Swamp or marsh (3) Till plain > Bog
Runoff class	Negligible
Elevation	15–620 m
Water table depth	Not specified
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)	1,194-1,346 mm
Frost-free period (actual range)	86-131 days
Freeze-free period (actual range)	119-164 days
Precipitation total (actual range)	1,118-1,448 mm
Frost-free period (average)	108 days
Freeze-free period (average)	143 days
Precipitation total (average)	1,270 mm

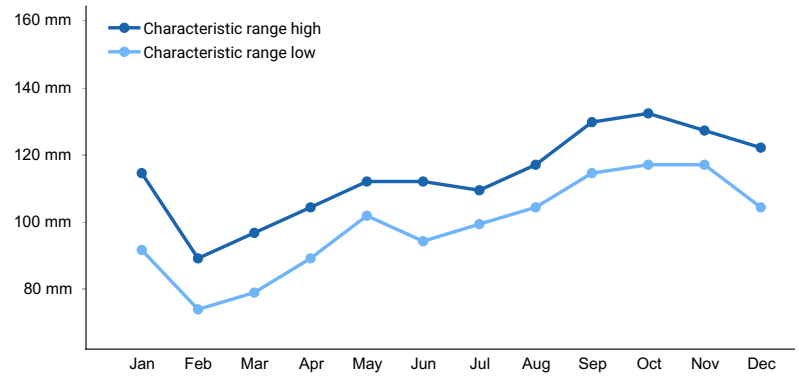


Figure 1. Monthly precipitation range

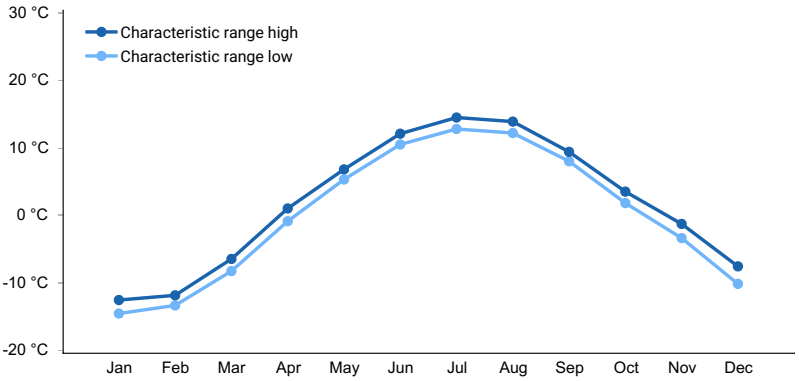


Figure 2. Monthly minimum temperature range

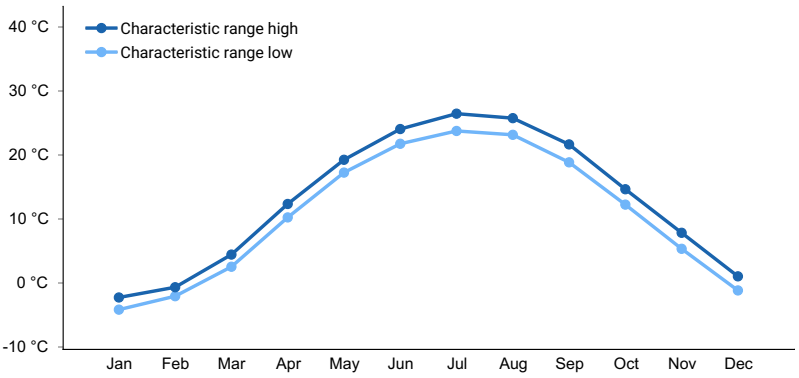


Figure 3. Monthly maximum temperature range

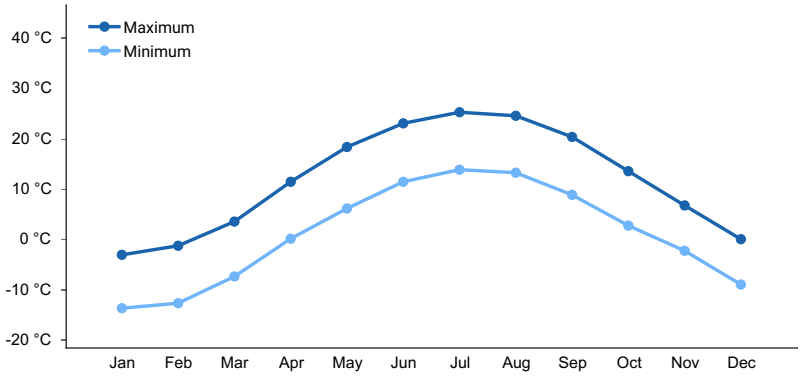


Figure 4. Monthly average minimum and maximum temperature

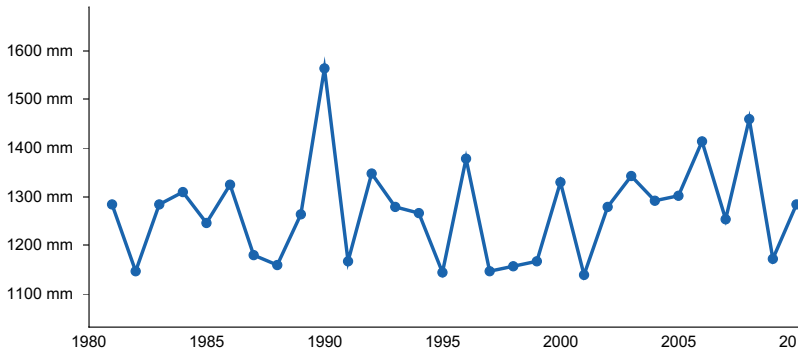


Figure 5. Annual precipitation pattern

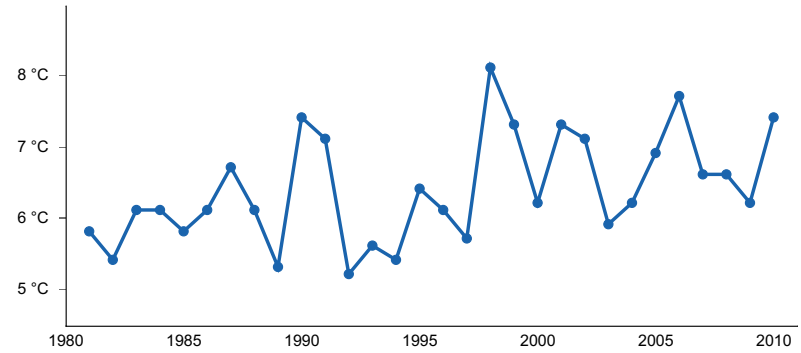


Figure 6. Annual average temperature pattern

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

Many occur in association with larger lakes or streams. Some occur as kettlehole fens (usually called kettlehole "bogs") associated with eskers or other glacial deposits.

Wetland description

The basins are generally closed, i.e., without inlets or outlets of surface water, and typically small in area. The basins in which these occur tend to be small and, where open water is still present, these peatlands form where wave energy is low. Groundwater and surface water feed these temperate peatlands. PH levels range from 4.5-6.

Soil features

The substrate chemistry is entirely acidic (pH levels range from 4.5-6) in some peatlands; in others, where bedrock or other substrate influence creates circumneutral to calcareous conditions, peatland chemistry may be entirely calcareous or vary from acidic to calcareous within the same peatland. Representative soils include: Bucksport and Wonsqueak.

Table 4. Representative soil features

Parent material	(1) Organic material (2) Glaciolacustrine deposits (3) Till
Surface texture	(1) Mucky peat (2) Silt (3) Loam
Drainage class	Very poorly drained
Permeability class	Very slow to slow
Soil depth	Not specified
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (12.7-58.4cm)	Not specified
Soil reaction (1:1 water) (11.4-19.8cm)	Not specified
Subsurface fragment volume <=3" (0-30.5cm)	Not specified
Subsurface fragment volume >3" (0cm)	Not specified

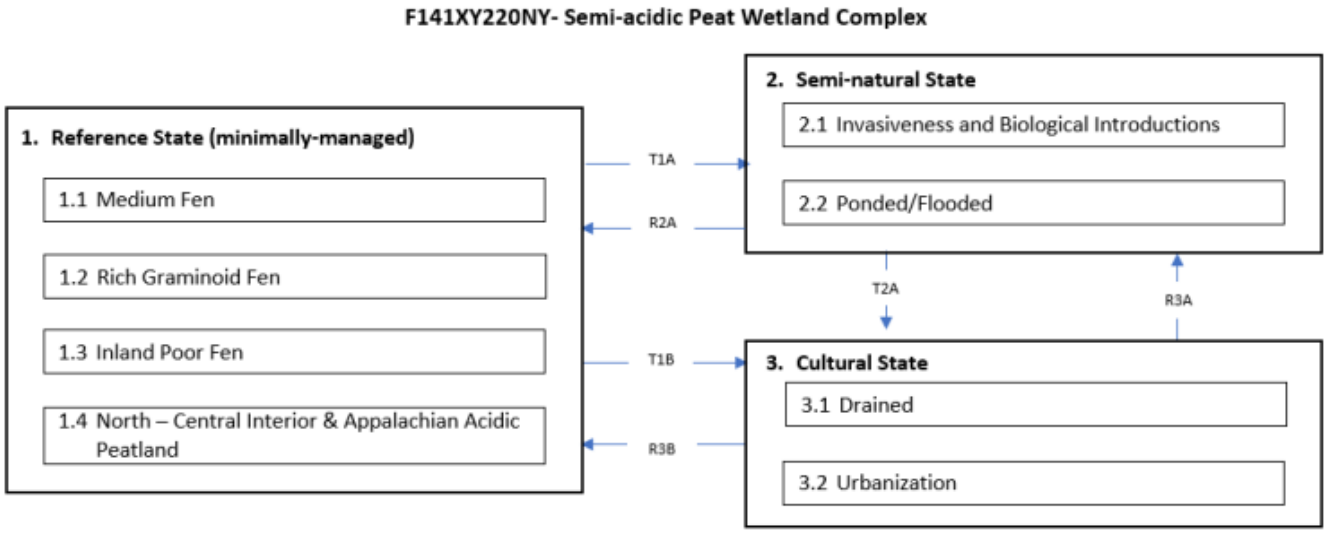
Ecological dynamics

[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).

The vegetation of this site is dominated by sphagnum moss and heath shrubs. It also supports other common bog species such as cotton grass in lower quantities. This site may sometimes support low cover of black spruce and larch trees, though the reason for tree presence or absence is poorly-understood.

This ecological site is resistant to major disturbances except for small scale hydrologic alterations that may create small patches of drained or ponded peatland (such as near a culvert). This ecological resistance can be attributed to the ability of these bogs to respond to large fluctuations in water, as the peat acts like a sponge, expanding and contracting with the water supply. There is also a general resistance to fire, insects, disease, construction, land management, etc. due to the wet nature and particular species on the site. Further study is needed to identify alternative states for this site.

State and transition model



Transition	*Drivers/practices*
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
T1B, T2A	hydrologic alteration (barrier, obstruction, dam, diversion), landscape alteration, mechanical soil disturbance, landscape development
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 flat, low-lying areas characterized by very poorly-drained, semi-acidic peat soils and bog vegetation. Soil pH is typically between 4.5 and 6.0 throughout, allowing for more overall species diversity than true acid bogs, but also lacking many true acid bog indicator species. It is dominated by sphagnum moss and heath shrubs, and supports other common bog species such as cotton grass in lower quantities. This site may also support low cover of black spruce and larch trees in some areas.

Characteristics and indicators. The vegetation of this site is dominated by sphagnum moss and heath shrubs. It also supports other common bog species such as cotton grass in lower quantities. This site may sometimes support low cover of black spruce and larch trees, though the reason for tree presence or absence is poorly-understood.

Resilience management. This ecological site is resistant to major disturbances except for small scale hydrologic alterations that may create small patches of drained or ponded peatland (such as near a culvert). This ecological resistance can be attributed to the ability of these bogs to respond to large fluctuations in water, as the peat acts like a sponge, expanding and contracting with the water supply. There is also a general resistance to fire, insects, disease, construction, land management, etc. due to the wet nature and particular species on the site. Further study is needed to identify alternative states for this site.

Dominant resource concerns

- Ponding and flooding
- Surface 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 1.1
Medium Fen

A moderately minerotrophic peatland (intermediate between rich fens and poor fens) in which the substrate is a mixed peat composed of graminoids, mosses, and woody species. Medium fens are fed by waters that are moderately mineralized, with pH values generally ranging from 4.5 to 6.5. Medium fens often occur as a narrow transition zone between an aquatic community and either a swamp or an upland community along the edges of streams and lakes. In medium fens, the herbaceous layer, dominated by the sedge *Carex lasiocarpa*, typically forms a canopy that overtops the low shrub layer. The physiognomy of medium fens may range from a dwarf shrubland to a perennial grassland, and be either shrub-dominated, herb dominated or have roughly equal amounts of shrubs and herbs. The dominant species in medium fens are usually the sedge *Carex lasiocarpa* and sweet-gale (*Myrica gale*). In addition to sweet-gale, characteristic shrubs include leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda polifolia* var. glaucophylla), speckled alder (*Alnus incana* ssp. rugosa), large cranberry (*Vaccinium macrocarpon*), and young red maple (*Acer rubrum*). Other shrubs include black chokeberry (*Aronia melanocarpa*), bog willow (*Salix pedicellaris*), meadow-sweet (*Spiraea alba* var. latifolia), hardhack (*Spiraea tomentosa*), and swamp rose (*Rosa palustris*). Alder-leaf buckthorn (*Rhamnus alnifolia*), and poison sumac (*Toxicodendron vernix*) may be present with low percent cover. In addition to the sedge *Carex lasiocarpa*, characteristic herbs include marsh St. John's-wort (*Triadenum virginicum*), pitcher-plant (*Sarracenia purpurea*), milfoil bladderwort (*Utricularia intermedia*), sundew (*Drosera rotundifolia*), white beakrush (*Rhynchospora alba*), marsh fern (*Thelypteris palustris*), arrowleaf (*Peltandra virginica*), rose pogonia (*Pogonia ophioglossoides*), grass pink (*Calopogon tuberosus*), swamp goldenrod (*Solidago uliginosa*), royal fern (*Osmunda regalis*), three-way sedge (*Dulichium arundinaceum*), buckbean (*Menyanthes trifoliata*), common cat-tail (*Typha latifolia*), and sundew (*Drosera intermedia*). Other herbs found in medium fens include blue flag (*Iris versicolor*), marsh cinquefoil (*Comarum palustre*), twig-rush (*Cladium mariscoides*), sedges (*Carex utriculata*, *C. leptalea*, *C. stricta*, *C. limosa*, *C. interior*), tufted loosestrife (*Lysimachia thyrsiflora*), alpine bulrush (*Trichophorum alpinum*), and narrow-leaf cat-tail (*Typha angustifolia*). A rare orchid of some medium fens is dragon’s mouth (*Arethusa bulbosa*). (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.

Dominant resource concerns

- Ponding and flooding
- Seasonal high water table
- 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
- 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

Rich Graminoid Fen

A strongly minerotrophic peatland in which the substrate is a predominantly graminoid peat that may or may not be underlain by marl. Rich fens are fed by waters that have high concentrations of minerals and high pH values, generally from 6.0 to 7.8. Rich graminoid fens are usually fed by water from highly calcareous springs or seepage. The dominant species in rich graminoid fens are sedges, although grasses and rushes may be common. Shrubs may be present, but collectively they have less than 50% cover. Peat mosses (Sphagnum spp.) are either absent or a minor component, with only the most minerotrophic species present. Other mosses, especially those requiring highly minerotrophic conditions, may be common. Characteristic herbs include spike muhly (*Muhlenbergia glomerata*), swamp goldenrod (*Solidago uliginosa*), sedges (*Carex flava*, *C. lasiocarpa*, *C. sterilis*, *C. aquatilis*, *C. prairea*, *C. hystericina*), bog-rush (*Cladium mariscoides*), grass-of-parnassus (*Parnassia glauca*), sundew (*Drosera rotundifolia*), marsh fern (*Thelypteris palustris*), white beakrush (*Rhynchospora alba*), common cat-tail (*Typha latifolia*), spikerush (*Eleocharis rostellata*), royal fern (*Osmunda regalis*), blue flag (*Iris versicolor*), and hard-stem bulrush (*Schoenoplectus acutus*). Other herbs found in rich graminoid fens include alpine bulrush (*Trichophorum alpinum*), flat-topped white aster (*Doellingeria umbellata* var. umbellata), cotton-grass (Eriophorum viridi-carinatum), boneset (*Eupatorium perfoliatum*), spotted joe-pye-weed (*Eutrochium maculatum*), buckbean (*Menyanthes trifoliata*), Ohio goldenrod (*Oligoneuron ohioense*), sedges (*Carex stricta*, *C. buxbaumii*, *C. pellita*, *C. leptalea*), spreading goldenrod (*Solidago patula*), fringed brome (*Bromus ciliatus*), marsh St. John's-wort (*Triadenum virginicum*), common horsetail (*Equisetum arvense*), marsh cinquefoil (*Comarum palustre*), field mint (*Mentha arvensis*), arrow-grasses (Triglochin maritimum, T. palustre), milfoil bladderwort (*Utricularia intermedia*), grass pink (*Calopogon tuberosus*), water-horehound (*Lycopus uniflorus*), rose pogonia (*Pogonia ophioglossoides*), golden ragwort (*Packera aurea*), fringed gentian (*Gentianopsis crinita*), and Kalm's lobelia (*Lobelia kalmii*). Characteristic shrubs include shrubby cinquefoil (*Dasiphora fruticosa* ssp. floribunda), bayberry (Myrica pensylvanica), speckled alder (*Alnus incana* ssp. rugosa), poison sumac (*Toxicodendron vernix*), red maple (*Acer rubrum*), alder-leaf buckthorn (*Rhamnus alnifolia*), red osier dogwood (*Cornus sericea*), and hoary willow (*Salix candida*). Other shrubs found in rich graminoid fens include northern white cedar (*Thuja occidentalis*), dwarf raspberry (*Rubus pubescens*), tamarack (*Larix laricina*), sweet-gale (*Myrica gale*), and swamp fly honeysuckle (*Lonicera oblongifolia*). (Edinger et al. 2014)

Resilience management. New York Natural Heritage Program State Rank: S1/S2 S1: Typically 5 or fewer occurrences, very few remaining individuals (for species), acres, or miles of stream, or some factor of its biology and/or ecology making it especially vulnerable in New York State. 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.

Dominant resource concerns

- Ponding and flooding
- Seasonal high water table
- Surface 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
- 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 1.3
Inland Poor Fen

This site is a weakly minerotrophic, flat peatland that occurs inland from the coastal plain in which the substrate is peat composed primarily of peat mosses (Sphagnum spp.) with admixtures of graminoid or woody peat. The dominant plants are peat mosses (Sphagnum spp.), with scattered sedges, shrubs, and stunted trees. Poor fens are fed by waters that are weakly mineralized, and have low pH values, generally between 3.5 and 5.0. This community typically develops where water moves through the peat mat, thus it often forms linear patches closely associated

with open water. Characteristic peat mosses include *Sphagnum angustifolium*, *S. cuspidatum*, *S. fallax*, *S. fuscum*, *S. magellanicum*, *S. papillosum*, *S. rubellum*, and S.russowii. Characteristic herbs include sedges (*Carex oligosperma*, *C. exilis*, *C. limosa*, *C. trisperma*, *C. utriculata*, C. paupercula, *C. canescens*, *C. michauxiana*, C. parviflora), white beakrush (*Rhynchospora alba*), cottongrasses (*Eriophorum vaginatum*, *E. virginicum*), round-leaf sundew (*Drosera rotundifolia*), rose pogonia (*Pogonia ophioglossoides*), grass pink (*Calopogon tuberosus*), and pitcher-plant (*Sarracenia purpurea*). *Carex lasiocarpa* may be present, but not dominant as in medium fens. A rare orchid of some inland poor fens is dragon's mouth (*Arethusa bulbosa*). Shrubs and dwarf shrubs are patchy and usually have less than 50% cover (i.e., not dominated by shrubs as in dwarf shrub bog). The taller sedges often overtop the short shrubs. Cranberries (*Vaccinium oxycoccos*, *V. macrocarpon*) are often dominant. Other characteristic shrubs include bog laurel (*Kalmia polifolia*), sheep laurel (*K. angustifolia*), sweet-gale (*Myrica gale*), black chokeberry (*Aronia melanocarpa*), leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda polifolia* var. glaucophylla), and Labrador tea (Rhododendron groenlandicum). Scattered stunted trees such as tamarack (*Larix laricina*), black spruce (*Picea mariana*), and red maple (*Acer rubrum*) may be present. Many of our "kettlehole bogs" are inland poor fens, according to this classification, since they are weakly minerotrophic. Poor fens often include hummocks that are essentially ombrotrophic islands within a weakly minerotrophic peatland. This community shares many characteristics and species with coastal plain poor fen, but can be distinguished by its geographic location off the coastal plain along with having more northern or boreal indicator species (e.g., *Kalmia polifolia*, *Andromeda polifolia* var. glaucophylla, Rhododendron groenlandicum, *Larix laricina*, *Picea mariana*). (Edinger et al. 2014)

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

Dominant resource concerns

- Ponding and flooding
- Surface 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 1.4
North-Central Interior and Appalachian Acidic Peatland

These Sphagnum and shrub peatlands occur in basins south of the Laurentian-Acadian region down to near the glacial boundary in the northeastern and north-central U.S. Unlike the true raised bogs of boreal regions, the vegetation is not raised above the groundwater level. They are found in colder regions, mostly in areas where glacial stagnation left coarse deposits and glacial depressions (many are "kettleholes"). The basins are generally closed, i.e., without inlets or outlets of surface water, and typically small in area. The nutrient-poor substrate and the reduced throughflow of water create oligotrophic conditions fostering the development of Sphagnum peat and the growth of peatland vegetation. In deeper basins, the vascular vegetation grows on a Sphagnum mat over water, with no mineral soil development. Ericaceous shrubs and dwarf-shrubs (e.g., *Chamaedaphne calyculata*) dominate, with patches of graminoid dominance. Some peatlands may have a sparse tree layer. Although these are often called bogs, in most cases they are technically fens (albeit nutrient-poor ones), as the vegetation remains in contact with the surface water. Trees include *Acer rubrum*, *Picea mariana*, and *Pinus rigida*. Shrubs may include *Alnus incana*, *Chamaedaphne calyculata*, *Decodon verticillatus*, *Gaylussacia baccata*, *Gaylussacia dumosa*, *Ilex verticillata*, *Larix laricina*, *Myrica gale*, *Aronia melanocarpa* (= Photinia melanocarpa), *Spiraea tomentosa*, *Vaccinium corymbosum*, *Vaccinium macrocarpon*, *Vaccinium myrtilloides*, *Vaccinium oxycoccos*, and *Viburnum nudum*. Forbs and graminoids may include *Calla palustris*, *Carex lasiocarpa*, *Carex oligosperma*, *Carex pauciflora*, *Carex utriculata*, *Dulichium arundinaceum*, *Eriophorum vaginatum*, *Eriophorum virginicum*, *Lysimachia terrestris*,

Osmunda regalis, *Triadenum virginicum*, Utricularia sp., and *Woodwardia virginica*. These peatlands occur in kettle depressions on pitted outwash and moraines and in flat areas and shallow depressions on glacial outwash and glacial lakeplain. Groundwater and surface water feed these temperate peatlands. It is not strongly calcareous and may be acidic in some places but not as much as boreal sites. These peatlands occurred in landscapes dominated by either forest or grassland/savanna. The fire regime is not well known but periodic surface fires likely helped limit the cover by trees. The basins in which these occur tend to be small and, where open water is still present, these peatlands form where wave energy is low. These peatlands are characterized by organic soils composed of saturated peat that contains partially decomposed sphagnum mosses and frequently fragments of sedges and wood. The peat soils are acidic, cool, and characterized by low nutrient availability and oxygen levels. The water-retaining capacity of sphagnum peat is tremendous and as a result these are saturated, anoxic systems with water tables near the surface. NatureServe Element Code: CES202.606 (NatureServe, 2022)

Resilience management. The cool, nutrient-poor water which feeds into this system favors peat development. This water can come from surface runoff or groundwater. Basins in which these peatlands occur are small, which limits the amount of nutrients that can be brought in by surface water. Groundwater sources flow through nutrient-poor, neutral to somewhat acidic substrates. Once peat begins to develop, it tends to create conditions favorable for continued peat development by contributing to the acidic, anoxic character of the water. Alterations in wetland hydrology and agricultural development can threaten examples of this system. These can occur due to ditching, road construction, quarrying/mining, or development of crop fields or pastures that affect groundwater or surface waterflows into sites. Both reductions and increases in groundwater or surface water input can negatively affect this system. Partial drainage of a site can lead to increased fertility as peat decomposes; this allows species typical of richer swamps or uplands to colonize. Increased surface waterflow can flood the peatland and transform it to an inundated wetland rather than a saturated peatland and can transport sediment and higher nutrient loads. Periodic fires infrequently help keep woody plants in check, and a reduction in this frequency will result in increased growth by these species. However, fires that occur when the peat has dried out (due to prolonged drought or a reduction in water input) can burn the peat and create mineral soil wetlands. Invasive species tend to increase after perturbations to other processes that maintain peatlands but can invade without changes, as well. Particularly aggressive invasive species that may threaten the diversity and vegetative structure of this peatland system include *Frangula alnus* (= Rhamnus frangula), *Phalaris arundinacea*, *Phragmites australis*, *Typha angustifolia*, and Typha x glauca. Disturbance near this system, whether crop fields, road building, urban development, or other activities, can serve as seed sources for invasive species. NatureServe Element Code: CES202.606 (NatureServe, 2022)

Dominant resource concerns

- Ponding and flooding
- Seasonal high water table
- Surface 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

State 2
Semi-natural State

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

Dominant resource concerns

- Ponding and flooding

- Surface 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 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
- Aquatic habitat for fish and other organisms

Community 2.2
Ponded/Flooded

During periods of heavy precipitation and seasonal high water tables, sites may become flooded and ponded.

Dominant resource concerns

- Ponding and flooding
- Seasonal high water table
- 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
- Terrestrial habitat for wildlife and invertebrates
- Aquatic habitat for fish and other organisms

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 influences). More research is needed to determine the extent of the cultural state associated with this ecological site.

Community 3.1
Drained

Hydrological alteration is implemented and site is drained

Dominant resource concerns

- Organic matter depletion
- 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 3.2
Urbanization

Hydrological alteration is implemented, site is drained, landscape is altered, landscape is developed. Alternatively, surrounding area to ecological site is developed and constructed, resulting in changes to ecological site composition, dynamics, and functions.

Dominant resource concerns

- Compaction
- Organic matter depletion
- 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
- 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

Transition T1B
State 1 to 3

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

Conservation practices

Dam, Diversion
Diversion
Dam
Land Clearing
Precision Land Forming
Land Smoothing
Drainage Water Management
Subsurface Drain
Floodproofing
Land Grading

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
Stream Habitat Improvement and Management
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
Extending existing riparian herbaceous cover for water quality protection and wildlife habitat
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
Herbaceous Weed Control
Aquatic Organism Passage Barrier Removal
Riparian buffer, terrestrial and aquatic wildlife habitat
Establish pollinator and/or beneficial insect habitat

Transition T2A
State 2 to 3

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

Conservation practices

Dam, Diversion
Diversion
Dam
Land Clearing
Precision Land Forming
Land Smoothing
Drainage Water Management
Subsurface Drain
Floodproofing
Land Grading
Monitoring and Evaluation

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

Riparian Herbaceous Cover
Stream Habitat Improvement and Management
Aquatic Organism Passage
Obstruction Removal
Tree/Shrub Establishment
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
Restoration and Management of Rare or Declining Habitats
Multi-species Native Perennials for Biomass/Wildlife Habitat
Monitoring and Evaluation
Aquatic Organism Passage Barrier Removal

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

Stream Habitat Improvement and Management
Aquatic Organism Passage
Obstruction Removal
Wetland Wildlife Habitat Management
Upland Wildlife Habitat Management
Shallow Water Development and Management
Constructed Wetland
Wetland Restoration
Wetland Creation
Wetland Enhancement
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Non-forested riparian zone enhancement for fish and wildlife
Multi-species Native Perennials for Biomass/Wildlife Habitat
Monitoring and Evaluation
Aquatic Organism Passage Barrier Removal

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

Christopher Mann

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	05/13/2025
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:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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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):**

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:**