V. PALUSTRINE SYSTEM

The palustrine system consists of non-tidal, perennial wetlands characterized by emergent vegetation. The system includes wetlands permanently saturated by seepage, permanently flooded wetlands, and wetlands that are seasonally or intermittently flooded (these may be seasonally dry) if the vegetative cover is predominantly hydrophytic and soils are hydric. Wetland communities are distinguished by their plant composition (hydrophytes), substrate (hydric soils), and hydrologic regime (frequency of flooding) (Cowardin 1979).

Peatlands are a special type of wetland in which the substrate primarily consists of accumulated peat (partly decomposed plant material such as mosses, sedges, and shrubs) or marl (organically derived calcium carbonate deposits), with little or no mineral soil. Stable water levels or constant water seepage allow little aeration of the substrate in peatlands, slowing decomposition of plant litter, and resulting in peat or marl accumulation. In this classification, peatlands are characterized by their hydrologic regime; water source and water chemistry are important factors. Minerotrophic peatlands (fens) are fed by groundwater that contains minerals obtained during passage through or over mineral soils or aquifers. Ombrotrophic peatlands (bogs) are fed primarily by direct rainfall, with little or no groundwater influence (Damman and French 1987). The vegetation of ombrotrophic peatlands is depauperate; plants in the families *Sphagnaceae* and *Ericaceae* are prominent. The vegetation of minerotrophic peatlands is comparatively rich in species; plants in the families *Cyperaceae* and *Poaceae* are prominent (Heinselman 1970).

In a natural landscape there are continuous gradients from ombrotrophic to strongly minerotrophic wetlands; there are also continuous gradients in soils from mineral soils to peat soils. The boundaries between different types of wetlands are not always discrete. Several different types of wetlands may occur together in a complex mosaic.

A. OPEN MINERAL SOIL WETLANDS

This subsystem includes wetlands with less than 50% canopy cover of trees. In this classification, a tree is defined as a woody plant usually having one principal stem or trunk, a definite crown shape, and characteristically reaching a mature height of at least 16 ft (5 m) (Driscoll et al. 1984). The dominant vegetation may include shrubs or herbs. Substrates range from mineral soils or bedrock to well-decomposed organic soils (muck). Fluctuating water levels allow enough aeration of the substrate to allow plant litter to decompose, so there is little or no accumulation of peat.

1. Deep emergent marsh: a marsh community that occurs on mineral soils or fine-grained organic soils (muck or well-decomposed peat); the substrate is flooded by waters that are not subject to violent wave action. Water depths can range from 6 in to 6.6 ft (15 cm to 2 m); water levels may fluctuate seasonally, but the substrate is rarely dry, and there is usually standing water in the fall.

The most abundant emergent aquatic plants are cattails (*Typha angustifolia, T. latifolia*), wild rice (*Zizania aquatica*), bur-weeds (*Sparganium eurycarpum, S. androcladum*), pickerel weed (*Pontederia cordata*), bulrushes (*Scirpus tabernaemontani, S. fluviatilis, S. heterochaetus., S. acutus, S. pungens, S. americanus*), arrowhead (*Sagittaria latifolia*), arrowleaf (*Peltandra virginica*), rice cutgrass (*Leersia oryzoides*), bayonet rush (*Juncus militaris*), water horsetail (*Equisetum fluviatile*) and bluejoint grass (*Calamagrostis canadensis*).

The most abundant floating-leaved aquatic plants are fragrant water lily (*Nymphaea odorata*), duckweeds (*Lemna minor, L. trisulca*), pondweeds (*Potamogeton natans, P. epihydrus, P. friesii, P. oakesianus, P. crispus, P. pusillus, P. zosteriformis, P. strictifolius*), spatterdock (*Nuphar variegata*), frog's-bit (*Hydrocharis morus-ranae*), watermeal (*Wolffia* spp.), water-shield (*Brasenia schreberi*), and water-chestnut (*Trapa natans*).

The most abundant submerged aquatic plants are pondweeds (*Potamogeton richardsonii, P. amplifolius, P. spirillus, P. crispus, P. zosteriformis*), coontail (*Ceratophyllum demersum*), chara (*Chara globularis*), water milfoils (*Myriophyllum spicatum, M. sibericum*), pipewort (*Eriocaulon aquaticum*), tapegrass (*Vallisneria americana*), liverwort (*Riccia fluitans*), naiad (*Najas flexilis*), water lobelia (*Lobelia dortmanna*), waterweed (*Elodea canadensis*), water stargrass (*Heteranthera dubia*), and bladderworts (*Utricularia vulgaris, U. intermedia*).

Animals that may be found in deep emergent marshes include red-winged blackbird (*Agelaius phoeniceus*), marsh wren (*Cistothorus palustris*), bullfrog (*Rana catesbeiana*), and painted turtle (*Chrysemys picta*). Rare species in some deep emergent marshes include American bittern (*Botaurus lentiginosus*), Virginia rail (*Rallus limicola*), and pied-billed grebe (*Podilymbus podiceps*).

Marshes that have been disturbed are frequently dominated by aggressive weedy species such as purple loosestrife (*Lythrum salicaria*) and reedgrass (*Phragmites australis*). Deep emergent marshes also occur in excavations that contain standing water (e.g., roadside ditches, gravel pits).

Distribution: throughout New York State.
Rank: G5 S5 *Revised:* 2001

Examples: Lake Champlain South Basin, Washington County; Lake Lila, Hamilton County; Chippewa Creek Marsh, St. Lawrence County; Upper and Lower Lakes, St. Lawrence County, Big Bay Swamp, Oswego County..

Sources: Bray 1915; Cowardin 1979; Gilman 1976; NYNHP field surveys.

2. Shallow emergent marsh: a marsh meadow community that occurs on mineral soil or deep muck soils (rather than true peat), that are permanently saturated and seasonally flooded. This marsh is better drained than a deep emergent marsh; water depths may range from 6 in to 3.3 ft (15 cm to 1 m) during flood stages, but the water level usually drops by mid to late summer and the substrate is exposed during an average year.

Most abundant herbaceous plants include bluejoint grass (*Calamagrostis canadensis*), cattails (*Typha latifolia, T. angustifolia, T. x glauca*), sedges (*Carex* spp.), marsh fern (*Thelypteris palustris*), manna grasses (*Glyceria pallida, G. canadensis*), spikerushes (*Eleocharis smalliana, E. obtusa*), bulrushes (*Scirpus cyperinus, S. tabernaemontani, S. atrovirens*), three-way sedge (*Dulichium arundinaceum*), sweetflag (*Acorus americanus*), tall meadow-rue (*Thalictrum pubescens*), marsh St. John's-wort (*Triadenum virginicum*), arrowhead (*Sagittaria latifolia*), goldenrods (*Solidago rugosa, S. gigantea*), eupatoriums (*Eupatorium maculatum, E. perfoliatum*), smartweeds (*Polygonum coccineum, P. amphibium, P. hydropiperoides*), marsh bedstraw (*Galium palustre*), jewelweed (*Impatiens capensis*), loosestrifes (*Lysimachia thyrsiflora, L. terrestris, L. ciliata*). Frequently in degraded examples reed canary grass (*Phalaris arundinacea*) and/or purple loosestrife (*Lythrum salicaria*) may become abundant.

Sedges (*Carex* spp.) may be abundant in shallow emergent marshes, but are not usually dominant. Marshes must have less than 50% cover of peat and tussock-forming sedges such as tussock sedges (*Carex stricta*), otherwise it may be classified as a sedge meadow. Characteristic shallow emergent marsh sedges include *Carex stricta, C. lacustris, C. lurida, C. hystricina, C. alata, C. vulpinoidea, C. comosa, C. utriculata, C. scoparia, C. gynandra, C. stipata,* and *C. crinita*.

Other plants characteristic of shallow emergent marshes (most frequent listed first) include blue flag iris (*Iris versicolor*), sensitive fern (*Onoclea sensibilis*), common skullcap (*Scutellaria galericulata*), begger-ticks (*Bidens* spp.), water-horehounds (*Lycopus uniflorus, L. americanus*), bur-weeds (*Sparganium americanum, S. eurycarpum*), swamp milkweed (*Asclepias incarnata*), water-hemlock (*Cicuta bulbifera*), asters (*Aster umbellatus, A. puniceus*), marsh bellflower (*Campanula aparinoides*), water purslane (*Ludwigia palustris*), royal and cinnamon ferns (*Osmunda regalis, O. cinnamomea*), marsh cinquefoil (*Potentilla palustris*), rushes (*Juncus effusus, J. canadensis*), arrowleaf (*Peltandra virginica*), purple-stem angelica (*Angelica atropurpurea*), water docks (*Rumex orbiculatus, R. verticillatus*), turtlehead (*Chelone glabra*), water-parsnip (*Sium suave*), and cardinal flower (*Lobelia cardinalis*).

Shallow emergent marshes may have scattered shrubs including rough alder (*Alnus incana* ssp. *rugosa*), water willow (*Decodon verticillatus*), shrubby dogwoods (*Cornus amomum, C. sericea*), willows (*Salix* spp.), meadow sweet (*Spiraea alba* var. *latifolia*), and buttonbush (*Cephalanthus occidentalis*). Areas with greater than 50% shrub cover are classified as shrub swamps.

Amphibians that may be found in shallow emergent marshes include frogs such as eastern American toad (*Bufo a. americanus*), northern spring peeper (*Pseudoacris c. crucifer*), green frog (*Rana clamitans melanota*), and wood frog (*Rana sylvatica*); and salamanders such as northern redback salamander (*Plethodon c. cinereus*) (Hunsinger 1999). Birds that may be found include red-winged blackbird (*Agelaius phoeniceus*), marsh wren (*Cistothorus palustris*), and common yellowthroat (*Geothlypis trichas*) (Levine 1998).

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.

Distribution: throughout New York State.

Rank: G5 S5 *Revised:* 2001

Examples: South Branch Grass River Colton, St. Lawrence County; West Branch Oswagatchie River Diana, Lewis County; East Branch Fish Creek, Lewis County; Jordan River, St. Lawrence/Franklin Counties; Lakeview Marshes, Jefferson County.

Sources: Bray 1915; Gilman 1976; Hotchkiss 1932; Hunsinger 1999; Levine 1998; Metzler and Tiner 1992; Tiner 1985; NYNHP field surveys.

3. Shrub swamp: an 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. 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 codominated by a mixture of species, or have a single dominant shrub species.

In northern New York many shrub swamps are dominated by alder (*Alnus incana* ssp. *rugosa*); these swamps are sometimes called *alder thickets*. A swamp dominated by red osier dogwood (*Cornus sericea*), silky dogwood (*C. amomum*), and willows (*Salix* spp.) may be called a *shrub carr*. Along the shores of some lakes and ponds there is a distinct zone dominated by water-willows (*Decodon verticillatus*) and/or butonbush (*Cephalanthus occidentalis*) which can sometimes fill a shallow basin.

Characteristic shrubs that are common in these and other types of shrub swamps include meadow-sweet (*Spiraea alba* var. *latifolia*), steeple-bush (*Spiraea tomentosa*), gray dogwood (*Cornus foemina* ssp. *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 cassinoides*), and arrowwood (*Viburnum recognitum*). More documentation and research is needed to distinguish the different types of shrub swamps in New York.

Birds that may be found in shrub swamps include common species such as common yellowthroat (*Geothlypis trichas*); and rare species such as American bittern (*Botaurus lentiginosus*), alder flycatcher (*Empidonax alnorum*), willow flycatcher (*E. trallii*), and Lincoln's sparrow (*Passerella lincolnii*) (Levine 1998).

Distribution: throughout New York State.

Rank: G5 S5 *Revised:* 2001

Examples: West Branch Oswagatchie River Diana, Lewis County; West Branch Sacandaga River, Hamilton County; Jordan River, St. Lawrence/Franklin Counties, Shingle Shanty Brook, Hamilton County, East Branch Fish Creek, Lewis County.

Sources: Bray 1915; Levine 1998; McVaugh 1958; Metzler and Tiner 1992; Shanks 1966; Tiner 1985; NYNHP field surveys.

4. Cobble shore wet meadow: a community that occurs on the cobble shores of lakes and streams where the substrate is moist from seepage or intermittent flooding. The substrate is a mixture of cobbles and sand. They are likely to be scoured by floods or winter ice floes, but there is apparently no significant accumulation of pack ice. Vegetation may be sparse.

Characteristic species include water-plantain (*Alisma plantago-aquatica*), beggar-ticks (*Bidens frondosa*), spikerushes (*Eleocharis* spp.), common horsetail (*Equisetum arvense*), boneset (*Eupatorium perfoliatum*), silverweed (*Potentilla anserina*), creeping spearwort (*Ranunculus reptans*), and three-square (*Scirpus americanus*). Where seepage water is calcareous, characteristic species include sedges (*Carex aurea, C. flava, C. granularis, C. viridula*), variegated horsetail (*Equisetum variegatum*), brook lobelia (*Lobelia kalmii*), marsh fern (*Thelypteris palustris*), rushes (*Juncus nodosus, J. alpinus, J. pelocarpus*), and mosses such as *Campylium stellatum* and *Drepanocladus* sp.

Distribution: apparently restricted to shores of Lake Champlain and the St. Lawrence River. Probably also occurs along Lake Ontario and possibly on a few large inland lakes such as the Finger Lakes.

Rank: G3? S2S3 *Revised:* 1990

Example: Valcour Island, Essex County.

Source: NYNHP field surveys.

5. Inland calcareous lake shore: the gravelly, sandy, or muddy shore of an inland lake or pond with calcareous water and seasonally fluctuating water levels. The substrate is either saturated or flooded. Vegetative cover may be sparse; the dominant species are herbaceous.

Characteristic species include spikerushes (*Eleocharis acicularis* and *E. palustris*), marsh rush (*Juncus canadensis*), hard-stem bulrush (*Scirpus acutus*), soft-stem bulrush (*S. tabernaemontani*), water plantain (*Alisma plantago-aquatica*), water stargrass (*Heteranthera dubia*), creeping spearwort (*Ranunculus reptans*), white water-crowfoot (*Ranunculus longirostris*), and lake-cress (*Armoracia aquatica*). More data on this community are needed.

Distribution: not well known, probably throughout upstate New York north of the Coastal Lowlands ecozone. Occurrences are reported from the Appalachian Plateau, Taconic Highlands, and Champlain ecozones.

Rank: G4? S3S4 *Revised:* 1990

Examples: Song Lake, Cortland County; Ausable Delta, Clinton County; Eastern Lake Ontario, Oswego/Jefferson Counties.

Source: NYNHP field surveys.

6. Inland non-calcareous lake shore: the gravelly, sandy or muddy shore of an inland lake or pond with seasonally fluctuating water levels where the water is not calcareous. The substrate is either saturated or flooded. Vegetative cover may be sparse; the dominant species are herbaceous.

Characteristic species include smartweed (*Polygonum pensylvanicum*), water lobelia (*Lobelia dortmanna*), cyperus (*Cyperus squarrosus*), sedge (*Fimbristylis autumnalis*), spikerush (*Eleocharis obtusa*), jointed rush (*Juncus articulatus*), mud-hyssop (*Gratiola neglecta*), and marsh purslane (*Ludwigia palustris*). More data on this community are needed.

Distribution: throughout upstate New York, north of the Coastal Lowlands ecozone.

Rank: G4G5 S4 *Revised:* 1990

Example: Polliwog Pond, Franklin County.

Source: NYNHP field surveys.

7. Coastal plain pond shore: the gently sloping shore of a coastal plain pond with seasonally and annually fluctuating water levels. The substrate is sandy, gravelly, or mucky. Vegetative cover varies with the water levels. In dry years when water levels are low and the substrate is exposed, there is a dense growth of annual sedges, grasses, and herbs. Submerged and floating-leaved aquatic plants, such as fragrant waterlily (*Nymphaea odorata*) and pondweeds (*Potamogeton* spp.), may become "stranded" on the exposed shore. In wet years when the water level is high and the substrate is flooded, vegetation is sparse, and only a few emergents and floating-leaved aquatics are apparent. A description of the aquatic component is included under the coastal plain pond community. The vegetation of this pond shore community can change dramatically from one year to the next depending on fluctuations in groundwater levels.

Coastal plain pond shores can be divided into four distinct zones following the proposed classification by Zaremba and Lamont (1993):

1. The *upper wetland shrub thicket* zone is treated as either pine barrens shrub swamp or the coastal variant of highbush blueberry bog thicket. This zone may also grade into red maple-black gum swamp, coastal plain Atlantic white cedar swamp, or in pond shores with steeper slopes pitch pine-oak forest.

2. The *upper, low herbaceous fringe* zone is a narrow band of vegetation with peaty substrate mixed with sand. The dominant plants of this zone are peat moss (*Sphagnum* spp.), yellow-eyed grass (*Xyris difformis*), narrow-leaved goldenrod (*Euthamia tenuifolia*), bluejoint grass (*Calamagrostis canadensis*), clubmosses (*Lycopodiella inundata, L. appressa*). Other plants of this zone include (*Agalinis virgata*), sedge (*Carex striata*), sundews (*Drosera intermedia, D. filiformis*), creeping St. John's-wort (*Hypericum adpressum*), slender blue-flag (*Iris prismatica*), redroot (*Lacnanthes caroliniana*), Nuttall's lobelia (*Lobelia nuttallii*), water-horehound (*Lycopus amplectans*), panic grasses (*Panicum acuminatum, P. verrucosum, P. wrightianum*), and large cranberry (*Vaccinium macrocarpon*). Occasionally, scattered seedlings of Atlantic white cedar (*Chamaecyparis thyoides*) may be found in this zone.

3. The *sandy exposed pond bottom* zone is often very sandy and dominated by annual species. This zone may be extremely wide at ponds with very gradual pond bottom slopes. The dominant plants of this zone are beakrushes (*Rhynchospora capitellata, R. nitens*), and nutrush (*Scleria reticularis* var. *reticularis*). Other species of this zone include yellow-eyed grass (*Xyris difformis*), Canadian St. John's-wort (*Hypericum canadense*), rushes (*Juncus pelocarpus, J canadensis*), rose coreopsis (*Coreopsis rosea*), spikerushes (*Eleocharis melanocarpa, E. tuberculosa*), umbrella-grass (*Fuirena pumila*), ludwigia (*Ludwigia sphaerocarpa*), bald-rush (*Rhynchospora scirpoides*), white beakrush (*Rhynchospora alba*), Virginia meadow-beauty (*Rhexia virginica*), marsh St. John's-wort (*Triadenum virginicum*), bladderwort (*Utricularia subulata*).

4. The *organic exposed pond bottom* zone is more frequently flooded than the sandy zone, hence has a greater accumulation of organics. The dominant plants of this zone can be extremely variable from year to year depending on the degree of flooding. In high water years, annual species that cannot germinate underwater are usually absent and submerged and floating-leaved aquatic plants are more abundant. In contrast, annual species tend to flourish in low water years and the aquatic species become less prevalent. The dominant plants of this zone are bald-rush (*Rhynchospora scirpoides*[l]), pipewort (*Eriocaulon aquaticum*[h]), (*Eleocharis obtusa*[l], *E. olivacea*[l]), gratiola (*Gratiola aurea*). Other species of this zone include twigrush (*Cladium mariscoides*), (*Eleocharis robbinsii*), bayonet rush (*Juncus militaris*), mermaid-weed (*Proserpinaca pectinata*), beaked rushes (*Rhynchospora*

macrostachya, R. inundata,), quill-leaf arrowhead (*Sagittaria teres* [h]), bladderworts (*Utricularia juncea*[l], *U. fibrosa, U. purpurea*[h], *U. striata*), yellow-eyed grasses (*Xyris smalliana*, *X. torta*).

[h] = more abundant in high water years

[l] = more abundant in low water years

Characteristic animals include eastern painted turtle (*Chrysemys picta picta*), muskrat (*Ondatra zibethica*), various dragonflies and damselflies, and chain pickerel (*Esox niger*). Rare animals of some coastal plain ponds and pond shores include bluets (*Enallagma recurvatum, E. laterale, E. pictum*), eastern mudminnow (*Umbra pygmaea*), tiger salamander (*Ambystoma tigrinum*), and banded sunfish (*Enneacanthus obesus*).

The primary disturbance in coastal plain pond shores is a periodic cycle of flooding and draw down. Hydrology of the ponds is controlled by a long term 2-3 year cycle of draw down and flooding tightly linked with local rainfall amounts and, in some ponds, local groundwater levels (Schneider 1992). The amount of groundwater influx for a given pond or pond system appears to be influenced by landscape position. For example, pond shores in proximity to topographical highs, such as kames and morainal hills, appear to have increased amounts of groundwater flow versus ponds in more level topography (Schneider 1992). Ponds positioned at higher elevations draw down faster than neighboring ponds at lower elevations. Secondary disturbances include fire, which influences vegetation at the pond shore shrub margin and may effect the amount of organic material in the pond substrate (Zaremba and Lamont 1993).

Because of the characteristic zones of vegetation that dominate a pond shore in any given year, ponds may have a number of different vegetation assemblages based on the extent of draw down, position within the pond shore, and overall composition of vegetation within a specific pond (Graham and Henry 1933, Zaremba and Lamont 1993, Schneider 1994). Coastal plain pond shores are a dynamic collection of vegetation and a well-zoned pond shore may display one or more vegetation associations in a single growing season. The vegetation associations that dominate New York pond shores probably should be recognized as stochastic, repeating vegetation "zones" that appear as a function of periodic fluctuation of hydrology (Zaremba and Lamont 1993, Schneider 1994).

Distribution: restricted to the Coastal Lowlands ecozone on Long Island.

Rank: G3G4 S2 *Revised:* 2001

Examples: Peasy's Pond, Suffolk County; Crooked Pond and Long Pond, Suffolk County; House Pond and Division Pond, Suffolk County. The best examples are concentrated in three main areas on Long Island, the Peconic River Headwaters, Sears Bellows County Park, and the Long Pond Greenbelt.

Sources: Graham and Henry 1933; MacDonald and Edinger 2000; Parker 1946; Schneider 1992; Schneider 1994; Williams 2001; Zaremba and Lamont 1993; NYNHP field surveys.

8. Sinkhole wetland: a small wetland, with or without a pond (a sinkhole pond), that occurs in a poorly drained sinkhole, typically underlain by limestone in a region of karst topography. The substrate may be dark muck that is rich in organic matter or deep, calcareous, gleyed clay. Water levels fluctuate seasonally, and the water is usually intermittent, basic and eutrophic. In some areas there are many sinkholes in a group that are hydrologically connected underground, even though they are clearly separate at the ground surface. A split into sinkhole wetland and sinkhole pond, the latter as a lacustrine community, may be warranted and is being evaluated.

Well-developed examples of this community may consist of about four physiognomic zones. The open water area is characterized by submergent aquatic plants such as spikerush (*Eleocharis acicularis*), water-parsnip (*Sium suave*), water plantain (*Alisma plantago-aquatica*), and water purslane (*Ludwigia palustris*). Surrounding the open water is typically a zone of emergent aquatic plants; characteristic species in this zone include sedges (*Carex vulpinoidea, C. lacustris C. canescens*), mannagrass (*Glyceria acutiflora*), bulrush (*Scirpus cyperinus*), beak rush (*Rhynchospora capillacea*), bluejoint grass (*Calamagrostis canadensis*), and small beggar-ticks (*Biden discoidea*). Some sinkhole wetlands are encircled by a ring of shrubs; characteristic shrubs are willows (*Salix sericea, S. lucida, S. nigra, S. petiolaris*). The outer zone may be forested, dominated by the characteristic tree species red maple (*Acer rubrum*), American elm (*Ulmus americana*), green ash (*Fraxinus pensylvanica*), white ash (*F. americana*), bur oak (Quercus macrocarpa), and swamp white oak (*Quercus bicolor*). Most examples have been altered by grazing and other forms of agricultural and only the emergent aquatic zone may remain. The community provides breeding habitat for amphibians such as green frog (*Rana clamitans*) and damselflies (Zygoptera). There may also be characteristic nesting birds and beetles (Coleoptera).

Three broad scale topographic settings for sinkhole wetlands are suspected. Typical examples occur on broad flat calcareous lowland plains such as those on the Great Lakes Plain. Others occur on broad gently sloping valleys and hills sometimes associated with

these plains and also in mountainous areas with calcareous bedrock. In addition, three hydrological variants are suspected. Typical examples occur as a string of small wetland pockets often interconnected via surface hydrology by an intermittent stream. In other examples sinkholes are large and merge into a single continuous wetland with intruding upland fingers. A third hydrological variant has one or more wetland pockets connected via groundwater. Two to five ecoregional variants (including Great Lakes and Lower New England types) are suspected to differ in characteristic and dominant biota. Data on regional, topographic, and hydrological variants, as well as characteristic animals, are needed.

Distribution: scattered on limestone bedrock north of the Coastal Lowland ecozone; documented only from the Eastern Ontario Plains sub-zone of the Great Lakes Plain ecozone and the Saint Lawrence Plains sub-zone of the Adirondack ecozone.

Examples: Spile Bridge Road Wetlands, St. Lawrence County; Johnny Cake Road Sinkhole Wetlands, Jefferson County; Western Rensselaer Plateau Escarpment, Rensselaer County.

Rank: G3? S1 *Revised:* 2001

Source: Walz et al. 2001; Williams 2001; NYNHP field surveys.

9. Maritime freshwater interdunal swales: a mosaic of wetlands that occur in low areas between dunes along the Atlantic coast; the low areas or swales are formed either by blowouts in the dunes that lower the soil surface to groundwater level, or by the seaward extension of dune fields. Soils are either sand or peaty sand; water levels fluctuate seasonally and annually, reflecting changes in groundwater levels. The dominant species are sedges and herbs; low shrubs are usually present, but they are never dominant. These wetlands may be quite small (less than 0.25 acre or 0.1 ha); species diversity is usually low. The composition may be quite variable between different interdunal swales.

Characteristic species include twig-rush (*Cladium mariscoides*), cyperus (*Cyperus* spp.), beakrush (*Rhynchospora capitellata*), marsh rush (*Juncus canadensis*), round-leaf sundew (*Drosera rotundifolia*), threadleaf sundew (*D. filiformis*), cranberry (*Vaccinium macrocarpon*), stiff yellow flax (*Linum striatum*), bladderwort (*Utricularia subulata*), slender yellow-eyed grass (*Xyris torta*), bayberry (*Myrica pensylvanica*), sweet gale (*M. gale*), and highbush blueberry (*Vaccinium corymbosum*). Data on characteristic animals are needed.

The name of this community was changed from "maritime interdunal swales" (Reschke 1990) to distinguish this community from brackish interdunal swales. The term "maritime" is kept to distinguish this community from interdunal swales in the Great Lakes region.

Distribution: near the seacoast in the Coastal Lowlands ecozone.

Rank: G3G4 S2 *Revised:* 2001

Examples: Napeague Dunes, Suffolk County; Atlantic Double Dunes, Suffolk County, Walking Dunes, Suffolk County.

Sources: Johnson 1985; NYNHP field surveys.

10. Pine barrens vernal pond: a seasonally fluctuating, groundwater-fed pond and associated wetland that typically occur in pine barrens, either in low kettlehole depressions of the coastal plain or inland outwash plains or in swales between dunes. The water is intermittent, typically vernally ponded, and circumneutral. The substrate is coarse sand, however, development of a shallow floating peat layer is common . These ponds and wetlands may be small. A split into pine barrens vernal wetland (or pine barrens vernal pondshore) and pine barrens vernal pond (a lacustrine community) may be warranted and is being evaluated.

Well-developed examples of this community may consist of about four physiognomic zones. Ponds are characterized by submergent aquatic plants such as pondweeds (*Potamogeton* spp.). Surrounding ponds are typically a zone of emergent aquatic plants dominated by graminoids and herbs. Sedges such as *Carex canescens*, three three-way sedge (*Dulichium arundinaceum*), and woolgrass (*Scirpus cyperinus*) and soft rush (*Juncus effusus*) may be dominant in this zone. Other herbs include tussock sedge (*Carex stricta*), marsh St. John-s-wort (*Triadenum virginicum*), cinnamon fern (*Osmunda cinnamomea*) marsh fern (*Thelypteris palustris*), and Virginia chain fern (*Woodwardia virginica*). Characteristic mosses include include (*Sphagnum fallax*). Some sites these are ringed by a zone of low shrubs. Characteristic shrubs include scattered highbush blueberry (*Vaccinium corymbosum*), winterberry (*Ilex verticillata*) and patches of leatherleaf (*Chamaedaphne calyculata*). Other shrubs include buttonbush (*Cephalanthus occidentalis*), black chokeberry (*Aronia melanocarpa*), black huckleberry (*Gaylussacia baccata*), mountain holly (*Nemopanthus mucronatus*), and meadow sweet (*Spiraea latifolia*). Stunted trees may be present on

hummocks within the wetland or surround the wetland; characteristic trees include red maple (*Acer rubrum*), gray birch (*Betula populifolia*), pitch pine (*Pinus rigida*), and quaking aspen (*Populus tremuloides*).

Amphibians that may be found in pine barrens vernal ponds include frogs such as eastern American toad (*Bufo americanus*), northern spring peeper (*Pseudoacris crucifer*), green frog (*Rana clamitans subsp. melanota*), and wood frog (*Rana sylvatica*). Less frequently occurring amphibians include eastern spadefoot toad (*Scaphiopus holbrookii*), Fowler-s toad (*Bufo fowleri*), and Jefferson salamander (*Ambystoma jeffersonianum*). Reptiles that may be found include spotted turtle (*Clemmys guttata*) and common snapping turtle (*Chelydra serpentina*) (Hunsinger 1999). Birds that may be found include red-winged blackbird (*Agelaius phoeniceus*) and common yellowthroat (*Geothlypis trichas*). Characteristic macroinvertebrates may include beetles (Coleoptera), Lepidoptera and water striders (*Gerris* sp.). These ponds are too small and emphemeral to support fish populations.

Distribution: known only from sandplains in the Great Lakes Plain and Hudson Valley ecozones and in the Western Adirondack Foothills subzone of the Adirondack ecozone.

Rank: G3G4 S2 *Revised:* 2001

Examples: Albany Pine Bush, Albany County; Rome Sand Plains, Oneida County; Chase Lake Sandplain, Lewis County.

Source: Hunsinger 1999; Williams 2001; NYNHP field surveys.

11. Pine barrens shrub swamp: a shrub-dominated wetland that occurs in shallow depressions in the coastal plain, often as a linear transition zone between a coastal plain pond shore and either pitch pine-scrub oak barrens or pitch pine-oak forest.

Characteristic tall shrubs include highbush blueberry (*Vaccinium corymbosum*), inkberry (*Ilex glabra*), male-berry (*Lyonia ligustrina*), fetterbush (*Leucothoe racemosa*), sweet pepper-bush (*Clethra alnifolia*). Other tall shrubs include staggerbush (*Lyonia mariana*), red chokeberry (*Aronia arbutifolia*), bayberry (*Myrica pensylvanica*), swamp azalea (*Rhododendron viscosum*). Characteristic short shrubs include highbush blueberry, leatherleaf (*Chamaedaphne calyculata*), dwarf huckleberry (*Gaylussacia dumosa*), sheep laurel (*Kalmia angustifolia*). Other short shrubs include sweet pepperbush, large cranberry (*Vaccinium macrocarpon*), and dangleberry (*Gaylussacia frondosa*).

The herb layer is sparse and characteristic herbs include Virginia chain fern (*Woodwardia virginica*), cinnamon fern (*Osmunda cinnamomea*), marsh fern (*Thelypteris palustris*) and tussock sedge (*Carex stricta*). *Sphagnum* is a characteristic moss in the groundlayer.

The largest and most diverse examples of pine barrens shrub swamp are located on the Roanoke and Ronkonkama moraines within fire prone forests. Most occur as small isolated segments, and large examples are rare. This community is linear in shape, often very thin (about 5-10 m) and typically less than 26 acres in size. The major ecological factors influencing this community include hydrology and fire. Pine barrens shrub swamps are best developed along the upper edges of coastal plain ponds that have variable hydrology, and are embedded in a fire prone forest, such as a pitch pine-oak forest.

Communities on Long Island with similar vegetation (i.e., dominated by tall shrubs such as *Vaccinium corymbosum*, *Leucothoe racemosa*, *Clethra alnifolia*, and *Chamaedaphne calyculata*) with deep peat deposits (20 cm-3 m) are treated as a coastal plain variety of highbush blueberry bog thicket. The two natural communities are separated by the fact that highbush blueberry bog thicket maintains a persistent hydrological regime, supports peat development, and often lacks “edge species” that are found in pine barrens shrub swamp such as *Lyonia mariana*, *Ilex glabra*, and *Myrica pensylvanica*. Pine barrens shrub swamp is essentially an edge community positioned between more persistent wetlands and a fire-prone upland. Consequently vegetation and soils reflect the constant tension between the contraction and expansion of adjacent wetlands and additional disturbances such as fire and frost. Peat develops only intermittently to a thin 5-10 centimeters layer, and vegetation consists of both wetland and upland species.

Distribution: restricted to the Coastal Lowlands ecozone.

Rank: G5 S3 *Revised:* 2001

Examples: Peconic Headwater Wetlands, Suffolk County; Sears Bellows Wetlands, Suffolk County.

Source: MacDonald and Edinger 2000; NYNHP field surveys.

B. OPEN PEATLANDS

This subsystem includes peatlands with less than 50% canopy cover of trees. The dominant vegetation may include shrubs, herbs, or mosses. Substrates range from coarse fibrous or woody peat, to fine-grained marl and organic muck. Peat layer should be at least 20 cm

deep.

1. Inland salt marsh: a wetland that occurs on saline mudflats associated with inland salt springs. The mucky substrate is permanently saturated and seasonally flooded. Vegetation is sparse, with less than 50% cover. Species diversity is low.

Characteristic species are salt-tolerant plants including salt marsh bulrush (*Scirpus maritimus*), seaside atriplex (*Atriplex patula*), salt marsh sand-spurry (*Spergularia marina*), creeping bent grass (*Agrostis stolonifera* var. *palustris*), salt-meadow grass (*Diplachne maritima*), dwarf spikerush (*Eleocharis parvula*), and narrow-leaf cattail (*Typha angustifolia*). These salt springs are rare, and they usually occur within a deep or shallow emergent marsh. In New York occurrences the surrounding marsh is usually dominated by purple loosestrife (*Lythrum salicaria*); since purple loosestrife is not very salt-tolerant, it usually does not grow in the inland salt marsh. Data on characteristic animals are needed.

Small areas of inland salt marsh are reported from saline wetlands that were artificially created. One example is a wetland bordering Wolf Creek below an old salt factory in Wyoming County; plants reported from this site include salt-meadow grass (*Spartina patens*), black grass (*Juncus gerardii*), and glasswort (*Salicornia europaea*).

Distribution: historically a rare community, many sites have been destroyed or degraded by salt extraction operations, filling, and development. Remnants are currently known from a few sites in the Drumlin and Erie-Ontario Plain sub-zones of the Great Lakes Plain ecozone.

Rank: G2 S1 *Revised:* 1990

Example: Carncross Salt Pond, Wayne County.

Sources: Catling and McKay 1981; Faust and Roberts 1983; Muenscher 1927; NYNHP field surveys.

2. Sedge meadow: 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, but must have deep enough peat (usually at least 20 cm) to be treated as a peatland, otherwise it may be classified as a mineral soil wetland such as shallow emergent marsh. Peats are usually fibrous, not sphagnous, and are usually underlain by deep muck. The dominant herbs must be members of the sedge family (Cyperaceae), typically of the genus *Carex.*

Sedge meadows are dominated by peat and tussock-forming sedges such as tussock-sedge (*Carex stricta*), with at least 50% cover. They are often codominated by bluejoint grass (*Calamagrostis canadensis*) with less than 50% cover, and other sedges (*Carex* spp., including *C. utriculata, C. vesicaria,* and *C. canescens*). Other frequently occurring plants with low percent cover include marsh cinquefoil (*Potentilla palustris*), sensitive fern (*Onoclea sensibilis*) manna grasses (*Glyceria* spp., *G. canadensis*), swamp loosestrife (*Lysimachia terrestris*), hairgrass (*Agrostis scabra*), marsh St. John's-wort (*Triadenum virginicum*), water horsetail (*Equisetum fluviatile*), tall meadow-rue (*Thalictrum pubescens*), spike rushes (*Eleocharis acicularis, E. obtusa*), sweetflag (*Acorus americanus*), spotted joe-pye-weed (*Eupatorium maculatum*), purple-stem angelica (*Angelica purpurea*), three-way sedge (*Dulichium arundinaceum*), and bulrushes (*Scirpus* spp.). Sparse shrubs may be present, such as meadow sweet (*Spiraea alba* var. *latifolia, S. tomentosa*), leatherleaf (*Chamaedaphne calyculata*), sweet gale (*Myrica gale*), and alder (*Alnus* spp.). More data on this community are needed.

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 form a floating mat, instead it is covered with water during flooding. When water levels are low, there is little or no open water.

Distribution: common in the Adirondacks, and sparsely scattered throughout upstate New York, north of the Coastal Lowlands ecozone.

Rank: G5 S4 *Revised:* 2001

Examples: Dutchess Meadows, Dutchess County; West Branch Sacandaga River, Hamilton County; Poestenkill Headwaters, Rensselaer County; Mad River Swamp, Lewis County.

Sources: Jeglum 1974; McVaugh 1958, NYNHP field surveys.

3. Marl pond shore: the marly shore of an inland pond. In glaciated terrain, marl deposition occurs most often in depressions, lakes, or ponds in areas with morainic hills of coarse-textured outwash gravels. Marl pond shores typically occur on inactive lacustrine marl deposits in kettleholes. Water levels may fluctuate seasonally; the substrate is usually saturated. Vegetation is sparse.

Characteristic species include tufted hairgrass (*Deschampsia cespitosa*), sedge (*Carex viridula*), spikerush (*Eleocharis palustris*), silverweed (*Potentilla*

anserina), boneset (*Eupatorium perfoliatum*), cardinal flower (*Lobelia cardinalis*), water-horehound (*Lycopus virginicus*), field mint (*Mentha arvensis*), and water smartweed (*Polygonum amphibium*). Data on characteristic animals are needed.

Distribution: known only from the Finger Lakes Highlands sub-zone of the Appalachian Plateau ecozone, and from the Erie-Ontario Plain sub-zone of the Great Lakes Plain ecozone.

Rank: G3G4 S1 *Revised:* 1990

Example: Cortland Marl Ponds, Cortland County.

Sources: Seischab 1984; Tufts 1976; NYNHP field surveys.

4. Marl fen: a strongly minerotrophic wetland in which the substrate is a marl bed derived from either lacustrine marl deposits or actively accumulating marl that is exposed at the ground surface. Marl is a white colored precipitate that consists of calcium carbonate mixed with clay. Marl fens have at least some exposed marl precipitate at the surface. The marl substrate is always saturated and may be either seasonally flooded or permanently flooded (e.g., adjacent to seepage pools or streams) and has a very high pH, generally greater than 7.5. Vegetation is often sparse and stunted. Mosses colonize the marl, and may initiate hummock formation (Seischab 1984). Marl fens may occur as small patches within a rich graminoid fen.

The dominant species in marl fens are graminoid. Characteristic herbaceous species include the sedge *Carex flava*, spikerush (*Eleocharis rostellata*), twig-rush (*Cladium mariscoides*), beakrush (*Rhynchospora capillacea*), water-horehound (*Lycopus uniflorus*), grass-of-Parnassus (*Parnassia glauca*), pitcher-plant (*Sarracenia purpurea*), hard-stem bulrush (*Scirpus acutus*), nutrush (*Scleria verticillata*), Ohio goldenrod (*Solidago ohioensis*), arrow-grass (*Triglochin palustre*), variegated horsetail (*Equisetum variegatum*), jointed rush (*Juncus articulatus*), and Kalm's lobelia (*Lobelia kalmii*). Other herbaceous species found in marl fens include the sedges *Carex crawei*, and *C. eburnea*. Shrubs found in marl fens include prostrate juniper (*Juniperus horizontalis*), shrubby cinquefoil (*Potentilla fruticosa*), and northern white cedar (*Thuja occidentalis*). Shrubby cinquefoil and *Carex eburnea* commonly occur on hummocks.

Characteristic non-vascular species include the moss *Campylium stellatum*, and the alga *Chara vulgaris*. *Chara vulgaris* is common in marl pools and along stream banks.

Data on characteristic animals are needed.

Distribution: known primarily from the Erie-Ontario Plain sub-zone of the Great Lakes Plain ecozone; also reported from the northern portion of the Hudson Valley ecozone.

Rank: G2G3 S1 *Revised:* 2001

Examples: Bergen Swamp, Genesee County; Junius Ponds Lowery Pond, Onondaga County.

Sources: Bernard *et al.* 1983; Godwin *et al.* 2000; Olivero 2001; Reschke *et al.* 1990; Seischab 1977, 1984; Seischab and Bernard 1985; NYNHP field surveys.

5. Rich sloping fen: a small, gently sloping, minerotrophic wetland, with shallow peat deposits, that occurs in a shallow depression on a slope composed of calcareous glacial deposits. Sloping fens are fed by small springs or groundwater seepage. Like other rich fens, their water sources have high concentrations of minerals and high pH values, generally from 6.0 to 7.8. Rich sloping fens are headwater wetlands with cold water constantly moving through them. They often have water flowing at the surface in small channels or rivulets. Rich sloping fens are often surrounded by upland forest and grade into other palustrine communities such as hemlock-hardwood swamp, shrub swamp, or shallow emergent marsh downslope.

The structure of rich sloping fens is variable; usually there are scattered trees and shrubs, and a nearly continuous groundlayer of herbs and bryophytes. They may be shrub-dominated or herb-dominated. Species diversity is usually very high and may include species from the surrounding forest.

Characteristic shrubs include red osier dogwood (*Cornus sericea*), the willows *Salix discolor*, *S. sericea*, and *S. bebbiana*, dwarf raspberry (*Rubus pubescens*), northern gooseberry (*Ribes hirtellum*), alder-leaf buckthorn (*Rhamnus alnifolia*), arrowwood (*Viburnum dentatum* var. *lucidum*), highbush blueberry (*Vaccinium corymbosum*), red maple (*Acer rubrum*), eastern red cedar (*Juniperus virginiana*), and hemlock (*Tsuga canadensis*). Other shrubs found in rich sloping fens include gray dogwood (*Cornus foemina*), poison sumac (*Toxicodendron vernix*), and shrubby cinquefoil (*Potentilla fruticosa*). Virgin's-bower (*Clematis virginiana*) is a characteristic vine.

Characteristic herbs include skunk-cabbage (*Symplocarpus foetidus*), marsh fern (*Thelypteris palustris*), spotted joe-pye-weed (*Eupatorium maculatum*), spreading goldenrod (*Solidago patula*), the sedges *Carex leptalea*, *C. flava*, *C. hystericina*, *C. interior*, *C. sterilis*, and *C. stricta*, golden ragwort (*Senecio aureus*), purple-stem aster (*Aster puniceus*),

cat-tails (*Typha latifolia* and *T. angustifolia*), swamp goldenrod (*Solidago uliginosa*), cotton-grass (*Eriophorum viridi-carinatum*), thoroughwort (*Eupatorium perfoliatum*), flat-top white aster (*Aster umbellatus*), purple avens (*Geum rivale*), tall meadow-rue (*Thalictrum pubescens*), common horsetail (*Equisetum arvense*), fowl mannagrass (*Glyceria striata*), field mint (*Mentha arvensis*), sundew (*Drosera rotundifolia*), water-horehound (*Lycopus americanus*), cinnamon fern (*Osmunda cinnamomea*), bulrush (*Scirpus atrovirens*), wild strawberry (*Fragaria virginiana*), water-horehound (*Lycopus uniflorus*), and bush goldenrod (*Euthamia graminifolia*). Other herbs found in rich sloping fens include the sedge *Carex prairea*, spike muhly (*Muhlenbergia glomerata*), turtle-heads (*Chelone glabra*), bog-candle (*Platanthera dilatata*), spreading globeflower (*Trollius laxus*), showy ladyslipper (*Cypripedium reginae*), and grass-of-Parnassus (*Parnassia glauca*).

Characteristic non-vascular species include the mosses *Campylium stellatum, Aulacomnium palustre, Calliergonella cuspidata, Bryum pseudotriquetrum, Fissidens adianthoides, Sphagnum warnstorfii,* and *Thuidium delicatulum.* Other non-vascular plants found in rich sloping fens include the mosses *Tomenthypnum nitens* and *Drepanocladus vernicosus.*

A rare animal of some rich sloping fens is bog turtle (*Clemmys muhlenbergii*). Data on characteristic animals are needed.

Distribution: sparsely scattered throughout upstate New York north of the Coastal Lowlands ecozone, mostly in the Central Appalachian and Finger Lake Highlands sub-zones of the Appalachian Plateau ecozone, and the Taconic Highlands ecozone but also in other parts of the state with calcareous glacial deposits.

Rank: G3 S1S2 *Revised:* 2001

Examples: Beaver Brook Fen Cortlandville, Cortland County; Dryden Slaterville Fir Swamp, Tompkins County; Dutchess Meadows, Dutchess County; East Malloryville Tamarack Swamp, Tompkins County; McClean Fen, Tompkins County; Ohio Fen, Livingston County.

Source: Godwin *et al.* 2000; Motzkin 1994; Olivero 2001; Reschke *et al.* 1990; NY Natural Heritage field surveys.

6. 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. *Sphagnum* is 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*), the sedges *Carex flava, C. lasiocarpa, C. sterilis, C. aquatilis, C. prairea,* and *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 (*Scirpus acutus*). Other herbs found in rich graminoid fens include alpine bulrush (*Scirpus hudsonianus*), flat-top white aster (*Aster umbellatus*), cotton-grass (*Eriophorum viridi-carinatum*), thoroughwort (*Eupatorium perfoliatum*), spotted joe-pye-weed (*Eupatorium maculatum*), buckbean (*Menyanthes trifoliata*), Ohio goldenrod (*Solidago ohioensis*), the sedges *Carex stricta, C. buxbaumii, C. pellita,* and *C. leptalea,* spreading goldenrod (*Solidago patula*), fringed brome (*Bromus ciliatus*), marsh St. John's wort (*Triadenum virginicum*), common horsetail (*Equisetum arvense*), marsh cinquefoil (*Potentilla palustris*), field mint (*Mentha arvensis*), arrow-grass (*Triglochin maritimum*), milfoil bladderwort (*Utricularia intermedia*), grass pink (*Calopogon tuberosus*), water-horehound (*Lycopus uniflorus*), rose pogonia (*Pogonia ophioglossoides*), golden ragwort (*Senecio aureus*), and Kalm's lobelia (*Lobelia kalmii*).

Characteristic shrubs include shrubby cinquefoil (*Potentilla fruticosa*), 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*).

Characteristic non-vascular species include the mosses *Campylium stellatum* and *Drepanocladus revolvens,* and the liverwort *Aneura pinguis.* Other non-vascular plants found in rich graminoid fens include the mosses *Bryum pseudotriquetrum, Sphagnum warnstorfii, Fissidens adianthoides, Sphagnum teres, Scorpidium*

scorpioides, and *Aulacomnium palustre*.

A rare animal of some rich graminoid fens is bog turtle (*Clemmys muhlenbergii*). Data on characteristic animals are needed.

Distribution: Scattered throughout upstate New York north of the Coastal Lowlands ecozone in the Appalachian Plateau, Great Lakes Plain, Mohawk Valley, Hudson Valley, Taconic Highlands, Tug Hill and St. Lawrence, and Adirondacks ecozones.

Rank: G3 S1S2 *Revised:* 2001

Examples: Bergen Swamp, Genesee County; Hidden Lake, Herkimer County; Junius Ponds, Seneca County; Newcomb Swamp, Essex County; Quaker Pond Fen, Monroe County; Zurich Bog, Wayne County.

Sources: Andrus 1980; Godwin *et al.* 2000; Goodwin 1943; Motzkin 1994; Olivero 2001; Reschke *et al.* 1990; Seischab 1984; Shanks 1966; NY Natural Heritage field surveys.

7. Rich shrub fen: a strongly minerotrophic peatland in which the substrate is a woody peat, which may or may not be underlain by marl or limestone bedrock. Rich fens are fed by waters that have high concentrations of minerals and high pH values, generally from 6.0 to 7.8.

The dominant species in rich shrub fens are shrubs, which form a canopy and overtop most herbs. Some rich shrub fens are dominated by low shrubs (under 4 ft or 1.2 m) that collectively have 80 to 90% cover in the community. Other rich shrub fens are dominated by taller shrubs (over 4 ft or 1.2 m) that collectively have 50 to 70% cover in the community with low shrubs and graminoids locally dominant in openings. The rich shrub fen community is somewhat broadly defined to include both the low shrub and taller shrub examples as well as regional variants distinguished by variations in their flora such as the lack of shrubby cinquefoil (*Potentilla fruticosa*) in northern examples. More data could lead to the elevation of these variants to community types. In rich shrub fens, *Sphagnum* is either absent, or a minor component, with only the most minerotrophic species present. Other mosses may be common.

Characteristic shrubs include red maple (*Acer rubrum*), red osier dogwood (*Cornus sericea*), speckled alder (*Alnus incana* ssp. *rugosa*), sweet-gale (*Myrica gale*), shrubby cinquefoil (*Potentilla fruticosa*), swamp fly honeysuckle (*Lonicera oblongifolia*), black chokeberry (*Aronia melanocarpa*), alder-leaf buckthorn (*Rhamnus alnifolia*), and poison sumac (*Toxicodendron vernix*). Other shrubs found in rich shrub fens include hoary willow (*Salix candida*), dwarf raspberry (*Rubus pubescens*), tamarack (*Larix laricina*), highbush blueberry (*Vaccinium corymbosum*), bog birch (*Betula pumila*), bayberry (*Myrica pensylvanica*), meadow-sweet (*Spiraea alba*), and northern white cedar (*Thuja occidentalis*).

Characteristic herbs include marsh fern (*Thelypteris palustris*), royal fern (*Osmunda regalis*), the sedges *Carex stricta* and *C. interior*, common cat-tail (*Typha latifolia*), bluejoint grass (*Calamagrostis canadensis*), tall meadow-rue (*Thalictrum pubescens*), water horsetail (*Equisetum fluviatile*), and marsh St. John's wort (*Triadenum virginicum*). Other herbs found in rich shrub fens include the sedge *Carex aquatilis*, skunk-cabbage (*Symplocarpus foetidus*), flat-top white aster (*Aster umbellatus*), spreading goldenrod (*Solidago patula*), blue flag (*Iris versicolor*), and spike muhly (*Muhlenbergia glomerata*).

Characteristic non-vascular species include the mosses *Calliergonella cuspidata*, *Aulacomnium palustre*, *Thuidium delicatulum*, *Campylium stellatum*, *Fissidens adianthoides*, *Sphagnum warnstorfii*, and *S. fimbriatum*.

Data on characteristic animals are needed.

Distribution: Scattered throughout upstate New York north of the Coastal Lowlands ecozone in the Appalachian Plateau, Great Lakes Plain, Mohawk Valley, Hudson Valley, Taconic Highlands, Tug Hill and St. Lawrence, and Adirondacks ecozones.

Rank: G3G4 S1S2 *Revised:* 2001

Examples: Bear Swamp Sempronius, Cayuga County; Bonaparte Swamp, Lewis County; Great Swamp Pawling; Dutchess County; Lisbon Swamp, Saint Lawrence County; Summit Lake Swamp, Otsego County.

Sources: Andrus 1980; Godwin *et al.* 2000; Johnson and Leopold 1994; Motzkin 1994; Olivero 2001; Reschke *et al.* 1990; NY Natural Heritage field surveys.

8. 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 shrub layer. The physiognomy of medium fens may range from a dwarf shrubland to a perennial grassland, and be either shrub-dominated, herb

dominanted 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*). Other characteristic shrubs include leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda glaucophylla*), speckled alder (*Alnus incana* ssp. *rugosa*), cranberry (*Vaccinium macrocarpon*), and red maple (*Acer rubrum*). Other shrubs found in medium fens include black chokeberry (*Aronia melanocarpa*), bog willow (*Salix pedicellaris*), meadow-sweet (*Spiraea alba*), hardhack (*Spiraea tomentosa*), and swamp rose (*Rosa palustris*).

Other 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*), 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 (*Potentilla palustris*), twig-rush (*Cladium mariscoides*), the sedges *Carex rostrata*, *Carex leptalea*, *Carex stricta*, *Carex limosa*, and *Carex interior*, tufted loosestrife (*Lysimachia thyrsiflora*), and narrow-leaf cat-tail (*Typha angustifolia*).

Characteristic non-vascular plants include the moss *Calliergonella cuspidata*. Other non-vascular plants found in medium fens include the mosses *Campylium stellatum*, *Calliergon giganteum*, *Aulacomnium palustre*, *Sphagnum magellanicum*, *S.contortum*, and *S. warnstorfii*, and the liverwort *Aneura pinguis*.

A rare moth of some medium fens is bog buckmoth (*Hemileuca* sp.1), which feeds on buckbean. A rare turtle of some medium fens is bog turtle (*Clemmys muhlenbergii*). Data on characteristic animals are needed.

Distribution: sparsely scattered throughout upstate New York north of the Coastal Lowlands ecozone, mostly in the Great Lakes Plain, Tug Hill and St. Lawrence, and Adirondacks ecozones.

Rank: G3G4 S2S3 *Revised:* 2001

Examples: Brennan Beach Fen, Oswego County, Deer Creek Marsh, Oswego County; Dunham Bay Marsh, Warren County; Fort Drum Mud Lake Fen, Lewis County; Long Pond, Oswego County; St. Mary's Pond, Oswego County; Newcomb Swamp Essex County; South Pond Amboy, Oswego County; South Pond Fen, Oswego County.

Sources: Andrus 1980; Bailey and Bedford 1999; Godwin *et al.* 2000; Johnson and Leopold 1994; Olivero 2001; Podniesinski 1994; Reschke *et al.* 1990; NY Natural Heritage field surveys.

9. Inland poor fen: a weakly minerotrophic peatland that occurs inland from the coastal plain in which the substrate is peat composed primarily of *Sphagnum*, with admixtures of graminoid or woody peat. The dominant species are *Sphagnum* mosses, 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.

Characteristic mosses include *Sphagnum rubellum*, *S. magellanicum*, *S. papillosum*, *S. cuspidatum*, *S. fuscum*, *S. angustifolium*, *S. fallax*, and *S. russowii*.

Characteristic herbs include sedges (*Carex oligosperma*, *C. exilis*, *C. limosa*, *C. trisperma*, *C. utriculata*, *C. paupercula*, *C. canescens*), white beakrush (*Rhynchospora alba*), cottongrasses (*Eriophorum vaginatum* ssp. *spissum*, *E. virginicum*), round-leaf sundew (*Drosera rotundifolia*), and pitcher-plant (*Sarracenia purpurea*). Shrubs and dwarf shrubs usually have less than 50% cover (i.e., not dominated by shrubs as in dwarf shrub bog).

Characteristic shrubs include cranberry (*Vaccinium oxycoccos*, *V. macrocarpon*), bog laurel (*Kalmia polifolia*), sheep laurel (*K. angustifolia*), sweet-gale (*Myrica gale*), black chokeberry (*Aronia melanocarpa*), leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda glaucophylla*), and Labrador tea (*Rhododendron groenlandicum*). Scattered stunted trees such as tamarack (*Larix laricina*), black spruce (*Picea mariana*) or red maple (*Acer rubrum*) may also 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.

Distribution: throughout upstate New York north of the Coastal Lowlands ecozone.

Rank: G4 S3 *Revised:* 2001

Examples: Massawepie Mire, St. Lawrence County; Willis Brook Bog, Franklin County; Kildare Peatlands St. Lawrence County; Cranberry Vly, Rensselaer County; Harris Bay Marsh.

Sources: Andrus 1980; Damman and French 1987; NYNHP field surveys.

10. Sliding fen: shallow peat bogs on 5-35 degree slopes on brow of alpine or subalpine cliffs. Pickering's reedgrass (*Calamagrostis pickeringii*), *Sphagnum compactum*, and other bog plants are found in these peatlands. Sliding fens presumably become supersaturated from major rain events and slide off the cliff before peat build-up resumes (Sperduto and Cogbill 1999). Water is derived from runoff and seeps at higher elevation. Reportedly the peat will accumulate until a critical mass is built up and the large areas of peat mat slides to the bottom of the the steep slope, a phenomenon that may occur once about every 500 years. Sliding fens may provide habitat for several uncommon *Sphagnum* spp., such as *S. lindbergii, S. tenellum,* and *S. pylaesii*, that are often found on the steep, bare, smooth, wet rock slides present on most of the higher mountains (Andus 1980).

Short shrub layer includes leatherleaf (*Chamaedaphne calyculata*), small cranberry (*Vaccinium oxycoccus*), bog bilberry (*V. uliginosum*), bog laurel (*Kalmia polifolia*), and green alder (*Alnus viridis*). Other small tees and shrubs include tamarack (Larix laricina) and Labrador tea (*Rhododendron groenlandicum*).

Characteristic herbs include Pickering's reedgrass (*Calamagrostis pickeringii*), bulrush (*Scirpus cespitosus*), closed gentian (*Gentiana linearis*), round-leaved sundew (*Drosera rotundifolia*), and sedge (*Carex bigelowii*). Other low-growing herbs include creeping snow-berry (*Gaultheria hispidula*),mountain firmoss (*Huperzia appalachiana*).

Characteristic mosses include peat mosses such as Sphagnum angustifolium, S. fuscum, S. rubellum, S. pylaesii, and S. russowii; other mosses such as Andraea sp. and Scappania nemorosa. Various crustose lichens grow on the open bedrock areas.

The sliding fen can be distinguished from the relatively more common inland poor fen by having more alpine flora, a much steeper slope, high elevation mountain setting, and peat sliding process. Microhabitats include herb-dominated patches, shub clusters, moss carpets, plus wet and dry exposed bedrock. Data from more examples are needed to refine the description.

Distribution: restricted to the Adirondack High Peaks subzone of the Adirondack ecozone.

Rank: G3G4 S1S2 *Revised:* 2001

Examples: Macintyre Range, Essex County, White Face Mountain, Essex County.

Sources: Andrus 1980; Sperduto and Cogbill 1999; Sperduto et al. 2000; Sperduto and Nichols 2000; Sperduto 2000.

11. Coastal plain poor fen: a weakly minerotrophic peatland that occurs on the coastal plain, in which the substrate is peat composed primarily of *Sphagnum*, with admixtures of graminoid and woody peat.

The dominant species are *Sphagnum* mosses, with scattered sedges, shrubs, and stunted trees. Poor fens are fed by waters that are weakly mineralized, with low pH values, generally between 4.0 and 5.5 (Andrus 1980). Characteristic mosses include *Sphagnum bartlettianum, S. fallax, S. flavicomans, S. magellanicum, S. recurvum, S. papillosum, S. torreyanum*, and *S. henryense*.

Characteristic shrubs include hardhack (*Spiraea tomentosa*), leatherleaf (*Chamaedaphne calyculata*), large cranberry (*Vaccinium macrocarpon*) water willow (*Decodon verticillatus*), sweet gale (*Myrica gale*) and dwarf huckleberry (*Galussacia dumosa*). Small patches within the fen may be dominated by dwarf shrubs and may be classified as dwarf shrub bog.

Characteristic herbs include twig-rush (*Cladium mariscoides*), sedges (*Carex rostrata* var. *utriculata, C. lasiocarpa, C. striata, C. exilis*), beakrushes (*Rhynchospora alba, R. fusca*), rushes (*Juncus canadensis, J. pelocarpus*), cottongrass (*Eriophorum virginicum*), sundews (*Drosera intermedia, D. rotundifolia*), marsh St. John's-wort (*Triadenum virginicum*), bladderworts (*Utricularia fibrosa, U. purpurea*), knotted spikerush (*Eleocharis equisetoides*), swamp loosestrife (*Lysimachia terrestris*), rose pogonia (*Pogonia ophioglossoides*), grass pink (*Calopogon tuberosus*), meadow beauty (*Rhexia virginica*), white water-lily (*Nymphaea odorata*). Sedges and rushes often overtop short shrubs by mid to late summer. Scattered stunted trees such as Atlantic white cedar (*Chamaecyparis thyoides*) and red maple (*Acer rubrum*) may also be present.

Animals observed using coastal plain poor fen include common snipe (*Gallinago gallinago*), great blue heron (*Ardea herodias*), green frog (*Rana clamitans melanota*), bull frog (*Rana catesbeiana*), and spotted turtle (*Clemmys guttata*).

On Long Island, coastal plain poor fens occur from the Nissequogue River and the central south shore to Montauk Point. They are best developed on the Roanoke Point Moraine outwash plain and the Ronkonkoma Moraine. Coastal plain poor fen appears to form best in small "delta-like" areas of organic deposits near the small stream outlets of coastal plain pond basins. Major ecological factors influencing this community include groundwater discharge combined with one or more of the following hydrological influences: coastal plain pond shore draw down, stream flow, or an abbreviated freshwater tide. Fire regime may influence poor fens situated within fire prone landscapes. Coastal plain poor fen vegetation appears to form readily behind stream impoundments.

Distribution: restricted to the Coastal Lowlands ecozone.

Rank: G3? S1 *Revised:* 2001

Examples: Jones Pond, Suffolk County; Cranberry Bog, Suffolk County; Fresh Pond, Suffolk County; Quogue Wetland, Suffolk County; Bow Drive Marsh, Suffolk County.

Sources: Andrus 1980; MacDonald and Edinger 2000; NYNHP field surveys.

12. Sea level fen: a small patch, sedge-dominated fen community that occurs at the upper edge of salt marsh complexes just above sea level where there is adjoining freshwater seepage. These fens are fed by acidic and oligotrophic freshwater seepage which mixes with salt or brackish water from tidal overwash at infrequent intervals, reportedly only during unusually high tides. Thus, by definition this fen is a palustrine, rather than an estuarine, community. Soils are those of a peatland with deep sedgy peat underlain by deep sand or gravel. The soil pore salinity is moderate at 2-5 ppt. The fen is herb dominated but can have trees and shrubs at low percent cover. There is usually nearly 100% cover of herbaceous plants with high species diversity.

Dominant plants include spikerush (*Eleocharis rostellata*), twig-rush (*Cladium mariscoides*) and three-square (*Scirpus pungens*). Other characteristic species in include sedge (*Carex hormathodes*), slender blue flag (*Iris prismatica*), Canada rush (*Juncus canadensis*), white beakrush (*Rhynchospora alba*), Canadian burnet (*Sanguisorba canadensis*), wild germander (*Teucrium canadense*), poison ivy (*Toxicodendron radicans*) and large cranberry (*Vaccinium macrocarpon*).

Typical trees and shrubs include scattered individuals of red cedar (*Juniperus virginiana*), pitch pine (*Pinus rigida*), bayberry (*Myrica pensylvanica*), groundsel-tree (*Baccharis halimifolia*) and salt marsh-elder (*Iva frutescens*). The invasion of reedgrass (*Phragmites australis*) is a serious threat to this community.

Distribution: Restricted to the upper estuarine portion of Coastal Lowlands Ecozone. Known examples confined to a small area in the Peconic Bay Estuary Region. Other examples expected from the large bays on the south shore of Long Island.

Rank: G1G2 S1 *Revised:* 2001

Examples: Northwest Creek, Suffolk County; Little Northwest Creek, Suffolk County; Hubbard Creek Marsh, Suffolk County; Napeague Meadow, Suffolk County; Heckscher State Park, Suffolk County.

Sources: Ludwig 1995, MacDonald and Edinger 2000; NYNHP field surveys.

13. Perched bog: an ombrotrophic (or very weakly minerotrophic) peatland that occurs in shallow depressions in rock outcrops where there is a perched water table. Vegetation is dominated by peat mosses (*Sphagnum* spp.) and ericaceous shrubs, and the substrate is a shallow peat overlying bedrock. Water in a perched bog is usually very acid (pH less than 5.0), has low amounts of dissolved minerals, and is especially low in calcium ions. Species diversity is usually low.

Characteristic species include several peat mosses (*Sphagnum fuscum, S. rubellum, S. nemoreum,* and *S. magellanicum*), leatherleaf (*Chamaedaphne calyculata*), sheep laurel (*Kalmia angustifolia*), steeple-bush (*Spiraea tomentosa*), cranberry (*Vaccinium macrocarpon*), and sedges (*Carex* spp.). More data on this community are needed.

Distribution: only known from the Lake Champlain Transition sub-zone of the Champlain ecozone and the Shawangunk Hills sub-zone of the Hudson Valley ecozone.

Rank: G3G4 S1S2 *Revised:* 1990

Examples: Altona Flat Rock, Clinton County; Sam's Point, Ulster County.

Sources: Andrus 1980; Damman and French 1987; NYNHP field surveys.

14. Patterned peatland: a large peatland with a gentle slope or divide in which the vegetation consists of a mosaic of high and low areas (relative to water levels) that are called strings and flarks, respectively. The strings and flarks occur as narrow or broad bands of vegetation that extend perpendicular to the direction of water flow across the slope of the peatland. The strings or hummocks (high, relatively dry areas) are usually ombrotrophic or weakly minerotrophic, and the flarks or hollows (low, relatively wet areas) are more minerotrophic than the strings. Patterning in peatlands may occur regardless of the ombrotrophic or minerotrophic nature of the peatland; there are many types of patterns that can occur. In New York, the most pronounced patterning occurs on a very large (550 acre or 223 ha) bog that is primarily ombrotrophic and is slightly raised at the center. This bog has a subtle ladderform pattern of slightly raised linear hummocks (strings) and broad, shallow hollows (flarks) along one of the slopes, as well as several small ponds. In this peatland, the dominant peat moss is *Sphagnum rubellum*;

this moss forms a nearly pure carpet in some areas of the bog, and it is common on the hummocks (strings). Other common mosses include *Sphagnum cuspidatum* and *S. majus* in hollows (flarks).

Characteristic herbs of the flarks include pod-grass (*Scheuchzeria palustris*), white beakrush (*Rhynchospora alba*), sedges (*Carex exilis, C. oligosperma*), cottongrass (*Eriophorum vaginatum* ssp. *spissum*), and pitcher-plant (*Sarracenia purpurea*). Characteristic species of the strings include sedges (*Carex pauciflora, C. limosa*), false Solomon's-seal (*Maianthemum trifolium*), meadow-sweet (*Spiraea alba* var. *latifolia*), lowbush blueberry (*Vaccinium angustifolium*), black chokeberry (*Aronia melanocarpa*), black spruce (*Picea mariana*), and tamarack (*Larix laricina*). The trees on the bog mat are stunted and are usually widely spaced on hummocks or strings. Low ericaceous shrubs such as leatherleaf (*Chamaedaphne calyculata*), Labrador tea (*Rhododendron groenlandicum*), bog laurel (*Kalmia polifolia*), sheep laurel (*Kalmia angustifolia*), and bog rosemary (*Andromeda glaucophylla*) are common in the strings, as well as in the flatter, unpatterned portions of the bog. Data on characteristic animals are needed.

Distribution: only known from the Western Adirondack Foothills ecozone.

Rank: G3G4 S1 *Revised:* 1990

Example: Bay Pond Bog, Franklin County, Spring Pond Bog, Franklin County.

Source: Worley 1982; NYNHP field surveys.

15. Dwarf shrub bog: an ombrotrophic or weakly minerotrophic peatland dominated by low-growing, evergreen, ericaceous shrubs and peat mosses (*Sphagnum* spp.). The surface of the peatland is typically a mosaic of hummock/hollow microtopography. The hummocks tend to have a higher abundance of shrubs than the hollows; however, these bogs have more than 50% cover of low-growing shrubs. Water is usually nutrient-poor and acidic.

The dominant shrub is often leatherleaf (*Chamaedaphne calyculata*), which may have more than 50% cover. Shrubs are typically taller than the herb layer which is usually graminoid, and generally the shrub heights are 1 m or less. Other prominent shrubs and herbs are sheep laurel (*Kalmia angustifolia*), bog laurel (*K. polifolia*), Labrador tea (*Rhododendron groenlandicum*), cranberry (*Vaccinium oxycoccos, V. macrocarpon*), the sedge *Carex trisperma*, and tawny cottongrass (*Eriophorum virginicum*).

Other characteristic, but less common plants are round-leaf sundew (*Drosera rotundifolia*), pitcher plant (*Sarracenia purpurea*), bog rosemary (*Andromeda glaucophylla*), huckleberry (*Gaylussacia baccata*), black chokeberry (*Aronia melanocarpa*), highbush blueberry (*Vaccinium corymbosum*), water-willow (*Decodon verticillatus*), meadow sweet (*Spiraea alba* var. *latifolia, S. tomentosa*),, marsh St. John's-wort (*Triadenum virginicum*), and the sedges *Carex canescens, Carex pauciflora,* and *Rhynchospora alba*. Scattered stunted trees may be present, including black spruce (*Picea mariana*), tamarack (*Larix laricina*), and red maple (*Acer rubrum*).

Characteristic peat mosses that form a nearly continuous carpet under the shrubs include *Sphagnum magellanicum, S. rubellum, S. fallax, S. fuscum, S. papillosum*, and *S. angustifolium*.

Characteristic animals include common yellowthroat (*Geothlypis trichas*), song sparrow (*Melospiza melodia*), savannah sparrow (*Passerculus sandwichensis*), masked shrew (*Sorex cinereus*), meadow jumping mouse (*Zapus hudsonius*), southern bog lemming (*Synaptomys cooperi*), and wood frog (*Rana sylvatica*).

A dwarf shrub bog may form a floating mat around a bog lake or along the banks of an oligotrophic stream; it may also occur as a large or small mat completely filling a basin. A dwarf shrub bog may grade into a highbush blueberry bog thicket, inland poor fen, or a black spruce-tamarack bog..

Distribution: occurs throughout upstate New York north of the Coastal Lowlands ecozone.

Rank: G4 S3 *Revised:* 2001

Examples: Bay Pond Bog, Franklin County; Massawepie Mire, St. Lawrence County; Sunday Swamp, Lewis County; Rome Sand Plains, Oneida County, Little Cedar Pond, Orange County.

Sources: Andrus 1980; Bray 1921; Damman and French 1987; Johnson 1985; Karlin and Andrus 1986; Karlin and Lynn 1988; Sperduto and Cogbill 1999; Sperduto et al. 2000; Sperduto and Nichols 2000; Sperduto 2000; NYNHP field surveys.

16. Highbush blueberry bog thicket: an ombrotrophic or weakly minerotrophic peatland dominated by tall, deciduous, ericaceous shrubs and peat mosses (*Sphagnum* spp.); the water is usually nutrient-poor and acidic.

The dominant shrub is usually highbush blueberry (*Vaccinium corymbosum*). At least three regional variants may be recognized in New York. The first is found throughout central and western New York, the second is primarily a northern variant, and the third is a

southern variant with coastal plain species.

Species characteristic of all three varieties, and typical of the central and western New York examples, include highbush blueberry, winterberry (*Ilex verticillata*), cinnamon fern (*Osmunda cinnamomea*), marsh fern (*Thelypteris palustris*), and *Sphagnum* spp. Stunted trees may be present at a low density and with less than 50% cover; red maple (*Acer rubrum*) occurs in many bog thickets. Other characteristic shrubs and herbs include black huckleberry (*Gaylussacia baccata*), false Solomon's-seal (*Smilacina trifolia*), and pitcher plant (*Sarracenia purpurea*).

Additional characteristic species in northern examples include mountain holly (*Nemopanthus mucronatus*) which may be codominant, sedge (*Carex trisperma*), and calla (*Calla palustris*). Scattered small small trees include larch (*Larix laricina*), black spruce (*Picea mariana*), and white pine (*Pinus strobus*).

The southern New York variant of this community contains substantially fewer northern taxa and numerous coastal indicator species such as swamp azalea (*Rhododendron viscosum*) which may become codominant, red chokeberry (*Aronia arbutifolia*), male-berry (*Lyonia ligustrina*), fetterbush (*Leucothoe racemosa*), sweet pepperbush (*Clethra alnifolia*), water willow (*Decodon verticillatus*), buttonbush (*Cephalanthus occidentalis*), marsh St. John's-wort (*Triadenum virginicum*), sedges (*Carex trisperma, C. striata*), three way sedge (*Dulichium arundinaceum*), and Virginia chain fern (*Woodwardia virginica*). Scattered small trees may include pitch pine (*Pinus rigida*) or Atlantic white cedar (*Chamaecyparis thyoides*) (MacDonald and Edinger 2000; Damman and French 1987).

Communities on Long Island with similar vegetation (i.e., dominated by tall shrubs such as *Vaccinium corymbosum*, *Leucothoe racemosa*, *Clethra alnifolia*, and *Chamaedaphne calyculata*) with shallow peat deposits (<20 cm) are treated as pine barrens shrub swamps. The two natural communities are separated by the fact that highbush blueberry bog thicket maintains a persistent hydrological regime, supports peat development, and often lacks "edge species" that are found in pine barrens shrub swamp, such as *Lyonia mariana*, *Ilex glabra*, and *Myrica pensylvanica*.

Characteristic peat mosses for all variants include *Sphagnum magellanicum*, *S. centrale*, *S. nemoreum*, and *S. fimbriatum*. Characteristic animals include common yellowthroat (*Geothlypis trichas*), swamp sparrow (*Melospiza georgiana*), song sparrow (*Melospiza melodia*), meadow jumping mouse (*Zapus hudsonius*), masked shrew (*Sorex cinereus*), southern red-backed vole (*Clethrionomys gapperi*), and green frog (*Rana clamitans*).

Distribution: occurs throughout New York State.

Rank: G4 S3 *Revised:* 2001

Examples: Brayton Marsh, Warren County; Sears Bellows Wetlands, Suffolk County; Protection Bog, Erie County; Harriman, Rockland County.

Source: Damman and French 1987; MacDonald and Edinger 2000; NYNHP field surveys.

C. FORESTED MINERAL SOIL WETLANDS

This subsystem includes seasonally flooded forests, and permanently flooded or saturated swamps. These forests and swamps typically have at least 50% canopy cover of trees. For the purposes of this classification, a tree is defined as a woody plant usually having one principal stem or trunk, a definite crown shape, and characteristically reaching a mature height of at least 16 ft (5 m) (Driscoll et al. 1984).

1. Floodplain forest: a hardwood forest that occurs on mineral soils on low terraces of river floodplains and river deltas. These sites are characterized by their flood regime; low areas are annually flooded in spring, and high areas are flooded irregularly. Some sites may be quite dry by late summer, whereas other sites may be flooded again in late summer or early autumn (these floods are caused by heavy precipitation associated with tropical storms). This is a broadly defined community; floodplain forests are quite variable and may be very diverse.

The most abundant trees include silver maple (*Acer saccharinum*), ashes (*Fraxinus pensylvanica, F. nigra, F. americana*), cottonwood (*Populus deltoides*), red maple (*Acer rubrum*), box elder (*Acer negundo*), elms (*Ulmus americana, U. rubra*), hickories (*Carya cordiformis, C. ovata, C. laciniosa*), butternut and black walnut (*Juglans cinerea, J. nigra*), sycamore (*Platanus occidentalis*), oaks (*Quercus bicolor, Q. palustris*), and river birch (*Betula nigra*). Other less frequently occurring trees include hackberry (*Celtis occidentalis*), tulip tree (*Liriodendron tulipifera*), basswood (*Tilia americana*), and sugar maple (*Acer saccharum*). Introduced trees, such as white willow (*Salix alba*) and black locust (*Robinia pseudo-acacia*), have become established in some floodplain forests.

The most abundant shrubs include spicebush (*Lindera benzoin*), ironwood (*Carpinus carolinianus*), bladdernut (*Staphylea trifoliata*), speckled alder (*Alnus incana* spp. *rugosa*), dogwoods *(Cornus sericea, C. foemina* spp. *racemosa, C. amomum*), viburnums (*Viburnum cassinoides, V. prunifolium, V. dentatum, V. lentago*), and sapling canopy trees. Invasive exotic shrubs that may be locally abundant include shrub honeysuckles (*Lonicera tatarica, L. morrowii*), and

multiflora rose (*Rosa multiflora*). Other less frequently occurring shrubs include meadowsweet (*Spiraea alba* var. *latifolia*) and winterberry (*Ilex verticillata*).

The most abundant vines include poison ivy (*Toxicodendron radicans*), wild grapes (*Vitis riparia, Vitis* spp.), Virginia creeper (*Parthenocissus quinquefolia*), virgin's bower (*Clematis virginiana*), and less frequently, moonseed (*Menispermum canadense*). Vines may form a dense liana in tree canopy and/or dominate the groundcover.

The most abundant herbs include sensitive fern (*Onoclea sensibilis*), jewelweeds (*Impatiens capensis, I. pallida*), ostrich fern (*Matteuccia struthiopteris*), white snakeroot (*Eupatorium rugosum*), wood nettle (*Laportea canadensis*), false nettle (*Boehmeria cylindrica*), goldenrods (*Solidago gigantea, S. canadensis, Solidago* spp.), lizard's tail (*Saururus cernuus*), and jumpseed (*Polygonum virginianum*). Invasive exotic herbs that may be locally abundant include moneywort (*Lysimachia nummularia*), garlic mustard (*Alliaria petiolata*), dame's rockets (*Hesperis matronalis*), and stilt grass (*Microstegium vimineum*). Other less frequently occurring herbs include skunk cabbage (*Symplocarpus foetidus*), enchanter's nightshade (*Circaea lutetiana* ssp. *canadensis*), bluejoint grass (*Calamagrostis canadensis*), white avens (*Geum canadense*), clearweed (*Pilea pumila*), jack-in-the-pulpit (*Arisaema triphyllum*), rice cutgrass (*Leersia oryzoides*), sedges *(Carex lacustris, C. intumescens, C. lupulina*), and many others.

Characteristic birds include yellow-throated vireo (*Vireo flavifrons*), tufted titmouse (*Parus bicolor*), red-bellied woodpecker (*Melanerpes carolinus*), and pileated woodpecker (*Dryocopus pileatus*).

The composition of the forest apparently changes in relation to flood frequency and elevation of floodplain terraces along larger rivers. Neighboring states recognize several floodplain forest variants based on dominant plants, flood regime, and topographic position (Fike 1999, Kearsley 1999, Sorenson et al. 1998). The composition of floodplain forests in New York State has not been studied in sufficient detail to characterize compositional variations and how they correlate with flood regime and terrace elevation.

Distribution: throughout upstate New York, north of the Coastal Lowlands ecozone.

Rank: G3G4 S2S3 *Revised:* 2001

Examples: Raquette River, Franklin County; Howland Island, Cayuga County; Catskill Creek, Greene County; Doyles Islands, Delaware County; South Bay Creek Wetlands, Washington County.

Sources: Barrett and Enser 1997; Bechtel and Sperduto 1998; Fike 1999; Gordon 1940; Kearsley 1999; Metzler and Damman 1985; Nichols et al. 2000; Sorenson et al. 1998; Veneman and Tiner 1990; NYNHP field surveys.

2. Red maple-hardwood swamp: a hardwood swamp that occurs in poorly drained depressions, usually on inorganic soils. This is a broadly defined community with many regional and edaphic variants. In any one stand red maple (*Acer rubrum*) is either the only canopy dominant, or it is codominant with one or more hardwoods including ashes (*Fraxinus pennsylvanica, F. nigra,* and *F. americana*), elms (*Ulmus americana* and *U. rubra*), yellow birch (*Betula alleghaniensis*), and swamp white oak (*Quercus bicolor*). Other trees with low percent cover include butternut (*Juglans cinerea*),bitternut hickory (*Carya cordiformis*), black gum (*Nyssa sylvatica*), ironwood (*Carpinus carolinianus*), and white pine (*Pinus strobus*).

The shrublayer is usually well-developed and may be quite dense. Characteristic shrubs are winterberry (*Ilex verticillata*), spicebush (*Lindera benzoin*), alders (*Alnus incana* ssp. *rugosa* and *A. serrulata*), viburnums (*Viburnum recognitum*, and *V. cassinoides*), highbush blueberry (*Vaccinium corymbosum*), common elderberry (*Sambucus canadensis*), and various shrubby dogwoods (*Cornus sericea, C. racemosa,* and *C. amomum*). Swamp azalea (*Rhododendron viscosum*) is more common in southern examples, and poison sumac (*Toxicodendron vernix*) and black ash are more common in richer (higher pH) examples.

The herbaceous layer may be quite diverse and is often dominated by ferns, including sensitive fern (*Onoclea sensibilis*), cinnamon fern (*Osmunda cinnamomea*), royal fern (*O. regalis*), and marsh fern (*Thelypteris palustris*), with much lesser amounts of crested wood fern (*Dryopteris cristata*), and spinulose wood fern (*Dryopteris carthusiana*). Characteristic herbs include skunk cabbage (*Symplocarpus foetidus*), white hellebore (*Veratrum viride*), sedges (*Carex stricta, C. lacustris*, and *C. intumescens*), jewelweed (*Impatiens capensis*), false nettle (*Boehmeria cylindrica*), arrow arum (*Peltandra virginica*), tall meadow rue (*Thalictrum pubescens*), and marsh marigold (*Caltha palustris*). Open patches within the swamp may contain other herbs characteristic of shallow emergent marsh.

Examples of wetland fauna that occur in the glaciated northeast red maple-hardwood swamps include wood duck (*Aix sponosa*), American black duck (*Anas rubripes*), northern waterthrush (*Seiurus noveboracensis*), beaver (*Castor canadensis*), river otter (*Lutra canadensis*), and mink (*Mustela vison*). These swamps provide breeding habitat for many wetland-dependent species, such as spring peeper (*Pseudacris crucifer*), American toad (*Bufo americanus*), wood frog (*Rana sylvatica*), and spotted salamander (*Ambystoma maculatum*) (Golet et al. 1993). More data on

characteristic animals, especially invertebrates, are needed.

Distribution: throughout New York State.

Rank: G5 S4S5 *Revised:* 2001

Example: Great Swamp Pawling, Dutchess County; Deer Creek Marsh, Oswego County; Toad Harbor Swamp; Oswego County; Orange Lake, Orange/Ulster County; Joralemon Woods, Albany County.

Sources: Cain and Penfound 1939; Golet et al. 1993; McVaugh 1958.

3. Red maple-black gum swamp: a maritime, coastal, or inland hardwood swamp that occurs in poorly drained depressions, sometimes in a narrow band between a stream and upland. Coastal plain examples have a shallow layer of acidic, well decomposed peat over saturated sandy loam or loamy sand. Inland examples usually occur on an acidic silt loam. Hummock-hollow microtopography is evident.

Red maple (*Acer rubrum*) and black gum (*Nyssa sylvatica*) are often codominant or black gum (*Nyssa sylvatica*) may be the dominant tree. Pitch pine (*Pinus rigida*) may occur on drier hummock islands in pine barrens settings.

The shrub layer is usually well developed. Characteristic shrubs are sweet pepperbush (*Clethra alnifolia*), highbush blueberry (*Vaccinium corymbosum*), swamp azalea (*Rhododendron viscosum*), fetterbush (*Leucothoe racemosa*), dangleberry (*Gaylussacia frondosa*), and on the Atlantic coastal plain inkberry (*Ilex glabra*). Vines such as greenbrier (*Smilax rotundifolia*), sawbrier (*Smilax glauca*), Virginia creeper (*Parthenocissus quinquefolia*), and poison ivy (*Toxicodendron radicans*) are present at low amounts in the understory. The herbaceous layer is not particularly diverse, characterized by cinnamon fern (*Osmunda cinnamomea*), skunk cabbage (*Symplocarpus foetidus*), and on the Atlantic coastal plain by netted chain fern (*Woodwardia areolata*). The nonvascular layer may or may not be well developed.

Characteristic nonvascular species are *Sphagnum girghensonii* and other *Sphagnum* spp.

More data on characteristic fauna are needed.

Distribution: limited to the North Atlantic Coast and Lower New England/Northern Piedmont Nature Conservancy Ecoregions. Known examples range from Connetquot River State Park, Islip east to Montauk Point, East Hampton in Suffolk County. Other examples with limited data are at Sunken Forest on Fire Island in Suffolk County and upstate in Rensselaer County. Most occurrences are apparently concentrated in Suffolk County but small patches are present farther west in Nassau County and upstate New York.

Rank: G3G4 S2 *Revised:* 2001

Examples: Connetquot River Watershed, Suffolk County; Lower Peconic River, Suffolk County; Shawangunk Mountains, Sullivan County.

Sources: Breden 1989; Cain and Penfound 1939; Golet et al. 1993; Greller 1977, Reschke 1990, Sneddon et al. 1998; McCormick 1979, NYNHP field surveys.

4. Red maple-sweetgum swamp: a hardwood swamp that occurs on somewhat poorly drained seasonally wet flats, usually on somewhat acidic gleyed to mottled clay loam or sandy loam. Red maple-sweetgum swamps often occur as a mosaic with upland forest communities.

Sweetgum (*Liquidambar styraciflua*) is often the dominant tree or may be codominant with red maple (*Acer rubrum*). Other codominant trees include pin oak (*Quercus palustris*) and black gum (*Nyssa sylvatica*). Other trees occurring at lower densities include swamp white oak (*Quercus bicolor*), red oak (*Quercus rubra*) and black ash (*Fraxinus nigra*). Willow oak (*Quercus phellos*) and sweet-bay (*Magnolia virginiana*) are often present in larger occurrences where they may occur at very low density. Trees often have buttressed trunks and exposed roots from hydrological influences.

The shrublayer is usually fairly well-developed. Characteristic shrubs are sweet pepperbush (*Clethra alnifolia*), swamp azalea (*Rhododendron viscosum*), arrowwood (*Viburnum recognitum*), spicebush (*Lindera benzoin*), highbush blueberry (*Vaccinium corymbosum*), black chokeberry (*Aronia melanocarpa*) and possibly fetterbush (*Leucothoe racemosa*). Vines such as greenbrier (*Smilax rotundifolia*), sawbrier (*S. glauca*), grape (*Vitis* spp.), Virginia creeper (*Parthenocissus quinquefolia*) and poison ivy (*Toxicodendron radicans*), are present at low amounts in the understory.

The herbaceous layer is often dominated by ferns, including netted chain fern (*Woodwardia aereolata*), cinnamon fern (*Osmunda cinnamomea*), and sensitive fern (*Onoclea sensibilis*). Characteristic herbs include lizard's-tail (*Saururus cernuus*), Canada mayflower (*Maianthemum canadense*), jumpseed (*Polygonum virginianum*), skunk cabbage (*Symplocarpus foetidus*) and jewelweed (*Impatiens capensis*). State-reported southern red oak (*Quercus falcata*) and state-extirpated mistletoe (*Phoradendron flavescens*) occur in this community south of New York and may have been historically present in this community in New York.

More data on characteristic fauna are needed.

Distribution: Probably restricted to Manhattan Hills Ecozone and western part of Coastal Lowlands Ecozone (Bray, 1915). At least one example in the Triasic Lowlands Ecozone. Known examples range from Hylan Boulevard and Bedell Avenue in the Tottenville portion of Staten Island (southernmost point in New York) north to Quaker Ridge Woods Scarsdale, Westchester County. Most occurrences are apparently concentrated in Richmond County. The community may occur or was historically present in very small patches farther east in Queens, Kings and Nassau Counties. Also likely to have been present historically in Bronx and New York Counties.

Rank: G4G5 S1S2 *Revised:* 2001

Example: Magnolia Swamp, Richmond County; Tallman Mountain, Rockland County.

Sources: Greller 1977, Sneddon, et. al. 1996, Golet et al. 1993; Grossman, et. al. 1994, Reschke 1990, Breden 1986, Stevens 1992, Robichaud and Buell 1973, Bray 1915; NYNHP field surveys.

5. Silver maple-ash swamp: a hardwood basin swamp that typically occurs in poorly-drained depressions or along the borders of large lakes, and less frequently in poorly drained soils along rivers. These sites are characterized by uniformly wet conditions with minimal seasonal fluctuations in water levels.

The dominant trees are usually silver maple (*Acer saccharinum*) and green ash (*Fraxinus pennsylvanica*). American elm (*Ulmus americana*) is often present and probably was a codominant prior to the onset of Dutch elm disease and elm yellows. Other trees include black ash (*F. nigra*), white ash (*F. americana*), swamp white oak (*Quercus bicolor*), red maple (*Acer rubrum*), and occasionally the silver maple-red maple hybrid "Freeman's maple" (*Acer x freemanii*). Many of the canopy trees occur in the subcanopy along with ironwood (*Carpinus carolinianus*).

Characteristic shrubs include winterberry (*Ilex verticillata*), spicebush (*Lindera benzoin*), various shrubby dogwoods *(Cornus foemina ssp. racemosa, C. amomum,* and *C. sericea*), various viburnums (*Viburnum recognitum, V. lentago,* and V. *cassinoides*), speckled alder (*Alnus incana* ssp. *rugosa*), gooseberries (*Ribes* spp.), and sapling canopy trees. Characteristic vines include Virginia creeper (*Parthenocissus quinquefolia*) and poison ivy (*Toxicodendron radicans*).

Characteristic herbs include sensitive fern (*Onoclea sensibilis*), skunk cabbage (*Symplocarpus foetidus*), false nettle (*Boehmeria cylindrica*), wood-nettle (*Laportea canadensis*), cinnamon fern (*Osmunda cinnamomea*), , royal fern (*O. regalis*), marsh fern (*Thelypteris palustris*), jewelweed (*Impatiens capensis*), manna grasses (*Glyceris striata, G. grandis*), and various sedges (*Carex lupulina, C. crinita, C. bromoides,* and *C. lacustris*). Other herbs in wetter examples include arrow arum (*Peltandra virginica*), arrowheads (*Sagittaria* spp.), wild calla (*Calla palustris*), cattail (*Typha latifolia*), and duckweeds (*Lemna* spp.). A few examples are dominated by reed canary grass (*Phalaris arundinacea*) and/or lizard's tail (*Sauruus cernuus*).

Silver maple-ash swamps are often underlain by calcareous bedrock and may contain a few calciphilic species, such as northern white cedar (*Thuja occidentalis*) and alder-leaf buckthorn (*Rhamnus alnifolia*). Ash-elm dominated swamps with little or no maple are tentatively included here until more data are collected on this variant.

Data on characteristic animals are needed.

Distribution: in central and western New York in the Appalachian Plateau ecozone, and in the Champlain Valley sub-zone of the Lake Champlain ecozone.

Rank: G3G4 S2S3 *Revised:* 2001

Examples: Kings Bay Wetlands, Clinton County; Beaver Creek Swamp, St. Lawrence County; Black Creek Swamp, Monroe County; Cicero Swamp, Onondaga County; Conesus Wetlands, Livingston County.

Source: Huenneke 1982; NYNHP field surveys.

6. Vernal pool: an aquatic community of one or more associated intermittently to ephemerally ponded, small, shallow depressions typically within an *upland* forest, but also within various palustrine and other terrestrial communities. Vernal pools are typically flooded in spring or after a heavy rainfall, but are usually dry during summer. Many vernal pools are filled again in autumn. Substrate is typically dense leaf litter over hydric soils. Substrate type is known to vary from deep sands to loam to sandstone pavement. Vernal pools typically occupy a confined basin (i.e., a standing waterbody without a flowing outlet), but may have an intermittent stream flowing out of it during high water. Several hydrologic types of vernal pools have been identified including natural isolated basins, floodplain basins, in-stream basins, swamp pools, and marsh pools (Barbour 1999).

This community includes a diverse group of invertebrates and amphibians that depend upon temporary pools as breeding habitat. Since vernal pools cannot support fish populations, there is no threat of fish predation on amphibian eggs or invertebrate larvae. Characteristic animals of vernal pools include species of amphibians, reptiles, crustaceans, mollusks, annelids, and

insects. Vernal pool species can be categorized as either *obligate* (species that depend upon vernal pool habitat for their survival), or *facultative* (species that are often found in vernal pools, but are not dependent on them and can successfully reproduce elsewhere) (Colburn 1997).

Obligate vernal pool amphibians include spotted salamander (*Ambystoma maculatum*), blue-spotted salamander (*A. laterale*), Jefferson=s salamander (*A. jeffersonianum*), marbled salamander (*A. opacum*) and wood frog (*Rana sylvatica*). Fairy shrimp (Anostraca) are obligate vernal pool crustaceans, with *Eubranchipus* spp. being the most common.

Facultative vernal pool amphibians include four-toed salamander (*Hemidactylium scutatum*), red-spotted newt (*Notophthalmus viridescens*), spring peeper (*Pseudacris crucifer*), gray tree frog (*Hyla versicolor*), green frog (*Rana clamitans*), American toad (*Bufo americanus*), and Fowler=s toad (*B. woodhousei fowleri*). Facultative vernal pool reptiles include painted turtle (*Chrysemys picta*), spotted turtle (*Clemmys guttata*), and snapping turtle (*Chelydra serpentina*). Facultative vernal pool mollusks include freshwater fingernail clams (*Sphaerium* sp., *Musculium* sp., and *Pisidium* sp.) and aquatic amphibious snails (*Physa* sp., *Lymnaea* sp., and *Helisoma* sp.). Facultative vernal pool insects include water scorpions (), predacious diving beetles (Dytiscidae), whirligig beetles (Gyrinidae), dobsonflies (Corydalidae), caddisflies (Trichoptera), dragonflies (Anisoptera), damselflies (Zygoptera), mosquitoes (Cuculidae), springtails (Collembula) and water striders (*Gerris* sp.). Leeches (Hirudinea) are a facultative vernal pool annelid.

Plants are predominantly hydrophytic, typically with a combination of obligate and facultative wetland species. Floating and submergent plants may be common, but emergent plants should be sparse or lacking. Characteristic vascular plants may include mannagrass (*Glyceria* sp.), spikerush (*Eleocharis acicularis*), water purslane (*Ludwigia palustris*), naiad (*Najas* sp.), duckweed (*Lemna minor*), and water-hemlock (*Cicuta maculata*). Characteristic bryophytes may include *Brachythecium rivulare*, *Calliergon* sp. and *Sphagnum* spp. A characteristic rare plant of examples on the coastal plain may be featherfoil (*Hottonia inflata*).

Five to seven ecoregional variants (including Northern Appalachian, Great Lakes, Lower New England, Alleghany Plateau and North Atlantic Coast types) are suspected to differ in characteristic and dominant vascular plants, amphibians and invertebrates, as well as water chemistry, water temperature, substrate type, and surrounding forest type. More data on regional variants are needed.

Distribution: throughout New York State.

Rank: G4 S3S4 *Revised:* 2001

Examples: River Road North Creek, Warren County; Shawangunk Mountains, Ulster County; Perigo Hill, Rensselaer County.

Sources: Barbour, S. 1999; Colburn, E.A. 1997; Huth and Smiley 1981; Swain and Kearsley 2000; Williams 2001; NYNHP field surveys.

7. Perched swamp white oak swamp: a swamp that occurs in a shallow depression on a forested hillside where the water table is locally perched above the surrounding groundwater level. The water level fluctuates seasonally; the swamp may be flooded in spring and nearly dry by late summer.

The dominant tree is swamp white oak (*Quercus bicolor*), which may form a nearly pure, open canopy stand in areas that are permanently saturated. In better-drained areas where the soil is seasonally dry, the canopy cover is greater and the canopy may include several other species such as scarlet oak (*Quercus coccinea*), white oak (*Q. alba*), red maple (*Acer rubrum*), white pine (*Pinus strobus*), and pitch pine (*P. rigida*).

The understory is fairly open, with scattered ericaceous shrubs including black huckleberry (*Gaylussacia baccata*), highbush blueberry (*Vaccinium corymbosum*), lowbush blueberry (*V. angustifolium*), and pinkster (*Rhododendron periclymenoides*). The groundcover may be sparse, with scattered patches of *Sphagnum* where the canopy cover is closed. In areas with an open canopy and wet soils, *Sphagnum* may form extensive carpets, mixed with sedge (*Carex stipata*), woolgrass (*Scirpus cyperinus*), mannagrass (*Glyceria striata*), marsh fern (*Thelypteris palustris*), arrowwood (*Viburnum recognitum*), and poison ivy (*Toxicodendron radicans*). Data on characteristic animals are needed.

Distribution: not well known; reported from the Finger Lakes Highlands sub-zone of the Appalachian Plateau ecozone.

Rank: G3G4 S1S2 *Revised:* 1990

Examples: South Hill Swamp, Tompkins County; Blueberry Patch Swamp, Schuyler County.

Sources: Tufts 1976; NYNHP field surveys.

8. Hemlock-hardwood swamp: a mixed swamp that occurs on mineral soils and deep muck in depressions which receive groundwater discharge, typically in areas where the aquifer is a basic or acidic substrate. These swamps usually have a fairly closed canopy (70 to 90% cover), sparse shrublayer, and low species diversity.

The tree canopy is typically dominated by hemlock

(*Tsuga canadensis*), and co-dominated by yellow birch (*Betula alleghaniensis*), and red maple (*Acer rubrum*). Other less frequently occurring tree include white pine (*Pinus strobus*), black gum (*Nyssa sylvatica*), and green ash (*Fraxinus pennsylvanica*).

Characteristic shrubs include saplings of canopy trees plus highbush blueberry (*Vaccinium corymbosum*) often dominant, with great rhododendron (*Rhododenron maximum*) and sweet pepperbush (*Clethra alnifolia*) becoming more common in Lower Hudson Valley examples. Other less frequently occurring shrubs include various viburnums (*Viburnumcassinoides, V. lentago,* and *V. lanatanoides*), winterberry (Ilex verticillata), and mountain holly (*Nemopanthus mucronatus*).

Characteristic herbs are cinnamon fern (*Osmunda cinnamomea*) and sensitive fern (*Onoclea sensibilis*). Groundcover may also be fairly sparse. Other less frequently occurring herbs include sedges *(Carex trisperma, C. folliculata,* and *C. bromoides*), goldthread (*Coptis trifolia*), Canada mayflower (*Maianthemum canadense*), mountain sorrel (*Oxalis montana*), foamflower (*Tiarella cordifolia*), and sarsparilla (*Aralia nudicaulis*).

This is a common and widespread swamp community. Some occurrences are very small (1 to 2 acres). Water levels in these swamps typically fluctuate seasonally: they may be flooded in spring and relatively dry by late summer.

Distribution: throughout upstate New York, north of the Coastal Lowlands ecozone.

Rank: G4G5 S4 *R* *evised:* 2001

Examples: Tamarack Swamp Delaware, Sullivan County; Protection Bog, Wyoming/Erie Counties; Vly Swamp, Ulster County; Tamarack Swamp Boylston, Oswego County; Harriman, Rockland County.

Sources: Bray 1915; McVaugh 1958; NYNHP field surveys.

9. Spruce-fir swamp: a conifer swamp that typically occurs in a drainage basin, in some cases filling the basin, but also can occur at the edge of a lake or pond, or along gentle slopes of islands where there is some nutrient input from groundwater discharge or subsurface flow. In the Adirondacks and the Tug Hill these swamps are often found in drainage basins occasionally flooded by beaver (*Castor canadensis*). These swamps are usually dense, with a fairly closed canopy (80 to 90% cover). The dominant tree is usually red spruce (*Picea rubens*). Codominant trees include balsam fir (*Abies balsamea*) and red maple (*Acer rubrum*). In the Catskills, balsam fir may be absent, and in the Adirondacks, black spruce (*Picea mariana*) or white spruce (*P. glauca*) may replace red spruce as a dominant tree. Other less frequently occurring trees include yellow birch (*Betula alleghaniensis*), white pine (*Pinus strobus*), and hemlock (*Tsuga canadensis*)

The shrublayer is often sparse; characteristic and dominant shrubs include mountain holly (*Nemopanthus mucronatus*) along with sapling canopy trees. Other less frequently occurring shrubs include alders (*Alnus viridis* ssp. *crispus, A. incana* ssp. *rugosa*), blueberries (*Vaccinium corymbosum, V. myrtilloides*), wild raisin (*Viburnum cassinoides*), mountain ash (*Sorbus americana*), and winterberry (*Ilex verticillata*).

Characteristic herbs are cinnamon fern (*Osmunda cinnamomea*), sedges (*Carex trisperma, C. folliculata*), gold thread (*Coptis trifolia*), bunchberry (*Cornus canadensis*), starflower (*Trientalis borealis*), wood sorrel (*Oxalis acetosella*), creeping snowberry (*Gaultheria hispidula*), and dewdrop (*Dalibarda repens*).

The non-vascular layer is often dominated by *Sphagnum* spp., including *S. girgensohnii, S. centrale,* and *S. angustifolium*). Other characteristic bryophytes include *Bazzania trilobata* and *Pleurozium schreberi*.

Spruce-fir swamps occur in lowlands where they may grade into either spruce flats or balsam flats (upland forests). A spruce-fir swamp is distinguished from spruce flats by the lower elevation of the swamp, wetland soils, presence in the swamp of patches of *Sphagnum* spp., and the absence of black cherry (*Prunus serotina*), a characteristic species of spruce flats and balsam flats.

A characteristic bird of spruce-fir swamps is the northern waterthrush (*Seiurus noveboracensis*).

Distribution: mostly found in the Adirondacks, Tug Hill, and Catskills ecozones, but also in Rensselaer Hill section of the Taconic Highland ecozone and extending south into the Appalachian Plateau ecozone.

Rank: G3G4 S3 *Revised:* 2001

Examples: Black Pond Swamp, Franklin County; Marion River, Hamilton County; Blue Swamp, Lewis County; Page Swamp, Lewis County; Brandy Brook, Ulster County; Poestenkill Headwaters, Rensselaer County; Mad River Swamp, Lewis County; Whetstone Creek Swamp, Lewis County..

Sources: Braun 1950; Zon 1914; NYNHP field surveys.

D. FORESTED PEATLANDS

This subsystem includes peatlands with at least 50% canopy cover of trees. Substrates range from coarse woody or fibrous peat to fine-grained marl and organic muck.

1. Inland Atlantic white cedar swamp: a conifer or mixed swamp that occurs on organic soils (usually peat) in poorly drained depressions and along pond edges in southeastern New York and northern New Jersey.

The characteristic tree is Atlantic white cedar (*Chamaecyparis thyoides*); the canopy cover of Chamaecyparis in these swamps is quite variable, ranging from nearly pure stands to as little as 30% of the canopy. In mixed stands the codominants are typically red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), and hemlock (*Tsuga canadensis*).

Characteristic small trees and shrubs are winterberry (Ilex verticillata), highbush blueberry (*Vaccinium corymbosum*), smooth winterberry (*Ilex laevigata*), rosebay (*Rhododendron maximum*), swamp azalea (*Rhododendron viscosum*), sweet pepperbush (*Clethra alnifolia*), mountain holly (*Nemopanthus mucronatus*), and red chokeberry (*Aronia arbutifolia*).

In a dense stand of *Chamaecyparis*, the groundcover is predominantly bryophytes, including several species of *Sphagnum*, and at least one characteristic liverwort, *Palavicinia lyellii*. In mixed stands with a more open canopy some characteristic herbs are cinnamon fern (*Osmunda cinnamomea*), interrupted fern (*O. claytoniana*), royal fern (*O. regalis*), skunk cabbage (*Symplocarpus foetidus*), wild calla (Calla palustris), and starflower (*Trientalis borealis*). Data on characteristic animals are needed.

Distribution: only known from the Hudson Highlands ecozone, the Central Hudson subzone of the Hudson Valley ecozone, and the Mongaup Hills subzone of the Appalachian Plateau ecozone.

Rank: G2G3 S1 *Revised:* 2001

Example: Little Cedar Bog, Orange County

Sources: Eyre 1980; Karlin 1997; Laderman 1989; Lynn 1984; NYNHP field surveys.

2. Coastal plain Atlantic white cedar swamp: a conifer or mixed swamp that occurs on organic soils along streams and in poorly drained depressions of the coastal plain of New England, Long Island, New Jersey, and southward.

Atlantic white cedar (*Chamaecyparis thyoides*) makes up over 50% of the canopy cover. In mixed stands in New York, red maple (*Acer rubrum*) is the codominant tree. Other less frequently occurring trees include black gum (*Nyssa sylvatica*) and pitch pine (*Pinus rigida*) on higher hummock islands within the swamp.

Characteristic shrubs include canopy trees along with sweet pepperbush (*Clethra alnifolia*), highbush blueberry (*Vaccinium corymbosum*), swamp azalea (*Rhododendron viscosum*), inkberry (*Ilex glabra*), dangleberry (*Gaylussacia frondosa*), black huckleberry (*G. baccata*), sheep laurel (*Kalmia angustifolia*), and bayberry (*Myrica pensylvanica*), and black chokeberry (*Aronia melanocarpa*).

Characteristic herbs, typically found in sunny openings in the swamp, include cinnamon fern (*Osmunda cinnamomea*), marsh fern (*Thelypteris palustris*), wintergreen (*Gaultheria procumbens*), sundew (*Drosera intermedia*), pitcher plant (*Sarracenia purpurea*), sundews (*Drosera intermedia, D. rotundifolia*), bladderworts (*Utricularia* spp.) marsh St. John's-wort (*Triadenum virginicum*), Virginia chain fern (*Woodwardia virginica*), and sedges such as *Carex striata*. Massachusetts fern (*Thelypteris simulata*) and two sedges (*Carex atlantica* and *C. collinsii*) are characteristic of these swamps in New England; these species occur in New York but they have not recently been reported from New York *Chamaecyparis* swamps.

The bryophyte layer is dominated by several species of *Sphagnum* moss.

A rare moth of some Atlantic white cedar swamps is Hessel's hairstreak (*Mitoura hesseli*), which feeds on Atlantic white cedar. More data on characteristic animals are needed.

Distribution: restricted to the Coastal Lowlands ecozone.

Rank: G3G4 S1 *Revised:* 2001

Example: Cranberry Bog County Park, Suffolk County.

Sources: Bicknell 1968; Ehrenfeld & Schneider 1991; Eyre 1980; Laderman 1987; Laderman 1989; Motzkin et al. 1993; Motzkin 1991; Schroeder and Taras 1985; Zampella et al. 1999; NYNHP field surveys.

3. 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*), ironwood (*Carpinus carolinianus*), 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 (*Potentilla fruticosa*). 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 are sedges such as *Carex trisperma, C. interior, C. stricta, C. lacustris*, and *C. leptalea.* and ferns such as royal fern (*Osmunda regalis*), cinnamon fern (*O. cinnamomea*), marsh fern (*Thelypteris palustris*), and crested wood fern (*Dryopteris cristata*), along with skunk cabbage (*Symplocarpus foetidus*), marsh marigold (*Caltha palustris*), and water horehound (*Lycopus uniflorus*). Other less frequently occurring herbs include cattail (*Typha latifolia*), goldthread (*Coptis trifolia*), flat-topped aster (*Aster umbellatus*), fowl manna grass (*Glyceria striata*), water horsetail (*Equisetum fluviatile*), buckbean (*Menyanthes trifoliata*), starflower (*Trientalis borealis*), goldenrods (*Solidago patula, S. uliginosa*), golden ragwort (*Senecio aureus*), marsh cinquefoil (*Potentilla palustris*).

The bryophyte layer is dominated by several species of *Sphagnum* moss, including *S. magellanicum, S. angustifolium,* and *S. warnstorfii.*

Data on characteristic animals are needed. These swamps are closely related to and often grade into rich shrub fens and rich graminoid fens.

Distribution: scattered throughout upstate New York, north of the Coastal Lowlands ecozone.

Rank: G3G4 S2S3 *Revised:* 2001

Examples: Deer Creek Marsh, Oswego County; Vly Swamp, Ulster County; Perch River Swamp, Jefferson County; Lisbon Swamp, St. Lawrence County; Drowned Lands Swamp, Columbia County; Brennen Beach Fen, Oswego County.

Sources: McVaugh 1958; NYNHP field surveys.

4. Pitch pine-blueberry peat swamp: a conifer swamp that occurs in shallow depressions in sand plains where peat has accumulated over a poorly drained sandy soil called an Ortstein. This soil has a horizon cemented by iron oxide; the cemented horizon impedes drainage, causing seasonal flooding.

The dominant tree is pitch pine (*Pinus rigida*). Gray birch (*Betula populifolia*) and red maple (*Acer rubrum*) are present at a low density. The canopy is open, with about 50 to 60 percent cover.

There is a dense shrublayer dominated by highbush blueberry (*Vaccinium corymbosum*), with small amounts of sheep laurel (*Kalmia angustifolia*), blueberry (*Vaccinium myrtilloides*), wild raisin (*Viburnum cassinoides*), and black chokeberry (*Aronia melanocarpa*).

The groundcover is a hummocky carpet of peat mosses (*Sphagnum* spp.) with scattered herbs including wintergreen (*Gaultheria procumbens*), bracken fern (*Pteridium aquilinum*), bunchberry (*Cornus canadensis*), Canada mayflower (*Maianthemum canadense*), swamp dewberry (*Rubus hispidus*), and bulrush (*Scirpus* sp.). More data on this community are needed.

Distribution: only known from the Erie-Ontario Plain sub-zone of the Great Lakes Plain ecozone. Examples were sought but not found on Long Island (MacDonald and Edinger 2000). Communities with a similar composition have been described from the New Jersey Pine Barrens.

Rank: G3? S1 *Revised:* 1990

Example: Huckleberry Swamp in the Rome Sand Plains, Oneida County.

Sources: Breden 1987; Leimanis 1993; MacDonald and Edinger 2000; NYNHP field surveys.

5. Northern white cedar swamp: 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 characteristic 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*), hemlock (*Tsuga canadensis*), balsam fir (*Abies balsamea*), tamarack (*Larix laricina*), yellow birch (*Betula alleghaniensis*), black ash (*Fraxinus nigra*), white pine (*Pinus strobus*), and black spruce (*Picea mariana*).

The shrublayer is usually sparse; characteristic species are dwarf raspberry (*Rubus pubescens*), red osier dogwood (*Cornus sericea*), swamp fly honeysuckle (*Lonicera oblongifolia*), 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 are the sedges *Carex leptalea* and *C. eburnea*, oak fern (*Gymnocarpium dryopteris*), gold thread (*Coptis trifolia*), starflower (*Trientalis borealis*), bunchberry (*Cornus canadensis*), miterwort (*Mitella nuda*), Canada mayflower (*Maianthemum canadense*), blue bead lily (*Clintonia borealis*), snowberry (*Gaultheria hispidula*), and partridge berry (*Mitchella repens*).

Characteristic herbs of hollows between the hummocks are the sedge *C. 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 calceolus*), and golden ragwort (*Senecio aureus*).

Characteristic bryophytes are several species of *Sphagnum* moss, feathermosses such as *Hylocomium splendens* and *Ptilium crista-castrensis*, and leafy liverworts such as *Bazzania trilobata* and *Trichocolea tomentella*.

Characteristic birds include northern waterthrush (*Seiurus noveboracensis*), winter wren (*Troglodytes troglodytes*), white-throated sparrow (*Zonotrichia albicollis*), and golden-crowned kinglet (*Regulus satrapa*).

Distribution: scattered across upstate New York, extending north from the Appalachian Plateau ecozone.

Rank: G3G4 S2S3 *Revised:* 1990

Examples: Bergen Swamp, Genesee County; Toad Harbor Swamp, Oswego County; Marion River, Hamilton County; Carley Swamp, Lewis County; Dunham Bay Marsh, Warren County; Ninemile Swamp, Madison/Oneida Counties; Nelson Swamp, Madison County; Summit Lake Swamp, Otsego County.

Sources: Seischab 1984; Shanks 1966; Sorensen et al. 1998; Sperduto and Engstrom 1998; NYNHP field surveys.

6. Rich hemlock-hardwood peat swamp: a mixed swamp that occurs in central New York in depressions or concave slopes which receive groundwater discharge, typically in areas where the groundwater flows through calcareous gravels of glacial deposits. These swamps usually have a fairly open canopy (50 to 70% cover), scattered shrubs, and a diverse groundlayer with sedges, mosses, and forbs.

The characteristic canopy trees are hemlock (*Tsuga canadensis*) which usually has at least 20% cover, red maple (*Acer rubrum*), yellow birch (*Betula alleghaniensis*), black ash (*Fraxinus nigra*), tamarack (*Larix laricina*), white pine (*Pinus strobus*), smooth serviceberry (*Amelanchier arborea* var. *laevis*), balsam fir (*Abies balsamea*), and northern white cedar (*Thuja occidentalis*). In any one swamp there may be very few (if any) stems of *Abies* or *Thuja*. In the Cayuga Lake area, some of these swamps are locally known as "fir tree swamps", even if there are only a few balsam fir present, because these are the only places locally where native balsam fir can be found.

Characteristic shrubs and vines are alder-leaf buckthorn (*Rhamnus alnifolia*), highbush blueberry (*Vaccinium corymbosum*), red osier dogwood (*Cornus sericea*), northern gooseberry (*Ribes hirtellum*), wild raisin (*Viburnum cassinoides*), virgin's bower (*Clematis virginiana*),and dwarf raspberry (*Rubus pubescens*).

Characteristic herbs are the sedges *Carex bromoides*, *C. interior*, and *C. scabrata*, manna grass (*Glyceria striata*), cinnamon fern (*Osmunda cinnamomea*), royal fern (*O. regalis*), sensitive fern (*Onoclea sensibilis*), marsh marigold (*Caltha palustris*), golden ragwort (*Senecio aureus*), meadow-rue (*Thalictrum pubescens*), miterwort (*Mitella nuda*), starry Solomon's seal (*Smilacina stellata*), spreading goldenrod (*Solidago patula*), white hellebore (*Veratrum viride*), swamp thistle (*Cirsium muticum*), purple avens (*Geum rivale*), globeflower (*Trollius laxus* ssp. *laxus*), and swamp saxifrage (*Saxifraga pensylvanica*).

Characteristic mosses are *Sphagnum russowii*, *S. warnstorfii*, *S. centrale*, *Aulacomnium palustre*, and *Campylium stellatum*. Data on characteristic animals are needed.

Distribution: Most occurrences located in the Central Appalachians and Finger Lake Highlands sub-zones of the Appalachian Plateau ecozone.

Rank: G3G4 S2S3 *Revised:* 1990

Examples: Bear Swamp Sempronius, Cayuga County; Perkins Swamp, Chautauqua County; Alder Bottom Wetlands, Chautauqua County; Malloryville Swamp, Tompkins County; Michigan Hollow Swamp, Tompkins County.

Sources: Tufts 1976; NYNHP field surveys.

7. Black spruce-tamarack bog: a conifer forest that occurs on acidic peatlands in cool, poorly drained depressions.

The characteristic trees are black spruce (*Picea mariana*) and tamarack (*Larix laricina*); in any one

stand, either tree may be dominant, or they may be codominant. Canopy cover is quite variable, ranging from open canopy woodlands with as little as 20% cover of evenly spaced canopy trees to closed canopy forests with 80 to 90% cover.

In the more open canopy stands there is usually a well-developed shrublayer characterized by several shrubs typical of bogs: leatherleaf (*Chamaedaphne calyculata*), sheep laurel (*Kalmia angustifolia*), highbush blueberry (*Vaccinium corymbosum*), Labrador tea (*Rhododendron groenlandicum*), mountain holly (*Nemopanthus mucronatus*), and wild raisin (*Viburnum nudum* var.*cassinoides*). In closed canopy stands the shrublayer is usually sparse; however the species composition is similar. The dominant groundcover consists of several species of *Sphagnum* moss, including *S. fimbriatum, S. girgensohnii,* and *S. magellanicum*, with scattered sedges and forbs.

Characteristic herbs are the sedge *Carex trisperma*, cotton grass (*Eriophorum* spp.), pitcher plant (*Sarracenia purpurea*), bunchberry (*Cornus canadensis*), and cinnamon fern (*Osmunda cinnamomea*). In shady areas where the canopy is dense, gold thread (*Coptis trifolia*) and creeping snowberry (*Gaultheria hispidula*) may be found. Vascular plant diversity is usually low in these forested peatlands; however the bryophyte and epiphytic lichen flora may be relatively diverse.

Characteristic animals include three-toed woodpecker (*Picoides tridactylus*), black-backed woodpecker (*Picoides arcticus*), olive-sided flycatcher (*Contopus borealis*), gray jay (*Perisoreus canadensis*), Lincoln's sparrow (*Melospiza lincolnii*), white-throated sparrow (*Zonotrichia albicollis*), golden-crowned kinglet (*Regulus satrapa*), spruce grouse (*Dendragapus canadensis*), and four-toed salamander (*Hemidactylium scutatum*).

A black spruce-tamarack bog may imperceptibly grade into and form a mosaic with a dwarf shrub bog. As the peat substrate thins and the wetland transitions to terrestrial communities, the black spruce-tamarack bog may grade into spruce flats.

Distribution: scattered throughout upstate New York; more common to the north in the Adirondacks ecozone.

Rank: G4G5 S3 *Revised:* 2001

Examples: Bolton Swamp, Warren County; Massawepie Mire, St. Lawrence County; Spring Pond Bog, Franklin County; Cicero Swamp, Oneida County;Bay Pond Bog, Franklin County; Kildare Peatlands, Franklin/St. Lawrence Counties; Sunday Swamp, Lewis County.

Sources: Bray 1921; Shanks 1966; NYNHP field surveys.

C. PALUSTRINE CULTURAL

This subsystem includes communities that are either created and maintained by human activities, or are modified by human influence to such a degree that the physical conformation of the substrate, the hydrology, or the biological composition of the resident community is substantially different from the character of the substrate, hydrology, or community as it existed prior to human influence.

1. Reverted drained muckland: a wetland with muck soils that has been drained and cultivated (e.g., for vegetable crops), and subsequently allowed to flood and thereby revert to a wetland.

Distribution: throughout upstate New York, north of the Coastal Lowlands ecozone.

Rank: G5 S5 *Revised:* 1990

2. Impounded marsh: a marsh (with less than 50% cover of trees) in which the water levels have been artificially manipulated or modified, often for the purpose of improving waterfowl habitat. Purple loosestrife (*Lythrum salicaria*) may become dominant when water levels are low. Vegetation often consists of species planted to improve waterfowl habitat, such as proso millet (*Panicum milaceum*), foxtail millet (*Setaria italica*), sorghum (*Sorghum bicolor*), and buckwheat (*Fagopyrum esculentum*).

Distribution: throughout upstate New York, north of the Coastal Lowlands ecozone.

Rank: G5 S5 *Revised:* 1990

Source: Giles 1969.

3. Impounded swamp: a swamp (with at least 50% cover of trees) where the water levels have been artificially manipulated or modified, often for the

purpose of improving waterfowl habitat. Red maple (*Acer rubrum*) is a characteristic tree. Often there are many standing dead tree trunks. Purple loosestrife (*Lythrum salicaria*) and duckweed (*Lemna minor*) may become dominant in the understory.

Distribution: throughout upstate New York, north of the Coastal Lowlands ecozone.

Rank: G5 S5 *Revised:* 1990

4. Reedgrass/purple loosestrife marsh: a marsh that has been disturbed by draining, filling, road salts, etc. in which reedgrass (*Phragmites australis*) or purple loosestrife (*Lythrum salicaria*) has become dominant. This community is common along highways and railroads.

Distribution: throughout New York State.

Rank: G5 S5 *Revised:* 1990

5. Dredge spoil wetland: a wetland in which the substrate consists of dredge spoils; reedgrass (*Phragmites australis*) is a characteristic species.

Distribution: throughout New York State.

Rank: G5 S5 *Revised:* 1990

6. Mine spoil wetland: a sparsely vegetated wetland in which the substrate consists of mine spoils.

Distribution: scattered throughout upstate New York, north of the Coastal Lowlands ecozone.

Rank: G5 S5 *Revised:* 1990

7. Water recharge basin: the aquatic community of a constructed depression near a road or development that receives runoff from paved surfaces and allows the water to percolate through to the groundwater, thereby recharging the groundwater. These basins are intermittently flooded during periods of heavy precipitation. On Long Island some of these are important as breeding habitat for amphibians such as tiger salamander (*Ambystoma tigrinum*).

Distribution: throughout New York State.

Rank: G5 S5 *Revised:* 1990

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