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## **ECOLOGICAL SYSTEM: NORTH-CENTRAL APPALACHIAN ACIDIC SWAMP**

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**Summary:** These swamps are distributed through the central Appalachians south to Virginia and west to Ohio. They are found in basins or on gently sloping seepage lowlands. The acidic substrate is mineral soil, often with a component of organic muck; if peat is present, it usually forms an organic epipedon over the mineral soil rather than a true peat substrate. *Tsuga canadensis* (eastern hemlock) is usually present and may be dominant. It is often mixed with deciduous wetland trees such as *Acer rubrum* (red maple) or *Nyssa sylvatica* (blackgum). *Sphagnum* (peatmoss) is an important component of the bryoid layer. Basin swamps tend to be more nutrient-poor and less species-rich than seepage swamps; in some settings, the two occur adjacent to each other with the basin swamp vegetation surrounded by seepage swamp vegetation on its upland periphery.

**High-ranked Species:** *Carex schweinitzii* (G3G4, schweinitz's sedge), *Helonias bullata* (G3, swamp-pink), *Polemonium vanbruntiae* (G3G4, bog Jacob's-ladder)

**Range:** This system occurs from central New England south to West Virginia and Virginia and west to Ohio. Its southern range limit in Virginia has not been determined or documented. United States: CT, MA, MD, NH, NJ, NY, OH, PA, RI, VA, VT, WV

### **Delaware Estuary Associations:**

- Central Appalachian Forested Acid Seep
- Eastern Hemlock - Great Laurel Swamp
- Lower New England Red Maple - Blackgum Swamp
- Red Maple - Black Ash Swamp
- Red Maple - Blackgum Basin Swamp
- Red Maple - Tussock Sedge Wooded Marsh
- Southern New England Red Maple Seepage Swamp

### **Similar Ecological Systems in the Delaware Estuary:**

- Atlantic Coastal Plain Northern Basin Peat Swamp

### **CLASSIFIERS FOR NORTH-CENTRAL APPALACHIAN ACIDIC SWAMP**

**Primary Division:** 202

**Land Cover Class:** Woody Wetland

**Spatial Scale & Pattern:** Large patch

**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

**Diagnostic Classifiers:** Forest and Woodland (Treed); Extensive Wet Flat; Needle-Leaved Tree; 30-180-day hydroperiod

**Non-diagnostic Classifiers:** Lowland; Temperate; Mineral: W/ A-Horizon >10 cm; Broad-Leaved Deciduous Tree; Acidic Water; Shallow (<15 cm) Water; Moderate (100-500 yrs) Persistence

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## **CENTRAL APPALACHIAN FORESTED ACID SEEP**

*Acer rubrum* - *Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest

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**Range:** This acidic deciduous swamp occurs in the central Appalachian Mountains north of the Cumberland drainage in the Central Appalachians and High Allegheny ecoregions, as well as the adjacent Cumberlands and Western Allegheny Plateau. This seep community occurs in the Pennsylvania portion of the Delaware Estuary.

**Environmental Description:** This community occurs on substrates which are saturated for extended periods during the growing season but which rarely have standing water, including forested seeps, hillsides, streamheads, floodplain edges, and poorly drained depressions. Occurrences tend to be small.

**Vegetation Description:** Characteristic trees are *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum), with other associates including *Tsuga canadensis* (eastern hemlock) and *Betula alleghaniensis* (yellow birch). The shrub stratum includes *Alnus serrulata* (smooth alder), *Photinia pyrifolia* (red chokeberry), *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry), *Rhododendron maximum* (great laurel), and *Rubus hispidus* (bristly dewberry). Characteristic herbs include *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Carex folliculata* (northern long sedge), *Carex trisperma* (three-seed sedge), *Carex intumescens* (greater bladder sedge), *Carex stricta* (tussock sedge), and *Poa trivialis* (rough bluegrass). *Sphagnum* (peatmoss) spp. are typical.

**Characteristic Species:** *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Osmunda cinnamomea* (cinnamon fern)

**Reference Sites:** none identified

**Global and State Conservation Ranks and Reasons:** GNR (1-Dec-1997). PA: SNR.

**VegBank Link for Plot Data:** [http://vegbank.org/natureserve/element\\_global.2.689039](http://vegbank.org/natureserve/element_global.2.689039)

**References:** Anderson et al. 1998, CAP pers. comm. 1998, Eastern Ecology Working Group n.d., Fike 1999, Harrison 2004

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Tree canopy	Broad-leaved deciduous tree	<i>Nyssa sylvatica</i> (blackgum)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Alnus serrulata</i> (smooth alder)

## EASTERN HEMLOCK - GREAT LAUREL SWAMP

*Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp. Forest

**Range:** This hemlock swamp occurs in the Central Appalachians, southeastern New York and northern New Jersey. If this type occurs in the Delaware Estuary study area, its distribution would be limited to the upper portions of the Schuylkill watershed in Pennsylvania.

**Environmental Description:** This hemlock swamp occurs on saturated acidic muck to imperfectly drained mineral soils in upland valleys, bedrock depressions, low slopes, and adjacent to streams and lakes. Mounds and depressions caused by uprooted trees are typical.



Photo by Pennsylvania Natural Heritage Program

**Vegetation Description:** The tree canopy is closed or nearly closed and dominated by *Tsuga canadensis* (eastern hemlock) with associates including *Acer rubrum* (red maple), *Nyssa sylvatica* (blackgum), *Pinus strobus* (eastern white pine), and *Betula alleghaniensis* (yellow birch). The well-developed shrub layer is strongly dominated by *Rhododendron maximum* (great laurel). Other shrubs may include *Ilex verticillata* (common winterberry), *Rhododendron viscosum* (swamp azalea),

*Vaccinium corymbosum* (highbush blueberry), and *Lindera benzoin* (northern spicebush). The sparse herb layer includes a variety of sedges, such as *Carex folliculata* (northern long sedge), *Carex trisperma* (three-seed sedge), *Carex intumescens* (greater bladder sedge), as well as ferns and forbs, such as *Osmunda cinnamomea* (cinnamon fern), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Maianthemum canadense* (Canada mayflower), *Coptis trifolia* (threeleaf goldthread), *Symplocarpus foetidus* (skunk-cabbage), *Trientalis borealis* (starflower), and *Calla palustris* (water arum). The bryophyte layer is well-developed and strongly dominated by *Sphagnum* (peatmoss) mosses. Other mosses may include *Aulacomnium palustre* (ribbed bog moss), *Hypnum imponens* (hypnum moss), and *Leucobryum glaucum* (pincushion moss) on drier hummocks.

**Characteristic Species:** *Rhododendron maximum* (great laurel), *Tsuga canadensis* (eastern hemlock)

**Management Concerns:** Hemlock wooly adelgid may have significant negative impacts to the vegetation structure, species composition, and habitat suitability of this association.

**Reference Sites:** near Long Pine Pond in the Delaware Water Gap National Recreation Area, NJ

**Global and State Conservation Ranks and Reasons:** GNR (1-Dec-1997). NJ: S1S2, PA: SNR.

**VegBank Link for Plot Data:** [http://vegbank.org/natureserve/element\\_global.2.688628](http://vegbank.org/natureserve/element_global.2.688628)

**References:** Breden 1989, Breden et al. 2001, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Harrison 2004, Karlin 1988

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Tree canopy	Needle-leaved tree	<i>Tsuga canadensis</i> (eastern hemlock)
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Herb (field)	Fern or fern ally	<i>Osmunda cinnamomea</i> (cinnamon fern)

## LOWER NEW ENGLAND RED MAPLE - BLACKGUM SWAMP

*Acer rubrum* / *Rhododendron viscosum* - *Clethra alnifolia* Forest

**Range:** This type includes red maple basin swamps of Lower New England and adjacent areas. It occurs in the New Jersey portion of the Delaware Estuary.

**Environmental Description:** These swamps occur in poorly drained depressions characterized by acidic, tannic water that does not receive substantial nutrient input from overland flow or groundwater seepage. The soils are comprised of peat.

**Vegetation Description:** *Acer rubrum* (red maple) dominates the canopy. Other common species that generally occur in low abundance include *Betula alleghaniensis* (yellow birch), *Fraxinus* (ash) spp., *Ulmus americana* (American elm), and *Nyssa sylvatica* (blackgum). The shrub layer is well-developed and often dense. *Vaccinium corymbosum* (highbush blueberry) and *Ilex verticillata* (common winterberry) are common and abundant. *Clethra alnifolia* (coastal sweet-pepperbush), *Alnus incana* (speckled alder), *Lindera benzoin* (northern spicebush), *Viburnum dentatum* (southern arrow-wood), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Spiraea alba* var. *latifolia* (broadleaf meadowsweet), *Rosa palustris* (swamp rose), and *Rhododendron viscosum* (swamp azalea) are frequent but less abundant, and on the Atlantic Coastal Plain *Ilex glabra* (inkberry or little gallberry), *Rhododendron maximum* (great laurel), and *Leucothoe racemosa* (swamp doghobble) may also be present. The herbaceous layer has scattered herbs and commonly includes *Osmunda cinnamomea* (cinnamon fern), *Symplocarpus foetidus* (skunk-cabbage), *Thelypteris palustris* (eastern marsh fern), *Dryopteris cristata* (crested woodfern), *Lycopus uniflorus* (northern bugleweed), *Impatiens capensis* (orange jewelweed), *Carex folliculata* (northern long sedge), *Carex stricta* (tussock sedge), *Carex intumescens* (greater bladder sedge), *Osmunda regalis* (royal fern), and *Onoclea sensibilis* (sensitive fern). Hummock-and-hollow

microtopography is evident; tree seedlings and upland species occur on the hummocks, including *Coptis trifolia* (threeleaf goldthread) (a northern affiliate in NJ), *Aralia nudicaulis* (wild sarsaparilla), *Trientalis borealis* (starflower), and *Gaultheria procumbens* (wintergreen). *Sphagnum* (peatmoss) mosses are dominant or abundant in hollows and at the bases of hummocks. This community is differentiated from *Acer rubrum* - *Nyssa sylvatica* - *Betula alleghaniensis* / *Sphagnum* spp. Forest (CEGL006014), that occurs in Pennsylvania's portion of the estuary, by the absence or low abundance of *Nyssa sylvatica* (blackgum) and *Picea rubens* (red spruce).

**Characteristic Species:** *Acer rubrum* (red maple), *Ilex verticillata* (common winterberry), *Vaccinium corymbosum* (highbush blueberry)

**Dynamics/Successional Trajectory:** These are poorly drained basins with acidic, nutrient-poor peat soils. There is little overland flow or groundwater contribution to the water budget.

**Reference Sites:** Brendan Byrne State Forest, NJ

**Global and State Conservation Ranks and Reasons:** GNR (1-Dec-1997). NJ: S4S5.

**VegBank Link for Plot Data:** [http://vegbank.org/natureserve/element\\_global.2.689957](http://vegbank.org/natureserve/element_global.2.689957)

**References:** Breden 1989, Breden et al. 2001, Dowhan and Rozsa 1989, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Golet et al. 1993, Metzler and Barrett 1996, Metzler and Barrett 2001, Rawinski 1984, Reschke 1990, Sperduto 2000a, Swain and Kearsley 2000, Thompson and Jenkins 1992

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Tree subcanopy	Broad-leaved deciduous tree	<i>Betula alleghaniensis</i> (yellow birch)
Tree subcanopy	Broad-leaved deciduous tree	<i>Quercus bicolor</i> (swamp white oak)
Tree subcanopy	Broad-leaved deciduous tree	<i>Ulmus americana</i> (American elm)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Ilex verticillata</i> (common winterberry)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Vaccinium corymbosum</i> (highbush blueberry)
Herb (field)	Forb	<i>Symplocarpus foetidus</i> (skunk-cabbage)
Herb (field)	Fern or fern ally	<i>Osmunda cinnamomea</i> (cinnamon fern)

## RED MAPLE - BLACK ASH SWAMP

*Fraxinus nigra* - *Acer rubrum* / *Carex leptalea* Saturated Forest

**Range:** This community is found in the unglaciated portions of the Lower New England/Northern Piedmont, High Allegheny Plateau, and Central Appalachians ecoregions, from New York to Maryland and West Virginia. It occurs in Pennsylvania in the Delaware Estuary.

**Environmental Description:** This is a closed-canopy deciduous swamp forest of poorly drained depressions or seepage zones in the unglaciated portions of the Lower New England/Northern Piedmont, High Allegheny Plateau, and Central Appalachians ecoregions. This forest can occur as narrow zones to small inclusions to large swamps.



Photo by Pennsylvania Natural Heritage Program

Soils are generally mucky and without substantial peat development. It often occurs in areas of calcareous bedrock.

**Vegetation Description:** The canopy is codominated by *Acer rubrum* (red maple) and *Fraxinus nigra* (black ash) with associates such as *Quercus bicolor* (swamp white oak), *Nyssa sylvatica* (blackgum), *Betula alleghaniensis* (yellow birch), *Ulmus rubra* (slippery elm), *Ulmus americana* (American elm), and *Pinus strobus* (eastern white pine). The understory is patchy, ranging from shrub-dominated to sedge-dominated. Shrubs include *Lindera benzoin* (northern spicebush), *Toxicodendron vernix* (poison-sumac), *Alnus incana* (speckled alder), *Alnus serrulata* (smooth alder), *Vaccinium corymbosum* (highbush blueberry), *Rhododendron viscosum* (swamp azalea), *Salix* (willow) spp., *Physocarpus opulifolius* (eastern ninebark), *Spiraea alba* var. *latifolia* (broadleaf meadowsweet), and *Rhamnus alnifolia* (alderleaf buckthorn). The herb layer is diverse with *Carex leptalea* (bristly-stalk sedge), *Carex bromoides* (brome-like sedge), *Caltha palustris* (yellow marsh-marigold), *Veratrum viride* (American false hellebore), *Platanthera grandiflora* (greater purple fringed orchid), *Geum rivale* (purple avens), *Symplocarpus foetidus* (skunk-cabbage), *Cypripedium reginae* (showy lady's-slipper), *Trollius laxus* (American globeflower), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Osmunda cinnamomea* (cinnamon fern), *Impatiens capensis* (orange jewelweed), *Cardamine bulbosa* (bulbous bittercress), *Saxifraga pennsylvanica* (eastern swamp saxifrage), *Dryopteris cristata* (crested woodfern), *Carex lacustris* (lake sedge), and *Symplocarpus foetidus* (skunk-cabbage).

**Characteristic Species:** *Carex leptalea* (bristly-stalk sedge), *Fraxinus nigra* (black ash)

**Dynamics/Successional Trajectory:** This community is persistent and is not successional to another forest type. The community is sensitive to changes in hydrology. Flooding due to beaver or man-made impoundments will eliminate the forest and perhaps most of the shrub cover, resulting in a shift to emergent marsh and floating-leaved aquatic vegetation (depending on depth of flooding). Drought or reduction of hydrologic inputs (i.e., well water pumping) may cause a shift to terrestrial vegetation and initiate succession to a terrestrial forest type.

**Management Concerns:** The maintenance of hydrology is necessary. This community type is susceptible to invasion by non-native species, especially after canopy disturbances.

**Reference Sites:** French Creek State Park (Pine Swamp), Berks County, PA, Queene Anne Park, Bucks County, PA

**Global and State Conservation Ranks and Reasons:** GNR (1-Dec-1997). PA: SNR.

**VegBank Link for Plot Data:** [http://vegbank.org/natureserve/element\\_global.2.686573](http://vegbank.org/natureserve/element_global.2.686573)

**References:** CAP pers. comm. 1998, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Harrison 2004

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Tree canopy	Broad-leaved deciduous tree	<i>Fraxinus nigra</i> (black ash)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Lindera benzoin</i> (northern spicebush)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Toxicodendron vernix</i> (poison-sumac)
Herb (field)	Fern or fern ally	<i>Osmunda cinnamomea</i> (cinnamon fern)

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## RED MAPLE - BLACKGUM BASIN SWAMP

*Acer rubrum* - *Nyssa sylvatica* - *Betula alleghaniensis* / *Sphagnum* spp. Forest

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**Range:** This community occurs in Pennsylvania in the Delaware Estuary.

**Environmental Description:** This blackgum basin swamp of the northeastern United States is found from the central Appalachians north to central New England, at the northern range limit for *Nyssa sylvatica* (blackgum). It occupies saturated or seasonally wet basins, typically perched basins in small watersheds within upland forests. In most settings, the mineral soil is overlain with a shallow to deep peat layer. Conditions are highly acidic and nutrient-poor.



Photo by Pennsylvania Natural Heritage Program

**Vegetation Description:** The canopy is dominated by *Acer rubrum* (red maple) and *Nyssa sylvatica* (blackgum); however, even where red maple is more abundant, the longevity and stature of the blackgum trees give them a strong impact. *Betula alleghaniensis* (yellow birch), *Tsuga canadensis* (eastern hemlock), *Pinus strobus* (eastern white pine), and in the north *Picea rubens* (red spruce) may be minor canopy associates. The most abundant shrubs are *Ilex verticillata* (common winterberry) and *Vaccinium corymbosum* (highbush blueberry); associated shrub species include *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Nemopanthus mucronatus* (catberry), *Kalmia angustifolia* (sheep laurel), *Lyonia ligustrina* (maleberry), and *Cephalanthus occidentalis* (common buttonbush). *Osmunda cinnamomea* (cinnamon fern) is the characteristic dominant in the herb layer, with associates including *Osmunda regalis* (royal fern), *Thelypteris palustris* (eastern marsh fern), *Woodwardia virginica* (Virginia chainfern), *Glyceria canadensis* (rattlesnake manna grass), *Coptis trifolia* (threeleaf goldthread), *Carex trisperma* (three-seed sedge), *Carex intumescens* (greater bladder sedge), *Triadenum virginicum* (Virginia marsh St. John's-wort), and *Symplocarpus foetidus* (skunk-cabbage). Mosses are primarily *Sphagnum* (peatmoss) spp., including *Sphagnum palustre* (prairie peatmoss) and *Sphagnum magellanicum* (Magellan's peatmoss). These swamps are distinguished from other basin swamps in the Northern Appalachians by the presence of *Nyssa sylvatica* (blackgum). They are distinguished from blackgum swamps further south by the absence of more central-Appalachian species such as *Liquidambar styraciflua* (sweetgum), *Rhododendron maximum* (great laurel), *Rhododendron viscosum* (swamp azalea), and *Magnolia virginiana* (sweetbay).

**Characteristic Species:** *Acer rubrum* (red maple), *Ilex verticillata* (common winterberry), *Nyssa sylvatica* (blackgum), *Osmunda cinnamomea* (cinnamon fern), *Vaccinium corymbosum* (highbush blueberry)

**Dynamics/Successional Trajectory:** The tree canopy varies from an open woodland to nearly complete. Shrubs are well represented and may be locally dense. Herbs are likewise patchy, and the herb layer is usually dominated by only a few species. The bryoid layer varies, but is often extensive. Hummock-and-hollow topography is often pronounced, with bryophytes common on the hummocks and in those hollows where water does not stand for long periods.

**Reference Sites:** near Portland Pumphouse #2, Delaware Water Gap, PA

**Global and State Conservation Ranks and Reasons:** GNR (1-Dec-1997). NJ: SNR, PA: SNR.

**VegBank Link for Plot Data:** [http://vegbank.org/natureserve/element\\_global.2.688103](http://vegbank.org/natureserve/element_global.2.688103)

**References:** Breden et al. 2001, Cain and Penfound 1938, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Gawler 2002, Golet et al. 1993, Harrison 2004, Metzler and Barrett 2001, NAP pers. comm. 1998, Rawinski 1984, Sperduto 2000b, Sperduto et al. 2000b, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000, Vogelmann 1976, Windisch 1995c, Zebryk 1990

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Tree canopy	Broad-leaved deciduous tree	<i>Nyssa sylvatica</i> (blackgum)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Ilex verticillata</i> (common winterberry)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Vaccinium corymbosum</i> (highbush blueberry)

## RED MAPLE - TUSSOCK SEDGE WOODED MARSH

*Acer rubrum* / *Carex stricta* - *Onoclea sensibilis* Woodland

**Range:** This wetland is found in central and northern New England, south to Pennsylvania and New Jersey. It occurs in Pennsylvania in the Delaware Estuary.

**Environmental Description:** This association is a partly wooded, deciduous-canopy wetland of central and northern New England. It occurs on muck soils or mineral soils with a surface organic layer, in poorly drained depressions influenced by groundwater. It is also common in those streamside and lakeside settings where the hydrology is that of a basin setting rather than a floodplain. The community is typically flooded in spring, with pools and small streams persisting throughout much of the growing season; soils may remain saturated, or may become dry on the surface over the course of the growing season. Hummock-and-hollow topography may be pronounced. In Pennsylvania this type is often associated with areas of past beaver impoundments.

**Vegetation Description:** The canopy consists of scattered trees, with as little as 25% overall cover. The shrub layer is patchy and may be extensive in places. The herb layer is typically well-developed, with ferns and graminoids dominant. The bryophyte cover is variable. *Acer rubrum* (red maple) is dominant in the canopy, often with many standing dead trees. Associated trees include *Fraxinus nigra* (black ash), *Nyssa sylvatica* (blackgum), *Quercus bicolor* (swamp white oak), *Quercus palustris* (pin oak), *Ulmus americana* (American elm), and occasional *Pinus strobus* (eastern white pine), *Tsuga canadensis* (eastern hemlock), or *Picea rubens* (red spruce). The shrub layer is characterized by *Vaccinium corymbosum* (highbush blueberry) and *Ilex verticillata* (common winterberry). Other shrubs may be locally common, including *Nemopanthus mucronatus* (catberry), *Viburnum nudum* var. *cassinoides* (northern wild raisin), *Viburnum recognitum* (northern arrow-wood), *Lyonia ligustrina* (maleberry), *Alnus incana* (speckled alder), *Ilex laevigata* (smooth winterberry holly), *Spiraea alba* (white meadowsweet), *Spiraea tomentosa* (steeplebush), and the creeping *Rubus hispida* (bristly dewberry). The herbaceous layer is typically dominated by the graminoids *Carex stricta* (tussock sedge), *Carex lacustris* (lake sedge), or *Calamagrostis canadensis* (bluejoint), or the ferns *Onoclea sensibilis* (sensitive fern), *Osmunda cinnamomea* (cinnamon fern), or *Osmunda claytoniana* (interrupted fern). Less abundant herbs include *Carex intumescens* (greater bladder sedge), *Carex folliculata* (northern long sedge), *Carex canescens* (silvery sedge), *Carex trisperma* (three-seed sedge), *Glyceria striata* (fowl mannagrass), *Osmunda regalis* (royal fern), *Dryopteris cristata* (crested woodfern), *Thelypteris palustris* (eastern marsh fern), *Lycopus uniflorus* (northern bugleweed), *Caltha palustris* (yellow marsh-marigold), and *Impatiens capensis* (orange jewelweed). *Sphagnum* (peatmoss) spp. are the characteristic bryophytes, with non-sphagnum mosses as associates.

**Characteristic Species:** *Acer rubrum* (red maple), *Ilex verticillata* (common winterberry), *Onoclea sensibilis* (sensitive fern), *Spiraea alba* var. *latifolia* (broadleaf meadowsweet), *Vaccinium corymbosum* (highbush blueberry)

**Dynamics/Successional Trajectory:** This plant community type is sensitive to changes in hydrology and represents a transition from a wetter, open tussock sedge marsh with low forest cover to a red maple palustrine forest with high canopy cover (and much reduced *Carex stricta* (tussock sedge) cover). Changes in hydrology will tend to shift community composition between the two types, with persistent deeper water levels favoring *Carex stricta* (tussock sedge) and drying conditions favoring *Acer rubrum* (red maple).

**Reference Sites:** Lake Towhee Park, Bucks County, PA (needs to be field checked); Great Swamp National Wildlife Refuge, Morris County, NJ

**Global and State Conservation Ranks and Reasons:** G3G5 (1-Dec-1997). NJ: SNR, PA: SNR.

**VegBank Link for Plot Data:** [http://vegbank.org/natureserve/element\\_global.2.684410](http://vegbank.org/natureserve/element_global.2.684410)

**References:** Barrett and Enser 1997, CAP pers. comm. 1998, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Eyre 1980, Fike 1999, Gawler 2002, Golet et al. 1993, Hunt 1999, Metzler and Barrett 2001, Moore and Taylor 1927, Rawinski 1984, Sperduto 2000a, Sperduto 2000b, Swain and Kearsley 2001, Thompson and Sorenson 2000

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Ilex verticillata</i> (common winterberry)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Vaccinium corymbosum</i> (highbush blueberry)
Short shrub/sapling meadowsweet)	Broad-leaved deciduous shrub	<i>Spiraea alba</i> var. <i>latifolia</i> (broadleaf meadowsweet)
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> (bluejoint)
Herb (field)	Graminoid	<i>Carex lacustris</i> (lake sedge)
Herb (field)	Graminoid	<i>Carex stricta</i> (tussock sedge)
Herb (field)	Fern or fern ally	<i>Osmunda cinnamomea</i> (cinnamon fern)
Herb (field)	Fern or fern ally	<i>Osmunda claytoniana</i> (interrupted fern)

## SOUTHERN NEW ENGLAND RED MAPLE SEEPAGE SWAMP

*Acer rubrum* - *Fraxinus* (*pennsylvanica*, *americana*) / *Lindera benzoin* / *Symplocarpus foetidus* Forest

**Range:** This vegetation occurs in southern New England south to the mid-Atlantic states and west to Pennsylvania. It occurs in New Jersey, Pennsylvania and possibly Delaware in the Delaware Estuary.

**Environmental Description:** This association is an acidic seepage swamp of southern New England and adjacent areas dominated by *Acer rubrum* (red maple). It generally occurs in seasonally saturated situations on slightly sloping hillsides, along small streams, or in basins that receive overland flooding in addition to groundwater influence. In general, these swamps are acidic and have some seepage indicators but



Photo by Pennsylvania Natural Heritage Program

are not particularly species-rich. Soils are shallow to moderately deep mucks over mineral soils.

**Vegetation Description:** *Acer rubrum* (red maple) dominates the canopy; *Fraxinus pennsylvanica* (green ash) or *Fraxinus americana* (white ash) are usually also found in the canopy. *Fraxinus nigra* (black ash) is not generally associated with this type and, if present, occurs only as scattered individuals. Other canopy associates may include *Liriodendron tulipifera* (tuliptree), *Quercus bicolor* (swamp white oak), and *Ulmus rubra* (slippery elm). Conifers, such as *Tsuga canadensis* (eastern hemlock) or *Pinus strobus* (eastern white pine), are generally absent or occur in very low abundance. The shrub layer may be fairly open to quite dense, depending on the amount of canopy closure. Shrub species commonly include *Ilex verticillata* (common winterberry), *Rhododendron viscosum* (swamp azalea), *Clethra alnifolia* (coastal sweet-pepperbush), *Lindera benzoin* (northern spicebush), and less commonly *Vaccinium corymbosum* (highbush blueberry), *Lyonia ligustrina* (maleberry), *Toxicodendron vernix* (poison-sumac), *Viburnum dentatum* (southern arrow-wood), and *Viburnum nudum var. cassinoides* (northern wild raisin). The herbaceous layer is variable in cover, and *Symplocarpus foetidus* (skunk-cabbage) and *Osmunda cinnamomea* (cinnamon fern) are nearly always present. Other herbaceous species include *Impatiens capensis* (orange jewelweed), *Carex stricta* (tussock sedge), *Veratrum viride* (American false hellebore), *Pilea pumila* (Canadian clearweed), *Osmunda regalis* (royal fern), *Onoclea sensibilis* (sensitive fern), *Thelypteris palustris* (eastern marsh fern), and *Glyceria* (mannagrass) spp. Microtopography is generally pronounced, resulting from tip-ups. Tree seedlings and *Sphagnum* (peatmoss) mosses are common on hummocks but do not in general form extensive carpets. Additional nonvascular species can include *Plagiomnium cuspidatum* and *Calliergon* (calliergon moss) spp.

**Characteristic Species:** *Acer rubrum* (red maple), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Osmunda cinnamomea* (cinnamon fern), *Symplocarpus foetidus* (skunk-cabbage)

**Reference Sites:** Clayton County Park, Delaware County, PA

**Global and State Conservation Ranks and Reasons:** G4G5 (25-Jun-1998). DE?:SNA, NJ: S3S5, PA: SNR.

**VegBank Link for Plot Data:** [http://vegbank.org/natureserve/element\\_global.2.688675](http://vegbank.org/natureserve/element_global.2.688675)

**References:** Breden 1989, Breden et al. 2001, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1993, Golet et al. 1993, Harrison 2004, MENHP 1991, Metzler and Barrett 2001, Rawinski 1984, Reschke 1990, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Clethra alnifolia</i> (coastal sweet-pepperbush)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Ilex verticillata</i> (common winterberry)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Lindera benzoin</i> (northern spicebush)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Rhododendron viscosum</i> (swamp azalea)
Herb (field)	Fern or fern ally	<i>Osmunda cinnamomea</i> (cinnamon fern)