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## **ECOLOGICAL SYSTEM: NORTHERN ATLANTIC COASTAL PLAIN TIDAL SWAMP**

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**Summary:** This system encompasses tidally flooded deciduous forests and shrublands in lower river floodplains and edges of estuaries of the North Atlantic Coastal Plain. This system is restricted to narrow zones along upper tidal reaches of Inner Coastal Plain rivers and tributaries which have sufficient volumes of fresh water and short flooding to be able to support tree canopies. According to Fleming et al. (2001) these areas are influenced by lunar tides up to 1 m (3 feet), but diluting freshwater flows from upstream keep salinity levels below 0.5 ppt. Deciduous hardwood species predominate, especially *Nyssa* (blackgum) and/or *Fraxinus* (ash).

**Range:** This system ranges from the James River, Virginia, northward to the New Jersey Coastal Plain. Examples are probably most common in the Chesapeake Bay region. United States: DE, MD, NJ, NY, VA

### **Delaware Estuary Associations:**

- Ash - Swamp Blackgum Freshwater Tidal Swamp
- Freshwater Tidal Woodland
- North Atlantic Fresh Tidal Shrub Swamp

### **CLASSIFIERS FOR NORTHERN ATLANTIC COASTAL PLAIN TIDAL SWAMP**

**Primary Division:** 203

**Land Cover Class:** Woody Wetland

**Spatial Scale & Pattern:** Small patch

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

**Diagnostic Classifiers:** Forest and Woodland (Treed); Tidal / Estuarine

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### **ASH - SWAMP BLACKGUM FRESHWATER TIDAL SWAMP**

*Fraxinus (profunda, pennsylvanica) - (Nyssa biflora) / Polygonum arifolium* Forest

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**Range:** This association is restricted to tidal rivers in Delaware, Maryland, and Virginia.

**Environmental Description:** This association occurs along fresh reaches of tidal rivers, usually receiving diurnal or irregular tidal flooding. There is distinct hummock-and-hollow microtopography with hollows flooded during higher tides.

**Vegetation Description:** The canopy of this freshwater tidal swamp is dominated by few tree species, generally *Fraxinus profunda* (pumpkin ash), *Fraxinus pennsylvanica* (green ash), and *Nyssa biflora* (swamp blackgum). Other canopy associates vary among occurrences and often include *Nyssa sylvatica* (blackgum), *Acer rubrum* (red maple), *Liquidambar styraciflua* (sweetgum), *Magnolia virginiana* (sweetbay), *Fraxinus profunda* (pumpkin ash), *Ulmus americana* (American elm), and *Pinus taeda* (loblolly pine). The shrub layer is well-developed and includes *Lindera benzoin* (northern spicebush), *Clethra alnifolia* (coastal sweet-pepperbush), *Leucothoe racemosa* (swamp doghobble), *Ilex verticillata* (common winterberry), *Ilex opaca* (American holly), *Ilex laevigata* (smooth winterberry holly), *Alnus serrulata* (smooth alder), *Rhododendron viscosum* (swamp azalea), *Viburnum dentatum* (southern arrow-wood), *Viburnum nudum* (wild raisin), *Morella cerifera* (wax-myrtle), *Vaccinium corymbosum* (highbush blueberry), *Vaccinium fuscum* (black highbush blueberry), *Itea virginica* (Virginia-willow), *Rosa palustris* (swamp rose), and *Cornus foemina* (stiff dogwood). *Alnus maritima* (seaside alder) is also characteristic in Delaware and Maryland. Vines may be dense and include *Smilax rotundifolia* (roundleaf greenbrier), *Toxicodendron radicans* (eastern poison-ivy), *Apios americana* (groundnut), *Parthenocissus quinquefolia* (Virginia creeper), *Bignonia capreolata* (crossvine), and *Dioscorea villosa* (wild yam). The herbaceous layer is variable in composition and richness. Common associates include *Polygonum arifolium* (halberd-leaf tearthumb), *Polygonum sagittatum* (arrowleaf tearthumb), *Peltandra virginica*

(green arrow-arum), *Saururus cernuus* (lizard's-tail), *Carex bromoides* (brome-like sedge), *Carex intumescens* (greater bladder sedge), *Impatiens capensis* (orange jewelweed), *Boehmeria cylindrica* (small-spike false nettle), *Leersia oryzoides* (rice cutgrass), *Commelina virginica* (swamp dayflower), *Cicuta maculata* (spotted water-hemlock), *Arisaema triphyllum* (Jack-in-the-pulpit), *Thalictrum pubescens* (king-of-the-meadow), *Thelypteris palustris* (eastern marsh fern), *Woodwardia areolata* (netted chainfern), *Carex stricta* (tussock sedge), *Zizania aquatica* (Indian wild rice), *Cinna arundinacea* (sweet woodreed), *Osmunda cinnamomea* (cinnamon fern), and *Osmunda regalis* (royal fern). The invasive exotic *Murdannia keisak* (marsh dewflower) can also occur in this association.

**Noteworthy Associated Plant and/or Animal Species:** *Alnus maritima* (seaside alder)

**Characteristic Species:** *Alnus maritima* (seaside alder), *Fraxinus pennsylvanica* (green ash), *Fraxinus profunda* (pumpkin ash), *Nyssa biflora* (swamp blackgum)

**Dynamics/Successional Trajectory:** *Fraxinus pennsylvanica* (green ash) and *Nyssa biflora* (swamp blackgum) tend to sort out where there is longer inundation and a mean water table near the hummock surface. *Acer rubrum* (red maple) and *Liquidambar styraciflua* (sweetgum) tend to occur where the mean water table is relatively lower (Rheinhardt 1992). Duration of flooding is a poorer predictor of canopy composition than mean depth of flooding. Certain sites exhibit crown stress and tree mortality from sea level rise.

**Management Concerns:** Sea level rise can contribute to tree mortality. The community is threatened by damming of rivers which results in restricting tidal influence and thus community structure and composition. It is also threatened by agricultural practices, particularly by pesticide and fertilizer runoff. The invasive exotic *Murdannia keisak* (marsh dewflower) can also occur in this association.

**Reference Sites:** Murderkill River, Kent County, DE

**Global and State Conservation Ranks and Reasons:** G3 (3-Dec-1998). DE: S3S4. This tidal woodland community has a restricted range, being confined to tidal rivers of Virginia, Maryland, and Delaware. It is estimated that there are fewer than 100 occurrences and 85,000 acres rangewide.

**VegBank Link for Plot Data:** [http://vegbank.org/natureserve/element\\_global.2.685830](http://vegbank.org/natureserve/element_global.2.685830)

**References:** Bartgis 1986, Berdine 1998, Bowman 2000, Clancy 1996, Eastern Ecology Working Group n.d., Fleming 2001, Fleming et al. 2001, Harrison 2004, Harrison pers. comm., Rheinhardt 1991, Rheinhardt 1992, Tiner 1985a, VDNH 2003

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Tree canopy	Broad-leaved deciduous tree	<i>Fraxinus pennsylvanica</i> (green ash)
Tree canopy	Broad-leaved deciduous tree	<i>Fraxinus profunda</i> (pumpkin ash)
Tree canopy	Broad-leaved deciduous tree	<i>Nyssa biflora</i> (swamp blackgum)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Lindera benzoin</i> (northern spicebush)
Shrub/sapling (tall & short)	Vine/Liana	<i>Smilax rotundifolia</i> (roundleaf greenbrier)
Herb (field)	Forb	<i>Polygonum arifolium</i> (halberd-leaf tearthumb)

## FRESHWATER TIDAL WOODLAND

*Acer rubrum* - *Fraxinus pennsylvanica* / *Polygonum* spp. Forest

**Range:** This association is confined to tidal rivers of Massachusetts, New York, and New Jersey and possibly Delaware.

**Environmental Description:** This freshwater tidal swamp occurs at the upper limit of tidal influence along coastal rivers. They are best developed along larger rivers with a gradual elevation gradient such

that tidal influence occurs over considerable distance. There is diurnal flooding with freshwater. Substrate is continuously wet and there is distinct hummock-and-hollow microtopography.

**Vegetation Description:** The canopy is characterized by *Acer rubrum* (red maple) and *Fraxinus pennsylvanica* (green ash), with *Ulmus rubra* (slippery elm), *Ulmus americana* (American elm), *Fraxinus nigra* (black ash), and *Carpinus caroliniana* (American hornbeam) being frequent associates and with *Chamaecyparis thyoides* (Atlantic white-cedar), *Thuja occidentalis* (northern white-cedar), or *Quercus bicolor* (swamp white oak) occurring locally in some occurrences. The shrub layer is characterized by *Ilex verticillata* (common winterberry), *Alnus serrulata* (smooth alder), *Alnus incana* (speckled alder), *Clethra alnifolia* (coastal sweet-pepperbush), *Rhododendron viscosum* (swamp azalea), *Vaccinium corymbosum* (highbush blueberry), *Lindera benzoin* (northern spicebush), *Cornus racemosa* (gray dogwood), *Cornus amomum* (silky dogwood), *Cornus sericea* (red-osier dogwood), *Cephalanthus occidentalis* (common buttonbush), and others. The herbaceous layer is a very diverse mixture of freshwater tidal marsh species and palustrine species and is characterized by *Peltandra virginica* (green arrow-arum), *Pontederia cordata* (pickerelweed), *Impatiens capensis* (orange jewelweed), *Leersia oryzoides* (rice cutgrass), *Onoclea sensibilis* (sensitive fern), *Pilea pumila* (Canadian clearweed), *Polygonum punctatum* (dotted smartweed), *Polygonum hydropiper* (marsh-pepper knotweed), *Polygonum hydropiperoides* (swamp smartweed), *Polygonum sagittatum* (arrowleaf tearthumb), *Zizania aquatica* (Indian wild rice), *Asclepias incarnata* (swamp milkweed), and *Arisaema triphyllum* (Jack-in-the-pulpit), among many others.

**Characteristic Species:** *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash)

**Dynamics/Successional Trajectory:** This swamp receives diurnal flooding with fresh tidal waters and occurs at the upper limit of tidal flooding. The tidal swamp forest transitions to tidal shrubland or to freshwater tidal marsh associations.

**Reference Sites:** Trenton Marsh, Mercer County, NJ; there is possibly a site on Slaughter Creek in DE

**Global and State Conservation Ranks and Reasons:** G2 (3-Dec-1998). DE?: SNA, NJ: S1S2. This freshwater tidal swamp community is restricted to the freshwater tidal portions of rivers in Massachusetts, New York, and New Jersey. Size range of individual occurrences is a few acres to 100 acres in the larger examples. The average size is likely to be 5-20 acres.

**VegBank Link for Plot Data:** [http://vegbank.org/natureserve/element\\_global.2.683445](http://vegbank.org/natureserve/element_global.2.683445)

**References:** Breden 1988, Breden 1989, Breden et al. 2001, Eastern Ecology Working Group n.d., Edinger et al. 2002, Metzler and Barrett 2001, Rawinski 1984, Reschke 1990, Swain and Kearsley 2001

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 pennsylvanica</i> (green ash)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Ilex verticillata</i> (common winterberry)
Herb (field)	Forb	<i>Peltandra virginica</i> (green arrow-arum)

## NORTH ATLANTIC FRESH TIDAL SHRUB SWAMP

*Alnus (incana ssp. rugosa, serrulata)* - *Cornus amomum* Shrubland

**Range:** This association is found in coastal areas with tidally influenced river systems from Maine to Delaware in the North Atlantic. It occurs in Delaware and New Jersey in the Delaware Estuary.

**Environmental Description:** This association occurs in freshwater tidal systems in fresh to brackish reaches of tidal rivers along the marsh-upland transition. This shrubland is best developed along major tidal river systems that have a gradual elevation gradient. The substrate is alluvial and fine silty loam,

loamy sand, or fine- or medium-grained sand without significant peat deposits. There is distinct hummock-and-hollow micro-relief.

**Vegetation Description:** This shrubland is dominated by *Alnus serrulata* (smooth alder) and/or *Alnus incana* ssp. *rugosa* (speckled alder). In some examples one or both of these may be characteristically dominant or nearly so. Other examples may be more semi-open with a mixed canopy of *Alnus* (alder) with other shrubs such as *Cornus amomum* (silky dogwood), *Rosa palustris* (swamp rose), *Ilex verticillata* (common winterberry), *Viburnum dentatum* (southern arrow-wood), *Clethra alnifolia* (coastal sweet-pepperbush), and *Lindera benzoin* (northern spicebush). Other woody plants which may be present include *Sambucus canadensis* (American elder), *Salix* (willow) spp., *Amorpha fruticosa* (tall indigobush), *Cephalanthus occidentalis* (common buttonbush), *Decodon verticillatus* (swamp-loosestrife), *Toxicodendron vernix* (poison-sumac), and *Toxicodendron radicans* (eastern poison-ivy). More northern examples may contain *Viburnum recognitum* (northern arrow-wood) and *Spiraea alba* var. *latifolia* (broadleaf meadowsweet). *Carex stricta* (tussock sedge) may also be present, and there is a great deal of micro-relief (tussocks and furrows) leading to high species diversity. Some herbaceous associates are *Osmunda regalis* var. *spectabilis* (royal fern), *Thelypteris palustris* var. *pubescens* (eastern marsh fern), *Galium* (bedstraw) spp., *Onoclea sensibilis* (sensitive fern), *Pilea fontana* (lesser clearweed), *Polygonum punctatum* (dotted smartweed), *Apios americana* (groundnut), *Typha latifolia* (broadleaf cattail), *Peltandra virginica* (green arrow-arum), *Pontederia cordata* (pickerelweed), *Mikania scandens* (climbing hempvine), *Symphotrichum novi-belgii* (new belgium American-aster), *Boehmeria cylindrica* (small-spike false nettle), *Impatiens capensis* (orange jewelweed), *Triadenum walteri* (greater marsh-St. John's-wort), *Asclepias incarnata* (swamp milkweed), *Carex atlantica* (prickly bog sedge), *Platanthera clavellata* (small green wood orchid), and *Xyris torta* (slender yellow-eyed-grass).

**Characteristic Species:** *Alnus incana* ssp. *rugosa* (speckled alder), *Alnus serrulata* (smooth alder)

**Dynamics/Successional Trajectory:** This shrubland community generally occurs between mean high tide level and mean high water level of annual river flooding in the spring, and it is generally flooded irregularly by spring tides.

**Reference Sites:** Lewden-Greene Park, New Castle County, DE; Trenton Marsh, Mercer County, NJ; north of Old Ferry Landing, Gloucester City, NJ; Edgewater Park Coves, NJ; Maurice River, south of Millville, NJ

**Global and State Conservation Ranks and Reasons:** GNR (15-Aug-1997). DE: SNR, NJ: SNR, PA: SNR.

**VegBank Link for Plot Data:** [http://vegbank.org/natureserve/element\\_global.2.684398](http://vegbank.org/natureserve/element_global.2.684398)

**References:** Bowman 2000, Breden 1989, Breden et al. 2001, Clancy 1996, Collins and Anderson 1994, Coulling pers. comm., Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Fleming pers. comm., Gawler 2001, Gawler 2002, Harrison and Stango 2003, Hart 1990, McCoy and Fleming 2000, Metzler and Barrett 2001, Metzler and Barrett 2004, Rawinski 1984, Reschke 1990, Sneddon et al. 1996, Sperduto 2000b, Swain and Kearsley 2000, Swain and Kearsley 2001, Tiner 1995

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Alnus incana</i> ssp. <i>rugosa</i> (speckled alder)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Alnus serrulata</i> (smooth alder)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Cornus amomum</i> (silky dogwood)