14790

Central Interior and Appalachian Swamp Systems

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Woody Wetland

Map Zones

41, 42, 47, 48, 50, 51, 53

Geographic Range

These wetlands are scattered throughout the north-central midwest (south of the Laurentian region) the north-central Appalachians and southern New England at low to mid elevations. In MZ51 the system is found in subsection 251Dh, and throughout all subsections of 222J and 222U. In MZ50 the system in found throughout 222ke, Kf and Kg.

Biophysical Site Description

Central Interior and Appalachian Swamp Systems can be found in several landscapes. Some swamp systems are found in surface-water depressions where the vegetation is separated from the water-table and the hydrology is driven by surface water. This type of system is found commonly over clay where there would be a perched water table. These sites experience significant seasonal hydrologic fluctuation, with the water table typically above the soil surface in spring and significantly below the surface during summer. Forested wetlands primarily impacted by surface water are common over broad areas of glacial lakeplain. Also swamp systems are found in ground-water depressions where groundwater is influencing the hydrology of the system. This type of system would be found over a coarse-textured soil substrate. These sites experience less hydrologic fluctuation than the surface-water depressional sites, and typically occupy relatively small areas relative to surface water influenced sites (Mitsch and Gosselink 2000).

Vegetation Description

This system is comprised of a variety of lowland hardwoods, including silver maple (Acer saccharinum), red maple (Acer rubrum), green ash (Fraxinus pennsylvanica), black ash (Fraxinus nigra), American elm (Ulmus americana), pin oak (Quercus palustris), swamp white oak (Quercus bicolor), sycamore (Platanus occidentalis), cottonwood (Populus deltoides) and a variety of other canopy associates. Silver maple, green ash, sycamore and cottonwood favor sites that experience seasonal inundation, whereas black ash favors organic deposits that are not subject to extreme hydrologic fluctuations. Stands are generally closed-canopy. Shrub and groundlayer diversity depends on canopy closure and hydrology, but is generally low on seasonally inundated sites. Hummocks, canopy openings and decomposing wood support higher diversity. Stands referred to as "flatwoods" range from wet to mesic, with species composition changing accordingly. Flatwoods on relatively dry substrate may be dominated by sugar maple (Acer saccharum), oaks and occasionally beech (Fagus grandifolia).

Typical ground layer species may occur Onoclea sensibilis (sensitive fern), Osmunda cinnamomea (cinnamon fern), Osmunda regalis (royal fern), Symplocarpus foetidus (skunk cabbage) Toxiodendron radicans (poison ivy), Parthenocissus quinquefolia (Virginia creeper), Caltha palustris (marsh-marigold), Glyceria striata (manna grass) and Lycopus spp. (water-horehound).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| ACSA2 | *Acer saccharinum* | Silver maple |
| ACRU | *Acer rubrum* | Red maple |
| FRPE | *Fraxinus pennsylvanica* | Green ash |
| FRNI | *Fraxinus nigra* | Black ash |
| QUPA2 | *Quercus palustris* | Pin oak |
| PLOC | *Platanus occidentalis* | American sycamore |
| QUBI | *Quercus bicolor* | Swamp white oak |
| ULAM | *Ulmus americana* | American elm |

Species names are from the NRCS PLANTS database. Check species codes at http://plants.usda.gov.

Disturbance Description

The dominant disturbance in this BpS is seasonal water table fluctuation, leading to varying periods of inundation. Spring flooding restricts seed germination and diversity of shrubs and ground layer species. Summer drought is an additional stressor. Shallowly rooted trees are subject to windthrow, but are typically rooted in mineral soils, which have greater structural stability than organic soils.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 989 | 100 |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 989 | 100 |  |  |

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

This system typically occurs as small to large patches, the largest patches occurring on glacial clay and sand-clay lakeplain.

Adjacency or Identification Concerns

This system commonly occurs as small to large patches in a matrix of fire-resistant systems, including beech-maple forest, and sometimes associated with fire-adapted systems, including oak savanna. This system is often referred to as ash, red maple or maple-ash-oak swamp (the latter particularly in OH). The majority of pre-European settlement acreage has been drained and converted to agriculture. Structure of remaining sites may be simplified by anthropogenic disturbances, including hydrologic alteration, grazing and introduction of invasive species. Invasive species occurring in this system include glossy buckthorn (Rhamnus frangula), garlic mustard (Alliaria petiolata), Japanese barberry (Berberis thunbergii) and multiflora rose (Rosa multiflora). Also the introduction of Dutch elm disease into North American forests has largely elimated large elms from native ecosystems.

Issues or Problems

Native Uncharacteristic Conditions

Strong dominance by red maple may indicate previous disturbance (grazing or pasturing, hydrologic alteration, beaver flooding, etc.).

Comments

Succession Classes

**Mapping Rules**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Upper Layer Lifeform** | **Height (m)** | **Canopy Cover (%)** | | | | | | | | | |
| **0-10** | **11-20** | **21-30** | **31-40** | **41 - 50** | **51-60** | **61-70** | **71-80** | **81-90** | **91-100** |
| Herb | 0-0.5 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Herb | 0.5-1.0 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Herb | >1.0 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 0-0.5 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 1.0-3.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | >3.0 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 0-5 | B | B | B | B | B | B | B | B | B | B |
| Tree | 5-10 | B | B | B | B | B | B | B | B | B | B |
| Tree | 10-25 | C | C | C | C | C | C | C | C | C | C |
| Tree | 25-50 | C | C | C | C | C | C | C | C | C | C |
| Tree | >50 | C | C | C | C | C | C | C | C | C | C |

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

**Description**

Class A 24 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| CEOC2 | Cephalanthus occidentalis | Common buttonbush | Low-Mid |
| CORU | Cornus rugosa | Roundleaf dogwood | Low-Mid |
| ILVE | Ilex verticillata | Common winterberry | Low-Mid |
| COAM2 | Cornus amomum | Silky dogwood | Low-Mid |

Description

This stage is an early successional stand following flooding or a rare stand-replacing fire. Shrubs increase in dominance over time, although open grass- and sedge-dominated wet meadow may be dominant for the first 10yrs+, particularly in areas in which existing shrubs were flood-killed. Open to dense thicket dominated by species such as Ilex verticillata (winterberry), Vaccinium corymbosum (highbush blueberry), Lindera benzoin (spicebush), Viburnum spp., Alnus rugosa (speckled alder) Cephalanthus occidentalis (buttonbush), Corylus cornuta (hazelnut), Salix spp.(willows) and Cornus spp. (dogwoods).

This stage results from major disturbance, including stand-replacement fire, flooding, or windthrow. Rare replacement firesand catastrophic windthrow can maintain the system in Early 1 All (an early shrub-herb- dominated successional stage). Flooding caused by beaver or other natural hydrologic alteration is estimated to occur every 300yrs, although this number may be much higher, and will also maintain the system in this class. Shrub thickets are sometimes relatively stable and long-persistent, but the concept used for this model is of a site that, due to edaphic factors, favors the development of forested wetland in the absence of major disturbance(s). As with all stages of this system, seasonal annual spring flooding, would occur. This natural process was not explicitly modeled but it should be assumed that it is occurring annually and maintaining the swamp forest instead of allowing it to succeed to drier forest type.

*Maximum Tree Size Class*  
None

Class B 36 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ACRU | Acer rubrum | Red maple | Upper |
| ACSA2 | Acer saccharinum | Silver maple | Upper |
| FRPE | Fraxinus pennsylvanica | Green ash | Upper |
| FRNI | Fraxinus nigra | Black ash | Upper |

Description

Mid-development forested swamp stage. Scattered tree canopy develops from seedlings that establish under shrubs. Typical species include silver maple (Acer saccharinum), red maple (Acer rubrum), green ash (Fraxinus pennsylvanica), black ash (Fraxinus nigra), American elm (Ulmus americana), pin oak (Quercus palustris), swamp white oak (Quercus bicolor), sycamore (Platanus occidentalis), cottonwood (Populus deltoides) and a variety of other canopy associates. General appearance is of a shrub-dominated system with an open tree canopy, grading into forested wetland at the end of this period.

As with all stages of this system, seasonal annual spring flooding, would occur. This natural process was not explicitly modeled but it should be assumed that it is occurring annually and maintaining the swamp forest instead of allowing it to succeed to drier forest type.

This stage transitions to Late Development Closed in the absence of major disturbance(s). Replacement fires were estimated to occur every 1000yrs; this likely varied across the region and depending on the nature of the upland matrix in any given area (fire-dependent vs. fire-intolerant). Replacement fires return the system to Early 1 All successional stage. Flooding caused by beaver or other natural hydrologic alteration is estimated to occur every 300yrs, although this number may be much higher, and will return the system to Early 1 All.

*Maximum Tree Size Class*  
Large 21-33"DBH

Class C 40 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ACRU | Acer rubrum | Red maple | Upper |
| ASCA2 | Asarum caudatum | British columbia wildginger | Upper |
| FRPE | Fraxinus pennsylvanica | Green ash | Upper |
| FRNI | Fraxinus nigra | Black ash | Upper |

Description

Mature forested swamp: Mature, multi-seral stands aged 80yrs+ This stage is dominated by the same tree species as Mid Development 1 Closed class B although the shrub layer is greatly reduced.

This stage is maintained by frequent windthrow of single trees or small to large patches of trees, modeled with the probability of occurring every 100yrs. Replacement fires were estimated to occur every 700-1000yrs; this likely varied across the region and depending on the nature of the upland matrix in any given area (fire-dependent vs. fire-intolerant). Replacement fires return the system to class A (an early shrub- (herb-) dominated successional stage. Catastrophic windthrow was estimated to occur every 600yrs and would also return the system to Early 1 All. Flooding caused by beaver or other natural hydrologic alteration is estimated to occur every 300yrs, although this number may be much higher, and will return the system to Early 1 All.

As with all stages of this system, seasonal annual spring flooding, would occur. This natural process was not explicitly modeled but it should be assumed that it is occurring annually and maintaining the swamp forest instead of allowing it to succeed to drier forest type.

*Maximum Tree Size Class*  
Very Large >33"DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:CLS | 29 |
| Mid1:CLS | 30 | Late1:CLS | 79 |
| Late1:CLS | 80 | Late1:CLS | 999 |

Probabilistic Transitions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Disturbance Type** | **Disturbance occurs In** | **Moves vegetation to** | **Disturbance Probability** | **Return Interval (yrs)** | **Reset Age to New Class Start Age After Disturbance?** | **Years Since Last Disturbance** |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Wind or Weather or Stress | Early1:ALL | Early1:ALL | 0.003 | 333 | No | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Wind or Weather or Stress | Mid1:CLS | Early1:ALL | 0.0045 | 222 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Early1:ALL | 0.0145 | 69 | Yes | 0 |

References

Mitsch, W.J. and J.G. Gosselink, eds. 2000. Wetlands: Third Edition. John Wiley and Sons, New York.

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.