13430

Atlantic Coastal Plain Mesic Hardwood Forest

BpS Model/Description Version: Aug. 2020

Updated: 4/25/2018

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Vegetation Type

Forest and Woodland

Map Zones

54, 55

Geographic Range

This upland system of the Atlantic Coastal Plain is found in suitable conditions from southern New Jersey south to Georgia, generally north of the natural range of *Pinus glabra* and *Magnolia grandiflora*. There is a broad gradient in climate and species composition from north to south and west. The boundary at the northern edge of its range (into New Jersey, north of the Chesapeake Bay Lowlands TNC ecoregion) may need clarification.

Biophysical Site Description

This model is specific to the mesic deciduous forests of the Atlantic Coastal Plain, north of the natural range of *Pinus glabra* and *Magnolia grandiflora*. The distribution of these forests is determined by the interaction of local topography and soil texture. Within the type, local variability in topography and moisture, as well as regional floristic variation, determine the canopy dominants. Richer and more mesic stands occur in more strongly concave and finer textured areas. This system occurs in a variety of moist non-wetland sites that are naturally sheltered from frequent fire. Most common are lower slope and bluff examples along streams and rivers in dissected terrain, but some examples occur on mesic flats between drier pine-dominated uplands and floodplains or on local high areas within bottomland terraces or nonriverine wet flats. Soils cover the full range of mineral soil textures, except the coarsest sands. Soils are not saturated for any significant time during the growing season, and seldom, if ever, are they extremely dry. Soils developed from calcareous materials or rich alluvium may be basic; others are strongly acidic. Sites are protected from most natural fires by steep topography or by surrounding extensive areas of non-flammable vegetation (NatureServe 2006).

Vegetation Description

Most stands of vegetation in this Biophysical Setting (BpS) are co-dominated by American beech (*Fagus grandifolia*) with or without white oak (*Quercus alba*). The more mesic end of the gradient may not include oaks at all, but instead show dominance by *Fagus grandifolia*, tuliptree (*Liriodendron tulipifera*), southern sugar maple (*Acer barbatum*), and/or sweetgum (Liquidambar styraciflua). In some sites, cherrybark oak (Quercus pagodaefolia) or Shumard oak (Quercus shumardii) are important canopy components. Swamp chestnut oak (Quercus michauxii) and/or water oak (Quercus nigra) may also be present, as well as bitternut hickory (Carya cordiformis), blackgum (Nyssa sylvatica) and umbrella magnolia (*Magnolia tripetala*). *Pinus taeda* is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past removal of the hardwood canopy and subsequent invasion. Analogous systems on the Gulf Coastal Plain have pine as a natural component, and this may be true for some examples of this system. Understories are usually well-developed. Shrub and herb layers may be sparse or moderately dense, with the herb layer being forb-dominated. Some typical smaller trees and shrubs include *Cornus florida, Symplocos tinctoria, Oxydendrum arboreum, Hamamelis virginiana, Morus rubra,* and *Stewartia malacodendron*. Within its range, *Sabal minor* may be a prominent shrub. Some stands may contain *Arundinaria gigantea*. Some typical herbs include *Mitchella repens* and *Hexastylis arifolia* (NatureServe 2006).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| QUAL | *Quercus alba* | White oak |
| FAGR | *Fagus grandifolia* | American beech |
| QUPA5 | *Quercus pagoda* | Cherrybark oak |
| LITU | *Liriodendron tulipifera* | Tuliptree |
| LIST2 | *Liquidambar styraciflua* | Sweetgum |
| QUSH | *Quercus shumardii* | Shumard's oak |

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

Disturbance Description

The fire regime is characterized by infrequent, low intensity surface fires and rare mosaic or replacement fires. The mean fire return interval (MFRI) is about 35yrs with wide year-to-year and within-type variation related to moisture cycles, degree of sheltering, and proximity to more fire-prone vegetation types. Anthropogenic fire was considered and it contributes to within-type MFRI variation.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 392 | 9 |  |  |
| Moderate (Mixed) | 159 | 22 |  |  |
| Low (Surface) | 52 | 69 |  |  |
| All Fires | 35 | 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

Stands of this type may be essentially linear features on the landscape, occupying slopes associated with concave drainage features. Under closed conditions, fire may only partially penetrate these systems from adjacent uplands.

NatureServe 2006 notes the corresponding Ecological System (CES203.242) as a large-patch system, occurring in mosaics with other small-patch systems, or as small isolated patches surrounded by wetlands. Generally occurs as small to large patches, of a few to dozens of acres. Mosaics may contain up to several hundred acres in close proximity.

Adjacency or Identification Concerns

Stands of this type may be essentially linear features on the landscape, occupying slopes associated with concave drainage features. There may be larger patches where side-drains join larger streams. Under closed canopy conditions, fire may only partially penetrate these systems from adjacent uplands.

Most commonly associated with Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest (CES203.241) and various floodplain systems. Less commonly associated with Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304). Floodplain systems often occur below this system (NatureServe 2006).

Issues or Problems

There is an issue with respect to recognizing canopy closure of just the overstory of this forest type. In this model, the sub-canopy closure really makes the difference between what an open and closed stand represent. The keep relative age was used in the model to keep it realistic.

Native Uncharacteristic Conditions

Comments

This BpS is based on a revision of the descriptive material for R9OADM of the Rapid Assessment process. (Notes from R9OADM: We have included the use of keep relative age in this model, realizing that in the long term, modeling this will either have to be accommodated in the software or reworked. The inclusion makes more ecological sense. Without it, the proportion of forests shift to the mid-successional forest class, which is not expected on the ground.)

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 | A | A | A | A | A | A | A | A | A | A |
| Herb | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Herb | >1.0 | A | A | A | A | A | A | A | A | A | A |
| 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 | A | A | A | A | A | A | A | A | A | A |
| Tree | 0-5 | A | A | A | A | A | A | A | A | A | A |
| Tree | 5-10 | C | C | C | C | C | C | C | C | B | B |
| Tree | 10-25 | C | C | C | C | C | C | C | C | B | B |
| Tree | 25-50 | D | D | D | D | D | D | D | D | E | E |
| Tree | >50 | D | D | D | D | D | D | D | D | E | E |

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 8 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUAL | Quercus alba | White oak | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| QUPA5 | Quercus pagoda | Cherrybark oak | Upper |
| LITU | Liriodendron tulipifera | Tuliptree | Upper |

Description

This class is characterized by sprouts, seedlings and saplings, primarily of major overstory species, occurring in gaps created by wind, lightning, insect/disease and, less frequently, fire. Shade intolerant species (e.g., *Liriodendron tulipifera*, LITU) are confined to multiple-tree gaps. This is not a fire-driven system; therefore, most of early succession would result from other disturbances, including tree fall.

*Maximum Tree Size Class*  
Sapling >4.5ft; <5"DBH

Class B 30 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUAL | Quercus alba | White oak | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| QUPA5 | Quercus pagoda | Cherrybark oak | Upper |
| LITU | Liriodendron tulipifera | Tuliptree | Upper |

Description

Class B is dominated by a young to early mature canopy with some obligate midstory and understory species. The closed condition is a function of understory/midstory development and depending on the age of the overstory, at least two strata are present. The fire frequency primarily impacts the amount of subcanopy vegetation. Under standard conditions, e.g., infrequent and low intensity fires, the stands have dense undergrowth and are considered closed.

*Maximum Tree Size Class*  
Medium 9-21"DBH

Class C 6 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUAL | Quercus alba | White oak | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| QUPA5 | Quercus pagoda | Cherrybark oak | Upper |
| LITU | Liriodendron tulipifera | Tuliptree | Upper |

Description

Class C has the same overstory composition and structure as B, but without a well-developed midstory. Surface fires serve to maintain the open understory in these stands.

*Maximum Tree Size Class*  
Medium 9-21"DBH

Class D 15 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUAL | Quercus alba | White oak | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| QUPA5 | Quercus pagoda | Cherrybark oak | Upper |
| LITU | Liriodendron tulipifera | Tuliptree | Upper |

Description

Class D is characterized by an early to late mature canopy that may exceed 100ft in height. Dominant overstory species vary depending on location and stand history. The open condition is dependent on the absence of multi-layered vertical structure. Surface fires maintain the open understory in these stands.

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

Class E 41 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUAL | Quercus alba | White oak | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| QUPA5 | Quercus pagoda | Cherrybark oak | Upper |
| LITU | Liriodendron tulipifera | Tuliptree | Upper |

Description

Class E exhibits the same overstory composition and structure as D. However, well-developed lower layers are present containing canopy species and other species confined to those levels. Fire frequency primarily impacts the amount of subcanopy vegetation. Under standard conditions, e.g., infrequent and low intensity fires, the stands have dense undergrowth and are considered closed.

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

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:CLS | 14 |
| Mid1:OPN | 15 | Late1:OPN | 79 |
| Mid1:CLS | 15 | Late1:CLS | 79 |
| Late1:OPN | 80 | Late1:OPN | 999 |
| 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 | 0.004 | 250 | Yes | 0 |
| Mixed Fire | Early1:ALL | Early1:ALL | 0.01 | 100 | No | 0 |
| Alternative Succession | Mid1:OPN | Mid1:CLS | 1 | 1 | Yes | 25 |
| Wind or Weather or Stress | Mid1:OPN | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.04 | 25 | No | 0 |
| Wind or Weather or Stress | Mid1:CLS | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.006 | 167 | Yes | 0 |
| Surface Fire | Mid1:CLS | Mid1:CLS | 0.012 | 83 | No | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 25 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Wind or Weather or Stress | Late1:OPN | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.04 | 25 | No | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Early1:ALL | 0.004 | 250 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.009 | 111 | Yes | 0 |
| Surface Fire | Late1:CLS | Late1:CLS | 0.018 | 56 | No | 0 |

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