14710

Central Interior and Appalachian Floodplain Systems

BpS Model/Description Version: Aug. 2020

Update: 3/27/2018

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Vegetation Type

Mixed Upland and Wetland

Map Zones

64, 65

Geographic Range

This systems group encompasses large-river floodplains over much of the eastern United States, from southern New England south to Georgia, and west to the Dakotas and eastern Oklahoma (NatureServe 2007).

Biophysical Site Description

This systems group encompasses large-river floodplains over much of the eastern U.S. (NatureServe 2007), but differs from the Coastal Plain model in several ways. First it is floristically different in that it lacks cypress and tupelo except in its lowest elevation where it transitions to the Coastal Plain. Permanent standing water is lacking except in the areas closest to sea level where oxbow lakes may exist. Hydroperiods are shorter and fluvial features such as river terraces, oxbows, alluvial flats, point bars, streamside levees and other fine-scale alluvial floodplain features are abundant. NatureServe (2007) notes some will include herbaceous sloughs and shrub wetlands, particularly in abandoned channels

The substrate is primarily alluvium. The generally fertile soils are usually sandy to loamy but include local clayey and gravelly areas (NatureServe 2007).

Synonyms for this Biophysical Setting (BpS) and its variations include eastern riverfront forest, bottomland hardwood forest, and alluvial forest. Fire and beaver activity create a mosaic whose elements include canebrake, beaver ponds, and grass-sedge meadows in abandoned beaver clearings, as well as the swamps and bottomland hardwood forests that make up >95% of the cover that exists today.

Vegetation Description

Most of the system is forest vegetation. The canopy is usually dominated by a mix of characteristic alluvial and bottomland species (depending on the region) such as sycamore (*Platanus occidentalis*), river birch (*Betula nigra*), box elder (*Acer negundo*), eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), and red maple (*Acer rubrum*). NatureServe (2007) notes that characteristic trees also include willows, especially black willow (*Salix nigra*) in the wettest areas, swamp chestnut oak (*Quercus michauxii*), cherrybark oak (*Quercus pagoda*), sugarberry (*Celtis laevigata*), and (at least in the Midwest) bur oak (*Quercus macrocarpa*) in more well-drained areas. The particular mix of tree species will vary across the geographic range of this systems group, with some trees absent over parts of the range. Successional areas are often dominated by sweetgum (*Liquidambar styraciflua*), or tulip tree (*Liriodendron tulipifera*).

The driest and most fire sheltered sites support species such as pignut hickory (*Carya glabra*), shagbark hickory (*Carya ovata*), beech (*Fagus grandifolia*), and other fire sensitive species.

Subcanopy species across the range of this type include American holly (*Ilex opaca*), deciduous holly (*Ilex decidua and Ilex ambigua*), red mulberry (*Morus rubra*), ironwood (*Carpinus caroliniana*) and hop hornbeam (*Ostrya virginiana*). Shrubs such as spicebush (*Lindera benzoin*), beautyberry (*Callicarpa americana),* yellowroot (*Xanthorhiza simplicissima*), common buttonbush (*Cephalanthus occidentalis*), roughleaf dogwood (*Cornus drummondii*), and pawpaw (*Asimina triloba*); sedges (*Carex* spp.); and grasses including eastern bottlebrush grass (*Elymus hystrix*), Canada wildrye (*Elymus Canadensis*), and Indian woodoats (*Chasmanthium latifolium*), and false nettle (*Boehmeria cylindrica*) may be present.

Oxbows may support herbaceous vegetation dominated by species including *Nelumbo lutea* and *Typha latifolia*.

Frequently reworked gravel bars may be dominated by young black willow (*Salix nigra*), sycamore (*Platanus occidentalis*), or river birch (*Betula nigra*), or they may have sparse vegetation of a wide variety of annual and perennial herbs of weedy habits (NatureServe 2007).

Natural levee forests form on ridges of silt and sand deposited on stream margins during flood conditions. A levee's width is related to the abundance of ground vegetation present to re-enforce sediment in future deposition events. They receive more light and may be dominated by stream margin specialists such as sycamore (*Platanus occidentalis*), willows (*Salix nigra*), river birch (*Betula nigra*), box elder (*Acer negundo*) and Eastern cottonwood (*Populus deltoides*). Streamside levees are typical habitat for river oats (*Chasmanthium latifolium*) and a diverse flora of other bottomland graminoids and forbs. Because of the particular mix and diversity of tree species will vary across the geographic range of this systems group, the list of BpS dominant and indicator species is only a rudimentary list.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PLOC | *Platanus occidentalis* | American sycamore |
| BENI | *Betula nigra* | River birch |
| ACRU | *Acer rubrum* | Red maple |
| LIST2 | *Liquidambar styraciflua* | Sweetgum |
| CELA | *Celtis laevigata* | Sugarberry |
| FAGR | *Fagus grandifolia* | American beech |
| FRPE | *Fraxinus pennsylvanica* | Green ash |
| SANI | *Salix nigra* | Black willow |

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

Disturbance Description

Fire regime group III (conspicuous and most frequent in stands with native grassy understory). Fire return interval varied highly. Most fires were very light surface fires, creeping in hardwood litter with some thin, patchy cover of bottomland grasses such as slender woodoats (*Chasmanthium laxum*) and river oats (*Uniola latifolia*). Flame lengths were mostly 6-12in. Even so, fire-scarred trees can be found in most bottomlands except in the wettest microsites. Stand replacement fires are unknown in this type. Except where Native American burning was involved, fires likely occurred primarily during drought conditions and then often only when fire spread into bottomlands from more pyrophytic uplands. Trees may be partially girdled by fire in duff, followed by bark sloughing. While fire rarely killed the tree, this allowed entry of rot, which, in the moist environment, often resulted in hollow trees, providing nesting and denning habitat for many species of birds and animals. Surface fires occurred on a frequency ranging from about 3-8yrs in grassy bottomland hardwood, to 25yrs or more in hardwood litter. Low areas having a long hydroperiod, islands, and areas protected from fire by back swamps and oxbows were virtually fire free. Fire effects were largely limited to top kill of shrubs and tree saplings less than 2in diameter, and formation of hollow trees.

Other Disturbance Types. The distinctive dynamics of river flooding are presumably the primary reason for the distinctive vegetation of this system, though not all of the factors are well known. The large rivers have the largest watersheds in the region, but the gradients of most of these rivers limit floods to fairly short duration. Flooding is most common in the winter, but may occur in other seasons. The sorting of plant communities by depositional landforms of different height suggest that wetness or depth of flood waters may be of significance, though it has much less influence than in the Coastal Plain. Flood waters have significant energy, and scouring and reworking of sediment are an important factor in bar and bank communities. In addition to disturbance, floods bring nutrient input, deposit sediment, and disperse plant seeds. While flooding rarely leads to canopy tree mortality except where beavers impounded a channel or along stream banks where a tree might be subject to undercutting in the process of channel migration, the most significant disturbance in bottomlands was wind.

Winds have a major affect in bottomland forests because of wet soils, less dense soil, and trees that are shallow-rooted. Like all but a few Eastern forest types, canopy tree mortality was limited to tree by tree or small group replacement and wind throw was the primary cause of mortality in bottomlands. The frequency of these events equates with major hurricanes (east of the mountains predominantly). The majority of wind throw seems to have been the result of hurricanes.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 613 | 13 | 200 | 1000 |
| Moderate (Mixed) | 399 | 20 | 150 | 500 |
| Low (Surface) | 122 | 67 | 4 | 200 |
| All Fires | 81 | 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

Narrow bands or isolated pockets are found along river and stream bottoms (quarter mile from stream, largely dependent upon nearby topography). Larger homogenous areas found in level or slightly rolling landscapes adequate in size to contain natural variation in vegetation and disturbance regime. (>5,000ac).

Adjacency or Identification Concerns

Compare to Southern Flood Plain model for the Atlantic and Gulf coastal plain variant of this type. This piedmont/Appalachian type is characterized by narrower floodplains and vegetation adapted to varying levels of inundation, but less long term flooding and permanent standing water. Floodplain forests are differentiated from adjacent mesophytic upland forests (see Rapid Assessment (RA) model R8MMHF, Mixed Mesic Hardwoods Forest) by the presence of plants indicative of alluvial or bottomland settings such a sycamore (*Platanus occidentalis*), river birch (*Betula nigra*), and box elder (*Acer negundo*). These bottomlands often allow drier-associated species such as oaks and pines to encroach during droughty periods, and then persist due to the lack of long-term inundation in steeper, narrower floodplains.

Standard Ecological Systems noted by NatureServe (2007) that make up this aggregated system include:

• Central Appalachian River Floodplain (CES202.608)

• North-Central Interior Floodplain (CES202.694)

• South-Central Interior Large Floodplain (CES202.705)

• Southern Piedmont Large Floodplain Forest (CES202.324)

Issues or Problems

Federal reservoirs have had a serious and negative effect, along with agriculture that has converted much floodplain acreage to drained agricultural land. In the remaining less altered floodplains, flood duration varies according to the river's gradient (NatureServe 2007).

Native Uncharacteristic Conditions

Comments

This model, as described for MZs 54 and 59, was adopted from BpS 1473 for Gulf and Atlantic Coastal Floodplain, and the Rapid Assessment model R8FPFOpi -- Bottomland Hardwood Forest. All relevant reference documents were left from R8FPFOpi that were mainly used in the General and Class descriptions. The Vegetation Dynamics Development Tool model was adopted from R8FPFOpi and a few class probabilistic transitions were changed or added.

Sue Gawler reviewed the model for applicability to MZ61.

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 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 0.5-1.0 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 1.0-3.0 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | >3.0 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 0-5 | A | A | A | A | A | A | UN | UN | UN | UN |
| Tree | 5-10 | A | A | A | A | A | A | UN | UN | UN | UN |
| Tree | 10-25 | UN | UN | UN | UN | UN | UN | C | C | B | B |
| Tree | 25-50 | UN | UN | UN | UN | UN | UN | D | D | E | E |
| Tree | >50 | UN | UN | UN | UN | UN | UN | 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** |
| ACRU | Acer rubrum | Red maple | All |
| ACNE | Acalypha neomexicana | New mexico copperleaf | All |
| FRPE | Fraxinus pennsylvanica | Green ash | All |
| BENI | Betula nigra | River birch | All |

Description

Tree fall gaps and other replacement disturbance areas with saplings and small trees up to 30cm DBH. Potential canopy species are typically mixed with subcanopy species and herbs, and an occasional stem of a short-lived early successional species such as willow (*Salix nigra*).

*Maximum Tree Size Class*  
Pole 5-9" DBH

Class B 25 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ACRU | Acer rubrum | Red maple | Upper |
| LIST2 | Liquidambar styraciflua | Sweetgum | Upper |
| BENI | Betula nigra | River birch | Upper |
| PLOC | Platanus occidentalis | American sycamore | Upper |

Description

Old tree fall gaps and replacement disturbance with closed canopy ranging from 30-70cm DBH. Shade tolerant species in the understory.

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

Class C 6 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PLOC | Platanus occidentalis | American sycamore | Upper |
| ACSA2 | Acer saccharinum | Silver maple | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| BENI | Betula nigra | River birch | Upper |

Description

Similar overstory as class B but more open, without a well-developed mid-story or understory. Grasses will also be present.

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

Class D 13 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PLOC | Platanus occidentalis | American sycamore | Upper |
| ACSA2 | Acer saccharinum | Silver maple | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| ULAM | Ulmus americana | American elm | Upper |

Description

More of a closed canopy then class C with trees ranging from 70-300yrs+ in age with minimal mid-story and understory shrubs and grasses. More shrubs and less grass than C. This class remains in a Late Open unless fire does not occur.

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

Class E 48 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PLOC | Platanus occidentalis | American sycamore | Upper |
| CELA | Celtis laevigata | Sugarberry | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| BENI | Betula nigra | River birch | Upper |

Description

Closed hardwood canopy with trees ranging from 70-300yrs+ in age. Extensive shade tolerant shrub understory and mid-story. This class can remain Late Closed for several hundred years.

*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 | 19 |
| Mid1:OPN | 20 | Late1:OPN | 69 |
| Mid1:CLS | 20 | Late1:CLS | 69 |
| Late1:OPN | 70 | Late1:OPN | 500 |
| Late1:CLS | 70 | Late1:CLS | 500 |

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** |
| Wind or Weather or Stress | Early1:ALL | Early1:ALL | 0.005 | 200 | No | 0 |
| Surface Fire | Early1:ALL | Early1:ALL | 0.005 | 200 | No | 0 |
| Optional 1 | Early1:ALL | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Mixed Fire | Early1:ALL | Early1:ALL | 0.007 | 143 | No | 0 |
| Alternative Succession | Mid1:OPN | Mid1:CLS | 1 | 1 | Yes | 30 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Optional 1 | Mid1:OPN | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Wind or Weather or Stress | Mid1:OPN | Mid1:OPN | 0.007 | 143 | No | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.01 | 100 | No | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.002 | 500 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Optional 1 | Mid1:CLS | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Surface Fire | Mid1:CLS | Mid1:OPN | 0.005 | 200 | Yes | 0 |
| Wind or Weather or Stress | Mid1:CLS | Mid1:OPN | 0.01 | 100 | Yes | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 50 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Optional 1 | Late1:OPN | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Insects or Disease | Late1:OPN | Late1:OPN | 0.005 | 200 | No | 0 |
| Wind or Weather or Stress | Late1:OPN | Late1:OPN | 0.007 | 143 | No | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.01 | 100 | No | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.003 | 333 | Yes | 0 |
| Optional 1 | Late1:CLS | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Insects or Disease | Late1:CLS | Late1:CLS | 0.005 | 200 | No | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.007 | 143 | Yes | 0 |
| Surface Fire | Late1:CLS | Late1:CLS | 0.01 | 100 | No | 0 |

Optional Disturbances

Optional 1: flooding

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