14730

Gulf and Atlantic Coastal Plain Floodplain Systems

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Woody Wetland

Map Zones

32, 37, 44

Geographic Range

Major river corridors of east Texas, western Louisiana, and southern Arkansas, excluding the rivers of the Mississippi Alluvial Plain ecoregion. Diggs et al. (2006) described this area as the seasonally flooded river floodplain situated between the permanent/semi-flooded forest/marshes and the mesic forest. This Biophysical Setting (BpS) occurs in all ECOMAP (Cleland et al. 2007) sections and subsections that contain third-order stream and riverine systems.

Biophysical Site Description

This BpS occurs on floodplain terraces of large rivers and streams in the Gulf Coastal Plain and Arkansas River Valley. It excludes the open-water *Taxodium distichum, Nyssa aquatica* and *Quercus lyrata* (bald cypress, water tupelo, and overcup oak) that occur in deep-water alluvial swamps, sloughs, and depressions that are flooded most or all of a given year. Synonyms for this BpS and its subdivisions include alluvial forest and southern bottomland hardwood forest.

Vegetation Description

Apart from treefall gaps, marshes, beaver ponds, and non-forested canebrakes, there is a continuous canopy of deciduous broadleaf species. Relative dominance of canopy tree species may vary according to regional location, hydrology (in relation to fine-scale topography), and soils. The tree canopy ranges from approximately 80-150ft tall. The understory is <80ft tall and is usually composed of the canopy species and deciduous broadleaf understory species. Understory shrub density is generally low, but may be dense on ridges within the bottoms that are less subject to inundation. Woody vines are abundant. The herbaceous layer is generally sparse due to shade and/or frequent inundation, although there may be relatively thick herbaceous vegetation in treefall gaps and early-seral stages. There are usually >10 species of canopy trees and >30 tree and shrub species total in any association-level plant community. Canopy tree density is within 15-30 trees/ac and canopy tree basal area is within 100-210ft2/ac. Many canopy trees exceed 20in in diameter and can be extremely large in diameter.

Riverbanks and flat, poorly drained areas within the floodplain are often dominated by black willow (*Salix nigra*), red maple (*Acer rubrum*), river birch (*Betula nigra*), box elder (*A. negundo*), sycamore (*Platanus occidentalis*), American elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), Carolina ash (*F. caroliniana*), sugarberry (*Celtis laevigata*), water hickory (*Carya aquatica*), persimmon (*Diospyros virginiana*), sweet bay (*Magnolia virginiana*), swamp laurel oak (*Q. laurifolia*), black hickory (*Carya aquatica*), delta post oak (*Q. similis*), and overcup oak. Ridges and levees in low areas and higher areas near the edges of floodplains may be dominated by sweetgum (*Liquidambar styraciflua*), water oak (*Q. nigra*), willow oak (*Q. phello*s), swamp chestnut oak (*Q. michauxii*), Nuttall’s red oak (*Q. nuttallii*), Shumard’s red oak (*Q. shumardii*), cherrybark oak (*Q. pagoda*), black cherry (*Prunus serotina*), winged elm (*U. alata*), loblolly pine (*Pinus taeda*), pecan (*C. illinoensis*), and shagbark hickory (*C. ovata*).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| QUNI | *Quercus nigra* | Water oak |
| FRPE | *Fraxinus pennsylvanica* | Green ash |
| QUPH | *Quercus phellos* | Willow oak |
| QULY | *Quercus lyrata* | Overcup oak |
| LIST2 | *Liquidambar styraciflua* | Sweetgum |
| NYSY | *Nyssa sylvatica* | Blackgum |
| QUTE | *Quercus texana* | Nuttall's oak |
| QUPA | *Quercus palaeolithicola* | Hybrid oak |

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

Disturbance Description

The dominant ecological processes in bottomland hardwood forests are windfall gaps and periodic flooding. Windfall gaps occur on local (a single, mature canopy tree) and landscape (tornadoes or hurricanes) scales. When canopy trees fall, seedlings in the understory are released and compete for a spot in the canopy. This leads to dense areas of herbaceous and woody vegetation in windfall gaps of all sizes. This is a major process in forest regeneration in bottomland hardwood forests. Canopy decline and reproductive failure can create late-seral Open stands. Flooding is more frequent on the lower terraces, but frequently floods occur on higher terraces (Wharton 1982, zones IV and V). Catastrophic floods can cause the loss of canopy over large areas. Duration of flooding varies with the placement of a site in the landscape and is a dominant process affecting vegetation on a given site. Flooding can deposit alluvium or scour the ground, depending on the landscape position of a site and the severity of the flood event.

Fire is infrequent on the lower terraces, but was frequent historically on older terraces, especially areas adjacent to upland pine or pine flatwoods. It is conjectured that Native Americans maintained canebrakes by deliberate fall burning. Infrequent, mild surface fires would occur in the system and would cause changes in composition and structure due to low fire tolerance.

Changes in hydrology due to the activities of beaver are also an important ecological process in bottomland hardwood forests. Beaver impoundments kill trees (sometimes over large areas) and may create open-water habitat and cypress-tupelo stands, or may cause stand replacement. Meandering streams are dynamic and frequently change course, eroding into the floodplain and depositing new point bars, thus creating new habitat for early-seral plant communities. Insect outbreaks occur infrequently in closed-canopy states.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 394 | 10 |  |  |
| Moderate (Mixed) | 258 | 15 |  |  |
| Low (Surface) | 49 | 75 |  |  |
| All Fires | 37 | 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

Bottomland hardwood forest occurs in millions of acres in the BpS, with smaller areas covered in larger streams in the coastal plain and Arkansas Valley.

Adjacency or Identification Concerns

This type also is bordered by a number of upland communities from which fire would have occasionally burned down into the bottoms, especially in drought years. When adjacent to loblolly flatwoods, the fire return interval increases in floodplain systems.

Issues or Problems

The fire history of this BpS is poorly understood, in part because there has been the widespread assumption that it did not burn. But, the fact that it had an extensive cane (*Arundinaria gigantea*) understory and canebrakes indicates that fire was much more common than is generally believed. These canebrakes exist as a patch community maintained by wind and fire. The effects of beaver ponds on forest dynamics in this system are also poorly understood at the landscape level, especially in the pre-settlement context. Note that the model assumes that a single pixel represents the area occupied by a single, very mature canopy tree. This accounts for the treefall gap ecological process.

Native Uncharacteristic Conditions

Possible changes in community species composition due to alteration of hydrology. Clearing of trees for use as pasture. Invasion by non-native trees, especially Chinese tallow.

Comments

Models and descriptions for map zone (MZ) 32, MZ37, and MZ44 were identified as duplicates during the BpS review process. The description from MZ37 was used for all three zones because it appears to be the most complete. Zollner was not a reviewer for MZ44 or MZ32.

For MZ37, this model was adapted slightly from the Rapid Assessment model R5SOIPif (Southern Floodplain) by Theo Witsell and Tom Foti, and was reviewed by Douglas Zollner. For east Texas description, see Nixon (2000).

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 | A | A | A | A | A | A | A | B | B | B |
| Tree | 10-25 | D | D | D | D | D | D | D | B | B | B |
| Tree | 25-50 | D | D | D | D | D | D | D | C | C | C |
| Tree | >50 | D | D | D | D | D | D | D | 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 10 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SANI | Salix nigra | Black willow | Lower |
| QUNI | Quercus nigra | Water oak | Lower |
| ACNE2 | Acer negundo | Boxelder | Lower |
| BENI | Betula nigra | River birch | Lower |

Description

This class includes small-scale windfall gaps (the principal method of regeneration in mature bottomland hardwood forests in the absence of larger scale disturbance), large-scale catastrophic wind disturbance (tornadoes and hurricanes), water impoundment and inundation (caused by channel blockage mainly due to beaver activity), and catastrophic stand replacement during major flood events and rare fire events. Infrequent surface fire occurs in this class.

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

Class B 16 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUNI | Quercus nigra | Water oak | Upper |
| QUPH | Quercus phellos | Willow oak | Upper |
| LIST2 | Liquidambar styraciflua | Sweetgum | Upper |
| FRPE | Fraxinus pennsylvanica | Green ash | Upper |

Description

This class is a mid-seral stage bottomland hardwood forest with a closed canopy. Replacement fire and mixed fire are rare in this state. Infrequent surface fire has little impact. Other replacement disturbances include large-scale catastrophic wind disturbance (tornadoes and hurricanes), water impoundment and inundation (caused by channel blockage mainly due to beaver activity), and major flood events.

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

Class C 43 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUPA5 | Quercus pagoda | Cherrybark oak | Upper |
| QUPH | Quercus phellos | Willow oak | Upper |
| QUMI | Quercus michauxii | Swamp chestnut oak | Upper |
| QUTE | Quercus texana | Nuttall's oak | Upper |

Description

This class is a mature, late-seral, closed-canopy bottomland hardwood forest. Replacement fire is rare in this state. Infrequent surface fire has little impact on the canopy. Mixed fire is rare but can open the stand. Other rare disturbances occur, including large-scale catastrophic wind disturbance (tornadoes and hurricanes), water impoundment and inundation (caused by channel blockage mainly due to beaver activity), and major flood events. Insects contribute minimally to thinning effect here.

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

Class D 31 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUPH | Quercus phellos | Willow oak | Upper |
| QULY | Quercus lyrata | Overcup oak | Upper |
| QUMI | Quercus michauxii | Swamp chestnut oak | Upper |
| LIST2 | Liquidambar styraciflua | Sweetgum | Upper |

Description

This class occurs through overstory decline in old-growth stages, combined with reproductive failure. Replacement fire is very rare. Mixed fires occur but are rare. Replacement events such as flooding and weather events also likely occur. Infrequent surface fire, flooding, insect infestation, and windthrow have little impact on the canopy. Also included in this category is the transitional recovery of these stands after disturbances, such that they are open understory for a few years, transitioning through the seral processes to a closed canopy.

*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 | 15 |
| Mid1:CLS | 16 | Late1:CLS | 45 |
| Late1:CLS | 46 | Late1:CLS | 999 |
| Late1:OPN | 46 | Late1:OPN | 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 | 0.003 | 333 | Yes | 0 |
| Optional 1 | Early1:ALL | Early1:ALL | 0.0035 | 286 | Yes | 0 |
| Surface Fire | Early1:ALL | Early1:ALL | 0.025 | 40 | No | 0 |
| Mixed Fire | Mid1:CLS | Mid1:CLS | 0.003 | 333 | 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 |
| Optional 1 | Mid1:CLS | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Surface Fire | Mid1:CLS | Mid1:CLS | 0.013 | 77 | No | 0 |
| Wind or Weather or Stress | Late1:OPN | Late1:OPN | 0.002 | 500 | No | 0 |
| Optional 1 | Late1:OPN | Late1:OPN | 0.002 | 500 | No | 0 |
| Insects or Disease | Late1:OPN | Late1:OPN | 0.002 | 500 | No | 0 |
| Wind or Weather or Stress | Late1:OPN | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Optional 1 | Late1:OPN | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.007 | 143 | No | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 0.02 | 50 | Yes | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.033 | 30 | No | 0 |
| Wind or Weather or Stress | Late1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Optional 1 | Late1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.003 | 333 | Yes | 0 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.004 | 250 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.006 | 167 | Yes | 0 |
| Optional 1 | Late1:CLS | Late1:OPN | 0.006 | 167 | Yes | 0 |
| Surface Fire | Late1:CLS | Late1:CLS | 0.013 | 77 | No | 0 |

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