14730

Gulf and Atlantic Coastal Plain Floodplain Systems

BpS Model/Description Version: Aug. 2020

Update: 3/18

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| **Modelers** |  | **Reviewers** |  |
| Kay Jenkins | None | Doug Zollner | dzollner@tnc.org |
| Jared Laing | jlaing@tnc.org | None | None |
| None | None | None | None |

Vegetation Type

Woody Wetland

Map Zones

36

Geographic Range

The Columbia Bottoms between the San Bernard and Brazos rivers, southwest of Houston. Occurs in ECOMAP (Cleland et al. 2007) subsection 255Dd.

Biophysical Site Description

This Biophysical Setting (BpS) occurs on floodplain terraces of large rivers and streams in the Gulf Coastal Plain. It excludes the open water, *Taxodium distichum--Nyssa aquatica* and *Quercus lyrata* (baldcypress--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 broadleaved 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 broad-leaved 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 more than 10 species of canopy trees and more than 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 100-210ft/ac. Many canopy trees exceed 20in in diameter and can be extremely large.

River banks and flat, poorly drained areas within the floodplain are often dominated by black willow (*Salix nigra*), red maple (*Acer rubrum*), box elder (*A. negundo*), American elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), sugarberry (*Celtis laevigata*), water hickory (*Carya aquatica*), persimmon (*Diospyros virginiana*). Ridges and levees in low areas and higher areas near the edges of floodplains may be dominated by water oak (*Q. nigra*), willow oak (*Q. phellos*), Nuttall's red oak (*Q. texana*), American elm, winged elm (*U. alata*), loblolly pine (*Pinus taeda*) and pecan (*C. illinoensis*). In the Columbia bottoms plateau oak (*Quercus fusiformis*), hawthorn (*Crataegus* ssp.) and cedar elm (*U. crassifolia*) become common.

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 |
| QUFU | *Quercus fusiformis* | Plateau oak |
| CAAQ2 | *Carya aquatica* | Water hickory |
| ULAM | *Ulmus americana* | American elm |
| QUTE | *Quercus texana* | Quercus texana |
| CELA | *Celtis laevigata* | Sugarberry |

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 the local (a single mature canopy tree) and the landscape (hurricanes) scale. 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 higher terraces (Wharton 1982, zones IV & V). Catastrophic floods can cause the loss of canopy over large areas, coastal areas are also impacted by storm surge from hurricanes and tropical storms as well as salt deposition. 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, cypress-tupelo stands, or 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 would occur infrequently in closed canopy states.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 391 | 10 |  |  |
| Moderate (Mixed) | 255 | 15 |  |  |
| Low (Surface) | 50 | 75 |  |  |
| All Fires | 38 | 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

The only large bottoms in map zone (MZ) 36 are the Columbia Bottoms.

Adjacency or Identification Concerns

Bordered by coastal prairie and marshes (BpS 1434 and 1490).

Issues or Problems

Native Uncharacteristic Conditions

Extensive changes in community species composition due to alteration of hydrology.

Comments

MZ36 was adapted from the MZ37 model for the same BpS by Roger W. Mangham and Jared Laing and reviewed by Douglas Zollner. MZ36 modelers, Kay Jenkins and Jared Laing, made significant changes to the model description resulting in the change in modelership. Douglas Zollner reviewed the model again for MZ36. 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 | B | B | B | B | B | B | B |
| Tree | 10-25 | D | D | D | B | B | B | B | 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** |
| CELA | Celtis laevigata | Sugarberry | Lower |
| QUNI | Quercus nigra | Water oak | Lower |
| ACNE2 | Acer negundo | Boxelder | Lower |
| QUPH | Quercus phellos | Willow oak | 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 (hurricane), water impoundment and inundation caused by channel blockage, mainly due to beaver activity, and catastrophic stand replacement during major flood events and rare replacement fire events. Infrequent surface fire occurs in this class until it succeeds to B.

*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 |
| QUFU | Quercus fusiformis | Plateau oak | 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 maintains this class until succession. Other replacement disturbances include large scale catastrophic wind disturbance (hurricane), water impoundment and inundation caused by channel blockage mainly due to beaver activity, and catastrophic stand replacement during 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** |
| QUFU | Quercus fusiformis | Plateau oak | Upper |
| ULAM | Ulmus americana | American elm | Upper |
| FOAC | Forestiera acuminata | Eastern swampprivet | Middle |
| CAAQ | Carex aquatilis | Water sedge | Upper |

Description

This class is a mature, late seral closed canopy bottomland hardwood forest. Replacement fire is rare in this state. Infrequent surface fire maintains this class. Mixed fire is rare. Other rare disturbances have either a replacement or thinning effect including large scale catastrophic wind disturbance (hurricane), water impoundment and inundation caused by channel blockage mainly due to beaver activity, and catastrophic stand replacement during 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** |
| QUFU | Quercus fusiformis | Plateau oak | Upper |
| QULY | Quercus lyrata | Overcup oak | Upper |
| QUNI | Quercus nigra | Water oak | Upper |

Description

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

*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 |

Optional Disturbances

Optional 1: Flooding

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