13290

East Gulf Coastal Plain Southern Loess Bluff Forest

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
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| None | None | None | None |
| None | None | None | None |

Vegetation Type

Forest and Woodland

Map Zones

45,46,99

Geographic Range

This system is endemic to the loess bluffs ("Bluff Hills" [Ecoregion 74a] of EPA (2004)) and the immediately adjacent Southern Rolling Plains (western portion of Ecoregion 74c) along the eastern edge of the Mississippi River Alluvial Plain in southwestern MS and adjacent LA (NatureServe 2006). This system extends through the lower one-third of MS into southeast LA from about 32 degrees N latitude, where the Big Black River transects the bluffs, to just below 31degrees N latitude near St. Francisville, LA.

Biophysical Site Description

Largely confined to steep bluffs east of the Mississippi River but including the hardwood-dominated western edge of the loess plains immediately to their east. Consisting of a belt of Pleistocene and Tertiary aeolian deposits (Braun 1950) that are often deeply eroded and very steep, with fertile topsoil and abundant moisture (Miller and Neiswender 1987). This BpS generally corresponds with Ecoregion 74a (Bluff Hills) and the western portion of Ecoregion 74c (Southern Rolling Plains) (EPA 2004). This system occupies upland loess bluffs, ravines, and adjacent plains that are considerably higher in elevation than the adjacent Mississippi River Alluvial Plain. The bluffs may extend to 150m (500ft) in elevation and from 30-60m (100-200ft) above the adjacent Mississippi Alluvial Plain. Loessal deposits are thickest near the river, becoming thinner to the east.

Vegetation Description

This system is usually a closed-canopy, multi-layered, forest. Defined within the range of southern magnolia (Magnolia grandiflora), it is described elsewhere as dominated by beech-magnolia on the bluffs, and cherrybark oak (Quercus pagoda), sweetgum (Liquidambar styraciflua) and other hardwoods on the plains. As with the northern bluffs, those descriptions perhaps understate the diversity of this BpS. Braun (1950) characterized the loess bluffs as mixed mesophytic forest, albeit modified in the southern loess bluffs by the occurrence of southern magnolia. Delcourt and Delcourt (1974) described a LA portion similarly. Indeed, over 50 tree species occur in the loess bluffs (Smith and Linnartz, 1980). Beyond beech, southern magnolia, cherrybark oak and sweetgum, significant canopy species include water, swamp chestnut, black, southern red and white oaks, as well as loblolly (Pinus taeda) and spruce pine (Pinus glabra), bitternut and mockernut hickories, blackgum and yellow-poplar.

Subcanopy, and some canopy, species include American hornbeam, eastern hophornbeam, red and Florida maples, sourwood, sassafras, flowering dogwood, persimmon, winged elm and American holly. These bluffs, as well as the northern bluffs, frequently provide habitat for species that are more common to the north (Delcourt and Delcourt 1975).

Vegetation of the loess plains would more likely be dominated by Quercus pagoda, Liquidambar styraciflua and other hardwood species, along with Pinus taeda (NatureServe 2006).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| QUPA5 | *Quercus pagoda* | Cherrybark oak |
| LIQUI | *Liquidambar* | Sweetgum |
| FAGR | *Fagus grandifolia* | American beech |
| MAGR4 | *Magnolia grandiflora* | Southern magnolia |
| QUNI | *Quercus nigra* | Water oak |
| PITA | *Pinus taeda* | Loblolly pine |
| PIGL2 | *Pinus glabra* | Spruce pine |
| NYSY | *Nyssa sylvatica* | Blackgum |

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

Disturbance Description

Considering the southern bluffs in conjunction with a portion of the adjacent plains, along with proximity to the Gulf of Mexico, causes this BpS to be somewhat less stable and more fire prone than the bluffs alone to the north. As modeled here, replacement disturbance has roughly equal probability of occurring by either fire or weather related events. The latter include windthrow, lightning and ice damage, as well as the inclusion of the erosion and mass wastage that give the bluffs their characteristic steepness. Widespread insect or disease mortality has not been reported. Wind/weather/stress replacement frequency is modeled near 220yrs, replacement fire return at approximately 215yrs, and all fire return frequency at about 40yrs. "Open" structure is uncommon, even when defined as canopy closure <81%, and may be created by mixed-severity fire. Surface fire may maintain open conditions, but it does not transition closed classes. Disturbance is presumed to occur primarily in small gaps (less than one-half acre). The presence of aggregates of intolerant species suggests that larger scale disturbances occasionally play a role, likely more so on the plains.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 218 | 19 | 100 | 1250 |
| Moderate (Mixed) | 189 | 22 | 90 | 650 |
| Low (Surface) | 69 | 59 | 40 | 145 |
| All Fires | 41 | 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 loess bluff forests are described by Natureserve (2006) as large patch communities. At the inferred scale of disturbance, an area of 500,000ac may capture the BpS mosaic.

Adjacency or Identification Concerns

Defined largely by hardwood domination, presumably tied to loessal depth and moisture regime, the historical eastern extent of this BpS may not be possible to determine.

Issues or Problems

For this BpS, the effect of surface fire is more reflected in the status of the sub-canopy than the overstory. However, since an open/closed distinction based on sub-canopy requires ground-based data, this model omits it, and only rarely allows mixed severity fire to create "open" stands. The result is a significant reduction in the percent displayed in open classes from previous models. Also, this BpS is sandwiched between the nonpyrophytic alluvial plain (Frost 1998) and the much drier loess plains which were home to significant aboriginal populations and thus, a heightened chance of fire. The degree of sheltering here is based on topography and a westerly approach of significant wind events.

Native Uncharacteristic Conditions

Comments

The Rapid Assessment model R9OADM served as a basis for the development of the VDDT model.

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 12 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUPA5 | Quercus pagoda | Cherrybark oak | Upper |
| LIQUI | Liquidambar | Sweetgum | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| MAGR4 | Magnolia grandiflora | Southern magnolia | Upper |

Description

This class is characterized by sprouts, seedlings and saplings, primarily of major overstory species, in gaps or small openings created by wind, lightning, soil slippage, insect/disease or fire. Shade intolerant species are confined to multiple-tree gaps. Canopy closure is usually complete beyond the first 3-5yrs.

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

Class B 43 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUPA5 | Quercus pagoda | Cherrybark oak | Upper |
| LIQUI | Liquidambar | Sweetgum | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| MAGR4 | Magnolia grandiflora | Southern magnolia | Upper |

Description

Class B is dominated by young to early mature canopy species with high canopy closure. A well-developed mid-story is likely present, particularly at later ages of this class, in the absence of surface fire.

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

Class C 7 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUPA5 | Quercus pagoda | Cherrybark oak | Upper |
| LIQUI | Liquidambar | Sweetgum | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| MAGR4 | Magnolia grandiflora | Southern magnolia | Upper |

Description

Similar to class B but with less canopy closure and no established mid-story. Surface fire may maintain open structure, but without it, or replacement disturbance, the canopy will close.

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

Class D 4 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUPA5 | Quercus pagoda | Cherrybark oak | Upper |
| LIQUI | Liquidambar | Sweetgum | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| MAGR4 | Magnolia grandiflora | Southern magnolia | Upper |

Description

Class D is characterized by an early to late mature canopy that may exceed 100ft in height. Canopy closure is less than full without well-developed lower layers. Dominant overstory species vary depending on location and stand history. Similar to class C, this class closes, barring other intervening transitions.

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

Class E 34 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUPA5 | Quercus pagoda | Cherrybark oak | Upper |
| LIQUI | Liquidambar | Sweetgum | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| MAGR4 | Magnolia grandiflora | Southern magnolia | Upper |

Description

Class E exhibits canopy characteristics similar to class D, but with higher canopy closure. This class often displays a multi-layered vertical structure except where an open understory has been maintained by light surface fire.

*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 | 15 |
| Mid1:OPN | 16 | Late1:OPN | 80 |
| Mid1:CLS | 16 | Late1:CLS | 80 |
| Late1:OPN | 81 | Late1:OPN | 999 |
| Late1:CLS | 81 | 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 | 0.005 | 200 | 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 | 0.005 | 200 | Yes | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.009 | 111 | Yes | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.02 | 50 | No | 0 |
| Wind or Weather or Stress | Mid1:CLS | Early1:ALL | 0.004 | 250 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.006 | 167 | Yes | 0 |
| Surface Fire | Mid1:CLS | Mid1:CLS | 0.014 | 71 | No | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 25 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.006 | 167 | Yes | 0 |
| Wind or Weather or Stress | Late1:OPN | Early1:ALL | 0.008 | 125 | Yes | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.025 | 40 | No | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.004 | 250 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Early1:ALL | 0.007 | 143 | Yes | 0 |
| Surface Fire | Late1:CLS | Late1:CLS | 0.019 | 53 | No | 0 |

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