13240

Northern Atlantic Coastal Plain Hardwood Forest

BpS Model/Description Version: Aug. 2020

Update: 5/25/2018

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| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Tim Simmons | tim.simmons@state.ma.us | Dr. William A. Patterson III | wap@forwild.umass.edu |
| Jason Cole | jcole@fs.fed.us | None | None |
| None | None | None | None |

Vegetation Type

Forest and Woodland

Map Zones

60, 65, 66

Geographic Range

Upper piedmont flats and lower mountain valleys on the east side of the Southern Appalachian Mountains, Georgia to Pennsylvania, including the Great Valley, the Shenandoah Valley, the Hudson Valley of New York and southern New England.

Biophysical Site Description

Eastern Woodland Mosaic forests dominated by oak are distributed across multiple physiographic and soil regions including unconsolidated sandy soils of the coastal plain to the predominantly loams and sandy loams (Lorimer, 2003). In glaciated areas often associated with outwash plains consisting of coarse sandy soils. Water and nutrient retention are low in areas dominated by glacially derived soils. Precipitation ranges widely but timing is more important to fire return interval. Dry periods in spring and fall accompanied by high winds increase fire probability.

Vegetation Description

The original community as described by early explorers and the first settlers was a mosaic of open woodland with interspersed prairies in the southern extent (Lederer 1672, Logan 1859) and shrubby grasslands in the northern extent (Stewart, 2002). Numerous pollen and charcoal studies provide little support for large grassland systems in the north with oak and pine dominated systems prevalent (Foster and Motzkin 2003). The prairie component in the south was located on the flat to convex and gently rolling uplands of the larger fire compartments. The largest of these in the southern part of the range was up to 5mi wide without a tree or only a few blackjack oaks (Logan 1859). Early explorers reported open treeless areas >3mi long (Pyne1982). In the Great Valley of Virginia, West Virginia and Maryland, extensive grasslands on the uplands were interspersed with oak woodland in ravines. The woodland canopy was dominated by post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), and shortleaf pine (*Pinus echinata*) in the southern half of the range, and by white oak (*Quercus alba*), mockernut hickory (*Carya tomentosa*), hackberry (*Celtis occidentalis*) and redcedar (*Juniperus virginiana*) in the Shenandoah Valley and other northern valleys with calcareous soils. On acidic soils, black oak (*Quercus velutina*) was a constituent in the northern range). Open prairies and the grassy understory beneath woodland trees were dominated by tallgrass species such as little bluestem (*Schizachyrium scoparium*) and Indiangrass (*Sorghastrum nutans*) on the drier sites, with switchgrass (*Panicum virgatum*) and big bluestem (*Andropogon gerardii*) in moist swales. The grasses were interspersed with a diverse assortment of perennial forbs. The federally endangered smooth coneflower (*Echinacea laevigata*) was a component of the herb layer in the southern range from North Carolina to northeast Georgia. Understories of fire-maintained wooded areas were characterized by short grasses such as poverty grass (*Danthonia* spp) in the southern end of the range and *Deschampsia flexuosa* in the northern range. Burned woodland and scrub vegetation were the habitat for the extinct subspecies of the western prairie chicken, the eastern heath hen (*Tympanuchus cupido cupido*) (Foster and Motzkin 2003). Many open sites were preferentially colonized by Euro-Americans because they were already partially cleared (Pyne, 1982, Stewart 2002).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| QUVE | *Quercus velutina* | Black oak |
| QUAL | *Quercus alba* | White oak |
| CATO | *Calochortus tolmiei* | Tolmie star-tulip |
| QURU | *Quercus rubra* | Northern red oak |
| QUST | *Quercus stellata* | Post oak |
| PIST | *Pinus strobus* | Eastern white pine |

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

Disturbance Description

Naturally this system has frequent fire dominated by low-intensity surface fires. These fires were often ignited by Native Americans with low mean fire return intervals. However, fire return intervals would have varied widely from a few years to several decades for any given point on the landscape. Fire return intervals of <5yrs over prolonged periods would have resulted in the creation of brushland, in which the oaks are continually forced to resprout without reaching "tree" status.

Lightning ignitions are insignificant except in ridgetop systems. Periodic tropical storms increase fuel loads through windthrow and crown damage, increase fire intensities and create ladder fuels causing the increased probability of stand-replacing fires.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 47 | 7 | 100 | 300 |
| Moderate (Mixed) | 44 | 8 | 20 | 60 |
| Low (Surface) | 4 | 85 | 1 | 7 |
| All Fires | 4 | 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

Probably the dominant vegetation around Native Algonquian settlements that were concentrated in river valleys and on sand plains. Thousands of acres were interspersed with vegetation influenced by less frequent fires on north-facing slopes and in wetlands.

Adjacency or Identification Concerns

The description of this type is limited to vegetation of the zone of prairie-woodland mosaic at the toe of the Appalachians and the Appalachian eastern interior valleys. Grades to the east into piedmont oak-hickory-shortleaf pine in the Carolinas and south, and to closed canopy oak-hickory forests in mid-Atlantic states and pine barrens in the northeast. On the piedmont there were smaller and more dispersed prairies which included several distinct types depending upon soils and geological substrates such as diabase and serpentine. Graded locally upslope into fire maintained chestnut oak (*Quercus montana*), mockernut hickory (*Carya tomentosa*) and, historically, American chestnut (*Castanea dentata*) forest with a grassy, fire-maintained understory. Grades into northern hardwoods in the northwest portion of the unit.

Issues or Problems

This is based on the Fire Regime Condition Class model EPWM (dated 20 November 2004), but original reference percentages could not be replicated, and class D may be under represented compared to the original model, but all class percentages are within +/- 10%. Fire regime frequencies are also similar to the original model.

Native Uncharacteristic Conditions

Comments

This model was directly adapted for LANDFIRE by Randy Swaty from the Rapid Assessment model R7EPWM (Eastern Woodland Mosaic). Changes included small shifts in class percentages (as result of fixing model rule violations), a change in vegetation height and cover to meet LANDFIRE rules, and small changes in disturbance chart numbers.

Suggested Reviewers: Cecil Frost - Independent, Dr. William A. Patterson III. - U-Mass, Doug Wallner - National Park Service, Paul Nelson, Tom Foti and Doug Zollner.

Dr. William A. Patterson III reviewed the model on 3 November 2007 and suggested minor changes to the disturbance description. Colleen Ryan incorporated these changes and made additional minor changes to the class descriptions to make them match the model.

Comments: For future model runs, the probability of a wind/weather disturbance should increase in late-open and late-closed with increased tree volume.

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 | A | A | A | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 0.5-1.0 | A | A | A | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 1.0-3.0 | A | A | A | UN | UN | UN | UN | UN | UN | UN |
| Shrub | >3.0 | A | A | A | UN | UN | UN | UN | UN | UN | UN |
| Tree | 0-5 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 5-10 | UN | UN | C | C | C | C | B | B | B | B |
| Tree | 10-25 | UN | UN | D | D | D | D | E | E | E | E |
| Tree | 25-50 | UN | UN | UN | UN | UN | UN | E | E | E | E |
| Tree | >50 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |

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** |
| SCSC | Schizachyrium scoparium | Little bluestem | Upper |
| QUVE | Quercus velutina | Black oak | Upper |
| QUAL | Quercus alba | White oak | Upper |
| BEPO | Betula populifolia | Gray birch | Upper |

Description

This class is post replacement consists of large open areas with oak sprouts, perennial grasses and forbs. Dominant lifeform is herbaceous. Height is herbaceous short-herbaceous medium.

*Maximum Tree Size Class*  
Seedling <4.5ft

Class B 8 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUVE | Quercus velutina | Black oak | Upper |
| QUAL | Quercus alba | White oak | Upper |
| BEPO | Betula populifolia | Gray birch | Upper |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |

Description

This class is a mid-closed state that consists of sapling to pole-sized oaks with reduced herbaceous understory.

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

Class C 12 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |
| QUVE | Quercus velutina | Black oak | Upper |
| QUAL | Quercus alba | White oak | Upper |
| BEPO | Betula populifolia | Gray birch | Upper |

Description

This class is a mid-open state that consists of shrub/grass understory with sapling to pole-sized oak overstory.

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

Class D 53 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUVE | Quercus velutina | Black oak | Upper |
| QUAL | Quercus alba | White oak | Upper |
| BEPO | Betula populifolia | Gray birch | Mid-Upper |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |

Description

This class is a late-open state that consists of lower tree canopy cover of woodland/savanna oak-hickory (and shortleaf pine in the southern range) overstory with understory of perennial grasses and forbs.

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

Class E 17 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUVE | Quercus velutina | Black oak | Upper |
| QUAL | Quercus alba | White oak | Upper |
| BEPO | Betula populifolia | Gray birch | Middle |
| VACO | Vaccinium corymbosum | Highbush blueberry | Lower |

Description

This class is a late-closed state with higher canopy closure of red oak, white oak, black oak, tulip poplar, hackberry, and in the most fire-sheltered ravines, sugar maple and beech in the north. In the south, white oak, post oak, mockernut hickory, and sometimes white pine (*Pinus strobus*) in fire-sheltered north slopes. Understory with tree saplings and low shrubs such as blueberry (*Vaccinium* spp.).

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

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:OPN | 9 |
| Mid1:OPN | 10 | Late1:OPN | 69 |
| Mid1:CLS | 20 | Late1:CLS | 69 |
| Late1:OPN | 70 | Late1:OPN | 999 |
| Late1:CLS | 70 | 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 | 0.2 | 5 | Yes | 0 |
| Alternative Succession | Mid1:OPN | Mid1:CLS | 1 | 1 | Yes | 10 |
| Wind or Weather or Stress | Mid1:OPN | Mid1:OPN | 0.001 | 1000 | No | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.025 | 40 | No | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.3 | 3 | No | 0 |
| Wind or Weather or Stress | Mid1:CLS | Mid1:OPN | 0.001 | 1000 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.025 | 40 | Yes | 0 |
| Surface Fire | Mid1:CLS | Mid1:CLS | 0.1 | 10 | No | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 10 |
| Wind or Weather or Stress | Late1:OPN | Late1:OPN | 0.001 | 1000 | No | 0 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.025 | 40 | No | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.3 | 3 | No | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.0005 | 2000 | Yes | 0 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.0005 | 2000 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.025 | 40 | Yes | 0 |
| Surface Fire | Late1:CLS | Late1:CLS | 0.2 | 5 | No | 0 |

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