

13350

## Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest

BpS Model/Description Version: Aug. 2020

| Modelers  |                                                                          | Reviewers   |                                                    |
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| None      | None                                                                     | None        | None                                               |
| None      | None                                                                     | None        | None                                               |

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### Vegetation Type

Forest and Woodland

### Map Zones

55, 58, 60

### Geographic Range

Within the southeast zone, this Biophysical Setting (BpS) is found on dissected landscapes in the Middle Atlantic Coastal Plain, Southeastern Plains, and Southern Coastal Plain (EPA Level III Ecoregions 63, 65, and 75) of Virginia, the Carolinas, Georgia, and Florida.

### Biophysical Site Description

This BpS occurs on upper slopes and drier rolling uplands of the upper (and less frequently lower) coastal plain that are somewhat fire sheltered. Soils are typically acidic, well drained, and of varying textures but exclusive of deep sands. Some rare examples may occur on more base-rich sites. Elevations generally range from 10-300ft above mean sea level. Soils are loamy to clayey and well drained but not excessively drained. Similar sites with coarse sandy soils tend to support other ecological systems, in part due to the influence of more frequent fire (NatureServe 2006).

### Vegetation Description

Vegetation consists of forests dominated by combinations of upland oaks, particularly *Quercus alba* (white oak), *Quercus falcata* (southern red oak), *Quercus stellata* (post oak), *Quercus margarettiae* (scrubby post oak), and other species. There is some variation between the composition of northern versus southern examples. In southern examples, evergreen or semi-evergreen oak species such as *Quercus nigra* (water oak) and *Quercus hemisphaerica* (darlington oak) become more prominent. Hickories (e.g., *Carya alba* [mockernut hickory], *Carya glabra* [pignut hickory], and/or *Carya pallida* [sand hickory]) may be present. There is some variation in composition with aspect and degree of exposure to fire. *Pinus echinata* (shortleaf pine) may be present in some stands, particularly on drier south- and west-facing slopes but is typically not dominant. *Pinus taeda* (loblolly pine) is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past cutting. More mesophytic species such as *Fagus grandifolia* (American beech) and *Magnolia grandiflora* (southern magnolia) are absent or are confined to the understory. A well-developed shrub layer may be present, with *Vaccinium* spp. and *Gaylussacia* spp. most typical. The herb layer is generally sparse, and species richness tends to be low. In examples where fires have occurred, the understory would be open and savanna-like and dominated by grasses and forbs rather than shrubs (NatureServe 2006).

### BpS Dominant and Indicator Species

| Symbol | Scientific Name              | Common Name           |
|--------|------------------------------|-----------------------|
| QUAL   | <i>Quercus alba</i>          | White oak             |
| QUST   | <i>Quercus stellata</i>      | Post oak              |
| CAGL8  | <i>Carya glabra</i>          | Pignut hickory        |
| QUFA   | <i>Quercus falcata</i>       | Southern red oak      |
| PITA   | <i>Pinus taeda</i>           | Loblolly pine         |
| CAAL27 | <i>Carya alba</i>            | Mockernut hickory     |
| QUHE2  | <i>Quercus hemisphaerica</i> | Quercus hemisphaerica |
| PIEC2  | <i>Pinus echinata</i>        | Shortleaf pine        |

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

### Disturbance Description

Frequent surface fires occurred on a 5-10yr return interval from both lightning and Native American ignitions. These frequent light surface fires maintained the grassy understory and kept more fire tolerant hardwoods and shrubs from capturing the understory and forming a midstory layer. Lightning fires occurred primarily during the spring dry season (April and May) with a secondary peak of Native American and settler burning during the fall (October and November).

There seems to be some discrepancy between the above description and the NatureServe 2006 description of the ecological system by the same name, Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest (CES203.241). This document indicates that fire is naturally infrequent in this system, which is the important factor separating it from adjacent *Pinus-palustris*-dominated systems. However, the document does agree with the description above that fires, if they penetrate, are likely to be low in intensity.

Occasionally, during extensive droughts, mixed-severity or stand-replacement fires did occur, especially in drier shortleaf-pine-dominated stands. Local thunderstorms created gaps on a small but continual basis. More extensive regional disturbances included tropical storms during the growing season and ice storms during winter (in the northern part of the range). Dense stands of middle- to older-aged pines (where present) were susceptible to periodic mortality from bark beetle epidemics.

### Fire Frequency Results

| Severity         | Min FI | Max FI |
|------------------|--------|--------|
| Replacement      |        |        |
| Moderate (Mixed) |        |        |
| Low (Surface)    |        |        |
| All Fires        |        |        |

### Scale Description

Generally occurs as small to medium patches, of a few to dozens of acres. Mosaics may contain up to several hundred acres in close proximity (NatureServe 2006).

Surface fire usually covered the entire fire compartment, which ranged in size from 10-500ac. The actual fires, however, were much larger. They usually started in the adjacent longleaf ecosystem and then entered into this vegetation type. Within this vegetation, there was

considerable patchiness in overstory species composition. Uniform composition varied in size from one-quarter acre to 5ac. This was related to topography and disturbance. In openings created by windthrow and disease where a single tree or two were lost, regeneration occurred. Larger gaps were created by tropical storms, ice storms, or bark beetle outbreaks. These disturbances still resulted in mostly small gap openings of one-quarter acre to 2ac. Large openings were infrequently created by replacement fires following extensive droughts coupled with severe bark beetle mortality.

### **Adjacency or Identification Concerns**

Many of the currently existing stands have much more loblolly pine than existed prior to European settlement. These stands are also much denser with more midstory hardwoods, including mesic hardwoods like red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), and water oak (*Quercus nigra*), and an understory dominated by woody shrubs and tree seedlings resulting from reduced frequency of surface fires.

NatureServe 2006 indicates there is some evidence that this system has expanded into areas once occupied by longleaf pine as fire has been suppressed. There may have been a shifting boundary between these systems, driven by variation in fire frequency. These forests probably generally exist naturally as old-growth forests, with canopy dynamics dominated by gap-phase regeneration.

Most commonly associated with Atlantic Coastal Plain Mesic Hardwood and Mixed Forest (CES203.242). Naturally grades to adjacent *Pinus-palustris*-dominated systems on drier or flatter sites, but virtually no examples remain with this association intact (NatureServe 2006).

### **Issues or Problems**

The former extent of this type is somewhat conjectural based on limited data from a few sites across the region. Historic fire return intervals, however, are much more certain. There is a model showing an increase in both temperature and precipitation in Florida that would increase forest disease and pest issues. The understory could become denser with both shrubs and invasive plant species due to climate change, which could change increase fire intensity and shorten fire intervals.

Also, if shortleaf pine becomes denser, then fire intensity will increase due to the downed/decaying shortleaf pine debris. Hurricanes are to increase, and shortleaf pine has been noticed to be susceptible to being blown down/snapped off due to high winds.

### **Native Uncharacteristic Conditions**

Patches dominated by *Pinus taeda* (loblolly pine) are artifacts of past disturbance and succession in the absence of fire.

### **Comments**

Models and descriptions for map zone (MZ) 55 and MZ58 were identical and identified as duplicates in the BpS review. Model results were slightly different for MZ60, but an examination of the model did not find any significant differences. Since the description for MZ60 was the same as the other MZs, the reviewer (J. Smith) made the decision to collapse MZ60 with MZ58 and MZ55, using the description from MZ55.

Revised: This model is based on R9OHPI from the Rapid Assessment phase (Outcalt, Frost) but is more restricted in its range (limited to the Atlantic Coastal Plain) and in its concept (being primarily hardwood, with limited shortleaf pine). This earlier model replaced R8PIECpi from the Southern Appalachian model zone.

Originally based on model from FRCC (POHS) developed by C. Frost, who needs to review the information contained in this database. No real changes to the VDDT model were made by Pyne from the earlier RA version.

## 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     | B     | B     | B      |
| Tree                 | 10-25      | C                | C     | C     | C     | C     | C     | C     | B     | B     | B      |
| Tree                 | 25-50      | D                | D     | D     | D     | D     | D     | D     | E     | E     | E      |
| Tree                 | >50        | D                | D     | D     | D     | D     | D     | D     | E     | 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

|                |           |                                             |
|----------------|-----------|---------------------------------------------|
| <b>Class A</b> | <b>10</b> | <b>Early Development 1 - All Structures</b> |
|----------------|-----------|---------------------------------------------|

### Indicator Species

| Symbol | Scientific Name       | Common Name           | Canopy Position |
|--------|-----------------------|-----------------------|-----------------|
| QUAL   | Quercus alba          | White oak             | Upper           |
| PIEC2  | Pinus echinata        | Shortleaf pine        | Upper           |
| QUHE2  | Quercus hemisphaerica | Quercus hemisphaerica | Upper           |
| QUST   | Quercus stellata      | Post oak              | Upper           |

### Description

| Symbol | Scientific Name | Common Name | Canopy Position |
|--------|-----------------|-------------|-----------------|
|--------|-----------------|-------------|-----------------|

|        |                  |                   |           |
|--------|------------------|-------------------|-----------|
| QUAL   | Quercus alba     | White oak         | Upper     |
| PIEC2  | Pinus echinata   | Shortleaf pine    | Mid-Upper |
| QUST   | Quercus stellata | Post oak          | Mid-Upper |
| CAAL27 | Carya alba       | Mockernut hickory | Mid-Upper |

#### Description

Class D is an open-canopy forest or woodland with large oaks (primarily more fire-tolerant ones) and pines (particularly shortleaf pine) and a herbaceous-dominated understory with a mixture of grasses and forbs.

#### Maximum Tree Size Class

Large 21-33" DBH

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### **Class E      13      Late Development 1 - Closed**

#### Indicator Species

| Symbol | Scientific Name | Common Name       | Canopy Position |
|--------|-----------------|-------------------|-----------------|
| QUAL   | Quercus alba    | White oak         | Upper           |
| QUFA   | Quercus falcata | Southern red oak  | Upper           |
| CAAL27 | Carya alba      | Mockernut hickory | Low-Mid         |
| COFL2  | Cornus florida  | Flowering dogwood | Low-Mid         |

#### Description

Class E is a closed-canopy forest with large oaks (including less fire-tolerant ones) and pines (including loblolly pine), a midstory of fire-intolerant hardwoods, and a sparse understory dominated by shrubs and tree seedlings.

#### 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:OPN    | 14            |
| Mid1:OPN   | 15             | Late1:OPN   | 59            |
| Mid1:CLS   | 15             | Late1:CLS   | 59            |
| Late1:OPN  | 60             | Late1:OPN   | 460           |
| Late1:CLS  | 60             | Late1:CLS   | 460           |

#### **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 |
|------------------------|-----------------------|---------------------|-------------------------|-----------------------|-----------------------------------------------------|------------------------------|
| Alternative Succession | Early1:ALL            | Mid1:CLS            | 1                       | 1                     | Yes                                                 | 13                           |

|                           |            |            |       |     |     |    |
|---------------------------|------------|------------|-------|-----|-----|----|
| Replacement Fire          | Early1:ALL | Early1:ALL | 0.01  | 100 | Yes | 0  |
| Surface Fire              | Early1:ALL | Early1:ALL | 0.14  | 7   | No  | 0  |
| Alternative Succession    | Mid1:OPN   | Mid1:CLS   | 1     | 1   | Yes | 12 |
| Wind or Weather or Stress | Mid1:OPN   | Early1:ALL | 0.004 | 250 | Yes | 0  |
| Replacement Fire          | Mid1:OPN   | Early1:ALL | 0.005 | 200 | Yes | 0  |
| Surface Fire              | Mid1:OPN   | Mid1:OPN   | 0.17  | 6   | 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   | 0.05  | 20  | Yes | 0  |
| Surface Fire              | Mid1:CLS   | Mid1:CLS   | 0.05  | 20  | No  | 0  |
| Alternative Succession    | Late1:OPN  | Late1:CLS  | 1     | 1   | Yes | 15 |
| Replacement Fire          | Late1:OPN  | Early1:ALL | 0.003 | 333 | Yes | 0  |
| Insects or Disease        | Late1:OPN  | Early1:ALL | 0.003 | 333 | Yes | 0  |
| Wind or Weather or Stress | Late1:OPN  | Early1:ALL | 0.005 | 200 | Yes | 0  |
| Surface Fire              | Late1:OPN  | Late1:OPN  | 0.17  | 6   | No  | 0  |
| Wind or Weather or Stress | Late1:CLS  | Early1:ALL | 0.004 | 250 | Yes | 0  |
| Replacement Fire          | Late1:CLS  | Early1:ALL | 0.005 | 200 | Yes | 0  |
| Insects or Disease        | Late1:CLS  | Early1:ALL | 0.005 | 200 | Yes | 0  |
| Wind or Weather or Stress | Late1:CLS  | Late1:OPN  | 0.01  | 100 | Yes | 0  |
| Mixed Fire                | Late1:CLS  | Late1:OPN  | 0.01  | 100 | Yes | 0  |
| Surface Fire              | Late1:CLS  | Late1:CLS  | 0.05  | 20  | No  | 0  |

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