13280

East Gulf Coastal Plain Limestone Forest

BpS Model/Description Version: Aug. 2020

Update: 5/29/2018

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Milo Pyne | milo\_pyne@natureserve.org | Chris Szell | cszell@tnc.org |
| Carl Nordman | carl\_nordman@natureserve.org | Keith Fisher | kfisher@tnc.org |
| None | None | None | None |

Vegetation Type

Forest and Woodland

Map Zones

46, 99

Geographic Range

Within the southeast zone this biophysical setting (BpS) is found on calcareous or base-rich soils of dissected landscapes in the Southern Coastal Plain and Southeastern Plains (EPA Level III Ecoregion 75 and parts of 65) of Georgia, Alabama, Mississippi, and Tennessee. It is most prevalent west and north through Alabama and Mississippi, in the Black Belt, Jackson Prairie Belt, and related areas.

Biophysical Site Description

This BpS occurs on upper slopes and drier rolling uplands of the upper east gulf coastal plain that may be somewhat fire sheltered. Soils are basic and contain substantial clay in the upper horizons, varying in depth. Examples are most common in the Black Belt region of Alabama and Mississippi, but are also present in more isolated patches in other portions of the region, including western Alabama, eastern Georgia, and southwestern middle Tennessee (NatureServe 2006).

Vegetation Description

Generally, the vegetation of this BpS consists of forests and woodlands on well-developed, deep soils. Typical stands are dominated by oaks and hickories, particularly species which are indicative of finer-textured soils and/or a higher base status in the soil (e.g. *Carya carolinae-septentrionalis, Quercus muehlenbergii, Quercus pagoda, Quercus shumardii,* and *Quercus stellata*). Other hardwood trees include *Fraxinus americana, Liquidambar styraciflua, Acer barbatum,* and *Aesculus glabra*. The rare *Carya myristiciformis* may also be found in some stands. Understory trees may include *Fraxinus americana* and *Juniperus virginiana* var. *virginiana*. Early-successional or fire-suppressed stands may exhibit greater dominance by *Juniperus virginiana*. More nutrient-rich or fire-sheltered stands may exhibit dominance or co-dominance by *Fraxinus americana, Tilia americana* (most commonly var. *caroliniana*, but var. *heterophylla* along the Chattahoochee River) and/or *Acer barbatum*. Understory trees may include smaller examples of canopy species in addition to *Aesculus pavia* var. *pavia, Cercis canadensis, Cornus florida, Ostrya virginiana*, and *Ulmus alata*. Shrubs and woody vines may include *Arundinaria gigantea, Berchemia scandens, Bignonia capreolata, Cocculus carolinus, Cornus drummondii, Crataegus* spp., *Euonymus americanus, Euonymus atropurpureus, Frangula* *caroliniana, Hydrangea quercifolia, Ilex decidua, Menispermum canadense, Parthenocissus quinquefolia, Ptelea trifoliata, Sideroxylon lycioides, Staphylea trifolia, Symphoricarpos orbiculatus, Toxicodendron radicans, Viburnum* spp and *Vitis* spp. Some typical herbs include *Chasmanthium laxum, Chasmanthium sessiliflorum, Dichanthelium boscii, Lithospermum tuberosum, Polystichum acrostichoides, Sanicula* spp., *Solidago auriculata, Spigelia marilandica, Trillium* spp., and *Verbesina virginica*. The ground layers of some stands may exhibit dominance by native warm-season grasses and other graminoids, including *Schizachyrium scoparium, Andropogon* spp., *Danthonia* spp. and *Carex cherokeensis*. In addition, *Tillandsia usneoides* may be present as an epiphyte.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| ACBA3 | *Acer barbatum* | Southern sugar maple |
| QUPA5 | *Quercus pagoda* | Cherrybark oak |
| QUSH | *Quercus shumardii* | Shumard's oak |
| CACA38 | *Carya carolinae-septentrionalis* | Southern shagbark hickory |
| FRAM2 | *Fraxinus americana* | White ash |
| JUVIV | *Juniperus virginiana var. virginiana* | Eastern redcedar |
| OSVIV | *Ostrya virginiana var. virginiana* | Hophornbeam |
| QUMU | *Quercus muehlenbergii* | Chinkapin oak |

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 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).

Occasionally, during extensive droughts, mixed severity or stand replacement fires did occur, especially in drier stands, or those containing eastern red-cedar or rarely with pines (e.g. loblolly and/or shortleaf) or local thunderstorm-caused blowdowns 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, and younger eastern red-cedars were killed by periodic droughts.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 201 | 3 |  |  |
| Moderate (Mixed) | 100 | 7 |  |  |
| Low (Surface) | 8 | 90 |  |  |
| All Fires | 7 | 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

Surface fire usually covered the entire fire compartment, which ranged in size from 10-500ac. The actual fires however, were presumably much larger. They could start in adjacent ecosystems (prairie-dominated in the Black Belt or possibly pine-dominated elsewhere) and then continue uninterrupted into this vegetation type. Within this vegetation there was considerable patchiness in overstory species composition. Uniform composition varied in size from 1/4-5ac. 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, insect and/or disease outbreaks, or prolonged drought. These disturbances still resulted in mostly small gap openings of 1/4 -2ac. Large opening were infrequently created by replacement fires following extensive droughts, or other tree mortality.

Adjacency or Identification Concerns

Many of the currently existing stands have much more dominance by fire-intolerant hardwoods like maples (*Acer barbatum, Acer leucoderme*, and *Acer rubrum*), white ash (*Fraxinus americana*) and sweetgum (*Liquidambar styraciflua*) as well as eastern red-cedar (and rarely shortleaf and/or loblolly pines) or than is thought to have existed prior to European settlement. These stands are also much denser with more midstory hardwoods, including fire-intolerant ones, and an understory dominated by woody shrubs and tree seedlings resulting from reduced frequency of surface fires.

This BpS/Ecological System is closely related to “regular” dry-mesic hardwood systems of the Gulf Coastal Plain (e.g. BpS 1330).

Issues or Problems

The former extent of this type is somewhat conjectural based on limited data from a few sites across the region. Its complete range is not fully understood. Historic fire return intervals however, are much more certain.

Native Uncharacteristic Conditions

Patches dominated by eastern red-cedar (or rarely with pines, e.g. loblolly and/or shortleaf) are artifacts of past disturbance and succession in the absence of fire. These are likely to eventually succumb to drought, fire, or insect damage (in the case of any pines). Pines are generally atypical due to the high base status in the soils.

Comments

**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 | 999 |
| Late1:CLS | 60 | 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** |
| 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 |

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**

Class A 11 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUMU | Quercus muehlenbergii | Chinkapin oak | All |
| JUVIV | Juniperus virginiana var. virginiana | Eastern redcedar | All |
| QUPA5 | Quercus pagoda | Cherrybark oak | All |
| QUSH | Quercus shumardii | Shumard's oak | All |

Description

Class A is characterized by oak, hickory, and eastern red-cedar reproduction (up to sapling size) in gaps. Oaks and other hardwoods dominate the woody strata, (including fire-intolerant taxa). Can be mixed oak and eastern red-cedar on drier sites, in larger gaps resulting from periodic droughts, and/or after mixed or replacement fires. The ground layer of gaps or more open stands is dominated by native warm-season grasses, other graminoids, and forbs intermixed with shrub saplings.

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

Class B 18 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUMU | Quercus muehlenbergii | Chinkapin oak | Mid-Upper |
| JUVIV | Juniperus virginiana var. virginiana | Eastern redcedar | Low-Mid |
| QUPA5 | Quercus pagoda | Cherrybark oak | Mid-Upper |
| QUSH | Quercus shumardii | Shumard's oak | Mid-Upper |

Description

Class B has a closed canopy dominated by hardwoods with a midstory of hardwoods, including fire-intolerant taxa, with eastern red-cedar, resulting from fire exclusion. Understory herbaceous growth, particularly grasses and graminoids, is reduced due to substantial shading from the canopy and midstory layers.

Rare replacement fires occur, as well as surface fires may occur but these are not intense or frequent enough to kill the overstory or thin the midstory. More intense mixed fires can reduce the overstory and midstory, and drive the system to a more open condition.

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

Class C 37 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUMU | Quercus muehlenbergii | Chinkapin oak | Mid-Upper |
| QUST | Quercus stellata | Post oak | Mid-Upper |
| CACA38 | Carya carolinae-septentrionalis | Southern shagbark hickory | Mid-Upper |
| OSVIV | Ostrya virginiana var. virginiana | Hophornbeam | Low-Mid |

Description

Class C is an open-canopy forest or woodland of oaks (primarily more fire-tolerant ones including chinquapin oak), with hickories and some other hardwoods and with a grass- and forb-dominated understory.

With surface fire occurring this class will retain an open structure. In the absence of fire, a midstory will develop. Rare replacement fires may occur. Severe wind or weather stresses can also cause a transition to an early post-replacement phase.

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

Class D 22 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUMU | Quercus muehlenbergii | Chinkapin oak | Upper |
| QUST | Quercus stellata | Post oak | Upper |
| CACA38 | Carya carolinae-septentrionalis | Southern shagbark hickory | Upper |
| OSVIV | Ostrya virginiana var. virginiana | Hophornbeam | Mid-Upper |

Description

This is an open-canopy forest or woodland with large oaks (primarily more fire-tolerant ones including chinquapin oak) and hickories, and an herbaceous-dominated understory with a mixture of grasses and forbs.

With surface fires occurring, class will retain an open, old growth structure. If fire is removed from the system, it will develop a midstory and transition into a closed state through an alternative successional pathway. Rare replacement fires may occur during extremely dry conditions. Insect and disease outbreaks and wind/weather stresses can also return this class to an early post-replacement phase.

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

Class E 12 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUPA5 | Quercus pagoda | Cherrybark oak | Upper |
| QUSH | Quercus shumardii | Shumard's oak | Upper |
| ACBA3 | Acer barbatum | Southern sugar maple | Mid-Upper |
| FRAM2 | Fraxinus americana | White ash | Mid-Upper |

Description

This is a closed-canopy forest with large oaks (including less fire-tolerant ones, such as *Quercus pagoda* and *Quercus shumardii*) as well as hickories and other hardwoods (including less fire-tolerant ones, such as *Acer barbatum* and *Fraxinus americana*), a midstory of fire-intolerant hardwoods, and a sparse understory dominated by shrubs and tree seedlings.

This state occurs when fire is absent from the system, or when light surface fires occur. Mixed fires will remove the midstory and some of the overstory, and return the system to a more open condition. Mixed fires are infrequent. Rare replacement fires may occur during extreme drought events, and return the system to the early post-replacement phase. Insect and disease outbreaks and wind/weather stresses can also return class E to the early post-replacement stage. Less intense, but more frequent wind/weather stresses can reduce the midstory and overstory and open the canopy of this class.

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

Model Parameters

References

Brown, James K. and Smith, Jane Kapler, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station. 257 pp.

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems. NatureServe, Arlington, VA.

Frost, C.C. 2000. Studies in landscape fire ecology and presettlement vegetation of the southeastern United States. Doctoral dissertation. University of North Carolina, Chapel Hill, NC.

Frost, C.C. 1998. Presettlement fire frequency regimes of the United States: a first approximation. In: Pruden, T.L. and Brennan, L.A., eds. Fire in ecosystem management: shifting the paradigm from suppression to prescription. Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, FL. Pages 70-81

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.

NatureServe. 2006. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of 18 July 2006.

Schmidt, Kirsten M., Menakis, James P., Hardy, Colin C., Hann, Wendel J., Bunnell, David L. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. Gen. Tech. Rep. RMRS-GTR-87. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 41 pp. + CD.

Spetich, Martin A., ed. 2004. Upland oak ecology symposium: history, current conditions, and sustainability. Gen. Tech. Rep. SRS–73. Asheville, NC: USDA Forest Service, Southern Research Station. 311 pp.

USDA Forest Service, Southern Forest Research Station, Southern Forest Resource Assessment, [Online]. Available: http://www.srs.fs.fed.us/sustain