14160

Western Highland Rim Prairie and Barrens

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

Herbaceous

Map Zones

48

Geographic Range

This system is restricted to the Western Highland Rim of Tennessee and equivalent landforms in adjacent Alabama and Kentucky. Examples (good condition examples are limited and of small size) are found in Lawrence, Lewis, and Hickman counties of Tennessee. These areas are scattered across Subsection 223Eg (USFS) and EPA Level IV Ecoregion 71f.

Biophysical Site Description

These grassy barren communities occur on droughty soils often associated with remnant Cretaceous gravels which lie atop flat upland terrain in the Western Highland Rim of Tennessee and equivalent landforms in adjacent Alabama and Kentucky as well as on cherty residuum or other drought-prone materials whose structure and composition serves to retard woody plant growth and reproductive success. The topography is flat to gently sloping. Some proposed factors which have functioned to maintain the openness of these areas include the soil/geology as well as fire, natural and managed grazing, and modern anthropogenic factors such as mowing for hay, etc.

Vegetation Description

Stands may vary in physiognomy from savanna-grasslands to oak-dominated woodlands and forests. Many stands are in a forested condition today due to lack of fire. Most known examples are dry to dry-mesic in moisture status, with little bluestem (*Schizachyrium scoparium*) and Indian grass (*Sorghastrum nutans*) being prominent components. Other graminoid species present include bushy bluestem (*Andropogon glomeratus*), Nuttall's reedgrass (*Calamagrostis coarctata)*, and switchgrass (*Panicum virgatum*). Other dominants may include *Symphyotrichum dumosum* (= *Aster dumosus), Helianthus angustifolius, Potentilla simplex, Solidago odora, Solidago rugosa, Pteridium aquilinum,* and *Polytrichum* commune. Woody species may include the relatively fire-tolerant oaks *Quercus stellata, Quercus alba,* and *Quercus marilandica*, along with *Quercus falcata, Acer rubrum, Rhus copallinum, Rubus argutus*, and *Smilax glauca.* The reviewer suggested adding *Pinus echinata, Liriodendron tulipifera, Carya* spp, *Quercus prinus*, and *Quercus coccinea*.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| QUAL | *Quercus alba* | White oak |
| QUST | *Quercus stellata* | Post oak |
| SONU2 | *Sorghastrum nutans* | Indiangrass |
| ANGE | *Andropogon gerardii* | Big bluestem |
| LIATR | *Liatris* | Blazing star |
| LECA8 | *Lespedeza capitata* | Roundhead lespedeza |
| PAVI2 | *Panicum virgatum* | Switchgrass |
| VACCI | *Vaccinium* | Blueberry |

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

Disturbance Description

Past fire and grazing constitute the major dynamic processes for this region. Fires were frequent (potentially on a 5yr return interval), primarily of human origin, and are thought to have occurred in late summer to early autumn prior to European settlement. Some proposed factors which have functioned to maintain the openness of this system following the reduction of fire frequency include the droughty, gravelly soils and resulting stresses to vegetation, as well as more occasional fire. Fralish et al. (1999) noted that both post oak and chestnut oak woodlands are essentially the result of fire suppression in the barrens and historic savannas. In some areas, where the soils are particularly harsh (droughty, nutrient-poor, rocky), stands may retain an open aspect in the absence of fire. Some of the extant examples are largely dependent on contemporary management regimes.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 40 | 21 |  |  |
| Moderate (Mixed) | 26 | 33 |  |  |
| Low (Surface) | 18 | 46 |  |  |
| All Fires | 8 | 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

Under pre-settlement conditions, this was presumably a "large patch" system that predominated on larger flat and convex fire compartments, interspersed with forested systems on the more concave and slightly fire-sheltered topographic surfaces of the western Highland Rim. The relationship between these systems (prairie and barrens versus dry-mesic forest) is a complex one and their relative proportion of the landscape would have shifted under different conditions of climate, human population density, and human cultural practices related to the use of fire for agriculture and game management. It is classed as a "small patch" system primarily due to its fragmentation by fire suppression, tree plantations, agriculture, and increasing suburban development.

Adjacency or Identification Concerns

There are old fields and anthropogenic areas which can mimic legitimate examples of this system, and conversely there are areas which will appear forested which are actually fire-suppressed examples of the system which have dense woody vegetation instead of grasses (these are class B or E examples).

Issues or Problems

While many of the native common plant species still occur in the current barren/prairie/savanna physiognomy-dominated stands, lack of natural disturbance regimes impact herbaceous species competition and abundance. The vegetation tends to be driven either to grassland herbaceous (partly by mowing) or closed-canopy forest, leading to the loss of the natural woodland-savanna matrix. This BpS is very similar in its dynamics to the East Gulf Coastal Plain Jackson Plain Prairie and Barrens, ESP 1427.

Native Uncharacteristic Conditions

The woodlands, savannas, and prairies of this region often become filled in with woody vegetation (e.g. red maple, sweetgum, oak, and hickory species) due to fire suppression. Pines are not typically extensive in this region (except for occasional *Virgina* and Shortleaf pines), but loblolly pine has recently been extensively planted for commercial forestry and can spread from these stands. White oak, post oak, and to a lesser extent blackjack oak woodlands and forests often “fill in” with less fire tolerant species (e.g. southern red oak, scarlet oak, red maple, sweetgum, blackgum, etc.), resulting in a closed canopy forest. It is difficult to discern at this point what proportion of the landscape might have been in a 'barrens' condition versus a forested one. The former condition would be more prevalent on larger, flatter fire compartments.

Comments

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 | UN | UN | UN | UN | UN | B | B | B | UN | UN |
| Shrub | 0.5-1.0 | UN | UN | UN | UN | UN | B | B | B | UN | UN |
| Shrub | 1.0-3.0 | UN | UN | UN | UN | UN | B | B | B | UN | UN |
| Shrub | >3.0 | UN | UN | UN | UN | UN | B | B | B | UN | UN |
| Tree | 0-5 | UN | UN | C | C | C | C | UN | UN | UN | UN |
| Tree | 5-10 | UN | UN | C | C | C | C | UN | UN | UN | UN |
| Tree | 10-25 | UN | UN | D | D | D | D | E | UN | UN | UN |
| Tree | 25-50 | UN | UN | D | D | D | D | E | UN | UN | UN |
| 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 26 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SCSC | Schizachyrium scoparium | Little bluestem | Upper |
| ANGE | Andropogon gerardii | Big bluestem | Upper |
| SONU2 | Sorghastrum nutans | Indiangrass | Upper |
| PAVI2 | Panicum virgatum | Switchgrass | Upper |

Description

Grassland class. Shrub and tree species are relatively infrequent and, if present, constitute <10% cover in the area. Dominated by big bluestem, Indiangrass, little bluestem, sunflowers (*Helianthus* spp.) and goldenrods (*Solidago* spp.), and switchgrass. Numerous forbs such as blazingstars (*Liatris* spp.), rattlesnake master (*Eryngium yuccifolium*), wild quinine (*Parthenium integrifolium*), among many others, are present, along with scattered young shrubs and shrub-sized trees (*Quercus, Carya, Vaccinium,* etc.). Fuel complexes consisted of short- and tall-grass prairie forbs and shrubs with moderate levels of woody seedling recruitment or resprouts (e.g. oaks and hickory species). This system is composed of fuel models 1 and 3. Replacement Fire 20yrs resets class. AltSuccession to B after 13yrs with no fire.

*Maximum Tree Size Class*  
None

Class B 10 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ACRU | Acer rubrum | Red maple | Mid-Upper |
| LIST2 | Liquidambar styraciflua | Sweetgum | Mid-Upper |
| QUFA | Quercus falcata | Southern red oak | Upper |
| RUAR2 | Rubus argutus | Sawtooth blackberry | Low-Mid |

Description

This class represents a shrubby prairie with emergent trees. Examples of this class are likely to be a variable mixture of shrubs and emergent trees. Shrub cover may exceed tree cover. Grass and forb species remain the same as in class A. Shrub species include climbing rose (*Rosa setigera*), blackberry (*Rubus argutus*), Prairie willow (*Salix humilis*), winged sumac (*Rhus copallinum*), persimmon (*Diospyros virginiana*), with oak and hickory saplings (*Quercus* spp., *Carya* spp.) The fuel model in this class starts at 1 and 3.

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

Class C 11 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUAL | Quercus alba | White oak | Upper |
| QUST | Quercus stellata | Post oak | Upper |
| ANGE | Andropogon gerardii | Big bluestem | Upper |
| SCSC | Schizachyrium scoparium | Little bluestem | Upper |

Description

This class represents a young savanna/prairie complex. This system is similar to D – Late Open, except with widely spaced younger trees (e.g. *Quercus alba* and *Quercus stellata*). Grass and forb species remain the same as in class A. Shrub species include climbing rose (*Rosa setigera*), Prairie willow (*Salix humilis* vars.), and winged sumac (*Rhus copallinum*). The fuel models in this class are 1 and 3.

*Maximum Tree Size Class*  
Very Large >33"DBH

Class D 39 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUST | Quercus stellata | Post oak | Upper |
| QUAL | Quercus alba | White oak | Upper |
| ANGE | Andropogon gerardii | Big bluestem | Lower |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |

Description

This class represents a savanna/prairie complex. Coverage of grasses and forbs may exceed that of trees. Shrubs are very limited. This system is similar to C – Early development, except with widely dispersed open-grown trees (i.e., *Quercus alba* and *Quercus stellata*) with significant DBH. Grass and forb species remain the same as in classes A and C. Shrub species include climbing rose (*Rosa setigera*) and winged sumac (*Rhus copallinum*). The fuel models in this class are 1 and 3.

*Maximum Tree Size Class*  
Very Large >33"DBH

Class E 14 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 | Mid-Upper |
| ACRU | Acer rubrum | Red maple | Middle |
| VACCI | Vaccinium | Blueberry | Lower |

Description

This class represents closed canopy forest and oak litter-blueberry (*Vaccinium* spp.) dominated woodlands. Older white oak and post oak remain co-dominant, with younger individuals of southern red oak, scarlet oak, red maple, and sweetgum filling in and closing up the understory, and eventually reaching the canopy and filling in the gaps between the older trees. These trees will ultimately dominate the canopy as the older trees senesce and die. Vaccinium, Rhododendron, and seedlings of less fire tolerant species comprise the shrub layer. Sourwood and blackgum are also common. Other shrub species include winged sumac (*Rhus copallinum*) and climbing rose (*Rosa setigera*).

*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:OPN | 14 |
| Mid1:OPN | 15 | Late1:OPN | 59 |
| Mid1:CLS | 15 | Late1:OPN | 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 | 0.05 | 20 | Yes | 0 |
| Alternative Succession | Mid1:OPN | Mid1:CLS | 1 | 1 | Yes | 10 |
| Wind or Weather or Stress | Mid1:OPN | Early1:ALL | 0.0066 | 152 | Yes | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.02 | 50 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.05 | 20 | No | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.1 | 10 | No | 0 |
| Alternative Succession | Mid1:CLS | Late1:CLS | 1 | 1 | Yes | 20 |
| Surface Fire | Mid1:CLS | Mid1:CLS | 0.02 | 50 | No | 0 |
| Wind or Weather or Stress | Mid1:CLS | Early1:ALL | 0.02 | 50 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.05 | 20 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.0667 | 15 | Yes | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 20 |
| Wind or Weather or Stress | Late1:OPN | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.05 | 20 | No | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.1 | 10 | No | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.01 | 100 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Surface Fire | Late1:CLS | Late1:CLS | 0.02 | 50 | No | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.05 | 20 | Yes | 0 |

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