14010

Central Interior Highlands Calcareous Glade and Barrens

BpS Model/Description Version: Aug. 202012/08

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Milo Pyne | milo\_pyne@NatureServe.org | Ray Wiggs | ray\_wiggs@nps.gov |
| Jason Milks | jmilks@tnc.org | Jim Drake | jim\_drake@natureserve.org |
| Tony Collins | tony\_collins@nps.gov | None | None |

**Reviewed by:** Illinois Fire Needs Assessment team and adopted for zones below

Vegetation Type

Steppe/Savanna

Map Zones

43, 44, 47, 48, 53

Geographic Range

This system is found primarily in the Interior Highlands of the Ozark, Ouachita, and unglaciated Interior Low Plateau regions ranging east to southern OH and including the Knobs region and Cliff section of KY, the Cumberland Plateau escarpment of TN, the Western Valley of the Tennessee River in TN, and the Moulton Valley of northern AL.

Biophysical Site Description

Occurs along moderate to steep slopes and steep valleys on primarily southerly to westerly facing slopes. Limestone and/or dolomite bedrock typify this system with shallow, moderately to well-drained soils interspersed with rocks. These soils often dry out during the summer and autumn, and then become saturated during the winter and spring.

Vegetation Description

Little bluestem (Schizachyrium scoparium) dominates this system and is commonly associated with big bluestem (Andropogon gerardii), sideoats grama (Bouteloua curtipendula), and calcium-loving, drought-tolerant plant species. Stunted woodlands primarily dominated by chinquapin oak (Quercus muehlenbergii) interspersed with Eastern redcedar (Juniperus virginiana) occur on variable-depth-to-bedrock soils. The trees typically occur as islands in a wider herbaceous or rocky area. The islands are found in microenvironments where the soil depth and available water are sufficient to support trees (e.g. depressions or fissures in the bedrock). Other woody plants associated with this system (within their ranges) include Shumard’s oak (Q. shumardii), post oak (Quercus stellata), eastern redbud (Cercis canadensis), winged elm (Ulmus alata), blue ash (Fraxinus quadrangulata), Ashe’s juniper (J. ashei), and Carolina buckthorn (Frangula caroliniana). Other herbaceous taxa include whorled rosinweed (Silphium trifoliatum), prairie rosinweed (S. terebinthinaceum), blazing stars (Liatris spp.), aromatic aster (Symphyotrichum oblongifolium), scarlet Indian paintbrush (Castilleja coccinea), diamond flowers (Hedyotis nigricans), fameflower (Talinum spp.), stonecrop (Sedum spp.), and wiry panicgrass (Panicum flexile). Small-scale stands of annual dropseed (Sporobolus spp.) may be prominent in some examples. In some examples, small-scale seepage areas may contain flatstem spikerush (Eleocharis compressa), crowpoison (Nothoscordum bivalve), limestone quillwort (Isoetes butleri), and common goldstar (Hypoxis hirsuta).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| SCSC | *Schizachyrium scoparium* | Little bluestem |
| ANGE | *Andropogon gerardii* | Big bluestem |
| QUMU | *Quercus muehlenbergii* | Chinkapin oak |
| SITE | *Silphium terebinthinaceum* | Silphium terebinthinaceum |
| BOCU | *Bouteloua curtipendula* | Sideoats grama |
| SILA3 | *Silphium laciniatum* | Compassplant |

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

Disturbance Description

Fire is the primary natural dynamic, fires help manage this system by restricting woody growth and maintaining the more open glade structure. Historically grazing by wild and domestic ungulate species represented a significant disturbance regime. Regionally significant drought cycles affect severity of other disturbance regimes. Some portions of sites for this system are so droughty and rocky that woody succession is severely retarded and fuels are either sparse of composed of very low annual grasses.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 19 | 18 |  |  |
| Moderate (Mixed) | 16 | 21 |  |  |
| Low (Surface) | 6 | 61 |  |  |
| All Fires | 3 | 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

Within its geographic range, collective acreage would be estimated in the tens of thousands of acres, however glade complexes occur in patches throughout the range in areas of two to more than one thousand acres in size.

Adjacency or Identification Concerns

Stands of this system are typically adjacent to dry oak woodlands and/or prairie associations on calcareous soils. Identification concerns include distinguishing stands of eastern red-cedar found on old fields and abandoned pastures in late, primary succession from over-encroachment of glades by eastern red-cedar. The pattern of interspersion of red-cedar with open, rocky zones should distinguish these, with the successional red-cedar being more continuous over larger areas.

Issues or Problems

Only minor edits to MZ44 model (Milks/Collins) done for MZs 47 and 48 (M. Pyne)

Native Uncharacteristic Conditions

Over-encroachment of native red-cedar species (J. ashei, J. virginiana) may occur today, in the prolonged absence of fire.

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 | 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 | UN | UN | UN | B | B | B | B | B | B | B |
| Shrub | 0.5-1.0 | UN | UN | UN | B | B | B | B | B | B | B |
| Shrub | 1.0-3.0 | UN | UN | UN | B | B | B | B | B | B | B |
| Shrub | >3.0 | UN | UN | UN | B | B | B | B | B | B | B |
| Tree | 0-5 | A | A | A | E | E | E | E | E | E | E |
| Tree | 5-10 | C | C | C | UN | UN | UN | UN | UN | UN | UN |
| Tree | 10-25 | D | D | D | UN | UN | UN | UN | UN | UN | UN |
| Tree | 25-50 | UN | UN | UN | UN | UN | UN | UN | 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 59 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |
| ANGE | Andropogon gerardii | Big bluestem | Lower |
| SITE | Silphium terebinthinaceum | Silphium terebinthinaceum | Lower |
| QUMU | Quercus muehlenbergii | Chinkapin oak | All |

Description

Class A is dominated by grasses, forbs, and sedges. Minimum cover would be zero on outcroppings of bedrock, and maximum canopy would be 100%. Height of dominant layer may be up to 4 ft. Tree seedlings would be scattered throughout the herbaceous layer. Perennial and annual forbs, grasses, and sedges dominate. The ground vegetation ranges to 4 feet high by midsummer. Scattered stunted trees persist in fissures in the soil. Tree species include oak and red-cedar seedlings.

*Maximum Tree Size Class*  
Seedling <4.5ft

Class B 7 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| JUVI | Juniperus virginiana | Eastern redcedar | Middle |
| JUAS | Juniperus ashei | Ashe's juniper | Middle |
| ANGE | Andropogon gerardii | Big bluestem | Lower |
| QUMU | Quercus muehlenbergii | Chinkapin oak | All |

Description

Mid-seral closed canopy dominated by small tree to shrub-sized eastern red-cedars. Isolated areas rarely affected by fire. Shrubs appear to be > trees (the upper layer?), and the box should be checked? Herbaceous layer persists but is overtopped by shrubs. Scattered hardwood saplings occur within shrub layer, and scattered stunted trees occur in the upper canopy.

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

Class C 23 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |
| ANGE | Andropogon gerardii | Big bluestem | Lower |
| SITE | Silphium terebinthinaceum | Silphium terebinthinaceum | Lower |
| QUMU | Quercus muehlenbergii | Chinkapin oak | All |

Description

Class C is dominated by a diverse herbaceous layer of grasses, sedges, and forbs. Minimum canopy closure would be zero in bedrock outcroppings, and 100% in areas with deeper soil. Mid-seral open canopy dominated by herbaceous layer of perennial grasses, forbs, and sedges. Shrub component occurs as cedar species and oak sprouts. Low-intensity, frequent fires maintain open structure. Tree species are scattered, but have developed some crown structure. Bedrock outcroppings remain open. Edaphic conditions determine species composition and arrangement. Likely represents greatest diversity among classes.

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

Class D 10 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |
| ANGE | Andropogon gerardii | Big bluestem | Lower |
| SITE | Silphium terebinthinaceum | Silphium terebinthinaceum | Lower |
| QUMU | Quercus muehlenbergii | Chinkapin oak | All |

Description

Late-seral open canopy dominated herbaceous layer of perennial grasses, forbs, and sedges. Class D is dominated by a diverse herbaceous layer of grasses, sedges, and forbs. Minimum canopy closure would be zero in bedrock outcroppings, and 100% in areas with deeper soil. Scattered shrub component occurs as cedar and oak saplings and resprouts. Tree species occur as widely-scattered oaks with well-developed crowns.

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

Class E 1 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| JUVI | Juniperus virginiana | Eastern redcedar | All |
| JUAS | Juniperus ashei | Ashe's juniper | Middle |
| QUMU | Quercus muehlenbergii | Chinkapin oak | All |

Description

Late-seral closed canopy dominated by shrub and tree layer of eastern red-cedar and Ashe's juniper. Widely scattered trees occur with stunted canopy growth due to competition of resources. Herbaceous layer largely reduced and extremely scattered. Bedrock layers are heavily encroached and may be completely covered in some areas.

*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 | 20 |
| Mid1:OPN | 21 | Late1:OPN | 70 |
| Mid1:CLS | 21 | Late1:CLS | 70 |
| Late1:OPN | 71 | Late1:OPN | 999 |
| Late1:CLS | 71 | 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 | 19 |
| Mixed Fire | Early1:ALL | Early1:ALL | 0.05 | 20 | No | 0 |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.07 | 14 | Yes | 0 |
| Surface Fire | Early1:ALL | Early1:ALL | 0.2 | 5 | No | 0 |
| Alternative Succession | Mid1:OPN | Mid1:CLS | 1 | 1 | Yes | 10 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.04 | 25 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.1 | 10 | No | 0 |
| Native Grazing | Mid1:OPN | Mid1:OPN | 0.15 | 7 | No | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.2 | 5 | No | 0 |
| Wind or Weather or Stress | Mid1:CLS | Mid1:CLS | 0.005 | 200 | No | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.01 | 100 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.02 | 50 | Yes | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 30 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.015 | 67 | Yes | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.1 | 10 | No | 0 |
| Native Grazing | Late1:OPN | Late1:OPN | 0.15 | 7 | No | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.2 | 5 | No | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.005 | 200 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.0083 | 120 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.05 | 20 | Yes | 0 |

References

Aldrich, J. R. and J. A. Bacone. 1982. Limestone glades of Harrison County, Indiana. Proc. Indiana Academy of Science 91:480-485.

Bacone, J. A., L.A. Casebere and M.D. Hutchison. 1983. Glades and barrens of Crawford and Perry counties, Indiana. Proceedings of the Indiana Academy of Science 92:367-373.

Baskin, J.M. and C.C. Baskin. 1978. Plant ecology of cedar glades in the Big Barren region of Kentucky. Rhodora 80:545-557.

Delcourt, H.R., P.A. Delcourt, G.R. Wilkins and E.N. Smith, Jr. 1986. Vegetational history of the cedar glades regions of Tennessee, Kentucky, and Missouri during the past 30,000 years. ASB Bull. 33:128-137.

DeSelm, H.R. 1993. Barrens and glades of the southern Ridge and ValleS.W., E.W. Chester and A.F. Scott, eds. The Natural History of Lower Tennessee and Cumberland River Valleys, Proc. 5th Ann. Symp., Center for Field Biol. of Land Between the Lakes and TVA. Austin Peay State University, Clarksville, TN.

Erickson, R.O., L.G. Brenner, and J. Wraight. 1942. Dolomitic glades of east-central Missouri. Annals of the Missouri Botanic Garden 29(2):89-101.

Guthrie, M. 1989. Silurian limestone glades and barrens of the Western Valley of Tennessee. Contract report to the Division of Ecological Services, Tennessee Department of Conservation, Nashville, TN. 113 pp.

Guyette, R. and E.A. McGinnes, Jr. 1982. Fire history of an Ozark glade in Missouri. Trans. Missouri Academy of Science 16:85-93.

Hilton, J.L. 1997. North Alabama Glade Study. Report prepared for the U.S. Fish & Wildlife Service. Alabama Natural Heritage Program, Montgomery. 96 pp. + appendices.

Keeland, B.D. 1978. Vegetation and soils in calcareous glades of northwest Arkansas. Master thesis. University of Arkansas. 46 pp.

Kimmel, V.L. and G.E. Pobasco. 1980. Change in the woody cover on limestone glades between 1938 and 1975. Trans. Missouri Academy of Science 14:69-74.

Kucera, C.L. and S.C. Martin. 1957. Vegetation and soil relationships in the glade region of the southwestern Missouri Ozarks. Ecology 38:285-291.

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

Nelson, P. and D. Ladd. 1981. Missouri glades: Part I. Missouriensis, J. Mo. Native Plant Society 3(3):5-9.

Nelson, P. and D. Ladd. 1982. Missouri glades: Part II. Missouriensis, J. Mo. Native Plant Society 3(4)6-11.

Nelson, P. and D. Ladd. 1983. Preliminary report on the identification, distribution and classification of Missouri glades. Pages 59-76 in: C. L. Kucera, editor. Proceedings of the Seventh North American Prairie Conference. Southwest Missouri State University, Springfield, MO.

Sutter, R., S. Benjamin, S. Rollins, G. Livingstone and N. Rudd. 1994. Baseline monitoring of calcareous glades at Chickamauga-Chattanooga National Military Park. Unpubl. rep. The Nature Conservancy, South. Heritage Task Force. Chapel Hill, NC. 88 pp. + appendix.