**14230**

**Southeastern Great Plains Tallgrass Prairie**

BpS Model/Description Version: Aug. 2020

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Doug Ladd | dladd@tnc.org | None | None |
| Blane Heuman | bheuman@tnc.org | None | None |
| None | None | None | None |

**Reviewed by:** Christine H. Bielski, Jessica L. Burnett, Victoria M. Donovan, Dirac Twidwell, and Carissa L. Wonkka

**Vegetation Type**

Herbaceous

**Map Zones**

43, 44

**Model Splits or Lumps**

In map zone (MZ) 44, this Biophysical Setting (BpS) is lumped with 1508.

**Geographic Range**

This system is found primarily within the Flint Hills of Kansas and the Osage Plains of Oklahoma, ranging into the Ozarks. Found in ECOMAP (Cleland et al. 2007) subsections 251Ea and 251Eb, with scattered outliers to the west and south, including the system of prairies and in the undissected portions of the Springfield Plateau region of Arkansas, Oklahoma, and Missouri.

**Biophysical Site Description**

The alternating shale plains separated by limestone scarps that in a broad sense decrease in elevation in a stairstep pattern, from northwest to southeast. The flatter plains were formerly nearly continuous tallgrass prairie, while the scarped limestone areas were more dissected with bedrock outcrops and a mixture of prairie and savanna (Nigh and Schroeder 2002). Because of the presence of the rocky substrate close to the surface and the rolling topography, this area is relatively unsuitable for agriculture. Most occurrences are on gently to moderately rolling terraces developed predominantly in sandstones and shales of Pennsylvanian age. Soils are moderately fertile to sterile and well drained. In addition, this region receives an annual precipitation total of 2-6in less than the surrounding regions due to a rainshadow produced by a combination of prevailing western winds and orographic effects.

**Vegetation Description**

Grasses form the matrix of the prairie with big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), prairie cordgrass (*Spartina pectinata*), and switchgrass (*Panicum virgatum*) dominated many Ozark Prairie and Woodlands. A rich forb diversity was and still is commonly present and includes *Helianthus* spp. (sunflower genus), panic grasses (*Dichanthelium* spp.), black-eyed Susan (*Rudbeckia subtomentosa*), compass plant (*Silphiym laciniatum*), blazing star (*Liatris* spp.), heath aster (*Symphyotrichum ericoides*), bush clover (*Lespedeza capitata*), goldenrods (*Solidago* spp.), and violet (*Viola pedatifida*) . Wetter areas support a rich diversity of rushes and sedges, including *Carex opaca*, *Carex oklahomensis*, *Carex buxaumii*, *Carex scoparia*, *Carex conjuncta*, *Carex davisii*, *Carex arkansasa*, and *Eleocharis tenuis*. Areas of deeper soil, especially lower slopes along draws, slopes, and terraces, support indigo (*Baptisia alba* var. *macrophylla*), narrow-leaved blazing star (*Liatris pycnostachya*), and ironweed (*Vernonia missurica*).

Oak grubs characterize that portion of this vegetation sequence that experienced recurring fires in advanced oak regeneration, which stimulates the resprouting response evidenced by the “grubs” or multi-stemmed stump sprouts of shingle oak (*Quercus imbricaria*), black oak (*Q. velutina*), blackjack oak (*Q. marilandica*), and others.

**BpS Dominant and Indicator Species**

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| SCSC | *Schizachyrium scoparium* | Little bluestem |
| ANGE | *Andropogon gerardii* | Big bluestem |
| SONU2 | *Sorghastrum nutans* | Indiangrass |
| PAVI2 | *Panicum virgatum* | Switchgrass |
| LIATR | *Liatris* | Blazing star |
| LECA8 | *Lespedeza capitata* | Roundhead lespedeza |
| SYER | *Symphyotrichum ericoides* | White heath aster |
| QUERC | *Quercus* | Oak |

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

**Disturbance Description**

Fire and grazing constitute the major dynamic processes for this region. Fires were frequent, primarily autumnal and of human origin. The grazing disturbance is considered in this model by reducing the average fire return interval probability in the grassland box. However, as oak-hickory regeneration becomes established, these species become largely fire-resistant with age. Surface fires within woodland and forest types occurred every 12-15yrs, reducing duff layers and allowing recruitment of oak-hickory stems.

**Fire Frequency**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 2 | 98 |  |  |
| Moderate (Mixed) | 80 | 2 |  |  |
| Low (Surface) | 502 |  |  |  |
| All Fires | 2 | 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**

This type occurs as small patch in MZ44 and large patch in the neighboring zones (MZs 43 and 42).

**Adjacency or Identification Concerns**

It is distinguished from Central Tallgrass Prairie (CES205.683) by having more species with southwestern geographic affinities and the presence of a thin soil layer over sandstones and shales substrates, although some areas of deeper soils are found within the region, especially on lower slopes, draws, and terraces.

**Issues or Problems**

Although many of the native common plant species still occur, grazing does impact this region. Poor grazing practices can lead to soil erosion and invasion by cool-season grasses such as tall fescue (*Festuca arundinaria*) and smooth brome (*Bromus inermis*).

**Native Uncharacteristic Conditions**

Prairies are grown up in woody vegetation due to fire suppression and/or previous overgrazing. In the western region of MZ43, eastern red cedar is highly abundant and is encroaching at alarming rates into open prairie. Some prairies today are forb-poor.

For modern or current conditions, add a successional class to account for encroachment of eastern red cedar and the potential for a closed-canopy juniper woodland state in the western region of MZ43. This process is briefly described under the vegetation description and the native uncharacteristic condition sections but is not accounted for as a potential successional class. An example of a late-development class consisting of closed-canopy juniper woodland is described in BpS 11320 -- 31.

**Comments**

This model was written for MZ44 and was copied to MZ43. It differs from the MZ32 model primarily due to the prairies periphery to oak woodlands and forests in MZ44. This proximity increases the perch sites and the source seed. MZ44 suggested reviewer: Tim Nigh MDC.

***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 | B | B | B | B | B | B | B | B | UN | UN |
| Shrub | 0.5-1.0 | B | B | B | B | B | B | B | B | UN | UN |
| Shrub | 1.0-3.0 | B | B | B | B | B | B | B | B | UN | UN |
| Shrub | >3.0 | B | B | B | B | B | B | B | B | UN | UN |
| Tree | 0-5 | B | B | C | C | C | C | C | C | UN | UN |
| Tree | 5-10 | B | B | C | C | C | C | C | C | UN | UN |
| Tree | 10-25 | C | C | C | C | C | C | C | C | 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 96 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. Dominated by little bluestem, big bluestem, Indiangrass, prairie cordgrass, and switchgrass. Numerous forbs such as *Helianthus* spp. (sunflower genus), prairie clovers (*Petalostemum* spp.), and coneflowers (*Echinacea pallida* and *Ratibida pinnata*), among many others, were present. Fuel complexes consisted of short- or tallgrass prairie forbs and shrubs with little or no tree regeneration. Replacement fire maintains the class.

Upper-layer lifeform is not the dominant lifeform. Shrub and tree species are relatively infrequent and, if present, constitute <10% cover in the area.

*Maximum Tree Size Class*  
None

Class B 3 Mid Development 1 - Closed

*Indicator Species*

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |
| ROSE2 | Rosa setigera | Climbing rose | Middle |
| SAHU2 | Salix humilis | Prairie willow | Upper |
| RHUS | Rhus | Sumac | Upper |

*Description*

This class represents a shrubby prairie. Grass and forb species remain the same as in Class A. Shrub species include climbing rose (*Rosa setigera*), prairie rose (*Rosa caroliniana*), leadplant (*Amorpha canescens*), Prairie willow (*Salix humilis*), smooth sumac (*Rhus glabra*), winged sumac (*Rhus copalina*), rough dogwood (*Cornus drummondii*), persimmon (*Diospyros virginiana*), and oak saplings (*Quercus* spp.).

*Maximum Tree Size Class*  
None

Class C 1 Mid Development 1 - Open

*Indicator Species*

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUVE | Quercus velutina | Black oak | Upper |
| QUMA3 | Quercus marilandica | Blackjack oak | Upper |
| DIVI5 | Diospyros virginiana | Common persimmon | Upper |
| FRAM2 | Fraxinus americana | White ash | Upper |

*Description*

This tree class is dominated by white ash (*Fraxiunus americana*), persimmon, shingle oak (*Quercus imbricaria*), slippery elm (*Ulmus rubra*), blackjack oak (*Quercus marilandica*), and black oak (*Quercus velutina*). Class B succeeds to C without fire. Trees in this class will be at least 3m tall and will range to 20m tall. The oak trees especially will increase in DBH in the open instead of increasing in height. Surface fire maintains the class.

Reviewers questioned lack of coniferous species as indicators in this class.

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

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Early1:ALL | 999 |
| Mid1:CLS | 10 | Mid1:CLS | 999 |
| Mid1:OPN | 20 | Mid1:OPN | 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 | 0.01 | 100 | Yes | 0 |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.6 | 2 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:CLS | 0.001 | 1000 | Yes | 0 |
| Wind or Weather or Stress | Mid1:OPN | Mid1:CLS | 0.002 | 500 | Yes | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.025 | 40 | Yes | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.042 | 24 | No | 0 |
| Alternative Succession | Mid1:CLS | Mid1:OPN | 0.01 | 100 | Yes | 0 |
| Surface Fire | Mid1:CLS | Mid1:CLS | 0.05 | 20 | No | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.3 | 3 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:CLS | 0.4 | 3 | No | 0 |

References

Cleland, D.T.; Freeouf, J.A.; Keys, J.E.; Nowacki, G.J.; Carpenter, C.A.; and McNab, W.H. 2007. Ecological Subregions: Sections and Subsections for the conterminous United States. Gen. Tech. Report WO-76D [Map on CD-ROM] (A.M. Sloan, cartographer). Washington, DC: U.S. Department of Agriculture, Forest Service, presentation scale 1:3,500,000; colored

Engle, D. M., Coppedge, B. R., & Fuhlendorf, S. D. (2008). From the dust bowl to the green glacier: human activity and environmental change in Great Plains grasslands. In *Western North American Juniperus Communities* (pp. 253-271). Springer New York.

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

Nigh, Timothy A. and Walter A. Schroeder 2002. Atlas of Missouri Ecoregions. Missouri Department of Conservation. The Conservation Commission--The State of Missouri. Pages 71-74.

Twidwell, D., Rogers, W. E., Fuhlendorf, S. D., Wonkka, C. L., Engle, D. M., Weir, J. R., & Taylor, C. A. (2013). The rising Great Plains fire campaign: citizens' response to woody plant encroachment. *Frontiers in Ecology and the Environment*, *11*(s1).