**14230**

**Southeastern Great Plains Tallgrass Prairie**

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
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**Vegetation Type**

Herbaceous

**Map Zones**

32, 35

**Geographic Range**

This system is found primarily within the Flint Hills and Osage Plains of Kansas, Missouri, and Oklahoma. In southern Oklahoma and Texas, this is the primary natural system of the "Grand Prairie" or "Fort Worth Prairie," ranging south into the Lampasas Cutplain of Texas (EPA 29d and 29e, respectively) (NatureServe, explorer.natureserve.org)

**Biophysical Site Description**

Soils are generally fine-textured Mollisols occurring in thin layers over shale with some areas of deeper soils, especially on lower slopes and lowlands. In Arkansas, small areas of this community occur along the Arkansas River Valley, a topoedaphic region characterized by broad, level to gently rolling uplands derived from shales. The combined effect of droughty soils, reduced precipitation, and prevailing level topography create conditions highly conducive to the ignition and spread of fires. This region includes large prairie areas in eastern Oklahoma and western Missouri south of the glacial line. Soil and precipitation encourage tree and shrub invasion in the absence of fire, although woody communities occur in fire-protected microsites. Precipitation gradient decreases from east to west with precipitation adequate to allow tree and shrub establishment in the absence of fire. Hardwoods restricted to fire-protected ravines and along stream corridors forming gallery forests.

**Vegetation Description**

Tallgrass prairie is dominated by big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*). Secondary species vary in importance regionally depending on topography and soil moisture relations and include sideoats grama (*Bouteloua curtipendula*), needlegrass (*Achnatherum spartea*), Junegrass (*Koeleria macrantha*), buffalograss (*Buchloe dactyloides*), blue grama (*Bouteloua gracilis*), and composite dropseed (*Sporobolus compositus*). At the southwestern extent of this type, sideoats grama (*Bouteloua curtipendula*), buffalograss (*Buchloe dactyloides*), and blue grama (*Bouteloua gracilis*) increase in percent cover. Western wheatgrass (*Pascopyrum smithii*), porcupine grass (*Hesperostipa spartea*), and various *Nassella* and *Hesperostipa* become more important in the northern half of this type. Several short-stature grasses such as *Dicanthelium* spp. and *Carex* spp. are also important throughout the type, particularly following heavy grazing. Annual forbs can include prairie (common) broomweed (*Amphiachyris dracunculoides*). Conspicuous perennial forbs include the genera *Ambrosia*, *Helianthus*, *Soladago*, *Liatris*, *Dalea*, *Viola*, and *Antennaria*. Shrubs that are important include *Rosa* spp., *Salix*, *Symphoricarpos*, and *Rhus*, and in the southern part of the region today, *Juniperus virginiana* is rapidly increasing in the absence of fire. Bison disturbance was historically an important disturbance that increased heterogeneity of patches on the landscape. A problem with much of the literature on fire in prairies, and therefore a caution, is that it does not include interaction with herbivory (Engle and Bidwell 2001). The interaction of large herbivore grazing and fire is critical to the vegetation and patch dynamics of the tallgrass prairie. Where and when fire occurred largely determined where and when herbivores were on the landscape. The altering of fuel loads by herbivores had a reciprocal effect on where and when fire would occur.

**BpS Dominant and Indicator Species**

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| ANGE | *Andropogon gerardii* | Big bluestem |
| SCSC | *Schizachyrium scoparium* | Little bluestem |
| SONU2 | *Sorghastrum nutans* | Indiangrass |
| PAVI2 | *Panicum virgatum* | Switchgrass |
| OLIGO3 | *Oligoneuron* | Goldenrod |
| SPCO16 | *Sporobolus compositus* | Composite dropseed |
| AMPS | *Ambrosia psilostachya* | Cuman ragweed |
| RUHI2 | *Rudbeckia hirta* | Blackeyed susan |

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

**Disturbance Description**

The region is characterized by frequent surface fires, both lightning and anthropogenic in origin (Higgins 1986). Due to the abundance of fine fuels, surface fires in the dormant season (spring, fall, winter) were usually replacement fires; however, growing-season fires could have been more variable in summers with abundant moisture leaving areas of incomplete herbaceous fuel combustion. Mixed fires occurred infrequently in heavily grazed or wet areas. Natural fires were possible during the dormant season through spring and during the late growing season (Bragg 1982; Higgins 1986; Engle and Bidwell 2001), dependent on the availability of dry fine fuels sufficient to carry a fire. Fires (probably ignited by lightning) likely occurred in the summer, but ignitions would not have spread as well as dormant-season fires due to higher fuel moisture. Prior to extirpation of bison, the fire return interval (FRI) was estimated to have been from 1-3yrs based on observation of travelers through the region (Gregg 1844; Olmstead 1855). Historic accounts from later in the 1800s often depict very large landscape-scale burns where an entire landscape was described as burning (Irving 1935; Jackson 1965). The accounts of fire size, however, followed the loss of bison as a major disturbance factor in the Great Plains and, thus, may not reflect historic reference fire conditions, which may have been more patchy. For example, Risser (1990) suggests that bison grazing affected fire patterns and thus the landscape patterns in tallgrass prairie. Recent studies suggest that bison -- and other grazing/browsing wildlife species -- preferentially seek out the new growth of recently burned areas affecting patch composition (e.g., Jackson 1965; Risser 1990; Steuter 1986; Coppedge and Shaw 1998; Fuhlendorf and Engle 2004). The fire/grazing interaction was critical to the dynamics of the tallgrass system.

The grazing disturbance is considered in this model by reducing the average FRI 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) | 82 | 2 |  |  |
| Low (Surface) | 492 |  |  |  |
| 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**

Using the fire/bison interaction model first proposed by Steuter (1986), recent modifications propose that anywhere from 1/6 to 1/3 of the landscape likely burned (Fuhlendorf and Engle 2004). Typically, following fire-induced green-up, intensive bison grazing alters community structure such that burned and grazed areas differ significantly from unburned areas (Steuter 1986; Fuhlendorf and Engle 2001, 2004). Heavily grazed and trampled burned areas are dominated by forbs and thus would not burn in the next 1-3yrs creating mixed fire intensity when there is a fire. Bison grazing, thus, drove or at the least strongly influenced fire and FRIs, which in turn influenced bison grazing distribution. This patch-burn model, which depicts a landscape composed of a continuously shifting mosaic of patches with a short time period of duration, is believed to best represent the historic fire regime. It is also consistent with the scenario essential to perpetuate habitat for certain native prairie species. For example, the patch-burn model provides conditions to maintain suitable lek sites, nesting sites, and brood rearing habitat for prairie chickens (*Tympanicus cupido*), which occurred in large numbers prior to European settlement (Sparks and Masters 1996). Both the fire/bison and patch-burn cattle grazing experiments that have recently been done are acknowledged to be a scaled-down version of the reference condition dynamics but have been shown to be very successful at maintaining all trophic levels of biodiversity (Fuhlendorf et al. 2006).

Between 1984 and 2014, 825 fires burned at least partially within the Southeastern Great Plains Tallgrass Prairie in map zones (MZs) 32 and 35 (MTBS, 2016). Fires that intersected with Southeastern Great Plains Tallgrass Prairie in MZs 32 and 35 ranged from 21 to >106, 000ac in size, with a mean fire size of ~4,500 acres (MTBS 2016).

**Adjacency or Identification Concerns**

Tallgrass prairie is the primary herbaceous component of the cross-timbers landscape. Prairie openings are found intermixed with the forest and woodlands of the cross-timbers, ranging in size from <1ac up to 1,000s of acres.

Mixedgrass is found generally to the west of the tallgrass prarie, although both short- and mixedgrass inclusions are present at a smaller scale based upon topoedaphic conditions.

**Issues or Problems**

Classifying tallgrass prairie into successional stages that are mappable given LANDFIRE rules was extremely challenging. The structure and composition of this system would have varied considerably given variations in climate, grazing, and fire. Furthermore, there was some disagreement among modelers and reviewers about whether or not to include shrub and tree successional pathways within the VDDT model or if it should include grass. The current model reflecting the majority opinion includes successional pathways for shrubs and trees, but they represent a very small portion of the landscape.

**Native Uncharacteristic Conditions**

Eastern red cedar (*Juniperus virginiana*) would have occurred in riparian areas or other fire-protected sites historically. Fire suppression and/or inadequate fire intensity due to lack of fine fuel (from intensive grazing) and planting in some areas have allowed eastern red cedar to spread into upland prairie areas today.

In MZ32, both Ashe’s juniper and eastern red cedar are highly abundant. Ashe’s juniper is more abundant in the southwestern region of MZ32 while eastern red cedar is more abundant in the northwestern region.

In MZ35, Ashe’s juniper, eastern red cedar, and mesquite are abundant. Eastern red cedar is more commonly found in the northeastern region of MZ35.

Osage orange (*Maclura pomifera*), which would have historically been relegated to fire-protected sites, was actively planted for shelterbelts around homesteads and living fences and has spread from those sites into prairies. The control of Osage orange is very difficult because of its resprouting ability and fire tolerance.

In general, there is much more woody vegetation in and around riparian areas today than there would have been historically due to lack of fire, fire exclusion, and the building of livestock ponds.

**Comments**

For any modeling of current or future conditions, users should add successional class to account for encroachment of *Juniperus* species and the potential for a closed-canopy juniper woodland state in MZs 32 and 35. 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 Biophysical Setting 11320–31.

For MZs 32 and 44, this model was initiated from the Rapid Assessment Southern Tallgrass Prairie model (R5PRTG) by Ron Masters and Tom Bragg and reviewed by David Engle (dme@mail.pss.okstate.edu) and Douglas Zollner (dzollner@tnc.org). Bob Hamilton worked on the model and description for MZ32, and Doug Ladd worked on the model and description for MZ44. Based on review comments, the regional lead merged the two similar models such that one description and one VDDT model would represent this system throughout MZs 32 and 44.

***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** |
| ANGE | Andropogon gerardii | Big bluestem | Upper |
| HELIA3 | Helianthus | Sunflower | Upper |
| SONU2 | Sorghastrum nutans | Indiangrass | Upper |
| SCSC | Schizachyrium scoparium | Little bluestem | 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. Lack of disturbance moves class to B.

In this early stage, grasses will be more nutritious and palatable; grazing by bison, antelope, deer, rodents, and lagomorphs would be common and maintain this class.

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 | Upper |
| ANGE | Andropogon gerardii | Big bluestem | Mid-Upper |
| SONU2 | Sorghastrum nutans | Indiangrass | Mid-Upper |
| RHUS | Rhus | Sumac | Lower |

*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.). The fuel model for this class is a fuel model 3; however, with increased leaf litter, the fuel model moves to a 2. Mixed fires and surface fires maintain the class.

*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.

*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 |

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