14152

Arkansas Valley Prairie and Woodland -- Woodland

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
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| None | None | None | None |

Vegetation Type

Herbaceous

Map Zones

44

Model Splits or Lumps

This Biophysical Setting (BpS) is split into multiple models: a matrix of prairie and woodland. Due to differences in fire regime (prairie is dominated by frequent high intensity fire [FRG 2] and woodland is dominated by frequent low intensity fire [FRG 1]), this type required two separate models. For modeling purposes, we split the BpS into two types: 1) Arkansas Valley Prairie and Woodland -- Prairie and 2) Arkansas Valley Prairie and Woodland -- Woodland. The General Information section for the prairie and woodland descriptions is identical for both models to reflect that these systems can be considered as one type. However, the Vegetation Classes section of the descriptions are different for the two types to reflect the differences in the VDDT models.

The prairie element of this BpS is often found at lower elevations relative to the woodland and is associated with Statsgo Association 12 - Leadvale-Taft (USDA-SCS, 1982).

The woodland element of this BpS is often, but not always, found at higher elevations relative to the prairie and is often associated with Statsgo Associations 13 and 15 - Enders-Mountainburg-Nella-Steprock and Linker-Mountainburg (USDA-SCS, 1982), respectively. Although the Arkansas Valley Prairie and Woodland -- Woodland, has very similar species composition to BpS 1364 Ozark-Ouachita Dry Oak Woodland, it can be distinguished by its adjacency to prairie.

Geographic Range

This BpS is found in the Arkansas Valley region of Arkansas and adjacent Oklahoma.

Biophysical Site Description

This BpS is characterized by broad level to gently rolling valleys derived from shales separated by narrow sandstone ridges. The shale-derived soils associated with prairies are thin and droughty. Sandy soils of the ridges, associated with woodlands, are somewhat deeper but still droughty. The vegetation occurs in bands across the landscape associated strongly with soil type. Fires in both physical settings are frequent but those in the prairies are more intense. The valley receives an annual precipitation total of 2-6in less than the surrounding regions (Ozark and Ouachita mountains) due to a rain shadow produced by a combination of prevailing winds and mountain orographic effects. The combined effect of droughty soils, reduced precipitation and prevailing level topography create conditions highly conducive to the ignition and spread of fires.

Vegetation Description

This system, like the nearby Cross Timbers, is an ecotone between prairie and eastern deciduous forests. Washington Irving and others have described areas of cross timbers that were evidently mid-seral closed and possibly late-seral closed, because of their inability to penetrate the forest on horseback and their description of the branching present in those stands. Others described stands within the cross timbers that were easily traversed via wagon.

Woodland vegetation in the Arkansas Valley Prairie and Woodland BpS is dominated by post oak (*Quercus stellata*) and to a lesser extent blackjack oak (*Q. marilandica*), hickory (*Carya* spp.) and eastern-red cedar (*Juniperus virginiana*) in protected areas. Shortleaf pine (*Pinus echinata*) sometimes dominates woodlands. The understory and canopy openings woodlands and the prairies, are dominated by big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*) and switchgrass (*Panicum virgatum*) along with a rich forb diversity that includes ashy sunflower (*Helianthus mollis*), pale purple coneflower (*Echinacea pallida*), rough coneflower (*Rudbeckia grandiflora*), compassplant *(Silphium laciniatum*), goldenrods (*Solidago* spp.), button eryngo (*Eryngium yuccifolium*), scarlet Indian paintbrush (*Castilleja coccinea*), blazing-stars (*Liatris* spp.), wild indigo (*Baptisia* spp.), Oklahoma grasspink (*Calopogon oklahomensis*) and green milkweed (*Asclepias hirtella).* Ground layer in closed canopy conditions is dominated by oak leaf litter, with little herbaceous cover. In the western portion of this BpS, on both sides of the Arkansas/Oklahoma border, prairies that probably established during the mid-Holocene dry interval approximately 5000 BP, were so extensive and consequently burned so frequently up to the early 19th Century that, even in this relatively humid climate (ca. 46in/yr.), the prairies never succeeded to woodland. Woodlands on sandy ridges varied from open to closed and from younger to older trees based on fire and tornado disturbance.

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 |
| QUST | *Quercus stellata* | Post oak |
| QUMA3 | *Quercus marilandica* | Blackjack oak |

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

Disturbance Description

The woodland component of this BpS is fire regime group I, with frequent surface fires and while the prairie component is fire regime group II, with frequent replacement fires. Fire frequency in the BpS is greater than in adjacent Ouachita and Ozark Mountains. Fire regimes are assumed to be a result of both aboriginal and lightning origin. Major drought cycles occur at approximately 20yr intervals and influence periodic stand replacement fire. Fires spread from the prairie over a fuel bed of grass through leaf litter and grass in woodlands. Historic prairie fires have been noted to slow down or stop at the border of nearby woodland vegetation, presumably when leaf moisture was high. Fire would penetrate or burn completely through late-seral, open stands, often as surface fires. Grazing by bison and elk were likely important secondary disturbances. Tornadoes are frequent in the region, partially or completely removing tree canopy, and returning mid and late seral stands to early seral stage (not modeled).

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 97 | 2 |  |  |
| Moderate (Mixed) | 14 | 14 |  |  |
| Low (Surface) | 3 | 84 |  |  |
| 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

The size and connectedness of woodland and prairie patches varies, from small patches of 200ac to well over several thousand acres. Nuttall (1980) described prairies several miles across with similar sized intervening wooded ridges. Fires could cross these boundaries and burn much larger areas than individual patches of prairie or woodland.

Adjacency or Identification Concerns

This BpS is bounded by and grades into dry oak woodland without associated prairie. Many woodlands within the BpS have been cleared for pasture or developed for other purposes. Cedar has increased, primarily in the woodlands, under fire suppression. Prairies have often been converted to cool season grass (fescue) or warm season grass (Bermuda) pasture. Remaining prairies are often hayed one or more times per growing season.

Issues or Problems

Little information is available on disturbance and successional history in the Arkansas Valley Prairie and Woodland region. Lack of historical information makes determining the percentage of landscape in each class difficult. First General Land Office land survey data might be useful for this. There are many more descriptions of the similar Cross Timbers region to the west.

Native Uncharacteristic Conditions

Eastern red cedar increases under fire suppression in woodlands. In prairies, a variety of shrubs and trees increase and may replace herbaceous species under fire suppression, particularly along streams.

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 | 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 | C | C | C | C | C | C | B | B | B | B |
| Tree | 5-10 | C | C | C | C | C | C | B | B | B | B |
| Tree | 10-25 | D | D | D | D | D | D | E | E | E | E |
| Tree | 25-50 | D | D | D | D | D | D | E | E | E | E |
| Tree | >50 | D | D | D | D | D | D | E | 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 19 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ANGE | Andropogon gerardii | Big bluestem | Mid-Upper |
| SONU2 | Sorghastrum nutans | Indiangrass | Mid-Upper |
| QUST | Quercus stellata | Post oak | Upper |
| QUMA3 | Quercus marilandica | Blackjack oak | Upper |

Description

If forest cover of woodland is removed by tornado, stand-replacement fire, anthropogenic action (clearcutting) or other causes, the initiation stage is dominated by prairie grasses and forbs along with sprouts and seedlings of the woody woodland species. Under appropriate fire regime the stage will rapidly succeed to a mid-development stage.

*Maximum Tree Size Class*  
None

Class B 16 Mid Development 2 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUST | Quercus stellata | Post oak | Upper |
| QUMA3 | Quercus marilandica | Blackjack oak | Mid-Upper |

Description

Mid-seral with closed canopy sapling to pole-sized oak with little or no herbaceous understory. Structure may be dense from lower to upper levels even in closed canopy conditions with persistent branches composing much of structure along with numerous small to medium diameter stems. Blueberry (*Vaccinium* spp.) may contribute to lower midstory structure in closed canopy stands.

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

Class C 36 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUST | Quercus stellata | Post oak | Upper |
| QUMA3 | Quercus marilandica | Blackjack oak | Mid-Upper |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |
| SONU2 | Sorghastrum nutans | Indiangrass | Lower |

Description

Mid-seral woodland/savanna overstory with perennial grasses. Open and somewhat park-like, this class may have some smaller mid-story trees but understory is primarily dominated by little bluestem and Indiangrass. More mesic sites may have big bluestem or switchgrass.

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

Class D 23 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUST | Quercus stellata | Post oak | Upper |
| QUMA3 | Quercus marilandica | Blackjack oak | Mid-Upper |
| SCSC | Schizachyrium scoparium | Little bluestem | Lower |
| SONU2 | Sorghastrum nutans | Indiangrass | Lower |

Description

Late-seral woodland/savanna oak overstory with ground layer of perennial grasses. This class is open and park-like with a tallgrass component of little bluestem and Indiangrass. More mesic sites may have big bluestem and switchgrass.

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

Class E 6 Late Development 2 - Closed

Upper Layer Lifeform: Tree

Upper Layer Canopy Cover: 61 - 100%

Upper Layer Canopy Height: Tree 10.1m - Tree 25m

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUST | Quercus stellata | Post oak | Upper |
| QUMA3 | Quercus marilandica | Blackjack oak | Mid-Upper |

Description

Late-seral, closed canopy oak dominated overstory community. Little to no herbaceous cover but has some shrub component. Dense structure is found from the lower to upper midstory in closed canopy conditions with persistent branches composing much of structure along with numerous small to medium diameter stems. *Vaccinium* spp. may contribute to lower midstory structure in closed canopy stands.

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

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:OPN | 19 |
| Mid1:OPN | 20 | Late1:OPN | 69 |
| Mid2:CLS | 20 | Late2:CLS | 69 |
| Late1:OPN | 70 | Late1:OPN | 999 |
| Late2:CLS | 70 | Late2: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 | Mid2:CLS | 1 | 1 | Yes | 8 |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.013 | 77 | Yes | 0 |
| Mixed Fire | Early1:ALL | Early1:ALL | 0.2 | 5 | No | 0 |
| Alternative Succession | Mid1:OPN | Mid2:CLS | 1 | 1 | Yes | 6 |
| Wind or Weather or Stress | Mid1:OPN | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.05 | 20 | No | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.5 | 2 | No | 0 |
| Wind or Weather or Stress | Mid2:CLS | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Replacement Fire | Mid2:CLS | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Mixed Fire | Mid2:CLS | Mid1:OPN | 0.05 | 20 | Yes | 0 |
| Surface Fire | Mid2:CLS | Mid2:CLS | 0.5 | 2 | No | 0 |
| Alternative Succession | Late1:OPN | Late2:CLS | 1 | 1 | Yes | 6 |
| 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 | 0.025 | 40 | No | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.5 | 2 | No | 0 |
| Wind or Weather or Stress | Late2:CLS | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Replacement Fire | Late2:CLS | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Mixed Fire | Late2:CLS | Late1:OPN | 0.025 | 40 | Yes | 0 |
| Surface Fire | Late2:CLS | Late2:CLS | 0.5 | 2 | No | 0 |

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