

14151

## Arkansas Valley Prairie and Woodland -- Prairie

BpS Model/Description Version: Aug. 2020

Update: 4/16/2018

| Modelers      |                                | Reviewers |      |
|---------------|--------------------------------|-----------|------|
| Tom Foti      | tom@arkansasheritage.org       | None      | None |
| Jennifer Akin | Jennifera@arkansasheritage.org | None      | None |
| 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. Prairies and the understory and canopy openings in woodlands 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 erylgo (*Eryngium yuccifolium*), scarlet Indian paintbrush (*Castilleja coccinea*), blazing-stars (*Liatris* spp.), wild indigo (*Baptisia* spp.), Oklahoma grasspink (*Calopogon oklahomensis*) and green milkweed (*Asclepias hirtella*). The 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   | <i>Andropogon gerardii</i>     | Big bluestem    |
| SCSC   | <i>Schizachyrium scoparium</i> | Little bluestem |
| SONU2  | <i>Sorghastrum nutans</i>      | Indiangrass     |
| PAVI2  | <i>Panicum virgatum</i>        | Switchgrass     |
| QUST   | <i>Quercus stellata</i>        | Post oak        |
| QUMA3  | <i>Quercus marilandica</i>     | 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

## Fire Frequency

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.

[illegible]

|       |         |   |   |   |   |   |   |    |    |    |    |
|-------|---------|---|---|---|---|---|---|----|----|----|----|
| 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  | B  | B  |
| Shrub | 0.5-1.0 | B | B | B | B | B | B | B  | B  | B  | B  |
| Shrub | 1.0-3.0 | B | B | B | B | B | B | B  | B  | B  | B  |
| Shrub | >3.0    | B | B | B | B | B | B | B  | B  | B  | B  |
| Tree  | 0-5     | B | B | B | B | B | B | B  | B  | B  | B  |
| Tree  | 5-10    | B | B | B | B | B | B | B  | B  | B  | B  |
| Tree  | 10-25   | C | C | C | C | C | C | UN | UN | UN | UN |
| Tree  | 25-50   | C | C | C | C | C | C | UN | UN | UN | UN |
| Tree  | >50     | C | C | C | C | C | C | 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      82      Early Development 1 - All Structures

#### *Indicator Species*

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

#### Description

Prairie community of perennial grasses and forbs typically on shallow soils derived from shale. Prairies are often extensive and may have scattered trees or shrubs. Big and little bluestem, Indiangrass and switchgrass dominate.

#### Maximum Tree Size Class

None

---

### Class B      1      Early Development 2 - All Structures

#### *Indicator Species*

| Symbol | Scientific Name     | Common Name  | Canopy Position |
|--------|---------------------|--------------|-----------------|
| SAAL5  | Sassafras albidum   | Sassafras    | Upper           |
| SMILA2 | Smilax              | Greenbrier   | Mid-Upper       |
| RUBUS  | Rubus               | Blackberry   | Mid-Upper       |
| ANGE   | Andropogon gerardii | Big bluestem | Mid-Upper       |

#### Description

This community is prairie degraded by absence of fire for several intervals. In the reference condition it was very limited, resulting possibly from grazing by bison or elk or Native American actions (fire suppression associated with settlement?). After European/American settlement, the extent of this condition increased greatly. It is characterized by an increase in brush and vines that over time can completely outcompete native prairie grasses and forbs. Trees can be present and can range to 100% cover, although usually less. Shrubs were chosen as the dominant lifeform because the shrub state is more common than the tree state and even when trees are present, shrubs will also be present.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

---

**Class C                      17                                      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

Under somewhat reduced frequency or intensity of fire in prairie sites the prairie may succeed to a savanna or woodland. This community seldom or never occurred in the western Arkansas Valley where the extent of prairie patches was so large and the physical site conditions (precipitation, soil) were so favorable to prairie that fire was very frequent and prairie never succeeded to woodland. However, in geomorphic/soil settings that were less extensive and where precipitation was somewhat higher, and therefore the fire frequency was lower, this woodland condition was more common. This occurred primarily in the eastern Arkansas Valley.

Maximum Tree Size Class

Medium 9-21"DBH

**Model Parameters**

**Deterministic Transitions**

| From Class | Begins at (yr) | Succeeds to | After (years) |
|------------|----------------|-------------|---------------|
| Early1:ALL | 0              | Early1:ALL  | 999           |
| Early2:ALL | 10             | Early2:ALL  | 999           |
| Late1:OPN  | 30             | Late1: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            | Early2:ALL          | 1                       | 1                     | Yes                                                 | 10                           |

|                        |            |            |       |      |     |   |
|------------------------|------------|------------|-------|------|-----|---|
| Alternative Succession | Early1:ALL | Late1:OPN  | 0.001 | 1000 | Yes | 0 |
| Replacement Fire       | Early1:ALL | Early1:ALL | 0.5   | 2    | Yes | 0 |
| Replacement Fire       | Early2:ALL | Early1:ALL | 0.1   | 10   | Yes | 0 |
| Mixed Fire             | Early2:ALL | Early2:ALL | 0.5   | 2    | No  | 0 |
| Replacement Fire       | Late1:OPN  | Early1:ALL | 0.005 | 200  | Yes | 0 |
| Surface Fire           | Late1:OPN  | Late1:OPN  | 0.5   | 2    | No  | 0 |

## References

- Bruner, W.E. 1931. The vegetation of Oklahoma. Ecological Monographs. 1:100-188.
- Clark, S.L. 2003. Stand dynamics of an old-growth forest in the Cross Timbers of Oklahoma. Ph.D. Dissertation, Oklahoma State University, Stillwater, OK.
- Clark, S.L. and S.W. Hallgren. 2004. Dynamics of oak (*Quercus marilandica* and *Q. stellata*) reproduction in an old-growth Cross Timbers forest. Southeastern Naturalist 2: 559-574.
- Dyksterhuis, E.J. 1948. The vegetation of the western cross timbers. Ecological Monographs 18: 327-376.
- Engle, D.M., T.G. Bidwell and R.E. Masters. 1996. Restoring Cross Timbers ecosystems with fire. Trans. North American Wildlife and Natural Resources Conference 61: 190-199.
- Hoagland, B.W. 2000. The vegetation of Oklahoma: a classification for landscape mapping and conservation planning. Southwestern Naturalist 45: 385-420.
- Hoagland, B.W., I.H. Butler, F.L. Johnson and S. Glenn. 1999. The Cross Timbers. In: R.C. Anderson, J.S. Fralish and J.M. Baskin (eds). Savannas, Barrens, and rock outcrop plant communities of North America. Cambridge University Press, New York.
- Irving, W. 1935. A tour of the prairies. Harlow Publ., Oklahoma City, OK. 252 pp.
- Johnson, F.L., and P.G. Risser. 1971. Some vegetational-environment relationships in the upland forests of Oklahoma. Ecology 60: 655-663.
- Johnson, F.L. and P.G. Risser. 1975. A quantitative comparison between an oak forest and an oak savannah in central Oklahoma. Southwestern Naturalist 20:75-84.
- Kennedy, R.K. 1973. An analysis of selected Oklahoma upland forest stands including both overstory and understory components. Ph.D. Dissertation, University of Oklahoma, Norman, OK.

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

Nuttall, T. 1980. A journal of travels into the Arkansas Territory during the year 1819. S. Lottinville (ed). University of Oklahoma Press, Norman, OK. 301 pp.

Rice, E.L. and W.T. Penfound. 1959. The upland forests of Oklahoma. *Ecology* 40: 593-608.

Roe, S.A. 1998. The vegetation of a tract of ancient cross timbers in Osage County, Oklahoma. M.S. Thesis, Oklahoma State University, Stillwater, OK 86 pp.

Shutler, A. and B. Hoagland. 2004. Presettlement vegetation in the cross timbers, Carter County, Oklahoma, 1871. *Proceedings of the Oklahoma Academy of Science* 84: 19-26.

Smeins, F. 1994. Cross timbers-Texas-Little bluestem-post oak. SRM 732. Pages 107-108 in T.N. Shiftlet, ed. *Rangeland cover types of the United States*. Soc. Range Manage., Denver, CO. 152 pp.

Stahle, D.W. and J.G. Hehr. 1984. Dendroclimatic Relationships of post oak across a precipitation gradient in the southcentral United States. *Annals of the Association of American Geographers* 74: 561-573.

Stahle, D.W. and P.L. Chaney. 1994. A predictive model for the location of ancient forests. *Natural Areas Journal*. 14: 151-158.

USDA-SCS. 1982. *Statso Soils Map*.