

13080

Crosstimbers Oak Forest and Woodland

BpS Model/Description Version: Aug. 2020

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Modelers		Reviewers	
Jeff Sparks	jeff.sparks@tpwd.state.tx.us	Steve Halgren	steve.hallgren@okstate.edu
Karen Kilgore	kkilgore@tfs.tamu.edu	Bruce Hoagland	None
None	None	None	None

Vegetation Type

Forest and Woodland

Map Zones

32, 35

Geographic Range

This biophysical setting (BpS) lies in central parts of Texas, Oklahoma, and Kansas. In Oklahoma, this type is primarily in ECOMAP section 255A. In Texas, this type is found in ECOMAP subsection 255Ba, 315Ga, 315C and 315D, 255E.

Biophysical Site Description

This BpS generally has sandy to loam Ustalf soils that are from moderately deep to shallow (NatureServe 2005). Moderate rainfall region with periodic severe drought (Johnson and Risser 1971, 1973). The vegetation occurs in bands across the landscape associated strongly with soil type. Available soil water (dictated by soil depth, texture and topographic position) also has a major influence on vegetation.

Cross timbers forest will be intermixed with prairies. The prairie type is mapped and modeled separately and will be found on finer soils produced from shale.

Vegetation Description

Historical accounts describe post-replacement shrub-scrub (early coppice) areas of cross timbers in addition to open and closed canopy conditions. The Cross Timbers is an ecotone between prairie and eastern deciduous forests. The black-capped vireo's historic range was associated with the post-replacement cross timbers vegetation type. 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. Yet others describe stands within the cross timbers that were easily traversed via wagon. Based on historical accounts and limited analysis of General Land Office survey data, more closed canopy conditions occurred on the landscape than might be expected for a frequent fire regime.

The vegetation is dominated by post oak (*Quercus stellata*) and to a lesser extent blackjack oak (*Q. marilandica*). In some stands, black hickory (*Carya texana*) and/or black oak (*Q. velutina*) are co-dominants. Woody species composition varies throughout the map zone. For example, in eastern crosstimbers forests winged elm (*Ulmus alata*), farkleberry (*Vaccinium arboretum*), serviceberry (*Amelanchier arboretum*), chinkapin oak (*Q. muehlenbergii*) and bitternut hickory

(*Carya cordiformis*) are common. Ash juniper (*Juniperus asheii*) is abundant on limestone formation in south central Oklahoma. The western crosstimbers stands may include mesquite (*Prosopis glandulosa*) and hybrids for shinnery (*Quercus havardii*) and post oak (*Q. stellata*). In many areas, eastern redcedar has dramatically increased in abundance due to land use and fire suppression. Other important woody plants include Mexican plum (*Prunus mexicana*), blackhaw (*Viburnum rufidulum*), cockspur hawthorn (*Crataegus crus-galli*), chittamwood (*Bumelia lanuginosa*), roughleaf dogwood (*Cornus drummondii*), greenbriar (*Smilax* spp.), sumac (*Rhus* spp.) and poison ivy (*Toxicodendron radicans*). In open conditions the understory and canopy openings are dominated by big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), purpletop (*Tridens flavus*), and various annual and perennial forbs. Forb abundance and diversity is dictated by woody stem density and overstory canopy cover. In closed canopy conditions, there is little to no herbaceous groundcover due to oak leaf litter. Dense woody stem structure is found from the lower to upper midstory in closed canopy conditions with persistent branches composing much of structure. In the eastern extent, *Vaccinium arboreum* contribute to lower midstory structure in closed canopy stands. The Cross Timbers is generally found within a landscape matrix of tallgrass prairie and/or mixed grass prairie in the western extents.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
QUST	<i>Quercus stellata</i>	Post oak
QUMA3	<i>Quercus marilandica</i>	Blackjack oak
SCHIZ4	<i>Schizachyrium</i>	Little bluestem
ANGE	<i>Andropogon gerardii</i>	Big bluestem

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

Disturbance Description

This BpS is fire regime group I, with frequent surface fires. Fire often worked in concert with drought, severe windthrow (i.e., tornadic thunderstorms and intense microbursts) and canopy gap formation to influence the structure and composition of cross timber stands. In addition, given the forest, woodland, grassland mosaic that exists in this class, fire intensity and frequency is related to the degree of canopy closure and the available fuels. The limited information available on fire chronologies is supportive of this assumption. Fire regimes are assumed to be a result of both aboriginal and lightning origin. Fire history studies from southwest Missouri and southeast Oklahoma suggest a mean fire return interval of 3-10yrs. Major drought cycles occur at approximately 20yr intervals and may influence periodic stand replacement fire depending on the season of fire. Fires have been reported to occur during and following drought periods. Mosaic fire or mixed severity fire is thought to play some role associated with drought cycles where leaves and grass are the primary fuel for carrying a fire. Surface fires were primarily wind driven fires in open (prairie) conditions over a fuel bed of predominantly grass although occasionally surface fires might have occurred in leaf litter given dry conditions. Historic prairie fires have been noted to slow down or stop at the border of cross timbers vegetation, presumably when leaf moisture was high. Surface fire would penetrate or burn completely through late-seral, open stands.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	157	3		

Moderate (Mixed)	93	5		
Low (Surface)	5	92		
All Fires	5	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 patches varies, from small patches of 200ac to landscape size of 100,000+ ac.

Adjacency or Identification Concerns

The BpS occurs adjacent to tallgrass or mixed prairie or within in a landscape matrix with patches of prairie. In eastern Oklahoma this type can be found adjacent to oak/hickory and oak/pine forest. In eastern Texas, this type can be found adjacent to oak/pine forest. Oaks will encroach into prairie areas of the Cross Timbers without fire. The deep alluvial soils of the bottomlands are not included in this BpS.

Issues or Problems

Areas of Cross Timbers existed in fire shadows at the juncture of rivers or larger streams. Areas that were rocky may have limited had fire influence and were essentially locked up on the landscape in late seral stages (Clark 2003, Clark and Hallgren 2004a, b, c). These areas varied in canopy closure depending on soil type. Some of these protected areas may have had a high surface rock component with less canopy cover and soil types with less rock may have been denser with near complete canopy closure. Little information is available on disturbance and successional history in the Cross Timbers region. Also, lack of historical information makes determining the percentage of landscape in each class difficult.

Native Uncharacteristic Conditions

Juniper spp. (*Juniperus asheii* and *Juniperus virginiana*) can be much more prevalent on the landscape today than they would have been historically. Prior to settlement juniper would have been found primarily on rocky sites that limited fire spread due to lack of fine fuel. It is thought that with lack of fire, juniper has encroached areas that it would not have existed historically. Not all areas have experienced juniper invasion probably because they still burn frequently, do not have a seed source, or the stands are too dense for juniper to establish.

Comments

Suggested reviewers for map zone (MZ) 35 include Rich Gray (Texas Forest Service), Dr. David Stahle (University of Arkansas) and Katie Croswaithe (Army National Guard).

For MZs 32 and 35 this model was developed from the Rapid Assessment Cross Timbers model (RXTMB) by Ron Masters and reviewed by Stacy Clark (stacyclark@fs.fed.us), David Engle (dme@mail.pss.okstate.edu) and Doug Zollner (dzollner@tnc.org). Minor changes to the text and the model resulted in a change in modelership for MZ35. Steve Halgren (steve.hallgren@okstate.edu) reviewed this type for MZs 32 and 35.

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	A	A	A	A	A	A	A	A	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 15 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUST	Quercus stellata	Post oak	Upper
QUMA3	Quercus marilandica	Blackjack oak	Mid-Upper
SCHIZ4	Schizachyrium	Little bluestem	Lower
ANGE	Andropogon gerardii	Big bluestem	None

Description

Oak reproduction (often coppice) to 15ft tall. Community of forbs and perennial grasses. More persistent on shallow soils. Openings may be small to extensive and have scattered live trees. Early on bluestems will be in the upper canopy but will be overtaken by the coppice oak sprouts.

Upper Layer Lifeform is not the dominant lifeform. Initially grasses will be dominant life form but will rapidly be overtaken and shaded out (to some extent) by coppice regeneration. As long as grasses are the dominate life form, the fire behavior fuel model will be 3, but change to fire behavior fuel model 8 as the class moves towards the later years.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

Class B 21 Mid Development 2 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUST	<i>Quercus stellata</i>	Post oak	Upper
QUMA3	<i>Quercus marilandica</i>	Blackjack oak	Mid-Upper

Description

Mid-seral with closed canopy (cover >60%) sapling to pole-sized oak with little or no herbaceous understory. Often coppice origin. 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. In the eastern extent, *Vaccinium* spp. may contribute to lower midstory structure in closed canopy stands.

Upper Layer Lifeform is not the dominant lifeform. There is an east-to-west decline in average tree height and diameter corresponding to a decreasing moisture gradient. Figures given reflect the central part of the range. As one goes further west, trees may actually drop a height and size class for minimum and maximum height and size class. Trees will not move up a class going to the east.

Maximum Tree Size Class

Pole 5-9" DBH

Class C	29	Mid Development 1 - Open
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUST	Quercus stellata	Post oak	Upper
QUMA3	Quercus marilandica	Blackjack oak	Mid-Upper
SCHIZ4	Schizachyrium	Little bluestem	None
ANGE	Andropogon gerardii	Big bluestem	None

Description

Mid-seral woodland/savanna overstory with perennial grasses (cover <60%). Open and somewhat park-like, this class may have some smaller mid-story trees but overall understory is dominated with little and big bluestem. More mesic sites may have switchgrass or other panic grass component.

Upper Layer Lifeform is not the dominant lifeform. There is an east-to-west decline in average tree height and diameter corresponding to a decreasing moisture gradient. Figures given reflect the central part of the range. Going farther west, trees may actually drop a height and size class for minimum and maximum height and size class. Trees will not move up a class going to the east.

Maximum Tree Size Class

Pole 5-9" DBH

Class D	25	Late Development 1 - Open
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Indicator Species

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:OPN	19
Mid1:OPN	20	Late1:OPN	79
Mid2:CLS	20	Late2:CLS	79
Late1:OPN	80	Late1:OPN	999
Late2:CLS	80	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	10
Replacement Fire	Early1:ALL	Early1:ALL	0.01	100	Yes	0
Mixed Fire	Early1:ALL	Early1:ALL	0.04	25	No	0
Surface Fire	Early1:ALL	Early1:ALL	0.25	4	No	0
Alternative Succession	Mid1:OPN	Mid2:CLS	1	1	Yes	10
Wind or Weather or Stress	Mid1:OPN	Early1:ALL	0.005	200	Yes	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.005	200	Yes	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.25	4	No	0
Competition or Maintenance	Mid2:CLS	Mid2:CLS	0.005	200	No	0
Wind or Weather or Stress	Mid2:CLS	Early1:ALL	0.005	200	Yes	0
Replacement Fire	Mid2:CLS	Early1:ALL	0.007	143	Yes	0
Mixed Fire	Mid2:CLS	Mid1:OPN	0.015	67	Yes	0
Surface Fire	Mid2:CLS	Mid2:CLS	0.05	20	No	0
Alternative Succession	Late1:OPN	Late2:CLS	1	1	Yes	15
Competition or Maintenance	Late1:OPN	Late1:OPN	0.005	200	No	0
Wind or Weather or Stress	Late1:OPN	Early1:ALL	0.005	200	Yes	0
Replacement Fire	Late1:OPN	Early1:ALL	0.005	200	Yes	0
Surface Fire	Late1:OPN	Late1:OPN	0.25	4	No	0
Wind or Weather or Stress	Late2:CLS	Late1:OPN	0.005	200	Yes	0
Replacement Fire	Late2:CLS	Early1:ALL	0.007	143	Yes	0

Competition or Maintenance	Late2:CLS	Late2:CLS	0.01	100	No	0
Mixed Fire	Late2:CLS	Late1:OPN	0.015	67	Yes	0
Surface Fire	Late2:CLS	Late2:CLS	0.05	20	No	0

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