13120
Ouachita Montane Oak Forest

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Modelers		Reviewers	
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None	None	None	None

Vegetation Type
Forest and Woodland

Map Zones
44

Model Splits or Lumps
This Biophysical Setting (BpS) is lumped with: 1363, 1364

Geographic Range
Interior Highlands, including portions of southern Illinois, southern Missouri, northern and west-central Arkansas and eastern Oklahoma. This vegetation type is represented in map zone (MZ) 44 ECOMAP sections of Arkansas in 223A, M223A, 231G and M231A (Cleland et al. 2007). Important ecoregions in Missouri include the White River Hills, Osage River Hills, Gasconade River Hills, Meramec River Hills and Current River Hills subsections, especially where these subsections transected the Central Plateau Subsection.

Biophysical Site Description
Soils are well to somewhat excessively drained, shallow to moderately deep with an extremely acid to moderately acid soil reaction in areas underlain by chert, sandstone and igneous rock while neutral to basic in areas underlain by dolomite or limestone. Also, occurs on novaculite formations in the Ouachita Mountains of Arkansas. These occupy moderately dissected to deeply dissected borders of undulating plains, especially those regions bordering the Central Plateau Subsection of the Ozark Highlands in Missouri. This vegetation type occupies ridgetops and south-to-west-facing slope aspects throughout the Arkansas and Missouri Ozarks and Arkansas and Oklahoma Ouachita Mountains in the absence of shortleaf pine (*Pinus echinata*). Elevation ranges between 600-2,500ft throughout its range in Arkansas. The moisture regime is adequate to allow tree and shrub seedling establishment in the absence of fire. Elevations range from 1,700-1,000ft in the St. Francois Mountains Subsection, and between 1,500ft to as low as 400ft along the southeastern portion of the Ozarks Plateau. Precipitation ranges from 40-45in fairly evenly distributed over the growing season. Descriptions include all dry woodland types, dolomite glades, sandstone glades and igneous glades described in Nelson (2005); CES202.692, CES202.691, CES202.707 in the Terrestrial Ecological Systems of the Great Lakes Region. In AR, this vegetation type occupies sandstone, shale, chert and novaculite glade systems. In Missouri, this type is typically on exposed upper slopes and summits overlaying Roubidoux sandstone or Upper Gasconade dolomite. Soils are rapidly draining with frequent occurrence of chert gravel or boulders at or near the surface.

Vegetation Description

Historic range of variability: Mixed oak and hickory without pine in Arkansas, and to a lesser extent some shortleaf pine locally within its narrower range, formed a dominant open canopy ranging from as low as 30% (<10% in expansive, open glades of southwest Missouri) to as high as 80%. Understory is generally sparse with an abundant ground layer of perennial grasses and forbs. The understory consisted of variable-age oak regeneration and some scattered shrubs. Densities vary widely depending on the random nature of historical ignition sources (30-60% for open canopy and 61-90% for closed canopy). Highly diverse groundcover vegetation consisting of many flammable forbs interspersed in warm season grasses left this fuel type susceptible to rapid drying, moderate fire spread rates and area coverage. Post oak (*Quercus stellata*) and black oak (*Q. velutina*) codominate with incursions of blackjack oak (*Q. marilandica*) and shortleaf pine in acidic soils formed by chert, sandstone and igneous substrates. In Arkansas, post oak codominates with blackjack oak and black hickory (*Carya texana*) with incursions of black oak. Dominant shrub species include farkleberry (*Vaccinium arboreum*) and winged elm (*Ulmus alata*) along with oak and hickory regeneration. Understory vegetation includes brakenfern (*Pteridium* spp.), beggarticks (*Desmodium* spp.), poverty oatgrass (*Danthonia spicata*) and bush clover. Chinkapin oak (*Q. muehlenbergii*) and post oak codominate on soils underlain by dolomite/limestone -- especially in association with dolomite glades.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
QUST	*Quercus stellata*	Post oak
QUMA	*Quercus macnabiana*	Quercus macnabiana
ANGE	*Andropogon gerardii*	Big bluestem
SCHIZ4	*Schizachyrium*	Little bluestem
VAAR	*Vaccinium arboreum*	Farkleberry
CATE9	*Carya texana*	Black hickory

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

Disturbance Description

Frequent surface fires promoted an open understory dominated by a groundcover of grasses and forbs. Drought-prone glade and other shallow or bedrock natural communities remained open for longer periods following fire or severe drought disturbance, especially glades. Stand replacement fires likely occurred during extreme drought but were limited in extent. Frequent fire dominated this vegetation group through surface fires associated with productive grass fuels and cycles of moisture and drought. Native ungulate grazing may have played a small role in replacement where buffalo and elk concentrated, but fire generally maintained systems. Drought and moist cycles play a strong role interacting with both fire and native grazing. Wind, tornados and ice storms affected stands less frequently, ranging in size from ten acres to thousands of acres. Historically, variable fire and native herbivore grazing patterns maintained a wide diversity of variably aged layers of oaks and shrubs among a uniform grass/forb groundcover.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	38	13	10	100
Moderate (Mixed)	89	6		
Low (Surface)	6	81	2	7
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

Dry oak/bluestem woodland occurred over much of the Ozark Highlands Section of Missouri and Arkansas (include other states). Analysis of historic vegetation shows that this vegetation type ranges from small patches (<10ac) across more deeply dissected, topographically complex subsections to matrix-sized patches (>1,000ac) within the remaining geographic range where landforms were more gently dissected. In the aggregate, this vegetation type likely exceeded 5 million acres across the Ozarks Landscape.

Adjacency or Identification Concerns

This vegetation group can be modeled and mapped as distinct from the dry to dry-mesic oak-hickory woodlands or forests primarily based on the topographic roughness of the landscape and proximity to surrounding oak savanna, prairie and White River glades and other glade types. Another distinct breaking point between this and dry-mesic oak/pine woodlands is the dominance or strong presence of warm season grasses, generally south and west-facing aspects and only moderate dissection of the landscape (ranging from gently dissected plains to moderately steep hills). This vegetation type feathers out in portions of the most deeply dissected Ozarks Section, especially around and east of the Current River in Missouri. Uncharacteristic current conditions: much reduced groundcover diversity due to overgrazing, scattered remnant herbs and grasses suppressed beneath dense second growth stands of increased black oak, red cedar (*Juniperus virginiana*), hickory, red oak, lowbush blueberry (*V. angustifolium*) and aromatic sumac (*Rhus aromatica*). These conditions are pervasive throughout all classes. Also, observations of native grazing bison and elk in certain enclosed refuges suggests that they played an important role in shaping and modifying the character of woodlands, in conjunction with fire effects. Uncharacteristic red oak, scarlet oak (*Q. coccinea*), white oak and red cedar along with shrubs aromatic sumac, lowbush blueberry and buckbrush (*Symphoricarpos occidentalis*) dominate in 5-9in or larger mid story canopy. Canopy is near 100% closed. Fuel model 9.

Issues or Problems

This type is mapped partly as the mosaic bluestem #39 and 45 on Bailey's map and #45 of the Oak-Hickory zone in Kuchler's Potential Natural Vegetation Groups. The Historical Vegetation Project of the Missouri Geographic Resources Center at University of Missouri, Columbia mapped this as open woodland across the Ozarks with as much as 35-50% covering the Ozark Highlands. For the most part, dominant grasses and forbs were the primary available fuel that dictated fire behavior. This former fuel type is mostly converted to deciduous artifact leaf litter today under an essentially closed canopy cover. Modeling attributes to map the spatial extent of this vegetation group should focus on southwest aspects, dry rocky soils, glade occurrences and association with coarse-scale historic vegetation models from University of Missouri Columbia for shrublands, barrens and open woodlands. Larger patches of this group (1,000ac or greater) are strongly associated with gentle to moderate undulations associated with dissected landscapes less than 150ft in elevation change. These decrease in cover as landscapes become more deeply dissected with greater elevation changes. With respect to the coarser-scale grouping of alliances, the descriptions for all dry woodland natural communities published in Nelson 2005 are more accurate, descriptive and functional.

Native Uncharacteristic Conditions

Comments

Much of this vegetation group is masked by 150yrs of intense overgrazing and fire suppression resulting in a much-changed composition and structure more indicative of ecosystem degradation -- especially from overgrazing. This degradation leaves impressions that current vegetation conditions are part of the expected "natural succession" from a former woodland/savanna-dominated landscape to one of natural "forest." Reviewers need to be experienced in recognizing and assessing this much-altered vegetation artifact. Reviewers recognize the five classes represent vegetation variation (expressed in patch size, variable effects of fire intensity and mortality) as dictated by topographic variations, soils, differences in ignition sources and characteristic variations of ecological subsections in Ozark Highlands.

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 9 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
SCHIZ4	Schizachyrium	Little bluestem	Lower
QUST	Quercus stellata	Post oak	Low-Mid
QUMA3	Quercus marilandica	Blackjack oak	Low-Mid
ANGE	Andropogon gerardii	Big bluestem	Lower

Description
This class is an early-seral stage, after replacement fire. Patchy grass and oak shrub regrowth; perennial grass seedlings and forbs. Little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), asters (*Aster* spp.) and goldenrods (*Solidago* spp.). Some of this landscape will remain permanently in an open condition due to edaphic conditions. May include scattered relict old growth trees up to 30in DBH and more than 200yrs old. Grasses and forbs make up the dominant life form with canopy of 30-75% with a height of 0.1-1.1m. Oak sprouts may quickly become codominant.

Maximum Tree Size Class
None

Class B 17 Mid Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUST	Quercus stellata	Post oak	Low-Mid
QUMA3	Quercus marilandica	Blackjack oak	Low-Mid
SCHIZ4	Schizachyrium	Little bluestem	Lower
HEHI2	Helianthus hirsutus	Hairy sunflower	Lower

Description
This class is a mid-seral closed system of mixed grass and oak shrub regeneration. Dominant life form is oak shrub, particularly on more productive sites associated with open drainages, headwater draws, north and east-facing backshoulders, narrow ridges. Glade regions retain openness with few shrubs. Without fire, eastern red cedar will encroach the glade habitats.

Maximum Tree Size Class
Medium 9-21"DBH

Class C 27 Mid Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUST	Quercus stellata	Post oak	All
QUMA3	Quercus marilandica	Blackjack oak	All
SCHIZ4	Schizachyrium	Little bluestem	Lower
ANGE	Andropogon gerardii	Big bluestem	Lower

Description
This class is a mid-seral open system of mixed grass and scattered groupings or individual oaks; glade openings maintained. Trees age slowly on generally dry soils and/or in competition with dense, highly diverse grass/forb structure. Tree structure is highly variable depending on topographic position. A nearly 100% cover of warm season grasses and forbs with a few scattered shrubs, in areas with soil, make up the primary fuel type despite the presence of trees in

varying canopy closures. Many characteristic forbs could be included equally in the class dominant species. Heavy ice or wind damage is possible in this class. In the absence of fire and/or grazing for some time this class may develop a closed canopy.

Maximum Tree Size Class
Medium 9-21"DBH

Class D 45 Late Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUST	Quercus stellata	Post oak	All
QUMA	Quercus macnabiana	Quercus macnabiana	All
SCHIZ4	Schizachyrium	Little bluestem	Lower
VAAR	Vaccinium arboreum	Farkleberry	Lower

Description
This class is a late-seral open oak woodland with continued maintained grass/forb groundcover. Some scattered oak shrubs. Glades and openings on southwest-facing slopes maintained. Some mixed, widely distributed oak trees and oak resprouts may be prevalent. Larger trees demonstrate occasional scars and are subject to wind disturbance. Dominance of old growth oak individuals may decrease over several hundred years due to wind disturbance, burning out of scarred hollow trees, lightning strikes and competition with grass/forb matrix thereby reducing total canopy cover. A nearly 100% cover of warm season grasses and forbs with a few scattered shrubs make up the primary fuel type despite the presence of trees in varying canopy closures.

Maximum Tree Size Class
Large 21-33"DBH

Class E 2 Late Development 2 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUST	Quercus stellata	Post oak	Upper
QUVE	Quercus velutina	Black oak	Upper
VAPA4	Vaccinium pallidum	Blue ridge blueberry	Lower

Description
This class is a late-seral closed canopy patch within a woodland complex. Productive areas missed by fire with thick patches of oak shrubs, sometimes interspersed with variable age and/or mature oak groves; grasses and forbs suppressed beneath dense leaf litter. These occur on sites missed by fire due to randomness, highly dissected topography, and/or locally moist soil environment.
Maximum Tree Size Class
Very Large >33"DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:OPN	6
Mid1:OPN	7	Late1:OPN	70
Mid1:CLS	7	Late2:CLS	70
Late1:OPN	71	Late1:OPN	999
Late2:CLS	71	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	Mid1:CLS	1	1	Yes	5
Native Grazing	Early1:ALL	Early1:ALL	0.1	10	No	0
Surface Fire	Early1:ALL	Early1:ALL	0.2	5	No	0
Replacement Fire	Early1:ALL	Early1:ALL	0.2	5	Yes	0
Alternative Succession	Mid1:OPN	Mid1:CLS	1	1	Yes	10
Wind or Weather or Stress	Mid1:OPN	Early1:ALL	0.001	1000	Yes	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.01	100	Yes	0
Mixed Fire	Mid1:OPN	Mid1:OPN	0.02	50	No	0
Native Grazing	Mid1:OPN	Mid1:OPN	0.1	10	No	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.2	5	No	0
Wind or Weather or Stress	Mid1:CLS	Mid1:OPN	0.015	67	Yes	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.025	40	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.025	40	Yes	0
Surface Fire	Mid1:CLS	Mid1:CLS	0.03	33	No	0
Alternative Succession	Late1:OPN	Late2:CLS	1	1	Yes	20
Wind or Weather or Stress	Late1:OPN	Early1:ALL	0.001	1000	Yes	0
Replacement Fire	Late1:OPN	Early1:ALL	0.001	1000	Yes	0
Mixed Fire	Late1:OPN	Late1:OPN	0.002	500	No	0
Native Grazing	Late1:OPN	Late1:OPN	0.1	10	No	0
Surface Fire	Late1:OPN	Late1:OPN	0.2	5	No	0
Wind or Weather or Stress	Late2:CLS	Late1:OPN	0.015	67	Yes	0
Replacement Fire	Late2:CLS	Early1:ALL	0.015	67	Yes	0

Surface Fire	Late2:CLS	Late2:CLS	0.03	33	No	0
Mixed Fire	Late2:CLS	Late1:OPN	0.05	20	Yes	0

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