

13170

Allegheny-Cumberland Dry Oak Forest and Woodland

BpS Model/Description Version: Aug. 2020

Update: 3/18

Modelers		Reviewers	
Brad Slaughter	slaughterb@michigan.gov	Tom Arbour	Tom.Arbour@dnr.state.oh.us
Jeff Sole	jsole@tnc.org	Ray Hicks	rhicks3@wvu.edu
Dave Minney	dminney@tnc.org		

Vegetation Type

Forest and Woodland

Map Zones

62

Geographic Range

This system occurs on the Allegheny, Piedmont, and Cumberland plateaus, and may be applicable to other forests in the Central Hardwoods Region dominated by oak species, predominantly *Quercus alba*. It also occurs from eastern Oklahoma to Massachusetts and from northern Michigan to Pennsylvania. It continues west to the Ozark and Ouachita Highlands.

NatureServe (2007) provides the following range description for the CES202.359 -- ALLEGHENY-CUMBERLAND DRY OAK FOREST AND WOODLAND: Allegheny and Cumberland plateaus, and ridges in the Ridge and Valley. This system can also be found as small isolated patches in the Southern Blue Ridge.

In map zone (MZ)62, this Biophysical Setting (BpS) occurs primarily on the unglaciated Allegheny plateau (Subsections 221Ee, Ed, Ef, Eg, Eb, Ec, Ea, 211Ga, and M221Ca; Cleland et al. 2007) although distribution may extend into the unglaciated Allegheny plateau in Ohio (Subsections 221Fa, Fc, Fb).

Biophysical Site Description

This system encompasses dry hardwood forests on predominantly acidic substrates in the Allegheny and Cumberland plateaus, and ridges in the Ridge and Valley. This system can also be found as small isolated patches in the Southern Blue Ridge. Its range is more or less consistent with the "Mixed Mesophytic Forest Region" of Braun (1950) and Greller (1988), although it is not a mesic forest type (NatureServe 2007).

Vegetation Description

These forests were typically dominated by white oak (*Quercus alba*), southern red oak (*Quercus falcata*, of restricted distribution in MZ62), chestnut oak (*Quercus prinus*), scarlet oak (*Quercus coccinea*), with lesser amounts of red maple (*Acer rubrum*), pignut hickory (*Carya glabra*), and mockernut hickory (*Carya alba*). Additional associates include sassafras (*Sassafras albidum*), black gum (*Nyssa sylvatica*), and sweet birch (*Betula lenta*). These occur in a variety of situations, most often on nutrient-poor or acidic soils and, to a much lesser extent, on circumneutral soils. American chestnut (*Castanea dentata*) was once dominant or codominant in many of these forests and sprouts of *C. dentata* can often be found where it was formerly a

common tree. Small inclusions of shortleaf pine (*Pinus echinata*) and/or Virginia pine (*Pinus virginiana*) may occur, particularly adjacent to escarpments or following fire. In the absence of fire, white pine (*Pinus strobus*) may invade some stands (NatureServe 2007).

Today, subcanopies and shrub layers are usually well-developed. Some areas (usually on drier sites) now have dense evergreen ericaceous shrub layers of mountain laurel (*Kalmia latifolia*), or, on more mesic sites, rhododendron (*Rhododendron* spp.). Additional characteristic species include maple-leaf viburnum (*Viburnum acerifolium*), lowbush blueberry (*Vaccinium pallidum*), low sweet blueberry (*V. angustifolium*), sweet-fern (*Comptonia peregrina*), the last species especially in open areas. Herbs, forbs, and ferns are usually sparse to moderate in density. Characteristic species include Canada mayflower (*Maianthemum canadense*), Pennsylvania sedge (*Carex pensylvanica*), sedge (*C. communis*), pipsissewa (*Chimaphila maculata*), trailing arbutus (*Epigaea repens*), wintergreen (*Gaultheria procumbens*), wild sarsaparilla (*Aralia nudicaulis*), bracken (*Pteridium aquilinum*), and pink lady's slipper (*Cypripedium acaule*) (Fike 1999).

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
QUAL	<i>Quercus alba</i>	White oak
QUPR2	<i>Quercus prinus</i>	Chestnut oak
QUCO2	<i>Quercus coccinea</i>	Scarlet oak
CAGL8	<i>Carya glabra</i>	Pignut hickory
CAAL27	<i>Carya alba</i>	Mockernut hickory
CADE12	<i>Castanea dentata</i>	American chestnut
ACRU	<i>Acer rubrum</i>	Red maple
QUFA	<i>Quercus falcata</i>	Southern red oak

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

Disturbance Description

This system is impacted by disturbances at different scales and in different seral states (estimated historic frequencies for the various modeled disturbances are included in this description below). In the later, more persistent portions of the life cycle, small canopy gaps may be created across the landscape by the death of individual (or small numbers of) trees which topple. However, weather related events (ice, wind, etc.) could have created gaps in the mature canopy that range from individual tree size to larger areas depending on the specific incident. Fire also occurred, mostly at low and moderate intensities, and could create much larger openings or more open forest canopies when they occur in any seral stage.

Most oaks are long-lived with typical age of mortality ranging from 200-400yrs. Scarlet and black oaks are shorter-lived with typical ages being approximately 50-100yrs, while white oaks can live as long as 600yrs. A mixed pine component would exist on poor soils on ridgetops. Extreme wind or ice storms occasionally create larger canopy openings.

The oak-hickory forest is predominantly Fire Regime I, characterized by low-severity surface fires. Historically, indigenous fires accounted for more than 95% of the ignitions over these landscapes. Vegetation types varied based on fire frequency and intensity. Grasslands burned often (annually, biennially) and were probably associated with flat-to-slightly rolling terrain that

effectively carried fire. These grasslands, deliberately maintained by Native Americans for hunting purposes, were probably scattered throughout the forest matrix. Oak-hickory grubs (tree-sprout and shrub thickets) and small areas of yellow pine occurred where fire frequency was a bit less, probably three to nine years. Grub conditions would also arise immediately after catastrophic burns that would top-kill tree-dominated communities.

Savannas and woodlands developed within a moderate burning regime, with fire return intervals also averaging every 3-9yrs. Closed-canopy oak-hickory forests would develop where fire return intervals stretched beyond 15yrs. Shade-tolerant, fire-sensitive maples (and associated late-successional trees) would regenerate and form understories beneath oak-hickory canopies when fire was excluded over several decades. With continued fire exclusion, maple and other late-successional species would gradually replace overstory oaks and hickories through gap capture (Sutherland and Hutchinson 2003). A mosaic of vegetation types comprised oak-hickory landscapes contingent on fire history (Cutter and Guyette 1994). In a recent study on fire history of a red oak stand in West Virginia it was found that fire intervals ranged from 7-32yrs from 1846 to 2002 with a median of approximately 16yrs, and prior to the fire control era ranged from 7-15yrs (Schuler and McClain, 2003). Schuler and McClain stated that these observations did not deviate significantly from previous research in the oak forests of Ohio, Maryland and Missouri. - the above description was taken from Rapid Assessment (RA) model R6OAH1 -- Oak Hickory.

NatureServe (2007) notes that Native Americans played a critical role in the development and maintenance of oak-hickory landscapes through fire ignition, as lightning-strike ignitions were limited. Natives burned these landscapes for a variety of reasons. Fire encouraged open habitats which, in turn, increased food-producing plants (forbs, mast) and ungulate herbivores (meat). Mixed (maple-dominated) forests were relegated to those areas where fire was restricted, often associated with mesic coves, wetter depressions, and lee-sides of natural fire breaks (e.g., rivers and lakes). Prolonged lengths of time (100-150yrs) were needed for maple dominance to manifest. In addition to fire frequency, the acidic substrate and landscape position of BpS 1317 likely inhibited the development of mesophytic forest.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	37	21		
Moderate (Mixed)	116	7		
Low (Surface)	10	72	2	25
All Fires	8	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

Pre-European oak-hickory forests covered hundreds of thousands of contiguous acres.

Adjacency or Identification Concerns

Adjacent Ecological System Comments: The somewhat more mesic and/or more base-rich forests of the lower slopes of the Cumberlands and the lower slopes and valleys in the Ridge and Valley are covered by South-Central Interior Mesophytic Forest (CES202.887 -- BpS 1321). Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457 -- BpS 1376) -- is found in some similar landscapes as BpS 1317 -- Allegheny-Cumberland Dry Oak Forest and

Woodland, but on more base-rich substrates, which usually correspond to different landform positions (NatureServe 2007).

The fire interval is overestimated for the areas of southwestern Ohio, and underestimated in the southern coalfields of West Virginia. In the former, agricultural land use breaks up the forest and fires cannot spread as widely as they do in southern West Virginia or in the Ridge and Valley province of the Cumberland Mountains.

Basswoods importance is generally overstated, especially in West Virginia. But cucumber-tree probably occupies that role in the northern and mountainous regions of West Virginia and southwestern Pennsylvania.

Issues or Problems

This type occurs across many coarse mapped RA Potential Natural Vegetation Groups. Many Fire Regime Condition Class models are redundant, overlap, or are similar.

Native Uncharacteristic Conditions

American Chestnut was once a dominant species in this type, but was reduced dramatically in the 1930s. Sprouts of *Castanea dentata* can often be found where it was formerly a common tree.

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	B	B	B	B	B	UN	UN	UN	UN	UN
Shrub	0.5-1.0	B	B	B	B	B	UN	UN	UN	UN	UN
Shrub	1.0-3.0	B	B	B	B	B	UN	UN	UN	UN	UN
Shrub	>3.0	B	B	B	B	B	UN	UN	UN	UN	UN
Tree	0-5	B	B	B	B	B	B	B	B	B	B
Tree	5-10	C	C	C	C	C	C	D	D	D	D
Tree	10-25	C	C	C	C	C	C	D	D	D	D
Tree	25-50	C	C	C	C	C	C	D	D	D	D
Tree	>50	C	C	C	C	C	C	D	D	D	D

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	6	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
QUAL	Quercus alba	White oak	Middle

Description

Class A is grasslands/savanna maintained by frequently recurring fire (1-5yrs). These patches would typically be <100ac, but may have been up to 500ac. Native Americans used these lands for hunting, and agriculture/native plant gathering. Without these disturbances tree seedlings and sprouts will establish and move the community to the mid-seral, open stage.

Maximum Tree Size Class

None

Class B	9	Mid Development 1 - Open
----------------	----------	---------------------------------

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUAL	Quercus alba	White oak	Upper
QURU	Quercus rubra	Northern red oak	Low-Mid
ANGE	Andropogon gerardii	Big bluestem	Upper
QUVE	Quercus velutina	Black oak	Mid-Upper

Description

This is an early tree regeneration (root and stump sprouts) phase; fire frequency is about 3-9yrs. Areas that receive frequent surface fires will be populated by fire-adapted species such as oaks and hickories. These fires will top-kill seedlings and sprouts and a proportion of the saplings. These communities will develop into the mid-seral, open oak-hickory forest class.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

Class C	48	Late Development 1 - Open
----------------	-----------	----------------------------------

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUAL	Quercus alba	White oak	Upper
QURU	Quercus rubra	Northern red oak	Upper
QUVE	Quercus velutina	Black oak	Upper
QUCO2	Quercus coccinea	Scarlet oak	Upper

Description

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
Replacement Fire	Early1:ALL	Early1:ALL	0.33	3	Yes	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.05	20	Yes	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.1	10	No	0
Replacement Fire	Late1:OPN	Early1:ALL	0.005	200	Yes	0
Mixed Fire	Late1:OPN	Late1:OPN	0.01	100	No	0
Surface Fire	Late1:OPN	Late1:OPN	0.1	10	No	0

Replacement Fire	Late2:CLS	Early1:ALL	0.003	333	Yes	0
Mixed Fire	Late2:CLS	Late1:OPN	0.01	100	Yes	0
Surface Fire	Late2:CLS	Late2:CLS	0.1	10	No	0

References

Braun, E.L. 1950. Deciduous forests of eastern North America. Hafner Publishing Company, New York, NY.

Braun, E.L. 1961. The woody plants of Ohio: Trees, shrubs and woody climbers native, naturalized and escaped. Hafner Publishing Company, NY. 362 pp.

Burns, Russell M. and Barbara H. Honkala, tech. coords. 1990. Silvics of North America: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654. USDA Forest Service, Washington, DC. Vol 2. 877 pp.

Cleland, D.T.; Freeouf, J.A.; Keys, J.E.; Nowacki, G.J.; Carpenter, C.A.; and McNab, W.H. 2007. Ecological Subregions: Sections and Subsections for the conterminous United States. Gen. Tech. Report WO-76D [Map on CD-ROM] (A.M. Sloan, cartographer). Washington, DC: U.S. Department of Agriculture, Forest Service, presentation scale 1:3,500,000; colored

Cutter, B.E. and R.P. Guyette. 1994. Fire history of an oak-hickory ridge top in the Missouri Ozarks. American Midland Naturalist 132:393-398.

Fike, J. 1999. Terrestrial and palustrine plant communities of Pennsylvania. Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry, Harrisburg, PA.

Goebel, P.C., D.M. Hix and M. Semko-Duncan. 2005. Composition and structure of two old-growth forest ecosystem types of southeastern Ohio. Ohio Journal of Science 105: 8-16.

Greller, A.M. 1988. Deciduous forest. 288-316. In: Barbour, M.G. and W.D. Billings, eds. North American terrestrial vegetation. Cambridge University Press, NY.

McEwan, R.W., T.F. Hutchinson, R.P. Long, D.R. Ford and B.C. McCarthy. 2007. Temporal and spatial patterns in fire occurrence during the establishment of mixed-oak forests in eastern North America. Journal of Vegetation Science 18:655-664.

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of 08 June 2007.

Schuler, T.M. and W.R. McClain. 2003. Fire history of a ridge and valley oak forest. Newtown Square, PA, USDA Forest Service, Northeastern Forest Service.

Sutherland, E.K., T.F. Hutchinson and D.A. Yaussy. 2003. Introduction, study area description and experimental design (Chapter 1). Newtown Square, PA, USDA Forest Service, Northeastern Research Station.