

13170

Allegheny-Cumberland Dry Oak Forest and Woodland

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Vegetation Type

Forest and Woodland

Map Zones

48, 53

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*. This system can also be found as small isolated patches in the Southern Blue Ridge (NatureServe 2007).

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 *Quercus alba*, *Quercus falcata*, *Quercus prinus*, *Quercus coccinea*, with lesser amounts of *Acer rubrum*, *Carya glabra*, and *Carya alba*. These occur in a variety of situations, most likely 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 *Pinus echinata* and/or *Pinus virginiana* may occur, particularly adjacent to escarpments or following fire. In the absence of fire, *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*), fetterbush (*Pieris floribunda*), or on more mesic sites rhododendron (*Rhododendron* spp.). Other areas have more open shrub layers, sometimes consisting of blueberries (*Vaccinium* spp.) or huckleberries (*Gaylussacia* spp.). Herbs, forbs, and ferns are usually sparse to moderate in density.

BpS Dominant and Indicator Species

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

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 3-9yrs. 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. (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.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	91	6	1	25
Moderate (Mixed)	1207		5	50
Low (Surface)	6	94	2	25
All Fires	6	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 – Biophysical Setting [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).

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

		Canopy Cover (%)
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Upper Layer Lifeform	Height (m)	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	E	E
Tree	10-25	C	C	C	C	C	C	D	D	E	E
Tree	25-50	C	C	C	C	C	C	D	D	E	E
Tree	>50	C	C	C	C	C	C	D	D	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 17 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ANGE	Andropogon gerardii	Big bluestem	Upper
SCHIZ4	Schizachyrium	Little bluestem	Upper
SONU2	Sorghastrum nutans	Indiangrass	Upper
QUAL	Quercus alba	White oak	Upper

Description

Class A is grasslands/savanna maintained by frequently recurring fire (1-5yrs). The dominant layer lifeform is grass/herbaceous with a sparse overstory of oak or pine. These patches would typically be less than 100ac, but may have been up to 500 acres. Native Americans used these lands for hunting, and agriculture/native plant gathering. If fire is absent, tree seedlings and sprouts will establish and move the community to the mid-seral, closed stage.

Maximum Tree Size Class

None

Class B 1 Mid Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUAL	Quercus alba	White oak	Upper

QURU	Quercus rubra	Northern red oak	Upper
ANGE	Andropogon gerardii	Big bluestem	Low-Mid
QUVE	Quercus velutina	Black oak	Upper

Description

This is an early tree regeneration (root and stump sprouts) phase; fire frequency is about 3-9yrs. Any area that does not burn frequently is probably too moist and will be populated by mixed-mesophytic tree species. Class B needs to have some surface fire to remove the more mesic (ACRU, ACSA, LITU, FAGR) seedlings and saplings from the understory and remove some of the oaks and hickories as well. Otherwise, you cannot get to the open woodland/savanna stages. In the absence of these fires, these communities will move to the late-seral closed, mixed mesophytic class (Class E).

Areas that receive frequent surface fires will be populated by fire-adapted species such as oaks and hickories.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

Class C 13 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	Upper
QUVE	Quercus velutina	Black oak	Upper
QUCO2	Quercus coccinea	Scarlet oak	Upper

Description

This class is defined as the mid-seral open oak-hickory savannas and woodlands with a fire return interval of 5-15yrs.

Maximum Tree Size Class

Medium 9-21"DBH

Class D 6 Late Development 1 - Closed

Indicator Species

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

Description

Class D is defined as a late seral closed canopy oak-hickory forest. Open understories of oak seedlings exist. If the late-succession open forest type persists without any type of fire, it will eventually convert to a late-succession mixed mesophytic closed forest type. This conversion is a result of species shift from dominant oaks to dominant maple, tulip tree, and beech, which do not support fire as readily.

Maximum Tree Size Class

Medium 9-21"DBH

Class E	63	Late Development 2 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ACRU	Acer rubrum	Red maple	Upper
ACSA3	Acer saccharum	Sugar maple	Upper
LIRIO	Liriodendron	Tuliptree	Upper
FAGR	Fagus grandifolia	American beech	Upper

Description

Mixed (maple) forests develop during the absence of fire. Dense understories of shade-tolerant species develop.

Maximum Tree Size Class

Medium 9-21"DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:OPN	20
Mid1:OPN	21	Late2:CLS	50
Mid1:CLS	21	Late1:CLS	50
Late1:CLS	51	Late1:CLS	999
Late2:CLS	51	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	19
Replacement Fire	Early1:ALL	Early1:ALL	0.05	20	Yes	0
Surface Fire	Early1:ALL	Early1:ALL	0.15	7	No	0
Alternative Succession	Mid1:OPN	Late1:CLS	1	1	Yes	28

Replacement Fire	Mid1:OPN	Early1:ALL	0.007	143	Yes	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.1	10	No	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.02	50	Yes	0
Replacement Fire	Late1:CLS	Early1:ALL	0.005	200	Yes	0
Mixed Fire	Late1:CLS	Late2:CLS	0.01	100	Yes	0
Alternative Succession	Late2:CLS	Late1:CLS	1	1	Yes	30
Replacement Fire	Late2:CLS	Early1:ALL	0.002	500	Yes	0
Optional 1	Late2:CLS	Early1:ALL	0.004	250	Yes	0
Surface Fire	Late2:CLS	Late2:CLS	0.2	5	No	0

Optional Disturbances

Optional 1: None

References

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