

13050

Southern Interior Low Plateau Dry-Mesic Oak Forest

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Vegetation Type

Forest and Woodland

Map Zones

53

Geographic Range

This system occurs in the southeastern Interior Highlands of the Interior Low Plateau region, including southern Indiana and a small part of southeastern Ohio. This system of upland hardwood-dominated forests occurs in the Interior Low Plateau region of the southeastern United States along ridgetops and slopes of various aspects. The system includes essentially all upland hardwood stands of the region except for mesic hardwood forests (which are accommodated by South-Central Interior Mesophytic Forest (CES202.887)).

Biophysical Site Description

This system encompasses dry hardwood forests on predominantly acidic substrates. Included here are a variety of associations ranging along a moisture gradient from submesic to drier ones. The submesic to dry-mesic expressions tend to be found on midslopes with northerly to easterly aspects, and the drier ones on southerly to westerly aspects and on broad ridges. Parent material can range from calcareous to acidic with very shallow, well- to excessively well-drained soils in the drier expressions and moderately well-drained soils in the submesic to dry-mesic ones. The canopy closure of this system ranges from closed to somewhat open in the drier examples. Historically, these examples may have been more open under conditions of more frequent fire.

Vegetation Description

The floristic expression of different stands included in this system varies considerably with aspect and soil type. A number of different *Quercus* species may dominate stands of this system, with *Carya* species also prominent. In the drier examples, *Quercus prinus* is typical over most of the range, reflecting relations with other Appalachian systems to the east. In addition, *Quercus stellata*, *Quercus marilandica*, and *Quercus coccinea* will also share dominance or be prominent in many of the drier examples. *Quercus shumardii* may appear in drier examples with high base status. *Quercus alba* may also be present but not typically dominant. In the submesic to dry-mesic examples, *Quercus alba* will typically exhibit dominance, possibly with *Quercus rubra* or *Quercus falcata*. The understories are typically shrub- and small tree-dominated, with the typical species varying with aspect, soil, and moisture relations.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
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QUAL	<i>Quercus alba</i>	White oak
QUVE	<i>Quercus velutina</i>	Black 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
QUST	<i>Quercus stellata</i>	Post oak

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

Disturbance Description

This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase regeneration. 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. 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 over 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. In turn, large herbivores (elk, bison) played a role in maintaining the openness of this system. 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 mesophytic species) would regenerate and form understories beneath oak-hickory canopies when fire was excluded over several decades. With continued fire exclusion, maple and other mesophytic 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 R6OAH -- 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 (40-70yrs) were needed for maple dominance to manifest.

Fire Frequency

Shrub	1.0-3.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Shrub	>3.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	0-5	A	A	A	B	B	B	B	B	B	B
Tree	5-10	A	A	C	C	C	C	D	D	E	E
Tree	10-25	A	A	C	C	C	C	D	D	E	E
Tree	25-50	UN	UN	C	C	C	C	D	D	E	E
Tree	>50	UN	UN	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 leaf form 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 59 Early Development 1 - All Structures

Indicator Species

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

Description

Type can be classified as open oak savannah or barrens as originally described by early European settlers. It is largely dominated by grasses, with few scattered trees. Class A is grasslands/savanna maintained by frequently recurring fire, on average approximately 90% of this type burned annually. These patch sizes were variable from small and glade-like to large landscape level. Native Americans used these lands for hunting, and agriculture/native plant gathering. Large herbivores likely played an important role in maintaining these systems in an open condition. On the lower elevations of this type, cane was likely a dominant grass cover type. 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 6 Mid Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUAL	Quercus alba	White oak	Upper
DANTH	Danthonia	Oatgrass	Lower
SCHIZ4	Schizachyrium	Little bluestem	Lower
QUVE	Quercus velutina	Black oak	Upper

Description

Type can be classified as thicket, very similar to old field succession. 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. Species such as Eastern Red Cedar, Elms, and in some cases Virginia Pine often begin the transition from Class A to Class B. Oak Hickory and mesophytic species may all be present in this class. 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. In the absence of fire, Class B will succeed to Class E due to the dominance of mesophytic species.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

Class C	27	Mid Development 1 - Open
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUAL	Quercus alba	White oak	Upper
SCHIZ4	Schizachyrium	Little bluestem	Lower
QUVE	Quercus velutina	Black oak	Upper
DANTH	Danthonia	Oatgrass	Lower

Description

Typed can be classified as open woodland. This class is defined as the mid-seral open oak-hickory woodland (which gradiates to Class A). This community quite commonly experiences frequent surface fires, and the fire return interval is typically 5-15yrs. Mesophytic species may be present, but oak-hickory is dominant in the regeneration layer. If fire is absent from this community for an extended period (approximately 25-30yrs), the canopy will become less open, moving the community into the late-seral, closed canopy, oak-hickory forest. An occasional canopy removal event from fire or weather followed by fire exclusion will move this community back to a mid-seral, closed early tree regeneration phase.

Maximum Tree Size Class

Medium 9-21"DBH

Class D	5	Late Development 1 - Closed
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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

Type can be classified as closed canopy oak-hickory forest. Class D is defined as a late seral closed canopy oak-hickory forest. Open understories of oak seedlings dominate on dry, xeric sites (fuel model 9), while mesophytic species dominate on more mesic sites (fuel model 8). Stand replacement fires in late-succession closed class types are rare and will result in return to a mid-succession closed Class B. Widespread, high severity fire is restricted to drought years due the mosaic of fuel models. If the late-succession open forest type persists for 70yrs without any type of fire, it will 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	3	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

Type can be classified as closed mesophytic forests. Mixed (maple) forests develop during the absence of fire. Dense understories of shade-tolerant species develop causing oak-hickory dominance to fade. Replacement fires are very rare, and will revert the system to a mid-succession closed class. Insect, wind and weather stress events will result in gap formation and a decline to mid-succession closed class.

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:CLS	3
Mid1:CLS	4	Mid1:OPN	19
Mid1:OPN	20	Mid1:OPN	999
Late1:CLS	20	Late1:CLS	999
Late2:CLS	20	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
Native Grazing	Early1:ALL	Early1:ALL	0.17	6	No	0
Replacement Fire	Early1:ALL	Early1:ALL	0.9	1	Yes	0
Alternative Succession	Mid1:OPN	Late1:CLS	1	1	Yes	20
Wind or Weather or Stress	Mid1:OPN	Early1:ALL	0.001	1000	Yes	0
Replacement Fire	Mid1:OPN	Mid1:CLS	0.01	100	Yes	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.2	5	No	0
Alternative Succession	Mid1:CLS	Late2:CLS	0.01	100	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.02	50	Yes	0
Surface Fire	Mid1:CLS	Mid1:CLS	0.1	10	No	0
Alternative Succession	Late1:CLS	Late2:CLS	1	1	Yes	70
Replacement Fire	Late1:CLS	Mid1:CLS	0.005	200	Yes	0
Mixed Fire	Late1:CLS	Mid1:OPN	0.015	67	Yes	0
Surface Fire	Late1:CLS	Late1:CLS	0.1	10	No	0
Replacement Fire	Late2:CLS	Mid1:CLS	0.0014	714	Yes	0
Wind or Weather or Stress	Late2:CLS	Mid1:CLS	0.007	143	Yes	0
Mixed Fire	Late2:CLS	Mid1:OPN	0.01	100	Yes	0
Surface Fire	Late2:CLS	Late2:CLS	0.05	20	No	0

References

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