

13770

Central Appalachian Pine-Oak Rocky Woodland

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Vegetation Type

Forest and Woodland

Map Zones

60, 61, 63, 64, 65, 66

Geographic Range

Scattered areas throughout Ridge and Valley of the Central Appalachians in West Virginia and possibly extending into south-central Pennsylvania, western Maryland and western Virginia.

NatureServe (2007) describes this system as occurring from central New England south to Virginia and West Virginia (see Central Appalachian Pine-Oak Rocky Woodland (CES202.600).

Ridge and valley province. Stands occur as scattered patches, common on crests of upper slopes of the ridges, shale barrens of eastern West Virginia (for Virginia, West Virginia, Kentucky) (SAF 1980).

This system is on the northern edge of its range in Vermont, where it is represented by scattered small forest and woodland hilltop patches in the Champlain Valley, Taconic Mountains, and Connecticut River Valley.

Biophysical Site Description

This forest type occurred where geological formations formed rocky cliffs and ridgetops, outcroppings, and steep slopes, mostly at lower elevations but occasionally occurring at elevations between 1000 and 4200ft MSL (1220m). In West Virginia, elevations are typically between 2000 and 4200ft MSL, and are usually the highest points in the immediate landscape. Aspects on slopes are typically southerly and westerly. This forest occurs east of the Allegheny Mountains, in the rain shadow. The substrate is derived from sandstone. The soils are shallow and droughty, with varying accumulations of litter and duff.

This group contains species-poor, fire-influenced, mixed woodlands of xeric, exposed montane habitats. Communities in this group occur in the Appalachians from New York south to northern Georgia. Sites are typically located on convex, south to west facets of steep spur ridges, narrow rocky crests, and cliff tops. Pine-Oak/Heath woodlands are widespread throughout both the

Ridge and Valley and Blue Ridge provinces in western Virginia. They occur at elevations from below 300m (1,000ft) to more than 1,200m (4,000ft) on various substrates, but most commonly on acidic, sedimentary and metasedimentary substrates, e.g., sandstone, quartzite, and shale. A few stands occur on Piedmont monadnocks and foothills. Soils are very infertile, shallow, and droughty (Virginia Nat Her 2007).

The type is restricted to poor, dry sites which have been disturbed in the recent past by heavy cutting, fire, or both. Thin, rocky soils in the mountainous areas. Soil strongly acid and devoid of nutrients, and low precipitation in shale barrens of eastern West Virginia and adjacent states (SAF 1980).

Vegetation Description

These woodlands and forests are dominated by dry site pine species mixed with some oaks. Individual stands may be dominated or co-dominated by pitch pine (*Pinus rigida*), red pine (*Pinus resinosa*), Table mountain pine (*Pinus pungens*), and Virginia pine (*Pinus virginiana*). Associated deciduous trees include black oak (*Quercus velutina*), scarlet oak (*Quercus coccinea*), chestnut oak (*Quercus prinus*), and black gum (*Nyssa sylvatica*). Associated shrub species include mountain laurel (*Kalmia latifolia*), scrub oak (*Quercus ilicifolia*), and black huckleberry (*Gaylussacia baccata*), and blueberries (*Vaccinium* sp.). Physiognomy ranges from tall, closed canopy red pine forests to dwarf pitch pine forests to open woodlands with varying pine and oak co-dominance. Table mountain pine, Virginia pine, and scarlet oak are absent from this system at the northern portion of its range.

The vegetation is patchy, with woodland as well as open portions. *Pinus* spp. are diagnostic and often are mixed with xerophytic *Quercus* spp. Some areas have a fairly well-developed heath shrub layer, others a graminoid layer (NatureServe 2007).

Short-statured table-mountain pine (*Pinus pungens*) and pitch pine (*Pinus rigida*) are usually the dominants forming an open overstory, often with co-dominant chestnut oak (*Quercus montana*, formerly known as *Quercus prinus*). Less important tree associates include scarlet oak (*Quercus coccinea*), Virginia pine (*Pinus virginiana*), and sassafras (*Sassafras albidum*). Except in the Piedmont stands, bear oak (*Quercus ilicifolia*) is characteristically abundant in the shrub layer, along with various ericaceous species. Colonial shrubs usually pre-empt available microhabitats for most herbaceous species, but bracken fern (*Pteridium aquilinum* var. *latiusculum*) and turkey-beard (*Xerophyllum asphodeloides*) are often competitive enough to achieve significant cover (Virginia Nat Her 2007).

Shrub or dwarf bear oak, pitch pine, SCO, CHO, WO, BJO, PTO, NRO, low bush blueberry, huckleberry, mountain laurel, sheep-laurel, sweetfern, teaberry, beardgrass, poverty oat grass (SAF 1980)

The globally rare variable sedge (*Carex polymorpha*), the state-rare northern pine snake (*Pituophis melanoleucus melanoleucus*) and several rare moths, all bear oak feeders, are locally associated with these woodlands. More common and conspicuous animals often found in these dry, rocky, semi-open habitats include the northern fence lizard (*Sceloporus undulatus hyacinthinus*) and the five-lined skink (*Eumeces fasciatus*) (Virginia Nat Her 2007).

A subset of northern and central Appalachian Pine-Oak/Heath communities that occurs on exposed, high-elevation summits of sedimentary ridges are sometimes referred to as montane or Appalachian “pine barrens.” Although these communities are fire-influenced, the vegetation retains a dwarfed, shrubland (< 6m [20ft] tall) physiognomy even during long absences of fire due to extremely shallow, xeric soils and constant exposure to severe winds and ice. Only one occurrence of such a “pine barren” is documented in Virginia, covering about 60ha (150ac) on Warm Springs Mountain (Bath County), at elevations between 1100-1200m (3,600 and 4,000 ft). Larger examples occur in nearby West Virginia at elevations from 1200-1375m (4,000 to 4,500 ft) on the summit of North Fork Mountain (Pendleton County). The singular Virginia occurrence is characterized by dense, nearly impenetrable thickets of Catawba rhododendron (*Rhododendron catawbiense*), bear oak (*Quercus ilicifolia*), mountain-laurel (*Kalmia latifolia*), black huckleberry (*Gaylussacia baccata*), and late lowbush blueberry (*Vaccinium angustifolium*), with scattered emergent (but still shrub-sized) pitch pines (*Pinus rigida*). The average height of the barrens vegetation varies from knee-high in years following intense burns to about 5m (16ft). Compositionally and environmentally, the Central Appalachian “pine barrens” can be considered part of the Pine-Oak/Heath Woodlands ecological group, but more study is needed to determine whether the Virginia stand represents a distinct community type (Virginia Nat Her 2007).

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
PIRE	<i>Pinus resinosa</i>	Red pine
PIRI	<i>Pinus rigida</i>	Pitch pine
PIPU5	<i>Pinus pungens</i>	Table mountain pine
QUVE	<i>Quercus velutina</i>	Black oak
QUCO2	<i>Quercus coccinea</i>	Scarlet oak
QUIL	<i>Quercus ilicifolia</i>	Bear oak
KALA	<i>Kalmia latifolia</i>	Mountain laurel
GABA	<i>Gaylussacia baccata</i>	Black huckleberry

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

Disturbance Description

Fire regime group V, any severity 200yrs+. These stands could have burned when fuel accumulations caused by extended drought and beetle kill created fuel continuity conditions favorable for fire spread. Lightning strikes on the ridgetops are probable ignition sources. These stands are surrounded by mixed oaks that may have burned more frequently; however, fire only reached the pine stands under severe burning conditions. The rocky terrain inhibited surface fires from the oak forests from reaching the pine forests. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire (NatureServe 2007).

Periodic fire is an important ecological process that provides opportunities for regeneration of both pines and less competitive herbaceous species, while setting back successional encroachment of potential overstory oaks (especially chestnut oak). On cliffs and other very rocky sites, the vegetation is self-perpetuating due to extreme edaphic conditions. (Virginia Nat Her 2007). In Vermont the absence of periodic fire typically leads to encroachment of red maple (*Acer rubrum*).

Kind of disturbance that favors creation and maintenance of bear oak-pitch pine is one that kills aboveground portions of oak and that recurs at frequent but not necessarily regular intervals. Fire is most common disturbance type, but frost pockets and late spring frosts documented as an ecological factor in Pennsylvania. If disturbances occur very frequently (every 2-3yrs) bear oak tend to be replaced by more resistant vegetation – low shrubs, grasses, ferns, other herbs. If disturbances infrequent, associated trees outgrow bear oak, which is shade intolerant and gets overtopped. With Pitch pine disturbance, fire produces basal sprouts, bole and crown sprouts, mostly one severe fire followed by longer non-fire period (SAF 1980).

A challenge with modeling fire regimes with this type is the level of fuels. The assumption in this model is that the edaphic conditions lead to a paucity of fuels to carry a fire. Local modelers should also check these publications that deal with similar ecosystems:

- Aldrich, S.R., Lafon, C.W., Grissino-Mayer, H.D. and DeWeese, G.G., 2014. Fire history and its relations with land use and climate over three centuries in the central Appalachian Mountains, USA. *Journal of Biogeography*, 41(11), pp.2093-2104.
- Hessl, A.E., Saladyga, T., Schuler, T., Clark, P. and Wixom, J., 2011. Fire history from three species on a central Appalachian ridgetop. *Canadian Journal of Forest Research*, 41(10), pp.2031-2039.

These papers suggest a more frequent fire regime. However, it is not clear if they were looking at sites with low fuel continuity as would exist on these rocky sites.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	411	46		
Moderate (Mixed)	383	50		
Low (Surface)	4591	4		
All Fires	190	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

Patch sizes can range from a few acres to 300ac+, but typically range from 1-50ac. It is usually a small patch occurrence.

Adjacency or Identification Concerns

The Southern Appalachian Montane Pine Forest and Woodland, Biophysical Setting (BpS) 1352, is similar, but is geographically separated and characterized by *Pinus pungens*. Stands of this system (BpS 1377--Central Appalachian Pine-Oak Rocky Woodland) are often immediately adjacent to stands of the Central Appalachian Dry Oak-Pine Forest, BpS 1369. There is variability within this system related to dominant pine species, aspect, and physiognomy (woodland vs. forest, pygmy vs. tall). This model was developed to approximate the most abundant expression within this map zone (*P. rigida*, *P. pungens* woodland to open forest).

NatureServe (2007) notes that the northern extent of this system (BpS 1377) in central New England may overlap with Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571), which has *Picea* spp. prominent.

Issues or Problems

Timber values on these sites are typically low, resulting in these areas being set aside for other uses, i.e., recreational sites, nature preserves, and second home development.

Fire reduction and the native insect pest, southern pine beetle (*Dendroctonus frontalis*) are the most serious threats to communities of this group, although historically, pine beetle-induced mortality followed by stand-replacing fire was a principal mechanism for pine regeneration (Virginia Nat Her 2007).

Native Uncharacteristic Conditions

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

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 3 Early Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PINUS	Pinus	Pine	Lower
QUERC	Quercus	Oak	Lower
GABA	Gaylussacia baccata	Black huckleberry	Lower

Description

Early development, open canopy. This seral stage is characterized by lichens, polytrichum, pine seedlings, oak seedlings, and shrub seedlings. The soil surface is mostly bare, with exposed rock surfaces and rocks, and scree cobbles, some of which were created by long-duration burning of lightered tree debris. Bare sand provides germination sites. This stage occurs with new site creation, i.e., rockfalls, slips, and other geologic events. Most typically, this stage occurs after severe stand replacement fire. The remaining root stocks of scrub oak and blueberry will exhibit sprouting. Recruitment of other species comes via animal and bird deposition from other sites, or any seed bank that was not consumed. This stage is not very common.

Maximum Tree Size Class

None

Class B	7	Mid Development 1 - Open
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PINUS	Pinus	Pine	Upper
QUERC	Quercus	Oak	Low-Mid
QUIL	Quercus ilicifolia	Bear oak	Lower
GABA	Gaylussacia baccata	Black huckleberry	Lower

Description

Early-development, open canopy. In this stage the pines have grown taller than the blueberries and scrub oaks. Differentiation of community structure is evident. Oaks, blackgum, and sweet birch are established (0.6-3ft) in the stand. The shrub layer is becoming well-developed with spreading crowns. Surface and mixed fires may occur. Surface fire will retain the class. Mixed fire will revert the class to Class A. Lightning strikes are the most probable source of ignition.

Upper Layer Lifeform is not the dominant lifeform. The dominant life form is the shrub layer of scrub oak and black huckleberry.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

Class C	74	Late Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PINUS	Pinus	Pine	Upper
QUERC	Quercus	Oak	Mid-Upper
NYSY	Nyssa sylvatica	Blackgum	Low-Mid
BELE	Betula lenta	Sweet birch	Low-Mid

Description

Maximum Tree Size Class
Medium 9-21" DBH

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:OPN	Early1:OPN	0.003	333	Yes	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.003	333	No	0

Mixed Fire	Mid1:OPN	Early1:OPN	0.003	333	Yes	0
Wind or Weather or Stress	Mid1:OPN	Mid1:OPN	0.1	10	No	0
Alternative Succession	Late1:OPN	Late1:CLS	1	1	Yes	40
Mixed Fire	Late1:OPN	Late1:OPN	0.0015	667	No	0
Replacement Fire	Late1:OPN	Early1:OPN	0.0015	667	Yes	0
Wind or Weather or Stress	Late1:OPN	Late1:CLS	0.025	40	Yes	0
Mixed Fire	Late1:CLS	Late1:OPN	0.003	333	Yes	0
Replacement Fire	Late1:CLS	Early1:OPN	0.003	333	Yes	0
Insects or Disease	Late1:CLS	Late1:OPN	0.01	100	Yes	0
Wind or Weather or Stress	Late1:CLS	Late1:OPN	0.1	10	Yes	0

References

Aldrich, S.R., Lafon, C.W., Grissino-Mayer, H.D. and DeWeese, G.G., 2014. Fire history and its relations with land use and climate over three centuries in the central Appalachian Mountains, USA. *Journal of Biogeography*, 41(11), pp.2093-2104.

Brooks, A.B. 1910. *West Virginia Geological Survey. Vol 5. Forestry and Wood Industries*, Acme Publishing, Morgantown, WV.

Hall, M. 200x. Unpublished thesis. Western Carolina University, Cullowhee, NC. (Community classification of Short Mountain WMA), WV.

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

Eyre, F. H. (ed). 1980. *Forest Cover Types of the United States and Canada*. Society of American Foresters, Washington, DC. 148 pp.

Virginia Natural Heritage Program. 2007. Pine-oak heath woodlands. Department of Conservation and Recreation. www.dcr.virginia.gov/natural_heritage.
See Vanderhort for pine references.

West Virginia Natural Heritage Program. 2007. Plots2-WV. Database System for West Virginia.