

Dry Pine and Pine-Oak Forests and Woodlands

Driving across West Virginia in winter, the evergreen trees pop out, no longer hidden by their deciduous tree associates. At high elevations they may be spruce, in moist areas they may be hemlocks, in drier areas they are often pines. Pines are adapted to sunny habitats along roadsides, but away from roads they dominate natural forests and woodlands in some of our most dramatic landscapes.

Ecological Description: Dry Pine and Pine-Oak Forests and Woodlands are a diverse group of natural communities united by their dominance or codominance by species of pine (*Pinus*). Native WV pines include shortleaf pine (*Pinus echinata*), Table Mountain pine (*Pinus pungens*), red pine (*Pinus resinosa*), pitch pine (*Pinus rigida*), white pine (*Pinus strobus*), and Virginia pine (*Pinus virginiana*).



Depending on the association, the canopies of these forests and woodlands range from open to closed and from nearly pure evergreen to mixed evergreen-deciduous. Canopy height is also variable, ranging from pygmy pitch pine forests <5 meters tall to mixed forests with white pines >40 meters tall towering over their oak companions. Common deciduous tree canopy associates include white oak (*Quercus alba*), scarlet oak (*Quercus coccinea*), chestnut oak (*Quercus prinus*), red oak (*Quercus rubra*), black oak (*Quercus velutina*), black gum (*Nyssa sylvatica*), sourwood (*Oxydendrum arboretum*), and red maple (*Acer rubrum*). Shrub layers in many stands are dominated by heaths, including mountain laurel (*Kalmia latifolia*), black huckleberry (*Gaylussacia baccata*), and blueberries (*Vaccinium angustifolium*, *Vaccinium pallidum*). Scrub oak (*Quercus ilicifolia*) may form understory thickets in eastern WV but is absent in the western parts of the state. Subshrub heaths which are common in many associations include pipsissewa (*Chimaphila maculata*), trailing arbutus (*Epigaea repens*), and wintergreen (*Gaultheria procumbens*). Herbs are usually sparse but include acid and drought tolerant species such as common cinquefoil (*Potentilla simplex*), longleaf summer bluet (*Houstonia longifolia*), cow-wheat (*Melampyrum lineare*), rattlesnake-weed (*Hieracium venosum*), Pennsylvania sedge (*Carex pensylvanica*), black-edge sedge (*Carex nigromarginata*), poverty oatgrass (*Danthonia spicata*), tufted hairgrass (*Deschampsia flexuosa*), and starved witchgrass (*Dichanthelium depauperatum*). White pincushion moss (*Leucobryum glaucum*) is common in most associations. Lichens are often abundant and diverse on soil, rocks, and wood.

The different pines have somewhat different habitat requirements but they are all adapted to relatively dry, warm sites, usually with rocky, highly acidic soils. They are often found on cliff tops, on ridges and hilltops, and on slopes with southwest aspects. Soils of most associations are derived from sandstones, but some occur on soils derived

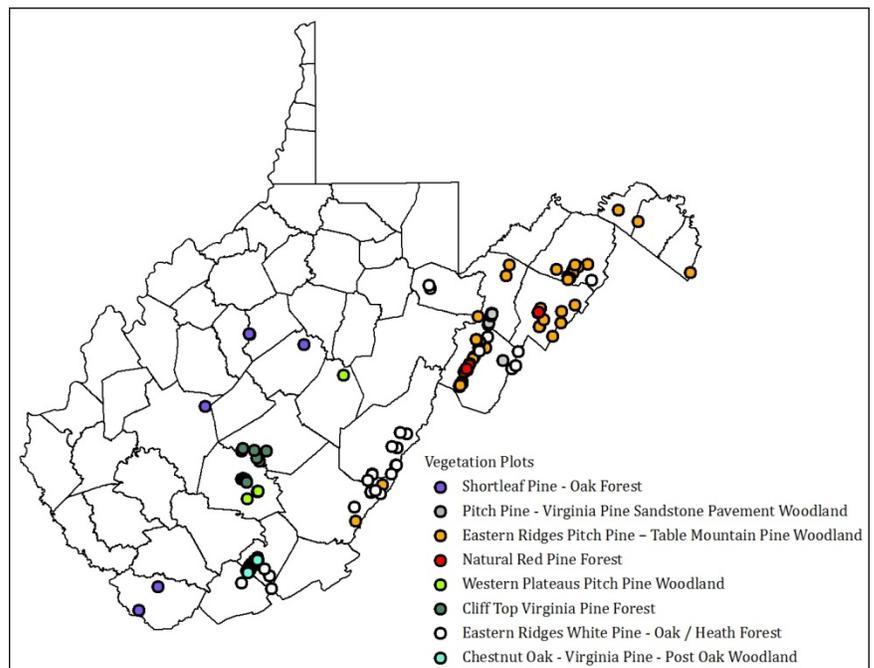
from sandstone or shale. Open woodlands on shale codominated by Virginia pine are usually classified as [Shale Barrens](#), the topic of another edition of *Wild Vegetation of West Virginia*. Most pine seedlings are shade intolerant and require an open canopy to promote regeneration, but white pine has intermediate shade tolerance and often becomes established in the understories of oak forests.

Pines are variously adapted to fire. White pine and Virginia pine have relatively thin bark and young trees are usually killed by fire, but older trees may become more fire resistant. Pitch pine and Table Mountain pine have similar fire ecology and often grow together in the Ridge and Valley; they are sometimes considered fire dependent but they reproduce and maintain themselves without fire on cliff tops and other hot, dry landscape positions. Short leaf pine is also adapted to fire and is generally considered fire dependent but it is longer lived than pitch or Table Mountain pine, so natural stands may persist in a landscape with longer fire intervals. Red pine is generally considered fire dependent across its main range to the north, but the disjunct natural stands on high ridges in WV reproduce successfully without fire, probably due to frequent canopy disturbance by wind and ice storms. All pine species may establish dense stands following fire if there is a nearby seed source. Natural fire ignitions are rare in WV.

Pines are also conspicuous in semi-natural and planted forests across WV. They may become established on less dry, more fertile sites following fire or other disturbance. Successional white pine forests are especially common in the Greenbrier and Bluestone Valleys on abandoned farmland. Successional Virginia pine forests are common on abandoned farmland at low to middle elevations across the state. Burn patches dominated by pitch and Table Mountain pine are common in the eastern counties. Over time, successional pine stands break up and become dominated by deciduous tree species. Pines, including species native and non-native to North America, have also been planted beyond their native ranges and sometimes reproduce successfully.

Animals that need these habitats: Pine warblers (*Setophaga pinus*) are obligates to these habitats and never nest away from pines. Pine warblers have decreased in the western counties as successional Virginia pine stands on abandoned farmland have declined. They remain common in the eastern counties where natural pine stands are more abundant. Vertebrate species of greatest conservation need in these habitats include the eastern spotted skunk (*Spilogale putorius*) and the timber rattlesnake (*Crotalus horridus*). Some native moth caterpillars (for example species of *Zale*) are pine feeders, but little is known about their distribution and taxonomy in WV. Caterpillars of another rare moth, the pine barrens underwing (*Catocala herodias*) feed on bear oak (*Quercus illicifolia*) which has high fidelity to the Ridge and Valley Pitch Pine – Table Mountain Pine Woodland.

Distribution: The biogeography of each pine species is unique. Short leaf pine is a southern pine which is uncommon at low elevations across WV. In the rain shadow east of the Allegheny Front, pitch pine and Table Mountain pine are common but west of the Allegheny Front, Table Mountain pine drops out and pitch pine becomes rare. Native stands of red pine on just two high ridges in eastern WV are the southernmost natural stands of this species in the world. Virginia pine is codominant on many shale barrens in



eastern WV (the topic of another edition in the [Wild Vegetation of West Virginia](#) series) but also dominates natural communities on top of cliffs that rim the gorges of the New and Gauley Rivers. The Eastern Ridges White Pine - Oak / Heath Forest is widespread in the Ridge and Valley and Greenbrier Valley and also has a disjunct occurrence around Parsons in Tucker County.

Places to see and visit: Hike to Potato Knob at [Holly River State Park](#) to see a rare example of the Western Plateaus Pitch Pine Woodland, but be forewarned, it is steep! Another place to see the Western Plateaus Pitch Pine Woodland is along the Islands in the Sky Trail at [Babcock State Park](#). West Virginia's Natural Red Pine Forest can be seen at The Nature Conservancy's [Pike Knob Preserve](#) and adjacent areas on the Monongahela National Forest. The Ridge and Valley Pitch Pine – Table Mountain Pine Woodland can be seen in many places including Cranny Crow Overlook at [Lost River State Park](#) or along the North Fork Mountain Trail on the Monongahela National Forest. An old growth example of the Eastern Ridges White Pine - Oak / Heath Forest can be seen along [Anthony Creek near Neola](#) on the Monongahela National Forest.

Conservation issues: The area occupied by successional pine stands in West Virginia is probably decreasing due to changes in land use and this may have a negative effect on some wildlife species. The U. S. Forest Service has used prescribed fires to promote pine habitats in WV's eastern mountains and the [Central Appalachians Fire Learning Network](#) has been established to promote knowledge and restoration of fire adapted ecosystems, including those dominated by pines. There is a region wide [Short Leaf Pine Initiative](#), but no projects to promote restoration of *Pinus echinata* habitats in WV are known. Small stands of short leaf pine may be easily extirpated by logging. Large scale declines in pines caused by infestations of the southern pine beetle (*Dendroctonus frontalis*) were documented in WV in the 1890s, and this, and other insect pests, may continue to be a threat, especially to small occurrences of rare pine associations. These infestations may easily go unnoticed without vigilant monitoring and timely control measures may be difficult to implement. Clifftop pine stands are increasingly impacted by trampling associated with recreational use concentrated around scenic overlooks and rock climbing areas.

Classification:

NatureServe Ecological Systems: Allegheny-Cumberland Dry Oak Forest and Woodland, Central Appalachian Pine-Oak Rocky Woodland, Central Appalachian Dry Oak-Pine Forest, Southern Appalachian Montane Pine Forest and Woodland

USNVC Association WV Scientific Name [Common Name]	Code	G Rank	S Rank	Links
<i>Pinus echinata</i> - <i>Quercus prinus</i> / <i>Vaccinium pallidum</i> / <i>Carex nigromarginata</i> Forest [Shortleaf Pine - Oak Forest]	CEGL004761	G2G3	S2	
<i>Pinus rigida</i> - <i>Pinus virginiana</i> / <i>Porpidia subsimplex</i> Sandstone Pavement Woodland [Pitch Pine - Virginia Pine Sandstone Pavement Woodland]	CEGL004821	G3	S1	
<i>Pinus (pungens, rigida)</i> - <i>Quercus prinus</i> / (<i>Quercus ilicifolia</i>) / <i>Gaylussacia baccata</i> Woodland [Eastern Ridges Pitch Pine – Table Mountain Pine Woodland]	CEGL004996	G4	S3	

<i>Pinus resinosa</i> / <i>Kalmia latifolia</i> - <i>Menziesia pilosa</i> / <i>Polypodium appalachianum</i> Forest [Natural Red Pine Forest]	CEGL006108	G1	S1	
<i>Pinus rigida</i> - <i>Quercus coccinea</i> / <i>Oxydendrum arboreum</i> / <i>Kalmia latifolia</i> Woodland [Western Plateaus Pitch Pine Woodland]	CEGL006557	G4Q	S1	
<i>Pinus virginiana</i> - <i>Nyssa sylvatica</i> / <i>Smilax rotundifolia</i> - <i>Vaccinium pallidum</i> Forest [Cliff Top Virginia Pine Forest]	CEGL007119	G3	S2	
<i>Pinus strobus</i> - <i>Quercus alba</i> - <i>Quercus prinus</i> / <i>Amelanchier arborea</i> / <i>Vaccinium pallidum</i> - (<i>Kalmia latifolia</i>) Forest [White Pine - Oak / Heath Forest]	CEGL008539	G4	S4	
<i>Quercus prinus</i> - <i>Pinus virginiana</i> - <i>Quercus stellata</i> / <i>Vaccinium pallidum</i> / <i>Carex pensylvanica</i> Woodland [Chestnut Oak - Virginia Pine - Post Oak Woodland]	CEGL008540	G3?	S2	

Key to Associations:

1. Semi-natural pine forests and woodlands on relatively productive sites, on abandoned farms and mines and other disturbed sites, and following fire and other stand replacement events. Stands are even-aged and short-lived with little pine regeneration, usually with evidence of succession towards deciduous forest. **Successional Pine Forests and Woodlands** (multiple USNVC associations, not treated further here)
1. Natural pine and pine-oak forests and woodlands, on hot, dry sites, often associated with cliffs and rock outcrops, or on aspects and positions with high solar exposure. Stands may be multi-aged and persistent, with pine regeneration under open canopies, or of shade tolerant species (*Pinus strobus*), or following natural disturbance events. **2**
2. Forests dominated by white pine (*Pinus strobus*) or red pine (*Pinus resinosa*) **3**
2. Forests and woodlands dominated or codominated by yellow pines (*Pinus echinata*, *P. pungens*, *P. rigida*, and *P. virginiana*) **4**
3. Forests codominated by *Pinus strobus* and *Quercus* spp.. **White Pine - Oak / Heath Forest**
3. Forests dominated by red pine (*Pinus resinosa*). **Natural Red Pine Forest**
4. Pine – oak forests with cover by *Pinus echinata* higher than other *Pinus* spp. **Shortleaf Pine - Oak Forest**
4. Pine and pine-oak forests and woodlands with cover by *Pinus echinata* lower than other *Pinus* spp.. *Pinus echinata* usually absent. **5**
5. Open woodlands dominated by *Pinus virginiana* and *Quercus* spp. on hot, dry sites with Devonian shale lithology in the eastern Ridges. **Shale Barrens** (not treated further here, see *WVWV* webpage on [Shale Barrens](#))

5. Pine and pine-oak forests and woodlands without the previous combination of floristic, geological, and geographical characteristics **6**
6. Severely stunted, open woodlands on sloping sandstone pavement in the Ridge and Valley. **Pitch Pine - Virginia Pine Sandstone Pavement Woodland**
6. Woodlands and forests on cliff tops and rocky slopes or on soil, in the Ridge and Valley and other regions of the state. **7**
7. Pine – oak forests with cover by *Pinus virginiana* higher than other *Pinus* spp. **8**
7. Woodlands and forests dominated by *Pinus rigida* and/or *Pinus pungens*. *Pinus virginiana* may be present with lower cover, or absent. **9**
8. Forests and woodlands dominated by *Pinus virginiana* in association with *Quercus prinus*, *Nyssa sylvatica*, and *Oxydendron arborea*, typically on acidic sandstone clifftops. **Cliff Top Virginia Pine Forest**
8. Forests and woodlands with *Pinus virginiana* in association with *Quercus prinus*, *Quercus stellata*, *Quercus rubra*, and *Juniperus virginiana*, on bluffs composed of shale or less sterile sandstone. **Chestnut Oak - Virginia Pine - Post Oak Woodland**
9. Forests and woodlands in the Ridge and Valley and Greenbrier Valley dominated by *Pinus rigida* and/or *Pinus pungens* **Eastern Ridges Pitch Pine – Table Mountain Pine Woodland**
9. Forests and woodlands in the Western Allegheny Plateau and the Cumberland Mountains dominated by *Pinus rigida* **Western Plateaus Pitch Pine Woodland**

Photo gallery:



References:

- Abrams, M., D. A. Orwig and T. E. Demeo. 1995. Dendroecological Analysis of Successional Dynamics for a Presettlement- Origin White-Pine-Mixed-Oak Forest in the Southern Appalachians, USA . Journal of Ecology 83: 123-133. <http://www.personal.psu.edu/faculty/a/g/agl/IOE%20Orwig%20Abrams%201995.pdf>
- Edgar, B. E. and H. P. Griscom. 2017. The Effect of Controlled Burns on Abundance of Woody Species in Appalachian Pine-Oak Forests at Buck Mountain, West Virginia. Natural Areas Journal 37: 30-38. <http://www.bioone.org/doi/full/10.3375/043.037.0106>
- Howard, L. F. 2015. A Quarter-Century of Change Without Fire: The High-Elevation Pitch Pine Community on Panther Knob, Pendleton County, West Virginia. Castanea 80: pp. 193-210. https://www.researchgate.net/publication/288022067_A_Quarter-Century_of_Change_Without_Fire_The_High-Elevation_Pitch_Pine_Community_on_Panther_Knob_Pendleton_County_West_Virginia
- Maxwell, S. 2010. Fire History of a Rimrock Pine Forest at New River Gorge National River, West Virginia. Natural Areas Journal 30: 305-3011. https://www.researchgate.net/publication/232683887_Fire_History_of_a_Rimrock_Pine_Forest_at_New_River_Gorge_National_River_West_Virginia
- Saladyga, T. 2017. Forest disturbance history from 'legacy' pitch pine (*Pinus rigida*) at the New River Gorge, West Virginia. Natural Areas Journal 37: 49-57. <http://www.bioone.org/doi/full/10.3375/043.037.0108>
- Hessl, A. E., T. Saladyga, T. Schuler, P. Clark, and J. Wixoma. 2011. Fire history from three species on a central Appalachian ridgetop. Canadian Journal of Forest Research. 41: 2031-2039. https://www.nrs.fs.fed.us/pubs/jrnl/2011/nrs_2011_hessl_001.pdf
- Asaro, C., L. A. Chamberlin, J. A. Rose, K. Mooneyham, and A. K. Rose. 2017. Mortality of eastern white pine (*Pinus strobus* L.) in association with a novel scale insect-pathogen complex in Virginia and West Virginia. Forest Ecology and Management <https://www.sciencedirect.com/science/article/pii/S0378112717315645#>